

Intelligent Transportation Systems (ITS) Architecture Comprehensive Update

Architecture Report

Prepared For:



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September 2019

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Executive Summary

The Northeast Ohio Area Coordinating Agency (NOACA) Regional Intelligent Transportation Systems (ITS) Architecture is a roadmap for the deployment and integration of ITS in the NOACA planning area for the next ten years. The NOACA planning area, defined as the region in this Architecture, geographically covers Cuyahoga, Lake, Geauga, Lorain, and Medina Counties in northeastern Ohio. The NOACA Regional ITS Architecture provides a framework for institutional agreements and technical integration of ITS implementation projects in the region. It describes the “big picture” for ITS deployment in terms of individual ITS components that will perform the functions necessary to deliver the desired needs. It supports effective and efficient deployment of transportation and ITS projects that address the transportation problems and needs in the region.

The NOACA Regional ITS Architecture is an open and integrated ITS architecture that is compliant with the Federal Highway Administration (FHWA) Final Rule and Federal Transit Administration (FTA) Policy on ITS Architecture and Standards. The architecture has been developed through a cooperative effort by the highway, transit, law enforcement, emergency management, commercial vehicle and freight management agencies. It represents a shared vision of how each agency’s systems work together by sharing information and resources to enhance transportation safety, efficiency, capacity, mobility, reliability, and security.



The purpose of the NOACA Regional ITS Architecture is to illustrate and document the integration of regional ITS systems to allow planning and deployment to occur in an organized and coordinated process. The architecture helps guide the planning, implementation, and integration of ITS devices deployed and managed by multiple types of agencies that provide transportation services within the region.

The Architecture helps to accomplish the following objectives for ITS deployment in the region:

- Facilitate stakeholder coordination in ITS planning, deployment and operations;
- Reflect the current state of ITS planning and deployment within a region;
- Provide high-level planning for enhancing regional transportation systems using current and future ITS technologies as well as emerging technologies such as smart cities, automated and connected vehicles; and
- Conform with the National ITS Architecture and FHWA Final Rule 940 and FTA Final Policy on ITS Architecture and Standards.

The NOACA Regional ITS Architecture describes coordination of overall system operations by defining interfaces between equipment and systems which have been or will be deployed by different organizational or operating agencies in the region. The Architecture identifies the current ITS deployment and how these systems interact and integrate with each other. It also builds on the existing systems and addresses the additional components deemed necessary to grow the ITS systems in the region over the next ten years to accommodate specific needs and issues of participating stakeholders.



ITS Standards are fundamental to the establishment of an open ITS environment that achieves the goals originally envisioned by the United States Department of Transportation (USDOT). Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances and new approaches evolve. Standards can be thought of as the glue that holds the various pieces of architecture together. They define how the communications within an ITS environment take place.

While the NOACA Regional ITS Architecture includes various ITS applications, it does not cover every conceivable ITS technology. As such, not all ITS standards will be applicable to the existing ITS component and future deployment. ITS standards applicable to the region's ITS were identified and documented in the website of the architecture as well as in the architecture database. It is important that stakeholders are aware of the importance of ITS standards, especially with respect to cost, risk, and interoperability issues both within the region and when connecting with other ITS architecture regions. These standards can save money in the long run, and make sure that various devices and systems "play well together".

The NOACA Regional ITS Architecture is documented in three forms. The first is this report which provides technical-oriented but high-level information regarding various aspects of the architecture. The second form is an architecture website that provides detailed architecture outputs in an organized web environment. The third is an architecture database that is prepared using the Regional Architecture Development for Intelligent Transportation (RAD-IT), a software tool developed by FHWA for developing ITS architectures. The details of the NOACA Regional ITS Architecture, including definitions of stakeholders, ITS inventory, projects, stakeholder roles and responsibilities, ITS services, interfaces among ITS systems, functional requirements, standards and agreements, are captured in the architecture database and the website of the architecture.

A companion Northeast Ohio ITS Strategic Plan was developed in conjunction with the architecture update effort. The ITS Strategic Plan defines the region's vision for ITS implementation, identifies regional ITS gaps and needs, and presents feasible ITS projects to consider for short, medium and long-term implementation. The ITS Strategic Plan aligns closely with the Regional ITS Architecture, supporting the identification and understanding of projects to be considered and included in the architecture.



1.0 Introduction

The Northeast Ohio Area Coordinating Agency (NOACA) Regional Intelligent Transportation Systems (ITS) Architecture is a roadmap for transportation systems integration in NOACA's five county (Cuyahoga, Lake, Geauga, Lorain, and Medina) northeastern Ohio region over the next ten years. The architecture has been developed through a cooperative effort by the region's transportation agencies, covering all modes and all roads in the region. The architecture represents a shared vision of how each agency's systems will work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travelers in the region.

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

- Planning Agencies to better reflect integration opportunities and operational needs into the transportation planning process.
- Operating Agencies to recognize and plan for transportation integration opportunities in the region.
- Other organizations and individuals that use the transportation system in the NOACA region.

The architecture provides an overarching framework that spans all of these organizations and individual transportation projects. Using the architecture, each transportation project can be viewed as an element of the overall transportation system, providing visibility into the relationship between individual transportation projects and ways to cost-effectively build an integrated transportation system over time. The architecture is described by this report, by a database in the Regional Architecture Development for Intelligent Transportation (RAD-IT) software format, and by a website that can be found at <https://noaca-its.aecomonline.net/Web/web/index.html>.

1.1 Document Overview

This report is organized into twelve sections:

- Section 1 – Introduction: Provides introductory information on the Regional ITS Architecture.
- Section 2 – Regional ITS Architecture Development Process: Describes the process used to update the Regional ITS Architecture
- Section 3 – Stakeholders: Describes the regional stakeholders involved in updating the Regional ITS Architecture
- Section 4 – Needs and Gap Assessment: Presents how stakeholder needs were identified and how ITS technologies help to meet those transportation related needs
- Section 5 – Inventory: Describes the various ITS technologies that are managed by regional stakeholders
- Section 6 – Service Packages and Interfaces: Identifies the Service Packages that in which ITS technologies are defined through the National ITS Reference Architecture
- Section 7 – Functional Requirements: Discusses the activities that are currently performed or planned to be performed by ITS systems in the region to provide regional ITS services.
- Section 8 – Standards: Identifies ITS standards for the region based on the ITS technologies are existing and planned for the region
- Section 9 – Agreements: Describes existing and potential agreements that can support operations, maintenance and management of ITS technologies

- Section 10 – Using the Regional ITS Architecture: Describes how NOACA can use the Regional ITS Architecture to support continued ITS deployment in the region
- Section 11 – Architecture Maintenance Plan: Describes how to maintain the Regional ITS Architecture over time
- Section 12 – Regional Strategic Plan Framework: Defines the short, medium, and long term ITS projects that have been planned for the region

1.2 Description of the Region

NOACA serves as the Metropolitan Planning Organization (MPO) for Lorain, Medina, Cuyahoga, Lake and Geauga Counties in northeast Ohio, and this Regional ITS Architecture provides a framework for institutional agreements and technical integration of ITS implementation projects in the region. It describes the “big picture” for ITS deployment in terms of individual ITS components that will perform the functions necessary to deliver the desired needs. It supports effective and efficient deployment of transportation and ITS projects that address the transportation problems and needs in the region.

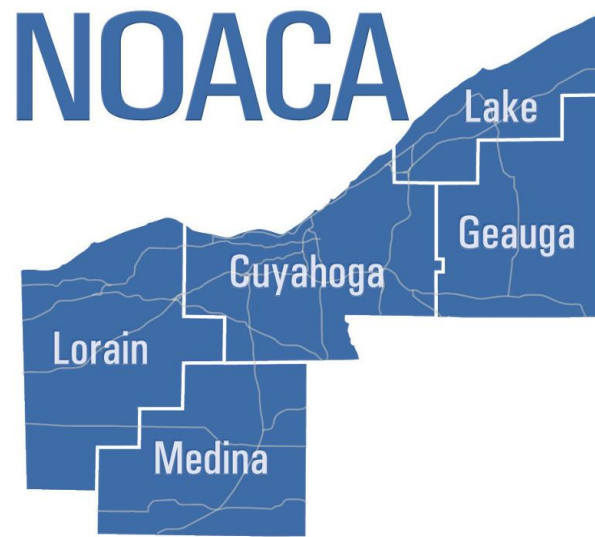


Figure 1. The Five-County NOACA Region

The NOACA Regional ITS Architecture provides approximately a ten-year outlook for ITS activities in the region. The architecture addresses existing ITS systems as well as those planned for development over the next ten years. It represents a snapshot of the currently anticipated projects based on information from stakeholders. As such, the architecture will require regular updates to ensure that it maintains accurate representation of the region.

The architecture covers services across a broad range of ITS, including traffic management, transit management, traveler information, emergency services, data management, maintenance and construction operations, electronic payment, parking management, road/weather information management, and automated and connected vehicles. Commercial vehicle services are covered as they relate to regional integration, but a more complete coverage of these would be provided at a statewide architecture level.

2.0 Regional ITS Architecture Development Process

2.1 Process Used to Create the Architecture

The process used to develop the NOACA Regional ITS Architecture is illustrated in Figure 2. This figure shows six general steps in the “life-cycle” of an ITS architecture. In the first four steps, the ITS architecture components are developed and then these components are used and maintained in steps 5 and 6. The development process begins with basic scope definition and team building and moves through increasingly detailed steps, culminating in specific architecture outputs and documents that will guide the “implementation” of the ITS architecture.

The key to the ITS architecture development process is to identify stakeholder needs, identify ITS projects to address those needs, and define project sequencing. The project definition outlines the project concepts and the associated details including project title, stakeholder, project scope, costs, benefits and the service packages defined in the NOACA Regional ITS Architecture. The project sequencing provides an approximate timeframe in which an ITS project may be implemented based on the understanding of the projects, project dependencies of the project, as well as other existing or planned ITS systems.

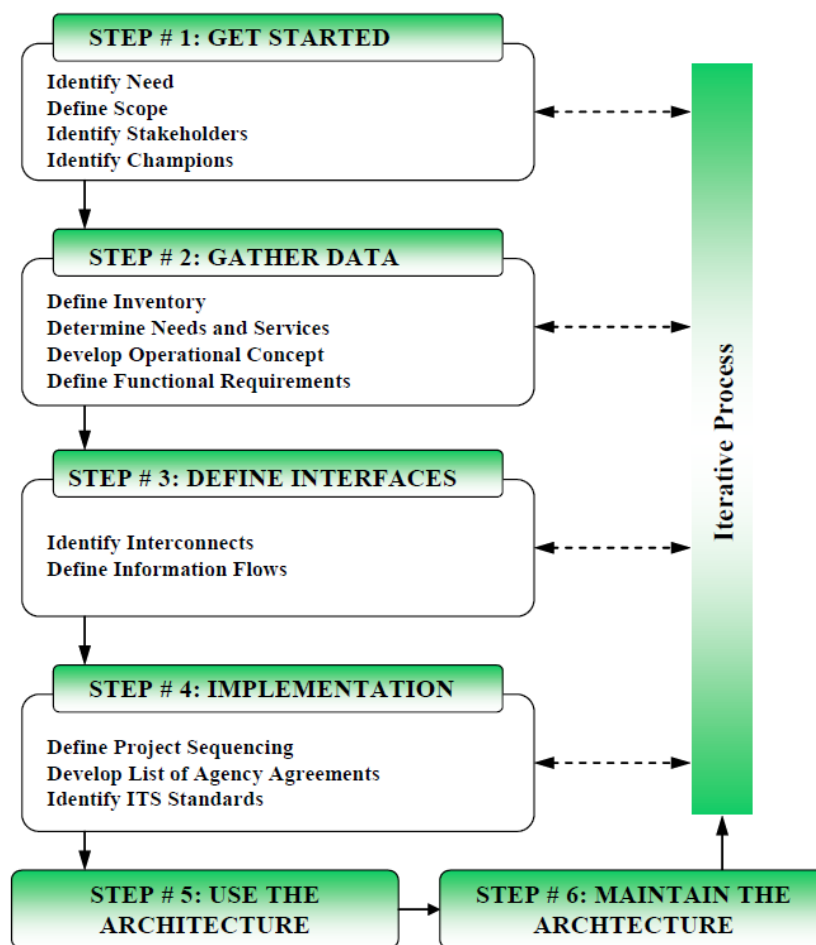


Figure 2. ITS Architecture Development Process

2.2 Systems Engineering

Systems Engineering is a phrase used to describe a cyclical process of planning, designing, implementing, testing, operating, and maintaining an ITS system. Essentially, this process covers the entire useful life of the system. Systems Engineering is a multi-step process that requires agencies to ask critical questions about how the technical aspects of the system will work together. This is often overlooked in complex systems.

Figure 3 graphically illustrates the Systems Engineering process in what is often referred to as the “V” diagram. The purpose of a “V” in the diagram is to show how the final deliverables relate back to the early decisions (The right side relates directly back to the left side). That way there are no surprises when the system is finally delivered. For example, while a system is being designed the various functions are documented as requirements, and then when the system is being built, these same functional requirements are compared to what was actually delivered.

The Systems Engineering process shows how each step of the process builds on the previous one and is reliant on a system of back checking to ensure that the project is being designed and constructed based on its originally intended purpose. Systems Engineering is a risk management tool that sets expectations and then verifies that those expectations are met. It also enables a change management system so that unexpected issues can be incorporated into the process.

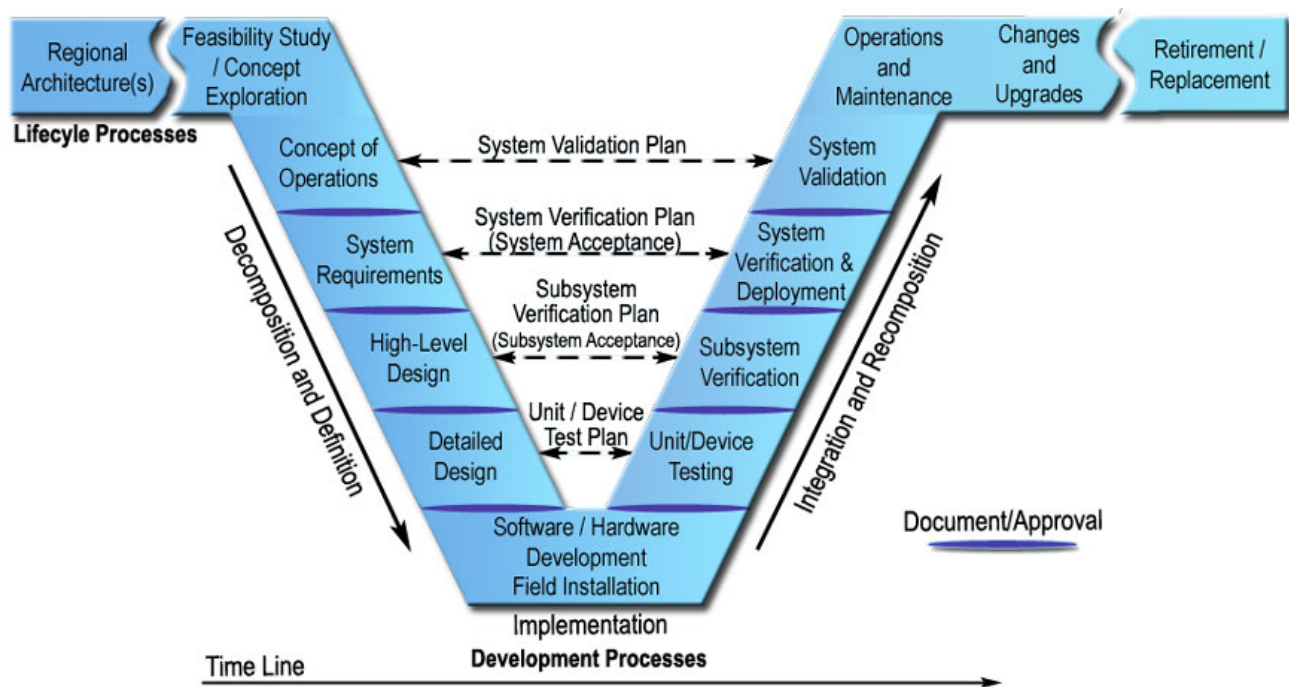


Figure 3. FHWA Systems Engineering Process (“V” Diagram)

2.3 Stakeholder Involvement

Stakeholders are commonly considered to be those who own or operate ITS technologies in the region as well as those who have an interest in regional transportation issues. Stakeholders provide crucial input regarding the region’s transportation investment and ITS deployments; therefore, stakeholder participation and coordination is critical to the success of the ITS architecture development.

The NOACA Regional ITS Architecture includes a wide range of stakeholders, and key stakeholders were identified early in the architecture development process. Information on ITS and transportation needs was gathered through survey input in August / September 2018 and was further discussed at three regional stakeholder meetings in September 2018. Additional surveys were distributed in October 2018 to understand the level of existing and planned ITS technologies in the region prior to updating the Regional ITS Architecture.

Follow-up stakeholder meetings were scheduled for May 2019 to review and comment on the updated Regional ITS Architecture. Stakeholders discussed a list of ITS projects that were identified during this planning process, verified project validity, identified additional projects, and discussed implementation timeline and strategies.

In addition, a Project Steering Committee was developed consisting of key regional stakeholders that represent key areas of the ITS, such as emergency management, transit operations, and traffic management, among other areas. The Project Steering Committee has also provided high-level directions and guidance on the project and served as champions to assist with promoting stakeholder participation within the region.

2.4 Requirements of the Final FHWA Rule and FTA Policy on Architecture

FHWA Rule 940 (http://ops.fhwa.dot.gov/its_arch_imp/docs/20010108.pdf) provides policies and procedures for implementing Section 5206(e) of the Transportation Equity Act for the 21st Century (TEA–21), Public Law 105–178, 112 Stat. 457, pertaining to conformance with the National ITS Architecture and Standards. The rule states, in part, that the final design of all ITS projects funded with Highway Trust Funds must accommodate the interface requirements and information exchanges as specified in the regional ITS architecture.

For federally funded ITS projects, several steps need to be followed as part of the systems engineering analysis and Rule 940 requirements. Rule 940 states that the systems engineering analysis shall include, at a minimum:

- Identification of portions of the regional ITS architecture being implemented (or if a regional ITS architecture does not exist, the applicable portions of the National ITS architecture)
- Identification of participating agencies roles and responsibilities
- Requirements definitions
- Analysis of alternative system configurations and technology options to meet requirements
- Procurement options
- Identification of applicable ITS standards and testing procedures
- Procedures and resources necessary for operations and management of the system

The rule requirements are applicable for all ITS projects funded through the Highway Trust Fund account. Conformity with the Rule 940 requirements is required for both routine and non-routine projects. However, with routine projects, the effort and the scope of systems engineering analysis should be minimal. For non-routine projects, the scale of the systems engineering analysis depends on the scope of the project.

While the use of the architecture and the systems engineering approach is mandatory for federally funded projects, project developers are encouraged to use this approach for any ITS project using state or local funds, especially for projects that integrate with other systems in the region.

The NOACA Regional ITS Architecture is a specific application of the framework specified in the National ITS Reference Architecture, tailored to the needs of the transportation stakeholders in the region. The

Architecture was developed following the systems engineering approach and the requirements set forth in FHWA Final Rule 940.

2.5 National ITS Reference Architecture and Project Website

The Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT), Version 8.2 was utilized throughout the update of the NOACA Regional ITS Architecture, and can be viewed at the following website: <https://local.iteris.com/arc-it/index.html>.

ARC-IT provides a common framework for planning, defining, and integrating ITS technologies and reflects the contributions of a broad cross-section of the ITS community (transportation practitioners, systems engineers, system developers, technology specialists, consultants, etc.).

As a reference architecture, ARC-IT provides a common basis that allows planners and engineers to conceive, design and implement ITS technologies using a common language as a basis for delivering ITS, but does not mandate any particular implementation. Using ARC-IT as a reference, the NOACA Regional ITS Architecture was updated to reflect the existing and planned ITS technologies and projects in the region.

This process utilized RAD-IT as a software application to develop the NOACA Regional ITS Architecture and the related project ITS architectures. RAD-IT software allows for the definition of ITS stakeholders, elements, and service packages described within this project report. The RAD-IT software also enabled the creation of web pages to house details of the architecture.

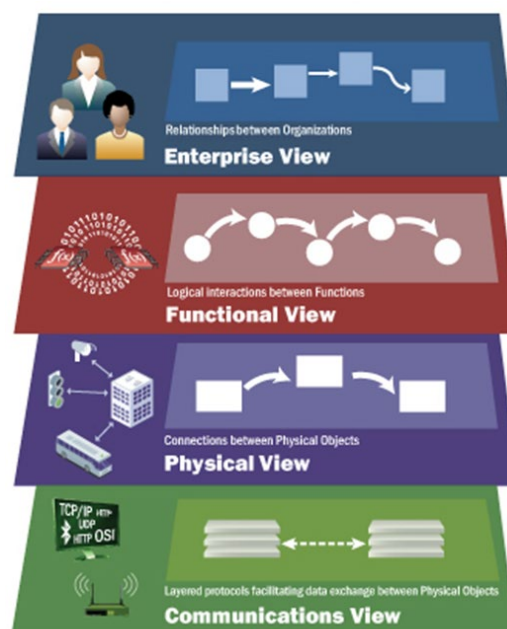


Figure 4. Top Level View of the National ITS Reference Architecture (ARC-IT)

3.0 Stakeholders

Stakeholder coordination and involvement is one of the key elements of the development of a regional ITS architecture. Because ITS often transcends traditional transportation infrastructure, it is important to consider a range of stakeholders beyond the traditional traffic, transit, and maintenance areas. In addition, it is important to consider stakeholders at a statewide level or stakeholders in adjoining regions.

This section describes the stakeholders that were involved in updating the NOACA Regional ITS Architecture. The summary of stakeholders, along with general operational roles and responsibilities with respect to ITS technologies and systems, was distributed for stakeholder review and comment during the course of the architecture update effort.

Table 1 presents the stakeholders that own or operate ITS technologies in the region as well as those who have an interest in regional transportation issues. Roles and responsibilities were presented by stakeholder and organized by the various transportation services provided within the region. The transportation services covered in the Regional ITS Architecture include:

- Archived Data Systems: The operation of systems to collect transportation data for use in nonoperational purposes (e.g. planning and research).
- Commercial Vehicle Operations (CVO): The development of systems to administer permits, check credentials and safety information, and enforce commercial vehicle regulations throughout the state, so as to make it safer to operate a private or commercial vehicle on the state roadways.
- Electronic Toll Collection: The operation of systems to manage the toll collection system which supports detection of vehicles on tollways and collects tolls electronically.
- Emergency Management: The operation of systems to provide emergency call taking, public safety dispatch, and emergency operations center operations.
- Freeway Management: The operation of systems to monitor freeway (or tollway) traffic flow and roadway conditions and provide strategies such as ramp metering or lane access control to improve the flow of traffic on the freeway. Includes systems to provide information to travelers on the roadway.
- Incident Management: The operation of systems to provide rapid and effective response to incidents. Includes systems to detect and verify incidents, along with coordinated agency response to the incidents.
- Maintenance and Construction: The operation of systems to manage the maintenance of roadways in the region, including winter snow and ice clearance. Includes the managing of construction operations.
- Surface Street Management: The operation of systems to monitor municipal roads traffic flow and roadway conditions and provide strategies such as traffic signal phasing and timing, to improve mobility and reduce congestion. Includes systems to provide information to travelers on the roadway.
- Transit Management: The operation of systems to more efficiently manage fleets of transit vehicles or transit rail. Includes systems to provide transit traveler information both pre-trip and during the trip.
- Traveler Information: the operation of systems to provide static and real time transportation information to travelers.

Table 1. Stakeholders and Their Roles and Responsibilities

Stakeholder	Transportation Service	Roles and Responsibilities
Case Western Reserve University	Emergency Management	<ul style="list-style-type: none"> Develop emergency plans, evacuation and re-entry plans, and disaster management plans. Coordinate evacuation and re-entry activities with the county EOC.
	Transit Management	<ul style="list-style-type: none"> Coordinate fixed-route transit schedule with other local transit agencies, particularly for transit connections at transit transfer points.
City of Cleveland	Emergency Management	<ul style="list-style-type: none"> Provide emergency call-taking (911). Dispatch public safety vehicles. Coordinate emergency response with county EOCs, the Highway Patrol, and other public safety agencies. Coordinate with the County EOC on emergency and incident responses, evacuation and re-entry activities, and disaster management.
	Maintenance and Construction Management	<ul style="list-style-type: none"> Provide maintenance of arterials in the city including snow and ice control and pavement maintenance. Perform maintenance for City owned ITS field equipment. Coordinate with Ohio DOT, Cuyahoga County and other municipalities on maintenance and construction activities. Provide maintenance and construction information to other agencies and the public.
	Surface Street Management	<ul style="list-style-type: none"> Operate traffic signal systems on local arterials and streets. Provide signal priority for transit vehicles. Provide signal preemption to emergency vehicles. Interconnect with signal systems in neighboring jurisdictions.
	Incident Management	<ul style="list-style-type: none"> Perform incident detection and verification for arterial streets in the City of Cleveland through video surveillance. Coordinate incident response with Cuyahoga County Emergency Services and City of Cleveland (Police, Fire, and EMS). Operate Dynamic Message Signs on City of Cleveland arterials to inform travelers of incidents Attend regular area coordination meetings with ODOT and other peers and perform after-action reviews with the group
Cleveland Department of Port Control	Emergency Management	<ul style="list-style-type: none"> Provide emergency call-taking. Dispatch public safety vehicles. Coordinate emergency response with Police, Fire, EMS and other public safety agencies. Coordinate with the County EOC on emergency and incident responses, evacuation and re-entry activities, and disaster management.
	Maintenance and Construction Management	<ul style="list-style-type: none"> Provide maintenance of Airport roadways including snow and ice control and pavement maintenance. Perform maintenance for Airport owned ITS field equipment. Coordinate with Ohio DOT, Cuyahoga County and other municipalities on maintenance and construction activities. Provide maintenance and construction information to other agencies and the public.
	Incident Management	<ul style="list-style-type: none"> Perform incident detection and verification for Airport roadways through video surveillance. Coordinate incident response with Police, Fire, EMS and other public safety agencies. Operate Dynamic Message Signs on Airport roadways to inform travelers of incidents
	Traveler Information	<ul style="list-style-type: none"> Provide transit arrival/departure information to travelers via digital message boards
Cuyahoga County Port Authority	Emergency Management	<ul style="list-style-type: none"> Monitor its transportation infrastructure (e.g. bridges, port facilities and operations centers) for potential threats using sensors and surveillance equipment and inform the appropriate public safety agencies.

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Cuyahoga County Emergency Services	Commercial Vehicle Operations	<ul style="list-style-type: none"> • Receive spill notification for hazardous materials (HAZMAT) from private commercial fleets. • Coordinate incident response for HAZMAT spills with county fire/EMS and/or local fire/EMS.
	Emergency Management	<ul style="list-style-type: none"> • Operate the County EOC in response to emergencies. • Coordinate with regional traffic agencies, public safety agencies, and transit agencies in emergency management and responses. • Develop emergency plans, evacuation and re-entry plans, and disaster management plans. • Provide emergency information to the media and information service providers.
	Incident Management	<ul style="list-style-type: none"> • Provide emergency call-taking (911) for the Cuyahoga County. • Dispatch Police, Fire, and EMS to incidents within Cuyahoga County. • Provide incident information to traffic and public safety agencies. • Attend regular area coordination meetings with ODOT and other peers and perform after-action reviews with the group
County Public Safety Agencies	Emergency Management	<ul style="list-style-type: none"> • Operate 911 centers and EOC facilities in response to emergencies. • Dispatch public safety vehicles to incidents in the region. • Develop county emergency plans; evacuation and re-entry plans; and disaster management plans. • Coordinate with regional public safety and transportation management agencies. • Monitor and detect potential, looming, and actual disasters including natural disasters and man-made disasters.
County Transit Agencies	Transit Management	<ul style="list-style-type: none"> • Provide fixed-route and/or paratransit services. • Provide transit traveler information on the agency's traveler information systems and to private sector traveler information services. • Coordinate transit schedules with GCRTA, particularly for transit connections at transit transfer points.
County and Municipal Public Works Departments	Incident Management	<ul style="list-style-type: none"> • Perform incident detection and verification for arterial streets. • Coordinate incident response with public safety agencies for incidents. • Attend regular area coordination meetings with ODOT and other peers and perform after-action reviews with the group
	Maintenance and Construction Management	<ul style="list-style-type: none"> • Provide maintenance of arterials including snow and ice control and pavement maintenance. • Provide maintenance and construction information to the traveling public through websites, portable DMS devices, social media, etc.
	Surface Street Management	<ul style="list-style-type: none"> • Operate traffic signal systems on local arterials and streets. • Provide signal preemption for emergency vehicles. • Provide signal priority for transit vehicles. • Cooperate with neighboring communities to operate and maintain signal coordination in regionally-significant corridors.
Municipal Public Safety Agencies	Emergency Management	<ul style="list-style-type: none"> • Provide emergency call-taking (911). • Dispatch public safety vehicles. • Coordinate emergency responses with county EOCs, the Highway Patrol, and other public safety agencies
FHWA	General	<ul style="list-style-type: none"> • Ensure roads and highways continue to be safe and efficient. • Provide financial and technical support to State, local and tribal governments for constructing, improving, and preserving the National Highway System.

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Greater Cleveland Regional Transit Authority (GCRTA)	Transit Management	<ul style="list-style-type: none"> • Provide fixed-route and paratransit services in the greater Cleveland metro area. • Track and evaluate schedule performance on fixed-route services. • Coordinate transit schedules with other local transit agencies, particularly for transit connections at transit transfer points. • Monitor safety and security on transit vehicles and at transit facilities using video surveillance and through transit user activated alarms. • Provide transit traveler information to the public via websites as well as on transit vehicles. • Coordinate with traffic agencies for transit signal priority
	Emergency Management	<ul style="list-style-type: none"> • Coordinate and support emergency response with county EOCs, the Highway Patrol, and other public safety agencies.
Laketran	Transit Management	<ul style="list-style-type: none"> • Provide fixed-route and paratransit services for Lake County. • Track and evaluate schedule performance on fixed-route transit services. • Coordinate transit schedules with GCRTA for connections at transit transfer points. • Monitor safety and security on transit vehicles and at transit facilities using video surveillance and through transit user activated alarms. • Provide transit traveler information to the public via websites as well as on transit vehicles. • Coordinate with traffic agencies for transit signal priority.
NOACA	General	<ul style="list-style-type: none"> • Review and determine proposed highway, bikeway and transit projects that will receive federal funding. • Work with Ohio DOT, project sponsors and other organizations to address regional transportation, air quality, and water quality needs. • Prepares the region's long-range transportation plan and short-range transportation improvement program. • Conduct studies that address congestion, improve safety and strengthen community livability.
Ohio Department of Public Safety / Ohio State Highway Patrol	Archived Data Systems	<ul style="list-style-type: none"> • Collect and archive crash and incident information in the state crash records database.
	Emergency Management	<ul style="list-style-type: none"> • Respond to potential threats to the transportation infrastructure. • Provide evacuation and incident information to regional ISPs and the media for travelers in the region.
	Incident Management	<ul style="list-style-type: none"> • Dispatch State Highway Patrol vehicles for incidents on expressways and Tollway. • Coordinate incident response with Ohio DOT and Turnpike. • Provide incident information to traffic and public safety agencies. • Attending regular area coordination meetings with ODOT and other peers and perform after-action reviews with the group
Ohio DOT	Archived Data Systems	<ul style="list-style-type: none"> • Collect and archive traffic information from traffic sensors.
	Emergency Management	<ul style="list-style-type: none"> • Operate Freeway Safety Patrol vehicles. • Coordinate emergency responses with the Highway Patrol and county EOCs. • Provide emergency information to the public. • Monitor transportation infrastructure for potential threats using sensors and surveillance equipment.
	Freeway Management	<ul style="list-style-type: none"> • Use Transportation Systems Management and Operations (TSMO) to review congested areas and provide technical / buildable solutions. • Provide traffic information to travelers via the OHGO Traffic website, information service providers, and the media. • Monitor highway traffic with traffic sensors and cameras. • Operate traffic information devices, such as dynamic message signs and highway advisory radios. • Operate variable speed limit system on I-90.

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Stakeholder	Transportation Service	Roles and Responsibilities
	Incident Management	<ul style="list-style-type: none"> Perform network surveillance along freeways for detection and verification of incidents Provide incident information to travelers. Attend regular area coordination meetings with ODOT and other peers and perform after-action reviews with the group
	Maintenance and Construction Management	<ul style="list-style-type: none"> Provide maintenance of state highways in the region, including snow and ice control and pavement maintenance. Collect road and weather conditions information and share the information with other agencies, the public, media and other private service providers. Perform maintenance for ITS field equipment. Provide maintenance and construction information to other agencies and the public.
	Traveler Information	<ul style="list-style-type: none"> Provide traffic, incident and construction information to travelers via the OHGO Traffic website.
Ohio Turnpike and Infrastructure Commission	Electronic Toll Collection	<ul style="list-style-type: none"> Perform electronic toll collection using EZ-Pass on the Ohio Turnpike. Operate a customer service center to process toll transactions and handle violations processing.
	Emergency Management	<ul style="list-style-type: none"> Operate Freeway Safety Patrol vehicles. Coordinate emergency responses with the Highway Patrol and county EOCs. Provide emergency information to the public.
	Freeway Management	<ul style="list-style-type: none"> Provide traffic information to travelers via the OHGO Traffic website, information service providers, and the media. Operate traffic information devices, such as portable changeable message signs and Turnpike Television.
	Incident Management	<ul style="list-style-type: none"> Provide incident information to travelers. Attend regular area coordination meetings with ODOT and other peers and perform after-action reviews with the group
	Traveler Information	<ul style="list-style-type: none"> Provide traffic information to travelers via traffic information devices (e.g. DMS, kiosks), websites, social media, etc.
	Maintenance and Construction Management	<ul style="list-style-type: none"> Provides maintenance of the turnpike including snow and ice control and pavement maintenance. Provide maintenance and construction information to other agencies and the public
U.S. Coast Guard	Emergency Management	<ul style="list-style-type: none"> Monitor its transportation infrastructure (e.g. bridges, waterways) for potential threats and inform the appropriate public safety agencies.
US Department of Homeland Security	Emergency Management	<ul style="list-style-type: none"> Secure the nation from various security threats by preventing terrorism, administering immigration laws, securing cyberspace, and ensuring disaster resilience.
	Incident Management	<ul style="list-style-type: none"> Coordinate incident response with federal, state, local government and private sector partners Provide incident information to DHS senior leadership with an assessment on the impact to infrastructure of national level significance through direct impact, interdependencies and/or cascading effects Attending regular area coordination meetings with ODOT and other peers and perform after action reviews with the group

4.0 Needs and Gap Assessment

This section presents a summary of the transportation needs and priorities within the region, as well as potential ITS solutions to meet those needs, based on stakeholder inputs gathered from surveys, workshops and interviews during the course of the architecture update effort.

4.1 Needs Identification

Stakeholders were surveyed in September 2018 on a series of common transportation issues and needs that could be addressed through the use of ITS and emerging technologies. Respondents were asked to rank the importance of the issue while considering the existing conditions within their communities or jurisdictions. Upon reviewing the total of 34 survey responses, the higher ranked needs were identified and are summarized in Table 2. These higher ranked stakeholder needs were traced to the NOACA Regional Strategic Plan Goals to illustrate how the needs relate to each goal and its respective objectives identified in the NOACA Regional Strategic Plan.

Table 2. High Priority Stakeholder Needs

Need Areas	High Priority Needs
Information Management	Need to enhance communications and information sharing among transportation agencies at all levels of government
Traffic Management	Need to improve traffic congestion mitigation
	Need to provide early warning of poor visibility conditions (snow squalls, sun, fog, heavy rains, etc.)
	Need to improve traffic signal interconnect and coordination to improve mobility
	Need to provide expanded traffic signal preemption for emergency vehicles
	Need to know incidents on major routes
Public Transportation	Need to improve on-time performance of transit services
	Need to improve efficiency of demand-responsive transit operations
	Need to improve transit connections for travelers
	Need to improve event, incident, and/or construction coordination with transit providers
Traveler Information	Need to provide travel times / delays on freeways / turnpike to the public
	Need to provide incident information for freeways / turnpike to the public
	Need to provide road closure / lane restriction information for freeways / turnpike to the public
	Need to provide road closure / lane restriction information for arterial roadways to the public
Commercial Vehicle Operations and Freight Management	Need to improve hazardous cargo tracking and routing
	Need to improve intermodal freight management
	Need to provide real-time truck parking availability
Roadway Maintenance	Need to improve temporary maintenance work zone safety for travelers and maintenance staff
	Need advanced and up-to- date road closure and temporary maintenance work zone information
	Need to collect roadway surface conditions data, such as icing, from vehicle sensors
Incident and Emergency Management	Need to identify alternate routes for the traveling public during major incidents on freeways
	Need to improve alternate route traffic management, including the communication of detour information
	Need improved incident detection on major routes
	Need improved incident management and coordination
	Need to improve emergency notification / dispatch and response times
Transportation Security	Need for security and safety monitoring in public spaces (for public safety / crime deterrent)
	Need to improve evacuation plan implementation using technology

4.2 Needs Analysis and Gap Assessment

Stakeholders were also surveyed in October 2018 on their existing and planned ITS capabilities that help to address transportation challenges. Respondents were asked to identify their agency's existing and planned ITS inventory and capabilities by various ITS functional areas. A total of 26 responses were gathered from agencies across all five counties of the region.

These existing and planned ITS capabilities were then reviewed against the high priority needs gathered through survey responses and from stakeholder workshops. The purpose of the review was to identify gaps as well as opportunities that may exist for future ITS technology deployment within the region. The results of the needs analysis and gaps assessment are summarized in Section 3.0 of the *2019 Northeast Ohio ITS Strategic Plan*. Detailed needs analysis and gaps assessment was documented in the project's *Task 4 Technical Memo*. Both documents can be accessed via the website of the architecture.

5.0 Inventory

The inventory of the NOACA Regional ITS Architecture contains all of the existing and future elements of ITS technology within the region. An inventory of elements was previously defined for the NOACA region that was used as a starting point in updating the inventory. These elements were updated and modified based on information gathered through survey responses and feedback provided at stakeholder workshops.

ITS elements within the Inventory represent the range of ITS devices and systems. Five classes of inventory elements can exist within an ITS Architecture, including:

- On vehicles (i.e. fire trucks, police cars, snow plows, etc.)
- In the field (i.e. traffic signals, cameras, etc.)
- At a center (i.e. traffic management centers, 911 dispatch centers, emergency operations centers, etc.)
- In the hands of travelers (i.e. computers, smartphones, etc.)
- At a support level (i.e. map systems, registration databases, etc.)

The technical functions that each of these elements perform are defined by the National ITS Reference Architecture as physical objects (subsystems and terminators). A high-level physical object interconnect diagram for the NOACA Regional ITS Architecture, as shown in Figure 5, illustrates the architecture subsystems and primary types of interconnections (or communications) between these subsystems. The shaded areas indicate the functions and services that are not currently existing and planned in the region.

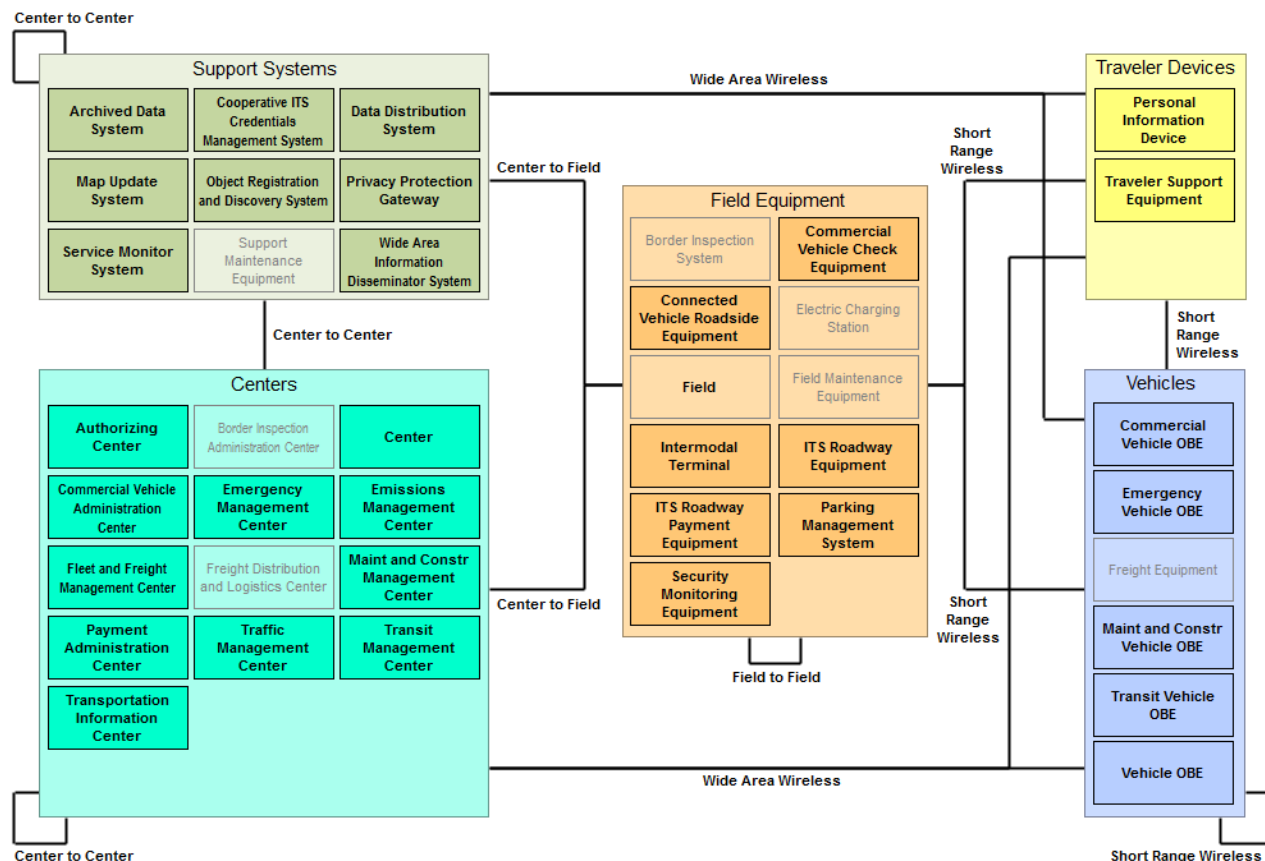


Figure 5. NOACA Regional ITS Architecture Physical Object Interconnect Diagram

In addition to Subsystem elements, there are additional elements added to the Inventory defined by the National ITS Reference Architecture as Terminators. These represent the people, systems, and general environment that interface with the Subsystem elements. Terminators typically represent the beginning or end of a flow of information in the ITS Architecture. No technical or functional requirements are assigned to terminators because they are the points outside the system boundaries where the architecture “plugs in” to the outside world.

A detailed listing of all the ITS elements in the NOACA region can be found by accessing the website of the architecture. Each ITS element is documented, at a high level, by the associated stakeholder(s), its status (e.g. existing or planned), and a brief description for each element in the ITS inventory. Each element is also mapped to the various types of subsystems and terminators defined by the National ITS Reference Architecture.

6.0 Service Packages and Interfaces

The service packages and interfaces of the NOACA Regional ITS Architecture illustrate how the ITS elements identified in the inventory interface with one another to deliver a given ITS service, as well as the flows of information that connect those ITS elements.

6.1 Service Packages

The Service Packages of an ITS architecture define a “service-oriented” perspective of how an ITS architecture can be structured. Service packages are a convenient way to assemble ITS components to address frequently needed services without having to itemize the components. Service packages present how the ITS elements (and their assigned subsystems and terminators) work together to deliver a given ITS service, as well as the flows of information that connect those ITS elements with other important external systems. They are tailored to fit real world transportation problems and needs. Service packages enable transportation planners and decision makers to select appropriate ITS services that satisfy local and statewide needs.

All service packages in the National ITS Reference Architecture (ARC-IT Version 8.2) were considered for their applicability to the NOACA region. Table 3 summarizes the status of ITS deployment with respect to service packages in the region. A detailed list of applicable service packages and their definitions are presented on the website of the architecture.

Table 3. Existing and Planned Service Packages within NOACA Region

Service Package	Name	Status
CVO02	Freight Administration	Planned
CVO03	Electronic Clearance	Existing
CVO04	CV Administrative Processes	Existing
CVO07	Roadside CVO Safety	Existing
CVO12	HAZMAT Management	Existing
CVO13	Roadside HAZMAT Security Detection and Mitigation	Existing
CVO15	Fleet and Freight Security	Existing
DM01	ITS Data Warehouse	Existing
MC01	Maintenance and Construction Vehicle and Equipment Tracking	Existing
MC02	Maintenance and Construction Vehicle Maintenance	Planned
MC04	Winter Maintenance	Planned
MC05	Roadway Maintenance and Construction	Planned
MC06	Work Zone Management	Planned
MC07	Work Zone Safety Monitoring	Planned
MC08	Maintenance and Construction Activity Coordination	Planned
PM01	Parking Space Management	Existing
PM03	Parking Electronic Payment	Planned
PS01	Emergency Call-Taking and Dispatch	Existing
PS02	Routing Support for Emergency Responders	Existing
PS03	Emergency Vehicle Preemption	Existing
PS04	Mayday Notification	Planned

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Service Package	Name	Status
PS08	Roadway Service Patrols	Existing
PS09	Transportation Infrastructure Protection	Planned
PS10	Wide-Area Alert	Planned
PS11	Early Warning System	Planned
PS12	Disaster Response and Recovery	Planned
PS13	Evacuation and Reentry Management	Existing
PS14	Disaster Traveler Information	Planned
PT01	Transit Vehicle Tracking	Existing
PT02	Transit Fixed-Route Operations	Existing
PT03	Dynamic Transit Operations	Planned
PT04	Transit Fare Collection Management	Existing
PT05	Transit Security	Existing
PT06	Transit Fleet Management	Planned
PT07	Transit Passenger Counting	Existing
PT08	Transit Traveler Information	Existing
PT09	Transit Signal Priority	Existing
PT14	Multi-modal Coordination	Planned
ST01	Emissions Monitoring	Planned
SU01	Connected Vehicle System Monitoring and Management	Planned
SU02	Core Authorization	Planned
SU03	Data Distribution	Planned
SU04	Map Management	Planned
SU05	Location and Time	Planned
SU06	Object Registration and Discovery	Planned
SU07	Privacy Protection	Planned
SU08	Security and Credentials Management	Planned
SU11	Vehicle Maintenance	Planned
TI01	Broadcast Traveler Information	Existing
TI02	Personalized Traveler Information	Existing
TI07	In-Vehicle Signage	Planned
TM01	Infrastructure-Based Traffic Surveillance	Existing
TM02	Vehicle-Based Traffic Surveillance	Planned
TM03	Traffic Signal Control	Existing
TM05	Traffic Metering	Planned
TM06	Traffic Information Dissemination	Existing
TM07	Regional Traffic Management	Planned
TM08	Traffic Incident Management System	Existing
TM10	Electronic Toll Collection	Existing
TM12	Dynamic Roadway Warning	Planned
TM13	Standard Railroad Grade Crossing	Existing

Service Package	Name	Status
TM14	Advanced Railroad Grade Crossing	Planned
TM17	Speed Warning and Enforcement	Planned
TM18	Drawbridge Management	Planned
TM19	Roadway Closure Management	Planned
TM20	Variable Speed Limits	Existing
TM22	Dynamic Lane Management and Shoulder Use	Planned
VS01	Autonomous Vehicle Safety Systems	Planned
VS03	Situational Awareness	Planned
VS16	Automated Vehicle Operations	Planned
WX01	Weather Data Collection	Existing
WX02	Weather Information Processing and Distribution	Planned
WX03	Spot Weather Impact Warning	Planned

6.2 Service Package Interfaces

While it is important to identify the various ITS systems and stakeholders as part of the architecture, a primary purpose of the NOACA Regional ITS Architecture is to identify the connectivity between systems. The two ways to describe this connectivity are:

- **Architecture Interconnects** define the connections between equipment and systems which may be deployed by the agencies throughout the region. In other words, what entities interact with each other.
- **Architecture (Information) Flows** define a high level information exchange associated with each interconnect between equipment and systems. In other words, what information is passed along the interconnect paths.

An example of an interconnect diagram is illustrated in Figure 6.

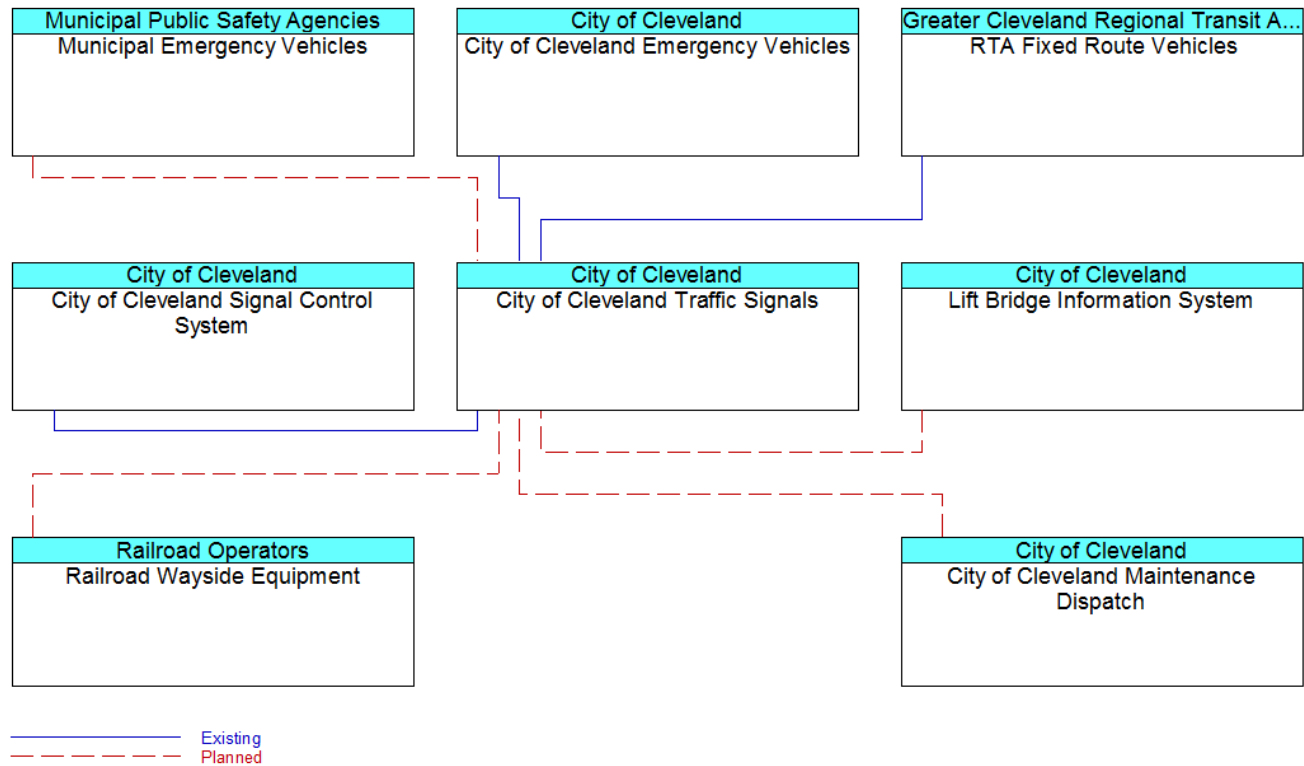


Figure 6. Interconnect Diagram for City of Cleveland Traffic Signal Field Devices

Figure 7 illustrates the architecture flow diagram for the City of Cleveland Traffic Signal field equipment and other systems/centers/field devices that are connected to it. Architecture (information) flows provide a high level description of information exchanges associated with each interconnect path between equipment and systems. From these diagrams the stakeholders can easily identify the existing or potential information exchange between agencies and systems. This provides a framework for analyzing how elements are related and thus identifies the areas for potential coordination and cooperation among agencies. Quite often, from these diagrams agencies can identify missing communication flows that should occur, leading to refinements during the lifecycle of the system.

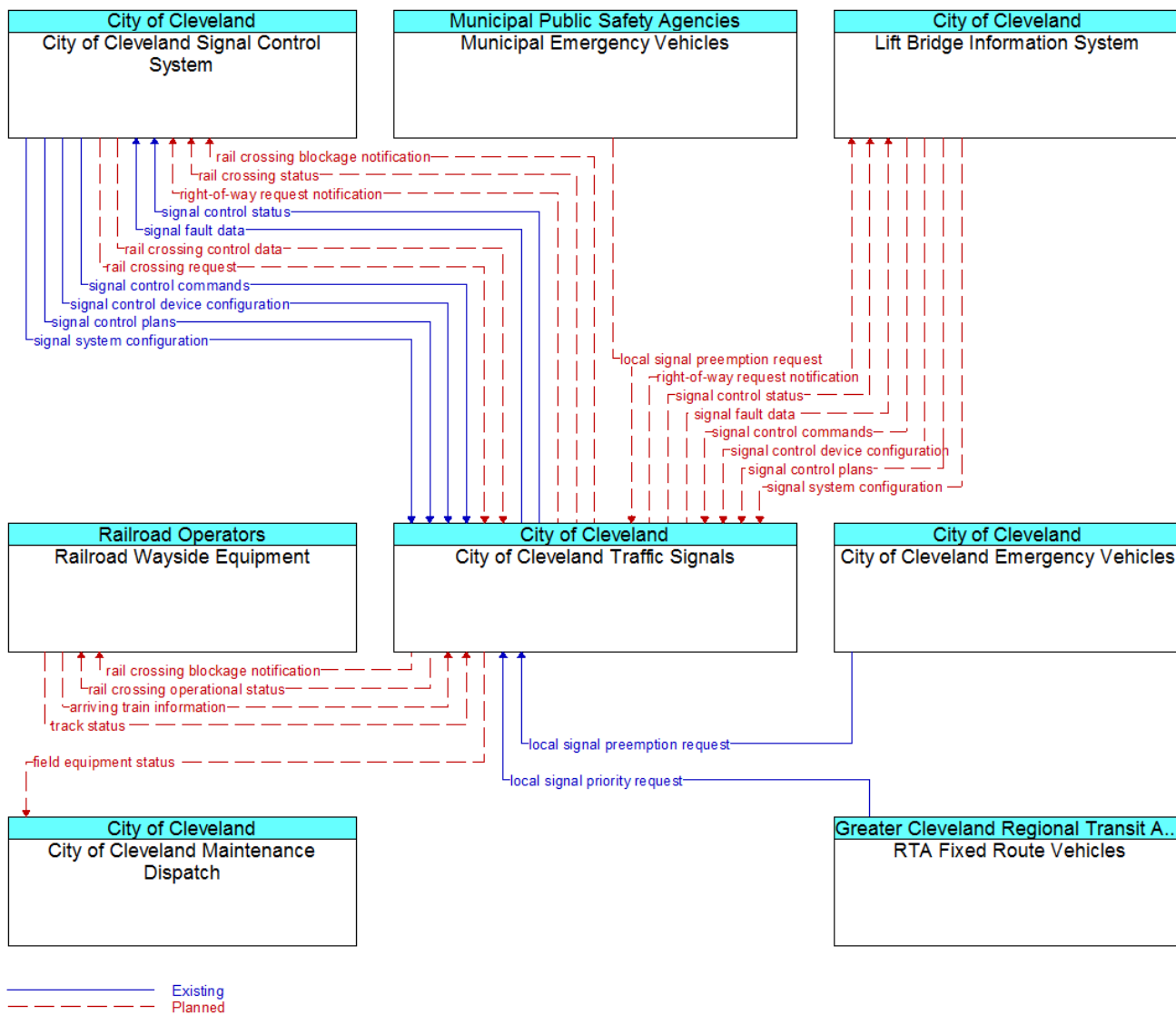


Figure 7. Example of an Architecture Flow Diagram

The National ITS Reference Architecture provides guidance in identifying potential information to be exchanged between commonly used ITS elements in the Inventory, and the RAD-IT software is used to generate the architecture flow diagrams between ITS elements in the Inventory.

A detailed listing of the interconnects and architecture flows of all ITS Inventory elements in the NOACA region can be explored on the website of the architecture. A detailed diagram for each applicable Service Package to the NOACA Region are included in Appendix B of this report. These can also be viewed on the website of the architecture.

7.0 Functional Requirements

A functional requirement is a task or activity that is currently performed or is planned to be performed by each system in the region to provide the required regional ITS services. The National ITS Reference Architecture has pre-defined all possible functional objects (i.e. equipment packages in previous versions of the National ITS Architecture).

In the National ITS Reference Architecture, a service package is defined by physical objects, functional objects, and architecture flows, all of which operate together to perform a particular transportation service. Functional objects represent pieces of a subsystem that perform a single function. (Note: there are no functional objects defined for the Terminators of the National ITS Reference Architecture, since they represent systems on the boundary of the architecture and do not have functional descriptions within the architecture).

For example, the Traffic Signal Control (TM03) service package contains three Traffic Management Center subsystem functional objects – “TMC Roadway Equipment Monitoring”, “TMC Signal Control” and “TMC Basic Surveillance”; and three ITS Roadway Equipment subsystem functional objects – “Roadway Field Management Station Operation”, “Roadway Signal Control” and “Roadway Basic Surveillance”. The definitions of these functional objects, as defined in version 8.2 of the National ITS Reference Architecture are:

- TMC Roadway Equipment Monitoring: This functional object 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.).
- TMC Signal Control: This functional object 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.
- Traffic Equipment Maintenance: This functional object 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.
- Roadway Field Management Station Operation: This functional object supports direct communications between field management stations and the local field equipment under their control.
- Roadway Signal Control: This functional object 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.

- Roadway Basic Surveillance: This functional object monitors traffic conditions using fixed equipment such as loop detectors and CCTV cameras.

The mapping of elements to the basic functions is provided on the hyperlinked website version of the architecture. The detail page for each element (which is accessed by clicking on the hyperlinked element name within the “ITS Inventory”, “Inventory by Stakeholder” or “Inventory by Entity” tabs) has a list of the subsystems assigned to the element.

For example, the City of Cleveland Traffic Signals element has the following functional objects assigned to it:

- Roadway Signal Control
- Roadway Signal Preemption
- Roadway Field Device Support

This represents a first level of detail that can be obtained in the hyperlinked website in connection with each functionality. The additional level of detail, or detailed functional requirements, can be accessed by clicking on any of the functional object associated with the element under review. Using the above example, viewing the City of Cleveland Traffic Signals element detail page, the user can see the functional objects listed above. If the user were to select one of the functional objects, the functional requirements detail page would appear. Along with a full description of what this functional object contains, as well as a listing of all element that are associated with this functional object, it lists the detailed functional requirements that have been customized for the NOACA Regional ITS Architecture. Functional requirements of all ITS Inventory elements in the NOACA region are contained in the website of the architecture.

8.0 Standards

Identification of ITS technical standards that support interfaces in the regional ITS architecture is often not understood by stakeholders, so the National ITS Architecture was created to provide the stakeholders with easy access to appropriate ITS standards that can be specifically applied to an ITS project. A summary of this task process is as follows:

- Using information flows identified in Step 3, identify relevant ITS standards for the region.
- Assess the ITS standard maturity and develop agreements for use of interim standards when determined necessary.
- Identify other regional and/or statewide standards that might apply.

As previously noted, it is important that stakeholders are aware of the importance of ITS standards, especially with respect to cost, risk, and interoperability issues both within the region and when connecting with other ITS architecture regions. These standards can save money in the long run, and make sure that various devices and systems “play well together”.

A list of ITS Standards identified by the RAD-IT software as applicable to the NOACA region is contained in the website of the architecture.

9.0 Agreements

The NOACA Regional ITS Architecture also provides an institutional framework for the deployment of ITS in the region. Institutional interoperability involves cooperation and coordination between various agencies and jurisdictions to achieve seamless functionality, regardless of agency boundaries or differences in neighboring agency systems.

Because the regional architecture identifies systems that require agencies to contribute resources and manpower to operate, inter-agency agreements are often needed to define the roles and responsibilities of each party. As projects are developed and implemented, a first step is to identify which agencies need to share data in order to realize the benefits of improved ITS coordination. A second step is to identify what data need to be shared among agencies. Some items may only be relevant to a single operating agency. Other items, particularly those involving law enforcement, may be protected for operational or privacy reasons. This initial screening process will enable agencies to focus on a more manageable set of data. This will help to streamline any software and communications development required, and will help to focus on operations on essential tasks.

9.1 Types of Agreements

There are several types of arrangements associated with the interfaces identified in the NOACA Regional ITS Architecture:

- A first step, as noted above, is to identify which agencies need to share data and which data should be shared between the agencies.
- Limitations on data sharing and privacy issues need to be identified and addressed. Aggregation may be used to obtain needed data while protecting privacy.
- Information sharing and exchanges between systems require knowledge of the transmission protocol and data formats to ensure compatibility.
- Coordinating field device operations owned by different agencies requires defined procedures for submitting message requests and rules governing when such requests can be honored. Such coordination may be done with informal arrangements such as a Memoranda of Understanding (MOU).
- Sharing control of field devices operated by different agencies sometimes involves liability issues, which leads to legal review and more formal agreements.
- Coordinated incident response may also require formal agreements, but also requires group training of personnel from various agencies.

In general, agreements may be obtained for data sharing, identifying responsibilities in case of specific events and geographic location, establishing common procedures, supporting regional operations, cost effective maintenance arrangements, and personnel training requirements.

Some common types of agreements are listed in Table 4. The agreement process may begin with something as simple as a handshake agreement. However, once interconnections and integration of systems begin, agencies may want to have more formalized agreements in place. A documented agreement will aid agencies in planning their operational costs, understanding their respective roles and responsibilities, and building trust for future projects. Formal agreements may be necessary where funding or financial arrangements are defined or participation in large regionally significant projects is required. Formal agreements also provide a means for sustaining the stakeholders' expectations when personnel and administration changes occur.

Table 4. Common Types of ITS Agreements

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

9.2 Existing Agreements

The practice and preference of agencies in the NOACA region has been to cooperate through simplified agreements such as letters and MOUs. Through a history of good working relationships, agencies have developed trust for one another. This has allowed them to proceed with jointly sponsored projects using simplified agreements that document the level of funding for each agency.

During the initial review of the Regional ITS Architecture, and at the stakeholder workshops held throughout the region, stakeholders identified a list of agreements that currently exist in the region. In addition to these existing agreements, the Regional ITS Architecture was used to determine a set of agreements that may need to be put into place in order to implement the interconnections described by the architecture. Table 5 displays the existing agreements within the region that have been identified by stakeholders. Stakeholders noted that there is a significant number of handshake agreements and other informal agreements. As a result, the list in Table 5 is a representative sample of the type of agreements that exist in the region, not a complete list. The main purpose is to illustrate the range of agreements as described in Table 4.

Table 5. A Sample of Existing Agreements in the NOACA Region

Existing Agreement	Stakeholders	Description
Statewide Equipment Sharing Agreement (Share Ohio)	City of Mentor	State wide equipment sharing program that enables municipalities to leverage resources in neighboring jurisdictions as needed for transportation projects.
Memorandum of Understanding	Cuyahoga County EMA and City of Cleveland / Board of Health	Cuyahoga County EMA has an existing MOU with the City of Cleveland and the Board of Health to share space as back up Emergency Operations Centers.
	Cuyahoga County and Police Departments	Cuyahoga County has agreements with police departments covering their acknowledgement of policies regarding use of license plate readers and mobile trailers for cameras
	Cuyahoga County and Police Departments	Cuyahoga County has a formal MOU with police agencies that utilize a data warehouse that supports law enforcement operations.
Interagency Agreements	City of Rocky River and Cuyahoga County	Agreement with Cuyahoga County for use of the Ready Notify system (free) software / messaging platform.
	RTA and Ohio Dept. of Admin. Services for use of MARCS	RTA has agreement with Ohio Department of Admin. Services for use of the Multi-Agency Radio Communication System (MARCS) as a 700/800 MHz radio and data network for RTA buses and trains.
	RTA and Cleveland State University	Agreement covering usage and operation of CAD / AVL equipment for vehicle location monitoring.
Intergovernmental Agreement	City of Rocky River	Agreement between City of Rocky River and other municipalities within the mutual aid district under Council of Government.
Mutual Aid Agreements	City of Avon, Avon Lake, and Sheffield Village	Mutual aid agreement between cities and villages to support law enforcement activities across jurisdictional boundaries.
	City of Rocky River and neighboring fire / police	Mutual aid agreement for fire and police response with neighboring jurisdictions to City of Rocky River.
	City of Rocky River and neighboring fire districts	Agreement for mutual aid district fire departments to use central dispatch and pay portion of costs (Operational Agreement).
Letter of Agreement for Emergency Operations Plan	Cuyahoga County Emergency Management Agency	Letters of Agreement created with about 50 different agencies and organizations that are written into the Cuyahoga County Emergency Operations Plan (EOP). Letters affirm an agency's awareness of their inclusion in the Plan and acknowledge their ability to fulfill whatever responsibilities are attributed to them.
Operations and Maintenance Agreements with Ohio DOT District 3	City of Ashland	City and ODOT to perform routine maintenance, snow and ice removal on various sections of US 42, US 250, SR 58, SR 60, SR 96, and SR 511; City and ODOT to perform signal maintenance on their respective City and State routes.
	City of Ontario	ODOT to perform snow and ice removal on various sections of US 30 and SR 314.
	City of Bellevue	City and ODOT to perform routine maintenance, snow and ice removal on various sections of US 20, SR 4, SR 113, and SR269; City and ODOT to perform signal maintenance on their respective City and State routes.
	City of Bucyrus	City performs snow and ice removal on SR 4 within city limits; City and ODOT perform routine maintenance on their respective city and state routes.

Existing Agreement	Stakeholders	Description
	City of Mansfield	City and ODOT to perform routine maintenance, snow and ice removal on various sections of US 30, SR 13, SR 39, SR 545, US 42, and SR 309; City to operate and maintain closed loop signal system on SR13; ODOT to maintain highway lighting on SR13 at the IR71 interchange.
	Various Cities and Villages in Lorain and Medina Counties	ODOT District 3 can enter into operations and maintenance agreements with cities and counties regarding traffic signal operations and maintenance and/or signal preemption installation on local and state routes, as well as right of entry agreements.
Operations and Maintenance Agreements with Ohio DOT District 12	Various Cities and Villages in Cuyahoga, Lake, and Geauga Counties	ODOT District 12 can enter into operations and maintenance agreements with cities and counties regarding traffic signal operations and maintenance and/or signal preemption installation on local and state routes, as well as snow plowing, signing, striping and road repairs.
Operations and Maintenance Agreement with Lake County	Various Cities and Villages along State Route 2 in Lake County	All Lake County communities have entered a routine maintenance and snow and ice removal agreement with Lake County Engineer to maintain State Route 2.

Table 5 summarizes different categories of agreements between various agencies in the NOACA region. Many of these agreements allow State or County agencies to service facilities that are located within smaller municipalities. Subject areas of focus include:

- Joint use of physical facilities and operational systems, such as agreement such as RTA use of Department of Administrative Services radio system.
- Coordination between law enforcement and transportation agencies related to dispatch operations and incident management activities.
- Mutual aid agreements between communities related to law enforcement, fire and emergency response.
- Consolidation of municipal emergency response plans and protocols under a County umbrella (Cuyahoga).
- Agreements between ODOT and municipalities, and between neighboring municipalities regarding snow and ice removal.
- Agreements between ODOT and municipalities regarding operation and maintenance of traffic signal systems.

In many cases these agreements are response to the fact that the NOACA region contains many small municipalities, which in some cases, have limited technical resources. In addition, municipalities can in some cases provide faster and more efficient access to certain areas of neighboring municipalities, resulting in agreements related to law enforcement, incident management and snow/ice removal.

These agreements for the most part are limited to two or three parties; with many of them between a specific municipality and ODOT. Agreements shown for RTA and Cuyahoga County Emergency response are broader in geographic scope. A potential gap is the lack of broader regional agreements to enhance traffic flow and service incidents. These would allow corridor or regionally-based strategies to be implemented. Agreements designed

to improve coordination between the multiple transit operators in the region was also noted as a way to improve overall mobility and job access for those without access to private vehicles.

9.3 Potential Agreements to Support Operations, Maintenance and Management

The Regional ITS Architecture can be used to determine a set of agreements that may need to be put into place to implement the interconnections described by the architecture. A list of potential agreements that may be needed between pairs of stakeholders described in the NOACA Regional ITS Architecture. The list of potential agreements was created by identifying element interfaces where the elements are owned, operated, or maintained by different stakeholders. This large list of potential interfaces was then reviewed to remove many of the interfaces between different stakeholders of the same agency, and to remove interfaces that won't need agreements (such as the interface between websites and the private users that access them). The list of potential agreements is contained in the website of the architecture.

The parties listed in the potential agreements can engage in any of the types of agreements listed in Table 6. The complexity of the agreement will dictate which type of agreement will be selected. For information sharing, a handshake agreement is typically adequate. For more complex arrangements, where one agency is allowing another agency control of their equipment or systems, more official agreements are recommended. Appendix C provides five example agreements, including multi-agency joint traffic signal operations, corridor-based regional signal operations, CCTV live video sharing, fiber optic sharing and regional transportation operations, that can be used as references for developing potential agreements.

Table 6 identifies potential agreements that might be needed for project implementation and/or operations for the short-term projects proposed in the ITS Strategic Plan. Note that the list does not include some projects for which no agreements are likely to be required. The agreements may take various forms ranging from "handshake" agreements to MOUs to more formal legal documents.

Most of the issues identified for potential agreements relate to data sharing/usage, operational responsibilities. Where financial responsibilities come into play, more formalized legal agreements may be necessary. Areas such as traffic signal coordination across municipalities may lend themselves to a standard agreement developed at the regional level, that can then be made available to municipalities. It should also be noted that ODOT has agreements in place related to winter maintenance and traffic signal operation that can be used in many of these projects or modified as needed.

Table 6. Potential Agreements for ITS Strategic Plan Short-Term Projects

Project	Description	Potential Areas for Agreements
Freeway Management System (FMS) Expansion	The FMS Expansion project's objective is to extend ODOT FMS field devices and communications on the freeway system, including expansion of: the TMC, DMS, CCTV, flow detection, freeway service patrols, hybrid communications systems, HAR, ramp metering, web-based services, and inter-agency communications networks.	<ul style="list-style-type: none"> • Sharing of field device data with Counties and municipalities. • Coordination with law enforcement with focus on priorities for using CCTV cameras. • Ramp metering rate modifications when parallel arterials are impacted. • Coordination between freeway service patrols and law enforcement.

Project	Description	Potential Areas for Agreements
ODOT Advanced Traffic Management System (ATMS)	ODOT is seeking a commercial off-the-shelf Advanced Traffic Management System software package to replace and expand the current in-house system. The new system shall consolidate resources (including Playbook), enhance capabilities, capture and archive roadway, traffic, speed, and weather data, provide functionality for forthcoming emerging technologies.	<ul style="list-style-type: none"> Information sharing with Regional, County and municipal agencies, including transit. Availability of ATMS software and training for interested regional and local agencies. Priority use by law enforcement when needed. Sharing of real-time and/or archived data with private traffic information services.
Traffic Monitoring Management System Enhancements	Expansion of ODOT's Statewide Traffic Monitoring Management System.	<ul style="list-style-type: none"> Information sharing with Regional, County and municipal agencies, including transit. Sharing of real-time and/or archived data with private traffic information services. Use of ODOT ROW for data collection and monitoring by private traffic information services.
Expand Traveler Information Delivery Methods	Enhancing traveler information dissemination methods may include enhancing OHGO, information provided through cable TV stations, and new connections to private sector dissemination methods.	<ul style="list-style-type: none"> Data sharing and usage agreements with private providers of traffic information. Agreements between municipalities and ODOT for reporting of construction activity.
Expand Road Weather Information System (RWIS)	RWIS expansion efforts may include installing additional RWIS stations at strategic locations. The project also considers testing mobile RWIS.	<ul style="list-style-type: none"> Sharing of RWIS data between transportation, law enforcement and maintenance agencies. Agreements with NWS to share data and enhance analytical capabilities.
Ohio Turnpike ACV Testing	The 241-mile Ohio Turnpike is DriveOhio's site for testing ACVs. The turnpike is outfitted – end to end – with fiber-optic cable, and it already has been a testing site for self-driving trucks.	<ul style="list-style-type: none"> Sharing of performance data between OTIC, DriveOhio, NOACA, and ODOT.
DriveOhio City Use Cases	Discussions are actively under way with Athens, Akron, Canton, Cincinnati, Cleveland, Dayton, Dublin, and Toledo for additional DriveOhio projects. Use cases that highlight each city's unique attributes are under development, ranging from workforce mobility, healthcare and education access, and mobility access for underserved, elderly and disabled populations.	<ul style="list-style-type: none"> Agreement between ODOT, transit agencies and other key stakeholders to share data and lessons learned from Drive Ohio projects.

Project	Description	Potential Areas for Agreements
I-90 Lake Effect Corridor	The Ohio Department of Transportation is equipping 60 miles of I-90 with short-range digital communication units. It is also going to test wireless technologies designed to send and receive data from those units as well as units on public service vehicles. The data, combined with new variable speed limit signs, will help local officials and law enforcement better manage the roadway to reduce crashes and fatalities. The project considers an expansion to other corridors in the near future.	<ul style="list-style-type: none"> • Agreements and protocols for data exchange between ODOT, law enforcement, winter maintenance and other municipal agencies. • Operational agreements documenting procedures for road closure and reduced speed limits. Conditions for such actions and the process for implementing them would be documented.
Regional Alternate Routes Planning	Develop a plan and operational strategy for alternate routes for traffic diversion due to major incidents with a focus on coordination between ODOT-operated freeways and locally-operated arterials. Plans would identify thresholds for when a specific segment of the roadway is considered affected, which alternate route(s) to implement; which agencies should be involved, how they communicate, and their roles and responsibilities in traffic control, timing adjustments, traveler information; and what ITS assets (CCTV, DMS, etc.) should be utilized to monitor the situation and provide en-route traveler information.	<ul style="list-style-type: none"> • Agreements between ODOT other transportation agencies and law enforcement identifying alternate routes, specifying thresholds for implementation and operational strategies, including responsibilities of various stakeholders. Procedures for monitoring outcomes and modifying plans based on those outcomes would also be included. • Agreements with private traffic information providers for data exchange and dissemination of data on alternate routes.
GCRTA CAD/AVL	The goal of this effort is to implement Computer Aided Dispatch using Automatic Vehicle Location technology for GCRTA, including: Automatic Passenger Counters, Closed Caption Television (CCTV) surveillance systems, automated stop announcements, and an enhanced Radio Communication system.	<ul style="list-style-type: none"> • Agreement and conditions for use of data with private transit information application developers. • Data sharing agreements with other regional transit providers to improve information and efficiency of transfers.
Laketran CAD/AVL	The goal of this effort is to implement Computer Aided Dispatch using Automatic Vehicle Location technology for Laketran, including: Automatic Passenger Counters, Closed Caption Television (CCTV) surveillance systems, automated stop announcements, and an enhanced Radio Communication system.	<ul style="list-style-type: none"> • Agreement and conditions for use of data with private transit information application developers. • Data sharing agreements with other regional transit providers to improve information and efficiency of transfers.
County Transit Agency ITS Updates	The objective of this effort is to update county transit vehicle ITS, including AVL systems for vehicles for Lorain and Medina counties as well as upgraded vehicle radios for Medina County.	<ul style="list-style-type: none"> • Agreement and conditions for use of data with private transit information application developers. • Data sharing agreements with other regional transit providers to improve information and efficiency of transfers.
GCRTA / Laketran Transit Vehicle WiFi	This effort will install wireless internet (Wi-Fi) on GCRTA/Laketran buses.	<ul style="list-style-type: none"> • Operational agreements between transit security and other law enforcement agencies regarding response.

Project	Description	Potential Areas for Agreements
Enhance and expand GCRTA and Laketran Paratransit services	This effort will implement an advanced para-transit scheduling and dispatch system at Laketran, coordinated with GCRTA.	<ul style="list-style-type: none"> Data sharing agreements with other regional transit providers to improve information and efficiency of transfers.
Signal Timing Optimization Program	This effort will re-time traffic signals on arterial roadways of regional significance. NOACA will lead the effort to update signal operations across key corridors in the region, and across jurisdictional boundaries, seeking to minimize stops and delays, reduce fuel consumption and air pollution, maximize traffic flow along arterial roadways, and improve safety by reducing rear end crashes.	<ul style="list-style-type: none"> Agreements between NOACA and roadway owners defining signal timing strategies, protocols for communication and coordination and procedures for modification of signal timings.
Automated Traffic Signal Performance Measures (ATSPMs)	This project will collect data at signalized intersections and develop performance measures using ATSPMS technologies to proactively manage signals in the region.	<ul style="list-style-type: none"> Agreements defining thresholds and responsibilities for setting and modification of signal timings on key corridors.
Municipal Signal Preemption	This effort will explore traffic signal preemption for emergency vehicles, which makes use of connected vehicle technology to preempt traffic signals so that emergency vehicle may safely and efficiently move through intersections.	<ul style="list-style-type: none"> Agreements between municipal transportation agencies and law enforcement on priority intersections for traffic signal preemption.
Upgrade Traffic Signals in multiple municipalities including East Cleveland, Rocky River, Strongsville, Lorain, Mayfield Heights, Beachwood, Cleveland Heights, Painesville, University Heights	This project will upgrade traffic signals and signal systems in the municipalities identified. Specific arterial corridors are identified in detail elsewhere in project documents.	<ul style="list-style-type: none"> Agreements between adjacent communities to coordinate signal timing. Agreements need to identify desired corridor speeds that balance mobility with impacts on adjoining land uses, particularly residential areas.
City of Cleveland Special Event Traffic Planning	This effort will develop plans, procedures, and systems to improve traffic conditions associated with special events such as concerts, sporting events, and festivals.	<ul style="list-style-type: none"> City agreement defining responsibilities of transportation and law enforcement agencies, as well as those of event managers. Agreement may define payments required from private event promoters to City for services.
Cuyahoga County Evacuation Plan Updates	This project will study and develop a plan to evacuate Cuyahoga County in case of an emergency affecting a mass area.	<ul style="list-style-type: none"> Agreement to support evacuation plan developed by County Emergency Management Agency (EMA). Responsibilities of transportation, maintenance communications and law enforcement agencies would be defined to support action plans developed by EMA.

10.0 Using the Regional ITS Architecture

The NOACA Regional ITS Architecture has been created as a consensus view of what ITS systems the stakeholders within the architecture boundary already have in place and what systems they plan to implement in the future. By its nature, the architecture is not a static set of outputs. The architecture should be modified as plans and priorities change, ITS projects are implemented, and the ITS needs and services evolve in the region. There are many actions that may cause a need to update the architecture, including:

- **Changes in Project Definition.** When actually defined, a project may add, subtract or modify elements, interfaces, or information flows of the ITS architecture. Because the architecture is meant to describe not only ITS planned, but also the current ITS implementations, it should be updated to correctly reflect the deployed projects.
- **Changes due to Project Addition/Deletion.** Occasionally a project will be added, deleted or modified during the planning process. When this occurs, the aspects of the ITS architecture associated with the project should be added, deleted or modified.
- **Changes in Project Status.** As projects are deployed, the status of the architecture elements, services and flows that are part of the projects will have to be changed from planned to exist. Elements, services and flows should be considered to exist when they are substantially complete.
- **Changes in Project Priority.** Due to funding constraints, technological changes or other considerations, a project planned may be delayed or accelerated. Such changes should be reflected in the NOACA Regional ITS Architecture.
- **Changes in Regional Needs.** Transportation planning is done to address regional transportation needs. Over time these needs change and the corresponding aspects of the ITS architecture that addresses these needs should be updated.
- **Changes in Participating Stakeholders.** Stakeholder involvement can also change over time. The ITS architecture should be updated to reflect the participating stakeholder roles in the statewide view of ITS elements, interfaces, and information flows.
- **Changes in Other Architectures.** The ITS architecture includes not only elements and interfaces within the architecture boundary, but also interfaces to elements in adjacent and other areas in Ohio. Changes in the Ohio Statewide ITS Architecture and ITS architectures in adjacent areas may necessitate changes in the NOACA Regional ITS Architecture to maintain consistency. A regional ITS architecture may overlap with the statewide ITS architecture, and a change in one architecture may necessitate a change in the other.
- **Changes in National ITS Reference Architecture.** The National ITS Reference Architecture will be expanded and evolved from time to time to include new user services or refine existing services. These changes should be considered as the NOACA Regional ITS Architecture is updated. Updates to the National ITS Reference Architecture and RAD-IT will be publicized on the U.S. DOT ITS Joint Program Office (JPO) website: <https://www.its.dot.gov/index.htm>.

10.1 Regional ITS Architecture Website

The home page of the NOACA Regional ITS Architecture website is contained at the following address:
<https://noaca-its.aecomonline.net/Web/web/index.html>.

The purpose of the website is to organize the details of the architecture into a form that is more readily accessible to stakeholders. It provides a method for stakeholders to access the architecture information in order to encourage use of the architecture in both transportation planning and project implementation.

The menu bar at the left provides access to different pages of the architecture. The pages to which each of these buttons leads are described below.

Home: This button takes the user to the homepage for the NOACA Regional ITS Architecture. The homepage describes the purpose of the architecture.

Scope: This page provides the geographic scope and service scope of the architecture. It also provides the planning time frame for the architecture.

Stakeholders: This page presents the full list of regional stakeholders, along with descriptions for each.

Inventory: This page presents the inventory of ITS elements along with a brief description of each. The inventory of ITS elements is arranged in an alphabetic order. The list of inventory can also be viewed by entity (subsystems and terminators as defined by the National ITS Reference Architecture) or by stakeholder.

Inventory by Entity: This page presents the inventory of ITS elements arranged by entity (subsystems and terminators). This allows all elements with related functions to be viewed simultaneously. Clicking on an element name opens a detail page that provides more information about the element, including a listing of all interfacing elements.

Inventory by Stakeholder: This page presents the inventory of ITS elements arranged by stakeholder. This allows all the elements owned by a single stakeholder to be viewed simultaneously. Clicking on an element name leads to a detail page that provides more information about the element, including a listing of all interfacing elements.

Services: This page presents a list of relevant service packages for the region and their deployment status. Clicking on the service package name links to the definition of the service package, its deployment status in the region, and a list of ITS elements associated with the service package.

Ops Concept: This page presents a table of relevant ITS service areas for the region. Clicking on a service area links to a detailed page with a list of stakeholders providing the service and their roles and responsibilities in the operations of the relevant ITS systems in the region.

Requirements: The page presents a list of ITS functional objects for the region. Clicking on a functional object leads to a detailed page that provides a description of the functional object, a list of regional ITS elements supporting the functions, and a list of functional requirements.

Interfaces: This page presents a table that identifies interfaces among ITS elements for the region. Clicking on an element in the “Element” column leads to a context diagram that shows how the element interfaces with other elements in the region. Clicking on an element in the “Interfacing Element” column brings up a detailed page that shows an interface diagram between the two elements, along with the definitions of the architecture / information flows.

Standards: This page provides a list of ITS standards that are applicable to the region. Clicking on the title of a standard opens a page that identifies how the standard can be applied to facilitate communications and electronic information exchanges in the region.

Agreements: This page presents a list of agreements that support ITS in the region.

Projects: This page presents a list of potential ITS projects for the region, along with recommended implementation time frame and brief project descriptions. Clicking on a project title opens a detailed page that provides additional information on the project.

10.2 Using ITS Architecture in Project Definition

Projects that emerge from the planning process can benefit from the use of the regional ITS architecture in their definition and development. Project implementation should follow a systems engineering process. Figure 3 on page 5 shows a typical project implementation process for deploying ITS projects. The project implementation process shown in Figure 3 is a systems engineering process. It is a process that can be used to systematically deploy ITS while reducing the risks associated with deployments. The systems engineering process is more than just steps in systems design and implementation; it is a life-cycle process. The process recognizes that many projects are deployed incrementally and expand over time. U.S. DOT Rule 940 requires that the systems engineering process be used for ITS projects that are funded with federal funds.

Applying the systems engineering process to ITS project development is a key new requirement that must be addressed by stakeholders using federal funds.

There are similarities between the systems engineering process and the project development process generally used by transportation agencies. The project development process is generally similar to as follows:

- Project Selection
- Authorization to Proceed
- Project Definition
 - Purpose and Need
 - Project Scoping
 - Conceptual Design
- Project Design
 - Preliminary Plan Development
 - Semi-Final Plan Development
 - Final Plan Development
- Construction
 - Testing
- Operation and Maintenance

Figure 8 illustrates the similarities and relationship between the project development process above to the FHWA systems engineering process.

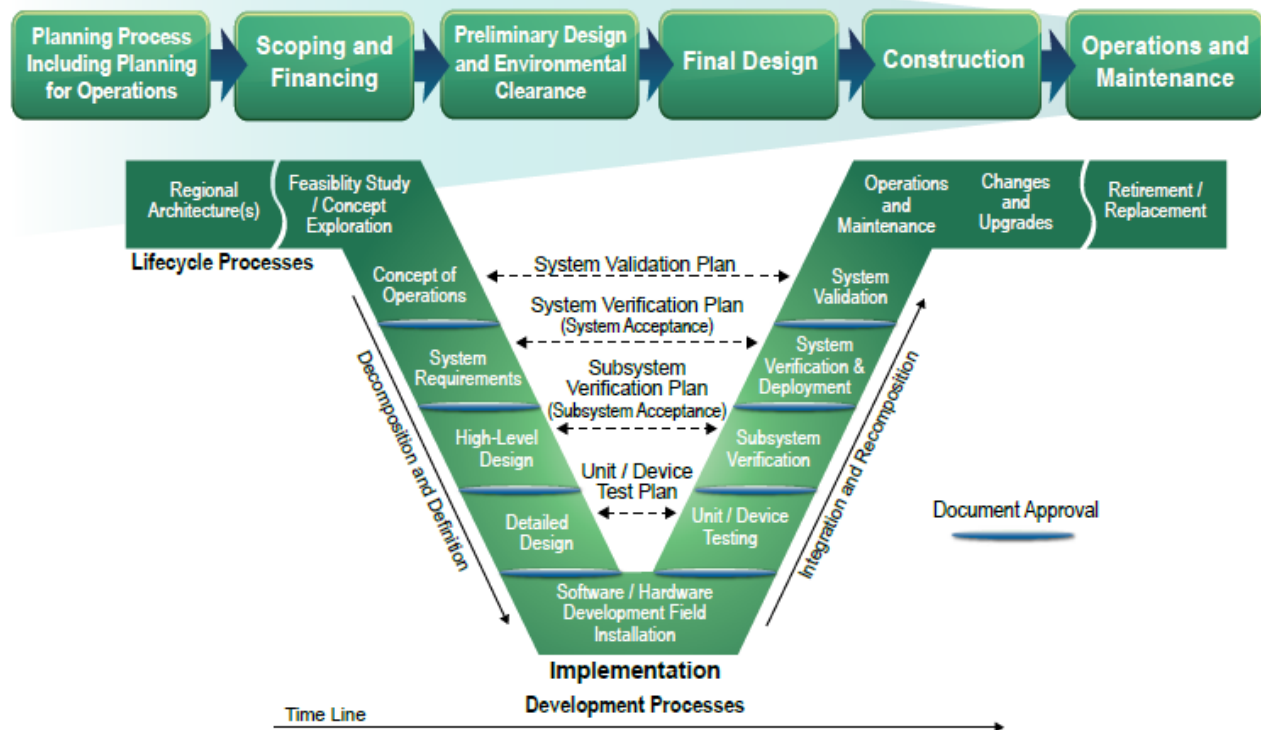


Figure 8. FHWA Systems Engineering Process ("V" Diagram) and Project Implementation Process

An ITS architecture can be used to support development of the concept of operations, requirements, and high-level design in the systems engineering process. In deploying an ITS related project, the ITS architecture should be used as the starting point for developing a project concept of operations (not to be confused with an operational concept, which defines the roles and responsibilities of the stakeholders). The concept of operations shows at a high level how the systems involved in a project operate in conjunction with the other systems of the region. According to the NHI course "Introduction to Systems Engineering for Advanced Transportation", a concept of operations includes the following information:

- Identification of stakeholders,
- Development of a vision for the project,
- Description of where the system(s) will be used,
- Description of organizational procedures or practices appropriate to the system(s), definition of critical performance parameters associated with the systems(s),
- Description of the utilization environment (conditions under which various parts of the system(s) will be used),
- Definition of performance measures used to evaluate the effectiveness of the system(s),
- Considerations of life cycle expectations, and
- Conditions under which the system(s) must operate (e.g. environmental conditions).

The customized service package diagrams tailored by the stakeholders can also assist in definition of requirements for ITS systems involved in a specific project. The ITS architecture contains high level functional

requirements for all ITS elements in the region. These high level requirements can be the starting point for developing more detailed requirements.

The ITS architecture also can support high level system design. The ITS architecture can be used by system designers to identify the ITS standards that are applicable for the interfaces included in the architecture.

While the above discussion relates the architecture to the general systems engineering process, Rule 940 does have a specific set of systems engineering analysis requirements that apply to all ITS projects that use funds from the Highway Trust Fund. The required systems engineering analysis steps are:

- Identification of portions of the regional ITS architecture being implemented (or if a regional ITS architecture does not exist, the applicable portions of the National ITS Architecture);
- Identification of participating agencies' roles and responsibilities;
- Requirements definitions;
- Analysis of alternative system configurations and technology options to meet requirements;
- Procurement options;
- Identification of applicable ITS standards and testing procedures; and
- Procedures and resources necessary for operations and management of the system.

10.3 Using ITS Architecture for Procurement

An up-to-date regional ITS architecture is important because projects must be aligned with the area's regional ITS architecture to receive federal funds. This section discusses how stakeholders can determine if a project is consistent with the architecture.

In order to use the NOACA Regional ITS Architecture to support project development, the agency must identify how the project contributes to or aligns with a portion of the architecture. This is a key step when using the architecture because it requires the agency to view the ITS project in the broader context of the entire architecture. Having an agency consider the wider architecture while the project's scope is being defined, enables them to consider the services, functionality, and integration opportunities that are envisioned by the region as a whole. This step is also required to meet the FHWA Architecture Rule/FTA Architecture Policy.

The NOACA Regional ITS Architecture should be used as early in the project development lifecycle as possible so that integration opportunities are considered. The architecture should be reviewed before firm project cost estimates are established so there is still opportunity to adjust the scope in order to accommodate the regional functionality and interfaces identified. This opportunity may occur before or after programming / budgeting, depending on how specifically the ITS project is defined in the programming / budget documents.

10.4 Funding for ITS Projects

ITS projects proposed for the NOACA region would qualify for several categories of federal highway and transit funding, such as: National Highway Performance Program (NHPP), Surface Transportation Program (STP), Congestion Mitigation and Air Quality Improvement Program (CMAQ), Highway Safety Improvement Program (HSIP), and FTA Sec. 5307. Highway-related ITS initiatives would likely be funded with STP funding dedicated to the NOACA region or CMAQ funds. Transit-related ITS initiatives would be funded with 5307 and CMAQ funds.

Increasingly, ITS elements are included as a component of broader-purposed highway improvement projects. In these cases, the ITS elements would be included with the NHPP, STP, or HSIP funded project, and such projects would be added to the TIP by Update, Amendment, or Modification procedures, as appropriate.

ITS projects and components may also be funded with, or included with projects funded with, state or local funds. State and locally funded projects are not required to be listed in the TIP unless they are deemed to be “regionally significant” (refer to the TIP for more discussion).

10.5 Project Design Concerns

When designing a project, functionality and ITS standards provide guidance and criteria to identify how the project will relate to the region’s overall operations. As projects grow in size, the functions and standards become complex and sometimes require agreements between agencies. It is beneficial to identify the agencies involved and the type(s) of agreement(s) needed early on in the project design.

How ITS components are shown in the architecture?

The National ITS Architecture uses Service Packages to depict the current and future functions of ITS systems. Entities that represent sources of information are called “subsystems”, which are grouped into four classes: centers, fields, vehicles, and travelers as shown in Table 7. The table provides descriptions from the National ITS Architecture for each subsystem and identifies examples of those subsystems in the region.

Table 7. Subsystem Definitions and Examples in NOACA Region

Subsystem	Definition	Examples in NOACA Region
Center	Provides management, administrative, and support functions for the transportation system. The center subsystems each communicate with other centers to enable coordination between modes and across jurisdictions.	Traffic Management Centers Emergency Operations Centers 911 Communications Centers
Field	Intelligent infrastructure distributed along the transportation network which perform surveillance, information gathering, and information dissemination and whose operation is governed by the center subsystem.	Traffic Signals CCTV Cameras Dynamic Message Signs Vehicle Detection
Vehicle	Covers ITS related elements on vehicle platforms such as automatic vehicle location equipment and operations capabilities for portable field equipment.	Maintenance and Construction Vehicles Public Safety Vehicles Incident Response Vehicles
Traveler	Equipment used by travelers to access ITS services prior to a trip, including information service providers.	Transit Bus Arrival/Departure Signs Smartphones Personal Computers
Support	Covers central office systems that provide support to other subsystems in transportation services	Archived Data Systems Data Distribution Systems

How to find general functional requirements related to a proposed project?

Functional requirements explain how an inventory item provides the services described in their functional objects. Functional objects group inventory items together based on what overall function they serve and are listed in deployment-sized pieces (for example: emergency dispatch, roadway basic surveillance, traffic data collection, and transit center fixed-route operations).

The functional requirements can be found on the National ITS Reference Architecture website (<https://local.iteris.com/arc-it/>). The following process should be followed to access requirements for specific inventory items:

- Select “Architecture” in the top left corner of the Home Page of the National ITS Reference Architecture website
- Then select “Physical” that appears under “Views”
- Then select the “Physical Objects” link in the first line of text of the “Physical” web page
- Select the subsystem or terminator for which you are seeking functional requirements. Note that physical objects are presented in three tabs. This includes one tab for all objects, and one tab each for Subsystems and Terminators.
- Select the Functionality tab on the page of the physical object
- Select the functional object of interest
- Under the “Requirements” tab, a list of functional requirements will be identified for each relevant functional object.

How to select communication standards that apply to the project

ITS standards define how system components interact within the overall framework of the National ITS Architecture. The use of standards ensures interoperability amongst various functions of an ITS project so that components or technologies from various vendors and at different scales (local, regional, and national) are still compatible. Standards also facilitate innovation in technology development without necessitating replacement of hardware or software systems that are needed to operate the new technology. Other purposes for ITS standards include:

- ITS standards used in a deployment can greatly reduce component development costs;
- ITS standards are open and non-proprietary, helping state and local transportation managers avoid costly single-source procurements and locked-in maintenance relationships with vendors;
- ITS standards support the deployment of interoperable ITS systems, helping agencies link together different types of ITS technologies and making system expansions easier to plan and implement; and
- ITS standards are being developed for many different types of ITS technologies and their use in project deployment is a key aspect of conformity with the FHWA Final Rule 940.

New standards that are developed go through an approval process before they are included in documents as formalized standards. Existing standards are amended and modified as needed based on new standards development or new technology development. Several national and international standards organizations are working toward developing ITS standards for communications, field infrastructure, messages and data dictionaries, and other areas. The organizations participating in ITS standards activities include:

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

Why agreements may be needed to support a proposed project?

Institutional agreements can support ITS functionality and project development in the region. Agreements allow agencies to document the roles and responsibilities of the particular service or function that is being agreed to, as well as any obligations each agency has for maintenance, operations, or financial support.

A listing of agreements based on the types of interfaces identified in the NOACA Regional ITS Architecture is contained in the website for the architecture. It is important to note that as ITS services and systems are implemented or expanded in the region, part of the planning and review process for those projects should include a review of potential agreements that would be needed for implementation or operations. These additional agreements are not listed in the ITS Architecture for specific projects because the possibility of coordination/sharing/joint operations is unique, and should be evaluated for every project.

11.0 Architecture Maintenance Plan

This section discusses how to maintain the ITS Architecture and Strategic Plan. It also includes discussion of how to plan and incorporate potential enhancements.

As noted in Section 10, the architecture should be modified as plans and priorities change, ITS projects are implemented, and the ITS needs and services evolve in the region. There are many actions that may cause a need to update the architecture, including:

- Changes in Project Definition.
- Changes due to Project Addition/Deletion.
- Changes in Project Status.
- Changes in Project Priority.
- Changes in Regional Needs.
- Changes in Participating Stakeholders.
- Changes in Other Architectures.
- Changes in National ITS Reference Architecture.

11.1 Maintenance Schedule

Three types of changes are identified that can trigger maintenance of the ITS architecture. Stakeholders impacted by changes in projects should be contacted as part of this process. Types of changes are discussed below:

Ad Hoc/One-Off Changes – As noted above, the urgency of updating ITS architecture based on ad-hoc or one-off changes in projects will vary depending on both the nature of the project and the nature of the change. Significant changes in project scope, technology or budgets, particularly those in larger projects would justify updating the architecture to incorporate that project change. Addition of significant new projects, or deletion of existing projects, would also call for an update. Less significant changes, as discussed above can be incorporated into regular architecture updates. It is assumed that NOACA would be responsible for these changes and would have at least one staff member trained on FHWA's RAD-IT architecture program.

Major Plan/Program Alignment – ITS architecture should be updated to align with the timeline of other State and regional programs such as the TIP, the 5-year plan and Long-Range Plans. Programs focused on technology, such as DriveOhio, could also trigger an ITS architecture update. This process is key to avoid inconsistency between the ITS Architecture and the overall funding and deployment plans of the region and the State. When a new plan or program is developed ITS Architecture should be reviewed and aligned as needed. NOACA would be responsible for updating the architecture, using FHWA's RAD-IT software. This has the potential to involve a significant level of effort and thus should be budgeted in NOACA's annual work program.

Regular Maintenance – As noted above, the ITS architecture should be updated on a regularly scheduled basis, to be determined by NOACA based on agency priorities and the rate of development of new projects. A five-year timeframe is a reasonable target if updates in the first two categories are carried out on a regular basis. Otherwise a more frequent update schedule may be needed. This activity would also be conducted by NOACA using RAD-IT and involve outreach to stakeholders. It may be possible to combine the stakeholder process into other NOACA committee activities.

In all three scenarios, coordination with ongoing planning activities is key to optimizing the use of the ITS Architecture. The development of the regional ITS architecture is not meant to compete with the formal transportation planning process. They must work together to provide the best “plan” for the region. Key ITS projects and initiatives are targeted early in the planning process in order to facilitate more effective integration with other projects in the region. The architecture can support and help define the goals and objectives of other NOACA plans since it provides a vision of ITS in the future as seen by the stakeholders. Operational concepts, service packages, and agency/subsystem interfaces can all provide more clarity to the Plan components for better scoping and allocating costs.¹

The chart shown in Figure 9 provides a graphic view of the key touchpoints between other planning activities and the ITS architecture. Table 8 provides a more detailed description of the process used to link plan development with ITS architecture. Specific steps are provided to (1) identify needs, goals and objectives that can be addressed with ITS; and (2) a process that can be followed to make sure that ITS project development is consistent with that of other projects. This process may be applied to a variety of planning activities, ranging from short-range Transportation Improvement Programs to Long-Range Plans.

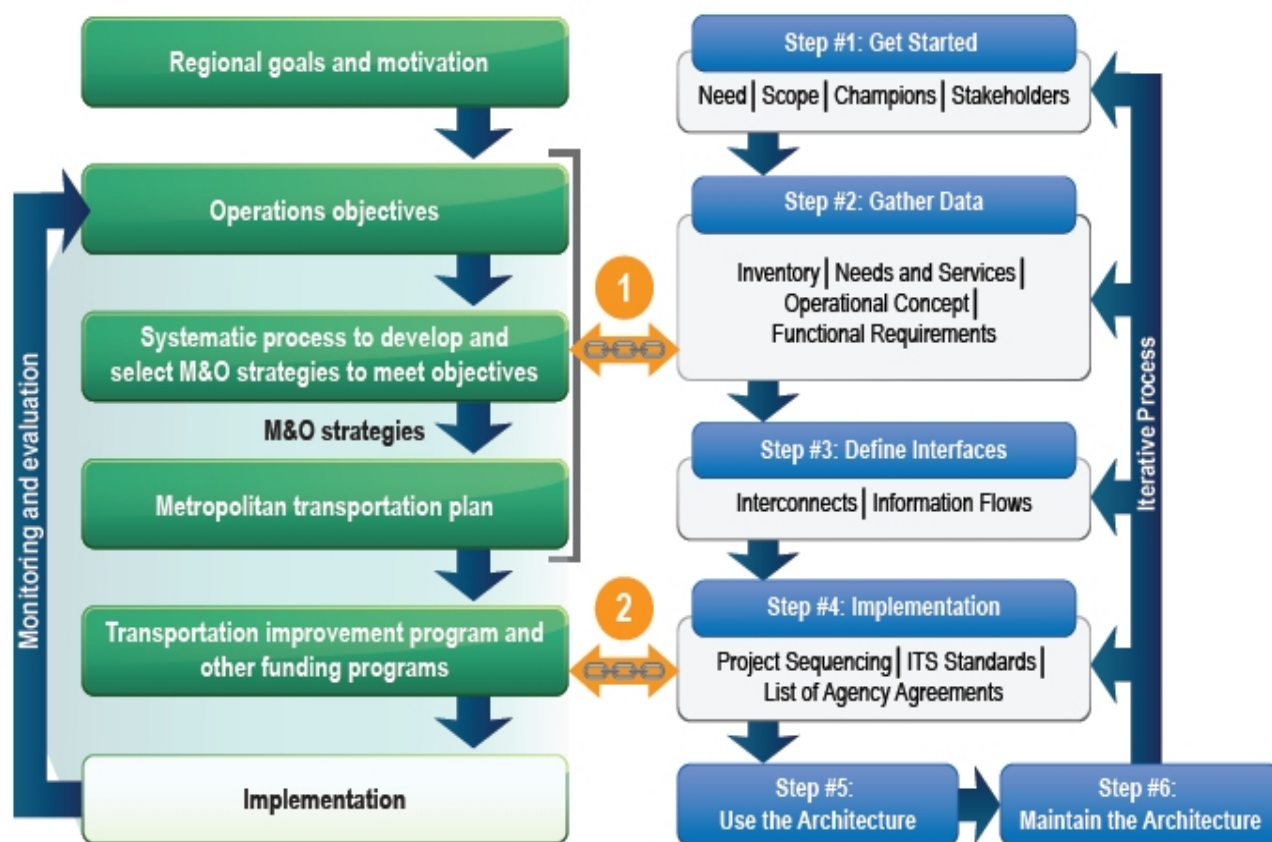


Figure 9. Relationship of Planning Activities and ITS Architecture

¹ http://www.ops.fhwa.dot.gov/its_arch_imp/faq.htm

Table 8. Documentation of Plan Development – ITS Architecture Coordination Process

Planning Step	Coordination with ITS Architecture	Output
1. Goals and Objectives	1. Identify key ITS Architecture stakeholders associated with each goal area (safety, mobility, etc.)	List and contact information for ITS stakeholders for each goal area
2. Identification of Needs and Deficiencies (using performance measures)	1. Categorize those needs and deficiencies which could be addressed all or in part with ITS solutions	List needs and deficiencies that may have ITS solutions
3. Development of Alternatives	1. Use output list identified in steps 1 and 2 to identify potential ITS and operational solutions 2. Review ITS architecture to determine whether proposed solutions are included 3. For those solutions included identify key stakeholders	List of potential ITS solutions, whether or not they currently are in architecture and associated key stakeholders (if included)
4. Refinement of Potential ITS Solutions	1. Define ITS alternatives, including geographic scope and technology 2. Determine whether project is stand-alone or should be incorporated into capital project 3. Review ITS architecture for project refinement – identify linkages, data flows and stakeholders 4. Refine project definition as needed	List of refined ITS solutions to be evaluated
5. Evaluation of Alternatives	1. Conduct evaluation of ITS alternatives identified in step 4 Output	Evaluation Report of Potential ITS Solutions identified in step 4
6. Project Selection and Prioritization	1. Develop project ranking / selection criteria 2. Rank ITS projects and develop prioritized list, applying ranking/selection criteria developed in step 1 3. Reprioritize projects based on financial constraints 4. Identify needed changes and/or additions to ITS architecture based on selected project list	Final list of prioritized ITS projects, based on fiscal constraints Update the ITS Architecture to reflect changes based on final list of prioritized ITS projects. For projects not in ITS define full architecture inputs, including stakeholders, service packages and data flows

11.2 Architecture Maintenance Resources

As noted earlier, the home page of the NOACA Regional ITS Architecture website is contained at the following address: <https://noaca-its.aecomonline.net/Web/web/index.html>. The webpages have been generated from the RAD-IT database that contains the elements and related details of the NOACA Regional ITS Architecture.

The “Help” function within the RAD-IT software utilized to create web pages contains detailed information to guide users through the process of updating web pages that would contain the information updated within the RAD-IT database. The content of the Help database within the RAD-IT software is also available in a PDF

Manual accessible at: <https://local.iteris.com/arc-it/tools/RAD-ITv8.1Help.pdf>. This manual provides instruction for all of the functions within the RAD-IT software package.

Among the more common RAD-IT database updates that could be made in response to comments from stakeholders are the following:

- Modifying stakeholder descriptions as needed – beginning on page 53 of the manual
- Creating a New Element (such as a new project) – beginning on page 58 of the manual
- Modifying an Element (such as making changes to a project) – beginning on page 62
- Updating and Managing Service Packages – beginning on page 65

11.3 Project Architecture Maintenance

As new regional ITS projects become known, they can be added to the NOACA Regional ITS Architecture from the “Start” tab of the RAD-IT file. This tab allows the user to create a new project-level architecture, or select an existing project-level architecture for editing if needed. The tab allows the user to define scope, time frame, and other basic definition information for the new or selected project architecture.

The left-hand side of the Start tab contains the regional and project architectures for selection and editing. Selecting an architecture causes the right hand side of the window to be filled in and makes the selected project architecture shown in the banner at the top of the window and on other tabs. A new project architecture can be created by selecting the “New” option under the Project Architecture area. The following process may be used to begin a new project architecture and add project details:

1. Select the type of architecture as a Project Architecture:
 - a. When creating a new Project Architecture in an open database file, the name and status of the architecture must be entered. The names of existing Project Architectures in this database file are displayed so you may see the existing names and enter a new name.
 - b. Note that all of the projects entered within the NOACA Regional ITS Architecture are Short Term projects that have been further defined within the Regional ITS Strategic Plan document. The project IDs have been added and begin with “S01...”, “S02...” and so on.
2. Enter the following required attributes of the Project architecture.
 - a. Name: The name of the project architecture.
 - b. Description: Description of the project architecture.
 - c. Timeframe: Define the planning timeframe that the Regional ITS Architecture will address. All of the projects entered within the NOACA Regional ITS Architecture are Short Term projects that have been further defined within the Regional ITS Strategic Plan document.
 - d. Status: Status of the Project Architecture. Note that all projects have been added as planned projects.
3. After selecting “apply” the project architecture will be created.

Note that if changes are made on either the “Inventory” or “Services” tabs while in a project architecture, these changes will be reflected in the larger Regional Architecture, and vice versa. This applies only to the elements, physical objects, and status changes of these variables on the “Inventory” or “Services” windows. Care should be taken when switching back and forth between the Regional and Project Architecture views. The current

architecture that is selected for editing within the RAD-IT file will be presented at the top of each tab as shown in Figure 10.

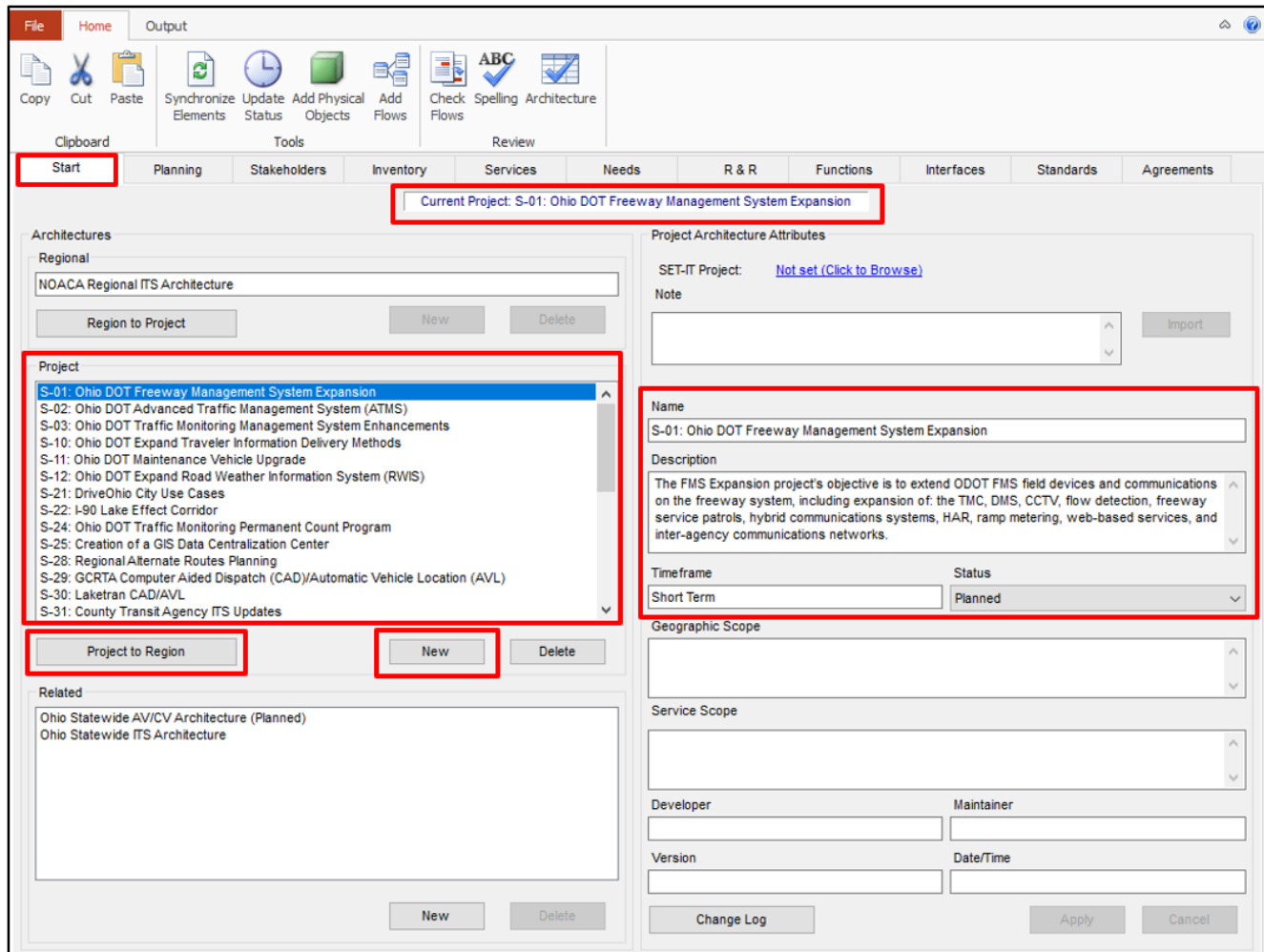


Figure 10. RAD-IT Architecture File and Project Architectures Listed on Start Tab

In order to regain consistency of information flows and interconnections between the Project Architectures and the Regional Architecture, such as customization done on the “Interfaces” tab in a project, the Project Architecture MUST be merged (or merged again, if previously done) into the Regional Architecture via the “Project to Region” option on the “Start” tab.

11.4 Potential Enhancements to Architecture

ITS Architectures are of greatest value when they are kept fresh and accurate, providing useful information in project selection, development and implementation. Keeping the ITS Architecture up to date with regular updates and coordinating these efforts with ongoing planning initiatives will not only make the architecture more useful but will help to convince stakeholders to participate more actively in the process. Since many projects are generated at the local level, it is a challenge to incorporate all of the ITS-related initiatives in the region. Some of the opportunities to enhance the architecture include:

- Regular updates as described in Section 11.1.
- Improved coordination between development of plans and ITS architecture.
- Improved linkages with partners like DriveOhio to keep abreast of new technology and develop common language to describe it.
- ITS architecture training for local officials would help to improve stakeholder participation. This could be an abbreviated session that provided basic knowledge, not full training on RAD-IT.
- Leverage improved familiarity of local stakeholders to compile list of local projects and promote additional interest in ITS solutions.
- Build on RAD-IT foundation by using the SET-IT software tool (or comparable) for project-level architectures. The tool supports pilots, test beds and early deployments. Use of this tool can strengthen the region's commitment to maintaining an up-to-date and connected ITS Architecture, given that this software integrates with the RAD-IT database.
- Assuring that at least one NOACA employee is fully trained on RAD-IT and SET-IT and has time set aside for architecture maintenance.
- Build upon ITS architecture capability to incorporate additional tools for system engineering and project design.

12.0 ITS Strategic Plan Framework

In addition to updating the Regional ITS architecture, an ITS Strategic Plan was developed to guide systematic and programmatic deployment of ITS in the region. Although many of these projects have identified funding sources, the list is not fiscally constrained. The list of projects in Table 9 represents a compilation of the types of projects the NOACA region feels will help meet their ITS needs and goals in the next 3 years. The ITS Strategic Plan, which can be accessed via the website of the architecture, contains additional project information, a table cross-referencing the high-priority needs identified with the proposed projects, as well as references and methodologies used to develop the plan.

Each of the short term ITS projects in Table 9 is also contained within the NOACA Regional ITS Architecture as a project architecture. The applicable stakeholders, inventory, and service packages within the NOACA Regional ITS Architecture have been selected for each project architecture. This can help to illustrate how these elements of the NOACA Regional ITS Architecture apply to each of these short term projects.

Table 9. List of ITS Projects for Short-Term Deployment

Short Term ITS Project Name	Description	Stakeholders
S01: Freeway Management System (FMS) Expansion	The FMS Expansion project's objective is to extend ODOT FMS field devices and communications on the freeway system, including expansion of: the TMC, DMS, CCTV, flow detection, freeway service patrols, hybrid communications systems, HAR, ramp metering, web-based services, and inter-agency communications networks.	Ohio DOT
S02: ODOT Advanced Traffic Management System (ATMS)	ODOT is seeking a commercial off-the-shelf Advanced Traffic Management System software package to replace and expand the current in-house system. The new system shall consolidate resources (including Playbook), enhance capabilities, capture and archive roadway, traffic, speed, and weather data, provide functionality for forthcoming emerging technologies.	Ohio DOT
S03: Traffic Monitoring Management System Enhancements	The objective of this project is to enhance/expand a Statewide Traffic Monitoring Management System created by ODOT.	Ohio DOT
S10: Expand Traveler Information Delivery Methods	Enhancing traveler information dissemination methods may include enhancing OHGO, information provided through cable TV stations, and new connections to private sector dissemination methods.	Ohio DOT
S11: Maintenance Vehicle Upgrade	Maintenance vehicle upgrades pertaining to ITS include the purchasing of new instrumented multi-subsystem data collection vehicles and associated software and maintenance.	Ohio DOT
S12: Expand Road Weather Information System (RWIS)	RWIS expansion efforts may include installing additional RWIS stations at strategic locations. The project also considers testing mobile RWIS.	Ohio DOT

Short Term ITS Project Name	Description	Stakeholders
S20: Ohio Turnpike ACV Testing	The 241-mile Ohio Turnpike is DriveOhio's site for testing ACVs. The turnpike is outfitted – end to end – with fiber-optic cable, and it already has been a testing site for self-driving trucks. Roadside units were installed in a 60-mile stretch of the turnpike and onboard units were installed and operational in fleet vehicles during the first quarter of 2018, giving the Ohio Turnpike Commission the ability to produce traffic and weather alerts for digitally connected vehicles and to use vehicle and road condition data to make better decisions about treating roads and managing incidents.	Ohio Turnpike and Infrastructure Commission
S21: DriveOhio City Use Cases	ODOT is collaborating with Athens, Akron, Canton, Cincinnati, Cleveland, Dayton, Dublin, and Toledo for additional DriveOhio projects. Use cases that highlight each city's unique attributes are under development, ranging from workforce mobility, healthcare and education access, and mobility access for underserved, elderly and disabled populations.	Ohio DOT, City of Cleveland, NOACA
S22: I-90 Lake Effect Corridor	ODOT is equipping 60 miles of I-90 with dedicate short range communications units. It will also test wireless technologies designed to send and receive data from those units as well as units on public service vehicles. The data, combined with new variable speed limit signs, will help local officials and law enforcement better manage the roadway to reduce crashes and fatalities. The project considers an expansion to other corridors in the near future.	Ohio DOT
S24: ODOT Traffic Monitoring Permanent Count Program	The effort advances the ODOT Traffic Monitoring Permanent Count Program, specifically by providing funding for items such as: supplies, utilities, software, counter maintenance, and an upgrade to the existing non-intrusive sensors and accessories.	Ohio DOT
S25: Creation of a GIS Data Centralization Center	The GIS Centralization Project will focus on an enterprise wide approach to managing geospatial resources providing for the development and integration of spatial data and GIS technology throughout ODOT.	Ohio DOT
S28: Regional Alternate Routes Planning	Develop a plan and operational strategy for alternate routes for traffic diversion due to major incidents with a focus on coordination between ODOT-operated freeways and locally-operated arterials. Plans would identify thresholds for when a specific segment of the roadway is considered affected, which alternate route(s) to implement; which agencies should be involved, how they communicate, and their roles and responsibilities in traffic control, timing adjustments, traveler information; and what ITS assets (CCTV, DMS, etc.) should be utilized to monitor the situation and provide en-route traveler information.	Ohio DOT, NOACA, Municipalities

Short Term ITS Project Name	Description	Stakeholders
S29: GCRTA Computer Aided Dispatch (CAD)/Automatic Vehicle Location (AVL)	The goal of this effort is to implement Computer Aided Dispatch using Automatic Vehicle Location technology for GCRTA, including: Automatic Passenger Counters, Closed Caption Television (CCTV) surveillance systems, automated stop announcements, and an enhanced Radio Communication system.	NOACA
S30: Laketrans CAD/AVL	The goal of this effort is to implement Computer Aided Dispatch using Automatic Vehicle Location technology for Laketrans, including: Automatic Passenger Counters, Closed Caption Television (CCTV) surveillance systems, automated stop announcements, and an enhanced Radio Communication system.	NOACA
S31: County Transit Agency ITS Updates	The objective of this effort is to update county transit vehicle ITS, including AVL systems for vehicles for Lorain and Medina counties as well as upgraded vehicle radios for Medina County. Medina County is also looking to install Mobile Data Terminals to communicate, track, and record vehicle and operational data.	Lorain County, Medina County
S32: GCRTA / Laketrans Transit Vehicle Wi-Fi	This effort will install wireless internet (Wi-Fi) on GCRTA/Laketrans buses.	GCRTA, Laketrans
S33: Enhance and expand GCRTA and Laketrans Paratransit services	This effort will implement an advanced para-transit scheduling and dispatch system at Laketrans, coordinated with GCRTA.	GCRTA, Laketrans
S37: Signal Timing Optimization Program	This effort will re-time traffic signals on arterial roadways of regional significance. NOACA will lead the effort to update signal operations across key corridors in the region, and across jurisdictional boundaries, seeking to minimize stops and delays, reduce fuel consumption and air pollution, maximize traffic flow along arterial roadways, and improve safety by reducing rear end crashes.	NOACA, Cuyahoga County, Geauga County, Lake County, Lorain County, Medina County, City of Cleveland
S38: Automated Traffic Signal Performance Measures (ATSPMs)	This project will collect data at signalized intersections and develop performance measures using ATSPMS technologies to proactively manage signals in the region.	NOACA, Cuyahoga County, Geauga County, Lake County, Lorain County, Medina County, City of Cleveland
S39: Municipal Signal Preemption	This effort will explore traffic signal preemption for emergency vehicles, which makes use of connected vehicle technology to preempt traffic signals so that emergency vehicle may safely and efficiently move through intersections.	Cuyahoga County, Geauga County, Lake County, Lorain County, Medina County, City of Cleveland

Short Term ITS Project Name	Description	Stakeholders
S40: Upgrade Traffic Signals in East Cleveland	This project will upgrade traffic signals and signal systems along Euclid Avenue, Superior Avenue, Terrace Road, Noble Road, and Hayden Drive in East Cleveland.	Cuyahoga County
S41: Upgrade traffic signals along US-20 and US-322	This project will upgrade traffic signals along US-20 (Center Ridge Road), from west of Stoney Ridge Road to Lear Nagle Road, in North Ridgeville as well as traffic signal improvements along US-322 (Mayfield Road), from Kenilworth Road to Warrensville Center Road, in Cleveland Heights	Lorain County
S42: Rocky River Signals	This project will upgrade traffic and pedestrian signals at 6 intersections along Center Ridge Road (US-20) from Pease Drive to Northview Road/Linden Road in the City of Rocky River.	Cuyahoga County
S43: Strongsville Signals	This city-wide signal upgrade project will upgrade signals along SR-82 and US-42 in the City of Strongsville.	Cuyahoga County
S44: Lorain Traffic Signals	This Lorain County project will replace nine signals throughout project limits as well as upgrade ADA ramps.	Lorain County
S45: Mayfield Heights Signals	This Cuyahoga County project will upgrade signals along the Mayfield Road corridor, from Iroquois Avenue to Gates Mills Towers Drive. It will replace four signals, partially upgrade 13 traffic signals, and install an advanced central control system.	Cuyahoga County
S46: Beachwood Signals	This project will upgrade signals primarily along SR175 and Cedar Road in the City of Beachwood, north of the Chagrin Boulevard corridor.	Cuyahoga County
S47: Cleveland Heights Signals	This project will reconstruct 12 signals in northern Cleveland Heights along Monticello Boulevard, Taylor Road, and Noble Road, as well as remove four unwarranted signals.	Cuyahoga County
S48: Painesville Signals	This Lorain County project will replace signal controllers and vehicle detection at 14 intersections along the two corridors, Richmond Street (SR 283) and Mentor Avenue (US 20), and remove three unwarranted traffic signals.	Lake County
S49: University Heights	This project will upgrade twenty-one traffic signals within University Heights along Cedar Road, Warrensville-Center Road, Washington Boulevard, and S. Green Road, including complete reconstruction at four intersections.	Cuyahoga County
S50: City of Cleveland Special Event Traffic Planning	This effort will develop plans, procedures, and systems to improve traffic conditions associated with special events such as concerts, sporting events, and festivals.	City of Cleveland
S53: Cuyahoga County Evacuation Plan Updates	This project will study and develop a plan to evacuate Cuyahoga County in case of an emergency affecting a mass area.	Cuyahoga County

Appendix A. Glossary

Architecture Flow: Architecture Flows (also referred to as “information flows”) refer to information that moves between the components of the physical architecture view of ARC-IT. Architecture flows are the primary tool that is used to define the ITS Architecture interfaces. These architecture flows define what types of information is transferred and how that transfer should occur. For example, one architecture flow would be a dispatcher communicating information to an emergency vehicle responding to an incident.

Architecture Interconnect: Interconnects are communications paths that carry information between components of the physical architecture view of ARC-IT. Several different types of interconnects are defined in ARC-IT to reflect the range of interface requirements in ITS. Some common examples are vehicle to vehicle, point to point, and roadside to vehicle links.

Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT): Title for the National ITS Reference Architecture that is utilized to develop the Ohio Statewide AV/CV Architecture. It provides a common framework for planning, defining, and integrating intelligent transportation systems. Further information can be found at: <https://local.iteris.com/arc-it/index.html>.

Automatic Vehicle Location (AVL): AVL systems track the approximate location of vehicles moving within a transportation network. The most common applications of AVL technology are for dispatching emergency vehicles, tracking transit vehicles and providing passengers with arrival time estimations through information displays.

Autonomous / Connected Vehicles (AV/CV): Vehicles with advanced technologies that allow the vehicle to perform various advanced driving tasks. This can include autonomous operation without the need for a human driver to perform various driving tasks, as well as communication with other vehicles and roadside devices to present real-time information to drivers on the roadway environment.

Center Physical Objects: Center Physical Objects provide management, administrative, and support functions for the transportation system. The centers each communicate with other centers to enable coordination between modes and across jurisdictions. Some examples of center objects are Traffic Management, Transit Management, Commercial Vehicle Administration, Archived Data Management, Emissions Management, Payment Administration, Emergency Management, Traveler Information, and Fleet and Freight Management. The Center class is one of five general physical object classes defined in ARC-IT.

Center to Center Communications: A communication link serving stationary entities, including center physical objects. It may be implemented using a variety of public or private communication networks and technologies. It can include, but is not limited to, twisted pair, coaxial cable, fiber optic, microwave relay networks, spread spectrum, etc. Both dedicated and shared communication resources may be used.

Commercial Vehicle Operations (CVO): Automated and semi-automated systems that support administrative functions for processing many of the functions required of commercial vehicle operators. This includes acquiring credentials, paying taxes, complying with enforcement and safety regulations as well as oversize/overweight permits.

Dedicated Short Range Communications (DSRC): DSRC is a Wi-Fi derivative technology developed to meet specialized needs for secure, low latency, wireless mobile data communications. It is uniquely configured to enable continuous, high-speed, trusted and authenticable data exchange among moving vehicles and between vehicles and roadway infrastructure or mobile devices, to support safety-critical applications, as well as less demanding mobility and environmental applications.

Dynamic Message Sign (DMS): Electronic signs that display traffic conditions, alerts or other useful information to motorists or pedestrians. The term is used interchangeably with previous terminology such as variable message signs (VMS) and changeable message signs (CMS).

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

Emergency Operations Center (EOC): Represents central offices and systems that support incident management, disaster response and evacuation, security monitoring, and other security and public safety-oriented applications. EOC's can also include the functions associated with fixed and mobile public safety communications centers including public safety call taker and dispatch centers operated by police (including transit police), fire, and emergency medical services.

Emergency Vehicle Preemption (EVP): This technology allows emergency vehicles (police, fire trucks, ambulances, etc.) to get priority treatment as they approach traffic signals. These systems can sense the location of the emergency vehicles and adjust the green times so they arrive at the incident sites faster and safer.

Field Physical Objects: Intelligent infrastructure distributed along the transportation network which performs surveillance, information provision, and plan execution control functions and whose operation is governed by center physical objects. Field systems/devices also directly interface to vehicle or mobile physical objects. The Field class is one of the five general classes of physical objects defined in ARC-IT.

Freeway Management Systems: Freeway Management Systems provide real-time control, guidance, warning, and management of traffic in order to improve the flow of people and goods safely and efficiently.

Functional Objects: Functional objects are the building blocks of the physical objects. Functional objects group similar processes of a particular subsystem together into an "implementable" package making it easier for the end users to select as they build the architecture or define a project. The grouping takes into account how the processes must function.

Intelligent Transportation Systems (ITS): ITS applies state-of-the-art and emerging technologies to provide more efficient and effective solutions to current multimodal transportation problems. Some examples of ITS are dynamic message signs, closed-circuit television monitoring systems, and traffic signal systems.

ITS Architecture: A common framework for planning, defining, and integrating intelligent transportation systems. An architecture functionally defines what the pieces of the system are and the information that is exchanged between those pieces. Architecture is defined functionally and does not prescribe particular technologies. This allows the architecture to remain effective over time as technologies evolve. It defines "what must be done," not "how it will be done."

OHGO: Statewide traffic and traveler information system for the state of Ohio accessible to the public via the internet at: <https://ohgo.com/>.

On-Board Equipment (OBE): OBE includes computer modules, display and a DSRC radio that is installed and embedded into vehicles which provide an interface to vehicular sensors, as well as a wireless communication interface to the roadside and back office environment.

On-Board Unit (OBU): OBU is a vehicle mounted device used to transmit and receive a variety of message traffic to and from other connected devices (other OBUs and RSUs). Among the message types and applications supported by this device are vehicle safety messages used to exchange information on each vehicle's dynamic movements for coordination and safety.

Operational Concept: An Operational Concept describes the roles and responsibilities of stakeholders in providing the ITS services included in the ITS Architecture. For example, one of the roles and responsibilities of the ODOT is to operate and maintain the state-operated traffic signal systems.

Physical Objects: Physical objects are systems or device that provide ITS functionality that makes up the ITS and the surrounding environment. They are defined in terms of the services they support, the processing they include, and their interfaces with other physical objects. They are grouped into five classes: Centers, Field, Support, Travelers, and Vehicles. Example physical objects are the Traffic Management Center, the Vehicle Onboard Equipment, and the ITS Roadway Equipment. These correspond to the physical world: respectively traffic operations centers, equipped connected automobiles, and roadside signal controllers.

RAD-IT: The Regional Architecture Development for Intelligent Transportation (RAD-IT) is an automated software tool used to build and maintain an ITS Architecture. It provides a means to input and manage system inventory, service packages, architecture flows and interconnects with regard to a Regional ITS Architecture and/or multiple Project ITS Architectures.

Roadside Unit (RSU): RSU is a connected device that is only allowed to operate from a fixed position (which may in fact be a permanent installation or from temporary equipment brought on-site for a period of time associated with an incident, road construction, or other event). Some RSUs may have connectivity to other nodes or the Internet.

Service Package: Service packages are a combination of ITS architecture components tailored to provide a specific ITS service. For example, the Traffic Incident Management System Service Package combines incident detection systems, roadside surveillance devices, and coordination of traffic management centers to fulfill a number of useful needs related to the rapid clearing of incidents.

Standards: Documented technical specifications sponsored by a Standards Development Organization (SDO) to be used consistently as rules, guidelines, or definitions of characteristics for data transactions.

Subsystem: The principle elements of the physical architecture view of the National ITS Architecture. Subsystems are individual pieces of the Intelligent Transportation System defined by the National ITS Architecture. Subsystems are grouped into four classes: Centers, Field, Vehicles, and Travelers.

Terminator: Terminators define the boundary of an architecture. The National ITS Reference Architecture terminators represent the people, systems, and general environment that connect to Intelligent Transportation Systems.

Traffic Management Center (TMC): Center that manages a broad range of transportation facilities including freeway systems, suburban highway systems, and urban and suburban traffic control systems. It communicates with roadside ITS equipment to monitor and manage traffic flow and monitor the condition of the roadway, surrounding environmental conditions, and field equipment status.

Transit Signal Priority (TSP): Transit signal priority refers to systems that usher transit vehicles through traffic-signal controlled intersections. Transit signal priority modifies the normal signal operation to better accommodate transit vehicles. Transit Signal Priority is similar to Emergency Vehicle Pre-emption, but is less invasive to the signal operation.


Transportation Systems Management and Operations (TSMO): Refers to strategies employed by transportation agencies that focus on operational improvements that can maintain and even restore the performance of the existing transportation system before adding extra system capacity (i.e. additional roadways, travel lanes). Strategies enable transportation agencies to “stretch” their funding to benefit more areas and customers.

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Legends of Service Package Diagrams

<div><div>Connected Vehicles Roadside Equipment</div><div>RSE Traveler Information Roadside Equipment</div><div>RSE Border Management</div></div>	<p>Physical objects are illustrated as colored rectangles. These are color coded according the type of physical object. Size of the object varies only for diagram efficiency, and to include all of the Function Object the P-Object may include in the given service package.</p> <div><div>Vehicle</div><div>Traveler</div><div>Field</div><div>Center</div><div>Support</div></div>
<div>TMC Basic Surveillance</div>	<p>Functional Objects appear as white rectangles placed inside the P-Object whose functionality they express.</p>
<div><div></div>Driver</div>	<p>Human actors appear as P-Objects with a small ‘human’ icon in the southwest corner. Human P-Objects never include Functional Objects.</p>
<div>(2B) barrier system control</div>	<p>Information Flows are shown as solid lines that include arrowheads to indicate the primary direction information is flowing. Flow appearance is further encoded as shown in the following rows.</p>
<div><div>Flow Time Context (1)</div><div><div>1 - Now</div><div>3 - Historical</div><div>2 - Recent</div><div>4 - Static</div></div></div>	<p>Flow Time Context is represented as a number to the left of the flow name. This indicates the time constraints that the destination places on receipt of the information provided by this flow. These are high level constraints, dependent on more detailed performance specification in standards and interface control documents.</p>
<div><div>Flow Spatial Context (A)</div><div><div>A - Adjacent</div><div>D - National</div><div>B - Local</div><div>E - Continental</div><div>C - Regional</div></div></div>	<p>Flow Spatial Context is represented as a letter adjacent to Time Context. This indicates the distance constraints around which the data provided by the Source is relevant. These are the high level constraints, dependent on more detailed performance specification in standards and interface control documents.</p>
<div><div>Flow Cardinality</div><div><div>Unicast</div><div>Multicast</div><div>Broadcast</div></div></div>	<p>Flow Cardinality is represented by arrowhead style. It indicates the distance constraints around which the data provided by the Source is relevant. These are high level constraints, dependent on more detailed performance specification in standards and interface control documents.</p>
<div><div>Flow Control</div><div><div>Transaction initiated By left-hand party</div><div>Receipt acknowledged</div></div></div>	<p>Flow Control is represented by a box (initiator) and a slash (acknowledgement required) attached to the flow.</p>
<div><div>Flow Security</div><div><div>Clear text. No Authent.</div><div>Encrypted. No Authent.</div><div>Clear text. Authenticated.</div><div>Encrypted. Authenticated.</div></div></div>	<p>Flow Security is represented by color. These are typically derived from the security analysis; any flow with Integrity of MODERATE or HIGH requires Authenticability; any flow with Confidentiality of MODERATE or HIGH require encryption.</p>

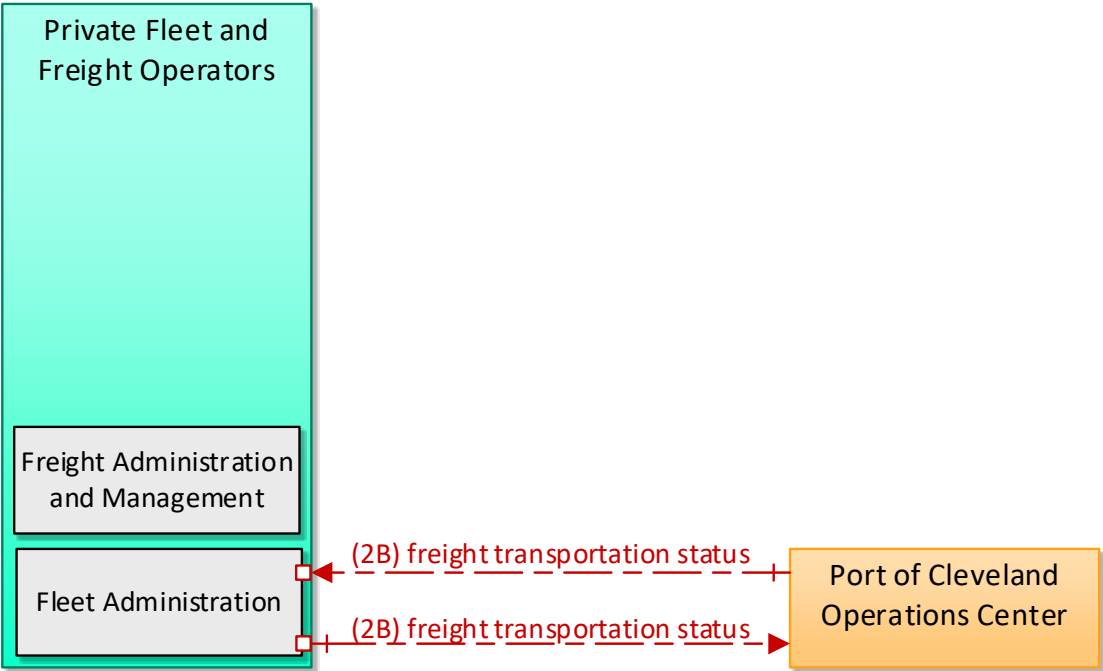


Figure B-1. CVO02 Freight Administration

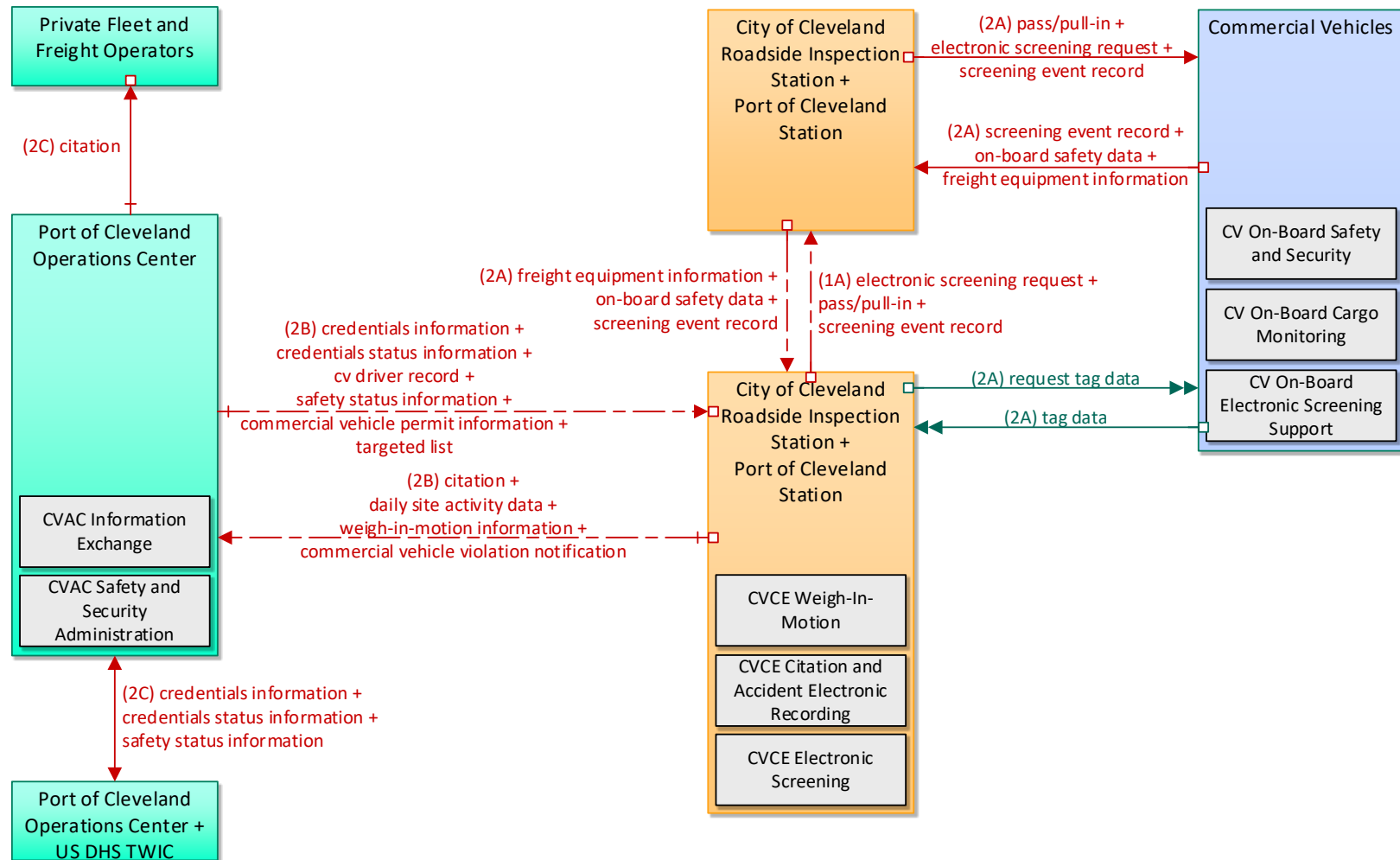


Figure B-2. CVO03 Electronic Clearance

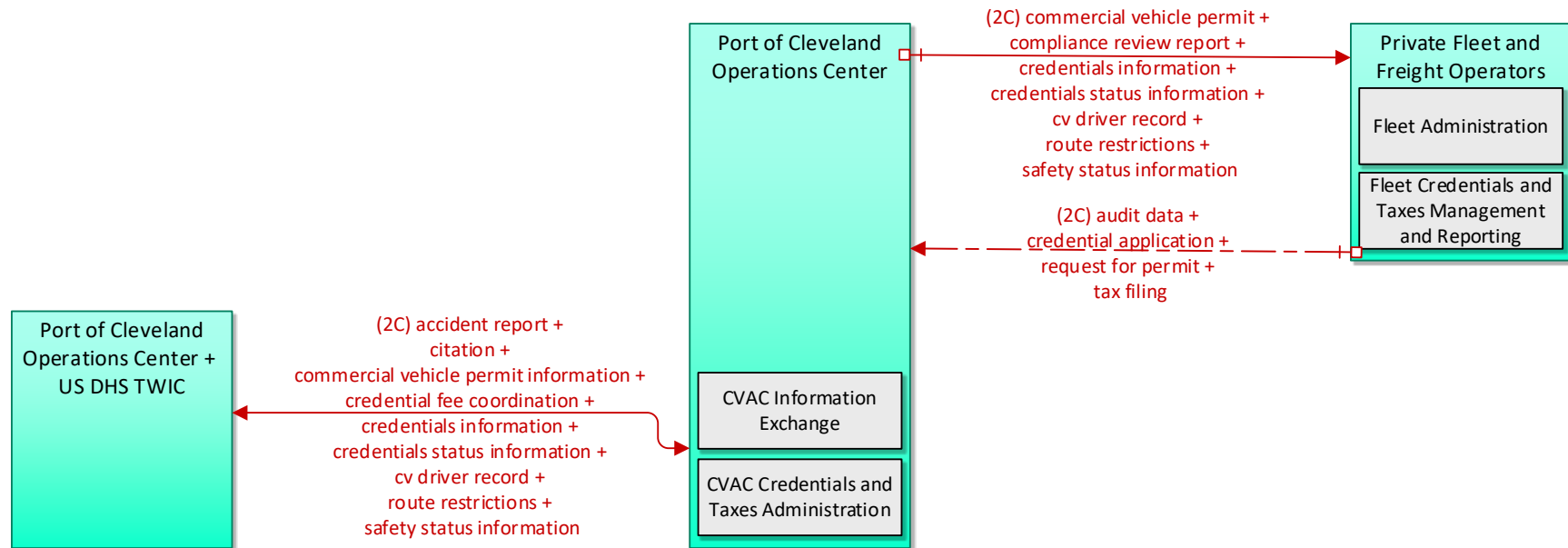


Figure B-3. CVO04 CV Administrative Processes

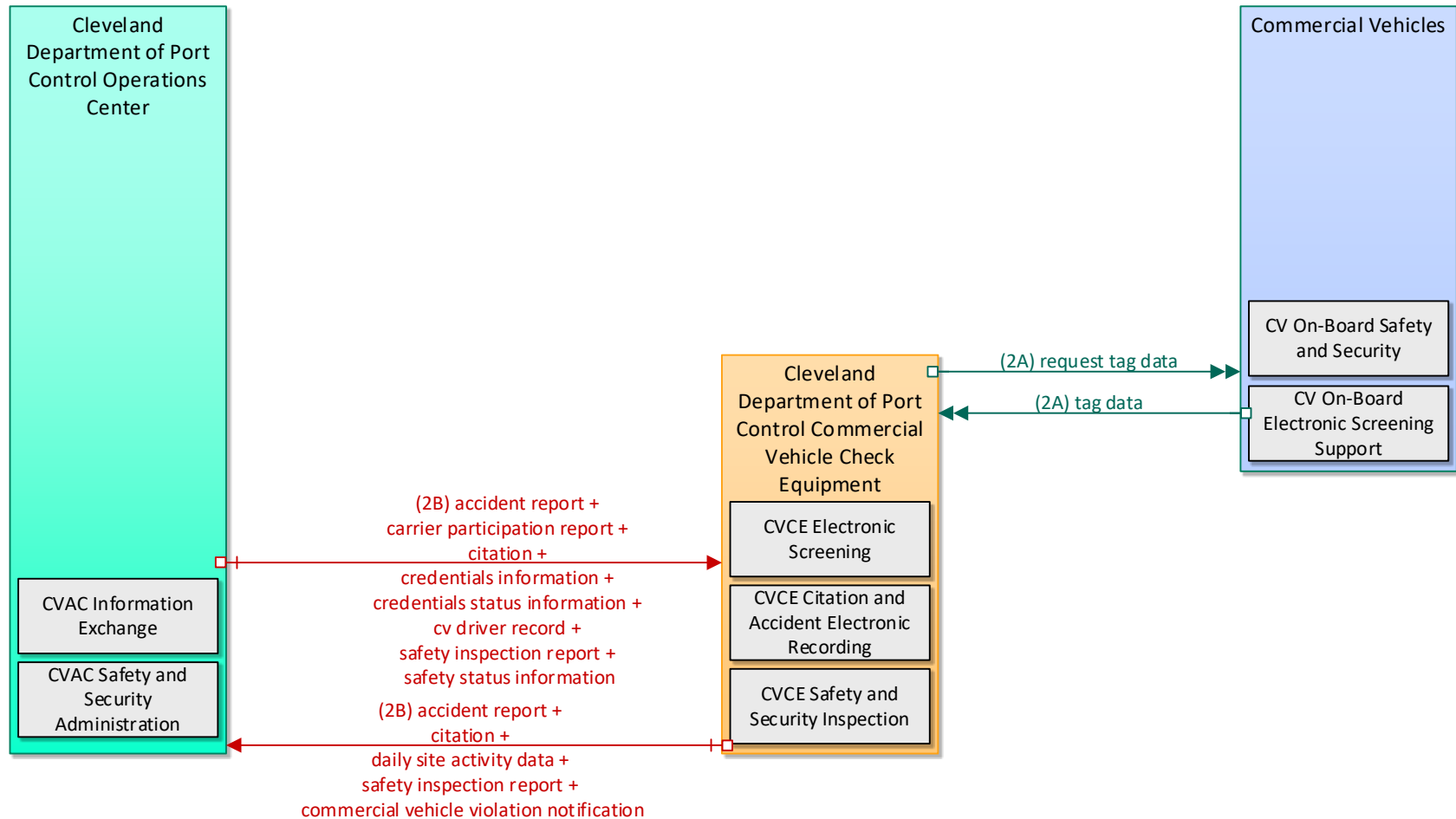


Figure B-4. CVO07 Roadside CVO Safety

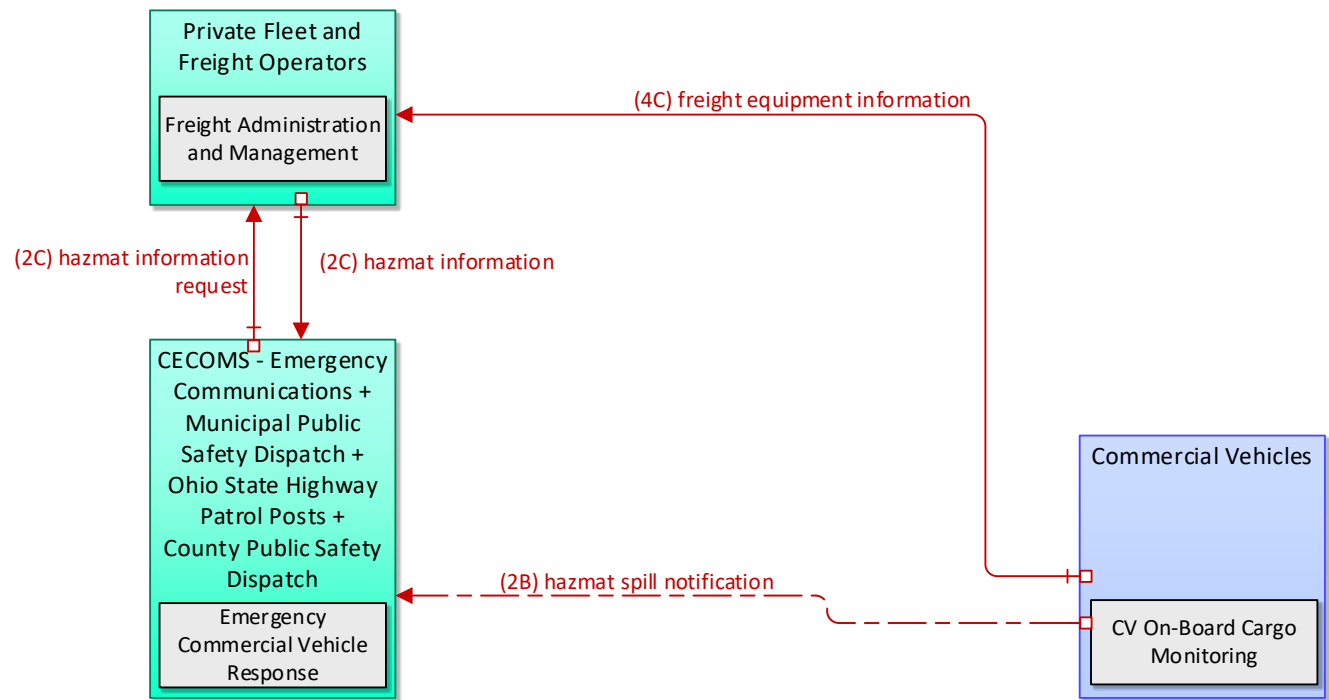


Figure B-5. CVO12 HAZMAT Management

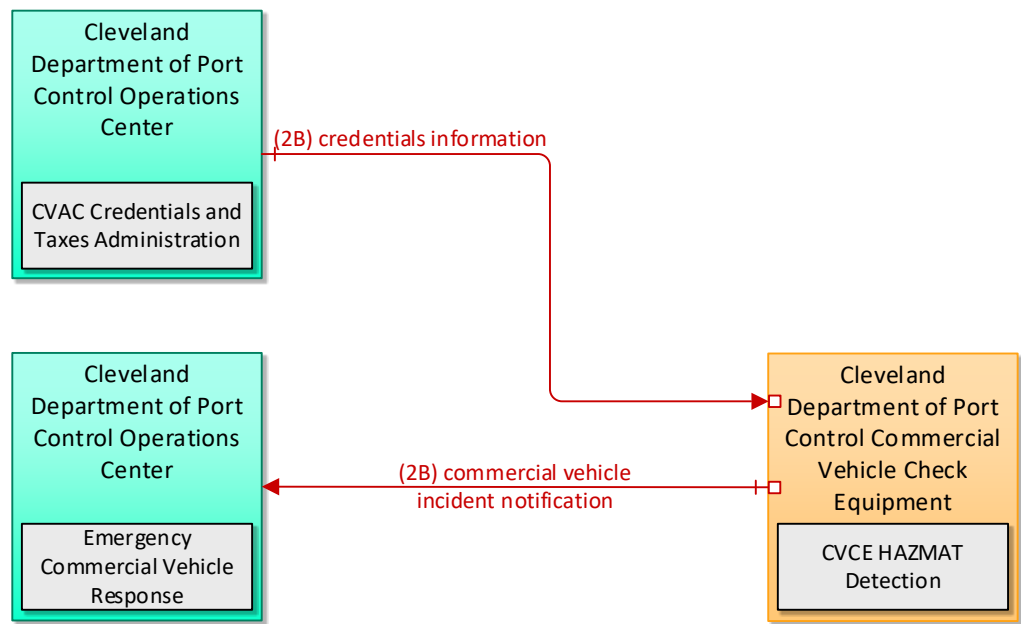


Figure B-6. CVO13 Roadside HAZMAT Security Detection and Mitigation

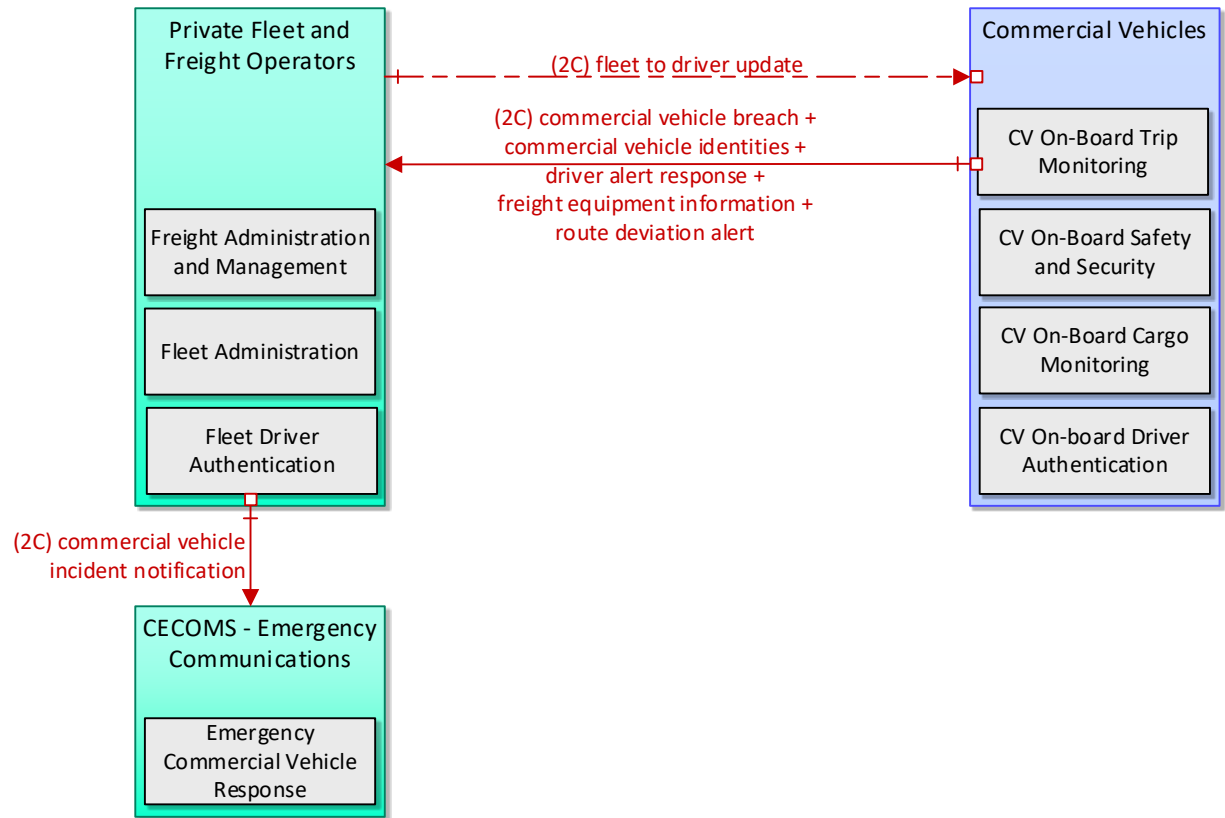


Figure B-7. CVO15 Fleet and Freight Security

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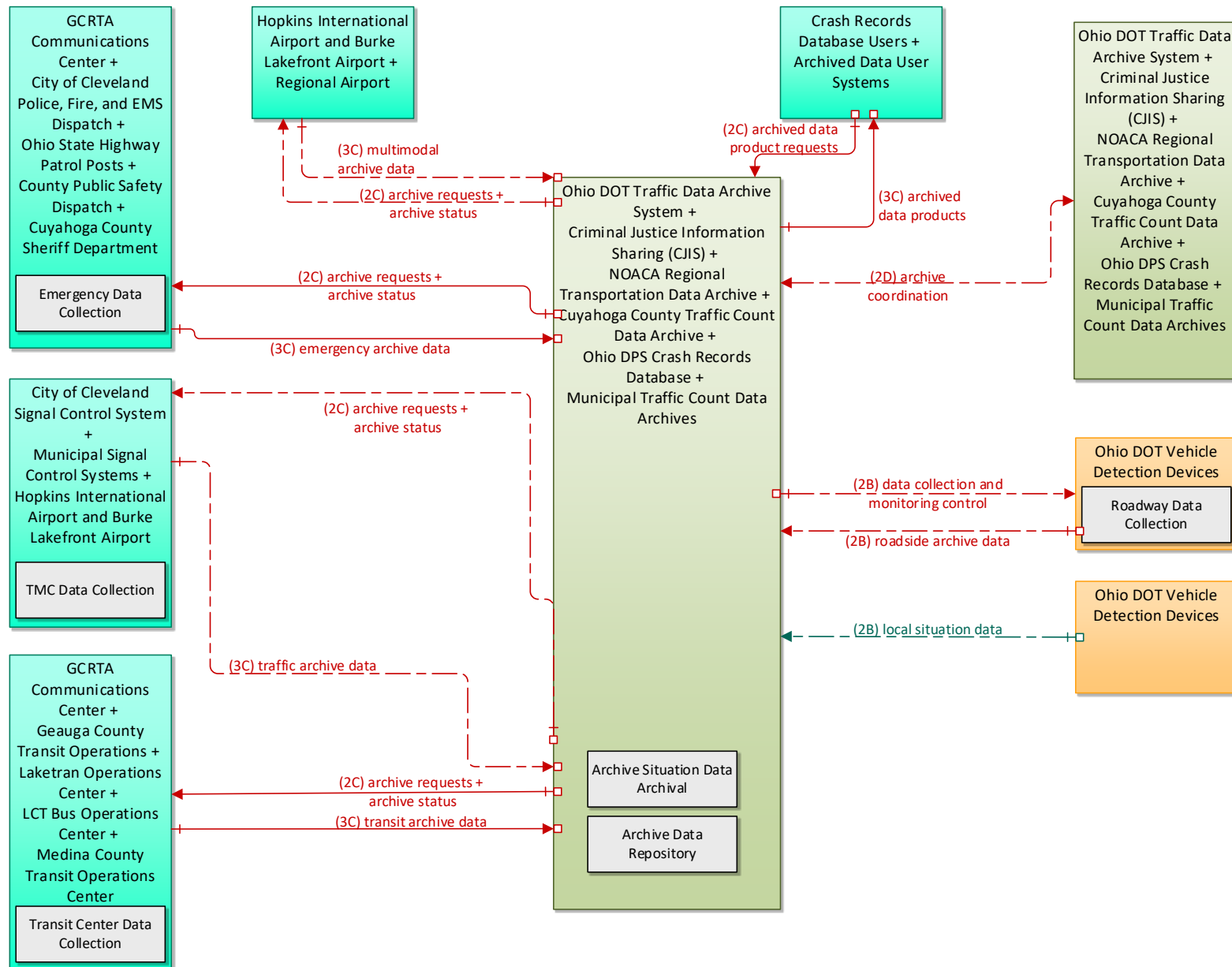


Figure B-8. DM01 ITS Data Warehouse

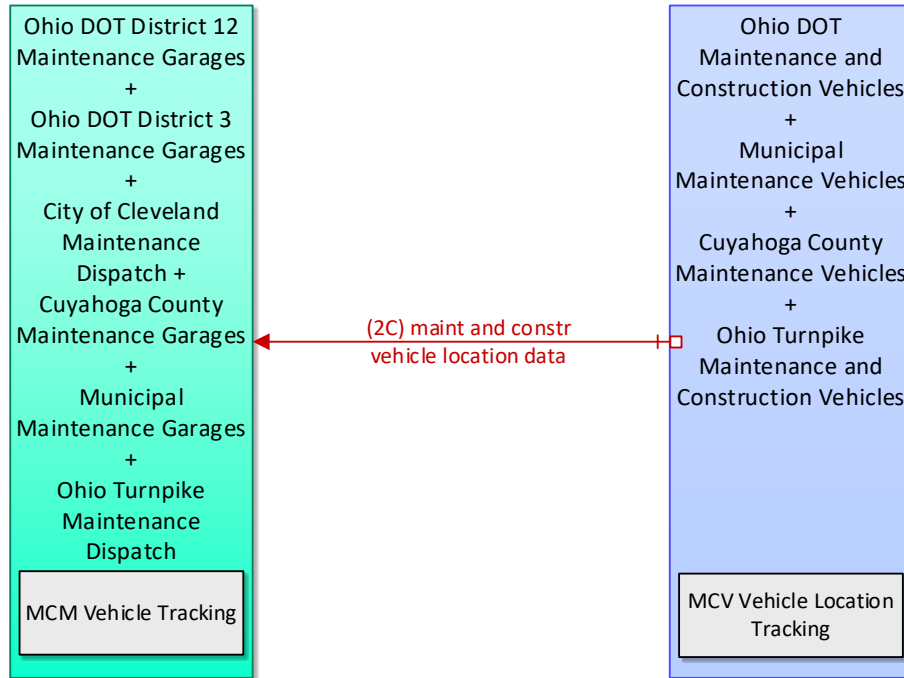


Figure B-9. MC01 Maintenance and Construction Vehicle and Equipment Tracking

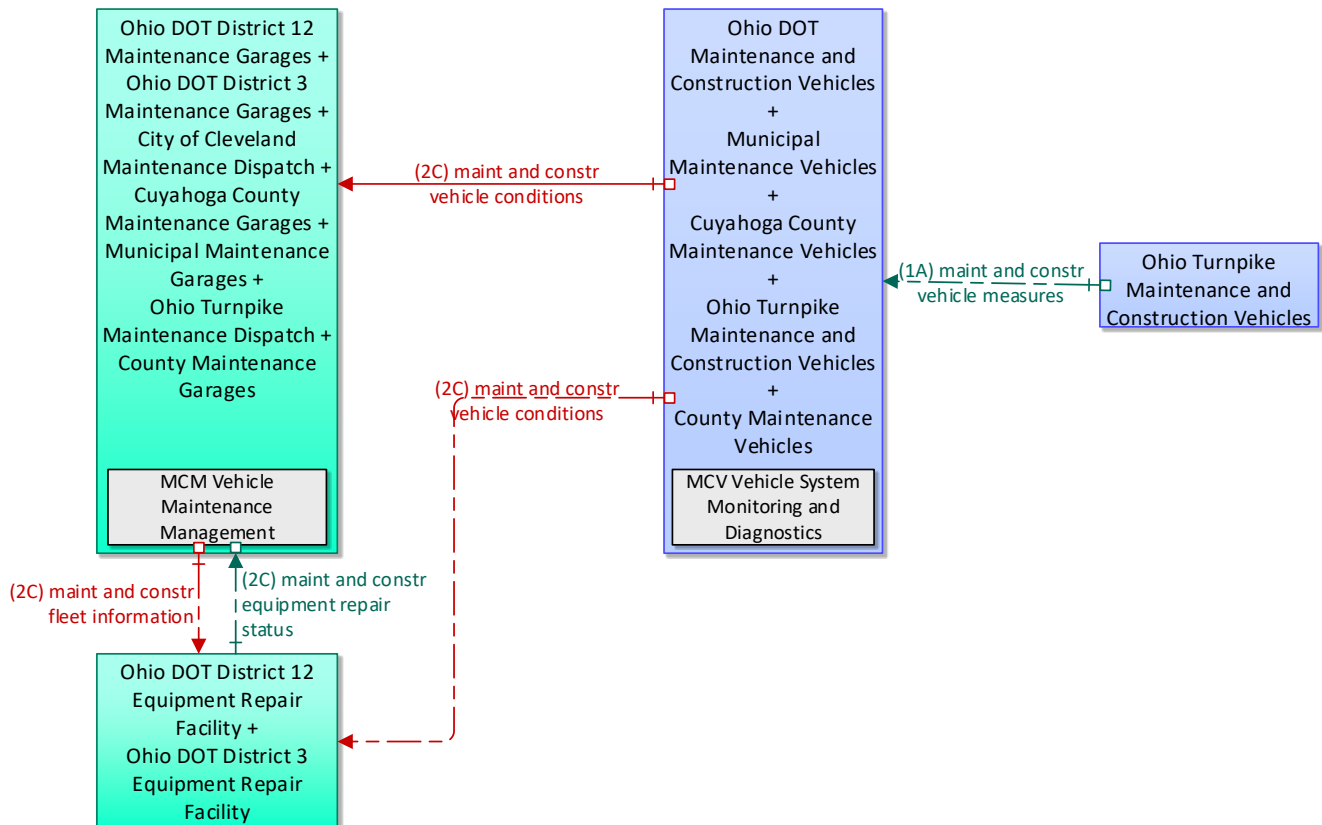


Figure B-10. MC02 Maintenance and Construction Vehicle Maintenance

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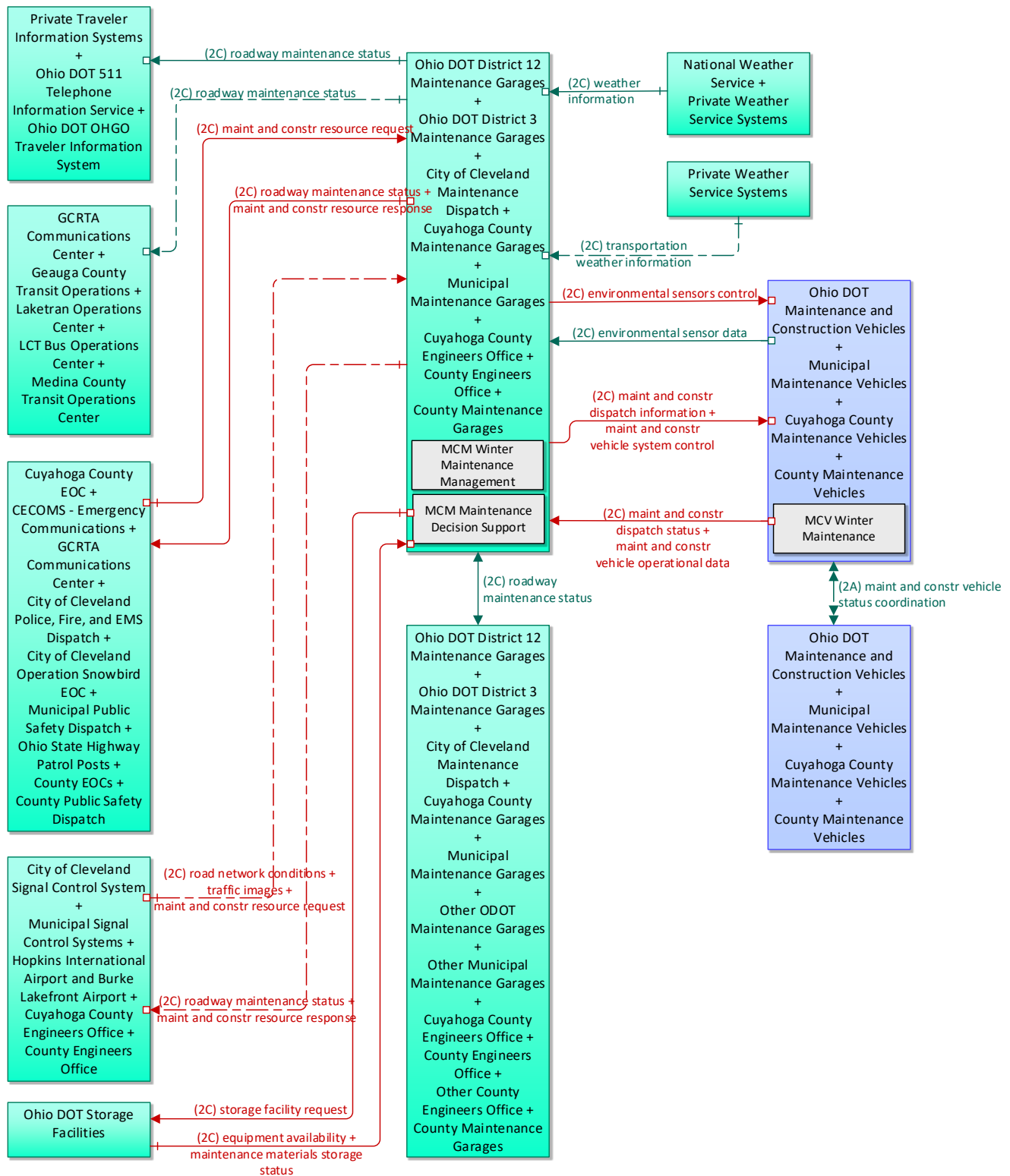


Figure B-11. MC04 Winter Maintenance

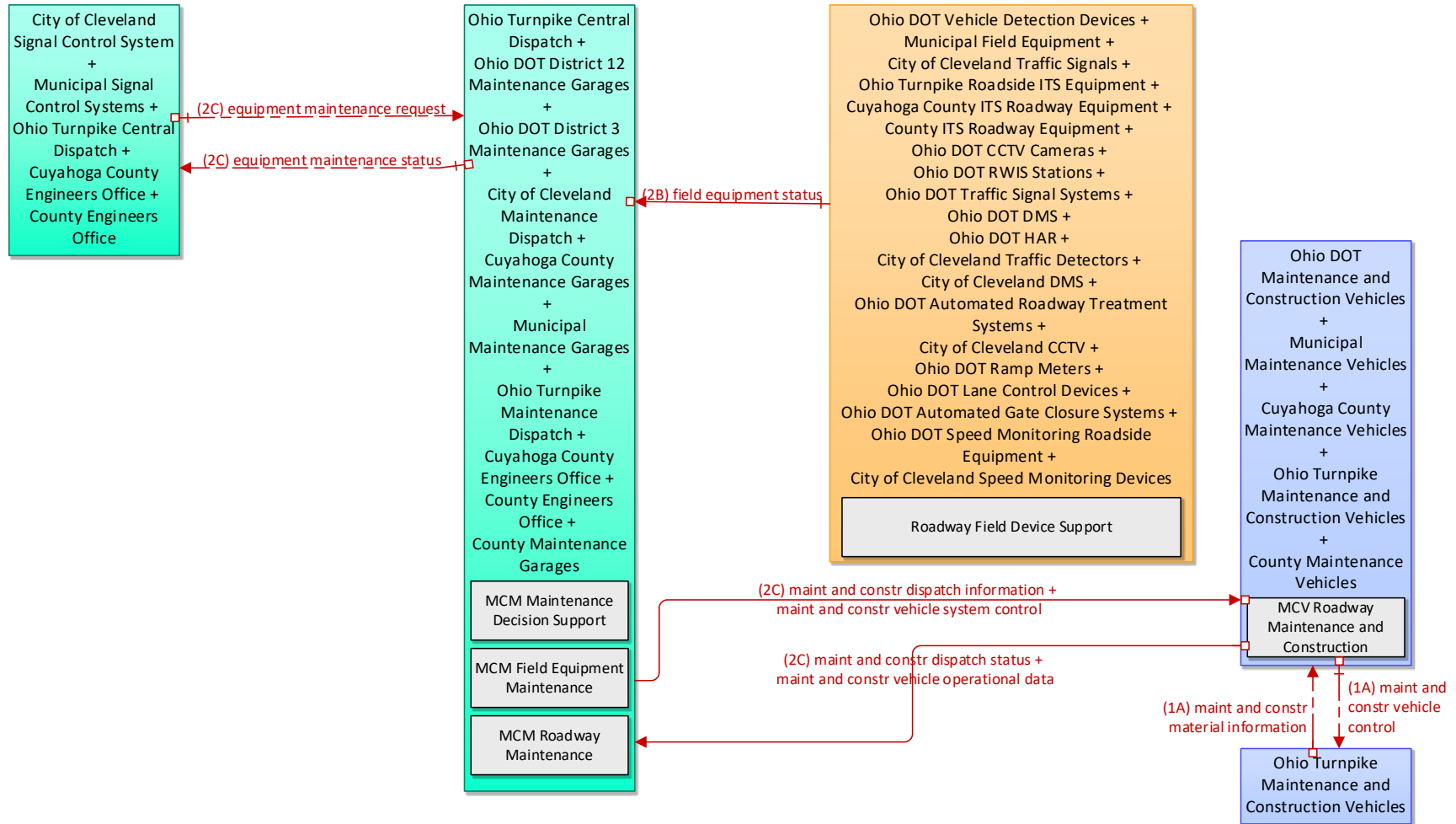


Figure B-12. MC05 Roadway Maintenance and Construction

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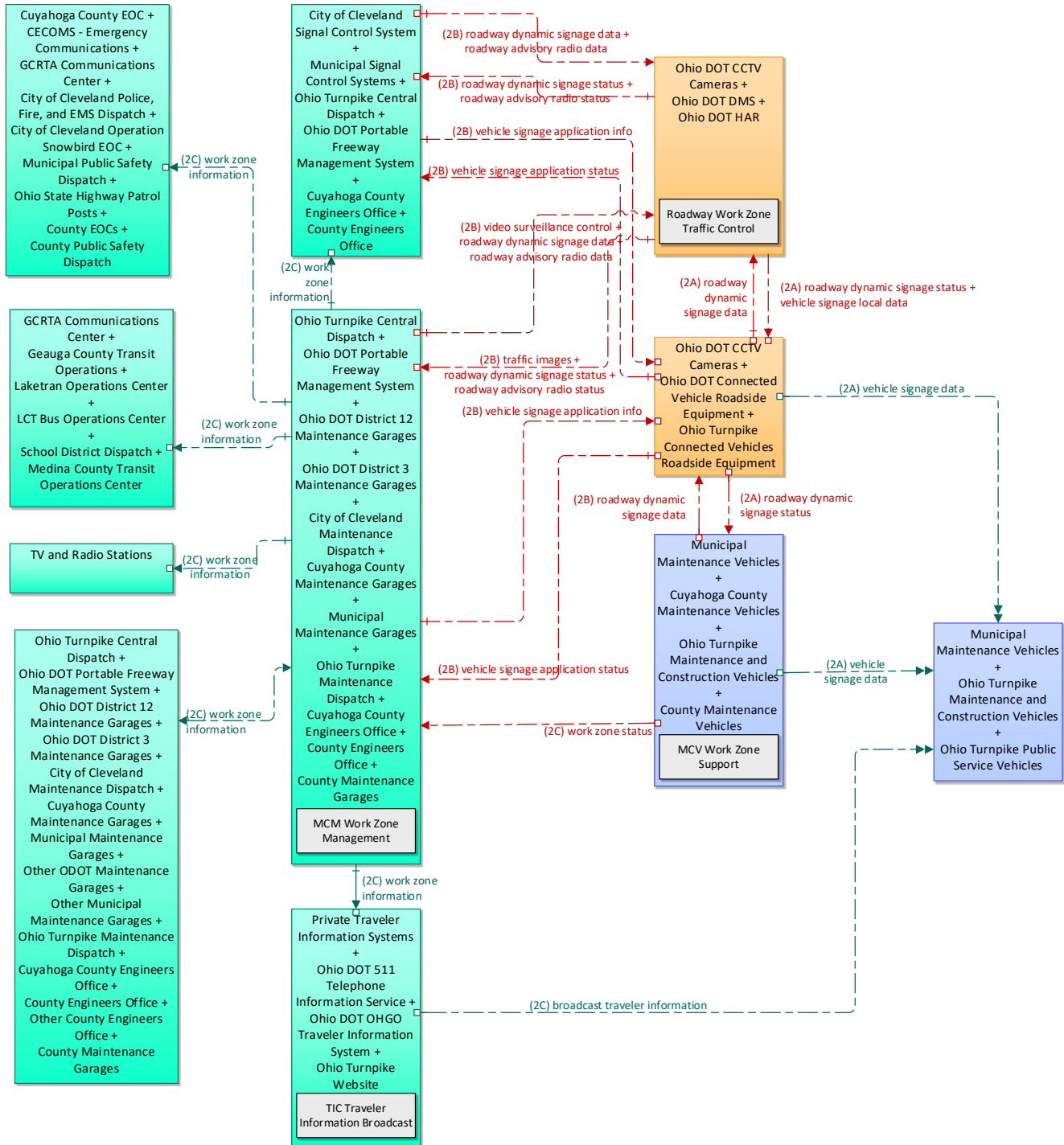


Figure B-13. MC06 Work Zone Management

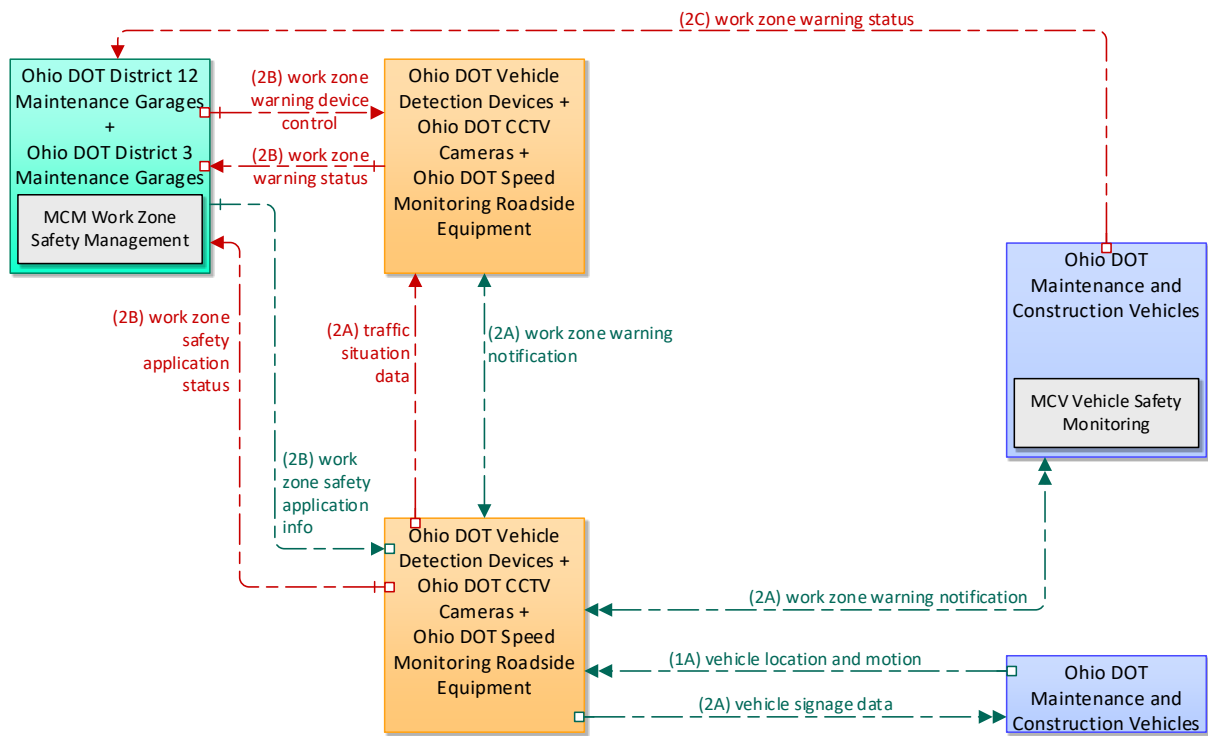


Figure B-14. MC07 Work Zone Safety Monitoring

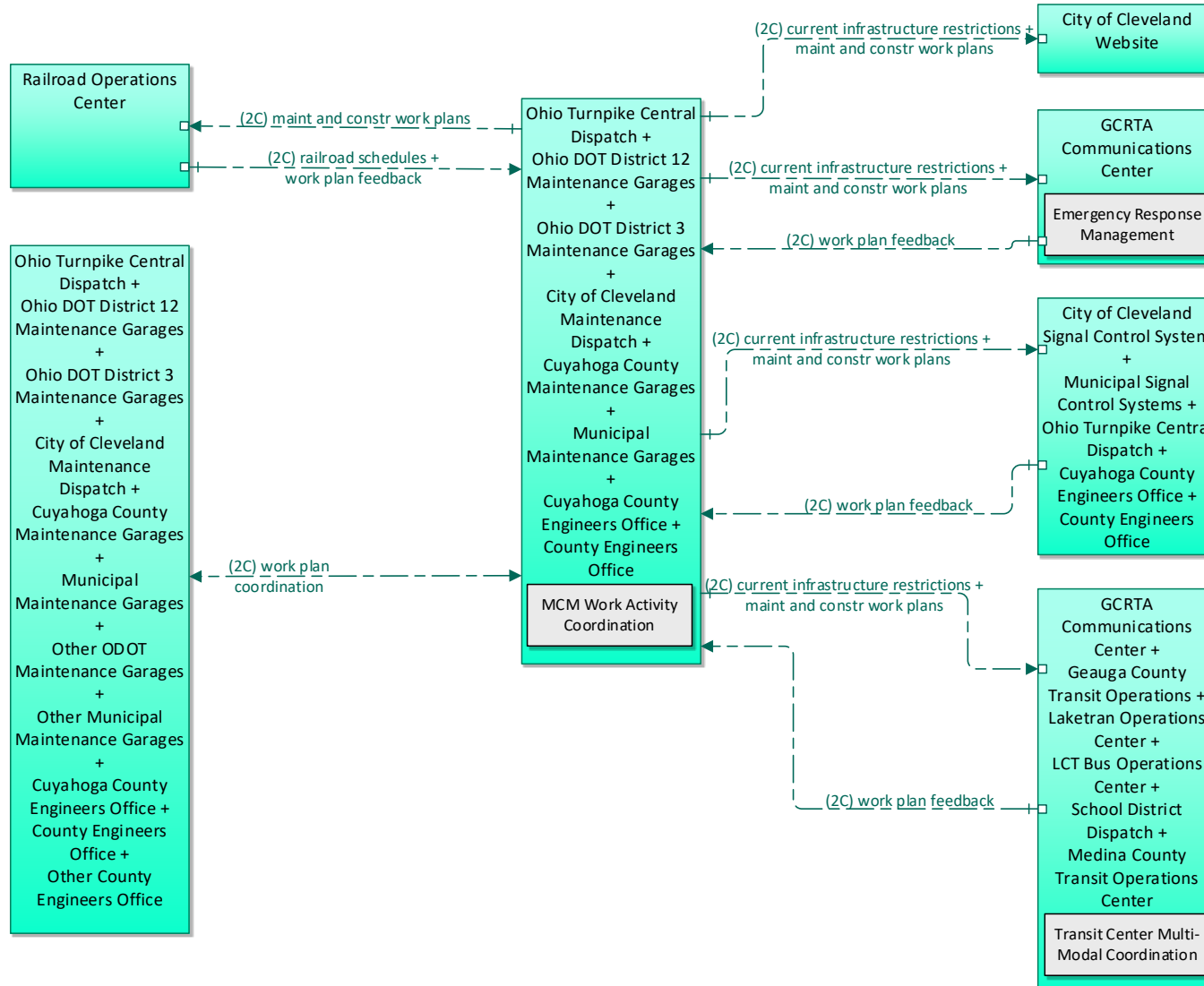


Figure B-15. MC08 Maintenance and Construction Activity Coordination

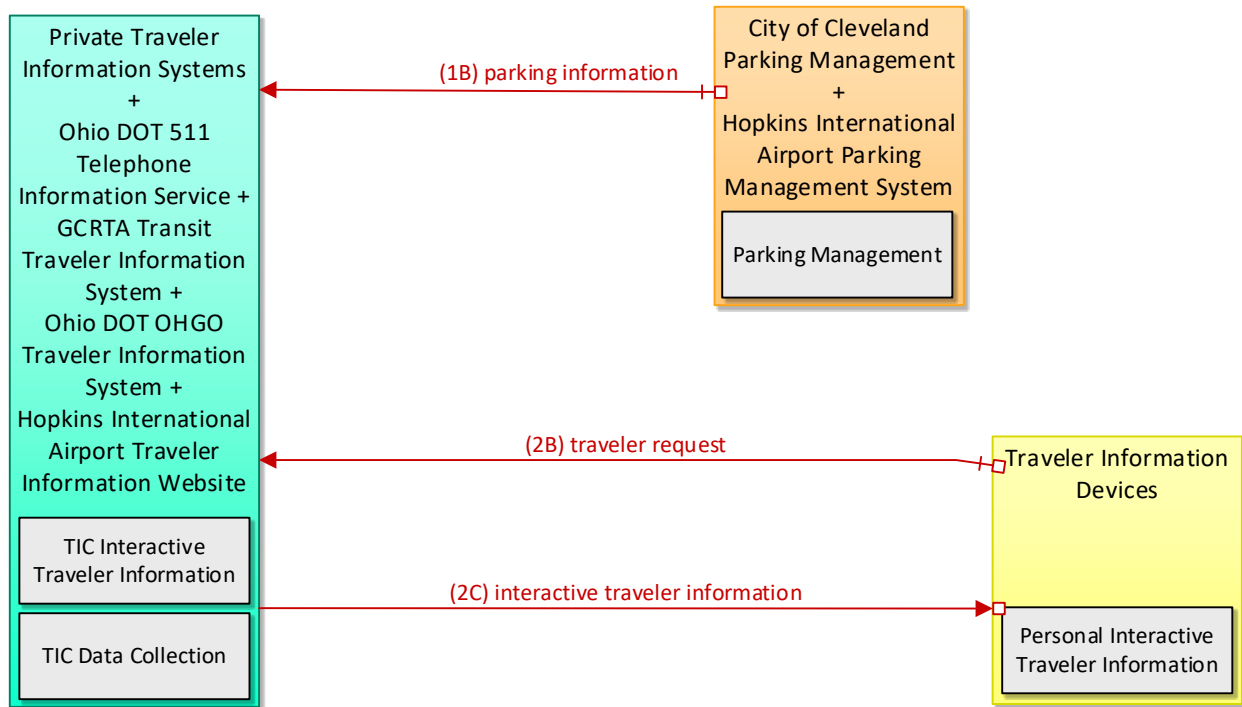


Figure B-16. PM01 Parking Space Management

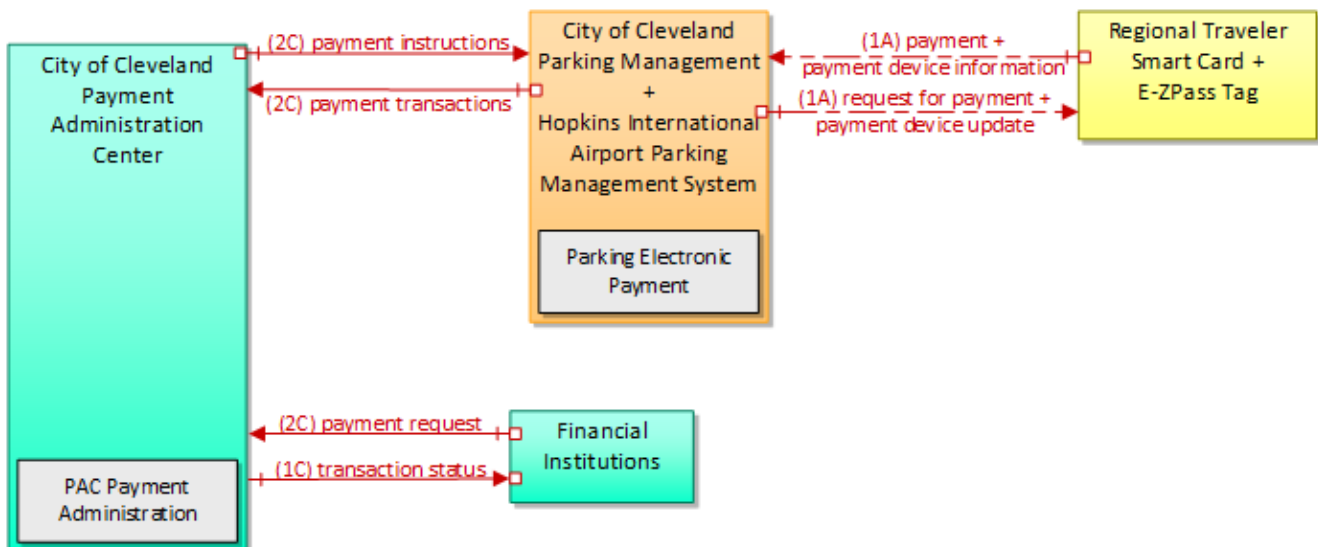


Figure B-17. PM03 Parking Electronic Payment

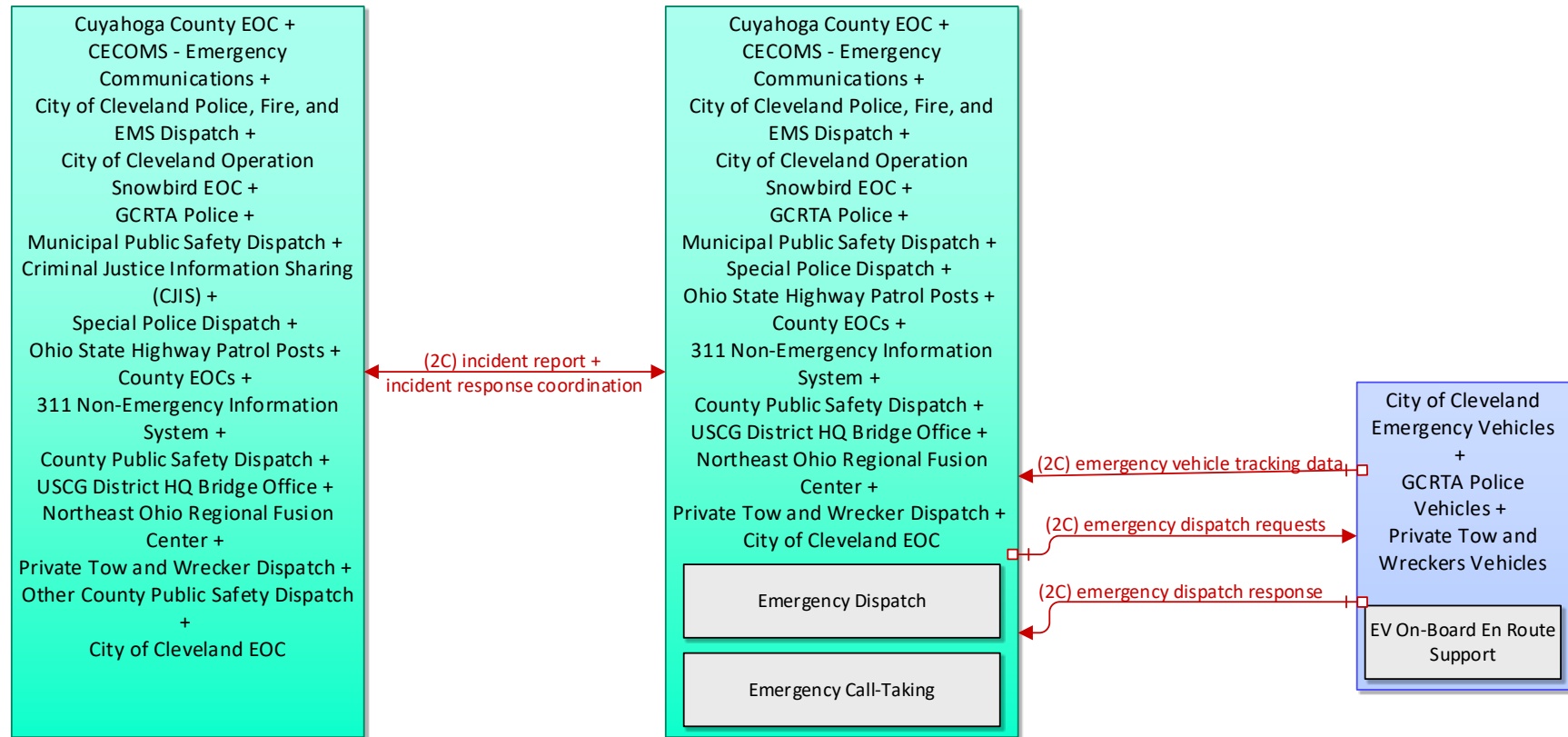


Figure B-18 PS01 Emergency Call-Taking and Dispatch

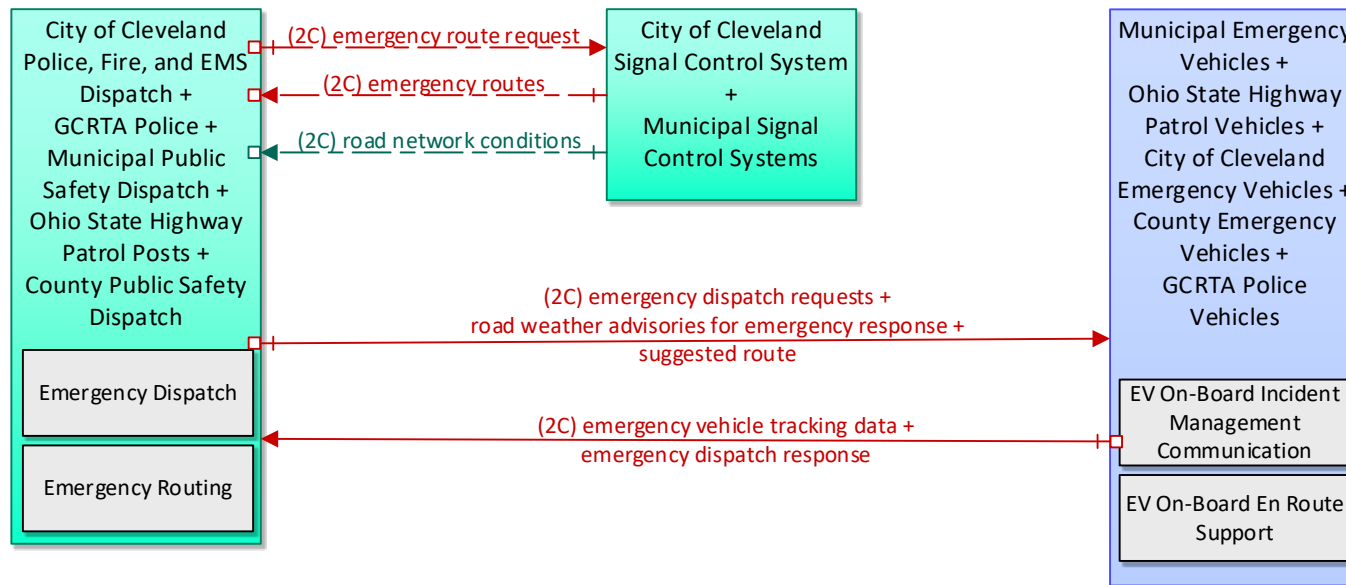


Figure B-19. PS02 Routing Support for Emergency Vehicles

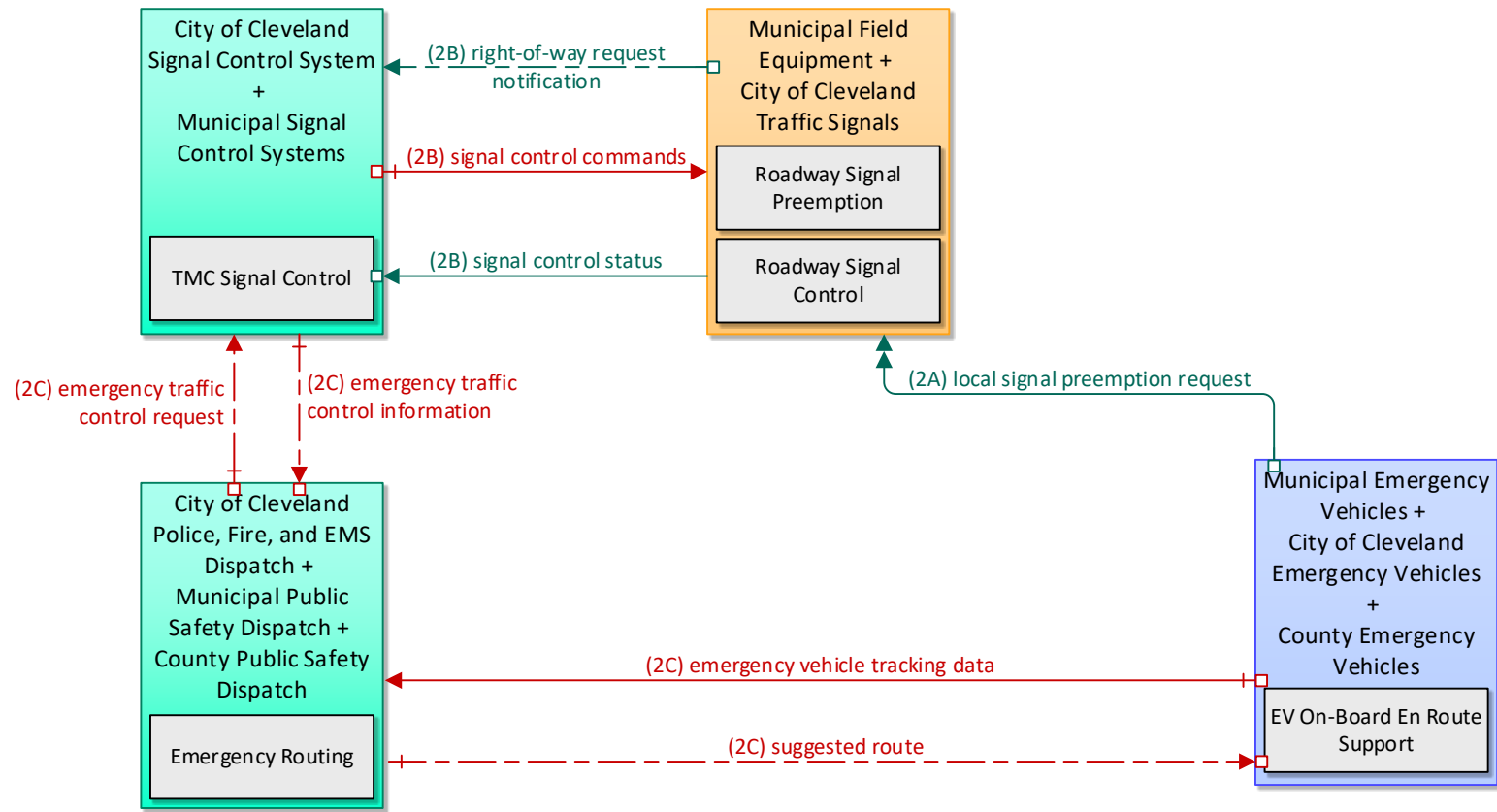


Figure B-20. PS03 Emergency Vehicle Preemption

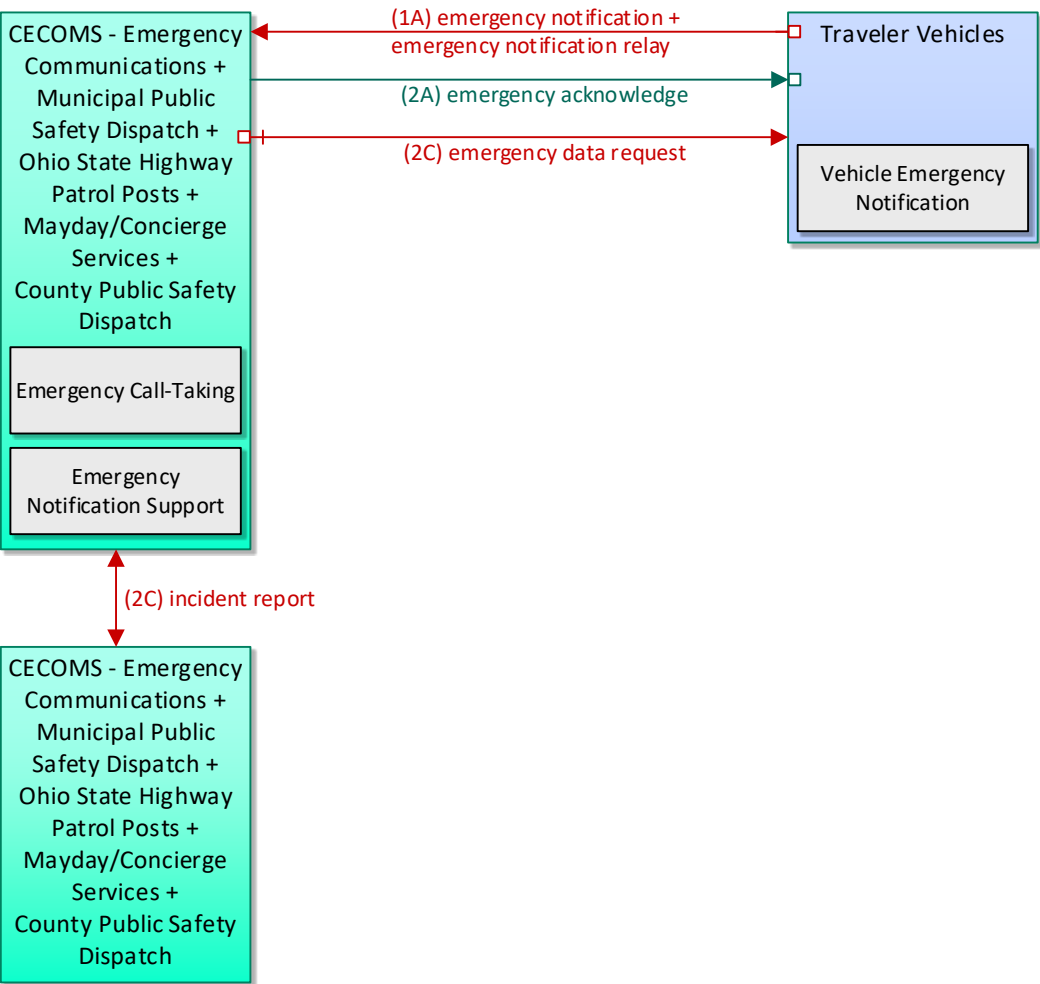


Figure B-21. PS04 Mayday Notification

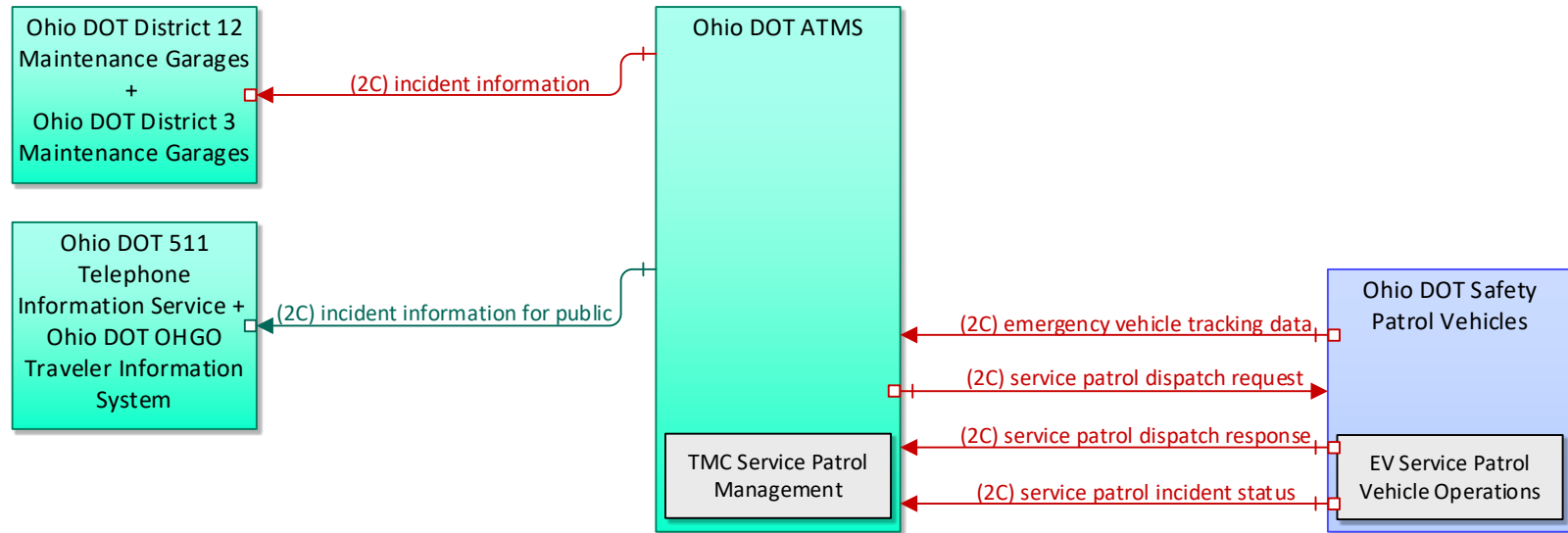


Figure B-22. PS08 Roadway Service Patrols

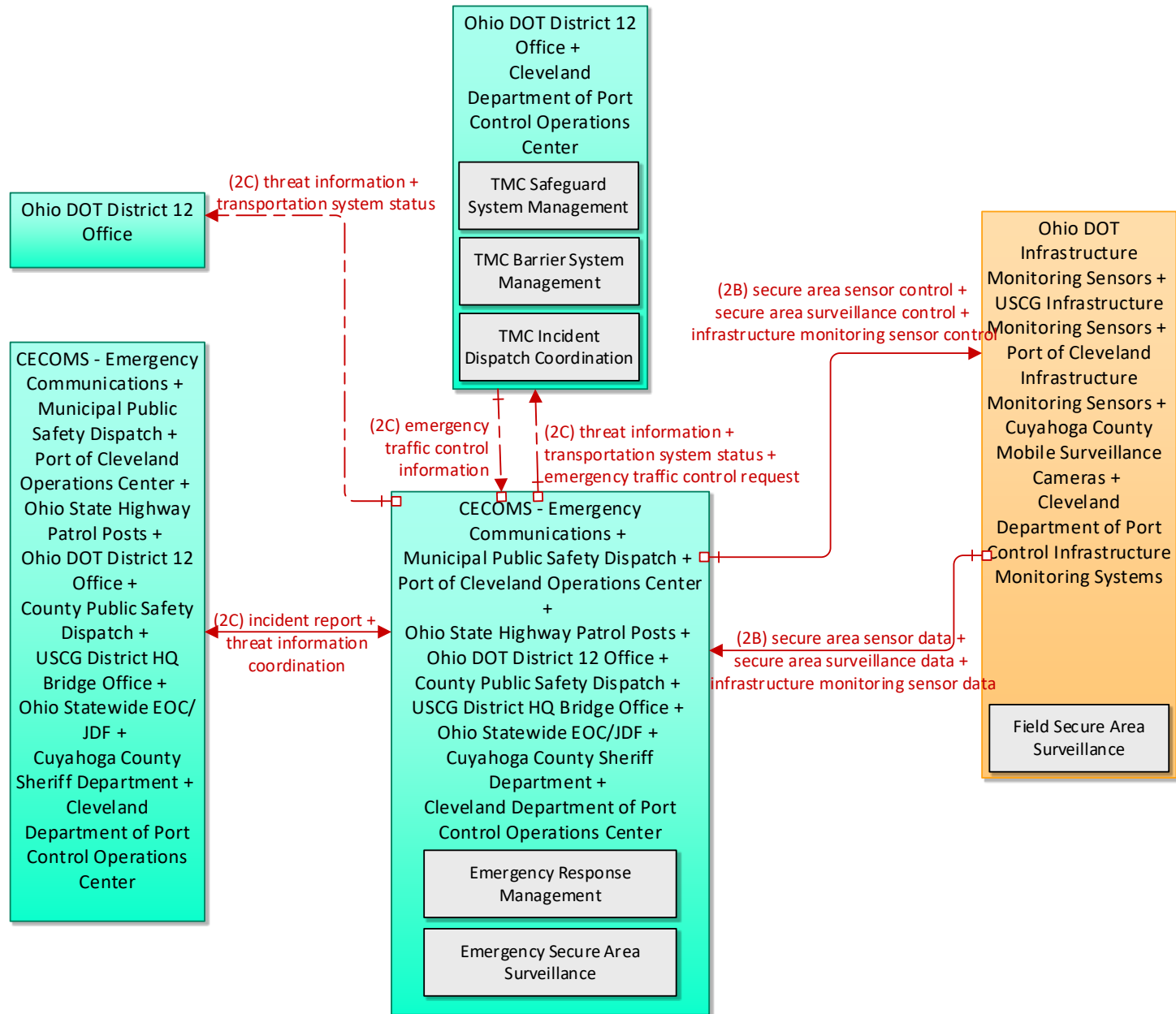


Figure B-23. PS09 Transportation Infrastructure Protection

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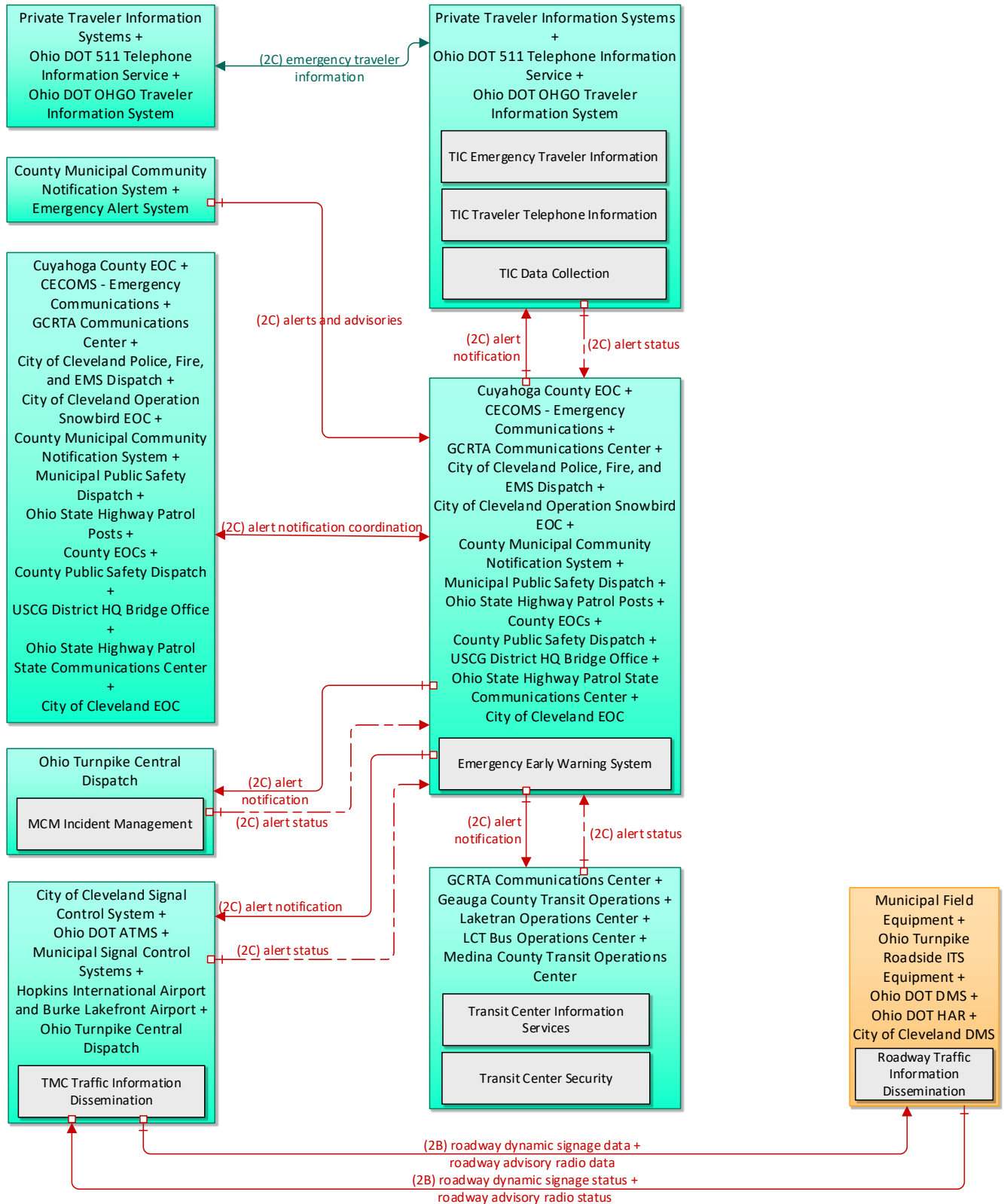


Figure B-24. PS10 Wide Area Alert

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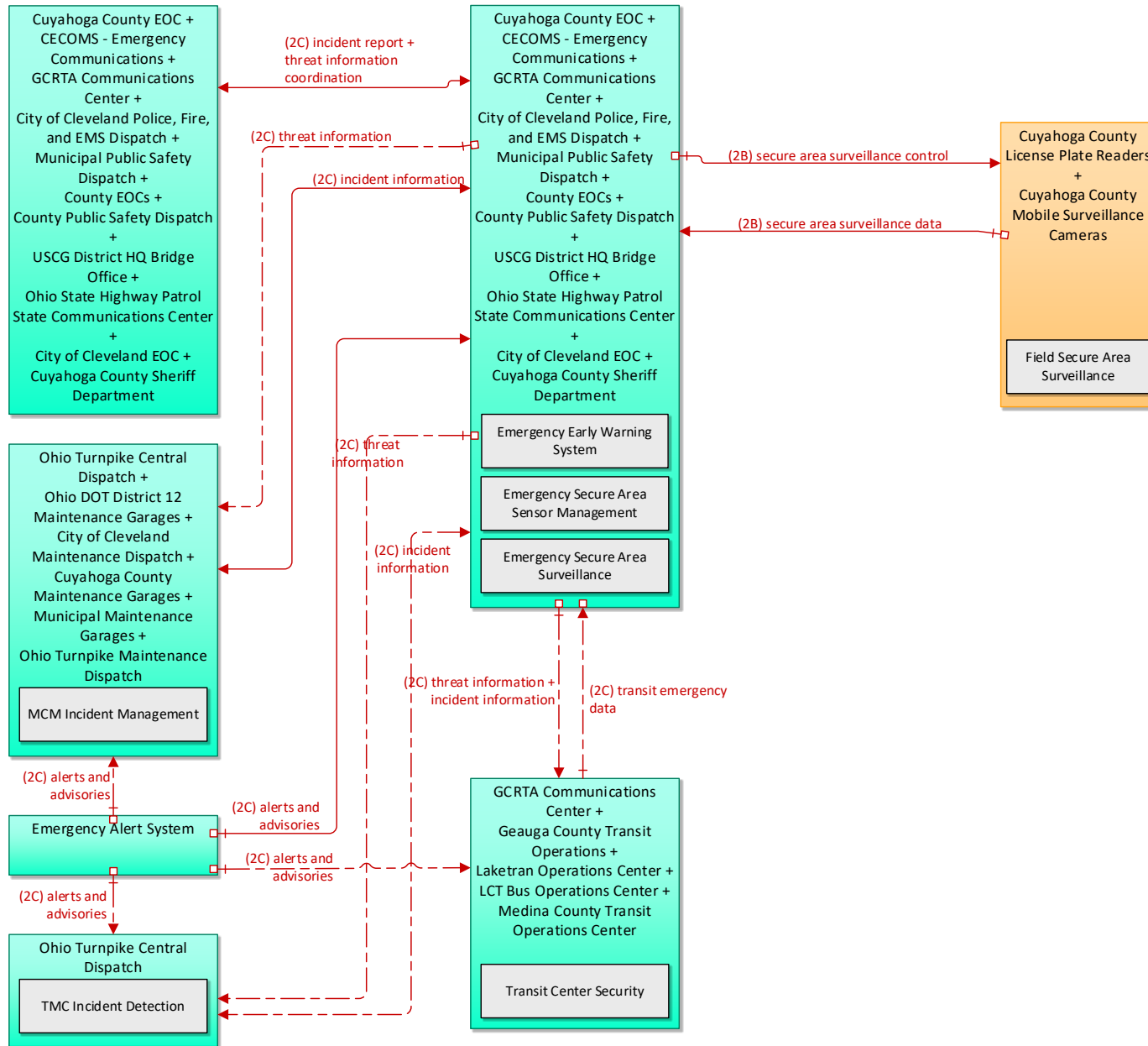


Figure B-25. PS11 Early Warning System

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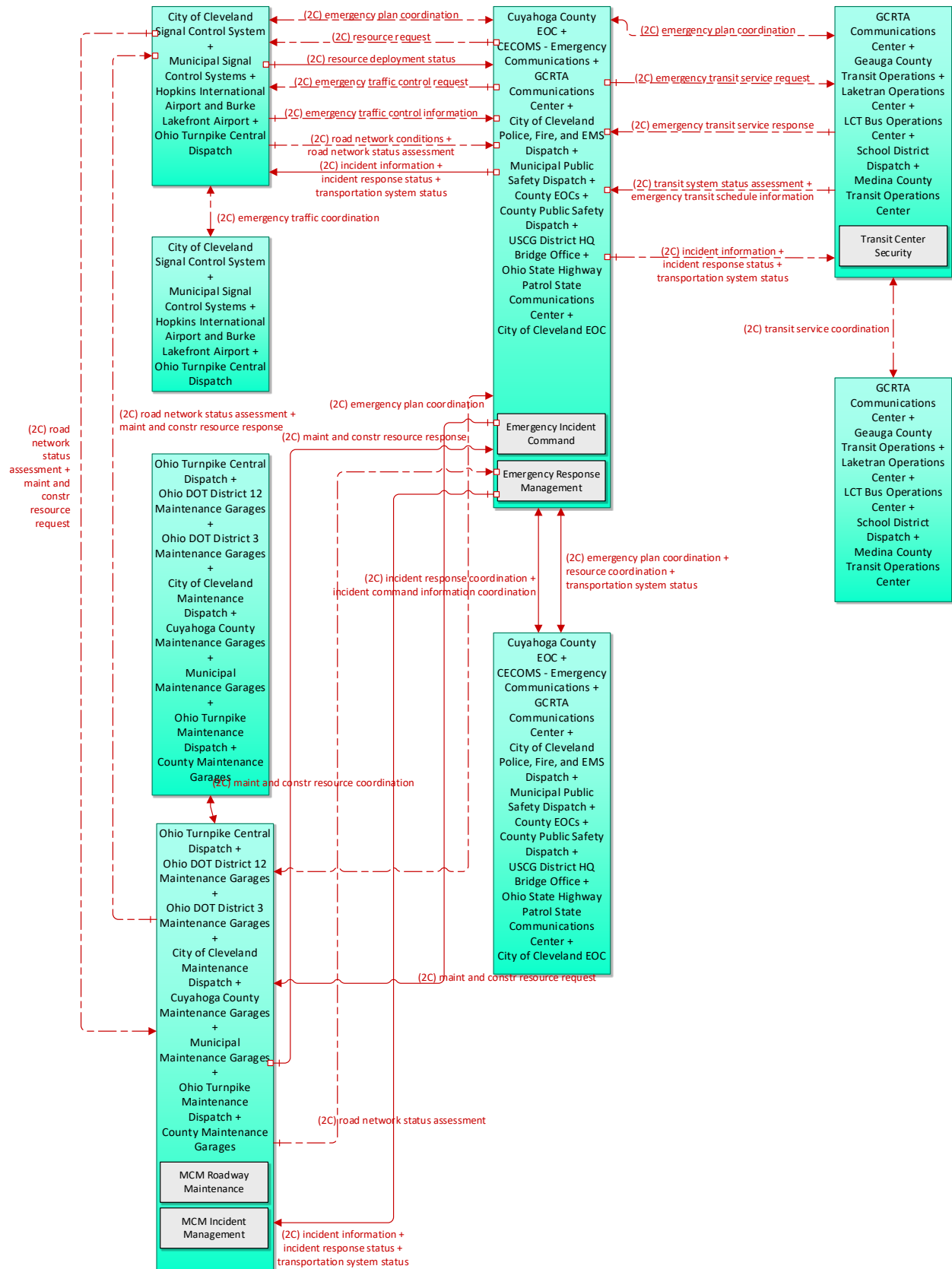


Figure B-26. PS12 Disaster Response and Recovery

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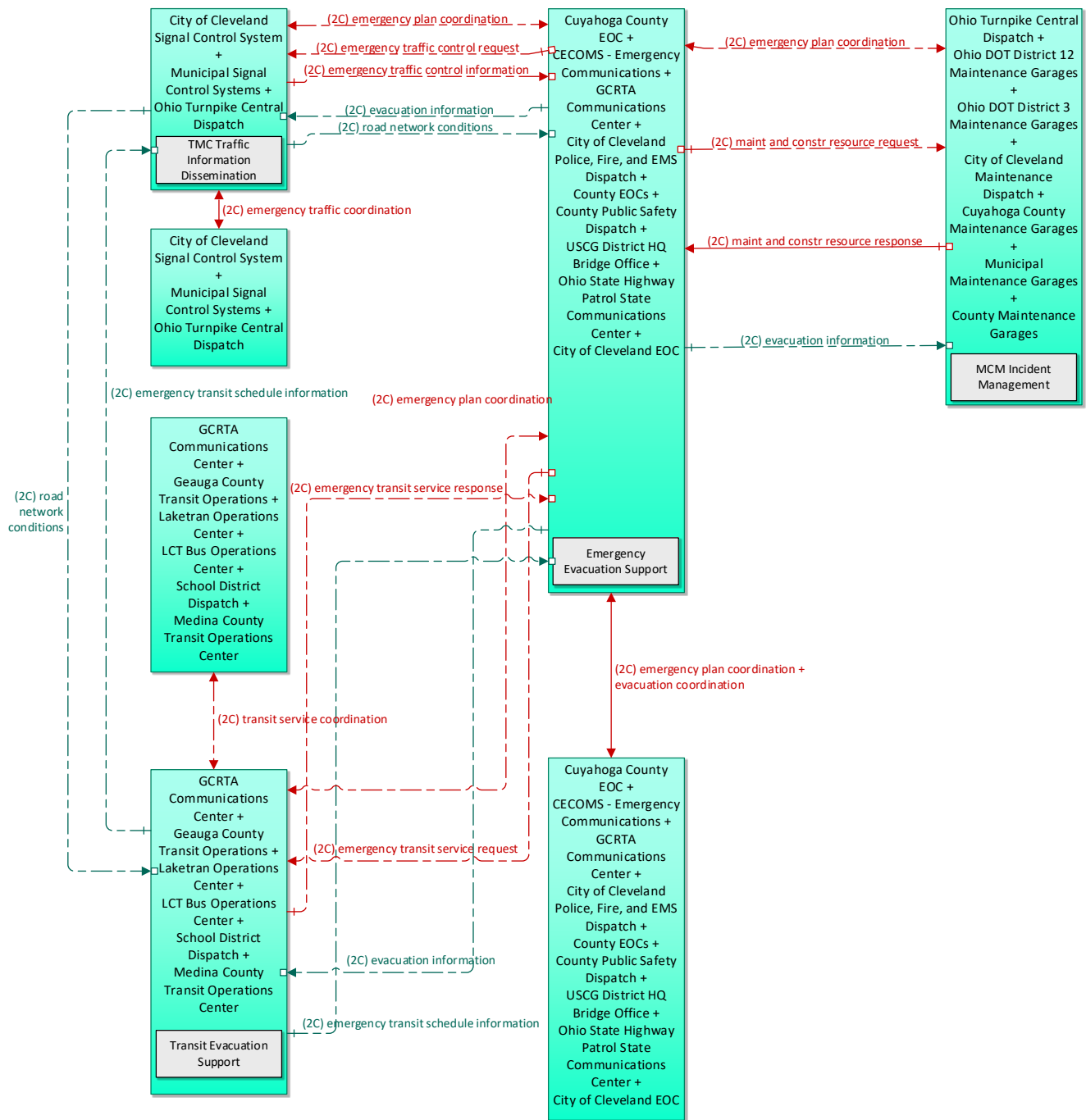


Figure B-27. PS13 Evacuation and Reentry Management

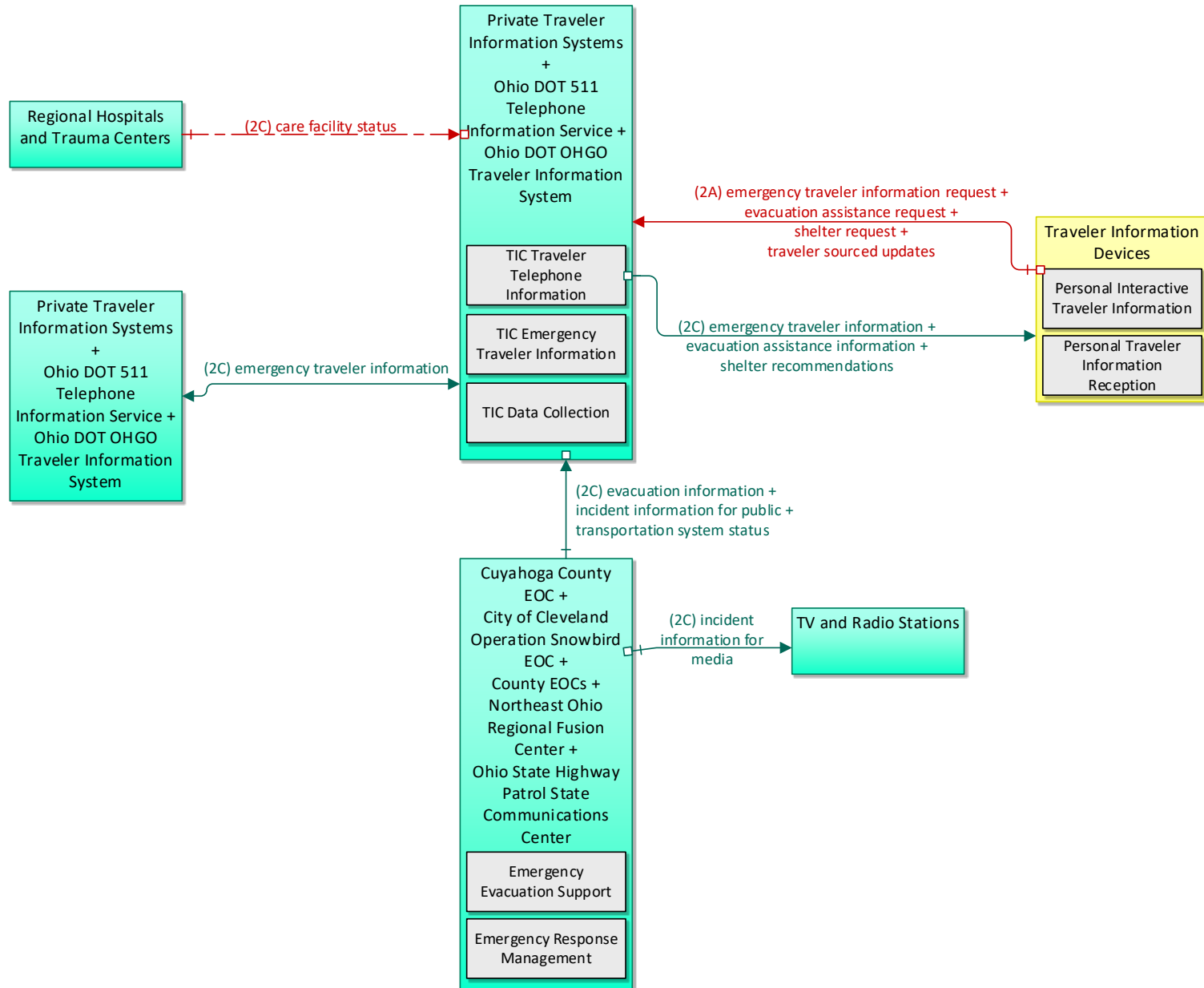


Figure B-28. PS14 Disaster Traveler Information

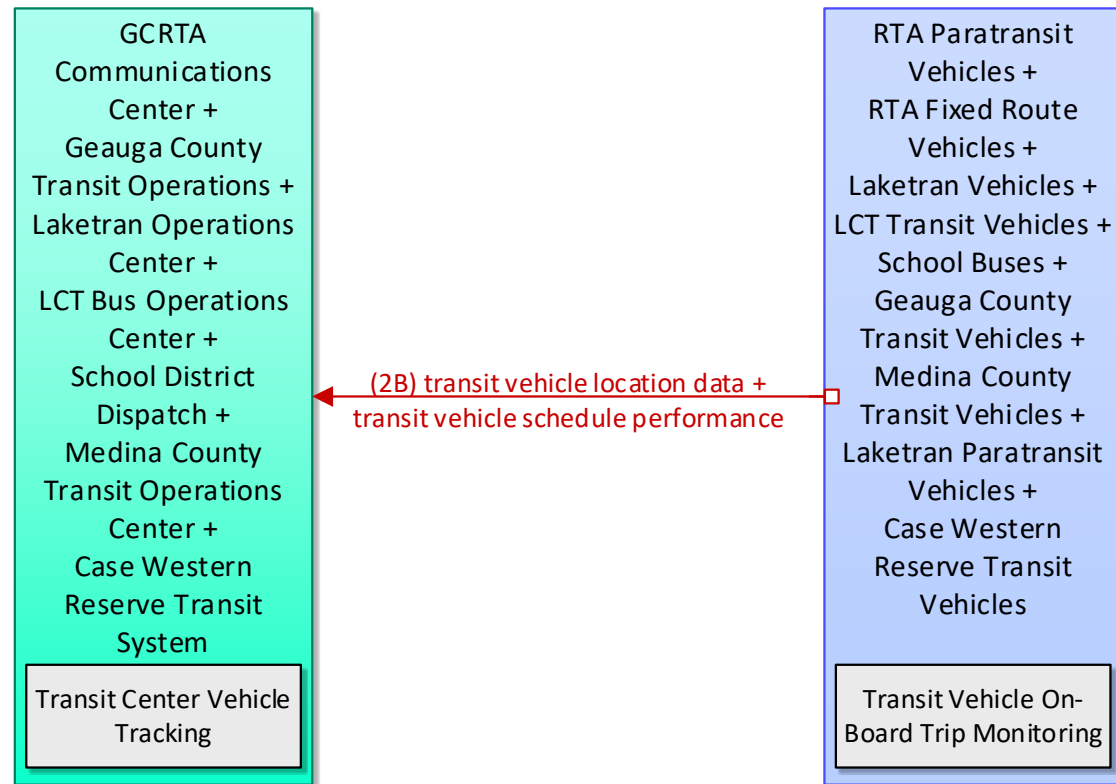


Figure B-29. PT 01 Transit Vehicle Tracking

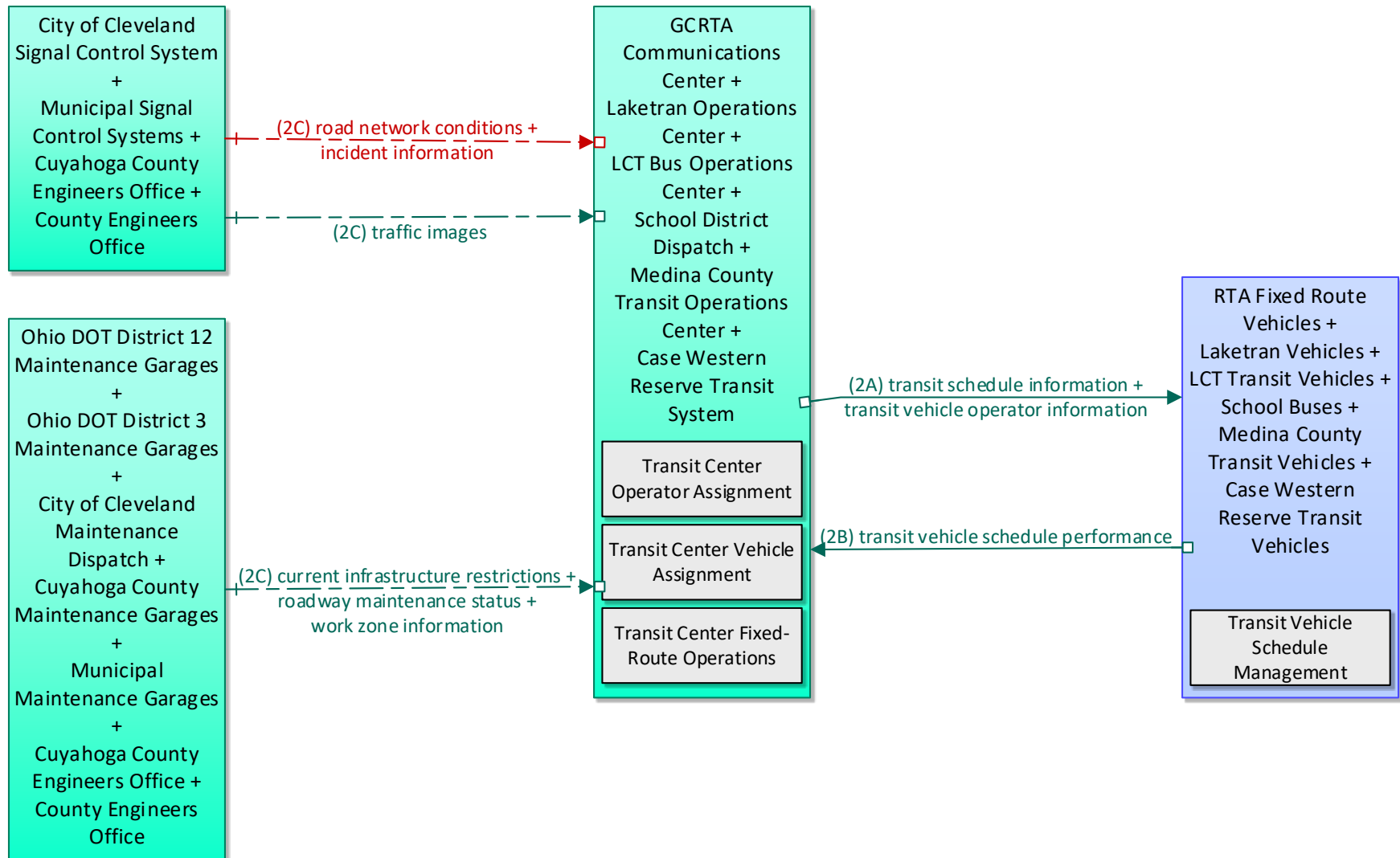


Figure B-30. PT02 Transit Fixed-Route Operations

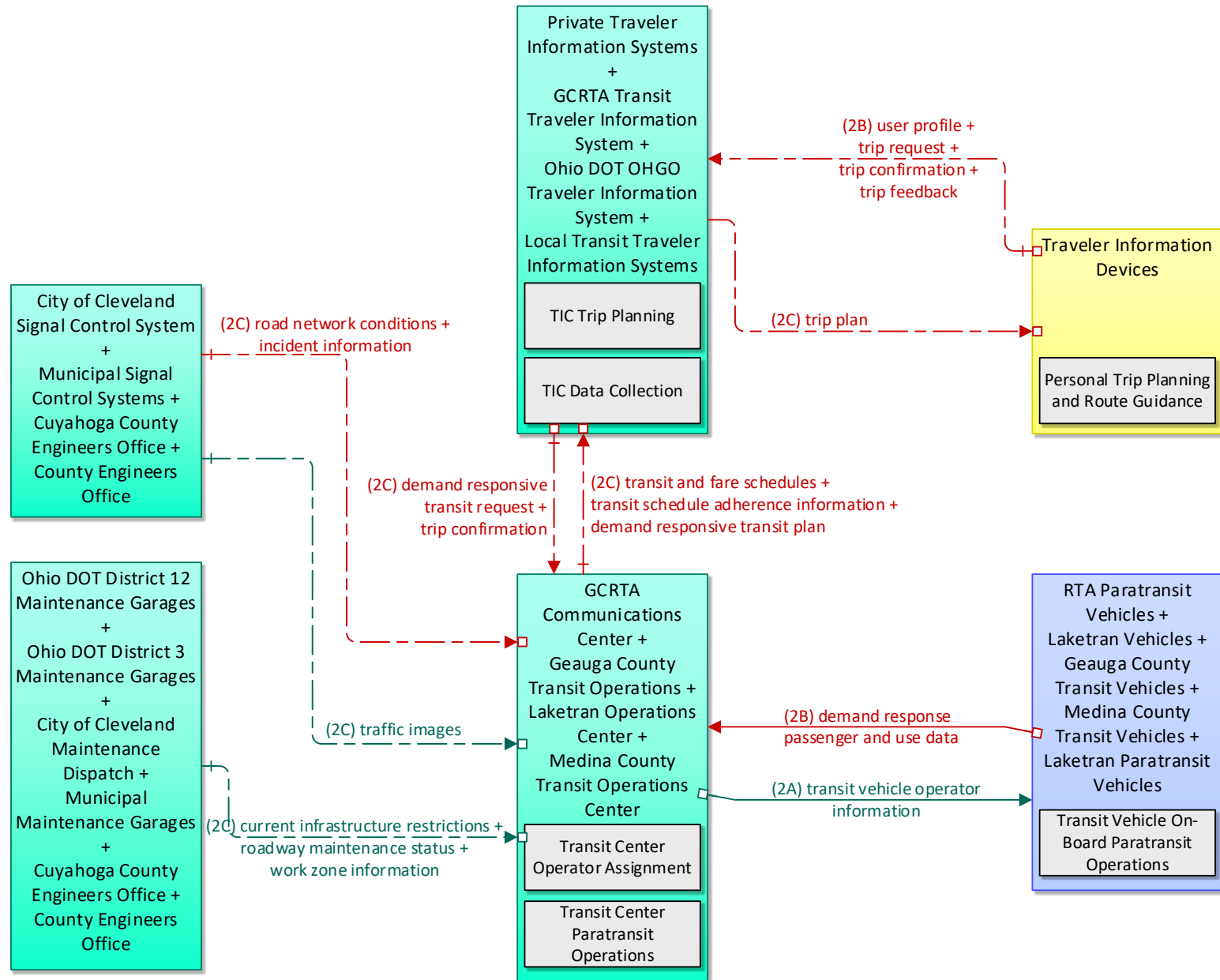


Figure B-31. PT03 Dynamic Transit Operations

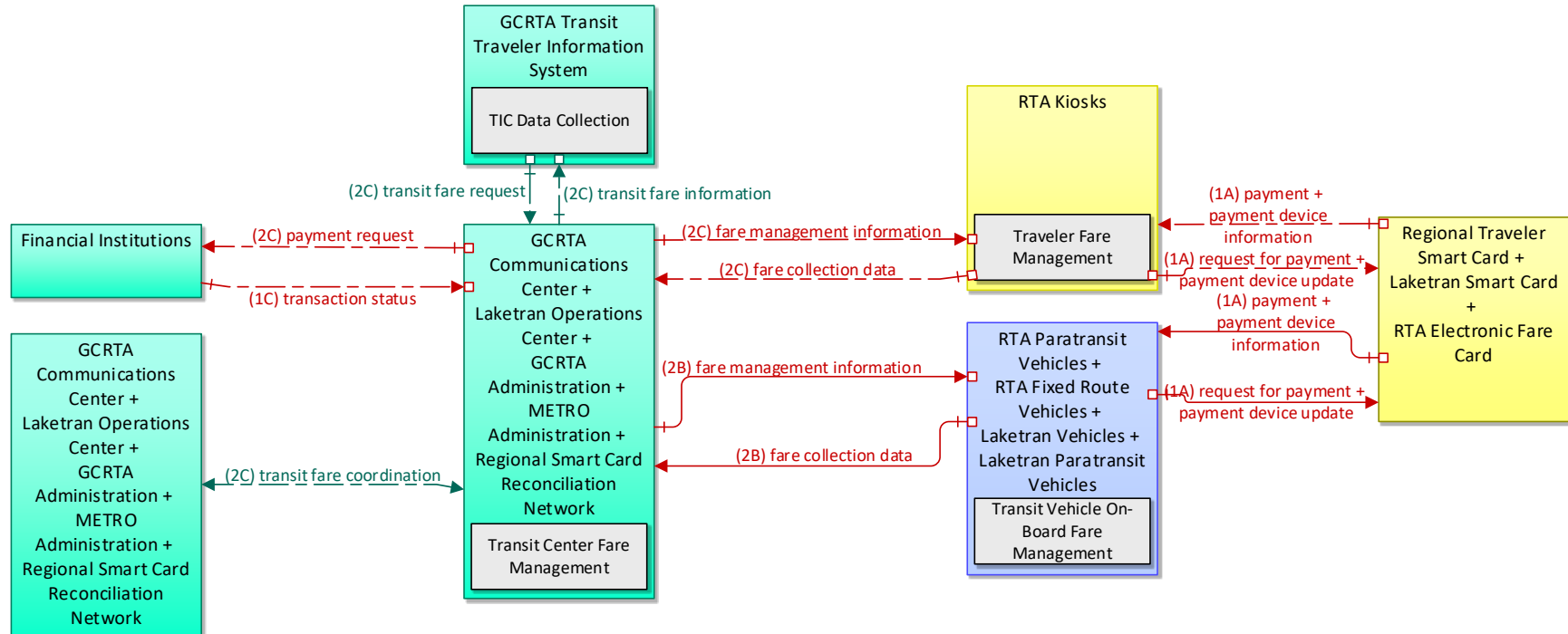


Figure B-32. PT04 Transit Fare Collection Management

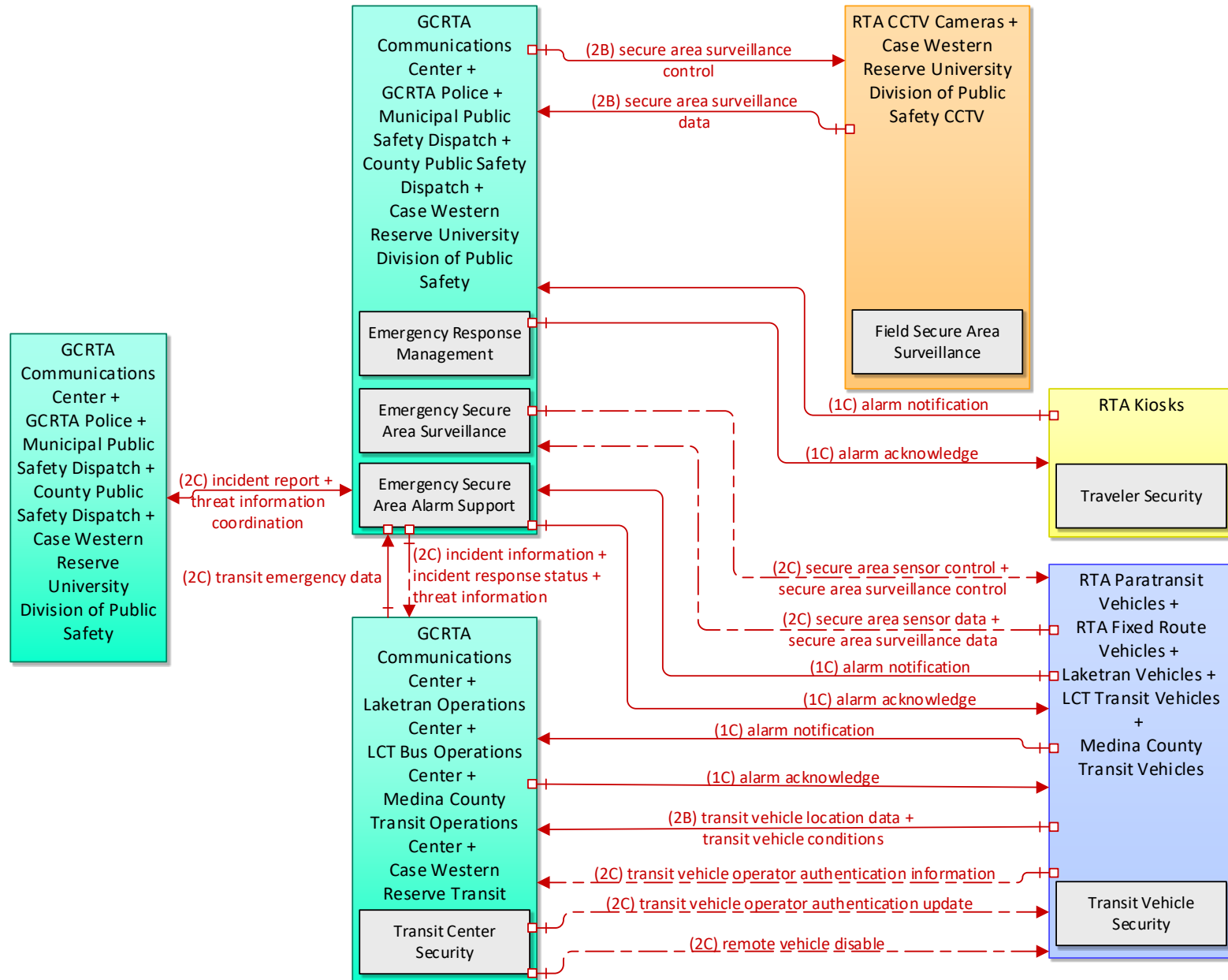


Figure B-33. PT05 Transit Security

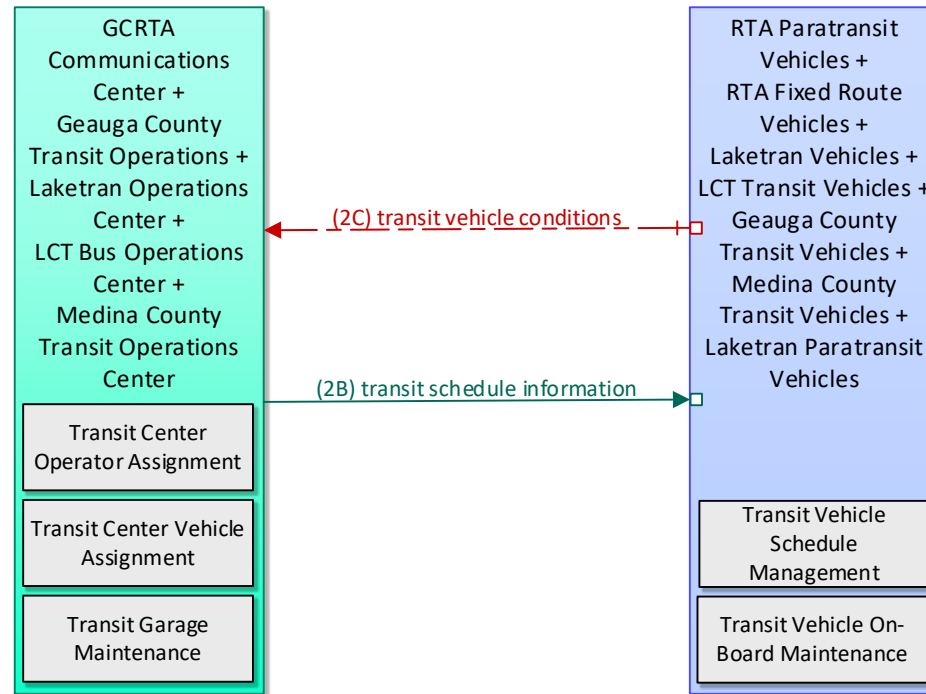


Figure B-34. PT06 Transit Fleet Management

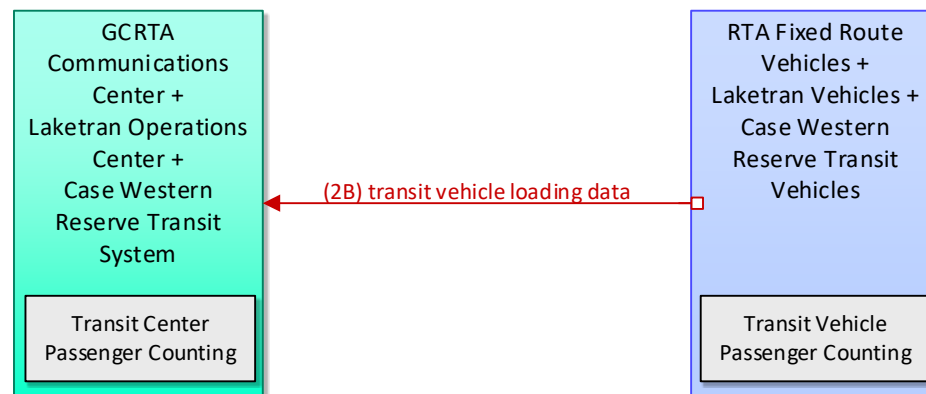


Figure B-35. PT07 Transit Passenger Counting

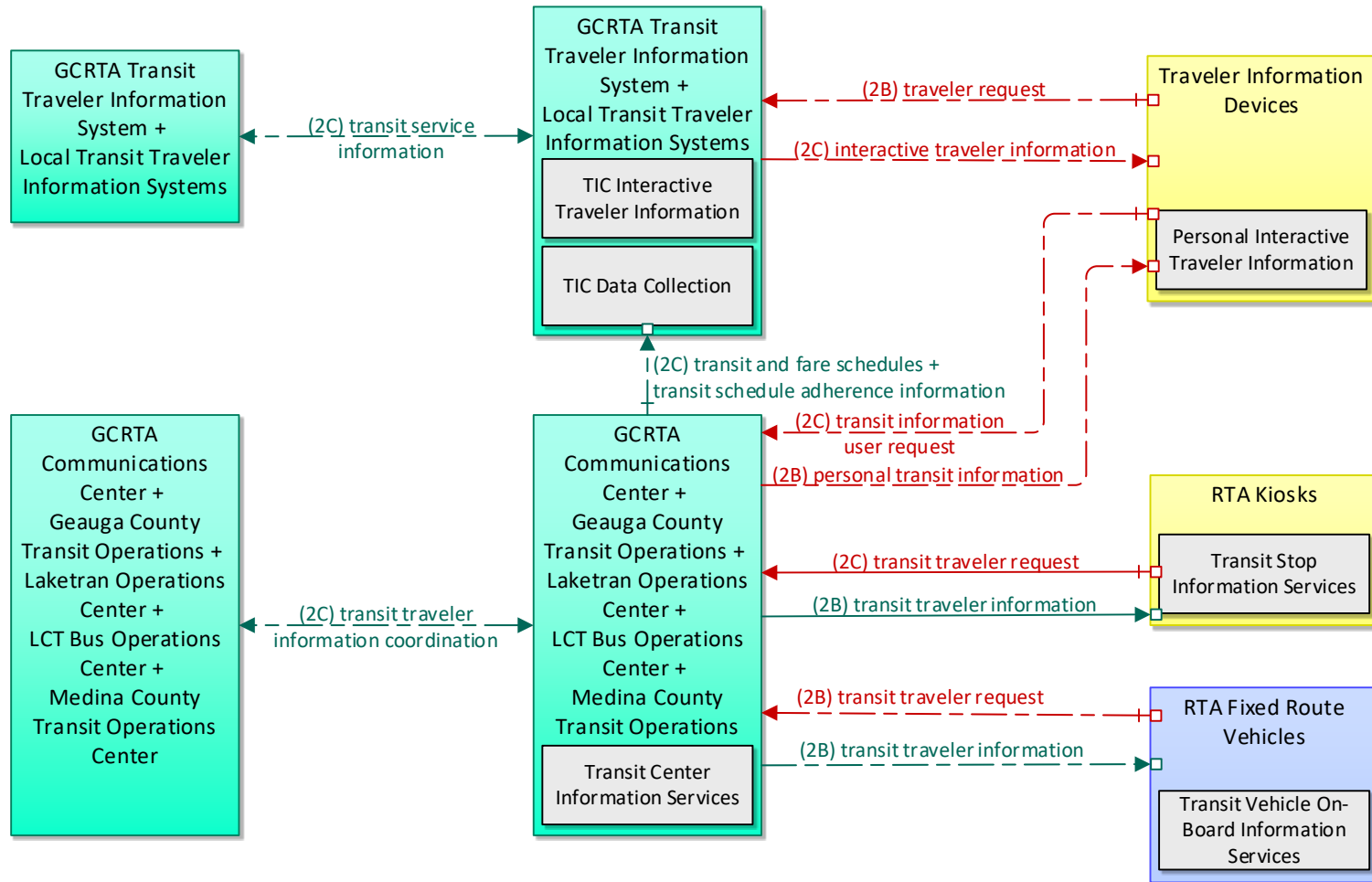


Figure B-36. PT08 Transit Traveler Information

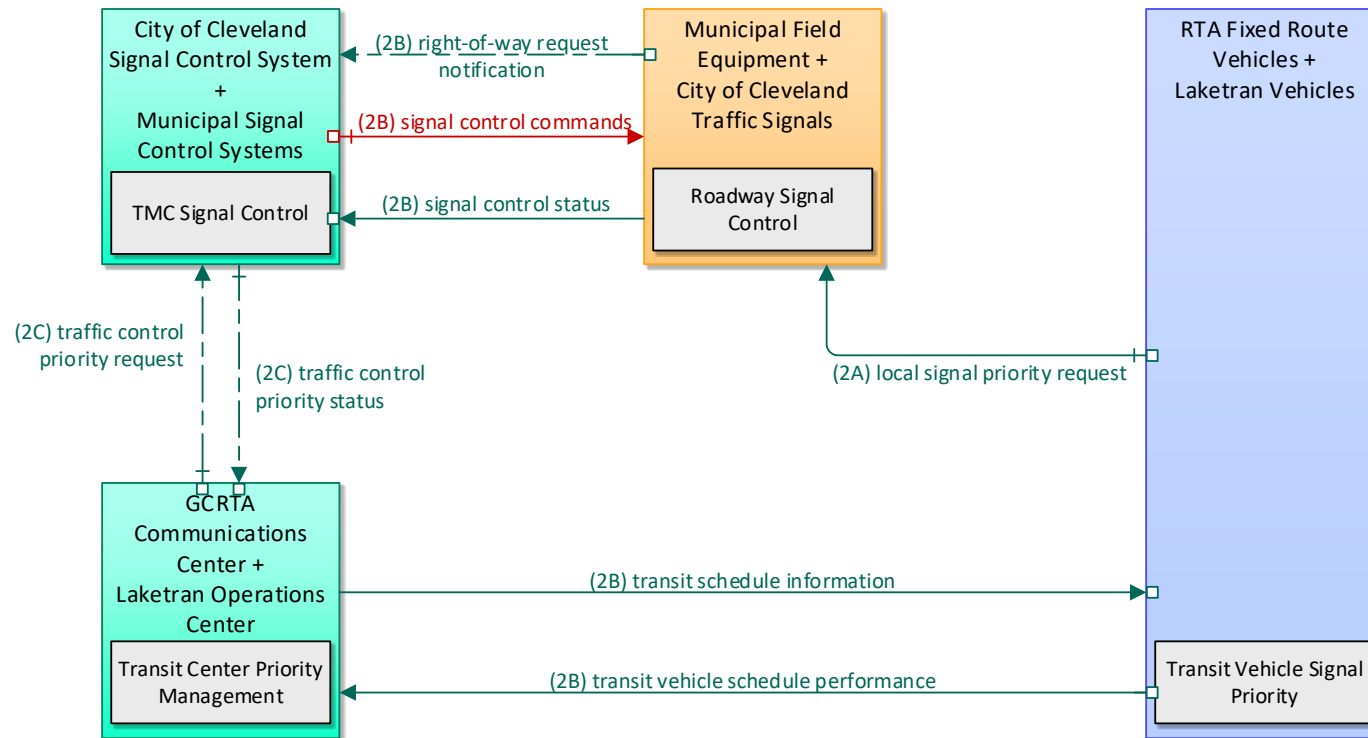


Figure B-37. PT09 Transit Signal Priority

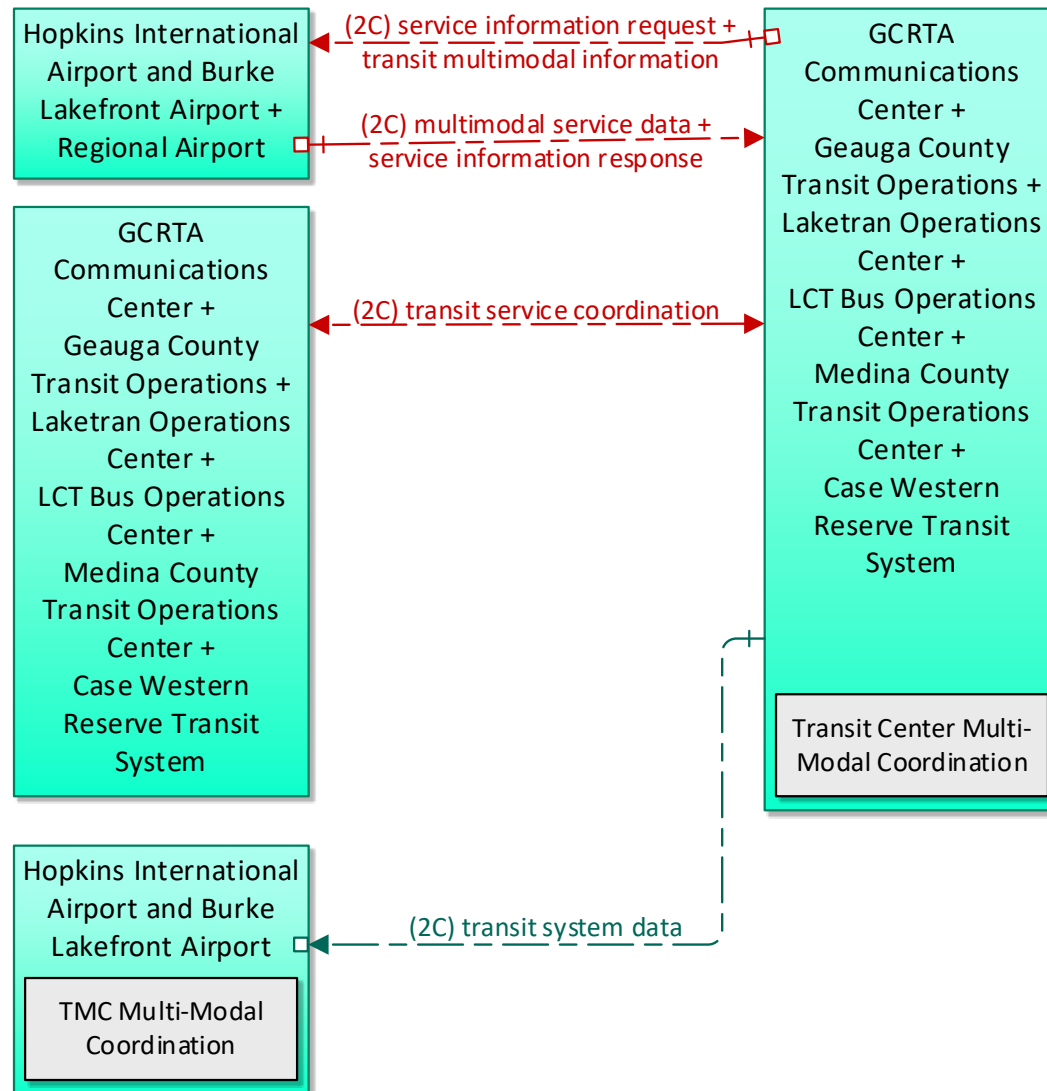


Figure B-38. PT14 Multi-modal Coordination

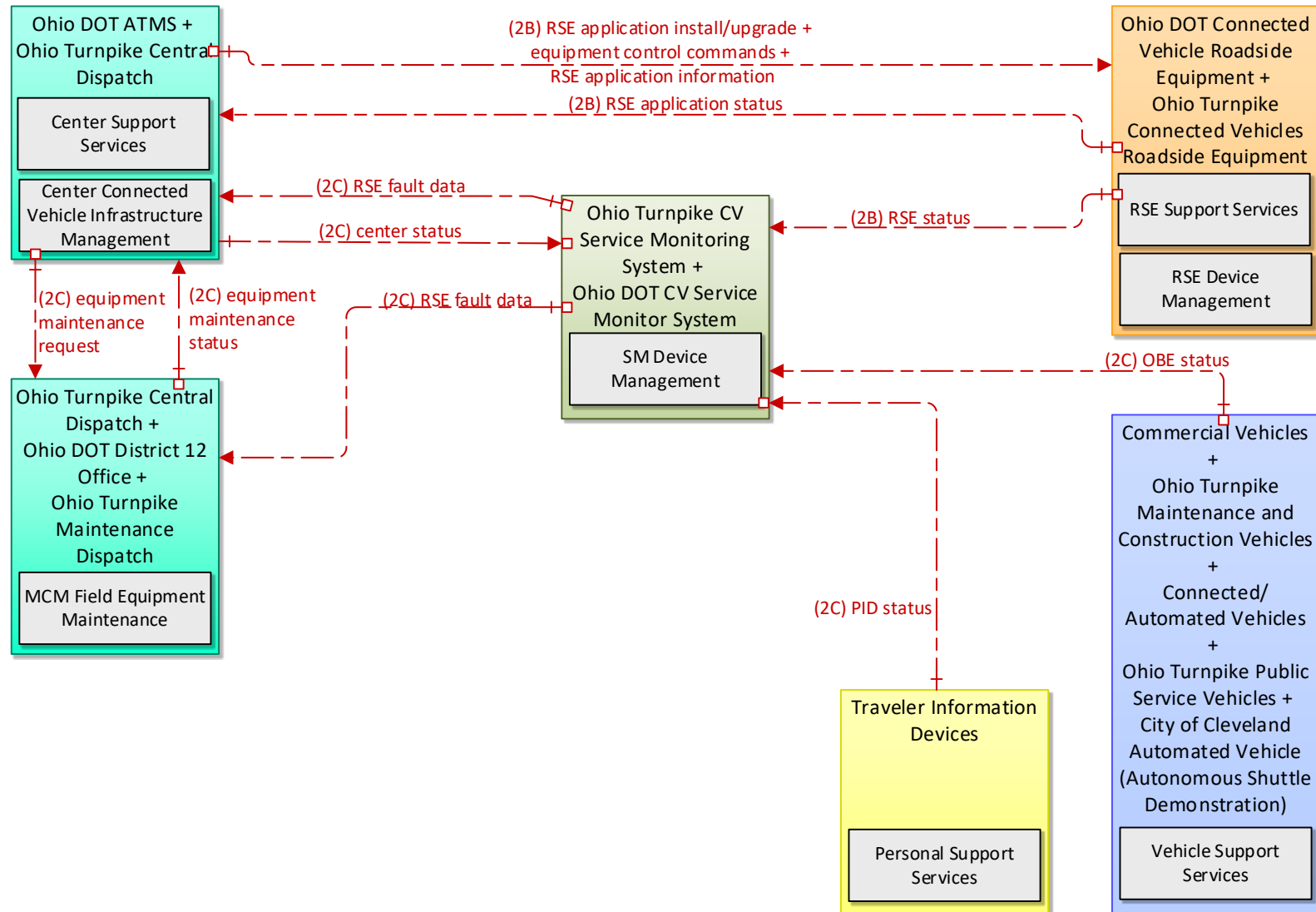


Figure B-39. SU01. Connected Vehicle System Monitoring and Management

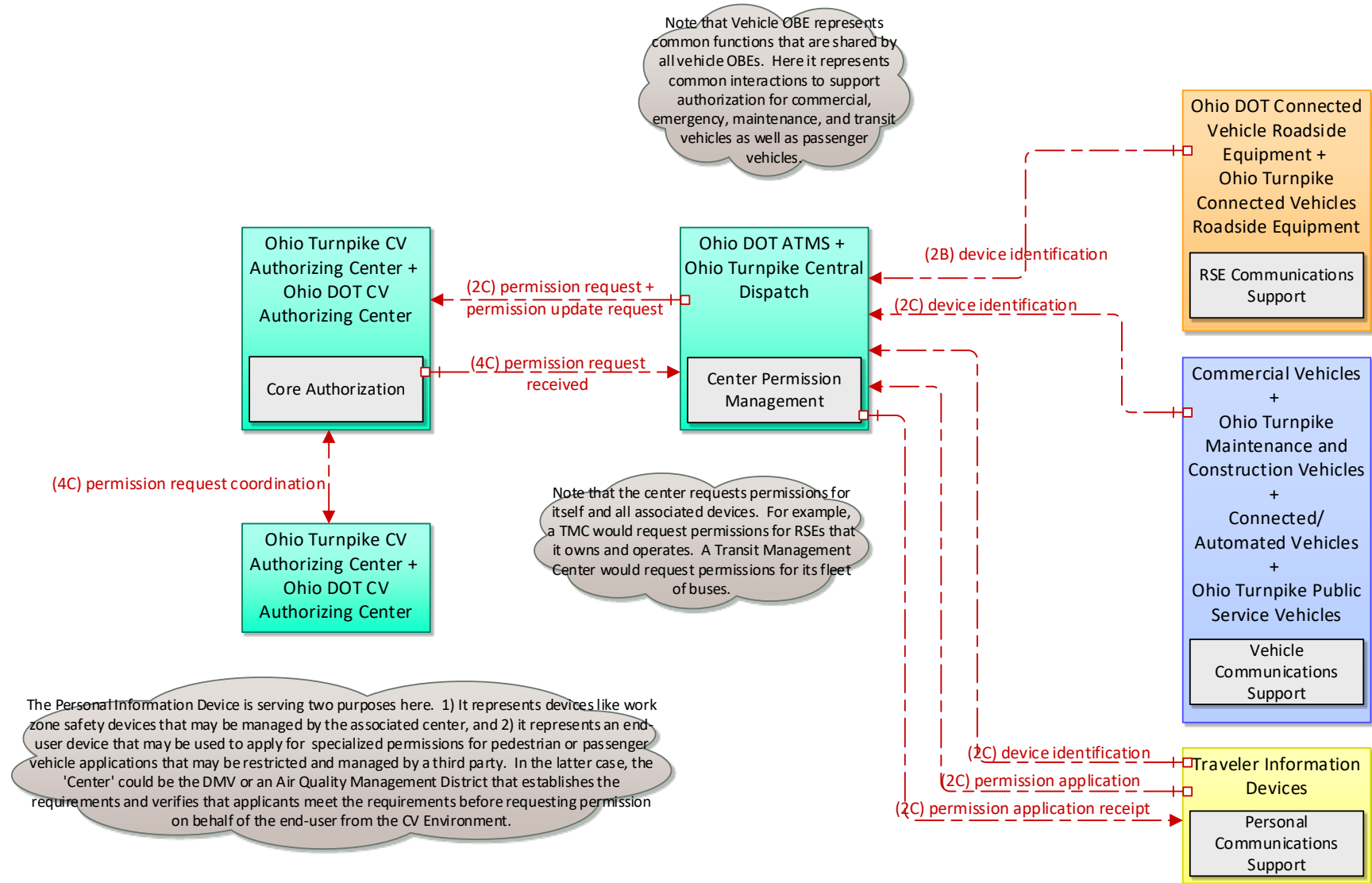


Figure B-40. SU02 Core Authorization

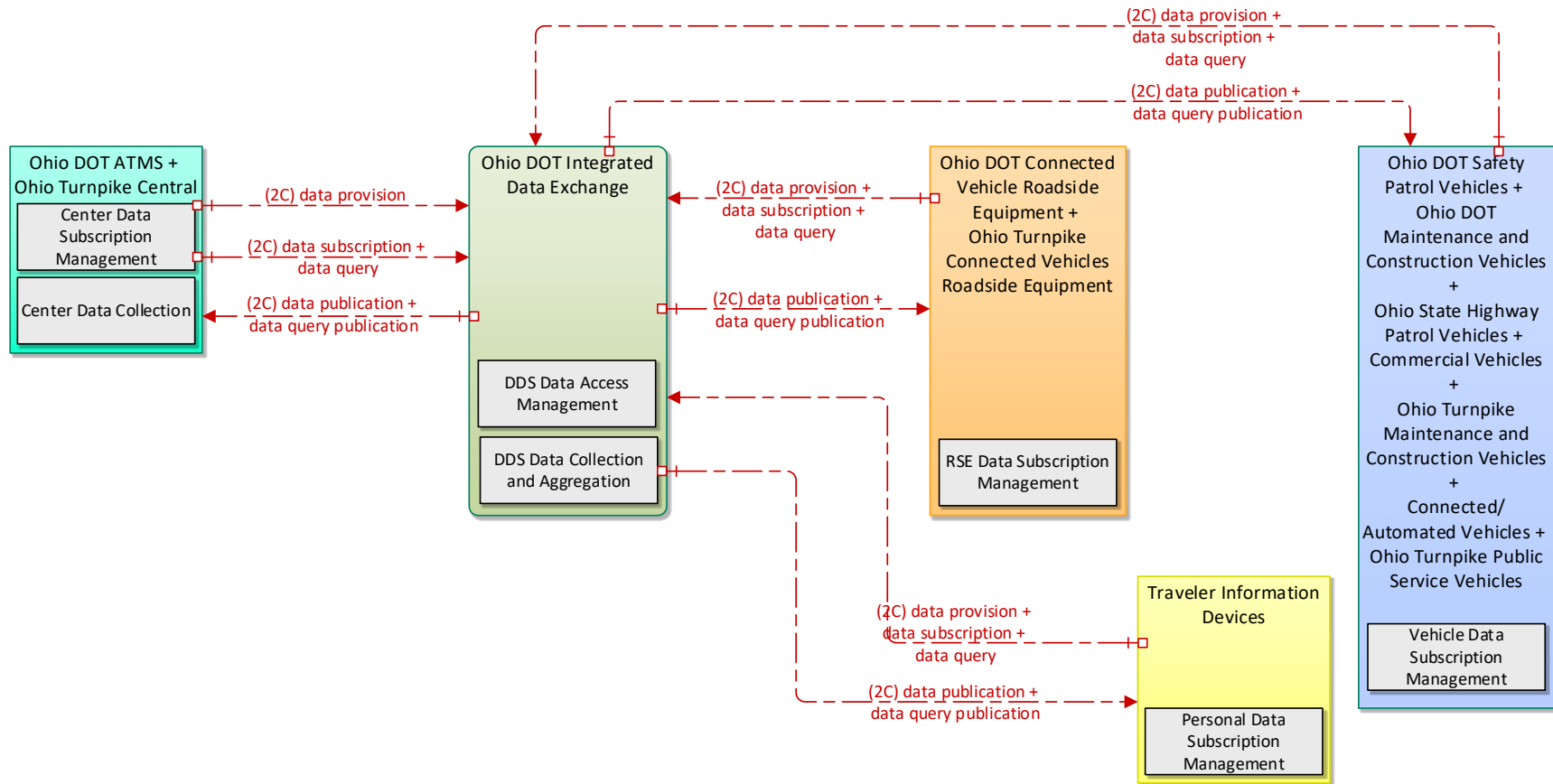


Figure B-41. SU03 Data Distribution

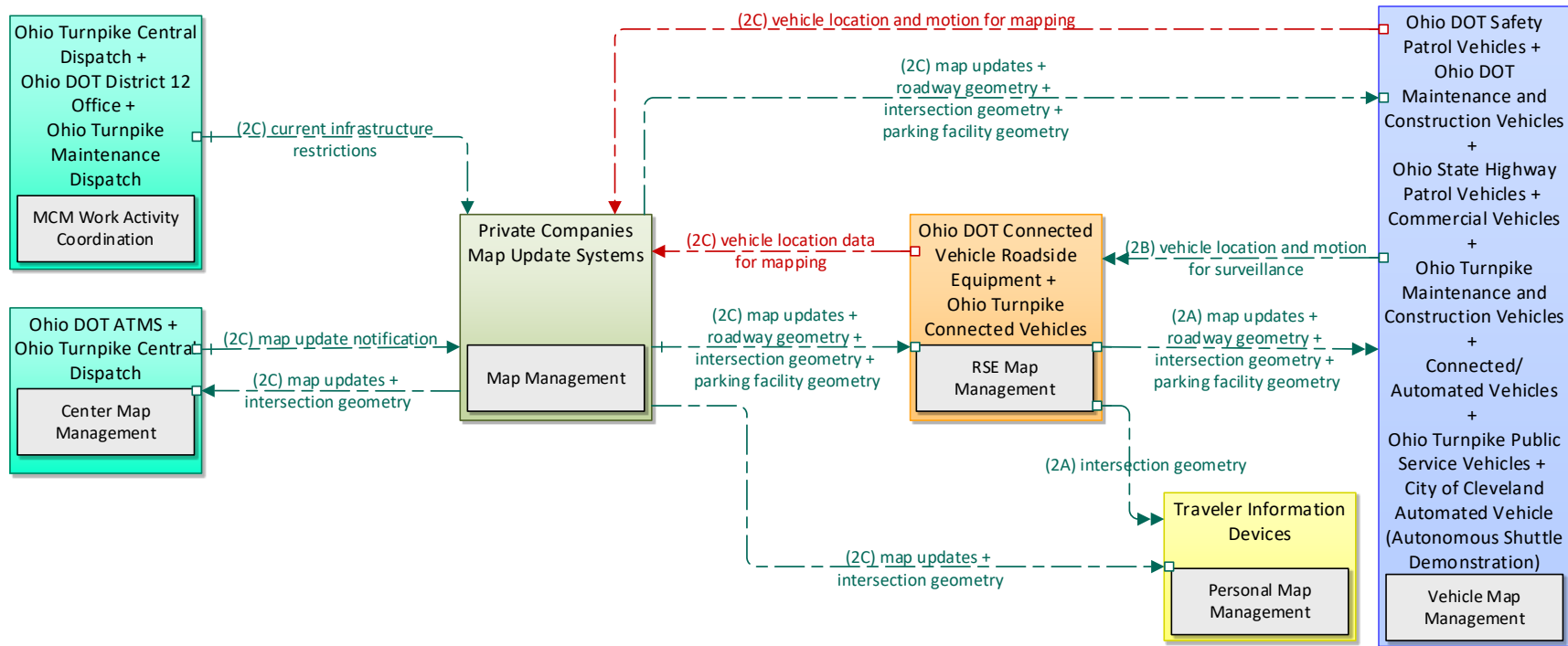


Figure B-42. SU04 Map Management

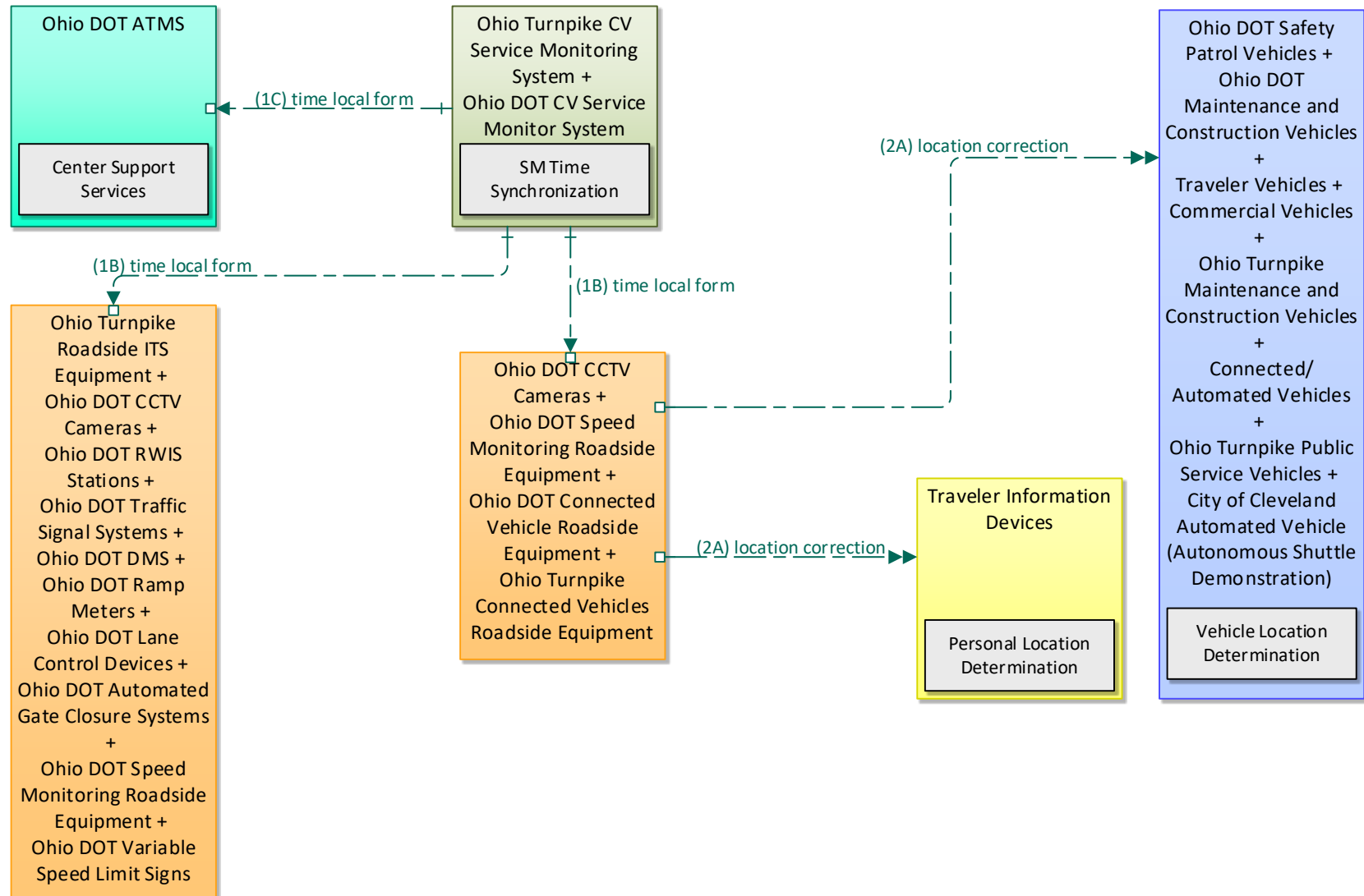


Figure B-43. SU05 Location and Time

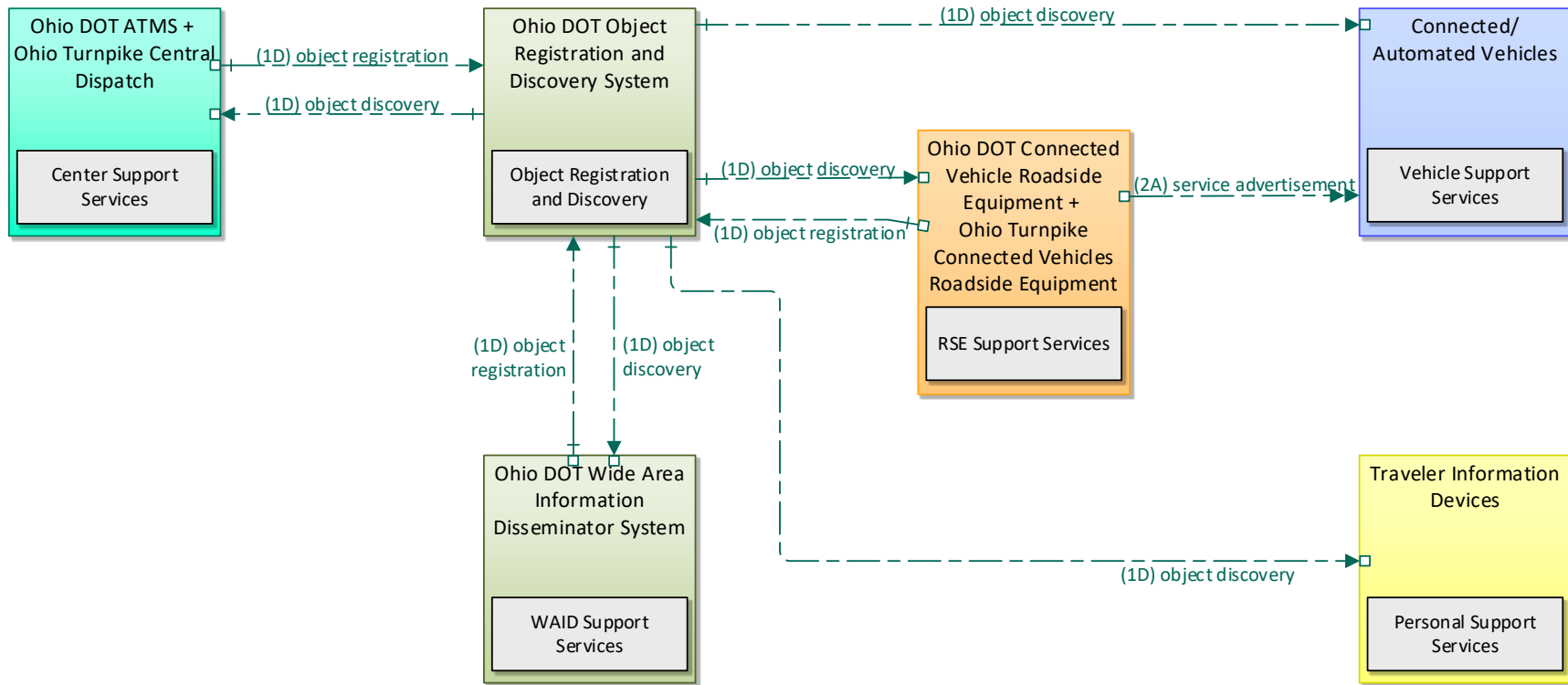


Figure B-44. SU06 Object Registration and Discovery

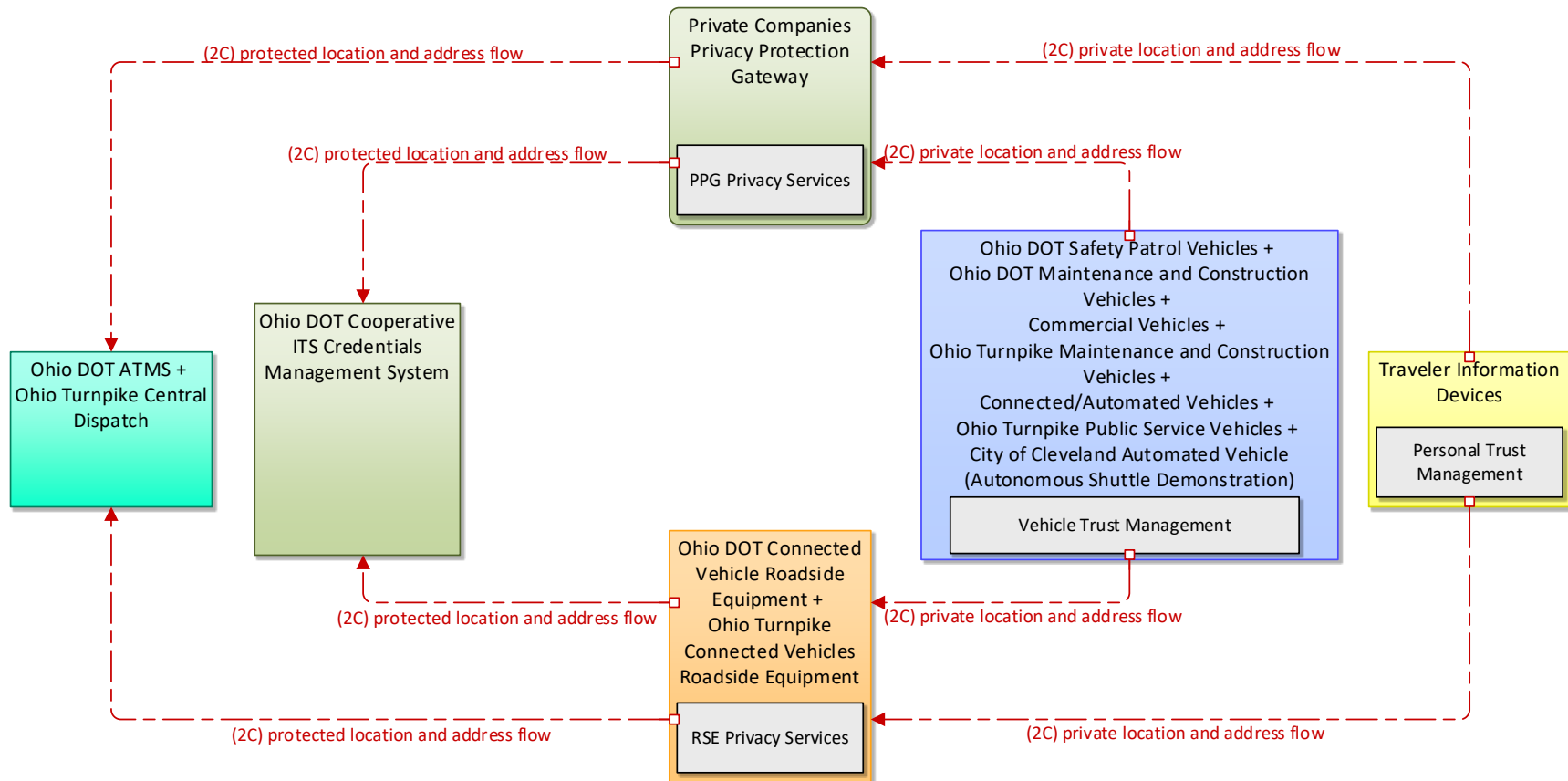


Figure B-45. SU07 Privacy Protection

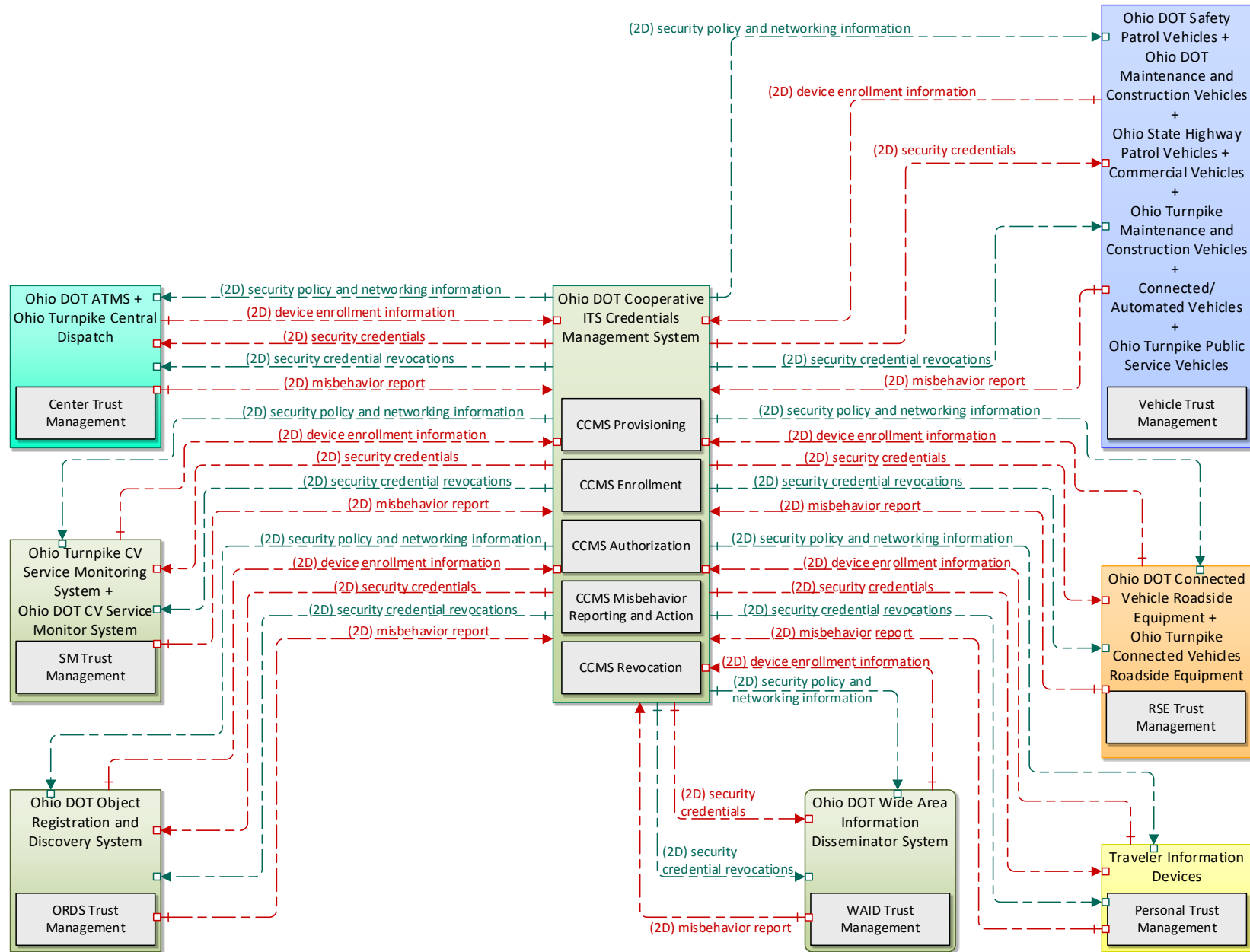


Figure B-46. SU08 Security and Credentials Management

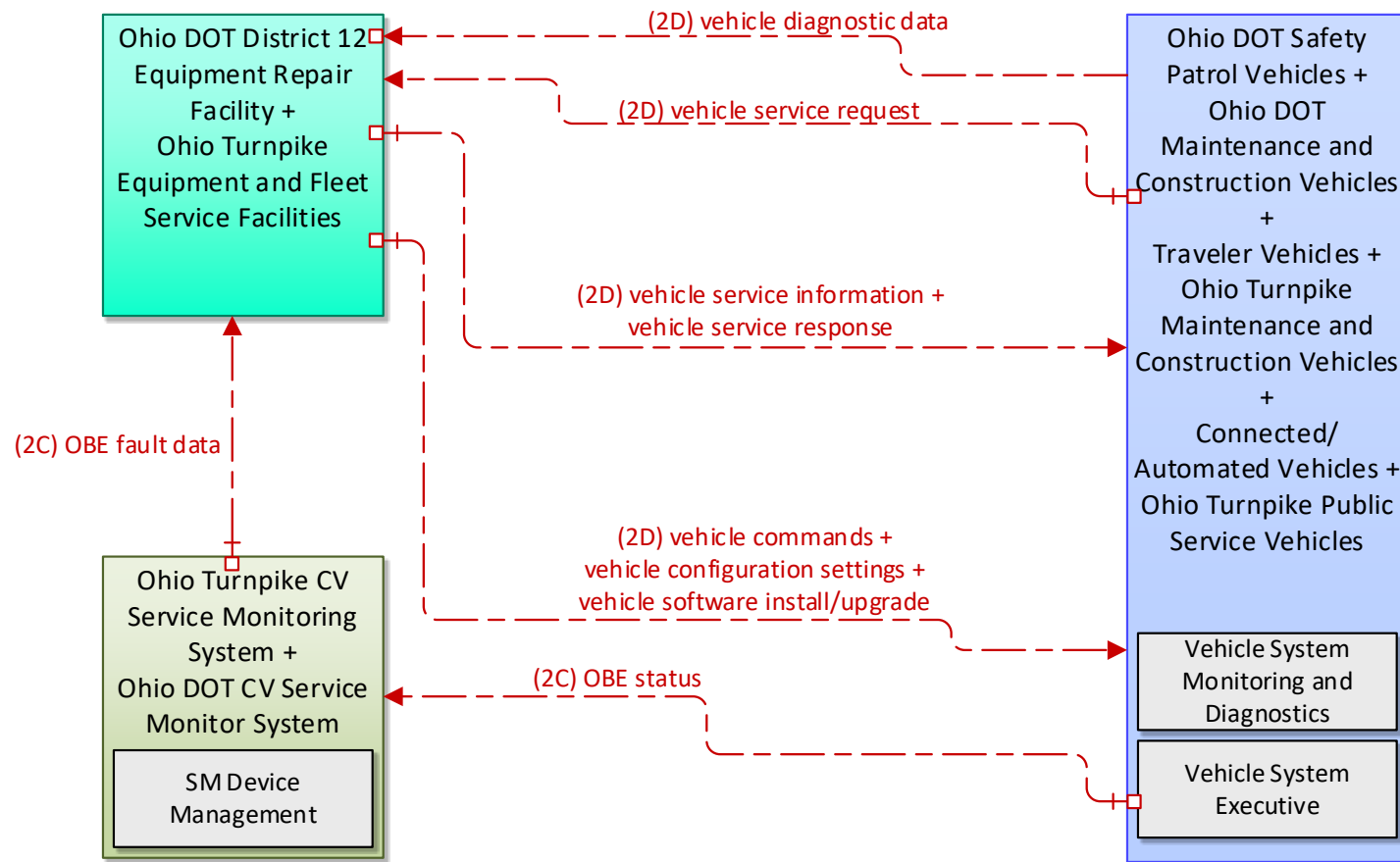


Figure B-47. SU11 Vehicle Maintenance

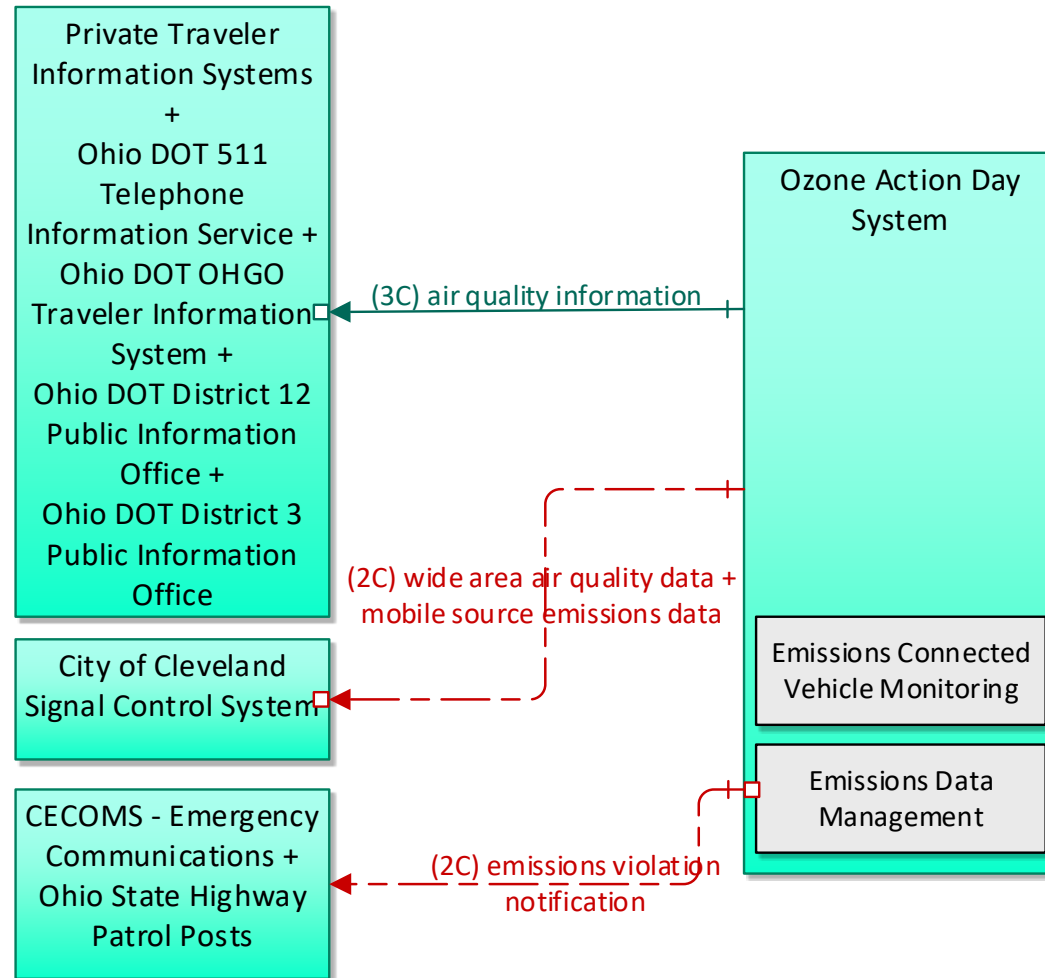


Figure B-48. ST01 Emissions Monitoring

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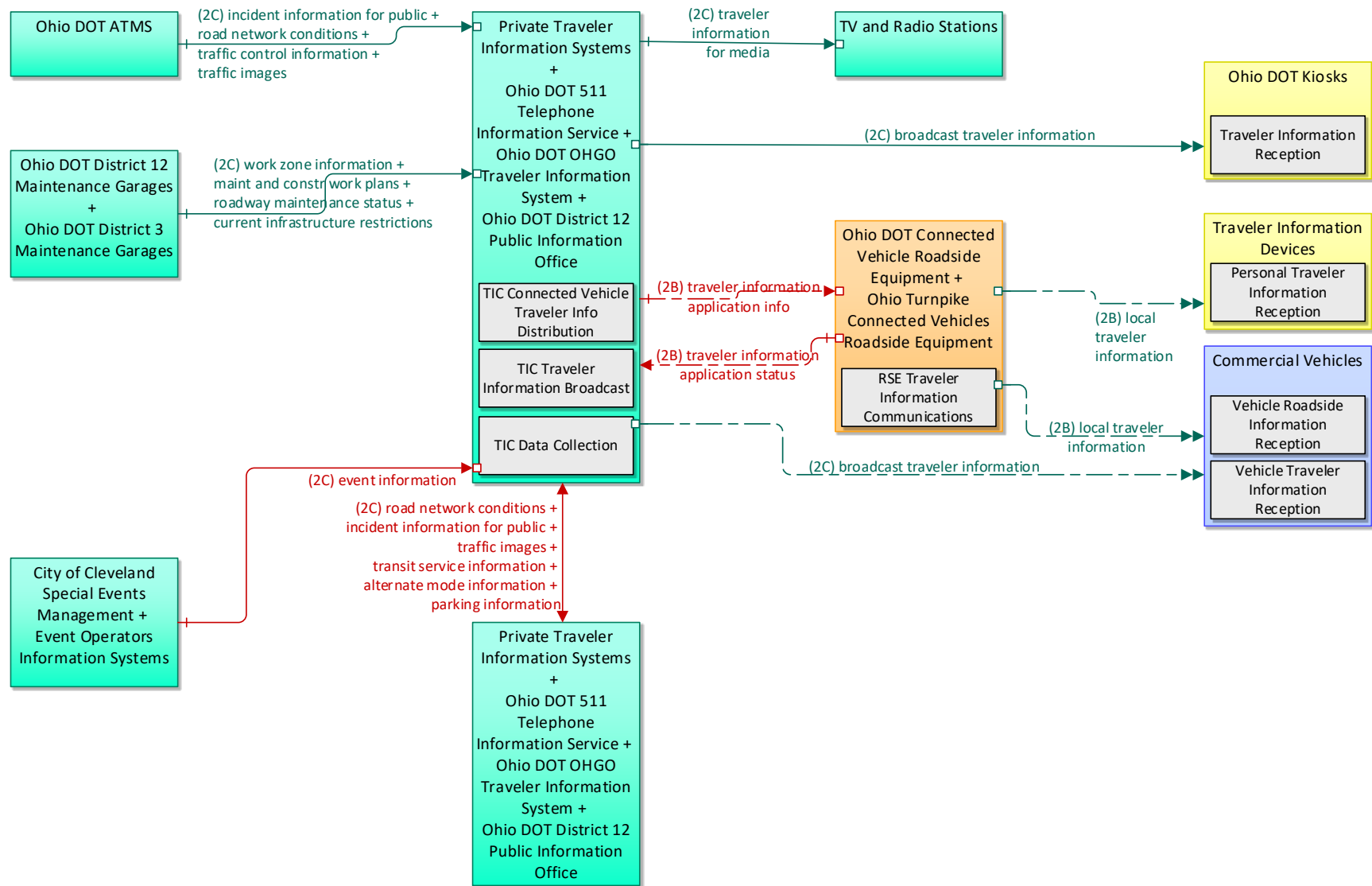


Figure B-49. TI01 Broadcast Traveler Information

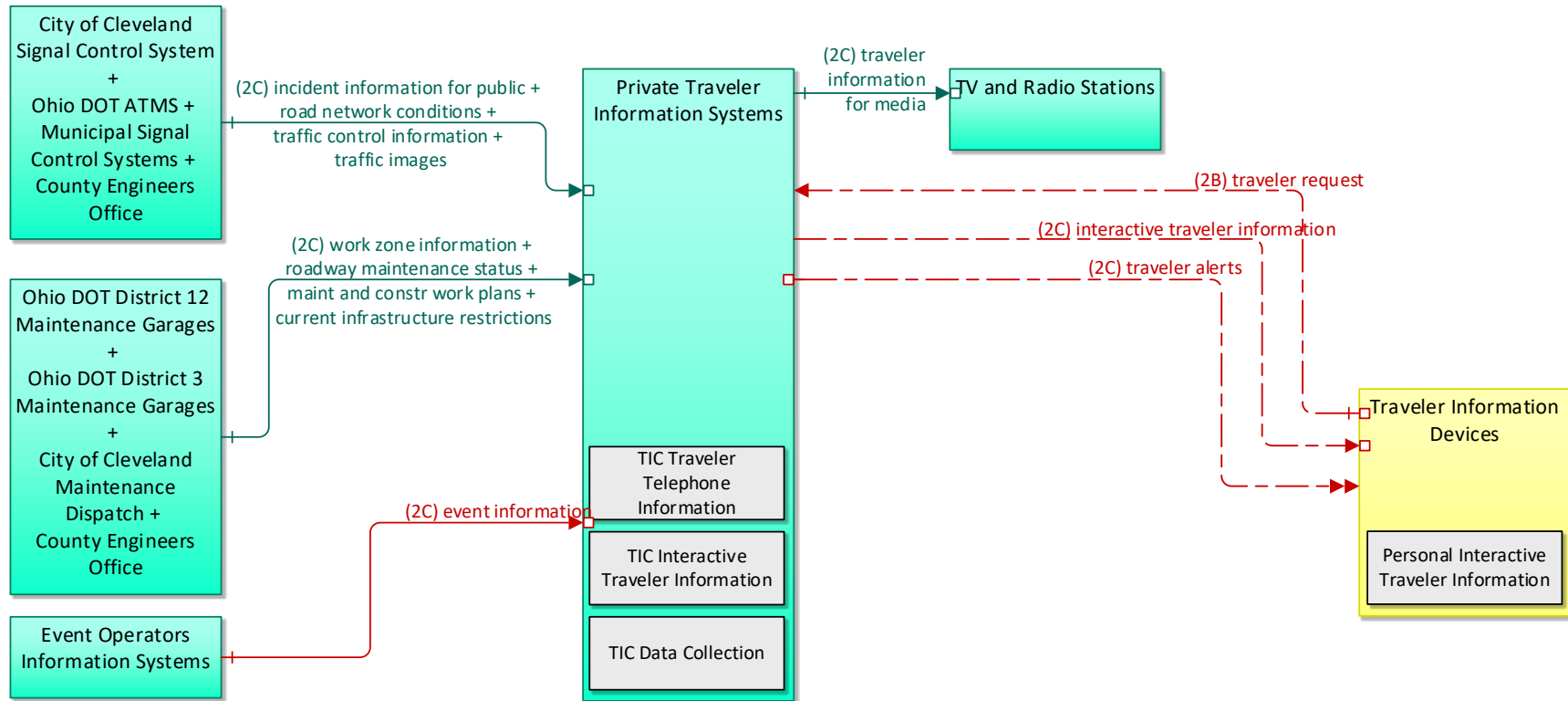


Figure B-50. T102. Personalized Traveler Information

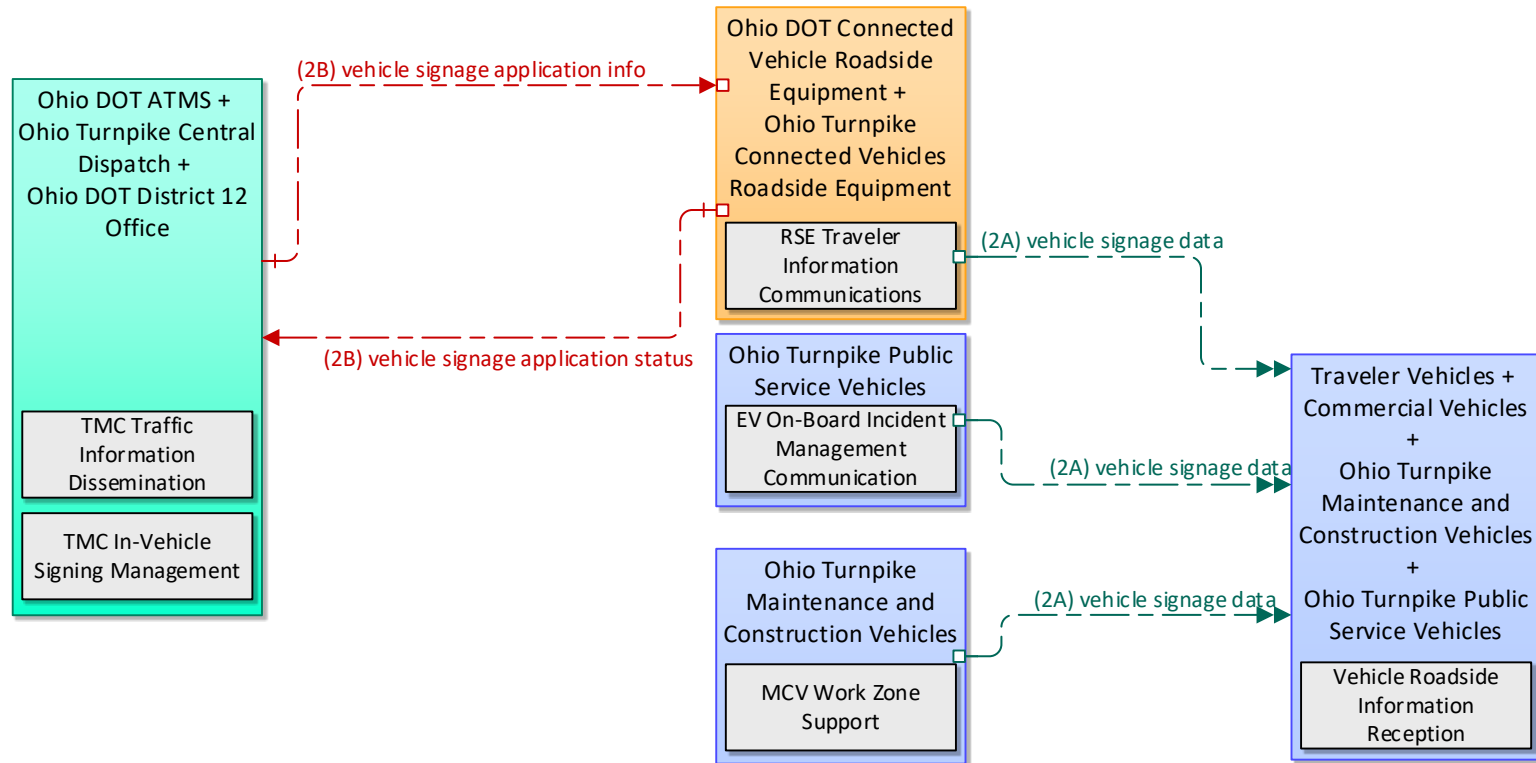


Figure B-51. TI07. In-Vehicle Signage

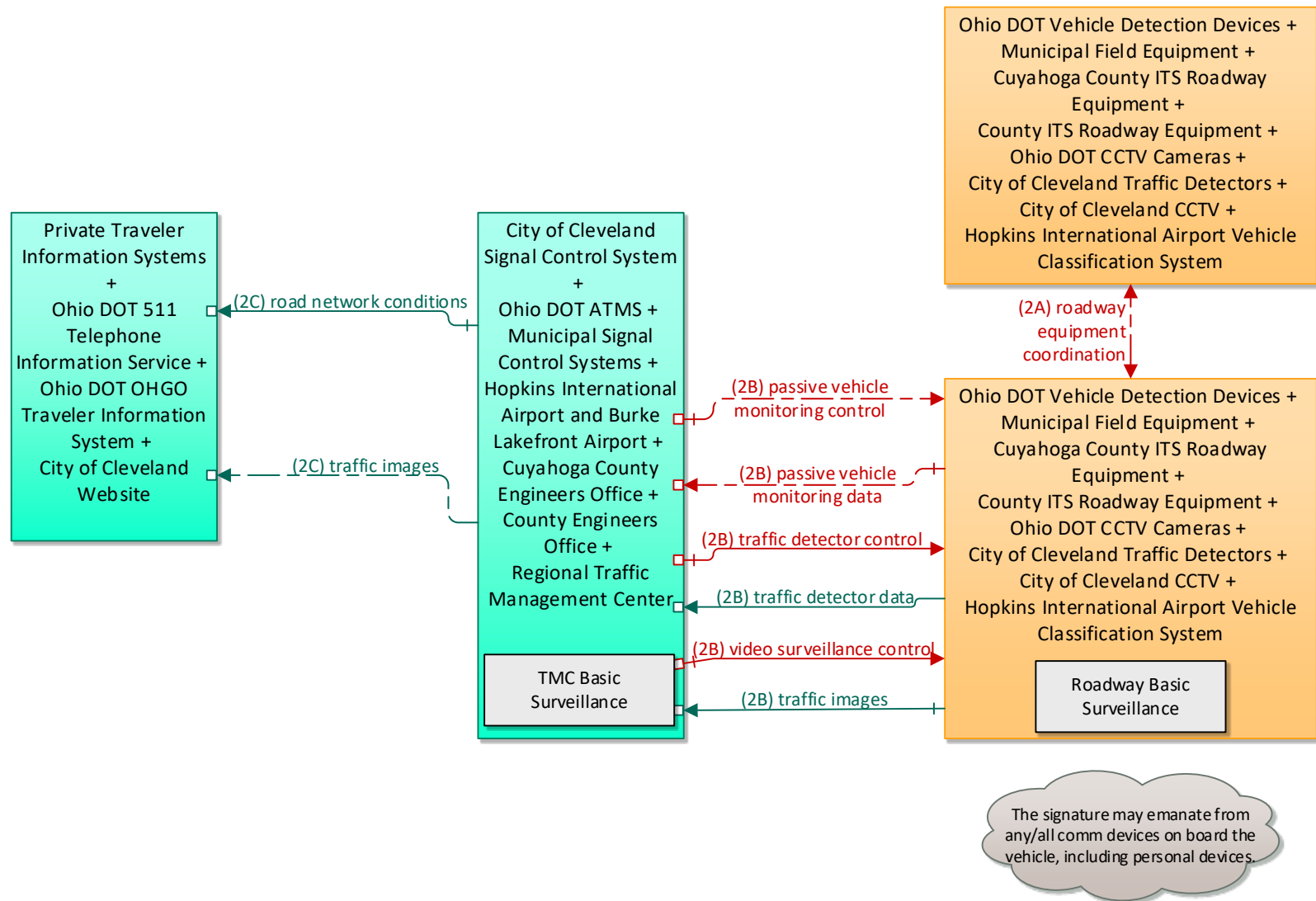


Figure B-52. TM01 Infrastructure-Based Traffic Surveillance

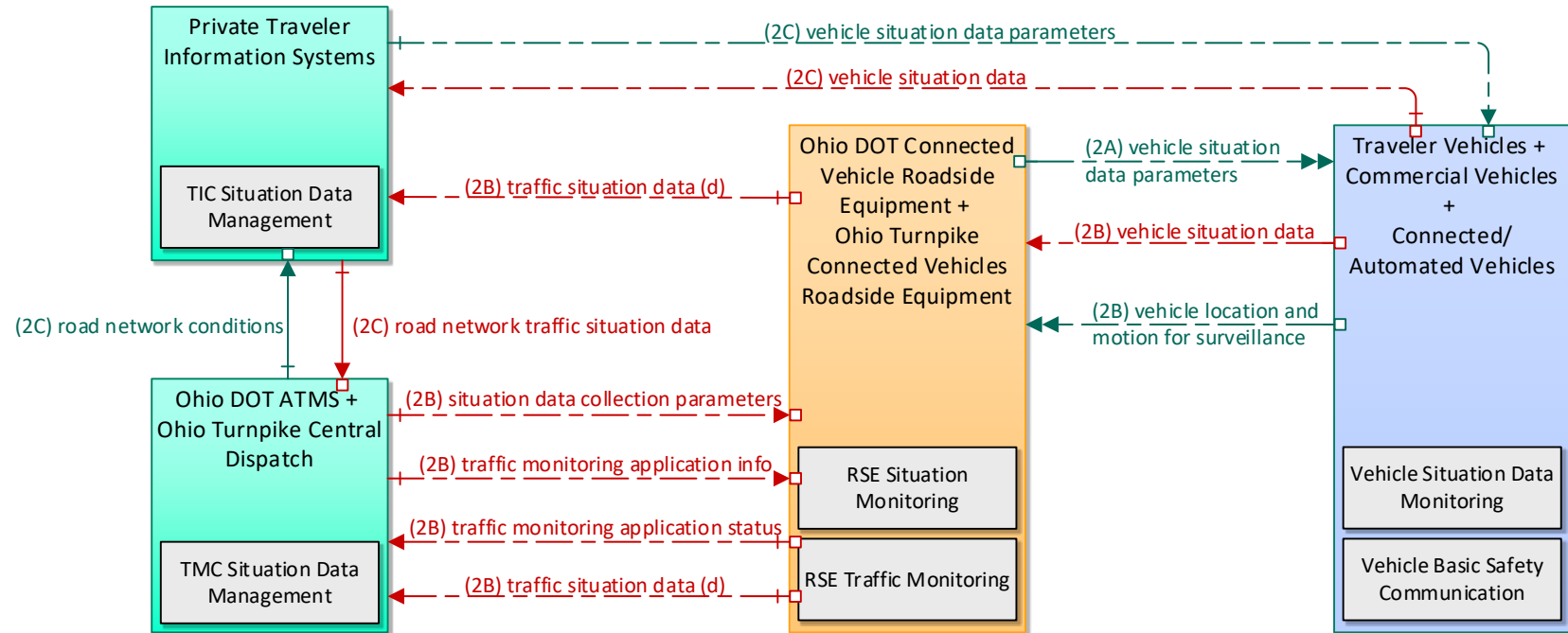


Figure B-53. TM02 Vehicle-Based Traffic Surveillance

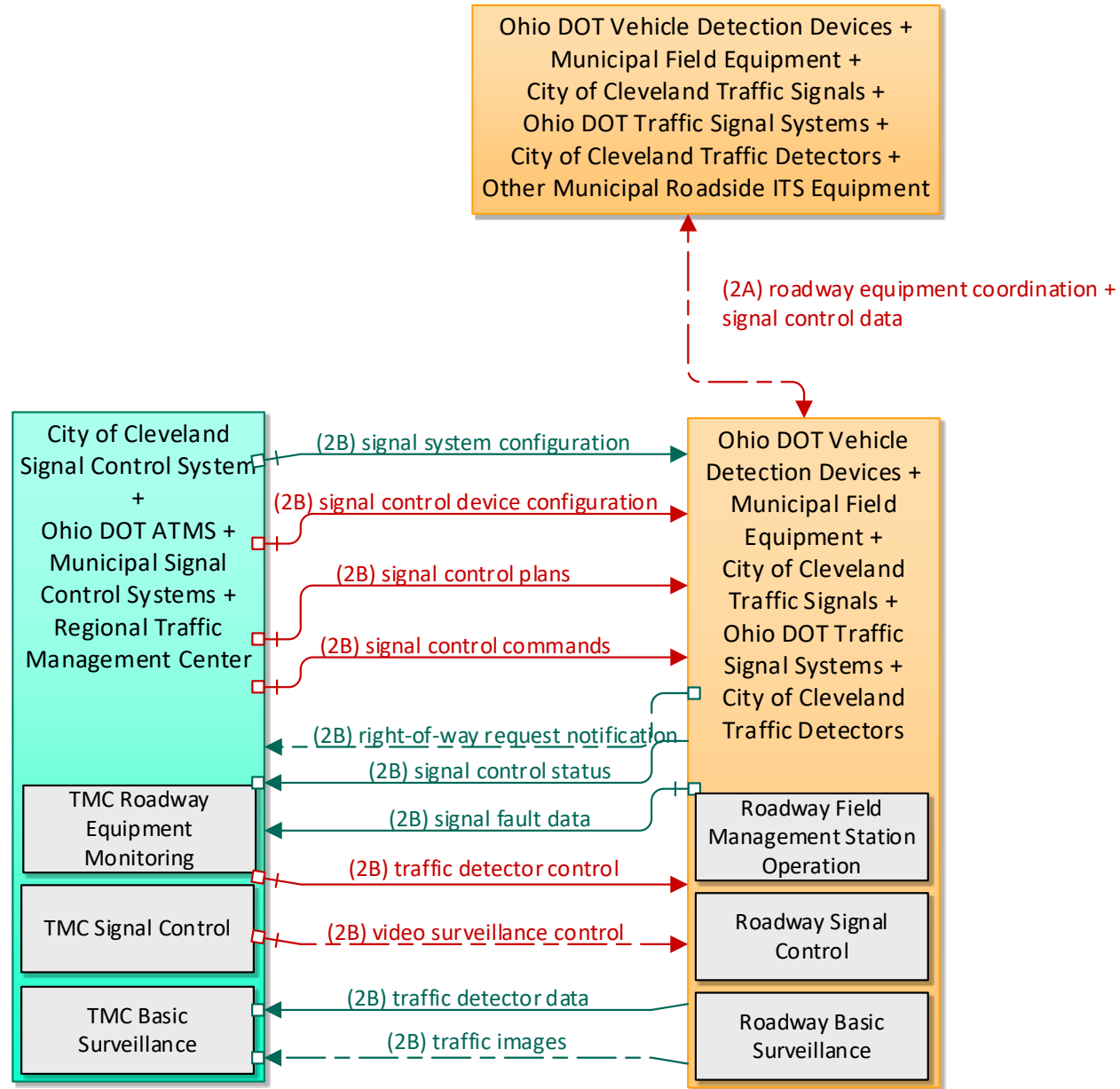


Figure B-54. TM03 Traffic Signal Control

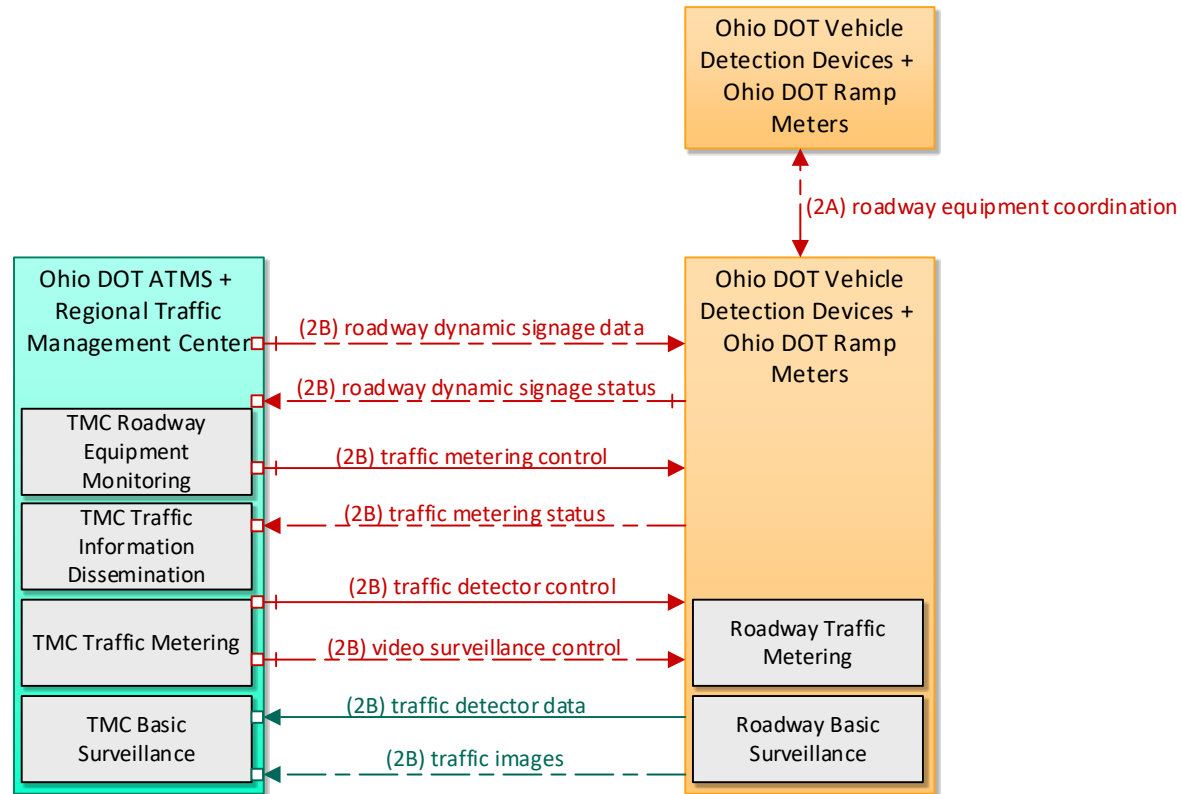


Figure B-55. TM05 Traffic Metering

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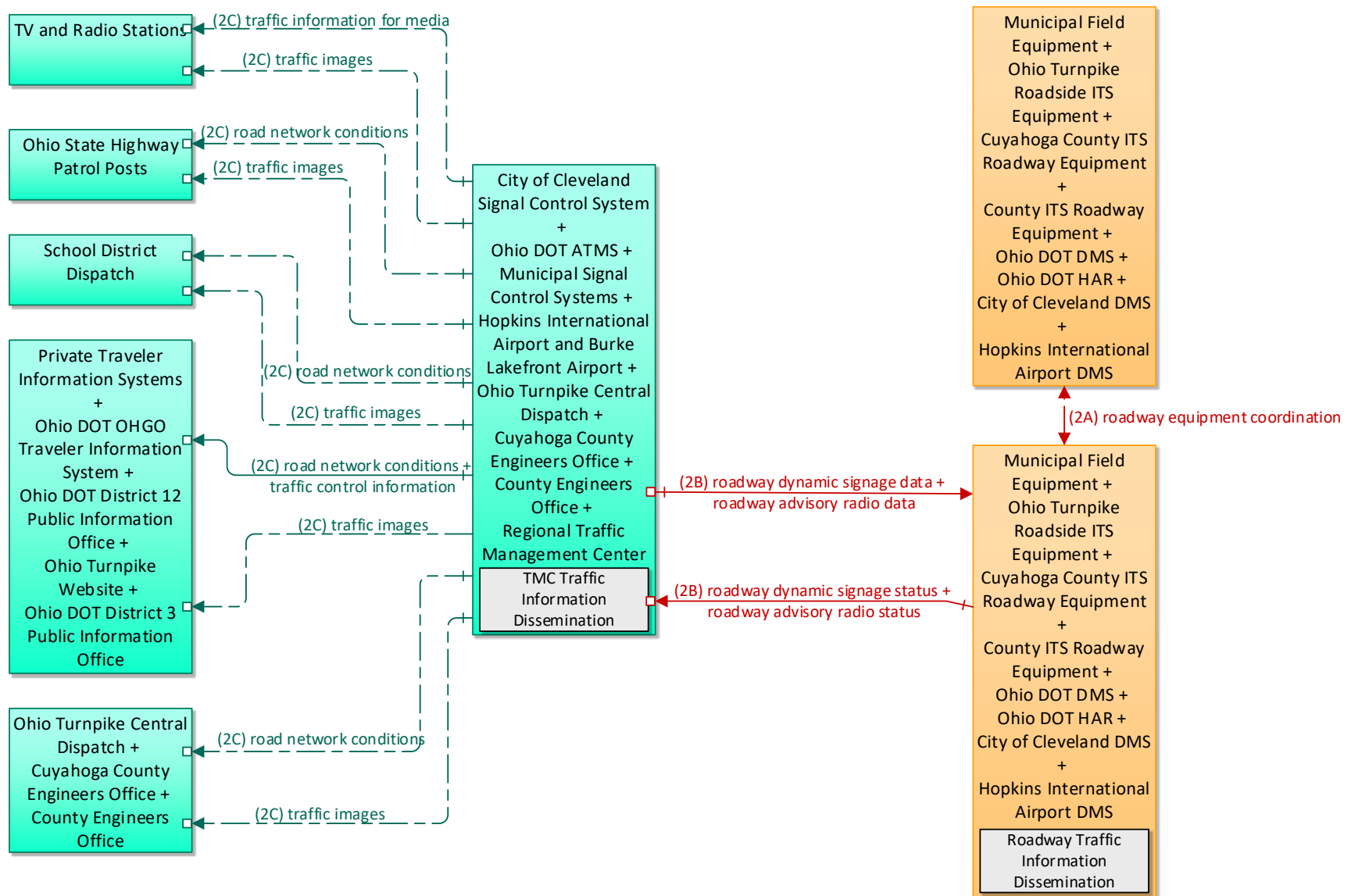


Figure B-56. TM06 Traffic Information Dissemination

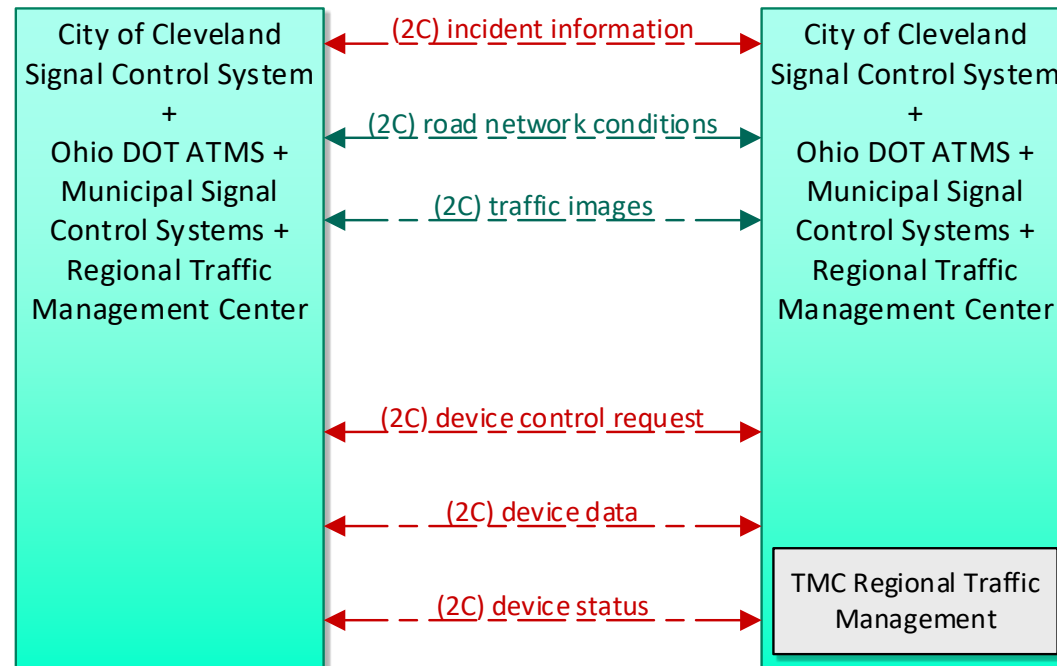


Figure B-57. TM07 Regional Traffic Management

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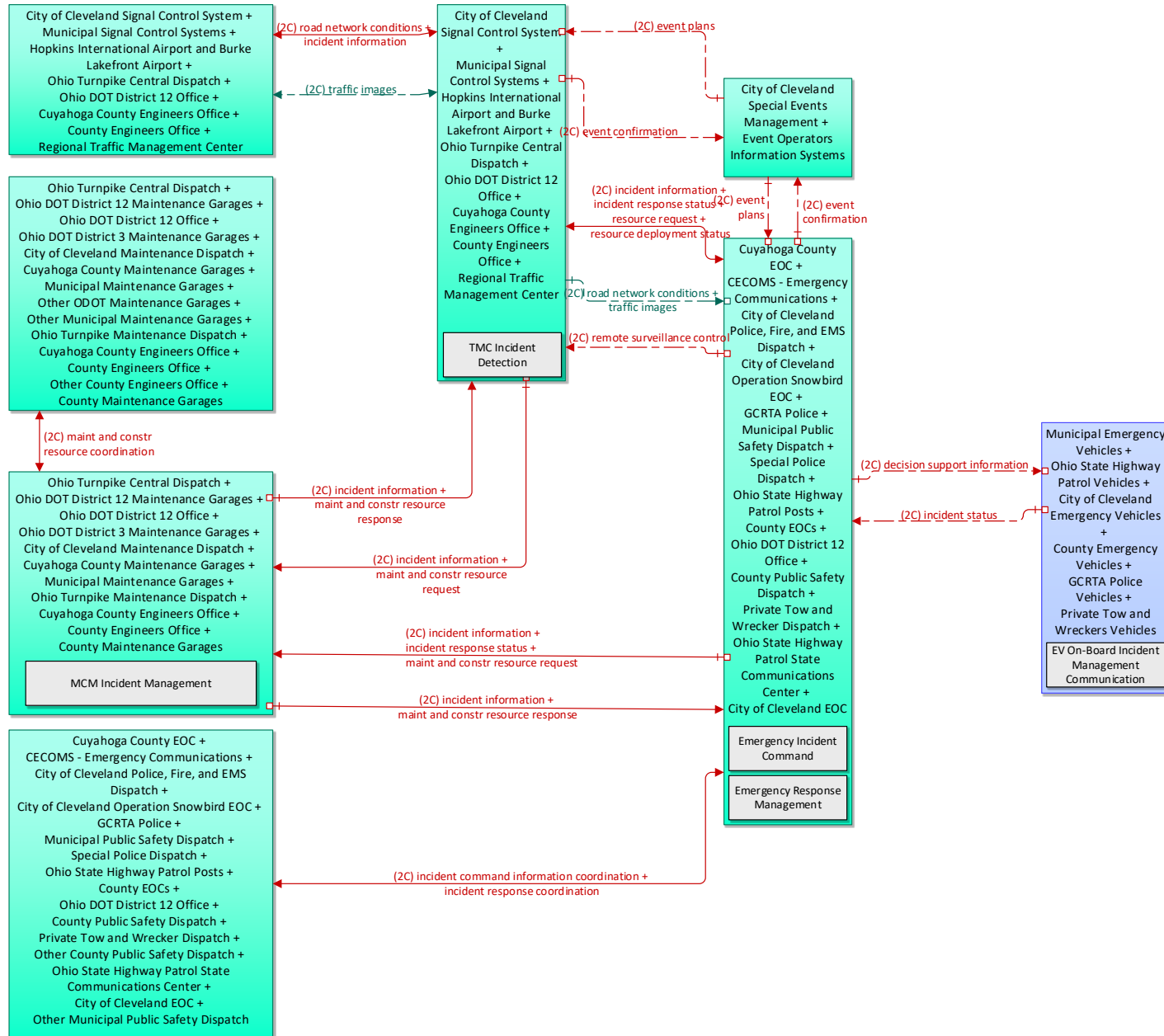


Figure B-58. TM08 Traffic Incident Management

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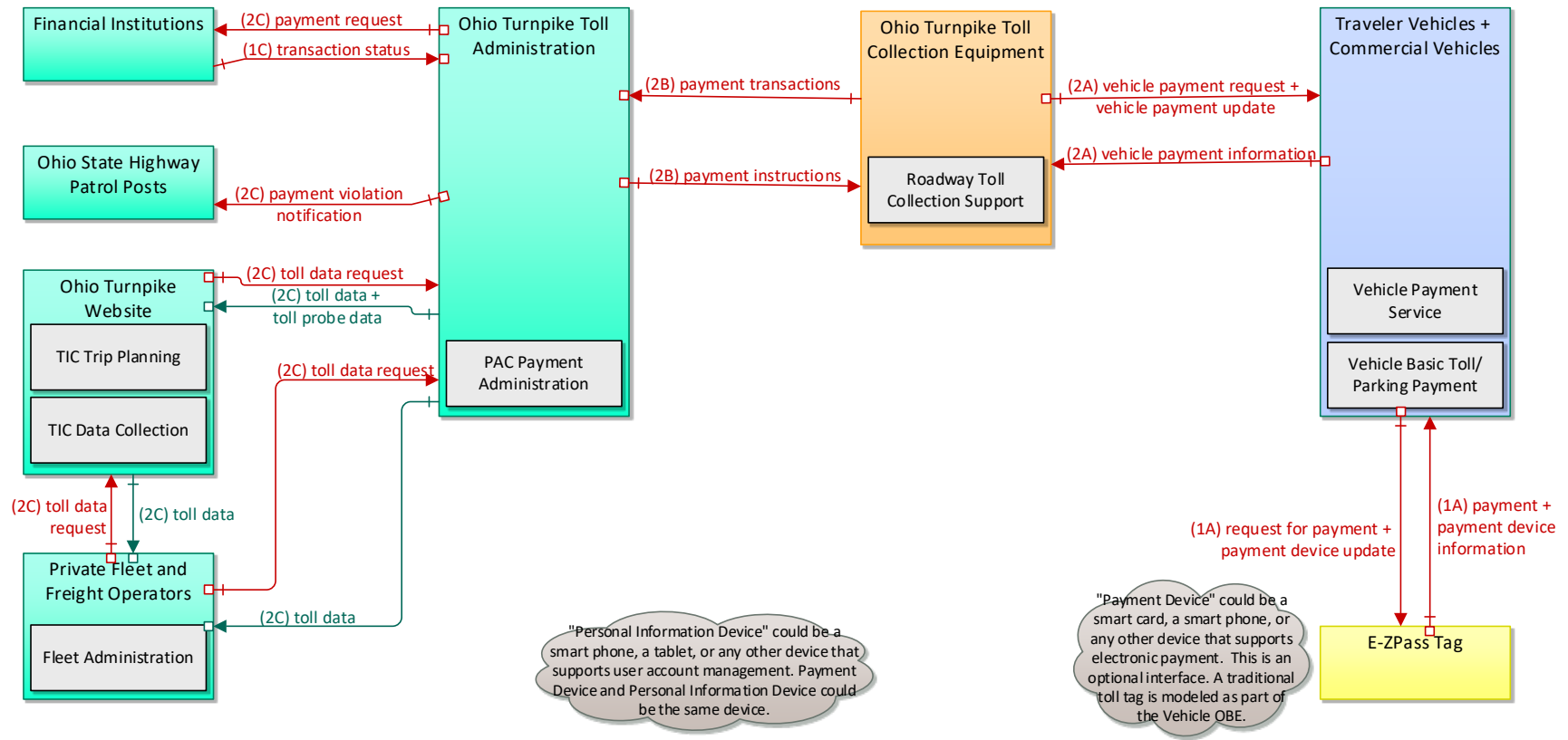


Figure B-59. TM10 Electronic Toll Collection

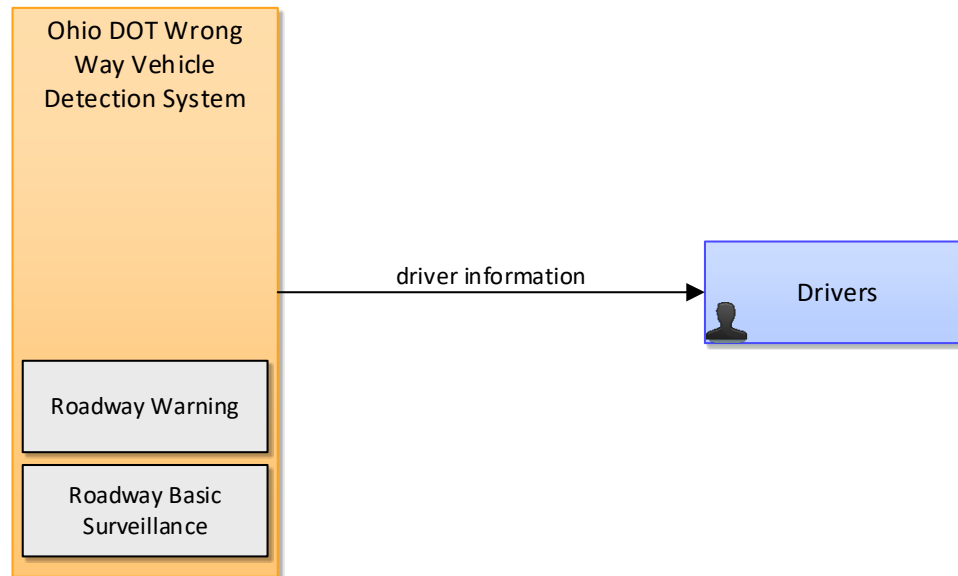


Figure B-60. TM12 Dynamic Roadway Warning

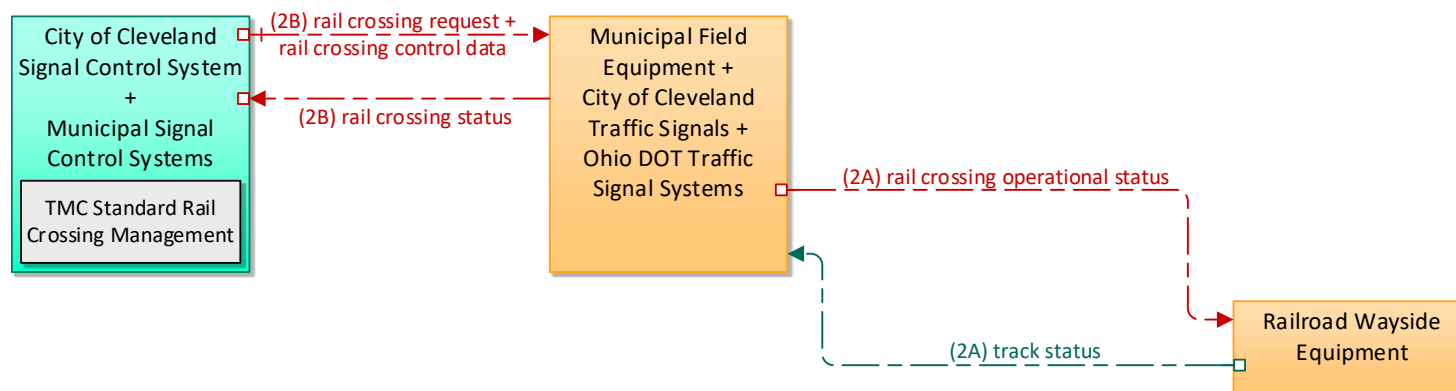


Figure B-61. TM13 Standard Railroad Grade Crossing

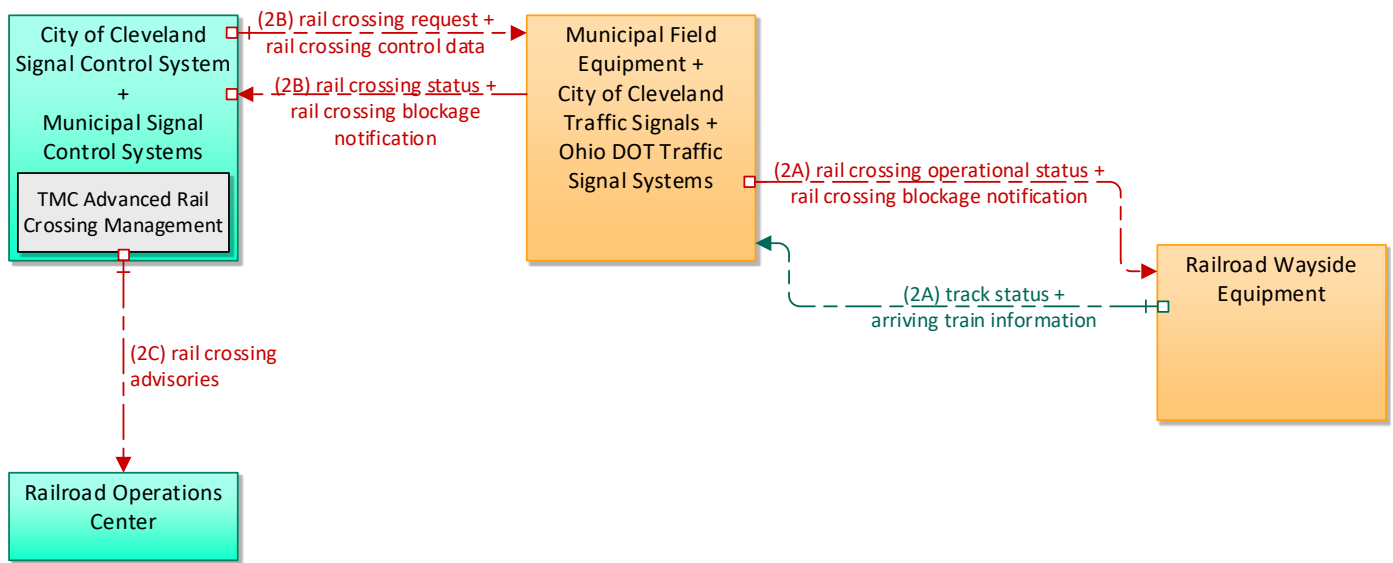


Figure B-62. TM14 Advanced Railroad Grade Crossing

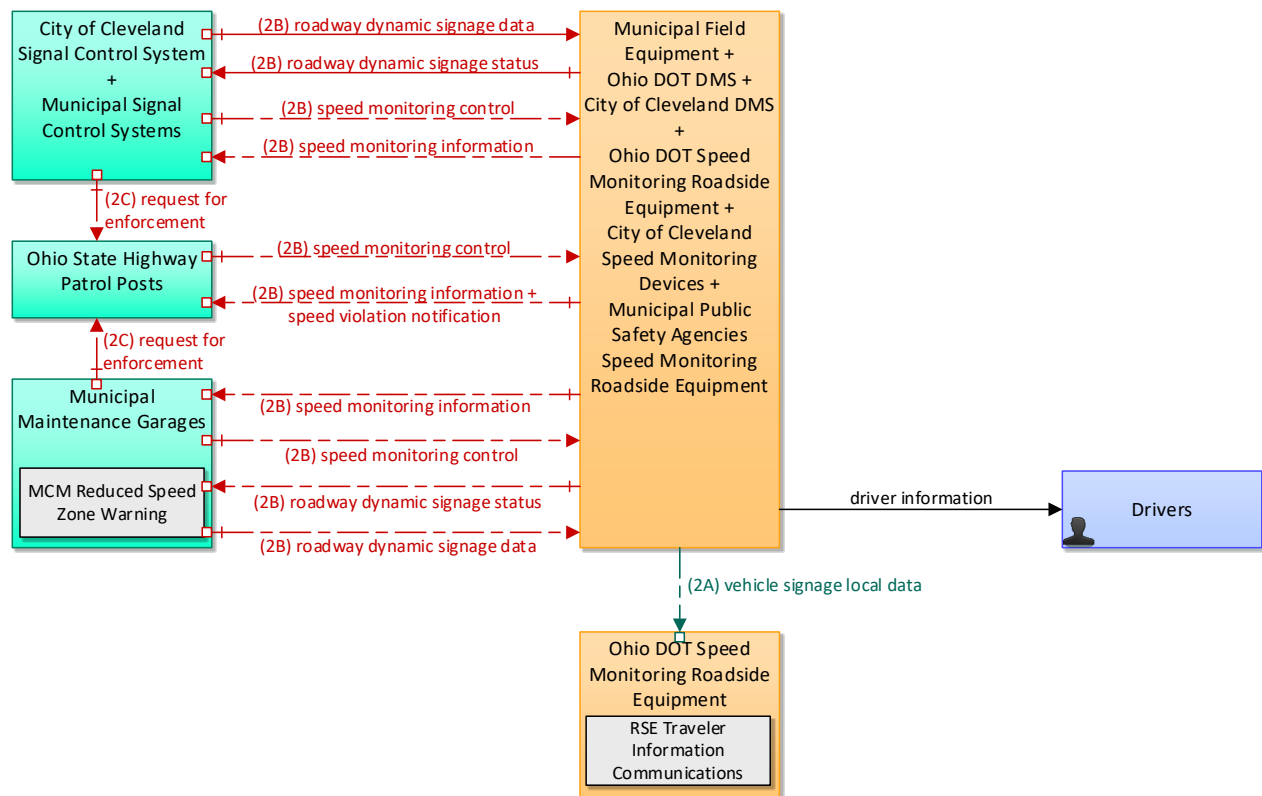


Figure B-63. TM17 Speed Warning and Enforcement

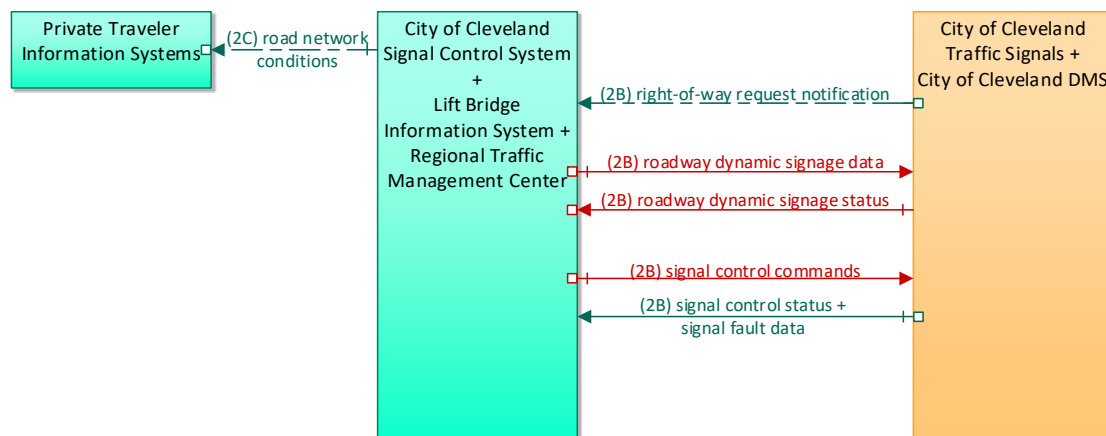


Figure B-64. TM18 Drawbridge Management

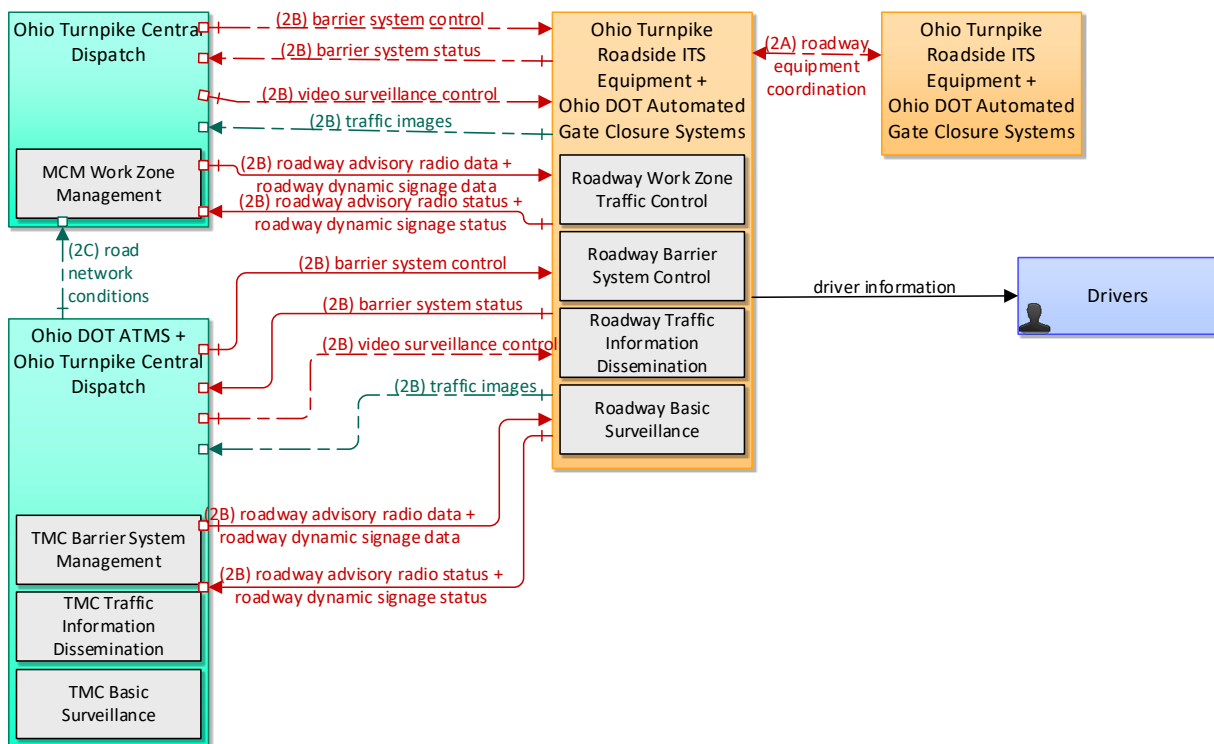


Figure B-65. TM19 Roadway Closure Management

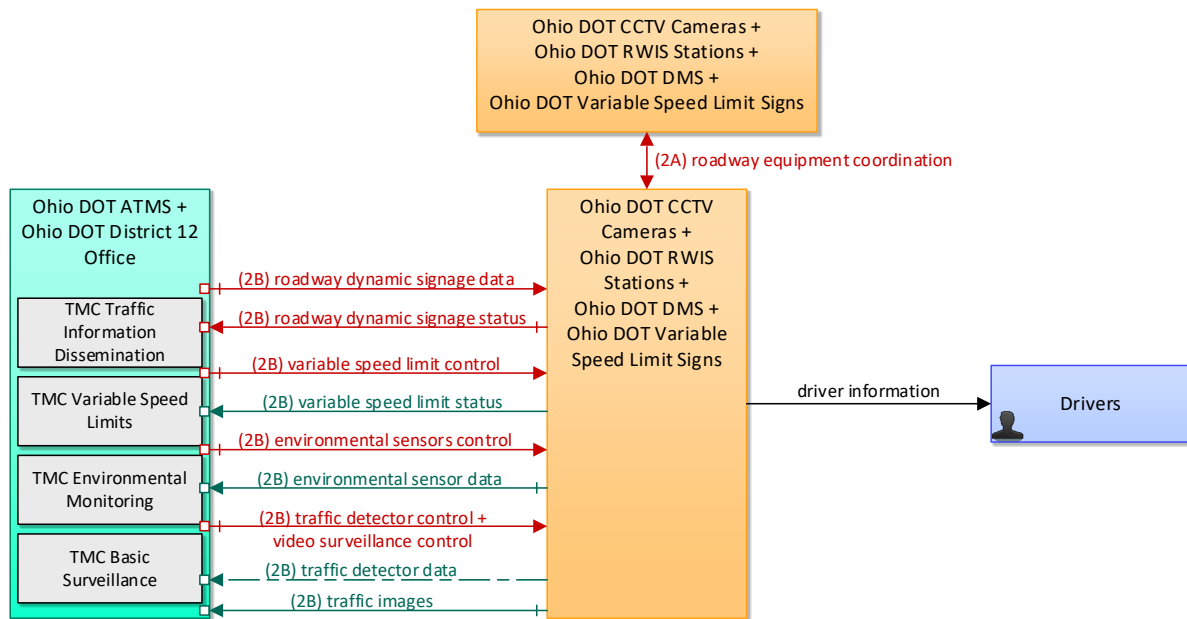


Figure B-66. TM20 Variable Speed Limits

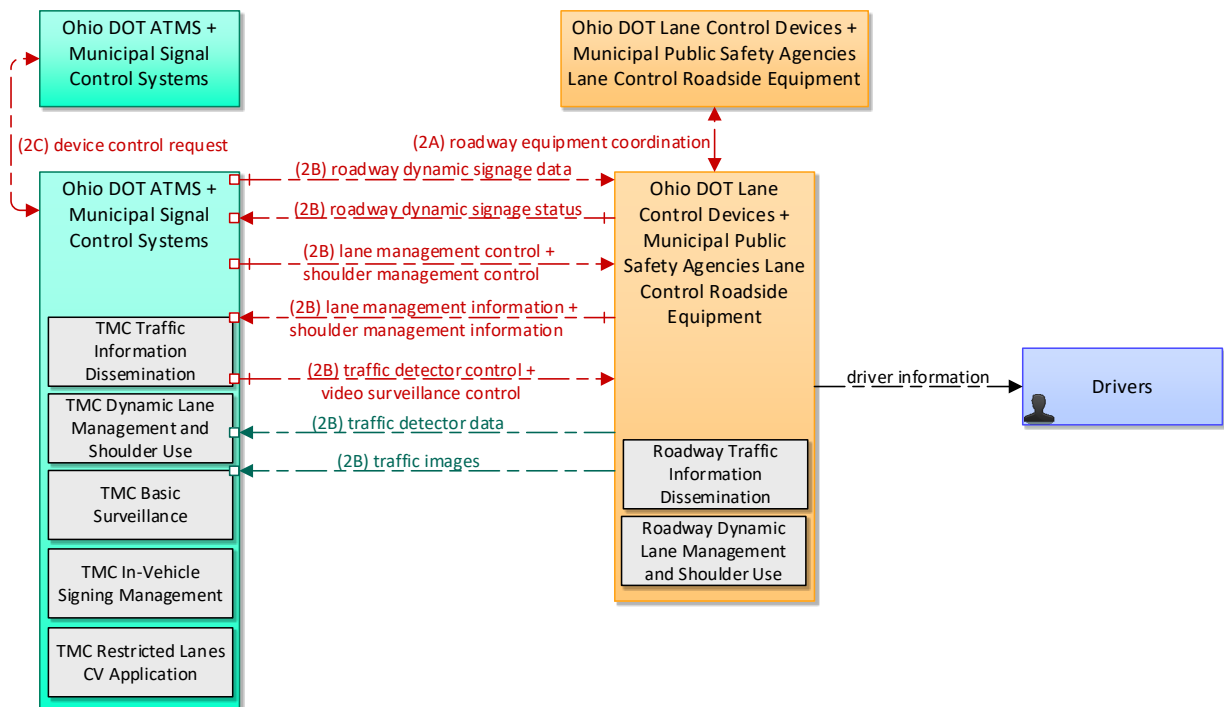


Figure B-67. TM22 Dynamic Lane Management and Shoulder Use

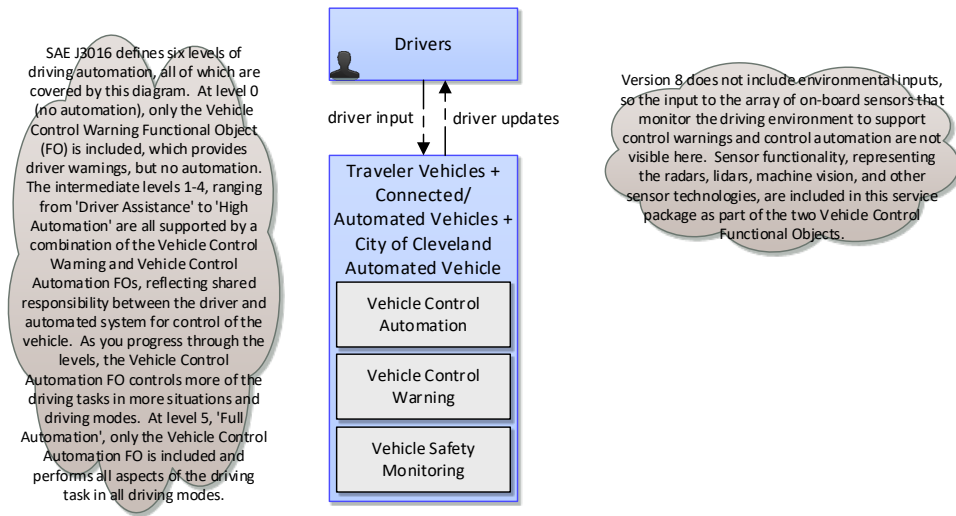


Figure B-68. VS01 Autonomous Vehicle Safety Systems

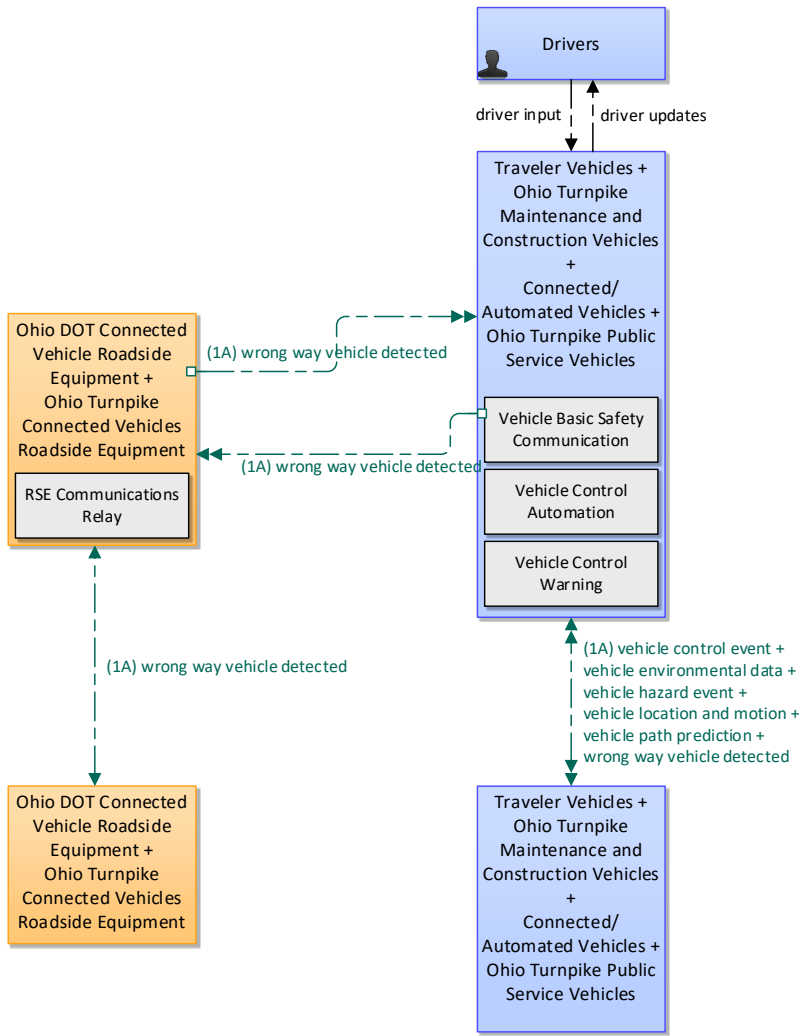


Figure B-69. VS03 Situational Awareness

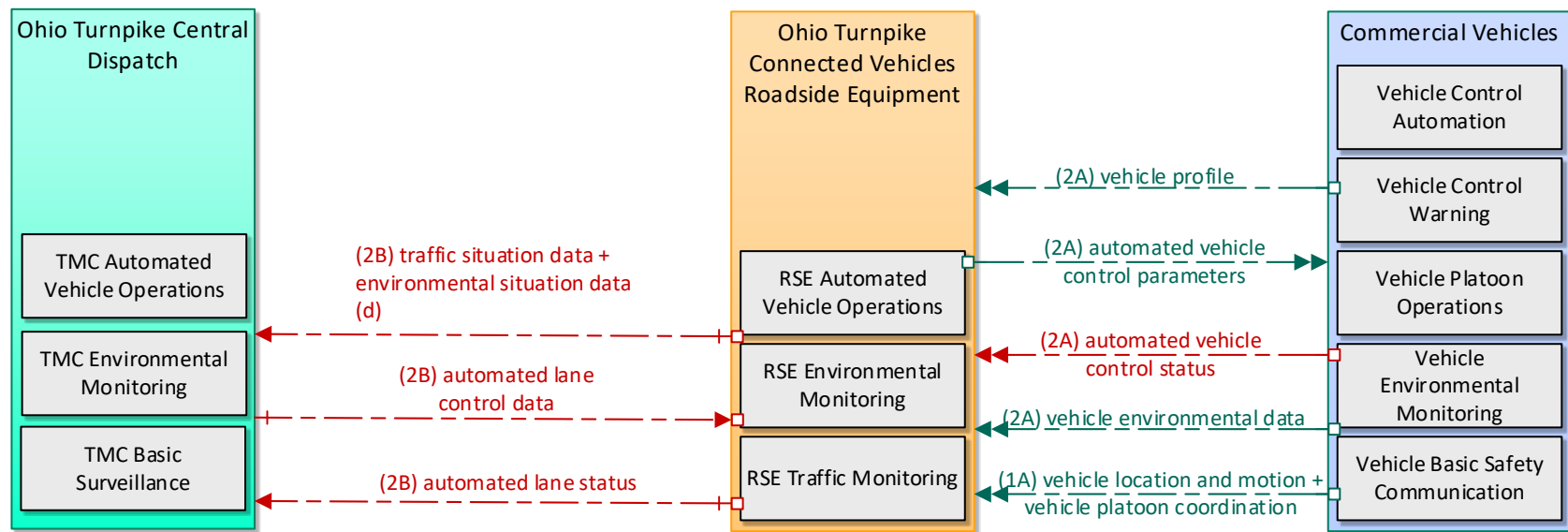


Figure B-70. VS16 Automated Vehicle Operations

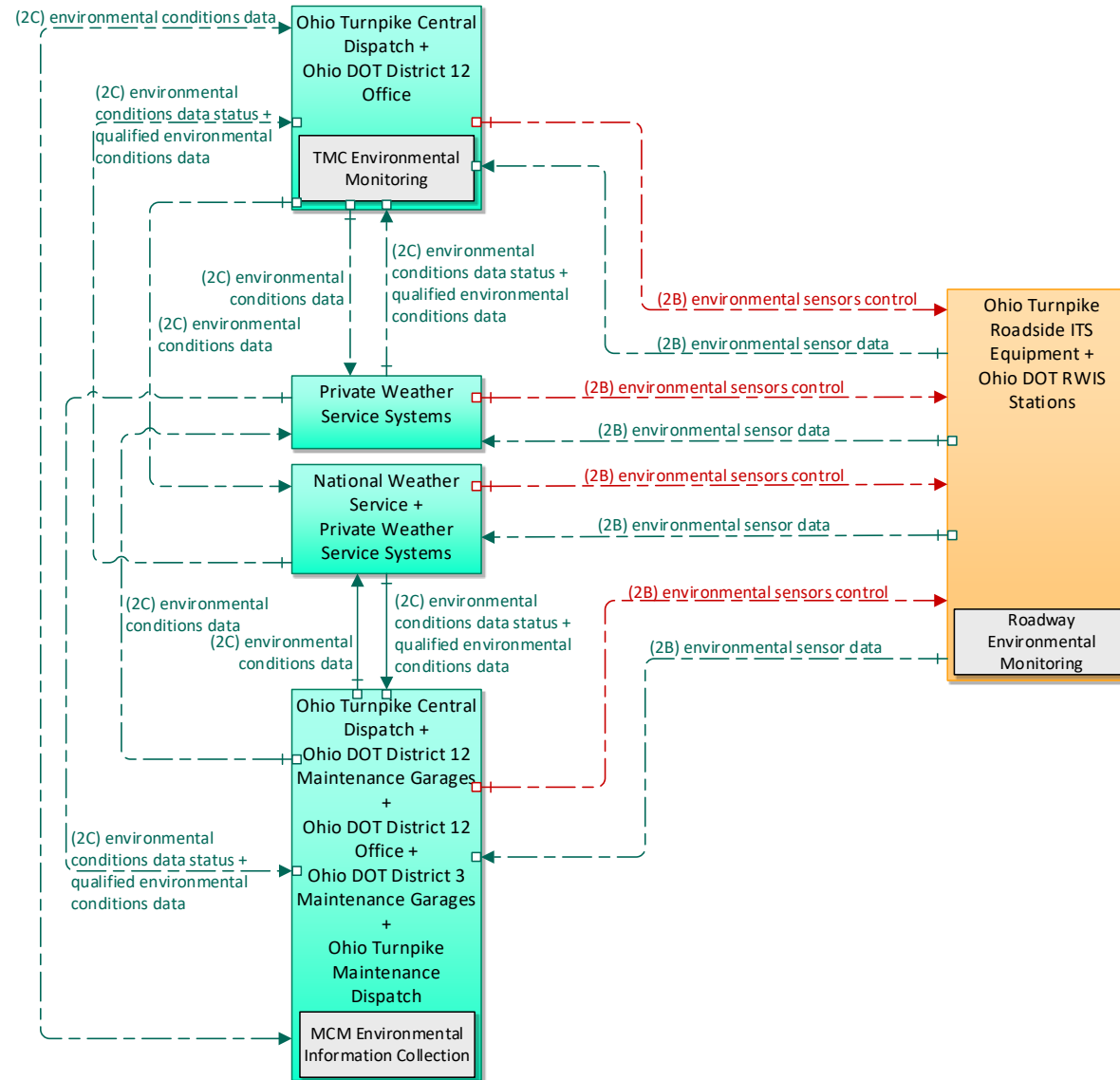


Figure B-71. WX01 Weather Data Collection

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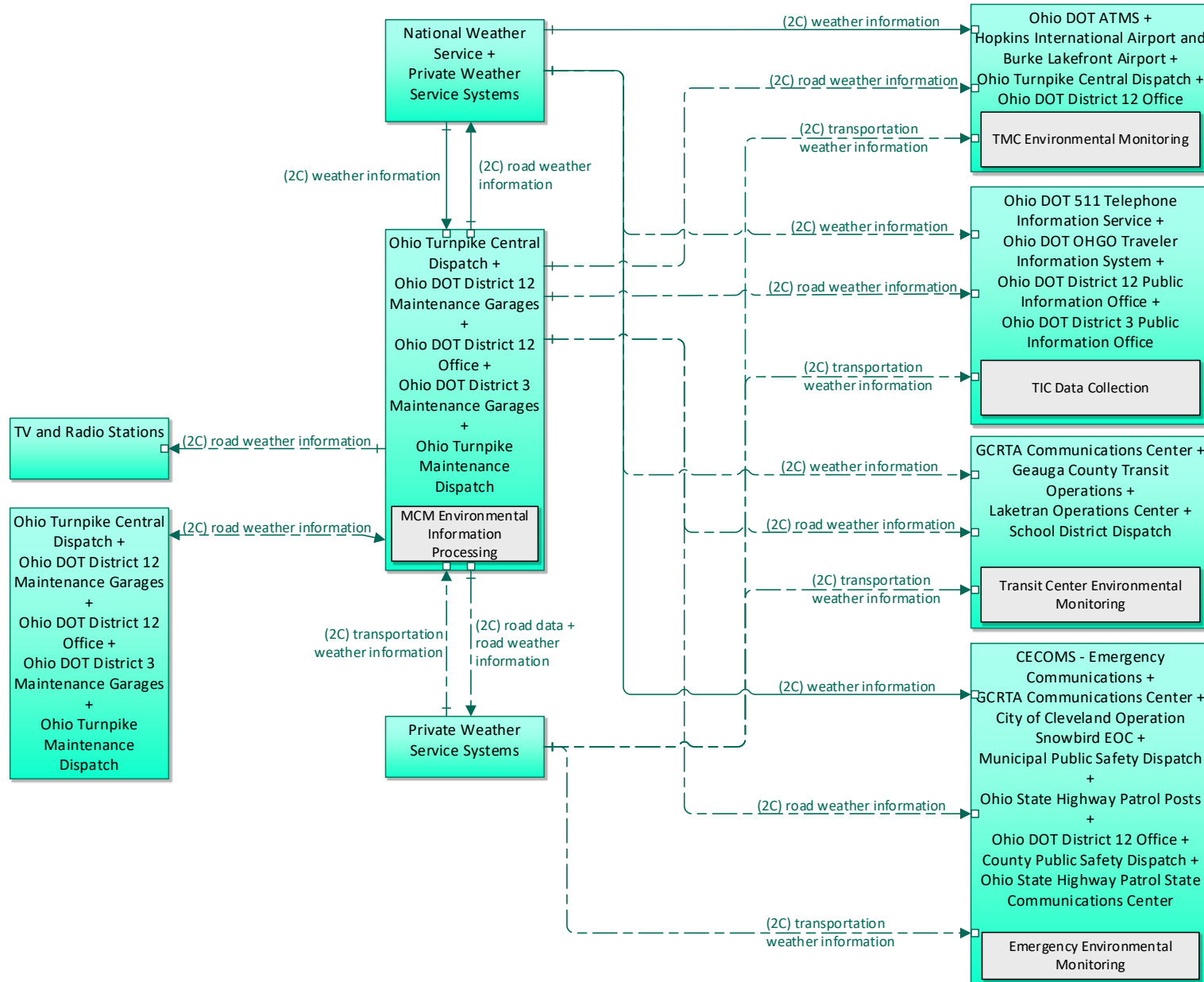


Figure B-72. WX02 Weather Information Processing and Distribution

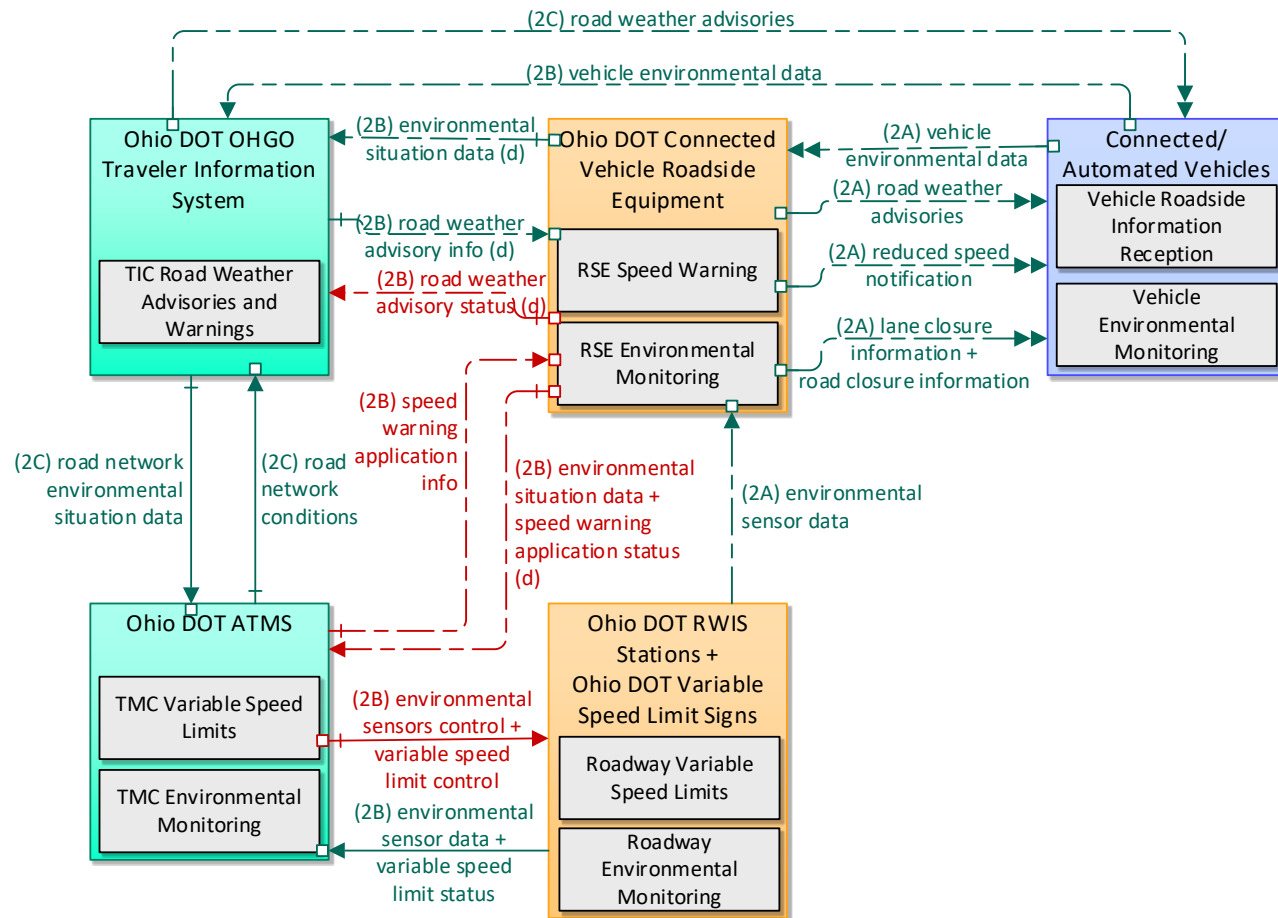


Figure B-73. WX03 Spot Weather Impact Warnings

Appendix C. Example Agreements

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement C-2

Example Agreement #2: CCTV Video Sharing with Responders..... C-12

Example Agreement #3: Fiber Optic Communications Sharing..... C-17

Example Agreement #4: Regional Transportation Operations Consortium C-20

Example Agreement #5: Regional Signal Operations Agreement C-24

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement (Page 1 of 10)

Interlocal Agreement - Clearwater

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COUNTYWIDE ATMS / ITS TRAFFIC SIGNAL
INTERLOCAL AGREEMENT

THIS AGREEMENT, made and entered into on the ____ day of _____, 2006, by and between Pinellas County, a political subdivision of the State of Florida, hereinafter referred to as the COUNTY, and the City of Clearwater, a municipal corporation, hereinafter referred to as the CITY,

WITNESSTH, That:

WHEREAS, this Agreement is made and entered between parties pursuant to Section 163.01, Florida Statutes, the "Florida Interlocal Cooperation Act of 1969", and

WHEREAS, the COUNTY and CITY desire to foster an atmosphere of cooperation, which will afford advantages to the citizens and businesses within the municipal boundaries and in the unincorporated area, and

WHEREAS, it is beneficial to all citizens throughout the County that the governments cooperate to address community needs in matters affecting health, safety, welfare, economic conditions and countywide mobility, and

WHEREAS, the COUNTY and CITY have determined that it is of mutual benefit to centralize traffic signal operations on specified arterial roads and other major thoroughfares, across municipal boundaries, establishing an Advanced Traffic Management System (ATMS), for the most efficient operations of those facilities on a countywide basis, and

WHEREAS, the COUNTY and CITY have determined that it is of mutual benefit to centralize Intelligent Transportation Systems (ITS) on specified arterial roads and other major thoroughfares across municipal boundaries, for the safest and most efficient operation of those facilities on a countywide basis, and

WHEREAS, the CITY presently has traffic control authority to carry out the matters authorized by Section 316.006(2), Florida Statutes on ATMS / ITS corridors within the city limits; and

WHEREAS, Section 125.01(p), Florida Statutes, authorizes counties to enter into agreements with other governmental agencies within or outside the boundaries of the county for joint performance, or performance by one unit in behalf of the other, of any of either agencies authorized functions.

WHEREAS, the Pinellas County Charter, Section 2.04(q), provides that County government has all powers necessary to transfer the functions and powers of any other

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement (Page 2 of 10)

Interlocal Agreement - Clearwater

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governmental agency upon approval by the governing body of that agency and the Board of County Commissioners, and

WHEREAS, Section 335.0415, Florida Statutes, authorizes that public roads may be transferred between jurisdictions only by mutual agreement of the affected governmental agencies.

WHEREAS, the COUNTY and CITY have determined that it is beneficial to transfer the responsibility for operation and maintenance all traffic control devices on any roadway to the COUNTY once ATMS / ITS equipment is installed, as per the implementation plan, and

WHEREAS, the COUNTY has agreed to assume the current funding obligation for the operations transferred hereunder, pursuant to the terms of this Agreement, and

WHEREAS, the COUNTY and CITY have determined that it is of mutual benefit to contract or transfer traffic signal maintenance between the CITY and the COUNTY for certain ATMS and non-ATMS traffic signals, and

WHEREAS, the COUNTY will establish, administer, manage, operate and maintain the Pinellas Countywide Primary Control Center, also known as the Pinellas County Regional Transportation Management Center, hereinafter referred to as the PCC, to provide for the ATMS and ITS.

NOW THEREFORE, the parties, in consideration of mutual promises herein contained, and for other goods and valuable consideration, receipt of which is hereby acknowledged by all parties, hereby agree as follows:

**SECTION 1
GENERAL**

It is mutually agreed that in exchange for relinquishing and transferring traffic control jurisdiction and related devices described herein on the ATMS / ITS corridors, to the COUNTY, the CITY shall be relieved of the expense associated with such traffic control, and in turn the COUNTY shall, after receiving such traffic control responsibilities, assume the costs and expenses of same. From this basic agreement the following sections are developed.

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement (Page 3 of 10)

Interlocal Agreement - Clearwater

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SECTION 2
ATMS / ITS NETWORK

- 2.1. For purposes of this Agreement the ATMS / ITS system network and implementation phasing is identified as Exhibit "A2". Exhibit "A2" is incorporated in the Metropolitan Planning Organization (MPO) Long Range Transportation Plan (LRTP). Any modifications to the map adopted by the MPO will automatically supersede the attached plan without need to amend this Agreement.
- 2.2. The CITY agrees to transfer to the COUNTY traffic control responsibilities on ATMS / ITS corridors at the beginning of the construction phase for ATMS corridor implementation projects within the CITY limits. This transfer will be effective upon "notice to proceed" for the construction contract. The COUNTY will perform all project coordination, construction inspection; system related activities and traffic control determinations. The COUNTY and CITY will develop a mutually agreed upon partnering plan for construction related activities.
- 2.3. For purposes of this agreement transfer of traffic control responsibilities on ATMS / ITS corridors shall be limited to those enumerated below. State roads remain the jurisdiction of the FDOT, however coordination of traffic control determinations with the FDOT will be by the COUNTY, with input from the CITY.
 - 2.3.1. Conduct required traffic engineering studies to determine appropriate traffic control devices.
 - 2.3.2. Install and maintain traffic signals where warranted.
 - 2.3.3. Establish traffic signal timing for all traffic signals.
 - 2.3.4. Establish timing plan settings for all traffic signals.
 - 2.3.5. Modification to signal timing and phasing.
 - 2.3.6. Establish speed limits.
 - 2.3.7. Prohibit or restrict left, right and U-turns.
 - 2.3.8. Designate crosswalks; establish school zones and safety zones for safe pedestrian movement.
 - 2.3.9. Establish and mark traffic lanes, bike lanes and other striping required to regulate, guide or warn traffic.
- 2.4. It is specifically understood and agreed that all rights and powers as may be vested in the CITY pursuant to Chapter 316 of the Florida Statutes or any other law or ordinance or charter provision of CITY and not specifically transferred to COUNTY herein shall be retained by CITY. It is further understood and agreed that CITY is not transferring any of its traffic enforcement functions, right or duties by the execution of this Agreement, and CITY shall fully retain such traffic enforcement functions, rights and duties together with all rights of enforcement of CITY traffic ordinances or state traffic statutes.

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement (Page 4 of 10)

Interlocal Agreement - Clearwater

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**SECTION 3
FUNDING**

- 3.1. The COUNTY will fund, administer, staff, operate and maintain the PCC to accomplish the directives set forth in this Agreement.
- 3.2. The COUNTY will be responsible for all funding, as becomes available, for implementation, operation and maintenance of the ATMS / ITS features on the ATMS / ITS corridors.
- 3.3. Following transfer of ATMS / ITS corridors, the COUNTY will assume all capital cost for signal upgrades or new signal construction. If the signal is included as part of a separate road improvement, land development or other transportation project, funding will be from the project source of funds.
- 3.4. Following transfer of ATMS / ITS corridors to the COUNTY, the COUNTY will assume all operation and maintenance costs related to all traffic control devices and ATMS / ITS devices.
- 3.5. Following transfer of ATMS / ITS corridors the COUNTY agrees to be responsible for and pay utility bills for traffic control devices and ITS devices only. Utility bills for streetlights or other features are excluded from COUNTY responsibility.
- 3.6. Following transfer of ATMS / ITS corridors the COUNTY shall contract with the CITY for city forces to maintain all the traffic signals on the ATMS / ITS corridors, within the city limits of Clearwater. Some ATMS / ITS and non-ATMS / ITS signals may also be contracted to the CITY or transferred to the COUNTY, as mutually agreed upon, for purposes of economy, location or staffing availability. The contract rate will be directly tied to the standard flat rate maintenance charges utilized by the COUNTY for their signal maintenance contracts. All maintenance contracts shall utilize standardized Level of Service criteria. See Exhibit "A1"
- 3.7. The CITY shall continue to maintain all traffic signals, vehicle detection systems and communications network on all roadways that have not been transferred to the COUNTY. All costs associated with these responsibilities will be the CITY'S expense.
- 3.8. The CITY will continue to fund, administer, operate and maintain the CITY'S Traffic Operations Center (TOC) and existing MTCS-PC signal system. All costs associated with these maintenance responsibilities will be the CITY'S expense.
- 3.9. Upon execution of this Agreement the COUNTY will fund future modifications required to utilize the TOC as the secondary control center and backup location to the PCC. Any design, building modifications, equipment, software or communications infrastructure funds budgeted prior to execution of this Agreement will continue to be funded through existing sources.
- 3.10. The COUNTY will continue to fund, administer operate and maintain the existing MTCS-PC signal system in all areas of the County except the City's of Clearwater and St.

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement (Page 5 of 10)

Interlocal Agreement - Clearwater

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Petersburg. All costs associated with these responsibilities will be the COUNTY'S expense.

- 3.11. There shall be no reimbursement or replacement for funds expended or budgeted for the ATMS / ITS implementation prior to execution of this agreement.

SECTION 4
PINELLAS COUNTY RESPONSIBILITIES

- 4.1. The COUNTY will exercise the necessary power, privilege and authority to accomplish countywide regional transportation management by operation of traffic signals and related intelligent transportation systems on the ATMS / ITS system.
- 4.2. The COUNTY will manage, operate and maintain the PCC through the County Public Works Department under the County Administrator. The functional management structure is defined in Exhibit "A1".
- 4.3. The COUNTY will provide all engineering and operational studies, signal system timing and make all traffic control determinations for ATMS / ITS corridors once they are transferred to the COUNTY.
- 4.4. The COUNTY will be the sole local government to negotiate public / private partnership agreements as related to the ATMS / ITS system. This includes companies that may provide infrastructure systems, components, or emerging technology in return for proprietary data that can be utilized for pay or premium services. This does not include agreements made by the CITY relative to equipment and services owned by the CITY.
- 4.5. The COUNTY Public Works Director will participate as an active member of the PCC Advisory Committee as outlined in Exhibit "A1". The COUNTY Public Works Director will chair the PCC Advisory Committee.
- 4.6. The COUNTY shall adhere to all standards set forth in the "Standard Operating Guidelines and Functional Management Structure for ATMS / ITS System", Exhibit "A1". The COUNTY agrees that the PCC Advisory Committee shall review, comment and approve all modifications to this document.
- 4.7. The COUNTY shall provide a CITY REPRESENTATIVE to be a liaison to the CITY for coordination of local issues. Should an existing CITY employee initially fill the position, the COUNTY would provide funding to the CITY for reimbursement of employee salary burdens through a separate inter-local agreement. Job duties are described in Exhibit "A1".
- 4.8. The COUNTY shall be the Primary Project Manager for design of all ATMS / ITS corridor projects and in prioritizing implementation of these systems. All projects will be built to specifications established by the COUNTY or FDOT.

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement (Page 6 of 10)

Interlocal Agreement - Clearwater

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- 4.9. Following transfer of an ATMS / ITS corridor any new traffic signals installed on transferred roadway within the city limits of Clearwater shall be paid for by the COUNTY, excluding state roads. Mast arm type signals will be utilized, including the CITY'S choice of color, unless circumstance or design limitations would preclude this type of installation. Other esthetic or decorative items will be handled through a separate Joint Project Agreement (JPA). Upon completion the maintenance will be contracted to the CITY as per section 3.6 and 5.3.
- 4.10. The COUNTY will provide and own the fiber-optic communication lines that constitute the countywide ATMS / ITS communication network trunk line. This excludes any CITY owned fiber-optic lines.
- 4.11. The COUNTY will involve the CITY in design, project meetings and plan reviews for all ATMS construction projects within the CITY limits.
- 4.12. The COUNTY will maintain close coordination with CITY fire and police agencies relative to operation and maintenance of traffic signals and preemption devices within the city limits. The CITY REPRESENTATIVE will be the primary contact for these agencies.

SECTION 5
CITY OF CLEARWATER RESPONSIBILITIES

- 5.1. The CITY Public Works Administrator will participate as an active member of the PCC Advisory Committee as outlined in Exhibit "A1".
- 5.2. The CITY shall adhere to all standards set forth in the "Standard Operating Guidelines and Functional Management Structure for ATMS / ITS System", Exhibit "A1". The CITY agrees that the PCC Advisory Committee shall review, comment and approve all modifications to this document.
- 5.3. The CITY may, at their own expense, house CITY staff members at the PCC. Operation and Maintenance Costs will be established through a separate agreement. In lieu of annual payment, the local contributions already made to the overall ATMS / ITS implementation will be deemed satisfactory compensation to offset annual payment until such costs exceed the CITY'S initial \$3.8 million contribution.
- 5.4. The CITY agrees to provide maintenance for mutually agreed upon ATMS and non-ATMS traffic signals, as outlined in Section 3.6 of this agreement.
- 5.5. The CITY agrees to utilize the CITY'S TOC, located in the Municipal Services Building, as a secondary control center and the backup location for the ATMS / ITS computer network, unless or until other mutually agreed upon provisions for back up are established.
- 5.6. The CITY may participate in ATMS / ITS corridor projects within or near the city limits including plans review, project meetings and construction coordination.

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement (Page 7 of 10)

Interlocal Agreement - Clearwater

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- 5.7. The CITY shall continue to operate and maintain the existing MTCS-PC signal system. This includes hardware and software maintenance, staffing at appropriate locations and signal timing plan development.
- 5.8. Following transfer of a ATMS / ITS corridor the CITY grants to the COUNTY permission and permit to use any CITY public rights-of-way or easement needed for maintenance of traffic signals, ATMS, ITS or communications facilities on those corridors.
- 5.9. Nothing in this agreement affects existing CITY duties or responsibilities for funding, traffic control or other CITY jurisdiction on any and all non-ATMS / ITS corridors.

SECTION 6
SPECIAL PROVISIONS

- 6.1. Upon execution of this Agreement, the existing Pinellas County Traffic Control Center, located on US 19, will operate as the PCC and be so designated.
- 6.2. The PCC staff and the CITY will coordinate efforts for all CITY special events. Each event will be studied to determine whether the impact of the event is better handled by the local TOC, PCC, or a combination of both. To the extent possible, events where there will be PCC involvement the CITY REPRESENTATIVE will coordinate and operate event related activities at the PCC.
- 6.3. The PCC will provide control access to the CITY for local ITS activities including parking information, special event management and other situations where utilizing ATMS / ITS devices provide benefit to the citizens of the CITY and the COUNTY. The PCC may, if circumstances dictate a higher level of need, supersede CITY control to utilize ATMS / ITS equipment for appropriate response. Such instances would include detection of an incident, emergency response, or other emergency level situation.

SECTION 7
MISCELLANEOUS PROVISIONS

- 7.1. Any amendment to or modifications of this Agreement or any alteration, extension, supplement or change of the time or scope of the work shall be in writing and signed by both parties.
- 7.2. This Agreement shall be governed and construed in accordance with the laws of the State of Florida.

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement (Page 8 of 10)

Interlocal Agreement - Clearwater

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- 7.3. Nothing herein shall be construed to create any third party beneficiary rights in any person not a party to this Agreement, nor to increase the liability of the COUNTY to third parties under any theory.
- 7.4. If any word, clause, sentence or paragraph of the Agreement is held invalid, the invalidity shall not affect other provisions of the Agreement which can be given effect without the invalid provision, and therefore the separate provisions of this Agreement are severable.
- 7.5. This document embodies the whole Agreement of the parties. There are no promises, terms, conditions or allegations other than those contained herein and this document shall supersede all previous communications, representations and/or agreements, whether written or verbal, between the parties hereto.
- 7.6. This Agreement shall be binding upon the parties, their successors, assigns and legal representatives.
- 7.7. The parties will offer each other full cooperation in the transition phase as well as throughout the term of this Agreement.

SECTION 8
FISCAL FUNDING CLAUSE

In the event that sufficient budgeted funds are not available for a new fiscal period, the COUNTY shall notify the CITY by January 1st of the fiscal year prior to such an occurrence and the Agreement shall terminate on the last day of the then fiscal year period without penalty or expense to the COUNTY.

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement (Page 9 of 10)

Interlocal Agreement - Clearwater

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**SECTION 9
EFFECTIVE DATE AND TERMINATION**

This Agreement shall take effect upon the County identifying funds for purposes of this agreement followed by execution by the parties and filing with the Clerk of the Circuit Court for Pinellas County, Florida. This Agreement shall be effective for a period of ten (10) years from the date of execution. This agreement may be renewed subject to execution of a written renewal agreement between the COUNTY and CITY. Each renewal period may not exceed (10) years. There is no limit to the number of renewals unless so specified in a subsequent renewal agreement. This Agreement shall be terminated upon mutual consent of the parties or by either party, upon formal written notice received prior to January 1st of any calendar year with termination becoming effective October 1st of the same calendar year.

Example Agreement #1: Joint ATMS / ITS Traffic Signal Operating Agreement (Page 10 of 10)

Interlocal Agreement - Clearwater

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IN WITNESS WHEREOF, the parties hereto have caused these present to be executed by their duly authorized officers, and their official seals hereto affixed, the day and year first above written.

ATTEST:
Ken Burke:

PINELLAS COUNTY, FLORIDA,
by and through its
Board of County Commissioners

By: _____
Deputy Clerk

By: _____
Chairman

Countersigned:

CITY OF CLEARWATER, FLORIDA,

By: _____
Mayor-Commissioner

By: _____
City Manager

ATTEST:

By: _____
City Clerk

APPROVED AS TO FORM

APPROVED AS TO FORM

OFFICE OF THE COUNTY ATTORNEY

OFFICE OF CITY ATTORNEY

Example Agreement #2: CCTV Video Sharing with Responders (Page 1 of 5)

Tennessee Department of Transportation And Private Entity USERS

ACCESS AGREEMENT FOR LIVE VIDEO AND INFORMATION SHARING

This Access Agreement for Live Video and Information Sharing is an Agreement between the Tennessee Department of Transportation (TDOT) and _____ hereafter referred to as the "USER."

The effective date of this Agreement is _____.

The "Access to Live Video" is that video provided by a Closed Circuit Television (CCTV) system developed for traffic management and provided by the Tennessee Department of Transportation Regional Transportation Management Centers (RTMC) operated by TDOT. The CCTV feeds will show live traffic conditions including crashes, stalled vehicles, road hazards, weather conditions, traffic congestion, maintenance work, and repair work locations.

The purpose of providing the USER with Access to Live Video is to detect and disseminate real-time traffic information to motorists and improve incident response and recovery. The following provisions of this Agreement are intended to ensure that the CCTV system is accessed and its information is used for this purpose and this purpose alone.

Information Sharing, as defined in this agreement, is that information provided or discovered by the USER which has an adverse traffic impact on any Tennessee Interstate, State Route, and that which adversely affects travelers. Any information that falls within this definition will be shared with the TDOT RTMC within 10 minutes of receiving such information.

The USER hereby acknowledges and agrees that other matters not specifically addressed in this Agreement may arise and that TDOT shall have the right to make changes in this Agreement, by adding provisions, deleting provisions, and/or changing existing provisions when in TDOT's opinion circumstances require such changes. TDOT shall provide prior written notice of any such changes to this Agreement to the USER at which time the USER may or may not accept the revisions. Not accepting future revisions may result in the USER being denied access to the live video feeds.

USER shall also retain the right to terminate this Agreement as provided herein.

Example Agreement #2: CCTV Video Sharing with Responders (Page 2 of 5)

1. GENERAL INFORMATION:

- A. TDOT will operate and maintain the CCTV system as a traffic management tool and, consistent with this purpose, TDOT agrees to provide the USER with Access to Live Video and Information Sharing. TDOT does not guarantee the continuity of this access, and TDOT does not warrant the quality of any video feeds or the accuracy of any image or information provided. Any reliance on such images or information is at the risk of the USER.
- B. TDOT will not record video feeds except for staff training purposes, and no recordings will be made available to the USER under this Agreement.
- C. TDOT will maintain exclusive control of the information and images released from the CCTV system to the USER, including but not limited to determining whether and when to provide a CCTV system feed, from what location, and for what duration. No feed will deploy the cameras' zoom capabilities, and no image will focus on vehicle license plates, drivers, or other personal identification of individuals involved in any traffic-related incident. No image will focus on any property or person outside the TDOT right-of-way. Access via feed will not be provided for events that are not, in the opinion of TDOT personnel, traffic-related. The decision whether to activate, and upon activation to terminate the access, is exclusively at the discretion of TDOT personnel.
- D. TDOT RTMC personnel will not accept requests that specific CCTV cameras are operated or repositioned.
- E. TDOT will provide each USER the same video feed from the CCTV system as any other USER participating in this Agreement. This Agreement in no way limits or restricts TDOT from providing video information to any other potential USER.
- F. TDOT reserves the right to terminate this video access program or to change the areas, times, or levels of access within the RTMC at any time.
- G. TDOT will provide Training Opportunities to all entities named in this Agreement and encourage participation in said training.

2. USER'S RESPONSIBILITIES:

- A. USER is exclusively responsible for any costs related to the purchase and installation of the equipment necessary to receive the live video feed. User will be required to remove previously installed equipment from the

Example Agreement #2: CCTV Video Sharing with Responders (Page 3 of 5)

RTMC (if any). USER is exclusively responsible for any costs related to the removal of this equipment. USER must give RTMC personnel reasonable advance notice to schedule an appointment to remove equipment and RTMC personnel reserve the right to schedule such at a time and in such a manner so as to not interrupt or otherwise obstruct RTMC operations. USER staff at the RTMC shall be under the general direction of the RTMC Manager for routine conduct, privileges, and protocols within the RTMC.

- B. USER shall maintain the security and integrity of the CCTV system by limiting use of the system to trained and authorized individuals within their organization, and by insuring the system is used for the specific purpose stated in this Agreement. No feed shall be purposely broadcast live or rebroadcast that is zoomed in on an incident where individuals or license numbers are recognizable.
- C. USER accepts all risks inherent with the live video feeds, including, but not limited to, interruptions in the video feed, downtime for maintenance, or unannounced adjustments to the camera displays. TDOT is providing the video feeds as a convenience to the USER and agrees to provide a good faith effort to maintain the video feed from TDOT equipment. The USER agrees to hold TDOT harmless, including TDOT employees and TDOT designated agents, from any damages caused to USER by loss of a video signal due to equipment failure or any act or omission on their part.
- D. USER agrees to provide TDOT with a technical contact person and with a list of all USER personnel trained to operate the TDOT SmartView system. USER shall limit technical calls to the RTMC for monitoring, diagnosing problems or otherwise performing any minor service on the SmartView system.
- E. USER agrees to acknowledge that the video feeds are provided by the Tennessee Department of Transportation.
- F. USER agrees to display the SMARTWAY logo in the upper left hand corner of any view provided outside of the agency.
- G. USER agrees to provide timely, accurate information and assistance to TDOT or other agencies, responders and roadway users about roadway conditions, major and minor incidents and alternate routes through the use of any media and USER resources.
 - i. USER agrees to notify the RTMC of their surrounding TDOT Region of any unexpected incidents that are expected to have an adverse impact on traffic operations of Interstate or State Routes, within 10 minutes of first notification to the USER. This applies to

Example Agreement #2: CCTV Video Sharing with Responders (Page 4 of 5)

any incident where TDOT or the Tennessee Highway Patrol is not already on-scene. Unexpected incidents may include, but are not limited to: traffic crashes, disabled vehicles, roadway debris, hazardous weather conditions, traffic queues, or traffic signal failures.

- ii. USER agrees to collaborate with TDOT with respect to traffic management of planned events that are expected to have an adverse impact on traffic operations of Interstate or State Routes. Planned events include temporary traffic generating events (such as concerts or fairs) and roadway work zone activities (such as construction or maintenance activities). Collaboration and information sharing between USER and TDOT should occur as early as possible.

- H. USER is invited to participate in quarterly Regional Traffic Incident Management meetings and may attend any traffic incident management training provided by participating agencies.

3. LIABILITY AND INDEMNITY PROVISIONS:

- A. USER agrees to defend, indemnify, and hold TDOT harmless from and against any and all liability and expense, including defense costs and legal fees, caused by any negligent or wrongful act or omission of the USER, or its agents, officers, and employees, in the use, possession, or dissemination of information made available from the CCTV system to the extent that such expenses or liability may be incurred by TDOT, including but not limited to, personal injury, bodily injury, death, property damage, and/or injury to privacy or reputation.
- B. The liability obligations assumed by the USER pursuant to this Agreement shall survive the termination of the Agreement, as to any and all claims including without limitation liability for any damages to TDOT property or for injury, death, property damage, or injury to personal reputation or privacy occurring as a proximate result of information made available from the CCTV system.

4. TERMINATION:

- A. TDOT or USER may terminate this Agreement at any time for any reason by providing written notice of termination.

Example Agreement #2: CCTV Video Sharing with Responders (Page 5 of 5)

**State of Tennessee
Department of Transportation**

Approved as to Form:

By: _____
John Schroer
Commissioner

John Reinbold
General Counsel

Date: _____

USER AGENCY _____

By _____

(Print Name) _____

(Title) _____

Date: _____

Approved by Legal Counsel for USER AGENCY

By _____

(Print Name) _____

(Title) _____

Date: _____

Example Agreement #3: Fiber Optic Communications Sharing (Page 1 of 3)

**I-4 SMIS Operations and Shared Communications Network
Agreement**

This Agreement is made and entered into this 11th day of August 1997, by and between the **STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION**, hereinafter called "**FDOT**" and **SEMINOLE COUNTY**, hereinafter called "**SEMINOLE**."

WITNESSETH:

WHEREAS, Interstate Highway 4 (I-4) is a State controlled and maintained transportation facility under the jurisdiction of **FDOT** which lies partly within the jurisdiction boundaries of Seminole County, and

WHEREAS, **FDOT** and **SEMINOLE** recognize the importance of rapid dissemination for reliable, credible, real-time Regional Traveler and Multimodal Information, and each will work in coordination and cooperation of foster Advance Traveler Information System initiatives. Both parties agree that it would be mutually beneficial to share both existing and proposed **FDOT** and **Seminole** owned fiber optic cable plants in order to facilitate the implementation of a common transportation communications network. This network sharing will provide the **FDOT** and **Seminole** with alternate cable paths and redundant rings for the **FDOT's** I-4 Surveillance and Motorist Information System (SMIS) and **Seminole's** Computerized Signal Systems, and

WHEREAS, it is a primary goal of **FDOT** and **Seminole** to provide for the safe and efficient movement of people and goods on Florida highways, it is desirous of both agencies to enter into this agreement which describes their working relationship and responsibilities in the operating and maintaining the I-4 Surveillance and Motorist Information System, hereinafter called "I-4 SMIS", along I-4, and

WHEREAS, I-4 SMIS is a means to (1) reduce the time between the occurrence of an accident and the arrival of emergency response vehicles (Law enforcement, wrecker, ambulance and fire/rescue); (2) provide real time data to Seminole County Traffic Action Center, hereinafter called "SEMTAC"; and (3) reduce delay and hazard to many other persons effected by the closing or partial closing of the highway due to an accident, disabled vehicle, spilled load, or often a combination of the three, and

WHEREAS, I-4 SMIS is a means to allow SEMTAC staff the ability to adjust traffic signal timings along arterial routes during congestion to minimize motorist stops, delays and to reduce fuel consumption, and

WHEREAS, I-4 SMIS permits the summoning of the law enforcement agency by detecting the change in speed of the vehicles by sensors in the roadway which can be verified visually by on-site cameras along I-4.

Example Agreement #3: Fiber Optic Communications Sharing (Page 2 of 3)

NOW THEREFORE, in consideration of the objectives of I-4 SMIS and the promises and representations herein, the parties agree as follows:

1. The **FDOT** and **Seminole** realize that a reliable communication network will be needed to facilitate the routing and termination of the fiber optic cable for the transfer of traffic related data. Thus, **FDOT** will allow **Seminole** to utilize six (6) fibers along I-4 SMIS to provide connectivity for communication purposes.
2. **Seminole** will allow at least two (2) single mode fiber strands within Countys' fiber network on designated loops for the **FDOT** regional transportation communication purpose and establishment of a redundant network. Additional dedications will be based on user needs and mutual agreement of the parties. **Seminole** will be responsible for maintaining their fiber optic cable plant and utility locates.
3. **Seminole** agrees to operate the system in the following contingencies: In an emergency situation whereby the **FDOT** is unable to communicate and control the I-4 SMIS equipment or **FDOT** requests Seminole's assistance during a major incident along I-4. In order to ensure its availability for the forgoing contingencies, Seminole Traffic Engineering will operate from 6 AM to 10:30 PM weekdays and during major incidents 24 hours per day. **Seminole** will follow their normal procedures when dispatching the appropriate law enforcement officers to an incident scene. **Seminole** will have visual contact with the scene via cameras which will aid in dispatching the appropriate agencies to the scene. **Seminole** will at a minimum follow the **FDOT** I-4 SMIS Operator guidelines.
4. The area-wide **FDOT** transportation fiber optic cable system will handle only traffic, regional traveler, and multimodal information and data. **FDOT** will assign band width in the **FDOT** area-wide transportation communication system based upon agency need and participation (ie., future users).
5. **Seminole** will purchase, install and make operational the T-1 hub tied into the I-4 SMIS. The **FDOT** agrees to maintain the I-4 SMIS and make the necessary jumper connections at Hub 5 and SEMTAC for **Seminole** to operate the I-4 SMIS in case of an emergency and will reconfigure the T-1 at no cost to **Seminole**. The **FDOT** will provide and train the SEMTAC staff on the manufacturer's operating software(s) (ie., changeable message sign, 170 detector stations, and camera) which will be utilized in emergency situations.
6. **Seminole** will promptly share all available incident, congestion, or emergency information gathered from its traffic management or traveler information system with **FDOT**.
7. The parties agree that they will not cause or allow the violation of the laws relating to ethics in government in the course of implementing the terms of this agreement.
8. Any revisions to the contents of this agreement shall require approval of both parties.

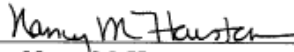
Example Agreement #3: Fiber Optic Communications Sharing (Page 3 of 3)

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed the day and year written.

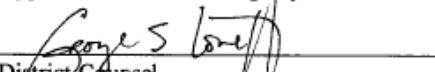
Attest:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION


Executive Secretary (seal)

By: 
Nancy M. Houston
District Secretary

Approved as to Form, Legality and Execution:


District Counsel

ATTEST:
COMMISSIONERS

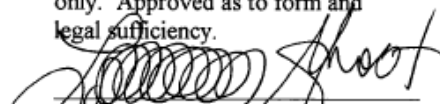
BOARD OF COUNTY
SEMINOLE COUNTY, FLORIDA


MARYANNE MORSE
Clerk of the Board of
County Commissioners of
Seminole County, Florida

BY: 
RANDALL C. MORRIS, Chairman

Date: 7/24/97

For the use and reliance of Seminole
only. Approved as to form and
legal sufficiency.


County Attorney

As authorized for execution by the Board
of County Commissioners at their 22 July
1997 regular meeting.

Example Agreement #4: Regional Transportation Operations Consortium (Page 1 of 4)

MEMORANDUM OF UNDERSTANDING

For

CENTRAL FLORIDA'S

REGIONAL TRANSPORTATION OPERATIONS CONSORTIUM

PURPOSE

This **MEMORANDUM OF UNDERSTANDING (MOU)** provides the framework and guidelines to promote coordinated decision-making and information sharing in planning, design, development and evaluation of Intelligent Transportation Systems (ITS) via a **REGIONAL TRANSPORTATION OPERATIONS CONSORTIUM (CONSORTIUM)**. This MOU is made by and among the Central Florida ITS Working Group members, collectively referred to as the **Parties**, and includes the following operating agencies:

**FLORIDA DEPARTMENT OF TRANSPORTATION - DISTRICT 5
ORLANDO-ORANGE COUNTY EXPRESSWAY AUTHORITY
FLORIDA DEPARTMENT OF TRANSPORTATION -TURNPIKE
ORANGE COUNTY
SEMINOLE COUNTY
VOLUSIA COUNTY
CITY OF ORLANDO
CITY OF DAYTONA BEACH
CENTRAL FLORIDA REGIONAL TRANSPORTATION AUTHORITY d/b/a LYNX
UNIVERSITY OF CENTRAL FLORIDA - CENTER FOR ADVANCED
TRANSPORTATION SYSTEMS SIMULATION
FLORIDA HIGHWAY PATROL, TROOP D
OSCEOLA COUNTY
BREVARD COUNTY**

CONCEPT

The **Parties** to this **MOU** recognize the importance of rapid dissemination of reliable, credible, real-time Regional Traveler Information, improved vehicular mobility, increased energy conservation and improved air quality and each will work in coordination and cooperation to establish a regional approach to Intelligent Transportation Systems (ITS), which includes a coordinated implementation of various transportation management technologies to facilitate regional mobility across jurisdictional lines.

The regional cooperative approach to ITS will be accomplished through a Regional Transportation Operations Consortium whose primary goal is to establish ITS performance standards that will provide interoperability among the regional partners.

Example Agreement #4: Regional Transportation Operations Consortium (Page 2 of 4)

OBJECTIVE

The objective of this **MOU** is to establish the organizational structure to promote coordinated decision-making and information sharing in planning, developing, and funding a Regional Transportation Operations Consortium of operating agencies within the Central Florida region for the deployment, operation and maintenance of ITS initiatives.

The primary Goals of all **Parties** are described below:

- Goal 1:** Safe and efficient transportation for residents, visitors and commerce
- Goal 2:** Protection of the public's investment in transportation
- Goal 3:** A region-wide interconnected transportation system that enhances Central Florida's economic competitiveness
- Goal 4:** Travel choices to ensure mobility, sustain the quality of the environment, preserve community values and reduce energy consumption
- Goal 5:** Safe and efficient evacuation efforts
- Goal 6:** Create a positive environment that allows for the development and deployment of ITS initiatives and leverage individual agency initiatives for regional benefit

It is desirable that all **Parties** enter into this **MOU**, which describes the working relationship and responsibilities in the operating and communication of all parties' respective Intelligent Transportation Systems and will maximize the involvement of all Parties in creating a Regional Transportation Operations Consortium in Central Florida.

All **Parties** executing this **MOU** agree to be responsible for their own acts and shall not be held responsible for the acts of any other agency executing this **MOU**.

ORGANIZATIONAL STRUCTURE

This **MOU** establishes an organizational structure for Central Florida's Regional Transportation Operations Consortium. This organizational structure will consist of three (3) tiers of "Coordination Teams" as described below:

1. Agency Managers – Handle Day to Day Operations
The Agency Managers shall be comprised of managers that are involved in the design, construction, operation and maintenance of Central Florida's various transportation management programs.
2. Leadership Teams – Various ITS Public Partners that are involved in ITS.
The Leadership Team shall be comprised of managers from public entities that administer or are involved in transportation management.

Example Agreement #4: Regional Transportation Operations Consortium (Page 3 of 4)

3. Executive Committee – Provides Overall Program direction. The Executive Committee shall consist of two committees:

- Florida Intrastate Highway System (FIHS) Executive Committee for operators of FIHS facilities
- Arterial Executive Committee for operators of arterials and other facilities

The FIHS and Arterial Executive Committees shall be comprised of a senior level executive or equivalent thereof.

Each Agency agrees to:

- Share all available data and information gathered from its traffic management or traveler information systems with other **Parties**
- Promptly share all available tourist, incident congestion or emergency information gathered from its traffic management or traveler information systems with other **Parties**
- Coordinate the implementation of ITS initiatives
- Pursue joint funding opportunities for collective implementation of ITS initiatives where participation of a **Party** in collective initiatives is subject to the agreement of that **Party**
- Coordinate to reduce vehicular delay from incidents and minimize response time
- Coordinate to improve emergency management communications for evacuations and major route closings, re-routings or restrictions

Notwithstanding the above, the parties should not be required to share information that is not subject to the Florida Public Records Act or is otherwise exempt therefrom.

All **Parties** executing this **MOU** commit to developing a Business Model for the **MOU** that will be reviewed and approved on an annual basis by the Executive Committee. The Business Model will include, but is not limited to, the following key areas:

- Roles of the three (3) Coordination Teams
- Decision Making Model for the MOU
- Definition of the Region
- Future Expansion of the Region
- Exchange of Information
- Identify Funding Opportunities
- Branding and Promotion

SOVEREIGN IMMUNITY

Each Party hereto agrees that it shall be solely responsible for the wrongful acts of its employees, officers and authorized agents to the extent provided under Section 768.28 Statutes. Nothing contained herein shall constitute a waiver by any party of its sovereign immunity under Section 768.28, Florida Statutes.

Example Agreement #4: Regional Transportation Operations Consortium (Page 4 of 4)

GENERAL PROVISIONS

All Parties executing this **MOU** recognize the following general provisions:

1. This MOU is not a binding contract, and each of the participants recognizes and acknowledges the individual constraints which may be imposed upon individual Consortium members because of such things as local regulations, specific state statutes, bonds, or other contractual covenants, agency policies and etc.
2. Each participating member of the Consortium has a specific constituency to which it has a primary duty and obligation, as well as, statutory or constitutional obligations generally described in the member's enabling legislation or charter.
3. Notwithstanding the provisions herein contained regarding the sharing of information, such sharing may be limited by individual agency policies or statutes or may be the subject of contractual non-disclosure, licenses or confidentiality agreements.
4. Consortium participants will exercise efforts in good faith, but no other Consortium member is entitled to contractually or otherwise rely upon such efforts, nor shall any member be subject to claims from another member because of failures or omissions.
5. Coordination in the implementation of Consortium initiatives does not impose an obligation upon any member to adopt or follow policies, equipment specifications, protocols or criteria in furtherance of a desire for uniformity.
6. Except as may be required by applicable law no Consortium member shall be required to comply with emergency management directives or plans where such compliance is inconsistent with or adverse to the practices and procedures of such member. No Consortium member shall be required to lift tolls unless so directed by the Governor in compliance with Florida Statutes

AGREEMENT EXECUTION: USE OF COUNTERPART SIGNATURE PAGES

This **MOU**, and any amendments hereto may be simultaneously executed in multiple counterparts, each of which so executed shall be deemed to be an original, and such counterparts together shall constitute one and the same instrument. Notwithstanding any other provision herein to the contrary, this MOU shall constitute an agreement amongst the parties that have executed a counterpart and parties listed but not executing shall not be deemed to be parties to the **MOU**.

Any party to this **MOU** may terminate its involvement with the Regional Transportation Operations Consortium provided that the party gives written notice of intent to terminate to all parties adhered to.

Example Agreement #5: Regional Signal Operations Agreement (Page 1 of 20)

**COOPERATIVE AGREEMENT
FOR FUNDING OPERATIONS OF OPERATION GREEN LIGHT
TRAFFIC CONTROL SYSTEM**

THIS COOPERATIVE AGREEMENT FOR FUNDING OPERATIONS OF OPERATION GREEN LIGHT TRAFFIC CONTROL SYSTEM (this "Agreement") is made and entered into this ____ day of _____, 2016 by and between Mid-America Regional Council ("MARC") and the City of Kansas City, Missouri, a Constitutionally Chartered Municipal Corporation, (the "City").

WHEREAS, the Mid-America Regional Council performed a feasibility study "*Operation Green Light Feasibility Report, June 2000*" (hereafter, the "Feasibility Report"), which created a regional arterial traffic signal coordination system known as "Operation Green Light", for the Kansas City Urban Area including facilities under the jurisdiction of the Missouri Department of Transportation, the Cities of Belton, Gladstone, Independence, Kansas City, Lee's Summit, Liberty, North Kansas City, Raymore in Missouri and the jurisdiction of the Kansas Department of Transportation, the Cities of Bonner Springs, Fairway, Lansing, Leavenworth, Leawood, Lenexa, Merriam, Mission, Mission Woods, Olathe, Overland Park, Prairie Village, Shawnee, Westwood and the Unified Government of Wyandotte County/Kansas City in Kansas (collectively, the Member Agencies); and

WHEREAS, the Strategic Plan 2013-2016 established the vision, mission, objectives and goals of the program; and

WHEREAS, improvement in traffic operational efficiency, air quality and monetary savings to the Member Agencies and the public can be realized from a consolidated management approach of coordinated traffic signal control along arterial corridors in the roadway systems of each Member Agency; and

WHEREAS, the Member Agencies and MARC desire to obtain a Regional Traffic Control System, hereinafter defined, for the purpose of coordinating traffic signals within the Jurisdictional Boundaries of the Member Agencies from a single Regional Traffic Management Center; and

WHEREAS, Member Agencies in Missouri are authorized pursuant to the provisions of Article VI, Section 16 of the Missouri Constitution and Sections 70.210 et. seq. of the Revised Statutes of Missouri to enter into cooperative agreements for the purpose of coordinating traffic signals between and within the Jurisdictional Boundaries of the Member Agencies; and

WHEREAS, each Member Agency has agreed to enter into an agreement to fund the cost of operating such a Regional Traffic Control System; and

NOW, THEREFORE, in consideration of the covenants and conditions herein set forth, MARC and the City (collectively, the "Parties") mutually agree as follows:

Sec. 1. STATUTORY AUTHORITY. Pursuant to the authority set forth in Article VI, Section 16 of the Missouri Constitution and Section 70.210 et. seq. R.S.Mo the parties enter into this Agreement to operate a Regional Traffic Control System, hereinafter defined, for the

Example Agreement #5: Regional Signal Operations Agreement (Page 2 of 20)

purpose of coordinating traffic signals within the Jurisdictional Boundaries of the Member Agencies from a single Regional Traffic Management Center.

Sec. 2. DEFINITIONS. As used in this Agreement, and Exhibit 1 through Exhibit 6, attached hereto and incorporated herein, the following words shall have the meanings set forth herein:

Exhibit 1 – Steering Committee Document

Exhibit 2 – Scope of Services

Exhibit 3 – Compensation

Exhibit 4 – Insurance Requirements

Exhibit 5 – Ownership Matrix

Exhibit 6 – Concept of Operations

Communications Network – All telecommunication infrastructure between Regional Traffic Management Centers, and Traffic Signal Controllers which are a part of the Regional Traffic Control System.

Jurisdictional Boundaries – the geographical boundaries of the governmental entities acting as political subdivisions of the states of Kansas and Missouri.

Jurisdictional Control Center – the site or location designated by the Member Agency containing various equipment, computer hardware and computer software capable of controlling and coordinating all Traffic Signal Controllers located within the Jurisdictional Boundaries of the Member Agency.

Member Agencies – Agencies that have entered into an agreement with MARC to participate in funding the cost of design, construction and operations of the Regional Traffic Control System.

Private Firms – any private firm or firms engaged by MARC to perform or provide any services, directly or indirectly, related to the operations of the Regional Traffic Control System (including, without limitation, design services provided for on-going operations), as more particularly set forth in Exhibit 2, attached hereto and incorporated herein by this reference.

Regional Traffic Control System - an array of components including Traffic Signal Controllers, wireless and wireline telecommunications equipment, interface units, computer hardware and software, digital storage media, operator's console, peripherals, and other related devices designed to monitor, control, and coordinate traffic movements at signalized intersections according to a given or developed plan.

Regional Traffic Management Center – the site or location designated by the Steering Committee containing various equipment, computer hardware and computer software capable of controlling and coordinating the Regional Traffic Control System. The Regional Traffic Management Center is sometimes referred to herein and in the Exhibits as the "TOC".

Example Agreement #5: Regional Signal Operations Agreement (Page 3 of 20)

Steering Committee – that committee created for the purpose of assisting and advising MARC with respect to the plans, specifications, construction and installation of the Regional Traffic Control System and consisting of voting representatives from the Member Agencies. The membership structure and policy are set forth in Exhibit 1, attached hereto and incorporated herein by this reference.

Traffic Signal Controller – a complete electrical mechanism responsible for traffic signal control and operation at an individual intersection.

Sec. 3. RESPONSIBILITIES OF PARTIES.

(a) MARC. MARC shall perform or cause to be performed the services set forth in Exhibit 2, which is attached hereto and incorporated herein by this reference.

(b) City. In addition to the obligations set forth in this Agreement, the City, in its capacity as a Member Agency, shall also perform all the obligations set forth in the document entitled "OGL Concept of Operations: Roles and Responsibilities", which is attached hereto as Exhibit 6 and incorporated herein by this reference. Furthermore, the City shall not interfere with MARC's exercise of its obligations under this Agreement, including, but not limited to, MARC's deployment of the regional signal timing and on-going operations of the Regional Traffic Control System.

Sec. 4. SHARE OF COSTS. Subject to the conditions set forth in this Agreement, the City will pay MARC an amount not to exceed Three Hundred Twenty-Three Thousand, Two Hundred and 00/100 Dollars (\$323,200.00) representing the City's share of the cost for the maintenance and operation of the Regional Traffic Control System as set forth in Exhibit 3, attached and incorporated herein by this reference. The "Operation Green Light Location/Ownership Matrix" set forth in Exhibit 5 attached hereto and incorporated into this Agreement, identifies the location and ownership of the software, hardware and other components comprising the Regional Traffic Control System.

Sec. 5. SHARING INFORMATION. MARC shall share information related to the maintenance and operation of the Regional Traffic Control System with the City, and the City shall share information with MARC and the Member Agencies necessary for the on-going maintenance and operation of the Regional Traffic Control System.

Sec. 6. SEVERABILITY. Should any provision hereof for any reason be deemed or ruled illegal, invalid or unconstitutional by any court of competent jurisdiction, no other provision of this Agreement shall be affected; and this Agreement shall then be construed and enforced as if such illegal or invalid or unconstitutional provision had not been contained herein.

Sec. 7. AUTONOMY. No provision of this Agreement shall be constructed to create any type of joint ownership of any property, any partnership or joint venture, or create any other rights or liabilities except as may be otherwise expressly set forth herein.

Sec. 8. EFFECTIVE DATE. The effective date of this Agreement shall be upon complete execution by the Parties.

Example Agreement #5: Regional Signal Operations Agreement (Page 4 of 20)

Sec. 9. TERMINATION FOR CONVENIENCE. Either party to this Agreement may terminate this Agreement by giving 180 days' notice to the other Party. Financial obligations will be honored up to the effective date of termination.

Sec. 10. MERGER. This Agreement constitutes the entire agreement between City and MARC with respect to this subject matter.

Sec. 11. INDEPENDENT CONTRACTOR. MARC is an independent contractor and is not the City's agent. MARC has no authority to take any action or execute any documents on behalf of the City.

Sec. 12. COMPLIANCE WITH LAWS. MARC shall comply with and shall require its Private Firms to comply with all federal, state and local laws, ordinances and regulations applicable to the work and this Agreement.

Sec. 13. DEFAULT AND REMEDIES. If MARC shall be in default or breach of any provision of this Agreement, the City may terminate this Agreement, suspend the City's performance, withhold payment or invoke any other legal or equitable remedy after giving MARC written notice and opportunity to correct such default or breach within thirty (30) days of receipt of such notice; provided, however, if such default or breach cannot be cured within thirty (30) days, then MARC shall commence to cure within thirty (30) days.

Sec. 14. WAIVER. Waiver by the City of any term, covenant, or condition hereof shall not operate as a waiver of any subsequent breach of the same or of any other term, covenant or condition. No term, covenant, or condition of this Agreement can be waived except by written consent of the City, and forbearance or indulgence by the City in any regard whatsoever shall not constitute a waiver of same to be performed by MARC to which the same may apply and, until complete performance by MARC of the term, covenant or condition, the City shall be entitled to invoke any remedy available to it under this Agreement or by law despite any such forbearance or indulgence.

Example Agreement #5: Regional Signal Operations Agreement (Page 5 of 20)

Sec. 15. MODIFICATION. Unless stated otherwise in this Agreement, no provision of this Agreement may be waived, modified or amended except in writing signed by the City and MARC.

Sec. 16. HEADINGS; CONSTRUCTION OF AGREEMENT. The headings of each section of this Agreement are for reference only. Unless the context of this Agreement clearly requires otherwise, all terms and words used herein, regardless of the number and gender in which used, shall be construed to include any other number, singular or plural, or any other gender, masculine, feminine or neuter, the same as if such words had been fully and properly written in that number or gender.

Sec. 17. AUDIT. The City shall have the right to audit this Agreement and all books, documents and records relating thereto. MARC shall maintain all its books, documents and records relating to this Agreement and any contract during the period of this Agreement and for three (3) years after the date of final payment of the contract or this Agreement, which ever expires last. The books, documents and records shall be made available for the City's review within fifteen (15) business days after the written request is made.

Sec. 18. AFFIRMATIVE ACTION. MARC shall not discriminate against any employee or applicant for employment because of race, color, religion, ancestry or national origin, sex, disability, age, or sexual orientation. MARC shall require any third party firms it contracts with ("Private Firms") to establish and maintain for the term of this Agreement an Affirmative Action Program in accordance with the provisions the Title VI of the Civil Rights Act of 1964, as amended. More specifically, any third party firm will comply with the applicable regulations of the U. S. Department of Transportation (USDOT) relative to non-discrimination in federally assisted programs of the USDOT, as contained in 49 CFR 21 through Appendix H and 23 CFR 710.405 which are herein incorporated by reference and made a part of this Agreement.

Sec. 19. ASSIGNABILITY OR SUBCONTRACTING. MARC shall not subcontract, assign or transfer any part or all of MARC's obligations or interests without the City's prior approval which shall not be unreasonably delayed or withheld. If MARC shall subcontract, assign, or transfer any part or all of MARC's interests or obligations under this Agreement without the prior approval of the City, it shall constitute a material breach of this Agreement.

Sec. 20. CONFLICTS OF INTEREST. MARC shall require its Private Firms to certify that no officer or employee of the City, or no spouse of such officer or employee, has, or will have, a direct or indirect financial or personal interest in this Agreement or any other related agreement, and that no officer or employee of the City, or member of such officer's or employee's immediate family, either has negotiated, or has or will have an arrangement, concerning employment to perform services on behalf of MARC or its Private Firms in this Agreement or any other related agreement.

Sec. 21. RULES OF CONSTRUCTION. The judicial rule of construction requiring or allowing an instrument to be construed to the detriment of or against the interests of the maker thereof shall not apply to this Agreement.

Sec. 22. NOTICE: Any notice to a party in connection with this Agreement shall be made in writing at the following address or such other address, as the party shall designate in writing:

Example Agreement #5: Regional Signal Operations Agreement (Page 6 of 20)

City of Kansas City, Missouri
Attention: Director of Public Works
414 E. 12th Street, 20th Floor
Kansas City, MO 64106

Mid-America Regional Council
Attention: Director of Transportation and Environment
600 Broadway, Suite 200
Kansas City, Missouri 64105

Sec. 23. GOVERNING LAW. This Agreement shall be construed and governed in accordance with the law of the State of Missouri without giving effect to Missouri's choice of law provisions. The City and MARC: (1) shall submit exclusively to the jurisdiction of the state and federal courts located in Jackson County, Missouri and no other; (2) shall waive any and all objections to jurisdiction and venue; and (3) shall not raise forum non conveniens as an objection to the location of any litigation.

Sec. 24. GENERAL INDEMNIFICATION.

(a) To the extent allowed by law, MARC shall defend, indemnify, and hold harmless the City and any of its agents, officials, officers and employees from and against all claims, damages, liability, losses, costs and expenses, including reasonable attorney fees, arising out of or resulting from any negligent acts or omissions in connection with the services performed by MARC under this Agreement, caused by MARC, its employees, agents, subcontractors, or caused by others for whom MARC is liable. Notwithstanding the foregoing, MARC is not required under this section to indemnify the City for the negligent acts of the City or any of its agencies, officials, officers, or employees.

(b) To the extent allowed by law, the City shall defend, indemnify, and hold harmless MARC and any of its agents, officials, officers and employees from and against all claims, damages, liability, losses, costs and expenses, including reasonable attorney fees, arising out of or resulting from any negligent acts or omissions in connection with the services performed by the City under this Agreement, caused by the City, its employees, agents, subcontractors, or caused by others for whom the City is liable. Notwithstanding the foregoing, the City is not required under this section to indemnify MARC for the negligent acts of MARC or any of its agencies, officials, officers, or employees

Sec. 25. INDEMNIFICATION BY PRIVATE FIRMS. MARC shall require its Private Firms (including, without limitation, any design professionals) to defend, indemnify, and hold harmless the City and any of its agencies, officials, officers, or employees from and against all claims, damages, liability, losses, costs, and expenses, including reasonable attorney fees, arising out of any negligent acts or omissions in connection with the services performed pursuant to this Agreement (including, without limitation, professional negligence), caused by a Private Firm, its employees, agents, contractors, or caused by others for whom the Private Firm is liable. Notwithstanding the foregoing, the Private Firm is not required under this section to indemnify the City for the negligent acts of the City or any of its agencies, officials, officers, or employees.

Example Agreement #5: Regional Signal Operations Agreement (Page 7 of 20)

Sec. 26. INSURANCE. MARC and any Private Firms retained by MARC shall maintain the types and amounts of insurance set forth in Exhibit 4, which is incorporated herein by this reference; provided, however, the limits set forth in Exhibit 4 are the minimum limits and MARC may carry higher limits as it may deem necessary, in its discretion, or as may be required by other Member Agencies. MARC shall name the City as an additional insured and shall ensure its Private Firms do the same.

Sec. 27 INITIAL TERM; RENEWAL OF TERM. The initial term of this Agreement shall be two (2) years ("Term") unless sooner terminated in accordance with Sections 9 or 13 of this Agreement. The Term of this Agreement shall automatically renew for one additional two (2) year period (the "Renewal Term") on the same terms and conditions as set forth herein; provided, the Term shall not automatically renew if the City provides written notice to MARC of its intention not to renew within 180 days prior to the expiration of the Term.

Sec. 28. CITY BUDGETING. City represents and warrants, to the best of its knowledge and after appropriate consultation, that terms of this Agreement conform to the requirements of the Missouri Constitution, Article VI, Section 23, 26(a). The City further represents and warrants that its chief administrative office, each year during the term of this Agreement, will submit to and advocate for approval by its governing body of a budget that includes amounts sufficient to pay the City's share of the OGL Operating Costs. The City also represents and warrants that its governing body, each fiscal year during the term of this Agreement, will fully consider and make all good faith and reasonable efforts to adopt a budget, for each successive fiscal period during the term of this Agreement, that specifically identifies amounts sufficient to permit the City to discharge all of its obligations under this Agreement.

Example Agreement #5: Regional Signal Operations Agreement (Page 8 of 20)

IN WITNESS WHEREOF, each party hereto has executed this Agreement on the day and year herein written.

MID-AMERICA REGIONAL COUNCIL

David A. Warm
Executive Director, Mid-America Regional Council

Date: _____

ACKNOWLEDGMENT

STATE OF MISSOURI)
) ss
COUNTY OF JACKSON)

On this ____ day of _____, 2016, before me, the undersigned, a Notary Public, appeared _____, to me personally known, or proved to me on the basis of satisfactory evidence, who, being by me duly sworn, did say that he is the Executive Director of Mid-America Regional Council (MARC) and that this foregoing instrument was signed and sealed in behalf of MARC by authority of its Board, and said officer acknowledged said instrument to be executed for the purposes therein stated and as the free act and deed of MARC.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal the day and year last above written.

Printed Name _____
Notary Public - State of Missouri
Commissioned in Jackson County

My commission expires:

Example Agreement #5: Regional Signal Operations Agreement (Page 9 of 20)

CITY OF KANSAS CITY, MISSOURI

By: _____

Title: _____

Date: _____

Approved as to form:

Assistant City Attorney

Financial Certification

I hereby certify that there is a balance otherwise unencumbered to the credit of the appropriation to which the above amount is chargeable and a cash balance otherwise unencumbered in the treasury to the credit of the fund from which payment is to be made, each sufficient to meet the above obligation and that the account has been encumbered by the estimated amount set forth above for the purpose described hereon.

Director of Finance for the City of Kansas City, Missouri

ACKNOWLEDGMENT

STATE OF MISSOURI)
) ss
COUNTY OF JACKSON)

On this ____ day of _____, 2016, before me, the undersigned, a Notary Public, appeared _____, to me personally known, or proved to me on the basis of satisfactory evidence, who, being by me duly sworn, did say that he is the _____ of the City of _____, Missouri, and that the foregoing instrument was signed and sealed on behalf of the City of _____, and said officer acknowledged said instrument to be executed for the purposes therein stated and as the free act and deed of said City.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal the day and year last above written.

Printed Name _____
Notary Public - State of Missouri
Commissioned in Jackson County

My commission expires:

Example Agreement #5: Regional Signal Operations Agreement (Page 10 of 20)

EXHIBIT 1

OPERATION GREEN LIGHT COMMITTEE
Role, Responsibility, and Organizational Structure

- 1.1.1 *Responsibilities: The Operation Green Light Steering Committee shall serve to approve budgets, procurement and staffing recommendations to the Mid-America Regional Council Board of Directors and to make other technical and policy decisions concerning the development, deployment and operation of the Operation Green Light regional traffic signal coordination program, including: approve the program's upcoming annual budget during the final meeting of the calendar year. Purchases and contracts shall follow MARC's established threshold guidelines as well as the following: amounts of \$15,000-\$25,000 shall be reported to the committee; amounts of \$25,001 or more shall be voted on and approved by the Steering Committee before purchase or contract is sent to MARC's Board of Directors for approval.*
- 1.1.2 Participate in program decision-making at key points by reviewing and providing comments on project deliverables and by approving or rejecting technical and policy recommendations;
- 1.1.3 Participate in the development of inter-jurisdictional agreements for the construction, operation, maintenance and other activities of the regional traffic signal coordination system; and
- 1.2 Call upon committee members to participate in Task Force work groups as technical issues rise requiring additional effort than time allows during a Steering Committee meeting. The Task Force shall submit to the Steering Committee recommendations based on its discussions.
- 1.3 Membership and Meetings: The Steering Committee shall be composed of representatives from participating agencies in the following manner:

(The following table is a current list as of May 2016)

Participating Agency Non-Funding Agency in Bold	Membership (voting)
Belton	1
Bonner Springs	1
Fairway	1
FHWA – MO & KS	Ex Officio
Gladstone	1
Independence	1
Kansas City, MO	1
KCScout	Ex Officio
KDOT	1
Lansing	1
Leavenworth	1
Leawood	1
Lee's Summit	1
Lenexa	1
Liberty	1
MARC	1
Merriam	1
Mission	1
Mission Woods	1
MoDOT	1
North Kansas City	1

Example Agreement #5: Regional Signal Operations Agreement (Page 11 of 20)

Olathe	1
Overland Park	1
Prairie Village	1
Raymore	1
Shawnee	1
Unified Government/KCK	1
Westwood	1

Each representative shall have a designated alternate with full authority to act in the absence of the representative. The Steering Committee may be expanded to include other additional members as approved by majority vote of the members of the existing Steering Committee.

The Steering Committee shall meet minimally on a quarterly basis but may meet more frequently if the business of the Steering Committee necessitates. The final meeting of the calendar year shall be designed to report on the State of the Operation Green Light Program including Budget reporting and approval of the future budget and election of the next vice-chairperson.

The chairperson of the Steering Committee shall have the authority to call a meeting of the Committee with a minimum of seven (7) calendar days' notice to all the members. Notice is deemed to have occurred from the date that it is deposited with the United States Postal Service, postage prepaid; distributed via Facsimile; OR distributed via E-mail addressed to the members of the Steering Committee. The chairperson and vice-chairperson shall help develop meeting agendas prior to meeting notices and shall preside over the meetings.

- 1.4 Chairperson and Vice-Chairperson: The Steering Committee members shall elect by majority vote of all of the voting members of the Committee, from amongst the members of the Committee, a vice-chairperson who will serve a one-year term. Said election will occur at the final regularly scheduled meeting of the calendar year of the Steering Committee prior to the expiration of the chairperson's one-year term. The vice-chairperson shall assume the responsibilities of the chairperson at the end of the chairperson's term and any time the chairperson is unable to attend committee meetings. Kansas and Missouri shall be represented in these positions in alternating years.

- 1.5 Quorum and Voting: All members of the Steering Committee shall be entitled to one vote on all matters submitted to the Committee for vote.

Any six of the voting members of the Steering Committee, including at least one member from Kansas City, Missouri, the Missouri Department of Transportation, Unified Government/Kansas City, Kansas, or Overland Park, Kansas, (based on the four largest agencies by signal count at the beginning of the current Operations contract term) shall constitute the quorum necessary to convene the meeting of the Committee. All official actions by the Steering Committee shall require a majority vote of the members present at the meeting.

All votes shall be taken and recorded in the minutes by roll call. Each member shall have the ability to recall any matter voted upon during his or her absence providing said member notifies in writing the committee chairperson or co-chairperson within 7 calendar days of when the meeting minutes are posted to the MARC website and/or delivered to committee members via email. Within 3 business days of being notified, the chairperson or co-chairperson shall collaborate with OGL staff to present the issue for a reconsideration of the vote via email to all committee members who will be asked to respond within 10 calendar days. If a response is not received by close of business on the 10th day, the member's previously cast vote shall be counted in the same manner.

Example Agreement #5: Regional Signal Operations Agreement (Page 12 of 20)

EXHIBIT 2

SCOPE OF WORK

1. Project Management

The Mid-America Regional Council (MARC) will provide staff time, equipment and materials, and contract services necessary to accomplish the following project management services:

- Arrange and conduct regular Steering Committee meetings to discuss and develop policies and procedures governing the development, implementation and on-going operation of the program;
- Arrange and conduct Technical Committee meetings as needed to discuss and develop recommendations concerning technical issues associated with the development, implementation and on-going operation of the project;
- Arrange and conduct other meetings with project participants as necessary to develop, implement and operate the project;
- Negotiate, execute and administer agreements with state and local governments to provide federal, state and local funding for the development, implementation and ongoing operation of the program;
- Develop and publish requests for proposals, consultant agreements and other procurement documents necessary to select and hire contractors to provide system integration services, telecommunications and traffic engineering design services, computer software, computer hardware, communications network, traffic signal equipment and other items necessary for the development, implementation and ongoing operation of the program;
- Negotiate, execute and administer agreements with private firms to provide system integration services, telecommunications and traffic engineering design services, computer software, computer hardware, communications network, traffic signal equipment and other items necessary for the development, implementation and ongoing operation of the program;
- Develop and maintain project budgets and schedules;
- Develop and maintain project databases;
- Publish and distribute project documents and other deliverables to participating state and local governments; and
- Perform other tasks necessary to manage and administer the program.

2. Traffic Signal Timing

MARC shall coordinate with agency staff or their delegates to develop and implement, with agency approval, the requisite signal timing plans for OGL intersections

Example Agreement #5: Regional Signal Operations Agreement (Page 13 of 20)

3. Operations and Maintenance

3.1. *Computer Software and Databases*

MARC will procure all required software and may engage a private firm or firms selected by the project Steering Committee to provide technical support and maintain computer software and databases at the Operation Green Light Traffic Operations Center. MARC staff shall be responsible for providing day-to-day maintenance of the computer software and databases including but not limited to data entry, backups, upgrades, etc., at the Operation Green Light Traffic Operations Center.

3.2. *Computer Network*

MARC will procure all required hardware and software. Any equipment (e.g. switches, routers, hubs, etc.) that is used for the field communication back bone will be considered part of the computer network. MARC may engage a private firm or firms selected by the Steering Committee to provide technical support and maintain the Operation Green Light computer network.

3.3. *Field Communications System*

All field communications equipment purchased by MARC will be maintained by MARC. The city will maintain any pre-existing, city-owned equipment that is utilized as part of the OGL field communication system. MARC staff will monitor the field communication system through monitoring software which is purchased by MARC. MARC may engage a private firm or firms selected by the project Steering Committee to maintain the regional field communications system. The scope of services for this work will be developed with and approved by the Steering Committee.

3.4. *Traffic Signal Controllers*

Each member agency shall be responsible for all maintenance to the traffic signal controllers. MARC responsibility will be limited to maintaining the regional field communication system and will terminate at the traffic controller unless otherwise specified. Traffic signal controllers and cabinets that have been purchased and/or installed as part of the OGL controller upgrade project will also be owned and maintained by the local jurisdiction once they have been received and/or accepted, and the local jurisdiction will be responsible for purchasing and installing replacement controllers that are compatible with the OGL system should the MARC-purchased controller fail.

Example Agreement #5: Regional Signal Operations Agreement (Page 14 of 20)

**EXHIBIT 3
COMPENSATION**

- A. The amount the City will pay MARC under this contract will not exceed **Three Hundred Twenty-Three Thousand, Two Hundred and 00/100 Dollars (\$323,200.00)**. This amount represents the City share of the total project cost as shown in Table 1 of this Exhibit. City shall pay MARC, upon invoice, for the actual costs incurred for MARC on a yearly basis.

Table 1			
Operation Green Light Program			
Annual Operations Costs			
Annual Operating Cost per Signal			\$1,600
Total Agency Signals in OGL			202
Total Agency Unsubsidized Annual cost			\$323,200.00
Cost per Year Subsidized			
Year	Federal Percentage	Annual Cost	Local Agency Cost
2017	50%	\$323,200.00	\$161,600.00
2018	50%	\$323,200.00	\$161,600.00
Total			\$323,200.00

- B. It shall be a condition precedent to payment of any invoice from MARC that MARC is in compliance with, and not in breach or default of, all terms, covenants and conditions of this Contract. If damages are sustained by City as a result of breach or default by MARC, City may withhold payment(s) to MARC for the purpose of set off until such time as the exact amount of damages due City from MARC may be determined.
- C. No request for payment will be processed unless the request is in proper form, correctly computed, and is approved as payable under the terms of this Contract.
- D. City is not liable for any obligation incurred by MARC except as approved under the provisions of this Contract.

Example Agreement #5: Regional Signal Operations Agreement (Page 15 of 20)

Exhibit 4

INSURANCE REQUIREMENTS

A. MARC shall procure and maintain and shall cause any Private Firm it engages to perform services under this Agreement to procure and maintain in effect throughout the duration of this Agreement, and for a period of two (2) years thereafter, insurance coverage not less than the types and amounts specified below. MARC shall not accept insurance policies from any Private Firm containing a Self-Insured Retention.

1. Commercial General Liability Insurance: with limits of \$500,000 per occurrence and \$2,000,000 aggregate, written on an "occurrence" basis. The policy shall be written or endorsed to include the following provisions:

- a. Severability of Interests Coverage applying to Additional Insureds
- b. Contractual Liability
- c. Per Project Aggregate Liability Limit or, where not available, the aggregate limit shall be \$2,000,000
- d. No Contractual Liability Limitation Endorsement
- e. Additional Insured Endorsement, ISO form CG20 10, current edition, or its equivalent

2. Workers' Compensation Insurance: as required by statute, including Employers Liability with limits of:

Workers Compensation Statutory
Employers Liability
\$100,000 accident with limits of:
\$500,000 disease-policy limit
\$100,000 disease-each employee

3. Commercial Automobile Liability Insurance: with \$500,000 per claim up to \$2,000,000 per occurrence, covering owned, hired, and non-owned automobiles. Coverage provided shall be on an "any auto" basis and written on an "occurrence" basis. The insurance will be written on a Commercial Business Auto form, or an acceptable equivalent, and will protect against claims arising out of the operation of motor vehicles, as to acts done in connection with the Agreement, by Design Professional.

4. Professional Liability Insurance (only applicable for Private Firms that are design professionals or other types of professionals that can carry professional liability insurance): with limits Per Claim/Annual Aggregate according to the following schedule:

<u>Fee Minimum Limits</u>	<u>Professional Liability Minimum</u>
Less than \$25,000	\$100,000
\$25,000 or more, but less than \$50,000	\$500,000
\$50,000 or more	\$1,000,000

B. The policies listed above may not be canceled until after thirty (30) days written notice of cancellation to MARC and the City, ten (10) days in the event of nonpayment of premium. The Commercial General and Automobile Liability Insurance specified above shall provide that MARC and the City and their agencies, officials, officers, and employees, while acting within the scope of their authority, will be named as additional insureds for the services performed under this Agreement. Private Firms engaged by MARC shall provide to MARC and the City at execution of this Agreement a certificate of insurance showing all required endorsements and additional insureds.

C. All insurance coverage must be written by companies that have an A.M. Best's rating of "B+V" or better, and are licensed or approved by the State of Kansas to do business in Kansas and by the State of Missouri to do business in Missouri.

D. Regardless of any approval by MARC or the City, it is the responsibility of the Private Firms to maintain the required insurance coverage in force at all times; its failure to do so will not relieve it of any contractual obligation or responsibility. In the event of a Private Firm's failure to maintain the required insurance in effect, MARC may order the Private Firm to immediately stop work, and upon ten (10) days notice and an opportunity to cure, may pursue its remedies for breach of this Agreement as provided for herein and by law.

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EXHIBIT 6					
Operation Green Light Location / Ownership Matrix					
Component	Location	Purchased By	Owned By	Maintained By	Comments
Software/Firmware					
TransSuite & Associated Software	OGL TOC	MARC	MARC	MARC*	Available for use by local agencies
Genetec Video System	OGL TOC	MARC	MARC	MARC*	
Other software used by MARC staff	OGL TOC	MARC	MARC	MARC*	
Computer Hardware					
OGL TOC Servers	OGL TOC	MARC	MARC	MARC*	
OGL TOC Workstations	OGL TOC	MARC	MARC	MARC*	
Agency TOC Servers	Local Agency	Local Agency	Local Agency	Local Agency	
Agency TOC Workstations	Local Agency	Local Agency	Local Agency	Local Agency	
Field Hardware					
OGL Field Network Equipment	Field	MARC	MARC	MARC*	
Local Agency Field Network Equipment	Field	Local Agency	Local Agency	Local Agency	Extension of City network
Existing Closed-Loop fiber re-tasked to OGL Network	Field	Local Agency	Local Agency	Local Agency	OGL owns switches to manage
Traffic Signal Controllers	Field	MARC/Local Agency	Local Agency	Local Agency	OGL purchased controllers only for original build-out
OGL-purchased Closed Circuit Camera	Field	MARC	Local Agency	Local Agency	
Miscellaneous					
OGL TOC Office	MoDOT KC District	MoDOT	MoDOT	MoDOT	
OGL TOC Phone System	OGL TOC	MoDOT	MoDOT	MoDOT	
OGL TOC Office Furniture & Equipment	OGL TOC	MARC	MARC	MARC*	
OGL Vehicles & Mobile Equipment	OGL TOC	MARC	MARC	MARC*	
* MARC maintained components to be maintained by joint-funded agreement					

* MARC maintained components to be maintained by joint-funded agreement

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Exhibit 6 **OGL Concept of Operations: Roles and Responsibilities**

Introduction

Operation Green Light (OGL) is a regional initiative to improve traffic flow and reduce vehicle emissions by coordinating traffic signals on major roadways in the Kansas City metropolitan area. OGL is a cooperative effort of the Mid-America Regional Council (MARC), state departments of transportation and local agencies working together to coordinate traffic signal timing plans and communication between traffic signal equipment across jurisdictional boundaries.

The concept of operations provides a high-level overview of the roles and responsibilities of the agencies participating in the operation and management of OGL. The concept of operations is intended to balance the need for standardization and uniformity of operations on OGL routes with the need to be responsive to the unique needs and circumstances of the agencies participating in OGL.

Signal Timing

Initial Deployment of Regional Timing Plans

The member agencies will partner with MARC and each other in developing regional traffic signal timing plans. In order to facilitate this work each member agency will provide MARC traffic counts and other relevant, available data for traffic signals that are part of regionally significant traffic corridors that pass through adjacent cities. This information may include;

- Existing timing plans and data in the existing traffic controller (controller data sheets)
- Intersection geometry via aerial mapping
- Signal phasing information (or policy)
- Historical traffic count information available
- Approved yellow and all-red clearance intervals (or policy)
- Pedestrian timing (or policy)
- Signal phasing policy (lead only/lead-lag/vary lead-lag by time-of-day)
- Historical citizen complaints on the intersection operation as needed

After providing data to MARC, each member agency will then work with MARC to cooperatively develop regionally optimized timing plans. The member agency will continue to be responsible for maintenance of timing plans for traffic signals that lie wholly within the member agency's jurisdictional boundaries and are not on OGL corridors unless the member agency decides to contract this work to MARC. The steps involved in the development of regional timing plans are:

- The member agency will either collect traffic counts on the arterials for signals maintained by the member agency and provide this information to MARC OR will contract with MARC to collect traffic counts as needed.
- In conjunction with member agency staff, MARC will conduct travel-time studies and speed profile studies on the arterial prior to implementation of the timing plans
- MARC may hold design meetings with representatives from the member agencies and other impacted agencies. At the first of these meetings the following items will be established
 - Number of timing plans and time of use (i.e., am, noon, pm, off-peaks, etc.)
 - Critical intersections of a corridor
 - An initial common corridor cycle length for each of the plans identified (i.e. am,



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pm, etc.) [Note: this cycle length may need to be revisited after developing the regional timing plan.]

- The member agency will then develop the following initial parameters for individual signals maintained by the member agency for each of the timing plans to be developed, and submit them to MARC for review and incorporation into regional plans for the OGL corridor;
 - phase sequencing
 - splits
 - offsets
- MARC will develop initial splits and offsets for any remaining signals and incorporate member agency developed timing plans into regional plans for the OGL corridor.
- MARC may then incorporate the regional plans into mutually agreed upon software as needed for review by the member agencies.
- At the second meeting, MARC and the member agencies will;
 - Review the regional timing plans developed
 - Review any software models developed
 - Determine if any changes to initial timings need to be made to optimize the operation of the corridor
- Once the member agencies have agreed on the different timing plans developed, they will download the timing plans into signal controllers maintained by each member agency OR will request MARC to provide signal timing plans and download to local controllers.
- In conjunction with member agency staff, MARC will field-monitor each arterial after a timing plan has been downloaded and will work with the member agency to make any additional changes to further optimize the flow of traffic if necessary.
- In conjunction with member agency staff, MARC will conduct travel-time and speed profile studies on arterials after implementation of the optimized signal timing plans

Providing Maintenance Timing Plans

As part of a regional effort, MARC will on a regular basis, or as requested, examine the operations of signals that are part of regionally significant traffic corridors that pass through the member agency and adjacent cities and determine if optimization is necessary. If minor changes to splits and offsets are to be made to individual signals along an OGL corridor the following steps will be followed:

- In conjunction with MARC, member agency staff will field-monitor the affected corridor or intersection(s)
- MARC will meet with affected member agencies if needed
- MARC will collect traffic counts as necessary OR the member agency will collect traffic counts at member agency maintained traffic signals
- The member agency will develop timing plans for member agency maintained signals and download them to controllers as necessary in coordination with MARC OR MARC will develop and provide revised arterial timing plans as needed
- In conjunction with member agency staff, MARC will field-monitor each arterial after timing plan download and provide further optimization if necessary by submitting updated timing plans for agency consideration and download

If major changes, such as changes to cycle lengths, phase sequencing and major changes to splits, are to be made along an OGL corridor, the process described above for initial deployment of regional timing plans may be used.

Incident Management



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The member agency will work with MARC and other member agencies to identify locations along the regionally significant arterials and interstate highways where incidents are prone to happen and have major impact on traffic flow. These locations may be manually forced to run special plans when an incident is observed at the TOC. The following steps shall be followed for planned, recurring, and anticipated incident response:

- MARC and member agencies will identify incident-prone locations
- MARC will meet with affected member agencies to discuss solutions
- MARC will develop signal timing plans for the incident
- MARC will submit such plans for review by member agencies
- MARC and member agencies will jointly determine the parameters required for invoking such a plan by the TOC
- Once the plan has been invoked (when the required parameters are met) MARC will inform the affected agencies immediately
- After the incident has been cleared, MARC will put signals back on their regular plans and inform member agencies

The member agency will inform MARC about construction and roadway closures and may request signal timing plan adjustments. MARC will provide special timing plans when requested to optimize traffic flow for agency consideration and download.

Citizen Complaints

Member agencies will route/report citizen complaints/requests on OGL signals to the TOC and MARC, in cooperation with the member agency, will respond to the complaint/request in a timely manner. MARC will also route/report received citizen complaints to the member agencies and maintain a response log.

Dispute Resolution

In the event that satisfactory agreement cannot be reached between member agencies on timing plans or incident plans developed for OGL, the dispute will be referred to the OGL Steering Committee, which will provide recommendations for resolution. Unless the responsible engineer for a member agency determines that such plans will create an unsafe condition within their jurisdiction, the member agency will implement the plans recommended by the Committee

Emergency Provisions

In the event of an emergency not already covered under a pre-arranged incident-management plan, the member agency will take any steps it considers necessary to manage traffic signals within its jurisdiction to ensure the safety of the traveling public. The member agency will notify MARC of any emergency changes made to OGL traffic signal timing plans in a timely manner and will work expeditiously with MARC to restore all OGL corridors within its jurisdiction to normal operation when the emergency subsides.

Field Communication Operation and Maintenance

MARC will be responsible for maintenance and replacement of all wireless communication infrastructure that is installed as a result of OGL initiated construction projects. Member agencies that have the capability to maintain their own communication infrastructure may do by separate agreement with MARC.



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Controller Upgrades and Work inside the Traffic Controller Cabinet

MARC will, with the applicable member agencies, upgrade traffic controllers that are incapable of communicating with the central system software. When work is performed that involves the opening of a traffic controller cabinet, the member agency will coordinate with the contractor and have a representative in the field. The member agency will test and approve/disapprove the work performed by the contractor and inform MARC of the fact. MARC will be responsible for administration and final approval of all OGL initiated construction projects. Member agencies are responsible for notifying and coordinating with OGL when undertaking traffic signal system construction projects on OGL corridors.

Technical Support for OGL Computer Network

MARC will provide technical support for the central system software and the laptop version of the central system software. MARC will also maintain the computer network hardware along with all network components such as network switches, routers, licensed and unlicensed radios, modems etc.

The Traffic Operations Center

MARC will staff OGL operations at the Traffic Operations Center (TOC). The TOC is currently co-located with the KC Scout program and offices in the MoDOT KC District offices.

The TOC will be staffed as determined by MARC. MARC expects to coordinate with Kansas City Scout and use the video monitoring capabilities available at the KC Scout TOC to alleviate congestion along arterials. It is recommended that member agencies with traffic management centers, at a minimum, staff their centers to operate on a schedule concurrent with OGL.

The staff will interact with citizens and the media and provide answers to traffic signal timing questions on OGL signals.

