

Regional Intelligent Transportation System Architecture Development for New York City

Implementation Plan

New York City Sub-Regional ITS Architecture

Final Report

February 24, 2005

By

ConSysTec Corp.

POB 517, 17 Miller Ave.

Shenorock, NY 10587-0517

914-248-8466

Prepared for

New York State Department of Transportation

D008598 PIN X735.48

**Traffic System Services for Traffic & Safety, Preliminary & Final Design Services,
Phases I-VI, Advanced Traffic Management System (ATMS) on Highways**

Table of Contents

1	Introduction.....	1
1.1	Background	1
1.2	Intended Audience	1
1.3	Purpose.....	2
1.4	Report Organization.....	2
2	Regional ITS Architecture	4
2.1	What are Intelligent Transportation Systems.....	4
2.2	National ITS Architecture	4
2.3	FHWA Final Rule and FTA Final Policy on ITS Architecture and Standards...	5
2.4	New York City Sub-Regional ITS Architecture	6
3	Implementation Strategy	8
3.1	Introduction.....	8
3.2	Regional Priorities.....	8
3.2.1	Customized Market Package Diagrams	8
3.3	Regional Priorities.....	10
3.3.1	Transportation Planning Factors	10
3.4	Project Sequence	13
3.4.1	Projects versus Market Packages	13
3.4.2	NYCSRA ITS Architecture Projects	13
3.5	NYMTC Transportation Improvement Program ITS Projects	48
4	Applicable ITS Standards	57
4.1	Introduction.....	57
4.2	What are ITS Standards?.....	57
4.2.1	ITS Standards Program.....	57
4.2.2	Current Status	60
4.2.3	Web Resources.....	74
4.3	Applicable Standards for the Region.....	74
4.4	Recommendation – ITS Standards.....	74
5	List of Agreements.....	80
5.1	Institutional Agreements.....	80
5.2	Types of Agreements	81
5.2.1	Handshake Agreements.....	83
5.2.2	Memorandum of Understanding	83
5.2.3	Interagency Agreement	83
5.3	NYCSRA List of Agreements	83
5.3.1	Existing Agreements.....	83

Revision History

Filename	Version	Date	Author	Comment
ImplementationPlan-Outline.doc	0.01	11/11/03	P. Chan	First draft – Outline submitted to F. Lai/NYSDOT.
ImplementationPlanV.02.doc	0.02	02/23/04	P. Chan	Second draft – For internal review.
ImplementationPlanV.03.doc	0.03	04/20/04	P. Chan	Third draft – Added Agreements.
ImplementationPlanV.03-msi	0.03	4/23/04	M. Insignares	Third draft – Internal Review
ImplementationPlanV.04.doc	0.04	4/23/04	P. Chan	Fourth draft – Submitted to NYCSRA Steering Committee
ImplementationPlanV.05.doc	0.05	6/28/04	P. Chan	Fifth draft – Includes comments from the NYCSRA Working Group meeting.
ImplementationPlanV.06.doc	0.06	11/03/04	P. Chan	Includes comments from the NYCSRA Working Group meeting.
ImplementationPlanV.07.doc	0.07	11/04/04	M. Insignares	Document review.
ImplementationPlanV.08.doc	0.08	11/16/04	M. Insignares	Removed entries in Agency Project Priorities until final agency review.
ImplementationPlanV.09.doc	0.09	11/23/04	M. Insignares	Minor revisions to clarify section on project sequence.
ImplementationPlanV.10.doc	0.10	2/15/05	M. Insignares, T.Harris	Final edits and changes to table 3.2, and 3.3 on project sequence. Added table 3.4 to show ITS projects in TIP.
ImplementationPlan.V.11.doc	0.11	2/24/2005	M. Insignares	Added paragraph to point out the need to identify the ITS Architecture Project ID when submitting projects for the Transportation Improvement Plan. See Section 3.5.

1 Introduction

1.1 *Background*

In December 2002, Consensus Systems Technologies Corp. (ConSysTec), was sub-contracted by Edwards and Kelcey, to develop a New York City Regional ITS Architecture for the five boroughs of New York City. This work was performed under a supplemental agreement (S.A. #26) between Edwards and Kelcey and New York State Department of Transportation, Contract D008598, PIN X735.48, Traffic System Services for Traffic & Safety, Preliminary & Final Design Services, Western Queens Regional Area.

Under this supplemental agreement, ConSysTec was to develop a New York City Sub-Regional ITS Architecture (NYCSRA) that was in accordance with the April 8, 2001 Final FHWA Rule and FTA Policy on Intelligent Transportation System Architecture and Standards. This Rule/Policy required that each region deploying ITS Projects funded through the highway trust fund must develop a “regional ITS architecture”. This regional ITS architecture, which is to be based on the National ITS Architecture, is intended to foster the deployment of integrated regional ITS systems in a cost-effective, practical manner.

With the participation and support of various transportation agencies in the New York City region, the NYCSRA was developed through a series of functional area meetings, workshops, and individual discussions. The results and outputs of the NYCSRA, which includes detailed interconnects and information flows based on the customized market packages, are presented in a separate document.

However, the Final FHWA Rule and FTA Policy on Intelligent Transportation System Architecture and Standards also require that each region and its participating stakeholders, must implement the regional ITS architecture once it has been developed. This document, Implementation Plan - New York City Sub-Regional ITS Architecture, presents the various outputs that flow from the NYCSRA. These outputs include a list of projects, a project sequence, a list of standards that can be used to implement the projects, and a list of agency agreements needed to support the needed services identified in the NYCSRA.

This document is the second of four documents that comprise the New York City Sub-Regional ITS Architecture. The first document contains the descriptions of the ITS systems and the identified interfaces between these systems. The third document, the Use Plan, describes the different methods that the NYCSRA can be used. The fourth document, the Maintenance Plan, presents the change management process agreed upon by the stakeholders for modifying and updating the NYCSRA as projects are implemented, new transportation services are needed, and as regional priorities and goals change. .

1.2 *Intended Audience*

Managers, planners and project managers from the stakeholder agencies will benefit most from this Implementation Plan document. At least one chapter in this Implementation Plan is

dedicated to each type of these users. For managers or decision-makers, this Implementation Plan document will guide these managers on the institutional agreements necessary to implement the regional ITS architecture. Without these agreements, it will be difficult to fully realize the benefits of deploying ITS systems. For planners, this Implementation Plan document will guide these planners in developing their transportation and future project plans. It will identify ITS projects that are needed in the region and assist in defining the scope of work. For project managers implementing projects, this document will guide project managers with functional requirements and standards that may be applicable to those projects.

In addition to managers, planners and project managers, this Implementation Plan document will also guide federal agencies and other entities responsible for checking that ITS projects complies with the developed NYCSRA.

1.3 Purpose

This Implementation Plan document presents the outputs from the current New York City Sub-Regional ITS Architecture and how they can be used to implement this architecture. These outputs identify the projects required to implement the current architecture, the sequence of projects to effectively meet the existing regional goals and needs, and the institutional agreements required to enable the efficient implementation of these projects. These outputs also presents the ITS standards that are currently available which will support the implementation of ITS systems in the region. These outputs will be introduced and presented in this document, based on the current version of the architecture. More detailed information on how to sequence projects, identify and specify ITS standards, and how to implement the projects will be presented in the Use Plan document.

1.4 Report Organization

This Implementation Plan has been prepared in support of the New York City Sub-Regional ITS Architecture. This Implementation Plan is broken into 6 chapters to facilitate the different types of implementer:

- **Chapter 1: Introduction** - Provides introductory and background information about this document, its purpose and why it is needed.
- **Chapter 2: Regional ITS Architecture** – This chapter contains a description of National ITS Architecture, a review of the FHWA Rule and FTA Policy, and a summary of the New York City Sub-Regional ITS Architecture.
- **Chapter 3: Implementation Strategy** – This chapter presents how project managers may use the NYCSRA to develop project scopes, functional requirements, and what standards to specify.
- **Chapter 4: List of Standards** – This chapter presents a list of standards that may be applicable to the projects identified by the NYCSRA.
- **Chapter 5: List of Agreements** – This chapter identifies interagency agreements that may be required to support the implementation of the NYCSRA.

All readers who are unfamiliar with regional ITS architectures and their benefits should skim through Chapter 1, Introduction and read Chapter 2, which provides information about regional ITS architectures and their uses.

Planners should read Chapter 3, which provides information on planning ITS projects and project sequencing.

Project managers should skim through Chapter 3 to obtain a general understanding of how their specific projects fit in the scheme of the regional ITS architecture and the regional goals and needs. Chapter 4 then provides project managers with a list of standards that may be appropriate for each identified project. This chapter also provides additional information about each standard, including current version of the standard, its status, and contact information.

Managers should then read Chapter 5, which discusses some of the institutional issues, and the agreements that may be needed to facilitate the implementation of the regional ITS architecture.

2 Regional ITS Architecture

2.1 *What are Intelligent Transportation Systems*

Until recently, the building and improvement of a transportation infrastructure meant the civil and mechanical construction or enlargement of roads, bridges and tunnels, as well as the associated enterprises that provide the vehicles (including public and private transit agencies, trucking, public safety and personal) that travel on the infrastructure. The use of ITS technologies to more efficiently operate and manage a region's transportation systems is increasingly important as travel demand steadily increases and the opportunities to build new infrastructure becomes prohibitively expensive because of the high costs and lack of available resources, including land space. This makes the deployment of ITS technologies to make more efficient use of the existing transportation network an attractive alternative.

As one component of a larger transportation infrastructure, ITS refers to the application of data processing, data communications, and systems engineering methodologies with the purpose of improved management, safety and efficiency of the surface and public transportation network. These ITS technological and management advances can address the following: the overall mobility needs of a region, the travel requirements of transportation network users, and the development, operation, management and maintenance needs of the transportation system providers, both public and private.

ITS provides agencies and their customers a means to address current urban problems, as well as anticipate and address future demand through a coordinated, intermodal approach to transportation. The application of ITS allows agencies to use modern technologies to better monitor their systems, providing the agencies with more accurate information to make more informed decisions on safely operating their systems. ITS also allows agencies to distribute this information to other agencies and to the public, so each can make more informed transportation decisions.

2.2 *National ITS Architecture*

The National ITS Architecture provides a common framework for planning, defining, and integrating intelligent transportation systems and defines:

- The functions (e.g., gather traffic information or request a route) that are required for ITS.
- The physical entities or subsystems where these functions reside (e.g., the roadside or the vehicle).
- The information flows and data flows that connect these functions and physical subsystems together into an integrated system.

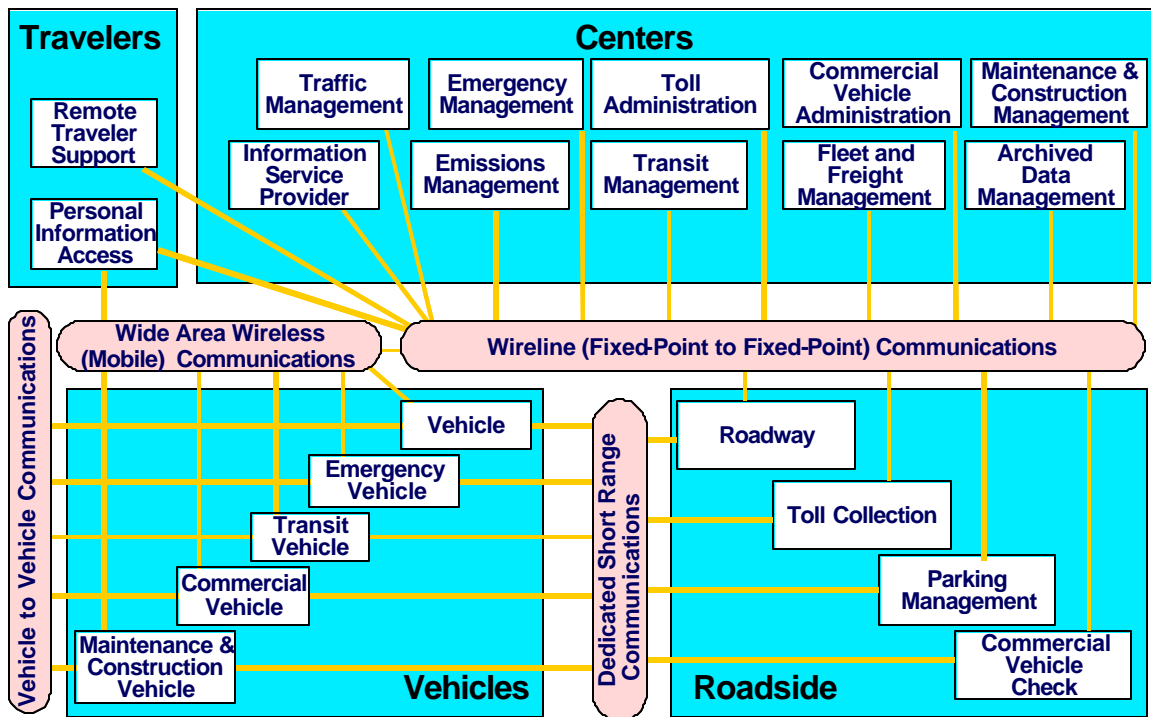


Figure 2-1. National ITS Architecture Version 4.0 – Sausage Diagram

The National ITS Architecture also introduces the concept of Market Packages. Market packages define potential ITS deployments in both narrative and diagrammatic form. Market package diagrams show which ITS systems are required to work together (across different operators, whether public or private) to deliver a given transportation service. Market packages are designed to address specific transportation problems and needs and relate back to the ITS services and their more detailed requirements.

2.3 FHWA Final Rule and FTA Final Policy on ITS Architecture and Standards

In 1997, Congress passed the Transportation Equity Act for the 21st Century (TEA-21) to address the need to begin working toward regionally integrated transportation systems. To implement Section 5206(e) of TEA-21, which requires ITS projects to conform to the National ITS Architecture (NITSA) and Standards, the Federal Highway Administration (FHWA) issued 23 Code of Federal Regulations Parts (CFR) 655 and 940, entitled "Intelligent Transportation Systems (ITS) Architecture and Standards" on April 1, 2001. Concurrently, the Federal Transit Administration (FTA) issued a Final Policy entitled "National ITS Architecture Policy on Transit Projects". The intent of the FHWA Final Rule (commonly referred to as Rule 940) and Final FTA Policy is to provide policies and procedures by which to implement ITS projects in an efficient manner and to conform to the National ITS Architecture.

The purpose of the Final Rule/Final Policy is to accelerate the deployment of integrated Intelligent Transportation Systems (ITS) by requiring development of a regional ITS architecture. This regional ITS architecture, which is based on the National ITS Architecture but customized to meet a region's particular needs, provides a plan by which a region can efficiently deploy ITS systems in a manner allowing for integration of these systems.

The Final Rule/Final Policy defines 9 required components that make up a regional ITS architecture. These components are:

1. Description of the region
2. Identification of participating agencies and other stakeholders
3. Operational concept
4. Agreements required for implementation
5. System functional requirements
6. Interface requirements
7. Identification of ITS standards
8. Sequence of projects required for implementation
9. Process for maintaining your Regional ITS Architecture

The contents of this document satisfies the last requirement of the FHWA Final Rule/FTA Final Policy.

2.4 *New York City Sub-Regional ITS Architecture*

With the participation and support of various transportation agencies in the New York City region, the NYCSRA was developed through a series of functional area meetings, workshops, and individual discussions. These functional area meetings, or workshops, focused on the issues, services, and interfaces of a set of stakeholders from a common area of ITS.

A Draft and Final functional area workshop were held for each area of ITS relevant to the New York City region. These areas were Traffic Management, Advanced Public Transportation, Incident Management/Emergency Management, Commercial Vehicles/Electronic Toll Collection/Parking, Maintenance and Construction, and Traveler Information Systems.

In the Draft Workshop, stakeholders made initial decisions about what stakeholders will participate in which ITS services, and key architectural decisions were framed and collected. "Customized" Market Packages were interactively created during the workshops. The emphasis of the first workshop was to determine what information is exchanged between which stakeholder ITS elements, plus a sense of the priority of various services. The draft architecture for the functional area was published for stakeholder review on the website shortly after the draft workshop. Stakeholders commented on the draft ITS architecture and their comments collected, categorized and analyzed.

In the Final functional area workshop, the ITS architecture was reviewed, including a detailed review of comments received beforehand and their proposed resolution. Critical in the stakeholder comment review were those comments where a change was required multiple stakeholder concurrence. Other comments (not submitted beforehand) from the participating stakeholders were also welcome and encouraged. Comments were generally stimulated by the review of the draft architecture as it pertained to the functional area.

A draft ITS deployment plan and integration strategy was then presented based on stakeholder input from the workshops. Stakeholder comments were collected, and used afterwards to develop the updated draft deployment plan and integration strategy documentation for each functional area. The results and outputs of the NYCSRA, which includes detailed interconnects and information flows based on the customized market packages, are presented in the Implementation Plan document.

3 Implementation Strategy

3.1 *Introduction*

The development of the New York City Sub-Regional ITS Architecture to this point has focused on creating and documenting a vision of what ITS services are desired for the New York City region for the next twenty years. This vision has focused around the Regional Transportation Plan (RTP) and the Transportation Improvement Plan (TIP); by determining what the regional transportation goals are, what transportation services are needed in the region to attain those goals, and what interfaces and information flows are needed between stakeholders to support those transportation services.

This chapter will discuss the next step in the regional ITS architecture process, which is to define the projects to develop and build those ITS systems to implement the NYCSRA. By implementation, it is meant to identify the projects and functional requirements to build the software that will realize the desired transportation services (interfaces and information flows) that have been defined by the NYCSRA.

In addition, this chapter will recommend a sequence of projects for implementing the NYCSRA, as required in FHWA Rule 940.9(d)6 and FTA National ITS Architecture Policy Section 5.d. The information developed in this chapter will satisfy this requirement.

Three steps are used towards the developing a project sequence for the NYCSRA. The first step is to document the regional priorities, that is, to prioritize the (ITS) transportation services desired by the region. The customized market package diagrams created earlier in the regional ITS architecture development process will be used as the basis for prioritizing these transportation services.

The second step is to define projects for the region. Again, the customized market package diagrams will be used as the basis for which ITS projects will be defined.

Finally, the outputs from the first two steps will be combined to develop a project sequence for the NYCSRA.

The three steps described in this chapter are not necessarily the only method to create a project sequence. Other methods can be used to get to develop a project sequence, particularly for smaller, less complex regions. However, this process used is one logical procedure to develop a project sequence for the New York City region.

3.2 *Regional Priorities*

3.2.1 Customized Market Package Diagrams

The first step for developing a project sequence is to document the regional priorities of the region, that is, prioritize the (ITS) transportation services desired by the region. ITS transportation services desired by the region are reflected in the customized market package diagrams created earlier in the regional ITS architecture development process. Market

packages collect together two or more system elements (from the same or multiple stakeholders) that must work together to deliver a given transportation service and the architecture flows that connect them and other important external systems on the boundary of ITS. In other words, they identify the ITS system elements required to implement a particular transportation service.

These customized market packages diagrams were derived from the market packages defined in the National ITS Architecture. However, these market packages were customized to reflect the unique systems and connections in the New York City region. The customized market packages defined for the New York City region were tailored to fit, separately or in combination, to meet the real-world transportation problems and needs of the region. The customized market packages document each stakeholder's current and future roles and responsibilities in the operation of its systems to provide a transportation service for the region. Market packages, customized for the specific consensus requirements, represent the information that may be exchanged between specific stakeholder elements to effect specific sets of user services.

The customized market package diagrams for the New York City region are organized by transportation functional area as follows:

- **Archived Data Management Systems (AD)** - These are systems used to collect transportation data for use in non-operational purposes (e.g. planning and research).
- **Advanced Public Transportation Systems (APTS)** - These are systems used to more efficiently manage fleets of transit vehicles or transit rail. This functional area also includes systems to provide transit traveler information both pre-trip and during the trip.
- **Advanced Traveler Information Systems (ATIS)** - These are systems used to provide static and real time transportation information to travelers.
- **Advanced Traffic Management Systems (ATMS)** - These are traffic signal control systems that react to changing traffic conditions and provide coordinated intersection timing over a corridor, an area, or multiple jurisdictions. This functional area also include systems used to monitor freeway (or tollway) traffic flow and roadway conditions, incident management and provide strategies such as ramp metering or lane access control to improve the flow of traffic on the freeway. These systems may also provide information to motorists on the roadway.
- **Commercial Vehicle Operations (CVO)** - These are systems used to more efficiently manage commercial fleets, monitor freight movements, hazardous materials movement, safety inspections, and electronic clearance (both domestic and international).
- **Emergency Management (EM)** - These are systems that provide emergency call taking, public safety dispatch, and support emergency operations center operations.
- **Maintenance and Construction (MC)** - These are systems used to manage the maintenance of roadways and equipment in the region, including winter snow and ice clearance, and construction operations.

3.3 *Regional Priorities*

The previous steps for project implementation of the NYCSRA identified the regional priorities for ITS transportation services, and identified packages by which to implement these ITS transportation services. The final step in this ITS project planning process is to develop a project sequence, or project priority, for deploying these ITS projects.

The integration of ITS in the region is “implemented” through many individual ITS projects and private sector initiatives that occur over many years, or possibly decades. Together, these projects and initiatives will require a significant investment by the public agencies and private companies in the region. To most efficiently use this investment and to yield the most benefits to the public up front, it is important to define a sequence, or ordering, to implement ITS projects and systems that will contribute to the integrated regional transportation system.

A good list of project priorities is dependent on two things:

- Transportation planning factors that are used to prioritize projects (e.g., identify early winners)
- Project dependencies that require successive ITS projects to build on one another.

3.3.1 Transportation Planning Factors

Transportation planning factors that may affect the project priorities include cost-benefit ratios, technical feasibility, institutional issues, financial constraints and the strategic priorities of the region. These factors may also include data or policy decisions that support the projects. For example, the lack of a common database identifying street names may impede properly sharing road network information, since there is no agreement on how locations are established.

Agency priorities and local priorities also will influence the actual sequencing of projects. Priorities can be established by reviewing the candidate projects and either identifying them as short-, medium- or long- term projects; or by identifying them as High, Medium, or Low priority projects.

High priority projects are those projects that serve the region’s, or agency’s, immediate needs and goals and are generally identified as short-term projects. For example, public safety, public security, and emergency responses are areas generally identified as critical goals to the regional plan, thus, projects that provide these transportation services or that satisfy these goals can be considered high priority projects. High priority projects may also include “early-winner” projects, that is, those projects that will provide immediate benefits to the region.

Medium priority projects are recommended for implementation between six and ten years in the future, and are identified as medium-term projects. These projects generally build on the existing ITS systems and infrastructure to provide enhanced functionality and expanded geographic coverage.

Low priority projects are recommended for implementation between eleven and twenty years in the future and are intended to complete the comprehensive ITS deployments in the region, and are defined as long-term projects. Some projects are rated as low priority because the

technologies to deploy the desired transportation services are not yet available or prohibitively expensive.

Table 3-1 lists the market package priorities (as defined in the NYMTC Integration Strategy) for the NYCSRA region, followed by their regional priority. The market package regional priorities identified are only guidelines for ITS services desired by the region. The market package regional priorities serves as a baseline and may be modified as determined to be necessary by the region. Each agency will ultimately "fund" projects based on their own budgets, policies and needs.

Table 3-1. Regional Market Package Priority

Transportation Service/Market Package	Regional Market Package Priority
ATMS01 - Network Surveillance	High
ATMS02 - Probe Surveillance	High
ATMS03 - Surface Street Control	High
ATMS04 - Freeway Control	High
ATMS05 - HOV and Reversible Lane Management	High
ATMS06 - Traffic Information Dissemination	High
ATMS07 - Regional Traffic Control	High
ATMS08 - Incident Management System	High
ATMS10 - Electronic Toll Collection	High
ATMS11 - Emissions Monitoring and Management	Medium
ATMS13 - Standard Railroad Grade Crossing	High
ATMS14 - Advanced Railroad Grade Crossing	High
ATMS15 - Railroad Operations Coordination	Low
ATMS16 - Parking Facility Management	Medium
ATMS18 - Reversible Lane Management	High
ATMS20 - Drawbridge Management	Medium
MC01 - Maint. and Const. Vehicle Tracking	High/Medium
MC02 - Maint. and Const. Vehicle Maintenance	Low
MC03 - Road Weather Data Collection	High
MC04 - Weather Information Processing and Distribution	High
MC05 - Roadway Automated Treatment	Medium
MC06 - Winter Maintenance	Medium

Transportation Service/Market Package	Regional Market Package Priority
MC07 - Roadway Maintenance and Construction	Medium
MC08 - Work Zone Management	Medium
MC09 - Work Zone Safety Monitoring	Low
MC10 - Maint. and Const. Activity Coordination	High
APTS1 - Transit Vehicle Tracking	High
APTS2 - Transit Fixed-Route Operations	High
APTS3 - Demand Response Transit Operations	Medium
APTS4 - Transit Passenger and Fare Management	Medium
APTS5 - Transit Security	High
APTS6 - Transit Maintenance	Medium
APTS7 - Multi-modal Coordination	Medium
APTS8 - Transit Traveler Information	High
ATIS1 - Broadcast Traveler Information	High
ATIS2 - Interactive Traveler Information	Medium
ATIS5 - ISP Based Route Guidance	Medium
AD1 - ITS Data Mart	Medium
AD2 - ITS Data Warehouse	Medium
AD3 - ITS Virtual Data Warehouse	Medium
EM1 - Emergency Response	High
EM2 - Emergency Routing	High/Medium
EM4 - Roadway Service Patrols	High
CVO01 - Fleet Administration	Medium/Low
CVO02 - Freight Administration	Low
CVO03 - Electronic Clearance	High
CVO04 - CV Administrative Processes	High
CVO06 - Weigh-In-Motion	Medium
CVO10 - HAZMAT Management	High

3.4 Project Sequence

The next step is to define projects to develop and build those ITS systems to implement the transportation services identified in the NYCSRA. By implementation, it is meant to build the software that will create the interfaces and communicate the information flows indicated in the customized market package diagrams to provide the transportation services identified by the NYCSRA.

3.4.1 Projects versus Market Packages

Before continuing, it is important to clarify what is meant by a project in the context of the NYCSRA. A Project, for the purposes of the regional ITS architecture is a:

- Set of functional requirements and (data) interfaces necessary to provide a transportation service
- Set of recommendations on how to plan and phase ITS elements

A Project, in the context of the regional ITS architecture do not have to be:

- A list of detailed scopes of work with a defined budget to be implemented by the agencies.
- A recommendation with direct effects on existing agency projects

In other words, projects for the purposes of the regional ITS architecture are not “projects” in the traditional sense, consisting of a contract with a scope of work and a defined budget. Rather, a “project” in the regional ITS architecture are a set of requirements, which together provide a transportation service. This transportation service may be monitoring the transportation network using video cameras, controlling traffic signals, tracking the location of transit vehicles, or disseminating transportation information to the public.

To emphasize this distinction, the term “packages” will be used instead of projects for the remainder of this Chapter to indicate the functional requirements related to these “packages” can be part of a larger project, such as a highway construction project.

3.4.2 NYCSRA ITS Architecture Projects

For the NYCSRA, potential ITS project were derived from the customized market package diagrams. Each market package diagram revolves around a transportation service and around at least one stakeholder and a stakeholder system. Each project minimally consists of two ITS systems (elements) and the information flows between these two systems. Package definition can be easily expanded to include information flows and interfaces with other ITS systems, particularly if those ITS systems are owned by the same agency or stakeholder. It is also important to recognize that often, several interfaces between multiple systems are needed to provide a transportation service, which is the overall goal of each project.

For example, Electronic Toll Collection requires data interfaces/flows between a vehicle and the electronic toll collection field equipment, and between the field equipment and the toll administration systems to provide complete electronic toll collection services. Data flows between just two of those ITS Elements will not provide a complete transportation service.

Certain market package diagrams also may result in multiple packages, either because it actually supports multiple packages, or because it involves several stakeholders. In many cases, packages can be combined to create larger “packages” or actual projects. However, the advantage of recognizing smaller-sized packages is that more opportunities may arise if the package definitions are small. For example, one transit package may be the installation of on-board sensors on transit vehicles to monitor and report vehicle status conditions, along with the hardware equipment and software to analyze the status information. A separate transit package may take the status information to schedule maintenance of those vehicles, if necessary.

Table 3-2 identifies the transportation packages that have been identified for the NYCSRA, sorted by Stakeholder. These ITS Architecture projects were derived by analyzing each customized market package diagram and searching for potential, and logical projects.

The table provides an ITS Architecture project identifier, a lead agency, a description of the project, market package dependencies that may affect the deployment of the package and its services. The description also suggests opportunities where agencies may procure and deploy systems simultaneously or jointly, for synergies or economies of scale. Finally, the table shows which customized market package diagrams may apply.

Table 3-3, which follows Table 3-2, includes recommendations for Port Authority of New York & New Jersey for consistency with the NYMTC Region and NYCSRA.

Table 3-2. ITS Architecture Project Sequence

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
1	FDNY	Emergency Routing – FDNY	This project provides the hardware, communications infrastructure and the software to support automatic vehicle location and dynamic routing of FDNY vehicles. Phase 2 of This project supports an interface to the Joint TMC to electronically collect road network and construction information for use in the dynamic routing of the vehicles.	EM2		High	EM02-2
2	IAG	Expansion of E-ZPass	This project supports the continued expansion of the E-ZPass electronic toll collection system. This expansion includes support for new applications beyond toll collection, such as parking. This project also includes development and application of new technologies, such as a regional smart card and new electronic toll tags using 5.9 Ghz technologies.	ATMS10		High	ATMS10-1
3	IAG	E-ZPass Parking Facilities – IAG	This project provides for the electronic collection of parking fees using the E-ZPass toll tags. This project includes the deployment of the E-ZPass readers at parking facilities, and the required interfaces to the E-ZPass Customer Service Centers to support the financial transactions.	ATMS16	ATMS10	Medium	ATMS16-2
4	Joint TMC	Traveler Information Systems - Joint TMC	This project is an expansion of the Traveler Information Systems operated from the Joint TMC. Traveler information includes road network conditions, construction information, traffic incidents, and traffic video images. The deployment of This project consists of three parts. The first part is the dissemination of traffic information to current travelers. This includes deploying dynamic message signs and highway advisory radios in the field. The second part is the dissemination of traffic information to the general public. This includes providing traffic information to the NYCDOT traveler information website, information service providers, the media, and to TRANSCOM. The third part is the interface to external sources of traveler information, including MTA NYCT Buses, NYCDOT Franchise Buses, and other divisions of NYCDOT, NYPD, and NYSDOT.	ATIS2, ATMS06, APTS7, ATMS07	ATMS01	Medium / High	ATIS2-10, ATMS06-01, APTS7-3, ATMS07-04, ATMS07-05, ATMS07-08

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
5	Joint TMC	Regional Traffic Control - Joint TMC	This project supports the sharing of traffic information, such as traffic incidents, between the Joint TMC and other regional transportation and emergency management agencies. Traffic information to be shared include status of traffic devices (e.g., messages on dynamic message signs), traffic incident reports and status, and traffic images. This project includes developing data interfaces to other regional systems, including NYPD systems, IIMS, NYC Office of Emergency Management, MTA Bridges and Tunnels, transit agencies, and TRANSCOM.	ATMS07	ATMS01	High	ATMS07-4, ATMS07-5
6	Joint TMC	Incident Management - Joint TMC	This project provides the interfaces from the Joint TMC to other regional emergency management centers in New York City. These interfaces enable the sharing of traffic incident information, including incident information, incident status, road network conditions, and requests for resources. This project includes the hardware and software to enable these functions. Agencies include FDNY, NYPD, NYC Department of Environmental Protection, NYC Department of Sanitation, MTA Bridges and Tunnels, NYC Office of Emergency Management, TRANSCOM, and the Port Authority of New York New Jersey through the TRANSCOM Regional Architecture Server.	ATMS08		High	ATMS08-01, ATMS08-02
7	Joint TMC	Emergency Response Coordination - Joint TMC	This project provides the interfaces from the Joint TMC to emergency management centers to transmit real-time road network and construction information. This information may be used to support dynamic routing of vehicles.	EM1		High	EM01-4
8	Joint TMC	Weather Information Processing and Distribution - Joint TMC	This project uses road environmental and weather data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc., so system operators can make decisions on corrective actions to take. This project also supports the dissemination of this information to other departments and agencies. This project includes the hardware, software, and communications infrastructure to support the processing and distribution of this data.	MC04	MC03	High	MC04-4, MC04-5

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
9	Joint TMC	Winter Maintenance Systems - Joint TMC	This project supports winter road maintenance, including snow plow operations, roadway treatment, and other snow and ice control activities. This project consists of three parts. Part one collects the sensor data concerning the environmental conditions of the roadway. Part two processes the information to schedule winter maintenance activities, determine appropriate responses, and track and manage response operations. Part three disseminates the information to the response vehicles, response departments, and other interested agencies. The package includes hardware; data interfaces, software, and communications infrastructure to support the processing and distribution of data, and to manage and schedule activities.	MC06	MC03	Medium	MC06-5, MC06-6
10	Joint TMC	Maintenance and Construction Activity Coordination - Joint TMC	This project supports the dissemination and coordination of maintenance and construction activities with other agencies. This project also supports the dissemination of these activities to information service providers. This project includes the hardware, software, and data interfaces to support these activities.	MC07, MC10		Medium/High	MC07-3, MC10-3, MC10-4
11	MTA Bridges and Tunnels	MTA Bridges and Tunnels Archive	This project provides a data archive for MTA Bridges and Tunnels operations. Information collected by the archive includes road network conditions, construction schedules, traffic incidents, and traffic counts. This project provides the hardware, software, the interfaces, and the communications infrastructure to develop and maintain the archive.	AD1		Medium	AD1-6, AD1-7
12	MTA Bridges and Tunnels	Interactive Traveler Information - MTA Bridges and Tunnels	This project is the deployment of an interactive MTA Bridges and Tunnels traveler information system to provide tailored information in response to a traveler request. This project "pushes" traveler information to a traveler based on a submitted profile. Personal devices supported include phones, personal digital assistants (PDAs), and kiosks.	ATIS2		Medium	ATIS2-02, ATIS2-03

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
13	MTA Bridges and Tunnels	Traffic Surveillance - MTA Bridges and Tunnels	<p>This project is an expansion of the existing traffic surveillance network. This includes the installation of various detector technologies on MTA Bridges and Tunnels roadways and ramps, including loop detectors, microwave detectors, and CCTV cameras. An extension of this project provides the processed traffic information and video images to traveler information systems.</p> <p>Regional Project Considerations: This project may be deployed with other packages as part of an overall Advanced Traffic Management System.</p>	ATMS01		High	ATMS01-8
14	MTA Bridges and Tunnels	TRANSMIT Expansion - MTA Bridges and Tunnels	This project is an expansion of the existing TRANSMIT system to extend coverage to the MTA Bridges and Tunnels facilities that do not already have TRANSMIT readers. This project includes the hardware, field equipment, and extending software capabilities, if needed.	ATMS02		High	ATMS02-1
15	MTA Bridges and Tunnels	Advanced Traffic Management System - MTA Bridges and Tunnels	This project is an expansion of the existing Advanced Traffic Management System for MTA Bridges and Tunnels. This project extends the capabilities of the existing Advanced Traffic Management System and includes additional hardware, software, field equipment such as lane control signals, and the communications infrastructure.	ATMS04	ATMS01	High	ATMS04-5
16	MTA Bridges and Tunnels	Traveler Information Systems - MTA Bridges and Tunnels	This project is an expansion of the Traveler Information System operated by MTA Bridges and Tunnels. Traveler information includes road network conditions, construction information, traffic incidents, and traffic video images. The deployment of This project consists of two distinct parts. The first part is the dissemination of traffic information to current travelers through dynamic message signs and highway advisory radios. The second part is the dissemination of traffic information to the general public. This includes providing traffic information to the MTA traveler information website, other information service providers, the media, and to TRANSCOM. The package includes the data interfaces, the hardware, software, and communications infrastructure to support these functions.	ATIS2, ATMS06	ATMS01	Medium / High	ATIS2-02, ATIS2-03, ATMS06-02

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
17	MTA Bridges and Tunnels	Regional Traffic Control - MTA Bridges and Tunnels	This project supports the sharing of traffic information, particularly traffic incidents, between MTA Bridges and Tunnels and other regional transportation and emergency management agencies. Traffic information to be shared include status of traffic devices (e.g., messages on dynamic message signs), traffic incident reports and status, and traffic images. This project includes the data interfaces to other regional systems, including TRANSCOM, the Joint TMC, and the NYC Office of Emergency Management.	ATMS07	ATMS01	High	ATMS07-03
18	MTA Bridges and Tunnels	Incident Management - MTA Bridges and Tunnels	This project provides the interfaces from the MTA Bridges and Tunnels to other regional emergency management centers in New York City. These interfaces enable the sharing of traffic incident information, including incident information, incident status, road network conditions, and requests for resources. This project includes the hardware and software to enable these functions.	ATMS08	ATMS01	High	ATMS08-03
19	MTA Bridges and Tunnels	Reversible Lane Management - MTA Bridges and Tunnels	This project provides for the management of reversible lane facilities. This project includes hardware equipment and software to coordinate the field equipment controlling reversible lanes, and sensors to detect wrong-way vehicles.	ATMS18	ATMS01, ATMS04	High	ATMS18-1
20	MTA Bridges and Tunnels	Drawbridge Management - MTA Bridges and Tunnels	This project provides for the management of drawbridges. This project consists of two parts. The first part provides the monitoring, control, and coordination of the control devices at the draw bridge. The second part provides the interfaces to disseminate the current and forecasted status of the drawbridge to travelers via information systems (e.g., dynamic message signs) and information service providers.	ATMS20		Medium	ATMS20-2
21	MTA Bridges and Tunnels	HAZMAT - MTA Bridges & Tunnels	This project provides the hardware and software to electronically obtain hazmat material information from commercial vehicles in distress, or from the commercial vehicle operator/shipper. This information is obtained upon emergency notification from the commercial vehicles.	CVO10		High	CVO10-1

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
22	MTA Bridges and Tunnels	Electronic Clearance - MTA Bridges and Tunnels	This project provides the system to electronically access the credentials of commercial vehicles.	CVO03		High	CVO03-1
23	MTA Bridges and Tunnels	Commercial Vehicles Administration System - MTA Bridges and Tunnels	This project provides for electronic application, processing, fee collection, issuance and distribution of credentials to commercial vehicles. This includes issuing permits for carrying HAZMAT materials, and overdimension vehicles.	CVO04		High	CVO04-2
24	MTA Bridges and Tunnels	Commercial Vehicle Overdimension Detection System - MTA Bridges & Tunnels	This project provides hardware equipment, communications infrastructure and software to support the detection of overdimension vehicles.	CVO06		Medium	CVO06-1
25	MTA Bridges and Tunnels	Emergency Routing - MTA Bridges and Tunnels	This project provides the hardware, communications infrastructure and the software to support automatic vehicle location and dynamic routing of MTA Bridges and Tunnels emergency response vehicles. Phase 2 of This project supports an interface to electronically collect current road network and construction information for use in the dynamic routing of the vehicles.	EM2		High	EM02-4
26	MTA Bridges and Tunnels	Maintenance Vehicle Tracking - MTA Bridges and Tunnels	This project provides the hardware and software to determine maintenance vehicle position either by the vehicle (GPS), by the communications infrastructure, beacons, or a combination.	MC01		High	MC01-3
27	MTA Bridges and Tunnels	Maintenance Tracking - MTA Bridges and Tunnels	This project provides the hardware and software to manage routine and corrective maintenance activities and perform vehicle maintenance scheduling. This project includes sensors on board maintenance and construction vehicles to monitor system status. The on board sensors may be monitored at the maintenance garage, or through wireless means while the maintenance vehicle is in service. This project is phased to initially install on-board sensors on existing maintenance vehicles in phases. The second phase is to purchase software to perform maintenance scheduling of vehicles at the garages.	MC02	MC01	Low	MC02-2

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
28	MTA Bridges and Tunnels	Weather Information Processing and Distribution - MTA Bridges and Tunnels	This project uses the road environmental and weather data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc., so system operators can make decisions on corrective actions to take. This project also supports the dissemination of this information to other departments, facilities and agencies. This project includes the hardware, software, and communications infrastructure to support the processing and distribution of this data.	MC04	MC03	High	MC04-2
29	MTA Bridges and Tunnels	Winter Maintenance Systems - MTA Bridges and Tunnels	This project supports winter road maintenance, including snow plow operations, roadway treatment, and other snow and ice control activities. The package includes hardware and software to schedule winter maintenance activities, determine appropriate responses, and track and manage response operations.	MC06	MC01	Medium	MC06-3
30	MTA HQ	MTA Bus Archive	This project provides a data archive for MTA bus operations. Information collected by the archive includes schedule performance. This project provides the hardware, software, the interfaces, and the communications infrastructure to develop and maintain the archive.	AD1		Medium	AD1-6, AD1-7
31	MTA HQ	MTA Rail Archive	This project provides a data archive for MTA rail operations. This includes subway and railroad operations. Information collected by the archive includes schedule performance. This project provides the hardware, software, the interfaces, and the communications infrastructure to develop and maintain the archive.	AD1		Medium	AD1-6, AD1-7
32	MTA HQ	Interactive Traveler Information - MTA	This project is the expansion of the MTA traveler information systems to provide tailored information in response to a traveler request. This project "pushes" traveler information to a traveler based on a submitted profile. Personal devices supported include phones, personal digital assistants (PDAs), and kiosks.	ATIS2		Medium	ATIS2-02, ATIS2-03

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
33	MTA Long Island Rail Road	Automated Vehicle Location - MTA Long Island Rail Road	Deploy beacons along the routes to determine train location and facilitate communications with trains. Possibly CBTC technology. Regional Project Considerations: Consider joint procurement of Automated Vehicle Location Systems with MTA Metro North Railroad, and MTA NYC Transit Staten Island Railway.	APTS1		High	APTS1-04
34	MTA Long Island Rail Road	Upgrade Transit Operations System - MTA NYC Long Island Rail Road	This upgrade package consists of three tasks, which may be phased. Task 1 is to process the information from the AVL system to update current transit schedules. Task 2 is to upgrade the existing system to perform vehicle routing, dispatching and scheduling based on information collected from the previous task. Task 3 is disseminate transit schedule information to transit users, planning groups, MTA traveler information systems, TRIPS123 and other Information Service Providers. Regional Project Considerations: Consider joint procurement to upgrade Transit Operations Systems with MTA NYCT Staten Island Railway and MTA Metro North Railroad.	APTS2, APTS8	APTS1	High	APTS2-07, APTS8-05
35	MTA Long Island Rail Road	Upgrade Transit Security - MTA Long Island Rail Road	This upgrade package expands the existing security and surveillance system. This upgrade package consists of 4 tasks. Task 1 involves expanding passive (generally video) surveillance of public areas, including railroad stations, waiting areas, and parking lots; and secured areas such as tracks, tunnels and other facilities. Task 2 provides active warning systems, such as panic buttons and emergency telephones. Task 3 provides the switching software so incidents can be routed to the correct responder with the correct information and images. Task 4 routes incident information to the agency's traveler information systems, including MTA websites and information displays. Regional Project Considerations: Consider joint procurement to upgrade Transit Security Systems with MTA Metro North Railroad and MTA NYCT Staten Island Railway.	APTS5		High	APTS5-02

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
36	MTA Long Island Rail Road	Install Automated Transit Maintenance - MTA Long Island Rail Road	<p>This project provides hardware equipment and software to monitor and schedule preventive and corrective maintenance of transit vehicles. This project includes sensors on board transit vehicles to monitor system status. The on board sensors may be monitored at the railroad depots, or through wireless means while the transit vehicle is in service. This project is phased to initially install the on-board sensors on existing railroad vehicles in phases. The second phase is to purchase the software to schedule maintenance at the rail depots/yards. It is assumed that newly purchased rail vehicles will already include the on-board sensors.</p> <p>Regional Project Considerations: Consider joint procurement to install Automated Vehicle Maintenance Systems with MTA Metro North Railroad and MTA NYCT Staten Island Railway.</p>	APTS6	APTS1	Medium	APTS6-06
37	MTA Long Island Rail Road	Transit Traveler Information - MTA Long Island Rail Road	This project provides transit users with real-time transit information. This project includes hardware equipment, software and communications infrastructure. Transit information includes transit incidents, real-time transit schedules, and transit stop announcements. Methods for providing the information includes transit web sites, IVR, on transit vehicles, transit stops, and transit stations.	APTS8		High	APTS8-05
38	MTA Long Island Rail Road	Drawbridge Management - MTA Long Island Rail Road	This project provides for the management of drawbridges. This project consists of two parts. The first part provides for the monitoring, control, and coordination of the control devices at the draw bridge. The second part provides for the interfaces to disseminate the current and forecasted status of the drawbridge to travelers via information systems (e.g., information displays) and information service providers.	ATMS20		Medium	ATMS20-1
39	MTA Metro North Railroad	Automated Vehicle Location - MTA Metro North Railroad	<p>Deploy beacons along the routes to determine train location and facilitate communications with trains. Possibly CBTC technology.</p> <p>Regional Project Considerations: Consider joint procurement of Automated Vehicle Location Systems with MTA Long Island Rail Road, and MTA NYC Transit Staten Island Railway.</p>	APTS1		High	APTS1-05

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
40	MTA Metro North Railroad	Upgrade Transit Operations System - MTA NYC Metro North Railroad	<p>This upgrade package consists of three tasks, which may be phased. Task 1 is to process the information from the AVL system to update current transit schedules. Task 2 is to upgrade the existing system to perform vehicle routing, dispatching and scheduling based on information collected from the previous task. Task 3 is disseminate transit schedule information to transit users, planning groups, MTA traveler information systems, TRIPS123 and other Information Service Providers.</p> <p>Regional Project Considerations: Consider joint procurement to upgrade Transit Operations Systems with MTA Long Island Rail Road and MTA NYCT Staten Island Railway.</p>	APTS2	APTS1	High	APTS2-08
41	MTA Metro North Railroad	Upgrade Transit Security - MTA Metro North Railroad	<p>This upgrade package expands the existing security and surveillance system. This upgrade package consists of 4 tasks. Task 1 involves expanding passive (generally video) surveillance of public areas, including railroad stations, waiting areas, and parking lots; and secured areas such as tracks, tunnels and other facilities. Task 2 provides active warning systems, such as panic buttons and emergency telephones. Task 3 provides the switching software so incidents can be routed to the correct responder with the correct information and images. Task 4 routes incident information to the agency's traveler information systems, including MTA websites and information displays.</p> <p>Regional Project Considerations: Consider joint procurement to upgrade Transit Security Systems with MTA Long Island Rail Road and MTA NYCT Staten Island Railway.</p>	APTS5		High	APTS5-03

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
42	MTA Metro North Railroad	Install Automated Transit Maintenance - MTA Metro North Railroad	<p>This project provides hardware equipment and software to monitor and schedule preventive and corrective maintenance of transit vehicles. This project includes sensors on board transit vehicles to monitor system status. The on board sensors may be monitored at the railroad depots, or through wireless means while the transit vehicle is in service. This project is phased to initially install the on-board sensors on existing railroad vehicles in phases. The second phase is to purchase the software to schedule maintenance at the rail depots/yards. It is assumed that newly purchased rail vehicles will already include the on-board sensors.</p> <p>Regional Project Considerations: Consider joint procurement to install Automated Vehicle Maintenance Systems with MTA Long Island Rail Road and MTA NYCT Staten Island Railway.</p>	APTS6	APTS1	Medium	APTS6-07
43	MTA Metro North Railroad	Transit Traveler Information - MTA Metro North Railroad	This project provides transit users with real-time transit information. This project includes hardware equipment, software and communications infrastructure. Transit information includes transit incidents, real-time transit schedules, and transit stop announcements. Methods for providing the information includes transit web sites, IVR, on transit vehicles, transit stops, and transit stations.	APTS8		High	APTS8-06
44	MTA Metro North Railroad	Parking Facility Management - MTA Metro North Railroad	This project provides for the management of MTA Metro North Railroad parking facilities. This project consists of two parts. The first part is the monitoring of the parking facilities for the electronic collection of parking fees and the current parking status. The second part is the dissemination of the current availability of parking spaces to the traveling public through information service providers.	ATMS16		Medium	ATMS16-4

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
45	MTA Metro North Railroad	Drawbridge Management - MTA Metro North Railroad	This project provides for the management of drawbridges. This project consists of two parts. The first part provides for the monitoring, control, and coordination of the control devices at the draw bridge. The second part provides for the interfaces to disseminate the current and forecasted status of the drawbridge to travelers via information systems (e.g., information displays) and information service providers.	ATMS20		Medium	ATMS20-3
46	MTA NYCT Buses	Automated Vehicle Location - MTA NYCT Buses	Consider joint procurement of Automated Vehicle Location Systems with NYCDOT Franchise Buses and MTA NYCT Paratransit.	APTS1		High	APTS1-02,
47	MTA NYCT Buses	Upgrade Transit Operations System - MTA NYC Transit Bus	This upgrade package consists of four tasks, which may be phased. Task 1 is to collect road network conditions and road construction activities from regional traffic management agencies. Task 2 is to process the information from the AVL system to update current transit schedules. Task 3 is to upgrade the existing system to perform vehicle routing, dispatching and scheduling based on information collected from the first two tasks. Task 4 is disseminate transit schedule information to transit users, planning groups, MTA traveler information systems, TRIPS123 and other Information Service Providers.	APTS2, APTS7	APTS1	High	APTS2-02, APTS2-03, APTS7-5
48	MTA NYCT Buses	Upgrade Transit Security - MTA NYC Transit Bus	This upgrade package expands the existing security and surveillance system. This upgrade package consists of 4 tasks. Task 1 involves expanding passive (generally video) surveillance of public areas, including bus stations, and bus stops; and secured areas such as bus depots and other facilities. Task 2 provides active warning systems, such as panic buttons and emergency telephones, including on transit buses. Task 3 provides the switching software so incidents can be routed to the correct responder with the correct information and images. Task 4 routes incident information to the agency's traveler information systems, including MTA websites and information displays. Regional Project Considerations: Consider joint procurement to upgrade Transit Security Systems with MTA NYCT Paratransit.	APTS5		High	APTS5-04

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
49	MTA NYCT Buses	Install Automated Transit Maintenance - MTA NYCT Transit Bus	This project provides hardware equipment and software to monitor and schedule preventive and corrective maintenance of transit vehicles. This project includes sensors on board transit vehicles to monitor system status. The on board sensors may be monitored at the bus depots, or through wireless means while the transit vehicle is in service. This project is phased to initially install the on-board sensors on existing transit buses in phases. The second phase is to purchase the software to schedule maintenance at the bus depot/garages. It is assumed that newly purchased transit buses will already include the on-board sensors	APTS6	APTS1	Medium	APTS6-02, APTS6-03
50	MTA NYCT Buses	Upgrade Maintenance Dispatch Communications - MTA NYCT Transit Bus	This project provides hardware equipment and software to support electronic dispatching of road service trucks to assist transit vehicles. This project includes automated vehicle location and supports dynamic routing of road service trucks. Vehicle position is determined using the same technology to determine the vehicle position of transit vehicles.	APTS6		Medium	APTS6-03
51	MTA NYCT Buses	Transit Priority - MTA NYCT Bus	This project provides hardware equipment and communications infrastructure to support bus priority for MTA NYCT Buses on the surface streets. This implementation may be performed by one of two methods. One method is by requests for bus priority from the MTA NYCT Bus Command Center to the NYC Joint TMC. The second method is from buses locally requesting bus priority at the traffic signal.	APTS7	APTS1	Medium	APTS7-5
52	MTA NYCT Buses	Transit Traveler Information - MTA NYCT Bus	This project provides transit users with real-time transit information. This project includes hardware equipment, software and communications infrastructure. Transit information includes transit incidents, real-time transit schedules, and transit stop announcements. Methods for providing the information includes transit web sites, IVR, on transit vehicles, transit stops, and transit stations.	APTS8		High	APTS8-02, APTS8-03

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
53	MTA NYCT Metrocard Administration	Expansion of MetroCard	This expansion package is the continued support of the MTA New York City Transit MetroCard Management System. This project includes extending the capabilities of the existing MetroCard system, and to extend the use of MetroCard to other transit systems, including PANYNJ PATH and PANYNJ Air Train.	APTS4		Medium	APTS4-1
54	MTA NYCT Paratransit	Automated Vehicle Location - MTA NYCT Paratransit	Determine bus vehicle position either by the vehicle (GPS), by the communications infrastructure, beacons, or a combination. Regional Project Consideration: Consider joint procurement of Automated Vehicle Location Systems with NYCDOT Franchise Buses and MTA NYCT Transit Buses.	APTS1		High	APTS1-03
55	MTA NYCT Paratransit	Upgrade Paratransit Operations System - MTA NYC Transit Paratransit	This upgrade package consists of four tasks, which may be phased. Task 1 is to collect road network conditions and road construction activities from regional traffic management agencies. Task 2 is to process the information from the AVL system to update current transit schedules. Task 3 is to upgrade the existing system to perform vehicle routing, dispatching and scheduling based on information collected from the first two tasks. Task 4 is disseminate transit schedule information to transit users, planning groups, MTA traveler information systems, TRIPS123 and other Information Service Providers.	APTS3	APTS1	Medium	APTS3-2
56	MTA NYCT Paratransit	Upgrade Transit Security - MTA NYCT Paratransit	This upgrade package expands the existing security and surveillance system. This upgrade package consists of 4 tasks. Task 1 involves expanding passive (generally video) surveillance of public areas, including bus stations, and bus stops; and secured areas such as bus depots and other facilities. Task 2 provides active warning systems, such as panic buttons and emergency telephones, including on transit buses. Task 3 provides the switching software so incidents can be routed to the correct responder with the correct information and images. Task 4 routes incident information to the agency's traveler information systems, including MTA websites and information displays. Regional Project Consideration: Consider joint procurement to upgrade Transit Security Systems with MTA NYC Transit Bus.	APTS5		High	APTS5-04

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
57	MTA NYCT Staten Island Railway	Automated Vehicle Location - MTA NYCT Staten Island Railway	Deploy beacons along the routes to determine train location and facilitate communications with trains. Possibly CBTC technology. Regional Project Consideration: Consider joint procurement of Automated Vehicle Location Systems with MTA Long Island Rail Road and Metro North Railroad.	APTS1		High	APTS1-03
58	MTA NYCT Staten Island Railway	Upgrade Transit Operations System - MTA NYCT Staten Island Railway	This upgrade package consists of three tasks, which may be phased. Task 1 is to process the information from the AVL system to update current transit schedules. Task 2 is to upgrade the existing system to perform vehicle routing, dispatching and scheduling based on information collected from the previous task. Task 3 is disseminate transit schedule information to transit users, planning groups, MTA traveler information systems, TRIPS123 and other Information Service Providers. Regional Project Consideration: Consider joint procurement to upgrade Transit Operations Systems with MTA Long Island Rail Road and Metro North Railroad.	APTS2	APTS1	High	APTS2-06
59	MTA NYCT Staten Island Railway	Upgrade Transit Security - MTA NYC Staten Island Railway	This upgrade package expands the existing security and surveillance system. This upgrade package consists of 4 tasks. Task 1 involves expanding passive (generally video) surveillance of public areas, including train stations and waiting areas; and secured areas such as maintenance depots and other facilities. Task 2 provides active warning systems, such as panic buttons and emergency telephones, including on railroad trains. Task 3 provides the switching software so incidents can be routed to the correct responder with the correct information and images. Task 4 routes incident information to the agency's traveler information systems, including MTA websites and information displays. Regional Project Consideration: Consider joint procurement to upgrade Transit Security Systems with MTA Long Island Rail Road and MTA Metro North Railroad	APTS5		High	APTS5-09

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
60	MTA NYCT Staten Island Railway	Install Automated Transit Maintenance - MTA NYCT Staten Island Railway	<p>This project provides hardware equipment and software to monitor and schedule preventive and corrective maintenance of transit vehicles. This project includes sensors on board transit vehicles to monitor system status. The on board sensors may be monitored at the railroad depots, or through wireless means while the transit vehicle is in service. This project is phased to initially install the on-board sensors on existing railroad vehicles in phases. The second phase is to purchase the software to schedule maintenance at the rail depots/yards. It is assumed that newly purchased rail vehicles will already include the on-board sensors.</p> <p>Regional Project Consideration: Consider joint procurement to install Automated Vehicle Maintenance Systems with MTA Long Island Rail Road and MTA Metro North Railroad.</p>	APTS6	APTS1	Medium	APTS6-05
61	MTA NYCT Staten Island Railway	Transit Coordination for Staten Island - MTA NYCT Staten Island Railway	The package provides the communications infrastructure and software to support transit coordination between the MTA NYCT Staten Island Railway, MTA NYCT Buses operating in Staten Island, NYCDOT Ferries, and other private ferry operators. This includes sharing transit incident information and real-time transit schedules.	APTS7	APTS1	Medium	APTS7-1, APTS7-5
62	MTA NYCT Subway	Automated Vehicle Location - MTA NYCT Subway	Deploy beacons along the routes to determine train location and facilitate communications with trains. Possibly CBTC technology.	APTS1		High	APTS1-02
63	MTA NYCT Subway	Upgrade Transit Operations System - MTA NYC Transit Subway	This upgrade package consists of three tasks, which may be phased. Task 1 is to process the information from the AVL system to update current transit schedules. Task 2 is to upgrade the existing system to perform vehicle routing, dispatching and scheduling based on information collected from the previous task. Task 3 is disseminate transit schedule information to transit users, planning groups, MTA traveler information systems, TRIPS123 and other Information Service Providers.	APTS2	APTS1	High	APTS2-04, APTS2-05

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
64	MTA NYCT Subway	Upgrade Transit Security - MTA NYC Transit Subway	This upgrade package expands the existing security and surveillance system. This upgrade package consists of 4 tasks. Task 1 involves expanding passive (generally video) surveillance of public areas, including train stations, token booths and waiting areas; and secured areas such as maintenance depots and other facilities. Task 2 provides active warning systems, such as panic buttons and emergency telephones, including on subway trains. Task 3 provides the switching software so incidents can be routed to the correct responder with the correct information and images. Task 4 routes incident information to the agency's traveler information systems, including MTA websites and information displays.	APTS5		High	APTS5-05
65	MTA NYCT Subway	Install Automated Transit Maintenance - MTA NYCT Transit Subway	This project provides hardware equipment and software to monitor and schedule preventive and corrective maintenance of transit vehicles. This project includes sensors on board transit vehicles to monitor system status. The on board sensors may be monitored at the subway depots, or through wireless means while the subway vehicle is in service. This project is phased to initially install the on-board sensors on existing subway vehicles in phases. The second phase is to purchase the software to schedule maintenance at the subway depots/yards. It is assumed that newly purchased subway vehicles will already include the on-board sensors.	APTS6	APTS1	Medium	APTS6-04
66	MTA NYCT Subway	Transit Traveler Information - MTA NYCT Subway	This project provides transit users with real-time transit information. This project includes hardware equipment, software and communications infrastructure. Transit information includes transit incidents, real-time transit schedules, and transit stop announcements. Methods for providing the information includes transit web sites, IVR, on transit vehicles, transit stops, and transit stations.	APTS8		High	APTS8-04

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
67	MTA Police	MTA Emergency Coordination System - MTA Police	This project expands the existing communications network between MTA Police and its operating agencies. The expansion supports coordination and sharing of incident information between MTA Police and the MTA operating agencies, including emergency notifications, video surveillance, and security system monitoring. The package also supports coordination between MTA Police and other emergency response agencies.	EM1		High	EM1-5, EM1-3
68	MTA Police	Emergency Routing - MTA Police	This project provides the hardware, communications infrastructure and the software to support automatic vehicle location and dynamic routing of MTA Police and other MTA emergency response vehicles. Phase 2 of This project supports an interface to the Joint TMC to electronically collect current road network and construction information for use in the dynamic routing of the vehicles.	EM2		High	EM2-3
69	New York State	Incident Management - New York State Public Safety Network	This project provides the interfaces between the regional transportation management centers and the new York State Public Safety Network. These interfaces enable the sharing of traffic incident information, including incident information, and incident status. This project includes the hardware and software to enable these functions.	EM1		High	EM1-6
70	New York State	Amber Alert	This project supports the interfaces between the regional transportation and emergency management agencies to receive, confirm, and request Amber Alert messages.	ATMS08		High	ATMS08-14
71	NYCDOT	NYC ITS Operators ITS Data Archive	This project provides for a central data archive for New York City ITS Systems. Participating agencies includes NYCDOT, MTA and NYSDOT. This project provides the hardware, software, the interfaces, and the communications infrastructure to develop and maintain the archive.	AD1		Medium	AD1-2, AD1-3
72	NYCDOS	Maintenance Vehicle Tracking - NYCDOS	This project provides the hardware and software to determine maintenance vehicle position either by the vehicle (GPS), by the communications infrastructure, beacons, or a combination.	MC01		High	MC01-2

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
73	NYCDOT	Multimodal Coordination - NYCDOT	This project provides the communications and software to support schedule information and sharing between multimodal transportation providers, including ferries, trains, airlines, and other modes of transportation.	APTS7	APTS1	Medium	APTS7-1, APTS7-3
74	NYCDOT	Interactive Traveler Information - NYCDOT	This project is the expansion of the NYCDOT traveler information systems to provide tailored information in response to a traveler request. This project "pushes" traveler information to a traveler based on a submitted profile. Personal devices supported include phones, personal digital assistants (PDAs), and kiosks.	ATIS2		Medium	ATIS2-10
75	NYCDOT	Traffic Surveillance - NYCDOT	<p>This project is an expansion of the existing traffic surveillance network. This includes the installation of various detector technologies on NYCDOT roads, including loop detectors, microwave detectors, and CCTV cameras. An extension of this project provides the processed traffic information and video images to traveler information systems.</p> <p>Regional Project Consideration: This project may be deployed with other packages, including Expansion of the Traffic Signal System, as part of an overall Advanced Traffic Management System.</p>	ATMS01		High	ATMS01-3
76	NYCDOT	TRANSMIT Expansion - NYCDOT	This project is an expansion of the existing TRANSMIT system to provide coverage on major arterials in New York City. This project includes the hardware, field equipment, and extending software capabilities, if needed.	ATMS02	ATMS10	High	ATMS02-2
77	NYCDOT	Expansion of the Traffic Signal System - NYCDOT	<p>This project is an expansion of the existing New York City Traffic Signal Control System (VTCS). This project includes an upgrade of the existing system capabilities, and expansion to include additional traffic signals to the existing system.</p> <p>Regional Project Consideration: This project may be deployed with other packages, including Traffic Surveillance, as part of an overall Advanced Traffic Management System.</p>	ATMS03		High	ATMS03-3

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
78	NYCDOT	Advanced Traffic Management System - NYCDOT	This project is an expansion of the existing traffic management systems controlled by NYCDOT. This includes lane control signals on limited access roadways owned by other entities, but operated by NYCDOT (e.g., Long Island Expressway HOV Lanes). This project includes providing traffic management systems on facilities where it does not already exist, and expanding the capabilities of existing traffic management systems. This project includes hardware, software, field equipment such as lane control signals, and the communications infrastructure.	ATMS04	ATMS01	High	ATMS04-5
79	NYCDOT	HOV Lane Management - NYCDOT	This project manages HOV lanes by coordinating lane control signals, ramp controls, and dynamic message signs. This project includes the hardware, software, field equipment, and communications infrastructure to support the coordination of the various systems.	ATMS05	ATMS01	High	ATMS05-1, ATMS05-3
80	NYCDOT	New York City Emissions Monitoring - NYCDOT	This project provides for the deployment of vehicle emissions sensors and air quality monitors in New York City. These emissions sensors and air quality monitors can be used to measure compliance with air quality standards.	ATMS11		Medium	ATMS11-1
81	NYCDOT	Railroad Crossing Intersections - NYCDOT	This project provides for the expansion and improvement of public safety at railroad crossings. This includes monitoring equipment status, coordination of traffic control around the railroad crossing, and activation of warning systems. This project includes the field equipment, software to support the coordination, and the communications infrastructure to support monitoring.	ATMS13		High	ATMS13-3
82	NYCDOT	Reversible Lane Management - NYCDOT	This project provides for the management of reversible lane facilities. This project includes hardware equipment and software to coordinate the field equipment controlling reversible lanes, and sensors to detect wrong-way vehicles.	ATMS04, ATMS05, ATMS18	ATMS01	High	ATMS04-5, ATMS05-1, ATMS05-3, ATMS18-3

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
83	NYCDOT	Drawbridge Management - NYCDOT	This project provides for the management of drawbridges. This project consists of two parts. The first part provides for the monitoring, control, and coordination of the control devices at the draw bridge. The second part provides for the interfaces to disseminate the current and forecasted status of the drawbridge to travelers via information systems (e.g., dynamic message signs) and information service providers.	ATMS20		Medium	ATMS20-4
84	NYCDOT	Commercial Vehicles Administration System - NYCDOT	This project provides for electronic application, processing, fee collection, issuance and distribution of credentials to commercial vehicles. This includes issuing permits for carrying HAZMAT materials, and overdimension vehicles.	CVO04		High	CVO04-1
85	NYCDOT	Emergency Routing - NYCDOT OER	This project provides the hardware, communications infrastructure and the software to support automatic vehicle location and dynamic routing of NYCDOT Office of Emergency Response vehicles. Phase 2 of This project supports an interface to the Joint TMC to electronically collect current road network and construction information for use in the dynamic routing of the vehicles.	EM2		High	EM02-2
86	NYCDOT	Maintenance Vehicle Tracking - NYCDOT	This project provides the hardware and software to determine maintenance vehicle position either by the vehicle (GPS), by the communications infrastructure, beacons, or a combination.	MC01		High	MC01-2
87	NYCDOT	Road Weather Information - NYCDOT	This project collects current road and weather conditions using sensors deployed on or about the roadway. This project also supports collection of roadway conditions using sensors located on maintenance and construction vehicles. This project includes the hardware, software, and communications infrastructure to support the collection of this data.	MC03, MC04		High	MC03-1, MC04-4, MC04-5, MC04-7
88	NYCDOT	Automated Roadway Treatment - NYCDOT	This project provides the hardware, field equipment, and software to automatically treat a roadway or bridge section based on environmental or atmospheric conditions. Treatment includes anti-icing chemicals. The package includes the environmental sensors to detect adverse conditions, the automated treatment system, and driver information system.	MC05		Medium	MC05-1

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
99	NYCDOT	Roadway Maintenance and Coordination - NYCDOT	This project supports scheduled and unscheduled roadway maintenance and construction activities. Support includes collection of information to schedule maintenance and roadway activities such as repairing ITS equipment, maintenance activities, hazard removals and repair work. This project includes hardware and software to support the activities.	MC07, MC10		Medium/High	MC07-3, MC10-3, MC10-4
90	NYCDOT	Workzone Management - TRANSCOM	This project supports the collection, dissemination and coordination of work zone activities with other agencies. This project includes hardware, data interfaces, software, and the communications infrastructure.	MC08		Medium	MC08-1
91	NYCDOT	Workzone Safety Monitoring - NYCDOT	This project provides systems to improve work crew safety and reduce collisions between the motoring public and maintenance and construction vehicles. This project detects vehicle intrusions in work zones and warns crew workers and drivers of imminent encroachment of other potential safety hazards.	MC09	MC08	Low	MC09-1
92	NYCDOT Division of Ferries	Automated Vehicle Location - NYCDOT Division of Ferries	Determine ferry position by instrumentation on the ferry, such as GPS.	APTS1		High	APTS1-10
93	NYCDOT Division of Ferries	Upgrade Transit Operations System - NYCDOT Division of Ferry Operations	This upgrade package consists of three tasks, which may be phased. Task 1 is to process the information from the AVL system to update current transit schedules. Task 2 is to upgrade the existing system to perform vehicle routing, dispatching and scheduling based on information collected from the first two tasks. Task 3 is disseminate transit schedule information to transit users, NYCDOT Traveler Information website, TRIPS123 and other Information Service Providers.	APTS2	APTS1	High	APTS2-14

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
94	NYCDOT Division of Ferries	Upgrade Transit Security - NYCDOT Division of Ferry Operations	This upgrade package expands the existing security and surveillance system. This upgrade package consists of 4 tasks. Task 1 involves expanding passive (generally video) surveillance of public areas, including ferry terminals and on the ferries. Task 2 provides active warning systems, such as panic buttons and emergency telephones, including on the ferries. Task 3 provides the switching software so incidents can be routed to the correct responder with the correct information and images. Task 4 routes incident information to the NYCDOT's traveler information systems, including NYCDOT websites and information displays.	APTS5		High	APTS5-13
95	NYCDOT Division of Ferries	Transit Traveler Information - NYCDOT Ferries	This project provides transit users with real-time transit information. This project includes hardware equipment, software and communications infrastructure. Transit information includes real-time ferry schedules. Methods for providing the information includes transit web sites, IVR, on ferries, and ferry terminals.	APTS7, APTS8		Medium/High	APTS7-8, APTS8-12
96	NYCDOT Franchise Buses	Automated Vehicle Location - NYCDOT Franchise Buses	Determine bus vehicle position either by the vehicle (GPS), by the communications infrastructure, beacons, or a combination. Regional Project Consideration: Consider joint procurement of Automated Vehicle Location Systems with MTA NYCT Transit Buses and MTA NYCT Paratransit.	APTS1		High	APTS1-07
97	NYCDOT Franchise Buses	Upgrade Transit Operations System - NYCDOT Franchise Buses	This upgrade package consists of four tasks, which may be phased. Task 1 is to collect road network conditions and road construction activities from regional traffic management agencies. Task 2 is to process the information from the AVL system to update current transit schedules. Task 3 is to upgrade the existing system to perform vehicle routing, dispatching and scheduling based on information collected from the first two tasks. Task 4 is disseminate transit schedule information to transit users, franchise operators, NYCDOT Traveler Information website, TRIPS123 and other Information Service Providers.	APTS2, APTS7	APTS1	High	APTS2-10, APTS7-3

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
98	NYCDOT Franchise Buses	Upgrade Transit Security - NYCDOT Franchise Buses	This upgrade package expands the existing security and surveillance system. This upgrade package consists of 4 tasks. Task 1 involves expanding passive (generally video) surveillance of public areas, including bus stations, and bus stops; and secured areas such as bus depots and other facilities. Task 2 provides active warning systems, such as panic buttons and emergency telephones, including on transit buses. Task 3 provides the switching software so incidents can be routed to the correct responder with the correct information and images. Task 4 routes incident information to the NYCDOT's traveler information systems, including NYCDOT websites and information displays.	APTS5		High	APTS5-12
99	NYCDOT Franchise Buses	Transit Coordination - NYCDOT Franchise Bus Systems	This project provides the communications and software to support transit coordination between NYCDOT Franchise Bus systems. In addition, it support coordination between the NYCDOT Franchise Bus Systems and NYCDOT Parking Facilities, such as Park-and-Ride lots.	APTS7	APTS1	Medium	APTS7-3
100	NYCDOT Franchise Buses	Transit Traveler Information - NYCDOT Franchise Bus	This project provides transit users with real-time transit information. This project includes hardware equipment, software and communications infrastructure. Transit information includes transit incidents, real-time transit schedules, and transit stop announcements. Methods for providing the information includes transit web sites, IVR, on transit vehicles, transit stops, and transit stations.	APTS8		High	APTS8-11
101	NYCDOT/NYCD CP	Parking Facility Management - NYCDOT/NYCD CP	This project provides for the management of NYCDOT parking facilities and the dissemination of parking information about publicly and privately operated off-street facilities. This project consists of two parts. The first part is the monitoring of the parking facilities for the electronic collection of parking fees and the current parking status. The second part is the dissemination of the current availability of parking spaces to the traveling public through NYC DOT/DCP Parking Information System, which includes a website, information service providers, and other traveler information devices, such as dynamic message signs.	ATMS16		Medium	ATMS16-1

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
102	NYCOEM	NYCOEM Emergency Response Coordination	This project provides the hardware, communications infrastructure and the software to exchange traffic incident information between the Office of Emergency Management and other regional emergency management agencies.	EM1		High	EM1-5
103	NYMTC	NYMTC/DCP Regional Planning Database	This project provides a traffic and transit data warehouse for the region. Information stored by the archive includes traffic counts, CVO counts, safety, speed occupancy, and transit ridership. Information also includes traditional planning data such as land use.	AD3	AD1	Medium	AD3-1
104	NYPD	New York City 911 Dispatch - NYPD	This project is the expansion of the existing New York City 911 dispatch center to support switching of electronic information to other emergency management dispatch centers in the region. This includes providing traffic incident information to the TRANSCOM Regional Architecture.	EM1		High	EM1-2
105	NYPD	NYPD Emergency Response Coordination - NYPD	This project provides the hardware, communications infrastructure and the software to exchange traffic incident information between NYPD Operations and other emergency management agencies. This may include connections to the TRANSCOM Regional Architecture.	EM1		High	EM1-3
106	NYPD	Emergency Routing - NYPD	This project provides the hardware, communications infrastructure and the software to support automatic vehicle location and dynamic routing of NYPD vehicles. Phase 2 of This project supports an interface to the Joint TMC to electronically collect current road network and construction information for use in the dynamic routing of the vehicles.	EM2		High	EM2-2
107	NYSDOT	Interactive Traveler Information - NYSDOT	This project is the expansion of the NYSDOT traveler information systems to provide tailored information in response to a traveler request. This project "pushes" traveler information to a traveler based on a submitted profile. Personal devices supported include phones, personal digital assistants (PDAs), and kiosks.	ATIS2		Medium	ATIS2-13

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
108	NYSDOT	Traffic Surveillance - NYSDOT	<p>This project is an expansion of the existing traffic surveillance network. This includes the installation of various detector technologies on NYSDOT roads, including loop detectors, microwave detectors, and CCTV cameras. An extension of this project provides the processed traffic information and video images to traveler information systems.</p> <p>Regional Project Consideration: This project may be deployed with other packages as part of an overall Advanced Traffic Management System.</p>	ATMS01		High	ATMS01-3, ATMS01-9
109	NYSDOT	Advanced Traffic Management System - NYSDOT	This project is an expansion of the existing NYSDOT Advanced Traffic Management Systems in New York City. This includes upgrading the existing system capabilities, and deploying additional field equipment along the limited access roadways (i.e., highways) in New York City. Field equipment may include lane control signals, ramp meters, and a communications infrastructure.	ATMS04	ATMS01	High	ATMS04-1
110	NYSDOT	New York Statewide IEN - NYSDOT	This project provides the interfaces from the Joint TMC to the New York State Department of Transportation Statewide Information Exchange Network (IEN). This interface enables the sharing of traffic information, including field equipment status, and traffic images between traffic management centers in New York State. This project includes the hardware and software to enable these functions.	ATMS07		High	ATMS07-11
111	NYSDOT	Expansion of IIMS - NYSDOT	This project is the expansion of Integrated Incident Management System communications network to other transportation and emergency management agencies that do not already have interfaces to the network. This project includes the hardware and field equipment to support the expansion, and enhancing software to support new functions and interfaces, as necessary.	ATMS08		High	ATMS08-13
112	NYSDOT	Maintenance Vehicle Tracking - NYSDOT	This project provides the hardware and software to determine maintenance vehicle position either by the vehicle (GPS), by the communications infrastructure, beacons, or a combination.	MC01		High	MC01-4

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
113	NYSDOT	Road Weather Information - NYSDOT	This project collects current road and weather conditions using sensors deployed on or about the roadway. This project also supports collection of roadway conditions using sensors located on maintenance and construction vehicles. This project includes the hardware, software, and communications infrastructure to support the collection of this data.	MC03, MC04		High	MC03-2, MC04-7
114	NYSDOT & NYPD	HELP Program - NYSDOT & NYPD	This project provides continued support and expansion of the HELP program. This project includes electronic dispatching and communications between the dispatch center and the HELP vehicles.	EM04		High	EM04-1
115	Pennsylvania Station	Transit Traveler Information - Pennsylvania Station	This project provides the hardware, communications and software to expand the traveler information systems in Pennsylvania Station. This project includes providing transit information, including real-time schedules, to information displays in the Station, to TRIPS 123, and to other information service providers.	APTS8		High	APTS8-14
116	Private ISPs	Interactive Traveler Information - Private ISPs	This project is to support the ability of Private ISPs to provide tailored information in response to a traveler request. This project "pushes" traveler information to a traveler based on a submitted profile. Personal devices supported include phones, personal digital assistants (PDAs), and kiosks.	ATIS2		Medium	ATIS2-14
117	Private Parking	Park and Ride Parking Facilities	This project provides for the management of Park and Ride parking facilities. This project consists of three parts. The first part is the monitoring of the parking facilities for the electronic collection of parking fees and the current parking status. The second part is the dissemination of the current availability of parking spaces to the traveling public through information service providers, and other traveler information devices, such as dynamic message signs. The third part supports the capability to reserve parking spaces.	ATMS16		Medium	ATMS16-3

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
118	TRANSCOM	TRANSCOM Archive	This project provides for a data archive of traffic and transit information collected by the TRANSCOM Regional Architecture. This information includes road network conditions, incidents, construction events, and transit schedules. This project provides the hardware, software, the interfaces, and the communications infrastructure to develop and maintain the archive.	AD1		Medium	AD1-5
119	TRANSCOM	TRIPS123	This project supports the communications infrastructure and the continuous operation of the TRIPS123 system. Regional Project Consideration: Coordinate with Transit Traveler Information packages.	APTS8, APTS7		High / Medium	APTS7-7, APTS8-13
120	TRANSCOM	Multimodal Coordination - TRANSCOM	This project provides the communications and software to support schedule information and sharing between multimodal transportation providers, including ferries, trains, airlines, and other modes of transportation.	APTS7	APTS1	Medium	APTS7-7
121	TRANSCOM	Transit Traveler Information - TRANSCOM	This project provides continued support and expansion of TRIPS 123 to disseminate transit information via web sites, IVR, and kiosks. Regional Project Consideration: Coordinate with TRIPS123 packages.	APTS8		High	APTS8-13
122	TRANSCOM	Interactive Traveler Information - TRIPS123	This project is the continued support and expansion of TRIPS123 to provide tailored information in response to a traveler request. This project "pushes" traveler information to a traveler based on a submitted profile. Personal devices supported include phones, personal digital assistants (PDAs), and kiosks. Regional Project Consideration: Coordinate with TRIPS123 packages.	ATIS5		Medium	ATIS5-1
123	TRANSCOM	TRIPS123 - Transit Advisor	This project supports and enhances the pre-trip route guidance planning services offered by TRIPS123 for transit service. This project provides the interfaces to the transit agencies to receive static information and real-time transit information; and the software to provide the route guidance. Regional Project Consideration: Coordinate with TRIPS123 packages.	ATIS5, APTS8		High	ATIS5-1, APTS8-13

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
124	TRANSCOM	TRANSMIT Expansion - TRANSCOM	This project is an expansion of the existing TRANSMIT system to complete coverage of the limited access roadway network (i.e., highways) in New York City. This project includes the hardware, field equipment, and extending software capabilities, if needed.	ATMS02		High	ATMS02-1
125	TRANSCOM	Regional Traffic Control - TRANSCOM	This project is the expansion of TRANSCOM's traffic dissemination and traffic information system to regional transportation agencies. This project includes the TRANSCOM Regional Architecture network, and the Inter-Regional Video Network (IRVN). The former supports the sharing of traffic information between the regional transportation and emergency management agencies, including status of traffic devices (e.g., messages on dynamic message signs), traffic incident reports and status, construction notices, and road network conditions. The latter supports the sharing of traffic images between the regional transportation and emergency management systems. Regional Project Consideration: Coordinate with other TRANSCOM Regional Architecture packages	ATMS07		High	ATMS07-09, ATMS07-10
126	TRANSCOM	Incident Management - TRANSCOM	This project provides the interfaces between TRANSCOM to other regional emergency and transportation management centers in New York City. These interfaces enable the sharing of traffic incident information, including incident information, incident status, road network conditions, and requests for resources. This project includes the hardware, software, and communications infrastructure to enable these functions. Regional Project Consideration: Coordinate with other TRANSCOM Regional Architecture packages.	ATMS08		High	ATMS08-09, ATMS08-10, ATMS08-11
127	TRANSCOM	Weather Information Processing and Distribution - TRANSCOM	This project collects road environmental and weather data from other agencies' systems and distributes the processed information to other agencies. This project includes the hardware, software, data interfaces and communications infrastructure to support the collection of this data. The data collected from the agencies through the data interfaces and distributed indicate hazardous environmental conditions such as icy road conditions, high winds, and dense fog.	MC04	MC03	High	MC04-6

ITS Architecture Project ID	Lead Agency	Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority	Customized Market Package Diagrams
128	TRANSCOM	Winter Maintenance Systems - TRANSCOM	This project provides for the collection and dissemination of the winter road maintenance being performed by agencies. Winter road maintenance collected and disseminated to other agencies include snow plow operations, roadway treatment, and other snow and ice control activities. The package includes hardware; data interfaces to and from participating agencies, software, and communications infrastructure.	MC06	MC01	Medium	MC06-5, MC06-6
129	TRANSCOM	Roadway Maintenance and Coordination - TRANSCOM	This project supports the collection and dissemination of scheduled and unscheduled roadway maintenance and construction. Information includes equipment status, maintenance activities, hazard removals and repair work This project includes hardware, data interfaces to and from participating agencies, software, and the communications infrastructure.	MC07, MC10		Medium/High	MC07-2, MC10-1, MC10-2, MC10-3
130	TRANSCOM	Workzone Management - TRANSCOM	This project supports the collection and dissemination of work zone activities from and to other agencies. This project includes hardware, data interfaces to and from participating agencies, software, and the communications infrastructure.	MC08		Medium	MC08-1
131	TRANSCOM	Maintenance and Construction Activity Coordination - TRANSCOM	This project supports the dissemination of maintenance and construction activity to centers which can utilize it as part of their operations. This project also supports the dissemination of these activities to information service providers. This project includes the hardware, software, and data interfaces to support these activities.	MC07, MC10		Medium/High	MC07-2, MC10-1, MC10-2, MC10-3
132	Other	Transit Vehicle Location Consortium	Support sharing of vehicle location information between the regional transit agencies and centers. Responsible for developing and defining regional standards for supporting this function.	APTS1		High	APTS1-11
133	Other	Regional SmartCard	This project supports the development of a regional transit smartcard. It includes the design of a system, an infrastructure for reciprocity network and implementation.	APTS4		Medium	APTS4-8

Table 3-3. Project Considerations for PANYNJ for Consistency with the NYMTC MPO Regional Priorities and New York City Sub Regional ITS Architecture

Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority
Interactive Traveler Information	This project is the expansion of the traveler information systems to provide tailored information in response to a traveler request. This project "pushes" traveler information to a traveler based on a submitted profile. Personal devices supported include phones, personal digital assistants (PDAs), and kiosks.	ATIS2		Medium
Traffic Surveillance	This project is an expansion of the existing traffic surveillance network, including loop detectors, microwave detectors, and CCTV cameras. An extension of this project provides the processed traffic information and video images to traveler information systems.	ATMS01		High
Expansion of the Traffic Signal System	This project is an expansion of the existing traffic control systems. This project includes an upgrade of the existing system capabilities, and expansion to include additional traffic signals to the existing system.	ATMS03		High
Advanced Traffic Management Systems	This project is an expansion of the existing Advanced Traffic Management Systems for the bridge facilities.	ATMS04	ATMS01	High
Incident Management	This project provides the electronic interfaces from the PANYNJ Bridges and Tunnels to its response vehicles and maintenance units; to TRANSCOM; and the Joint TMC through the TRANSCOM Regional Architecture Server. This project includes the hardware, software and communications infrastructure to enable these functions.	ATMS08		High
Automated Transit Vehicle Location	Deploy beacons along the routes to determine train location and facilitate communications with trains.	APTS1		High

Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority
Upgrade Transit Operations System	This upgrade package consists of three tasks, which may be phased. Task 1 is to process the information from the AVL system to update current transit schedules. Task 2 is to upgrade the existing system to perform vehicle routing, dispatching and scheduling based on information collected from the previous task. Task 3 is disseminate transit schedule information to transit users, planning groups, and traveler information systems.	APTS2	APTS1	High
Upgrade Transit Security	This upgrade package expands the existing security and surveillance system using passive (generally video) surveillance of public areas, train stations and waiting areas; and secured areas such as maintenance depots and other facilities.	APTS5		High
Install Automated Transit Maintenance	This project provides hardware equipment and software to monitor and schedule preventive and corrective maintenance of transit vehicles. This project includes sensors on board transit vehicles to monitor system status. The on board sensors may be monitored at the railroad depots, or through wireless means while the transit vehicle is in service. This project is phased to initially install the on-board sensors on existing railroad vehicles in phases. The second phase is to purchase the software to schedule maintenance at the rail depots/yards. It is assumed that newly purchased rail vehicles will already include the on-board sensors	APTS6	APTS1	Medium
Transit Traveler Information	This project provides transit users with real-time transit information. This project includes hardware equipment, software and communications infrastructure. Transit information includes transit incidents, real-time transit schedules, and transit stop announcements. Methods for providing the information includes transit web sites, IVR, on transit vehicles, transit stops, and transit stations.	APTS8		High
Electronic Clearance	This project provides the system to electronically access the credentials of commercial vehicles.	CVO03		High

Project Name	Project Description	Market Package	Market Package Dependencies	Regional Priority
Commercial Vehicle Overdimension Detection System	This project provides hardware equipment, communications infrastructure and software to support the detection of overdimension vehicles.	CVO06		Medium
HAZMAT Management	This project includes the automatic detection and notification of HAZMAT incidents, and related incident management coordination activities.	CVO10		High
Maintenance Vehicle Tracking	This project provides the hardware and software to determine maintenance vehicle position either by the vehicle (GPS), by the communications infrastructure, beacons, or a combination.	MC01		High
Winter Maintenance Systems	This project supports winter road maintenance, including snow plow operations, roadway treatment, and other snow and ice control activities. The package includes hardware and software to schedule winter maintenance activities, determine appropriate responses, and track and manage response operations.	MC06	MC01	Medium

3.5 NYMTC Transportation Improvement Program ITS Projects

The NYMTC Transportation Improvement Program constitutes a regional plan for transportation projects. Some of these projects may include ITS elements. It is recommended that agencies that submit projects (that include ITS) for inclusion in the TIP identify the portions of the ITS architecture that apply. A straight forward mechanism to tie the proposed TIP projects to the ITS architecture is to identify the ITS Architecture Project Identifier (column 1 of Table 3-2 - ITS Architecture Project Sequence).

The list of projects (which may include ITS), as defined in the current NYMTC TIP, is shown in Table 3-4 below.

Table 3-4. NYMTC Transportation Improvement Plan (TIP) - Potential ITS Projects

TIP ID	Lead Agency	Project Description	Location	Projected 3-Year Cost (Millions)	Funding Source
AW 36		Toll Plaza - AW 36 - Installation of CCTV for coverage on all faces of Toll Plazas.		12.799	
AW 37		Toll Plaza - AW 37 - Operations Center @ RI and others		0.200	
AW 80		Toll Plaza - AW 80 - VMS and gantry installation		5.100	
MW17-5969	MTA NYCT	Communications Systems: Data network: IND/BMT-ATM	System-Wide	40.000	5307 5309
RC03-5874	MTA NYCT	Fare collection, stations: replace automatic fare collection electronics.	System-Wide	0.000	LCL
SF01-4589	MTA NYCT	Bus Locator System: Service management/customer information system	System-Wide	85.000	LCL
SF06-6327	MTA NYCT	Bus Locator System: Service management/customer information system	System-Wide	12.000	LCL CMAQ
ST12-5276	MTA NYCT	Public Address/Customer Information System: Canarsie Line 24 Stations	System-Wide	0.000	LCL
T508-2005 T508-2006	MTA NYCT	Signals and Communication	System-Wide	118.4 218.4	LCL LCL
Various	MTA NYCT	Signal Modernization	System-Wide	Various	LCL
Various	NYSDOT	Signing and signalization improvements throughout all boroughs.	All	Various	
X024.21	NYSDOT	Route 9A/Westside Hwy: Clarkson Street to Hoeatio Street. Reconstruction segment 4 - Alignment, ITS, utilities, public walk/bikeway, and pedestrian bridge.	New York	0.000	SDF NHS
X024.22	NYSDOT	Route 9A/Westside Hwy: Battery Place, Little West Street - State Street. Route 9A reconstruction segment 1 - Alignment, ITS, utilities, public walk/bikeway, and pedestrian bridge.	New York	0.000	SDF NHS
X024.23	NYSDOT	Route 9A/Westside Hwy: Battery Place, Harrison Street. Route 9A reconstruction segment 2 - Alignment, ITS, utilities, public walk/bikeway, and pedestrian bridge.	New York	0.000	STPU SDF

Implementation Plan - NYC Sub-Regional ITS Architecture

TIP ID	Lead Agency	Project Description	Location	Projected 3-Year Cost (Millions)	Funding Source
X024.24	NYSDOT	Route 9A/Westside Hwy: Harrison Street to Clarkson Street. Route 9A reconstruction segment 3 - Alignment, ITS, utilities, public walk/bikeway, and pedestrian bridge.	New York	0.000	NHS LOC STPX SDF
X024.25	NYSDOT	Route 9A/Westside Hwy: Horatio Street to West 25th Street. Route 9A reconstruction segment 5 - Alignment, ITS, utilities, public walk/bikeway, and pedestrian bridge.	New York	0.000	SDF
X024.27	NYSDOT	Route 9A/Westside Hwy: West 42nd Street to West 59th Street. Route 9A reconstruction segment 7 - Alignment, ITS, utilities, public walk/bikeway, and pedestrian bridge.	New York	0.000	NYS
X024.39	NYSDOT	Route 9A/Westside Hwy: Battery Place to West 59th Street. The operational connection of the Intelligent Traffic System (ITS) of the Route 9A reconstruction project.	New York	0.000	SDF NHS
X024.42	NYSDOT	Pedestrian safety at canal street triangle.	New York	0.000	SDF
X096.17	NYSDOT	Install transmit technologies along Route 440 and Staten Island Expressway	Richmond	0.000	SDF
X110.22	NYSDOT	Bronx River Parkway at Gun Hill Road Exit/Mosholu Parkway Exit	Bronx	0.050	SDF STPS
X228.65	NYSDOT	Install Advanced Traffic Management System to reduce both recurring and non-recurring delays on the I495 (Long Island Expressway) corridor from the Queens Mid-town Tunnel to the Van Wyck Expressway.	Queens	30.790	IM STPU SDF
x500.68	NYPA	Purchase of eight 30-foot hybrid electric buses for downtown loop.	New York	0.000	LOC PRIV NYS CMAQ
x500.76	NYSDEC	New York State emissions laboratory construction to benefit vehicular testing improvement	All	0.000	SDF CMAQ
X500.77	NYSDOT	Community Transit Information Link Project	Kings	0.000	SDF CMAQ
X500.92	NYCDOT	Advance traveler information dissemination service (ATIDS)	All	0.000	LOC CMAQ
X500.93	NYCDOT	Deployment of a Real Time traffic adaptive system for New York City	All	0.000	LOC CMAQ
X500.94	NYCDOT	Local street network management and incident management	All	0.000	LOC CMAQ
X501.03	NYSDOT	Jamaica Center Pedestrian Center	Queens	0.965	CMAQ LOC
X501.09	NYCDCP/ NYCDOT	Downtown Flushing multimodal connection (College Point Blvd) which links Queens Northshore and Brooklyn Queens Greenway.	Queens	0.000	LOC STPU CMAQ
X501.12	NYCDOT	Deployment of a Real Time traffic adaptive system in Brooklyn	Kings	0.000	LOC
X501.13	NYCDCP	Parking information dissemination and demonstration project II	All	0.585	LOC CMAQ

Implementation Plan - NYC Sub-Regional ITS Architecture

TIP ID	Lead Agency	Project Description	Location	Projected 3-Year Cost (Millions)	Funding Source
X501.15	Short Line Bus	Operate bus service between various points in Orange County and GWB Bus Terminal	Bronx	0.150	SDF CMAQ NHS
X501.18	PANYNJ	Freight information Real Time system	Kings	0.000	SDF CMAQ
X501.19	NYCDOT	Purchase of 22 CNG replacement buses for Green Bus Lines	All	0.000	LOC CMAQ
X501.22	NYCDPR	Bronx River Greenway Bike Pedestrian Facility (Connection to Westchester County)	Bronx	1.322	LOC CMAQ TCSP HPP
X501.27	NYCDOT	Create a fiber cable network to connect outer boroughs to the Traffic Management Center	All	0.000	LOC CMAQ
X501.29	NYSDOT	Ozone action days - episodic emissions control program to provide alerts of forecast high ozone levels and limited outreach to the general public and large employers.	All	0.500	SDF CMAQ
X550.47	NYCDOT	Design and implementation of an integrated program of traffic and pedestrian safety improvements, intermodal improvements and streetscape enhancements for the 5th Avenue Bay Bridge retail corridor from 94th St. to 64th St.	Kings	0.000	LOC STPE
X726.84	NYSDOT	I-95 Cross Bronx Expressway (George Washington Bridge - Throgs Neck Bridge). Evaluate, design, and construct, advanced traffic management system elements. This is one of the early action portions of X804.08, Phase I.	Bronx	0.000	SDF
X730.85	NYSDOT	I-278 Gowanus Expressway (Verrazano Bridge to Battery Tunnel) Interim emergency repairs FY1999 - Improve rideability and address safety/structural flag along the entire viaduct. Operation of the upper GOW Bus/HOV lane and build and operate the Lower Gowanus Bus/HOV lane	Kings	0.000	SDF HBRR
X730.88	NYSDOT	I-278 Gowanus Expressway (Verrazano Bridge to Battery Tunnel) Interim emergency repairs FY 2000 - Improve rideability and address safety/structural flag along the entire viaduct. Operation of the upper GOW Bus/HOV lane and build and operate the Lower Gowanus Bus/HOV lane	Kings	0.000	SDF NHS
X730.89	NYSDOT	I-278 Gowanus Expressway (Verrazano Bridge to Battery Tunnel) Interim emergency repairs FY2001 - Improve rideability and address safety/structural flag along the entire viaduct. Operation of the upper GOW Bus/HOV lane and build and operate the Lower Gowanus Bus/HOV lane	Kings	0.000	SDF IM HBRR

Implementation Plan - NYC Sub-Regional ITS Architecture

TIP ID	Lead Agency	Project Description	Location	Projected 3-Year Cost (Millions)	Funding Source
X730.92	NYSDOT	Staten Island Expressway Renwick Sirt, Staten Island Expressway EB shoulder Bus Lane along with Bus Prioritization on ramps and service roads during the AM peak.	Richmond	0.000	SDF
X730.93	NYSDOT	Staten Island Expressway rehab of the mainline and overpass bridges, truck climbing lanes on EB and WB SIE within existing ROW, safety and operational improvements, upgrading of non-standard features, bus prioritization and TSM improvements.	Richmond	29.255	SDF IM STPU NHS STPX HBRR
X731.05	NYSDOT	Small scale park and ride facilities at various locations in Staten Island.	Richmond	3.400	SDF STPX
X731.08	NYSDOT	Transit mobility enhancement Inc. signal prioritization, arterial priority lines. Transit/travel info services improvement to transit loading passenger amenities. Enhancement to bus fleet depots, high speed ferry, enhance park and ride system.	Richmond	0.000	LOC 5309
X731.09	NYSDOT	Develop plans and construction of 5 VMS installations. Scope: VMS	Richmond	0.000	SDF
X735.47	NYSDOT	I-678 Van Wyck Expressway (Queens Blvd to Belt Pkwy) rehabilitation of Van Wyck Intelligent Transportation System (ITS): Computer, cameras, for traffic surveillance.	Queens	0.000	SDF
X735.48	NYSDOT	Develop plans and construction of ITS. Install new enhanced communication network. Scope: VMS, HAR, CCTV, communications.	Queens	0.500	SDF STPU STPX NHS
X735.49	NYSDOT	I-678 Van Wyck Expressway Incident Management - Purchase of additional emergency equipment. Phase 2: KEW Garden Interchange to Belt Pkwy.	Queens	0.000	SDF
X735.71	NYSDOT	Western Queens ITS Phase II: Kew Gardens/I-678 Van Wyck Expressway, Triboro/Grans Central Pkwy, I-678 Van Wyck Expressway	Queens	0.000	SDF STPU
X735.72	NYSDOT	Western Queens ITS Phase III: BQE/LIE ITS - I-678 Van Wyck Expressway	Queens	0.000	SDF NHS
X754.82	NYCDOT	Rehabilitation of Fordham Plaza Structure Over Metro-North	Bronx	0.000	SDF STPU
X757.50	NYCEDC/ NYCDOT	Design and construction of Midtown West Intermodal Ferry Terminal at Pier 79, NYC	New York	0.000	LOC HPP PRIV EAR
X757.51	NYCEDC	Construct intermodal facility at Castle Clinton in Battery Park. Enhancements funds will construct a roof enclosure for the rebuilt Castle Clinton National Monument	New York	0.000	LOC HPP PRIV STPE
X757.84	DASNY	Forham University's Regional Transportation/Parking Facility	Bronx	0.000	LOC HPP

Implementation Plan - NYC Sub-Regional ITS Architecture

TIP ID	Lead Agency	Project Description	Location	Projected 3-Year Cost (Millions)	Funding Source
X757.89	NYCDOT	Design, Construction and Related Enhancement of the Grand Concourse Between E.161st Street and 166th Street, NYC	Bronx	0.000	LOC HPP
X757.90	NYCDOT	Enhance transportation operations and coordination or information amongst organizations in the NYC to share real time data on traffic, transit, construction, special events, and incident information.	All	0.000	SDF LOC ITS
X758.12	NYCEDC/ BBPDC	Traffic & access study to develop multimodal access strategy to maximize types of access and minimize neg. traffic impacts in the communities surrounding the park. Design a wide range of strategies to improve mass transit and alternative transp. access.	Kings	0.000	TCSP
X758.22	NYCDOT	Reconstruction of Annandale Road bridge over Staten Island rapid transit using innovative materials (stainless clad steel, sensor, dataloggers, etc.).	Richmond	0.000	HBRD
X802.43	NYCDOT	Construction of Topics 4 computerized traffic signalization program	Bronx, Kings, Queens	0.000	CMAQ LOC STPU
X802.73	NYCDOT	Modernization of signal controllers (phase II)	All	16.369	LOC STPU LOC CMAQ
X803.09	NYCDOT	Operational support to traffic management center facility for computerized signalization of the five boroughs from 7/1/98 thru 6/30/99	All	0.000	LOC STPU
X803.10	NYCDOT	Operational support to traffic management center facility for computerized signalization of the five boroughs from 7/1/99 thru 6/30/00	All	0.000	LOC STPU
X803.11	NYCDOT	Operational support to traffic management center facility for computerized signalization of the five boroughs from 7/1/00 thru 6/30/01	All	0.000	LOC STPU
X803.12	NYCDOT	Operational support to traffic management center facility for computerized signalization of the five boroughs from 7/1/01 thru 6/30/02	All	0.000	LOC STPU STPX
X803.13	NYCDOT	Operational support to traffic management center facility for computerized signalization of the five boroughs from 7/1/02 thru 6/30/03	All	0.000	LOC STPU STPX
X803.14	NYCDOT	Operational support to traffic management center facility for computerized signalization of the five boroughs.	All	26.506	STPX LOC
X803.16	NYCDOT	Operational support to traffic management center facility for computerized signalization of the five boroughs.	All	28.913	STPX LOC
X803.16	NYCDOT	Operational support to traffic management center facility for computerized signalization of the five boroughs.	All	29.786	STPX LOC

Implementation Plan - NYC Sub-Regional ITS Architecture

TIP ID	Lead Agency	Project Description	Location	Projected 3-Year Cost (Millions)	Funding Source
X803.79	NYCDOT	Advance Traffic Mgt Center - Address traffic congestion in the CBD by expanding video surveillance to detect random incidents (such as accidents, breakdowns, illegal parking, and infrastructure emergencies) and implement a real-time response.	New York	0.000	LOC HPP
X804.00	NYMTC	Southern Brooklyn transportation investment study - multi-modal transportation improvement alternatives to manage current/forecasted congestion	Kings, Queens	0.000	SDF STPU
X804.08	NYSDOT	Bruckner Expressway ITS - Triboro Bridge NE Thruway, Phase I installation of Intelligent Transportation System (ITS) on State routes in the Bronx and Northern Manhattan.	Bronx, New York	0.000	SDF STPU NHS
X804.09	NYSDOT	Bronx and Northern Manhattan (Major Deegan, CBW & HHP, City Line) - Phase 2 installation of Intelligent Transportation System (ITS) on State routes in the Bronx and Northern Manhattan.	Bronx, New York	0.000	SDF
X804.10	NYSDOT	Bronx and Northern Manhattan (HHP, 72nd Street City Line) - Phase 3 installation of Intelligent Transportation System (ITS) on State routes in the Bronx and Northern Manhattan.	Bronx, New York	0.000	SDF
X804.11	NYSDOT	Installation of Intelligent Transportation System (ITS) on state routes in Eastern Queens (Eastern Queensm JFK Airport, Laurelton Pkwy).	Queens	1.400	SDF STPU
X804.13	NYSDOT	Incident Management - Phase 1 - Development and implementation of incident management system to take disabled cars off the road and improve safety on State routes citywide.	Bronx, Queens, Kings, Richmond	0.000	SDF CMAQ ITS
X804.14	NYSDOT	ITS Operational Support - Phase 1 - Design of operational support facilities for the Intelligent Transportation System (ITS) Network	All	0.000	SDF STPU
X804.17	NYSDOT	ITS Control Center - Phase 2 - General construction of the ITS Control Center to effectively operate the advance traffic management system (ATMS) with real-time information	Kings	0.000	NHS SDF
X804.18	NYSDOT	Staten Island ITS Verrazano/Outer Bridge crossing Goethals Bridge/Bayonne construction of the Intelligent Transportation System (ITS) for state routes on Staten Island.	Richmond	0.300	STPU SDF STPU NHS
X804.19	NYSDOT	Brooklyn ITS - Phase 1 - Construction of the Intelligent Transportation System (ITS) for state routes in Brooklyn	Kings	1.750	SDF STPU
X804.22	NYSDOT	ITS Operational Support - Phase 3 - Design of Operational support for the Intelligent Transportation System (ITS) on State routes citywide.	All	0.000	SDF IM STPX

Implementation Plan - NYC Sub-Regional ITS Architecture

TIP ID	Lead Agency	Project Description	Location	Projected 3-Year Cost (Millions)	Funding Source
X804.24	NYSDOT	ITS System maintenance and operational support on State routes citywide	All	6.790	SDF STPX
X804.52	NYSDOT	I-278 Gowanus Expressway, Battery Tunnel, Verrazano Bridge - Interim ITS during Gowanus Expressway reconstruction. Incident detection and motorist info.	Kings	0.000	SDF
X805.25	NYSDOT	NY/NJ/CT Model Deployment Initiative - USDOT demonstration project using TRANSCOM structure to disseminate multi-modal traveler information through integration of agency transportation operations management systems in the metro area.	All	0.000	ITS LOC DEMO
X805.28	NYCDOT	Transmit Expansion - Installing sensors along several Bronx corridors to collect various travel data such as speed through the E-Z Pass system.	Bronx	0.000	SDF
X805.34	NYSDOT	Construction of the ITS Control Center - Electrical work for X804.16 and X804.17	Queens	0.000	SDF ITS
X805.35	NYSDOT	Construction of the ITS Control Center - A/C and Plumbing components of X804.16 and X804.17	Queens	0.000	SDF ITS
X805.50	NYSDOT/ NYCDOT	Technical planning and coordination for NYC agencies involved in transportation ITS program.	All	0.000	SDF STPX STPU LOC
X805.66	NYSDOT	Integrate traffic management and traveler information exchange and enhance operational coordination b/w thr NYSDOT's traffic management center in Hauppauge, Long Island with the Joint State/City Traffic Management Center in NYC.	All	0.000	SDF ITS
X805.69	NYSDOT	Bronx and N. Manhattan ITS Phase II - spanning from Major Deegan Expressway: Triboro Bridge to Westchester County line and Sheridan Expressway: from I-278 to I-95	Bronx, New York	5.200	STPX SDF STPU
X805.70	NYSDOT	Cross Bronx Expressway and Hutchinson River Pky ITS	Bronx, New York	22.056	SDF NHS IM
X805.71	NYSDOT	ITS Operational Support - Phase 5 - Design of operational support for the Intelligent Transportation System (ITS) on State routes citywide.	All	5.000	SDF
X805.78	NYSDOT	Develop incident management system using Highway Emergency Local Patrols (HELP)	All	0.000	SDF
X805.79	NYSDOT	Develop incident management system using Highway Emergency Local Patrols (HELP)	All	5.000	SDF NHS
X805.80	NYSDOT	Develop incident management system using Highway Emergency Local Patrols (HELP)	All	5.000	SDF
X805.83	NYSDOT	Bronx River Parkway ITS spanning through Bronx River Pkwy, Mosholu Pkwy, Henry Hudson Pkwy, and Harlem River Drive.	Bronx, New York	38.700	SDF STPX STPU

Implementation Plan - NYC Sub-Regional ITS Architecture

TIP ID	Lead Agency	Project Description	Location	Projected 3-Year Cost (Millions)	Funding Source
X805.95	NYSDOT	ITS System maintenance and operational support on State routes citywide	All	0.500	SDF STPX
X806.02	NYSDOT	Develop Incident management system spanning from I-278 BQE (Atlantic Ave to GCP and TBB to I-678) using highway emergency local patrols (HELP)	All	8.564	SDF CMAQ
X806.07	NYSDOT	ITS Control Center - Phase 2 - Electrical construction of the ITS Control Center to effectively operate the advance traffic management system (ATMS) with real-time information	Kings	0.000	NHS SDF
X806.08	NYSDOT	ITS Control Center - Phase 2 - Mechanical construction of the ITS Control Center to effectively operate the advance traffic management system (ATMS) with real-time information	Kings	0.000	NHS SDF
X806.09	NYSDOT	ITS Control Center - Phase 2 - Plumbing construction of the ITS Control Center to effectively operate the advance traffic management system (ATMS) with real-time information	Kings	0.000	NHS SDF
X806.10	NYSDOT	ITS Control Center - Phase 2 - Video/System integration construction of the ITS Control Center to effectively operate the advance traffic management system (ATMS) with real-time information	Kings	0.820	NHS SDF
X806.11	NYSDOT	ITS Operations at the Joint Traffic Operations Center	Queens	5.000	SDF
X806.14	NYSDOT	ITS Control Center - Phase 2 - Fire suppression construction of the ITS Control Center to effectively operate the advance traffic management system (ATMS) with real-time information	Kings	0.720	NHS SDF
X822.92	NYCDOT	NYCDOT Ferry Program: Reconstruction of Whitehall Street Terminal of Staten Island Ferry	New York	0.984	LOC 5309 TIFA EAR
X822.99	NYSDOT	Regional Development and enhancement of multi-agency integration of information and communications systems to support effective use of advanced public transportation system for interoperable and coordinate transit service and operational information among NYS trans. oper.	All	0.000	SDF ITS
X823.01	NYSDOT	Jamaica Bay Transportation HUB - Reconstruction of an existing dock and an existing seawall to restore the shoreline, as well as the development of a facility that would provide necessary services for passengers embarking and disembarking from ferries and water taxis.	Queens	0.625	SDF FBD S330
X823.03	NYCDOT	Purchase of computers and other ancillary items to support federal grant program	All	0.000	LOC

Implementation Plan - NYC Sub-Regional ITS Architecture

TIP ID	Lead Agency	Project Description	Location	Projected 3-Year Cost (Millions)	Funding Source
X823.08	NYCEDC/ DOT / GJDC	Jamaica Transportation Center: Pedestrian street realignment at the intersection of Archer Ave. and Suphtin Blvd. to accommodate bus requirements and increase pedestrian circulation.	Queens	0.491	LOC STPE 5309
X825.47	NYSDOT	E&H Block Grant-8 - Section 5310 program for transporting elderly and persons with disabilities by private non-profit group	All	0.000	5310
X825.48	NYSDOT	E&H Block Grant-9 - Section 5310 program for transporting elderly and persons with disabilities by private non-profit group	All	0.000	5310
X825.49	NYSDOT	E&H Block Grant-10 - Section 5310 program for transporting elderly and persons with disabilities by private non-profit group	All	0.000	5310
X825.54	NYSDOT	E&H Block - Section 5310 program for transporting elderly and persons with disabilities by private non-profit group	All	0.000	5310
X825.55	NYSDOT	E&H Block - Section 5310 program for transporting elderly and persons with disabilities by private non-profit group	All	0.467	5310
X935.69	NYCEDC	Bklyn Waterfront rail improvement (65th St Rail Road - Red Hook): Realignment and rehabilitation of rail trackage along First Avenue, construction of intermodal rail facilities at two city-owned marine terminals in Brooklyn and related facilities.	Kings	0.000	NYS HPP

4 Applicable ITS Standards

4.1 *Introduction*

The previous step for the implementation of the New York City Sub-Regional ITS Architecture identified projects and a project sequence to support the desired transportation services for the region. Many of these projects identified involves information flows between different ITS elements and systems which are necessary to provide the ITS services desired.

This Chapter will discuss the next step in the regional ITS architecture process, which is to identify applicable ITS Standards that can be considered for implementation. By implementation, it is meant to build the software that will create the interfaces and information flows that have been defined by the NYCSRA.

This discussion of ITS Standards in this Chapter consists of three parts. The first part of the discussion provides a brief introduction to ITS Standards and their benefits. A list of the ITS Standards currently available or under development is provided, along with its current status. The discussion will also provide references on where more information can be found on the ITS Development process.

The second part of the discussion is an identification of applicable ITS Standards for the NYCSRA. The ITS standards discussion will include both regional and national ITS standards.

The final part of the discussion will provide recommendations on which ITS Standards should be considered for the region.

4.2 *What are ITS Standards?*

Standards specify how to do things consistently. They may specify how things should work, or they may describe certain physical attributes. ITS standards are national or regional industry-consensus standards that define how ITS system components operate. ITS standards establish a common way in which systems and devices connect and communicate with one another. By specifying how systems and components interconnect, the standards promote interoperability, allowing 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.

4.2.1 *ITS Standards Program*

The U.S. DOT ITS Standards Program is working toward the widespread use of national ITS standards to encourage the interoperability of ITS systems. Through cooperative agreements with seven standards development organizations (SDOs), the Standards Program is

accelerating development of about 100 non-proprietary, industry-based, consensus ITS standards, and is encouraging public-sector participation in the development process. The SDOs that are involved in the development of ITS standards are:

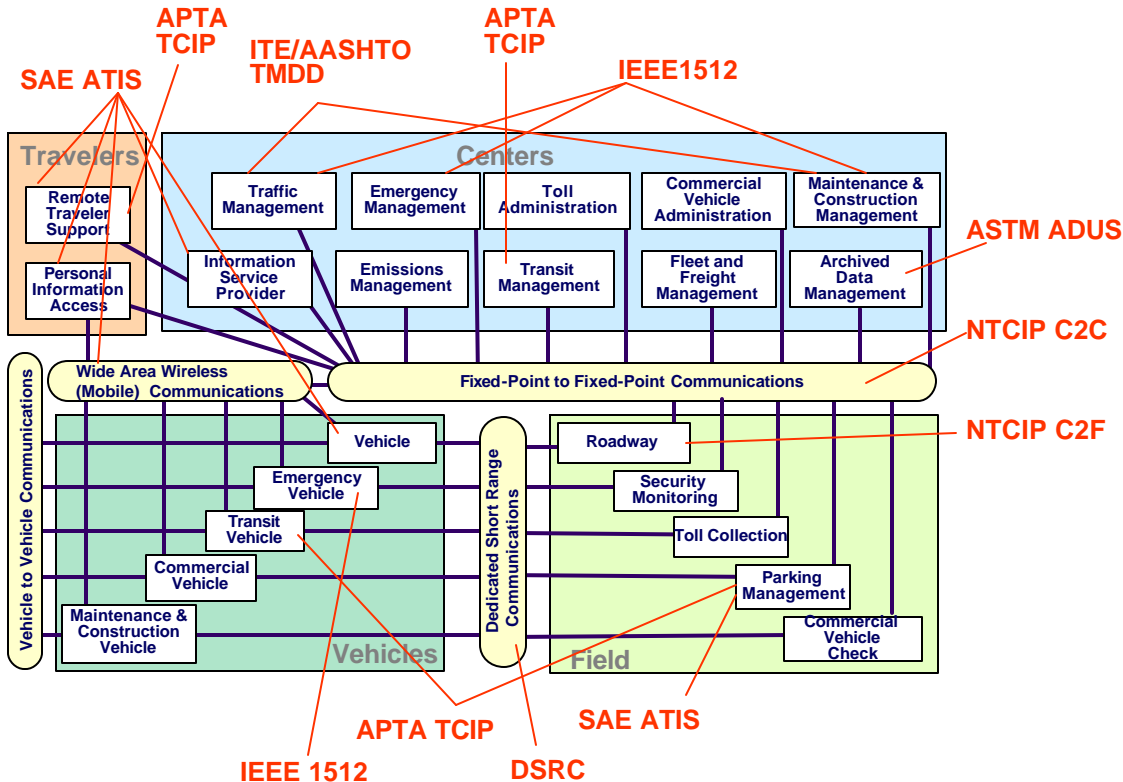
- American Association of State Highway and Transportation Officials (AASHTO)
- American Public Transportation Association (APTA)
- American Society for Testing & Materials (ASTM)
- Institute of Electrical and Electronics Engineers (IEEE)
- Institute of Transportation Engineers (ITE)
- National Electrical Manufacturers Association (NEMA)
- Society of Automotive Engineers (SAE)

In addition to adopting national standards, a region may wish to adopt regional standards that would facilitate interoperability and the integration of ITS systems in the region. For example, standard base maps, naming conventions, measurement & location standards, and organizational structure identifiers can all facilitate the meaningful exchange of information between systems in the region. Specific examples of regional standards include the Inter-Agency Group (IAG) standard for the New York City region's electronic toll collection system (E-ZPass), and the New York City Department of City Planning's ITS database for archiving transportation data for the region. These types of regional standards should also be considered and can be included in the standards documentation at the discretion of the region.

Standards are an important tool that will allow efficient implementation of the regional ITS architecture over time. Establishing regional and national standards for exchanging information among ITS systems is important not only from an interoperability point of view; it also reduces risk and cost since a region can select among multiple vendors for deployment products. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances and new approaches evolve. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances, vendors change, and new approaches evolve.

The figure below shows the relation of the suite of ITS standards activities to the National ITS Architecture.

Table 4-1. Relation of National ITS Architecture to Suite of ITS Standards



Make a note that DSRC is not a standard; but all of the above are suite of standards, Cite WAVE standard. DSRC is not implemented today with open standards.

In general, each information flow has up to three types of standards that are relevant: a message set standard, a data element standard, and one or more communications protocol standards. In general, each information flow has up to three types of standards that are relevant: a message set standard, a data element standard, and one or more communications protocol standards. This is summarized below:

- **C - Communications protocol** – are the rules to move information. The protocol may consist of rules regarding data formats, control information coordination, error handling, or timing.
- **D - Data Elements** – are the smallest entity of data. Sometimes labeled as data objects or object definitions, they are the building blocks for transferring bits of information.
- **M - Message Sets** – are strings of data elements put together to provide related, relevant information. A group of pre-defined messages can accomplish a function.

Standards application areas are deployment-oriented categories that focus on specific ITS services or systems. Each application area contains one or more interfaces in the National ITS Architecture.

- **C2R - Center-to-Roadside** – This category of application areas includes those standards that provide communication links between a transportation or traffic management center and roadside equipment that regulates the flow of traffic.
- **C2C - Center-to-Center** – This category of application areas includes those standards that facilitate communication between transportation management centers. This category includes communications necessary for transit use.
- **C2T - Center-to-Vehicle/Traveler** – This category of application areas includes those standards that facilitate communication between transportation management centers and the driver of a vehicle or a traveler planning a trip. This category also includes communications necessary for coordination between transit management centers and their vehicles.
- **R2V - Roadside-to-Vehicle** – This category of application areas includes those standards that facilitate wireless communication between roadside equipment and vehicles on the road.
- **R2R - Roadside-to-Roadside** - This application area category includes standards that facilitate communications between railroad wayside equipment and highway roadside equipment.

A report identifying ITS Standards supporting regional and national interoperability is a required component of the regional ITS architecture as identified in FHWA Rule 940.9(d)7 and FTA National ITS Architecture Policy Section 5.d.7, and is included as an output of the NYCSRA. The Rule/Policy requires, where appropriate, that federally funded ITS projects use ITS standards that are adopted by the USDOT. No ITS standards have been formally adopted by the USDOT as of April 2004, but as the SDO-approved standards mature and their market penetration expands, USDOT may decide to adopt it through a formal rulemaking process.

4.2.2 Current Status

Table 4-2 summarizes the current status of the ITS Standards that are available or that are under development. The table indicates the application area (C2R, C2C, C2T, R2V, R2R) and type of information flow (Communications (C), Data Element (D), Message Set (M)); the ITS Standard, the current status of that ITS standard, a description about what the Standard encompasses, and contact information.

Table 4-2. Current ITS Standards

Type	Standard	Standard Title	Status	Description	Contact
C	NTCIP 1101	NTCIP Simple Transportation Management Framework (STMF) – TS3.2, Amendment 1	To be replaced by NTCIP 1102, NTCIP 1103, and NTCIP 8004	The STMF describes the simple transportation management framework used for managing and communicating information between management stations and transportation devices. It covers integrated management of transportation networks, networking devices, and transportation specific equipment attached to NTCIP-based networks.	Robert De Roche, Robert De Roche Consulting
C	NTCIP 1102	NTCIP - Octet Encoding Rules (OER) – v01.12	Recommended Standard	Defines the presentation layer data encoding rules that are used in conjunction with application layer protocols defined in other standards. serves as a replacement for part of NTCIP 1101 (STMF), but also defines additional features.	Robert De Roche, Robert De Roche Consulting
C	NTCIP 1103	NTCIP Transportation Management Protocol (TMP) – v01.15	User comment draft	Includes STMP (NTCIP 1101) wit additional definitions.	Robert De Roche, Robert De Roche Consulting
	NTCIP 1104	NTCIP CORBA Naming Convention Specification	User comment draft	Defines the naming service for CORBA for use in center-to-center communications in the transportation domain, and lists the requirements for establishing names for management systems and for the objects managed by those systems.	Manny Insignares, Consensus Systems Technologies Corp.
	NTCIP 1105	NTCIP CORBA Security Service Specification	User comment draft	Defines the standard security feature for CORBA NTCIP systems	Manny Insignares, Consensus Systems Technologies Corp.
	NTCIP 1106	NTCIP CORBA Near Real-Time Data Service Specification	Approved work item	Defines the standards way in which real-time data should be exchanged within CORBA systems.	Manny Insignares, Consensus Systems Technologies Corp.
C2R D, M	NTCIP 1201	NTCIP - Global Object Definitions – Version 1, Amendment 1	Version 2 in user comment draft (v02.26)	Defines the pieces of data that are likely to be used in multiple device types, such as time, schedules, report generation	Ken Vaughn, Trevilon Corp.

Type	Standard	Standard Title	Status	Description	Contact
C2R D, M	NTCIP 1202	NTCIP - Object Definitions for Actuated Traffic Signal Controller Units – Version 1, Amendment 1	Version 2 in user comment draft (v02.18)	Defines the data that are frequently found in actuated traffic signal controllers.	Peter Ragsdale, McCain Traffic Supply, Inc. Beth Ramirez, City of Dallas
C2R D, M	NTCIP 1203	NTCIP - Object Definitions for Dynamic Message Signs – Version 1, Amendment 1	Version 2 in user comment draft (v02.27)	Defines the data that are found in dynamic message signs, including blank-out signs, changeable message signs, and variable message signs.	Chris Bates, Trevilon Corporation
C2R D, M	NTCIP 1204	NTCIP - Object Definitions for Environmental Sensor Stations – Version 1, Amendment 1	Version 2 to be submitted for user comment draft (v02.18)	Defines the data that are found in road weather information stations and air quality sensors.	Gene Martin, Virginia DOT
C2R D, M	NTCIP 1205	NTCIP - Object Definitions for Closed Circuit Television Camera Control – Version 1	Recommended Standard. Amendment 1 in development	Defines the data that are used to control video cameras	Michael Forbis, Washington State Department of Transportation
C2R D, M	NTCIP 1206	NTCIP – Object Definitions for Data Collection – User Comment Draft - v01.21	Version 1 submitted for balloting	Deals with the data stored in roadside count stations.	Rick Stalowski, Peek Traffic Systems. Inc.
C2R D, M	NTCIP 1207	NTCIP - Object Definitions for Ramp Meter Control – Version 1	Recommended Standard	Defines the data that are found in ramp meters	Brian Simi, CalTrans
C2C D, M	NTCIP 1208	NTCIP - Object Definitions for Video Switches – User Comment Draft – v01.04	Version 1 submitted for balloting	Defines the data to control a video switch to enable multiple monitors to view multiple video feeds.	Michael Forbis, Washington State Department of Transportation
C2R D, M	NTCIP 1209	NTCIP - Object Definitions for Transportation Sensor Systems – Version 1	Version 1 submitted for balloting	Deals with the data collected by various types of detectors used by real-time management systems.	Curtis G. Herrick, Herrick Consulting
C2R D, M	NTCIP 1210	NTCIP – Objects for Signal System Masters – User comment draft – v01.14	Resolving user comments	Defines the data used to control a field master	Richard Denney, Iteris, Inc.
C2R D, M	NTCIP 1211	NTCIP – Objects for Signal Control and Prioritization – User comment draft – v01.26	Version 1 submitted for balloting	Defines the data for controlling traffic signal systems in priority applications	Ronald Atherley, King Count DOT – Metro Transit

Type	Standard	Standard Title	Status	Description	Contact
C2R D, M	NTCIP 1212	NTCIP – Objects for Network Camera Operations – Working Group Draft	In development	Defines the data that are used with digital image cameras	Michael Forbis, Washington State Department of Transportation
C2R D, M	NTCIP 1213	NTCIP – Objects for Electrical and Lighting Management Systems – Working Group Draft	In development	Defines the data for roadside electrical and lighting management systems	Karl Burkett, Texas DOT
C2C D, M	NTCIP 1301	NTCIP Weather Report Message Set for ESS – Working Group Draft	In development	Defines the message set to exchange weather and pavement data between centers	E.A. (Gene) Martin, Virginia DOT
C2C	NTCIP 1602	NTCIP - Generic Reference Model	In development	Defines a UML-based model for traffic management center communications	Manny Insignares, Consensus Systems Technologies Corp.
C	NTCIP 2001	NTCIP - Class B Profile – Version 1, Amendment 1	To be rescinded by NTCIP 2201, NTCIP 2301, NTCIP 2101, and NTCIP 2102	Defines the low bandwidth NTCIP protocol.	Robert De Roche, Robert De Roche Consulting
C	NTCIP 2002	NTCIP - Class A and Class C Profile	Withdrawn	Withdrawn.	
C	NTCIP 2101	NTCIP - Point-to-Multipoint Protocol/RS232 Subnetwork Profile – Version 1	Recommended Standard	Defines how to communicate over a multi-drop serial communications link.	Robert De Roche, Robert De Roche Consulting
C	NTCIP 2102	NTCIP - Point-to-Multipoint Protocol/FSK Subnetwork Profile – Version 1	Recommended Standard	Defines how to communicate over twisted wire using FSK modems.	Robert De Roche, Robert De Roche Consulting
C	NTCIP 2103	NTCIP - Point-to-Point Protocol/RS232 Subnetwork Profile – Version 1	Recommended Standard	Defines how to communicate over a dial-up link or other serial point-to-point link.	Robert De Roche, Robert De Roche Consulting
C	NTCIP 2104	NTCIP - Ethernet Subnetwork Profile – Version 1	Recommended Standard	Defines how to communicate over ethernet links.	Robert De Roche, Robert De Roche Consulting
C	NTCIP 2201	NTCIP Transport Profile – Version 1	Recommended Standard	Defines a bandwidth efficient mechanism to transit data when the subject devices are directly connected and do not require network services.	Robert De Roche, Robert De Roche Consulting

Type	Standard	Standard Title	Status	Description	Contact
C	NTCIP 2202	NTCIP - Internet (TCP/IP & UDP/IP) Transport Profiles – Version 1	Recommended Standard	Defines how to communicate using the Internet suite of protocols.	Robert De Roche, Robert De Roche Consulting
C	NTCIP 2301	NTCIP – Simple Transportation Management Framework Application Profile – Version 1	Approved	Defines how to exchange data between a management system and a field device.	Robert De Roche, Robert De Roche Consulting
C	NTCIP 2302	NTCIP - Trivial File Transfer Protocol - Application Profile – Version 1	Approved	Defines how to use the Trivial File Transfer Protocol within transportation networks	Robert De Roche, Robert De Roche Consulting
C	NTCIP 2303	NTCIP - File Transfer Protocol - Application Profile – Version 1	Approved	Defines how to use the File Transfer Protocol within transportation networks	Robert De Roche, Robert De Roche Consulting
C	NTCIP 2304	NTCIP - Application Profile - Data Exchange (DATEX)	Recommended Standard	Defines how to use the DATEX-ASN protocol within US-based transportation networks.	Manny Insignares, Consensus Systems Technologies Corp.
C	NTCIP 2305	NTCIP - Application Profile - CORBA	User Comment Draft – Further development on hold	Defines how to use the Common Object Request Broker Architecture protocol within transportation networks.	Manny Insignares, Consensus Systems Technologies Corp.
C2C	NTCIP 7001	NTCIP InP-DATEX – Working Group Draft	Development on hold	Defines what services are required within DATEX centers to determine what messages and data the center supports	Manny Insignares, Consensus Systems Technologies Corp.
C2C	NTCIP 7002	NTCIP InP-CORBA – Working Group Draft	Development on hold	Defines what CORBA services are required in ITS systems.	Manny Insignares, Consensus Systems Technologies Corp.
	NTCIP 9000	NTCIP Guide	Recommended Standard	General information guide for NTCIP. Focus is primarily on center to field communications	Curtis Herrick, G.C. Herrick Associates
C2C	NTCIP 9010	NTCIP Information Report – Using XML in Center-to-Center Communications	User Comment Draft	General information report describing future XML-based standards development efforts.	Manny Insignares, Consensus Systems Technologies Corp.
	NTCIP 9011	Guide on NTCIP Testing Certification	Working Group Draft	White paper on issues related to NTCIP testing and certification	Steve Dellenback, SWRI Joe Stapleton, URS
	NTCIP 9012	NTCIP Testing Guide for Users	Working Group Draft	Guide to assist agencies with defining a testing process for testing of devices that incorporate the NTCIP standards.	Steve Dellenback, SWRI Joe Stapleton, URS

Type	Standard	Standard Title	Status	Description	Contact
	ANSI TS284	Commercial Vehicle Safety Reports	Accepted	Defines the format and data to request and send reports on the safe operation of commercial road vehicles	The John Hopkins University Applied Physics Laboratory
	ANSI TS285	Commercial Vehicle Safety and Credentials Information Exchange	Accepted	Defines the format and data to request and send information on safety and credentials information.	The John Hopkins University Applied Physics Laboratory
	ANSI TS286	Commercial Vehicle Credential	Accepted	Defines the format and data to apply for required credentials.	The John Hopkins University Applied Physics Laboratory
D, M	TCIP 3.0	Transit Communications Interface Profiles	Under Development	A single standard is being developed that covers the multiple business areas of the previous suite of standards. The initial draft for ballot is expected in December 2004.	Isaac K. Takyi, Ph.D., MTA
D, M	UTFS-xxx	Universal Transit Farecard Standard	Under Development	This standard will define the interfaces needed for regional fare cards.	Tom Parker, BART
	E17.54.02.1	Standard Specification for Metadata Content for ITS-Generated Data	In development	Specifies how to annotate data for subsequent uses.	Rich Margiotta, Cambridge Systematics
	E17.54.02.2	Standard Specification for Archiving ITS-Related Traffic Monitoring Data	In development	Specifies a data dictionary for archiving traffic data.	Rich Margiotta, Cambridge Systematics
	E2158-01	Std. Spec. for Ded Short Range Comm. (DSRC) Physical Layer Using Microwave in the 902-928 MHz Band	Published Standard	Specification for the RF characteristics (physical layer) for DSRC operating in the range of 902-928 MHz. Supports both active and backscatter transponders.	Dan Smith, ASTM
	E2213-02	Std. Spec. for Telecomm. and Info. Exchange between Roadside and Vehicle Systems: 5.9 GHz DSRC	Published Standard	A medium access control layer (MAC) and physical layer (PHY) specification for wireless connectivity using dedicated short-range communications (DSRC) services.	Dan Smith, ASTM
	E2259-03	Standard Guide for Archiving and Retrieving ITS-Generated Data-	Published Standard	This guide covers desired approaches to be considered and followed in planning, developing, and operating specific ADMS for the archiving and retrieval of ITS-generated data	Rich Margiotta Cambridge Systematics
	PS105-99	Standard Specification for DSRC - Data Link Layer	Published Standard	Specification for the protocol (data link) communications. Supports both synchronous and asynchronous modes for operations.	Daniel Smith, ASTM

Type	Standard	Standard Title	Status	Description	Contact
	EIA-794	Data Radio Channel (DARC) System	Published Standard	Specifies the DARC FM Subcarrier waveform for the delivery of traveler information, messages and data services to mobile, portable and fixed receivers.	Jean Johnson, CEA
	EIA-7945	Subcarrier Traffic Information Channel (STIC) System	Published Standard	A flexible waveform defined for the physical and data link layers for delivery of data to mobile and fixed users using a sub-carrier on a broadcast FM station.	Jean Johnson, CEA
	Bks 1-6: SH94633-SH 94638	The Survey and Analysis of Existing Standards and those Under Development Applicable to the Needs of the ITS Communications Technologies	Published Standard	The survey and analysis of existing standards (and those under development) that include requirements for both wireline and wireless transmissions.	Anita C. Ricketts, IEEE
	P1512.1	Standard for Traffic Incident Management Message Sets for Use by EMCs	Published Standard	Enables consistent standardized communications among Incident Management centers, fleet and freight management centers, information service providers, emergency management centers, planning subsystems, traffic management centers and transit management centers.	Anita C. Ricketts, IEEE
	P1512.2	Standard for Public Safety Incident Management Message Sets for Use by EMCs	Balloting	A comprehensive set of messages required for incident management that is unique to public safety communications. These message sets will be generated and transmitted among the emergency management subsystem to all the other subsystems and public safety providers.	Anita C. Ricketts, IEEE
	P1556	Standard for Security and Privacy of Vehicle/Roadside Communication Including Smart Card Communications	Balloting	Identifies security methods to be used in DSRC message transmission at specific frequencies, and develops a single standard methodology for the protection of information between the vehicle and the roadside.	Anita C. Ricketts, IEEE

Type	Standard	Standard Title	Status	Description	Contact
	P1609.1	Standard for Dedicated Short Range Communications Resource Manager	Balloting	This standard describes a resource manager that arbitrates requests for transponder usage.	Tom Kurihara, TKstd Management
	P1609.2	Standard for Dedicated Short Range Communications Application Layer	In development	Describes an application layer standard to be used for 5.9 GHz DSRC.	Tom Kurihara, TKstd Management
	P1609.3	Standard for IP Interface for Dedicated Short Range Communications	In development	Describes standard that supports higher layer communication stacks, including TCP/IP.	Tom Kurihara, TKstd Management
	P1609.4	Standard for Data Dictionary and Message Sets for Dedicated Short Range Communications	In development	Describes various standard message formats for DSRC applications at 5.9 GHz.	Anita C. Ricketts, IEEE
	Std 1404-1998	Guide for Microwave Communications System Development	Published Standard	A guide that addresses all the requirements for microwave system design, procurement, construction, maintenance, and subsequent operations	Anita C. Ricketts, IEEE
	Std 1488-2000	Standard for Message Set Template for Intelligent Transportation Systems	Published Standard	A standard for an ITS message set template. Approved for trial use through June 2002.	Anita C. Ricketts, IEEE
	Std 1489-1999	Standard for Data Dictionaries for Intelligent Transportation Systems - Part 1 Functional Area Data Dictionaries	Published Standard	A set of meta entities and meta attributes for ITS data dictionaries, as well as associated conventions and schemas, that enable describing, standardizing, and managing all ITS data.	Anita C. Ricketts, IEEE
	Std 1512.3- 2002	Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers	Published Standard	Enables consistent standardized communications among incident management centers, HAZMAT teams, police, local government, special emergency and emergency management centers.	Anita C. Ricketts, IEEE

Type	Standard	Standard Title	Status	Description	Contact
	Std 1512-2000	Standard for Common Incident Management Message Sets for use by Emergency Management Centers	Published Standard	Standards describing the form and content of the incident management messages sets for emergency management systems (EMS) to traffic management systems (TMS) and from emergency management systems to the emergency telephone system (ETS) or (E911).	Anita C. Ricketts, IEEE
	Std 1570-2002	Standard for the Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection	Published Standard	This standard defines the logical and physical interfaces, and the performance attributes for the interface between the rail subsystem and the highway subsystem at a highway rail intersection.	Anita C. Ricketts, IEEE
	9603-1	Application Program Interface (API) Standard for the Advanced Transportation Controller (ATC)-	Recommended Standard	An advanced transportation controller (ATC) software application program interfaces (APIs) that support ITS data flows and standards enabling the deployment of ITS functions.	James Cheeks, ITE
	9603-2	Advanced Transportation Controller (ATC) Cabinet	Balloting	Functional physical design requirements for an advanced transportation controller (ATC) cabinet that supports the deployment of multiple ITS functions in a single cabinet.	James Cheeks, ITE
	9603-3	Advanced Transportation Controller (ATC)	Balloting	Standard for advanced transportation controller (ATC) devices to support ITS data flows and standards that enable deployment of ITS.	James Cheeks, ITE
	TM 1.03	Standard for Functional Level Traffic Management Data Dictionary (TMDD)- working on amendment	Published Standard	This document contains data elements for roadway links and for incidents and traffic-disruptive roadway events. Includes data elements for traffic control, ramp metering, traffic modeling, video camera control traffic, parking management and weather forecasting, as well as data elements related to detectors, actuated signal controllers, vehicle probes, and dynamic message signs.	James Cheeks, ITE

Type	Standard	Standard Title	Status	Description	Contact
	TM 2.01	Message Sets for External TMC Communication (MS/ETMCC)- working on amendments	Published Standard	A message set standard for communication between traffic management centers and other ITS centers, including information service providers, emergency management systems, missions management systems, and transit management systems	James Cheeks, ITE
	SAE-J1663	Truth-in-Labeling Standard for Navigation Map Databases	Published Standard	This standard defines consistent terminology, metrics, and tests for describing the content and quality of navigable map databases.	Jack Pokrzywa, SAE
	SAE-J1708	Serial Data Comm. Between MicroComputer Systems in Heavy-Duty Vehicle Applications	Published standard	Defines a recommended practice for implementing a bi-directional, serial communication link among modules containing microcomputers. Defines those parameters of the serial link that relate primarily to hardware and basic software compatibility such as interface requirements, system protocol, and message format.	Jack Pokrzywa, SAE
	SAE-J1746	ISP-Vehicle Location Referencing Standard	Published standard	referencing format for information service provider (ISP) -to-vehicle and vehicle-to-ISP references. This standard will reflect the cross-streets profile of the current location reference message specification (LRMS) document as expressed in the National Location Referencing Information Report (SAE J2374).	Jack Pokrzywa, SAE
C, D, M	SAE-J1760	ITS Data Bus Data Security Services Recommended Practice	Published standard	Specifies definition of data security requirements between devices on the ITS data bus (IDB) and definitions of device and message level security. Also includes a mechanism to discourage theft of data bus modules.	Jack Pokrzywa, SAE
	SAE-J1761	Information Report on ITS Terms and Definitions	Published standard	A dictionary of terminology in the ITS field, with a focus on the vehicle and interfaces to the vehicle.	Jack Pokrzywa, SAE

Type	Standard	Standard Title	Status	Description	Contact
	SAE-J1763	A Conceptual ITS Architecture: An ATIS Perspective	Published standard	This Information Report describes a general reference architecture for integration of multiple advanced traveler information system (ATIS) devices.	Jack Pokrzywa, SAE
D, M	SAE-J2313	On-Board Land Vehicle Mayday Reporting Interface	Published standard	A general specification that prescribes protocol methods which enable vendors with different communication methods to communicate with response agencies in a standard format.	Jack Pokrzywa, SAE
	SAE-J2352	Mayday Industry Survey Information Report	Published standard	A summary of information obtained by way of a survey conducted in 1997 of MAYDAY system manufacturers. The information is limited to technical data as it pertains to vehicle and on-board MAYDAY system operations.	Jack Pokrzywa, SAE
	SAE-J2353	Data Dictionary for Advanced Traveler Information Systems (ATIS)	Published standard	A minimum set of medium-independent data elements needed by potential information service providers to deploy ATIS services and provide the basis for future interoperability of ATIS devices.	Jack Pokrzywa, SAE
M	SAE-J2354	Message Set for Advanced Traveler Information System (ATIS)	Published standard	A basic message set using the data elements from the ATIS data dictionary needed by potential information service providers to deploy ATIS services and to provide the basis for future interoperability of ATIS devices.	Jack Pokrzywa, SAE
	SAE-J2355	ITS Data Bus Architecture Reference Model Information Report	Published standard	A reference model for an in-vehicle data bus. The ITS data bus (IDB) will enable manufacturers, dealers, and vehicle owners to install a wide range of electronics equipment reliably and safely in a vehicle at any time during the vehicle lifecycle.	Jack Pokrzywa, SAE
C	SAE-J2366-2	ITS Data Bus Protocol - Link Layer Recommended Practice	Published standard	Requirements for the link layer (layer 7 of the OSI model) for the ITS data bus.	Jack Pokrzywa, SAE

Type	Standard	Standard Title	Status	Description	Contact
C	SAE-J2366/1	ITS Data Bus Protocol - Physical Layer Recommended Practice	Published standard	A physical interface device (connector) that will ensure compatibility between vehicles and aftermarket devices. Physical interface performance requirements, circuit identification and configuration, and electrical requirements for the physical layer of the ITS data bus.	Jack Pokrzywa, SAE
C	SAE-J2366/4	ITS Data Bus Protocol - Thin Transport Layer Recommended Practice	Published standard	Requirements for the thin transport layer (Layer 4 of the OSI model) for the ITS data bus.	Jack Pokrzywa, SAE
C, D, M	SAE-J2366/7	ITS Data Bus Protocol - Application Layer Recommended Practice	Published standard	Requirements for the application layer (layer 7 of the OSI model) for the ITS data bus.	Jack Pokrzywa, SAE
C, D, M	SAE-J2367	ITS Data Bus Gateway Recommended Practice	Published standard		Jack Pokrzywa, SAE
C, D, M	SAE-J2369	Standard for ATIS Message Sets Delivered Over Bandwidth Restricted Media	Published standard	A general framework allowing transmission of traveler information via bandwidth reduced media such as found in wireless applications. Creates a uniform coding and message structure for link travel times, incident text, weather and transit for broadcast delivery.	Jack Pokrzywa, SAE
	SAE-J2372	Field Test Analysis Information Report	Published standard	This information report presents the results of field tests on location-referencing standards.	Jack Pokrzywa, SAE
	SAE-J2372	Stakeholders Workshop Information Report	Published standard	Results of workshops to solicit and discuss stakeholder requirements for location referencing standardization.	Jack Pokrzywa, SAE
	SAE-J2374	Location Referencing Message Specification	Published standard	A basis for location referencing standardization activities by various application communities and SDOs.	Jack Pokrzywa, SAE
H	SAE-J2395	ITS In-Vehicle Message Priority	Published standard	Specifies orderly temporal and spatial presentation of ITS information to the driver.	Jack Pokrzywa, SAE

Type	Standard	Standard Title	Status	Description	Contact
H	SAE-J2396	Measurement of Driver Visual Behavior Using Video Based Methods (Def. & Meas.)	Published standard	Procedures for collecting, reducing, analyzing, and reporting on driver-eye glance data in a manner suitable for evaluating ITS systems and comparing alternative designs for a particular system in terms of visual demand. Helps insure that systems minimize the time a driver's eyes are off the road.	Jack Pokrzywa, SAE
H	SAE-J2399	Adaptive Cruise Control: Operating Characteristics and User Interface	Published standard	This standard presents the minimum requirements for safety-related elements of the operating characteristics and user interface of vehicles equipped with adaptive cruise control (ACC). It also coordinates the operating characteristics and user interface with collision warning and avoidance, along with other driver systems.	Jack Pokrzywa, SAE
H	SAE-J2400	Forward Collision Warning: Operating Characteristics and User Interface	Published standard	Minimum safety and human factor requirements for front collision warning (FCW) operating characteristics and driver interfaces to ensure consistency across vehicles so that drivers can quickly understand and safely use a FCW-equipped vehicle.	Jack Pokrzywa, SAE
M	SAE-J2529	Rules for Standardizing Street Names and Route IDs	Published standard	Specifies the rules for standardizing street names for use in ATIS and other ITS applications.	Jack Pokrzywa, SAE
	SAE-J2539	Comparison of GATS Messages to SAE ATIS Standards Information Report	Published standard	An overview and comparison of Global Automotive Telematics Standard (GATS) messages developed for use on global system mobile (GSM) cellular phone systems (European).	Jack Pokrzywa, SAE
M	SAE-J2540	Messages for Handling Strings and Look-Up Tables in ATIS Standards	Published standard	Describes the process used in various SAE ATIS message set standards to deliver textual strings and provides national tables used in the delivery of incident description.	Jack Pokrzywa, SAE
D, M	SAE-J2540-1	RDS (Radio Data System) Phrase List	Published standard		Jack Pokrzywa, SAE

Type	Standard	Standard Title	Status	Description	Contact
D, M	SAE-J2540-2	ITIS (International Traveler Information Systems) PhraseLists	Published standard		Jack Pokrzywa, SAE
D, M	SAE-J2540-3	National Names Phrase List	Published standard		Jack Pokrzywa, SAE
	SAE-J2630	Converting ATIS Message Standards from ASN.1 to XML	Published standard		Jack Pokrzywa, SAE

4.2.3 Web Resources

The list below provides information about web sites that contain information about the ITS standards program.

www.its-standards.net	Institute of Transportation Engineers
www.ntcip.org	National Transportation Communications for ITS Protocol

4.3 *Applicable Standards for the Region*

The list of ITS Standards currently under development or are available currently numbers 101. Although U.S. DOT encourages the use of ITS Standards, not all 101 U.S. DOT Standards are applicable to the New York City region. For example, many of the SAE standards are related to vehicle safety and controls, and are not applicable to the NYCSRA at this time, except for possibly transit vehicle monitoring.

Also, several regional standards already exist and agreed upon, and thus region may be better served by using these regional standards instead of the U.S. DOT ITS Standards. Examples of regional standards includes the Inter-Agency Group (IAG) standards for electronic toll tags (i.e., E-ZPass), the TRANSCOM Regional Architecture communications protocol, the Inter-Regional Video Network protocols, regional fare payment card (?to be verified?) and the New York City Department of City Planning ITS Data Archive. For each of these examples, agencies already agreed to use established formats and protocols, and thus switching to the different formats and protocols identified by the ITS Standards Development Program may be costly. However, as these systems are upgraded or expanded in the future, it may be worth the investment to transition these systems to use the recommended ITS Standards.

Table x in the appendices lists what ITS Standards may be applicable to the NYCSRA, sorted by Stakeholder, and Stakeholder element. The table includes what architecture data flow that the ITS Standard supports, and with which elements that the architecture flow exchange data with.

<This will be added in the next draft>.

4.4 *Recommendation – ITS Standards*

This chapter provides an evaluation of the current ITS Standards and whether these ITS Standards are applicable for deployment in the New York City region. Considerations on if an ITS Standard is recommended for deployment in the New York City region include the following:

- Will the ITS standard be mature or available in the deployment timeframe?
- Has the ITS standard been approved or published by the SDOs?
- Is the ITS standard supported by multiple vendors?
- Has the ITS standard been deployed by other agencies?
- Has the ITS standard been tested or are standard testing procedures been developed?

- Is an update to the ITS standard expected in the near future?

The evaluation included if each ITS Standard supports the region's needs and requirements. Regions and agencies may have functional requirements or needs that may not be supported by the standards. Although ITS Standards generally support most common user requirements and needs, it may not support the less common functions or needs that the New York City region may require. Although the ITS Standards allow for the support of some customization to meet a region's unique requirements, it is a concern if the region has too many unique requirements that the ITS Standards support.

For example, the current approved version of NTCIP 1203, Object Definitions for Dynamic Message Signs (Version 1, Amendment 1) does not currently support multi-color, graphical variable message signs, not does it support control of the variable message sign from multiple traffic management centers. However, support for multi-color graphics is included in the Version 2 of the Standard, which is currently being voted upon, and support for control from multiple centers is not a critical issue, thus the Standard is recommended for use in the New York City region.

Table 4-3 lists the ITS Standards recommended for deployment in the New York City region and a timeframe for its deployment.

Table 4-3. Recommended ITS Standards

Standard	Standard Title	Comments	Timeframe
NTCIP 1102	NTCIP – Octet Encoding Rules (OER) – v01.12	Defines the presentation layer data encoding rules that are used in conjunction with application layer protocols defined in other standards.	Immediate.
NTCIP 1103	NTCIP Transportation Management Protocol (TMP) – v01.15	Base standard for NTCIP.	Immediate.
NTCIP 1201	NTCIP - Global Object Definitions – Version 1, Amendment 1	Defines the pieces of data that are likely to be used in multiple field devices, including traffic signals,	Immediate
NTCIP 1202	NTCIP - Object Definitions for Actuated Traffic Signal Controller Units – Version 1, Amendment 1	Defines the data that are frequently found in actuated traffic signal controllers.	
NTCIP 1203	NTCIP - Object Definitions for Dynamic Message Signs – Version 1, Amendment 1	Defines the data that are found in dynamic message signs, including blank-out signs, changeable message signs, and variable message signs.	Immediate. For new deployments, Version 2 of the Standard is recommended once approved.
NTCIP 1204	NTCIP - Object Definitions for Environmental Sensor Stations – Version 1, Amendment 1	Defines the data that are found in road weather information stations and air quality sensors.	Immediate.
NTCIP 1205	NTCIP - Object Definitions for Closed Circuit Television Camera Control – Version 1	Defines the data that are used to control video cameras	Immediate.

Standard	Standard Title	Comments	Timeframe
NTCIP 1206	NTCIP – Object Definitions for Data Collection – User Comment Draft - v01.21	Deals with the data stored in roadside count stations.	Immediate, once approved.
NTCIP 1208	NTCIP - Object Definitions for Video Switches – User Comment Draft – v01.04	Defines the data to control a video switch to enable multiple monitors to view multiple video feeds.	Immediate.
NTCIP 1209	NTCIP - Object Definitions for Transportation Sensor Systems – Version 1	Deals with the data collected by various types of detectors used by real-time management systems.	Immediate.
NTCIP 1210	NTCIP – Objects for Signal System Masters – User comment draft – v01.14	Defines the data used to control a field master	Immediate, once approval.
NTCIP 1212	NTCIP – Objects for Network Camera Operations – Working Group Draft	Defines the data that are used with digital image cameras	Immediate, once approved.
NTCIP 1213	NTCIP – Objects for Electrical and Lighting Management Systems – Working Group Draft	Defines the data for roadside electrical and lighting management systems	Immediate, once approved.
NTCIP 1301	NTCIP Weather Report Message Set for ESS – Working Group Draft	Defines the message set to exchange weather and pavement data between centers	Immediate, once approved.
NTCIP 1602	NTCIP - Generic Reference Model	Defines a UML-based model for traffic management center communications	
NTCIP 2101	NTCIP - Point-to-Multipoint Protocol/RS232 Subnetwork Profile – Version 1	Defines how to communicate over a multi-drop serial communications link.	Immediate.
NTCIP 2102	NTCIP - Point-to-Multipoint Protocol/FSK Subnetwork Profile – Version 1	Defines how to communicate over twisted wire using FSK modems.	Immediate.
NTCIP 2103	NTCIP - Point-to-Point Protocol/RS232 Subnetwork Profile – Version 1	Defines how to communicate over a dial-up link or other serial point-to-point link.	Immediate.
NTCIP 2104	NTCIP - Ethernet Subnetwork Profile – Version 1	Defines how to communicate over ethernet links.	
NTCIP 2201	NTCIP Transport Profile – Version 1	Defines a bandwidth efficient mechanism to transit data when the subject devices are directly connected and do not require network services.	Immediate.
NTCIP 2202	NTCIP - Internet (TCP/IP & UDP/IP) Transport Profiles – Version 1	Defines how to communicate using the Internet suite of protocols.	Immediate.
NTCIP 2301	NTCIP – Simple Transportation Management Framework Application Profile – Version 1	Defines how to exchange data between a management system and a field device.	Immediate.
NTCIP 2302	NTCIP - Trivial File Transfer Protocol - Application Profile – Version 1	Defines how to use the Trivial File Transfer Protocol within transportation networks	Immediate.

Standard	Standard Title	Comments	Timeframe
NTCIP 2303	NTCIP - File Transfer Protocol - Application Profile – Version 1	Defines how to use the File Transfer Protocol within transportation networks	Immediate.
NTCIP 9010	NTCIP Information Report – Using XML in Center-to-Center Communications	General information report describing future XML - based standards development efforts.	Immediate.
ANSI TS284	Commercial Vehicle Safety Reports	Defines the format and data to request and send reports on the safe operation of commercial road vehicles	
ANSI TS285	Commercial Vehicle Safety and Credentials Information Exchange	Defines the format and data to request and send information on safety and credentials information.	
ANSI TS286	Commercial Vehicle Credential	Defines the format and data to apply for required credentials.	
TCIP 3.0	Transit Communications Interface Profiles	A single standard is being developed that covers the multiple business areas of the previous suite of standards.	
UTFS-xxx	Universal Transit Farecard Standard	This standard will define the interfaces needed for regional fare cards.	
E17.54.02.1	Standard Specification for Metadata Content for ITS-Generated Data	Specifies how to annotate data for subsequent uses.	Consider adopting, once approved. Dependent on status of NYCDOP ITS Archive Database.
E17.54.02.2	Standard Specification for Archiving ITS-Related Traffic Monitoring Data	Specifies a data dictionary for archiving traffic data.	Consider adopting once approved. Dependent on status of NYCDOP ITS Archive Database.
E2259-03	Standard Guide for Archiving and Retrieving ITS-Generated Data-	This guide covers desired approaches to be considered and followed in planning, developing, and operating specific ADMS for the archiving and retrieval of ITS-generated data	Consider adopting. Dependent on status of NYCDOP ITS Archive Database.
EIA -794	Data Radio Channel (DARC) System	Specifies the DARC FM Subcarrier waveform for the delivery of traveler information, messages and data services to mobile, portable and fixed receivers.	Consider adopting.
EIA -7945	Subcarrier Traffic Information Channel (STIC) System	A flexible waveform defined for the physical and data link layers for delivery of data to mobile and fixed users using a sub-carrier on a broadcast FM station.	Consider adopting.
P1512.1	Standard for Traffic Incident Management Message Sets for Use by EMCs	Enables consistent standardized communications among Incident Management centers, fleet and freight management centers, information service providers, emergency management centers, planning subsystems, traffic management centers and transit management centers.	Immediate.

Standard	Standard Title	Comments	Timeframe
P1512.2	Standard for Public Safety Incident Management Message Sets for Use by EMCs	A comprehensive set of messages required for incident management that is unique to public safety communications. These message sets will be generated and transmitted among the emergency management subsystem to all the other subsystems and public safety providers.	Immediate.
Std 1488-2000	Standard for Message Set Template for Intelligent Transportation Systems	A standard for an ITS message set template. Approved for trial use through June 2002.	Immediate.
Std 1489-1999	Standard for Data Dictionaries for Intelligent Transportation Systems - Part 1 Functional Area Data Dictionaries	A set of meta entities and meta attributes for ITS data dictionaries, as well as associated conventions and schemas, that enable describing, standardizing, and managing all ITS data.	Immediate.
Std 1512.3-2002	Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers	Enables consistent standardized communications among incident management centers, HAZMAT teams, police, local government, special emergency and emergency management centers.	Immediate.
Std 1512-2000	Standard for Common Incident Management Message Sets for use by Emergency Management Centers	Standards describing the form and content of the incident management messages sets for emergency management systems (EMS) to traffic management systems (TMS) and from emergency management systems to the emergency telephone system (ETS) or (E911).	Immediate.
Std 1570-2002	Standard for the Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection	This standard defines the logical and physical interfaces, and the performance attributes for the interface between the rail subsystem and the highway subsystem at a highway rail intersection.	Consider adopting upon upgrades of highway rail intersections.
9603-1	Application Program Interface (API) Standard for the Advanced Transportation Controller (ATC)-	An advanced transportation controller (ATC) software application program interfaces (APIs) that support ITS data flows and standards enabling the deployment of ITS functions.	Consider adopting if ATCs are deployed.
9603-2	Advanced Transportation Controller (ATC) Cabinet	Functional physical design requirements for an advanced transportation controller (ATC) cabinet that supports the deployment of multiple ITS functions in a single cabinet.	Consider adopting if ATCs are deployed.
9603-3	Advanced Transportation Controller (ATC)	Standard for advanced transportation controller (ATC) devices to support ITS data flows and standards that enable deployment of ITS.	Consider adopting if ATCs are deployed.
TM 1.03	Standard for Functional Level Traffic Management Data Dictionary (TMDD)- working on amendment	This document contains data elements for roadway links and for incidents and traffic-disruptive roadway events. Includes data elements for traffic control, ramp metering, traffic modeling, video camera control traffic, parking management and weather forecasting, as well as data elements related to detectors, actuated signal controllers, vehicle probes, and dynamic message signs.	Immediate. Amendment 1 is recommended upon approval.

Standard	Standard Title	Comments	Timeframe
TM 2.01	Message Sets for External TMC Communication (MS/ETMCC)- working on amendments	A message set standard for communication between traffic management centers and other ITS centers, including information service providers, emergency management systems, missions management systems, and transit management systems	Immediate.
SAE-J2353	Data Dictionary for Advanced Traveler Information Systems (ATIS)	A minimum set of medium-independent data elements needed by potential information service providers to deploy ATIS services and provide the basis for future interoperability of ATIS devices.	Immediate.
SAE-J2354	Message Set for Advanced Traveler Information System (ATIS)	A basic message set using the data elements from the ATIS data dictionary needed by potential information service providers to deploy ATIS services and to provide the basis for future interoperability of ATIS devices.	Immediate.

5 List of Agreements

Thus far, the focus of this document has been on the technical aspects of the regional ITS architecture, such as the interfaces, the data flows, and the ITS standards that support the architecture. However, institutional agreements will likely need to be developed among the various stakeholder agencies and organizations to support the technical implementation of the NYCSRA and to realize the integration documented in the regional ITS architecture.

This Chapter discusses the next step in the regional ITS architecture process, which is to list the institutional agreements necessary to implement the NYCSRA. By implementation, it is meant to build the software that will create the interfaces and information flows between the ITS Elements and stakeholders that have been defined by the NYCSRA.

It is important to clarify that the Final Rule/Policy does not require that agreements be formulated, rather only a list of potential agreements that may be necessary to implement the regional ITS architecture must be created.

This discussion of Institutional Agreements consists of three parts. The first part begins with a discussion and examples on why agreements are needed.

This part is followed by a review on the types of agreements, such as MOUs and operational policies. This part also provides guidelines on what types of information should be included in these agreements.

The next part, a list of the required agreements is compiled and new agreements that must be created are identified, augmenting agreements that are already in place.

5.1 *Institutional Agreements*

The NYCSRA provides both a technical and institutional framework for the deployment of ITS in the New York City region. In its use as a planning tool, the NYCSRA provides a blueprint for the institutional cooperation that will be needed to deploy integrated ITS systems in the region. Institutional cooperation involves coordination between various agencies and jurisdictions to achieve seamless operations and/or interoperability in the region.

Agreements among the different stakeholder agencies and organizations are required to realize the integration defined in the regional ITS architecture. Agreements are a potential understanding has to be achieved between the stakeholders to implement the regional ITS architecture. These institutional agreements may cover the operation of ITS systems, utilization of ITS standards, and/or policies regarding the sharing of data between agencies and organizations, and may include the operational procedures.

A list of potential agreements for the operations of ITS systems in a region is a requirement, as identified in FHWA Rule 940.9(d)4 and FTA National ITS Architecture Policy Section 5.d.

5.2 *Types of Agreements*

Each flow of information of control between ITS systems documented in the NYCSRA represents some level of cooperation between those stakeholders and a potential requirement for an agreement. This does not mean that an agreement is necessary for every piece of data identified in the NYCSRA, nor does it require an agreement between one stakeholder and every other stakeholder for which it has a data interface with.

The number of agreements, the level of formality and the structure of each agreement will be dependent on the parties involved. The parties involved may already have an existing agreement that can be extended and used to support the cooperative implementation and operation of ITS systems in the region. The nature of the existing relationship between those parties may also be a factor determining the type of agreement, such as whether the parties already have a good working relationship.

Agreements between agencies and organizations can be all encompassing, covering multiple areas, including operations of ITS systems, data sharing, operational policies, and/or establishing data interfaces. Or, multiple agreements may exist between two organizations and/or agencies, each covering a specific area or specific data flow.

Agreements are established to clearly define responsibilities among the involved parties. The level of formality generally increases as risks escalate and when financial transactions take place. Formality will also increase when the performance or lack of performance on the part of one organization impacts the operations of another. For example, if an agency maintains and operates the traffic signals of another agency, failure to restore a failed traffic signal in a timely fashion could have a significant impact. As different systems are linked together, they will depend upon each other. The clear definition of responsibilities for all parties will help ensure smooth transportation operations for the region and the involved parties.

The following is a checklist of potential information that should be considered in the development of an agreement:

- Concept of Operations – A basic description, in English, on the nature of the agreement and the areas of responsibility for the operation and maintenance that the agreement encompasses.
- Roles and Responsibilities – A description of the duties of each party involved in the agreement, including time frames on when those duties are to be performed.
- Data Sharing – A description of the data to be shared. The description may include the type of data, the format of the data, the conditions when the data is to be transmitted, and the manner that the data can be used. This may include a definition of any ITS Standards or protocols that are to be used.
- Control Sharing – A description of when control of ITS devices and/or systems are to be shared. The description may include the rights, privileges, and priority of the parties involved, procedures for taking control, and any other restrictions.

- Data Interfaces – As opposed to the data being shared, the data interface describes the physical aspects of the data interface. This may include physical access points, demarcation points and security
- Maintenance – A description of the maintenance responsibilities of all parties involved, contact information and the availability (such as repair time) of the ITS device or system.
- System Documentation
- Ownership – May include areas such as liability, indemnity and intellectual property
- Other Contractual Information – May include areas such as dispute resolution and termination of agreement.
- Compensation
- Permission for Deployment – Such as when deploying equipment on other stakeholder's property or jurisdiction.

There are several types of arrangements associated with data interfaces between ITS Elements. Initially, a list of all information exchanges between different stakeholders was created. The information and control flows were then reviewed and agreement types were defined. The categories for the agreement derived, or agreement types, plus a general definition is shown below:

- **Roadside Devices (RS)** - Exchange of traffic flow information, control and information of traffic control devices (DMS, CCTV, HAR, traffic signals, ramp meters), and HRI.
- **Transit Information (TR)** - Exchange of transit schedule and real-time transit operational data
- **Commercial Vehicle (CV)** - Exchange of commercial vehicle operational and CVO information
- **Video Sharing (VS)** – Video, traffic images, and video control
- **Incident and roadway status (IM)** - Exchange of planned and unplanned incidents (roadway incidents, roadway closures, weather), emergency and incident response coordination
- **Traveler Information (TI)** – Traveler information and parking
- **Emergency Alerts (EA)** - Emergency and public safety alerts
- **Archived Data (AD)** - Exchange of archived operational information (for planners, historical evaluation of operations, government reporting, etc.)
- **Toll Information (ET)** – Exchange of toll information including transactions.
- **Other (OT)** – Miscellaneous Information, including operating protocols

In developing agreements, agencies may wish to review all information and control exchanges documented in the architecture that apply for the timeframe of the agreement.

5.2.1 Handshake Agreements

Handshake agreements are informal agreements between two or more agencies. They can be implemented quickly and can be effective for short-term agreements.

5.2.2 Memorandum of Understanding

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).

5.2.3 Interagency Agreement

Sharing control of field devices operated by different agencies involves more liability issues, which requires more formal agreements. Coordinated incident response may also require formal agreements. 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.

More detailed discussions on what should be included, how to determine when agreements are needed and how to extract that information from the regional architecture should be in the Use Plan.

5.3 *NYCSRA List of Agreements*

5.3.1 Existing Agreements

In the New York City sub region, there is a long history of formal and informal inter-agency cooperation, for which agreements have typically been established.

Table 5-1 lists of present agreements in the NYCSRA region.

Agreement	Executing Agency	Other Agency	Description
TRANSCOM Multi-Year Agreement	TRANSCOM	Connecticut Department of Transportation, Metropolitan Transportation Authority, MTA Bridges and Tunnels, MTA New York City Transit, New Jersey Department of Transportation, New Jersey State Police, New Jersey Transit Corporation, New Jersey Turnpike Authority, New York City Department of Transportation, New York (City) Police Department, New York State Bridge Authority, New York State Department of Transportation, New York State Police, New York State Thruway Authority, Port Authority of New York and New Jersey, Port Authority Trans Hudson Corporation	Agreement covers member agencies' share of funding for TRANSCOM's base operations which provides a cooperative approach to regional transportation management. Base operations include the sharing of traffic and transit incidents, construction activities, and special events. It also includes real-time traffic information from agencies' ITS systems, such as the TRANSMIT system and NYSDOT's INFORM.

Agreement	Executing Agency	Other Agency	Description
TRANSMIT/TRANSCOM Regional Architecture System agreements	TRANSCOM	Connecticut Department of Transportation, Metropolitan Transportation Authority, MTA Bridges and Tunnels, MTA New York City Transit, New Jersey Department of Transportation, New Jersey State Police, New Jersey Transit Corporation, New Jersey Turnpike Authority, New Jersey Turnpike Authority (Garden State Parkway Division), New York City Department of Transportation, New York (City) Police Department, New York State Bridge Authority, New York State Department of Transportation, New York State Police, New York State Thruway Authority, Port Authority of New York and New Jersey, Port Authority Trans Hudson Corporation, Bergen Co. Police, Westchester County Department of Transportation	TRANSMIT (TRANSCOM's System for Managing Incidents and Traffic) uses vehicles equipped with the region's E-ZPass electronic toll collection tags as aggregate, anonymous traffic probes, allowing the systems to calculate link travel times and speeds and detect incidents. The TRANSCOM Regional Architecture system integrates the ITS systems of the public agencies in the NJ/NY/CT metropolitan region. The agreement allows for the electronic sharing of the transportation information, among the agencies' operations centers.
Inter-agency Remote Video Network (IRVN) agreements,	TRANSCOM	Connecticut Department of Transportation, MTA Bridges and Tunnels, MTA New York City Transit, New Jersey Department of Transportation, New Jersey State Police, New Jersey Transit Corporation, New Jersey Turnpike Authority, New Jersey Turnpike Authority (Garden State Parkway Division), New York (City) Police Department, New York State Department of Transportation, New York State Thruway Authority, Port Authority of New York and New Jersey, New York State Emergency Management Office	The agreement allows the public agencies to share the video feeds from key transportation facilities throughout the region through the IRVN system.
Service Area Travelers Interactive Network (SATIN) agreements	TRANSCOM	Connecticut Department of Transportation, Metropolitan Transportation Authority, New Jersey Transit Corporation, New Jersey Turnpike Authority (Garden State Parkway Division), New York City Department of Transportation, New York State Thruway Authority, Port Authority of New York and New Jersey, Port Authority Trans Hudson Corporation	The SATIN project provides interactive kiosks at major transit and roadway hubs to disseminate the transportation information described.
Data Interface agreements	TRANSCOM	Connecticut Department of Transportation (I-95 System), MTA Bridges and Tunnels (VMS/HAR System), MTA New York City Transit (Transit Authority System), New Jersey Department of Transportation (MAGIC System), New Jersey Turnpike Authority (Turnpike System), New York City Department of Transportation (CATS & MICE Systems), New York State Department of Transportation (INFORM	The agreement allows for Data Interfaces, integrating individual agency ITS systems into the TRANSCOM Regional Architecture system, allowing for the electronic sharing of transportation information among the agencies' operations centers.

Implementation Plan - NYC Sub-Regional ITS Architecture

Agreement	Executing Agency	Other Agency	Description
		System), New York State Thruway Authority (Thruway System), Port Authority of New York and New Jersey (GWB and LT/HT System)	
Sale of Information agreements	TRANSCOM	Private Information Service Providers	Sale of Information agreements specify the conditions under which the media and other non-member entities can access and use TRANSCOM's transportation information.