Binghamton Metropolitan Transportation Study

Binghamton Regional ITS Architecture

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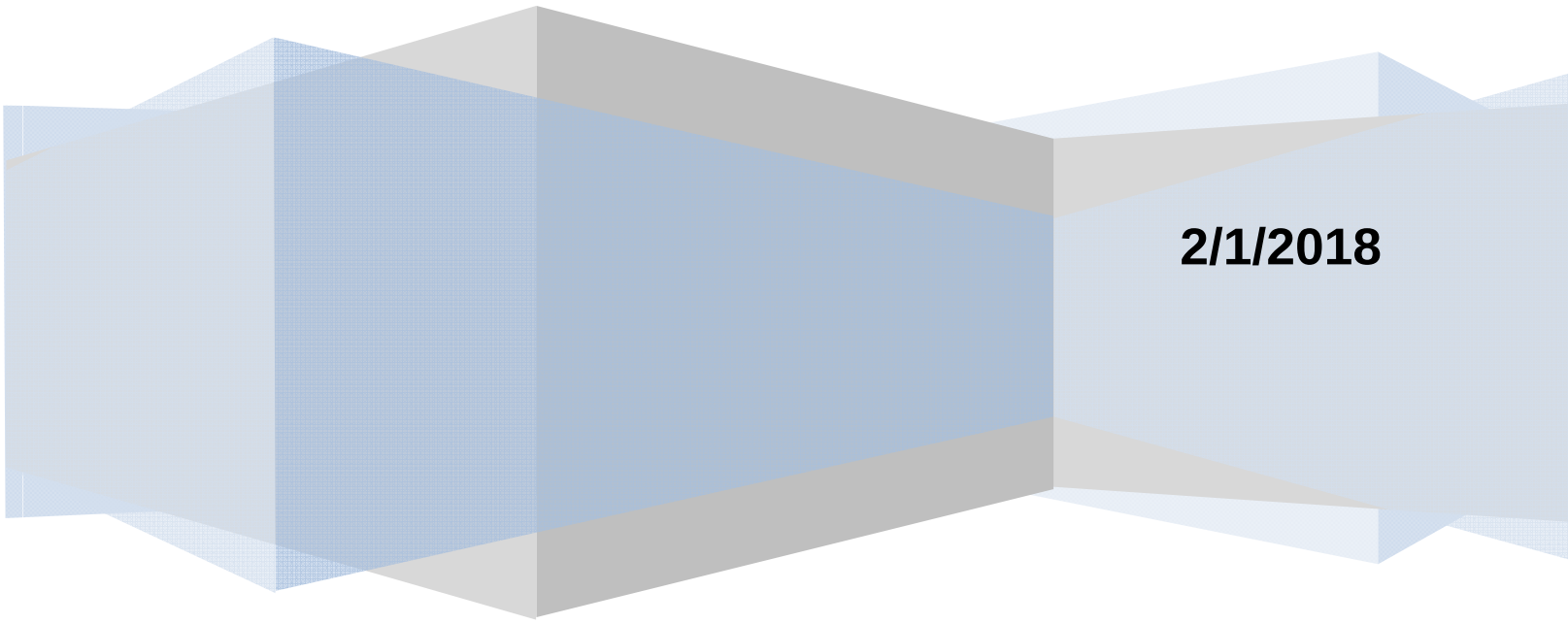

2/1/2018

BMTS
BINGHAMTON METROPOLITAN TRANSPORTATION STUDY
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BINGHAMTON METROPOLITAN TRANSPORTATION STUDY
POLICY COMMITTEE
RESOLUTION 2018-04

Resolution endorsing the BMTS Regional ITS Architecture.

WHEREAS the Binghamton Metropolitan Transportation Study Policy Committee has been designated by the Governor of the State of New York as the Metropolitan Planning Organization responsible, together with the State, for the comprehensive, continuing, and cooperative transportation planning process for the Binghamton Urban Area, and

WHEREAS, the Federal Highway Administration (FHWA) issued a rule and the Federal Transit Administration (FTA) issued a policy that requires FHWA and FTA funded Intelligent Transportation Systems (ITS) projects conform to the National ITS Architecture and applicable standards; and

WHEREAS the rule/policy requires that the National ITS Architecture be used to develop a "Regional ITS Architecture"; and

WHEREAS the *BMTS Regional ITS Architecture* was prepared for NYSDOT Region 9 by BMTS Staff with input from NYSDOT Region 9 and the region's transportation, transit, and public safety agencies; and

WHEREAS the BMTS Planning Committee on February 22nd, 2018 has endorsed, by consensus, a resolution recommending approval of the BMTS Regional ITS Architecture; and

NOW THEREFORE BE IT RESOLVED that the BMTS Policy Committee endorses the BMTS Regional ITS Architecture.

CERTIFICATION OF RESOLUTION 2018-04

I, the undersigned, duly elected Chair of the Binghamton Metropolitan Transportation Study Policy Committee, do hereby certify that the foregoing is a true and correct copy of BMTS Policy Committee Resolution 2018-04, adopted by consensus this 1st day of March, 2018.

Michael Marinaccio, Chair
BMTS Policy Committee

3-1-18
Date

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1 Introduction

The Federal Highway Administration issued a Final Rule on Intelligent Transportation System Architecture and Standards in January 2001; the Federal Transit Administration issued a National ITS Architecture Policy on Transit Projects concurrently (see Appendix A for the full text). This action was taken to implement §5206(e) of the Transportation Equity Act for the 21st Century.

The rule required that any region that was implementing ITS projects at the time of the issuance of the rule shall have a regional ITS architecture by February 7, 2005; other regions were required to have an architecture in place within four years of its first ITS project being advanced to final design.

The initial Intelligent Transportation System Architecture for the Binghamton Metropolitan Region was prepared by the Binghamton Metropolitan Transportation Study (BMTS) in 2005. This document will serve to update that publication based on newly installed ITS infrastructure within the region, advances in technology within the field of ITS and current federal initiatives for the planning and implementation of ITS measures.

Federal regulation dictates the elements the ITS Regional Architecture must include, and that it must follow the framework of the ITS National Architecture. The required components are:

a. A description of the region, timeframe, and service scope;
b. Identification of participating agencies and other stakeholders;
c. An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the regional ITS architecture;
d. Any agreements (existing or new) required for operations, including at a minimum those affecting ITS project interoperability, utilization of ITS related standards, and the operation of the projects identified in the regional ITS architecture;
e. System functional requirements;
f. Interface requirements and information exchanges with planned and existing systems and subsystems (for example, subsystems and architecture flows as defined in the National ITS Architecture);
g. Identification of ITS standards supporting regional and national interoperability; and

h. The sequence of projects required for implementation

The Binghamton Metropolitan Regional ITS Architecture complies with all of these requirements.

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2 Architecture Scope

The Binghamton Regional ITS Architecture is a roadmap for transportation systems integration. The architecture was developed through a cooperative effort by the region's transportation agencies, covering all modes and all roads in the region. It represents a shared vision of how each agency's systems will work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travelers in the region.

The architecture provides an overarching framework that spans all of the region's transportation organizations and individual transportation projects. Using the architecture, each transportation project can be viewed as an element of the overall transportation system, providing visibility into the relationship between individual transportation projects and ways to cost-effectively build an integrated transportation system over time. This chapter establishes the scope of the architecture in terms of its geographic breadth, the scope of services that are covered, and the time horizon that is addressed.

Description

BMTS Version 1

Timeframe

20 Years

Geographic Scope

Binghamton Metropolitan Planning Area within New York State. Includes City of Binghamton. Village of Johnson City. Village of Endicott. Village of Owego. Village of Port Dickinson. Village of Candor. Village of Nichols. Village of Windsor. Town of Owego. Town of Vestal. Town of Union. Town of Maine. Town of Dickinson. Town of Chenango. Town of Binghamton. Town of Fenton. Town of Kirkwood. Town of Conklin. Town of Windsor.

Revision Date

2/01/2018

3 Relationship to Planning

The Binghamton Regional ITS Architecture is an integral part of planning for the operations and maintenance strategies that are addressed by the regional transportation planning process. The architecture provides a framework that connects operations and maintenance objectives and strategies with the integrated transportation system improvements that are implemented as a progressive series of ITS projects. The architecture also is used to define the data needs associated with performance monitoring that supports an informed planning process. This chapter identifies the planning objectives, strategies, and associated performance measures from the regional plan. These planning elements are connected with ITS services in the RAD-IT database.

Table 1 – Relationship to Planning

Type	Name	Description	Source	Service Package
Objective	Improve active work zone management.	Improve management of NYSDOT maintenance work zones on high speed/high volume facilities. Make work zone location information available to emergency services groups and transit agencies. Improve interstate and inter-region work zone information availability.	BMTS ITS Strategic Plan and Implementation Strategy	MC06: Work Zone Management
Objective	Improve active work zone management.	Improve management of NYSDOT maintenance work zones on high speed/high volume facilities. Make work zone location information available to emergency services groups and transit agencies. Improve interstate and inter-region work zone information availability.	BMTS ITS Strategic Plan and Implementation Strategy	MC08: Maintenance and Construction Activity Coordination
Objective	Improve active work zone management.	Improve management of NYSDOT maintenance work zones on high speed/high volume facilities. Make work zone location information available to emergency services groups and transit agencies. Improve interstate and inter-region work zone information availability.	BMTS ITS Strategic Plan and Implementation Strategy	TM06: Traffic Information Dissemination
Objective	Improve active work zone management.	Improve management of NYSDOT maintenance work zones on high speed/high volume facilities. Make work zone location information available to emergency services groups and transit agencies. Improve interstate and inter-region work zone information availability.	BMTS ITS Strategic Plan and Implementation Strategy	TM08: Traffic Incident Management System
Objective	Improve freeway incident management on expressways.	Improve incident detection capabilities. Provide support to traffic operations personnel to determine an appropriate response to freeway incidents through better coordination with emergency management, maintenance management, and other incident response personnel. Improve dissemination of incident information to travelers. Provide automatic notification when maintenance forces are needed to assist in incident management. Implement automated traveler detour notification and implementation, including the ability to provide accurate detour information to drivers of oversize freight vehicles.	BMTS ITS Strategic Plan and Implementation Strategy	TM01: Infrastructure-Based Traffic Surveillance
Objective	Improve freeway incident management on expressways.	Improve incident detection capabilities. Provide support to traffic operations personnel to determine an appropriate response to freeway incidents through better coordination with emergency management, maintenance management, and other incident response personnel. Improve dissemination of incident information to travelers. Provide automatic notification when maintenance forces are needed to assist in incident management. Implement automated traveler detour notification and implementation, including the ability to provide accurate detour information to drivers of oversize freight vehicles.	BMTS ITS Strategic Plan and Implementation Strategy	TM06: Traffic Information Dissemination
Objective	Improve freeway incident management on expressways.	Improve incident detection capabilities. Provide support to traffic operations personnel to determine an appropriate response to freeway incidents through better coordination with emergency management, maintenance management, and other incident response personnel. Improve dissemination of incident information to travelers. Provide automatic notification when maintenance forces are needed to assist in incident management. Implement automated traveler detour notification and implementation, including the ability to provide accurate detour information to drivers of oversize freight vehicles.	BMTS ITS Strategic Plan and Implementation Strategy	TM08: Traffic Incident Management System

Type	Name	Description	Source	Service Package
Objective	Improve operation of signalized arterials to reduce congestion and improve safety.	Improve traffic signal timing to reduce unnecessary delay by converting signalized arterial streets to adaptive signal timing technology. Candidates for this service would include NY 434 (Vestal Parkway) in the City of Binghamton and Town of Vestal; US 11 (Front Street) in the Town of Dickinson and Chenango; US 11 (Court Street) in the Town of Kirkwood and City of Binghamton; and NY 17C (Main Street) in the City of Binghamton, Village of Johnson City, Town of Union, and Village of Endicott.	BMTS Long Range Plan (Looking Forward 2040)	TM01: Infrastructure-Based Traffic Surveillance
Objective	Improve operation of signalized arterials to reduce congestion and improve safety.	Improve traffic signal timing to reduce unnecessary delay by converting signalized arterial streets to adaptive signal timing technology. Candidates for this service would include NY 434 (Vestal Parkway) in the City of Binghamton and Town of Vestal; US 11 (Front Street) in the Town of Dickinson and Chenango; US 11 (Court Street) in the Town of Kirkwood and City of Binghamton; and NY 17C (Main Street) in the City of Binghamton, Village of Johnson City, Town of Union, and Village of Endicott.	BMTS Long Range Plan (Looking Forward 2040)	TM03: Traffic Signal Control
Objective	Improve special event traffic management.	Improve special event traffic management through use of better dissemination of traffic information and detour information to travelers.	BMTS ITS Strategic Plan and Implementation Strategy	TM06: Traffic Information Dissemination
Objective	Increase efficiency of roadway winter maintenance.	Improve roadway winter maintenance through use of Road Weather Information Stations (RWIS) and maintenance vehicle Automatic Vehicle Location (AVL) /connected vehicle technology.	NYSDOT Road Weather Information System Statewide Implementation Plan March 2014	MC04: Winter Maintenance
Objective	Increase efficiency of roadway winter maintenance.	Improve roadway winter maintenance through use of Road Weather Information Stations (RWIS) and maintenance vehicle Automatic Vehicle Location (AVL) /connected vehicle technology.	NYSDOT Road Weather Information System Statewide Implementation Plan March 2014	WX01: Weather Data Collection
Objective	Increase efficiency of roadway winter maintenance.	Improve roadway winter maintenance through use of Road Weather Information Stations (RWIS) and maintenance vehicle Automatic Vehicle Location (AVL) /connected vehicle technology.	NYSDOT Road Weather Information System Statewide Implementation Plan March 2014	WX02: Weather Information Processing and Distribution
Objective	Install automated ice control treatments.	Install automated ice control treatments on structures in critical locations on high volume/high speed facilities. Would include sensors to monitor pavement and atmospheric conditions to determine when pavement treatment is required.	BMTS ITS Strategic Plan and Implementation Strategy	MC03: Roadway Automated Treatment
Objective	Install automated ice control treatments.	Install automated ice control treatments on structures in critical locations on high volume/high speed facilities. Would include sensors to monitor pavement and atmospheric conditions to determine when pavement treatment is required.	BMTS ITS Strategic Plan and Implementation Strategy	MC04: Winter Maintenance
Objective	Install automated ice control treatments.	Install automated ice control treatments on structures in critical locations on high volume/high speed facilities. Would include sensors to monitor pavement and atmospheric conditions to determine when pavement treatment is required.	BMTS ITS Strategic Plan and Implementation Strategy	WX01: Weather Data Collection
Objective	Install automated ice control treatments.	Install automated ice control treatments on structures in critical locations on high volume/high speed facilities. Would include sensors to monitor pavement and atmospheric conditions to determine when pavement treatment is required.	BMTS ITS Strategic Plan and Implementation Strategy	WX02: Weather Information Processing and Distribution

Type	Name	Description	Source	Service Package
Objective	Install Automatic Vehicle Location units on Broome County Department of Public Transportation BC Transit buses and paratransit vehicles.	Install Automatic Vehicle Location (AVL) units on all of the Broome County Department of Public Transportation's BC Transit buses and paratransit vehicles, with the ability to transmit real-time schedule and location information to transit personnel and customers through smartphones and other personal computing devices.	BMTS ITS Strategic Plan and Implementation Strategy	PT01: Transit Vehicle Tracking
Objective	Install Automatic Vehicle Location units on Broome County Department of Public Transportation BC Transit buses and paratransit vehicles.	Install Automatic Vehicle Location units on all of the Broome County Department of Public Transportation's BC Transit buses and paratransit vehicles, with the ability to transmit real-time schedule and location information to transit personnel and customers through smartphones and other personal computing devices.	BMTS ITS Strategic Plan and Implementation Strategy	PT02: Transit Fixed-Route Operations
Objective	Install Automatic Vehicle Location units on Broome County Department of Public Transportation BC Transit buses and paratransit vehicles.	Install Automatic Vehicle Location units on all of the Broome County Department of Public Transportation's BC Transit buses and paratransit vehicles, with the ability to transmit real-time schedule and location information to transit personnel and customers through smartphones and other personal computing devices.	BMTS ITS Strategic Plan and Implementation Strategy	PT08: Transit Traveler Information
Objective	Provide improved traveler information services.	Provide up-to-date weather/road condition information to travelers who are outside the Binghamton region, but who are traveling to or through the area. Develop a website and provide informational kiosks at appropriate locations to disseminate travel information to the public.	BMTS ITS Strategic Plan and Implementation Strategy	TI02: Personalized Traveler Information
Objective	Provide incident verification and automated Mayday notification.	Improve incident verification in locations where cell-911 calls produce unreliable information. Provide automated Mayday notification from vehicle crashes in rural areas.	BMTS ITS Strategic Plan and Implementation Strategy	PS04: Mayday Notification
Objective	Provide real-time information on the location of NYSDOT maintenance vehicles.	Install Automatic Vehicle Location (AVL) units on NYSDOT maintenance vehicles.	BMTS ITS Strategic Plan and Implementation Strategy	MC01: Maintenance and Construction Vehicle and Equipment Tracking
Objective	Reduce truck speeds at critical freeway locations.	Reduce truck speeds at critical freeway locations through use of automated monitoring of commercial vehicle speeds, and notification service to warn drivers when speed is excessive. Environmental conditions and vehicle characteristics may be monitored and factored into the safe speed advisories that are provided to drivers.	BMTS ITS Strategic Plan and Implementation Strategy	TM17: Speed Warning and Enforcement

4 ITS Stakeholders

Identifying stakeholders is an important task in ITS architecture development since effective ITS involves the integration of multiple stakeholders and their transportation systems. This section describes the stakeholders who either participated in the creation of the Binghamton Regional ITS Architecture or whom the participating stakeholders felt were needed to be included in the architecture. Some stakeholders have been grouped in order to better reflect mutual participation or involvement in transportation services and elements. Every stakeholder in this section is related to one or more of the transportation inventory elements described in the next chapter, either as an individual stakeholder or as a member of a stakeholder group.

Table 2 – ITS Stakeholders

Stakeholder Name	Stakeholder Description
Broome County Department of Public Transportation	Sole public transportation provider in Broome County. Operates BC Transit fixed route service in the Broome County portion of the Binghamton Urbanized Area. Also operates BC Lift paratransit service for the disabled, and BC Country paratransit service that operates in the rural areas of Broome County not served by BC Transit.
Broome County Office of Emergency Services	Provides preparation, response and mitigation for emergencies and disasters that occur within Broome County. Operates Broome County Emergency Dispatch/911 service and NY Alert emergency notification system.
County and Municipal Highway Departments	Broome County, Tioga County, and municipal highway departments.
Local Media Outlets	Binghamton-area television, radio, and print media.
Local Police Departments/Fire Departments/Emergency Squads (Broome County)	Local fire departments and emergency responders in the Broome County portion of the Binghamton MPO Planning Area.
Local Police Departments/Fire Departments/Emergency Squads (Tioga County)	Local fire departments and emergency responders in the Tioga County portion of the Binghamton MPO Planning Area.
National Oceanic and Atmospheric Administration	National Weather Service.
New York State Department of Motor Vehicles	Agency responsible for motor vehicle registration and licensing. Maintains accident databases and other motor vehicle safety data.
New York State Department of Transportation Main Office	Headquarters of the New York State Department of Transportation, the agency tasked with the development and operation of New York State-operated transportation facilities and services.
New York State Department of Transportation Region 9	NYSDOT Region 9 is responsible for the maintenance and operation of all State-owned highways and traffic control devices in the New York portion of the Binghamton Metropolitan Region. Region 9 also operates a traffic operations center that coordinates freeway management, incident management and travel information functions for the Binghamton Metropolitan Region.
New York State Office of Emergency Management	Coordinates the emergency and disaster response activities of all State agencies. Assists local governments with emergency management programs.
New York State Police	New York State statewide law enforcement agency.
Pennsylvania Department of Transportation	The Pennsylvania Department of Transportation is responsible for the maintenance and operation of all State-owned highways and traffic control devices in the Pennsylvania portion of the Binghamton Metropolitan Region.
POV Drivers	Privately owned vehicle drivers.
POV In-Vehicle Communication Services	Privately owned vehicle in-vehicle communication services such as On-Star, that provide automatic emergency notification and traveler information services.
Special Event Sponsor	Special Event Sponsors that have knowledge of events that may impact travel on roadways or other modal means. Examples of special event sponsors include sporting events, conventions, motorcades/parades, and public/political events.
Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Law enforcement agency for Tioga County. Operates Tioga County E911 Communications Center performing emergency communications for all law enforcement agencies, emergency squad/first responder units, and fire departments operating within Tioga County. Operates Tioga County Hyper-Reach Emergency Alert System.
Travelers	Any individual who uses transportation services.

5 ITS Inventory

An inventory of existing and planned transportation systems is the basis for the Binghamton Regional ITS Architecture. The transportation system inventory was developed based on input from stakeholders throughout the region. The inventory includes a list of ITS elements and the associated stakeholder responsible for system operation.

This section describes every surface transportation inventory element for the region. A transportation element can be either a center, support, vehicle, traveler or field equipment. Each transportation element listed below has one or more stakeholders associated with it. In order to reduce the complexity of the architecture, some transportation elements with like functionality have been grouped together. Each transportation inventory element is mapped to at least one ARC-IT physical object.

Inventory

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
BCDOPT Automatic Vehicle Location	Transit Automatic Vehicle Location (AVL) systems are on-board devices that can be used to track vehicle location. AVL systems consist of two components: A GPS system that tracks the real-time location of the vehicle, and software that displays the vehicle location on a map. AVL systems are used by transit services internally to provide transit vehicle location data for performance monitoring and incident response. Optionally, transit services can also use AVL systems to provide transit vehicle location information to the general public, using internet-based tracking in concert with traveler support services such as informational displays at stops.	Broome County Department of Public Transportation	Planned	Transit Vehicle OBE
BCDOPT BC Transit Electronic Fareboxes	Electronic fareboxes are vehicle on-board electronics that support fare collection using cash or a payment device such as a dedicated transit smart card. Collected fare data and other boarding information is made available to the transit management center.	Broome County Department of Public Transportation	Existing	Transit Vehicle OBE
BCDOPT Payment Device	Payment devices enable the electronic transfer of funds from the user of a service (I.e. a traveler) to the provider of the service. Currently available BCDOPT payment devices include transit-dedicated swipe-activated cards.	Travelers	Existing	Payment Device
BCDOPT Transit Information Center	Proposed clearinghouse to provide information on the Broome County Department of Public Transportation's BC Transit urban fixed route service, and BC Lift and BC Country paratransit service.	Broome County Department of Public Transportation	Planned	Transportation Information Center
BCDOPT Transit Information Center Personnel	This 'TIC Operator' represents the person or people that monitor and manage traveler information services provided by the Transportation Information Center.	Broome County Department of Public Transportation	Planned	TIC Operator

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
BCDOPT Transit Management Center	The Broome County Department of Public Transportation's (BCDOPT) transit management function serves as the Transit Management Center for the Binghamton Regional ITS Architecture. In general, the 'Transit Management Center' manages transit vehicle fleets and coordinates with other modes and transportation services. It provides operations, maintenance, customer information, planning and management functions for the transit property. It spans distinct central dispatch and garage management systems and supports the spectrum of fixed route, flexible route, paratransit services, transit rail, and bus rapid transit (BRT) service. The physical object's interfaces support communication between transit departments and with other operating entities such as emergency response services and traffic management systems.	Broome County Department of Public Transportation	Existing	Transit Management Center
BCDOPT Transit Management Center Personnel	BCDOPT Transit Management Center Personnel are responsible for fleet management, maintenance operations, and scheduling activities of the transit system.	Broome County Department of Public Transportation	Existing	Transit Operations Personnel
BCDOPT Transit Vehicle OBE	Transit vehicle on-board electronics.	Broome County Department of Public Transportation	Existing	Transit Vehicle OBE
BCDOPT Transit Vehicle Operators	The 'Transit Vehicle Operator' represents the person that receives and provides additional information that is specific to operating the ITS functions in all types of transit vehicles. The information received by the operator would include status of on-board systems. Additional information received depends upon the type of transit vehicle. In the case of fixed route transit vehicles, the Transit Vehicle Operator would receive operator instructions that might include actions to take to correct schedule deviations. In the case of flexible fixed routes and demand response routes the information would also include dynamic routing or passenger pickup information.	Broome County Department of Public Transportation	Existing	Transit Vehicle Operator
BCDOPT Transit Vehicle Security Equipment	Transit vehicle security equipment includes surveillance and sensor systems that monitor the on-board environment, such as CCTV cameras, and alarm systems that can be activated by the vehicle operator.	Broome County Department of Public Transportation	Existing	Transit Vehicle OBE

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
BCDOPT Transit Vehicles	The 'Transit Vehicle' represents the transit vehicle that hosts the on-board equipment that provides ITS functions, in this case the busses and paratransit vehicles of the Broome County Department of Public Transportation. In general, the "Transit Vehicle" physical object includes a specialized and extended databus that is subject to different vehicle databus standards and hosts a broad range of components that are unique to a transit vehicle including the farebox and associated electronics, passenger counters, and transit security systems.	Broome County Department of Public Transportation	Existing	Transit Vehicle
BCDOPT Traveler Support Equipment	Traveler Support Equipment provides access to traveler information at transit stations, transit stops, other fixed sites along travel routes (e.g., rest stops, merchant locations), and major trip generation locations such as special event centers, hotels, office complexes, amusement parks, and theaters. Traveler information access points include kiosks and informational displays supporting varied levels of interaction and information access. At transit stops these might be simple displays providing schedule information and imminent arrival signals.	Broome County Department of Public Transportation	Planned	Traveler Support Equipment
Broome County 911 System	Broome County 911 system receives 911 and other emergency calls, and interfaces with other agencies to assist in the verification and assessment of emergencies and to forward emergency information to the appropriate response agency.	Broome County Office of Emergency Services	Existing	Emergency Telecommunications System
Broome County Emergency Management Center	Administered by the Broome County Office of Emergency Services. In general, an 'Emergency Management Center' represents systems that support incident management, disaster response and evacuation, security monitoring, and other security and public safety-oriented ITS applications. It includes the functions associated with fixed and mobile public safety communications centers including public safety answering point and dispatch centers operated by police, fire, and emergency medical services (in this case the Broome County Emergency Dispatch/911 Center) as well as a reverse-911 function (as in the NY- Alert emergency public notification system).	Broome County Office of Emergency Services	Existing	Emergency Management Center

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
Broome County Emergency Management Center Personnel	Emergency System Operator' represents the Broome County Office of Emergency Services personnel that monitor emergency requests, (including those from the E911 Operator) and set up pre-defined responses to be executed by an emergency management system. The operator may also override predefined responses where it is observed that they are not achieving the desired result. This also includes dispatchers who manage an emergency fleet (police, fire, ambulance, HAZMAT, etc.) or higher order emergency managers who provide response coordination during emergencies.	Broome County Office of Emergency Services	Existing	Emergency System Operator
CLARUS	The Clarus Initiative is an integrated weather observation and data management system designed to collect RWIS data, perform quality checks, and share data across various transportation and meteorological agencies in the United States.	New York State Department of Transportation Region 9	Existing	Surface Transportation Weather Service
County and Municipal Highway Departments	In the Binghamton Regional ITS Architecture, the County and municipal highway departments in the Binghamton region function as the 'Other Maintenance and Construction Management Centers' physical object, acting as a source and destination for ITS information flows from the NYSDOT Region 9 Maintenance and Construction Management Center, enabling maintenance and construction operations to be coordinated across jurisdictions.	County and Municipal Highway Departments	Existing	Other Maint and Constr Mgmt Centers
Driver	The 'Driver' represents the person that operates a vehicle on the roadway. Included are operators of private, transit, commercial, and emergency vehicles where the interactions are not particular to the type of vehicle (e.g., interactions supporting vehicle safety applications). The Driver originates driver requests and receives driver information that reflects the interactions which might be useful to all drivers, regardless of vehicle classification.	POV Drivers	Existing	Driver
Event Promoter System	'Event Promoter System' represents Special Event Sponsors that have knowledge of events that may impact travel on roadways or other modal means. Examples of special event sponsors include sporting events, conventions, motorcades/parades, and public/political events. These promoters interface to the ITS to provide event information such as date, time, estimated duration, location, and any other information pertinent to traffic movement in the surrounding area.	Special Event Sponsor	Planned	Event Promoter System

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
Hyper-Reach Emergency Alert System	Hyper-Reach is Tioga County's computer-based emergency notification and voice broadcasting system which allows for the delivery of emergency information to the public.	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Existing	Emergency Telecommunications System
Local Media Outlets	The Media element represents the information systems that provide traffic reports, travel conditions, and other transportation-related news services to the traveling public through radio, TV, and other media. Traffic and travel advisory information that are collected by ITS are provided to this object. It is also a source for traffic flow information, incident and special event information, and other events that may have implications for the transportation system.	Local Media Outlets	Existing	Media
Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Represents the various types of on-board ITS equipment that provide the processing, storage, and communications functions that are specific to emergency vehicles, such as traffic signal preemption equipment or vehicle tracking units.	Local Police Departments/Fire Departments/Emergency Squads (Broome County)	Planned	Emergency Vehicle OBE Other EV OBEs
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Represents the various types of on-board ITS equipment that provide the processing, storage, and communications functions that are specific to emergency vehicles, such as traffic signal preemption equipment or vehicle tracking units.	Local Police Departments/Fire Departments/Emergency Squads (Tioga County)	Planned	Emergency Vehicle OBE Other EV OBEs
Local Police/Sheriff/Fire/EMS Personnel (Broome County)	'Emergency Personnel' represents personnel that are responsible for police, fire, emergency medical services, towing, service patrols, and other special response team (e.g., hazardous material clean-up) activities at an incident site. These personnel are associated with the Emergency Vehicle during dispatch to the incident site, but often work independently of the Emergency Vehicle while providing their incident response services.	Local Police Departments/Fire Departments/Emergency Squads (Broome County)	Existing	Emergency Personnel
Local Police/Sheriff/Fire/EMS Personnel (Tioga County)	'Emergency Personnel' represents personnel that are responsible for police, fire, emergency medical services, towing, service patrols, and other special response team (e.g., hazardous material clean-up) activities at an incident site. These personnel are associated with the Emergency Vehicle during dispatch to the incident site, but often work independently of the Emergency Vehicle while providing their incident response services.	Local Police Departments/Fire Departments/Emergency Squads (Tioga County)	Existing	Emergency Personnel

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
Municipal Emergency Vehicle Traffic Signal Preemption Equipment	The Manual on Uniform Traffic Control Devices (MUTCD) defines traffic signal preemption as “the transfer of normal operation of a traffic control signal to a special control mode of operation”. Preemption interrupts normal signal operations to transfer right of way to the direction of an approaching emergency vehicle. This right of way is usually achieved with a green indication on the approach of the vehicle requesting preemption. Currently 136 traffic signals in the Binghamton region are equipped with preemption transponders. 86 are located on municipally-owned signals. Of these, 50 are owned by the City of Binghamton, 14 by the Village of Johnson City, 11 by the Village of Endicott, 6 by the Town of Union, 4 by the Town of Vestal, and 1 by the Town of Chenango.	County and Municipal Highway Departments	Existing	ITS Roadway Equipment
National Oceanic and Atmospheric Administration National Weather Service	The National Weather Service provides atmospheric weather observations and forecasts, hydrologic information, climate information and warnings of hazardous weather. The 'Weather Service System' physical object provides weather, hydrologic, and climate information and warnings of hazardous weather including thunderstorms, flooding, hurricanes, tornadoes, winter weather, tsunamis, and climate events. It provides atmospheric weather observations and forecasts that are collected and derived by the National Weather Service, private sector providers, and various research organizations. The interface provides formatted weather data products suitable for on-line processing and integration with other ITS data products as well as Doppler radar images, satellite images, severe storm warnings, and other products that are formatted for presentation to various ITS users.	National Oceanic and Atmospheric Administration	Existing	Weather Service System
New York State Police Personnel (Broome County)	'Emergency Personnel' represents personnel that are responsible for police, fire, emergency medical services, towing, service patrols, and other special response team (e.g., hazardous material clean-up) activities at an incident site. These personnel are associated with the Emergency Vehicle during dispatch to the incident site, but often work independently of the Emergency Vehicle while providing their incident response services.	New York State Police	Existing	Emergency Personnel

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
New York State Police Personnel (Tioga County)	'Emergency Personnel' represents personnel that are responsible for police, fire, emergency medical services, towing, service patrols, and other special response team (e.g., hazardous material clean-up) activities at an incident site. These personnel are associated with the Emergency Vehicle during dispatch to the incident site, but often work independently of the Emergency Vehicle while providing their incident response services.	New York State Police	Planned	Emergency Personnel
New York State Police Vehicle OBE (Broome County)	Represents the various types of on-board ITS equipment that provide the processing, storage, and communications functions that are specific to emergency vehicles, such as traffic signal preemption equipment or vehicle tracking units.	New York State Police	Planned	Emergency Vehicle OBE Other EV OBEs
New York State Police Vehicle OBE (Tioga County)	Represents the various types of on-board ITS equipment that provide the processing, storage, and communications functions that are specific to emergency vehicles, such as traffic signal preemption equipment or vehicle tracking units.	New York State Police	Planned	Emergency Vehicle OBE Other EV OBEs
NYAlerts System	New York State's emergency alert and notification system provides warning and emergency information, including transportation incident alerts, to the public via e-mail, text messages and a web portal.	New York State Office of Emergency Management	Existing	Emergency Telecommunications System
NYSDOT Main Office	NYSDOT Main Office represents the Statewide transportation information functions of the New York State Department of Transportation.	New York State Department of Transportation Main Office	Existing	Other Transportation Information Centers
NYSDOT Region 9 Emergency Vehicle Traffic Signal Preemption Equipment	The Manual on Uniform Traffic Control Devices (MUTCD) defines traffic signal preemption as “the transfer of normal operation of a traffic control signal to a special control mode of operation”. Preemption interrupts normal signal operations to transfer right of way to the direction of an approaching emergency vehicle. This right of way is usually achieved with a green indication on the approach of the vehicle requesting preemption. Currently 136 traffic signals in the Binghamton region are equipped with preemption transponders. Of these, 76 are located on signals owned and maintained by NYSDOT, all in Broome County.	New York State Department of Transportation Region 9	Planned	ITS Roadway Equipment

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
NYSDOT Region 9 Highway Advisory Radio	The Highway Advisory Radio system in the Binghamton region consists of radio transmitters located at the approaches to the I-81/NY 17/1-86 interchange. These transmitters use the AM Radio band to broadcast information and advisories regarding traffic incidents, construction activities and weather. In addition, the system includes signs informing travelers of the frequency where the broadcast can be picked up, with an attached flashing beacon that is activated when an alert or advisory has been issued.	New York State Department of Transportation Region 9	Existing	ITS Roadway Equipment
NYSDOT Region 9 Highway Surveillance Cameras	Closed circuit television cameras (CCTV) placed at or near the I-81/NY17/I-86 interchange linked to the NYSDOT Region 9 Traffic Operations Center that provides imagery used for traffic monitoring and incident management. Video feed can be provided to other centers and to general public. Potential for installation at other locations in the future.	New York State Department of Transportation Region 9	Existing	ITS Roadway Equipment
NYSDOT Region 9 ITS Roadway Equipment		New York State Department of Transportation Region 9	Existing	ITS Roadway Equipment
NYSDOT Region 9 Maintenance and Construction Administrative Systems	Maintenance and Construction Administrative Systems' represents the various administrative systems that support the operation of ITS systems for maintenance and construction operations. The interfaces to this object support general administrative data interchanges between ITS and non-ITS systems. This includes: interfaces to purchasing for equipment and consumables resupply, interfaces to human resources that manage training and special certification for field crews and other personnel, and interfaces to contract administration functions that administer and monitor the work performance for maintenance and construction contracts.	New York State Department of Transportation Region 9	Existing	Maint and Constr Administrative Systems
NYSDOT Region 9 Maintenance and Construction Field Personnel	Represents the personnel that perform maintenance and construction field activities including vehicle and equipment operators, field supervisory personnel, field crews, and work zone safety personnel. Information flowing from the Maintenance and Construction Field Personnel will include those system inputs specific to maintenance and construction operations, such as information regarding work zone status, or the status of maintenance actions. The field personnel are also monitored within the work zone to enhance work zone safety. Information provided to Maintenance and Construction Field Personnel includes dispatch requests, maintenance and construction actions to be performed, and work zone safety warnings.	New York State Department of Transportation Region 9	Existing	Maint and Constr Field Personnel

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
NYSDOT Region 9 Maintenance and Construction Management Center	The 'Maintenance and Construction Management Center' monitors and manages roadway infrastructure construction and maintenance activities. The center receives a wide range of status information from these vehicles and performs vehicle dispatch, routing, and resource management for the vehicle fleets and associated equipment. In addition, the center participates in incident response by deploying maintenance and construction resources to an incident scene, in coordination with other center physical objects. The center manages equipment at the roadside, including environmental sensors and automated systems that monitor and mitigate adverse road and surface weather conditions. It manages the repair and maintenance of both non-ITS and ITS equipment including the traffic controllers, detectors, dynamic message signs, signals, and other equipment associated with the roadway infrastructure. Weather information is collected and fused with other data sources and used to support advanced decision support systems. The 'Maintenance and Construction Management Center' remotely monitors and manages ITS capabilities in work zones, gathering, storing, and disseminating work zone information to other systems. It manages traffic in the vicinity of the work zone and advises drivers of work zone status (either directly at the roadside or through an interface with the Transportation Information Center or Traffic Management Center physical objects.). Construction and maintenance activities are tracked and coordinated with other systems, improving the quality and accuracy of information available regarding closures and other roadway construction and maintenance activities. NYSDOT Region 9 Maintenance and Construction Operations Center serves as the Maintenance and Construction Operations Center physical object in the Binghamton Regional ITS Architecture. Currently most ITS functions are not enabled. The center receives RWIS input, dispatches highway maintenance resources, can control variable message signs. Potentially, the center will receive input from other maintenance and construction field devices and vehicle OBE to assist in the allocation of maintenance resources.	New York State Department of Transportation Region 9	Existing	Maint and Constr Management Center
NYSDOT Region 9 Maintenance and Construction Management Center Personnel	NYSDOT personnel that directly interface with a Maintenance and Construction Management Center. These personnel interact with fleet dispatch and management systems, road maintenance systems, incident management systems, work plan scheduling systems, and work zone management systems. They provide operator data and command inputs to direct system operations to varying degrees depending on the type of system and the deployment scenario.	New York State Department of Transportation Region 9	Existing	Maint and Constr Center Personnel

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
NYSDOT Region 9 Maintenance and Construction Vehicle	NYSDOT Region 9 Maintenance and Construction Vehicles. The 'Maintenance and Construction Vehicle' object represents the maintenance, construction, or other specialized vehicle or equipment that hosts the on-board equipment that provides ITS functionality. It includes the databus, actuators, and other access points that are used by the on-board equipment to monitor and control the host vehicle systems. For example, the interface to this physical object is used to control the operation of the snow plow and monitor the amount of materials (e.g., sand or salt) on-board.	New York State Department of Transportation Region 9	Existing	Maint and Constr Vehicle
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	The 'Maintenance and Construction Vehicle OBE' resides in a maintenance, construction, or other specialized service vehicle or equipment and provides the processing, storage, and communications functions necessary to support highway maintenance and construction.	New York State Department of Transportation Region 9	Planned	Maint and Constr Vehicle OBE
NYSDOT Region 9 Permanent Continuous Traffic Count Stations	Remote Traffic Microwave Sensors used for the detection and measurement of traffic on highways. Real-time volume and speed monitoring equipment.	New York State Department of Transportation Region 9	Existing	ITS Roadway Equipment
NYSDOT Region 9 Road Weather Information Stations	Road Weather Information Stations (RWIS) are environmental sensor stations, with an attendant communication system and processing unit, used to transmit relevant weather information to NYSDOT regional maintenance personnel. This data is integrated into a winter maintenance decision support system (MDSS) in order to assist with decision-making for winter road treatments. Currently, two RWIS are located within the area covered by the Binghamton Regional ITS Architecture.	New York State Department of Transportation Region 9	Existing	ITS Roadway Equipment
NYSDOT Region 9 Roadway Automated Treatment	A typical Roadway Automated Treatment system would consist of an anti-icing spray system located on a high volume/high speed facility prone to icy conditions, and would be activated based on data collected by environmental sensors. In addition, some type of driver information system such as a dynamic message sign would be used to inform motorists that the system has been activated.	New York State Department of Transportation Region 9	Planned	ITS Roadway Equipment

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
NYSDOT Region 9 Roadway Passive Monitoring	'Roadway Passive Monitoring' monitors passing vehicles for a signature that can be used to recognize the same vehicle at different points in the network and measure travel times. Depending on the implementation and the penetration rate of the technology that is monitored, other point traffic measures may also be inferred by monitoring the number of vehicles within range over time. Today this approach is implemented most commonly using a Bluetooth receiver that passively monitors Bluetooth devices on-board passing vehicles and license plate readers that record the vehicle license plate number, but any widely deployed vehicle communications technology or feature that can be passively monitored to uniquely identify a vehicle could be used.	New York State Department of Transportation Region 9	Planned	ITS Roadway Equipment
NYSDOT Region 9 Roadway Signal Control	Roadway Signal Control' includes the field elements that monitor and control signalized intersections. It includes the traffic signal controllers, detectors, conflict monitors, signal heads, and other ancillary equipment that supports traffic signal control. It also includes field masters, and equipment that supports communications with a central monitoring and/or control system, as applicable. The communications link supports upload and download of signal timings and other parameters and reporting of current intersection status. It represents the field equipment used in all levels of traffic signal control from basic actuated systems that operate on fixed timing plans through adaptive systems. It also supports all signalized intersection configurations, including those that accommodate pedestrians. In advanced, future implementations, environmental data may be monitored and used to support dilemma zone processing and other aspects of signal control that are sensitive to local environmental conditions. This functional object is an instance of the NYSDOT Region 9 ITS Roadway Equipment physical object and would include the equipment needed to convert signalized arterial streets in the Binghamton region to adaptive signal timing technology, as proposed in the BMTS Long Range Plan.	New York State Department of Transportation Region 9	Planned	ITS Roadway Equipment

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
NYSDOT Region 9 Traffic Management Center (TOC)	The NYSDOT Region 9 Traffic Operation Center (TOC) functions as the Traffic Management Center for the geographic area covered by the Binghamton Regional ITS Architecture. Currently the NYSDOT Region 9 TOC monitors traffic conditions and provides freeway traffic management and incident management through the use of CCTV cameras and remote traffic microwave sensors. The TOC also coordinates with other centers such as the Emergency Management Center, and the Maintenance and Construction Center to support their incident management functions, and disseminates traffic and incident information to travelers through the use of variable message signs and highway advisory radio. serves an incident management role represents centers that manage a broad range of transportation facilities including freeway systems, rural and suburban highway systems, and urban and suburban traffic control systems. It communicates with ITS Roadway Equipment and Connected Vehicle Roadside Equipment (RSE) to monitor and manage traffic flow and monitor the condition of the roadway, surrounding environmental conditions, and field equipment status. It manages traffic and transportation resources to support allied agencies in responding to, and recovering from, incidents ranging from minor traffic incidents through major disasters.	New York State Department of Transportation Region 9	Existing	Traffic Management Center
NYSDOT Region 9 Traffic Management Center (TOC) Personnel	'Traffic Operations Personnel' represents the people that operate a traffic management center. These personnel interact with traffic control systems, traffic surveillance systems, incident management systems, work zone management systems, and travel demand management systems. They provide operator data and command inputs to direct system operations to varying degrees depending on the type of system and the deployment scenario.	New York State Department of Transportation Region 9	Existing	Traffic Operations Personnel
NYSDOT Region 9 Transportation Information Center	The Transportation Information Center collects, processes, stores, and disseminates transportation information to system operators and the traveling public.	New York State Department of Transportation Main Office	Planned	Transportation Information Center
NYSDOT Region 9 Transportation Information Center Personnel	This 'TIC Operator' represents the person or people that monitor and manage traveler information services provided by the Transportation Information Center.	New York State Department of Transportation Region 9	Planned	TIC Operator

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
NYSDOT Region 9 Variable Message Signs	Variable message signs (VMS) are LED displays that are used to disseminate warnings and advisories regarding construction/maintenance activity and detours, special events, weather conditions, and other types of alerts. VMS can be permanent structures mounted overhead or on the side of a roadway, or portable units. VMS are used to give motorists real-time traffic condition information, safety information, and guidance regarding planned and unplanned events that significantly impact traffic on the State's highway system. In addition, traffic congestion warnings, travel times, and other authorized messages may be displayed on VMS.	New York State Department of Transportation Region 9	Existing	ITS Roadway Equipment
Other Vehicle OBEs	'Other Vehicle OBEs' represents other connected vehicles that are communicating with the host vehicle. This includes all connected motorized vehicles including passenger cars, trucks, and motorcycles and specialty vehicles (e.g., maintenance vehicles, transit vehicles) that also include the basic 'Vehicle OBE' functionality that supports V2V communications. This object provides a source and destination for information transfers between connected vehicles. The host vehicle on-board equipment, represented by the Vehicle OBE physical object, sends information to, and receives information from the Other Vehicle OBEs to model all connected vehicle V2V communications in the Binghamton Regional ITS Architecture.	POV In-Vehicle Communication Services	Planned	Other Vehicle OBEs
Social Media	'Social Media' provides forums for social interaction and opportunities for gathering and distributing traveler information. These sites provide crowd sourced information and the opportunity to provide traveler information to specific communities of interest. Examples include Facebook, Twitter, and LinkedIn. Each social media platform offers its own tools and API that allow integration of web content into a shared social media experience.	Travelers	Existing	Social Media
Tioga County 911 System	The Tioga County 911 system receives 911 and other emergency calls, and interfaces with other agencies to assist in the verification and assessment of emergencies and to forward emergency information to the appropriate response agency.	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Existing	Emergency Telecommunications System

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	In general, an 'Emergency Management Center' represents systems that support incident management, disaster response and evacuation, security monitoring, and other security and public safety-oriented ITS applications. It includes the functions associated with fixed and mobile public safety communications centers including public safety answering point and dispatch centers operated by police, fire, and emergency medical services. In Tioga County these functions are under the purview of two departments. The Emergency 911 Communications Center is the PSAP and emergency dispatch center for Tioga County, and is operated by the Tioga County Sheriff's Department. The Tioga County Department of Emergency Management coordinates Tioga County's efforts to prepare for and respond to emergency situations.	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Existing	Emergency Management Center
Tioga County Emergency Management Center (Sheriff Emergency Dispatch) Personnel	Emergency System Operator' represents the Tioga County Office of Emergency Services personnel and Tioga County Sheriff Emergency Dispatch personnel that monitor emergency requests, (including those from the E911 Operator) and set up pre-defined responses to be executed by an emergency management system. The operator may also override predefined responses where it is observed that they are not achieving the desired result. This also includes dispatchers who manage an emergency fleet (police, fire, ambulance, HAZMAT, etc.) or higher order emergency managers who provide response coordination during emergencies.	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Existing	Emergency System Operator
Traveler	The 'Traveler' represents any individual who uses transportation services. The interfaces to the traveler provide general pre-trip and en route information supporting trip planning, personal guidance, and requests for assistance in an emergency that are relevant to all transportation system users. It also represents users of a public transportation system and addresses interfaces these users have within a transit vehicle or at transit facilities such as roadside stops and transit centers.	Travelers	Existing	Traveler

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
Traveler Personal Information Device	The 'Personal Information Device' provides the capability for travelers to receive formatted traveler information wherever they are. Capabilities include traveler information, trip planning, and route guidance. Frequently a smart phone, the Personal Information Device provides travelers with the capability to receive route planning and other personally focused transportation services from the infrastructure in the field, at home, at work, or while en route. Personal Information Devices may operate independently or may be linked with connected vehicle on-board equipment.	Travelers	Existing	Personal Information Device
Vehicle	'Vehicle' represents a complete operating vehicle. It includes the vehicle platform that interfaces with and hosts ITS electronics and all of the driver convenience and entertainment systems, and other non-ITS electronics on-board the vehicle. Interfaces represent both internal on-board interfaces between ITS equipment and other vehicle systems and other passive and active external interfaces or views of the vehicle that support vehicle/traffic monitoring and management. External interfaces may also represent equipment that is carried into the vehicle (e.g., a smartphone that is brought into the vehicle). Internal interfaces are often implemented through a vehicle databus (see 'Vehicle Databus' for more information), which is also included in this object.	POV Drivers	Existing	Vehicle

Element Name	Element Description	Stakeholder	Element Status	Associated Physical Objects
Vehicle OBE	The Vehicle On-Board Equipment (OBE) provides the vehicle-based sensory, processing, storage, and communications functions that support efficient, safe, and convenient travel. The Vehicle OBE includes general capabilities that apply to passenger cars, trucks, and motorcycles. Many of these capabilities (e.g., see the Vehicle Safety service packages) apply to all vehicle types including personal vehicles, commercial vehicles, emergency vehicles, transit vehicles, and maintenance vehicles. From this perspective, the Vehicle OBE includes the common interfaces and functions that apply to all motorized vehicles. The radio(s) supporting V2V and V2I communications are a key component of the Vehicle OBE. Both one-way and two-way communications options support a spectrum of information services from basic broadcast to advanced personalized information services. Route guidance capabilities assist in formulation of an optimal route and step by step guidance along the travel route. Advanced sensors, processors, enhanced driver interfaces, and actuators complement the driver information services so that, in addition to making informed mode and route selections, the driver travels these routes in a safer and more consistent manner. This physical object supports all six levels of driving automation as defined in SAE J3016. Initial collision avoidance functions provide 'vigilant co-pilot' driver warning capabilities. More advanced functions assume limited control of the vehicle to maintain lane position and safe headways. In the most advanced implementations, this Physical Object supports full automation of all aspects of the driving task, aided by communications with other vehicles in the vicinity and in coordination with supporting infrastructure subsystems.	POV Drivers	Existing	Vehicle OBE

6 ITS Services

ITS services, or service packages, describe what can be done to improve the efficiency, safety, and convenience of the regional transportation system through better information, advanced systems and new technologies. Some services are specific to one primary stakeholder while others require broad stakeholder participation. This section describes the ITS services that meet the transportation needs in the Binghamton Region.

Table 3 – ITS Services

Service Package	Service Package Name	Service Package Description	Service Package Status
MC01	Maintenance and Construction Vehicle and Equipment Tracking	This service package tracks the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities. Checks can include ensuring the correct roads are being plowed and work activity is being performed at the correct locations.	Planned
MC03	Roadway Automated Treatment	This service package automatically treats a roadway section based on environmental or atmospheric conditions. Treatments include fog dispersion, anti-icing chemicals, etc. The service package includes the environmental sensors that detect adverse conditions, the automated treatment system itself, and driver information systems (e.g., dynamic message signs) that warn drivers when the treatment system is activated.	Planned
MC04	Winter Maintenance	This service package supports winter road maintenance including snow plow operations, roadway treatments (e.g., salt spraying and other anti-icing material applications), and other snow and ice control activities. This package monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.	Existing
MC06	Work Zone Management	This service package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., TIC, traffic management, other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This service package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.	Existing
MC08	Maintenance and Construction Activity Coordination	This service package supports the dissemination of maintenance and construction activity to centers that can utilize it as part of their operations, or to Transportation Information Centers who can provide the information to travelers. Center to center coordination of work plans supports adjustments to reduce disruption to regional transportation operations.	Planned
PS01	Emergency Call-Taking and Dispatch	This service package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Centers supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Center and an Emergency Vehicle supports dispatch and provision of information to responding personnel.	Existing
PS01	Emergency Call-Taking and Dispatch Tioga County	--Instance of <PS01>-- This service package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Centers supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Center and an Emergency Vehicle supports dispatch and provision of information to responding personnel.	Existing
PS02	Routing Support for Emergency Responders	This service package provides information to support dynamic routing of emergency vehicles. Traffic information, road conditions, and weather advisories are provided to enhance emergency vehicle routing. The Emergency Management Center provides routing information based on real-time conditions and has the option to request an ingress/egress route from the Traffic Management Center.	Existing

Service Package	Service Package Name	Service Package Description	Service Package Status
PS02	Routing Support for Emergency Responders Tioga County	--Instance of <PS02>-- This service package provides information to support dynamic routing of emergency vehicles. Traffic information, road conditions, and weather advisories are provided to enhance emergency vehicle routing. The Emergency Management Center provides routing information based on real-time conditions and has the option to request an ingress/egress route from the Traffic Management Center.	Planned
PS03	Emergency Vehicle Preemption	This service package provides signal preemption for public safety first responder vehicles. Both traditional signal preemption systems and new systems based on connected vehicle technology are covered. In more advanced systems, movement of public safety vehicles through the intersection can be facilitated by clearing queues and holding conflicting phases. In addition, this SP also covers the transition back to normal traffic signal operations after providing emergency vehicle preemption.	Existing
PS04	Mayday Notification	This service package provides the capability for a vehicle to automatically transmit an emergency message when the vehicle has been involved in a crash or other distress situation. An automatic crash notification feature transmits key data on the crash recorded by sensors mounted in the vehicle (e.g. deployment of airbags) without the need for involvement of the driver. The emergency message is sent to emergency response services, which determines and carries out the appropriate response. This service package allows passing vehicles to receive and forward mayday requests in areas where no communications infrastructure exists. Emergency notifications from personal devices are also supported.	Planned
PS04	Mayday Notification (Tioga County)	--Instance of <PS04>-- This service package provides the capability for a vehicle to automatically transmit an emergency message when the vehicle has been involved in a crash or other distress situation. An automatic crash notification feature transmits key data on the crash recorded by sensors mounted in the vehicle (e.g. deployment of airbags) without the need for involvement of the driver. The emergency message is sent to emergency response services, which determines and carries out the appropriate response. This service package allows passing vehicles to receive and forward mayday requests in areas where no communications infrastructure exists. Emergency notifications from personal devices are also supported.	Planned
PS10	Wide-Area Alert	This service package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-vehicle displays, transit displays, 511 traveler information systems, and traveler information web sites.	Existing
PS10	Wide-Area Alert (Instance 1) Tioga County	--Instance of <PS10>-- This service package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-vehicle displays, transit displays, 511 traveler information systems, and traveler information web sites.	Planned

Service Package	Service Package Name	Service Package Description	Service Package Status
PT01	Transit Vehicle Tracking	This service package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time.	Planned
PT02	Transit Fixed-Route Operations	This service package performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service monitors the transit vehicle trip performance against the schedule and provides information displays at the Transit Management Center.	Planned
PT03	Dynamic Transit Operations	The Dynamic Transit Operations service package allows travelers to request trips and obtain itineraries using a personal device such as a smart phone, tablet, or personal computer. The trips and itineraries cover multiple transportation services (public transportation modes, private transportation services, shared-ride, walking and biking). This service package builds on existing technology systems such as computer-aided dispatch/ automated vehicle location (CAD/AVL) systems and automated scheduling software, providing a coordination function within and between transit providers that would dynamically schedule and dispatch or modify the route of an in-service vehicle by matching compatible trips together. TI06 covers other shared use transportation options.	Planned
PT04	Transit Fare Collection Management	This service package manages transit fare collection on-board transit vehicles and at transit stops using electronic means. It allows transit users to use a traveler card or other electronic payment device such as a smart phone. Readers located either in the infrastructure or on-board the transit vehicles enable electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Center.	Existing
PT05	Transit Security	This service package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment performs surveillance and sensor monitoring in order to identify potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition, this service package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring).Most of the surveillance and sensor data that is collected by this service package may be monitored by either the Emergency Management Center or the Transit Management Center, providing two possible approaches to implementing this service package. This service package also supports remote transit vehicle disabling and transit vehicle operator authentication by the Transit Management Center.	Planned
PT07	Transit Passenger Counting	This service package counts the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the management center. The collected data can be used to calculate reliable ridership figures and measure passenger load information at particular stops.	Existing
PT08	Transit Traveler Information	This service package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this service package.	Planned

Service Package	Service Package Name	Service Package Description	Service Package Status
TI02	Personalized Traveler Information	This service package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications with the traveler. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal and web pages via smart phone, tablet, personal computer, and a variety of in-vehicle devices.	Planned
TM01	Infrastructure-Based Traffic Surveillance	This service package includes traffic detectors, other surveillance equipment, the supporting field equipment, and Center to Field communications to transmit the collected data back to the Traffic Management Center. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Center). The data generated by this service package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Traveler Information Center physical object.	Planned
TM03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the TM07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Planned
TM06	Traffic Information Dissemination	This service package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, travel restrictions, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Transportation Information Centers. A link to the Maintenance and Construction Management Center allows real time information on road/bridge closures and restrictions due to maintenance and construction activities to be disseminated.	Planned

Service Package	Service Package Name	Service Package Description	Service Package Status
TM08	Traffic Incident Management System	This service package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The service package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this service package to detect and verify incidents and implement an appropriate response. This service package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between centers. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination service package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information service packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel.	Planned
TM08	Traffic Incident Management System (Tioga County)	--Instance of <TM08>-- This service package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The service package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this service package to detect and verify incidents and implement an appropriate response. This service package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between centers. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination service package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information service packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel.	Planned
TM17	Speed Warning and Enforcement	This service package monitors vehicle speeds and supports warning drivers when their speed is excessive. Also the service includes notifications to an enforcement agency to enforce the speed limit of the roadway. Speed monitoring can be made via spot speed or average speed measurements. Roadside equipment can display the speed of passing vehicles and/or suggest a safe driving speed. Environmental conditions and vehicle characteristics may be monitored and factored into the safe speed advisories that are provided to the motorist. For example, warnings can be generated recognizing the limitations of a given vehicle for the geometry of the roadway such as rollover risk for tall vehicles. This service focuses on monitoring of vehicle speeds and enforcement of the speed limit while the variable speed limits service (covered in TM20-Variable Speed Limits service package) focuses on varying the posted speed limits to create more uniform speeds along a roadway, to promote safer driving during adverse conditions (such as fog) and/or to reduce air pollution.	Planned

Service Package	Service Package Name	Service Package Description	Service Package Status
WX01	Weather Data Collection	This service package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway. It also collects data from vehicles in the road network that can be used to directly measure or infer current environmental conditions. It leverages vehicle on-board systems that measure temperature, sense current weather conditions (rain and sun sensors) and also can monitor aspects of the vehicle operational status (e.g., use of headlights, wipers, and traction control system) to gather information about local environmental conditions. In addition, environmental sensor systems located on Maintenance and Construction Vehicles are also potential data sources. The collected environmental data is used by the Weather Information Processing and Distribution service package to process the information and make decisions on operations. The collected environmental data may be aggregated, combined with data attributes and sent to meteorological systems for data qualification and further data consolidation. The service package may also request and receive qualified data sets from meteorological systems.	Planned
WX02	Weather Information Processing and Distribution	This service package processes and distributes the environmental information collected from the Weather Data Collection service package. This service package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so operational centers and decision support systems can make decision on corrective actions to take. The continuing updates of road condition information and current temperatures can be used to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination service package, and aid operators in scheduling work activity.	Planned

7 Roles and Responsibilities

The Operational Concept lists the roles and responsibilities that each participating agency must take on to provide the ITS services included in the ITS Architecture. Changing needs may arise that will require an agreement to be formed between all affected parties that defines new or additional roles. Defining the roles and responsibilities of the participating stakeholders in the region and the willingness of agencies to accept their roles and responsibilities is an important step in realizing the common goal of an interoperable ITS system throughout the Binghamton re

Table 4 – Roles and Responsibilities

RR Area Name	Stakeholder	RR Description	RR Status
Emergency Management for Binghamton Regional ITS Architecture	Broome County Office of Emergency Services	Operate Public Safety Answering Point/911 service and provide emergency dispatch services for Broome County.	Existing
Emergency Management for Binghamton Regional ITS Architecture	Broome County Office of Emergency Services	Provide Broome County-specific information to NYAlert reverse notification system.	Existing
Emergency Management for Binghamton Regional ITS Architecture	Broome County Office of Emergency Services	Provide routing for emergency vehicles.	Planned
Emergency Management for Binghamton Regional ITS Architecture	County and Municipal Highway Departments	Install and maintain emergency vehicle preemption traffic signal equipment.	Existing
Emergency Management for Binghamton Regional ITS Architecture	Local Police Departments/Fire Departments/Emergency Squads (Broome County)	Utilize emergency vehicle preemption equipment when appropriate.	Existing
Emergency Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Provide support for Broome County Office of Emergency Services and Tioga County Sheriff Dispatch routing for emergency vehicles.	Planned
Emergency Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Install and maintain emergency vehicle preemption traffic signal equipment.	Existing
Emergency Management for Binghamton Regional ITS Architecture	New York State Police	Utilize emergency vehicle preemption equipment when appropriate.	Existing
Emergency Management for Binghamton Regional ITS Architecture	POV In-Vehicle Communication Services	Provide vehicle emergency notification capability for drivers or collision detection sensors to summon emergency assistance.	Existing

RR Area Name	Stakeholder	RR Description	RR Status
Emergency Management for Binghamton Regional ITS Architecture	POV In-Vehicle Communication Services	Enable a connected vehicle that is passing within radio range of a vehicle in need of assistance to store the notification and then forward it to a public safety agency when communications are available.	Planned
Emergency Management for Binghamton Regional ITS Architecture	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Operate Tioga County Hyper-Reach Emergency Alert System to notify the public of potential hazards and emergencies via land-line phone, cellular phone, email, and/or TDD.	Existing
Emergency Management for Binghamton Regional ITS Architecture	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Operate 911 Public Safety Answering Point/911 service and provide emergency dispatch services for Tioga County.	Existing
Emergency Management for Binghamton Regional ITS Architecture	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Provide routing for emergency vehicles.	Planned
Freeway Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Monitor traffic conditions at various freeway locations using ITS roadway equipment such as CCTV cameras and permanent continuous count traffic stations.	Existing
Freeway Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Disseminate information on traffic and road conditions, closure and detour information, travel restrictions, incident information, and emergency alerts and driver advisories via highway advisory radio to motorists.	Planned
Freeway Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Disseminate information on traffic and road conditions, closure and detour information, travel restrictions, incident information, and emergency alerts and driver advisories to media outlets.	Existing
Freeway Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	New York State Department of Transportation Region 9 Traffic Operations Center disseminates information on traffic and road conditions, closure and detour information, travel restrictions, incident information, and emergency alerts and driver advisories to NYSDOT Region 9 Maintenance and Construction and Transportation Information Centers, BCDOPT Transit Management Center, and Broome and Tioga County Emergency Management Centers.	Planned
Incident Management for Binghamton Regional ITS Architecture	Broome County Office of Emergency Services	Track the availability of resources and assist in the appropriate allocation of these resources for a particular emergency response.	Existing
Incident Management for Binghamton Regional ITS Architecture	Broome County Office of Emergency Services	Coordinates with the public through the Emergency Telecommunication Systems (e.g., NYAlerts).	Existing
Incident Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Provide information to support dispatch and routing of emergency response and service vehicles as well as coordination with other cooperating agencies.	Planned

RR Area Name	Stakeholder	RR Description	RR Status
Incident Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Support maintenance and construction participation in coordinated incident response.	Planned
Incident Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Monitors and control traffic sensor and surveillance systems that support incident detection and verification.	Planned
Incident Management for Binghamton Regional ITS Architecture	Special Event Sponsor	Provide event plans for special events that may impact traffic.	Planned
Incident Management for Binghamton Regional ITS Architecture	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Coordinates with the public through the Emergency Telecommunication Systems (e.g., Hyper-Reach Alerts).	Existing
Incident Management for Binghamton Regional ITS Architecture	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Track the availability of resources and assist in the appropriate allocation of these resources for a particular emergency response.	Existing
Maintenance and Construction for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Use automated vehicle location units in maintenance and construction vehicles to track their location and activities.	Planned
Maintenance and Construction for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Use automated ice control treatments located at critical locations on high volume/high speed locations to improve winter road surface conditions.	Planned
Maintenance and Construction for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Monitor environmental conditions using roadway weather information stations and maintenance vehicle on-board sensors to determine appropriate snow and ice control response, and manage response operations.	Planned
Maintenance and Construction for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Provide NYSDOT Region 9 Traffic Management Center and Transportation Information Center, BCDOPT Transit Management Center, Broome and Tioga County's Emergency Management Centers, and local media outlets, with reports on roadway maintenance status.	Planned
Maintenance and Construction for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Use variable message signs and highway advisory radio to control work zone traffic conditions.	Planned
Surface Street Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Operate Transportation Information center to receive informational inputs from NYSDOT Traffic Operations Center, BCDOPT Transit Management Center, Broome County Emergency Management Center, NYSDOT Region 9 Maintenance and Construction Management Center.	Planned

RR Area Name	Stakeholder	RR Description	RR Status
Surface Street Management for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Monitor and manage traffic flow at intersections with adaptive signal technology.	Planned
Transit Services for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Use Transit Automatic Vehicle Location Units on BCDOPT Transit Vehicles to perform vehicle tracking, and enable the provision of real-time location and on-time information.	Planned
Transit Services for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Provide transit service information including routes, schedules and fare information to Transit Information Center, as well as real-time location and on-time information.	Planned
Transit Services for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Provide incident information and dynamic transit schedule adherence and transit vehicle location information to the Transit Information Center.	Planned
Transit Services for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Use Automated Vehicle Location System to determine schedule adherence and update schedule information, and provide transit customers with this information via personal information devices.	Planned
Transit Services for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Use computer-aided dispatching and automated vehicle location technologies to enable paratransit customer trip requests via personal information devices such as a smartphone or PC.	Planned
Transit Services for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Enable transit customers to use traveler cards for payment using electronic fare collection.	Existing
Transit Services for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Use on-board CCTV cameras and other surveillance equipment to monitor security on transit vehicles.	Existing
Transit Services for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Collect transit ridership and fare data using electronic fare boxes.	Existing
Traveler Information for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Use Transit Automatic Vehicle Location Units on BCDOPT Transit Vehicles to perform vehicle tracking, and enable the provision of real-time location and on-time information.	Planned
Traveler Information for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Provide transit service information including routes, schedules and fare information to Transit Information Center, as well as real-time location and on-time information.	Planned
Traveler Information for Binghamton Regional ITS Architecture	Broome County Department of Public Transportation	Provide incident information and dynamic transit schedule adherence and transit vehicle location information to the Transit Information Center.	Planned

RR Area Name	Stakeholder	RR Description	RR Status
Traveler Information for Binghamton Regional ITS Architecture	Broome County Office of Emergency Services	Notification of existence of incident and expected severity, location, time and nature of incident to the Transportation Information Center. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system. may impact the transportation system.	Planned
Traveler Information for Binghamton Regional ITS Architecture	Broome County Office of Emergency Services	Use NY-Alert system to alert the public of potential hazards and emergencies via phone and facsimile transmissions.	Existing
Traveler Information for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Operate Transportation Information Center to receive informational inputs from NYSDOT Traffic Operations Center, BCDOPT Transit Management Center, Broome County Emergency Management Center, NYSDOT Region 9 Maintenance and Construction Management Center.	Planned
Traveler Information for Binghamton Regional ITS Architecture	Special Event Sponsor	Provide event information such as date, time, estimated duration, location, and any other information pertinent to traffic movement in the surrounding area, to the Transportation Information Center.	Planned
Traveler Information for Binghamton Regional ITS Architecture	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Operate Tioga County Hyper-Reach Emergency Alert System to notify the public of potential hazards and emergencies via land-line phone, cellular phone, email, and/or TDD.	Existing
Traveler Information for Binghamton Regional ITS Architecture	Tioga County Sheriff Dispatch/Tioga County Department of Emergency Management	Notification of existence of incident and expected severity, location, time and nature of incident to the Transportation Information Center. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system. may impact the transportation system.	Planned
Weather for Binghamton Regional ITS Architecture	New York State Department of Transportation Region 9	Processes current and forecast weather data, road condition information, local environmental data from RWIS stations and maintenance vehicle on-board sensors, and uses internal models to develop specialized detailed forecasts of local weather and surface conditions.	Planned

8. Functional Requirements

Each ITS system operated by the stakeholders must perform certain functions to effectively deliver the ITS services desired by the region. The primary functions that each system needs to perform are broadly defined in the Binghamton Regional ITS Architecture. The high-level requirements are grouped into functional objects that identify requirements associated with each selected ITS service package.

Table 5 – Functional Requirements

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
BCDOPT Automatic Vehicle Location	Transit Vehicle OBE	Transit Vehicle On-Board Information Services	'Transit Vehicle On-board Information Services' furnishes en-route transit users with real-time travel-related information on-board a transit vehicle. Current information that can be provided to transit users includes transit routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, non-motorized transportation services, and special events are provided. In addition to tailored information for individual transit users, it also supports general annunciation and/or display of general schedule information, imminent arrival information, and other information of general interest to transit users.	No	
BCDOPT Automatic Vehicle Location	Transit Vehicle OBE	Transit Vehicle On-Board Trip Monitoring	'Transit Vehicle On-Board Trip Monitoring' tracks vehicle location, monitors fuel usage, collects operational status (doors opened/closed, running times, etc.) and sends the collected, time stamped data to the Transit Management Center.	No	
BCDOPT Automatic Vehicle Location	Transit Vehicle OBE	Transit Vehicle Schedule Management	'Transit Vehicle Schedule Management' monitors schedule performance and identifies corrective actions when a deviation is detected. It provides two-way communication between the transit vehicle and center, enabling the center to communicate with the vehicle operator and monitor on-board systems.	No	
BCDOPT BC Transit Electronic Fareboxes	Transit Vehicle OBE	Transit Vehicle On-Board Fare Management	'Transit Vehicle On-board Fare Management' supports fare collection using a standard fare card or other non-monetary fare medium and detects payment violations. Collected fare data are made available to the center.	No	
BCDOPT BC Transit Electronic Fareboxes	Transit Vehicle OBE	Transit Vehicle Passenger Counting	'Transit Vehicle Passenger Counting' collects transit vehicle loading data and makes it available to the center.	No	
BCDOPT Payment Device	Payment Device			No	
BCDOPT Transit Information Center	Transportation Information Center			No	
BCDOPT Transit Information Center Personnel	TIC Operator			No	
BCDOPT Transit Management Center	Transit Management Center	Transit Center Environmental Monitoring	'Transit Center Environmental Monitoring' assimilates current and forecast road conditions and surface weather information from a variety of sources, including both weather service providers and vehicle probes. The collected environmental information is monitored and used to support transit operations.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
BCDOPT Transit Management Center	Transit Management Center	Transit Center Fare Management	'Transit Center Fare Management' manages fare collection and passenger load management at the transit center. It provides the back office functions that support transit fare collection, supporting payment reconciliation with links to financial institutions and enforcement agencies for fare violations. It collects data required to determine accurate ridership levels, establish fares, and distribute fare information. It loads fare data into the vehicle prior to the beginning of normal operations and unloads fare collection data from the vehicle at the close out of normal operations.	No	
BCDOPT Transit Management Center	Transit Management Center	Transit Center Fixed-Route Operations	'Transit Center Fixed-Route Operations' manages fixed route transit operations. It supports creation of schedules, blocks and runs for fixed and flexible route transit services. It allows fixed-route and flexible-route transit services to disseminate schedules and automatically updates customer service operator systems with the most current schedule information. It also supports automated dispatch of transit vehicles. Current vehicle schedule adherence and optimum scenarios for schedule adjustment are also provided. It also receives and processes transit vehicle loading data.	No	
BCDOPT Transit Management Center	Transit Management Center	Transit Center Information Services	'Transit Center Information Services' collects the latest available information for a transit service and makes it available to transit customers and to Transportation Information Centers for further distribution. Customers are provided information at transit stops and other public transportation areas before they embark and on-board the transit vehicle once they are en route. Information provided can include the latest available information on transit routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, yellow pages, and special events. In addition to general service information, tailored information (e.g., itineraries) are provided to individual transit users.	No	
BCDOPT Transit Management Center	Transit Management Center	Transit Center Multi-Modal Coordination	'Transit Center Multi-Modal Coordination' supports transit service coordination between transit properties and coordinates with other surface and air transportation modes. As part of service coordination, it shares schedule and trip information, as well as transit transfer cluster (a collection of stop points, stations, or terminals where transfers can be made conveniently) and transfer point information between Multimodal Transportation Service Providers, Transit Agencies, and ISPs. An interface to Traffic Management also supports demand management strategies.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
BCDOPT Transit Management Center	Transit Management Center	Transit Center Paratransit Operations	'Transit Center Paratransit Operations' manages demand responsive transit services, including paratransit services. It supports planning and scheduling of these services, allowing paratransit and other demand response transit services to plan efficient routes and better estimate arrival times. It also supports automated dispatch of paratransit vehicles and tracks passenger pick-ups and drop-offs. Customer service operator systems are updated with the most current schedule information.	No	
BCDOPT Transit Management Center	Transit Management Center	Transit Center Passenger Counting	'Transit Center Passenger Counting' receives and processes transit vehicle loading data using two-way communications from equipped transit vehicles.	No	
BCDOPT Transit Management Center	Transit Management Center	Transit Center Security	'Transit Center Security' monitors transit vehicle operator or traveler activated alarms received from on-board a transit vehicle. It supports transit vehicle operator authentication and provides the capability to remotely disable a transit vehicle. It also includes the capability to alert operators and police to potential incidents identified by these security features.	No	
BCDOPT Transit Management Center	Transit Management Center	Transit Center Vehicle Assignment	'Transit Center Vehicle Assignment' assigns individual transit vehicles to vehicle blocks and downloads this information to the transit vehicle. It also provides an exception handling process for the vehicle assignment function to generate new, supplemental vehicle assignments when required by changes during the operating day. It provides an inventory management function for the transit facility which stores functional attributes about each of the vehicles owned by the transit operator. These attributes permit the planning and assignment functions to match vehicles with routes based on suitability for the types of service required by the particular routes.	No	
BCDOPT Transit Management Center	Transit Management Center	Transit Center Vehicle Tracking	'Transit Center Vehicle Tracking' monitors transit vehicle location. The location information is collected via a data communication link between the transit vehicles and the transit center. The location information is presented to the transit operator on a digitized map of the transit service area. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. The real-time schedule information is disseminated to other information providers, which furnish the information to travelers.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
BCDOPT Transit Management Center	Transit Management Center	Transit Garage Maintenance	'Transit Garage Maintenance' provides advanced maintenance functions for the transit property. It collects operational and maintenance data from transit vehicles, manages vehicle service histories, and monitors operators and vehicles. It collects vehicle mileage data and uses it to automatically generate preventative maintenance schedules for each vehicle by utilizing vehicle tracking data. In addition, it provides information to service personnel to support maintenance activities and records and verifies that maintenance work was performed.	No	
BCDOPT Transit Management Center Personnel	Transit Operations Personnel			No	
BCDOPT Transit Vehicle OBE	Transit Vehicle OBE	Transit Vehicle On-Board Information Services	'Transit Vehicle On-board Information Services' furnishes en-route transit users with real-time travel-related information on-board a transit vehicle. Current information that can be provided to transit users includes transit routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, non-motorized transportation services, and special events are provided. In addition to tailored information for individual transit users, it also supports general annunciation and/or display of general schedule information, imminent arrival information, and other information of general interest to transit users.	No	
BCDOPT Transit Vehicle OBE	Transit Vehicle OBE	Transit Vehicle On-Board Maintenance	'Transit Vehicle On-Board Maintenance' collects and processes transit vehicle maintenance data on-board the vehicle, including mileage and vehicle operating conditions. This maintenance information is provided to the management center and used to schedule future vehicle maintenance and repair.	No	
BCDOPT Transit Vehicle OBE	Transit Vehicle OBE	Transit Vehicle On-Board Paratransit Operations	'Transit Vehicle On-board Paratransit Operations' forwards paratransit and flexible-route dispatch requests to the operator and forwards acknowledgements to the center. It coordinates with, and assists the operator in managing multi-stop runs associated with demand responsive transit services including paratransit. It collects transit vehicle passenger data and makes it available to the center.	No	
BCDOPT Transit Vehicle OBE	Transit Vehicle OBE	Transit Vehicle Passenger Counting	'Transit Vehicle Passenger Counting' collects transit vehicle loading data and makes it available to the center.	No	
BCDOPT Transit Vehicle Operators	Transit Vehicle Operator			No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
BCDOPT Transit Vehicle Security Equipment	Transit Vehicle OBE	Transit Vehicle Security	'Transit Vehicle Security' provides security and safety functions on-board the transit vehicle. It includes surveillance and sensor systems that monitor the on-board environment, silent alarms that can be activated by transit user or vehicle operator, operator authentication, and a remote vehicle disable function. The surveillance equipment includes video (e.g. CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g. metal detectors).	No	
BCDOPT Transit Vehicles	Transit Vehicle			No	
BCDOPT Traveler Support Equipment	Traveler Support Equipment			No	
Broome County 911 System	Emergency Telecommunications System			No	
Broome County Emergency Management Center	Emergency Management Center	Emergency Call-Taking	'Emergency Call-Taking' supports the emergency call-taker, collecting available information about the caller and the reported emergency, and forwarding this information to other objects that formulate and manage the emergency response. It receives 9-1-1, 7-digit local access, and motorist call-box calls and interfaces to other agencies to assist in the verification and assessment of the emergency and to forward the emergency information to the appropriate response agency.	No	
Broome County Emergency Management Center	Emergency Management Center	Emergency Dispatch	'Emergency Dispatch' tracks the location and status of emergency vehicles and dispatches these vehicles to incidents. Pertinent incident information is gathered from the public and other public safety agencies and relayed to the responding units. Incident status and the status of the responding units is tracked so that additional units can be dispatched and/or unit status can be returned to available when the incident is cleared and closed.	No	
Broome County Emergency Management Center	Emergency Management Center	Emergency Early Warning System	'Emergency Early Warning System' monitors alerting and advisory systems, information collected by ITS surveillance and sensors, and reports from other agencies and uses this information to identify potential, imminent, or in-progress major incidents or disasters. Notification is provided to initiate the emergency response, including public notification using ITS traveler information systems, where appropriate.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
Broome County Emergency Management Center	Emergency Management Center	Emergency Environmental Monitoring	'Emergency Environmental Monitoring' collects current and forecast road conditions and surface weather information from a variety of sources. The collected environmental information is monitored and presented to the operator and used to more effectively manage incidents.	No	
Broome County Emergency Management Center	Emergency Management Center	Emergency Incident Command	'Emergency Incident Command' provides tactical decision support, resource coordination, and communications integration for Incident Commands that are established by first responders at or near the incident scene to support local management of an incident. It supports communications with public safety, emergency management, transportation, and other allied response agency centers, tracks and maintains resource information, action plans, and the incident command organization itself. Information is shared with agency centers including resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response. It supports the functions and interfaces commonly supported by a mobile command center.	No	
Broome County Emergency Management Center	Emergency Management Center	Emergency Response Management	'Emergency Response Management' provides the strategic emergency response capabilities and broad inter-agency interfaces that are implemented for extraordinary incidents and disasters that require response from outside the local community. It provides the functional capabilities and interfaces commonly associated with Emergency Operations Centers. It develops and stores emergency response plans and manages overall coordinated response to emergencies. It monitors real-time information on the state of the regional transportation system including current traffic and road conditions, weather conditions, special event and incident information. It tracks the availability of resources and assists in the appropriate allocation of these resources for a particular emergency response. It also provides coordination between multiple allied agencies before and during emergencies to implement emergency response plans and track progress through the incident. It also coordinates with the public through the Emergency Telecommunication Systems (e.g., Reverse 911). It coordinates with public health systems to provide the most appropriate response for emergencies involving biological or other medical hazards.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
Broome County Emergency Management Center	Emergency Management Center	Emergency Routing	'Emergency Routing' supports routing of emergency vehicles and enlists support from the Traffic Management Center to facilitate travel along these routes. Routes may be determined based on real-time traffic information and road conditions or routes may be provided by the Traffic Management Center on request. Vehicles are tracked and routes are based on current vehicle location. It may coordinate with the Traffic Management Center to provide preemption or otherwise adapt the traffic control strategy along the selected route.	No	
Broome County Emergency Management Center Personnel	Emergency System Operator			No	
CLARUS	Surface Transportation Weather Service			No	
County and Municipal Highway Departments	Other Maint and Constr Mgmt Centers			No	
Driver	Driver			No	
Event Promoter System	Event Promoter System			No	
Hyper-Reach Emergency Alert System	Emergency Telecommunications System			No	
Local Media Outlets	Media			No	
Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Emergency Vehicle OBE	EV On-Board En Route Support	'EV On-Board En Route Support' provides communications functions to responding emergency vehicles that reduce response times and improve safety of responding public safety personnel and the general public. It supports traffic signal preemption via short range communication directly with signal control equipment and sends alert messages to surrounding vehicles.	No	
Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Emergency Vehicle OBE	EV On-Board Incident Management Communication	'EV On-board Incident Management Communication' provides communications support to first responders. Information about the incident, information on dispatched resources, and ancillary information such as road and weather conditions are provided to emergency personnel. Emergency personnel transmit information about the incident such as identification of vehicles and people involved, the extent of injuries, hazardous material, resources on site, site management strategies in effect, and current clearance status. Emergency personnel may also send in-vehicle signing messages to approaching traffic using short range communications.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Emergency Vehicle OBE	EV On-Board En Route Support	'EV On-Board En Route Support' provides communications functions to responding emergency vehicles that reduce response times and improve safety of responding public safety personnel and the general public. It supports traffic signal preemption via short range communication directly with signal control equipment and sends alert messages to surrounding vehicles.	No	
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Emergency Vehicle OBE	EV On-Board Incident Management Communication	'EV On-board Incident Management Communication' provides communications support to first responders. Information about the incident, information on dispatched resources, and ancillary information such as road and weather conditions are provided to emergency personnel. Emergency personnel transmit information about the incident such as identification of vehicles and people involved, the extent of injuries, hazardous material, resources on site, site management strategies in effect, and current clearance status. Emergency personnel may also send in-vehicle signing messages to approaching traffic using short range communications.	No	
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Other EV OBEs			No	
Local Police/Sheriff/Fire/EMS Personnel (Broome County)	Emergency Personnel			No	
Local Police/Sheriff/Fire/EMS Personnel (Tioga County)	Emergency Personnel			No	
Municipal Emergency Vehicle Traffic Signal Preemption Equipment	ITS Roadway Equipment			No	
National Oceanic and Atmospheric Administration National Weather Service	Weather Service System			No	
New York State Police Personnel (Broome County)	Emergency Personnel			No	
New York State Police Personnel (Tioga County)	Emergency Personnel			No	
New York State Police Vehicle OBE (Broome County)	Emergency Vehicle OBE	EV On-Board En Route Support	'EV On-Board En Route Support' provides communications functions to responding emergency vehicles that reduce response times and improve safety of responding public safety personnel and the general public. It supports traffic signal preemption via short range communication directly with signal control equipment and sends alert messages to surrounding vehicles.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
New York State Police Vehicle OBE (Broome County)	Emergency Vehicle OBE	EV On-Board Incident Management Communication	'EV On-board Incident Management Communication' provides communications support to first responders. Information about the incident, information on dispatched resources, and ancillary information such as road and weather conditions are provided to emergency personnel. Emergency personnel transmit information about the incident such as identification of vehicles and people involved, the extent of injuries, hazardous material, resources on site, site management strategies in effect, and current clearance status. Emergency personnel may also send in-vehicle signing messages to approaching traffic using short range communications.	No	
New York State Police Vehicle OBE (Tioga County)	Emergency Vehicle OBE	EV On-Board En Route Support	'EV On-Board En Route Support' provides communications functions to responding emergency vehicles that reduce response times and improve safety of responding public safety personnel and the general public. It supports traffic signal preemption via short range communication directly with signal control equipment and sends alert messages to surrounding vehicles.	No	
New York State Police Vehicle OBE (Tioga County)	Emergency Vehicle OBE	EV On-Board Incident Management Communication	'EV On-board Incident Management Communication' provides communications support to first responders. Information about the incident, information on dispatched resources, and ancillary information such as road and weather conditions are provided to emergency personnel. Emergency personnel transmit information about the incident such as identification of vehicles and people involved, the extent of injuries, hazardous material, resources on site, site management strategies in effect, and current clearance status. Emergency personnel may also send in-vehicle signing messages to approaching traffic using short range communications.	No	
New York State Police Vehicle OBE (Tioga County)	Other EV OBEs			No	
NYAlerts System	Emergency Telecommunications System			No	
NYSDOT Main Office	Other Transportation Information Centers			No	
NYSDOT Region 9 Emergency Vehicle Traffic Signal Preemption Equipment	ITS Roadway Equipment			No	
NYSDOT Region 9 Highway Advisory Radio	ITS Roadway Equipment	Roadway Traffic Information Dissemination	'Roadway Traffic Information Dissemination' includes field elements that provide information to drivers, including dynamic message signs and highway advisory radios.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
NYSDOT Region 9 Highway Surveillance Cameras	ITS Roadway Equipment	Roadway Work Zone Traffic Control	'Roadway Work Zone Traffic Control' controls traffic in areas of the roadway where maintenance and construction activities are underway, monitoring and controlling traffic using field equipment such as CCTV cameras, dynamic messages signs, and gates/barriers. Work zone speeds and delays are provided to the motorist prior to the work zones.	No	
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Basic Surveillance	'Roadway Basic Surveillance' monitors traffic conditions using fixed equipment such as loop detectors and CCTV cameras.	No	
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Incident Detection	'Roadway Incident Detection' provides incident detection using traffic detectors and surveillance equipment. It monitors for unusual traffic conditions that may indicate an incident or processes surveillance images, watching for potential incidents. It provides potential incident information as well as traffic flow and images to the center for processing and presentation to traffic operations personnel.	No	
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Passive Monitoring	'Roadway Passive Monitoring' monitors passing vehicles for a signature that can be used to recognize the same vehicle at different points in the network and measure travel times. Depending on the implementation and the penetration rate of the technology that is monitored, other point traffic measures may also be inferred by monitoring the number of vehicles within range over time. Today this approach is implemented most commonly using a Bluetooth receiver that passively monitors Bluetooth devices on-board passing vehicles and license plate readers that record the vehicle license plate number, but any widely deployed vehicle communications technology or feature that can be passively monitored to uniquely identify a vehicle could be used.	No	
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Signal Control	'Roadway Signal Control' includes the field elements that monitor and control signalized intersections. It includes the traffic signal controllers, detectors, conflict monitors, signal heads, and other ancillary equipment that supports traffic signal control. It also includes field masters, and equipment that supports communications with a central monitoring and/or control system, as applicable. The communications link supports upload and download of signal timings and other parameters and reporting of current intersection status. It represents the field equipment used in all levels of traffic signal control from basic actuated systems that operate on fixed timing plans through adaptive systems. It also supports all signalized intersection configurations, including those that accommodate pedestrians. In advanced, future implementations, environmental data may be monitored and used to support dilemma zone processing and other aspects of signal control that are sensitive to local environmental conditions.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Signal Preemption	'Roadway Signal Preemption' includes the field elements that receive signal preemption requests from emergency vehicles approaching a signalized intersection and overrides the current operation of the traffic signals to stop conflicting traffic and grant right-of-way to the approaching vehicle.	No	
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Traffic Information Dissemination	'Roadway Traffic Information Dissemination' includes field elements that provide information to drivers, including dynamic message signs and highway advisory radios.	No	
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Work Zone Traffic Control	'Roadway Work Zone Traffic Control' controls traffic in areas of the roadway where maintenance and construction activities are underway, monitoring and controlling traffic using field equipment such as CCTV cameras, dynamic messages signs, and gates/barriers. Work zone speeds and delays are provided to the motorist prior to the work zones.	No	
NYSDOT Region 9 Maintenance and Construction Administrative Systems	Maint and Constr Administrative Systems			No	
NYSDOT Region 9 Maintenance and Construction Field Personnel	Maint and Constr Field Personnel			No	
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Automated Treatment System Control	'MCM Automated Treatment System Control' remotely monitors and controls automated road treatment systems that disperse anti-icing chemicals or otherwise treat a road segment. The automated treatment system may be remotely activated by this object or it may include environmental sensors that activate the system automatically based on sensed environmental conditions. This object monitors treatment system operation, sets operating parameters, and directly controls system activation if necessary.	No	
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Environmental Information Collection	'MCM Environmental Information Collection' collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway. In addition to fixed sensor stations at the roadside, this functional object also collects environmental information from sensor systems located on Maintenance and Construction Vehicles. It also collects current and forecast environmental conditions information that is made available by other systems. The functional object aggregates the sensor system data and provides it, along with data attributes to other applications.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Environmental Information Processing	'MCM Environmental Information Processing' processes current and forecast weather data, road condition information, local environmental data, and uses internal models to develop specialized detailed forecasts of local weather and surface conditions. The processed environmental information products are presented to center personnel and disseminated to other centers.	No	
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Incident Management	'MCM Incident Management' supports maintenance and construction participation in coordinated incident response. Incident notifications are shared, incident response resources are managed, and the overall incident situation and incident response status is coordinated among allied response organizations.	No	
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Maintenance Decision Support	'MCM Maintenance Decision Support' recommends maintenance courses of action based on current and forecast environmental and road conditions and additional application specific information. Decisions are supported through understandable presentation of filtered and fused environmental and road condition information for specific time horizons as well as specific maintenance recommendations that are generated by the system based on this integrated information. The recommended courses of action are supported by information on the anticipated consequences of action or inaction, when available.	No	
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Reduced Speed Zone Warning	'MCM Reduced Speed Zone Warning' supports remote control and monitoring of reduced speed zone warning roadside equipment. It provides posted speed limits and associated schedules and information about associated road configuration changes including lane merges and shifts. It monitors field equipment operation and reports current status to the operator.	No	
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Vehicle Tracking	'MCM Vehicle Tracking' tracks the location of maintenance and construction vehicles and other equipment. Vehicle/equipment location and associated information is presented to the operator.	No	
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Winter Maintenance Management	'MCM Winter Maintenance Management' manages winter road maintenance, tracking and controlling snow plow operations, roadway treatment (e.g., salt spraying and other material applications), and other snow and ice control operations. It monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Work Activity Coordination	'MCM Work Activity Coordination' disseminates work activity schedules and current asset restrictions to other agencies. Work schedules are coordinated with operating agencies, factoring in the needs and activities of other agencies and adjacent jurisdictions. Work schedules are also distributed to Transportation Information Centers for dissemination to the traveling public.	No	
NYSDOT Region 9 Maintenance and Construction Management Center Personnel	Maint and Constr Center Personnel			No	
NYSDOT Region 9 Maintenance and Construction Vehicle	Maint and Constr Vehicle			No	
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Maint and Constr Vehicle OBE	MCV Environmental Monitoring	'MCV Environmental Monitoring' collects current road and surface weather conditions from sensors on-board the maintenance and construction vehicle or by querying fixed sensors on or near the roadway. Environmental information including road surface temperature, air temperature, and wind speed is measured and spatially located and time stamped, and reported back to a center.	No	
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Maint and Constr Vehicle OBE	MCV Vehicle Location Tracking	'MCV Vehicle Location Tracking' monitors vehicle location and reports the position and timestamp information to the dispatch center.	No	
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Maint and Constr Vehicle OBE	MCV Winter Maintenance	'MCV Winter Maintenance' supports snow plow operations and other roadway treatments (e.g., salt spraying and other material applications). It supports communications with the center to receive information and instructions that are provided to the vehicle operator and also supports remote control of on-board systems. It tracks operational status of snow and ice control operations and provides this information back to the center.	No	
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Maint and Constr Vehicle OBE	MCV Work Zone Support	'MCV Work Zone Support' provides communications and support for local management of a work zone. It supports communications between field personnel and the managing center to keep the center appraised of current work zone status. It controls vehicle-mounted driver information systems (e.g., dynamic message signs) and uses short range communications to monitor and control other fixed or portable driver information systems in the work zone.	No	
NYSDOT Region 9 Permanent Continuous Traffic Count Stations	ITS Roadway Equipment			No	
NYSDOT Region 9 Road Weather Information Stations	ITS Roadway Equipment			No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
NYSDOT Region 9 Roadway Automated Treatment	ITS Roadway Equipment	Roadway Automated Treatment	'Roadway Automated Treatment' automatically treats a roadway section based on environmental or atmospheric conditions or under center control. Treatments include fog dispersion, anti-icing chemicals, etc. It communicates with the center and environmental sensors to support system activation and optionally with sign(s) that warn the driver in adverse conditions when the system is activated.	No	
NYSDOT Region 9 Roadway Automated Treatment	ITS Roadway Equipment	Roadway Environmental Monitoring	'Roadway Environmental Monitoring' measures environmental conditions and communicates the collected information back to a center where it can be monitored and analyzed or to other field devices to support communications to vehicles. A broad array of general weather and road surface information may be collected. Weather conditions that may be measured include temperature, wind, humidity, precipitation, and visibility. Surface and sub-surface sensors can measure road surface temperature, moisture, icing, salinity, and other measures.	No	
NYSDOT Region 9 Roadway Automated Treatment	ITS Roadway Equipment	Roadway Traffic Information Dissemination	'Roadway Traffic Information Dissemination' includes field elements that provide information to drivers, including dynamic message signs and highway advisory radios.	No	
NYSDOT Region 9 Roadway Passive Monitoring	ITS Roadway Equipment	Roadway Passive Monitoring	'Roadway Passive Monitoring' monitors passing vehicles for a signature that can be used to recognize the same vehicle at different points in the network and measure travel times. Depending on the implementation and the penetration rate of the technology that is monitored, other point traffic measures may also be inferred by monitoring the number of vehicles within range over time. Today this approach is implemented most commonly using a Bluetooth receiver that passively monitors Bluetooth devices on-board passing vehicles and license plate readers that record the vehicle license plate number, but any widely deployed vehicle communications technology or feature that can be passively monitored to uniquely identify a vehicle could be used.	No	
NYSDOT Region 9 Roadway Signal Control	ITS Roadway Equipment			No	
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Basic Surveillance	'TMC Basic Surveillance' remotely monitors and controls traffic sensor systems and surveillance (e.g., CCTV) equipment, and collects, processes and stores the collected traffic data. Current traffic information and other real-time transportation information is also collected from other centers. The collected information is provided to traffic operations personnel and made available to other centers.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Environmental Monitoring	'TMC Environmental Monitoring' assimilates current and forecast road conditions and surface weather information using a combination of weather service provider information, information collected by other centers such as the Maintenance and Construction Management Center, and data collected from environmental sensors deployed on and about the roadway. The collected environmental information is monitored and presented to the operator. This information can be used to issue general traveler advisories and support location specific warnings to drivers.	No	
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Incident Detection	'TMC Incident Detection' identifies and reports incidents to Traffic Operations Personnel. It remotely monitors and controls traffic sensor and surveillance systems that support incident detection and verification. It analyzes and reduces the collected sensor and surveillance data, external alerting and advisory and incident reporting systems, anticipated demand information from intermodal freight depots, border crossings, special event information, and identifies and reports incidents and hazardous conditions	No	
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Incident Dispatch Coordination	'TMC Incident Dispatch Coordination' formulates and manages an incident response that takes into account the incident potential, incident impacts, and resources required for incident management. It provides information to support dispatch and routing of emergency response and service vehicles as well as coordination with other cooperating agencies. It provides access to traffic management resources that provide surveillance of the incident, traffic control in the surrounding area, and support for the incident response. It monitors the incident response and collects performance measures such as incident response and clearance times.	No	
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Multi-Modal Coordination	'TMC Multi-Modal Coordination' supports center-to-center coordination between the Traffic Management and Transit Management Centers. It monitors transit operations and provides traffic signal priority for transit vehicles on request from the Transit Management Center.	No	
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Passive Surveillance	'TMC Passive Surveillance' collects time stamped vehicle identities from different detection zones, correlates the identities, and calculates link travel times and derives other traffic measures.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Roadway Equipment Monitoring	'TMC Roadway Equipment Monitoring' monitors the operational status of field equipment and detects failures. It presents field equipment status to Traffic Operations Personnel and reports failures to the Maintenance and Construction Management Center. It tracks the repair or replacement of the failed equipment. The entire range of ITS field equipment may be monitored including sensors (traffic, infrastructure, environmental, security, speed, etc.) and devices (highway advisory radio, dynamic message signs, automated roadway treatment systems, barrier and safeguard systems, cameras, traffic signals and override equipment, ramp meters, beacons, security surveillance equipment, etc.).	No	
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Signal Control	'TMC Signal Control' provides the capability for traffic managers to monitor and manage the traffic flow at signalized intersections. This capability includes analyzing and reducing the collected data from traffic surveillance equipment and developing and implementing control plans for signalized intersections. Control plans may be developed and implemented that coordinate signals at many intersections under the domain of a single Traffic Management Center and are responsive to traffic conditions and adapt to support incidents, preemption and priority requests, pedestrian crossing calls, etc.	No	
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Speed Warning	'TMC Speed Warning' supports remote control and monitoring of reduced speed zone warning roadside equipment. It provides the location and extent of the reduced speed zone, the posted speed limit(s) with information about the applicability of the speed limit(s) (e.g., time of day, day of week, seasonality, relevant vehicle types) and information about associated road configuration changes including lane merges and shifts. It monitors field equipment operation and reports current status to the operator.	No	
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Traffic Information Dissemination	'TMC Traffic Information Dissemination' disseminates traffic and road conditions, closure and detour information, incident information, driver advisories, and other traffic-related data to other centers, the media, and driver information systems. It monitors and controls driver information system field equipment including dynamic message signs and highway advisory radio, managing dissemination of driver information through these systems.	No	
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Work Zone Traffic Management	'TMC Work Zone Traffic Management' coordinates work plans with maintenance systems so that work zones are established that have minimum traffic impact. Traffic control strategies are implemented to further mitigate traffic impacts associated with work zones that are established, providing work zone information to driver information systems such as dynamic message signs.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
NYSDOT Region 9 Traffic Management Center (TOC) Personnel	Traffic Operations Personnel			No	
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Data Collection	'TIC Data Collection' collects transportation-related data from other centers, performs data quality checks on the collected data and then consolidates, verifies, and refines the data and makes it available in a consistent format to applications that support operational data sharing between centers and deliver traveler information to end-users. A broad range of data is collected including traffic and road conditions, transit data, emergency information and advisories, weather data, special event information, traveler services, parking, multimodal data, and toll/pricing data. It also shares data with other transportation information centers.	No	
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Emergency Traveler Information	'TIC Emergency Traveler Information' provides emergency information to the public, including wide-area alerts and evacuation information. It provides emergency alerts, information on evacuation zones and evacuation requirements, evacuation destinations and shelter information, available transportation modes, and traffic and road conditions at the origin, destination, and along the evacuation routes. In addition to general evacuation information, personalized information including tailored evacuation routes, service information, and estimated travel times is also provided based on traveler specified origin, destination, and route parameters. Updated information is provided throughout the evacuation and subsequent reentry as status changes and plans are adapted.	No	
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Interactive Traveler Information	'TIC Interactive Traveler Information' disseminates personalized traveler information including traffic and road conditions, transit information, maintenance and construction information, multimodal information, event information, and weather information. Tailored information is provided based on the traveler's request in this interactive service.	No	
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Situation Data Management	'TIC Situation Data Management' manages connected vehicle situation data collection, quality controls, filtering, aggregation, and storage. Through this process, raw data reported by connected vehicles are transformed into information products that can be accessed and used to support transportation operations and traveler information. The distribution of the connected vehicle-derived information products is handled by other functional objects.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Traveler Information Broadcast	'TIC Traveler Information Broadcast' disseminates traveler information including traffic and road conditions, incident information, maintenance and construction information, event information, transit information, parking information, and weather information. The same information is broadcast to all equipped traveler interface systems and vehicles.	No	
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Traveler Telephone Information	'TIC Traveler Telephone Information' services voice-based traveler requests for information that supports traveler telephone information systems like 511. It takes requests for traveler information, which could be voice-formatted traveler requests, dual-tone multi-frequency (DTMF)-based requests, or a simple traveler information request, and returns the requested traveler information in the proper format. In addition to servicing requests for traveler information, it also collects and forwards alerts and advisories to traveler telephone information systems.	No	
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Trip Planning	'TIC Trip Planning' provides pre-trip and en-route trip planning services for travelers. It receives origin, destination, constraints, and preferences and returns trip plan(s) that meet the supplied criteria. Trip plans may be based on current traffic and road conditions, transit schedule information, and other real-time traveler information. Candidate trip plans are multimodal and may include vehicle, transit, and alternate mode segments (e.g., rail, ferry, bicycle routes, and walkways) based on traveler preferences. It also confirms the trip plan for the traveler and supports reservations and advanced payment for portions of the trip. The trip plan includes specific routing information and instructions for each segment of the trip and may also include information and reservations for additional services (e.g., parking) along the route.	No	
NYSDOT Region 9 Transportation Information Center Personnel	TIC Operator			No	
NYSDOT Region 9 Variable Message Signs	ITS Roadway Equipment	Roadway Traffic Information Dissemination	'Roadway Traffic Information Dissemination' includes field elements that provide information to drivers, including dynamic message signs and highway advisory radios.	No	
NYSDOT Region 9 Variable Message Signs	ITS Roadway Equipment	Roadway Work Zone Traffic Control	'Roadway Work Zone Traffic Control' controls traffic in areas of the roadway where maintenance and construction activities are underway, monitoring and controlling traffic using field equipment such as CCTV cameras, dynamic messages signs, and gates/barriers. Work zone speeds and delays are provided to the motorist prior to the work zones.	No	
Other Vehicle OBEs	Other Vehicle OBEs			No	
Social Media	Social Media			No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
Tioga County 911 System	Emergency Telecommunications System			No	
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Call-Taking	'Emergency Call-Taking' supports the emergency call-taker, collecting available information about the caller and the reported emergency, and forwarding this information to other objects that formulate and manage the emergency response. It receives 9-1-1, 7-digit local access, and motorist call-box calls and interfaces to other agencies to assist in the verification and assessment of the emergency and to forward the emergency information to the appropriate response agency.	No	
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Dispatch	'Emergency Dispatch' tracks the location and status of emergency vehicles and dispatches these vehicles to incidents. Pertinent incident information is gathered from the public and other public safety agencies and relayed to the responding units. Incident status and the status of the responding units is tracked so that additional units can be dispatched and/or unit status can be returned to available when the incident is cleared and closed.	No	
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Early Warning System	'Emergency Early Warning System' monitors alerting and advisory systems, information collected by ITS surveillance and sensors, and reports from other agencies and uses this information to identify potential, imminent, or in-progress major incidents or disasters. Notification is provided to initiate the emergency response, including public notification using ITS traveler information systems, where appropriate.	No	
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Environmental Monitoring	'Emergency Environmental Monitoring' collects current and forecast road conditions and surface weather information from a variety of sources. The collected environmental information is monitored and presented to the operator and used to more effectively manage incidents.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Incident Command	'Emergency Incident Command' provides tactical decision support, resource coordination, and communications integration for Incident Commands that are established by first responders at or near the incident scene to support local management of an incident. It supports communications with public safety, emergency management, transportation, and other allied response agency centers, tracks and maintains resource information, action plans, and the incident command organization itself. Information is shared with agency centers including resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response. It supports the functions and interfaces commonly supported by a mobile command center.	No	
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Routing	'Emergency Routing' supports routing of emergency vehicles and enlists support from the Traffic Management Center to facilitate travel along these routes. Routes may be determined based on real-time traffic information and road conditions or routes may be provided by the Traffic Management Center on request. Vehicles are tracked and routes are based on current vehicle location. It may coordinate with the Traffic Management Center to provide preemption or otherwise adapt the traffic control strategy along the selected route.	No	
Tioga County Emergency Management Center (Sheriff Emergency Dispatch) Personnel	Emergency System Operator			No	
Traveler	Traveler			No	
Traveler Personal Information Device	Personal Information Device	Personal Interactive Traveler Information	'Personal Interactive Traveler Information' provides traffic information, road conditions, transit information, yellow pages (traveler services) information, special event information, and other traveler information that is specifically tailored based on the traveler's request and/or previously submitted traveler profile information. It also supports interactive services that support enrollment, account management, and payments for transportation services. The interactive traveler information capability is provided by personal devices including personal computers and personal portable devices such as smart phones.	No	

Element Name	Physical Object Name	Functional Object	Functional Object Description	FO User Defined	Requirement #
Traveler Personal Information Device	Personal Information Device	Personal Trip Planning and Route Guidance	'Personal Trip Planning and Route Guidance' provides a personalized trip plan to the traveler. The trip plan is calculated based on preferences and constraints supplied by the traveler and provided to the traveler for confirmation. Coordination may continue during the trip so that the route plan can be modified to account for new information. Many equipment configurations are possible including systems that provide a basic trip plan to the traveler as well as more sophisticated systems that can provide transition by transition guidance to the traveler along a multi-modal route with transfers. Devices represented by this functional object include desktop computers at home, work, or at major trip generation sites, plus personal devices such as tablets and smart phones.	No	
Vehicle	Vehicle			No	
Vehicle OBE	Vehicle OBE	Vehicle Emergency Notification	'Vehicle Emergency Notification' provides the capability for drivers or collision detection sensors to report an emergency and summon assistance. It includes the on-board collision detection sensors, a mechanism for the driver to summon assistance, and two-way communications.	No	
Vehicle OBE	Vehicle OBE	Vehicle Interactive Traveler Information	'Vehicle Interactive Traveler Information' provides drivers with personalized traveler information including traffic and road conditions, transit information, maintenance and construction information, multimodal information, event information, and weather information. The provided information is tailored based on driver requests. Both one-time requests for information and on-going information streams based on a submitted traveler profile and preferences are supported.	No	

9 Interfaces Between Systems

The interfaces of the transportation systems in Binghamton Regional ITS Architecture are based on ARC-IT and tailored to reflect the plan for the region. Architecture diagrams display the transportation systems in the Binghamton Regional ITS Architecture, and more importantly, how these systems are and will be connected with one another so information can be exchanged and transportation services can be coordinated. Stakeholders may use these diagrams to identify integration opportunities. Each system in the region is represented with two types of diagrams, a context diagram and an interface diagram.

A context diagram shows a particular system and all other systems with which it shares information. Interconnects are represented as single lines and indicate information sharing without specifying the type of information being shared or the direction of the information movement.

Following each interconnect context diagram are a series of interface diagrams showing the information (i.e., information flows) movement between the various systems. Descriptions of the information flows are included at the end of the chapter.

Information about the interfaces of the systems in the region is contained in the RAD-IT database. RAD-IT can be used to create tailored interconnect and information flow diagrams for any system in the database.

Table 6: Interconnects (Information Flows)

Source Element	Flow Name	Destination Element	Flow Status
BCDOPT Automatic Vehicle Location	transit vehicle location data	BCDOPT Transit Management Center	Planned
BCDOPT Automatic Vehicle Location	transit vehicle operator display	BCDOPT Transit Vehicle Operators	Planned
BCDOPT Automatic Vehicle Location	transit vehicle schedule performance	BCDOPT Transit Management Center	Planned
BCDOPT BC Transit Electronic Fareboxes	demand response passenger and use data	BCDOPT Transit Management Center	Planned
BCDOPT BC Transit Electronic Fareboxes	fare collection data	BCDOPT Transit Management Center	Existing
BCDOPT BC Transit Electronic Fareboxes	payment device update	BCDOPT Payment Device	Existing
BCDOPT BC Transit Electronic Fareboxes	request for payment	BCDOPT Payment Device	Existing
BCDOPT BC Transit Electronic Fareboxes	transit vehicle loading data	BCDOPT Transit Management Center	Existing
BCDOPT BC Transit Electronic Fareboxes	transit vehicle operator display	BCDOPT Transit Vehicle Operators	Existing
BCDOPT Payment Device	payment	BCDOPT BC Transit Electronic Fareboxes	Existing
BCDOPT Payment Device	payment	BCDOPT Traveler Support Equipment	Existing
BCDOPT Payment Device	payment device information	BCDOPT BC Transit Electronic Fareboxes	Existing
BCDOPT Payment Device	payment device information	BCDOPT Traveler Support Equipment	Existing
BCDOPT Transit Information Center	demand responsive transit request	BCDOPT Transit Management Center	Planned
BCDOPT Transit Information Center	interactive traveler information	Traveler Personal Information Device	Planned

Source Element	Flow Name	Destination Element	Flow Status
BCDOPT Transit Information Center	transit service information	NYSDOT Main Office	Planned
BCDOPT Transit Information Center	traveler alerts	Traveler Personal Information Device	Planned
BCDOPT Transit Information Center	trip confirmation	BCDOPT Transit Management Center	Planned
BCDOPT Transit Information Center	trip plan	Traveler Personal Information Device	Planned
BCDOPT Transit Information Center Personnel	TIC operator input	BCDOPT Transit Information Center	Planned
BCDOPT Transit Management Center	alarm acknowledge	BCDOPT Transit Vehicle Security Equipment	Planned
BCDOPT Transit Management Center	alert status	Broome County Emergency Management Center	Existing
BCDOPT Transit Management Center	demand responsive transit plan	BCDOPT Transit Information Center	Planned
BCDOPT Transit Management Center	fare management information	BCDOPT BC Transit Electronic Fareboxes	Existing
BCDOPT Transit Management Center	personal transit information	Traveler Personal Information Device	Planned
BCDOPT Transit Management Center	route assignment	BCDOPT Transit Vehicle Operators	Planned
BCDOPT Transit Management Center	transit and fare schedules	BCDOPT Transit Information Center	Planned
BCDOPT Transit Management Center	transit and fare schedules	NYSDOT Region 9 Transportation Information Center	Planned
BCDOPT Transit Management Center	transit emergency data	Broome County Emergency Management Center	Existing
BCDOPT Transit Management Center	transit fare information	BCDOPT Transit Information Center	Planned
BCDOPT Transit Management Center	transit fare information	NYSDOT Region 9 Transportation Information Center	Planned

Source Element	Flow Name	Destination Element	Flow Status
BCDOPT Transit Management Center	transit incident information	BCDOPT Transit Information Center	Planned
BCDOPT Transit Management Center	transit incidents for media	Local Media Outlets	Planned
BCDOPT Transit Management Center	transit information for media	Local Media Outlets	Planned
BCDOPT Transit Management Center	transit operations status	BCDOPT Transit Management Center Personnel	Existing
BCDOPT Transit Management Center	transit probe data	BCDOPT Transit Information Center	Planned
BCDOPT Transit Management Center	transit schedule adherence information	BCDOPT Transit Information Center	Planned
BCDOPT Transit Management Center	transit schedule information	BCDOPT Automatic Vehicle Location	Planned
BCDOPT Transit Management Center	transit schedule information	BCDOPT Transit Vehicle OBE	Planned
BCDOPT Transit Management Center	transit traveler information	BCDOPT Transit Vehicle OBE	Planned
BCDOPT Transit Management Center	transit traveler information	BCDOPT Traveler Support Equipment	Existing
BCDOPT Transit Management Center	transit vehicle operator information	BCDOPT Transit Vehicle OBE	Planned
BCDOPT Transit Management Center	trip plan	Traveler Personal Information Device	Planned
BCDOPT Transit Management Center	work plan feedback	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
BCDOPT Transit Management Center Personnel	transit operations personnel input	BCDOPT Transit Management Center	Existing
BCDOPT Transit Vehicle OBE	transit vehicle operator display	BCDOPT Transit Vehicle Operators	Existing

Source Element	Flow Name	Destination Element	Flow Status
BCDOPT Transit Vehicle OBE	traveler interface updates	Traveler	Existing
BCDOPT Transit Vehicle Operators	transit vehicle operator availability	BCDOPT Transit Management Center	Planned
BCDOPT Transit Vehicle Operators	transit vehicle operator input	BCDOPT Automatic Vehicle Location	Planned
BCDOPT Transit Vehicle Operators	transit vehicle operator input	BCDOPT BC Transit Electronic Fareboxes	Existing
BCDOPT Transit Vehicle Operators	transit vehicle operator input	BCDOPT Transit Vehicle OBE	Planned
BCDOPT Transit Vehicle Operators	transit vehicle operator input	BCDOPT Transit Vehicle Security Equipment	Planned
BCDOPT Transit Vehicle Security Equipment	alarm notification	BCDOPT Transit Management Center	Planned
BCDOPT Transit Vehicle Security Equipment	alarm notification	Broome County Emergency Management Center	Planned
BCDOPT Transit Vehicle Security Equipment	transit vehicle conditions	BCDOPT Transit Management Center	Planned
BCDOPT Transit Vehicle Security Equipment	transit vehicle operator display	BCDOPT Transit Vehicle Operators	Planned
BCDOPT Transit Vehicles	host transit vehicle status	BCDOPT Automatic Vehicle Location	Planned
BCDOPT Transit Vehicles	host transit vehicle status	BCDOPT Transit Vehicle OBE	Planned
BCDOPT Transit Vehicles	host transit vehicle status	BCDOPT Transit Vehicle Security Equipment	Planned
BCDOPT Traveler Support Equipment	payment device update	BCDOPT Payment Device	Existing
BCDOPT Traveler Support Equipment	request for payment	BCDOPT Payment Device	Existing
BCDOPT Traveler Support Equipment	traveler interface updates	Traveler	Existing

Source Element	Flow Name	Destination Element	Flow Status
Broome County 911 System	incident notification	Broome County Emergency Management Center	Existing
Broome County Emergency Management Center	alarm acknowledge	BCDOPT Transit Vehicle Security Equipment	Planned
Broome County Emergency Management Center	alert notification	BCDOPT Transit Management Center	Existing
Broome County Emergency Management Center	alert notification	NYSDOT Region 9 Maintenance and Construction Management Center	Existing
Broome County Emergency Management Center	alert notification	NYSDOT Region 9 Traffic Management Center (TOC)	Existing
Broome County Emergency Management Center	alert notification	Social Media	Existing
Broome County Emergency Management Center	alert notification coordination	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
Broome County Emergency Management Center	decision support information	Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Planned
Broome County Emergency Management Center	decision support information	New York State Police Vehicle OBE (Broome County)	Planned
Broome County Emergency Management Center	emergency acknowledge	Traveler Personal Information Device	Planned
Broome County Emergency Management Center	emergency acknowledge	Vehicle OBE	Planned
Broome County Emergency Management Center	emergency data request	Vehicle OBE	Planned
Broome County Emergency Management Center	emergency dispatch requests	Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Existing
Broome County Emergency Management Center	emergency dispatch requests	New York State Police Vehicle OBE (Broome County)	Existing
Broome County Emergency Management Center	emergency operations status	Broome County Emergency Management Center Personnel	Existing

Source Element	Flow Name	Destination Element	Flow Status
Broome County Emergency Management Center	emergency route request	NYSDOT Region 9 Traffic Management Center (TOC)	Existing
Broome County Emergency Management Center	event confirmation	Event Promoter System	Planned
Broome County Emergency Management Center	incident command information coordination	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
Broome County Emergency Management Center	incident command information presentation	Local Police/Sheriff/Fire/EMS Personnel (Broome County)	Planned
Broome County Emergency Management Center	incident command information presentation	New York State Police Personnel (Broome County)	Planned
Broome County Emergency Management Center	incident information	BCDOPT Transit Management Center	Existing
Broome County Emergency Management Center	incident information	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
Broome County Emergency Management Center	incident information	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Broome County Emergency Management Center	incident information for media	Local Media Outlets	Planned
Broome County Emergency Management Center	incident information for public	NYAlerts System	Existing
Broome County Emergency Management Center	incident notification response	Broome County 911 System	Existing
Broome County Emergency Management Center	incident report	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
Broome County Emergency Management Center	incident response coordination	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
Broome County Emergency Management Center	incident response status	BCDOPT Transit Management Center	Existing

Source Element	Flow Name	Destination Element	Flow Status
Broome County Emergency Management Center	incident response status	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
Broome County Emergency Management Center	incident response status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Broome County Emergency Management Center	incident response status	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
Broome County Emergency Management Center	maint and constr resource request	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
Broome County Emergency Management Center	remote surveillance control	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Broome County Emergency Management Center	resource deployment status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Broome County Emergency Management Center	resource request	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Broome County Emergency Management Center	road weather advisories for emergency response	Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Planned
Broome County Emergency Management Center	road weather advisories for emergency response	New York State Police Vehicle OBE (Broome County)	Planned
Broome County Emergency Management Center	suggested route	Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Planned
Broome County Emergency Management Center	suggested route	New York State Police Vehicle OBE (Broome County)	Planned
Broome County Emergency Management Center	threat information	BCDOPT Transit Management Center	Planned
Broome County Emergency Management Center	threat information coordination	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned

Source Element	Flow Name	Destination Element	Flow Status
Broome County Emergency Management Center	work plan feedback	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
Broome County Emergency Management Center Personnel	emergency operations input	Broome County Emergency Management Center	Existing
CLARUS	environmental conditions data status	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
CLARUS	environmental conditions data status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
CLARUS	qualified environmental conditions data	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
CLARUS	qualified environmental conditions data	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
CLARUS	transportation weather information	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
CLARUS	transportation weather information	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
County and Municipal Highway Departments	maint and constr resource coordination	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
County and Municipal Highway Departments	roadway maintenance status	NYSDOT Region 9 Maintenance and Construction Management Center	Existing
County and Municipal Highway Departments	work plan coordination	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
County and Municipal Highway Departments	work zone information	NYSDOT Region 9 Maintenance and Construction Management Center	Existing

Source Element	Flow Name	Destination Element	Flow Status
Driver	driver input	Vehicle OBE	Existing
Driver	request for service	Vehicle OBE	Planned
Event Promoter System	event information	NYSDOT Region 9 Transportation Information Center	Planned
Event Promoter System	event plans	Broome County Emergency Management Center	Planned
Event Promoter System	event plans	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Event Promoter System	event plans	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
Local Media Outlets	external reports	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	emergency dispatch response	Broome County Emergency Management Center	Existing
Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	emergency vehicle tracking data	Broome County Emergency Management Center	Planned
Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	incident status	Broome County Emergency Management Center	Planned
Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	local signal preemption request	Municipal Emergency Vehicle Traffic Signal Preemption Equipment	Existing
Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	local signal preemption request	NYSDOT Region 9 Emergency Vehicle Traffic Signal Preemption Equipment	Existing
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	emergency dispatch response	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	emergency personnel information presentation	Local Police/Sheriff/Fire/EMS Personnel (Tioga County)	Existing

Source Element	Flow Name	Destination Element	Flow Status
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	emergency vehicle tracking data	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	incident status	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
Local Police/Sheriff/Fire/EMS Personnel (Broome County)	emergency personnel input	Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Existing
Local Police/Sheriff/Fire/EMS Personnel (Broome County)	incident command inputs	Broome County Emergency Management Center	Planned
Local Police/Sheriff/Fire/EMS Personnel (Broome County)	incident command inputs	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
Local Police/Sheriff/Fire/EMS Personnel (Tioga County)	emergency personnel input	Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Existing
Municipal Emergency Vehicle Traffic Signal Preemption Equipment	driver information	Local Police/Sheriff/Fire/EMS Personnel (Broome County)	Existing
Municipal Emergency Vehicle Traffic Signal Preemption Equipment	driver information	New York State Police Personnel (Broome County)	Existing
National Oceanic and Atmospheric Administration National Weather Service	environmental conditions data status	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
National Oceanic and Atmospheric Administration National Weather Service	environmental conditions data status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
National Oceanic and Atmospheric Administration National Weather Service	environmental sensors control	NYSDOT Region 9 Road Weather Information Stations	Planned
National Oceanic and Atmospheric Administration National Weather Service	qualified environmental conditions data	NYSDOT Region 9 Maintenance and Construction Management Center	Planned

Source Element	Flow Name	Destination Element	Flow Status
National Oceanic and Atmospheric Administration National Weather Service	qualified environmental conditions data	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
National Oceanic and Atmospheric Administration National Weather Service	qualified environmental conditions data	NYSDOT Region 9 Transportation Information Center	Planned
National Oceanic and Atmospheric Administration National Weather Service	weather information	Broome County Emergency Management Center	Existing
National Oceanic and Atmospheric Administration National Weather Service	weather information	NYSDOT Region 9 Maintenance and Construction Management Center	Existing
National Oceanic and Atmospheric Administration National Weather Service	weather information	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
National Oceanic and Atmospheric Administration National Weather Service	weather information	NYSDOT Region 9 Transportation Information Center	Planned
National Oceanic and Atmospheric Administration National Weather Service	weather information	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
New York State Police Personnel (Broome County)	emergency personnel input	New York State Police Vehicle OBE (Broome County)	Existing
New York State Police Personnel (Broome County)	incident command inputs	Broome County Emergency Management Center	Planned
New York State Police Personnel (Tioga County)	emergency personnel input	New York State Police Vehicle OBE (Tioga County)	Existing
New York State Police Vehicle OBE (Broome County)	emergency dispatch response	Broome County Emergency Management Center	Existing
New York State Police Vehicle OBE (Broome County)	emergency personnel information presentation	New York State Police Personnel (Broome County)	Existing

Source Element	Flow Name	Destination Element	Flow Status
New York State Police Vehicle OBE (Broome County)	emergency vehicle tracking data	Broome County Emergency Management Center	Planned
New York State Police Vehicle OBE (Broome County)	incident status	Broome County Emergency Management Center	Planned
New York State Police Vehicle OBE (Broome County)	local signal preemption request	Municipal Emergency Vehicle Traffic Signal Preemption Equipment	Existing
New York State Police Vehicle OBE (Broome County)	local signal preemption request	NYSDOT Region 9 Emergency Vehicle Traffic Signal Preemption Equipment	Existing
New York State Police Vehicle OBE (Tioga County)	emergency dispatch response	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
New York State Police Vehicle OBE (Tioga County)	emergency personnel information presentation	New York State Police Personnel (Tioga County)	Existing
New York State Police Vehicle OBE (Tioga County)	emergency vehicle tracking data	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
New York State Police Vehicle OBE (Tioga County)	incident status	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
NYSDOT Main Office	alternate mode information	BCDOPT Transit Information Center	Planned
NYSDOT Main Office	emergency traveler information	BCDOPT Transit Information Center	Planned
NYSDOT Main Office	emergency traveler information	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Main Office	incident information	BCDOPT Transit Information Center	Planned
NYSDOT Main Office	incident information	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Main Office	road network conditions	BCDOPT Transit Information Center	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Main Office	road network conditions	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Emergency Vehicle Traffic Signal Preemption Equipment	driver information	Local Police/Sheriff/Fire/EMS Personnel (Broome County)	Existing
NYSDOT Region 9 Emergency Vehicle Traffic Signal Preemption Equipment	driver information	New York State Police Personnel (Broome County)	Existing
NYSDOT Region 9 Highway Advisory Radio	broadcast advisories	Vehicle	Planned
NYSDOT Region 9 Highway Advisory Radio	driver information	Driver	Existing
NYSDOT Region 9 Highway Surveillance Cameras	roadway information system status	NYSDOT Region 9 Maintenance and Construction Management Center	Existing
NYSDOT Region 9 Highway Surveillance Cameras	roadway information system status	NYSDOT Region 9 Traffic Management Center (TOC)	Existing
NYSDOT Region 9 Highway Surveillance Cameras	traffic images	NYSDOT Region 9 Traffic Management Center (TOC)	Existing
NYSDOT Region 9 ITS Roadway Equipment	environmental sensor data	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 ITS Roadway Equipment	environmental sensor data	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 ITS Roadway Equipment	roadway equipment coordination	NYSDOT Region 9 Roadway Automated Treatment	Planned
NYSDOT Region 9 ITS Roadway Equipment	roadway equipment coordination	NYSDOT Region 9 Roadway Passive Monitoring	Planned
NYSDOT Region 9 ITS Roadway Equipment	roadway equipment coordination	NYSDOT Region 9 Roadway Signal Control	Planned
NYSDOT Region 9 ITS Roadway Equipment	roadway equipment coordination	NYSDOT Region 9 Variable Message Signs	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 ITS Roadway Equipment	roadway information system status	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 ITS Roadway Equipment	roadway information system status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 ITS Roadway Equipment	speed monitoring information	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 ITS Roadway Equipment	speed monitoring information	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 ITS Roadway Equipment	traffic flow	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Maintenance and Construction Administrative Systems	maint and constr administrative information	NYSDOT Region 9 Maintenance and Construction Management Center	Existing
NYSDOT Region 9 Maintenance and Construction Field Personnel	driver environmental input	NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Planned
NYSDOT Region 9 Maintenance and Construction Field Personnel	maint and constr field personnel input	NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	alert status	Broome County Emergency Management Center	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	alert status	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	current infrastructure restrictions	BCDOPT Transit Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	current infrastructure restrictions	Broome County Emergency Management Center	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Maintenance and Construction Management Center	current infrastructure restrictions	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	current infrastructure restrictions	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	current infrastructure restrictions	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	environmental conditions data	CLARUS	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	environmental conditions data	National Oceanic and Atmospheric Administration National Weather Service	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	environmental conditions data	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	environmental sensors control	NYSDOT Region 9 ITS Roadway Equipment	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	environmental sensors control	NYSDOT Region 9 Maintenance and Construction Vehicle	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	environmental sensors control	NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	environmental sensors control	NYSDOT Region 9 Road Weather Information Stations	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	equipment maintenance status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Maintenance and Construction Management Center	incident information	Broome County Emergency Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	incident information	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	incident information	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr administrative request	NYSDOT Region 9 Maintenance and Construction Administrative Systems	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr dispatch information	NYSDOT Region 9 Maintenance and Construction Vehicle	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr dispatch information	NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr operations information presentation	NYSDOT Region 9 Maintenance and Construction Management Center Personnel	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr resource coordination	County and Municipal Highway Departments	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr resource response	Broome County Emergency Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr resource response	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr resource response	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr vehicle system control	NYSDOT Region 9 Maintenance and Construction Vehicle	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr vehicle system control	NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr work performance	NYSDOT Region 9 Maintenance and Construction Administrative Systems	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr work plans	BCDOPT Transit Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr work plans	Broome County Emergency Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr work plans	Local Media Outlets	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr work plans	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr work plans	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	maint and constr work plans	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	road data	CLARUS	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	road weather information	BCDOPT Transit Management Center	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Maintenance and Construction Management Center	road weather information	Broome County Emergency Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	road weather information	CLARUS	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	road weather information	County and Municipal Highway Departments	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	road weather information	Local Media Outlets	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	road weather information	National Oceanic and Atmospheric Administration National Weather Service	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	road weather information	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	road weather information	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	road weather information	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	roadway information system data	NYSDOT Region 9 Highway Surveillance Cameras	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	roadway information system data	NYSDOT Region 9 ITS Roadway Equipment	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	roadway information system data	NYSDOT Region 9 Road Weather Information Stations	Existing

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Maintenance and Construction Management Center	roadway information system data	NYSDOT Region 9 Roadway Automated Treatment	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	roadway information system data	NYSDOT Region 9 Variable Message Signs	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	roadway maintenance status	BCDOPT Transit Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	roadway maintenance status	Broome County Emergency Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	roadway maintenance status	County and Municipal Highway Departments	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	roadway maintenance status	Local Media Outlets	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	roadway maintenance status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	roadway maintenance status	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	roadway maintenance status	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	roadway treatment system control	NYSDOT Region 9 Roadway Automated Treatment	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	speed monitoring control	NYSDOT Region 9 ITS Roadway Equipment	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Maintenance and Construction Management Center	video surveillance control	NYSDOT Region 9 Highway Surveillance Cameras	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	work plan coordination	County and Municipal Highway Departments	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	work zone information	BCDOPT Transit Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	work zone information	Broome County Emergency Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	work zone information	County and Municipal Highway Departments	Existing
NYSDOT Region 9 Maintenance and Construction Management Center	work zone information	Local Media Outlets	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	work zone information	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	work zone information	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Maintenance and Construction Management Center	work zone information	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
NYSDOT Region 9 Maintenance and Construction Management Center Personnel	maint and constr center personnel input	NYSDOT Region 9 Maintenance and Construction Management Center	Existing
NYSDOT Region 9 Maintenance and Construction Vehicle	maint and constr material information	NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	environmental sensor data	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	maint and constr dispatch status	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	maint and constr field personnel information presentation	NYSDOT Region 9 Maintenance and Construction Field Personnel	Planned
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	maint and constr vehicle condition presentation	NYSDOT Region 9 Maintenance and Construction Field Personnel	Planned
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	maint and constr vehicle control	NYSDOT Region 9 Maintenance and Construction Vehicle	Planned
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	maint and constr vehicle location data	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	maint and constr vehicle operational data	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	work zone status	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Permanent Continuous Traffic Count Stations	roadway equipment coordination	NYSDOT Region 9 ITS Roadway Equipment	Planned
NYSDOT Region 9 Permanent Continuous Traffic Count Stations	roadway information system status	NYSDOT Region 9 Traffic Management Center (TOC)	Existing
NYSDOT Region 9 Permanent Continuous Traffic Count Stations	traffic flow	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Road Weather Information Stations	environmental sensor data	CLARUS	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Road Weather Information Stations	environmental sensor data	National Oceanic and Atmospheric Administration National Weather Service	Planned
NYSDOT Region 9 Road Weather Information Stations	environmental sensor data	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Road Weather Information Stations	environmental sensor data	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Road Weather Information Stations	roadway equipment coordination	NYSDOT Region 9 Roadway Automated Treatment	Planned
NYSDOT Region 9 Road Weather Information Stations	roadway equipment coordination	NYSDOT Region 9 Variable Message Signs	Planned
NYSDOT Region 9 Roadway Automated Treatment	roadway equipment coordination	NYSDOT Region 9 ITS Roadway Equipment	Planned
NYSDOT Region 9 Roadway Automated Treatment	roadway equipment coordination	NYSDOT Region 9 Road Weather Information Stations	Planned
NYSDOT Region 9 Roadway Automated Treatment	roadway equipment coordination	NYSDOT Region 9 Variable Message Signs	Planned
NYSDOT Region 9 Roadway Automated Treatment	roadway treatment system status	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Roadway Passive Monitoring	passive vehicle monitoring data	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Roadway Passive Monitoring	roadway equipment coordination	NYSDOT Region 9 Highway Surveillance Cameras	Planned
NYSDOT Region 9 Roadway Passive Monitoring	roadway equipment coordination	NYSDOT Region 9 ITS Roadway Equipment	Planned
NYSDOT Region 9 Roadway Passive Monitoring	roadway information system status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Roadway Passive Monitoring	traffic flow	NYSDOT Region 9 Traffic Management Center (TOC)	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Roadway Signal Control	roadway equipment coordination	NYSDOT Region 9 ITS Roadway Equipment	Planned
NYSDOT Region 9 Roadway Signal Control	signal control status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Roadway Signal Control	signal fault data	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	alert status	Broome County Emergency Management Center	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	alert status	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	emergency routes	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	environmental conditions data	CLARUS	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	environmental conditions data	National Oceanic and Atmospheric Administration National Weather Service	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	environmental conditions data	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	environmental sensors control	NYSDOT Region 9 ITS Roadway Equipment	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	environmental sensors control	NYSDOT Region 9 Road Weather Information Stations	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	equipment maintenance request	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	event confirmation	Event Promoter System	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	incident information	Broome County Emergency Management Center	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Traffic Management Center (TOC)	incident information	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	incident information	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	incident information	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	incident response status	Broome County Emergency Management Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	incident response status	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	interactive traveler information	Traveler Personal Information Device	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	maint and constr resource request	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	passive vehicle monitoring control	NYSDOT Region 9 Roadway Passive Monitoring	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	resource deployment status	Broome County Emergency Management Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	resource deployment status	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	resource request	Broome County Emergency Management Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	resource request	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	road network conditions	Broome County Emergency Management Center	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Traffic Management Center (TOC)	road network conditions	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	road network conditions	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	road network conditions	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	road network environmental situation data	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	roadway information system data	NYSDOT Region 9 Highway Advisory Radio	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	roadway information system data	NYSDOT Region 9 Highway Surveillance Cameras	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	roadway information system data	NYSDOT Region 9 Permanent Continuous Traffic Count Stations	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	roadway information system data	NYSDOT Region 9 Road Weather Information Stations	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	roadway information system data	NYSDOT Region 9 Roadway Passive Monitoring	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	roadway information system data	NYSDOT Region 9 Roadway Signal Control	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	roadway information system data	NYSDOT Region 9 Variable Message Signs	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	signal control commands	NYSDOT Region 9 Roadway Signal Control	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	signal control device configuration	NYSDOT Region 9 Roadway Signal Control	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	signal control plans	NYSDOT Region 9 Roadway Signal Control	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Traffic Management Center (TOC)	signal system configuration	NYSDOT Region 9 Roadway Signal Control	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	speed monitoring control	NYSDOT Region 9 ITS Roadway Equipment	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	traffic control information	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	traffic images	Broome County Emergency Management Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	traffic images	Local Media Outlets	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	traffic images	NYSDOT Region 9 Maintenance and Construction Management Center	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	traffic images	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	traffic information for media	Local Media Outlets	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	traffic operator data	NYSDOT Region 9 Traffic Management Center (TOC) Personnel	Existing
NYSDOT Region 9 Traffic Management Center (TOC)	traffic sensor control	NYSDOT Region 9 ITS Roadway Equipment	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	traffic sensor control	NYSDOT Region 9 Permanent Continuous Traffic Count Stations	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	traffic sensor control	NYSDOT Region 9 Roadway Passive Monitoring	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	traffic sensor control	NYSDOT Region 9 Roadway Signal Control	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	video surveillance control	NYSDOT Region 9 Highway Surveillance Cameras	Planned
NYSDOT Region 9 Traffic Management Center (TOC)	work plan feedback	NYSDOT Region 9 Maintenance and Construction Management Center	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Traffic Management Center (TOC) Personnel	traffic operator input	NYSDOT Region 9 Traffic Management Center (TOC)	Existing
NYSDOT Region 9 Transportation Information Center	broadcast traveler information	Vehicle OBE	Planned
NYSDOT Region 9 Transportation Information Center	emergency traveler information	BCDOPT Traveler Support Equipment	Planned
NYSDOT Region 9 Transportation Information Center	emergency traveler information	NYSDOT Main Office	Planned
NYSDOT Region 9 Transportation Information Center	emergency traveler information	Traveler Personal Information Device	Planned
NYSDOT Region 9 Transportation Information Center	emergency traveler information	Vehicle OBE	Planned
NYSDOT Region 9 Transportation Information Center	incident information	NYSDOT Main Office	Planned
NYSDOT Region 9 Transportation Information Center	interactive traveler information	BCDOPT Traveler Support Equipment	Planned
NYSDOT Region 9 Transportation Information Center	interactive traveler information	Traveler Personal Information Device	Planned
NYSDOT Region 9 Transportation Information Center	interactive traveler information	Vehicle OBE	Planned
NYSDOT Region 9 Transportation Information Center	road network conditions	NYSDOT Main Office	Planned
NYSDOT Region 9 Transportation Information Center	road network environmental situation data	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
NYSDOT Region 9 Transportation Information Center	social media presence	Social Media	Planned
NYSDOT Region 9 Transportation Information Center	TIC operations information presentation	NYSDOT Region 9 Transportation Information Center Personnel	Planned
NYSDOT Region 9 Transportation Information Center	traffic images	NYSDOT Main Office	Planned

Source Element	Flow Name	Destination Element	Flow Status
NYSDOT Region 9 Transportation Information Center	transit fare request	BCDOPT Transit Management Center	Planned
NYSDOT Region 9 Transportation Information Center	traveler alerts	Traveler Personal Information Device	Planned
NYSDOT Region 9 Transportation Information Center	traveler alerts	Vehicle OBE	Planned
NYSDOT Region 9 Transportation Information Center	traveler information for media	Local Media Outlets	Planned
NYSDOT Region 9 Transportation Information Center Personnel	TIC operator input	NYSDOT Region 9 Transportation Information Center	Planned
NYSDOT Region 9 Variable Message Signs	driver information	Driver	Existing
NYSDOT Region 9 Variable Message Signs	roadway equipment coordination	NYSDOT Region 9 ITS Roadway Equipment	Planned
NYSDOT Region 9 Variable Message Signs	roadway equipment coordination	NYSDOT Region 9 Road Weather Information Stations	Planned
NYSDOT Region 9 Variable Message Signs	roadway equipment coordination	NYSDOT Region 9 Roadway Automated Treatment	Planned
NYSDOT Region 9 Variable Message Signs	roadway information system status	NYSDOT Region 9 Maintenance and Construction Management Center	Existing
NYSDOT Region 9 Variable Message Signs	roadway information system status	NYSDOT Region 9 Traffic Management Center (TOC)	Existing
Other Vehicle OBEs	emergency acknowledge	Vehicle OBE	Planned
Other Vehicle OBEs	emergency notification	Vehicle OBE	Planned
Other Vehicle OBEs	emergency notification relay	Vehicle OBE	Planned
Social Media	interactive traveler information	Traveler Personal Information Device	Planned

Source Element	Flow Name	Destination Element	Flow Status
Social Media	traveler sourced updates	NYSDOT Region 9 Transportation Information Center	Planned
Tioga County 911 System	incident notification	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	alert notification	NYSDOT Region 9 Maintenance and Construction Management Center	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	alert notification	NYSDOT Region 9 Traffic Management Center (TOC)	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	alert notification	Social Media	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	alert notification coordination	Broome County Emergency Management Center	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	decision support information	Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	decision support information	New York State Police Vehicle OBE (Tioga County)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	emergency acknowledge	Traveler Personal Information Device	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	emergency acknowledge	Vehicle OBE	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	emergency data request	Vehicle OBE	Planned

Source Element	Flow Name	Destination Element	Flow Status
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	emergency dispatch requests	Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	emergency dispatch requests	New York State Police Vehicle OBE (Tioga County)	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	emergency operations status	Tioga County Emergency Management Center (Sheriff Emergency Dispatch) Personnel	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	emergency route request	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	event confirmation	Event Promoter System	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident command information coordination	Broome County Emergency Management Center	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident command information presentation	Local Police/Sheriff/Fire/EMS Personnel (Broome County)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident command information presentation	New York State Police Personnel (Broome County)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident information	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident information	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident information for media	Local Media Outlets	Planned

Source Element	Flow Name	Destination Element	Flow Status
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident information for public	Hyper-Reach Emergency Alert System	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident information for public	NYAlerts System	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident notification response	Tioga County 911 System	Existing
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident report	Broome County Emergency Management Center	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident response coordination	Broome County Emergency Management Center	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident response status	Broome County Emergency Management Center	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident response status	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	incident response status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	maint and constr resource request	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	remote surveillance control	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	resource deployment status	NYSDOT Region 9 Traffic Management Center (TOC)	Planned

Source Element	Flow Name	Destination Element	Flow Status
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	resource request	NYSDOT Region 9 Traffic Management Center (TOC)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	road weather advisories for emergency response	Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	road weather advisories for emergency response	Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	road weather advisories for emergency response	New York State Police Vehicle OBE (Tioga County)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	suggested route	Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	suggested route	New York State Police Vehicle OBE (Tioga County)	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	threat information coordination	Broome County Emergency Management Center	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	work plan feedback	NYSDOT Region 9 Maintenance and Construction Management Center	Planned
Tioga County Emergency Management Center (Sheriff Emergency Dispatch) Personnel	emergency operations input	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
Traveler	traveler input	BCDOPT BC Transit Electronic Fareboxes	Existing
Traveler	traveler input	BCDOPT Transit Vehicle OBE	Planned
Traveler	traveler input	Traveler Personal Information Device	Existing

Source Element	Flow Name	Destination Element	Flow Status
Traveler Personal Information Device	emergency notification	Broome County Emergency Management Center	Existing
Traveler Personal Information Device	emergency notification	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
Traveler Personal Information Device	emergency notification relay	Broome County Emergency Management Center	Planned
Traveler Personal Information Device	emergency notification relay	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned
Traveler Personal Information Device	transit information user request	BCDOPT Transit Management Center	Planned
Traveler Personal Information Device	traveler interface updates	Traveler	Existing
Traveler Personal Information Device	traveler request	BCDOPT Transit Information Center	Planned
Traveler Personal Information Device	traveler request	NYSDOT Region 9 Transportation Information Center	Planned
Traveler Personal Information Device	traveler request	Social Media	Planned
Traveler Personal Information Device	traveler sourced updates	Social Media	Planned
Traveler Personal Information Device	trip confirmation	BCDOPT Transit Information Center	Planned
Traveler Personal Information Device	trip feedback	BCDOPT Transit Information Center	Planned
Traveler Personal Information Device	trip request	BCDOPT Transit Information Center	Planned
Traveler Personal Information Device	user profile	BCDOPT Transit Information Center	Planned
Vehicle	communications signature	NYSDOT Region 9 Roadway Passive Monitoring	Planned

Source Element	Flow Name	Destination Element	Flow Status
Vehicle	driver input information	Vehicle OBE	Planned
Vehicle	host vehicle status	Vehicle OBE	Planned
Vehicle OBE	driver update information	Vehicle	Planned
Vehicle OBE	driver updates	Driver	Existing
Vehicle OBE	emergency acknowledge	Other Vehicle OBEs	Planned
Vehicle OBE	emergency notification	Broome County Emergency Management Center	Existing
Vehicle OBE	emergency notification	Other Vehicle OBEs	Planned
Vehicle OBE	emergency notification	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Existing
Vehicle OBE	emergency notification relay	Broome County Emergency Management Center	Planned
Vehicle OBE	emergency notification relay	Other Vehicle OBEs	Planned
Vehicle OBE	emergency notification relay	Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Planned

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Appendix A. Functional Requirements Details

Each ITS system operated by the stakeholders must perform certain functions to effectively deliver the ITS services for the region. The primary functions that each system needs to perform are broadly defined in the Binghamton Regional ITS Architecture. The high-level requirements are grouped into functional areas that identify requirements associated with each selected ITS service.

Table 7 – Functional Requirements Details
Requirements

Element Name	Physical Object Name	Functional Object	Functional Object Description
BCDOPT Automatic Vehicle Location	Transit Vehicle OBE	Transit Vehicle On-Board Information Services	'Transit Vehicle On-board Information Services' furnishes en-route transit users with real-time travel-related information on-board a transit vehicle. Current information that can be provided to transit users includes transit routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, non-motorized transportation services, and special events are provided. In addition to tailored information for individual transit users, it also supports general annunciation and/or display of general schedule information, imminent arrival information, and other information of general interest to transit users.
BCDOPT Automatic Vehicle Location	Transit Vehicle OBE	Transit Vehicle On-Board Trip Monitoring	'Transit Vehicle On-Board Trip Monitoring' tracks vehicle location, monitors fuel usage, collects operational status (doors opened/closed, running times, etc.) and sends the collected, time stamped data to the Transit Management Center.
BCDOPT Automatic Vehicle Location	Transit Vehicle OBE	Transit Vehicle Schedule Management	'Transit Vehicle Schedule Management' monitors schedule performance and identifies corrective actions when a deviation is detected. It provides two-way communication between the transit vehicle and center, enabling the center to communicate with the vehicle operator and monitor on-board systems.
BCDOPT BC Transit Electronic Fareboxes	Transit Vehicle OBE	Transit Vehicle On-Board Fare Management	'Transit Vehicle On-board Fare Management' supports fare collection using a standard fare card or other non-monetary fare medium and detects payment violations. Collected fare data are made available to the center.
BCDOPT BC Transit Electronic Fareboxes	Transit Vehicle OBE	Transit Vehicle Passenger Counting	'Transit Vehicle Passenger Counting' collects transit vehicle loading data and makes it available to the center.
BCDOPT Payment Device	Payment Device		
BCDOPT Transit Information Center	Transportation Information Center		
BCDOPT Transit Information Center Personnel	TIC Operator		

Element Name	Physical Object Name	Functional Object	Functional Object Description
BCDOPT Transit Management Center	Transit Management Center	Transit Center Environmental Monitoring	'Transit Center Environmental Monitoring' assimilates current and forecast road conditions and surface weather information from a variety of sources, including both weather service providers and vehicle probes. The collected environmental information is monitored and used to support transit operations.
BCDOPT Transit Management Center	Transit Management Center	Transit Center Fare Management	'Transit Center Fare Management' manages fare collection and passenger load management at the transit center. It provides the back office functions that support transit fare collection, supporting payment reconciliation with links to financial institutions and enforcement agencies for fare violations. It collects data required to determine accurate ridership levels, establish fares, and distribute fare information. It loads fare data into the vehicle prior to the beginning of normal operations and unloads fare collection data from the vehicle at the close out of normal operations.
BCDOPT Transit Management Center	Transit Management Center	Transit Center Fixed-Route Operations	'Transit Center Fixed-Route Operations' manages fixed route transit operations. It supports creation of schedules, blocks and runs for fixed and flexible route transit services. It allows fixed-route and flexible-route transit services to disseminate schedules and automatically updates customer service operator systems with the most current schedule information. It also supports automated dispatch of transit vehicles. Current vehicle schedule adherence and optimum scenarios for schedule adjustment are also provided. It also receives and processes transit vehicle loading data.
BCDOPT Transit Management Center	Transit Management Center	Transit Center Information Services	'Transit Center Information Services' collects the latest available information for a transit service and makes it available to transit customers and to Transportation Information Centers for further distribution. Customers are provided information at transit stops and other public transportation areas before they embark and on-board the transit vehicle once they are en route. Information provided can include the latest available information on transit routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, yellow pages, and special events. In addition to general service information, tailored information (e.g., itineraries) are provided to individual transit users.
BCDOPT Transit Management Center	Transit Management Center	Transit Center Multi-Modal Coordination	'Transit Center Multi-Modal Coordination' supports transit service coordination between transit properties and coordinates with other surface and air transportation modes. As part of service coordination, it shares schedule and trip information, as well as transit transfer cluster (a collection of stop points, stations, or terminals where transfers can be made conveniently) and transfer point information between Multimodal Transportation Service Providers, Transit Agencies, and ISPs. An interface to Traffic Management also supports demand management strategies.

Element Name	Physical Object Name	Functional Object	Functional Object Description
BCDOPT Transit Management Center	Transit Management Center	Transit Center Paratransit Operations	'Transit Center Paratransit Operations' manages demand responsive transit services, including paratransit services. It supports planning and scheduling of these services, allowing paratransit and other demand response transit services to plan efficient routes and better estimate arrival times. It also supports automated dispatch of paratransit vehicles and tracks passenger pick-ups and drop-offs. Customer service operator systems are updated with the most current schedule information.
BCDOPT Transit Management Center	Transit Management Center	Transit Center Passenger Counting	'Transit Center Passenger Counting' receives and processes transit vehicle loading data using two-way communications from equipped transit vehicles.
BCDOPT Transit Management Center	Transit Management Center	Transit Center Security	'Transit Center Security' monitors transit vehicle operator or traveler activated alarms received from on-board a transit vehicle. It supports transit vehicle operator authentication and provides the capability to remotely disable a transit vehicle. It also includes the capability to alert operators and police to potential incidents identified by these security features.
BCDOPT Transit Management Center	Transit Management Center	Transit Center Vehicle Assignment	'Transit Center Vehicle Assignment' assigns individual transit vehicles to vehicle blocks and downloads this information to the transit vehicle. It also provides an exception handling process for the vehicle assignment function to generate new, supplemental vehicle assignments when required by changes during the operating day. It provides an inventory management function for the transit facility which stores functional attributes about each of the vehicles owned by the transit operator. These attributes permit the planning and assignment functions to match vehicles with routes based on suitability for the types of service required by the particular routes.
BCDOPT Transit Management Center	Transit Management Center	Transit Center Vehicle Tracking	'Transit Center Vehicle Tracking' monitors transit vehicle location. The location information is collected via a data communication link between the transit vehicles and the transit center. The location information is presented to the transit operator on a digitized map of the transit service area. The location data may be used to determine real time schedule adherence and update the transit system’s schedule in real-time. The real-time schedule information is disseminated to other information providers, which furnish the information to travelers.

Element Name	Physical Object Name	Functional Object	Functional Object Description
BCDOPT Transit Management Center	Transit Management Center	Transit Garage Maintenance	'Transit Garage Maintenance' provides advanced maintenance functions for the transit property. It collects operational and maintenance data from transit vehicles, manages vehicle service histories, and monitors operators and vehicles. It collects vehicle mileage data and uses it to automatically generate preventative maintenance schedules for each vehicle by utilizing vehicle tracking data. In addition, it provides information to service personnel to support maintenance activities and records and verifies that maintenance work was performed.
BCDOPT Transit Management Center Personnel	Transit Operations Personnel		
BCDOPT Transit Vehicle OBE	Transit Vehicle OBE	Transit Vehicle On-Board Information Services	'Transit Vehicle On-board Information Services' furnishes en-route transit users with real-time travel-related information on-board a transit vehicle. Current information that can be provided to transit users includes transit routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, non-motorized transportation services, and special events are provided. In addition to tailored information for individual transit users, it also supports general annunciation and/or display of general schedule information, imminent arrival information, and other information of general interest to transit users.
BCDOPT Transit Vehicle OBE	Transit Vehicle OBE	Transit Vehicle On-Board Maintenance	'Transit Vehicle On-Board Maintenance' collects and processes transit vehicle maintenance data on-board the vehicle, including mileage and vehicle operating conditions. This maintenance information is provided to the management center and used to schedule future vehicle maintenance and repair.
BCDOPT Transit Vehicle OBE	Transit Vehicle OBE	Transit Vehicle On-Board Paratransit Operations	'Transit Vehicle On-board Paratransit Operations' forwards paratransit and flexible-route dispatch requests to the operator and forwards acknowledgements to the center. It coordinates with, and assists the operator in managing multi-stop runs associated with demand responsive transit services including paratransit. It collects transit vehicle passenger data and makes it available to the center.
BCDOPT Transit Vehicle OBE	Transit Vehicle OBE	Transit Vehicle Passenger Counting	'Transit Vehicle Passenger Counting' collects transit vehicle loading data and makes it available to the center.
BCDOPT Transit Vehicle Operators	Transit Vehicle Operator		

Element Name	Physical Object Name	Functional Object	Functional Object Description
BCDOPT Transit Vehicle Security Equipment	Transit Vehicle OBE	Transit Vehicle Security	'Transit Vehicle Security' provides security and safety functions on-board the transit vehicle. It includes surveillance and sensor systems that monitor the on-board environment, silent alarms that can be activated by transit user or vehicle operator, operator authentication, and a remote vehicle disable function. The surveillance equipment includes video (e.g. CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g. chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g. metal detectors).
BCDOPT Transit Vehicles	Transit Vehicle		
BCDOPT Traveler Support Equipment	Traveler Support Equipment		
Broome County 911 System	Emergency Telecommunications System		
Broome County Emergency Management Center	Emergency Management Center	Emergency Call-Taking	'Emergency Call-Taking' supports the emergency call-taker, collecting available information about the caller and the reported emergency, and forwarding this information to other objects that formulate and manage the emergency response. It receives 9-1-1, 7-digit local access, and motorist call-box calls and interfaces to other agencies to assist in the verification and assessment of the emergency and to forward the emergency information to the appropriate response agency.
Broome County Emergency Management Center	Emergency Management Center	Emergency Dispatch	'Emergency Dispatch' tracks the location and status of emergency vehicles and dispatches these vehicles to incidents. Pertinent incident information is gathered from the public and other public safety agencies and relayed to the responding units. Incident status and the status of the responding units is tracked so that additional units can be dispatched and/or unit status can be returned to available when the incident is cleared and closed.
Broome County Emergency Management Center	Emergency Management Center	Emergency Early Warning System	'Emergency Early Warning System' monitors alerting and advisory systems, information collected by ITS surveillance and sensors, and reports from other agencies and uses this information to identify potential, imminent, or in-progress major incidents or disasters. Notification is provided to initiate the emergency response, including public notification using ITS traveler information systems, where appropriate.

Element Name	Physical Object Name	Functional Object	Functional Object Description
Broome County Emergency Management Center	Emergency Management Center	Emergency Environmental Monitoring	'Emergency Environmental Monitoring' collects current and forecast road conditions and surface weather information from a variety of sources. The collected environmental information is monitored and presented to the operator and used to more effectively manage incidents.
Broome County Emergency Management Center	Emergency Management Center	Emergency Incident Command	'Emergency Incident Command' provides tactical decision support, resource coordination, and communications integration for Incident Commands that are established by first responders at or near the incident scene to support local management of an incident. It supports communications with public safety, emergency management, transportation, and other allied response agency centers, tracks and maintains resource information, action plans, and the incident command organization itself. Information is shared with agency centers including resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response. It supports the functions and interfaces commonly supported by a mobile command center.
Broome County Emergency Management Center	Emergency Management Center	Emergency Response Management	'Emergency Response Management' provides the strategic emergency response capabilities and broad inter-agency interfaces that are implemented for extraordinary incidents and disasters that require response from outside the local community. It provides the functional capabilities and interfaces commonly associated with Emergency Operations Centers. It develops and stores emergency response plans and manages overall coordinated response to emergencies. It monitors real-time information on the state of the regional transportation system including current traffic and road conditions, weather conditions, special event and incident information. It tracks the availability of resources and assists in the appropriate allocation of these resources for a particular emergency response. It also provides coordination between multiple allied agencies before and during emergencies to implement emergency response plans and track progress through the incident. It also coordinates with the public through the Emergency Telecommunication Systems (e.g., Reverse 911). It coordinates with public health systems to provide the most appropriate response for emergencies involving biological or other medical hazards.
Broome County Emergency Management Center	Emergency Management Center	Emergency Routing	'Emergency Routing' supports routing of emergency vehicles and enlists support from the Traffic Management Center to facilitate travel along these routes. Routes may be determined based on real-time traffic information and road conditions or routes may be provided by the Traffic Management Center on request. Vehicles are tracked and routes are based on current vehicle location. It may coordinate with the Traffic Management Center to provide preemption or otherwise adapt the traffic control strategy along the selected route.

Element Name	Physical Object Name	Functional Object	Functional Object Description
Broome County Emergency Management Center Personnel	Emergency System Operator		
CLARUS	Surface Transportation Weather Service		
County and Municipal Highway Departments	Other Maint and Constr Mgmt Centers		
Driver	Driver		
Event Promoter System	Event Promoter System		
Hyper-Reach Emergency Alert System	Emergency Telecommunications System		
Local Media Outlets	Media		
Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Emergency Vehicle OBE	EV On-Board En Route Support	'EV On-Board En Route Support' provides communications functions to responding emergency vehicles that reduce response times and improve safety of responding public safety personnel and the general public. It supports traffic signal preemption via short range communication directly with signal control equipment and sends alert messages to surrounding vehicles.
Local Police/Fire/EMS Emergency Vehicle OBE (Broome County)	Emergency Vehicle OBE	EV On-Board Incident Management Communication	'EV On-board Incident Management Communication' provides communications support to first responders. Information about the incident, information on dispatched resources, and ancillary information such as road and weather conditions are provided to emergency personnel. Emergency personnel transmit information about the incident such as identification of vehicles and people involved, the extent of injuries, hazardous material, resources on site, site management strategies in effect, and current clearance status. Emergency personnel may also send in-vehicle signing messages to approaching traffic using short range communications.

Element Name	Physical Object Name	Functional Object	Functional Object Description
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Emergency Vehicle OBE	EV On-Board En Route Support	'EV On-Board En Route Support' provides communications functions to responding emergency vehicles that reduce response times and improve safety of responding public safety personnel and the general public. It supports traffic signal preemption via short range communication directly with signal control equipment and sends alert messages to surrounding vehicles.
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Emergency Vehicle OBE	EV On-Board Incident Management Communication	'EV On-board Incident Management Communication' provides communications support to first responders. Information about the incident, information on dispatched resources, and ancillary information such as road and weather conditions are provided to emergency personnel. Emergency personnel transmit information about the incident such as identification of vehicles and people involved, the extent of injuries, hazardous material, resources on site, site management strategies in effect, and current clearance status. Emergency personnel may also send in-vehicle signing messages to approaching traffic using short range communications.
Local Police/Fire/EMS Emergency Vehicle OBE (Tioga County)	Other EV OBEs		
Local Police/Sheriff/Fire/EMS Personnel (Broome County)	Emergency Personnel		
Local Police/Sheriff/Fire/EMS Personnel (Tioga County)	Emergency Personnel		
Municipal Emergency Vehicle Traffic Signal Preemption Equipment	ITS Roadway Equipment		
National Oceanic and Atmospheric Administration National Weather Service	Weather Service System		
New York State Police Personnel (Broome County)	Emergency Personnel		

Element Name	Physical Object Name	Functional Object	Functional Object Description
New York State Police Personnel (Tioga County)	Emergency Personnel		
New York State Police Vehicle OBE (Broome County)	Emergency Vehicle OBE	EV On-Board En Route Support	'EV On-Board En Route Support' provides communications functions to responding emergency vehicles that reduce response times and improve safety of responding public safety personnel and the general public. It supports traffic signal preemption via short range communication directly with signal control equipment and sends alert messages to surrounding vehicles.
New York State Police Vehicle OBE (Broome County)	Emergency Vehicle OBE	EV On-Board Incident Management Communication	'EV On-board Incident Management Communication' provides communications support to first responders. Information about the incident, information on dispatched resources, and ancillary information such as road and weather conditions are provided to emergency personnel. Emergency personnel transmit information about the incident such as identification of vehicles and people involved, the extent of injuries, hazardous material, resources on site, site management strategies in effect, and current clearance status. Emergency personnel may also send in-vehicle signing messages to approaching traffic using short range communications.
New York State Police Vehicle OBE (Tioga County)	Emergency Vehicle OBE	EV On-Board En Route Support	'EV On-Board En Route Support' provides communications functions to responding emergency vehicles that reduce response times and improve safety of responding public safety personnel and the general public. It supports traffic signal preemption via short range communication directly with signal control equipment and sends alert messages to surrounding vehicles.
New York State Police Vehicle OBE (Tioga County)	Emergency Vehicle OBE	EV On-Board Incident Management Communication	'EV On-board Incident Management Communication' provides communications support to first responders. Information about the incident, information on dispatched resources, and ancillary information such as road and weather conditions are provided to emergency personnel. Emergency personnel transmit information about the incident such as identification of vehicles and people involved, the extent of injuries, hazardous material, resources on site, site management strategies in effect, and current clearance status. Emergency personnel may also send in-vehicle signing messages to approaching traffic using short range communications.
New York State Police Vehicle OBE (Tioga County)	Other EV OBEs		

Element Name	Physical Object Name	Functional Object	Functional Object Description
NYAlerts System	Emergency Telecommunications System		
NYSDOT Main Office	Other Transportation Information Centers		
NYSDOT Region 9 Emergency Vehicle Traffic Signal Preemption Equipment	ITS Roadway Equipment		
NYSDOT Region 9 Highway Advisory Radio	ITS Roadway Equipment	Roadway Traffic Information Dissemination	'Roadway Traffic Information Dissemination' includes field elements that provide information to drivers, including dynamic message signs and highway advisory radios.
NYSDOT Region 9 Highway Surveillance Cameras	ITS Roadway Equipment	Roadway Work Zone Traffic Control	'Roadway Work Zone Traffic Control' controls traffic in areas of the roadway where maintenance and construction activities are underway, monitoring and controlling traffic using field equipment such as CCTV cameras, dynamic messages signs, and gates/barriers. Work zone speeds and delays are provided to the motorist prior to the work zones.
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Basic Surveillance	'Roadway Basic Surveillance' monitors traffic conditions using fixed equipment such as loop detectors and CCTV cameras.
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Incident Detection	'Roadway Incident Detection' provides incident detection using traffic detectors and surveillance equipment. It monitors for unusual traffic conditions that may indicate an incident or processes surveillance images, watching for potential incidents. It provides potential incident information as well as traffic flow and images to the center for processing and presentation to traffic operations personnel.

Element Name	Physical Object Name	Functional Object	Functional Object Description
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Passive Monitoring	'Roadway Passive Monitoring' monitors passing vehicles for a signature that can be used to recognize the same vehicle at different points in the network and measure travel times. Depending on the implementation and the penetration rate of the technology that is monitored, other point traffic measures may also be inferred by monitoring the number of vehicles within range over time. Today this approach is implemented most commonly using a Bluetooth receiver that passively monitors Bluetooth devices on-board passing vehicles and license plate readers that record the vehicle license plate number, but any widely deployed vehicle communications technology or feature that can be passively monitored to uniquely identify a vehicle could be used.
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Signal Control	'Roadway Signal Control' includes the field elements that monitor and control signalized intersections. It includes the traffic signal controllers, detectors, conflict monitors, signal heads, and other ancillary equipment that supports traffic signal control. It also includes field masters, and equipment that supports communications with a central monitoring and/or control system, as applicable. The communications link supports upload and download of signal timings and other parameters and reporting of current intersection status. It represents the field equipment used in all levels of traffic signal control from basic actuated systems that operate on fixed timing plans through adaptive systems. It also supports all signalized intersection configurations, including those that accommodate pedestrians. In advanced, future implementations, environmental data may be monitored and used to support dilemma zone processing and other aspects of signal control that are sensitive to local environmental conditions.
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Signal Preemption	'Roadway Signal Preemption' includes the field elements that receive signal preemption requests from emergency vehicles approaching a signalized intersection and overrides the current operation of the traffic signals to stop conflicting traffic and grant right-of-way to the approaching vehicle.
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Traffic Information Dissemination	'Roadway Traffic Information Dissemination' includes field elements that provide information to drivers, including dynamic message signs and highway advisory radios.
NYSDOT Region 9 ITS Roadway Equipment	ITS Roadway Equipment	Roadway Work Zone Traffic Control	'Roadway Work Zone Traffic Control' controls traffic in areas of the roadway where maintenance and construction activities are underway, monitoring and controlling traffic using field equipment such as CCTV cameras, dynamic messages signs, and gates/barriers. Work zone speeds and delays are provided to the motorist prior to the work zones.

Element Name	Physical Object Name	Functional Object	Functional Object Description
NYSDOT Region 9 Maintenance and Construction Administrative Systems	Maint and Constr Administrative Systems		
NYSDOT Region 9 Maintenance and Construction Field Personnel	Maint and Constr Field Personnel		
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Automated Treatment System Control	'MCM Automated Treatment System Control' remotely monitors and controls automated road treatment systems that disperse anti-icing chemicals or otherwise treat a road segment. The automated treatment system may be remotely activated by this object or it may include environmental sensors that activate the system automatically based on sensed environmental conditions. This object monitors treatment system operation, sets operating parameters, and directly controls system activation if necessary.
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Environmental Information Collection	'MCM Environmental Information Collection' collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway. In addition to fixed sensor stations at the roadside, this functional object also collects environmental information from sensor systems located on Maintenance and Construction Vehicles. It also collects current and forecast environmental conditions information that is made available by other systems. The functional object aggregates the sensor system data and provides it, along with data attributes to other applications.
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Environmental Information Processing	'MCM Environmental Information Processing' processes current and forecast weather data, road condition information, local environmental data, and uses internal models to develop specialized detailed forecasts of local weather and surface conditions. The processed environmental information products are presented to center personnel and disseminated to other centers.
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Incident Management	'MCM Incident Management' supports maintenance and construction participation in coordinated incident response. Incident notifications are shared, incident response resources are managed, and the overall incident situation and incident response status is coordinated among allied response organizations.

Element Name	Physical Object Name	Functional Object	Functional Object Description
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Maintenance Decision Support	'MCM Maintenance Decision Support' recommends maintenance courses of action based on current and forecast environmental and road conditions and additional application specific information. Decisions are supported through understandable presentation of filtered and fused environmental and road condition information for specific time horizons as well as specific maintenance recommendations that are generated by the system based on this integrated information. The recommended courses of action are supported by information on the anticipated consequences of action or inaction, when available.
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Reduced Speed Zone Warning	'MCM Reduced Speed Zone Warning' supports remote control and monitoring of reduced speed zone warning roadside equipment. It provides posted speed limits and associated schedules and information about associated road configuration changes including lane merges and shifts. It monitors field equipment operation and reports current status to the operator.
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Vehicle Tracking	'MCM Vehicle Tracking' tracks the location of maintenance and construction vehicles and other equipment. Vehicle/equipment location and associated information is presented to the operator.
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Winter Maintenance Management	'MCM Winter Maintenance Management' manages winter road maintenance, tracking and controlling snow plow operations, roadway treatment (e.g., salt spraying and other material applications), and other snow and ice control operations. It monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.
NYSDOT Region 9 Maintenance and Construction Management Center	Maint and Constr Management Center	MCM Work Activity Coordination	'MCM Work Activity Coordination' disseminates work activity schedules and current asset restrictions to other agencies. Work schedules are coordinated with operating agencies, factoring in the needs and activities of other agencies and adjacent jurisdictions. Work schedules are also distributed to Transportation Information Centers for dissemination to the traveling public.
NYSDOT Region 9 Maintenance and Construction Management Center Personnel	Maint and Constr Center Personnel		
NYSDOT Region 9 Maintenance and Construction Vehicle	Maint and Constr Vehicle		

Element Name	Physical Object Name	Functional Object	Functional Object Description
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Maint and Constr Vehicle OBE	MCV Environmental Monitoring	'MCV Environmental Monitoring' collects current road and surface weather conditions from sensors on-board the maintenance and construction vehicle or by querying fixed sensors on or near the roadway. Environmental information including road surface temperature, air temperature, and wind speed is measured and spatially located and time stamped, and reported back to a center.
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Maint and Constr Vehicle OBE	MCV Vehicle Location Tracking	'MCV Vehicle Location Tracking' monitors vehicle location and reports the position and timestamp information to the dispatch center.
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Maint and Constr Vehicle OBE	MCV Winter Maintenance	'MCV Winter Maintenance' supports snow plow operations and other roadway treatments (e.g., salt spraying and other material applications). It supports communications with the center to receive information and instructions that are provided to the vehicle operator and also supports remote control of on-board systems. It tracks operational status of snow and ice control operations and provides this information back to the center.
NYSDOT Region 9 Maintenance and Construction Vehicle OBE	Maint and Constr Vehicle OBE	MCV Work Zone Support	'MCV Work Zone Support' provides communications and support for local management of a work zone. It supports communications between field personnel and the managing center to keep the center appraised of current work zone status. It controls vehicle-mounted driver information systems (e.g., dynamic message signs) and uses short range communications to monitor and control other fixed or portable driver information systems in the work zone.
NYSDOT Region 9 Permanent Continuous Traffic Count Stations	ITS Roadway Equipment		
NYSDOT Region 9 Road Weather Information Stations	ITS Roadway Equipment		
NYSDOT Region 9 Roadway Automated Treatment	ITS Roadway Equipment	Roadway Automated Treatment	'Roadway Automated Treatment' automatically treats a roadway section based on environmental or atmospheric conditions or under center control. Treatments include fog dispersion, anti-icing chemicals, etc. It communicates with the center and environmental sensors to support system activation and optionally with sign(s) that warn the driver in adverse conditions when the system is activated.

Element Name	Physical Object Name	Functional Object	Functional Object Description
NYSDOT Region 9 Roadway Automated Treatment	ITS Roadway Equipment	Roadway Environmental Monitoring	'Roadway Environmental Monitoring' measures environmental conditions and communicates the collected information back to a center where it can be monitored and analyzed or to other field devices to support communications to vehicles. A broad array of general weather and road surface information may be collected. Weather conditions that may be measured include temperature, wind, humidity, precipitation, and visibility. Surface and sub-surface sensors can measure road surface temperature, moisture, icing, salinity, and other measures.
NYSDOT Region 9 Roadway Automated Treatment	ITS Roadway Equipment	Roadway Traffic Information Dissemination	'Roadway Traffic Information Dissemination' includes field elements that provide information to drivers, including dynamic message signs and highway advisory radios.
NYSDOT Region 9 Roadway Passive Monitoring	ITS Roadway Equipment	Roadway Passive Monitoring	'Roadway Passive Monitoring' monitors passing vehicles for a signature that can be used to recognize the same vehicle at different points in the network and measure travel times. Depending on the implementation and the penetration rate of the technology that is monitored, other point traffic measures may also be inferred by monitoring the number of vehicles within range over time. Today this approach is implemented most commonly using a Bluetooth receiver that passively monitors Bluetooth devices on-board passing vehicles and license plate readers that record the vehicle license plate number, but any widely deployed vehicle communications technology or feature that can be passively monitored to uniquely identify a vehicle could be used.
NYSDOT Region 9 Roadway Signal Control	ITS Roadway Equipment		
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Basic Surveillance	'TMC Basic Surveillance' remotely monitors and controls traffic sensor systems and surveillance (e.g., CCTV) equipment, and collects, processes and stores the collected traffic data. Current traffic information and other real-time transportation information is also collected from other centers. The collected information is provided to traffic operations personnel and made available to other centers.
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Environmental Monitoring	'TMC Environmental Monitoring' assimilates current and forecast road conditions and surface weather information using a combination of weather service provider information, information collected by other centers such as the Maintenance and Construction Management Center, and data collected from environmental sensors deployed on and about the roadway. The collected environmental information is monitored and presented to the operator. This information can be used to issue general traveler advisories and support location specific warnings to drivers.

Element Name	Physical Object Name	Functional Object	Functional Object Description
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Incident Detection	'TMC Incident Detection' identifies and reports incidents to Traffic Operations Personnel. It remotely monitors and controls traffic sensor and surveillance systems that support incident detection and verification. It analyzes and reduces the collected sensor and surveillance data, external alerting and advisory and incident reporting systems, anticipated demand information from intermodal freight depots, border crossings, special event information, and identifies and reports incidents and hazardous conditions
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Incident Dispatch Coordination	'TMC Incident Dispatch Coordination' formulates and manages an incident response that takes into account the incident potential, incident impacts, and resources required for incident management. It provides information to support dispatch and routing of emergency response and service vehicles as well as coordination with other cooperating agencies. It provides access to traffic management resources that provide surveillance of the incident, traffic control in the surrounding area, and support for the incident response. It monitors the incident response and collects performance measures such as incident response and clearance times.
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Multi-Modal Coordination	'TMC Multi-Modal Coordination' supports center-to-center coordination between the Traffic Management and Transit Management Centers. It monitors transit operations and provides traffic signal priority for transit vehicles on request from the Transit Management Center.
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Passive Surveillance	'TMC Passive Surveillance' collects time stamped vehicle identities from different detection zones, correlates the identities, and calculates link travel times and derives other traffic measures.
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Roadway Equipment Monitoring	'TMC Roadway Equipment Monitoring' monitors the operational status of field equipment and detects failures. It presents field equipment status to Traffic Operations Personnel and reports failures to the Maintenance and Construction Management Center. It tracks the repair or replacement of the failed equipment. The entire range of ITS field equipment may be monitored including sensors (traffic, infrastructure, environmental, security, speed, etc.) and devices (highway advisory radio, dynamic message signs, automated roadway treatment systems, barrier and safeguard systems, cameras, traffic signals and override equipment, ramp meters, beacons, security surveillance equipment, etc.).

Element Name	Physical Object Name	Functional Object	Functional Object Description
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Signal Control	'TMC Signal Control' provides the capability for traffic managers to monitor and manage the traffic flow at signalized intersections. This capability includes analyzing and reducing the collected data from traffic surveillance equipment and developing and implementing control plans for signalized intersections. Control plans may be developed and implemented that coordinate signals at many intersections under the domain of a single Traffic Management Center and are responsive to traffic conditions and adapt to support incidents, preemption and priority requests, pedestrian crossing calls, etc.
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Speed Warning	'TMC Speed Warning' supports remote control and monitoring of reduced speed zone warning roadside equipment. It provides the location and extent of the reduced speed zone, the posted speed limit(s) with information about the applicability of the speed limit(s) (e.g., time of day, day of week, seasonality, relevant vehicle types) and information about associated road configuration changes including lane merges and shifts. It monitors field equipment operation and reports current status to the operator.
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Traffic Information Dissemination	'TMC Traffic Information Dissemination' disseminates traffic and road conditions, closure and detour information, incident information, driver advisories, and other traffic-related data to other centers, the media, and driver information systems. It monitors and controls driver information system field equipment including dynamic message signs and highway advisory radio, managing dissemination of driver information through these systems.
NYSDOT Region 9 Traffic Management Center (TOC)	Traffic Management Center	TMC Work Zone Traffic Management	'TMC Work Zone Traffic Management' coordinates work plans with maintenance systems so that work zones are established that have minimum traffic impact. Traffic control strategies are implemented to further mitigate traffic impacts associated with work zones that are established, providing work zone information to driver information systems such as dynamic message signs.
NYSDOT Region 9 Traffic Management Center (TOC) Personnel	Traffic Operations Personnel		

Element Name	Physical Object Name	Functional Object	Functional Object Description
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Data Collection	'TIC Data Collection' collects transportation-related data from other centers, performs data quality checks on the collected data and then consolidates, verifies, and refines the data and makes it available in a consistent format to applications that support operational data sharing between centers and deliver traveler information to end-users. A broad range of data is collected including traffic and road conditions, transit data, emergency information and advisories, weather data, special event information, traveler services, parking, multimodal data, and toll/pricing data. It also shares data with other transportation information centers.
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Emergency Traveler Information	'TIC Emergency Traveler Information' provides emergency information to the public, including wide-area alerts and evacuation information. It provides emergency alerts, information on evacuation zones and evacuation requirements, evacuation destinations and shelter information, available transportation modes, and traffic and road conditions at the origin, destination, and along the evacuation routes. In addition to general evacuation information, personalized information including tailored evacuation routes, service information, and estimated travel times is also provided based on traveler specified origin, destination, and route parameters. Updated information is provided throughout the evacuation and subsequent reentry as status changes and plans are adapted.
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Interactive Traveler Information	'TIC Interactive Traveler Information' disseminates personalized traveler information including traffic and road conditions, transit information, maintenance and construction information, multimodal information, event information, and weather information. Tailored information is provided based on the traveler's request in this interactive service.
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Situation Data Management	'TIC Situation Data Management' manages connected vehicle situation data collection, quality controls, filtering, aggregation, and storage. Through this process, raw data reported by connected vehicles are transformed into information products that can be accessed and used to support transportation operations and traveler information. The distribution of the connected vehicle-derived information products is handled by other functional objects.
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Traveler Information Broadcast	'TIC Traveler Information Broadcast' disseminates traveler information including traffic and road conditions, incident information, maintenance and construction information, event information, transit information, parking information, and weather information. The same information is broadcast to all equipped traveler interface systems and vehicles.

Element Name	Physical Object Name	Functional Object	Functional Object Description
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Traveler Telephone Information	'TIC Traveler Telephone Information' services voice-based traveler requests for information that supports traveler telephone information systems like 511. It takes requests for traveler information, which could be voice-formatted traveler requests, dual-tone multi-frequency (DTMF)-based requests, or a simple traveler information request, and returns the requested traveler information in the proper format. In addition to servicing requests for traveler information, it also collects and forwards alerts and advisories to traveler telephone information systems.
NYSDOT Region 9 Transportation Information Center	Transportation Information Center	TIC Trip Planning	'TIC Trip Planning' provides pre-trip and en-route trip planning services for travelers. It receives origin, destination, constraints, and preferences and returns trip plan(s) that meet the supplied criteria. Trip plans may be based on current traffic and road conditions, transit schedule information, and other real-time traveler information. Candidate trip plans are multimodal and may include vehicle, transit, and alternate mode segments (e.g., rail, ferry, bicycle routes, and walkways) based on traveler preferences. It also confirms the trip plan for the traveler and supports reservations and advanced payment for portions of the trip. The trip plan includes specific routing information and instructions for each segment of the trip and may also include information and reservations for additional services (e.g., parking) along the route.
NYSDOT Region 9 Transportation Information Center Personnel	TIC Operator		
NYSDOT Region 9 Variable Message Signs	ITS Roadway Equipment	Roadway Traffic Information Dissemination	'Roadway Traffic Information Dissemination' includes field elements that provide information to drivers, including dynamic message signs and highway advisory radios.
NYSDOT Region 9 Variable Message Signs	ITS Roadway Equipment	Roadway Work Zone Traffic Control	'Roadway Work Zone Traffic Control' controls traffic in areas of the roadway where maintenance and construction activities are underway, monitoring and controlling traffic using field equipment such as CCTV cameras, dynamic messages signs, and gates/barriers. Work zone speeds and delays are provided to the motorist prior to the work zones.
Other Vehicle OBEs	Other Vehicle OBEs		
Social Media	Social Media		

Element Name	Physical Object Name	Functional Object	Functional Object Description
Tioga County 911 System	Emergency Telecommunications System		
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Call-Taking	'Emergency Call-Taking' supports the emergency call-taker, collecting available information about the caller and the reported emergency, and forwarding this information to other objects that formulate and manage the emergency response. It receives 9-1-1, 7-digit local access, and motorist call-box calls and interfaces to other agencies to assist in the verification and assessment of the emergency and to forward the emergency information to the appropriate response agency.
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Dispatch	'Emergency Dispatch' tracks the location and status of emergency vehicles and dispatches these vehicles to incidents. Pertinent incident information is gathered from the public and other public safety agencies and relayed to the responding units. Incident status and the status of the responding units is tracked so that additional units can be dispatched and/or unit status can be returned to available when the incident is cleared and closed.
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Early Warning System	'Emergency Early Warning System' monitors alerting and advisory systems, information collected by ITS surveillance and sensors, and reports from other agencies and uses this information to identify potential, imminent, or in-progress major incidents or disasters. Notification is provided to initiate the emergency response, including public notification using ITS traveler information systems, where appropriate.
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Environmental Monitoring	'Emergency Environmental Monitoring' collects current and forecast road conditions and surface weather information from a variety of sources. The collected environmental information is monitored and presented to the operator and used to more effectively manage incidents.
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Incident Command	'Emergency Incident Command' provides tactical decision support, resource coordination, and communications integration for Incident Commands that are established by first responders at or near the incident scene to support local management of an incident. It supports communications with public safety, emergency management, transportation, and other allied response agency centers, tracks and maintains resource information, action plans, and the incident command organization itself. Information is shared with agency centers including resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response. It supports the functions and interfaces commonly supported by a mobile command center.

Element Name	Physical Object Name	Functional Object	Functional Object Description
Tioga County Emergency Management Center (Sheriff Emergency Dispatch)	Emergency Management Center	Emergency Routing	'Emergency Routing' supports routing of emergency vehicles and enlists support from the Traffic Management Center to facilitate travel along these routes. Routes may be determined based on real-time traffic information and road conditions or routes may be provided by the Traffic Management Center on request. Vehicles are tracked and routes are based on current vehicle location. It may coordinate with the Traffic Management Center to provide preemption or otherwise adapt the traffic control strategy along the selected route.
Tioga County Emergency Management Center (Sheriff Emergency Dispatch) Personnel	Emergency System Operator		
Traveler	Traveler		
Traveler Personal Information Device	Personal Information Device	Personal Interactive Traveler Information	'Personal Interactive Traveler Information' provides traffic information, road conditions, transit information, yellow pages (traveler services) information, special event information, and other traveler information that is specifically tailored based on the traveler's request and/or previously submitted traveler profile information. It also supports interactive services that support enrollment, account management, and payments for transportation services. The interactive traveler information capability is provided by personal devices including personal computers and personal portable devices such as smart phones.
Traveler Personal Information Device	Personal Information Device	Personal Trip Planning and Route Guidance	'Personal Trip Planning and Route Guidance' provides a personalized trip plan to the traveler. The trip plan is calculated based on preferences and constraints supplied by the traveler and provided to the traveler for confirmation. Coordination may continue during the trip so that the route plan can be modified to account for new information. Many equipment configurations are possible including systems that provide a basic trip plan to the traveler as well as more sophisticated systems that can provide transition by transition guidance to the traveler along a multi-modal route with transfers. Devices represented by this functional object include desktop computers at home, work, or at major trip generation sites, plus personal devices such as tablets and smart phones.
Vehicle	Vehicle		
Vehicle OBE	Vehicle OBE	Vehicle Emergency Notification	'Vehicle Emergency Notification' provides the capability for drivers or collision detection sensors to report an emergency and summon assistance. It includes the on-board collision detection sensors, a mechanism for the driver to summon assistance, and two-way communications.

Element Name	Physical Object Name	Functional Object	Functional Object Description
Vehicle OBE	Vehicle OBE	Vehicle Interactive Traveler Information	'Vehicle Interactive Traveler Information' provides drivers with personalized traveler information including traffic and road conditions, transit information, maintenance and construction information, multimodal information, event information, and weather information. The provided information is tailored based on driver requests. Both one-time requests for information and on-going information streams based on a submitted traveler profile and preferences are supported.

Appendix B. Interfaces Details

The interfaces of the transportation systems in the Binghamton Regional ITS Architecture are based on ARC-IT and tailored to reflect the plan for the region. Architecture diagrams display the transportation systems in the Binghamton Regional ITS Architecture, and more importantly, how these systems are and will be connected with one another so information can be exchanged and transportation services can be coordinated. Stakeholders may use these diagrams to identify integration opportunities. Each system in the region is represented with two types of diagrams, a context diagram and an interface diagram.

A context diagram shows a particular system and all other systems with which it shares information. Interconnects are represented as single lines and indicate information sharing without specifying the type of information being shared or the direction of the information movement.

Following each interconnect context diagram are a series of information flow diagrams showing the information (i.e. information flows) movement between the various systems. Descriptions of the information flows are included at the end of the chapter.

Information about the interfaces of the systems in the region is contained in the RAD-IT database. RAD-IT can be used to create tailored interconnect and information flow diagrams for any system in the database.

Binghamton Regional ITS Architecture Interface Diagrams

Architecture Flow Definitions

Flow Name	Description
alarm acknowledge	Confirmation that alarm was received, instructions and additional information for the alarm initiator, and requests for additional information.
alarm notification	Notification of activation of an audible or silent alarm by a traveler in a public area or by a transit vehicle operator using an on-board device.
alert notification	Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.
alert notification coordination	Coordination of emergency alerts to be distributed to the public. This includes notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public and status of the public notification.

Flow Name	Description
alert status	Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.
alternate mode information	Schedule information for alternate mode transportation providers such as air, ferry, and passenger-carrying heavy rail.
broadcast advisories	General broadcast advisories that are provided over wide-area wireless communications direct to the vehicle radio. These analog advisory messages may provide similar content to ITS broadcast information flows, but include no digital data component. Existing Highway-Advisory Radio (HAR) advisory messages are a prime example of this flow.
broadcast traveler information	General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.
communications signature	Communications from devices on-board a vehicle, including personal devices that are carried into the vehicle, that can be monitored by ITS field equipment to uniquely identify the vehicle. This flow represents communications from Bluetooth device(s) on-board a vehicle that may be monitored by ITS field equipment or any other passive or active communications from the vehicle that can be used to identify a vehicle to support traffic monitoring. This flow specifically covers passive monitoring of vehicle communications. Other information flows cover active communications between ITS equipment on-board a vehicle and ITS field equipment.
current infrastructure restrictions	Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.
decision support information	Information provided to support effective and safe incident response, including local traffic, road, and weather conditions, hazardous material information, and the current status of resources (including vehicles, other equipment, supplies) that have been allocated to an incident.
demand response passenger and use data	Data collected on board a demand response vehicle relating to the picking up and discharging of passengers.
demand responsive transit plan	Plan regarding overall demand responsive transit schedules and deployment.
demand responsive transit request	Request for paratransit support.
driver environmental input	Current road (e.g., surface conditions, icing, snow depths) and surface weather conditions (e.g., visibility, precipitation) as reported by the driver.
driver information	Regulatory, warning, and guidance information provided to the driver while en route to support safe and efficient vehicle operation.
driver input	Driver input to the vehicle on-board equipment including configuration data, settings and preferences, interactive requests, and control commands.
driver input information	Driver input received from the driver-vehicle interface equipment via the vehicle bus. It includes configuration data, settings and preferences, interactive requests, and control commands for the connected vehicle on-board equipment.
driver update information	Information provided to the driver-vehicle interface to inform the driver about current conditions, potential hazards, and the current status of vehicle on-board equipment. The flow includes the information to be presented to the driver and associated metadata that supports processing, prioritization, and presentation by the DVI as visual displays, audible information and warnings, and/or haptic feedback.
driver updates	Information provided to the driver including visual displays, audible information and warnings, and haptic feedback. The updates inform the driver about current conditions, potential hazards, and the current status of vehicle on-board equipment.
emergency acknowledge	Acknowledge request for emergency assistance and provide additional details regarding actions and verification requirements.
emergency data request	A request for additional information or a control command issued by the emergency response agency in response to an emergency request for assistance from a traveler.

Flow Name	Description
emergency dispatch requests	Emergency vehicle dispatch instructions including incident location and available information concerning the incident.
emergency dispatch response	Request for additional emergency dispatch information and provision of en route status.
emergency notification	An emergency request for assistance that is automatically initiated by a vehicle or manually initiated by a vehicle occupant. The request includes call-back number, date, time, location, pre-event vehicle heading, vehicle make, model, model year, and fuel type, and crash severity indicators. Crash severity indicators include: airbags deployed, number of impacts, crash delta velocity, principle direction of force, and rollover indication. In addition, seatbelt restraint use, number of occupants, occupant location, and intrusion may be included. For commercial vehicles, this flow may also include freight equipment type (box, flatbed, trailer, container, etc.), type of cargo (refrigerated, non-perishable, liquid, etc.), hazardous material data, quantity of cargo, and cargo permits as applicable (hazmat, special routing permissions).
emergency notification relay	The relay of a previously received emergency notification. This relay enables a connected vehicle that is passing within radio range of a vehicle in need of assistance to store the notification and then forward it to a public safety agency when communications is available. Multiple relays may be necessary in remote areas with infrequent traffic and spotty communications coverage. The relay includes all of the information included in the original emergency notification (see 'emergency notification') and relay-specific data that can be used to manage the relay. Relay-specific data may include the date and time of original emergency notification receipt and the number of times the message has been relayed.
emergency operations input	Emergency operator input supporting call taking, dispatch, emergency operations, security monitoring, and other operations and communications center operator functions.
emergency operations status	Presentation of information to the operator including emergency operations data, supporting a range of emergency operating positions including call taker, dispatch, emergency operations, security monitoring, and various other operations and communications center operator positions.
emergency personnel information presentation	Presentation of information to emergency personnel in the field including dispatch information, incident information, current road network conditions, device status, and other supporting information.
emergency personnel input	User input from emergency personnel in the field including dispatch coordination, incident status information, and remote device control requests.
emergency route request	Request for access routes for emergency response vehicles and equipment. This may be a request for ingress or egress routes or other emergency routes.
emergency routes	Suggested ingress and egress routes for access to and between the scene and staging areas or other specialized emergency access routes.
emergency traveler information	Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.
emergency vehicle tracking data	The current location and operating status of the emergency vehicle.
environmental conditions data	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.
environmental conditions data status	Status of the data quality of environmental conditions data provided by a data contributor. Includes not only status by sensor, but statistical data regarding the quality checking of data provided.
environmental sensor data	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.
environmental sensors control	Data used to configure and control environmental sensors.

Flow Name	Description
equipment maintenance request	Identification of field equipment requiring repair and known information about the associated faults.
equipment maintenance status	Current status of field equipment maintenance actions.
event confirmation	Confirmation that special event details have been received and processed.
event information	Special event information for travelers. This would include a broader array of information than the similar "event plans" that conveys only information necessary to support traffic management for the event.
event plans	Plans for major events possibly impacting traffic.
external reports	Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).
fare collection data	Fare collection information including the summary of fare system data and financial payment transaction data.
fare management information	Transit fare information and transaction data used to manage transit fare processing.
host transit vehicle status	Information provided to the ITS on-board equipment from other systems on the Transit Vehicle Platform.
host vehicle status	Information provided to the ITS on-board equipment from other systems on the vehicle platform. This includes the current status of the powertrain, steering, and braking systems, and status of other safety and convenience systems. In implementations where GPS is not integrated into the Vehicle On-Board Equipment, the host vehicle is also the source for data describing the vehicle's location in three dimensions (latitude, longitude, elevation) and accurate time that can be used for time synchronization across the ITS environment.
incident command information coordination	Information that supports local management of an incident. It includes resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response.
incident command information presentation	Presentation of information to emergency personnel in the field that supports local tactical decision-making within an incident command system structure.
incident command inputs	User input from emergency personnel including incident command status, incident information and resource coordination.
incident information	Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.
incident information for media	Report of current desensitized incident information prepared for public dissemination through the media.
incident information for public	Report of current desensitized incident information prepared for public dissemination through the telecommunications system.
incident notification	The notification of an incident including its nature, severity, and location.
incident notification response	Interactive acknowledgement and verification of the incident information received, requests for additional information, and general information on incident response status.
incident report	Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.

Flow Name	Description
incident response coordination	Incident response procedures and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow provides current situation information, including a summary of incident status and its impact on the transportation system and other infrastructure, and current and planned response activities. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.
incident response status	Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.
incident status	Information gathered at the incident site that more completely characterizes the incident and provides current incident response status. This includes notification of medical facility transport and details about the vehicle occupants being transported.
interactive traveler information	Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and confirmations.
local signal preemption request	Direct control signal or message to a signalized intersection that results in preemption of the current control plan and grants right-of-way to the requesting vehicle.
maint and constr administrative information	Administrative information that is provided to support maintenance and construction operations. This information includes: equipment and consumables resupply purchase request status, personnel qualifications including training and special certifications, environmental regulations and rules that may impact maintenance activities, and requests and project requirements from contract administration.
maint and constr administrative request	Requests for maintenance and construction administrative information or services. Requests include: requests to purchasing for equipment and consumables resupply and requests to human resources that manage training and special certification for field crews and other personnel.
maint and constr center personnel input	User input from maintenance and construction center personnel including routing information, scheduling data, dispatch instructions, device configuration and control, resource allocations, alerts, incident and emergency response plan coordination.
maint and constr dispatch information	Information used to dispatch maintenance and construction vehicles, equipment, and crews and information used to keep work zone crews informed. This information includes routing information, traffic information, road restrictions, incident information, environmental information, decision support information, maintenance schedule data, dispatch instructions, personnel assignments, alert notifications, and corrective actions.
maint and constr dispatch status	Current maintenance and construction status including work data, operator status, crew status, and equipment status.
maint and constr field personnel information presentation	Information presented to maintenance and construction field personnel including vehicle routing and traffic information, road restrictions, environmental information, decision support information, maintenance schedules, dispatch instructions, maintenance personnel assignments, vehicle maintenance information, work zone status information, and corrective actions.
maint and constr field personnel input	User input from field personnel including current maintenance and construction status information as well as on-board device control.
maint and constr material information	Information on materials stored on the vehicle including quantity and current application rate.
maint and constr operations information presentation	Presentation of maintenance and construction operations information to center personnel. This information includes maintenance resource status (vehicles, equipment, and personnel), work schedule information, work status, road and weather conditions, traffic information, incident information and associated resource requests, security alerts, emergency response plans and a range of other information that supports efficient maintenance and construction operations and planning.
maint and constr resource coordination	Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response.
maint and constr resource request	Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of resources.

Flow Name	Description
maint and constr resource response	Current status of maintenance and construction resources including availability and deployment status. General resource inventory information covering vehicles, equipment, materials, and people and specific resource deployment status may be included.
maint and constr vehicle condition presentation	Presentation of vehicle diagnostics and operating status information to maintenance and construction field personnel including speed, engine temperature, mileage, tire wear, brake wear, belt wear, maintenance and construction system status, environmental sensor information, and other measures associated with the operation of a maintenance vehicle.
maint and constr vehicle control	Control data sent from on-board ITS systems to control maintenance and construction vehicle equipment, including control of materials dispersion rate and other control functions that will vary with vehicle type and application.
maint and constr vehicle location data	The current location and related status (e.g., direction and speed) of the maintenance/construction vehicle.
maint and constr vehicle operational data	Data that describes the maintenance and construction activity performed by the vehicle. Operational data includes materials usage (amount stored and current application rate), operational state of the maintenance equipment (e.g., blade up/down, spreader pattern), vehicle safety status, and other measures associated with the operation of a maintenance, construction, or other special purpose vehicle. Operational data may include basic operational status of the vehicle equipment or a more precise record of the work performed (e.g., application of crack sealant with precise locations and application characteristics).
maint and constr vehicle system control	Configure and control data that supports remote control of on-board maintenance and construction vehicle systems and field equipment that is remotely controlled by the vehicle. For example, the data can be used to adjust material application rates and spread patterns.
maint and constr work performance	Overall project status and work performance information provided to support contract administration.
maint and constr work plans	Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.
passive vehicle monitoring control	Control commands used to control detection systems that rely on infrastructure-based identification of individual vehicles to measure travel times and other related measures by identifying the same vehicle at different points in the network. Related technologies include Bluetooth readers and license plate recognition systems.
passive vehicle monitoring data	Time stamped identifiers that identify the vehicles that have passed through a detection zone.
payment	Payment of some kind (e.g., toll, parking, fare) by traveler which, in most cases, can be related to a credit account.
payment device information	The traveler personal information such as name, address, license number, user account information, trip records and profile data.
payment device update	Information updated concerning traveler's personal data including name, address, user account information, trip records, and profile data.
personal transit information	General and personalized transit information for a particular fixed route, flexible route, or paratransit system.
qualified environmental conditions data	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) that has had quality checks performed on it and has been formatted and consolidated by the Clarus system. Attributes relating to the data collection (and aggregation) are also included.
remote surveillance control	The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.
request for payment	Request to deduct cost of service from user's payment account.
request for service	Driver inputs that summon an emergency response, request a financial transaction, or initiate other services.
resource deployment status	Status of resource deployment identifying the resources (vehicles, equipment, materials, and personnel) available and their current status. General resource inventory information and specific status of deployed resources may be included.

Flow Name	Description
resource request	A request for resources to implement special traffic control measures, assist in clean up, verify an incident, etc. The request may poll for resource availability or request pre-staging, staging, or immediate deployment of resources. Resources may be explicitly requested or a service may be requested and the specific resource deployment may be determined by the responding agency.
road data	Basic road facility and treatment information that supports road conditions forecasts.
road network conditions	Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included.
road network environmental situation data	Aggregated environmental situation data collected from vehicles and other sources for the road network. Aggregated information would include measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, ALB status, and other collected vehicle system status and sensor information for the region.
road weather advisories for emergency response	Segment-specific weather and road conditions including real-time advisories of deteriorating road and weather conditions, medium-term advisories for the next 2–12 hours, and long-term advisories more than 12 hours into the future. This flow is filtered, tailored, and augmented to support emergency responders.
road weather information	Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.
roadway equipment coordination	The direct flow of information between field equipment. This includes transfer of information between sensors and driver information systems (e.g., DMS, HAR, variable speed limit signs, dynamic lane signs) or control devices (e.g., traffic signals, ramp meters), direct coordination between adjacent control devices, interfaces between detection and warning or alarm systems, and any other direct communications between field equipment.
roadway information system data	Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.
roadway information system status	Current operating status of dynamic message signs, highway advisory radios, or other configurable field equipment that provides dynamic information to the driver.
roadway maintenance status	Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).
roadway treatment system control	Control data for remotely located, automated devices, that treat the road surface (e.g. de-icing applications).
roadway treatment system status	Current operational status of automated roadway treatment devices (e.g., anti-icing systems).
route assignment	Route assignment information for transit vehicle operator.
signal control commands	Control of traffic signal controllers or field masters including clock synchronization.
signal control device configuration	Data used to configure traffic signal control equipment including local controllers and system masters.
signal control plans	Traffic signal timing parameters including minimum green time and interval durations for basic operation and cycle length, splits, offset, phase sequence, etc. for coordinated systems.
signal control status	Operational and status data of traffic signal control equipment including operating condition and current indications.
signal fault data	Faults from traffic signal control equipment.
signal system configuration	Data used to configure traffic signal systems including configuring control sections and mode of operation (time based or traffic responsive).

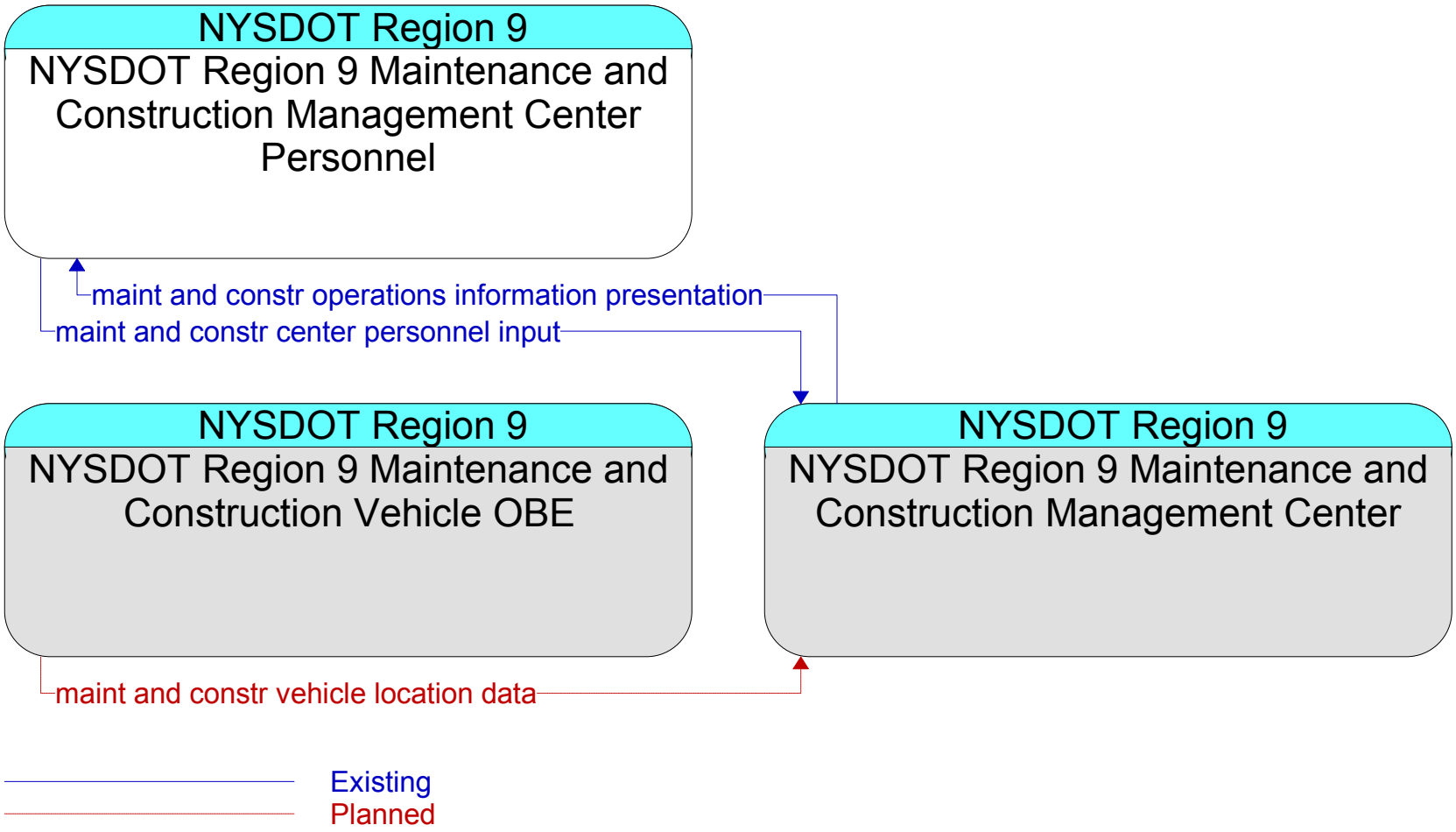
Flow Name	Description
social media presence	Each social media platform offers its own tools and API that allow integration of web content into a social media experience. This interface establishes a social media presence for traveler information sites, providing current traveler information to subscribers.
speed monitoring control	Information used to configure and control automated speed monitoring, speed warning, and speed enforcement systems.
speed monitoring information	System status including current operational state and logged information including measured speeds, warning messages displayed, and violation records.
suggested route	Suggested route for a dispatched emergency or maintenance vehicle that may reflect current network conditions and the additional routing options available to en route emergency or maintenance vehicles that are not available to the general public.
threat information	Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc.
threat information coordination	Sensor, surveillance, and threat data including raw and processed data that is collected by sensor and surveillance equipment located in secure areas.
TIC operations information presentation	Presentation of information to the TIC Operator including current operational status, parameters for broadcast information settings, route selection controls, and travel optimization algorithms.
TIC operator input	User input from the TIC system operator including requests to monitor current system operation and inputs to affect system operation including tuning and performance enhancement parameters to traveler information algorithms.
traffic control information	Represents the flow of traffic control and status information from a TMC to a third party TIC. This is reporting only, not actual control.
traffic flow	Raw and/or processed traffic sensor system data which allows derivation of traffic flow variables (e.g., speed, volume, and density measures) and associated information (e.g., congestion, potential incidents). This flow includes the traffic data and the operational status of the traffic sensor system.
traffic images	High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications. This flow includes the images and meta data that describes the images.
traffic information for media	Report of traffic conditions including traffic incident reports for public dissemination through the media. The reports may also include information on diversions and alternate routes, closures, and special traffic restrictions in effect.
traffic operator data	Presentation of traffic operations data to the operator including traffic conditions, current operating status of field equipment, maintenance activity status, incident status, video images, security alerts, emergency response plan updates and other information. This data keeps the operator appraised of current road network status, provides feedback to the operator as traffic control actions are implemented, provides transportation security inputs, and supports review of historical data and preparation for future traffic operations activities.
traffic operator input	User input from traffic operations personnel including requests for information, configuration changes, commands to adjust current traffic control strategies (e.g., adjust signal timing plans, change DMS messages), and other traffic operations data entry.
traffic sensor control	Information used to configure and control traffic sensor systems such as inductive loop detectors and machine vision sensors.
transit and fare schedules	Transit service information including routes, schedules, and fare information.
transit emergency data	Initial notification of transit emergency at a transit stop or on transit vehicles and further coordination as additional details become available and the response is coordinated.
transit fare information	Information provided by transit management that supports fare payment transactions.
transit fare request	Request for fare information and transit fare payment.
transit incident information	Information on transit incidents that impact transit services for public dissemination.
transit incidents for media	Report of an incident impacting transit operations for public dissemination through the media.
transit information for media	Report of transit schedule deviations for public dissemination through the media.

Flow Name	Description
transit information user request	Request for special transit routing, real-time schedule information, and availability information.
transit operations personnel input	User input from transit operations personnel including instructions governing service availability, schedules, emergency response plans, transit personnel assignments, transit maintenance requirements, and other inputs that establish general system operating requirements and procedures.
transit operations status	Presentation of information to transit operations personnel including accumulated schedule and fare information, ridership and on-time performance information, emergency response plans, transit personnel information, maintenance records, and other information intended to support overall planning and management of a transit property.
transit probe data	Aggregate probe data derived from tracking transit vehicles. Data collected could include transit vehicle speeds and travel times for a given link or collection of links.
transit schedule adherence information	Dynamic transit schedule adherence and transit vehicle location information.
transit schedule information	Current and projected transit schedule information used to initialize the transit vehicle with a vehicle assignment, monitor schedule performance, and develop corrective actions on-board.
transit service information	Transit service information including routes, schedules, and fare information as well as dynamic transit schedule adherence and transit vehicle location information.
transit traveler information	Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, alerts and advisories, and general transit service information.
transit vehicle conditions	Operating conditions of transit vehicle (e.g., engine running, oil pressure, fuel level and usage).
transit vehicle loading data	Data collected on board the transit vehicle relating to passenger boarding and alighting.
transit vehicle location data	Current transit vehicle location and related operational conditions data provided by a transit vehicle.
transit vehicle operator availability	Transit vehicle operator availability data that can be used to develop vehicle operator assignments and detailed operations schedules.
transit vehicle operator display	Visual, audible, and tactile outputs to the transit vehicle operator including vehicle surveillance information, alarm information, vehicle system status, information from the operations center, and information indicating the status of all other on-board ITS services.
transit vehicle operator information	Transit service instructions, wide area alerts, traffic information, road conditions, and other information for both transit and paratransit operators.
transit vehicle operator input	Transit vehicle operator inputs to on-board ITS equipment, including tactile and verbal inputs. Includes authentication information, on-board system control, emergency requests, and fare transaction data.
transit vehicle schedule performance	Estimated times of arrival and anticipated schedule deviations reported by a transit vehicle.
transportation weather information	Current and forecast road conditions and weather information (e.g., surface condition, flooding, wind advisories, visibility, etc.) associated with the transportation network. This information is of a resolution, timeliness, and accuracy to be useful in transportation decision making.
traveler alerts	Traveler information alerts reporting congestion, incidents, adverse road or weather conditions, parking availability, transit service delays or interruptions, and other information that may impact the traveler. Relevant alerts are provided based on traveler-supplied profile information including trip characteristics and preferences.
traveler information for media	General traveler information regarding incidents, unusual traffic conditions, transit issues, or other advisory information that has been desensitized and provided to the media.
traveler input	User input from a traveler to summon assistance, request travel information, make a reservation, or request any other traveler service.

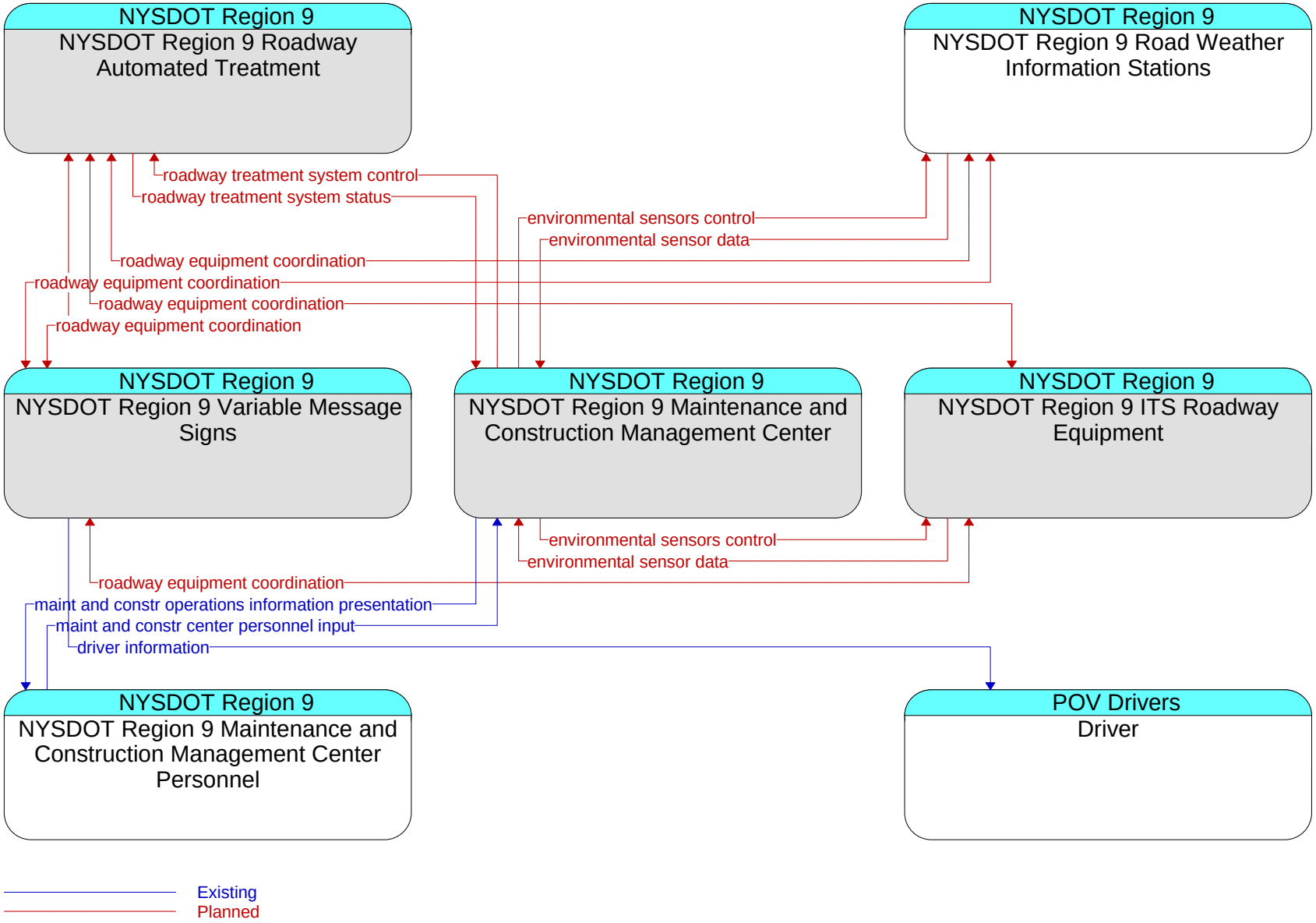
Flow Name	Description
traveler interface updates	Visual or audio information (e.g., routes, messages, guidance, emergency information) that is provided to the traveler.
traveler request	A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.
traveler sourced updates	Traveler posts on traffic and road conditions, transit services, traveler services, shelter information and other real-time crowd-sourced data that may be shared with other travelers.
trip confirmation	Acknowledgement by the driver/traveler of acceptance of a trip plan with associated personal and payment information required to confirm reservations.
trip feedback	Information provided at the conclusion of a trip that supports performance monitoring and system optimization. Information provided may include a record of the trip including HOV/HOT lane usage and user provided feedback at the conclusion of the trip.
trip plan	A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.
trip request	Request for trip planning services that identifies the trip origin, destination(s), timing, preferences, and constraints. The request may also include the requestor's location or a request for transit and parking reservations and ridesharing options associated with the trip.
user profile	Information provided to register for a travel service and create a user account. The provided information includes personal identification, traveler preferences (e.g., maximum transfer wait time, maximum walking distance, mode preferences, special needs), device information, a user ID and password, and information to support payment transactions, if applicable.
video surveillance control	Information used to configure and control video surveillance systems.
weather information	Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).
work plan coordination	Coordination of work plan schedules and activities between maintenance and construction organizations or systems. This information includes the work plan schedules and comments and suggested changes that are exchanged as work plans are coordinated and finalized.
work plan feedback	Comments and suggested changes to proposed construction and maintenance work schedules and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.
work zone information	Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.
work zone status	Current work zone status including current location (and future locations for moving work zones), impact to the roadway, required lane shifts, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits.

Appendix C. Binghamton Regional ITS Architecture Service Package Physical Diagrams

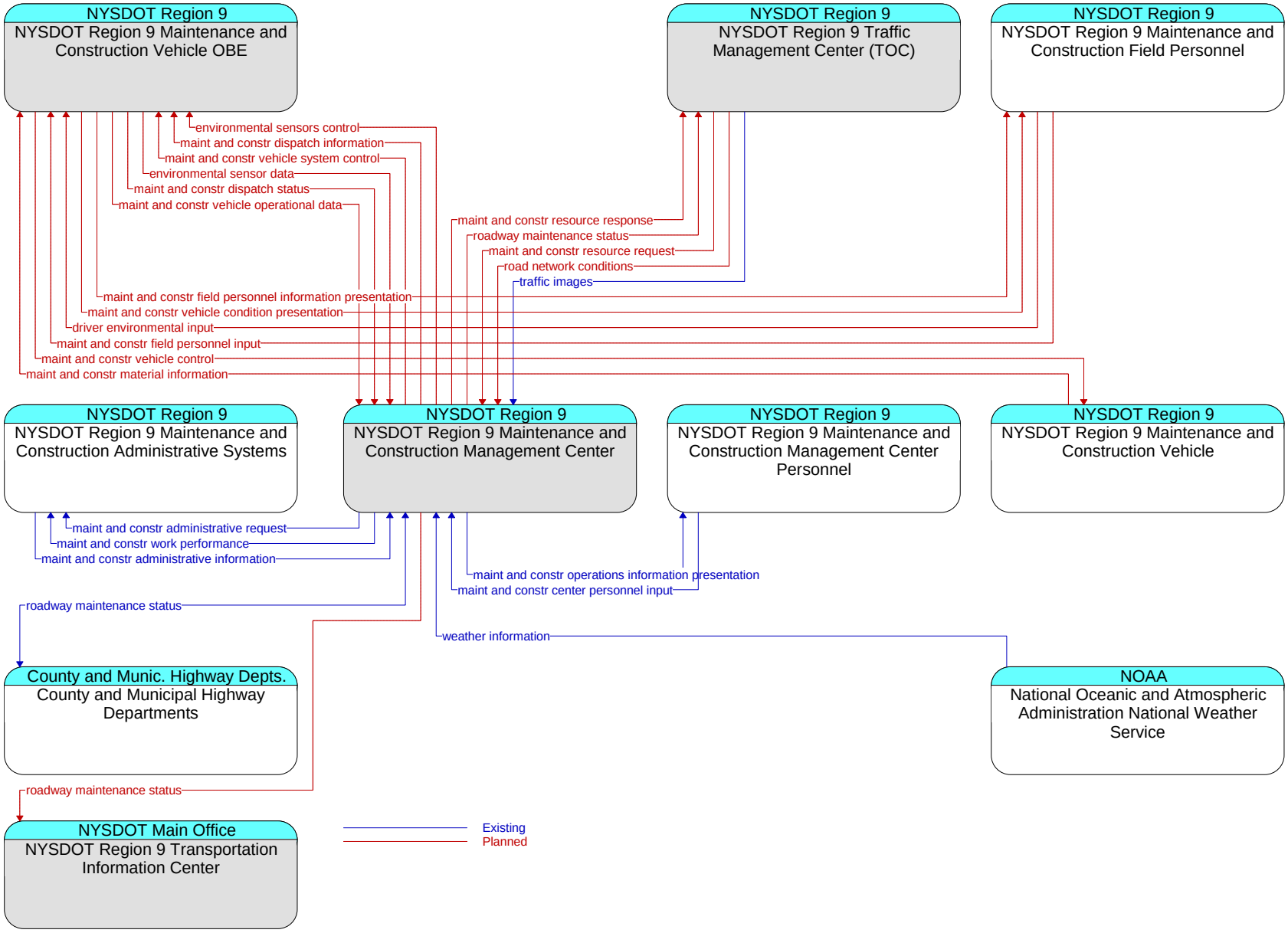
Service Package:
MC01 Maintenance and Construction Vehicle and Equipment Tracking



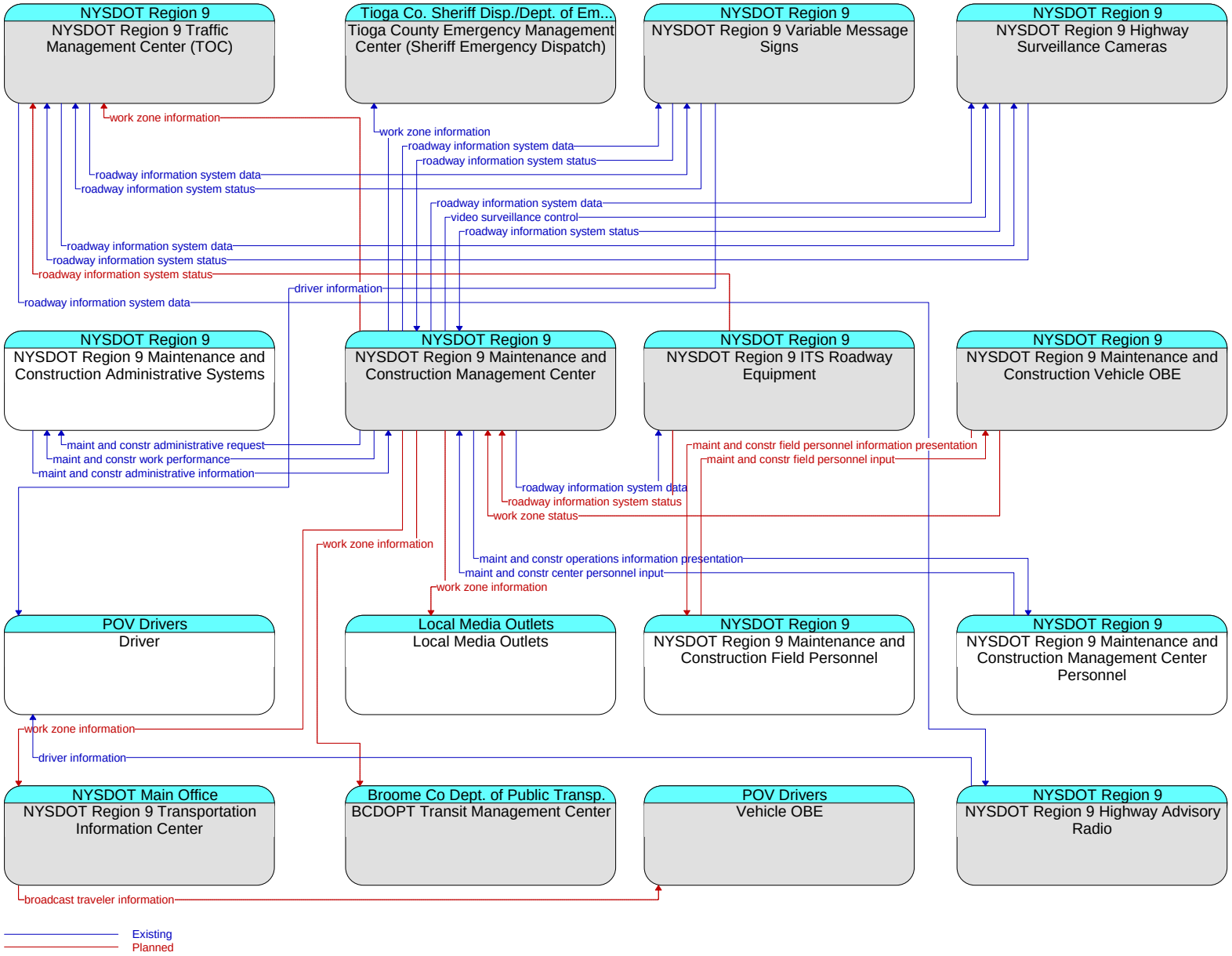
Service Package:
MC03 Roadway Automated Treatment



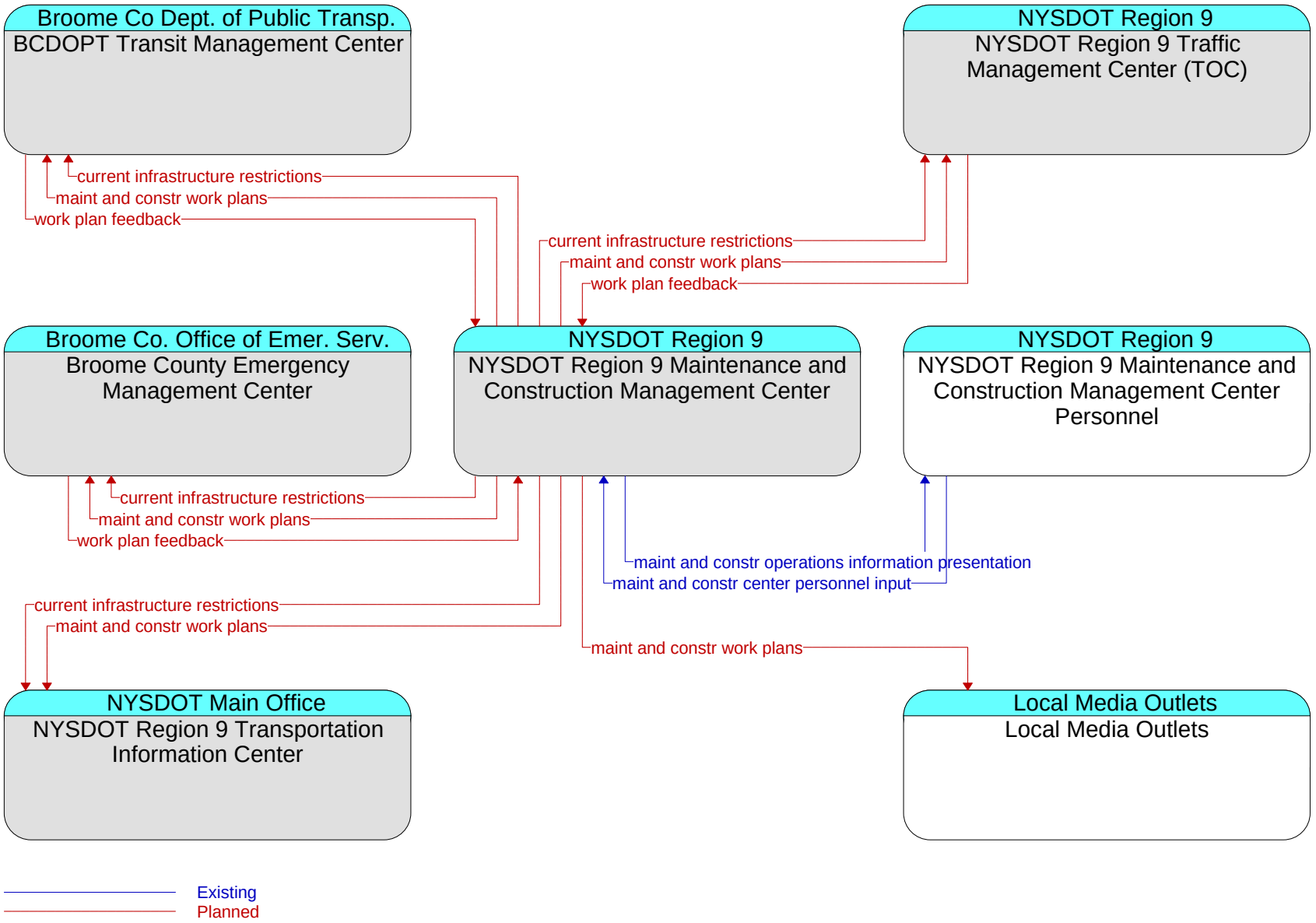
Service Package:
MC04 Winter Maintenance



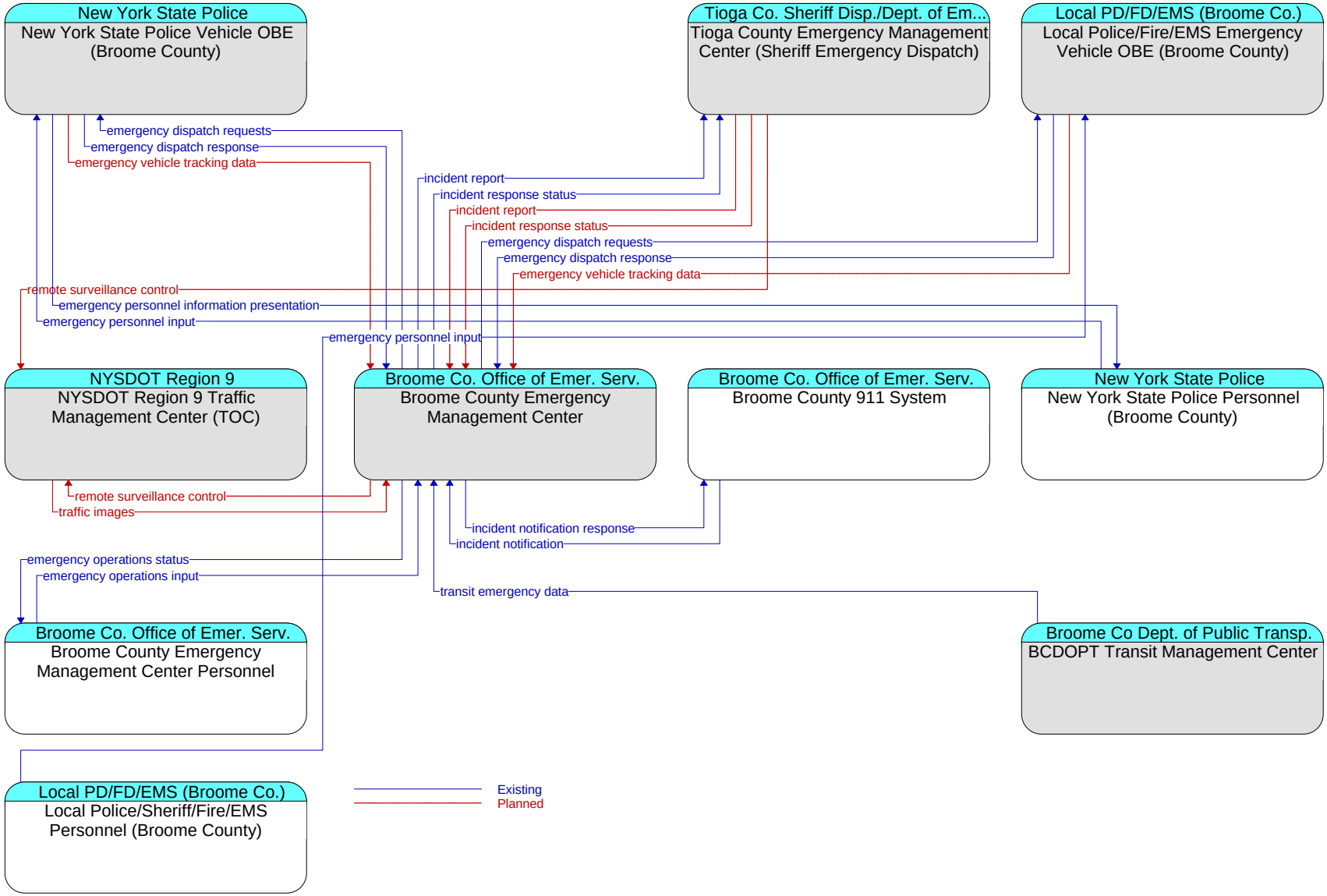
Service Package:
MC06 Work Zone Management



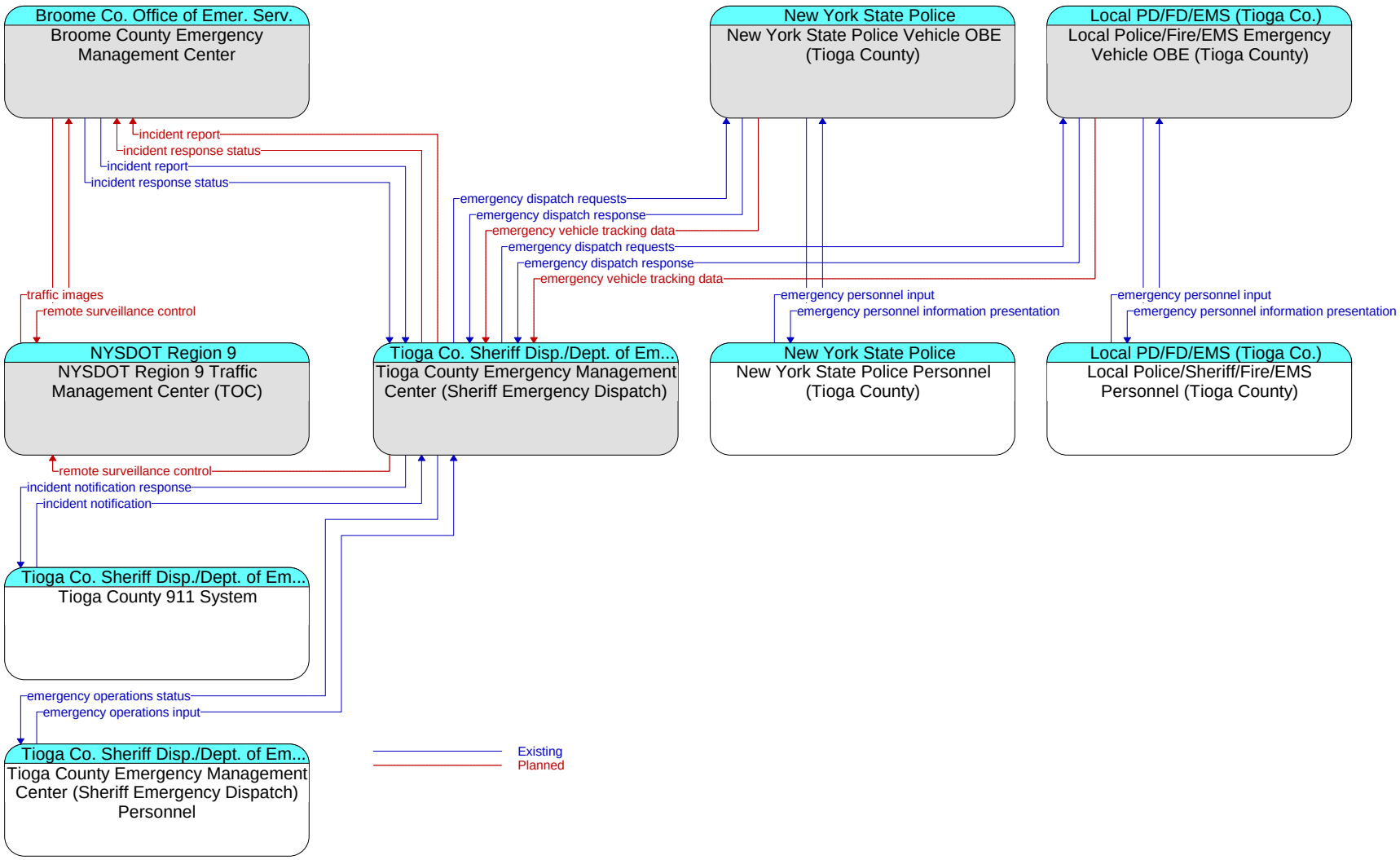
Service Package:
MC08 Maintenance and Construction Activity Coordination



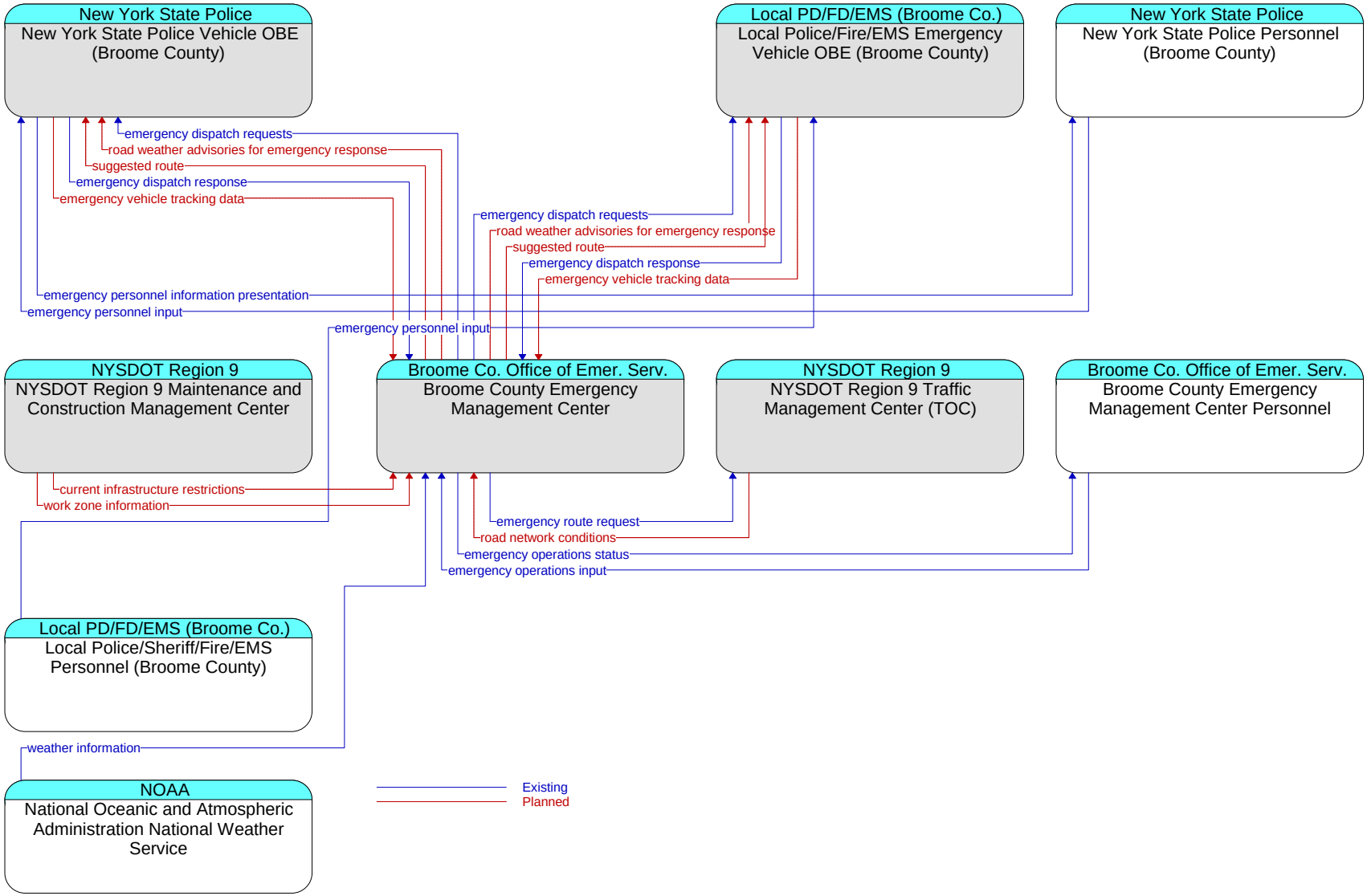
Service Package:
PS01 Emergency Call Taking and Dispatch (Broome County)



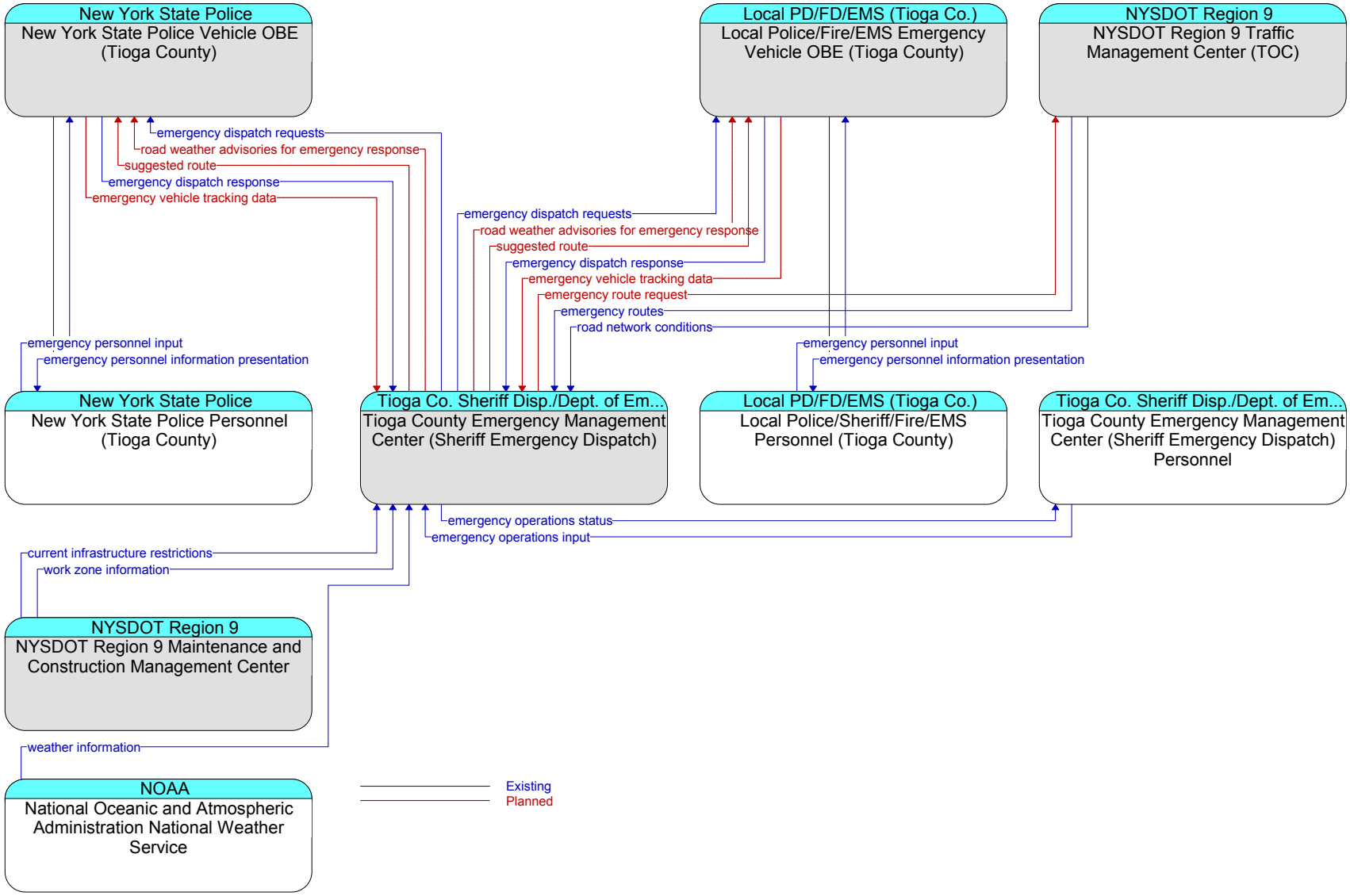
Service Package:
PS01 Emergency Call Taking and Dispatch (Tioga County)



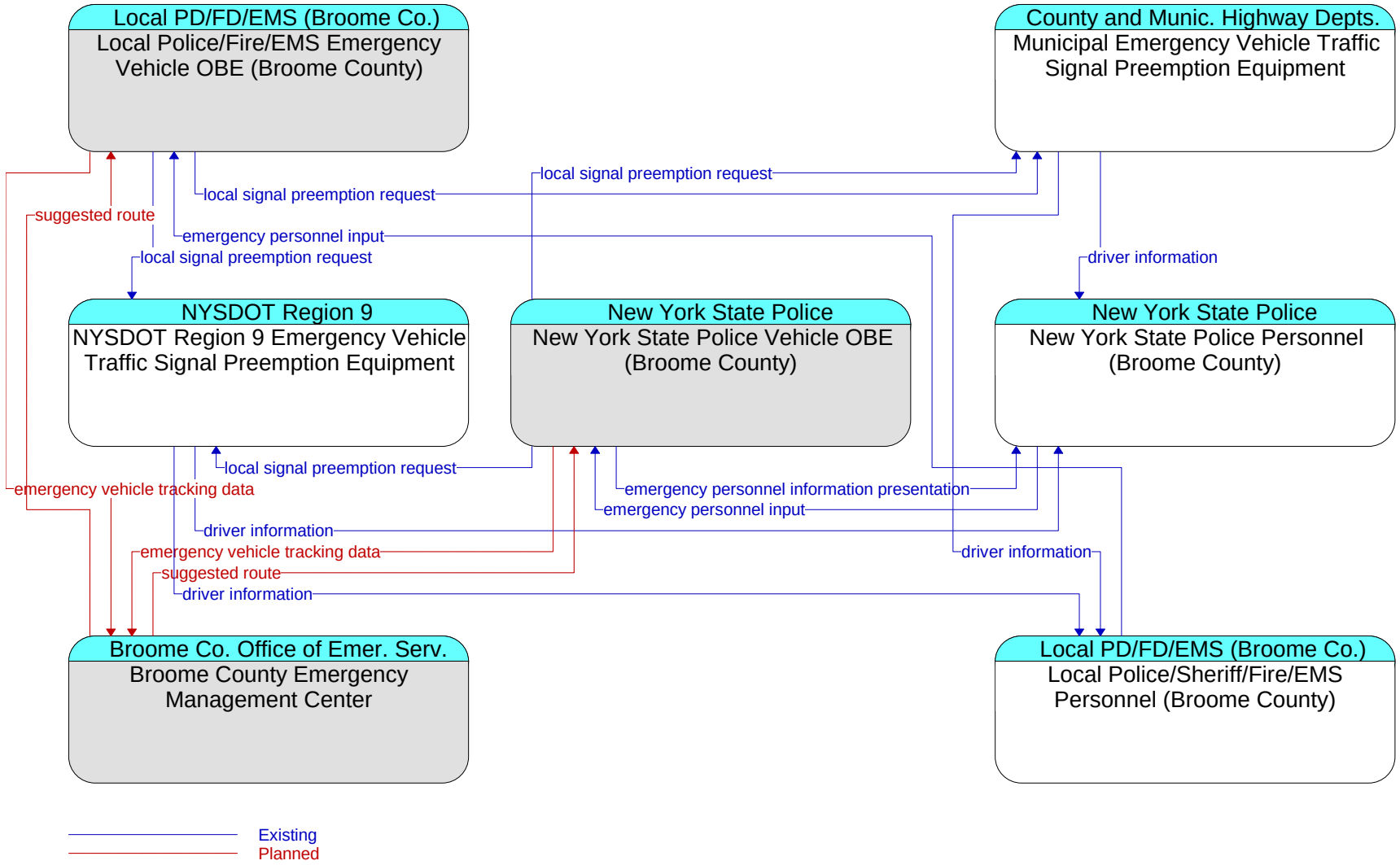
Service Package:
PS02 Routing Support for Emergency Responders (Broome County)



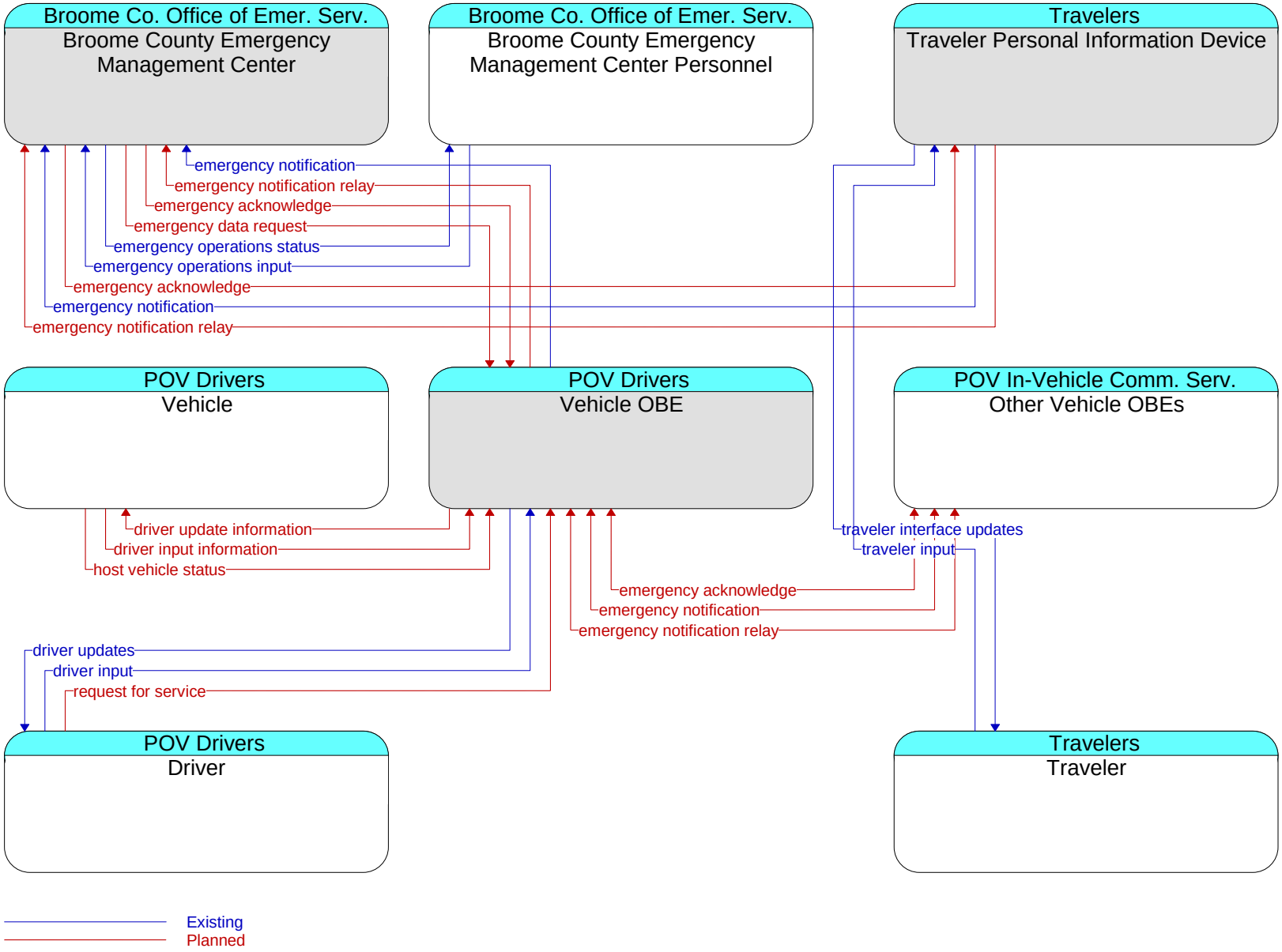
Service Package:
PS02 Routing Support for Emergency Responders (Tioga County)



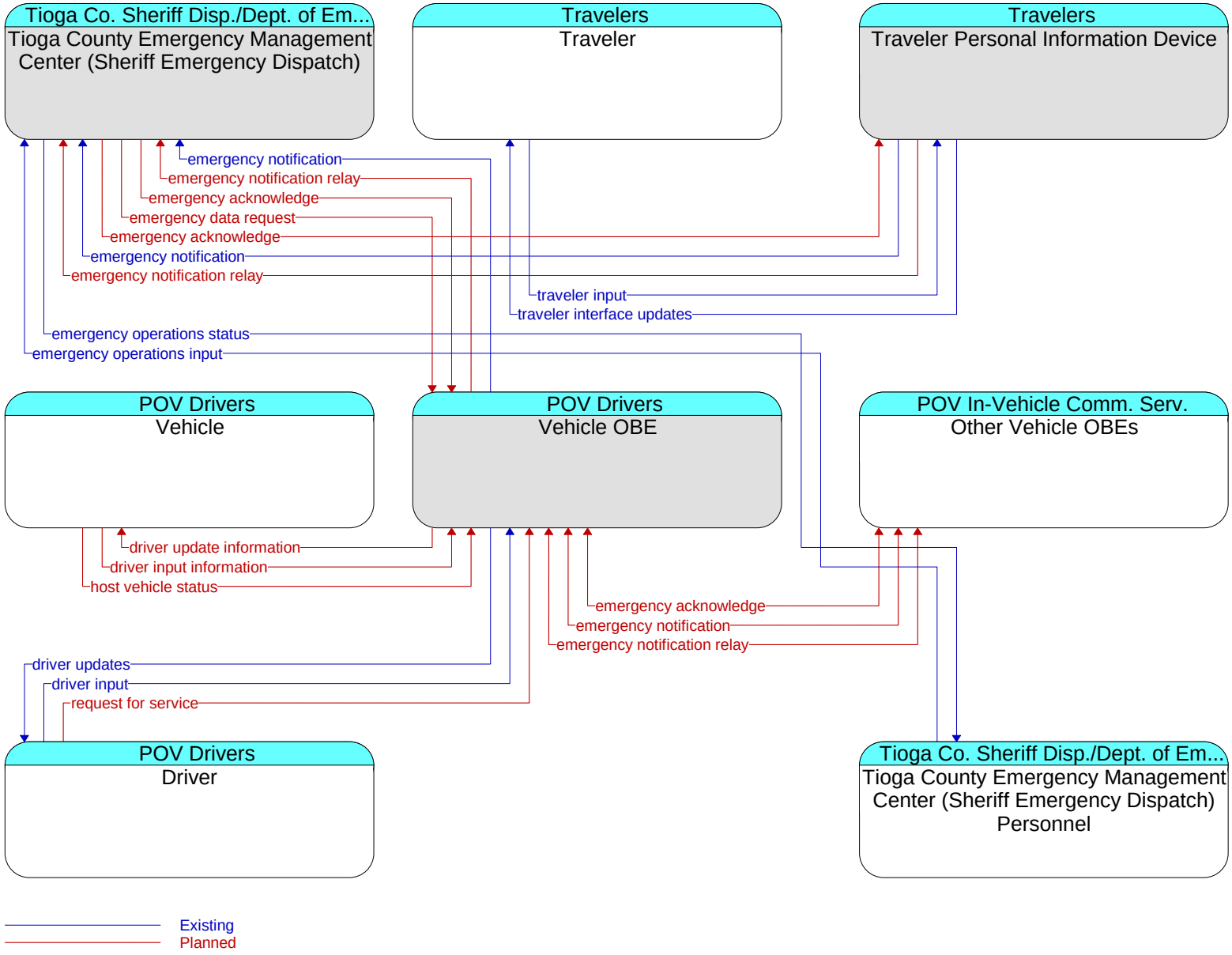
Service Package:
PS03 Emergency Vehicle Preemption



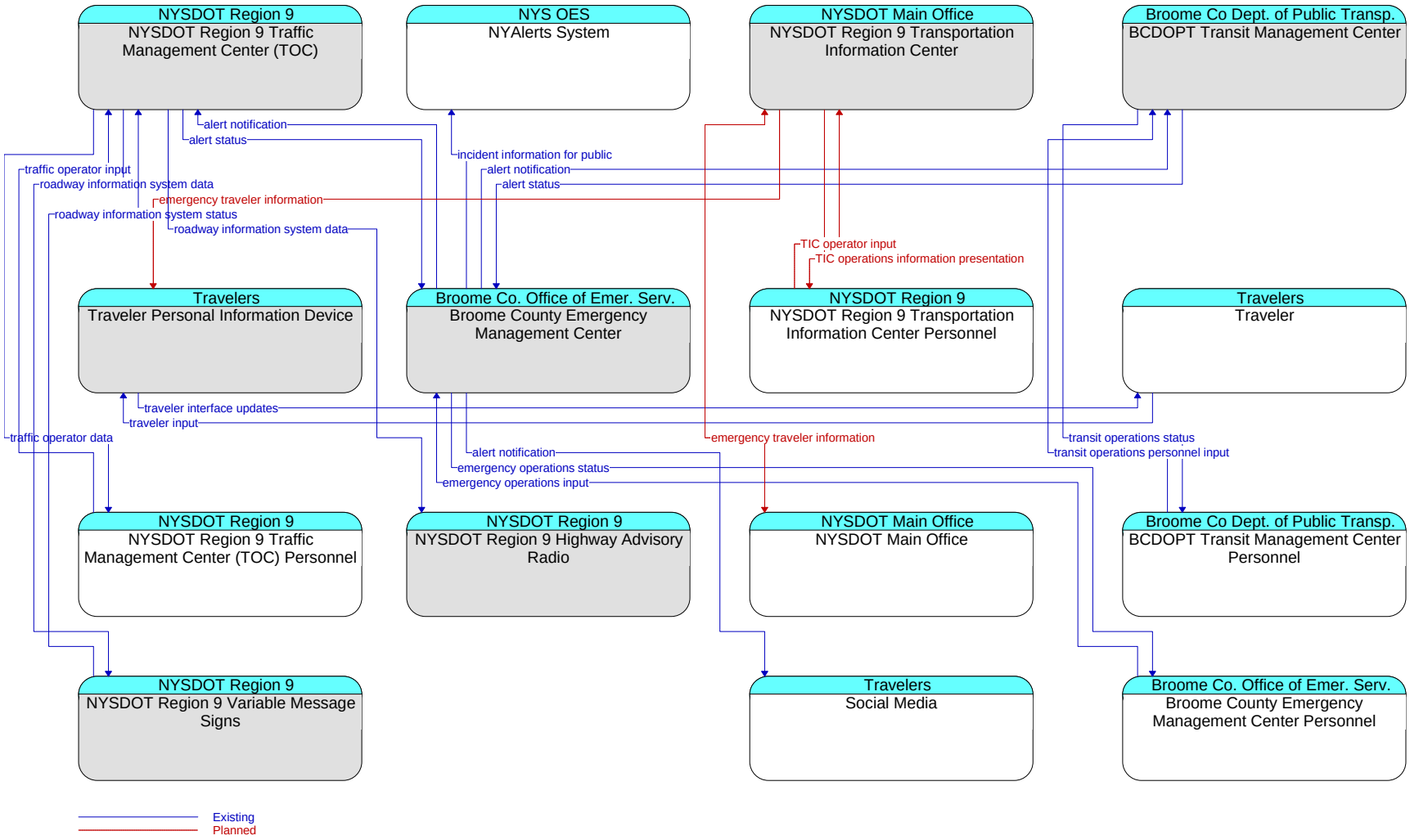
Service Package:
PS04 Mayday Notification (Broome County)



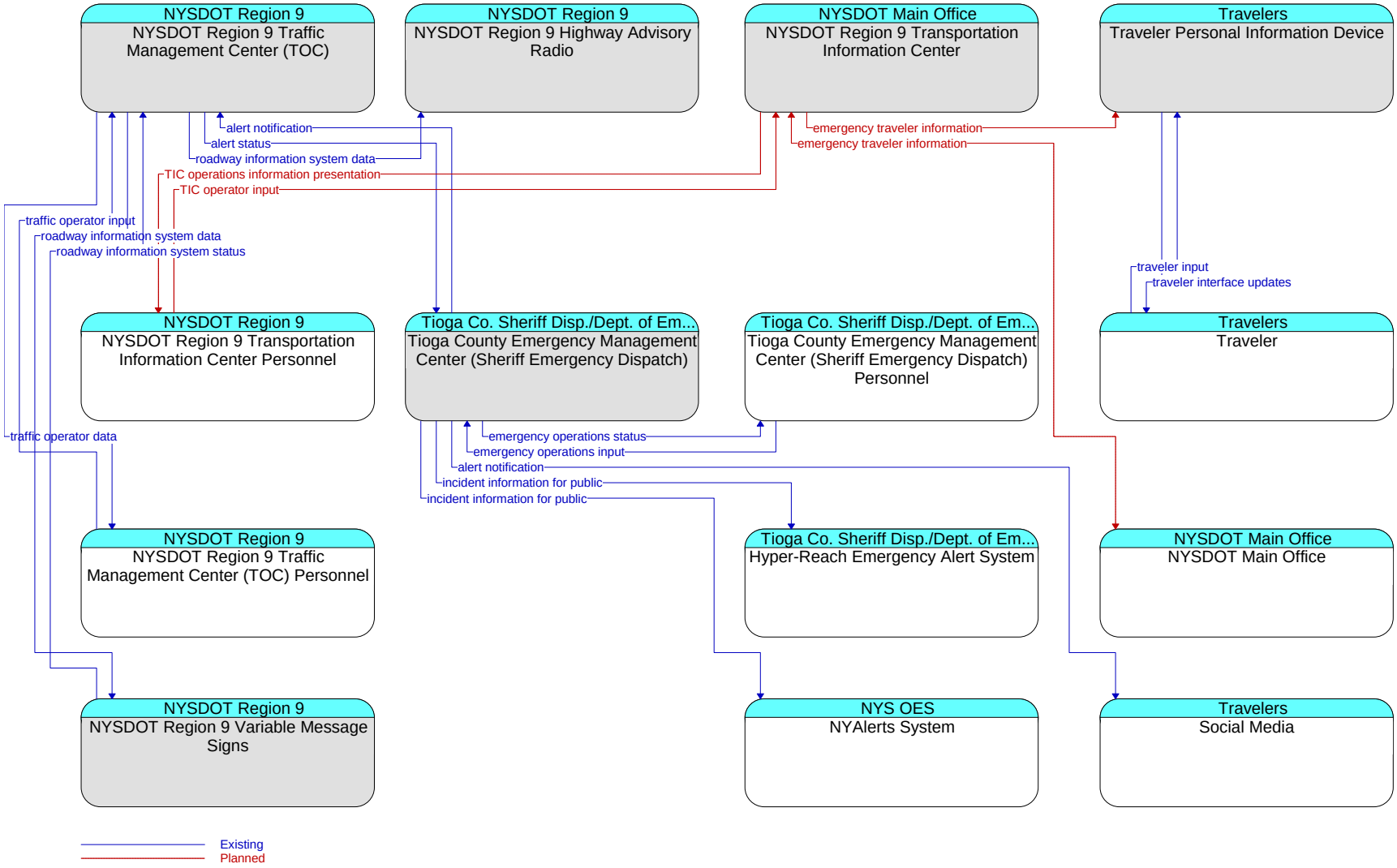
Service Package:
PS04 Mayday Notification (Tioga County)



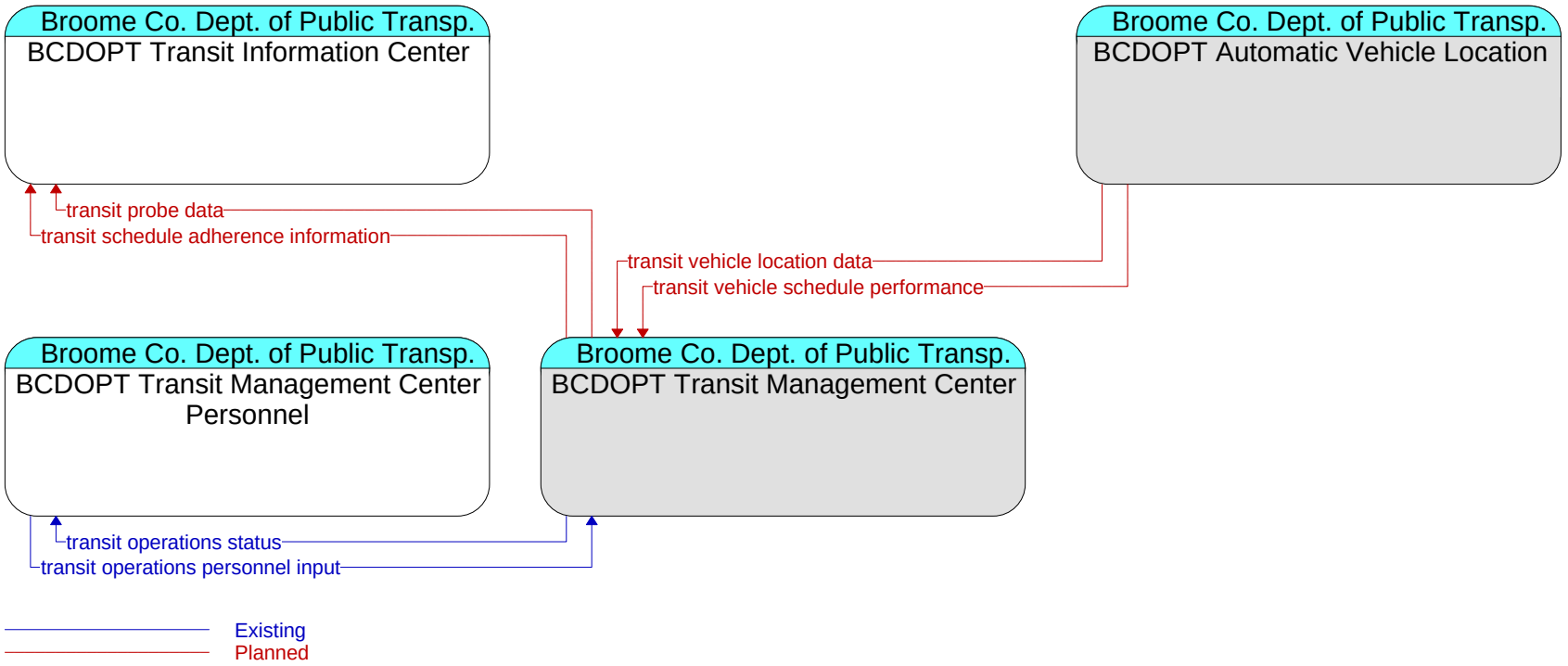
Service Package:
PS10 Wide-Area Alert (Broome County)



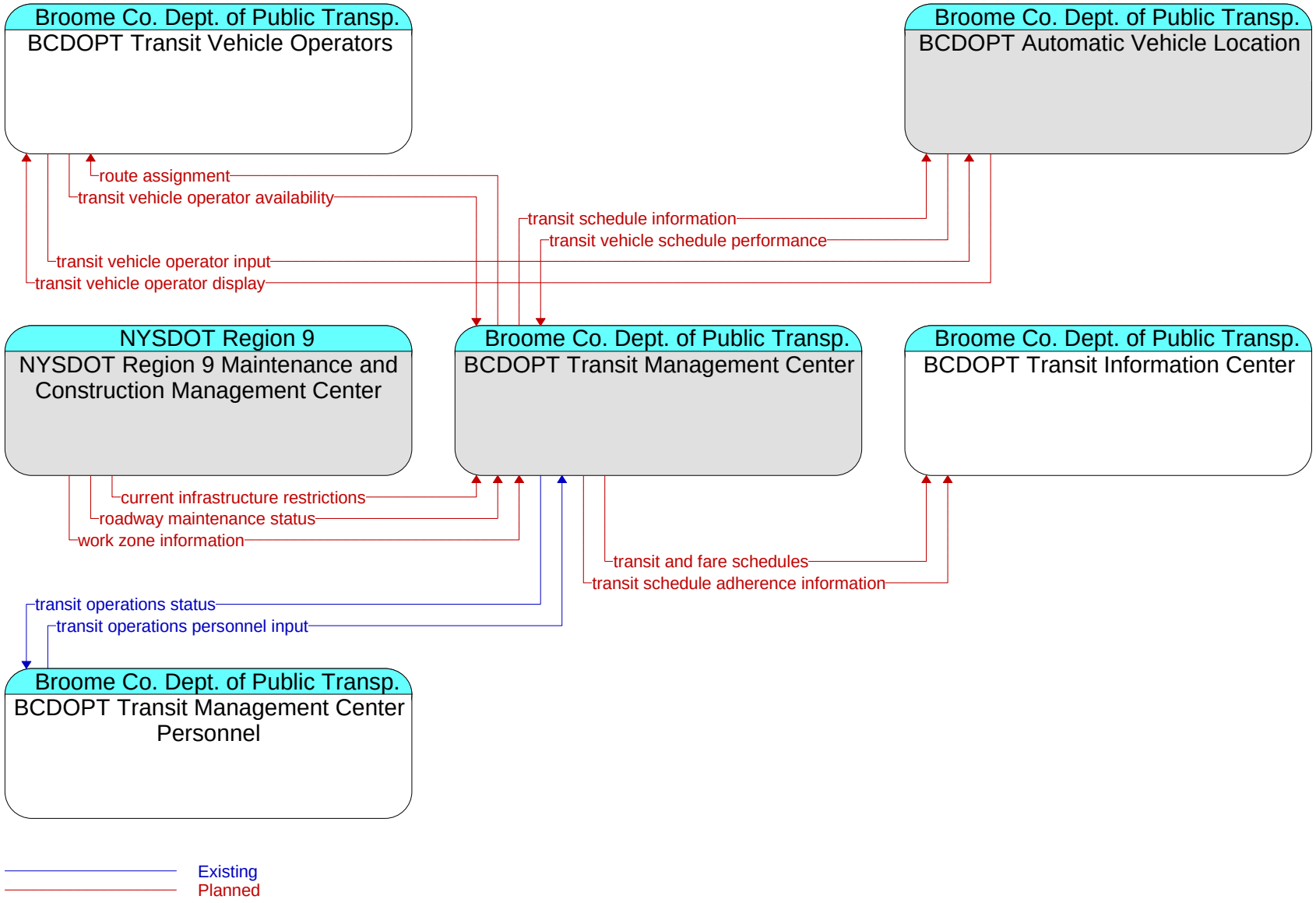
Service Package:
PS10 Wide-Area Alert (Tioga County)



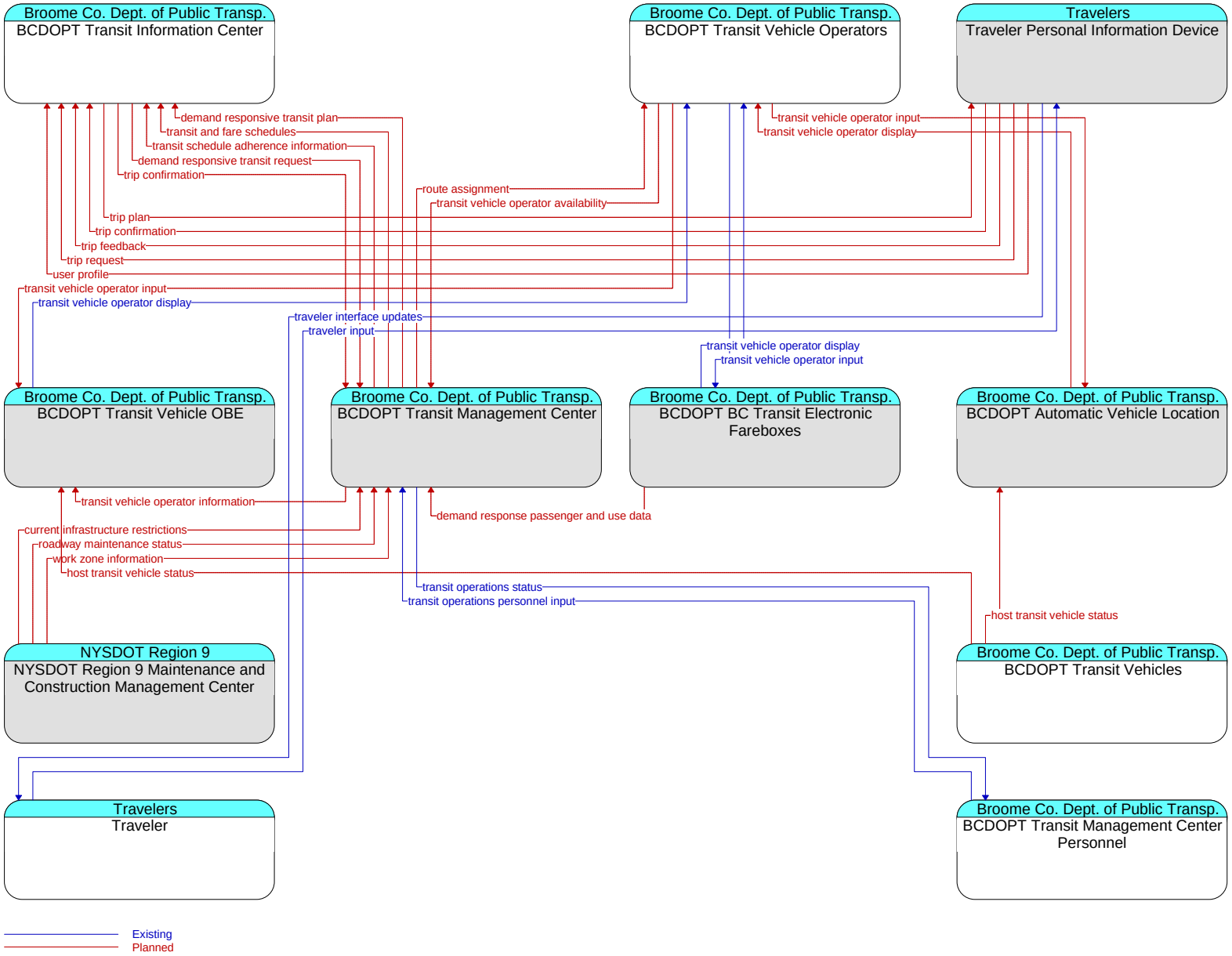
Service Package:
PT01 Transit Vehicle Tracking



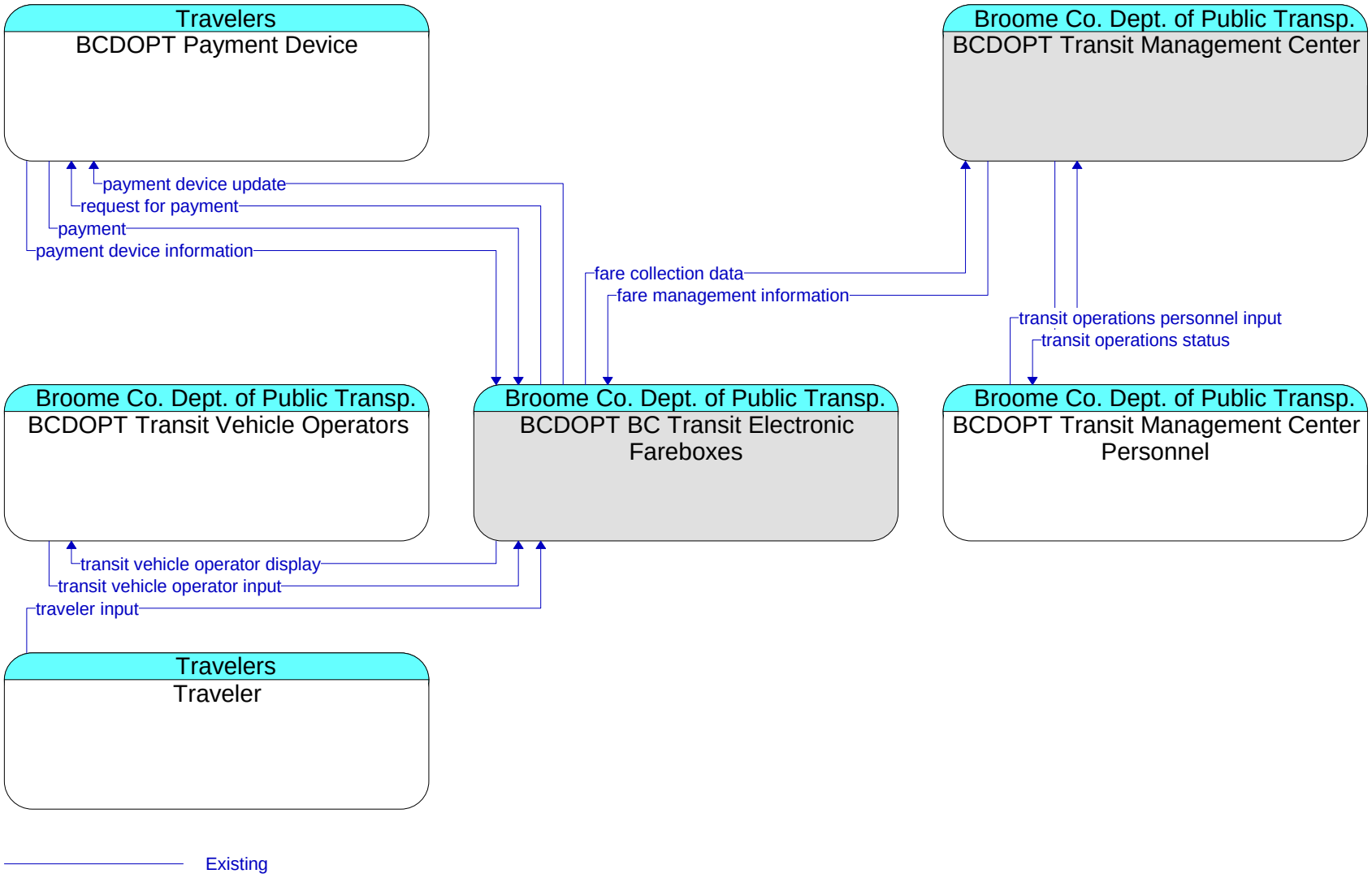
Service Package:
PT02 Transit Fixed-Route Operations



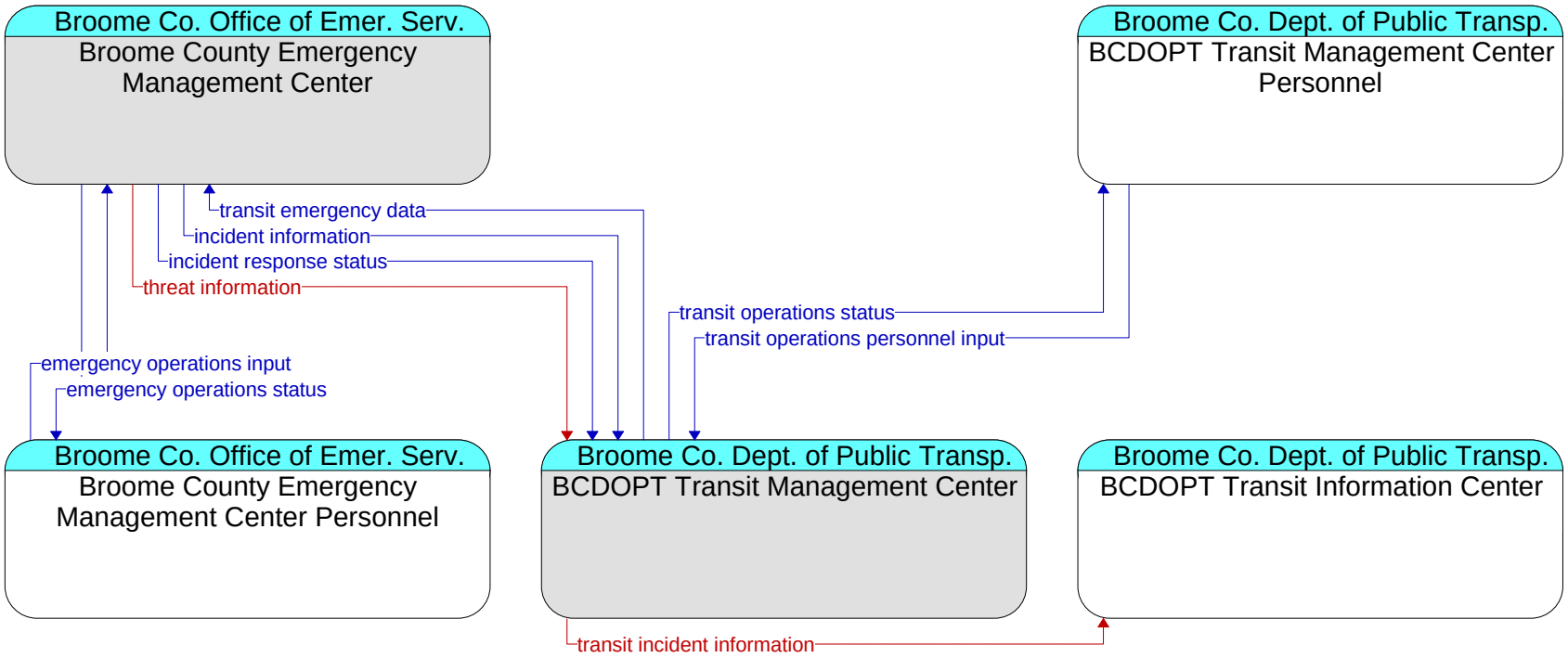
Service Package:
PT03 Dynamic Transit Operations



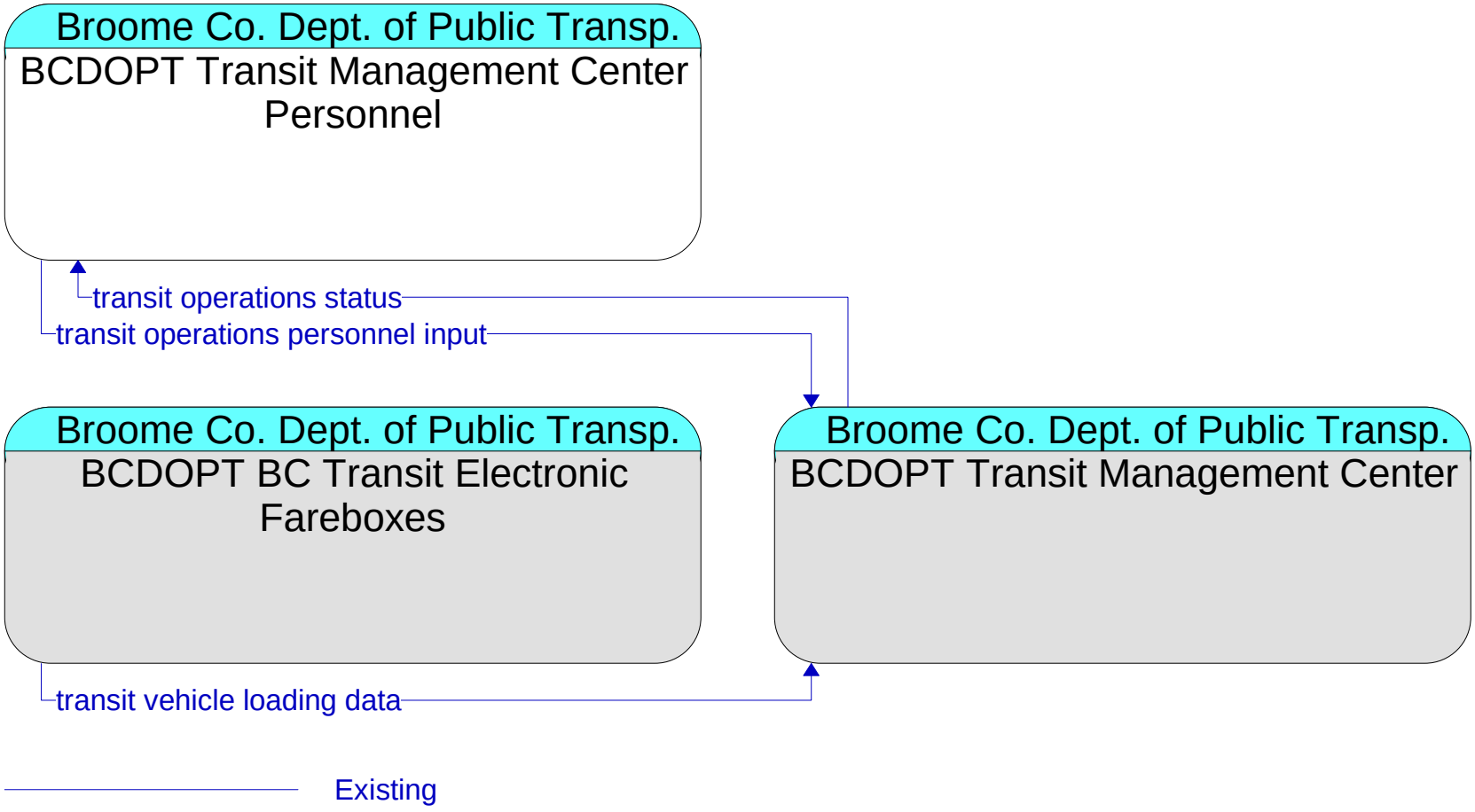
Service Package:
PT04 Transit Fare Collection Management



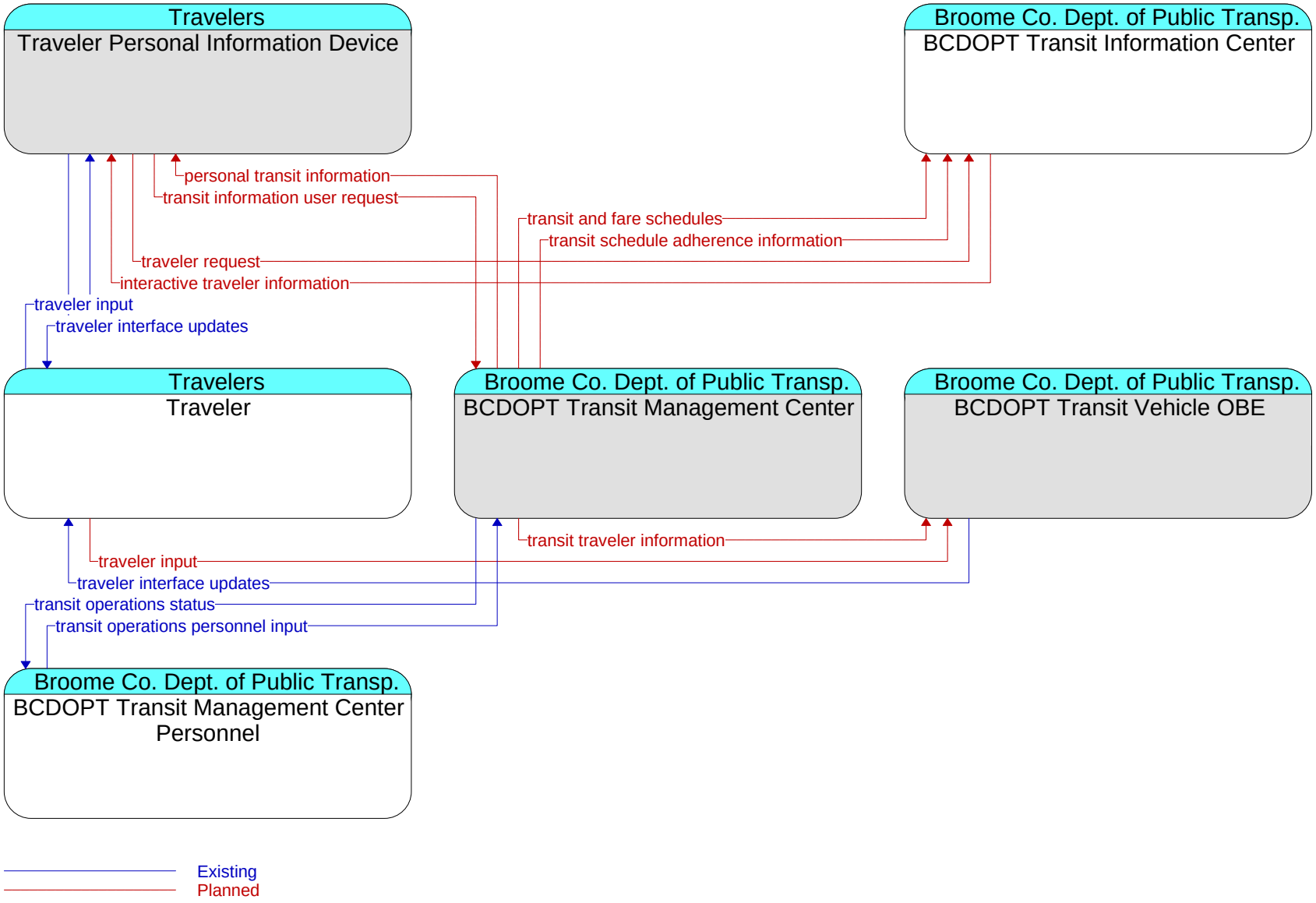
Service Package:
PT05 Transit Security



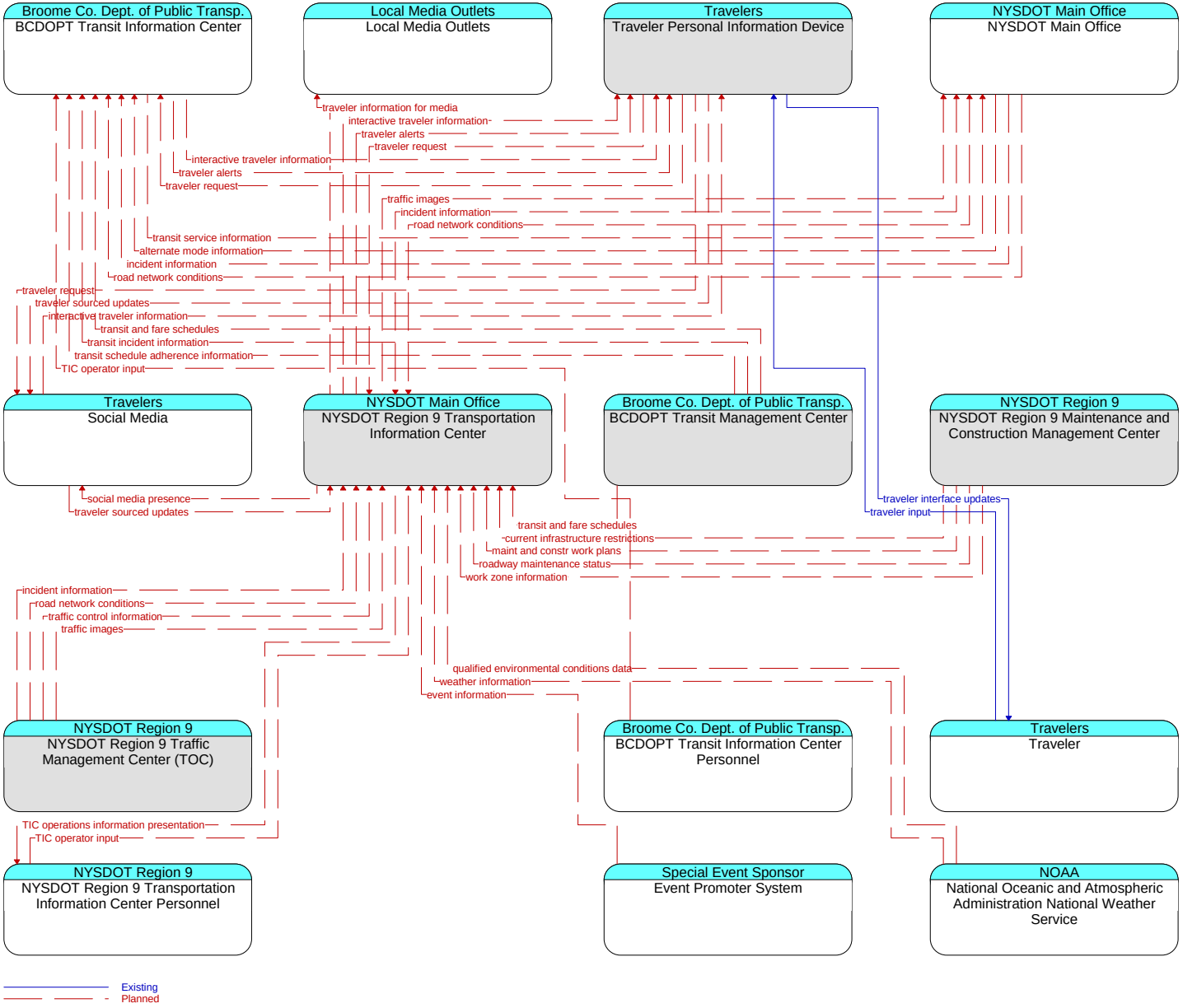
Service Package:
PT07 Transit Passenger Counting



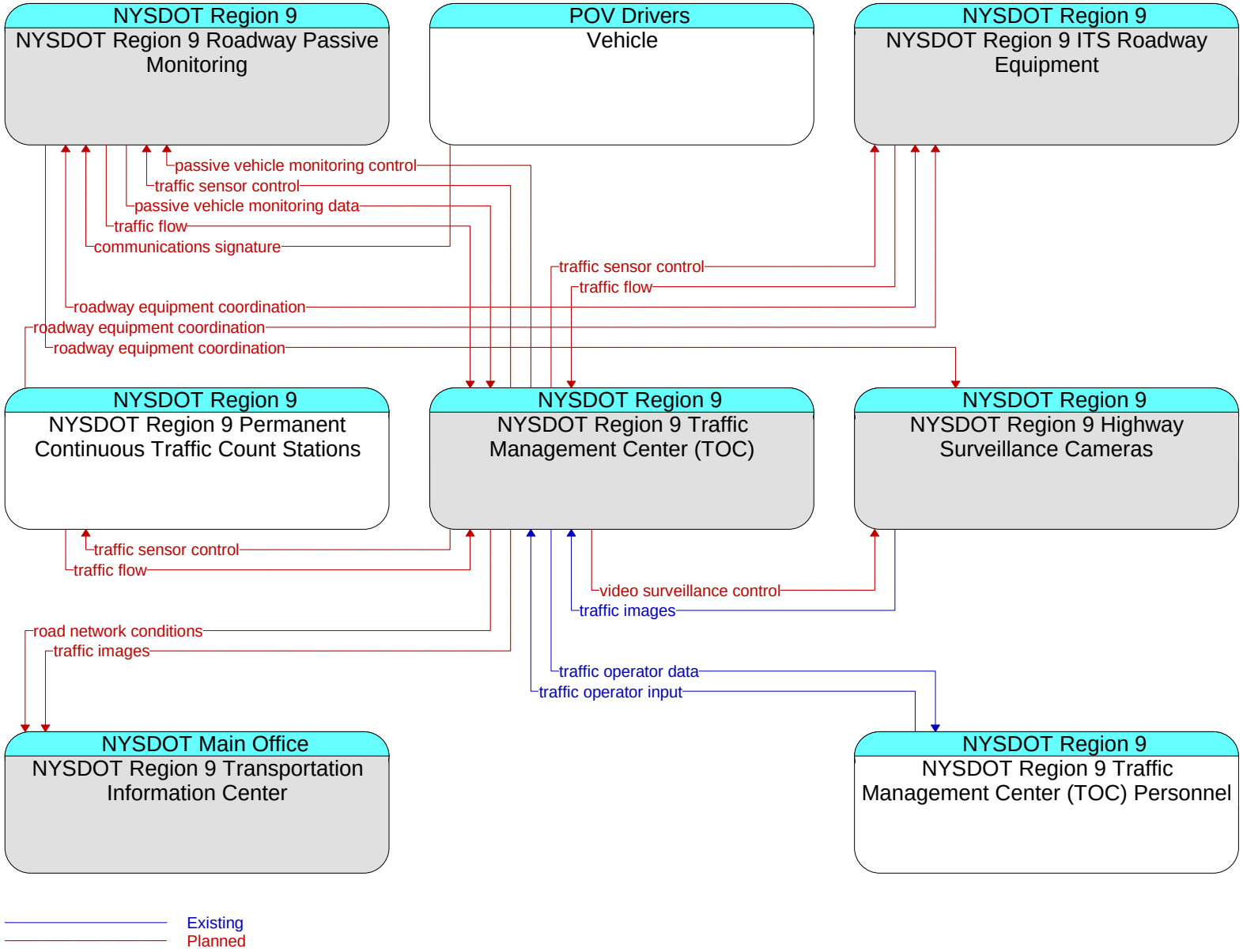
Service Package:
PT08 Transit Traveler Information



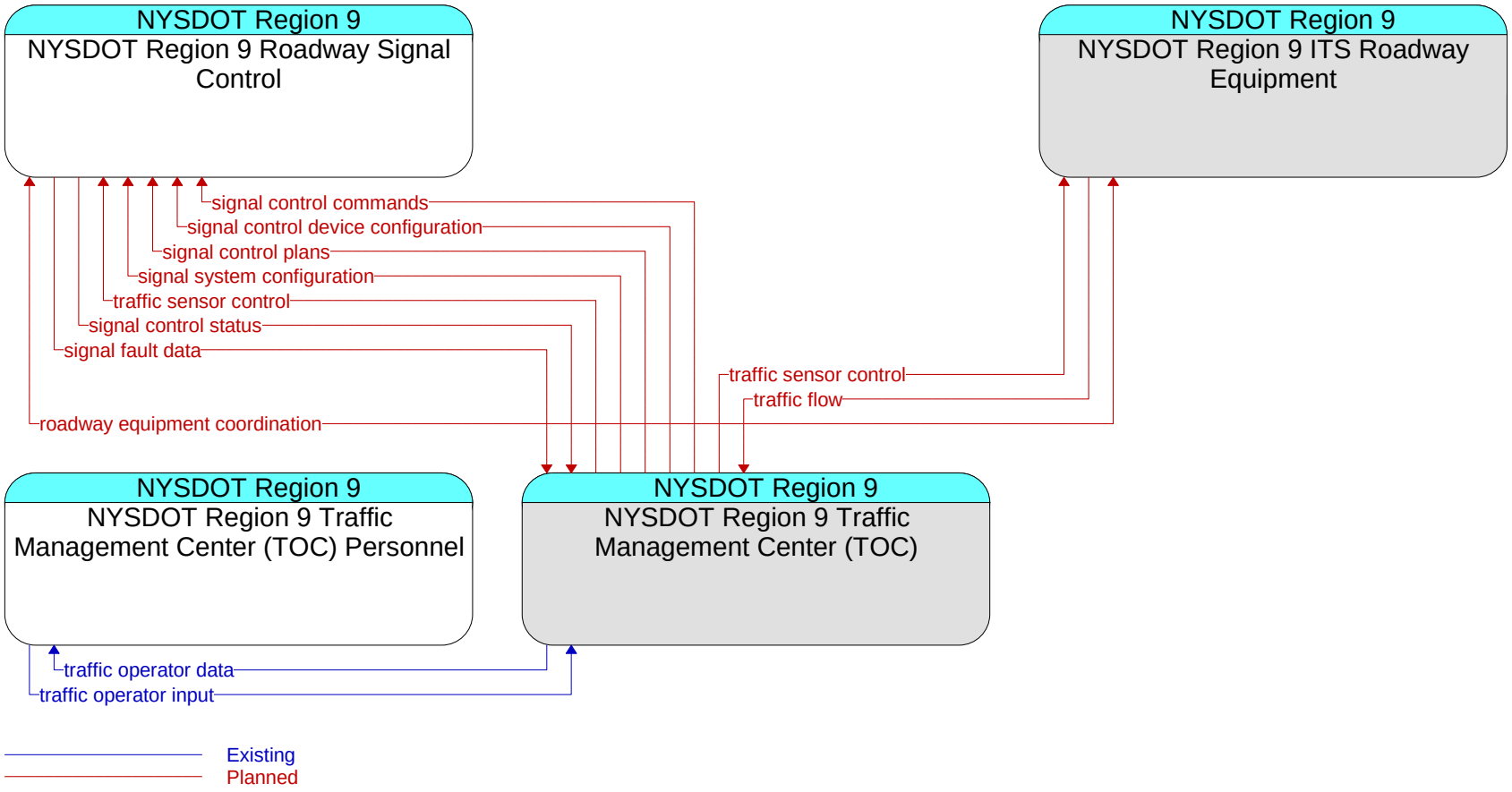
Service Package:
TI02 Personalized Traveler Information



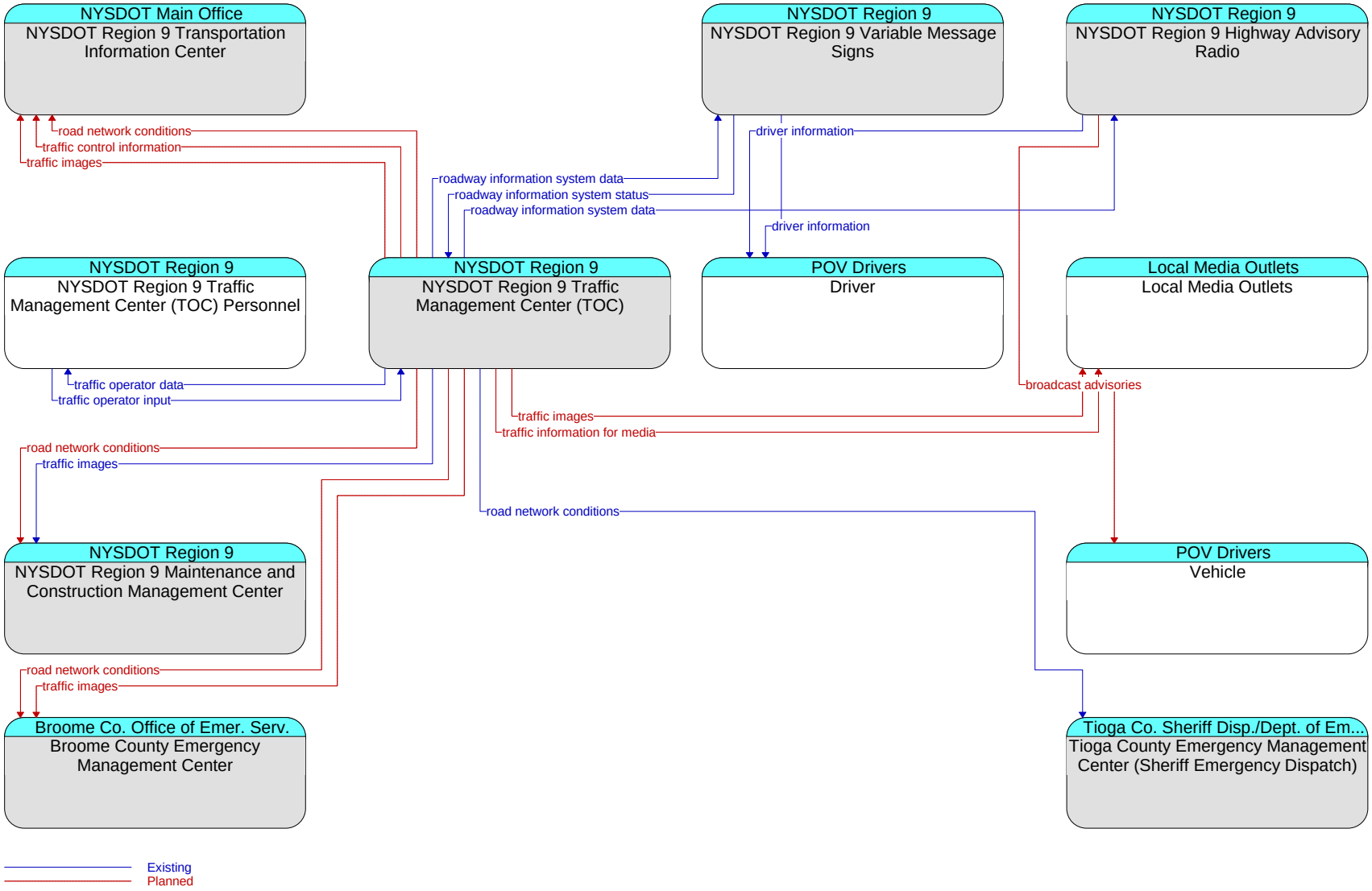
Service Package:
TM01 Infrastructure-Based Traffic Surveillance



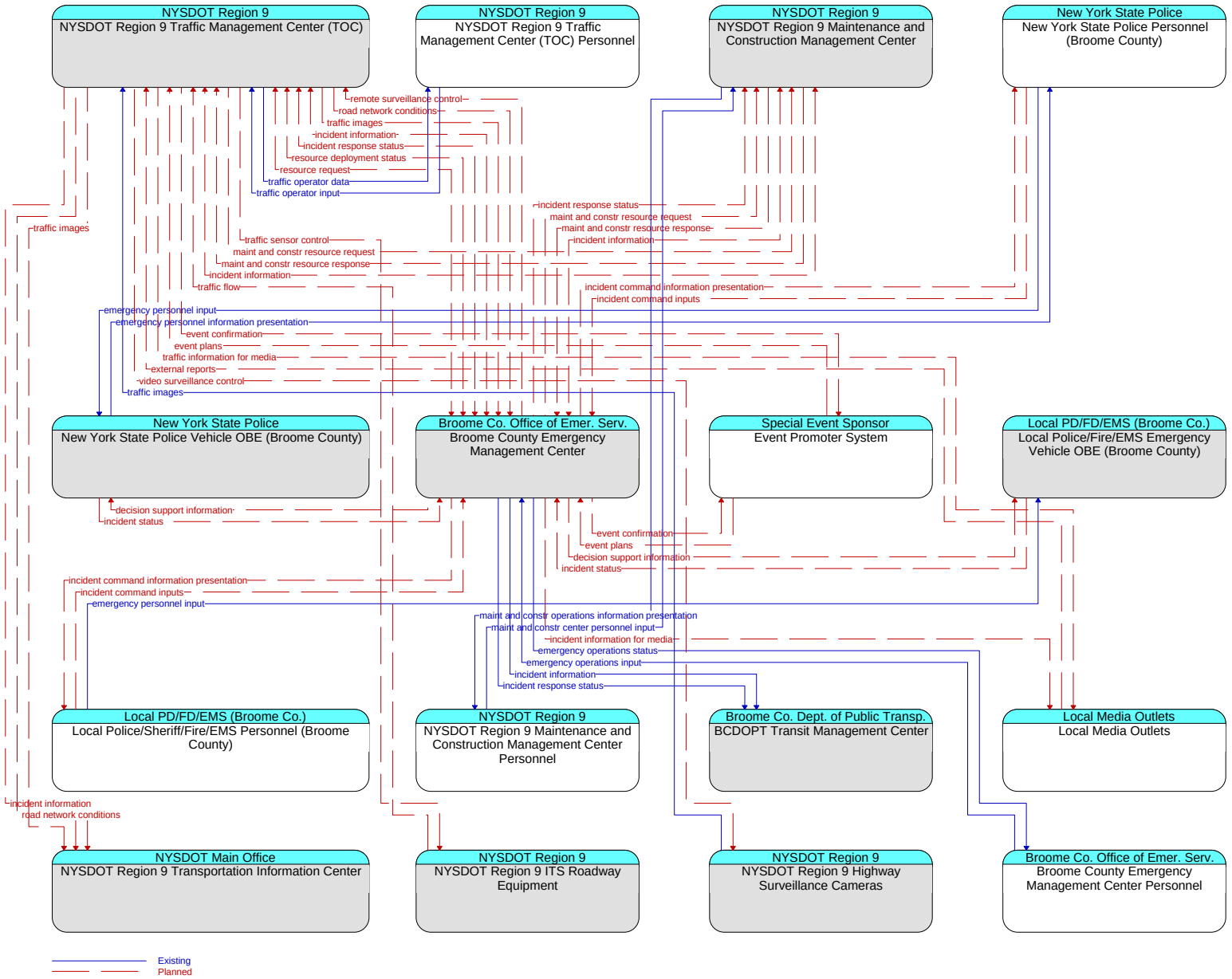
Service Package:
TM03 Traffic Signal Control



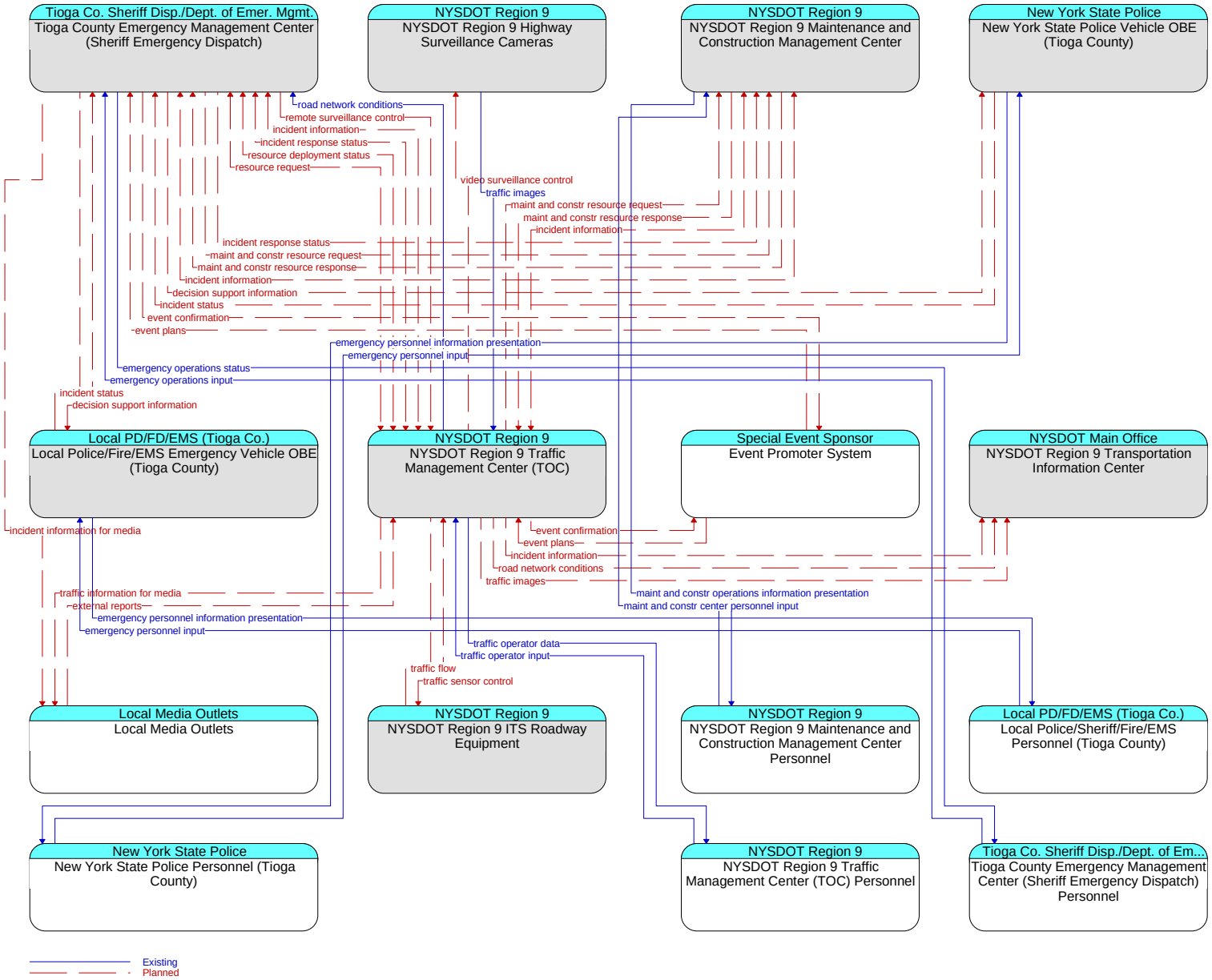
Service Package:
TM06 Traffic Information Dissemination



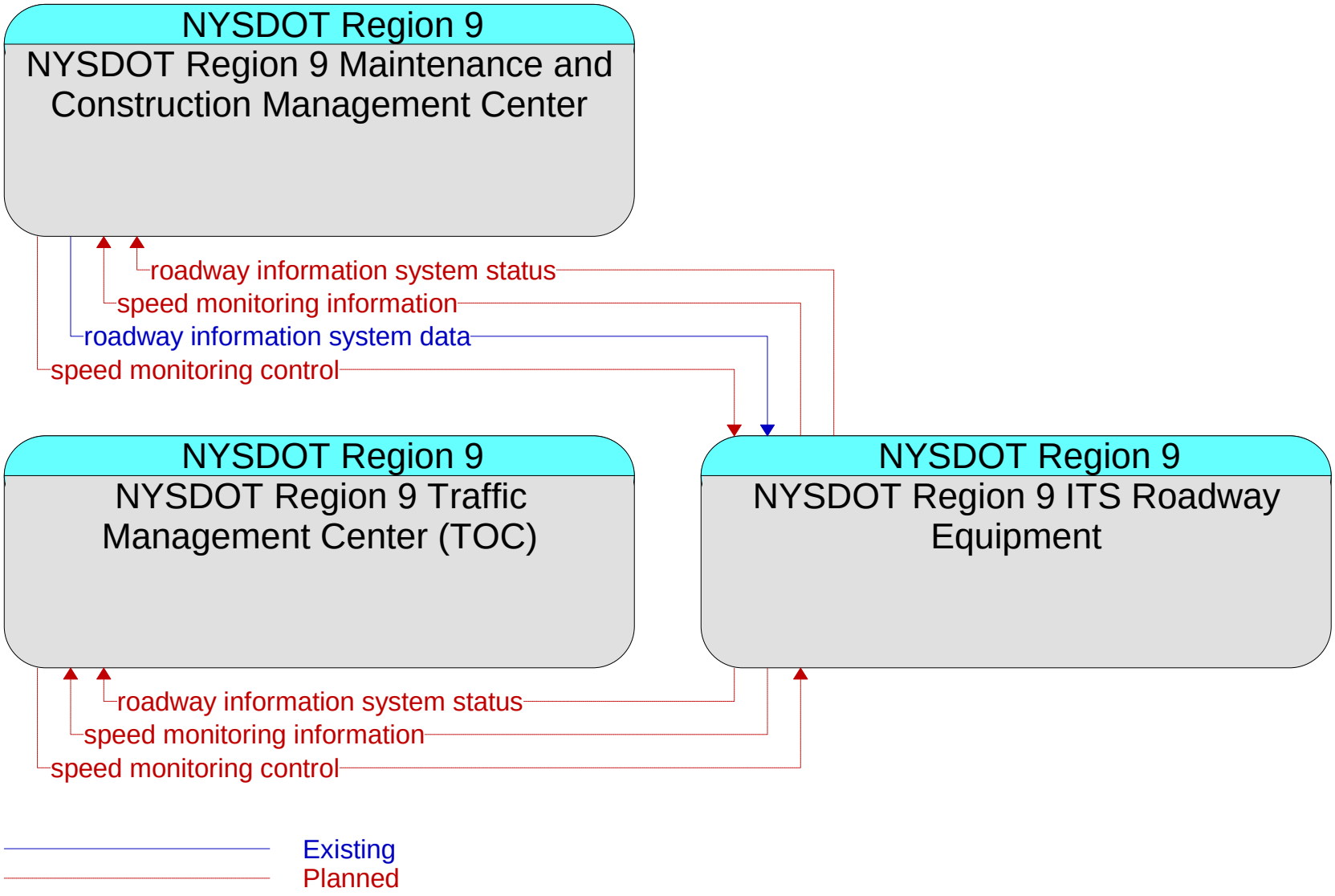
Service Package:
TM08 Traffic Incident Management System (Broome County)



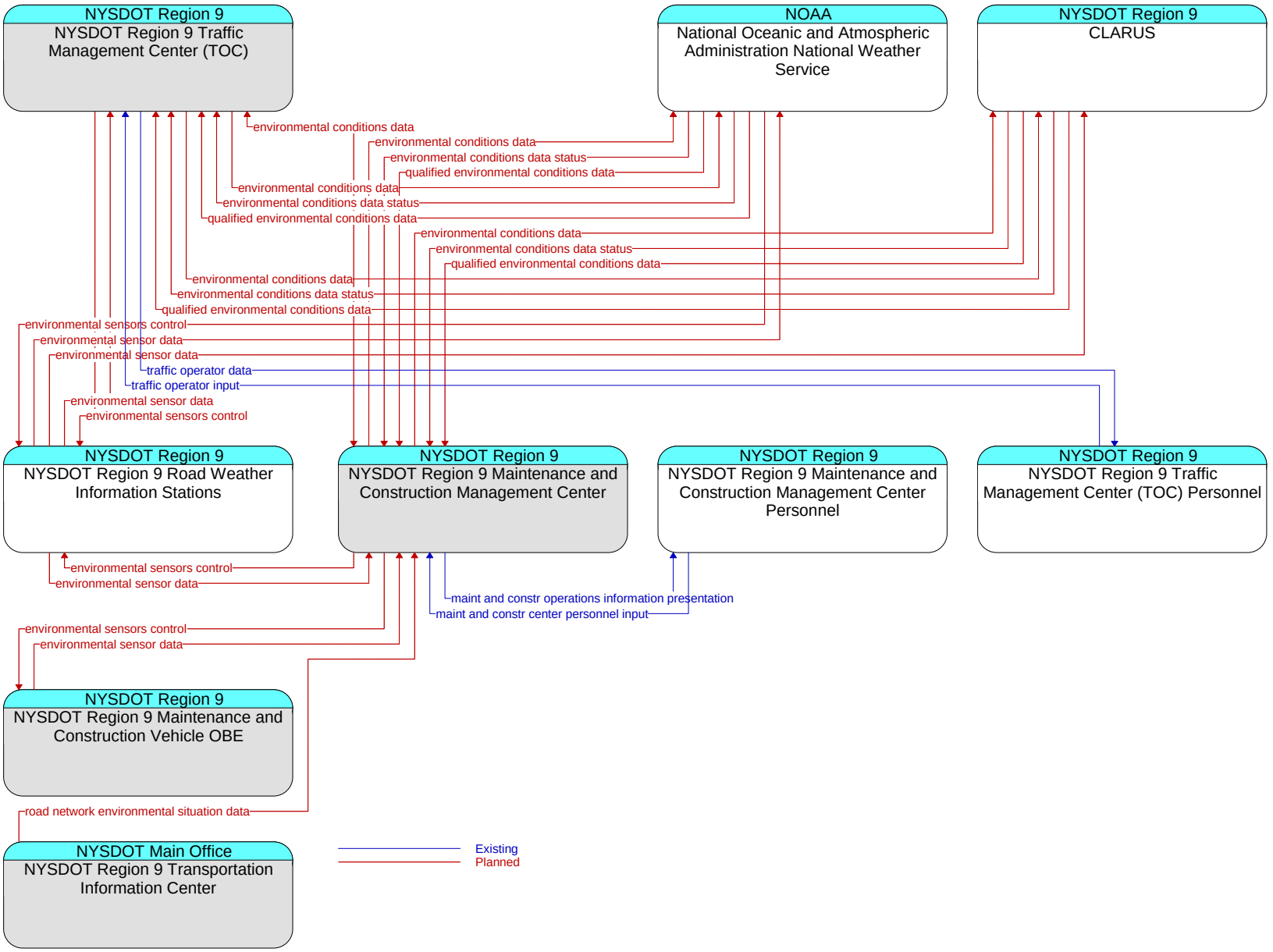
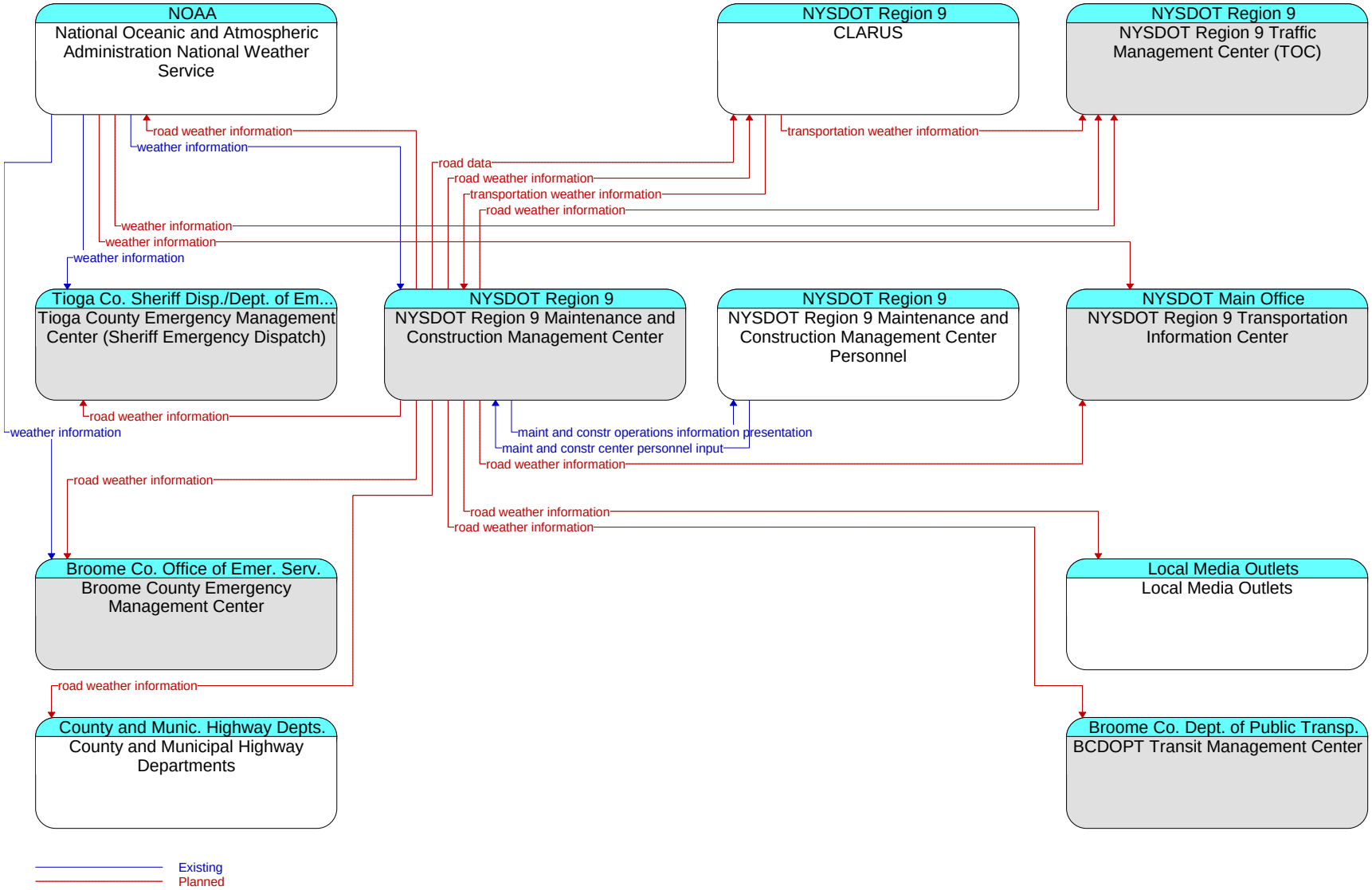
Service Package:
TM08 Traffic Incident Management System (Tioga County)



Service Package:
TM17 Speed Warning and Enforcement



Service Package:
WX01 Weather Data Collection



Service Package:
WX02 Weather Information Processing and Distribution