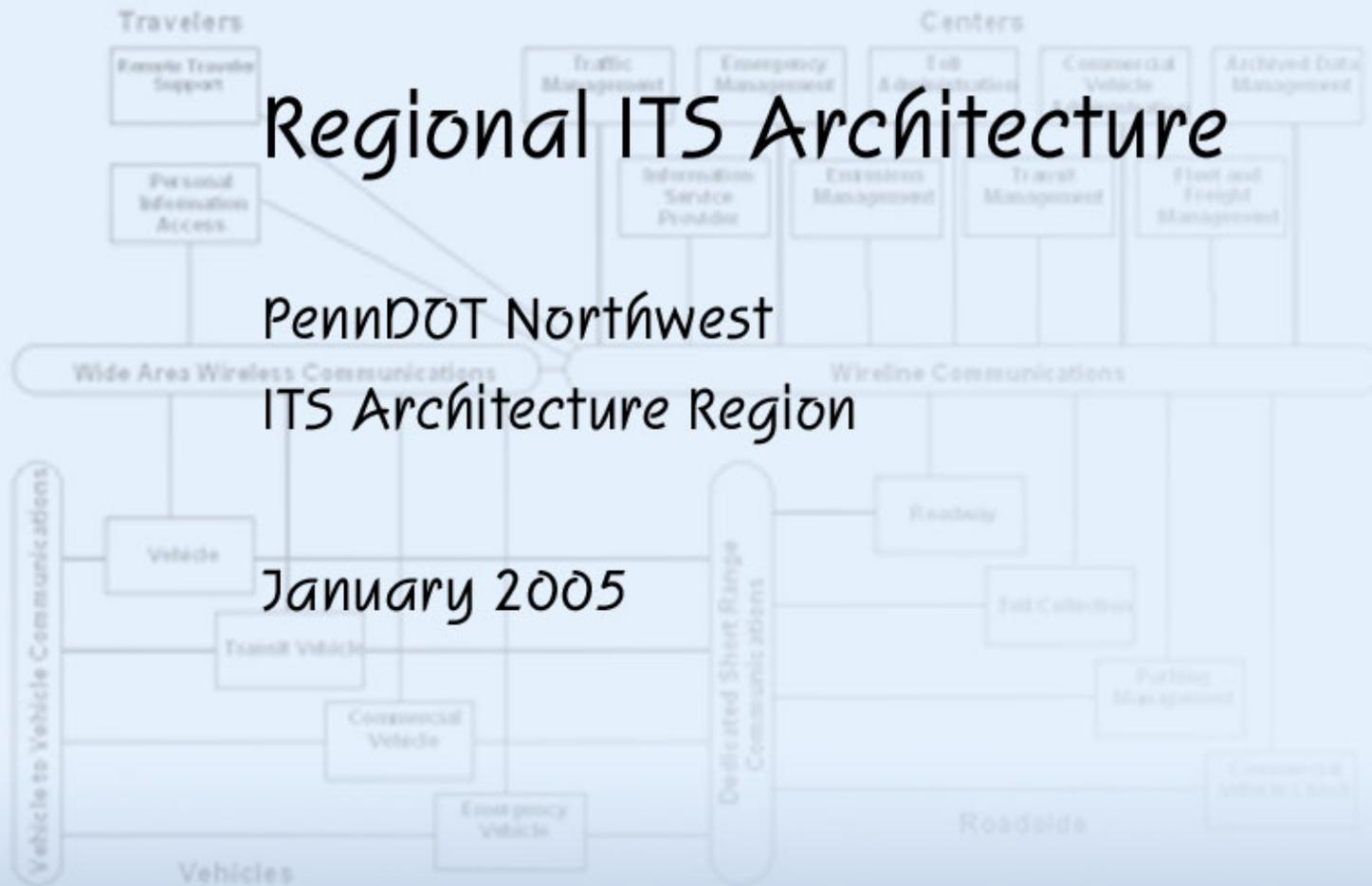


Regional ITS Architecture

PennDOT Northwest
ITS Architecture Region

January 2005



PA

r e g i o n a l i t s a r c h i t e c t u r e



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Erie – Metropolitan Planning Organization

Pending adoption on April 20, 2005

Northwest – Rural Planning Organization

Adopted March 17, 2005

Shenango Valley – Metropolitan Planning Organization

Adopted February 15, 2005

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Major contributions from the Statewide Working Group, Regional Advisory Panel, and Parsons Brinckerhoff made the development of the Northwest Regional ITS Architecture possible.

Statewide Working Group

The Statewide Working Group guided the Commonwealth through the development of the Architectures. Their principal role was to ensure that the Regional Architectures were reasonably uniform and consistent.

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*Chief of Program Development/Project
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Matt Weaver – PennDOT Central Office,
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Jessie Yung – Federal Highway
Administration (FHWA)

Mike Pack – PennDOT Central Office,
Eastern Regional ITS Liaison

Mike Herron – Federal Highway
Administration (FHWA)

Karen Russell – PennDOT Central Office,
Program Development Division

Regional Champion

The Regional Champions supported the RAP by facilitating the RAP meetings and played a critical role in coordinating with the Statewide Working Group for merging statewide visions with Regional characteristics. The Champions for this Region were:

Bob Skarda – Northwest Pennsylvania Regional Planning and Development
Commission

Jake Welsh – Erie Metropolitan Planning Organization

Regional Advisory Panel

The Regional Advisory Panel lead and guided the Regional ITS Architecture development in the Southwest ITS Architecture Region. The Architecture was developed with input from regional stakeholders, channeled and focused by the RAP.

Randall Brink – PennDOT District 1-0

Thomas McClelland – PennDOT District 1-0

Todd Crago – Crawford County OES

Lt. Douglas McGee – Pennsylvania State Police

Dan Gracenin – Mercer County Regional Planning Commission

Neva Rambish – Warren County Emergency Management Agency

Bob Gray – Pennsylvania State University

Dale Robinson – Erie County Emergency Management Agency

Israel Gray – City of Erie Department of Public Works

Nicholas Sleptzoff – Erie County Emergency Management Agency

Thomas Hoffman – Erie County MPO

Scott Snyder – PennDOT District 10-0

Mark Kukla – City of Erie

Dennis Solensky – Erie Metropolitan Transit Authority

Parsons Brinckerhoff

The principal role of Parsons Brinckerhoff was to oversee and produce the Regional ITS Architectures. The PB Team consisted of:

Mike Harris – PB Farradyne – Project Manager

Noah Goodall – PB Farradyne – Web

Joel Ticatch – PB Farradyne – Assistant Project Manager

Wayne Spaulding – PB Farradyne – Northwest Region Lead

JD Schneeberger – PB Farradyne – Turbo

Steve Kimble – PB Farradyne – Northwest Region Support

Conformity Statement

The Northwest Region of the Commonwealth of Pennsylvania is in compliance with the requirements of the “Intelligent Transportation Systems Architecture and Standards,” as mandated by the Federal Highway Administration (23 CFR 940) and supported by the policy of the Federal Transit Administration.

The following policy objectives are enumerated in 23 CFR 940.5: “ITS projects shall conform to the National ITS Architecture and standards in accordance with the requirements contained in this [Federal rule]. Conformance with the National ITS Architecture is interpreted to mean the use of the National ITS Architecture to develop a [R]egional ITS Architecture, and the subsequent adherence of all ITS projects to that [R]egional ITS Architecture. Development of the [R]egional ITS Architecture should be consistent with the transportation planning process for Statewide and Metropolitan Transportation Planning.”

The Northwest Region’s ITS Architecture was developed to address these specific policy objectives. The resultant Regional ITS Architecture is consistent with Pennsylvania’s statewide and metropolitan transportation planning processes.

1 Introduction

This document, developed under the *Pennsylvania Intelligent Transportation Systems (ITS) Architecture* initiative, presents the ITS Architecture for Pennsylvania's Northwest Region, which is comprised of seven counties in the Northwest part of the state. The Northwest Region encompasses PennDOT Engineering District 1-0. The document is the result of intensive data-gathering, research, and planning activities conducted between March 2003 and January 2005. The current version of the ITS Architecture was generated in January 2005.

The Northwest Regional ITS Architecture was prepared under the auspices of a Regional Advisory Panel (RAP), a panel of experts drawn from transportation stakeholder organizations across the Region and State. Additional stakeholder organizations participated in the process of "validating" the Architecture. PB Farradyne, a division of Parsons Brinckerhoff, Inc., executed development of the Architecture under contract to the Pennsylvania Department of Transportation (PennDOT). PennDOT appointed an ITS Statewide Working Group to establish statewide ITS Architecture standards, advise and guide the statewide process, and ensure consistency across the Regions.

The Northwest Regional ITS Architecture is one of nine Regional Architectures being developed across the Commonwealth of Pennsylvania, as shown in Figure 1-1, below:

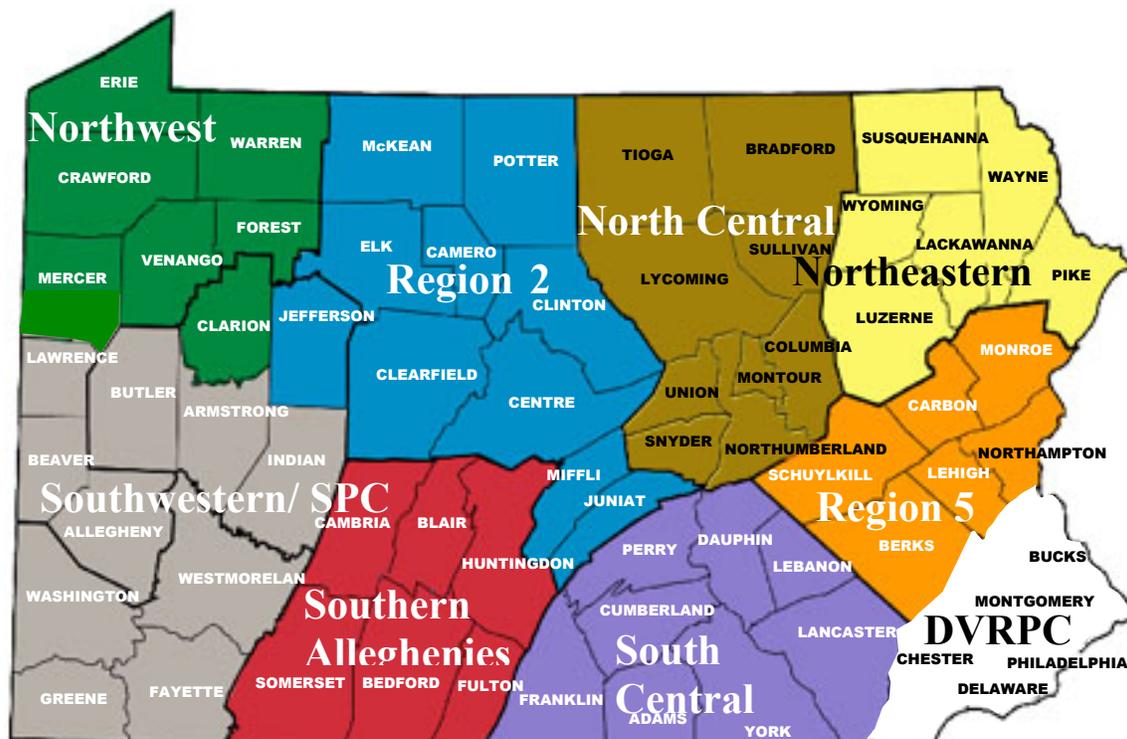


Figure 1-1: PennDOT ITS Architecture Regions

1.1 Architecture Process

PennDOT took a structured approach to developing Regional ITS Architectures throughout the State. The Regional ITS Architecture development process was defined and documented in the “Pennsylvania ITS Architecture Phase I Report,” dated February 2003. PennDOT, the Federal Highway Administration (FHWA), the Pennsylvania State Police (PSP), and the Planning Partners championed the former effort.

The Phase I Report describes PennDOT’s approach towards developing Regional ITS Architectures in Pennsylvania while utilizing the national guidance. The approach ensures that the resultant Architectures depict the ITS infrastructure in the Region and conform to the National ITS Architecture. The process developed is inherently flexible and adaptable so that special conditions and circumstances in each Region can be effectively addressed or otherwise accommodated, while maintaining statewide consistency.

The development process was specifically designed to support the preparation and refinement of Regional ITS Architectures across Pennsylvania. The process benefits the Pennsylvania environment, optimizes the national guidance, and creates an efficient and effective response to regional needs and circumstances.

The complete process for developing Regional ITS Architectures in Pennsylvania, as described in the Phase I Report, is:

- Task 1.0 — Define Architecture Scope
- Task 2.0 — Inventory Systems and Define Needs, Services, and Operations Concept
- Task 3.0 — Generate Strawman Regional ITS Architecture
- Task 4.0 — Conduct Outreach to Validate Regional ITS Architecture
- Task 5.0 — Finalize the Regional ITS Architecture

The process is depicted in further detail in the following schematic:

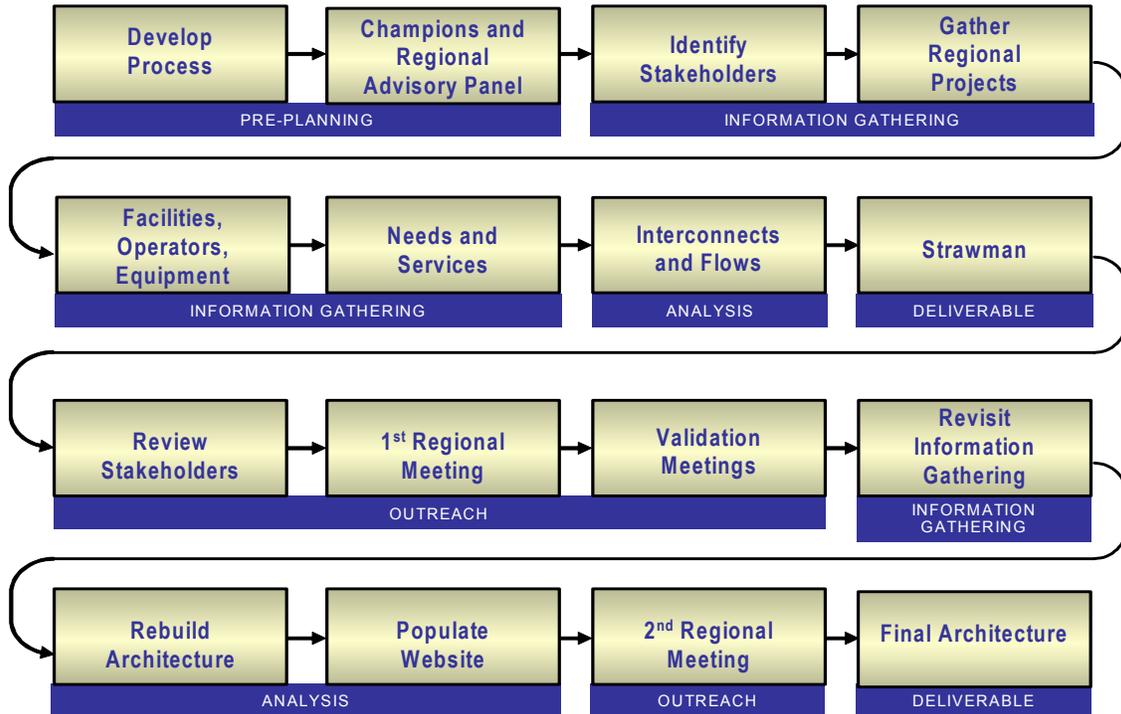


Figure 1-2: Pennsylvania ITS Architecture Process Schematic

1.2 Using this Document

This document is, principally, a resource instrument, designed to assist engineers, planners, designers, developers, managers, and decision-makers in defining a regionally-integrated surface transportation infrastructure that promotes safety, maximizes operational efficiencies, and utilizes appropriate technologies. Materials in the document are targeted at traditional surface transportation organizations, transit agencies, and the host of entities that interface with the transportation infrastructure. The latter include incident and emergency management personnel, commercial vehicle operators, shippers, operators of tourist destinations, event managers, traveler information providers, etc.

The document is a resource instrument to be consulted during the planning process. It is not intended as a textbook to be read from cover-to-cover.

The term “ITS” implies the use of technologies or other innovations to achieve new operational efficiencies in transportation. Yet, an ITS Architecture is, itself, technology-independent; that is, it identifies *who and what* need to connect, but not *how* those connections ought to best be accomplished.

An ITS Architecture describes the interrelationships that exist—or ought to exist—among transportation “elements” across the Region. It distinguishes between those

relationships that exist now and those planned for the future. However, the Architecture does not judge the efficacy, or utility, of those relationships or assess whether the technologies or procedures supporting those linkages are optimized. These sorts of judgments will need to be made after the Regional ITS Architecture is finalized.

Document Organization and Access Strategies

The ITS Architecture is presented in five primary sections:

- Section 1 — *Introduction*
- Section 2 — *Architecture Scope*
- Section 3 — *Regional Systems Inventory, Needs, and Services*
- Section 4 — *Regional Architecture*
- *Appendices*

Section 1, *Introduction*, contains important background information and establishes the “context” for the Architecture effort. This section defines key concepts and terms, examines the utility of a Regional ITS Architecture, the importance of maintaining the Architecture, ITS standards, and strategies for mainstreaming, or institutionalizing, ITS. This section should be read in its entirety.

Section 2, *Architecture Scope*, summarizes the general scope and magnitude of the Regional ITS Architecture effort. It describes the Northwest Region, emphasizing those characteristics that potentially impact transportation activities and performance. It further identifies major ITS stakeholders and existing and planned ITS projects across the Region. This section of the document should also be read in its totality.

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Users of the ITS Architecture should familiarize themselves with the general content of Section 3. Thereafter, when they are engaged in ITS deployment planning or related activities, they can generally proceed directly to Section 4. Users can return to Section

3, as needed, for descriptions of the elements being investigated, identification of the pertinent roadway corridors, and more comprehensive understanding of the interrelationships across elements.

Section 4, *Regional Architecture*, graphically displays the details of the ITS Architecture. Notably, Figure 4-2, *Regional Subsystem Interconnect Diagram Showing Elements*, identifies the systems and subsystems with which each regional ITS element is associated; elements are color-coded—here and throughout the remainder of the document—according to which of the four primary systems they fall under (i.e., Centers, Roadside, Vehicles, or Travelers). Similarly, Table 4-2, *Regional Interconnect Matrix*, specifies which elements gather inputs from—or furnish outputs to—other elements. The remainder of Section 4 is a compendium of the ITS elements. Each element is depicted in terms of the other elements with which it interfaces, and then each “element pair” is examined in detail. The detailed pairings show the types of information that pass between the elements, the direction of the information flow, and whether the flow currently exists or is planned.

Practitioners consulting the Regional ITS Architecture can use Table 4-2 to determine those elements pertinent to their investigations and proceed directly to the corresponding interconnect diagrams. From the diagrams, practitioners can gather the essential information.

The *Appendices* contain a wealth of supplemental materials to assist practitioners in comprehending the Architecture. These include: (1) ITS acronyms; (2) definitions of ITS terminology; (3) definitions of subsystems/terminators and architecture flows identified and defined in the National ITS Architecture; (4) “operations coverage” across the Region; and (5) summaries of Outreach and Validation meetings.

Sample Access Scenario

The Regional ITS Architecture is a valuable planning tool. The following sample scenario defines how a stakeholder in the Region might utilize the material presented in this document:

A transit agency planner in Pennsylvania’s Northwest Region preparing to deploy an automatic vehicle location (AVL) system on its buses can learn a great deal from consulting the Regional ITS Architecture. By turning to the Regional Transit Agency Offices’ Interconnect Diagram, the transit planner can immediately grasp the range of stakeholders potentially interested in receiving pertinent vehicle location and more detailed transit data (e.g., 911 Communication Centers, PennDOT Traffic Management Centers, Personal Traveler Information Devices, etc.). The planner would discover that connections between 911 Communication Centers are generally in place; that the remaining interfaces do not currently exist, but are planned for the future.

By consulting the interconnect and information flow diagrams, the transit planner would further learn that AVL inputs might effectively be used to improve the detail, precision, and timeliness of transit emergency data that already pass to other agencies in the

Region. The diagrams further show that future “hooks” are planned for communicating bus status data to other agencies. For example, PennDOT would like to use the transit vehicles as probe data to identify congested corridors in the Region. Other stakeholders might be interested in broadcasting vehicle status or delay data to their users.

Access to the ITS Architecture enables users to view the pertinent infrastructure before new ITS projects are undertaken. Existing and planned interrelationships can be quickly viewed and grasped, and the realm of agencies and other entities with a potential stake in the subject matter can be easily identified. Details about the information passing between stakeholders offer insight into optimizing future deployments and concretizing the range of possibilities for important new projects.

Accessing the Architecture On-Line

Key sections of the Regional ITS Architecture—notably Section 4 of the hardcopy document—are accessible on-line. To access the Northwest Regional Architecture, go to:

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When you access this location, the web screen shown in Figure 1-3 will be displayed:

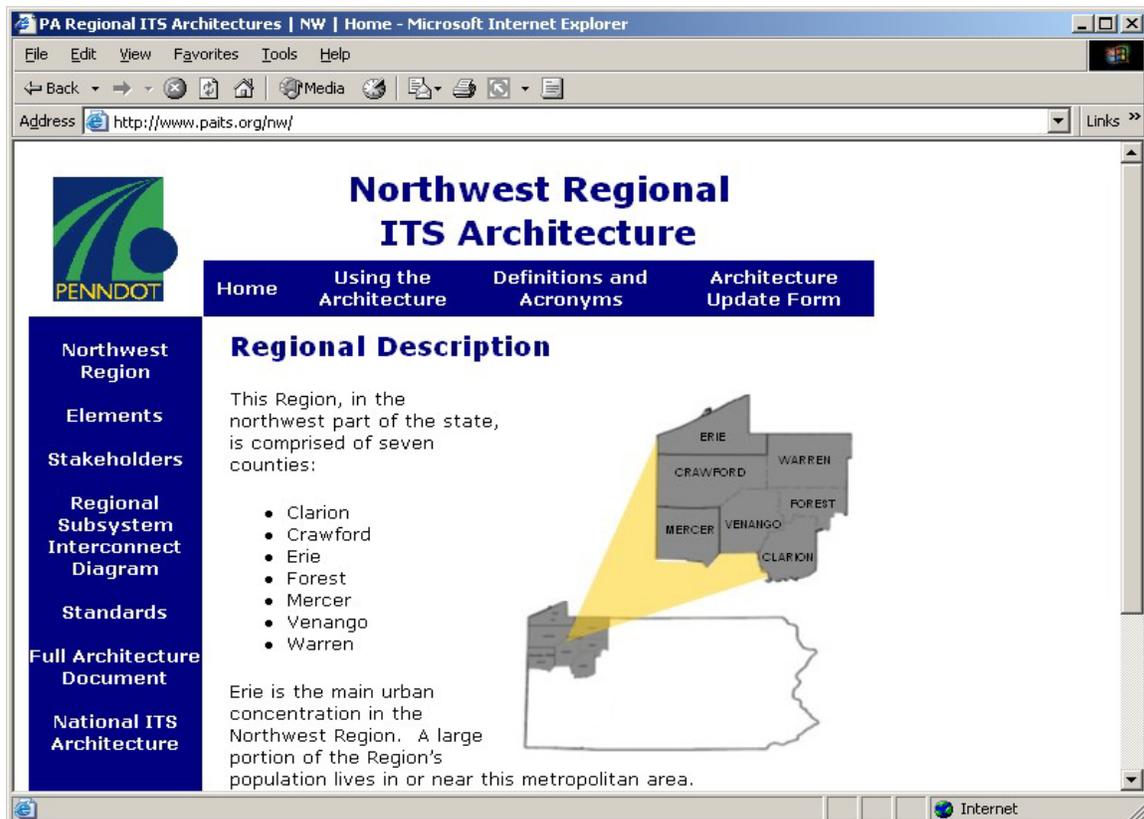


Figure 1-3: Pennsylvania ITS Architecture Web Site

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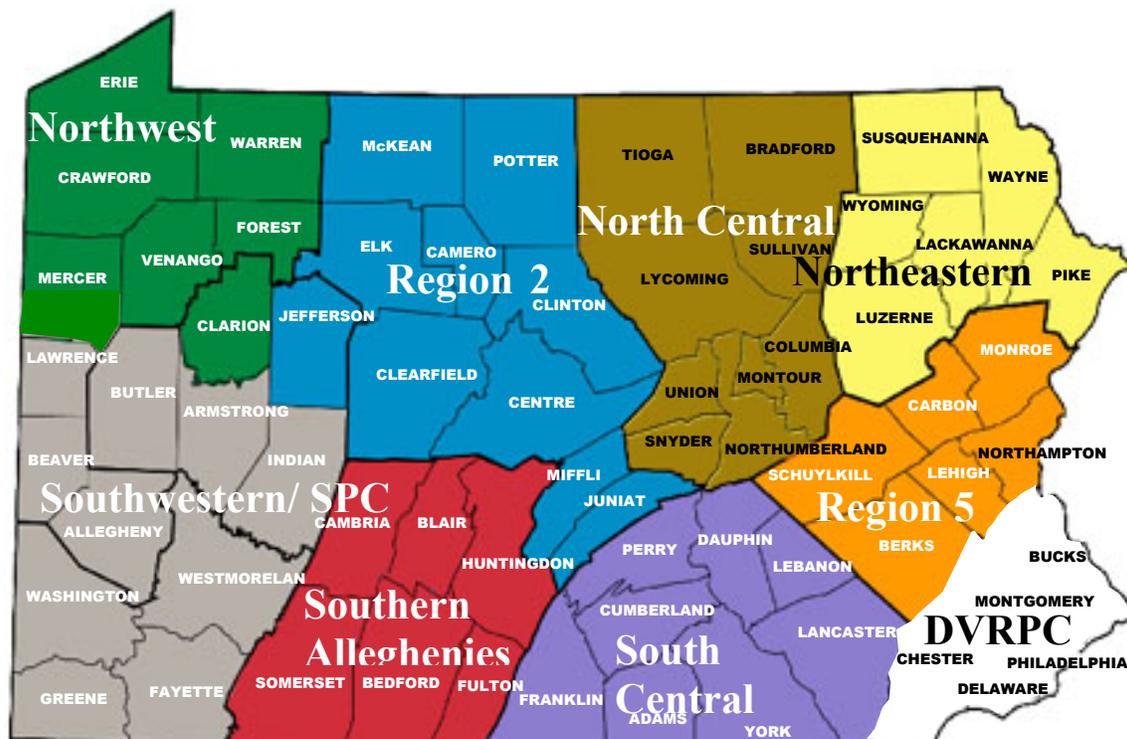


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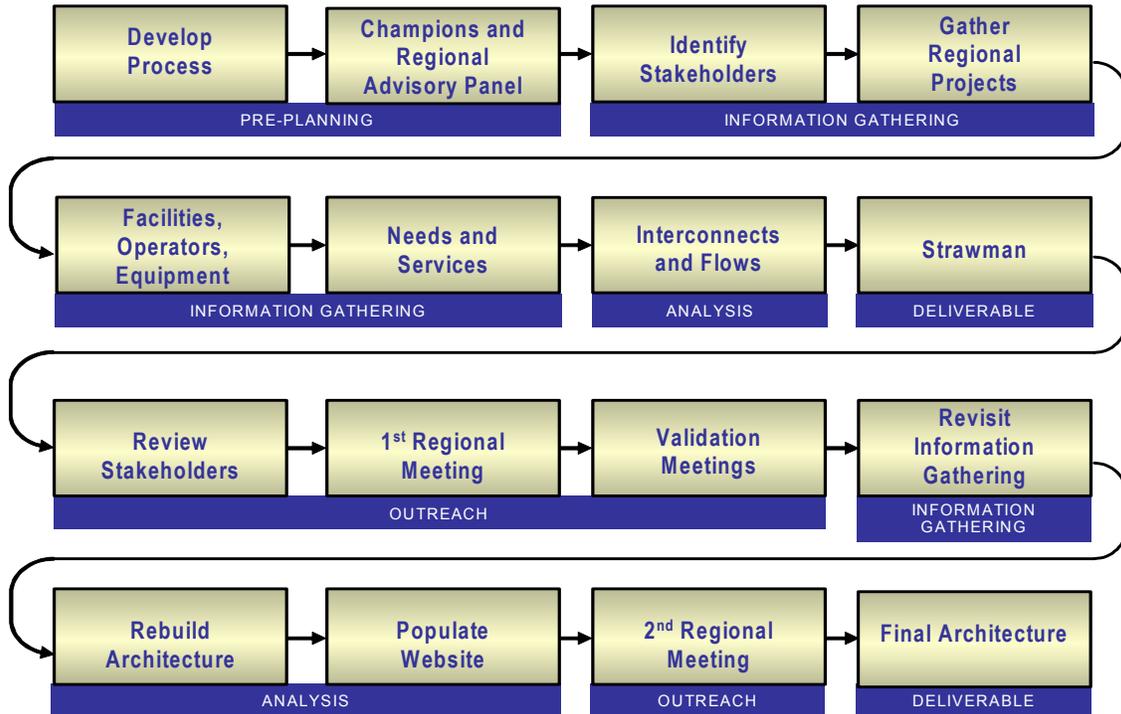


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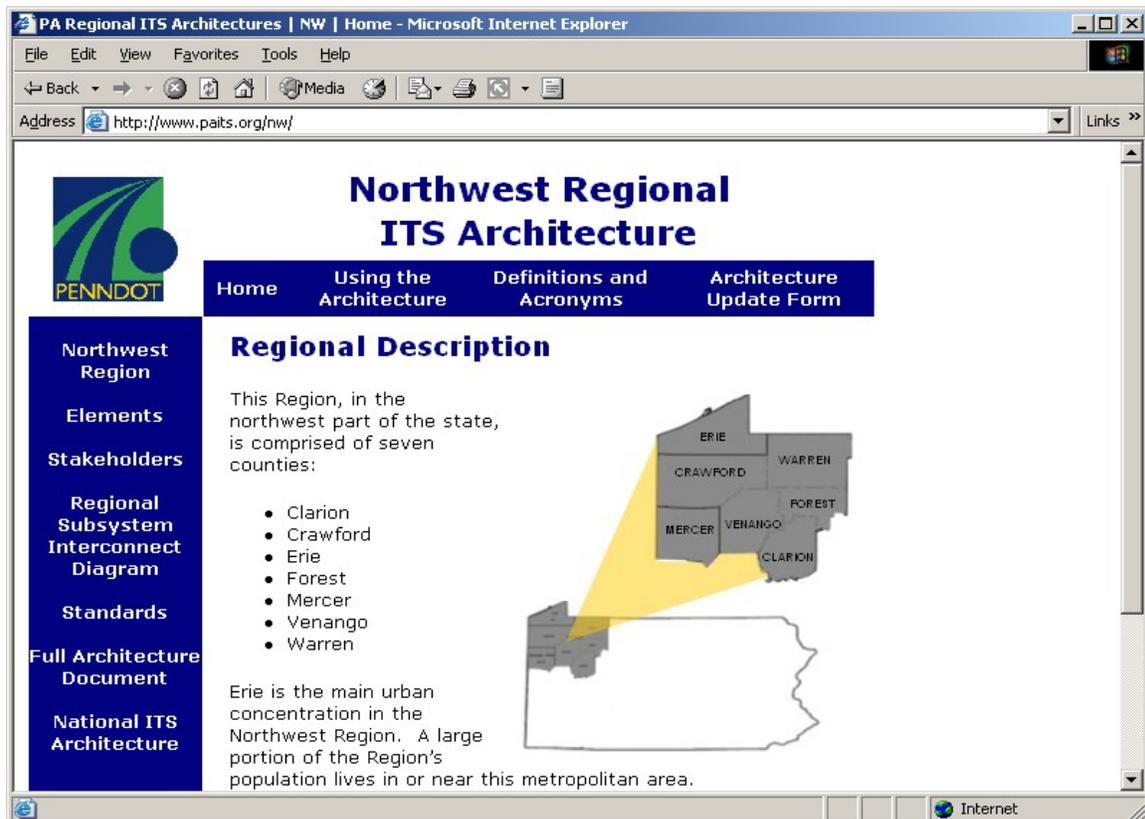


Figure 1-3: Pennsylvania ITS Architecture Web Site

From the Northwest Regional ITS Architecture Homepage (www.paits.org/nw), there are three ways to access information about a specific element:

1. Click on “Elements” and select any element from the list.
2. Click on “Stakeholders” and select the correct stakeholder, and then select an element.
3. Click on the “System Interconnect Diagram” for a sausage diagram of the Region that lists the elements grouped by type. Clicking on the element in the diagram will take you to page associated with the selected element.

After locating the page for a given element, users can download a PDF file that includes the interconnect diagram and architectural flow diagrams.

Definitions of Architecture terms, acronyms, information flows, and subsystem terminators are also included on the website.

1.3 Utility of the Architecture

Developing, maintaining, and utilizing the ITS Architecture offers a range of significant benefits to the adopting Region. These benefits include the following:

- A Regional ITS Architecture enables planning and deployment to occur in an organized and coordinated manner. It offers a framework for systematically identifying and evaluating prospective solutions to the transportation problems in the Region. It establishes an environment for inter-agency cooperation and coordination. Stakeholders across the Region may use the Architecture to plan their ITS projects to support regional goals and priorities. Utilization of the Architecture also helps to ensure consistency among the state, regional, and local planning processes.
- A Regional ITS Architecture establishes institutional mechanisms that promote the development and deployment of ITS projects. The Architecture compels the Region to set up forums for the discussion of regional transportation requirements. These forums, in turn, encourage the building of relationships among transportation professionals and stakeholders across the Region—these professionals are thereby given opportunities to understand the needs, issues, constraints, etc. of other transportation sectors. As the regional dialogue expands, institutional barriers tend to crumble and the integration of disparate goals, concepts, approaches, and solutions is increasingly possible. With this institutional integration comes the sharing of technologies and information, so that innovative, region-wide thinking becomes a guiding principle in transportation planning and new, synergistic relationships take hold. Additionally, the Architecture provides the basis for updating the Transportation Plan, the Transportation Improvement Program (TIP), the Statewide TIP, and the State Implementation Plan (SIP).

- A Regional ITS Architecture promotes interoperability. The Architecture reveals to stakeholders the key interrelationships presently established in the Region and those planned for the future. These interrelationship requirements identify those areas where operational or technology bridges to multiple agencies are needed. In this way, the Architecture helps to anticipate and plan for the integration requirements between state, regional, and local systems. Significantly, the Architecture promotes adherence to consistent and uniform standards across the Region. By its very nature, it also ensures consistency in documentation of ITS elements across the Region.
- A Regional ITS Architecture encourages efficient investment. As prospective new ITS projects are identified in the Region, they can be “plotted” on the Regional Architecture and their interrelationships with existing and planned components assessed. This lessens the probability that a particular project will result in a “dead-end” investment. It also helps planners to identify and invest in projects capable of addressing multiple needs, such as automated vehicle location (AVL) systems that can both improve on-road performance and inform customers of status conditions. In general, the Architecture offers regional stakeholders a basis for prioritizing ITS projects and making sound investment choices.
- A Regional ITS Architecture satisfies the Federal mandate. The mandate of the U.S. Federal Highway Administration (FHWA) requires that Regional ITS Architectures be completed by April 2005, in order for stakeholders in the Region to continue using Federal funds for the development and deployment of ITS projects. Consequently, promulgation of Regional ITS Architectures is necessary for continued access to Federal funds for ITS deployment.

1.4 ITS Standards

ITS standards are industry-consensus standards that define how system components operate within a consistent framework. By specifying how systems and components interconnect, ITS standards promote interoperability.

A seamless transportation system relies on clear communication between agencies, systems, and individuals. To ensure that different entities can communicate, the systems must be designed according to standards. For PennDOT, this might mean systems that can exchange data between regional and statewide centers. At the local level, this can mean data exchanges between jurisdictions concerning incidents, congestion, and signal timing plans.

An interoperable and seamless transportation system provides several benefits. Transportation agencies are now increasingly communicating with law enforcement, as police are usually the first to learn of incidents. Many transportation agencies are linking their transportation management centers with police dispatch. When systems are interoperable, police and emergency units can respond faster to crashes; this often

relieves congestion and improves safety. In an emergency, quick and reliable communication is even more crucial.

To accrue the benefits noted above, systems and the underlying equipment must be designed according to standards that enable interoperability. Future systems and equipment should be designed to meet these standards. Existing systems and equipment, additionally, should be updated to meet the standards.

The USDOT's ITS Standards Program is working with existing standards development organizations (SDO's) to establish a national collection of ITS standards. The following organizations participate in ITS standards activities:

- AASHTO (American Association of State Highway and Transportation Officials)
- 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)

The following organization oversees the development of ITS standards:

- ANSI (American National Standards Institute)

For more information on ITS standards, visit www.standards.its.dot.gov or www.ntcip.org.

To identify ITS standards applicable to the Northwest Regional ITS Architecture, visit the National ITS Architecture website. This site provides a listing of all National ITS Architecture information flows and their associated standards. A Northwest ITS Architecture user can access applicable ITS standards by:

1. Viewing the information flow diagrams in the Northwest Regional ITS Architecture document.
2. Visiting the National ITS Architecture website:
<http://itsarch.iteris.com/itsarch/html/af/padde.htm>
3. Identifying a specific Architecture Flow, by name, in the Regional ITS Architecture document, clicking on that Architecture Flow name on the National ITS Architecture website, and the reviewing the details under "Standard Activities."

The current ITS standards—or pertinent standards activities—will be displayed for the information flow that the user specifies.

1.5 Maintaining the Architecture

As ITS projects are planned and implemented, the Regional ITS Architecture will need to be updated to reflect the new ITS priorities and strategies emerging through the transportation planning process. The Regional ITS Architecture is not a static document, but rather is a “living” document. The ITS Architecture must grow and adapt as plans change, ITS projects are implemented, and ITS needs and services evolve in the Region.

In order to serve as a regional framework, the Regional Architecture must be maintained so that it continues to reflect the current and planned ITS systems, interconnections, etc. The following circumstances or conditions may all trigger the need to make changes to the Architecture:

- Changes in Regional needs. Regional ITS Architectures are created to support transportation planning in addressing regional needs. Over time, these needs can change and the corresponding aspects of the Regional ITS Architecture that address these needs may have to be updated. These changes in needs will also typically be expressed in updates to planning documents, such as regional transportation plans.
- New stakeholders. As new stakeholders become active in ITS, the Regional ITS Architecture should be updated to reflect their place in the regional view of ITS elements, interfaces, and information flows. Why might new stakeholders emerge? The stakeholders might represent new organizations that were not in place during the original Architecture development. Maybe the geographic scope of the Architecture is being expanded, bringing in new stakeholders. Perhaps additional transportation modes or transportation services are being considered that touch the systems of additional stakeholders.
- Changes in scope of services considered. The range of services considered by the Regional ITS Architecture expands. This might happen because the National ITS Architecture has been expanded and updated to include new user services or to better define how existing elements satisfy the user services. A Regional ITS Architecture based on an earlier version of the National ITS Architecture should take into consideration these changes as the Regional ITS Architecture is updated. The National ITS Architecture may have expanded to include a user service that has been discussed in the Region, but not included in the Architecture, or was included in a cursory manner. Changes in the National ITS Architecture are not, of themselves, a reason to update a Regional ITS Architecture, but the Region may want to consider new services in the context of their regional needs.
- Changes in stakeholder or element names. An agency’s name, or the name used to describe their element(s), undergoes change. Transportation agencies occasionally merge, split, or just rename themselves. In addition, element names may evolve as projects are defined. The Regional ITS Architecture

should be updated to use the currently correct names for both stakeholders and elements.

- Changes in other Architectures. A Regional ITS Architecture covers not only elements and interfaces within the Region, but also interfaces to elements in adjoining Regions. Changes in the Regional ITS Architecture in one Region may necessitate changes in the Architecture in an adjoining Region to maintain consistency between the two.

There are also several changes relating to project definition that will cause the need for updates.

- Change due to project definition or implementation. When actually defined or implemented, a project may add, subtract, or modify elements, interfaces, or information flows from the Regional ITS Architecture. Because the Regional Architecture is meant to describe the current (as well as future) regional implementation of ITS, it must be updated to accurately reflect how the developed projects integrate into the Region.
- Change due to project addition/deletion. Occasionally a project will be added or deleted through the planning process, or even during project delivery. Some aspects of the Regional ITS Architecture that are associated with the project may be expanded, changed, or removed.
- Change in project priority. Due to funding constraints or other considerations, the planned project sequencing may change. Delaying a project may have a ripple effect on other projects that depend on it; conversely, raising the priority for a project's implementation may impact other projects that are related to it.

The purpose of maintaining the Architecture is to keep it current and relevant, so that stakeholders will use it as a technical and institutional reference when developing specific ITS project plans. In order to maintain the Architecture, three decisions must be discussed:

- Who — Who will lead and implement the maintenance effort?
- When — When will the Regional ITS Architecture change be updated?
- What — What parts of the Regional ITS Architecture will be maintained?
- How — How will the Architecture be maintained?

Who Will Maintain the Architecture?

In cooperation with the Pennsylvania ITS Architecture Regions, PennDOT Central Office expects to utilize a statewide approach to maintaining the Commonwealth's nine Regional ITS Architectures. Although PennDOT Central Office will lead the

maintenance effort in the Northwest Region, *all* stakeholders will still need to participate in the process. Maintenance of the Architecture is a recurring, long-term effort that requires inputs from all stakeholders in the Region.

When Will the Architecture be Updated?

The Regional ITS Architecture is expected to be updated every four years to coincide with updates to long-range plans throughout the Commonwealth. There will be a process planning effort prior to the update in order to ensure statewide consistency of the updates. This timeframe will be used throughout the state. The next update to the Northwest Regional ITS Architecture is projected to be completed by Autumn 2008.

What Will be Maintained?

The constituent parts of the Regional ITS Architecture that will be maintained is referred to as the “baseline.” The baseline of the Regional ITS Architecture for the Northwest Region includes:

- Description of the Region. This description includes the geographic scope, functional scope, and architecture horizon. Geographic scope defines the ITS elements within the Region. Functional scope defines which services are included. Architecture horizon is the distance (in years) into the future that the Architecture will consider.
- Regional ITS Projects Matrix. The matrix includes a list of existing and planned ITS projects for the Region.
- List of stakeholders. The listing and description of ITS Stakeholders in the Region should be revised as stakeholders evolve, consolidate, or separate.
- List of elements. The inventory of ITS elements is a key aspect to the Architecture. Changes in stakeholders, as well as operational concepts, may impact the inventory of elements. Furthermore, implementation and planning status may change (i.e., change from planned to existing).
- Systems Inventory. Links the ITS Projects Matrix to Regional elements. Additionally, the Systems Inventory defines the functionalities of the elements.
- Needs and Services Tables. The Needs and Services Tables define the existing and future flow of information being shared between elements. The Needs and Services tables serve as the building blocks for the programming/building of the Architecture.
- Interconnect diagrams. Interfaces between elements define the interactions between one another. They provide information on “who” is talking to “whom.”

- Information flow diagrams. Information flows between elements define the details of the Architecture. They are the detailed description of how elements interact or will interact in the future. This is the key aspect of the baseline and will likely see the greatest amount of change.
- Applicable ITS Standards. The selection of standards depends on the information exchange requirements. The maintenance process should consider how ITS standards may have evolved and matured since the last update.

How Will the Architecture be Maintained?

PennDOT Central Office will be responsible for updating the aforementioned parts of the Regional ITS Architecture. In order to document the necessary changes to the Regional ITS Architecture, the Pennsylvania ITS Architecture website (www.paits.org) will be utilized as a tool for tracking changes to the Architecture.

All stakeholders in the Region involved in ITS project activity will be responsible for documenting additions, changes, and updates to the ITS Architecture.

To document an update, go to the Northwest Regional ITS Architecture Homepage (www.paits.org/nw) and follow these steps:

1. Select the “Architecture Update Form” at the top of the screen. This link takes you to the requisite form.
2. Complete the “Architecture Update Form.” The form, shown on the following page allows a stakeholder to suggest an update to the Architecture. The form is broken into five sections: (1) Contact Information, (2) New ITS Project, (3) New Stakeholder, (4) New Element, and (5) Other Changes. Each section is described below:
 - Contact Information — Contains contact information (name, organization, email, and phone number) so that the stakeholder submitting the form can be contacted in the future.
 - New ITS Project — Future ITS projects considered for State and/or Federal funding should be documented in this section. Project name, stakeholder, type of funding requested, location, deployment date, and a brief description of the project should be inputted here.
 - New Stakeholder — Requests for new stakeholders and changes to stakeholder names/descriptions should be identified in this section of the form. The status, existing or planned, should also be identified.
 - New Element — Requests for a new element and changes to element names/descriptions should be identified in this section of the form. The status, existing or planned, should also be identified.

- Other Changes — Other changes to the Regional ITS Architecture can be documented in this section.
3. Submit the “Architecture Update Form.” The form can be submitted by clicking on the “Submit” button on the bottom of the webpage. Once submitted, the form will be sent to the webmaster who will compile the information. The information will be utilized for the next update to the Regional ITS Architecture.
 4. Once the “Architecture Update Form” has been submitted, the information will be sent to the webmaster. The webmaster will compile the information and post it on the Architecture website. Once posted, the information can be accessed by (1) clicking on the “update list” link at the top of the “Architecture Maintenance Form” webpage or (2) going to <http://paitis.org/nw/update.htm>.

Northwest ITS Architecture Maintenance Form

Contact Information

Name of Submitter:	Submission Date:
Organization:	Phone Number:
Email Address:	

New ITS Project

Project Name:	
Stakeholders:	Funding: <input type="checkbox"/> Local Funding <input type="checkbox"/> State Funding <input type="checkbox"/> Federal Funding Details:
Location:	Deployment Date:
Project Description:	

New Stakeholder

Stakeholder Name:
Status: <input type="checkbox"/> Existing <input type="checkbox"/> Planned
Stakeholder Description:

New Element

Element Name:	Stakeholder:
Status: <input type="checkbox"/> Existing <input type="checkbox"/> Planned	
Element Description:	

Other Changes

Other Changes:

Contact the [PAITS Webmaster](#) with questions and comments.

1.6 Moving Forward/Institutionalizing ITS

Across the State, PennDOT has enjoyed strong commitment to ITS deployment initiatives, some through traditional funding mechanisms and most through federal funds earmarked for ITS. In virtually all Regions, there is an increasing emphasis on regional deployments and coordination among public agencies, illuminated by the cooperative effort displayed by the creation of Regional ITS Architectures. An integral part of the ITS planning, agency coordination, and program development activities is the cooperation and coordination with PennDOT Districts, MPO's and/or RPO's throughout the State that overlap, and regional stakeholders.

The application of advanced technologies to solve some of the transportation-related problems was first initiated by staff from DVRPC in the Philadelphia Region a few decades ago. Since then, there is a fully integrated system in place in Pittsburgh and operation centers are being explored in many other areas of the State. However, only since 2002, has there been a concerted effort to consolidate all of the individual ITS efforts by each agency and jurisdiction into a comprehensive and consolidated plan, starting with the creation of Regional ITS Architectures for each Region of the State that are coordinated and have statewide consistency.

Each regional agency represented in these Regional ITS Architectures has unique responsibilities for planning, operating, maintaining, or monitoring the transportation system.

Responsibility for, and involvement with, ITS by key agencies in the Northwest Region has become a joint effort between PennDOT Districts, MPO's, and regional stakeholders. These groups, together, have assumed responsibility for coordinating regional ITS planning and deployment.

Figure 1-4 shows a map of the current PennDOT district boundaries by county. Figure 1-5 shows a map of the current MPO and RPO boundaries by county. The purpose of these figures is to give the reader context into the PennDOT district and MPO boundaries.

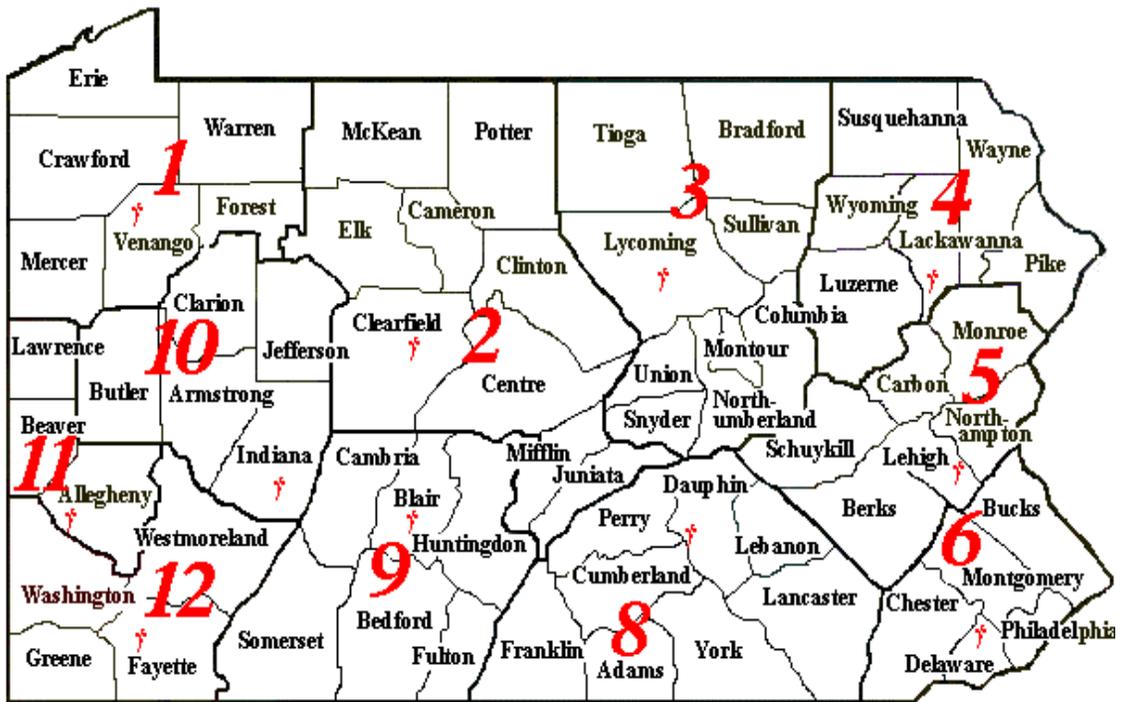


Figure 1-4: PennDOT District Map

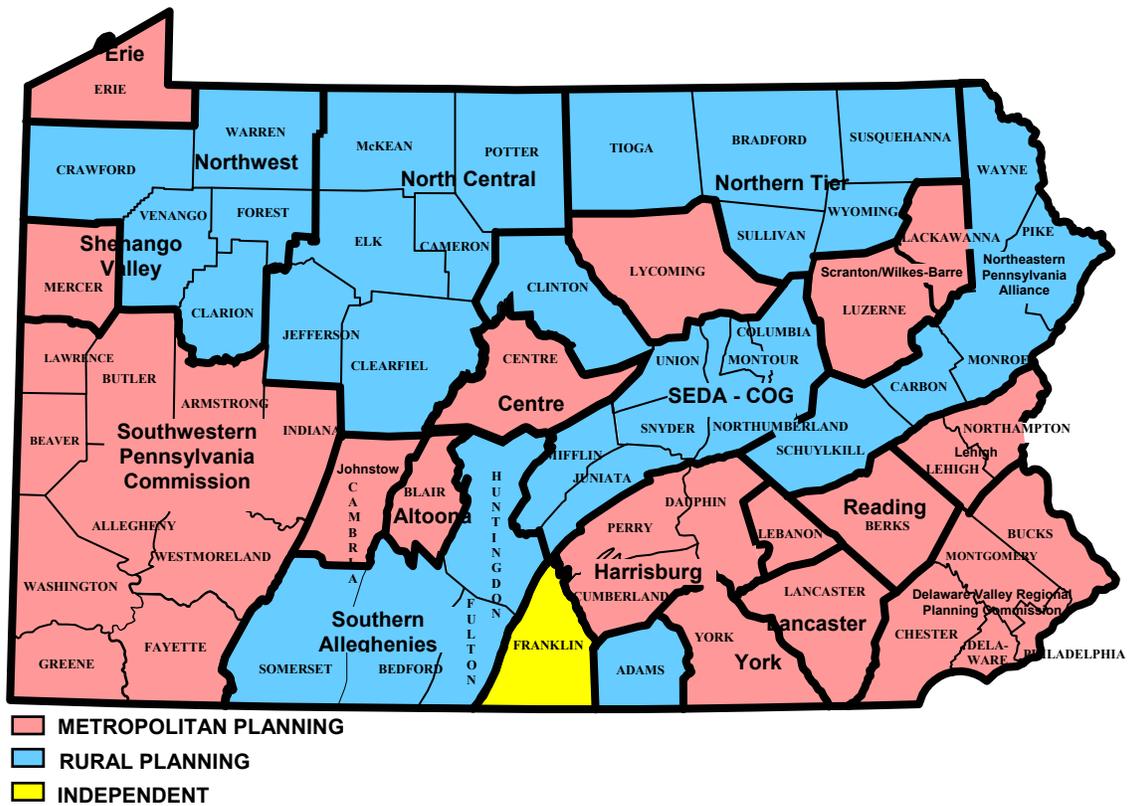


Figure 1-5: Pennsylvania MPO/RPO Map

Mainstreaming

To date, there have been ITS plans in place to cover a few metropolitan areas across the Commonwealth of Pennsylvania. These early plans have led to isolated, non-integrated ITS equipment being scattered throughout the State, except for in the Pittsburgh and Philadelphia Regions. The current deployments have primarily been PennDOT led. The ITS projects deployed to date have already produced important benefits for PennDOT and the traveling public. Unfortunately they have also led to questions about integration across boundaries and the costs, in labor and resources, associated with operating and maintaining these technology deployments.

The Regional ITS Architecture effort has helped to begin addressing these issues by, first, bringing regional agencies to the table to discuss regional technology deployment. Secondly, the Architectures have built a regional foundation for understanding the needs, applications, and linkages to the technologies that are currently deployed or scheduled to be deployed. Lastly, the ITS Architectures will set the stage for “mainstreaming” to occur.

“Mainstreaming” is, simply, getting technology issues in the transportation environment in front of the representative regional bodies for discussion, analysis, and decision making, in the same way that traditional transportation improvements are processed. ITS and operations can no longer be considered just a PennDOT initiative, but must now be viewed as requiring regional input.

Throughout the State, MPO’s and RPO’s will work with PennDOT and other regional stakeholders to include ITS as part of long-range plans that eventually spill into regional and statewide Transportation Improvement Programs (TIP’s). MPO’s and RPO’s should strive to go beyond the basic federal requirement of including transportation projects receiving certain types of federal funds in a Region’s TIP and use the TIP to highlight ITS projects. Project evaluation criteria used to select projects might now be modified in order for ITS projects to be fairly evaluated. Most traditional selection processes to date have excluded valuable ITS projects by not considering the regional needs and benefits associated with technology projects.

There are key factors that can contribute to increased coordination and mainstreaming of ITS within the transportation planning process throughout the Commonwealth of Pennsylvania:

- Creating and utilizing committees or task forces that foster ITS discussions and open communications.
- Cultivating support for ITS deployments, coordination, and integration from the administrators of influential state and regional transportation agencies.
- Creating committees to target coordination, integration, technical, and policy issues.

- Learning from previous ITS deployments.
- Instilling trust in representatives of area agencies in the responsibilities and performance of the MPO, RPO, PennDOT, and regional stakeholder staff that enable them to mainstream ITS and coordinate the area's ITS/Operations efforts.
- Encouraging advocacy for ITS initiatives among top managers.
- Incorporating ITS projects in the Region's long-range transportation plans.
- Developing ITS programs and plans.
- Utilizing the Regional ITS Architecture.
- Including ITS projects within the TIP.
- Utilizing enhanced criteria for selecting ITS projects for inclusion in the TIP.
- Educating elected officials and agency administrators in ITS terminology and strategies.
- Educating other prime stakeholders (beyond traditional transportation agencies) about ITS.
- Educating MPO and RPO staff about ITS.
- Conducting scanning reviews to ITS deployments in external regions and states.

MPO, RPO, and PennDOT Role

Throughout the State, transportation officials can look to the MPO/RPO to function in the role of ITS facilitator, ITS educator, and ITS project funding prioritizer. The MPO/RPO is often best able to provide a regional context for projects in geographic areas with many political boundaries and to better understand the experiences of a traveling public that tends to have minimal interest in the jurisdictions they pass through. The MPO/RPO has historically been able to recognize the different philosophies of sub-regions and fuse these philosophies into common goals and priorities when working on regional projects. In addition, the MPO/RPO offers a direct conduit to the politicians and is, therefore, seen as the only entity fully capable of educating elected officials about ITS regional applications.

MPO/RPO staff members must recognize, however, that their involvement with specific ITS projects relies on invitations to participate from the sponsoring agencies, such as PennDOT. Inclusion in non-planning activities is generally possible because the MPO/RPO staff have an established record of being knowledgeable, cooperative, and trustworthy. The MPO/RPO staff has earned the respect of the Region not only from their collective knowledge and responsiveness, but also because they have not

overreached their authority. Indeed, when the MPO/RPO staff is knowledgeable about ITS applications, good listeners, and not prone to pressing a narrow agenda, the process to mainstreaming ITS products and services is much simpler since the agency most attuned to the transportation planning process is also the agency most trusted. These conditions may prove to be the most critical toward mainstreaming ITS in the transportation planning process.

Regional ITS Coordination Committees

Regional agencies should consider coordinating all regional ITS efforts into a single regional operations plan. To do this, a committee composed of transportation agencies and operators should be formed. There should be a policy body and a technical body to the committee. This plan should then be used as input into the regional long-range plan.

Elected officials and transportation managers sometimes use or form committees through which they act as regional advocates for ITS. These can be non-profit government organizations composed of elected officials, as well as business interests. The primary goal of these committees is generally to use technology to improve mobility through political and project advocacy. On an annual basis, the committee members adopt a set of projects with regional significance; these include ITS products and services promoted to municipal managers and local transportation officials.

In some metropolitan areas around the country, elected officials and transportation managers have personally taken on the responsibility to act as advocates for ITS products and services. Strong leadership from top management of transportation providers can elevate ITS throughout the Region.

ITS technologies tend to be most useful when planned and deployed from a regional perspective that cuts across geographic boundaries, agencies, and transportation modes. A wide range of stakeholders should have input into ITS planning and deployment activities since many of these agencies will be required to operate these systems or provide coordination and information to enable these systems to function efficiently. This requires elected officials and staff within—and across agencies—to communicate and coordinate with one another. It can, however, be difficult to plan for and deploy ITS within a Region, especially in areas comprised of many local autonomous communities.

One role of a regional committee is to aid in coordinating ITS activities across jurisdictions and agencies. In keeping with the coordinating role, the committee can form a workgroup to improve procedures for incident clearance and make the procedures more uniform within the Region. The workgroup can consist of law enforcement personnel, MPO staff, DOT staff, and officials from select municipalities.

Endorsement of ITS

Public endorsement of ITS products and services demonstrates to all regional stakeholders that ITS is accepted as a tool to solve transportation problems and will be seriously considered as a funding option in the Region's transportation planning process. Elected officials are the most important people from whom to garner support for ITS since they make funding decisions and can influence support by other stakeholders. It is also important for mid- and upper-level transportation managers to support ITS since they inform elected officials and guide funding decisions within their respective transportation organizations. To gain their support, elected officials and transportation managers need to be provided with data and information that define ITS products and services, explain how the technologies are used, and detail the benefits of ITS that can potentially accrue.

In the Northwest Region, regular updates from the MPO's to elected officials should be considered during ITS program planning, and implementation. For example, to secure support, the MPO's can brief officials on the logical arguments supporting freeway management in order to receive congestion information and show relationships among incidents, congestion, and air pollution. Local problems can be highlighted and then examined in terms of how ITS products and services can help solve these problems. The message is that transportation professionals in the Region should aggressively manage traffic and focus on reliability and mobility.

Education

Education can improve coordination across jurisdictions and modes in several ways, including increasing awareness of ITS products and services, reducing tensions between agencies representing different transportation modes, and getting planners and operations staff to understand each other's responsibilities and terminology. A lack of awareness of ITS products and services, and their associated benefits, hinders the routine consideration of ITS technologies in a Region's planning and deployment processes. Until a few years ago, ITS education was primarily the responsibility of each agency considering ITS. However, MPO staff should consider taking the lead in creating and providing programs to educate regional stakeholders.

There are many forums available for educating and training transportation professionals in ITS, and not all require a formal classroom setting. For instance, "scanning tours" take place outside a classroom. These tours enable participants to learn how to use the technologies and then interject some first-hand knowledge about the equipment being analyzed into the ITS discussion. Invitees to these scanning tours can consist of:

- County commissioners,
- Executive boards,
- Policy boards,
- Transit operations staff,
- MPO staff,
- Politicians, and

- Public safety officials.

A mixture of upper management, operations, and policy people should be considered. Scanning tours should be taken at the beginning of regional planning efforts or when exposure is needed in advance of a specific project to help decision-makers conceptualize what they need. Elected officials and transportation managers can also become educated about ITS technologies, products, and services by participating on regional, statewide, or national committees, especially those established to consider ITS solutions.

Training courses are available for stakeholders in the Region to learn more about ITS. Such courses are available through the National Highway Institute (NHI) at the following website:

<http://www.nhi.fhwa.dot.gov/default.asp>

National ITS Architecture and Turbo Architecture training are available through the U.S. Department of Transportation. Information on training can be found at the following website:

<http://itsarch.iteris.com/itsarch/html/training/training.htm>

2 Architecture Scope

This section summarizes the study's scope of services and identifies the matrix used to assess "conformity." The Conformity Matrix, developed by the Statewide Working Group, is specific to Pennsylvania and has been used in every Region across the Commonwealth to ensure statewide consistency. Descriptions of the Region, regional stakeholders, and existing regional ITS projects are also included in this section.

2.1 Scope of Services

At the outset of the study, the Northwest Architecture Region's Regional Advisory Panel (RAP) determined that the Region would need to work through all five of the study tasks required to develop the Regional ITS Architecture. The five tasks are:

- Define an Architecture Scope,
- Inventory Systems and Define Needs, Services, and an Operations Coverage,
- Generate a Strawman Regional ITS Architecture,
- Conduct Outreach to Validate the Regional ITS Architecture, and
- Finalize the Regional ITS Architecture.

Consistent with its mandate, the RAP oversaw execution of the Architecture development methodology.

2.2 Conformity Matrix

The Pennsylvania Architecture Checklist, specified in the Phase I Report, that preceded the Architecture study, was used to verify compliance of the Northwest Regional ITS Architecture with the prescribed methodology. By checking off the bulleted list of outputs and considerations in the checklist tables, below, a Region and State ensures conformity with the Federal Mandate and consistency among the Architectures.

Compliance of the Northwest Regional ITS Architecture with the Pennsylvania Architecture Checklist is validated in the following tables:

Checklist Table #1

Key Task To Complete	Key Outputs from Task to Include in Regional ITS Architecture (Do we have?)	Considerations and Conformity & Validation Checks (Did we consider and address?)
Define the Regional Architecture Scope	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Description-of-region map and text, that includes: <ul style="list-style-type: none"> ✓ Geographic area (Districts, Counties, Cities, Corridors) ✓ Service boundaries, major roadway systems ✓ Relationship among jurisdictions within Region ✓ Relationship to adjacent Regions and jurisdictions <input checked="" type="checkbox"/> Existing projects matrix (key projects only), that includes: <ul style="list-style-type: none"> ✓ Project description ✓ Impacts on Region ✓ ITS components ✓ Timetables <input checked="" type="checkbox"/> Scope of services summary (If Not Previously Developed), that includes: <ul style="list-style-type: none"> ✓ Regional stakeholders list ✓ Owners and operators of ITS systems in Region ✓ Entities with stake or interest in Regional transportation issues ✓ Conformity requirements matrix 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Has a Regional Champion been identified? <input checked="" type="checkbox"/> Have traditional, existing, transportation planning documentation been reviewed? <input checked="" type="checkbox"/> Is there consistency between regional scope and transportation plans? <input checked="" type="checkbox"/> Is there consistency between Regional scope and National ITS Architecture

Checklist Table #2

Key Task to Complete	Key Outputs from Task to Include in Regional ITS Architecture (Do we have?)	Considerations and Conformity & Validation Checks (Did we consider and address?)
Develop an Inventory of Regional Systems & Define Regional Needs, Services, and Operational Concept	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> System inventory, that includes: <ul style="list-style-type: none"> ✓ System name(s) ✓ Descriptions ✓ Status (existing or planned) ✓ Associated subsystems/terminators in National ITS Architecture ✓ System owner/operator (stakeholders and system elements) <input checked="" type="checkbox"/> Needs and services summary, that includes: <ul style="list-style-type: none"> ✓ Regional needs ✓ ITS services (planned or implemented) <input checked="" type="checkbox"/> Operations coverage that includes: <ul style="list-style-type: none"> ✓ Operational roadways. ✓ Assignment of operational coverage 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Is there completeness and consistency of the inventory among stakeholders? <input checked="" type="checkbox"/> Is the conformity to and compatibility with the Architecture? <input checked="" type="checkbox"/> Has the Region considered the following: <ul style="list-style-type: none"> ✓ System operations that extend beyond Regional boundaries ✓ Impacts on contiguous Regions or jurisdictions ✓ Operational characteristics along corridors and at local levels ✓ Locations and operational characteristics of planned traffic operations centers (TMC) ✓ Working relationship among stakeholder organizations

Checklist Table #3

Key Task to Complete	Key Outputs from Task to Include in Regional ITS Architecture <i>(Do we have?)</i>	Considerations and Conformity & Validation Checks <i>(Did we consider and address?)</i>
<p>Generate Strawman (Rough Draft) Architecture</p>	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Develop a Regional systems interconnect summary, that includes: <ul style="list-style-type: none"> ✓ Diagram of actual and potential connections between subsystems ✓ Connection status (existing or planned) for each connection <input checked="" type="checkbox"/> Develop Regional information flow diagrams, that include: <ul style="list-style-type: none"> ✓ Descriptive name for the information ✓ Information flow status (existing or planned) ✓ Direction of information flow <input checked="" type="checkbox"/> Develop a Regional Strawman Architecture, that includes: <ul style="list-style-type: none"> ✓ Architecture approach ✓ Needs & services ✓ Systems inventory ✓ Interconnects ✓ Information flows 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Have the interconnections and information exchanges across Regional boundaries been identified? <input checked="" type="checkbox"/> Has the ability of the communications infrastructure to support the proposed interconnections been addressed at a high-level? <input checked="" type="checkbox"/> Is there completeness and consistency in the interconnects summary? <input checked="" type="checkbox"/> Is there completeness and consistency among the information flow diagrams? <input checked="" type="checkbox"/> Is there consistency and compatibility with the completed or evolving Architectures in other Regions in the state? <input checked="" type="checkbox"/> Is there conformity and compatibility with the National ITS Architecture?

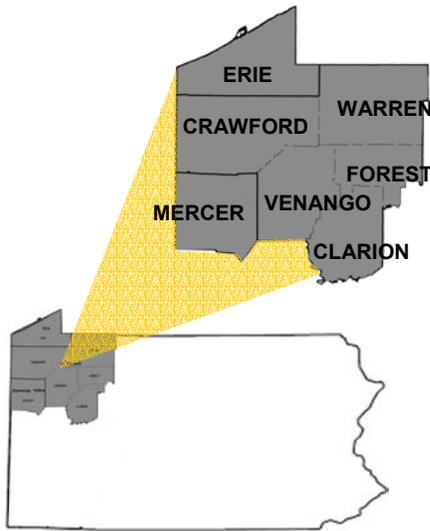
Checklist Table #4

Key Task to Complete	Key Outputs from Task to Include in Regional ITS Architecture <i>(Do we have?)</i>	Considerations and Conformity & Validation Checks <i>(Did we consider and address?)</i>
<p>Conduct Outreach to Validate Architecture</p>	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Develop Stakeholders' guide to Regional Architecture, that could include: <ul style="list-style-type: none"> ✓ Background on Regional Architecture project ✓ Stakeholder review and validation process ✓ Glossary of technical terms <input checked="" type="checkbox"/> Documentation of stakeholder inputs <input checked="" type="checkbox"/> Refined and validated Architecture 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Have real-world and program issues been considered? <input checked="" type="checkbox"/> Have any unusual institutional Issues been identified? <input checked="" type="checkbox"/> Have any specialized data-sharing requirements been identified? <input checked="" type="checkbox"/> Have political considerations been identified? <input checked="" type="checkbox"/> Have any other unique conditions, circumstances, or issues in the Region been identified? <input checked="" type="checkbox"/> Have Stakeholders from areas contiguous to the Region been involved? <input checked="" type="checkbox"/> Is there conformity with FHWA Regional ITS Architecture Assessment Criteria?

Checklist Table #5

Key Task to Complete	Key Outputs from Task to Include in Regional ITS Architecture <i>(Do we have?)</i>	Considerations and Conformity & Validation Checks <i>(Did we consider and address?)</i>
Finalize the Regional Architecture	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Final Regional ITS Architecture Document <input checked="" type="checkbox"/> Statewide Operations Framework Input <ul style="list-style-type: none"> ✓ Regional Architecture overview ✓ High-level Regional operations summary ✓ Relationship between Region and State 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Is there consistency and compatibility among the Regional ITS Architectures?

2.3 Description of the Region



This Region, in the northwest part of the state, is comprised of seven counties: Clarion, Crawford, Erie, Forest, Mercer, Venango, and Warren. The Northeastern Region encompasses PennDOT Engineering District 1-0. The Region is depicted in Figure 2-1.

Erie is the main urban concentrations in the Northwest Region. A large portion of the Region’s population lives in or near this metropolitan area.

Figure 2-1: Northwest ITS Architecture Region

Table 2-1 reveals that approximately 640 thousand people — or approximately five percent of statewide residents of the Commonwealth of Pennsylvania — live in the Northwest ITS Architecture Region. Approximately three quarters of the Region’s population resides in Crawford, Erie, and Mercer Counties, with the remainder scattered among the other three counties of the Region.

Table 2-1: Northwest ITS Architecture Region Population by County

County	% Population
Clarion	7%
Crawford	14%
Erie	44%
Forest	1%
Mercer	19%
Venango	9%
Warren	7%
Total Population in the NW Region	639,641

(Source: U.S. Census Bureau, 2000)

Table 2-2 compares specific population traits in Northwest to those across Pennsylvania and the U.S. generally. For instance, the Region is nominally more homogeneous than either the statewide or national populations — only 6.1 percent of the Northwest residents are classified as minorities. Similarly, the Region’s population skews older than the national average — the median age of NW residents is 37.9, as compared to 35 years nationally. Mean family size and per capita income resemble those across Pennsylvania and the United States.

Table 2-2: Comparison of Key Population Demographics Northwest ITS Architecture Region, Pennsylvania, and the United States

Demographic Factor	NW Region	Pennsylvania	United States
Total Population	639,641	12,281,054	281,421,906
% Minority Population	6.1%	14.6%	24.9%
Median Age (In Years)	37.9	38.0	35.3
Mean Family Size	3.04	3.04	3.14
Per Capita Income	\$17,223	\$20,880	\$21,587

(Source: U.S. Census Bureau, 2000)

Table 2-3 examines commuting patterns in the Region to the state and national commuting conditions. Four-out-of-five Northwest workers drive to work alone, higher than the state and national “drive-alone” rates. Ten percent of workers in the Region carpool to work, which is comparable to the statewide average. One percent of workers use public transportation; considerably less than state and national transit usage trends. The average one-way commute time for Northwest ITS Architecture Region workers is 25 minutes, which compares to the 25-26 minutes for Pennsylvania and U.S. workers generally.

Table 2-3: Comparison of Commuting Patterns Among Workers 16 & Over Northwest ITS Architecture Region, Pennsylvania, and the United States

Commuting Pattern	NW Region	Pennsylvania	United States
Total Workers 16 & Over	280,366	5,556,311	128,279,228
% Commuters Driving Alone	80.0%	76.5%	75.7%
% Commuters Carpooling	10.9%	10.4%	12.2%
% Commuters Using Public Transportation	0.9%	5.2%	4.7%
Mean Travel Time to Work (Minutes)	19.7	25.2	25.5

(Source: U.S. Census Bureau, 2000)

As shown in Table 2-4, the Northwest Region encompasses a substantial network of roadways. As reported in PennDOT's *2002 Highway Statistics*, the Region contains 9198 linear miles of roadway, signifying 7.6 percent of the Commonwealth's total linear mileage. This includes 3,749 linear miles of roadway maintained by PennDOT, with the remaining road miles maintained by the municipalities, etc.

Table 2-4: Northwest ITS Architecture Region Linear Miles

County	PennDOT Linear Miles	Total Linear Miles
Clarion	469.6	1,427.4
Crawford	909.9	2,432.8
Erie	778.8	2,569.6
Forest	206.5	541.4
Mercer	743.5	2,016.4
Venango	529.0	1,364.9
Warren	531.4	1,331.9
Regional Total	4,168.7	11,684.1
Statewide Total	39,905.5	120,297.7

Table 2.5 depicts the daily vehicle miles of travel (DVMT) across the Region, which is substantial. Total DVMT on all roadways in the Region, as reported in the *2002 Highway Statistics* was approximately 14.2 million miles. The DVMT on PennDOT roadways was approximately 17.3 million miles.

Table 2-5: Northwest Daily Vehicle Miles of Travel

County	PennDOT DVMT	Total DVMT
Clarion	1,528,684	1,727,410
Crawford	1,949,279	2,264,807
Erie	5,041,790	6,387,627
Forest	168,659	366,533
Mercer	3,178,477	3,666,478
Venango	1,433,438	1,668,510
Warren	931,528	1,263,210
Regional Total	14,231,855	17,345,575
Statewide	217,331,036	287,203,348

The Northwest ITS Architecture Region contains a range of important highway corridors. The most significant corridors are depicted in Figure 2-6.

Table 2-6: Significant Highway Corridors

Interstates	United States (U.S.) Routes	Pennsylvania (PA) Routes
Interstate 79 (I-79)	US Route 6 (US-6)	PA Route 8 (PA-8)
Interstate 80 (I-80)	US Route 19 (US-19)	PA Route 18 (PA-18)
Interstate 86 (I-86)	US Route 20 (US-20)	PA Route 58 (PA-58)
Interstate 90 (I-90)	US Route 62 (US-62)	PA Route 257 (PA-257)
	US Route 322 (US-322)	PA Route 97 (PA-97)
		PA Route 60 (PA-60)

The Northwest Region contains intermodal facilities and service providers that support passenger and freight, including:

- Erie International Airport,
- Erie Intermodal Transportation Center,
- Erie Amtrak Station, and
- Port of Erie.

The Northwest Region contains tourist attractions and travel destinations, including:

- Presque Isle State Park,
- Erie Bay front District,
- PennDOT Welcome Centers, and
- Mercer County Prime Outlets.

The Region is also home to multiple transit providers, including:

- Crawford Area Transportation Authority (CATA),
- Erie Metropolitan Transit Authority (EMTA),
- Transit Authority of Warren County (TAWC),
- Mercer County Community Transit (MCCT), and
- Shenango Valley Shuttle Service.

2.4 Regional Stakeholders

This section documents the Regional stakeholders defined by the RAP for inclusion and participation in the Regional ITS Architecture effort. Stakeholders are generally identified in terms of agencies and specific individuals in those agencies responsible for policy and operations. Agencies were selected by assessing the mission of operation of services related to the transportation system. Therefore Emergency Management Services (EMS), Incident Management (IM), ITS, Transit, and enforcement activities were all included. Planning agencies were included as well because capital and some Operations & Maintenance (O&M) funds are programmed through these agencies.

Adjacent State Emergency Management Agencies: Adjacent state Emergency Management Agencies responsible for coordinating state agency emergency response to support county and local governments in the areas of civil defense, disaster mitigation and preparedness, planning, and response to and recovery from man-made and natural disasters.

Adjacent State Public Safety Agencies: Local and statewide public safety agencies in New York and Ohio, the states that border the Region. These agencies are responsible for coordination activities related to common incidents at state borders, as well as major emergencies, disasters, and events that have impacts within the Region.

Adjacent State Transit Agencies: Agencies responsible for operating, maintaining, and managing public transportation services within Ohio and New York, the states that border the Region. Includes public and private agencies that operate transit services, primarily to move riders to and from metropolitan areas within the Region or adjacent states.

Commercial Vehicle Companies: Privately owned trucking companies responsible for the safe and efficient movement of goods using the transportation system in the Region. Services provided by various commercial vehicle agencies include the delivery of intermodal shipments (containers and trailers), bulk materials

(including chemical and HAZMAT products), and specialized cargo (legal, over-dimensional, and heavy haul shipments).

Counties: Clarion, Crawford, Erie, Forest, Mercer, Venango, and Warren county-level public safety agencies operating within the Region. Include emergency management agencies (EMA's), county police, and typically a county-wide 911 center.



Erie Metropolitan Transit Authority (EMTA): Erie Metropolitan Transit Authority (EMTA) operates fixed-route bus and paratransit operations (EMTA LIFT) within Erie County. The agency operates several vehicles, as well as a few Park-n-Ride lots within the Region, including the Erie Intermodal Transportation Center. For more information, visit the EMTA website (www.emtaerie.com).

Erie Municipal Airport Authority (EMAA): Owners and operators of Erie International Airport. Provide administrative services, as well as security and traffic operations within and around the airport. For more information, visit the EMAA website at (<http://www.erieairport.org/>).

General Public: The community or the people as a whole using the transportation system. The general public may be an automobile driver, transit passenger, computer, or cell-phone user obtaining travel information, or any other person interacting with the transportation system in the Region.

Mercer County Transit Agencies: Shenango Valley Shuttle Service (SVSS) and Mercer County Community Transit (MCCT) that operate transit services throughout Mercer County.

Municipalities: Pennsylvania cities, boroughs, or townships incorporated for local governments throughout the Region. Municipalities are responsible for local roads, which account for 70 percent of the Pennsylvania road system. Municipalities are also responsible for various local operations within its limits, including public safety (police, fire, and EMS) and traffic signal systems.



Pennsylvania Department of Transportation (PennDOT): The Pennsylvania Department of Transportation is the Commonwealth's statewide transportation agency responsible for building, maintaining, and operating the state's roads, bridges and tunnels. PennDOT consists of a single Central Office and 11 District Offices throughout the state.

PennDOT's Central Office consists of several internal organizations, including the Bureau of Maintenance and Operations (BOMO), Motor Carrier Division, Bureau of Planning and Research (BPR), Bureau of Highway Safety and Traffic Engineering (BHSTE), Bureau of Licensing, Bureau of Motor Vehicles, Bureau of Freights and Rails, Bureau of Information Systems, Communication Office of Information Technology, and

Press Office. PennDOT's Central Office oversees statewide operations and is responsible for coordination of transportation services between the 11 Districts.

PennDOT's District Offices are responsible for the design, operation, maintenance, and construction of state highways and bridges in their respective districts.

For more information, visit PennDOT's website (<http://www.dot.state.pa.us>).



Pennsylvania Emergency Management Agency (PEMA): The Pennsylvania Emergency Management Agency (PEMA) coordinates state agency emergency response, including the Office of the State Fire Commissioner and Office of Homeland

Security, to support county and local governments in the areas of civil defense, disaster mitigation and preparedness, planning, and response to and recovery from man-made and natural disasters. For more information, visit PEMA's website (<http://www.pema.state.pa.us>).

Pennsylvania Office of Homeland Security:

Pennsylvania Homeland Security addresses the security needs of the state. Developed in response to 9/11 the Homeland Security Office is focusing on a range of important security needs and services, including transportation-related issues. Potential high-threat topics — e.g., nuclear power plants, DOE shipments, chemical industry, major distribution of gas and electric utilities, and other target infrastructure — are all covered through the Office's Homeland Security mission. Initially, the ITS Architecture focuses on security issues as part of incident management. In the future, as the Office's mandate is refined, additional security services and needs are likely to be reflected in the Architecture.



Pennsylvania State Police (PSP): The Pennsylvania State Police is a full service statewide law enforcement agency that fulfills the law enforcement needs of the general public across the Commonwealth of Pennsylvania. Transportation services provided by the Pennsylvania State Police include: (1) incident response, (2) commercial vehicle inspections, and (3) law enforcement on state highways. For more information, visit the Pennsylvania State Police website (<http://www.psp.state.pa.us>).



Regional Media: The regional media consist of all regional/local television and radio stations that provide weather, traffic, and other information to the general public via means of mass communication.

Regional Transit Agencies: Includes agencies operating public transportation services within the Region, excluding Erie Metropolitan Transit Authority and Shenango Valley Shuttle Service. Includes Crawford Area Transportation Authority (CATA –

operating within Crawford County), Transit Authority of Warren County (TAWC – operating within Warren County), Clarion County Paratransit (operating within Clarion County), Area Transportation Authority (operating in parts of Clarion County), and VenanGO Bus (operating within Venango County).

Towing Industry: The towing industry consists of privately owned towing agencies in the Region responsible for incident cleanup and removal of vehicles at incident sites.

Various Stakeholders: This stakeholder represents several stakeholders within the Region working in conjunction to initiate, own, operate, and/or maintain transportation infrastructure within the Region.

Weather Information Providers: Public agencies and private companies that provide weather forecast information to transportation agencies, emergency response entities, media outlets, and the general public. The category includes the National Weather Service/NOAA, Accuweather, The Weather Channel, and others.

2.5 Regional ITS Projects

The Regional ITS Projects Matrix identifies ITS projects in the Region and provides a high-level description of the projects. The matrix denotes the status of each project, as follows:

- Existing — An ITS project that is deployed and operational.
- Planned 1 — A future ITS project that is programmed or formally documented by the MPO, DOT, transit agency, police, or other transportation stakeholder.
- Planned 2 — A future ITS project that is not programmed or documented.

The information on projects shown in the matrix (see Table 2-7) was collected from Regional or Municipal planning documents, or otherwise enunciated by members of the RAP. Regional stakeholders went through a process of defining projects as existing, planned 1, or planned 2. A planning horizon of 20 years was used as a criterion in determining those projects to include in the matrix.

Table 2-7: Regional ITS Projects

Stakeholder	Project	Status	Project Description
Commercial Vehicle Companies	Private Carrier Commercial Vehicle Tracking System	Existing	Commercial Vehicle Tracking System provides tracking information of all the trucks using the system. Commercial vehicles also have communication devices to communicate with the trucking agency on-route.
Commercial Vehicle Companies	Private Carrier Fleet Maintenance Management	Existing	This program provides capabilities to administer preventive maintenance schedules.
Commercial Vehicle Companies	FHWA Carrier Compliance Review	Existing	The FHWA Compliance Review process involves examining carrier records to ensure that the carrier meets all safety-related regulations and does not have unsafe operating practices.
Counties	County Emergency Operation Centers	Existing	County-wide emergency operations centers that can be activated to coordinate response agencies for various levels of emergency events.
Counties	Regional/County/Municipal PSAP/911 Centers	Existing	Public Safety Answering Points (PSAP) or 911 Centers to dispatch and manage resources for some incidents. Centers are run at several different jurisdictional levels, including regional, county, or local/municipal.
Counties	Erie County Emergency Management Agency Weather Data	Planned 1	Erie County Emergency Services has plans to deploy weather radar system at its facility using data likely provided by local television station.

Stakeholder	Project	Status	Project Description
Erie Metropolitan Transit Authority (EMTA)	EMTA Bus AVL	Planned 1	Erie Metropolitan Transit Authority has plans to put AVL in paratransit and fixed-route buses for tracking and transit management operations.
Erie Metropolitan Transit Authority (EMTA)	EMTA Multi-modal Transportation Management Center	Planned 1	EMTA has plans for multi-modal transit management center (Glenwood Center), which will have centralized management of transit operations, and possibly other modes (e.g., traffic management).
Erie Metropolitan Transit Authority (EMTA)	EMTA Traveler Information System	Planned 1	EMTA has plans to provide traveler information based on current bus locations. Real-time traveler information will be distributed through the dedicated EMTA Website, message signs at bus stops, as well as kiosks located at various public locations.
Erie Metropolitan Transit Authority (EMTA)	EMTA Automated Transit Fare Payment	Planned 2	EMTA has future need to deploy a fare payment system that collects fares from customer-owned smartcards that automatically deduct/add funds from an associated account. Payment transactions can be made either on the vehicles or through kiosks located at offices/stops.
Erie Metropolitan Transit Authority (EMTA)	EMTA Transit Fare Payment	Existing	EMTA currently has in-vehicle transit fare payment devices that track and then transfer payment information at the end of a vehicle route to a system in the EMTA garages.
Erie Metropolitan Transit Authority (EMTA)	EMTA In-Vehicle Emergency Notification	Existing	EMTA currently has pushbutton devices in transit vehicles to allow drivers to alert transit management operators of emergency situations.

Stakeholder	Project	Status	Project Description
Erie Metropolitan Transit Authority (EMTA)	EMTA Transit Vehicle Diagnostic Tracking System	Existing	EMTA currently has a system that tracks maintenance records by downloading data from in-vehicle systems.
General Public	Personal Traveler Information System	Existing	These systems allow users to access transportation related information through their personal information devices including personal computers, PDA etc.,
Mercer County Transit Agencies	Mercer County Transit Vehicle Diagnostic Tracking System	Planned 2	Mercer County transit agencies have future need for a system that tracks maintenance records by downloading data from in-vehicle systems.
Mercer County Transit Agencies	Mercer County Transit Automated Transit Fare Payment	Planned 2	Mercer County transit agencies have future need to deploy a fare payment system that collects fares from customer-owned smartcards that automatically deduct/add funds from an associated account.
Mercer County Transit Agencies	Mercer County Transit In-Vehicle Emergency Notification	Existing	Mercer County transit agencies currently have pushbutton devices in transit vehicles to allow drivers to alert transit management operators of emergency situations.
Mercer County Transit Agencies	Mercer County Community Transit (MCCT) Bus AVL and Dispatch	Existing and Planned 2	Mercer County Community Transit currently dispatches paratransit vehicles from center. Plans to have AVL in fixed-route buses for tracking and transit management operations.
Municipalities	Municipal Emergency Vehicle Preemption Expansion/Upgrade	Planned 1	Update outdated equipment, and expand on existing signal coverage, for emergency preemption systems on various public safety agency vehicles and municipal traffic signal systems within Erie County.
Municipalities	Municipal Public Safety Services	Existing	These services include fire, police, and EMS vehicles and personnel responding to incidents/emergencies.

Stakeholder	Project	Status	Project Description
Municipalities	Municipality Traffic Signal Systems	Existing and Planned 2	Several closed-loop traffic signal systems currently exist, and a few (including city of Erie) traffic responsive traffic signal systems are needed for in the region. Also, there is a need for manipulates to remotely monitor and control existing traffic signals
Municipalities	Municipal Traffic Intersection Video Detection	Planned 2	Municipal traffic management offices have future need to deploy signal system video detection equipment that will also provide general monitoring functionality.
Municipalities	City of Erie Traffic Signal System	Existing	City currently has a closed loop signal system with central control software. Software workstation is also located at PennDOT D1 Office.
PennDOT (Central Office)	Winter Road Condition Hotline for Interstate Highways	Existing	A hotline phone service that disseminates seasonal statewide road conditions including road closures, detours, alternative routes, work zone/ construction events, and road surface conditions.
PennDOT (Central Office)	Roadway Weather Information System (RWIS)	Existing	Road Weather Information Systems collect weather information/images throughout the state. RWIS information is made available to the public and transportation agencies via a webpage.
PennDOT (Central Office)	PennDOT Performance and Registration Information Systems Management (PRISM)	Existing	This project began as an effort to explore the potential of linking the Commercial Vehicle registration process to motor carrier safety.

Stakeholder	Project	Status	Project Description
PennDOT (Central Office)	PennDOT Safety and Fitness Electronic Record (SAFER)	Planned 1	SAFER is a software program that enables the enforcement community to transmit and receive data on CVO safety, credential, and inspection to and from the roadside.
PennDOT (Central Office)	PennDOT Transportation Management Centers (TMC's)	Planned 2	PennDOT intends to enhance existing Transportation Management Centers (TMC's), and establish new TMC's, to monitor and control the transportation system in partnership with other transportation operations providers.
PennDOT (Central Office)	PennDOT "Wizard" Work Zone Alert Radio	Planned 1	The alert radio alerts truck drivers to work zone conditions.
PennDOT (Central Office)	Statewide Telecommunication	Planned 2	This project would develop a statewide telecommunication system
PennDOT (Central Office)	Construction Projects (current and future)	Existing	This projects allows for road closure, work zone and construction information dissemination through PennDOT website.
PennDOT (Central Office)	Central Repository	Planned 2	This project would involve developing a central repository for information. The central repository information would include work zone information, real time traffic information, and accident information among others. The central repository will facilitate better coordination among various PennDOT offices and the customers.

Stakeholder	Project	Status	Project Description
PennDOT (Central Office)	Real -time Traffic Information Website	Planned 2	This project would include deployment of a real time traffic information website which would disseminate the following real time information: traffic information, incident information, work zone information and weather advisory information.
PennDOT (Central Office)	Statewide GIS based Incident Detour Map	Planned 2	This project would develop a statewide GIS based incident detour map for various major interstate routes. The statewide GIS based data would be consistent with the Counties' GIS data.
PennDOT (Central Office)	Video Sharing	Planned 2	This project would involve sharing of video images among various PennDOT Districts, PSP, PEMA, and other coordinating agencies.
PennDOT (Central Office)	Web site Portal for Assisting Commercial Vehicle Operators	Planned 2	In addition to the real time traffic information, this website would assist the commercial vehicle operators by providing video images, incident alerts, customized incident information/alerts, site restrictions. This website would also assist the commercial vehicle operators by reducing paper work necessary for their operations.
PennDOT (Districts 1-0 and 10-0)	PennDOT D1 and D10 (County Maintenance Divisions) Winter Maintenance Vehicle On-board Systems	Planned 2	Providing various technologies to facilitate maintenance of roadways during severe winter weather conditions. May include technologies such as "synthetic vision system" that will help drivers maintain where lanes are during whiteout conditions.

Stakeholder	Project	Status	Project Description
PennDOT (Districts 1-0 and 10-0)	PennDOT D1 and D10 (County Maintenance Divisions) Maintenance Program	Existing	This program provides maintenance of PennDOT roadways and ITS devices. Includes winter weather event operations.
PennDOT (Districts 1-0 and 10-0)	PennDOT D1 and D10 (Construction Divisions) Construction Program	Existing	This program provides coordination for various work zone and ITS-related construction activities.
PennDOT (Districts 1-0 and 10-0)	PennDOT D1 and D10 Detour Route System	Planned 2	There is a need to improve existing static signage, routes, and agency coordination for detours off major highways.
PennDOT (Districts 1-0 and 10-0)	PennDOT D1 and D10 Freeway Work Zone Management Projects	Planned 2	PennDOT D1 and D10 have need for direct communication links between county maintenance office and field operations at work zones.
PennDOT (Districts 1-0 and 10-0)	PennDOT D1 and D10 Highway Queue Detection Systems	Planned 2	PennDOT D1 and D2 have operational need for queue detection systems.
PennDOT (Districts 1-0 and 10-0)	PennDOT D1 and D10 Winter Weather Maintenance Management	Planned 2	PennDOT D1 and D2 have operational need for managing winter maintenance vehicles.
PennDOT (Districts 1-0 and 10-0)	PennDOT D10 and D1 I-80 ITS Device Installation	Planned 1	Involves installation of VMS, HAR, and RWIS systems along I-80 corridor through Clarion and Venango Counties. Devices will be controlled primarily by D10 and D1 offices, and redundant control will be provided by PennDOT D2 RTMC.
PennDOT (District 1-0)	PennDOT D1 Anti-icing bridge devices for Erie (Strategic Plan section 2)	Planned 1	Bridge anti-icing device planned in Erie Bay front.

Stakeholder	Project	Status	Project Description
PennDOT (District 1-0)	PennDOT D1 Expanded Traffic Management Office	Planned 1	PennDOT District 1-0 office plans to expand current ITS device control capabilities, better manage the maintenance and construction of roadways, provide more traveler information via website, and begin coordinating incident response operations with other agencies.
PennDOT (District 1-0)	PennDOT D1 HAR Systems	Existing	HAR systems are composed of radio transmitters used to provide travel advisories to motorists.
PennDOT (District 1-0)	PennDOT D1 Overhead/ Pedestal DMS Systems	Existing	Overhead and pedestal permanent Dynamic Message Signs (DMS) systems are composed of signs where messages can be changed from a remote dial-up connection in order to provide real-time travel information to motorists.
PennDOT (District 1-0)	PennDOT D1 Overhead/Pedestal DMS, HAR, and HAR Beacon Signs for Mercer SR 80 (Strategic Plan Section 1)	Planned 1	Three DMS (Ohio border overhead, and SR 60 (I-376 possible), one HAR (rest area), and two HAR beacon signs. Programmed for 2007.
PennDOT (District 1-0)	PennDOT D1 Pedestal DMS and HAR Beacon Signs for Erie SR 79 (Strategic Plan Section 9)	Planned 1	Northbound DMS for approach to I-90 and two highway advisory radio beacon signs. Programmed for 2006.
PennDOT (District 1-0)	PennDOT D1 Pedestal DMS and HAR Beacon Signs for Erie SR 90 (Strategic Plan section 2)	Planned 1	Eastbound and Westbound DMS at I-79 and two HAR beacon signs. Programmed for 2007.
PennDOT (District 1-0)	PennDOT D1 Pedestal DMS for Erie SR 90 (Strategic Plan Sections 3 and 4)	Planned 1	Westbound DMS at East Side Access Highway and Eastbound DMS at I-86. Programmed for 2011.
PennDOT (District 1-0)	PennDOT D1 Pedestal DMS System for Erie SR 79 (Strategic Plan Section 10)	Planned 1	Southbound DMS for approach to I-90. Programmed for 2010.

Stakeholder	Project	Status	Project Description
PennDOT (District 1-0)	PennDOT D1 Pedestal DMS System for Erie SR 79 (Strategic Plan Section 11)	Planned 1	Northbound DMS for 12 th Street / Bay front decision point. Programmed for 2012.
PennDOT (District 1-0)	Erie Bay Front DMS Signs	Planned 2	There is operational need to place dynamic message signs along the Erie Bay front roadway that would likely be deployed by PennDOT District 1 having shared control with City of Erie Traffic Office. The signs would alert motorists of congestion along the roadway and possibly relay alternate routes.
PennDOT (District 1-0)	PennDOT D1 Portable DMS Systems	Existing	Portable DMS systems provide ability to post messages at any roadside location. Facilitates county maintenance offices with on-site maintenance/construction/incident management.
PennDOT (District 1-0)	PennDOT D1 Transportation Management Office	Existing	PennDOT District 1-0 office in Oil City has ability to control various ITS field devices, and manages roadway maintenance and construction activities. Also provides limited information about construction activities via website.
PennDOT (District 1-0)	PennDOT Erie County Maintenance Office Weather Service	Existing	PennDOT County Maintenance Office has agreement with local television station to receive live radar data using system at the PennDOT facility.
PennDOT (District 10-0)	PennDOT D10 Expanded Traffic Management Office	Existing	PennDOT District 10-0 office plans to expand ITS device control capabilities, better manage the maintenance and construction of roadways, provide more traveler information via website, and begin coordinating incident response operations with other agencies.

Stakeholder	Project	Status	Project Description
PennDOT (District 10-0)	PennDOT D10 Transportation Management Office	Existing	PennDOT District 10-0 office in Indiana, PA manages roadway maintenance and construction activities. Also provides limited information about construction activities via website.
PennDOT (District 10-0)	PennDOT D10 Vehicles Roadway Surface Condition Readers	Existing	PennDOT currently has winter maintenance vehicles that read and collect data on pavement temperatures, and other measurements.
Pennsylvania Emergency Management Agency (PEMA)	PEMA Emergency Operation Center	Existing	Emergency Operation Center provides agency coordination for significant incidents, events, and emergencies throughout Pennsylvania. Also collects/distributes information from various agencies for a Daily Incident Report webpage.
Pennsylvania Emergency Management Agency (PEMA)	PEMA Truck	Existing	PEMA truck acts as a backup to the operations of the PEMA's Emergency Operations Center. The mobility of the truck allows establishing an Emergency Operations Center at the incidence location in case of major incident.
Pennsylvania Emergency Management Agency (PEMA)	Pennsylvania Emergency Information Reporting System (PEIRS)	Existing	A statewide electronic database, the Pennsylvania Emergency Information Reporting System (PEIRS) collects information from all state agencies responding to incidents/emergencies in the Commonwealth of Pennsylvania.
Pennsylvania Emergency Management Agency (PEMA)	Regional Agile Port Intermodal Distribution System (RAPID)	Existing	This system uses global positioning satellites to keep track of any military cargo or hazardous materials moving by ship, truck or rail.

Stakeholder	Project	Status	Project Description
Pennsylvania State Police (PSP)	Incident Information Management System (IIMS)	Existing	The Incident Information Management System is a database used to provide PSP vehicles incident reporting and dispatching capabilities.
Pennsylvania State Police (PSP)	PSP Dispatch Centers	Existing	PSP Dispatch Centers are responsible for PSP operations. Dispatch Centers dispatch PSP Vehicles to incidents and emergencies on state highways.
Pennsylvania State Police (PSP)	PSP Consolidated Dispatch Center	Planned 1	PSP Consolidated Dispatch Centers will provide consolidated dispatch and management of PSP resources for incident/emergency operations throughout the coverage area.
Pennsylvania State Police (PSP)	Mobile Data Terminals (MDT's)	Existing and Planned 1	In-vehicle systems used by the vehicles to communicate and receive dispatch information from PSP and other agencies' systems. MDT's are currently being integrated with other state agencies now (i.e. PEMA) and municipal agencies in the future.
Regional Media	Media Traveler Information Service	Planned 2	Need for Media to provide collected data on roadway conditions, traffic, construction activities, and incident information for the general public.
Regional Transit Agencies	CATA Paratransit Automatic Vehicle Location System	Existing	Crawford County CATA currently dispatches paratransit vehicles from center. Plans to have AVL in fixed-route buses for tracking and transit management operations.

Stakeholder	Project	Status	Project Description
Regional Transit Agencies	CATA Automated Transit Fare Payment	Planned 2	Crawford County CATA has future need to deploy a fare payment system that collects fares from customer-owned smartcards that automatically deduct/add funds from an associated account.
Regional Transit Agencies	CATA In-Vehicle Emergency Notification	Existing	Crawford County CATA currently has pushbutton devices in transit vehicles to allow drivers to alert transit management operators of emergency situations.
Regional Transit Agencies	CATA Transit Vehicle Diagnostic Tracking System	Planned 2	Crawford County CATA has future need for a system that tracks maintenance records by downloading data from in-vehicle systems.
Various Stakeholders	800 MHz Statewide Communication System	Existing	This project involves the deployment of a statewide 800 MHz wireless communication system for state agencies.
Various Stakeholders	511 Traveler Information Phone System	Planned 2	Project that may be initiated by PennDOT and the PTC to collect and distribute traveler information via a dedicated 511 phone number throughout the state.
Various Stakeholders	AMBER Alert Coordination	Existing	AMBER alert coordination between PennDOT Central Office, PEMA, PennDOT District Offices, and PSP.
Various Stakeholders	Regional Personal Travel Cards	Planned 2	This is a future project that may consist of fare/travel cards owned by the general public. Future regional fare cards may be compatible with regional transit agency systems to facilitate transit fare or parking payment for one/multiple transit provider(s) using a single card.

Stakeholder	Project	Status	Project Description
Various Stakeholders	Winter Emergency Management Coordination System	Planned 2	Need for better winter weather notification, coordination, and information exchange between agencies responding to adverse winter conditions. Will include better coordination between weather services, PennDOT, police, and county EMA's.

3 Regional Systems Inventory, Needs, and Services

The National ITS Architecture provides guidance on collecting and creating ITS Architectures using regional data. Given this guidance, this section provides a common sense approach to gathering information, providing a logical flow down to this information in order to create the Regional ITS Architecture. This section documents elements (groups that operate), systems inventory (what these groups are doing), needs (information or data that these groups need or use from others) and services (information or data that these groups provide to others). This section also includes a section on operations coverage.

3.1 Element Descriptions

Element descriptions are furnished below to document the groups that operate in the transportation environment as related to ITS. These elements are described in terms of their mission and relationship to the Regional ITS Architecture. Elements refer to organizational entities that operate in the transportation environment and are stakeholders in the effort. Elements also include planning agencies that are involved in the “business” of programming ITS into the mainstream project planning process.



911 Communication Centers: County-operated locations serving as Public Safety Answering Points (PSAP's) for answering and managing 911 calls. Include systems and personnel that coordinate incident dispatch with various emergency response agencies, as well as dispatch requests from responders in the field. Municipal public safety vehicles and other specialty response vehicles, such as wreckers, ambulances, and local fire, police and EMS, and HAZMAT teams are dispatched by the 911 centers.

Adjacent PennDOT County Maintenance Offices: This element includes county maintenance offices, and stockpiles located in PennDOT Districts 2-0 and 11-0-0, which border the Region. The element includes personnel and systems that coordinate with PennDOT entities in District 1-0 to perform traffic management, maintenance and construction, and incident/emergency management operations at or near District borders.

Adjacent State Emergency Management Offices: Adjacent state Management Agency Emergency Operation Center stores, coordinates, and utilizes emergency response and evacuation information/plans to facilitate coordinated emergency response for all responding agencies. Adjacent state EMA's coordinate with PEMA during emergency operations affecting both Maryland and Pennsylvania.

Adjacent State Public Safety Offices: Local and statewide public safety and emergency management agency offices/operations centers located in New York and

Ohio, the states adjacent to the Region. Includes systems and personnel that provide coordination for common incidents at state borders, as well as major emergencies, disasters, and events that have impacts within the Region. Includes a variety of systems to monitor emergencies and coordinate emergency management, including existing/planned wireline and wireless communications technologies, mobile incident response vehicles, and systems/procedures to coordinate with other stakeholder agencies.

Adjacent State Transit Offices: Offices operated by transit agencies within Ohio and New York, the states that border the Region. Includes public and private systems that operate transit vehicles and traveler information for services that adjoin transit routes within the Region. Specifically includes Western Reserve Transit Authority (WRTA) office in Ohio that plans to coordinate with Shenango Valley Shuttle Service and other PA Transit operations for services to/from Youngstown, OH.

Adjacent State Transportation Offices: This element is made up of DOT offices, maintenance garages, and Transportation Management Centers (TMC's) operated by transportation agencies in New York and Ohio, the states adjacent to the Region. TMC's included in this element include the NYSDOT Incident Coordination Center, the NYSTA Thruway Statewide Operations Center (TSOC) in Albany, NY, the multi-agency Niagara International Transportation Technology Coalition (NITTEC) transportation operations center in Buffalo, NY, as well as other existing/future TMC's operated by the New York State Thruway Authority and the Ohio DOT. This element provides general coordination regarding adjacent state incidents, construction, maintenance, and traffic conditions that will impact the Region. It also includes DOT-operated garages responsible for road maintenance at state borders, which will coordinate with PennDOT county maintenance operations.

Commercial Vehicle Company Offices: Commercial Vehicle Company Offices owned by private operated freight hauling agencies operating in the Region. This element also includes the Pennsylvania Motor Trucking Association. Includes the existing and future Commercial Vehicle Company systems which provide the capability for freight managers to furnish drivers with routing information, support safety and hazardous materials credentialing, conduct safety checks, support vehicle diagnostic checks and on-board monitoring, automate recordkeeping, etc.

Commercial Vehicles: Privately-owned freight hauling vehicles operating in the Region. This element includes existing and future in-vehicle devices enabling vehicles to communicate with (1) Commercial Vehicle Company Offices, (2) Commercial Vehicle Company systems, and (3) and other agency systems throughout Pennsylvania.



County EMA Centers: County-operated facilities within the Region responsible for centralized emergency coordination during emergency and hazmat response situations. Includes systems and personnel at the center that provide a single point of

contact by collocating representatives from various emergency response agencies/departments.

EMAA Offices: Offices located at the Erie International Airport, which is owned and operated by the Erie Municipal Airport Authority (EMAA). Includes personnel and systems that provide security and traffic operation within and around the airport. EMAA resources are part of several regional emergency response plans and coordination procedures.

EMTA Offices: EMTA-operated offices/garages, including the EMTA main office and garages, as well as the EMTA LIFT paratransit service office and garage. Includes existing and future systems and personnel that provide transit and emergency management, transit information, vehicle maintenance, and security operations for EMTA. Future consolidations of EMTA fixed-route and paratransit operations are planned for at a single consolidated location.

EMTA Remote Traveler Support: Future EMTA-operated remote traveler information and support systems. May include electronic displays with dynamic traveler information at bus stops and public locations, as well as kiosks for transit information and fare payment or debit increase using electronic fare cards.

EMTA Transit Vehicles: EMTA-operated fixed-route and paratransit vehicles. Includes drivers and systems that provide existing/future driver-to-dispatch communications, automated payment, automated passenger count, AVL, as well as vehicle maintenance and diagnostics tracking.

High Threat Facilities: Operations and management headquarters for major security assets located within or adjacent to the Region, which require special treatment in terms of emergency response and security. Existing/future systems include facility surveillance and secure communications with local, state, and national police and emergency management agencies.

Mercer County Transit Agency Offices: Mercer County Community Transit and Shenango Valley Shuttle Service-operated offices/garages servicing Mercer County. Includes systems and personnel that provide centralized transit and emergency management, traveler information, coordinated service operations, as well as vehicle maintenance.

Mercer County Transit Vehicles: Vehicles and in-vehicle systems operated by Mercer County Community Transit and Shenango Valley Shuttle Service in Mercer County. Includes drivers and in-vehicle systems that provide existing/future driver-to-dispatch communications, AVL, vehicle maintenance and diagnostics tracking, as well as other systems to be planned for.

Municipal Field Devices: Municipality-operated traffic management field devices. Include traffic signal system components.

Municipal Traffic Management Offices: Municipality-operated (see list in Final Report) traffic engineering and operations offices throughout the Region. The element includes systems and personnel that provide existing/future monitoring, controlling, and maintaining of traffic management field devices – typically signal systems. Also provide traffic signal timing change coordination, as well as emergency, maintenance, and construction coordination with other agencies.

Municipal/Regional Public Safety Offices: This element consists of municipality-operated public safety offices and includes systems and personnel from police, fire, and EMS agencies that provide local incident response and traffic control services.

Municipal/Regional Public Safety Vehicles: Includes systems, resources, and personnel operating police, fire, EMS, and other emergency response vehicles including helicopter resources and bomb squads. Also includes existing/planned in-vehicle systems including voice/data communications.



PEMA Emergency Operation Center: Systems housed at the PEMA Statewide Emergency Operation Center (Harrisburg), Western Area Office (Indiana), and Eastern Area Office (Hamburg). PEMA Western and Eastern Regional Offices serve as regional operational arms of the Statewide Emergency Operation Center in Harrisburg.

PEMA stores, coordinates, and utilizes emergency response and evacuation information/plans to facilitate coordinated emergency response for all responding agencies throughout Pennsylvania. PEMA supports county and local governments in the areas of civil defense, disaster mitigation and preparedness, planning, and response to and recovery from manmade or natural disasters. It interfaces with other emergency management agencies to support coordinated emergency response involving multiple agencies. As the response progresses, situation information including damage assessments, response status, and evacuation and resource data are shared to keep all allied agencies apprised of the response.

PennDOT Central Office Field Devices: Field devices owned and operated by PennDOT Central Office. Field devices include existing/future RWIS stations, commercial vehicle check systems, automatic traffic recorders, and other field devices distributed on and along the roadway that monitor, control, and manage traffic.

PennDOT Central Office Organizations: Systems located at the PennDOT Central Office Organizations in Harrisburg. The element consists of those Central Office Organizations operating transportation systems, including the Bureau of Maintenance and Operations (BOMO), Motor Carrier Division, Bureau of Planning and Research (BPR), Bureau of Highway Safety and Traffic Engineering (BHSTE), Bureau of

Licensing, Bureau of Motor Vehicles, Bureau of Freights and Rails, Bureau of Information Systems, Communication Office of Information Technology, and Press Office.

PennDOT D1 County Maintenance Offices: Pennsylvania Department of Transportation Engineering District 1-0 County Maintenance Offices and stockpile locations in Mercer, Crawford, Erie, Venango, Forest, and Warren Counties. This element includes personnel and existing/future systems that provide overall coordination and support for construction and routine maintenance on PennDOT roadways, field operations and resource allocation during incident/emergency response, as well as management of construction and maintenance equipment.

PennDOT D1 Field Devices: Pennsylvania Department of Transportation Engineering District 1-0 field devices. Includes future/existing HAR, CCTV cameras, work zone safety monitoring devices, deicing sprayers, and DMS.

PennDOT D1 TMC: Pennsylvania Department of Transportation Engineering District 1-0 office located in Oil City. Includes personnel and existing/future systems that provide traffic management, incident/emergency response, as well as maintenance and construction coordination along PennDOT roadways. The existing District 1-0 ITS operations within the traffic unit will act as a District Transportation Management Center.

PennDOT D1 Vehicles: Pennsylvania Department of Transportation Engineering District 1-0-operated vehicles. Includes field personnel and existing/future in-vehicle systems within routine construction and maintenance vehicles.

PennDOT D10 County Maintenance Offices: Pennsylvania Department of Transportation Engineering District 10-0 County Maintenance Offices and stockpile locations in Clarion County. Included in this element are those personnel and existing/future systems that provide overall coordination and support for construction and routine maintenance on PennDOT roadways, field operations and resource allocation during incident/emergency response, as well as management of construction and maintenance equipment.



PennDOT D10 Field Devices: Pennsylvania Department of Transportation Engineering District 10-0-operated field devices. Includes existing/future HAR, CCTV cameras, work zone safety monitoring devices, deicing sprayers, and DMS.

PennDOT D10 TMC: Pennsylvania Department of Transportation Engineering District 10-0 office in Indiana, PA responsible for operating roadways in Clarion County within the Region. Includes personnel and existing/future systems that provide traffic management, incident/emergency response, as well as maintenance and construction coordination along PennDOT roadways. The existing District 10-0 ITS operations within the traffic unit will act as a District Transportation Management Center.

PennDOT D10 Vehicles: Pennsylvania Department of Transportation Engineering District 10-0-operated vehicles. Includes field personnel and existing/future in-vehicle systems within routine construction and maintenance vehicles.

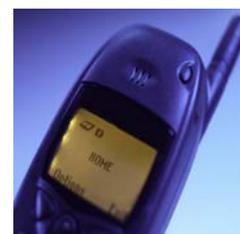
PennDOT D11 RTMC: Pennsylvania Department of Transportation Engineering District 11-0 existing Regional Transportation Management Center (TMC) including personnel and existing/planned systems that provide traffic management, incident/emergency response, and maintenance and construction coordination services along PennDOT roadways.

PennDOT D2 TMC: Pennsylvania Department of Transportation Engineering District 2-0 existing Transportation Management Center (TMC) including personnel and existing/planned systems that provide traffic management, incident/emergency response, and maintenance and construction coordination services along PennDOT roadways. The District 2-0 TMC may act as a Regional Transportation Management Center (RTMC) in the future.

PennDOT STMC: A potential future PennDOT transportation management center for providing statewide coordination and operations. The STMC is based on the latest PennDOT Statewide Transportation Management Approach and will be located in Harrisburg and provide (1) traffic, incident, and emergency management operations and (2) will be a collection/distribution point for traveler information data throughout the entire state of Pennsylvania. Additionally, the PennDOT STMC will be responsible for (1) coordinating PennDOT statewide operations, (2) coordinating among Districts and adjacent states, (3) coordinating with other state agencies (PSP, PTC, and PEMA), (4) performing political and public relations, (5) coordinating weather events, and (6) commercial vehicle operations.

Pennsylvania Office of Homeland Security: State-level department responsible for coordination of activities between other state agencies involved in security and threat management. Appropriate communications and management systems are still under development.

Personal Traveler Information Devices: This element consists of Personal Traveler Information Devices owned by the general public used to access and provide transportation information. Personal Traveler Information devices include personal computers, phones (including cell phones for reporting incidents and retrieving travel conditions en-route), and personal digital assistants (PDA's).





PSP Offices: Includes the (1) Pennsylvania State Police Headquarters located in Harrisburg Pennsylvania, (2) existing barracks, and (3) existing/future Consolidated Dispatch Centers. PSP Offices represent public safety systems that support incident management, disaster response and evacuation, security monitoring, disseminating incident information and other security and public safety-oriented ITS applications.

PSP Offices utilize several existing and future systems including mobile data terminals (MDT's) and Incident Information Management System (IIMS). MDT's are used to communicate and dispatch PSP vehicles. MDT's are currently being integrated with other state agencies now (i.e. PEMA) and municipal agencies in the future. Additionally, PSP Offices interface with other Emergency Management agencies to support coordinated emergency response. The IIMS is an all exclusive system performing dispatch and reporting functions throughout the Region and state.

PSP Vehicles: All existing/future systems within Pennsylvania State Police vehicles. In-vehicle systems include voice communications and mobile data terminals (MDT's) used by the vehicles to communicate and receive dispatch information from PSP and other agency systems. MDT's are currently being integrated with other state agencies (i.e. PEMA) and will be integrated with municipal agencies in the future.



Regional Media Outlets: Systems housed at regional television and radio stations that collect, process, store, and/or disseminate transportation information to the traveling public. This element also includes the local public access channel. Regional Media provides basic advisories, traffic and road conditions, transit schedule information, yellow pages information, and parking information to the general public.

Regional Transit Agency Offices: Regional Transit Agency Offices includes all the transit operation centers (including the multimodal centers and airports) in the Northwest Region providing fixed and "shared ride program" operations. Includes systems and personnel that provide centralized transit and emergency management, vehicle maintenance, and security operations for the transit agencies.

Regional Transit Vehicles: Various regional transit agency's vehicles and in-vehicle systems. Include drivers and in-vehicle systems that provide existing/planned driver-to-dispatch communications, automated payment, automated passenger count, AVL, and vehicle maintenance and diagnostics tracking.

Towing Industry Responders: Privately-owned towing companies operating in the Region responsible for the towing and cleanup of traffic incidents.

Weather Information Providers: Systems operated by private companies and public agencies that collect, analyze, and disseminate information on current and future weather conditions. Existing/future systems include surveillance devices (satellites, weather station, and Doppler radar), central database and analysis tools, and public and private information distribution networks.

3.2 Systems Inventory

Using existing documentation, ITS systems in the Region — both existing and planned — were identified. The inventory is presented in tabular format by agency. The information presented here provides traceability from the systems projects initially entered into the Architecture. Because the Architecture is a “living” document, this section will need to be updated as time passes. Projects are grouped into three categories: *Existing*, *Planned 1*, and *Planned 2*. As noted previously, *Planned 1* projects refer to efforts that are currently programmed or funded, whereas *Planned 2* projects are neither funded nor programmed.

Table 3-1: Regional Systems Inventory

Element	Stakeholder	Functionality	Status	Project
911 Communication Centers	Counties	Currently, only state agencies have 800 MHz system in place for interoperable voice communications, text messaging, and vehicle tracking. This may eventually be deployed at local level to be in municipal public safety vehicles, and integrated into County	Planned 1	<ul style="list-style-type: none"> 800 MHz Statewide Communication System Regional/County/Municipal PSAP/911 Centers
		County/Municipal 911 centers are contacted by field command to dispatch specialty services and vehicles, such as towing and hazmat teams. Specialty services and vehicles are also contacted directly by the field command.	Existing	
		County EMA and 911 centers contact PSP when incidents occur on state roadways	Existing	
		County EMA and 911 centers contact PennDOT District offices for some incidents along state roadways.	Existing	
		Roadway incident notification to the County and Municipal 911 centers comes from public phone calls and State Police Dispatch, or PennDOT Offices if local jurisdiction services are needed on the scene.	Existing	
		PennDOT County Maintenance Office personnel currently inform 911 centers if they encounter incidents/events that require additional resources.	Existing	

Element	Stakeholder	Functionality	Status	Project
		911 Centers coordinate incident/emergency response with Adjacent State Public Safety offices.	Existing	
		PennDOT D1 and D10 County Maintenance Office currently contact 911 centers with incident notification and information.	Existing	
		Dispatch for local public vehicles goes from the County/Municipal EMA/911 center directly to the local municipality vehicles.	Existing	
		County EMA Centers and 911 Centers coordinate emergency response with adjacent state public safety agencies	Existing	
		911 Centers operate at different jurisdictional levels within Region, including regional, county, and local/municipal.	Existing	
		The 800 MHz radio is planned for the entire region. This will create interoperability for all public service vehicles and centers.	Planned 1	
		911 Communication Centers receive severe weather alerts from National Weather Service and PEMA, and then forward on to Municipal Public Safety Vehicles, County EMA', and Local Media Outlets.	Existing	
Adjacent PennDOT County Maintenance Offices	Pennsylvania Department of Transportation	PennDOT County Maintenance offices are typically first and only responders to incidents and resource requests. Will only get PennDOT District Office staff involved if large incident, e.g., requiring lane closure.	Existing	

Element	Stakeholder	Functionality	Status	Project
		PennDOT D1 and D10 County Maintenance Offices coordinate incident response operations with each other, and County Maintenance Offices in adjacent PennDOT Districts.	Existing	
Adjacent State Emergency Management Offices	Adjacent State Emergency Management Agencies	Adjacent State Emergency Management Offices coordinate with PEMA during emergencies affecting multiple states.	Existing	
Adjacent State Public Safety Offices	Adjacent State Public Safety Agencies	PSP Troop D plans to provide incident reports and response coordination with Ohio Highway Patrol Posts in Youngstown area.	Planned 1	<ul style="list-style-type: none"> • AMBER Alert Coordination • 800 MHz Statewide Communication System • Winter Emergency Management Coordination System
		County EMA Centers and 911 Centers coordinate emergency response with adjacent state public safety agencies.	Existing	
		911 Centers coordinate incident/emergency response with Adjacent State Public Safety offices.	Existing	
Adjacent State Transit Offices	Adjacent State Transit Agencies	Mercer County Transit Agencies operate fixed route transit in Mercer County. Plans to exchange information with Western Reserve Transit Authority (WRTA) in Ohio to coordinate schedules and ridership, as well as transit traveler information.	Planned 1	
		Crawford County CATA currently coordinates transit schedules and operations with transit agencies in Ashtabula County, OH.	Existing	
		Mercer County Transit Agencies and Adjacent State Transit Agencies currently exchange ridership information/data.	Existing	

Element	Stakeholder	Functionality	Status	Project
		EMTA plans to coordinate transit service and operations with adjacent state transit agencies in Ashtabula County, Ohio.	Planned 2	
Adjacent State Transportation Offices	Adjacent State Transportation Agencies	PennDOT District 1-0 Office coordinates emergency response and traffic operations with NY and Ohio DOT offices.	Existing	
		There is a need for PennDOT D1 to coordinate with the Niagara International Transportation Technology Coalition (NITTEC) TOC in Buffalo for traffic and emergency management coordination, device control, as well as traveler information for regional travel.	Planned 2	
		PennDOT D1 County Maintenance Offices plan to coordinate with ODOT D4 Maintenance Garages to exchange work zone information, work plan coordination, roadway maintenance status, and maintenance and construction resource coordination.	Planned 1	
Commercial Vehicle Company Offices	Commercial Vehicle Companies	Provides the PennDOT Motor Carrier Division with appropriate credentials, registration, and title fees	Existing	<ul style="list-style-type: none"> Private Carrier Commercial Vehicle Tracking System Private Carrier Fleet Maintenance Management FHWA Carrier Compliance Review Commercial Vehicle
		Provides vehicle tracking of Commercial Vehicles	Existing	
		Provides capabilities to track cargo and freight	Existing	
		Provides capabilities to generate preventative maintenance schedule based on the vehicle miles traveled determined using vehicle tracking	Existing	

Element	Stakeholder	Functionality	Status	Project
		Provides appropriate transportation and emergency agencies with hazmat and emergency information	Existing	Tracking System
Commercial Vehicles	Commercial Vehicle Companies	Monitors adherence to the PennDOT Motor Carrier Division weight and safety enforcement activities	Existing	<ul style="list-style-type: none"> Private Carrier Commercial Vehicle Tracking System Private Carrier Fleet Maintenance Management FHWA Carrier Compliance Review
		Supports devices to communicate with Commercial Vehicle Company Offices. May include the addition of a cell-based radio and equipment	Existing	
		Offers the capability for Commercial Vehicle Offices to track vehicles using automatic vehicle location (AVL) systems to monitor the movement of cargo and freight	Existing	
County EMA Centers	Counties	There is a need for systematic coordination with the National Weather Service in order to alert the appropriate emergency response and PennDOT roadway maintenance personnel during winter storms.	Planned 2	<ul style="list-style-type: none"> 800 MHz Statewide Communication System Winter Emergency Management Coordination System AMBER Alert Coordination Erie County Emergency Management Agency Weather Data County Emergency
		Erie County Emergency Services has plans to deploy weather radar system at its facility using data likely provided by local television station.	Planned 1	
		County EMA's plan to have capability to interrupt television broadcasts to issue emergency/weather alerts.	Planned 1	
		County EMA's coordinate winter weather alerts with the National Weather Service.	Existing	

Element	Stakeholder	Functionality	Status	Project
		County EMA Centers and 911 Centers coordinate emergency response with adjacent state public safety agencies.	Existing	Operation Centers
		911 Communication Centers receive severe weather alerts from National Weather Service and PEMA, and then forward on to Municipal Public Safety Vehicles, County EMA's, and Local Media Outlets.	Existing	
		PennDOT BHSTE coordinates with PEMA and other agencies (PennDOT Districts, PSP, County EMA's, etc.) in case of major incidents	Existing	
		PEMA gathers/provides specific incident information from/to County EMA's, PA State Police, and PennDOT.	Existing	
		The Erie International Airport coordinates emergency operations with county EMA's, and PEMA.	Existing	
EMAA Offices	Erie Municipal Airport Authority (EMAA)	The Erie International Airport public safety office coordinates emergency operations with other local public safety offices.	Existing	
		The Erie International Airport coordinates emergency operations with county EMA's, and PEMA.	Existing	

Element	Stakeholder	Functionality	Status	Project
EMTA Offices	Erie Metropolitan Transit Authority (EMTA)	Regional transit agencies have future need to deploy regional travel cards that may be compatible with all transit agency fare payment systems to facilitate transit fare or parking payment using a single card.	Planned 2	<ul style="list-style-type: none"> EMTA Multi-modal Transportation Management Center EMTA Transit Vehicle Diagnostic Tracking System EMTA Transit Fare Payment EMTA Traveler Information System EMTA Automated Transit Fare Payment EMTA Bus AVL
		EMTA plans to provide transit users information about when the next bus will arrive at stops and on website.	Planned 1	
		EMTA plans to install AVL on buses for vehicle tracking and management	Planned 1	
		EMTA has plans to consolidate paratransit (LIFT) and fixed-route operations into single transit management center.	Planned 1	
		EMTA currently has fixed-route fare management systems that collect and store ridership data on buses, transfer data at garages, and then manage data through systems at EMTA offices.	Existing	
		Currently, EMTA vehicles transfer fare payment data to EMTA office garage system at end of route.	Existing	
		EMTA LIFT has need for paratransit automated scheduling system based on demand data collected from customers. Would transfer data to drivers in real-time.	Planned 2	
		EMTA plans to coordinate with PennDOT Erie County Maintenance Office to obtain maintenance and construction information effecting routes.	Planned 2	

Element	Stakeholder	Functionality	Status	Project
		EMTA would like to have kiosks in public areas that provide trip scheduling and information, as well as fare payment machines.	Planned 1	
		EMTA plans to coordinate transit operations with Crawford and Warren County Transit agencies.	Planned 2	
		EMTA currently has pushbutton devices in transit vehicles to allow drivers to alert transit management operators of emergency situations.	Existing	
		EMTA office currently exchanges information with local media about service disruptions	Existing	
		Users can currently request paratransit service on EMTA LIFT website.	Existing	
		EMTA LIFT paratransit currently has call receiving that communicate with customers, and dispatch services that communicate with vehicle drivers.	Existing	
		EMTA plans to coordinate transit service and operations with adjacent state transit agencies in Ashtabula County, Ohio.	Planned 2	
EMTA Remote Traveler Support	Erie Metropolitan Transit Authority (EMTA)	Regional transit agencies have future need to deploy regional travel cards that may be compatible with all transit agency fare payment systems to facilitate transit fare or parking payment using a single card.	Planned 2	<ul style="list-style-type: none"> Regional Personal Travel Cards EMTA Automated Transit Fare Payment EMTA Traveler Information System
		EMTA plans to provide transit users information about when the next bus will arrive at stops and on website.	Planned 1	

Element	Stakeholder	Functionality	Status	Project
		EMTA would like to have kiosks in public areas that provide trip scheduling and information, as well as fare payment machines.	Planned 1	
EMTA Transit Vehicles	Erie Metropolitan Transit Authority (EMTA)	EMTA plans to install AVL on buses for vehicle tracking and management	Planned 1	<ul style="list-style-type: none"> EMTA Bus AVL EMTA Transit Fare Payment EMTA In-Vehicle Emergency Notification EMTA Automated Transit Fare Payment EMTA Transit Vehicle Diagnostic Tracking System Regional Personal Travel Cards
		EMTA LIFT paratransit currently has call receiving that communicate with customers, and dispatch services that communicate with vehicle drivers.	Existing	
		EMTA LIFT would like for paratransit automated scheduling system based on demand data collected from customers. Would transfer data to drivers in real-time.	Planned 2	
		EMTA currently has pushbutton devices in transit vehicles to allow drivers to alert transit management operators of emergency situations.	Existing	
		EMTA currently has fixed-route fare management systems that collect and store ridership data on buses, transfer data at garages, and then manage data through systems at EMTA offices.	Existing	
		Currently, EMTA vehicles transfer fare payment data to EMTA office garage system at end of route.	Existing	
		Regional transit agencies have future need to deploy regional travel cards that may be compatible with all transit agency fare payment systems to facilitate transit fare or parking payment using a single card.	Planned 2	

Element	Stakeholder	Functionality	Status	Project
High Threat Facilities	High Threat Facilities	Include major facilities that require special security and/or emergency response coordination	Existing	
		Reports high-threat facility information to 911 Communications and EMA Centers	Existing	
Mercer County Transit Agency Offices	Mercer County Transit Agencies	Regional transit agencies have future need to deploy regional travel cards that may be compatible with all transit agency fare payment systems to facilitate transit fare or parking payment using a single card.	Planned 2	<ul style="list-style-type: none"> • Mercer County Community Transit (MCCT) Bus AVL and Dispatch • Mercer County Transit In-Vehicle Emergency Notification • Mercer County Transit Vehicle Diagnostic Tracking System • Mercer County Transit Automated Transit Fare Payment
		Mercer County Transit Agencies operates fixed route transit in Mercer County. Plans to exchange information with Western Reserve Transit Authority (WRTA) in Ohio to coordinate schedules and ridership, as well as transit traveler information.	Planned 1	
		Mercer County Transit agencies currently have pushbutton devices in transit vehicles to allow drivers to alert transit management operators of emergency situations.	Existing	
		Mercer County Transit Agencies and Adjacent State Transit Agencies currently exchange ridership information/data.	Existing	
		Mercer County Transit agencies currently coordinate with PennDOT County Maintenance Office for any maintenance/construction/weather effecting routes.	Existing	

Element	Stakeholder	Functionality	Status	Project
		Crawford County (CATA) and Mercer County transit agencies have future need for transit vehicle diagnostics tracking systems in garages.	Planned 2	
Mercer County Transit Vehicles	Mercer County Transit Agencies	Regional transit agencies have future need to deploy regional travel cards that may be compatible with all transit agency fare payment systems to facilitate transit fare or parking payment using a single card.	Planned 2	<ul style="list-style-type: none"> • Mercer County Transit In-Vehicle Emergency Notification • Mercer County Transit Automated Transit Fare Payment • Mercer County Community Transit (MCCT) Bus AVL and Dispatch • Regional Personal Travel Cards • Mercer County Transit Vehicle Diagnostic Tracking System
		Mercer County Transit agencies currently have pushbutton devices in transit vehicles to allow drivers to alert transit management operators of emergency situations.	Existing	
		Crawford County (CATA) and Mercer County transit agencies have future need for transit vehicle diagnostics tracking systems in garages.	Planned 2	
Municipal Field Devices	Municipalities	Several municipalities throughout Region have emergency vehicle preemptions systems.	Existing	<ul style="list-style-type: none"> • City of Erie Traffic Signal System • Emergency Vehicle Preemption Expansion/Upgrade • Traffic Signal Systems
		Future Erie emergency vehicle preemption system may be based on GPS solution that tracks location of vehicles from public safety agency systems, which request from signal system.	Planned 2	
		Future City of Erie traffic system will monitor and control signals using traffic-responsive software	Planned 2	

Element	Stakeholder	Functionality	Status	Project
		City of Erie Traffic Offices has future need to deploy signal system video detection equipment that will also provide general monitoring functionality.	Planned 2	<ul style="list-style-type: none"> Municipal Traffic Intersection Video Detection
		PennDOT D1 Office currently has access to City of Erie signal system using central software workstation.	Existing	
		Municipality traffic offices generally operate through basic device monitoring for maintenance purposes, "resetting" of controllers, verification of malfunction reports, and any timing changes.	Existing	
		City of Erie and a few other surrounding municipalities currently have emergency vehicle preemptions systems.	Existing	
Municipal Traffic Management Offices	Municipalities	PennDOT County Maintenance Offices coordinate construction and maintenance activities with PennDOT District Offices, and Municipal Traffic Management/Public Safety Offices.	Existing	<ul style="list-style-type: none"> City of Erie Traffic Signal System Municipal Traffic Intersection Video Detection Traffic Signal Systems
		Future Erie emergency vehicle preemption system may be based on GPS solution that tracks location of vehicles from public safety agency systems, which request from signal system.	Planned 2	
		Future City of Erie traffic system will monitor and control signals using traffic-responsive software	Planned 2	
		Municipality traffic offices typically use local police to perform field maintenance/control on signal systems when needed.	Existing	

Element	Stakeholder	Functionality	Status	Project
		There is operational need to place dynamic message signs along the Erie Bay front roadway that would likely be deployed by PennDOT District 1 having shared control with City of Erie Traffic Office.	Planned 2	
		There is a general need for coordinating PennDOT detour routes and timing plans with municipalities	Planned 2	
		City of Erie Traffic Offices has future need to deploy signal system video detection equipment that will also provide general monitoring functionality.	Planned 2	
		PennDOT D1 Office currently has access to City of Erie signal system using central software workstation.	Existing	
		Municipality traffic offices generally operate through basic device monitoring for maintenance purposes, "resetting" of controllers, verification of malfunction reports, and any timing changes.	Existing	
		Municipal Traffic Management Offices share information with the media.	Existing	
		PennDOT D1 and D10 District Offices coordinate construction and maintenance schedules and activities with county maintenance offices, and municipalities.	Existing	
Municipal/Regional Public Safety Offices	Municipalities	The Erie International Airport public safety office coordinates emergency operations with other local public safety offices.	Existing	<ul style="list-style-type: none"> 800 MHz Statewide Communication System

Element	Stakeholder	Functionality	Status	Project
		The 800 MHz radio is planned for the entire region. This will create interoperability for all public service vehicles and centers.	Planned 1	<ul style="list-style-type: none"> Public Safety Services Erie Bay Front DMS
		Future Erie emergency vehicle preemption system may be based on GPS solution that tracks location of vehicles from public safety agency systems, which request from signal system.	Planned 2	
		911 Centers operate at different jurisdictional levels within Region, including regional, county, and local/municipal.	Existing	
		PennDOT D1 and D10 County Maintenance Offices will contact local public safety offices if signals are not operating correctly.	Existing	
		PennDOT D1 office currently coordinates and shares work plan information with local public safety agencies.	Existing	
		Vehicle tracking data from Municipal Public Safety Vehicles is needed at Municipal Public Safety Offices.	Planned 2	
		Municipality traffic offices typically use local police to perform field maintenance/control on signal systems when needed.	Existing	

Element	Stakeholder	Functionality	Status	Project
		Currently, only state agencies have 800 MHz system in place for interoperable voice communications, text messaging, and vehicle tracking. This may eventually be deployed at local level to be in municipal public safety vehicles, and integrated into County	Planned 1	
Municipal/Regional Public Safety Vehicles	Municipalities	The 800 MHz radio is planned for the entire region. This will create interoperability for all public service vehicles and centers.	Planned 1	<ul style="list-style-type: none"> Regional/County/Municipal PSAP/911 Centers Emergency Vehicle Preemption Expansion/Upgrade 800 MHz Statewide Communication System
		City of Erie and a few other surrounding municipalities currently have emergency vehicle preemptions systems.	Existing	
		911 Communication Centers receive severe weather alerts from National Weather Service and PEMA, and then forward on to Municipal Public Safety Vehicles, County EMA', and Local Media Outlets.	Existing	
		Currently, only state agencies have 800 MHz system in place for interoperable voice communications, text messaging, and vehicle tracking. This may eventually be deployed at local level to be in municipal public safety vehicles, and integrated into County	Planned 1	
		Several municipalities throughout Region have emergency vehicle preemptions systems.	Existing	

Element	Stakeholder	Functionality	Status	Project
		County/Municipal 911 centers are contacted by field command to dispatch specialty services and vehicles, such as towing and hazmat teams. Specialty services and vehicles are also contacted directly by the field command.	Existing	
		Vehicle tracking data from Municipal Public Safety Vehicles is needed at Municipal Public Safety Offices.	Planned 2	
		Municipal public safety vehicles dispatch private towing units directly from field	Existing	
		Future Erie emergency vehicle preemption system may be based on GPS solution that tracks location of vehicles from public safety agency systems, which request from signal system.	Planned 2	
PEMA Emergency Operation Center	Pennsylvania Emergency Management Agency (PEMA)	Notifies appropriate transportation and emergency agencies of any major disasters	Existing	<ul style="list-style-type: none"> • PEMA Emergency Operation Center • PEMA Truck • Pennsylvania Emergency Information Reporting System (PEIRS)
		Coordinates with cooperating agencies in case of major disasters	Existing	
		Runs a statewide electronic database, Pennsylvania Emergency Information Reporting System (PEIRS) that collects information from all state agencies responding to incidents/emergencies statewide	Existing	
		Gathers/provides specific incident information from/to County Emus, Pennsylvania State Police, PennDOT, and PTC	Existing	

Element	Stakeholder	Functionality	Status	Project
		Gathers current and forecast road conditions and surface weather information from a variety of sources to monitor major natural disasters	Existing	
		Disseminates disaster information to the public	Existing	
		Monitors alerting and advisory systems reported by other emergency agencies	Existing	
		Develops and stores emergency evacuation plans	Existing	
		Serves as one-point contact for all the coordinating agencies during emergencies	Existing	
		Provides incident command in case of a major event	Existing	
		Contacts on-site field officers through the County EMA agencies.	Existing	
		Plans to control PTC DMS during emergencies	Planned 2	
PennDOT Central Office Field Devices	Pennsylvania Department of Transportation (PennDOT)	Monitors roadway weather conditions and provides RWIS data to PennDOT Central Office and County Maintenance Offices	Existing	<ul style="list-style-type: none"> Roadway Weather Information System (RWIS) PennDOT Commercial Vehicle Information Systems and Networks (CVISN) Project
		Collects Commercial Vehicle safety inspection and violations data	Existing	
PennDOT Central Office Organizations	Pennsylvania Department of Transportation	PennDOT BHSTE coordinates with PEMA and other agencies (PennDOT Districts, PSP, County EMA's, Transit agencies, etc.) in case of major incidents	Existing	<ul style="list-style-type: none"> PennDOT Transportation Management Centers

Element	Stakeholder	Functionality	Status	Project
	(PennDOT)	The PennDOT Central Office Press Office communicates traffic-related information to Regional Media Outlets	Existing	(TMC's) <ul style="list-style-type: none"> • Winter Road Condition Hotline for Interstate Highways • Roadway Weather Information System (RWIS) • PennDOT Commercial Vehicle Information Systems and Networks (CVISN) Project • PennDOT Performance and Registration Information Systems Management (PRISM) • PennDOT Safety and Fitness Electronic Record (SAFER) • PennDOT ITS Transportation Management Approach • Construction Projects (current and future) • Central Repository • Real -time Traffic Information Website
		PennDOT (Motor Carrier Division) maintains commercial vehicle registrations	Existing	
		CVO Supports the exchange of safety credential information across the jurisdictions	Existing	
		CVO Supports the collection and review of carrier safety data and determines the carrier safety rating	Planned 1	
		PennDOT Motor Carrier Division conducts roadside commercial vehicle inspections	Existing	
		PennDOT Motor Carrier Division provides appropriate credentials to motor carriers and collects necessary registration and title fees	Existing	
		PennDOT Motor Carrier Division conducts weight enforcement activities	Existing	
		PennDOT Bureau of Planning and Research owns and maintains Automatic Traffic Recorders throughout the state	Existing	
		RWIS data flows from the RWIS site to Central Office (BOMO) to a public website	Existing	
		RWIS monitor roadway weather conditions and transfer information to PennDOT BOMO	Existing	

Element	Stakeholder	Functionality	Status	Project
		Receives environmental conditions information from various weather sources to aid in scheduling routine maintenance activities	Existing	<ul style="list-style-type: none"> • Statewide GIS based Incident Detour Map • Video Sharing • Web site Portal for Assisting Commercial Vehicle Operators • Statewide Telecommunication
PennDOT D1 County Maintenance Offices	Pennsylvania Department of Transportation (PennDOT)	Provides overall management and support for routine maintenance on a roadway system or right-of-way	Existing	
		PennDOT has a need to implement on-site work zone safety systems that communicate with county maintenance offices.	Planned 2	
		PennDOT D1 County Maintenance Offices plan to coordinate with ODOT D4 Maintenance Garages to exchange work zone information, work plan coordination, roadway maintenance status, and maintenance and construction resource coordination.	Planned 1	
		PennDOT D1 and D10 District Offices coordinate construction and maintenance schedules and activities with county maintenance offices, and municipalities.	Existing	

Element	Stakeholder	Functionality	Status	Project
		PennDOT D1 and D10 County Maintenance Offices coordinate incident response operations with each other, and County Maintenance Offices in adjacent PennDOT Districts.	Existing	
		PennDOT County Maintenance Offices relay maintenance and work zone information to local media outlets.	Existing	
		PennDOT County Maintenance offices are typically first and only responders to incidents and resource requests. Will only get PennDOT District Office staff involved if large incident, e.g., requiring lane closure.	Existing	
		PennDOT County Maintenance office in Erie currently receives weather system radar data from local television station at system set up in PennDOT facility.	Existing	
		District 1-0 County Maintenance offices are the primary point of PennDOT contact for incidents and weather response between PSP, 911 Centers, County EMA, PennDOT Central Office, Adjacent PennDOT Districts, and Adjacent State Transportation Agencies.	Existing	
		County Maintenance Offices get RWIS information in real-time. Everyone else has to get the information from the public website. It takes approximately 1 hour for information to be published on the website.	Existing	

Element	Stakeholder	Functionality	Status	Project
		PennDOT D1 and D10 County Maintenance Office currently contact 911 centers with incident notification and information.	Existing	
		PSP Dispatch Centers currently coordinate emergency response and incident reporting with D1 and D10 county maintenance offices.	Existing	
		Mercer County Transit agencies currently coordinate with PennDOT County Maintenance Office for any maintenance/construction/weather effecting routes.	Existing	
		PennDOT D1 Office plans to exchange traffic data with D11 office and D1 county maintenance offices.	Planned 2	
		EMTA plans to coordinate with PennDOT Erie County Maintenance Office to obtain maintenance and construction information effecting routes.	Planned 2	
		PennDOT County Maintenance Office personnel currently inform 911 centers if they encounter incidents/events that require additional resources.	Existing	
		PennDOT has a need to have better communications with work zones.	Planned 2	
		PennDOT D1 District and County Maintenance offices currently post construction and maintenance information on websites.	Existing	
		PennDOT D1 County Maintenance Office currently operates bridge de-icing systems remotely.	Existing	

Element	Stakeholder	Functionality	Status	Project
		There is a need for systematic coordination with the National Weather Service in order to alert the appropriate emergency response and PennDOT roadway maintenance personnel during winter storms.	Planned 2	
		Existing systems PennDOT District 1-0 County Maintenance Offices and Stockpiles download information about salt/chemical distribution, mileage, and other data that is stored in on-board vehicle systems.	Existing	
		PennDOT needs an automated winter weather advisory alert system, as well as a more automated way of coordinating road maintenance operations with between the District offices, county maintenance offices, and vehicles.	Planned 2	
		PennDOT D1 and D10 County Maintenance Offices will contact local public safety offices if signals are not operating correctly.	Existing	
		Crawford County CATA currently coordinates with PennDOT County Maintenance Office for any maintenance/construction/weather effecting routes.	Existing	
PennDOT D1 Field Devices	Pennsylvania Department of Transportation	Traffic detectors along freeways should be planned for (far) future in PennDOT D1 and D10 in order to best let travelers know what route to take.	Planned 2	<ul style="list-style-type: none"> • Pedestal DMS for Erie SR 90 (Strategic Plan sections

Element	Stakeholder	Functionality	Status	Project
	(PennDOT)	There is operational need to place dynamic message signs along the Erie Bay front roadway that would likely be deployed by PennDOT District 1 having shared control with City of Erie Traffic Office.	Planned 2	3 and 4) <ul style="list-style-type: none"> • Pedestal DMS and HAR beacon signs for Erie SR 90 (Strategic Plan section 2) • Pedestal DMS and HAR beacon signs for Erie SR 79 (Strategic Plan section 9) • Overhead/Pedestal DMS, HAR, and HAR beacon signs for Mercer SR 80 (Strategic Plan section 1) • Overhead/ Pedestal DMS Systems • I-80 ITS Device Installation • Highway Queue Detection Systems • HAR Systems • Freeway Work Zone Management
		PennDOT has a need to implement on-site work zone safety systems that communicate with county maintenance offices.	Planned 2	
		PennDOT D11 RTMC plans to collect share CCTV images with D1 Field Devices in Mercer County.	Planned 1	
		PennDOT D1 Office currently has ability to control VMS and HAR field devices.	Existing	
		PennDOT D1 has a need for queue detection/warning systems along roadways	Planned 2	
		PennDOT D1 County Maintenance Office currently operates bridge de-icing systems remotely.	Existing	
		Future control of D1 field devices is planned for D2 RTMC and D10 Office.	Planned 2	
		Existing District 11-0 TMC in Bridgeville (outside of Pittsburgh) currently operates District 1-0-owned VMS and HAR devices along I-79 in Mercer County.	Existing	

Element	Stakeholder	Functionality	Status	Project
		D1 office will act as a Transportation Management Center (TMC), as set forth in latest PennDOT ITS Operational Concept. As such, they will have control of most devices within district, and backup control will be provided by District 11 RTMC and future ST	Planned 1	<ul style="list-style-type: none"> Erie Bay front DMS Detour Route System Anti-icing bridge devices for Erie (Strategic Plan section 2) Portable DMS Systems Pedestal DMS System for Erie SR 79 (Strategic Plan section 11) Pedestal DMS System for Erie SR 79 (Strategic Plan section 10)
		Current PennDOT D1-owned field devices include VMS and HAR.	Existing	
		AFLAD stations that combine RWIS and anti-icing sprayers are currently owned by D1. Operate remotely.	Existing	
PennDOT D1 TMC	Pennsylvania Department of Transportation (PennDOT)	There is a need for systematic coordination with the National Weather Service in order to alert the appropriate emergency response and PennDOT roadway maintenance personnel during winter storms.	Planned 2	<ul style="list-style-type: none"> PennDOT D1 Traffic Management Office Detour Route System Winter Weather Maintenance Management Maintenance Program 800 MHz Statewide Communication System Erie Bay front DMS
		There is a need for PennDOT D1 to coordinate with the Niagara International Transportation Technology Coalition (NITTEC) TOC in Buffalo for traffic and emergency management coordination, device control, as well as traveler information for regional travel.	Planned 2	
		There is a general need for coordinating PennDOT detour routes and timing plans with municipalities	Planned 2	

Element	Stakeholder	Functionality	Status	Project
		PennDOT STMC currently plans to operate District field devices via communications through the District Offices, rather than direct redundant communication with field devices.	Planned 1	<ul style="list-style-type: none"> • AMBER Alert Coordination • Winter Emergency Management Coordination System • Construction Program • PennDOT D1 • I-80 ITS Device Installation • Anti-icing bridge devices for Erie (Strategic Plan section 2) • Adjacent State DOT/PennDOT Coordination • HAR Systems
		PennDOT needs an automated winter weather advisory alert system, as well as a more automated way of coordinating road maintenance operations with between the District offices, county maintenance offices, and vehicles.	Planned 2	
		PennDOT District 1 Office coordinates emergency response and traffic operations with NY and Ohio DOT offices.	Existing	
		PennDOT D11-0 currently gets faxed weather bulletins from PennDOT D1-0 with info from I-79 weather stations. Weather info is then relayed to D1-0 HAR radios (by who?).	Existing	
		PennDOT D1 Office currently coordinates maintenance equipment usage with D10 County Maintenance Offices	Existing	
		PennDOT D1 and D10 District Offices coordinate construction and maintenance schedules and activities with county maintenance offices, and municipalities.	Existing	
		PennDOT County Maintenance Offices exchange maintenance information directly to maintenance vehicles.	Existing	

Element	Stakeholder	Functionality	Status	Project
		PennDOT County Maintenance Offices coordinate construction and maintenance activities with PennDOT District Offices, and Municipal Traffic Management/Public Safety Offices.	Existing	
		D1 office will act as a Transportation Management Center (TMC), as set forth in latest PennDOT ITS Operational Concept. As such, they will have control of most devices within district, and backup control will be provided by District 11 RTMC and future ST	Planned 1	
		County EMA and 911 centers contact PennDOT District offices for some incidents along state roadways.	Existing	
		All PennDOT District Offices currently coordinate AMBER alert operations.	Existing	
		PennDOT D1 Office currently has ability to control VMS and HAR field devices.	Existing	
		There is operational need to place dynamic message signs along the Erie Bay front roadway that would likely be deployed by PennDOT District 1 having shared control with City of Erie Traffic Office.	Planned 2	
		Roadway incident notification to the County and Municipal 911 centers comes from public phone calls and State Police Dispatch, or PennDOT Offices if local jurisdiction services are needed on the scene.	Existing	

Element	Stakeholder	Functionality	Status	Project
		Currently, information exchanged between PennDOT D1 vehicles and District 1-0 office is for those personnel located at construction zones.	Existing	
		PennDOT D1 Office currently has access to City of Erie signal system using central software workstation.	Existing	
		PennDOT BHSTE coordinates with PEMA and other agencies (PennDOT Districts, PSP, County EMA's, etc.) in case of major incidents	Existing	
		PennDOT D1 office currently coordinates and shares work plan information with local public safety agencies.	Existing	
		PennDOT D1 Office plans to exchange traffic data with D11 office and D1 county maintenance offices.	Planned 2	
		PennDOT County Maintenance offices are typically first and only responders to incidents and resource requests. Will only get PennDOT District Office staff involved if large incident, e.g., requiring lane closure.	Existing	
PennDOT D1 Vehicles	Pennsylvania Department of Transportation (PennDOT)	There is a future need for PennDOT District 1-0 snow plows to have road surface reading equipment to act as weather probes.	Planned 2	<ul style="list-style-type: none"> • Winter maintenance vehicle on-board systems • Maintenance Program • Freeway Work Zone Management
		PennDOT needs an automated winter weather advisory alert system, as well as a more automated way of coordinating road maintenance operations with between the District offices, county maintenance offices, and vehicles.	Planned 2	

Element	Stakeholder	Functionality	Status	Project
		PennDOT has a need to have better communications with work zones.	Planned 2	<ul style="list-style-type: none"> • Detour Route System • Construction Program • Winter Weather Maintenance Management
		Existing systems PennDOT District 1-0 County Maintenance Offices and Stockpiles download information about salt/chemical distribution, mileage, and other data that is stored in on-board vehicle systems.	Existing	
		Currently, information exchanged between PennDOT D1 vehicles and District 1-0 office is for those personnel located at construction zones.	Existing	
PennDOT D10 County Maintenance Offices	Pennsylvania Department of Transportation (PennDOT)	PSP Dispatch Centers currently coordinate emergency response and incident reporting with D1 and D10 county maintenance offices.	Existing	<ul style="list-style-type: none"> • Portable DMS Systems • Adjacent State DOT/PennDOT Coordination • Freeway Work Zone Management • Detour Route System • Maintenance Program • Winter Weather Maintenance Management • Winter Emergency Management Coordination
		PennDOT needs an automated winter weather advisory alert system, as well as a more automated way of coordinating road maintenance operations with between the District offices, county maintenance offices, and vehicles.	Planned 2	
		PennDOT has a need to have better communications with work zones.	Planned 2	
		PennDOT D10 plans on deploying bridge de-icing sprayers to be controlled remotely by County Maintenance Offices.	Planned 2	
		PennDOT D10 County Maintenance offices coordinate maintenance information with local newspapers.	Existing	

Element	Stakeholder	Functionality	Status	Project
		PennDOT County Maintenance Offices relay maintenance and work zone information to local media outlets.	Existing	System
		Monitors vehicle and equipment conditions, tracks maintenance history, and schedules routine and corrective maintenance.	Existing	
		PennDOT D1 and D10 District Offices coordinate construction and maintenance schedules and activities with county maintenance offices, and municipalities.	Existing	
		There is a need for systematic coordination with the National Weather Service in order to alert the appropriate emergency response and PennDOT roadway maintenance personnel during winter storms.	Planned 2	
		PennDOT D1 and D10 County Maintenance Offices coordinate incident response operations with each other, and County Maintenance Offices in adjacent PennDOT Districts.	Existing	
		PennDOT District 10-0 County Maintenance offices are the primary point of PennDOT contact for incidents and weather response between PSP, 911 Centers, County EMA, PennDOT Central Office, Adjacent PennDOT Districts, and Adjacent State Transportation Agencies	Existing	

Element	Stakeholder	Functionality	Status	Project
		PennDOT D1 Office currently coordinates maintenance equipment usage with D10 County Maintenance Offices	Existing	
		PennDOT County Maintenance Offices exchange maintenance information directly to maintenance vehicles.	Existing	
		PennDOT County Maintenance offices are typically first and only responders to incidents and resource requests. Will only get PennDOT District Office staff involved if large incident, e.g., requiring lane closure.	Existing	
		PennDOT has a need to implement on-site work zone safety systems that communicate with county maintenance offices.	Planned 2	
		County Maintenance Offices get RWIS information in real-time. Everyone else has to get the information from the public website. It takes approximately 1 hour for information to be published on the website.	Existing	
		PennDOT D1 and D10 County Maintenance Offices will contact local public safety offices if signals are not operating correctly.	Existing	
		PennDOT District 10-0 office will have primary control of the future VMS and HAR field devices being installed on I-80. District 2-0 RTMC will provide redundant control capabilities.	Planned 1	

Element	Stakeholder	Functionality	Status	Project
		PennDOT County Maintenance Office personnel currently inform 911 centers if they encounter incidents/events that require additional resources.	Existing	
		Provides overall management and support for routine maintenance on a roadway system or right-of-way	Existing	
		PennDOT D1 and D10 County Maintenance Office currently contact 911 centers with incident notification and information.	Existing	
PennDOT D10 Field Devices	Pennsylvania Department of Transportation (PennDOT)	Traffic detectors along freeways should be planned for (far) future in PennDOT D1 and D10 in order to best let travelers know what route to take.	Planned 2	<ul style="list-style-type: none"> • Highway Queue Detection Systems • I-80 ITS Device Installation • Portable DMS Systems • Maintenance Program • Construction Program • Freeway Work Zone Management • Detour Route System • HAR Systems
		There is a need for D11 RTMC to have control of future D10 ITS devices in Clarion County along I-80	Planned 2	
		PennDOT has a need to implement on-site work zone safety systems that communicate with county maintenance offices.	Planned 2	
		PennDOT District 10-0 office will have primary control of the future VMS and HAR field devices being installed on I-80. District 2-0 RTMC will provide redundant control capabilities.	Planned 1	
		PennDOT D2 TMC to control field devices in PennDOT D10 counties along I-80.	Planned 1	
		PennDOT D10 plans on deploying bridge de-icing sprayers to be controlled remotely by County Maintenance Offices.	Planned 2	

Element	Stakeholder	Functionality	Status	Project
		New VMS, HAR, and HAR alert signs and flashers will be deployed along I-80 in upcoming projects. Will be controlled remotely and on-site.	Planned 1	
		D10 office will act as a Transportation Management Center (TMC), as set forth in latest PennDOT ITS Operational Concept. As such, they will have control of most devices within district, and backup control will be provided by District 2 RTMC and future ST	Planned 1	
PennDOT D10 TMC	Pennsylvania Department of Transportation (PennDOT)	There is a need for D11 RTMC to have control of future D10 ITS devices in Clarion County along I-80	Planned 2	<ul style="list-style-type: none"> • PennDOT D10 Traffic Management Office • Maintenance Program • Detour Route System • PennDOT D10 Expanded Traffic Management Office • Construction Program • Winter Emergency Management Coordination System • Adjacent State DOT/PennDOT Coordination • Winter Weather
		The D10 office has a dial-up connection to RWIS information collected by BOMO.	Existing	
		Pre-planned detour routes and signing in D10	Existing	
		PennDOT District 10-0 office will have primary control of the future VMS and HAR field devices being installed on I-80. District 2-0 RTMC will provide redundant control capabilities.	Planned 1	
		PennDOT D1 and D10 District Offices coordinate construction and maintenance schedules and activities with county maintenance offices, and municipalities.	Existing	
		PennDOT County Maintenance Offices coordinate construction and maintenance activities with PennDOT District Offices, and Municipal Traffic Management/Public Safety Offices.	Existing	

Element	Stakeholder	Functionality	Status	Project
		PennDOT County Maintenance offices are typically first and only responders to incidents and resource requests. Will only get PennDOT District Office staff involved if large incident, e.g., requiring lane closure.	Existing	Maintenance Management <ul style="list-style-type: none"> • 800 MHz Statewide Communication System • AMBER Alert Coordination
		Future control of D1 field devices is planned for D2 RTMC and D10 Office.	Planned 2	
		District construction and maintenance activity database is maintained at PennDOT District 10-0 Office, and posted on public Website. District office collects data from County Maintenance Offices.	Existing	
		D10 office will act as a Transportation Management Center (TMC), as set forth in latest PennDOT ITS Operational Concept. As such, they will have control of most devices within district, and backup control will be provided by District 2 RTMC and future ST	Planned 1	
		PennDOT needs an automated winter weather advisory alert system, as well as a more automated way of coordinating road maintenance operations with between the District offices, county maintenance offices, and vehicles.	Planned 2	
		There is a need for systematic coordination with the National Weather Service in order to alert the appropriate emergency response and PennDOT roadway maintenance personnel during winter storms.	Planned 2	

Element	Stakeholder	Functionality	Status	Project
PennDOT D10 Vehicles	Pennsylvania Department of Transportation (PennDOT)	PennDOT needs an automated winter weather advisory alert system, as well as a more automated way of coordinating road maintenance operations with between the District offices, county maintenance offices, and vehicles.	Planned 2	<ul style="list-style-type: none"> • Detour Route System • D10 Vehicles Roadway Surface Condition Readers • Construction Program • Winter Weather Maintenance Management • Winter maintenance vehicle on-board systems • Maintenance Program • Freeway Work Zone Management
		PennDOT has a need to have better communications with work zones.	Planned 2	
		PennDOT County Maintenance Offices exchange maintenance information directly to maintenance vehicles.	Existing	
PennDOT D11 RTMC	Pennsylvania Department of Transportation (PennDOT)	PennDOT D11 RTMC plans to collect share CCTV images with D1 Field Devices in Mercer County.	Planned 1	<ul style="list-style-type: none"> • Winter Emergency Management Coordination System • AMBER Alert Coordination • Construction Program • PennDOT D11 Traffic
		PennDOT D1 Office plans to exchange traffic data with D11 office and D1 county maintenance offices.	Planned 2	
		Existing District 11-0 TMC in Bridgeville (outside of Pittsburgh) currently operates District 1-0-owned VMS and HAR devices along I-79 in Mercer County.	Existing	

Element	Stakeholder	Functionality	Status	Project
		D1 office will act as a Transportation Management Center (TMC), as set forth in latest PennDOT ITS Operational Concept. As such, they will have control of most devices within district, and backup control will be provided by District 11 RTMC and future ST	Planned 1	Management Center
PennDOT D2 TMC	Pennsylvania Department of Transportation (PennDOT)	Proactive incident/congestion management (24x7 operations)	Planned 2	<ul style="list-style-type: none"> • Winter Emergency Management Coordination System • Maintenance Program • AMBER Alert Coordination • PennDOT D2 Traffic Management Center
		PennDOT District 10-0 office will have primary control of the future VMS and HAR field devices being installed on I-80. District 2-0 RTMC will provide redundant control capabilities.	Planned 1	
		D10 office will act as a Transportation Management Center (TMC), as set forth in latest PennDOT ITS Operational Concept. As such, they will have control of most devices within district, and backup control will be provided by District 2 RTMC and future ST	Planned 1	
		Assumes control of adjacent District ITS devices during off-peak periods	Planned 1	
		PennDOT D2 TMC to control field devices in PennDOT D10 counties along I-80.	Planned 1	
		Future control of D1 field devices is planned for D2 RTMC and D10 Office.	Planned 2	
PennDOT STMC	Pennsylvania Department of	Could potentially serve as back-up operations management to PennDOT RTMC's	Planned 2	<ul style="list-style-type: none"> • PennDOT Transportation Management Centers

Element	Stakeholder	Functionality	Status	Project
	Transportation (PennDOT)	May support ATIS systems	Planned 2	(TMC's) <ul style="list-style-type: none"> • Winter Road Condition Hotline for Interstate Highways • Roadway Weather Information System (RWIS) • PennDOT Commercial Vehicle Information Systems and Networks (CVISN) Project • PennDOT Performance and Registration Information Systems Management (PRISM) • PennDOT Safety and Fitness Electronic Record (SAFER) • PennDOT ITS Transportation Management Approach • Construction Projects (current and future)
		May coordinate statewide operations (among districts and other states) and other state agencies (PSP, PTC, PEMA)	Planned 2	
		May perform political and public relations on behalf of PennDOT	Planned 2	
		May coordinate weather events throughout PennDOT	Planned 2	
		May coordinate incident, emergency, and inter/intra-state events	Planned 2	
		May act as central data repository	Planned 2	
		May coordinate Amber Alert for PennDOT	Planned 2	
		May be responsible for maintaining commercial vehicle registrations and credentials	Planned 2	
		May be responsible for maintaining the state's Motor Carrier Safety Assistance Program (MCSAP) files	Planned 2	
		May be responsible for conducting roadside inspections	Planned 2	

Element	Stakeholder	Functionality	Status	Project
		May be responsible for conducting weight enforcement activities	Planned 2	<ul style="list-style-type: none"> • Central Repository • Real -time Traffic Information Website • Statewide GIS based Incident Detour Map • Video Sharing • Web site Portal for Assisting Commercial Vehicle Operators • Statewide Telecommunication
Pennsylvania Office of Homeland Security	Pennsylvania Office of Homeland Security	Coordinates homeland security activities within the Commonwealth, both with municipal and county officials and with the federal Department of Homeland Security	Existing	
Personal Traveler Information Devices	General Public	RWIS data flows from the RWIS site to Central Office (BOMO) to a public website	Existing	<ul style="list-style-type: none"> • Traveler information service • Regional/County/Municipal PSAP/911 Centers • PennDOT Central Office Roadway Weather Information System (RWIS)
		PennDOT D1 District and County Maintenance offices currently post construction and maintenance information on websites.	Existing	
		EMTA plans to provide transit users information about when the next bus will arrive at stops and on website.	Planned 1	

Element	Stakeholder	Functionality	Status	Project
		EMTA LIFT paratranist currently has call receiving that communicate with customers, and dispatch services that communicate with vehicle drivers.	Existing	<ul style="list-style-type: none"> • PennDOT STMC • EMTA Traveler Information System
		District construction and maintenance activity database is maintained at PennDOT District 10-0 Office, and posted on public Website. District office collects data from County Maintenance Offices.	Existing	
		Users can currently request paratransit service on EMTA LIFT website.	Existing	
		There is a need for Media to provide collected information on roadway conditions, traffic, construction activities, and incident information for the general public.	Planned 2	
		Some regional transit agencies will provide schedules via their own dedicated websites	Planned 1	
PSP Offices	Pennsylvania State Police (PSP)	Provides capability to access traffic information from personal devices including pager, cell phone, computer etc.	Existing	<ul style="list-style-type: none"> • Pennsylvania State Police Dispatch Centers • Incident Information Management System (IIMS) • Pennsylvania State Police Consolidated Dispatch Center • 800 MHz Statewide
		Receives roadway incident notification from the County 911 Centers, PennDOT Offices, or PTC Offices	Existing	
		Plans to receive CCTV images from PTC. PTC intends to share CCTV images with PennDOT, PEMA, and other incident management agencies	Planned 1	

Element	Stakeholder	Functionality	Status	Project
		Receives work zone coverage plans and requests for troopers to cover work zones from PennDOT District Offices	Existing	Communication System <ul style="list-style-type: none"> • AMBER Alert Coordination
		Receives forwarded 911 calls from County 911 Communication Centers	Existing	
		Coordinates with other incident response agencies through PennDOT provided radio communication	Existing	
		Coordinates with in case of major incidents	Existing	
		Provides incident information to other agencies including PEMA, PennDOT, and radio stations	Existing	
		The 800 MHz radio is planned for the entire Region. This will create interoperability for all public service vehicles and centers	Planned 1	
		Coordinates with PennDOT County Maintenance Offices or District Offices for requesting salt and performing other maintenance operations	Existing	
PSP Vehicles	Pennsylvania State Police (PSP)	Receive incident and dispatch information from PSP Offices	Existing	<ul style="list-style-type: none"> • 800 MHz Statewide Communication System • Emergency Vehicle Traffic Signal Preemption • Mobile Data Terminals (MDT's)
		Coordinates with PSP Dispatch Center and other emergency management agencies during incidents	Existing	
Regional Media Outlets	Regional Media	Radio stations currently get incident information from State Police	Existing	<ul style="list-style-type: none"> • Traveler information service

Element	Stakeholder	Functionality	Status	Project
		PennDOT County Maintenance office in Erie currently receives weather system radar data from local television station at system set up in PennDOT facility.	Existing	<ul style="list-style-type: none"> • PennDOT Erie County Maintenance Office Weather Service
		Erie County Emergency Services has plans to deploy weather radar system at its facility using data likely provided by local television station.	Planned 1	<ul style="list-style-type: none"> • Erie County Emergency Management Agency Weather Data
		EMTA office currently exchanges information with local media about service disruptions	Existing	
		PennDOT D10 County Maintenance offices coordinate maintenance information with local newspapers.	Existing	
		Municipal Traffic Management Offices share information with the media.	Existing	
		There is a need for Media to provide collected information on roadway conditions, traffic, construction activities, and incident information for the general public.	Planned 2	
		911 Communication Centers receive severe weather alerts from National Weather Service and PEMA, and then forward on to Municipal Public Safety Vehicles, County EMA', and Local Media Outlets.	Existing	
		PennDOT County Maintenance Offices relay maintenance and work zone information to local media outlets.	Existing	

Element	Stakeholder	Functionality	Status	Project
		County EMA' plans to have capability to interrupt television broadcasts to issue emergency/weather alerts.	Planned 1	
Regional Transit Agency Offices	Regional Transit Agencies	Regional transit agencies have future need to deploy regional travel cards that may be compatible with all transit agency fare payment systems to facilitate transit fare or parking payment using a single card.	Planned 2	<ul style="list-style-type: none"> • Bus AVL and dispatch • CATA In-Vehicle Emergency Notification • Adjacent State Transit Coordination • CATA Transit Vehicle Diagnostic Tracking System • CATA Automated Transit Fare Payment • CATA Paratransit Automatic Vehicle Location System
		Crawford County CATA paratransit vehicles currently have vehicle tracking system.	Existing	
		Crawford County CATA has pushbutton devices in transit vehicles to allow drivers to alert transit management operators of emergency situations.	Existing	
		Crawford County CATA currently coordinates with PennDOT County Maintenance Office for any maintenance/construction/weather effecting routes.	Existing	
		Crawford County CATA currently coordinates transit schedules and operations with transit agencies in Ashtabula County, OH.	Existing	
		Crawford County (CATA) and Mercer County transit agencies have future need for transit vehicle diagnostics tracking systems in garages.	Planned 2	
		Meadville and Warren transit agencies may be interested in future fare collection systems, but currently do not have set plans or funding.	Planned 2	

Element	Stakeholder	Functionality	Status	Project
		Some regional transit agencies will provide schedules via their own dedicated websites	Planned 1	
		EMTA plans to coordinate transit operations with Crawford and Warren County Transit agencies.	Planned 2	
Regional Transit Agency Vehicles	Other Regional Transit Agencies	Regional transit agencies have future need to deploy regional travel cards that may be compatible with all transit agency fare payment systems to facilitate transit fare or parking payment using a single card.	Planned 2	<ul style="list-style-type: none"> • CATA Paratransit Automatic Vehicle Location System • CATA Transit Vehicle Diagnostic Tracking System • CATA In-Vehicle Emergency Notification • CATA Automated Transit Fare Payment • Regional Personal Travel Cards • Bus AVL and dispatch
		Mercer County Community Transit (MCCT) has need for AVL in paratransit vehicles.	Planned 2	
		Meadville and Warren transit agencies may be interested in future fare collection systems, but currently do not have set plans or funding.	Planned 2	
		Crawford County CATA paratransit vehicles currently have vehicle tracking system.	Existing	
		Crawford County CATA has pushbutton devices in transit vehicles to allow drivers to alert transit management operators of emergency situations.	Existing	
		Crawford County (CATA) and Mercer County transit agencies have future need for transit vehicle diagnostics tracking systems in garages.	Planned 2	
Towing Industry Responders	Towing Industry	Assists with cleanup of accident sites	Existing	
		Responds to requests from the PSP and 911 Centers	Existing	

Element	Stakeholder	Functionality	Status	Project
Weather Information Providers	Weather Information Providers	Provides web-based (free) and weather service provider (subscription) information	Existing	

3.3 Needs

Sections 3.3 and 3.4 examine each element defined in Section 3.2 in terms of *needs* (what each element — i.e., agency stakeholder — needs from others) and *services* (what each element can provide to others). This information is used to program *Turbo Architecture*, the National ITS Architecture software. “Needs” refer to the information inputs from one agency operation to another; they are presented in tabular format and trace back to the systems inventory.

Table 3-2: Regional Needs Table

Element	Need (operation/data inputs from others)	Status	Origin Element
911 Communication Centers	Incident notification and coordination	Existing	PSP Offices, County EMA Centers, PEMA Emergency Operation Center, Personal Traveler Information Devices, Municipal/Regional Public Safety Offices, Adjacent State Public Safety Offices, PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
	Field dispatch requests	Existing	Municipal/Regional Public Safety Vehicles
	Vehicle tracking data	Planned 2	Municipal/Regional Public Safety Vehicles
	Severe weather alerts and information	Existing	Weather Information Providers
	Roadway weather conditions	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
		Planned 2	PennDOT D1 TMC, PennDOT D10 TMC
Adjacent PennDOT County Maintenance Offices	Incident notification and coordination	Existing	PennDOT D1 County Maintenance Offices
	Maintenance and construction coordination	Existing	PennDOT D1 County Maintenance Offices

Element	Need (operation/data inputs from others)	Status	Origin Element
	Roadway weather information	Existing	PennDOT D1 County Maintenance Offices
Adjacent State Emergency Management Offices	Emergency coordination	Existing	PEMA Emergency Operation Center
Adjacent State Public Safety Offices	Incident/emergency notification and response coordination	Existing	911 Communication Centers, County EMA Centers, Municipal/Regional Public Safety Offices
		Planned 2	PSP Offices, PSP Vehicles, PennDOT STMC
Adjacent State Transit Offices	Transit operations coordination	Existing	Regional Transit Agency Offices, Mercer County Transit Agency Offices
		Planned 2	EMTA Offices
Adjacent State Transportation Offices	Traffic management and information coordination	Existing	PennDOT D1 TMC, PennDOT STMC
	Traffic device control coordination	Planned 2	PennDOT D1 TMC
	Maintenance and construction coordination	Planned 1	PennDOT D1 TMC, PennDOT D1 County Maintenance Offices
	Incident report and response coordination	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC, PSP Offices, PEMA Emergency Operation Center, PennDOT Central Office Organizations
		Planned 2	PennDOT STMC
Maintenance and construction resource coordination	Existing	PennDOT D1 County Maintenance Offices	

Element	Need (operation/data inputs from others)	Status	Origin Element
	Road weather information	Existing	PennDOT Central Office Organizations
Commercial Vehicle Company Offices	Credential status verification	Existing	PTC Offices, PennDOT Central Office Organizations
		Planned 2	PennDOT STMC
	Trip log	Existing	Commercial Vehicles
	On-board vehicle and safety data	Existing	Commercial Vehicles
	Driver update	Existing	Commercial Vehicles
	Compliance review report	Planned 2	PennDOT STMC
	Safety inspection report	Planned 2	PennDOT STMC
	Tax filing and citation	Planned 2	PennDOT STMC
Commercial Vehicles	Communication with the company offices	Existing	Commercial Vehicle Company Offices
	Safety inspection (electronic)	Planned 2	PennDOT Central Office Field Devices

Element	Need (operation/data inputs from others)	Status	Origin Element
County EMA Centers	Large-scale emergency notification and response coordination	Existing	PSP Offices, 911 Communication Centers, Municipal/Regional Public Safety Offices, PennDOT D1 TMC, PennDOT D10 TMC, PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices, PEMA Emergency Operation Center, EMAA Offices, PennDOT Central Office Organizations, Regional Transit Agency Offices, EMTA Offices, Mercer County Transit Agency Offices, Adjacent State Public Safety Offices
		Planned 2	PennDOT STMC
	Weather information	Existing	Weather Information Providers
	Roadway weather conditions	Existing	PennDOT D1 TMC, PennDOT D10 TMC, PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
		Planned 2	PennDOT STMC
	EMAA Offices	Emergency notification and response coordination	Existing
EMTA Offices	Vehicle location information	Planned 1	EMTA Transit Vehicles
	Transit information request	Existing	Personal Traveler Information Devices
	Traveler profile	Planned 2	Personal Traveler Information Devices
	Transit operations coordination	Planned 2	Regional Transit Agency Offices, Adjacent State Transit Offices

Element	Need (operation/data inputs from others)	Status	Origin Element
	Passenger and fare collection data	Existing / Planned 2	EMTA Transit Vehicles
	Current roadway restrictions and construction information	Planned 2	PennDOT D1 County Maintenance Offices
	Road weather information	Planned 2	PennDOT D1 County Maintenance Offices
	Road work plans	Planned 2	PennDOT D1 County Maintenance Offices
	Transit emergency coordination	Existing	County EMA Centers
	Transit vehicle emergency notification	Existing	EMTA Transit Vehicles
	Transit vehicle conditions	Existing	EMTA Transit Vehicles
	Transit management communications	Existing	EMTA Transit Vehicles
EMTA Remote Traveler Support	Transit traveler information	Planned 1	EMTA Offices
	Trip planning information	Planned 1	EMTA Offices
	Transit fare payment information	Planned 2	EMTA Offices, Regional Personal Traveler Cards
EMTA Transit Vehicles	Transit management communications	Existing	EMTA Offices
	Fare payment information	Planned 2	EMTA Offices, Regional Personal Traveler Cards
High Threat Facilities	Threat information coordination	Existing	911 Communication Centers, County EMA Centers
Mercer County Transit	Transit emergency coordination	Existing	County EMA Centers

Element	Need (operation/data inputs from others)	Status	Origin Element
Agency Offices	Transit information request	Existing	Personal Traveler Information Devices
	AVL data	Existing	Mercer County Transit Vehicles
	Transit vehicle emergency notification	Existing	Mercer County Transit Vehicles
	Transit vehicle conditions	Planned 2	Mercer County Transit Vehicles
	Transit management communications	Existing	Mercer County Transit Vehicles
	Fare payment information	Planned 2	Mercer County Transit Vehicles
	Current roadway restrictions and construction information	Existing	PennDOT D1 County Maintenance Offices
	Road weather information	Planned 2	PennDOT D1 County Maintenance Offices
	Road work plans	Existing	PennDOT D1 County Maintenance Offices
	Transit operations coordination	Existing	Adjacent State Transit Offices
Planned 1		Regional Transit Agency Offices	
Mercer County Transit Vehicles	Transit management communications	Existing	Mercer County Transit Agency Offices
	Fare payment information	Planned 2	Mercer County Transit Agency Offices, Regional Personal Traveler Cards
Municipal Field Devices	Signal system control information	Existing	Municipal Traffic Management Offices
	Traffic detection device control	Planned 1	Municipal Traffic Management Offices
	Video monitoring control	Planned 2	Municipal Traffic Management Offices

Element	Need (operation/data inputs from others)	Status	Origin Element
	Emergency vehicle preemption request signal	Existing	Municipal/Regional Public Safety Vehicles
Municipal Traffic Management Offices	Work plan/work zone coordination	Planned 2	PennDOT D10 TMC
	Coordinated freeway detour information	Planned 2	PennDOT D10 TMC, PennDOT D1 TMC
	Traffic information coordination	Existing	PennDOT D10 TMC, PennDOT D1 TMC
	Traffic management device coordination	Existing	PennDOT D1 TMC
		Planned 2	PennDOT D10 TMC
	Emergency traffic control request	Planned 2	County EMA Centers
	Signal system maintenance request	Existing	911 Communication Centers
	Traffic flow and detection data	Planned 1	Municipal Field Devices
	Traffic monitoring images	Planned 2	Municipal Field Devices
Signal system status	Existing	Municipal Field Devices	
Municipal/Regional Public Safety Offices	Incident report and response coordination	Existing	911 Communication Centers, County EMA Centers, Adjacent State Public Safety Offices, EMAA Offices
	Vehicle location data	Planned 2	Municipal/Regional Public Safety Vehicles
	Signal system maintenance request	Existing	Municipal Traffic Management Offices
	Maintenance and construction coordination	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
	Work plan coordination	Existing	PennDOT D10 TMC, PennDOT D1 TMC

Element	Need (operation/data inputs from others)	Status	Origin Element
Municipal/Regional Public Safety Vehicles	Incident/emergency dispatch and location information	Existing	911 Communication Centers
	Incident command information	Existing	Municipal/Regional Public Safety Offices
PEMA Emergency Operation Center	HAZMAT information	Existing	PSP Offices, Commercial Vehicle Company Offices, County EMA Centers
	Major incident/event coordination	Existing	911 Communication Centers, County EMA Centers, PSP Offices, PennDOT D1 TMC, PennDOT D10 TMC, PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices, PennDOT Central Office Organizations, Regional Transit Agency Offices, EMTA Offices, Mercer County Transit Agency Offices, EMTA Offices
		Planned 2	PennDOT STMC
	Pennsylvania Emergency Information Reporting System (PEIRS) information	Existing	County EMA Centers, PSP Offices, PennDOT D1 TMC, PennDOT D10 TMC, PennDOT Central Office Organizations
		Planned 2	PennDOT STMC
	Archived emergency data	Existing	County EMA Centers, 911 Communication Centers, PSP Offices
	Roadway and traffic conditions and current road/bridge closings	Existing	PennDOT Central Office Organizations, PennDOT D1 TMC, PennDOT D10 TMC
PennDOT Central Office	RWIS device control	Existing	PennDOT Central Office

Element	Need (operation/data inputs from others)	Status	Origin Element
Field Devices		Planned 2	PennDOT STMC
	Safety inspection and electronic screening information	Planned 2	Commercial Vehicles, PennDOT STMC
PennDOT Central Office Organizations	PennDOT Central Office Bureau downloads data from traffic counters in the field throughout region.	Existing	County Planning Agency Offices
	PennDOT BHSTE coordinates with PEMA and other agencies (PennDOT Districts, PSP, County EMA's, etc.) in case of major incidents	Existing	PennDOT Central Office Field Devices
	PennDOT (Motor Carrier Division) maintains commercial vehicle registrations	Existing	PEMA Emergency Operation Center, County Planning Agency
	PEMA gathers/provides specific incident information from/to County EMA's, PSP, PennDOT, and PTC.	Existing	PennDOT Central Office Field Devices
	CVO supports the exchange of safety credential information across the jurisdictions	Existing	PennDOT D1 TMC, PSP Offices, PTC Offices, PEMA Emergency Operation Center
	CVO Supports the collection and review of carrier safety data and determines the carrier safety rating	Planned 1	PennDOT D1 TMC, PennDOT STMC
	CVO provides tax credentials, collects taxes, audits accounts, and conducts tax-related enforcement activities as appropriate	Existing	Adjacent PennDOT Districts, PennDOT D1 TMC, PTC Offices, Municipal Offices
	PennDOT Motor Carrier Division conducts roadside inspections	Planned 2	PennDOT D1 TMC, PennDOT STMC
	PennDOT Motor Carrier Division is responsible for providing appropriate credentials to motor carriers as well as collecting necessary registration and title fees	Existing	County Planning Organizations
PennDOT BPR owns and maintains Automatic Traffic Recorders	Existing	PennDOT Central Office Field Devices	

Element	Need (operation/data inputs from others)	Status	Origin Element
	County Maintenance Offices get RWIS information in real-time. Everyone else has to get the information from the public website. It takes approximately 1 hour for information to be published on the website.	Existing	PennDOT Central Office Field Devices
	RWIS data flows from the RWIS site to Central Office (BOMO) to a public website	Existing	Commercial Vehicle Company Offices
	RWIS monitor roadway weather conditions and transfer information to PennDOT BOMO	Existing	PennDOT D1 County Maintenance Offices
	PennDOT Motor Carrier Division conducts weight enforcement activities	Existing	PennDOT D1 County Maintenance Offices
	Device control	Existing	PennDOT Central Office, PennDOT D1 County Maintenance Offices
	Vehicle registrations	Planned 1	Commercial Vehicle Company Offices
	Credentialing information	Planned 1	Commercial Vehicle Company Offices
	Safety/screening information including weight enforcement	Planned1	Commercial Vehicle Company Offices
PennDOT D1 County Maintenance Offices	Incident/emergency report and response coordination	Existing	County EMA Centers, PennDOT D1 TMC, PSP Offices, 911 Communication Centers, Adjacent State Transportation Offices, PennDOT D11 RTMC, Adjacent PennDOT County Maintenance Offices, PennDOT D10 County Maintenance Offices
		Planned 2	PennDOT STMC, PennDOT D2 TMC
	Maintenance resource request	Existing	911 Communication Centers, County EMA Centers,

Element	Need (operation/data inputs from others)	Status	Origin Element
	Maintenance and construction coordination	Existing	PennDOT D1 TMC, PSP Offices, PennDOT D11 RTMC, Municipal/Regional Public Safety Offices, Adjacent State Transportation Offices, Adjacent PennDOT County Maintenance Offices, PennDOT D10 County Maintenance Offices
		Planned 2	PennDOT STMC, PennDOT D2 TMC
	Road and traffic conditions	Existing	PennDOT D1 TMC, PennDOT D11 RTMC
		Planned 2	PennDOT D2 TMC
	Work plan coordination	Existing	Adjacent State Transportation Offices, PennDOT D11 RTMC, Adjacent PennDOT County Maintenance Offices, PennDOT D10 County Maintenance Offices, PennDOT D1 TMC
		Planned 2	PennDOT D2 TMC,
	External incident/emergency reports from media	Existing	Regional Media Outlets
	Adherent weather alert/update information and data	Existing	Weather Information Providers
	Current weather systems data	Existing	Regional Media Outlets
	Current road restrictions	Existing	PennDOT D1 TMC
	Winter weather maintenance management system information	Planned 2	PennDOT D1 TMC, PennDOT D1 Vehicles
	Infrastructure condition information	Existing	PennDOT D1 Vehicles

Element	Need (operation/data inputs from others)	Status	Origin Element
	Vehicle location data	Planned 2	PennDOT D1 Vehicles
	Work zone status information	Existing	PennDOT D1 Vehicles
	Maintenance vehicle conditions data	Existing	PennDOT D1 Vehicles
	Roadway monitoring images	Planned 2	PennDOT D1 Field Devices
	Work zone status and monitoring information	Planned 2	PennDOT D1 Field Devices
	RWIS information	Existing	PennDOT Central Office Organizations
PennDOT D1 Field Devices	Device control	Existing	PennDOT D1 TMC, PennDOT D1 County Maintenance Offices, PennDOT D11 RTMC
		Planned 2	PennDOT D2 TMC
PennDOT D1 TMC	Incident/emergency information	Existing	PSP Offices, County EMA Centers, PEMA Emergency Operation Center, 911 Communication Centers, PennDOT D10 TMC, PennDOT D11 RTMC, PennDOT D2 TMC, Adjacent State Transportation Offices, PennDOT D1 County Maintenance Offices
		Planned 2	PennDOT STMC
	Incident/emergency resource request	Existing	911 Communication Centers, County EMA Centers

Element	Need (operation/data inputs from others)	Status	Origin Element
	Incident/emergency response coordination	Existing	County EMA Centers, PennDOT D10 TMC, PennDOT D11 RTMC, PennDOT D2 TMC, Adjacent State Transportation Offices, PennDOT D1 County Maintenance Offices
	Emergency traffic control request	Existing	County EMA Centers
	Work plan coordination	Existing	Municipal/Regional Public Safety Offices, Municipal Traffic Management Offices, PennDOT D10 TMC, Adjacent State Transportation Offices, PennDOT D1 County Maintenance Offices
	Road restrictions information	Existing	PennDOT D1 County Maintenance Offices
	Traveler information coordination	Planned 1	PennDOT D1 County Maintenance Offices
	Maintenance and construction coordination	Existing	PennDOT D1 County Maintenance Offices, Municipal Traffic Management Offices
	Road conditions and traffic management information	Existing	Adjacent State Transportation Offices, PennDOT D10 TMC, PennDOT D11 RTMC, PennDOT D2 TMC, Municipal Traffic Management Offices, PennDOT Central Office Organizations, PennDOT D1 County Maintenance Offices
		Planned 2	PennDOT STMC
Traffic management device control coordination	Existing	Municipal Traffic Management Offices, PennDOT D11 RTMC	

Element	Need (operation/data inputs from others)	Status	Origin Element	
		Planned 2	PennDOT D10 TMC, PennDOT D2 TMC, Adjacent State Transportation Offices	
	External incident/emergency reports from media	Existing	Regional Media Outlets	
	Winter weather maintenance management system information	Planned 2	PennDOT D1 County Maintenance Offices, PennDOT D1 Vehicles	
	Winter weather alert/status information	Planned 2	Weather Information Providers	
	Field device status		Existing	PennDOT D1 Field Devices,
			Planned 1	PennDOT D10 Field Devices
	CCTV images	Planned 2	PennDOT D1 Field Devices	
	Vehicle location data	Planned 2	PennDOT D1 Vehicles	
	Work zone status information	Existing	PennDOT D1 Vehicles	
	Construction vehicle conditions data	Existing	PennDOT D1 Vehicles	
	RWIS information	Existing	PennDOT Central Office Organizations	
	Speed monitoring information	Planned 2	PennDOT D1 Field Devices	
PennDOT D1 Vehicles	Winter maintenance management system information	Planned 2	PennDOT D1 TMC, PennDOT D1 County Maintenance Offices	
	Vehicle remote maintenance system control	Planned 2	PennDOT D1 County Maintenance Offices	
	Maintenance and construction dispatch information	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC	

Element	Need (operation/data inputs from others)	Status	Origin Element
PennDOT D10 County Maintenance Offices	Incident/emergency report and response coordination	Existing	County EMA Centers, PennDOT D10 TMC, PSP Offices, 911 Communication Centers, PennDOT D1 County Maintenance Offices
		Planned 2	PennDOT STMC
	Maintenance resource request	Existing	911 Communication Centers, County EMA Centers,
	Maintenance and construction coordination	Existing	PennDOT D10 TMC, PSP Offices, Municipal/Regional Public Safety Offices, PennDOT D1 County Maintenance Offices
		Planned 2	PennDOT STMC
	Road and traffic conditions	Existing	PennDOT D10 TMC
	Work plan coordination	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 TMC
	External incident/emergency reports from media	Existing	Regional Media Outlets
	Adherent weather alert/update information and data	Planned 2	Weather Information Providers
	Infrastructure condition information	Existing	PennDOT D10 Vehicles
	Vehicle location data	Planned 2	PennDOT D10 Vehicles
	Work zone status information	Existing	PennDOT D10 Vehicles
	Maintenance vehicle conditions data	Planned 1	PennDOT D10 Vehicles
	Field device status	Planned 1	PennDOT D10 Field Devices
	Roadway monitoring images	Planned 2	PennDOT D10 Field Devices

Element	Need (operation/data inputs from others)	Status	Origin Element
	Work zone status and monitoring information	Planned 2	PennDOT D10 Field Devices
	RWIS information	Existing	PennDOT Central Office Organizations
	Current roadway restrictions	Existing	PennDOT D10 TMC
PennDOT D10 Field Devices	Device control	Planned 1	PennDOT D10 TMC, PennDOT D10 County Maintenance Offices, PennDOT D2 TMC, PennDOT D1 TMC
PennDOT D10 TMC	Incident/emergency information	Existing	PSP Offices, County EMA Centers, PEMA Emergency Operation Center, 911 Communication Centers, PennDOT D1 TMC, PennDOT D10 County Maintenance Offices
	Incident/emergency resource request	Existing	911 Communication Centers, County EMA Centers
	Incident/emergency response coordination		County EMA Centers, PennDOT D1 TMC, PennDOT D10 County Maintenance Offices
	Emergency traffic control request	Existing	County EMA Centers
	Work plan coordination	Existing	Municipal/Regional Public Safety Offices, Municipal Traffic Management Offices, PennDOT D1 TMC, PennDOT D10 County Maintenance Offices
	Road restrictions information	Existing	PennDOT D10 County Maintenance Offices

Element	Need (operation/data inputs from others)	Status	Origin Element
	Traveler information coordination	Existing	PennDOT D10 County Maintenance Offices
	Maintenance and construction coordination	Existing	PennDOT D10 County Maintenance Offices, Municipal Traffic Management Offices
		Planned 2	Municipal/Regional Public Safety Offices
	Road conditions and traffic management information	Existing	PennDOT D1 TMC, Municipal Traffic Management Offices, PennDOT Central Office Organizations, PennDOT D10 County Maintenance Offices
		Planned 2	PennDOT STMC, PennDOT D2 TMC
	Traffic management device control coordination	Planned 1	PennDOT D1 TMC, PennDOT D2 TMC
		Planned 2	Municipal Traffic Management Offices
	External incident/emergency reports from media	Existing	Regional Media Outlets
	Winter weather alert/status information	Existing	Weather Information Providers
	Field device status	Planned 1	PennDOT D10 Field Devices
	CCTV images	Planned 2	PennDOT D10 Field Devices
	Vehicle location data	Planned 2	PennDOT D10 Vehicles
	Work zone status information	Existing	PennDOT D10 Vehicles
	Construction vehicle conditions data	Planned 2	PennDOT D10 Vehicles
	RWIS information	Existing	PennDOT Central Office Organizations

Element	Need (operation/data inputs from others)	Status	Origin Element
	Speed monitoring information	Planned 2	PennDOT D10 Field Devices
PennDOT D10 Vehicles	Vehicle remote maintenance system control	Planned 2	PennDOT D10 County Maintenance Offices
	Maintenance and construction dispatch information	Existing	PennDOT D10 County Maintenance Offices, PennDOT D10 TMC
PennDOT D11 RTMC	Device status	Existing	PennDOT D1 Field Devices
	Current road restriction information	Existing	PennDOT D1 County Maintenance Offices
	Field device control coordination	Existing	PennDOT D1 TMC, PennDOT D1 County Maintenance Offices
	Maintenance and construction coordination information	Existing	PennDOT D1 County Maintenance Offices
	Current road weather conditions	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC
	Work plan coordination	Existing	PennDOT D1 County Maintenance Offices
	Incident/emergency report and response coordination	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC
	Traffic flow data and CCTV images	Planned 2	PennDOT D1 Field Devices
PennDOT D2 TMC	Device status	Planned 1	PennDOT D10 Field Devices, PennDOT D1 Field Devices
	Field device control coordination	Planned 2	PennDOT D1 TMC, PennDOT D10 TMC

Element	Need (operation/data inputs from others)	Status	Origin Element
	Maintenance and construction coordination	Existing	PennDOT D1 County Maintenance Offices
	Current road weather conditions	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC
	Work plan coordination	Existing	PennDOT D1 County Maintenance Offices
	Incident/emergency report and response coordination	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC
	Traffic flow data and CCTV images	Planned 2	PennDOT D1 Field Devices, PennDOT D10 Field Devices
PennDOT STMC	Incident/emergency information	Planned 2	PennDOT D1 TMC, PennDOT D10 TMC, PSP Offices, PEMA Emergency Operation Center
	Traffic conditions	Planned 2	PennDOT D1 TMC, PennDOT D10 TMC
	RWIS data	Planned 2	PennDOT Central Office Field Devices
	Archived data	Planned 2	PennDOT D1 TMC, PennDOT D10 TMC, PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
	Vehicle registrations	Planned1	Commercial Vehicle Agencies
	Credentialing information	Planned1	Commercial Vehicle Agencies
	Safety/screening information including weight enforcement	Planned1	Commercial Vehicle Agencies

Element	Need (operation/data inputs from others)	Status	Origin Element
	Maintenance and Construction information including snow removal	Planned 2	PennDOT D1 TMC, PennDOT D10 TMC, PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
Pennsylvania Office of Homeland Security	Threat information coordination	Existing	PEMA Emergency Operation Center
Personal Traveler Information Devices	Weather, roadway related information	Existing	PennDOT D1 TMC, PennDOT D10 TMC, PennDOT Central Office Organizations, Regional Media Outlets
	Maintenance and construction traveler information	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 TMC
	Next-bus arrival times and real-time scheduling	Planned 2	Regional Transit Agency Offices, EMTA Offices, Mercer County Transit Agency Offices
	Trip planning information	Planned 2	EMTA Offices
	Transit schedules	Existing	Regional Transit Agency Offices, EMTA Offices, Mercer County Transit Agency Offices
PSP Offices	Incident/emergency notification	Planned 2	PSP Vehicles, 911 Communication Centers, County EMA Centers, PEMA Emergency Operation Center
	Incident/emergency dispatch and information	Existing	PSP Vehicles, Towing Industry Responders

Element	Need (operation/data inputs from others)	Status	Origin Element
	Incident response coordination	Existing	911 Communication Centers, County EMA Centers, PennDOT D1 TMC, PennDOT D10 TMC, PEMA Emergency Operation Center, PennDOT Central Office Organizations
		Planned 2	PennDOT STMC, Adjacent State Public Safety Offices
	HAZMAT information	Existing	Commercial Vehicle Company Offices
	Work zone information	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
PSP Vehicles	Incident/emergency dispatch	Existing	PSP Offices
	Incident detection and location information	Existing	PSP Offices
	Incident status updates	Existing	PSP Offices
	Coordination through 800 MHz voice communications with all regional emergency management agency centers and vehicles	Planned 1	County EMA Centers, 911 Communication Centers, PSP Vehicles, PEMA Emergency Operation Center, PennDOT D5 STMC
Regional Media Outlets	Incident location and status information	Existing	PSP Offices, County EMA Centers, PennDOT D1 TMC, PennDOT D10 TMC
		Planned 2	PennDOT STMC
	Emergency information broadcast	Planned 1	County EMA Centers
	Traveler Information for Media	Planned 2	PennDOT D1 TMC, PennDOT D10 TMC, PennDOT STMC

Element	Need (operation/data inputs from others)	Status	Origin Element
	Transit travel information and advisories	Existing	Regional Transit Agency Offices, EMTA Offices, Mercer County Transit Agency Offices
	Work zone, road condition, and road maintenance information	Planned 2	PennDOT D1 TMC, PennDOT D10 TMC, Municipal Traffic Management Offices, PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
Regional Personal Traveler Cards	Fare payment request and information	Planned 2	Regional Transit Vehicles, EMTA Remote Traveler Support, EMTA Transit Vehicles, Mercer County Transit Vehicles
Regional Transit Agency Offices	Transit emergency coordination	Existing	County EMA Centers
	Transit information request	Existing	Personal Traveler Information Devices
	AVL data	Existing	Regional Transit Vehicles
	Transit vehicle emergency notification	Existing	Regional Transit Vehicles
	Transit vehicle conditions	Planned 2	Regional Transit Vehicles
	Transit management communications	Existing	Regional Transit Vehicles
	Fare payment information	Planned 2	Regional Transit Vehicles
	Current roadway restrictions and construction information	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
	Road weather information	Planned 2	PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices

Element	Need (operation/data inputs from others)	Status	Origin Element
	Road work plans	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
	Transit operations coordination	Existing	Adjacent State Transit Offices
		Planned 1	EMTA Offices, Mercer County Transit Agency Offices
Regional Transit Vehicles	Transit management communications	Existing	Regional Transit Agency Offices
	Fare payment information	Planned 2	Regional Transit Agency Offices, Regional Personal Traveler Cards
Towing Industry Responders	Dispatch requests	Existing	PSP Offices, 911 Communication Centers
Weather Information Providers	Road weather information	Existing	PennDOT D1 County Maintenance Offices
		Planned 2	PennDOT D10 County Maintenance Offices, PennDOT D1 TMC, PennDOT D10 TMC

3.4 Services

Sections 3.3 and 3.4 examine each element defined in Section 3.2 in terms of *needs* (what each element — i.e., agency stakeholder — needs from others) and *services* (what each element can provide to others). This information is used to program *Turbo Architecture*, the National ITS Architecture software. “Services” refer to the information outputs from one agency operation to another; they are presented in tabular format and trace back to the systems inventory.

Table 3-3: Regional Services Table

Element	Service (operation/data outputs to others)	Status	Destination Element
911 Communication Centers	Incident/emergency notification and response coordination	Existing	Adjacent State Public Safety Offices, County EMA Centers, Municipal/Regional Public Safety Offices, PennDOT D1 County Maintenance Offices, PennDOT D1 TMC, PennDOT D10 County Maintenance Offices, PennDOT D10 TMC, PSP Offices,
	Signal system maintenance request	Existing	Municipal Traffic Management Offices
	Incident/emergency dispatch and location information	Existing	Municipal/Regional Public Safety Vehicles, Towing Industry Responders
	Major incident/event coordination	Existing	PEMA Emergency Operation Center
	Archived emergency data	Existing	PEMA Emergency Operation Center
	Incident/emergency resource request	Existing	PennDOT D1 TMC, PennDOT D10 TMC
	Maintenance resource request	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
Adjacent PennDOT County Maintenance Offices	Incident/emergency report and response coordination	Existing	PennDOT D1 County Maintenance Offices
	Maintenance and construction coordination	Existing	PennDOT D1 County Maintenance Offices
	Work plan coordination	Existing	PennDOT D1 County Maintenance Offices
Adjacent State Emergency Management Agencies	Emergency coordination	Existing	PEMA Emergency Operation Center
Adjacent State Public Safety Offices	Incident report and response coordination	Existing	911 Communication Centers, Municipal/Regional Public Safety Offices

Element	Service (operation/data outputs to others)	Status	Destination Element
	Large-scale emergency notification and response coordination	Existing	County EMA Centers
Adjacent State Transit Offices	Transit operations coordination	Planned 2	EMTA Offices, Mercer County Transit Agency Offices, Regional Transit Agency Offices
Adjacent State Transportation Offices	Incident/emergency report and response coordination	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC
	Maintenance and construction coordination	Existing	PennDOT D1 County Maintenance Offices,
	Work plan coordination	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC
	Road conditions and traffic management information	Existing	PennDOT D1 TMC
	Traffic management device control coordination	Planned 2	PennDOT D1 TMC
County EMA Centers	Incident/emergency notification and response coordination	Existing	911 Communication Centers, Adjacent State Public Safety Offices, EMAA Offices, Municipal/Regional Public Safety Offices, PennDOT D1 County Maintenance Offices, PennDOT D1 TMC, PennDOT D10 County Maintenance Offices, PennDOT D10 TMC PSP Offices
	Transit emergency coordination	Existing	EMTA Offices, Mercer County Transit Agency Offices, Regional Transit Agency Offices
	Emergency traffic control request	Planned 2	Municipal Traffic Management Offices, PennDOT D1 TMC, PennDOT D10 TMC
	HAZMAT information	Existing	PEMA Emergency Operation Center
	Major incident/event coordination	Existing	PEMA Emergency Operation Center

Element	Service (operation/data outputs to others)	Status	Destination Element
	Pennsylvania Emergency Information Reporting System (PEIRS) information	Existing	PEMA Emergency Operation Center
	Archived emergency data	Existing	PEMA Emergency Operation Center
	Maintenance resource request	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
	Incident/emergency information	Existing	PennDOT D1 TMC, PennDOT D10 TMC
	Incident/emergency resource request	Existing	PennDOT D1 TMC, PennDOT D10 TMC
	Incident location and status information	Existing	Regional Media Outlets
	Emergency information broadcast	Planned 1	Regional Media Outlets
EMAA Offices	Large-scale emergency notification and response coordination	Existing	County EMA Centers, PEMA Emergency Operation Center
	Incident report and response coordination	Existing	Municipal/Regional Public Safety Offices
EMTA Offices	Transit operations coordination	Planned 2	Adjacent State Transit Offices, Regional Transit Agency Offices
	Large-scale emergency notification and response coordination	Existing	County EMA Centers, PEMA Emergency Operation Center
	Transit traveler information	Planned 1	EMTA Remote Traveler Support
	Trip planning information	Planned 1	EMTA Remote Traveler Support Personal Traveler Information Devices

Element	Service (operation/data outputs to others)	Status	Destination Element
	Transit fare payment information	Planned 2	EMTA Remote Traveler Support
	Transit management communications	Existing	EMTA Transit Vehicles
	Fare payment information	Planned 2	EMTA Transit Vehicles
	Next-bus arrival times and real-time scheduling	Planned 2	Personal Traveler Information Devices
	Trip planning information	Planned 2	
	Transit schedules	Existing	Personal Traveler Information Devices
	Transit travel information and advisories	Existing	Regional Media Outlets
EMTA Remote Traveler Support	Fare payment request and information	Planned 2	Regional Personal Traveler Cards
EMTA Transit Vehicles	Vehicle location information	Planned 1	EMTA Offices
	Passenger and fare collection data	Existing / Planned 2	EMTA Offices
	Transit vehicle emergency notification	Existing	EMTA Offices
	Transit vehicle conditions	Existing	EMTA Offices
	Transit management communications	Existing	EMTA Offices
	Fare payment request and information	Planned 2	Regional Personal Traveler Cards
High Threat Facilities	Threat information coordination	Existing	911 Communication Centers, County EMA Centers
Mercer County Transit	Transit operations coordination	Existing	Adjacent State Transit Offices

Element	Service (operation/data outputs to others)	Status	Destination Element
Agency Offices	Large-scale emergency notification and response coordination	Existing	County EMA Centers, PEMA Emergency Operation Center
	Transit management communications	Existing	Mercer County Transit Vehicles
	Fare payment information	Planned 2	Mercer County Transit Vehicles
	Next-bus arrival times and real-time scheduling	Planned 2	Personal Traveler Information Devices
	Transit schedules	Existing	Personal Traveler Information Devices
	Transit travel information and advisories	Existing	Regional Media Outlets
Mercer County Transit Vehicles	AVL data	Existing	Mercer County Transit Agency Offices
	Transit vehicle emergency notification	Existing	Mercer County Transit Agency Offices
	Transit vehicle conditions	Planned 2	Mercer County Transit Agency Offices
	Transit management communications	Existing	Mercer County Transit Agency Offices
	Fare payment information	Planned 2	Mercer County Transit Agency Offices
	Fare payment request and information	Planned 2	Regional Personal Traveler Cards
Municipal Field Devices	Traffic flow and detection data	Planned 1	Municipal Traffic Management Offices
	Traffic monitoring images	Planned 2	Municipal Traffic Management Offices
	Signal system status	Existing	Municipal Traffic Management Offices
Municipal Traffic Management Offices	Signal system control information	Existing	Municipal Field Devices
	Traffic detection device control	Planned 1	Municipal Field Devices

Element	Service (operation/data outputs to others)	Status	Destination Element
	Video monitoring control	Planned 2	Municipal Field Devices
	Signal system maintenance request	Existing	Municipal/Regional Public Safety Offices
	Work plan coordination	Existing	PennDOT D1 TMC, PennDOT D10 TMC
	Maintenance and construction coordination	Existing	PennDOT D1 TMC, PennDOT D10 TMC
	Road conditions and traffic management information	Existing	PennDOT D1 TMC, PennDOT D10 TMC
	Traffic management device control coordination	Existing	PennDOT D1 TMC
	Work zone, road condition, and road maintenance information	Planned 2	Regional Media Outlets
Municipal/Regional Public Safety Offices	Incident/emergency notification and response coordination	Existing	911 Communication Centers, Adjacent State Public Safety Offices
	Large-scale emergency notification and response coordination	Existing	County EMA Centers
	Incident command information	Existing	Municipal/Regional Public Safety Vehicles
	Maintenance and construction coordination	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 County Maintenance Offices
	Work plan coordination	Existing	PennDOT D1 TMC, PennDOT D10 TMC
Municipal/Regional Public Safety Vehicles	Field dispatch requests	Existing	911 Communication Centers

Element	Service (operation/data outputs to others)	Status	Destination Element
	Vehicle tracking data	Planned 2	911 Communication Centers, Municipal/Regional Public Safety Offices
	Emergency vehicle preemption request signal	Existing	Municipal Field Devices
PEMA Emergency Operation Center	Incident response coordination	Existing	911 Communication Centers, County EMA Centers, Incident Response Agency Offices, Adjacent State Emergency Management Offices, PennDOT Central Office Organizations
		Planned 2	PennDOT STMC
	PIERS Incident data	Existing	911 Communication Centers
	Traffic control coordination	Planned 2	PTC Offices
	Threat information coordination	Existing	Pennsylvania Office of Homeland Security
PennDOT Central Office Field Devices	RWIS information	Existing	PennDOT Central Office Organizations, PennDOT D1 County Maintenance Offices
		Planned 2	PennDOT STMC
	Safety inspection reports and violation notification	Existing	PennDOT Central Office Organizations
		Planned 2	PennDOT STMC
PennDOT Central Office Organizations	Request for archived data (BPR)	Existing	Regional Transit Offices, PennDOT D9 TMC
		Planned 2	PennDOT STMC
	Incident and emergency information and coordination (BHSTE)	Existing	PEMA Emergency Operation Center, PennDOT D1 TMC, PSP Offices, TRANSCOM Center

Element	Service (operation/data outputs to others)	Status	Destination Element
		Planned 2	PennDOT STMC
	Traffic information and conditions (BHSTE)	Existing	PennDOT D1 TMC
		Planned 2	PennDOT STMC
	Work zone information (BOMO)	Existing	PennDOT D1 TMC
		Planned 2	PennDOT STMC
	Maintenance and Construction coordination		PennDOT D1 TMC
		Planned 2	PennDOT STMC
	Commercial vehicle enforcement information (Motor Carrier Division)	Existing	PSP Offices
		Planned 2	PennDOT STMC
	Media information	Existing	Regional Media Outlets
PennDOT D1 County Maintenance Offices	Incident/emergency notification and coordination	Existing	911 Communication Centers, Adjacent PennDOT County Maintenance Offices, Adjacent State Transportation Offices, PennDOT D1 TMC, PennDOT D10 County Maintenance Offices, PennDOT D11 RTMC, PennDOT D2 TMC
	Roadway weather conditions	Existing	911 Communication Centers, Adjacent PennDOT County Maintenance Offices, County EMA Centers, PennDOT D11 RTMC, PennDOT D2 TMC, Weather Information Providers

Element	Service (operation/data outputs to others)	Status	Destination Element
	Maintenance and construction coordination	Existing	Adjacent PennDOT County Maintenance Offices, Municipal/Regional Public Safety Offices, PennDOT D1 TMC, PennDOT D10 County Maintenance Offices, PennDOT D11 RTMC, PennDOT D2 TMC
		Planned 1	Adjacent State Transportation Offices
	Maintenance and construction resource coordination	Existing	Adjacent State Transportation Offices
	Large-scale emergency notification and response coordination	Existing	County EMA Centers, PEMA Emergency Operation Center
	Road work plans	Planned 2	EMTA Offices
	Current roadway restrictions and construction information	Planned 2	EMTA Offices
	Road weather information	Planned 2	EMTA Offices, Mercer County Transit Agency Offices, Regional Transit Agency Offices
	Current roadway restrictions and construction information	Existing	Mercer County Transit Agency Offices, Regional Transit Agency Offices, PennDOT D1 TMC, PennDOT D11 RTMC
	Road work plans	Existing	Mercer County Transit Agency Offices, Regional Transit Agency Offices
	RWIS monitor roadway weather conditions and transfer information to PennDOT BOMO	Existing	PennDOT Central Office Organizations
PennDOT Motor Carrier Division conducts weight enforcement activities	Existing	PennDOT Central Office Organizations	

Element	Service (operation/data outputs to others)	Status	Destination Element
	Device control	Existing	PennDOT D1 Field Devices
	Work plan coordination	Existing	PennDOT D1 TMC, PennDOT D10 County Maintenance Offices, PennDOT D11 RTMC, PennDOT D2 TMC
	Traveler information coordination	Planned 1	PennDOT D1 TMC
	Road conditions and traffic management information	Existing	PennDOT D1 TMC
	Winter weather maintenance management system information	Planned 2	PennDOT D1 TMC
	Winter maintenance management system information	Planned 2	PennDOT D1 Vehicles
	Vehicle remote maintenance system control		PennDOT D1 Vehicles
	Maintenance and construction dispatch information	Existing	PennDOT D1 Vehicles
	Field device control coordination	Existing	PennDOT D11 RTMC
	Archived data	Planned 2	PennDOT STMC
	Maintenance and Construction information including snow removal	Planned 2	PennDOT STMC
	Maintenance and construction traveler information	Existing	Personal Traveler Information Devices
	Work zone information	Existing	PSP Offices
	Work zone, road condition, and road maintenance information	Planned 2	Regional Media Outlets
PennDOT D1 Field Devices	Roadway monitoring images	Planned 2	PennDOT D1 County Maintenance Offices
	Work zone status and monitoring information	Planned 2	PennDOT D1 County Maintenance Offices

Element	Service (operation/data outputs to others)	Status	Destination Element
	Field device status	Existing	PennDOT D1 TMC, PennDOT D11 RTMC, PennDOT D2 TMC
	CCTV images	Planned 2	PennDOT D1 TMC, PennDOT D11 RTMC, PennDOT D2 TMC
	Speed monitoring information	Planned 2	PennDOT D1 TMC, PennDOT D11 RTMC, PennDOT D2 TMC
PennDOT D1 TMC	Roadway weather conditions	Planned 2	911 Communication Centers County, EMA Centers
	Traffic management and information coordination	Existing	Adjacent State Transportation Offices, Municipal Traffic Management Offices, PennDOT D10 TMC, PennDOT D11 RTMC, PennDOT D2 TMC, PennDOT STMC
	Traffic device control coordination	Existing	Municipal Traffic Management Offices, PennDOT D11 RTMC
		Planned 1	PennDOT D10 TMC
		Planned 2	Adjacent State Transportation Offices, PennDOT D2 TMC
	Maintenance and construction coordination	Planned 1	Adjacent State Transportation Offices, PennDOT D1 County Maintenance Offices
	Incident report and response coordination	Existing	Adjacent State Transportation Offices, PennDOT D1 County Maintenance Offices, PennDOT D10 TMC, PennDOT D11 RTMC, PennDOT D2 TMC, PennDOT STMC PSP Offices
Relaying information from emergency operations to trucking companies	Existing	Commercial Vehicle Company Offices	

Element	Service (operation/data outputs to others)	Status	Destination Element
	Large-scale emergency notification and response coordination	Existing	County EMA Centers, PEMA Emergency Operation Center
	Coordinated freeway detour information	Planned 2	Municipal Traffic Management Offices
	Work plan coordination	Existing	Municipal/Regional Public Safety Offices, PennDOT D1 County Maintenance Offices, PennDOT D10 TMC
	Road and traffic conditions	Existing	PennDOT D1 County Maintenance Offices
	Current road restrictions	Existing	PennDOT D1 County Maintenance Offices
	Winter weather maintenance management system information	Planned 2	PennDOT D1 County Maintenance Offices
	Device control	Existing	PennDOT D1 Field Devices
		Planned 1	PennDOT D10 Field Devices
	Winter maintenance management system information	Planned 2	PennDOT D1 Vehicles
	Maintenance and construction dispatch information	Existing	PennDOT D1 Vehicles
	Archived data	Planned 2	PennDOT STMC
	Maintenance and Construction information including snow removal	Planned 2	PennDOT STMC
	Weather, roadway related information	Existing	Personal Traveler Information Devices
	Incident location and status information	Existing	Regional Media Outlets

Element	Service (operation/data outputs to others)	Status	Destination Element
	Traveler Information for Media	Planned 2	Regional Media Outlets
	Work zone, road condition, and road maintenance information	Planned 2	Regional Media Outlets
	Road weather information	Planned 2	Weather Information Providers
	Pennsylvania Emergency Information Reporting System (PEIRS) information	Existing	PEMA Emergency Operation Center
	Roadway and traffic conditions and current road/bridge closings	Existing	PEMA Emergency Operation Center
	CVO supports the exchange of safety credential information across the jurisdictions	Existing	PennDOT Central Office Organizations
	CVO Supports the collection and review of carrier safety data and determines the carrier safety rating	Planned 1	PennDOT Central Office Organizations
	CVO provides tax credentials, collects taxes, audits accounts, and conducts tax-related enforcement activities as appropriate PennDOT Motor Carrier Division conducts roadside inspections	Existing Planned 2	PennDOT Central Office Organizations PennDOT Central Office Organizations
PennDOT D1 Vehicles	Winter weather maintenance management system information	Planned 2	PennDOT D1 County Maintenance Offices PennDOT D1 TMC
	Infrastructure condition information	Existing	PennDOT D1 County Maintenance Offices
	Vehicle location data	Planned 2	PennDOT D1 County Maintenance Offices PennDOT D1 TMC
	Work zone status information	Existing	PennDOT D1 County Maintenance Offices PennDOT D1 TMC

Element	Service (operation/data outputs to others)	Status	Destination Element
	Maintenance vehicle conditions data	Existing	PennDOT D1 County Maintenance Offices
	Construction vehicle conditions data	Existing	PennDOT D1 TMC
PennDOT D10 County Maintenance Offices	Incident/emergency report and response coordination	Existing	911 Communication Centers, PennDOT D1 County Maintenance Offices, PennDOT D10 TMC
	Roadway weather conditions	Existing	911 Communication Centers, Regional Transit Agency Offices, County EMA Centers, Weather Information Providers
	Large-scale emergency notification and response coordination	Existing	County EMA Centers, PEMA Emergency Operation Center
	Maintenance and construction coordination	Existing	Municipal/Regional Public Safety Offices, PennDOT D1 County Maintenance Offices, PennDOT D10 TMC
	Work plan coordination	Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 TMC
	Device control	Planned 1	PennDOT D10 Field Devices
	Road restrictions information	Existing	PennDOT D10 TMC
	Traveler information coordination	Existing	PennDOT D10 TMC
	Road conditions and traffic management information	Existing	PennDOT D10 TMC
	Vehicle remote maintenance system control	Planned 2	PennDOT D10 Vehicles
	Maintenance and construction dispatch information	Existing	PennDOT D10 Vehicles

Element	Service (operation/data outputs to others)	Status	Destination Element
	Archived data	Planned 2	PennDOT STMC
	Maintenance and Construction information including snow removal	Planned 2	PennDOT STMC
	Work zone information	Existing	PSP Offices
	Work zone, road condition, and road maintenance information	Planned 2	Regional Media Outlets
	Current roadway restrictions and construction information	Existing	Regional Transit Agency Offices
	Road work plans	Existing	Regional Transit Agency Offices
PennDOT D10 Field Devices	Field device status	Planned 1	PennDOT D1 TMC, PennDOT D10 County Maintenance Offices, PennDOT D10 TMC, PennDOT D2 TMC
	Roadway monitoring images	Planned 2	PennDOT D10 County Maintenance Offices, PennDOT D10 TMC, PennDOT D2 TMC
	Work zone status and monitoring information	Planned 2	PennDOT D10 County Maintenance Offices
	Speed monitoring information	Planned 2	PennDOT D10 TMC PennDOT D2 TMC
PennDOT D10 TMC	Roadway weather conditions	Planned 2	911 Communication Centers, County EMA Centers, Weather Information Providers
	Large-scale emergency notification and response coordination	Existing	County EMA Centers, PEMA Emergency Operation Center

Element	Service (operation/data outputs to others)	Status	Destination Element	
	Coordinated freeway detour information	Planned 2	Municipal Traffic Management Offices	
	Traffic information coordination	Existing	Municipal Traffic Management Offices, PennDOT D1 TMC, PennDOT D10 County Maintenance Offices	
	Traffic management device coordination	Planned 2	Municipal Traffic Management Offices, PennDOT D1 TMC, PennDOT D2 TMC	
	Work plan coordination		Existing	Municipal/Regional Public Safety Offices, PennDOT D1 TMC, PennDOT D10 County Maintenance Offices
			Planned 2	Municipal Traffic Management Offices
	Pennsylvania Emergency Information Reporting System (PEIRS) information	Existing	PEMA Emergency Operation Center	
	Roadway and traffic conditions and current road/bridge closings	Existing	PEMA Emergency Operation Center	
	Incident/emergency report and response coordination	Existing	PennDOT D10 County Maintenance Offices, PennDOT D1 TMC, PSP Offices	
	Maintenance and construction coordination	Existing	PennDOT D10 County Maintenance Offices	
	Current roadway restrictions	Existing	PennDOT D10 County Maintenance Offices	
	Device control	Planned 1	PennDOT D10 Field Devices	
	Maintenance and construction dispatch information	Existing	PennDOT D10 Vehicles	
	Incident/emergency information	Planned 2	PennDOT STMC	
	Traffic conditions	Planned 2	PennDOT STMC	
	RWIS data	Planned 2	PennDOT STMC	

Element	Service (operation/data outputs to others)	Status	Destination Element
	Archived data	Planned 2	PennDOT STMC
	Maintenance and Construction information including snow removal	Planned 2	PennDOT STMC
	Maintenance and construction traveler information	Existing	Personal Traveler Information Devices
	Incident location and status information	Existing	Regional Media Outlets
	Traveler Information for Media	Planned 2	Regional Media Outlets
	Work zone, road condition, and road maintenance information	Existing	Personal Traveler Information Devices
Planned 2		Regional Media Outlets	
PennDOT D10 Vehicles	Infrastructure condition information	Existing	PennDOT D10 County Maintenance Offices
	Vehicle location data	Planned 2	PennDOT D10 County Maintenance Offices PennDOT D10 TMC
	Work zone status information	Existing	PennDOT D10 County Maintenance Offices PennDOT D10 TMC
	Maintenance vehicle conditions data	Planned 1	PennDOT D10 County Maintenance Offices
	Construction vehicle conditions data	Planned 2	PennDOT D10 TMC
PennDOT D11 RTMC	Incident/emergency report and response coordination	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC
	Maintenance and construction coordination	Existing	PennDOT D1 County Maintenance Offices
	Road and traffic conditions	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC
	Work plan coordination	Existing	PennDOT D1 County Maintenance Offices
	Device control	Existing	PennDOT D1 Field Devices

Element	Service (operation/data outputs to others)	Status	Destination Element
	Traffic management device control coordination	Existing	PennDOT D1 TMC
PennDOT D2 TMC	Incident/emergency report and response coordination	Planned 2	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC
	Maintenance and construction coordination	Planned 2	PennDOT D1 County Maintenance Offices
	Road and traffic conditions	Existing	PennDOT D1 TMC
		Planned 2	PennDOT D1 County Maintenance Offices, PennDOT D10 TMC
	Work plan coordination	Planned 2	PennDOT D1 County Maintenance Offices
	Device control	Planned 2	PennDOT D1 Field Devices
	Device control	Planned 1	PennDOT D10 Field Devices
	Traffic management device control coordination	Planned 1	PennDOT D10 TMC
Planned 2		PennDOT D1 TMC	
PennDOT STMC	Incident and emergency information and coordination	Planned 2	PEMA Emergency Operation Center, PennDOT Central Office Organizations, PennDOT D1 TMC, Adjacent State Transportation Offices, PSP Offices
	Request for archived data	Planned 2	PennDOT Central Office Organizations, PennDOT D1 TMC, Adjacent State Transportation Offices
	Traffic information, restrictions, and conditions	Planned 2	PennDOT Central Office Organizations, PennDOT D1 TMC, Adjacent State Transportation Offices

Element	Service (operation/data outputs to others)	Status	Destination Element
	Work zone information	Planned 2	PennDOT Central Office Organizations, PennDOT D1 TMC, Adjacent State Transportation Offices
	Maintenance and Construction coordination	Planned 2	PennDOT Central Office Organizations, PennDOT D1 TMC, Adjacent State Transportation Offices
	Commercial vehicle enforcement information	Planned 2	PennDOT Central Office Organizations, Commercial Vehicle Company Offices
	Road weather information	Planned 2	PennDOT Central Office Organizations, PennDOT D1 TMC, Regional Media Outlets
	Media information	Planned 2	Regional Media Outlets
Pennsylvania Office of Homeland Security	Threat information coordination	Existing	PEMA Emergency Operation Center
Personal Traveler Information Devices	Incident notification and coordination	Existing	911 Communication Centers
	Transit information request	Existing	EMTA Offices, Mercer County Transit Agency Offices, Regional Transit Agency Offices
	Traveler profile	Planned 2	EMTA Offices
Regional Media Outlets	External incident/emergency reports from media	Existing	PennDOT D1 County Maintenance Offices, PennDOT D1 TMC, PennDOT D10 County Maintenance Offices, PennDOT D10 TMC
	Current weather systems data	Existing	PennDOT D1 County Maintenance Offices

Element	Service (operation/data outputs to others)	Status	Destination Element
	Weather, roadway related information	Existing	Personal Traveler Information Devices
Regional Personal Traveler Cards	Transit fare payment information	Planned 2	EMTA Remote Traveler Support
	Fare payment information	Planned 2	EMTA Transit Vehicles, Mercer County Transit Vehicles, Regional Transit Vehicles
Regional Transit Agency Offices	Transit operations coordination	Existing	Adjacent State Transit Offices
		Planned 1	Mercer County Transit Agency Offices
		Planned 2	EMTA Offices
	Large-scale emergency notification and response coordination	Existing	County EMA Centers, PEMA Emergency Operation Center
	Next-bus arrival times and real-time scheduling	Planned 2	Personal Traveler Information Devices
	Transit schedules	Existing	Personal Traveler Information Devices
	Transit travel information and advisories	Existing	Regional Media Outlets
	Transit management communications	Existing	Regional Transit Vehicles
	Fare payment information	Planned 2	Regional Transit Vehicles
	Regional Transit	Fare payment request and information	Planned 2

Element	Service (operation/data outputs to others)	Status	Destination Element
Vehicles	AVL data	Existing	Regional Transit Agency Offices
	Transit vehicle emergency notification	Existing	Regional Transit Agency Offices
	Transit vehicle conditions	Planned 2	Regional Transit Agency Offices
	Transit management communications	Existing	Regional Transit Agency Offices
	Fare payment information	Planned 2	Regional Transit Agency Offices
Towing Industry Responders	Emergency dispatch coordination	Existing	911 Communication Centers, PSP Offices
Weather Information Providers	Severe weather alerts and information	Existing	911 Communication Centers, County EMA Centers
		Existing	PennDOT D1 County Maintenance Offices, PennDOT D10 TMC
	Adherent weather alert/update information and data	Planned 2	PennDOT D1 TMC, PennDOT D10 County Maintenance Offices

4 Regional ITS Architecture

The Regional ITS Architecture was created using the process discussed in Section 1.1 'Architecture Process' on this document. The development of the Regional ITS Architecture consisted of: (1) developing a Strawman document using the RAP as a source of information gathering, (2) outreaching to ITS stakeholders in the Region and validating the Strawman, and (3) revising the Architecture to reflect stakeholder inputs from the outreach process. This process is further discussed below.

Strawman

Using existing documentation and information gathered from the RAP (Section 3 tables) a Strawman, or draft, Regional ITS Architecture was developed. The RAP consisted of key stakeholders in the Region and was used to gather preliminary information for Architecture development. This information was then used to assign actual and potential "interconnects" and "information flows" between among the ITS elements. The result was this effort was a draft version of this Final Report, known as the Strawman Architecture. The Strawman Architecture document was created and submitted to PennDOT on August 13, 2004.

Outreach

Outreach is the sharing of information to stakeholders. The ITS Architecture effort was led with outreach being a central activity of the project. Stakeholders were gathered through an extensive effort working with the RAP. RAP members identified key regional persons and agencies involved in surface transportation activities that may benefit from the ITS Architecture effort. Three outreach segments were scheduled into the process to gather input and reach out to these important stakeholders:

Outreach Activity 1: Regional Meeting (called the 1st Bookend meeting) - this meeting provided an introduction to ITS, provided context for the effort and set the stage for smaller working meetings.

Outreach Activity 2: Small Working Meetings (called Validation meetings) - these were a series of meetings that were smaller in size and broken into functional areas such as; traffic, emergency management, incident management, enforcement, transit and planning. Stakeholders attending these meetings reviewed and edited a piece of the draft of the ITS Architecture that pertained directly to their agency and job function. In this way the ITS Architecture became validated by each stakeholder represented in the ITS Architecture.

Outreach Activity 3: Regional Meeting (called the 2nd Bookend meeting) - this meeting concluded the ITS Architecture effort and launched the next steps of preparing a regional operations plan, that has input into the regional long-range plan and regional transportation improvement program.

All of these activities were led by PennDOT and regional champions. In many cases RAP members championed the effort as well. The success of this regions ITS Architecture effort can be directly tied to the efforts of regional champions and the willingness of the regional stakeholders to participate to complete this effort.

Bookend Meeting #1

On September 21, 2004, a Stakeholders Bookend Meeting convened in Altoona Pennsylvania. The meeting began the outreach process by introducing Regional stakeholders to ITS operation, ITS planning, and the Architecture project.

Agencies represented at the Bookend Meeting included PennDOT, airports, transit agencies, counties, cities, emergency management agencies, planning offices, townships, partnership organizations, the enforcement community, and policy organizations. Detailed meeting minutes, including the stakeholders in attendance, are included in Appendix F.

Validation Meetings

Validation meetings were conducted in October 2004 with small intimate groups of stakeholders to validate the Strawman Architecture. These meetings were used to expand, tailor, and refine the documentation of existing and planned interconnects and information flows. Detailed meeting minutes from the Validation Meetings are contained in Appendix G.

Bookend Meeting #2

Bookend Meeting #2 was held on January 13, 2005 in Erie, Pennsylvania. The meeting included many of the stakeholders that participated at the first Bookend Meeting and validation meetings. Detailed meeting minutes are included in Appendix H.

Final Architecture

This report, Final Regional ITS Architecture, was developed based on comments received from stakeholders during the outreach process. Stakeholder comments from the outreach process were reconciled and incorporated into the Strawman document, resulting in the Final Architecture. The following sections depict the final ITS Architecture diagrams. These diagrams include:

- Subsystem Interconnect Diagrams,
- Interconnect Diagrams, and
- Information Flow Diagrams.

4.1 Subsystem Interconnect Diagram

This diagram presents the Regional ITS Architecture relationships between subsystems and the communication between them. As shown this diagram provides a visual representation of data used in the development of the Regional ITS Architecture. Subsystems that do not pertain this particular Regional ITS Architecture are denoted in a light grey text. The Subsystem Interconnect Diagram is divided into four system classes; Travelers, Centers, Vehicles, and Roadside. A color scheme (green, yellow, blue, and red) links subsystems and elements back to the System Interconnect Diagram.

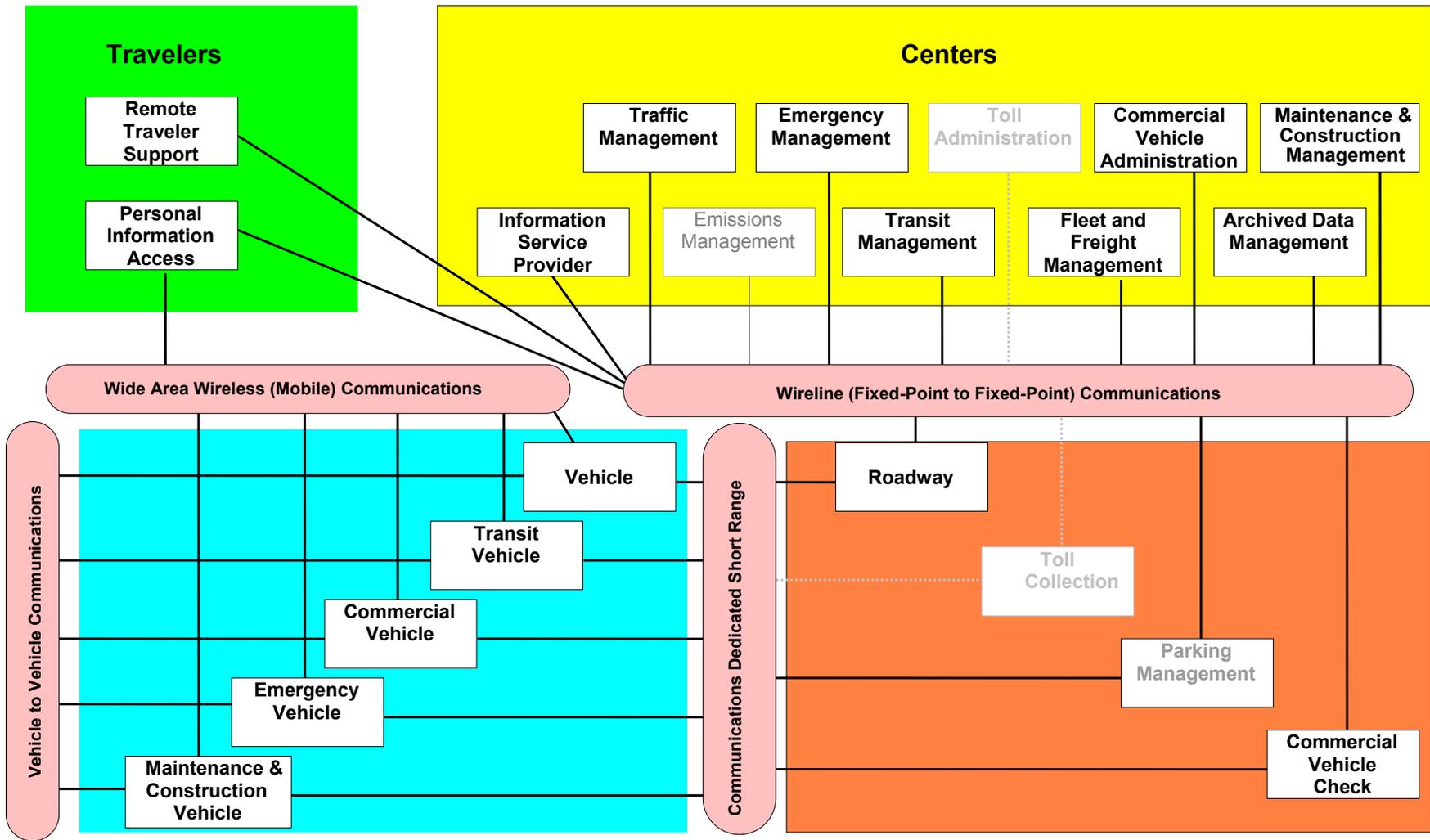


Figure 4-1: Subsystem Interconnect Diagram

4.2 Regional Subsystem Interconnect Diagram showing Elements

This diagram presents the regional ITS Architecture relationships between subsystems, the communication between them, and the elements within each subsystem. As shown this diagram provides a visual representation of data used in the development of the Regional ITS Architecture. In this diagram elements have been added to make this diagram useful for regional specificity. This information is also provided in a tabular format listed by element.

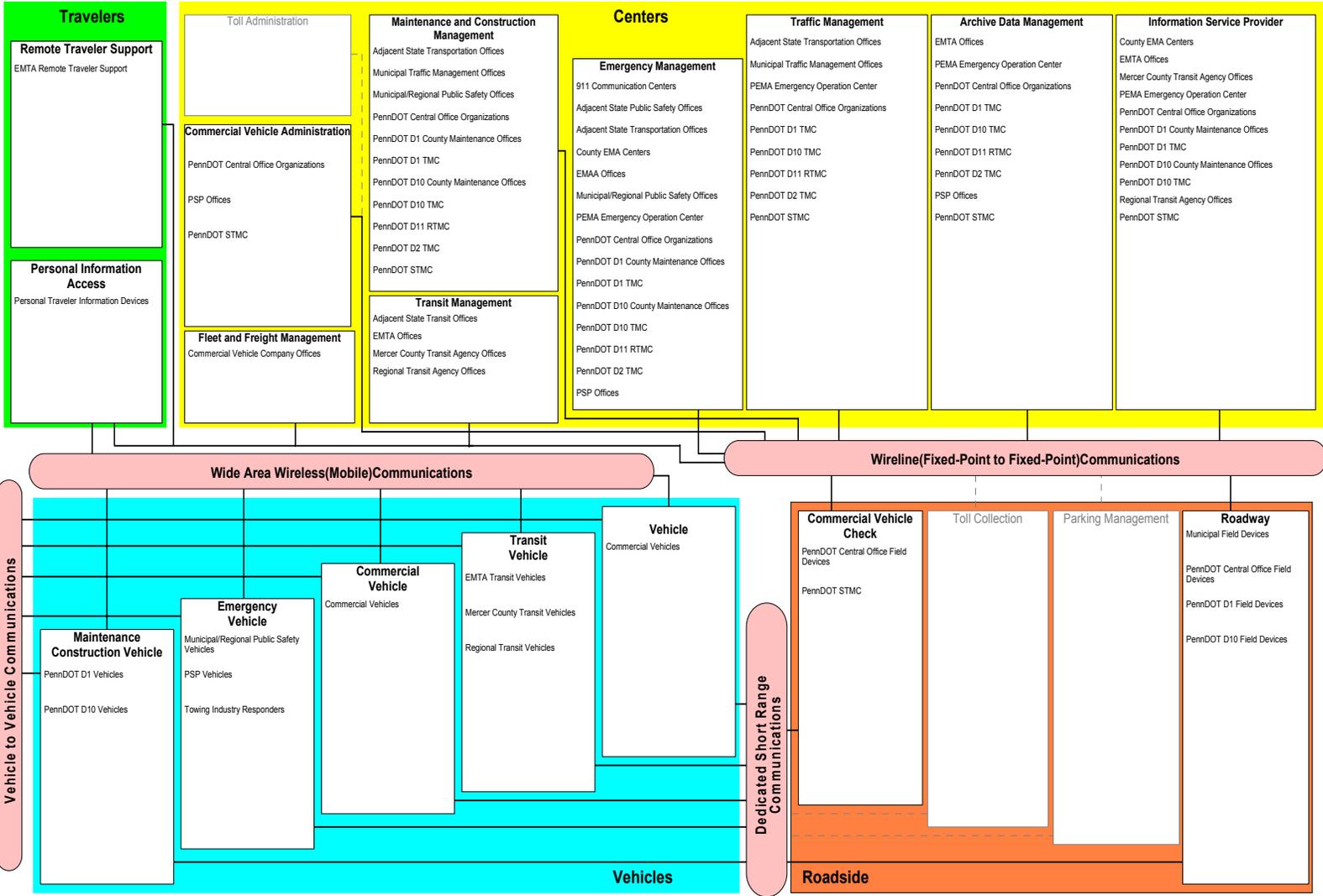


Figure 4-2: Regional Subsystem Interconnect Diagram showing Elements

Table 4-1: Regional Subsystems/Terminators

Element	Subsystem/Terminator mapped to:
911 Communication Centers	Emergency Management
Adjacent PennDOT County Maintenance Offices	Maintenance and Construction Management
Adjacent State Public Safety Offices	Emergency Management
Adjacent State Transit Offices	Transit Management
Adjacent State Transportation Offices	Emergency Management Maintenance and Construction Management Traffic Management
Commercial Vehicle Company Offices	Fleet and Freight Management
Commercial Vehicles	Commercial Vehicle Vehicle
County EMA Centers	Emergency Management Information Service Provider
EMAA Offices	Emergency Management
EMTA Offices	Archived Data Management Information Service Provider Transit Management
EMTA Remote Traveler Support	Remote Traveler Support
EMTA Transit Vehicles	Transit Vehicle
High Threat Facilities	Emergency Management
Mercer County Transit Agency Offices	Transit Management
Mercer County Transit Vehicles	Transit Vehicles
Municipal Field Devices	Roadway
Municipal Traffic Management Offices	Maintenance and Construction Management Traffic Management
Municipal/Regional Public Safety Offices	Emergency Management Maintenance and Construction Management
Municipal/Regional Public Safety Vehicles	Emergency Vehicle
PEMA Emergency Operation Center	Archived Data Management Emergency Management Information Service Provider

Element	Subsystem/Terminator mapped to:
	Traffic Management
PennDOT Central Office Field Devices	Commercial Vehicle Check Roadway
PennDOT Central Office Organizations	Archived Data Management Archived Data User Systems Commercial Vehicle Administration Emergency Management Information Service Provider Maintenance and Construction Management Traffic Management
PennDOT D1 County Maintenance Offices	Archived Data User Systems Emergency Management Information Service Provider Maintenance and Construction Management
PennDOT D1 Field Devices	Roadway
PennDOT D1 TMC	Archived Data Management Archived Data User Systems Emergency Management Information Service Provider Maintenance and Construction Management Traffic Management
PennDOT D1 Vehicles	Maintenance and Construction Vehicle
PennDOT D10 County Maintenance Offices	Archived Data User Systems Emergency Management Information Service Provider Maintenance and Construction Management
PennDOT D10 Field Devices	Roadway
PennDOT D10 TMC	Archived Data Management Archived Data User Systems Emergency Management Information Service Provider Maintenance and Construction Management Traffic Management
PennDOT D10 Vehicles	Maintenance and Construction Vehicle
PennDOT D11 RTMC	Archived Data Management

Element	Subsystem/Terminator mapped to:
	Archived Data User Systems Emergency Management Information Service Provider Maintenance and Construction Management Traffic Management
PennDOT D2 TMC	Archived Data Management Archived Data User Systems Emergency Management Information Service Provider Maintenance and Construction Management Traffic Management
PennDOT STMC	Archived Data Management Archived Data User Systems Commercial Vehicle Administration Commercial Vehicle Check Emergency Management Information Service Provider Maintenance and Construction Management Traffic Management
Pennsylvania Office of Homeland Security	Emergency Management
Personal Traveler Information Devices	Personal Information Access
PSP Offices	Archived Data Management Commercial vehicle Administration Emergency Management
PSP Vehicles	Emergency Vehicle
Regional Media Outlets	Media
Regional Transit Agency Offices	Information Service Provider Transit Management
Regional Transit Vehicles	Transit Vehicle
Towing Industry Responders	Emergency vehicle
Weather Information Providers	Weather Service

4.3 Interconnect Matrix

This section documents the actual and potential “interconnects” (i.e., interfaces) among the ITS elements. Interconnects show where one operation will connect data or information with another operation. The section is primarily documented as Turbo software output.

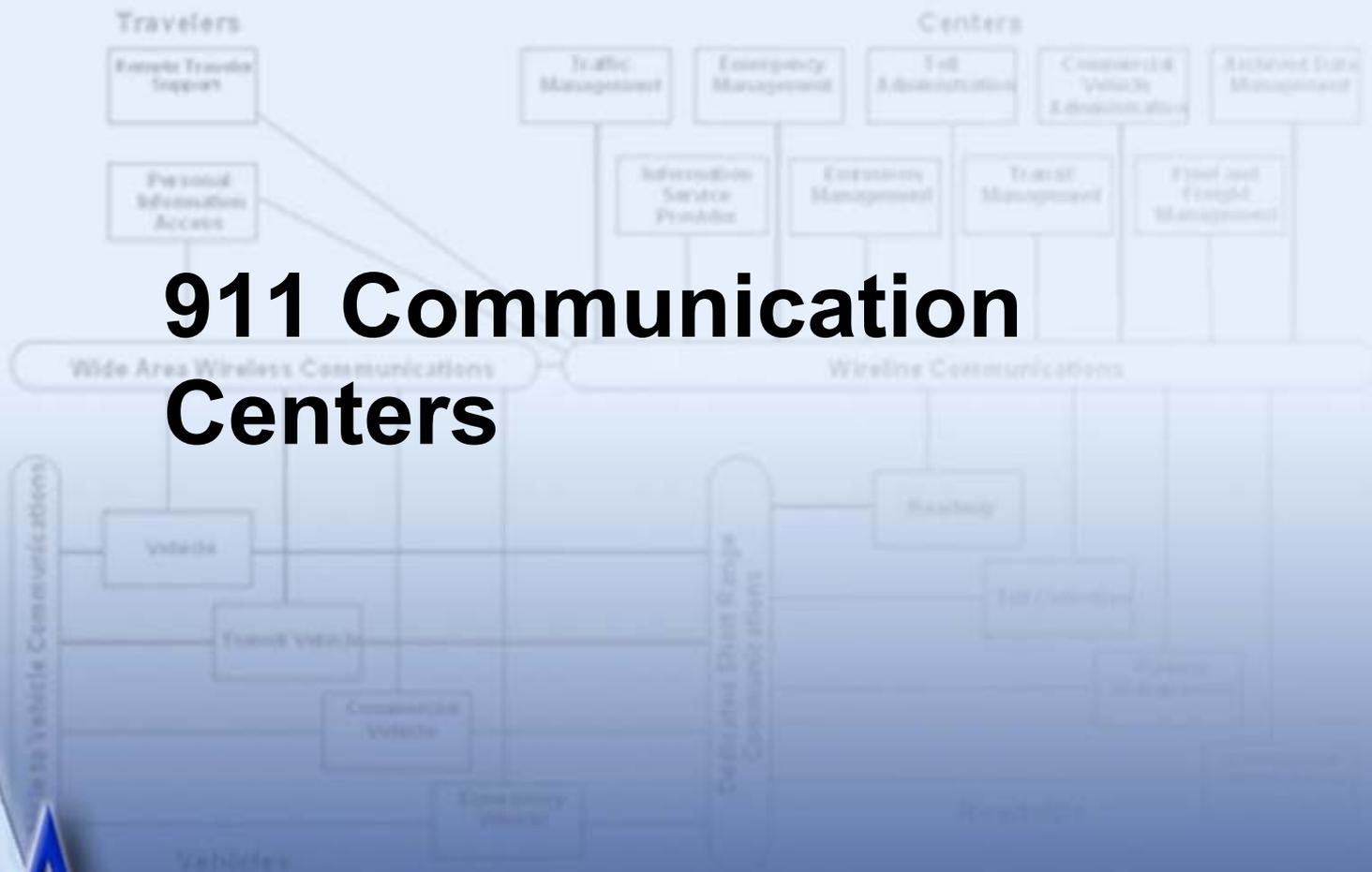
Table 4-2: Regional Interconnect Matrix

	911 Communication Centers	Adjacent PennDOT County Maintenance Offices	Adjacent State Public Safety Offices	Adjacent State Transit Offices	Adjacent State Transportation Offices	Commercial Vehicle Company Offices	Commercial Vehicles	County EMA Centers	EMAA Offices	EMTA Offices	EMTA Remote Traveler Support	EMTA Transit Vehicles	High Threat Facilities	Mercer County Transit Agency Offices	Mercer County Transit Vehicles	Municipal Field Devices	Municipal Traffic Management Offices	Municipal/Regional Public Safety Offices	Municipal/Regional Public Safety Vehicles	PEMA Emergency Operation Center	PennDOT Central Office Field Devices	PennDOT Central Office Organizations	PennDOT D1 County Maintenance Offices	PennDOT D1 Field Devices	PennDOT D1 TMC	PennDOT D1 Vehicles	PennDOT D10 County Maintenance Offices	PennDOT D10 Field Devices	PennDOT D10 TMC	PennDOT D10 Vehicles	PennDOT D11 RTMC	PennDOT D2 TMC	PennDOT STMC	Pennsylvania Office of Homeland Security	Personal Traveler Information Devices	PSP Offices	PSP Vehicles	Regional Media Outlets	Regional Transit Agency Offices	Regional Transit Vehicles	Towing Industry Responders	Weather Information Providers						
911 Communication Centers			X					X					X				X	X	X	X			X			X		X							X	X						X	X					
Adjacent PennDOT County Maintenance Offices																						X																										
Adjacent State Public Safety Offices	X							X										X																				X										
Adjacent State Transit Offices										X				X																										X								
Adjacent State Transportation Offices																						X											X															
Commercial Vehicle Company Offices						X																X											X				X											
Commercial Vehicles						X															X																											
County EMA Centers	X		X						X	X			X	X			X	X		X		X		X			X											X		X					X			
EMAA Offices							X										X		X														X															
EMTA Offices				X			X				X	X										X	X														X	X		X	X							
EMTA Remote Traveler Support										X																																						
EMTA Transit Vehicles										X																																						
High Threat Facilities	X						X																																									
Mercer County Transit Agency Offices				X			X							X								X	X												X	X		X	X									

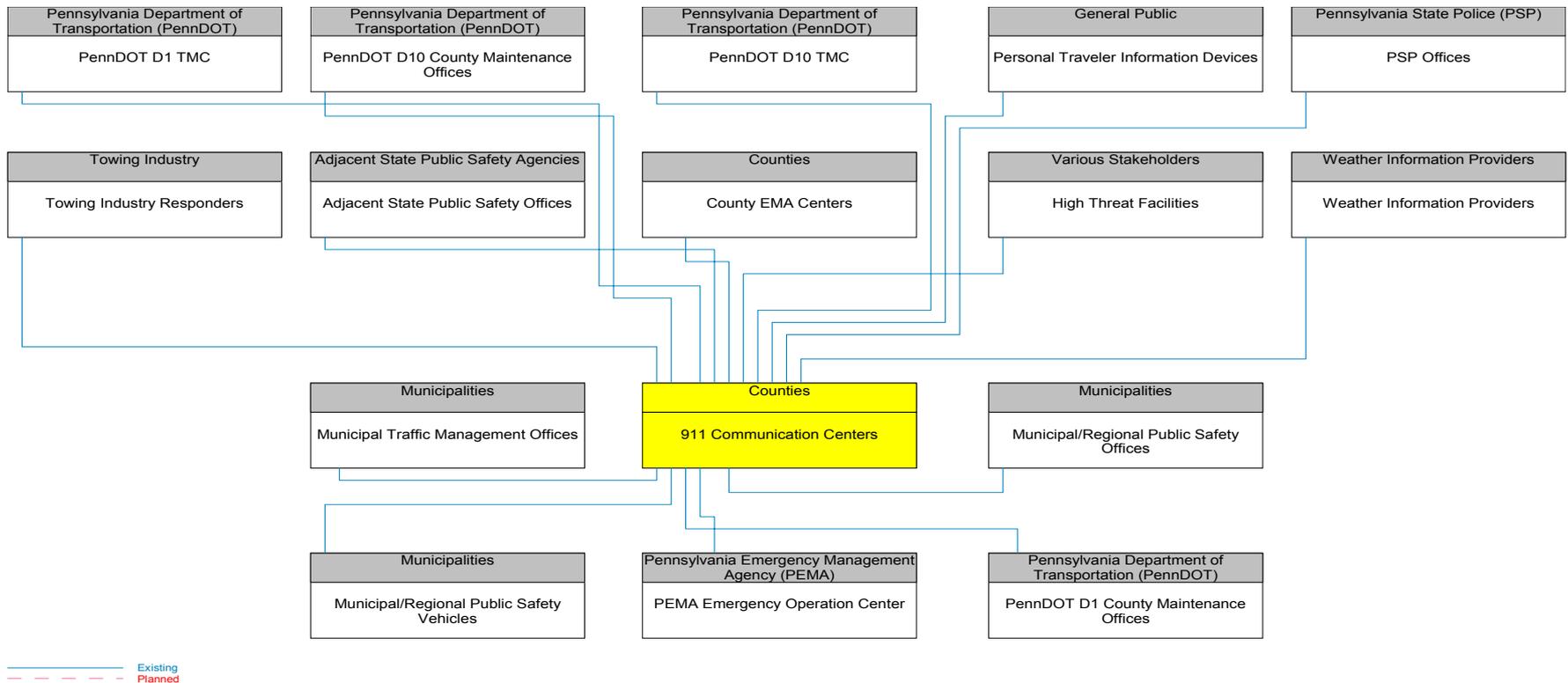
4.4 ITS Architecture

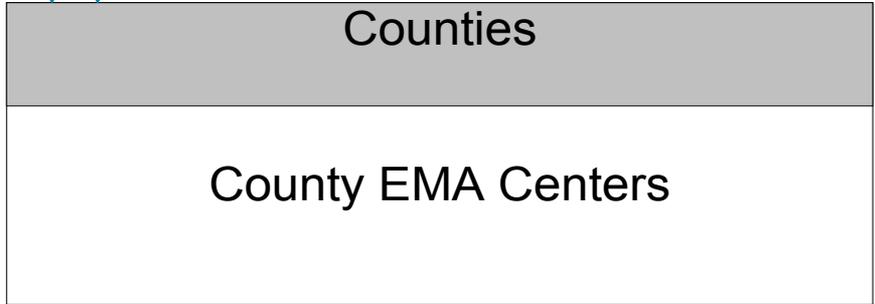
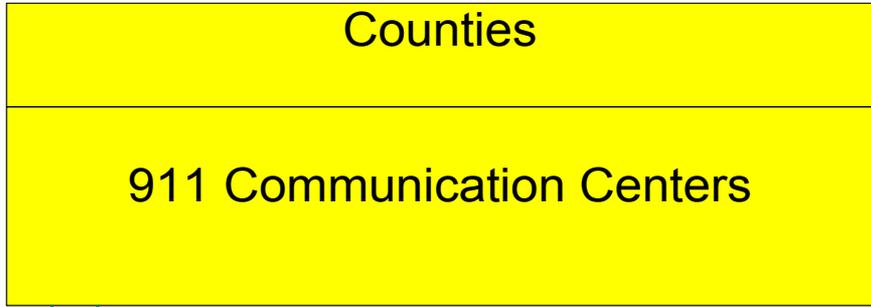
This section documents the “information flow” between the elements. The information flows describe what data or information is passing between one operation and another operation. The section is primarily documented as Turbo software outputs.

911 Communication Centers

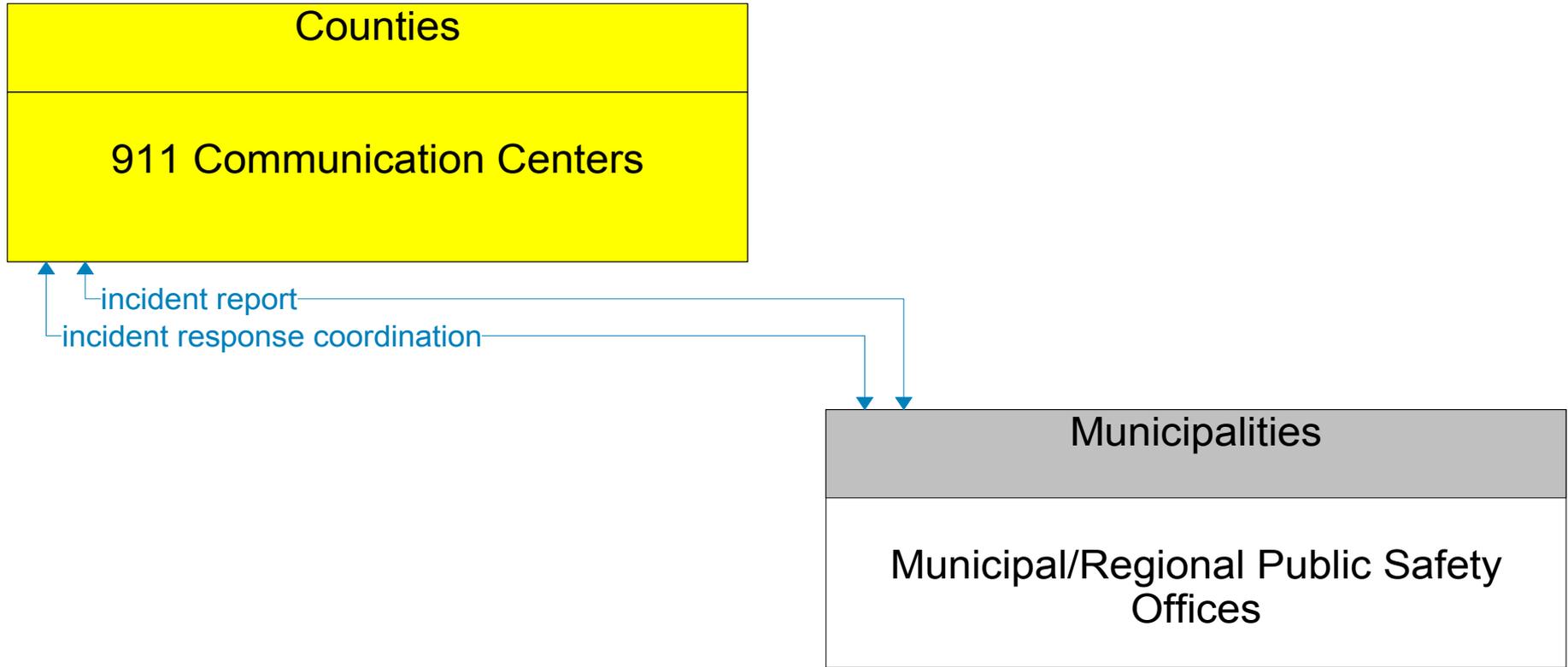


911 Communication Centers Interconnect Diagram

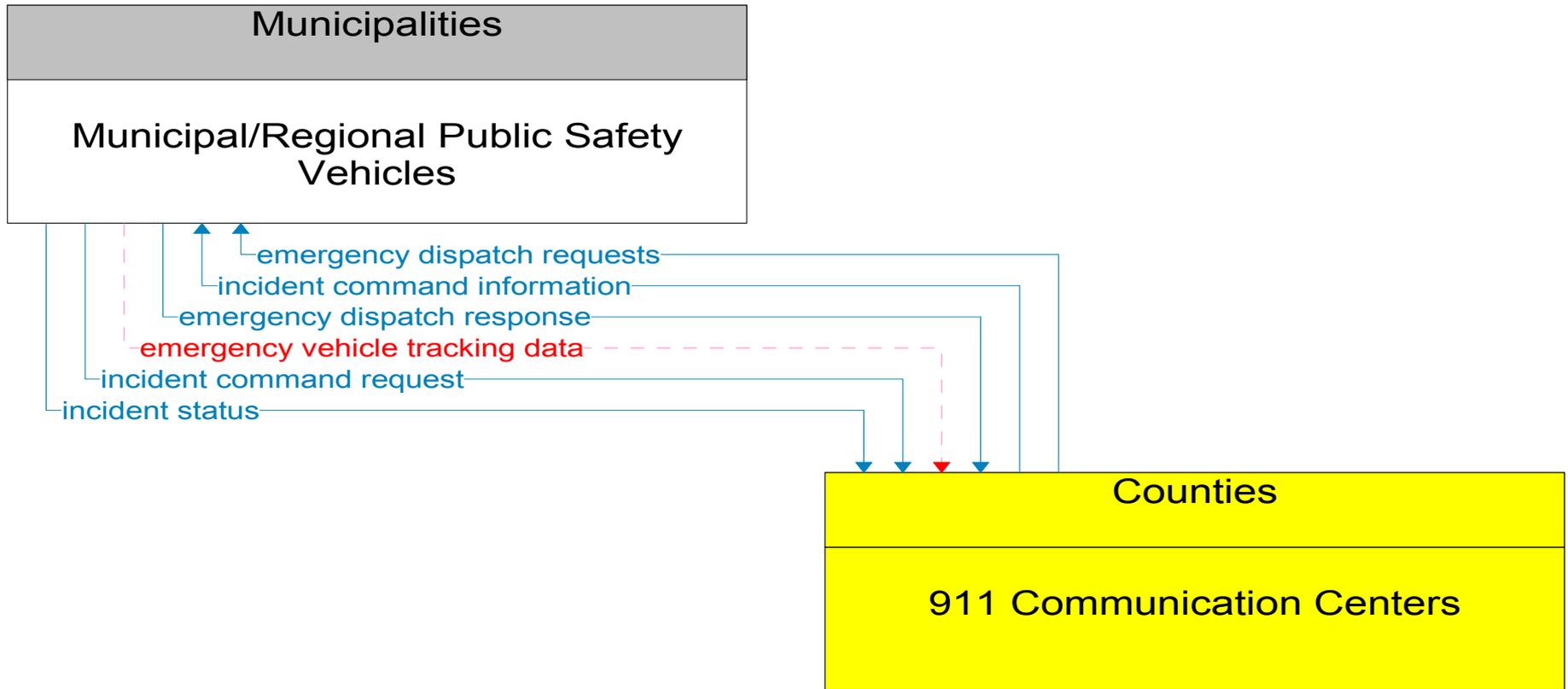




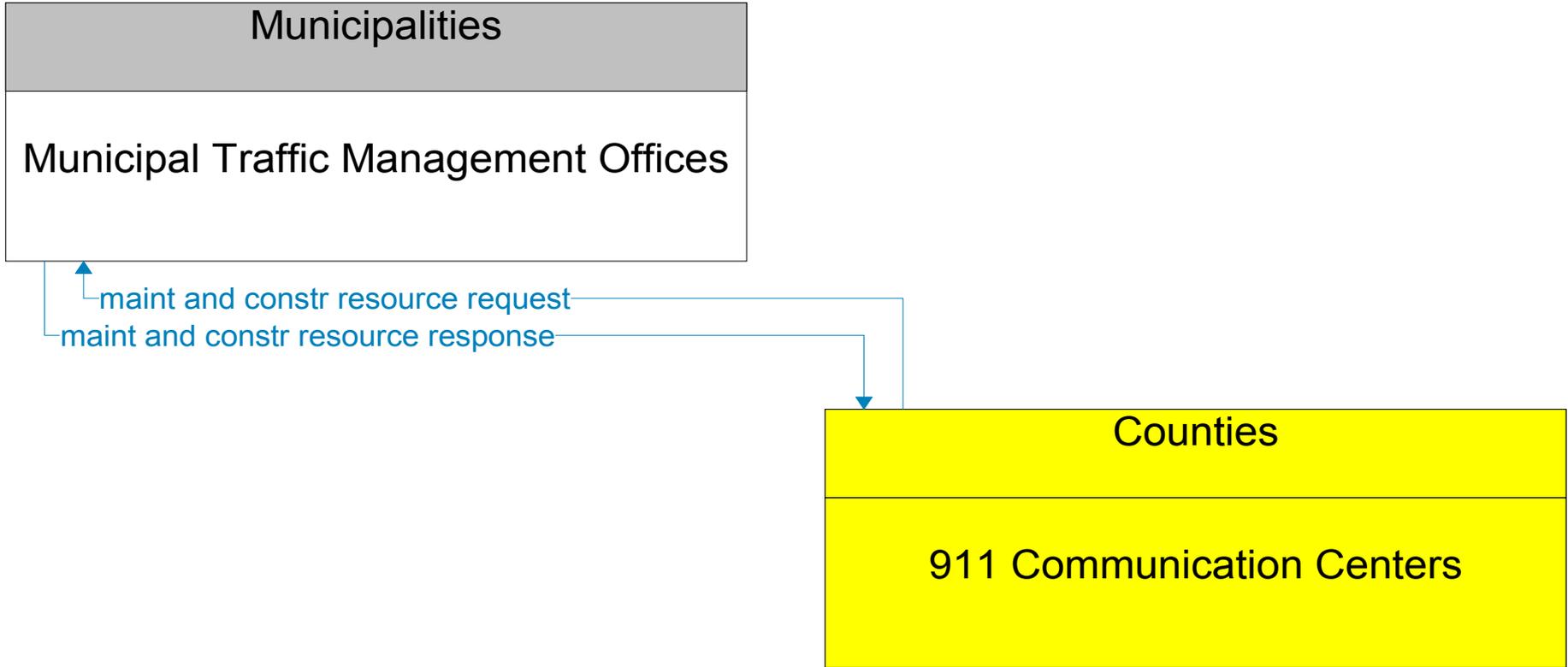
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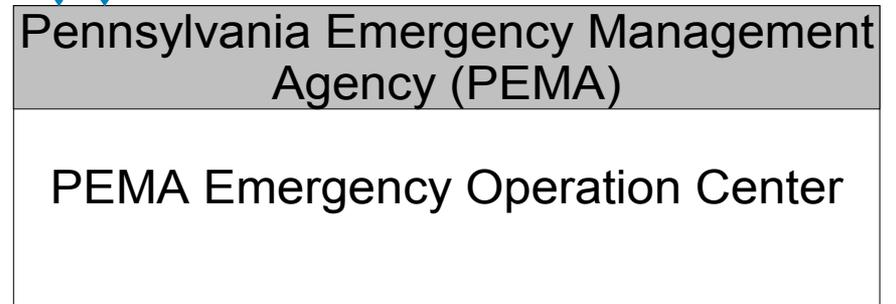
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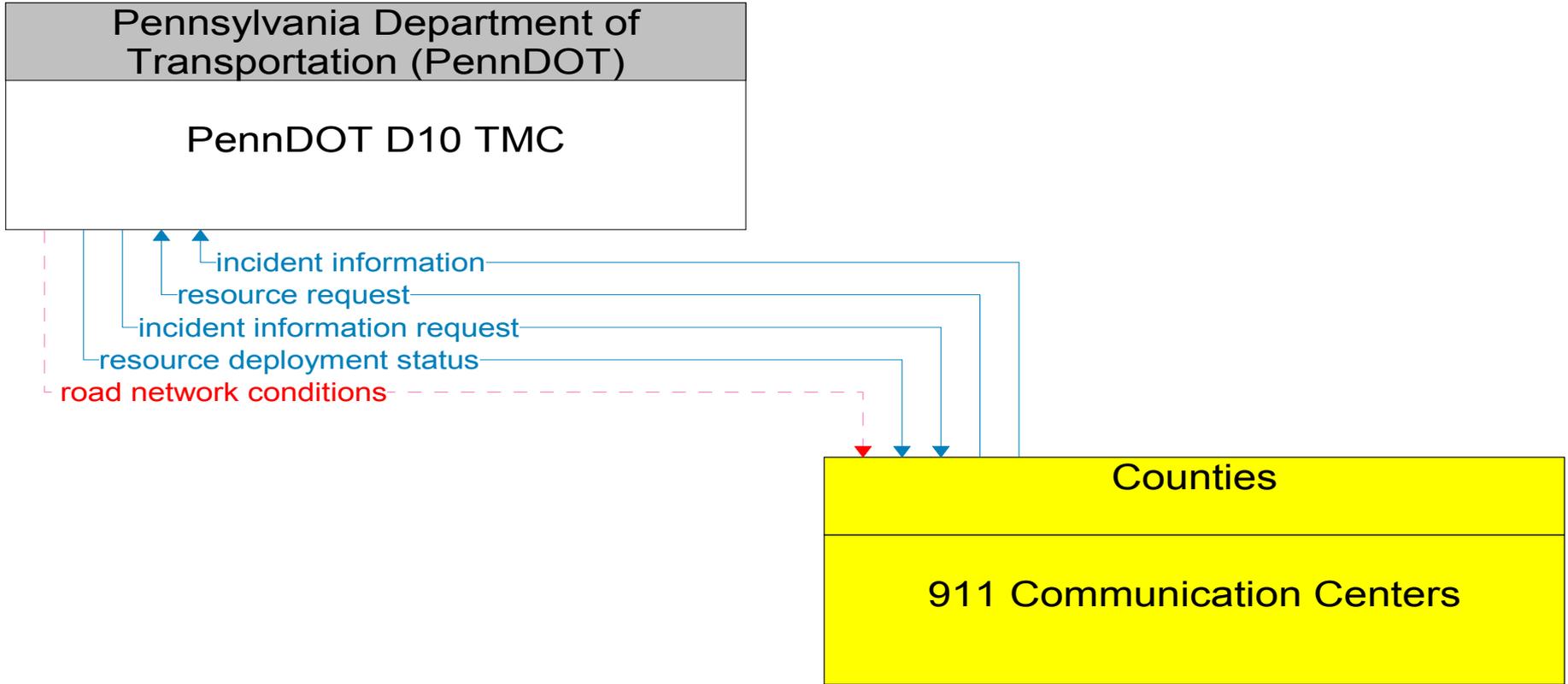


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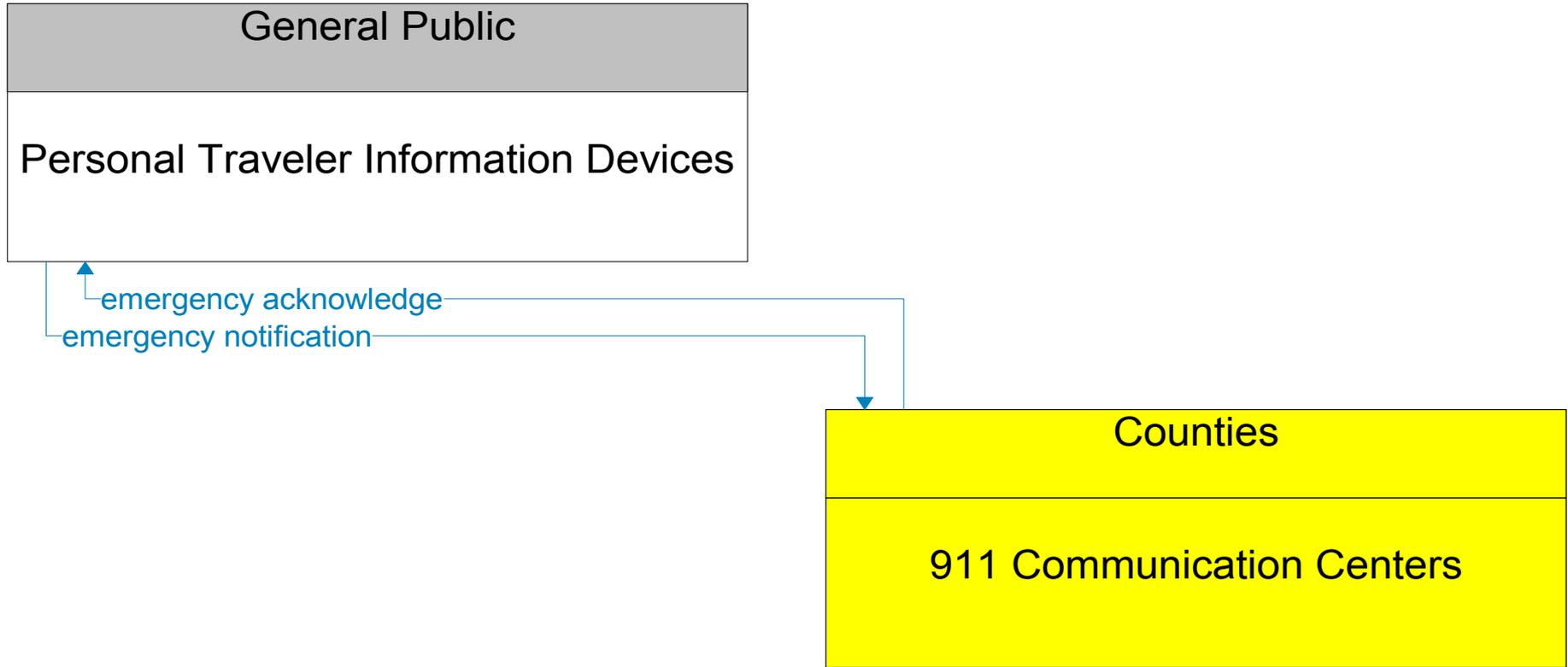


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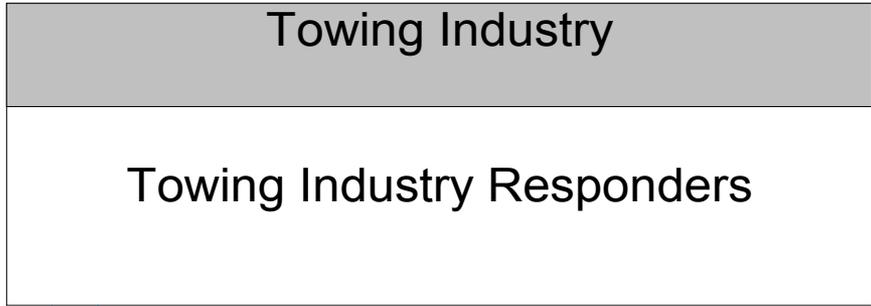




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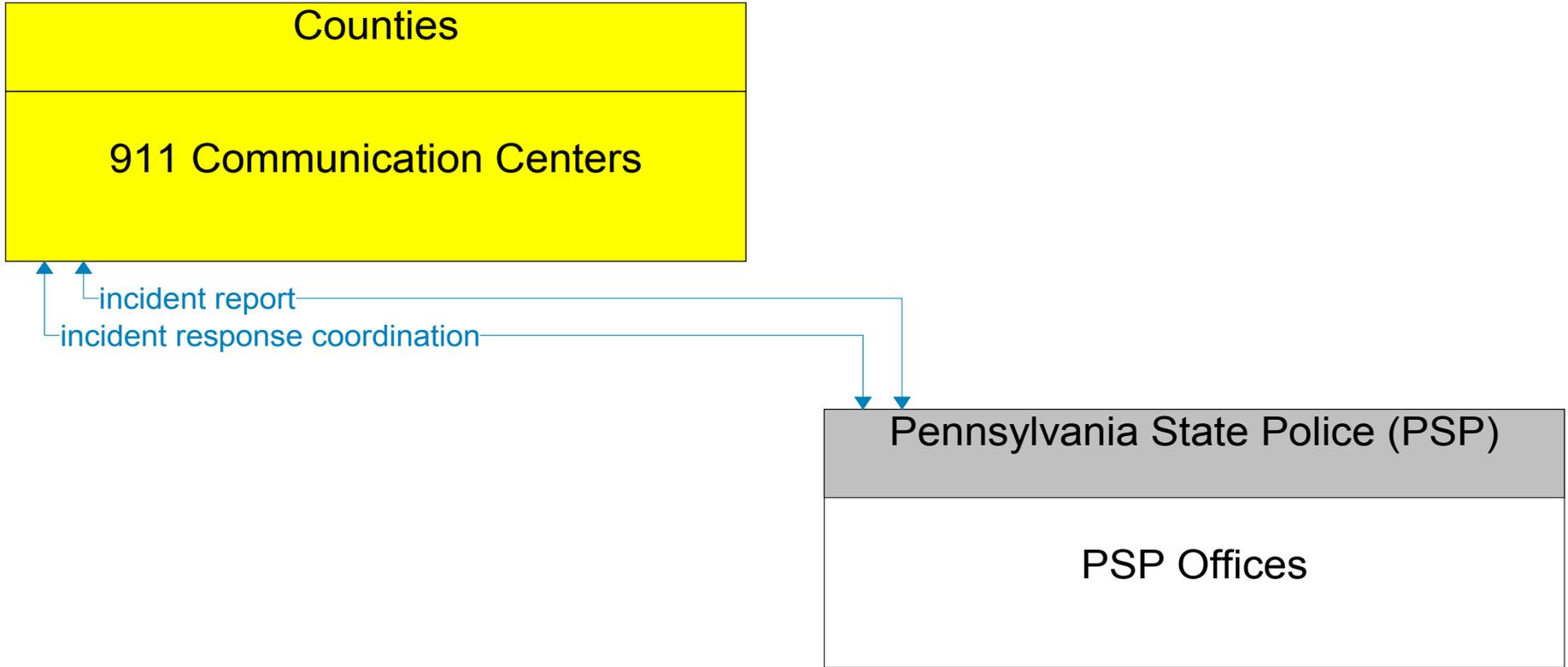
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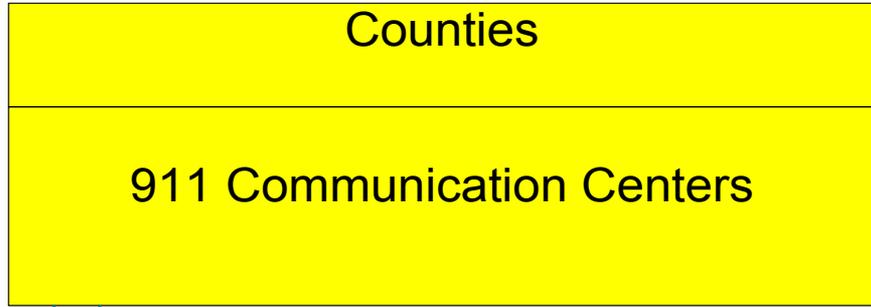
emergency dispatch requests
emergency dispatch response



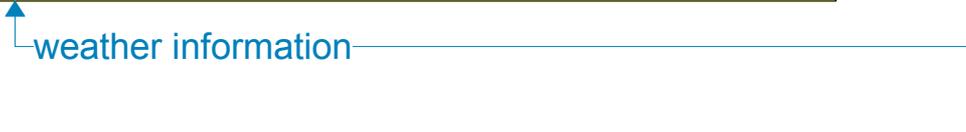
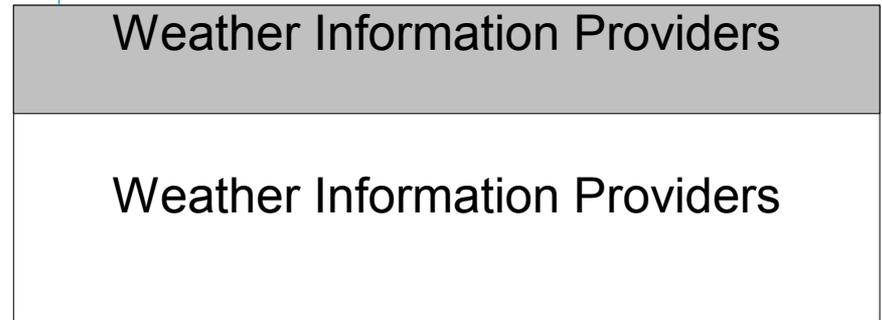
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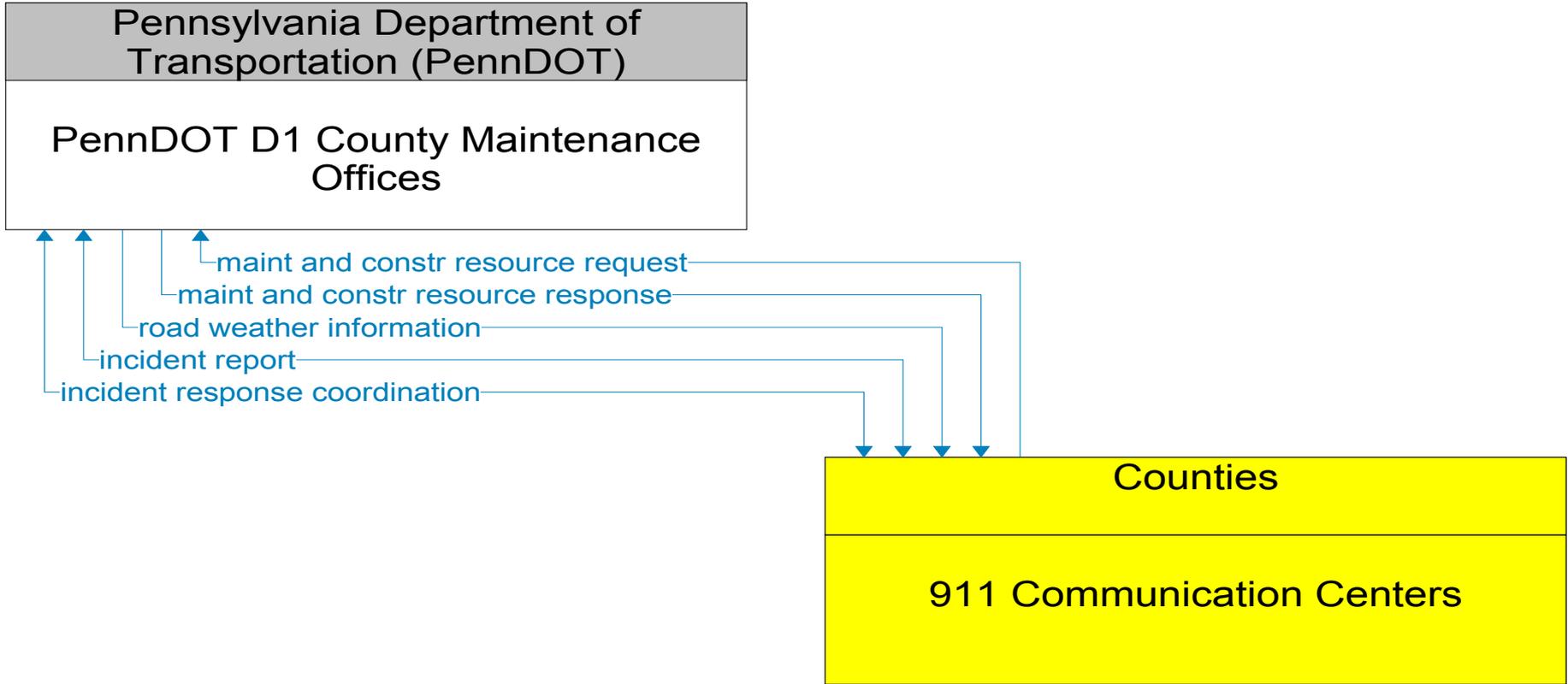
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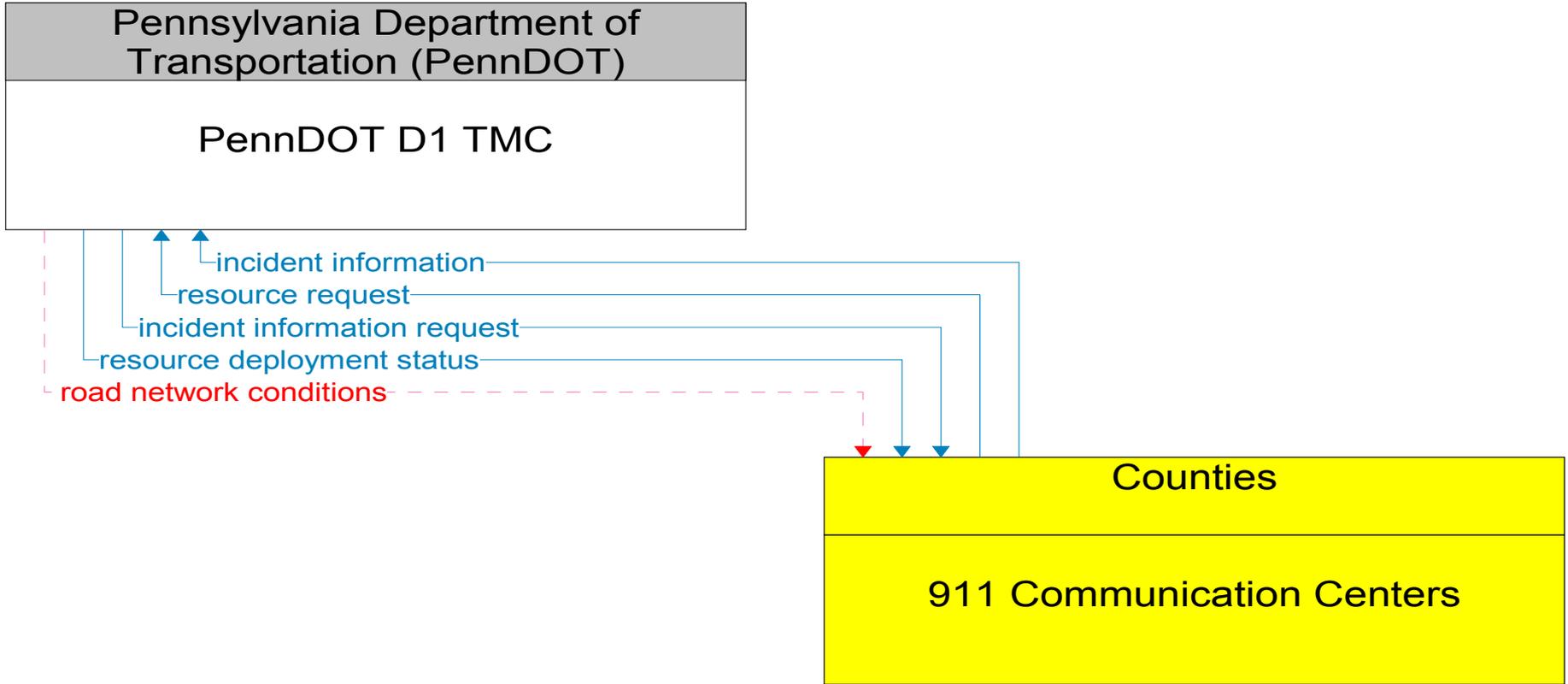
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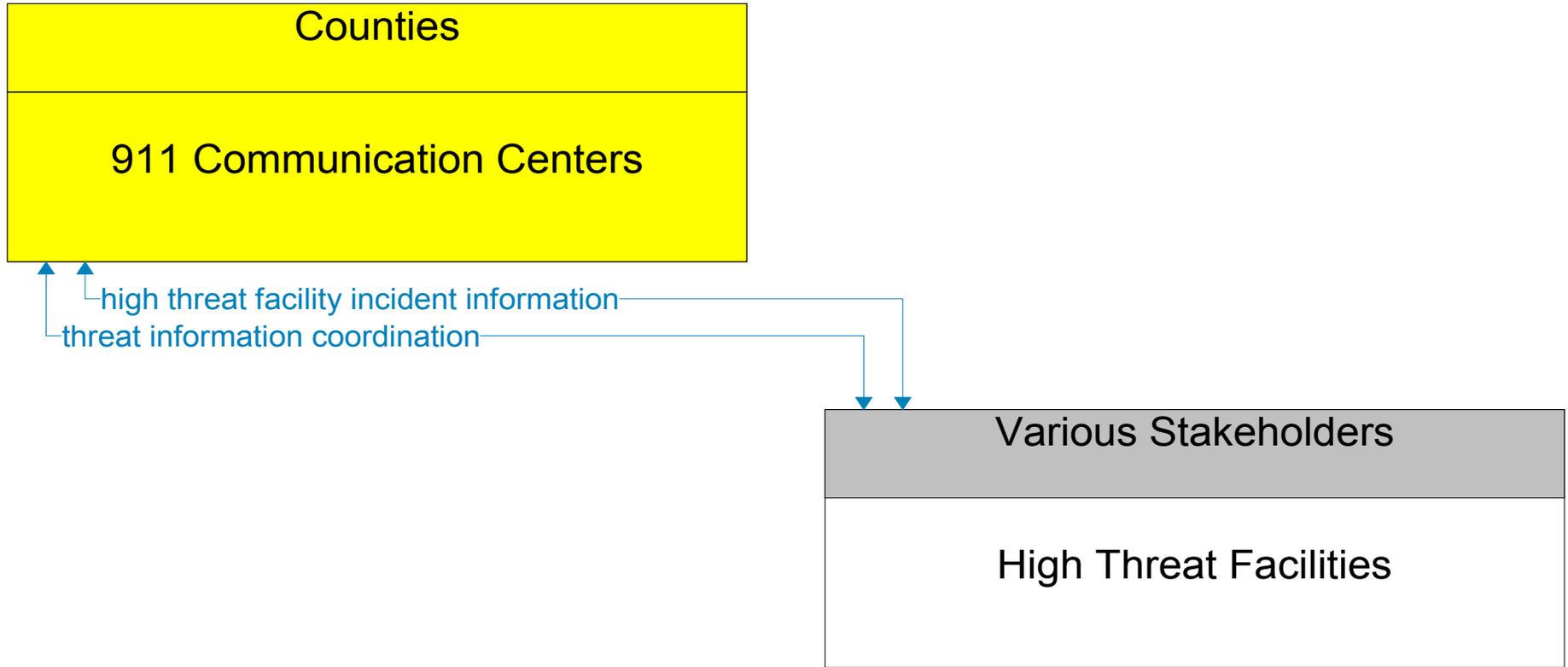
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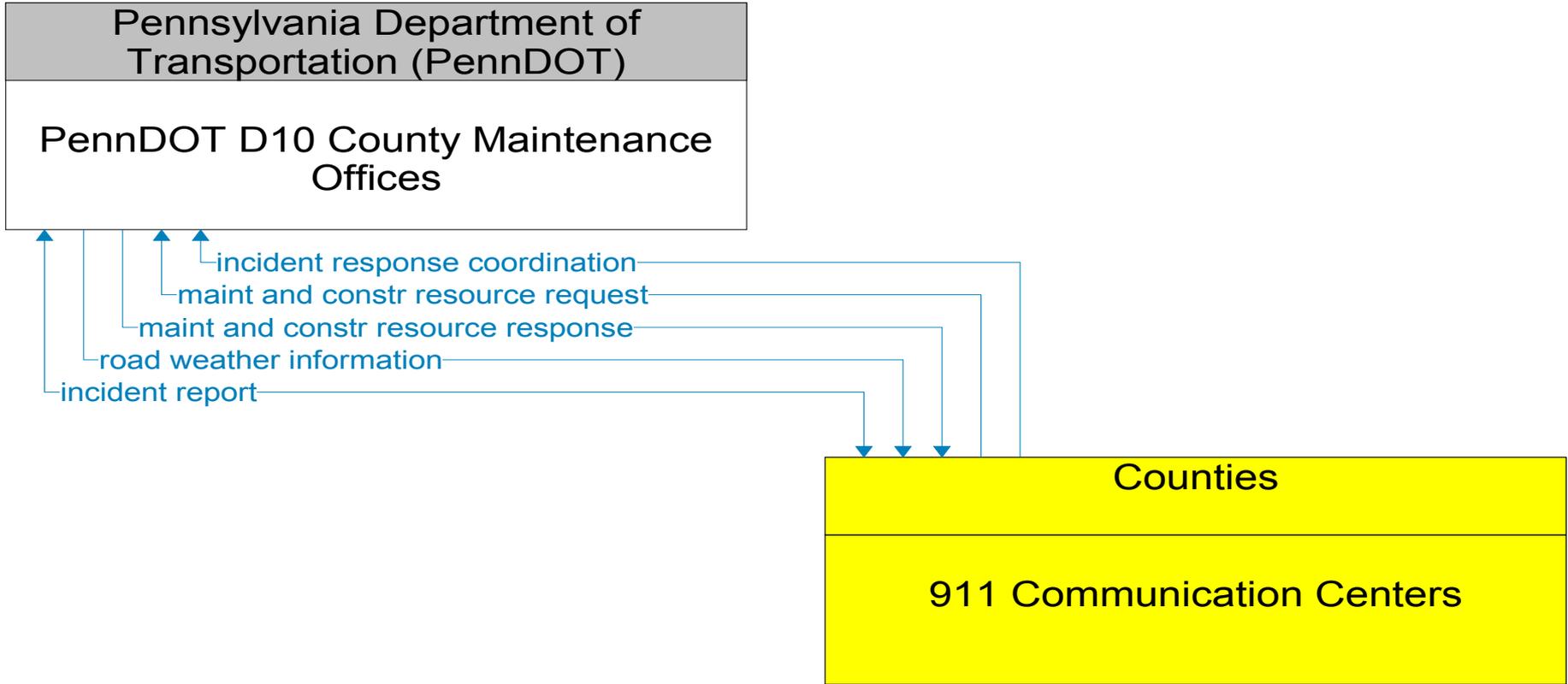
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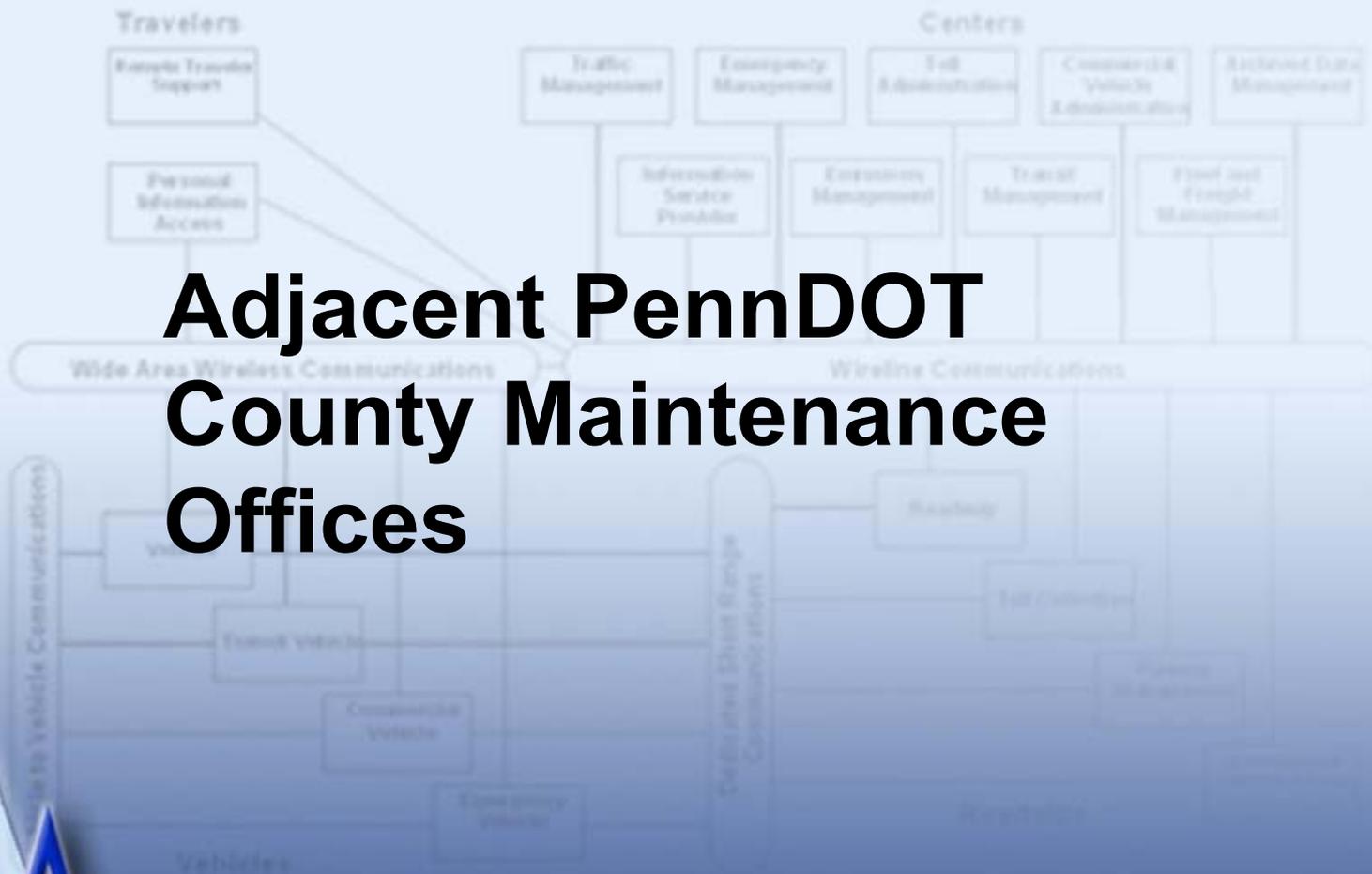


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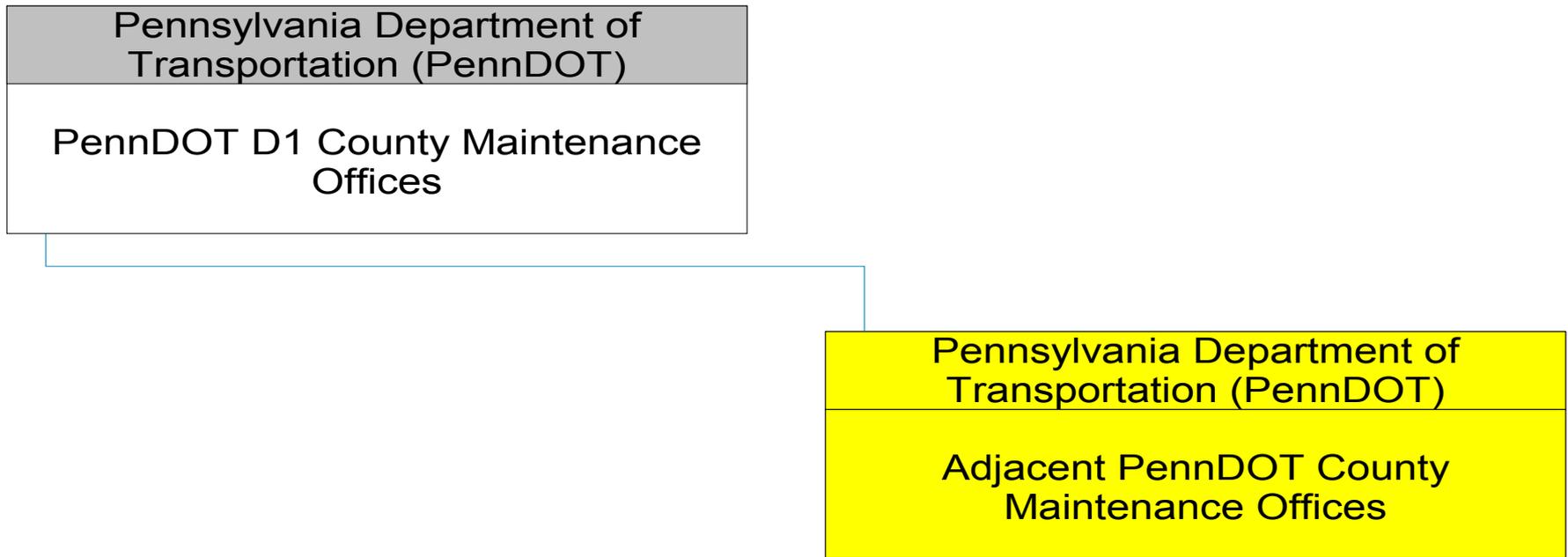


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Adjacent PennDOT County Maintenance Offices



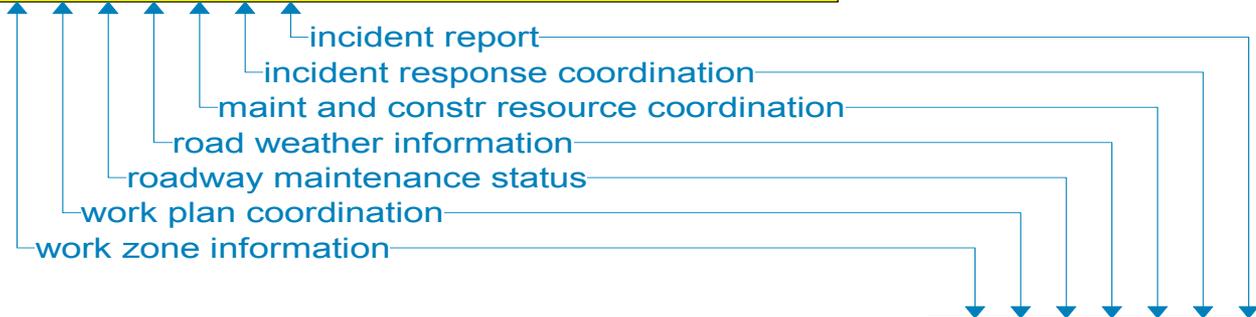
Adjacent PennDOT County Maintenance Offices Interconnect Diagram



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Pennsylvania Department of
Transportation (PennDOT)

Adjacent PennDOT County
Maintenance Offices

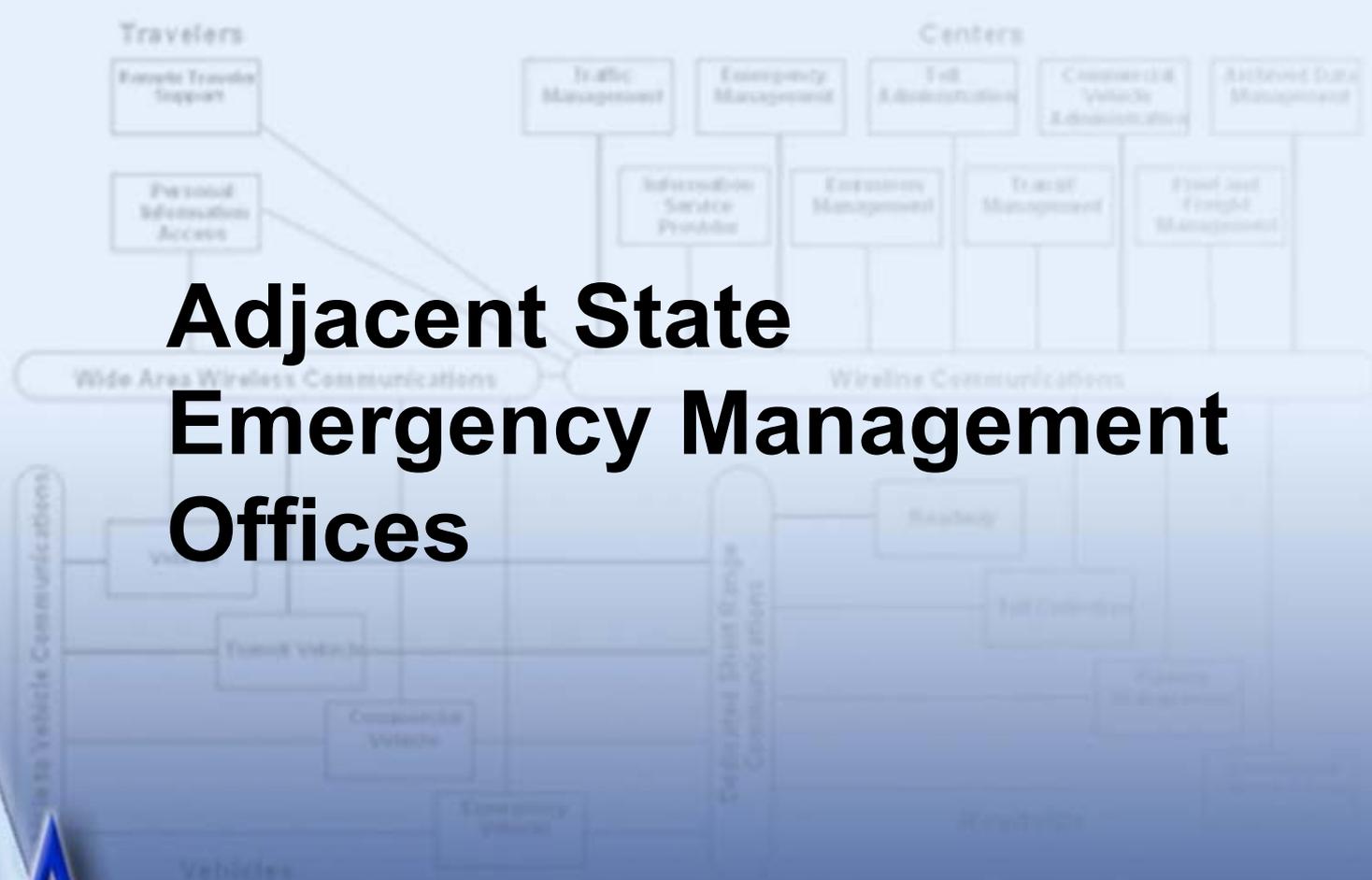


Pennsylvania Department of
Transportation (PennDOT)

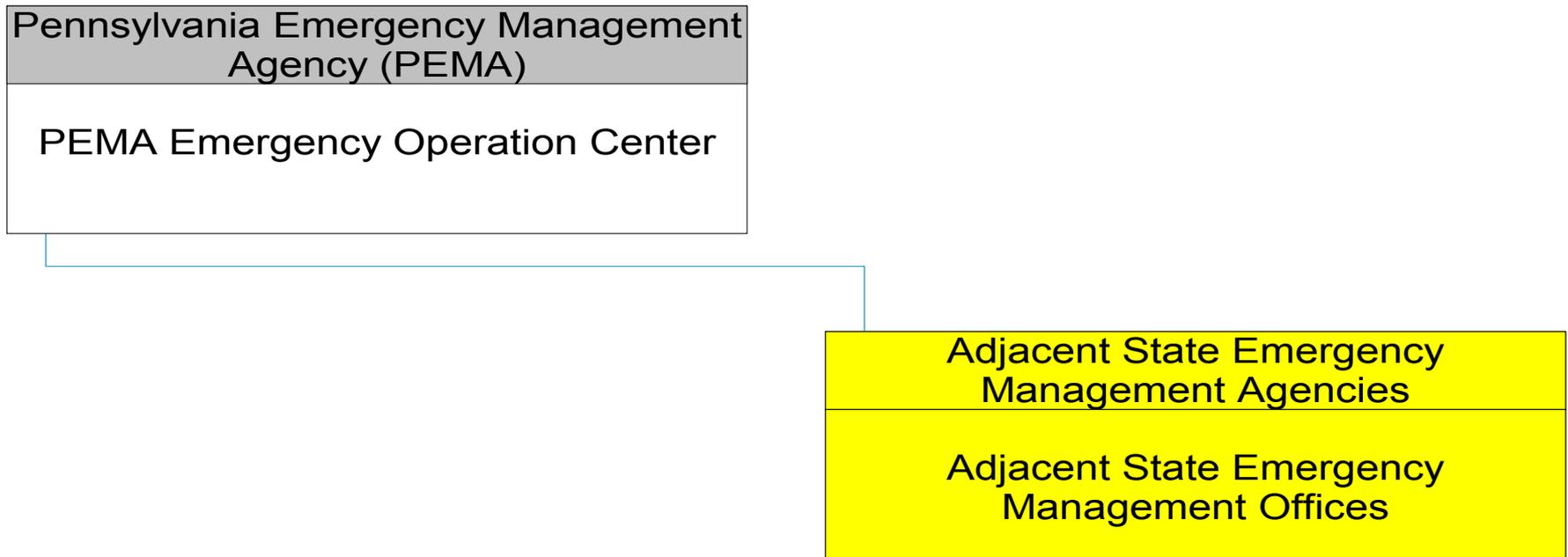
PennDOT D1 County Maintenance
Offices

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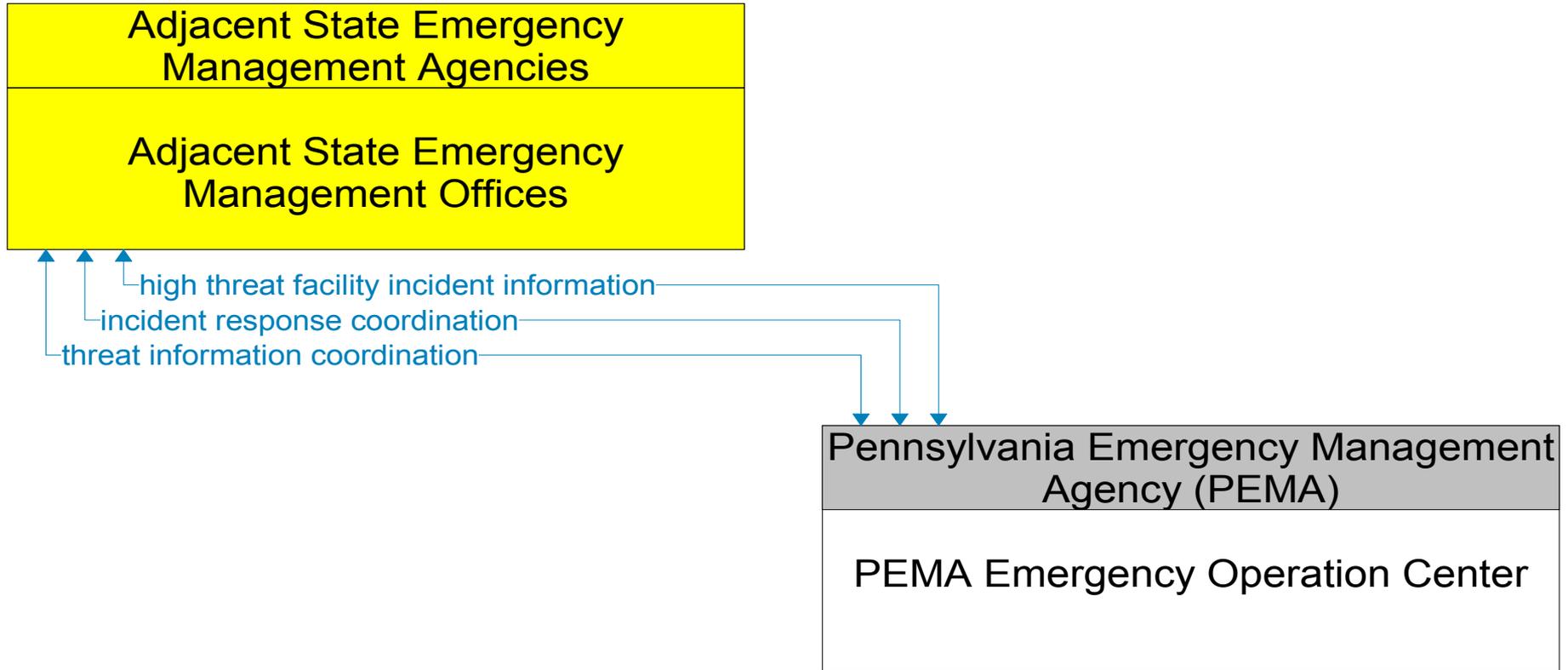
Adjacent State Emergency Management Offices



Adjacent State Emergency Management Offices Interconnect Diagram

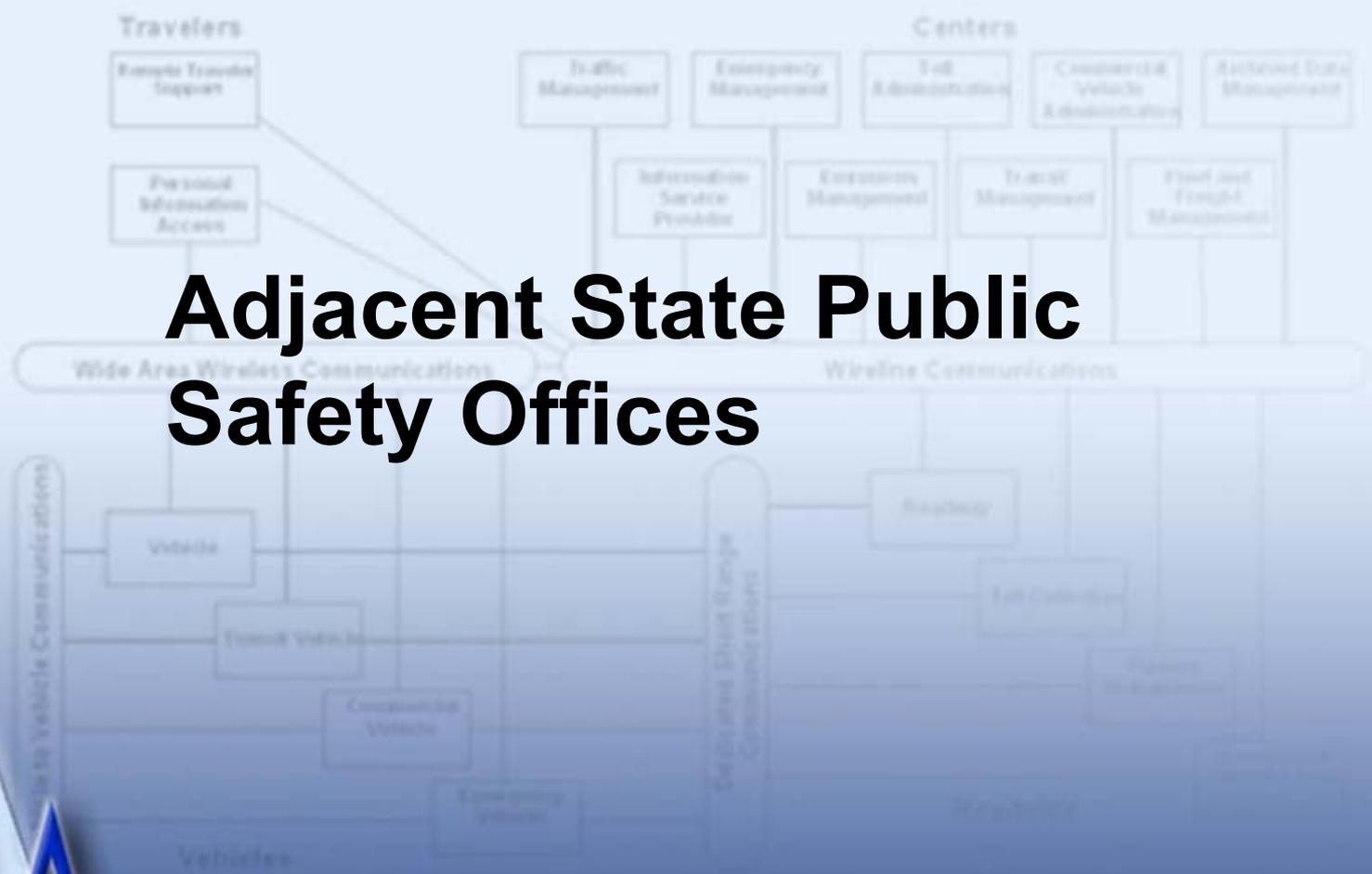


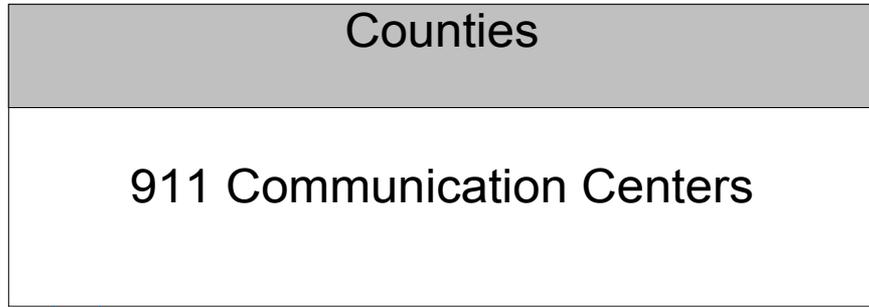
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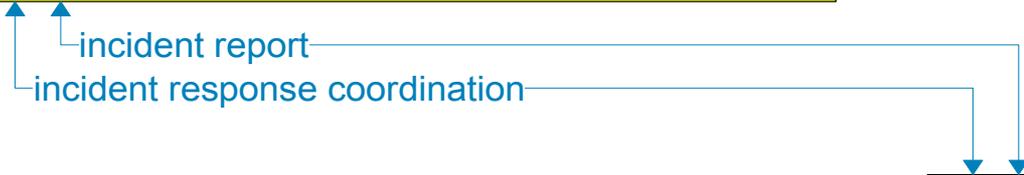
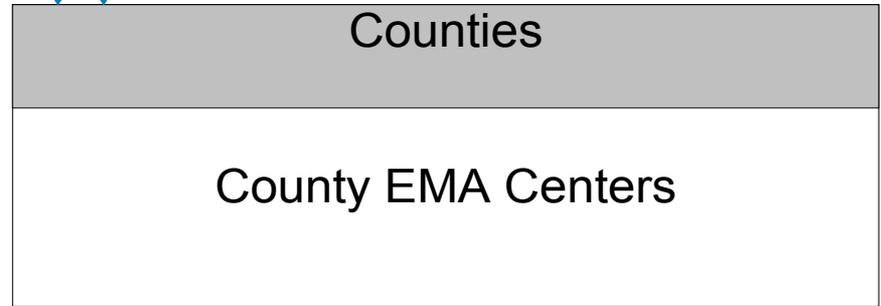
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Adjacent State Public Safety Offices

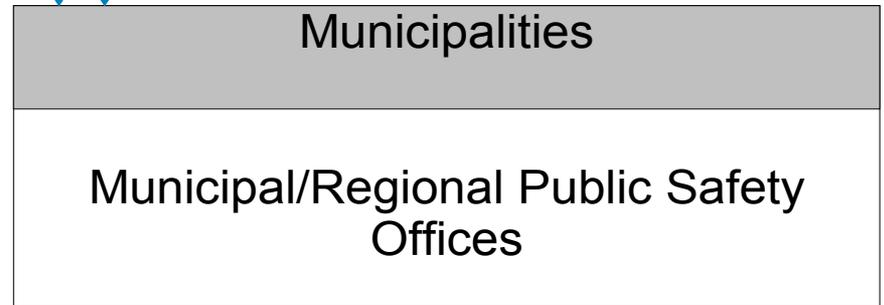
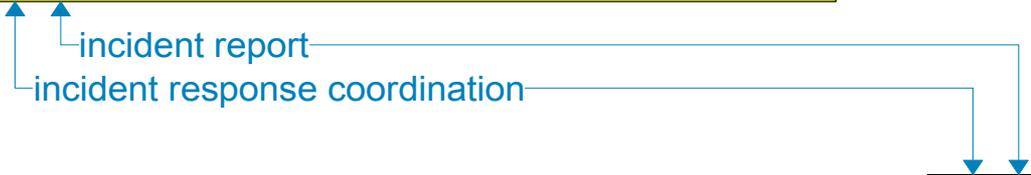




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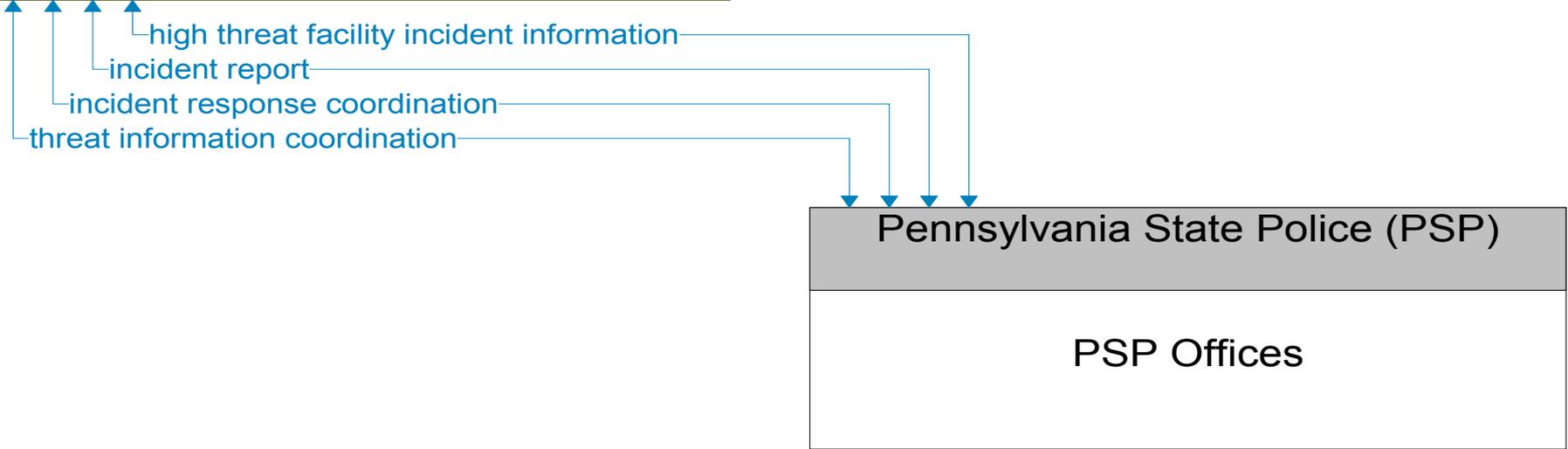


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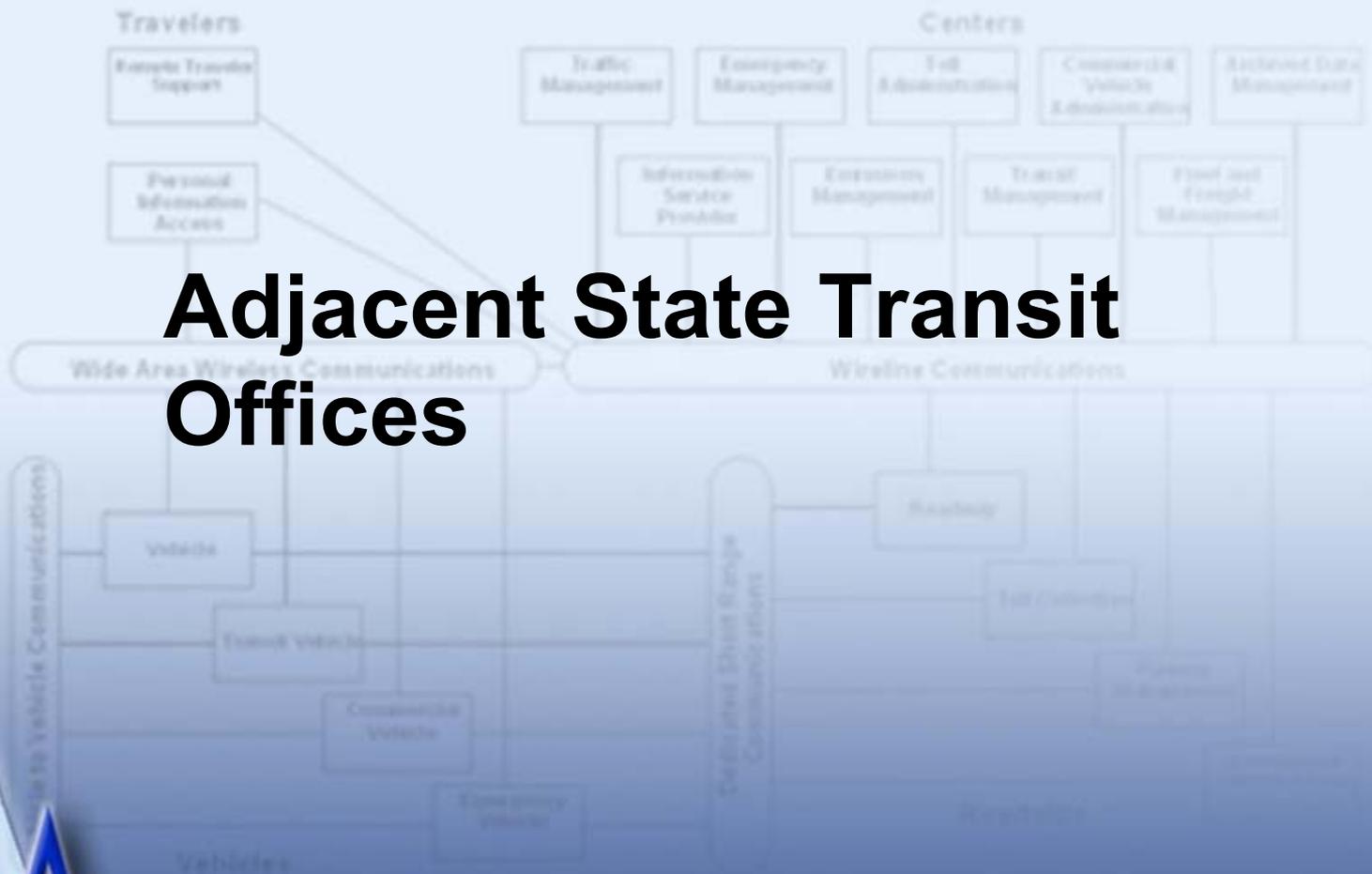
Adjacent State Public Safety Agencies

Adjacent State Public Safety Offices

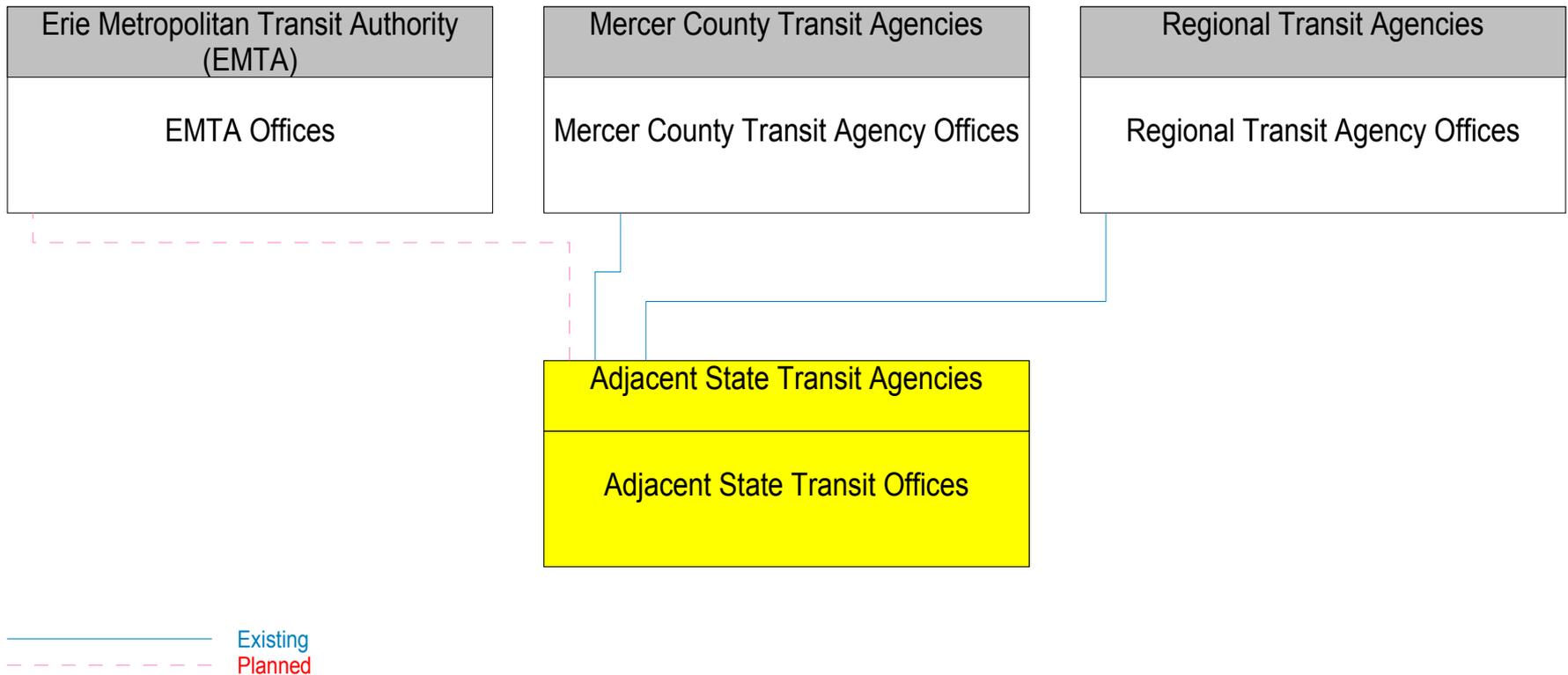


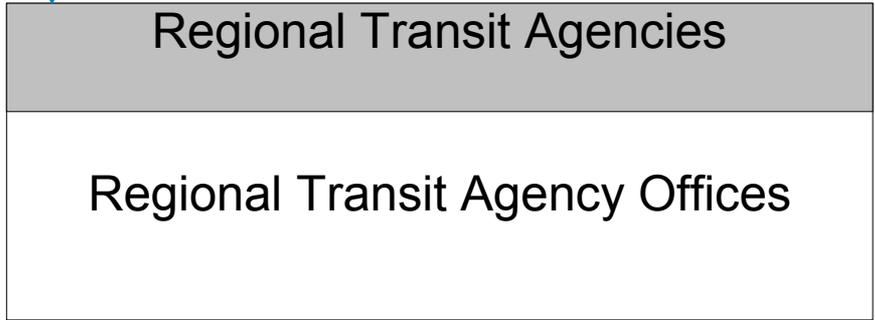
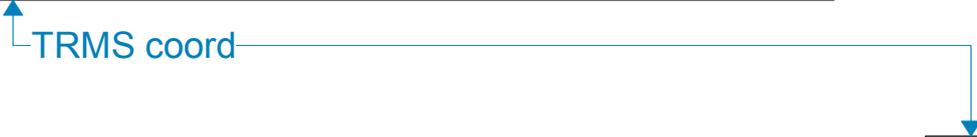
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Adjacent State Transit Offices

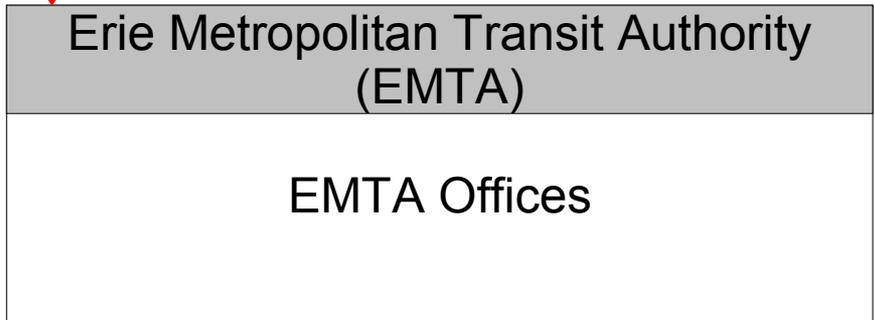


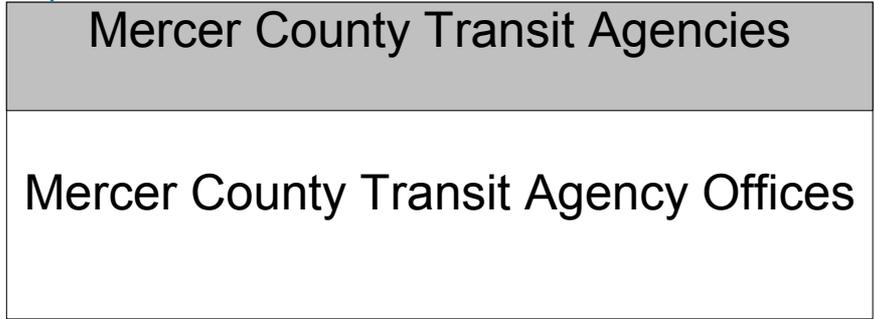
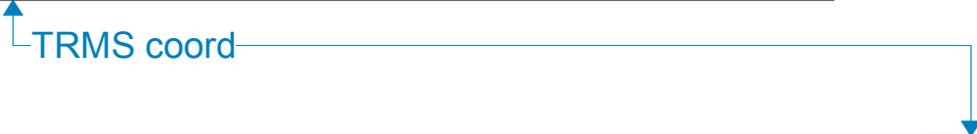
Adjacent State Transit Offices Interconnect Diagram



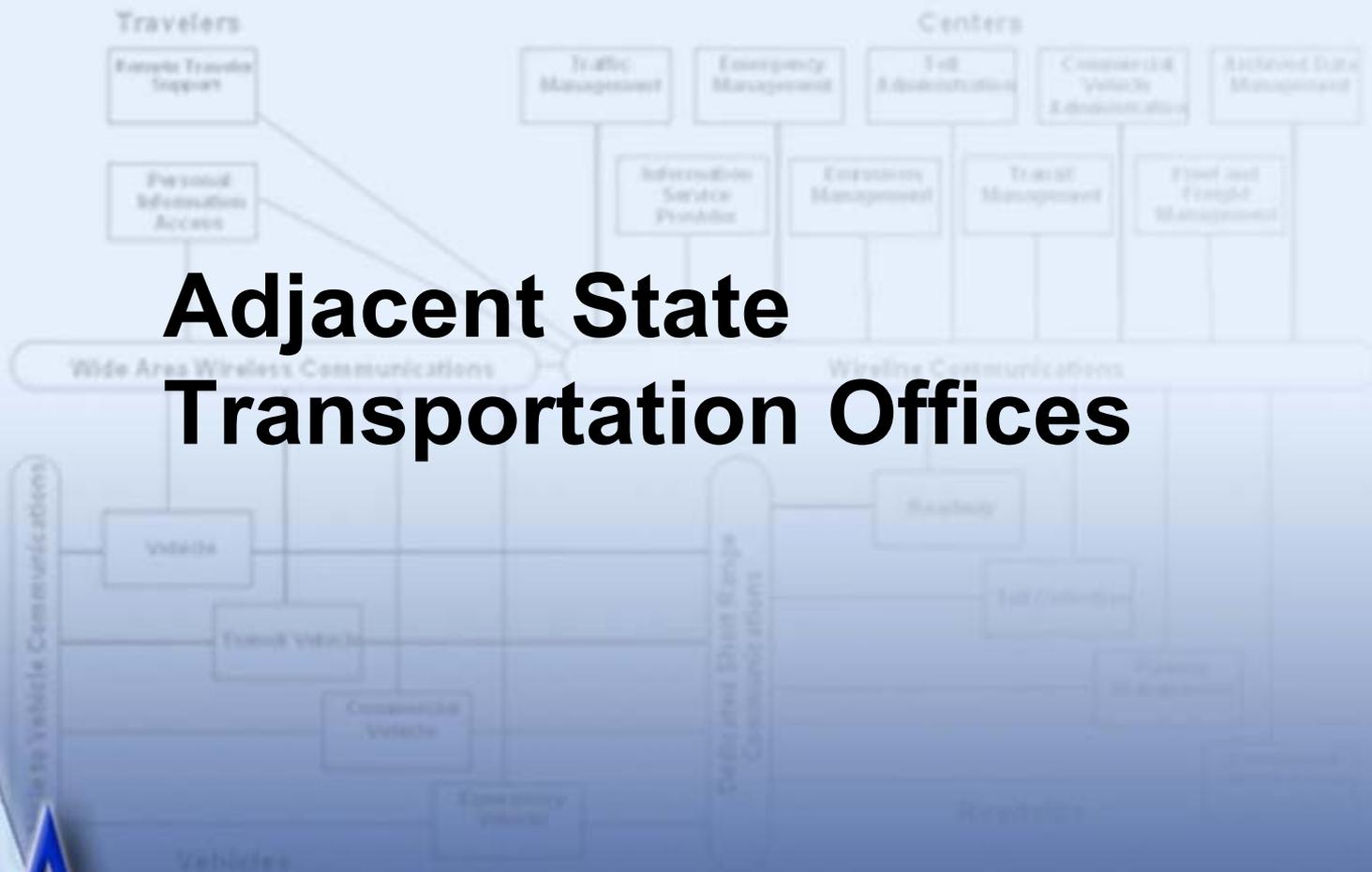


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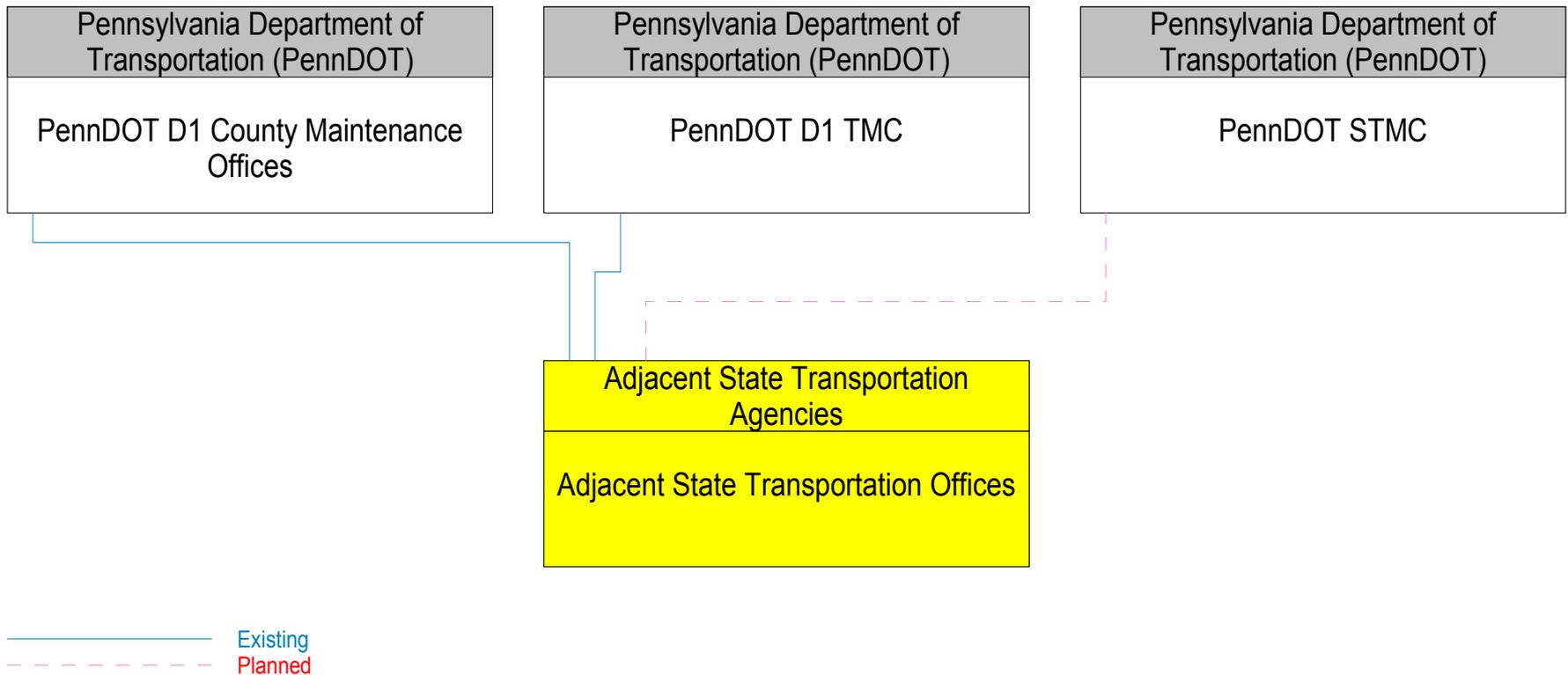


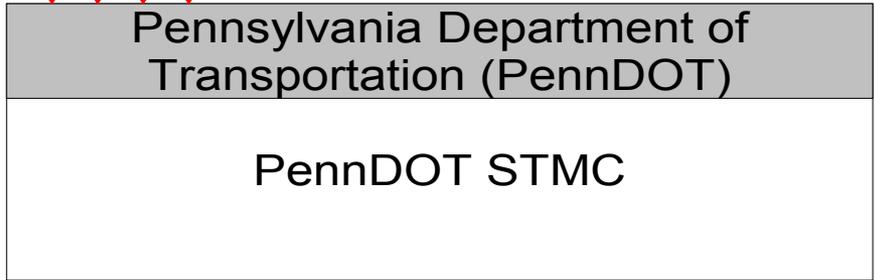
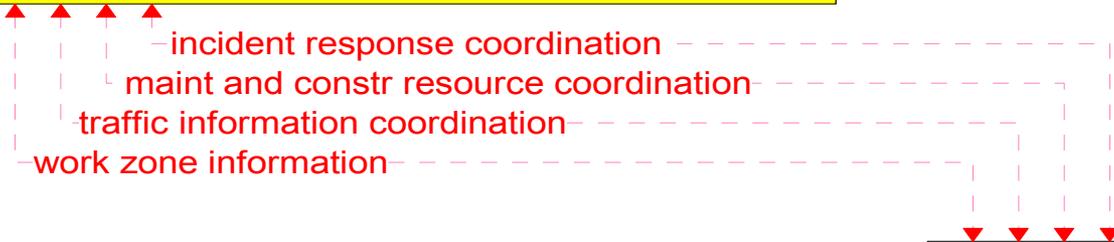
Adjacent State Transportation Offices



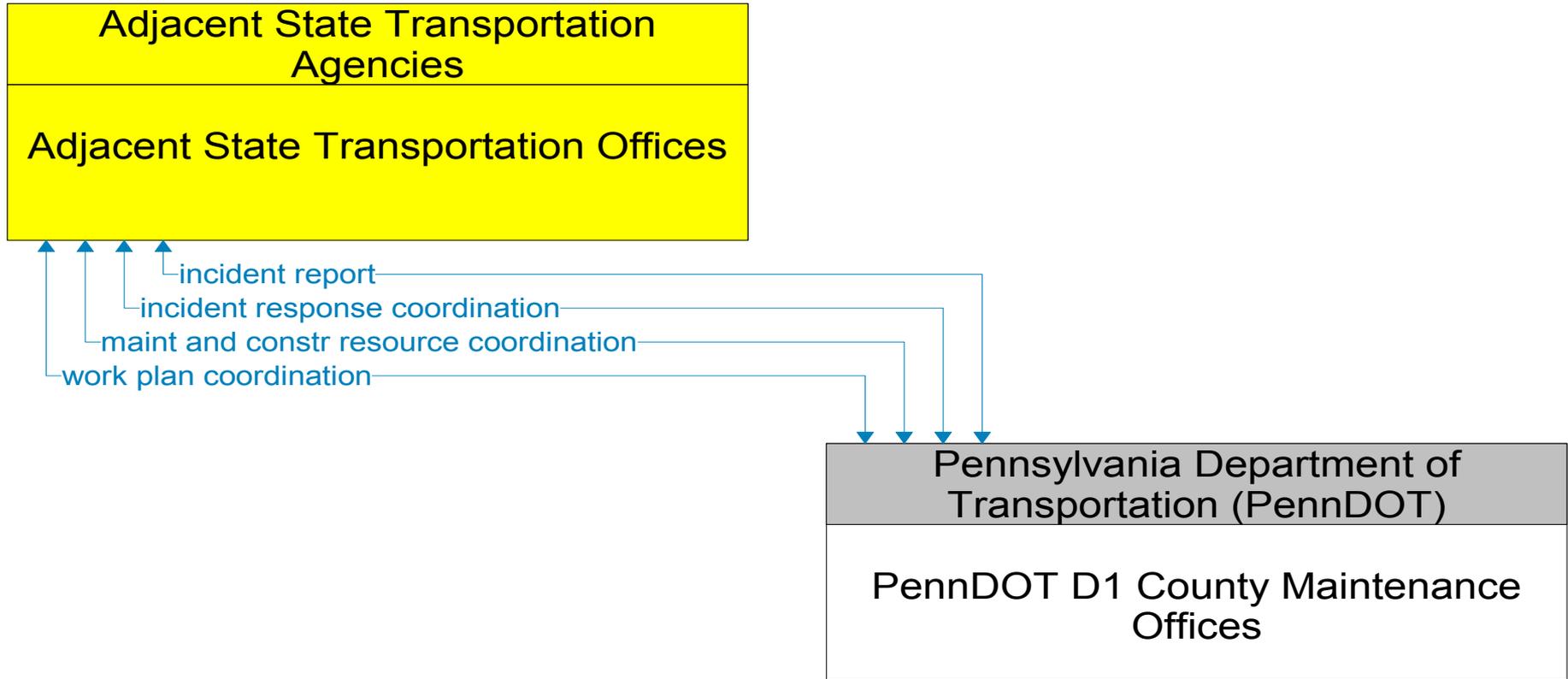
PA

Adjacent State Transportation Offices Interconnect Diagram

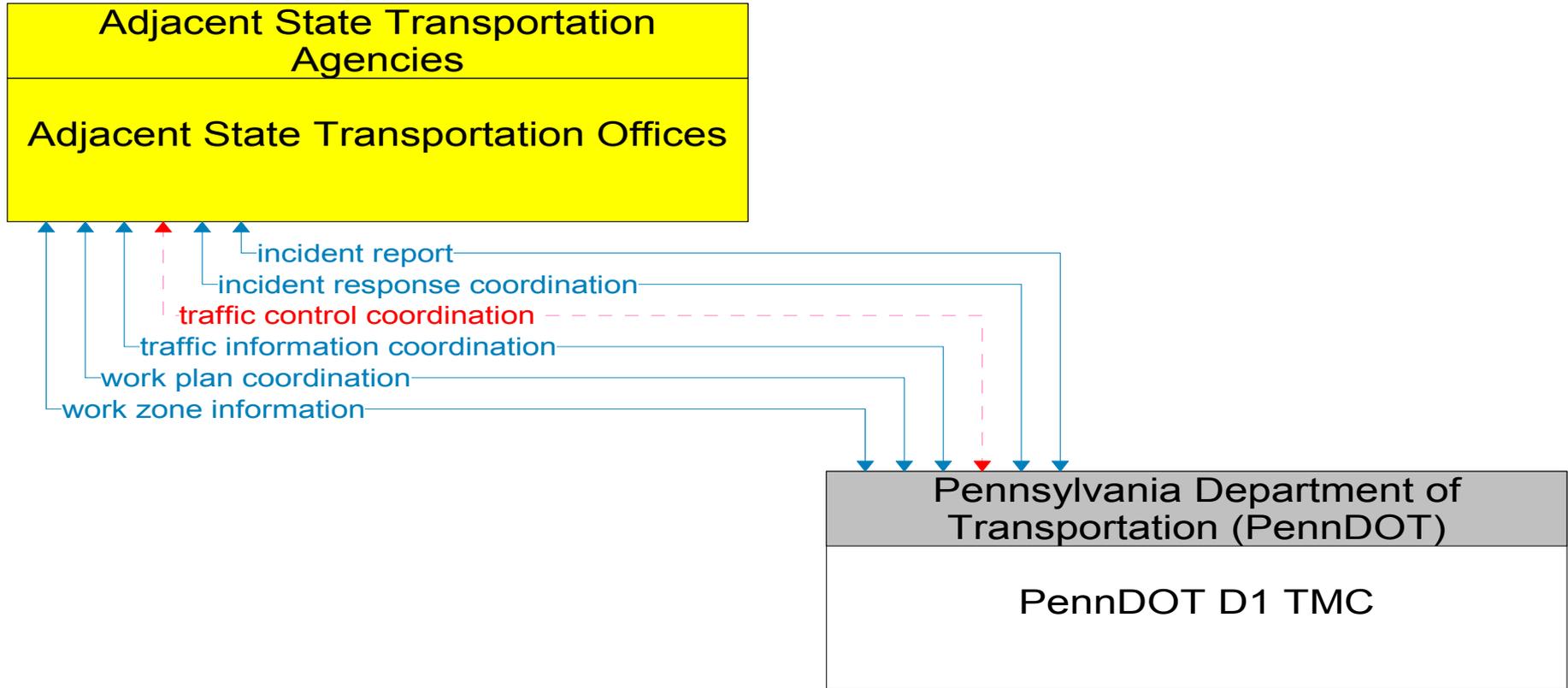




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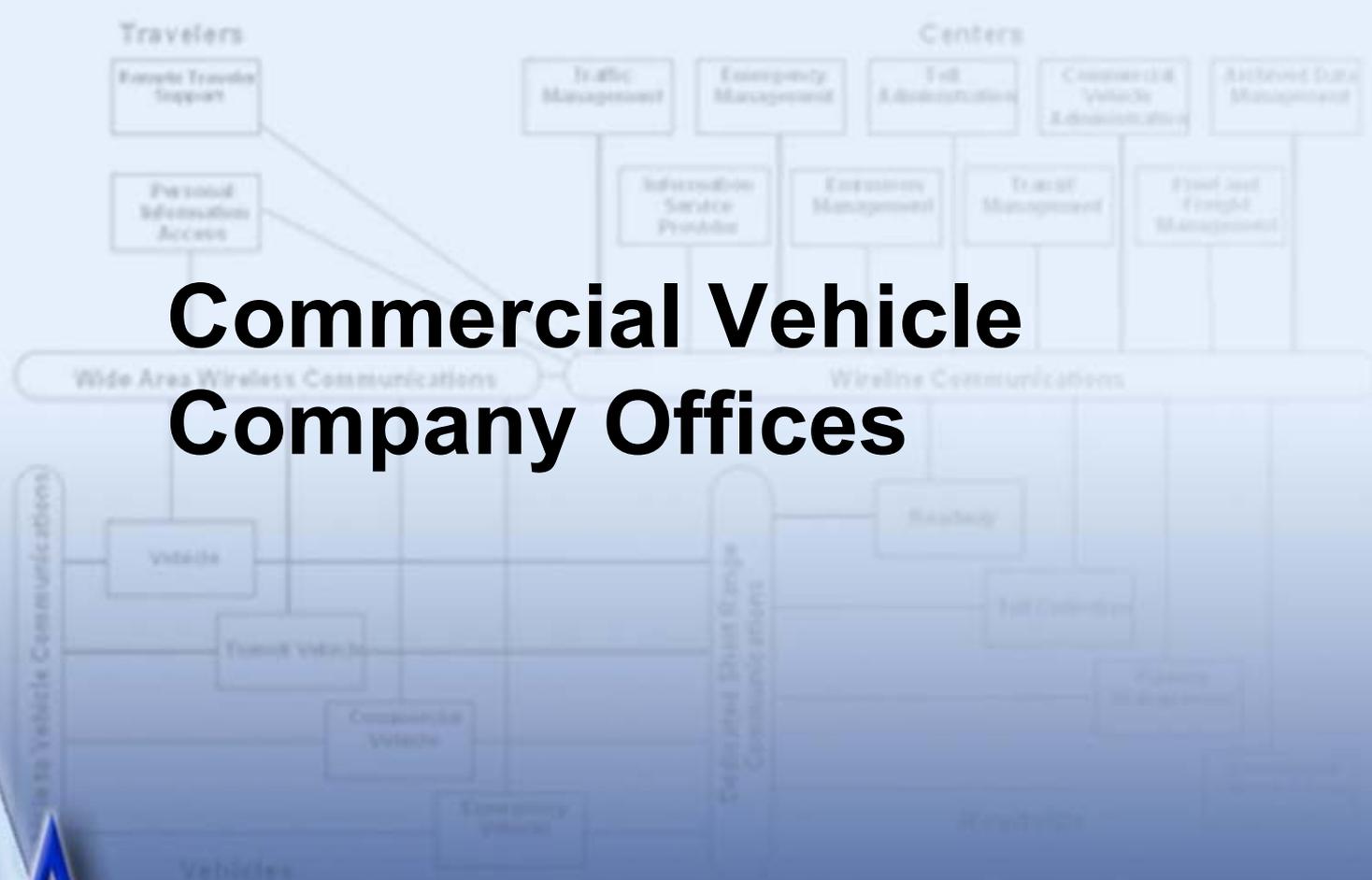


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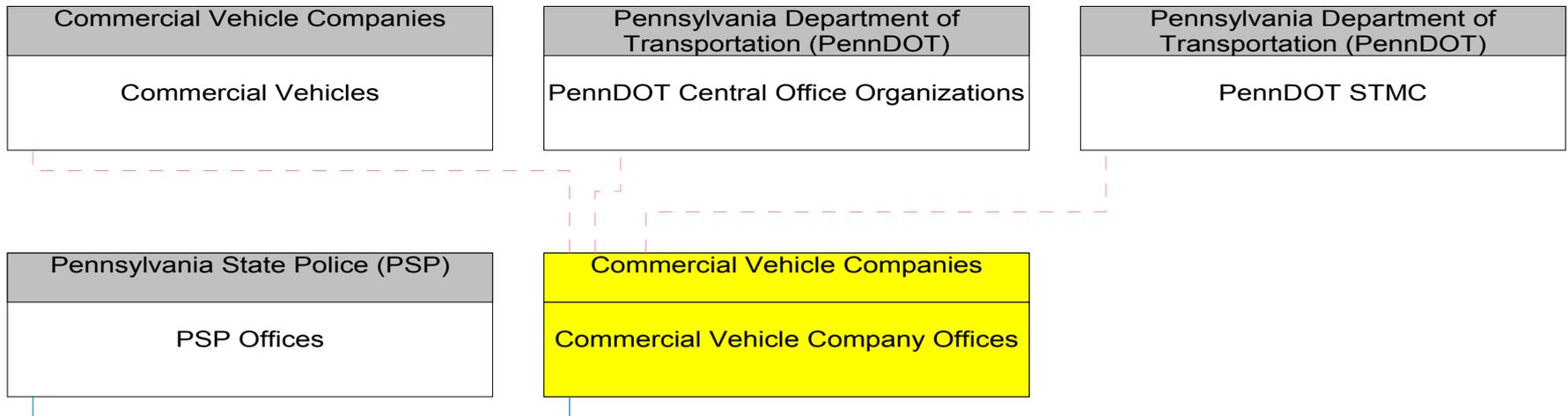


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Commercial Vehicle Company Offices



Commercial Vehicle Company Offices Interconnect Diagram



———— Existing
- - - - - Planned

Pennsylvania Department of
Transportation (PennDOT)

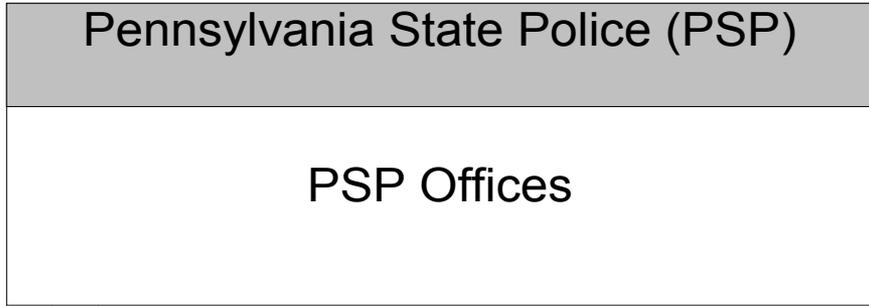
PennDOT Central Office Organizations

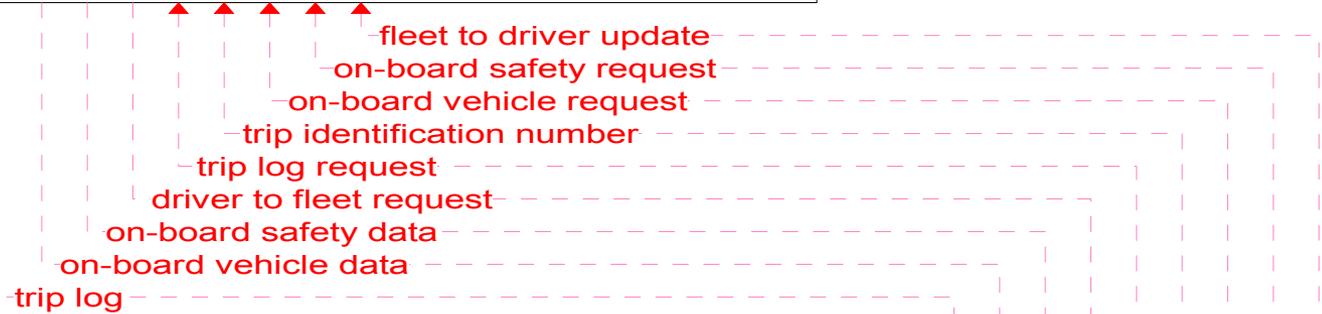
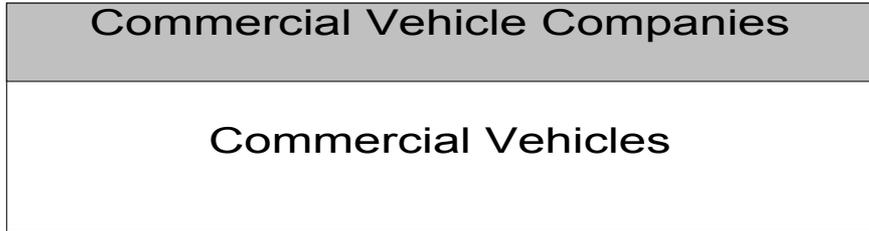


Commercial Vehicle Companies

Commercial Vehicle Company Offices

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———— Existing
- - - - - Planned

Pennsylvania Department of
Transportation (PennDOT)

PennDOT STMC

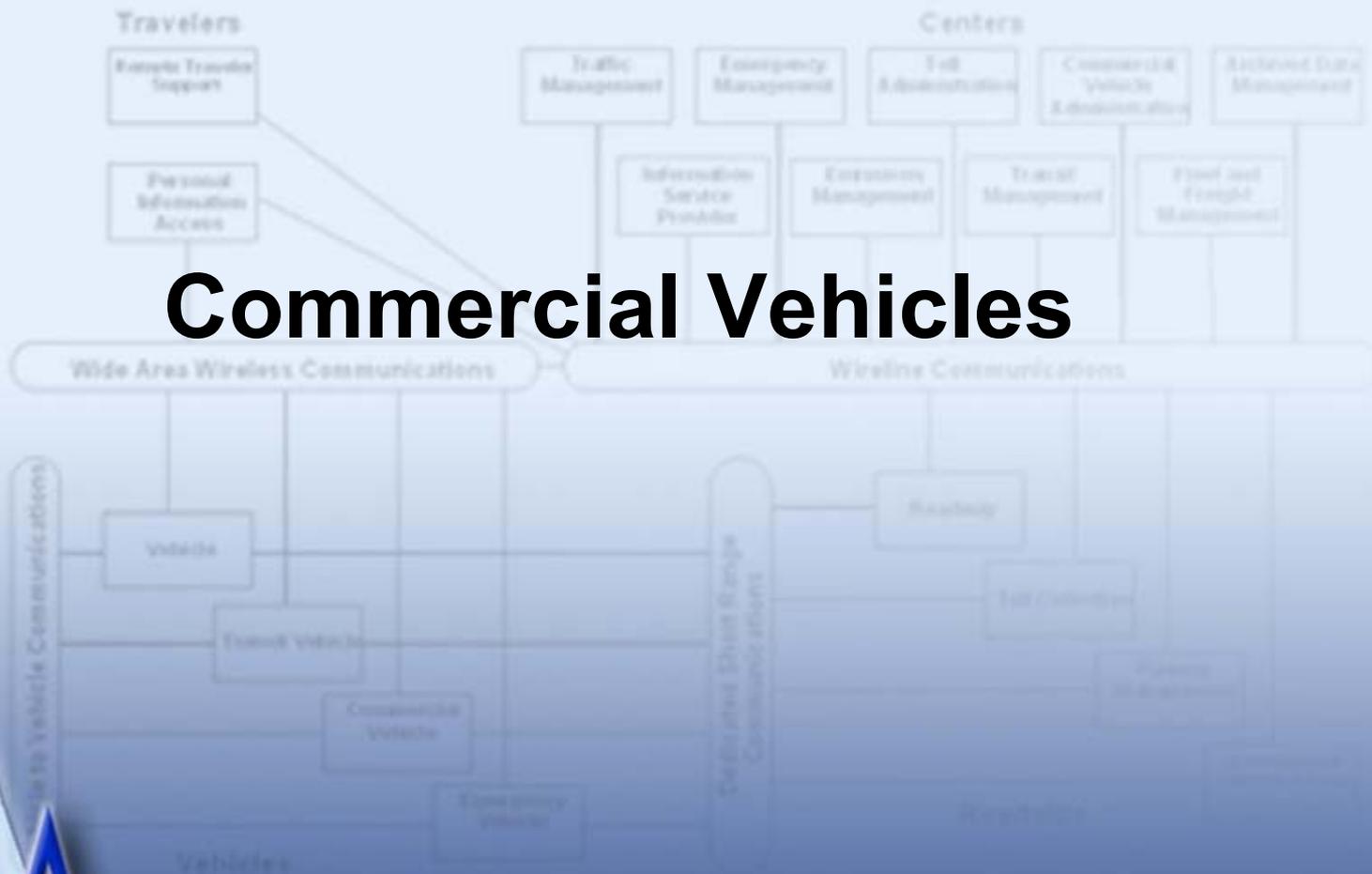


Commercial Vehicle Companies

Commercial Vehicle Company Offices

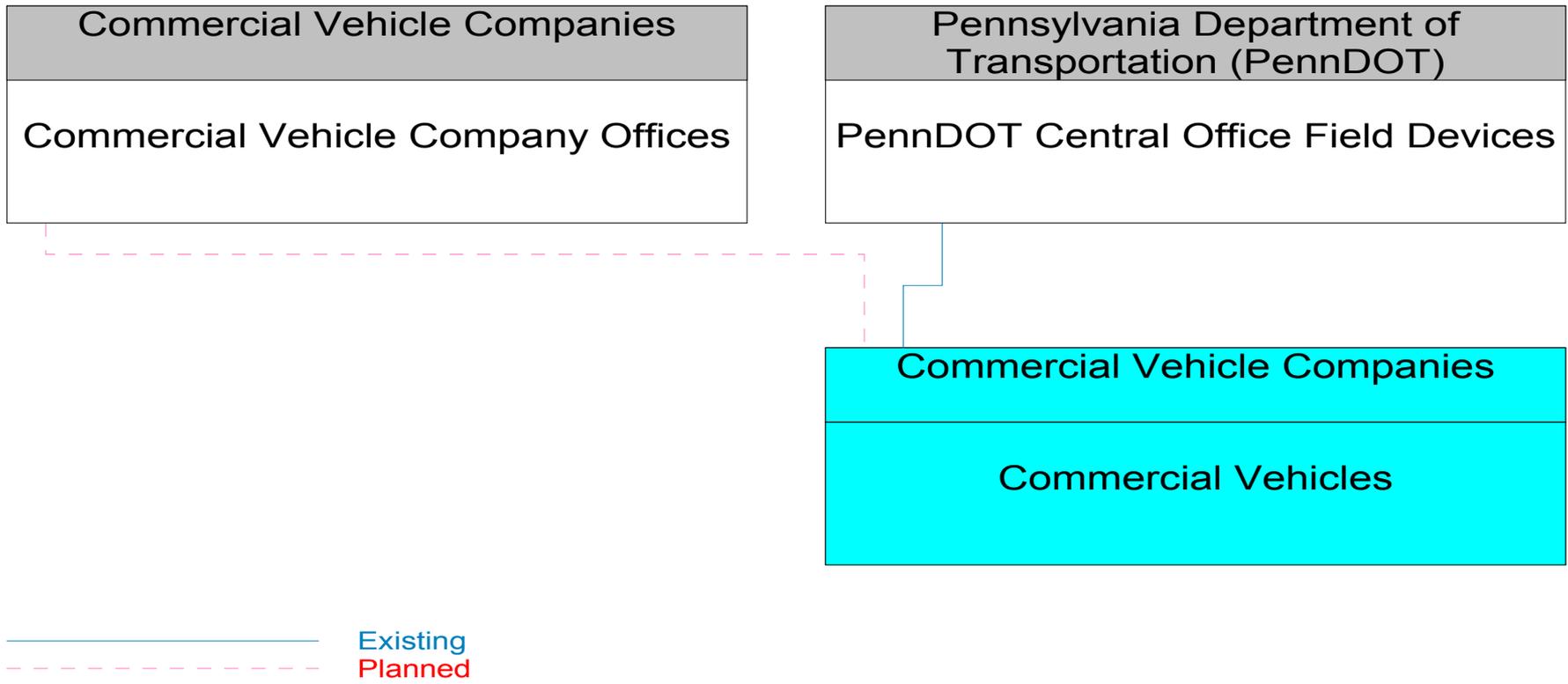
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Planned

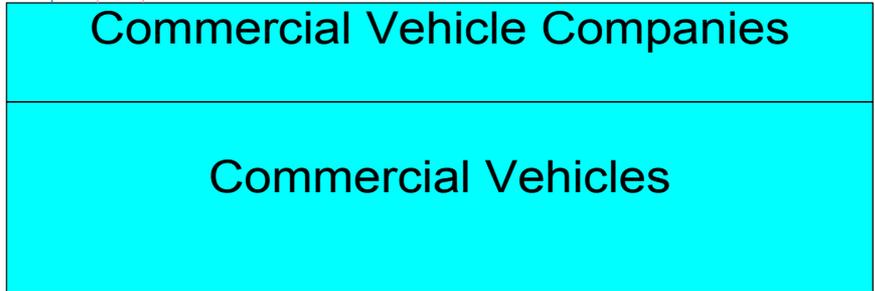
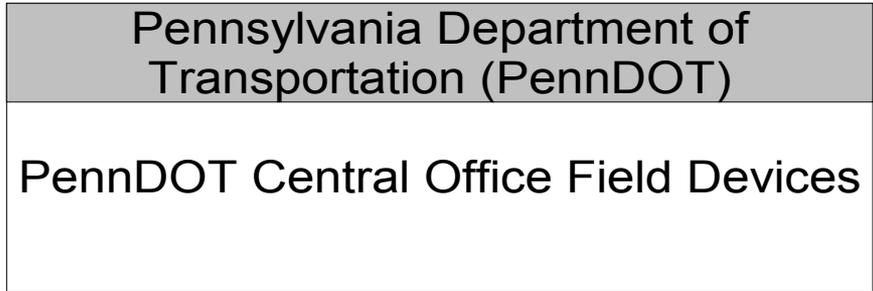
Commercial Vehicles



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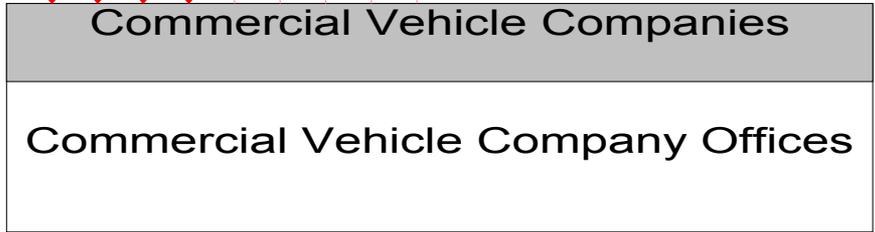
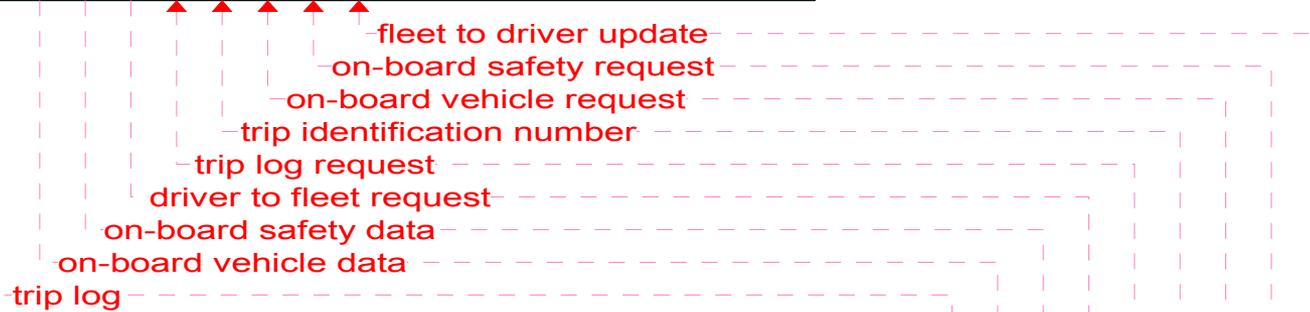
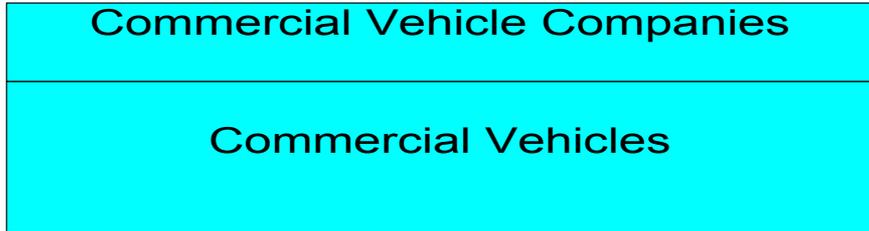
Commercial Vehicles Interconnect Diagram





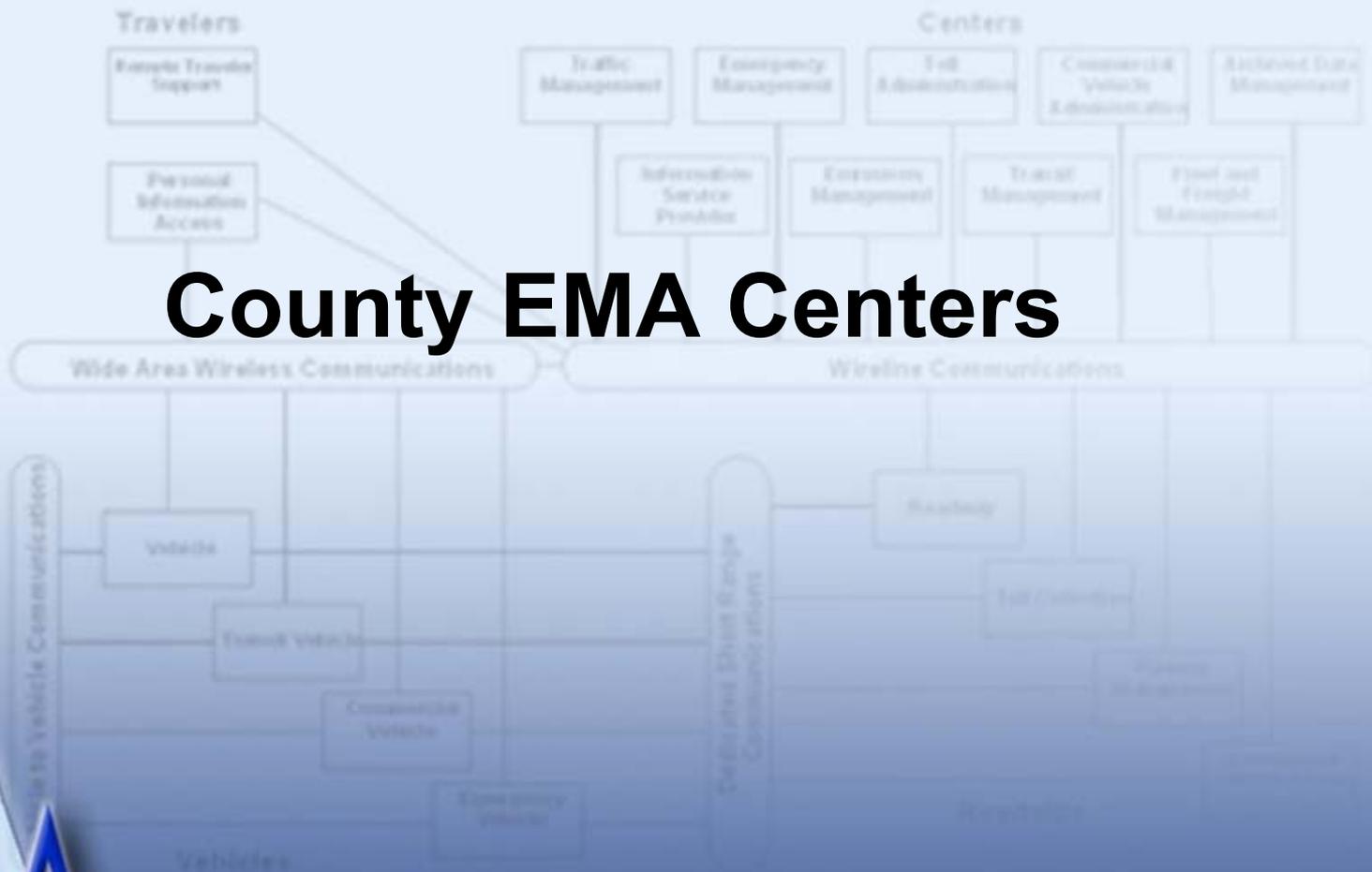
———— Existing

- - - - - Planned

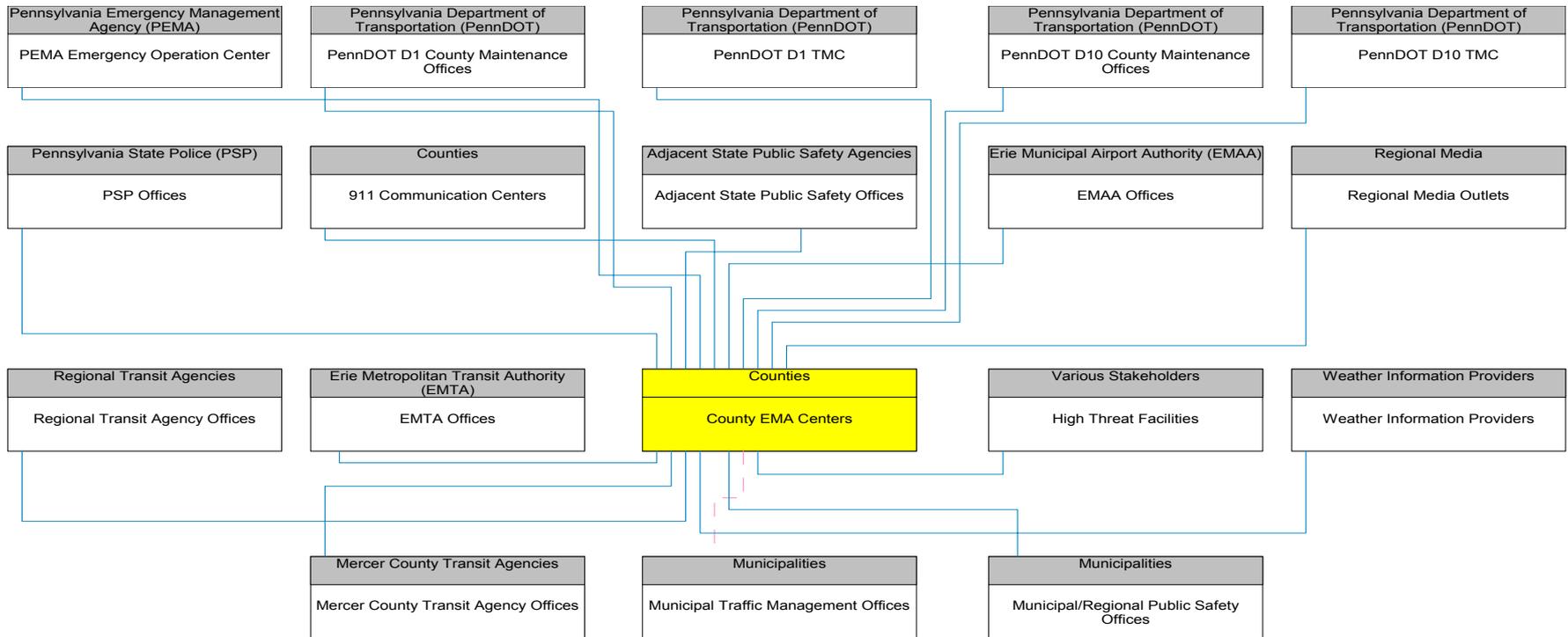


Existing
Planned

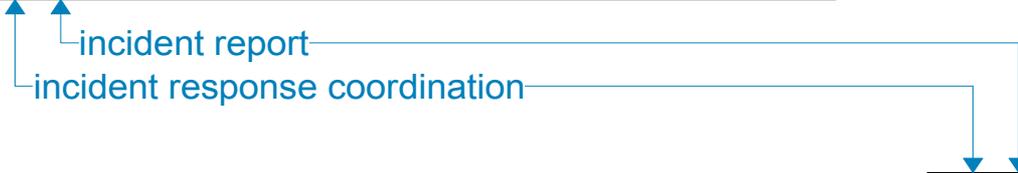
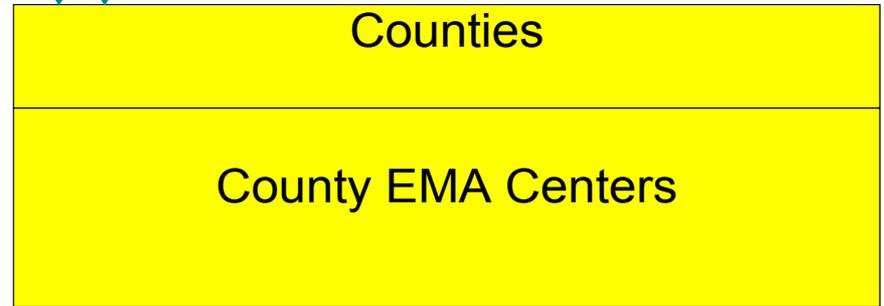
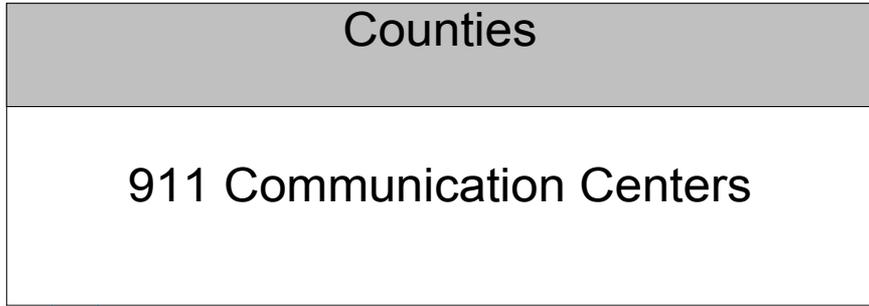
County EMA Centers



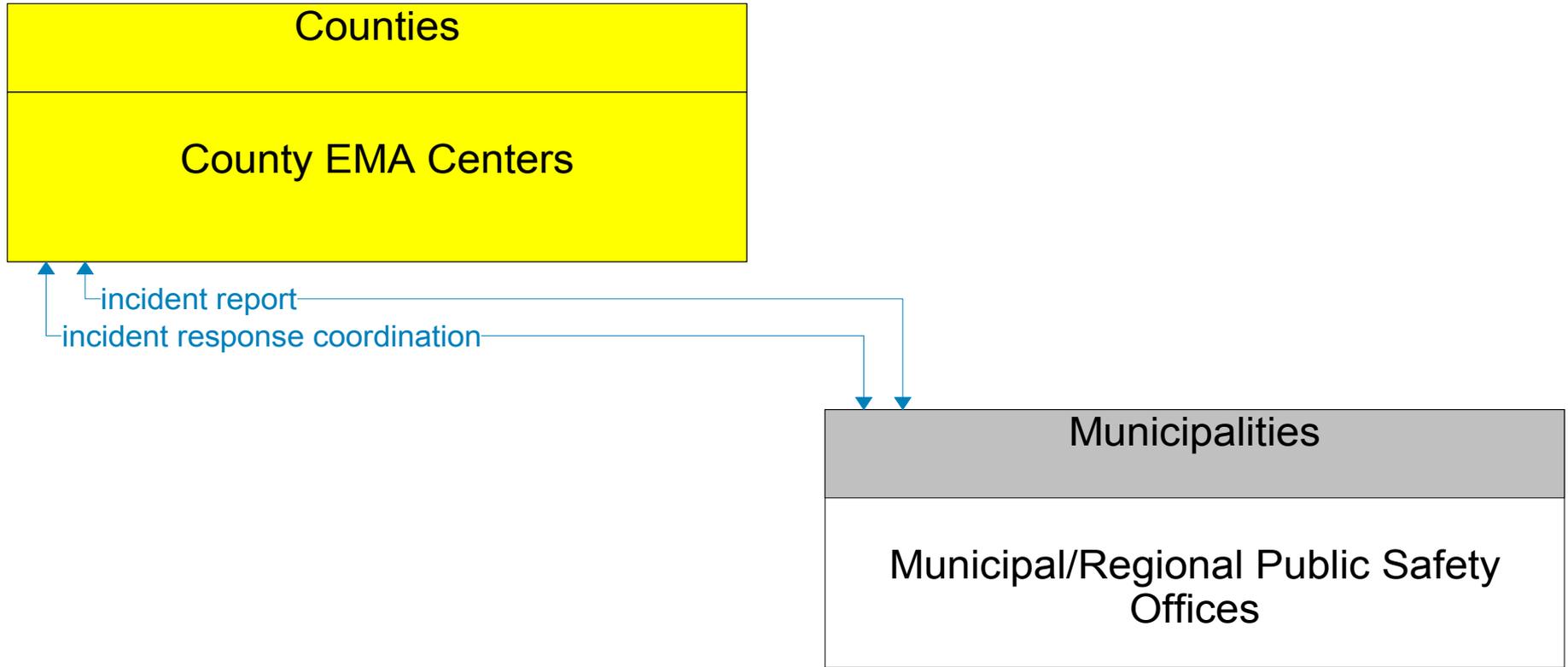
County EMA Centers Interconnect Diagram



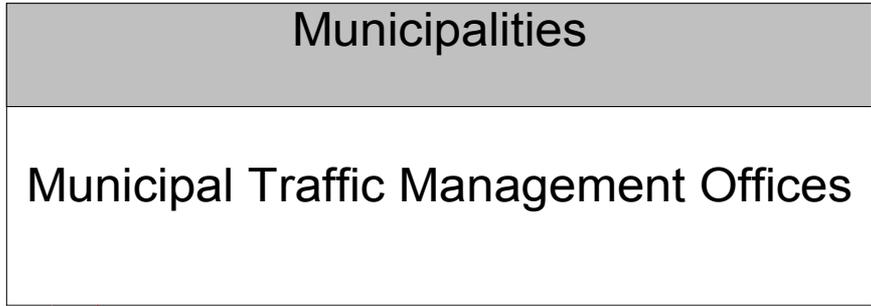
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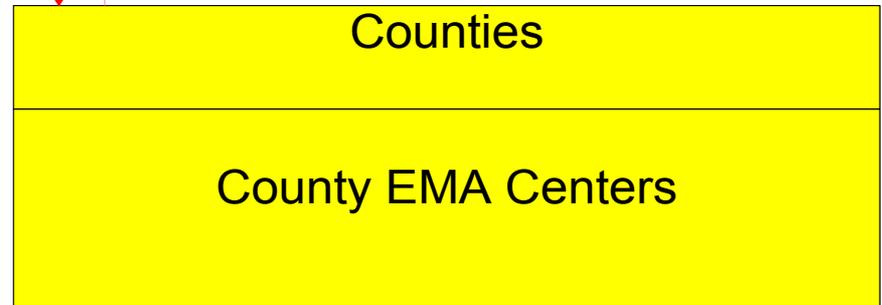
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Planned



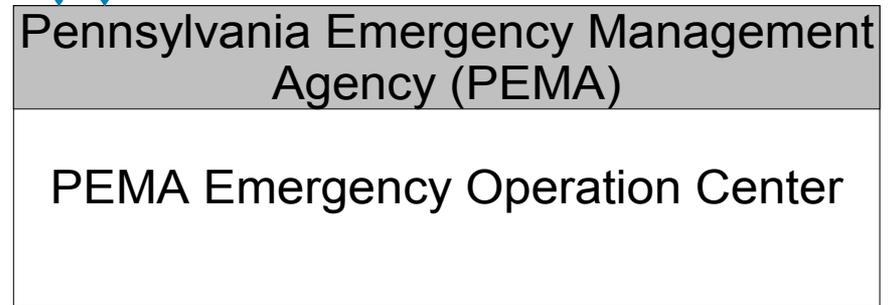
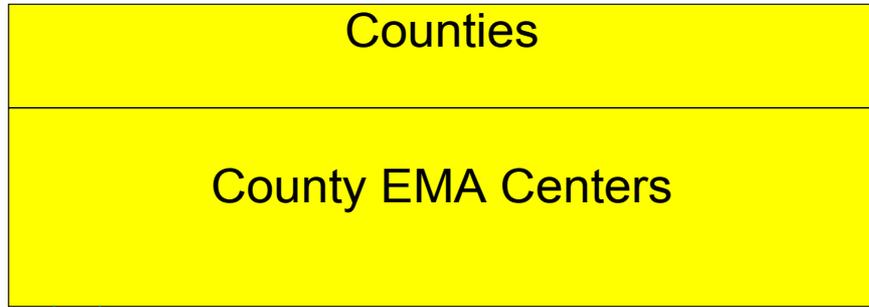
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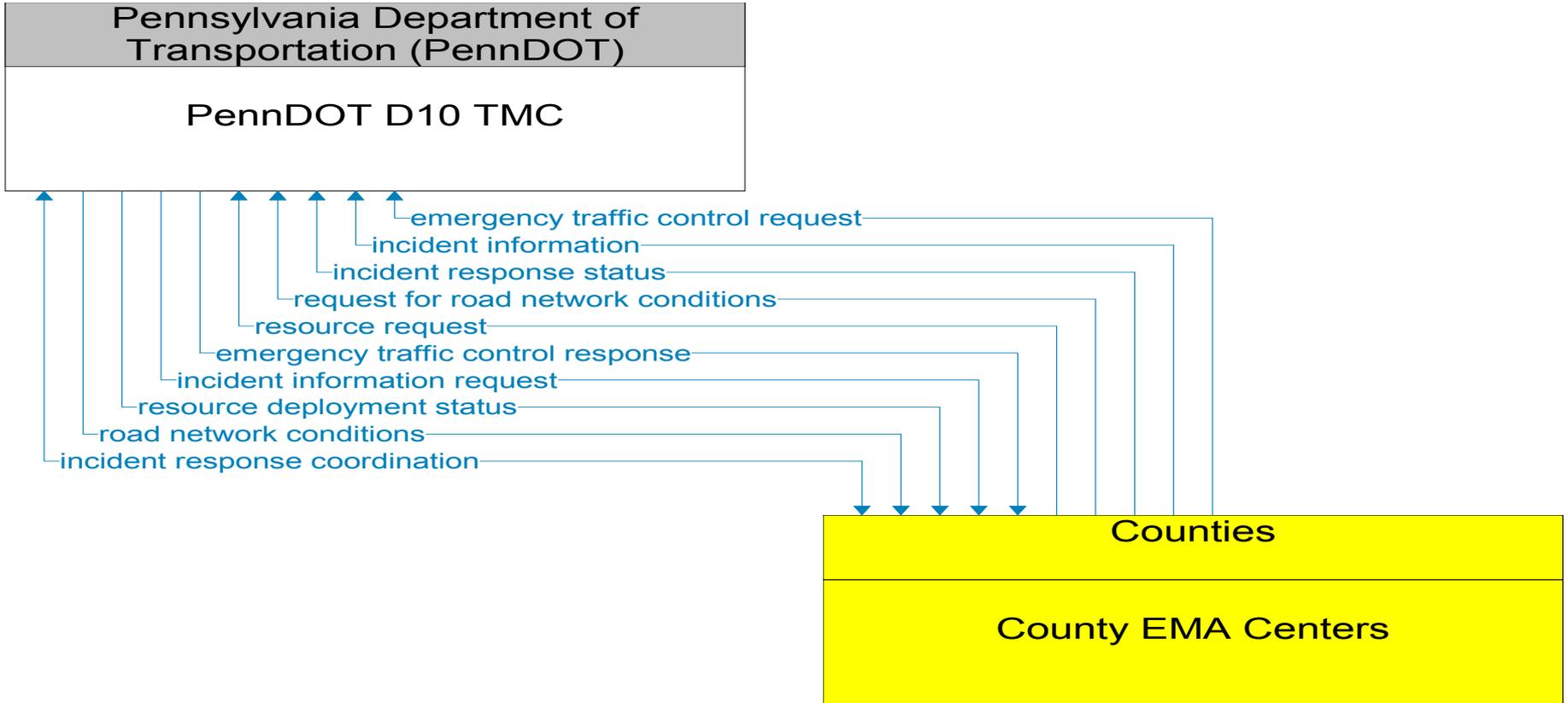


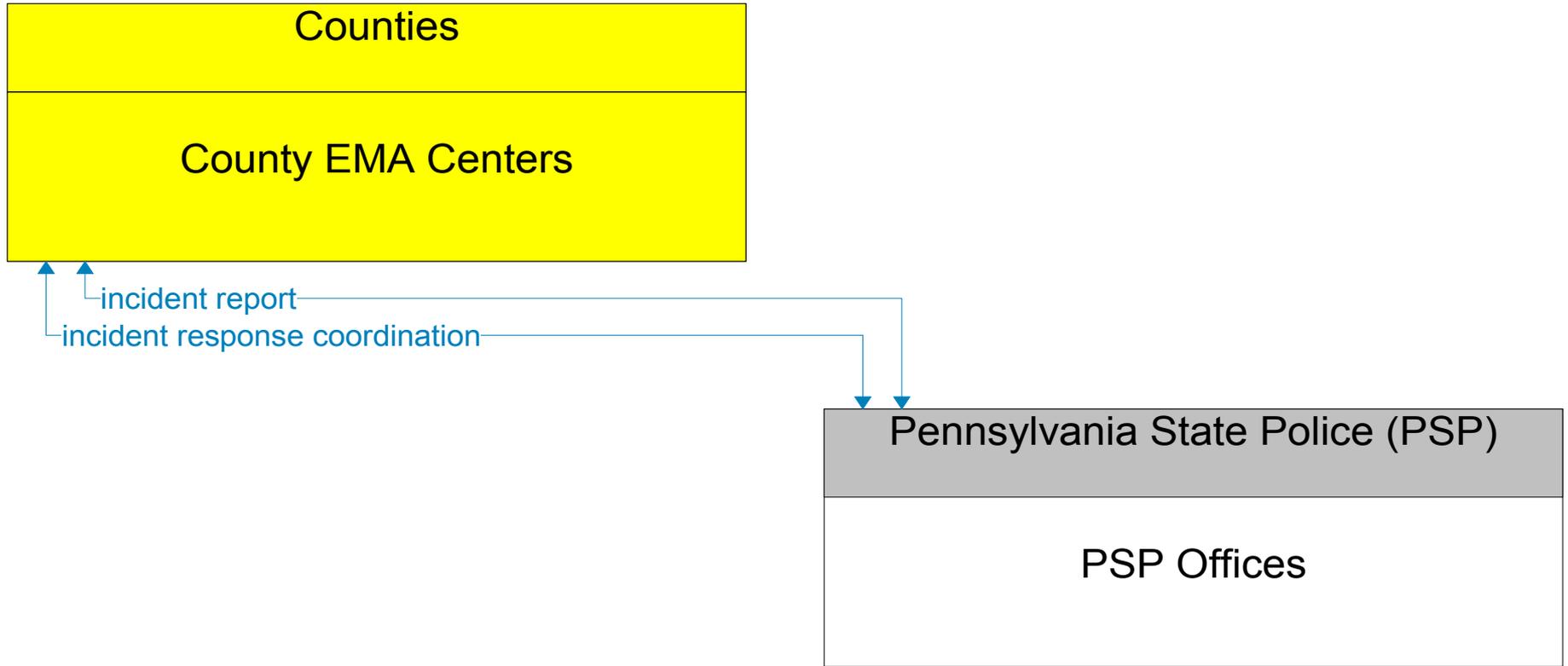
emergency traffic control request
emergency traffic control response



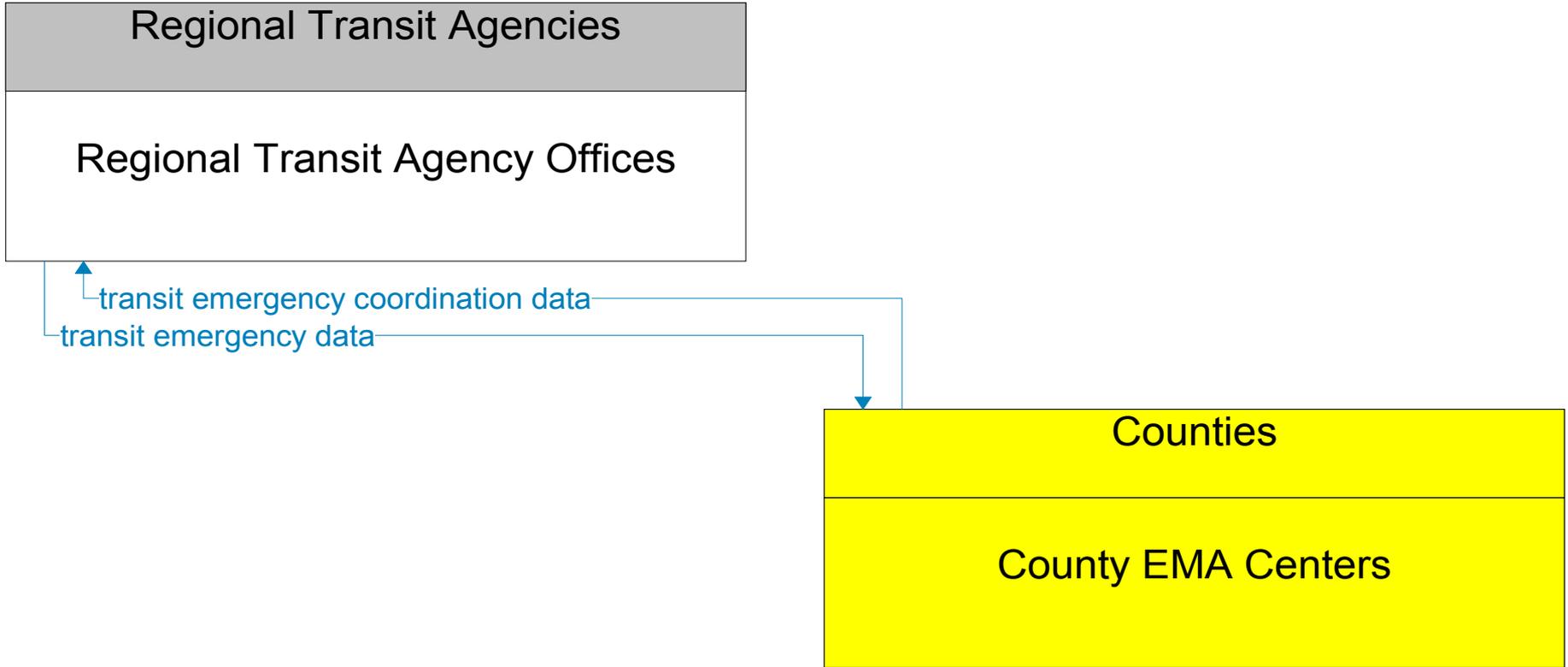
Existing
Planned

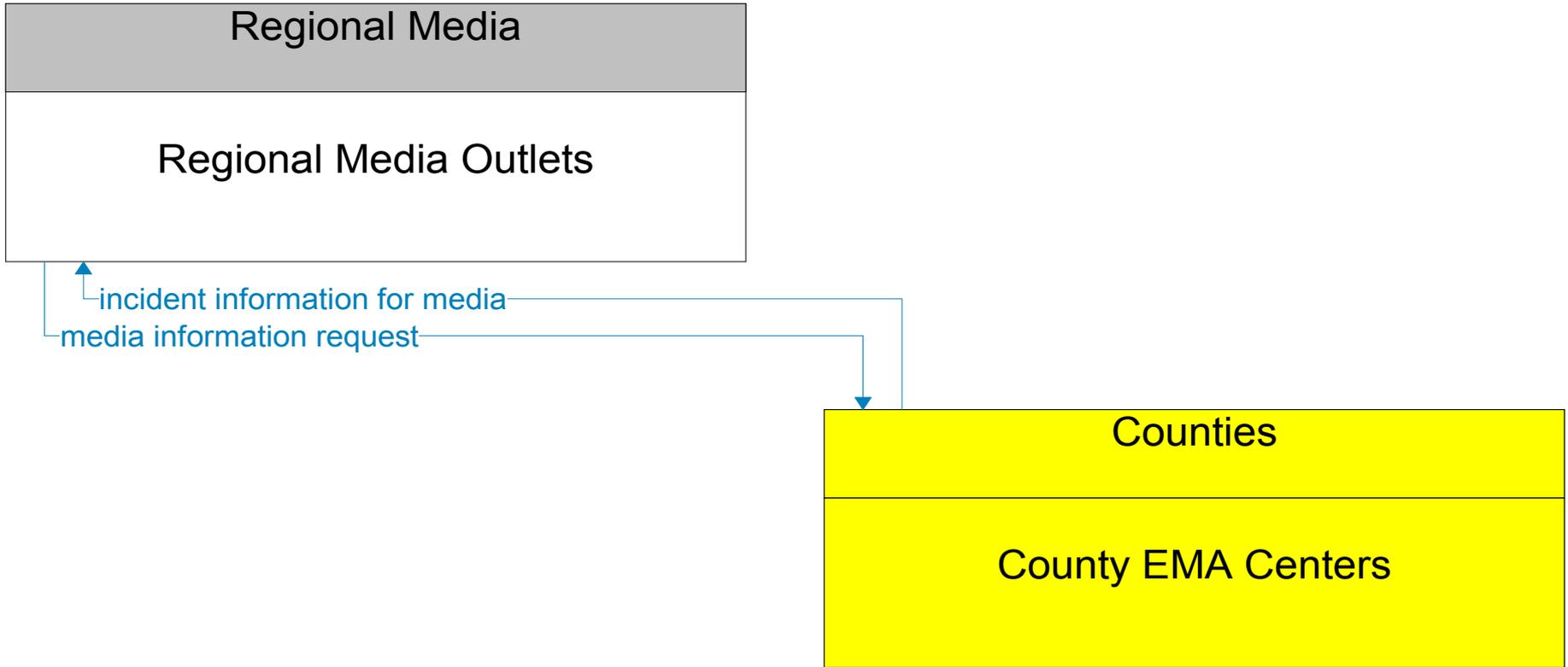




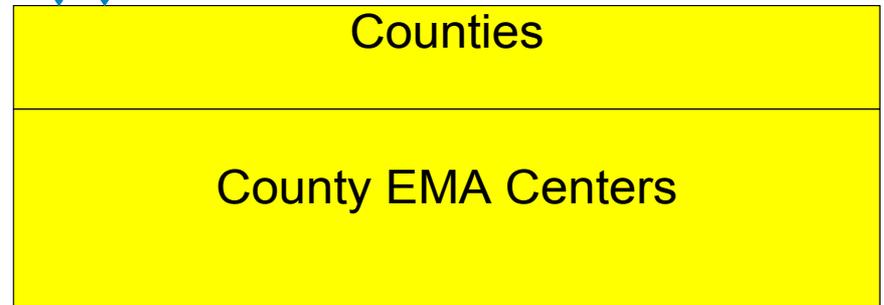
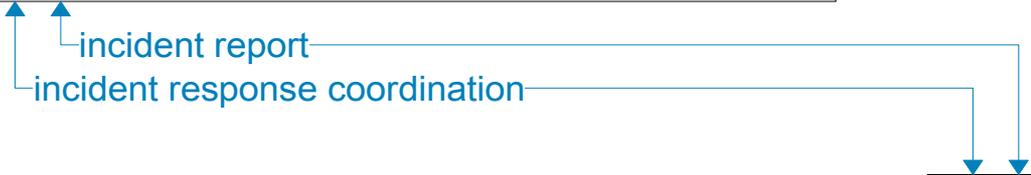


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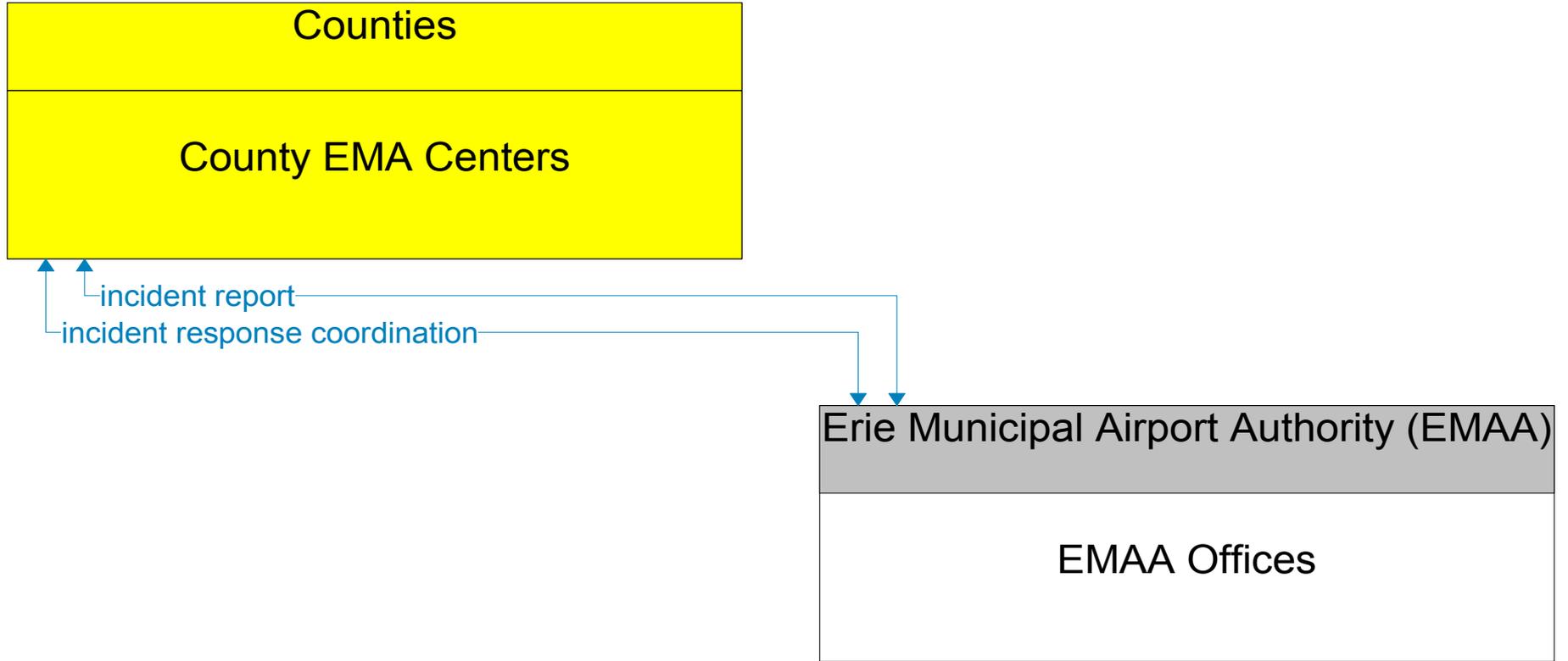




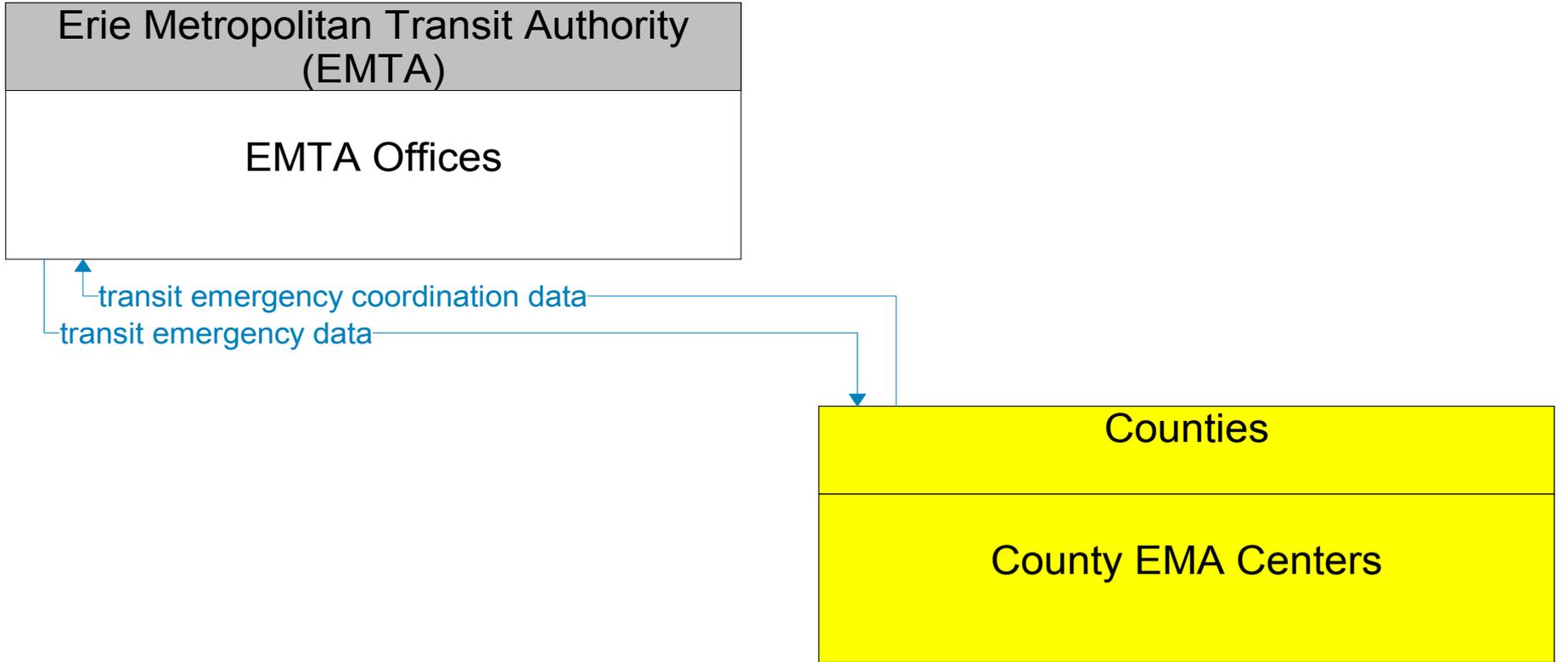
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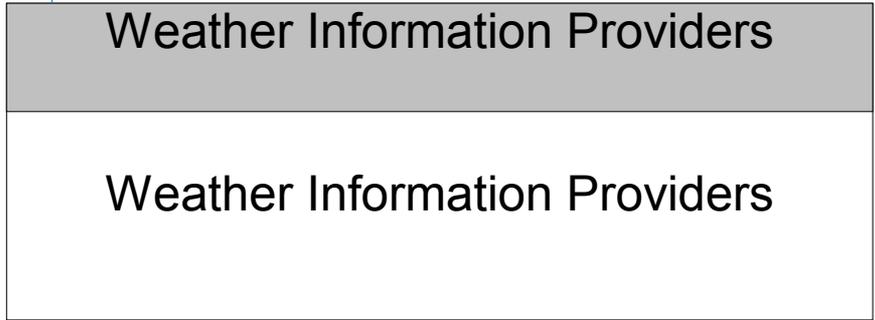
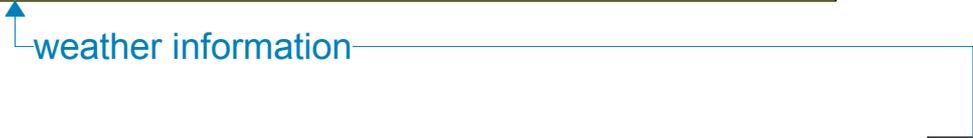
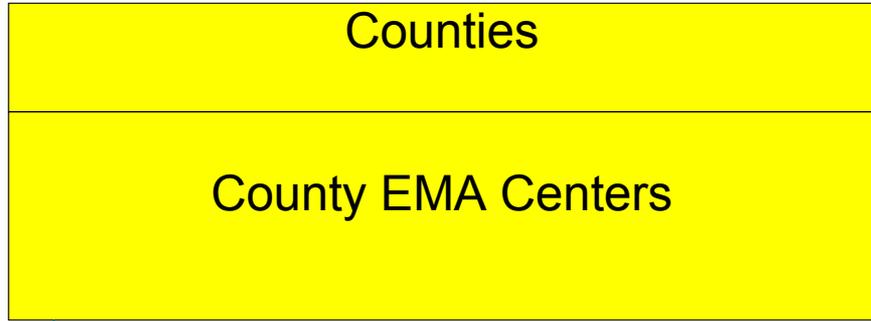


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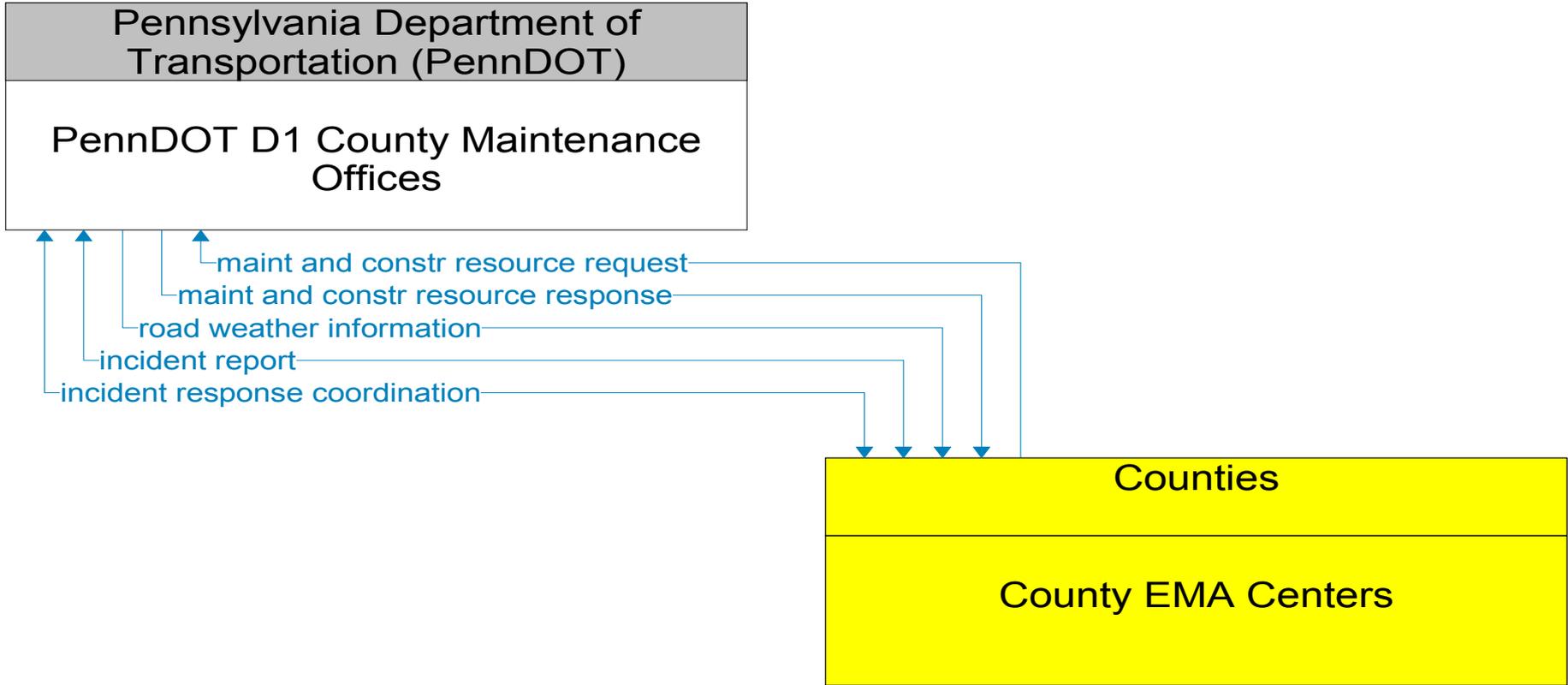


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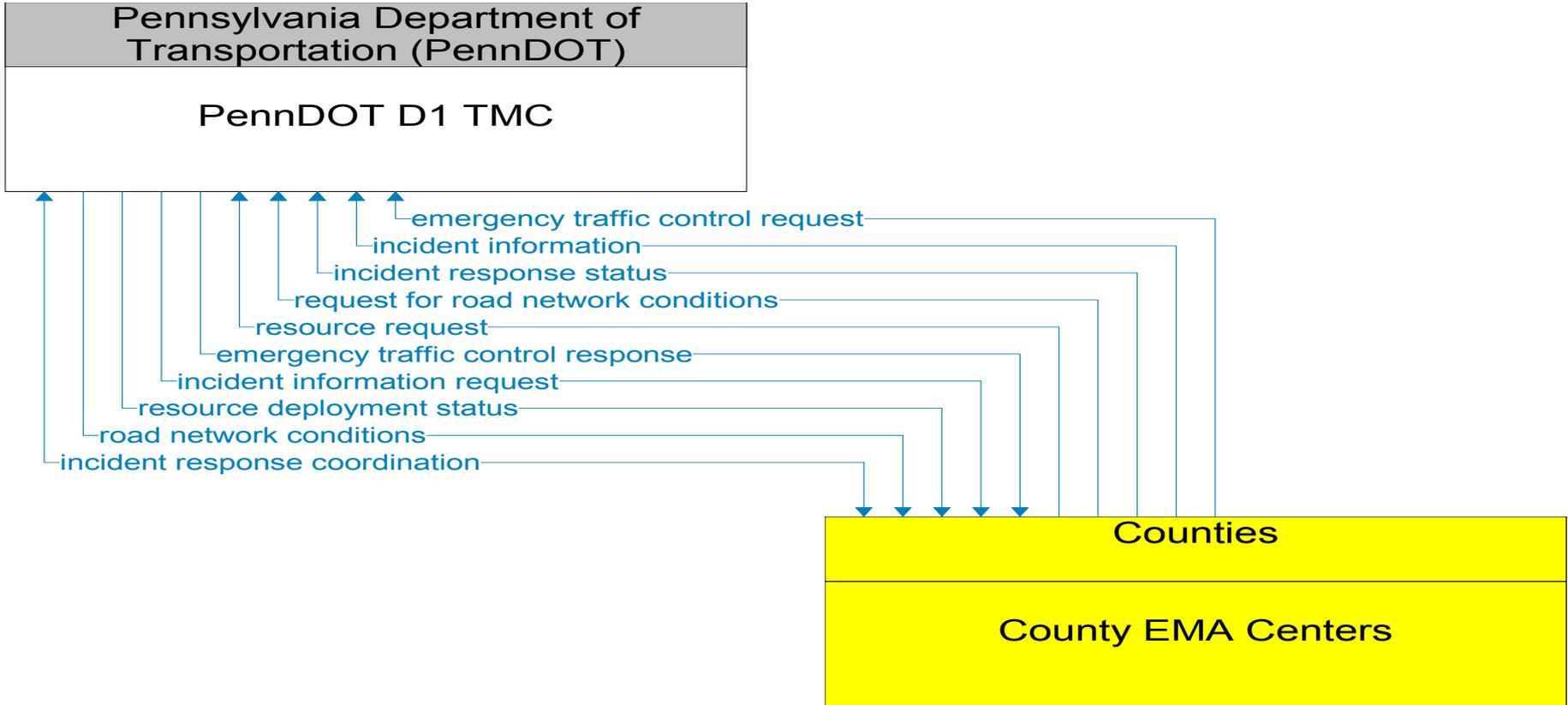


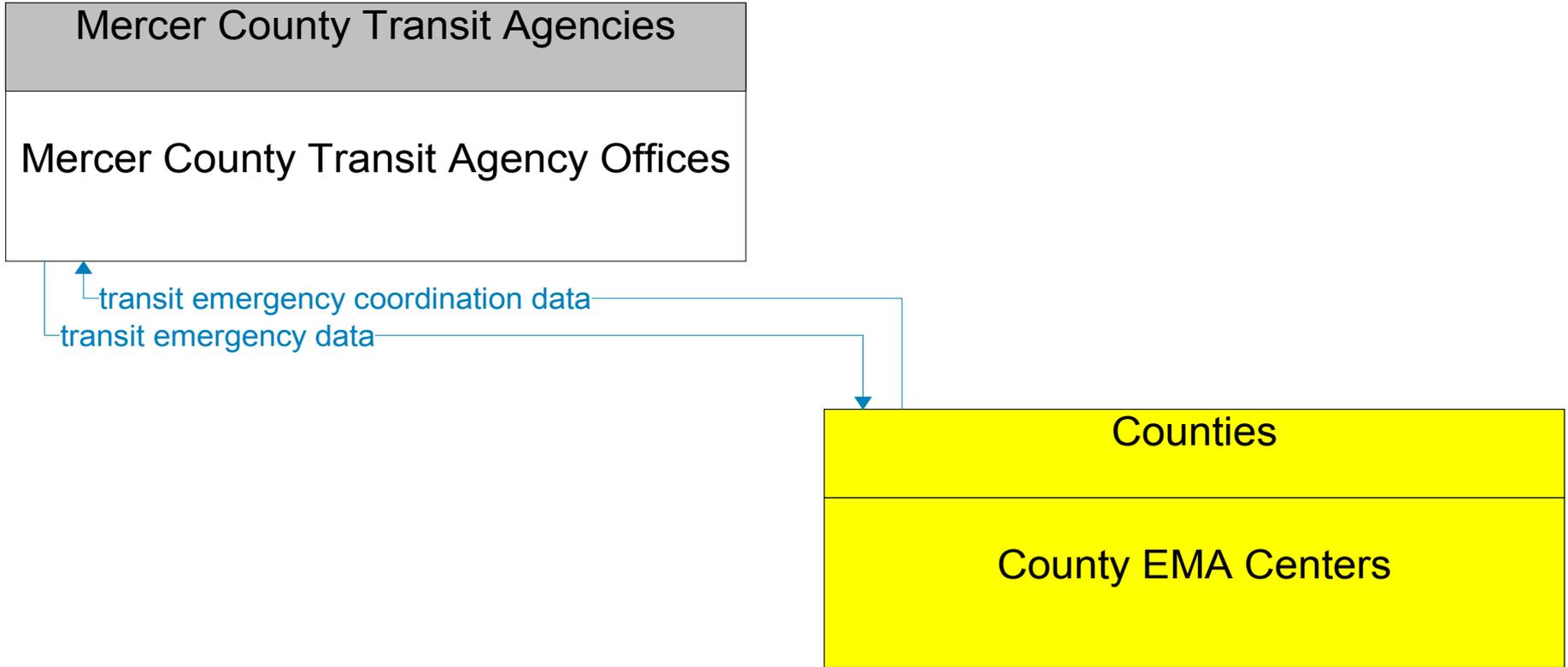


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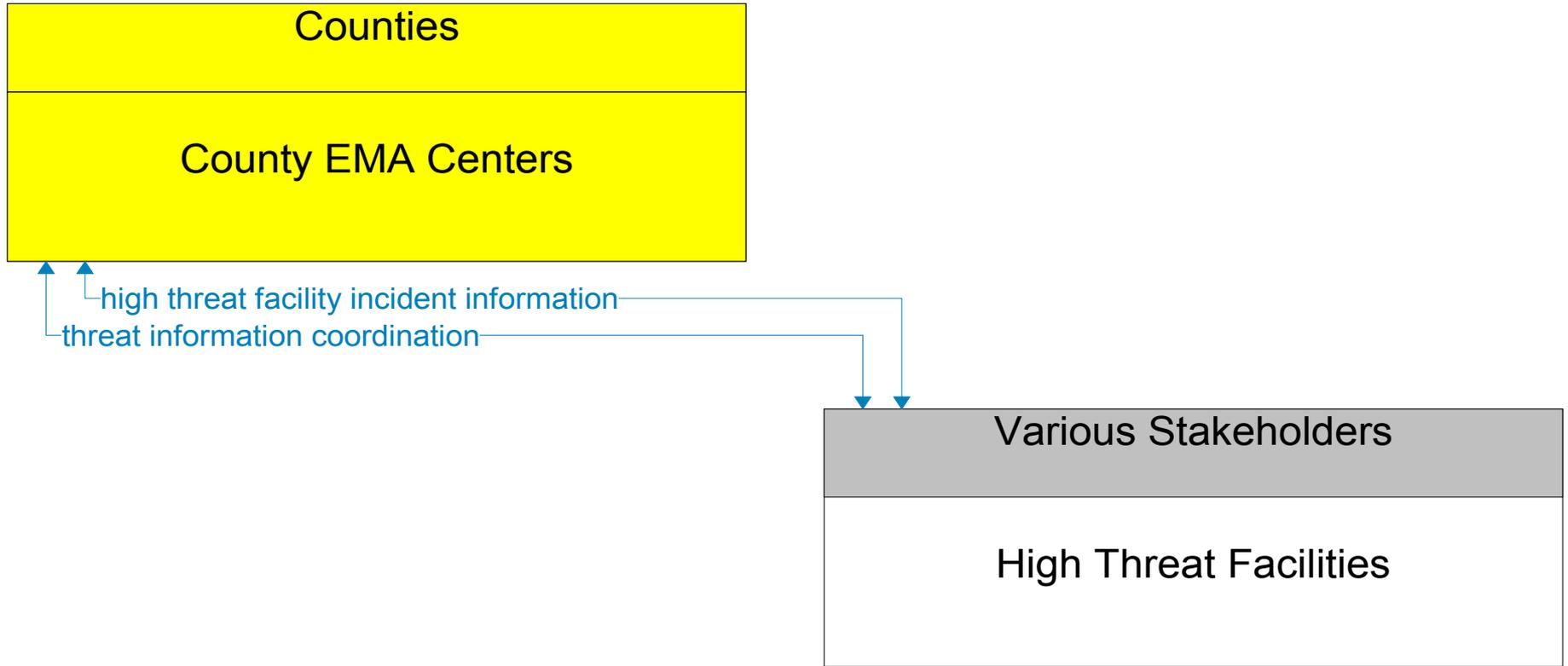


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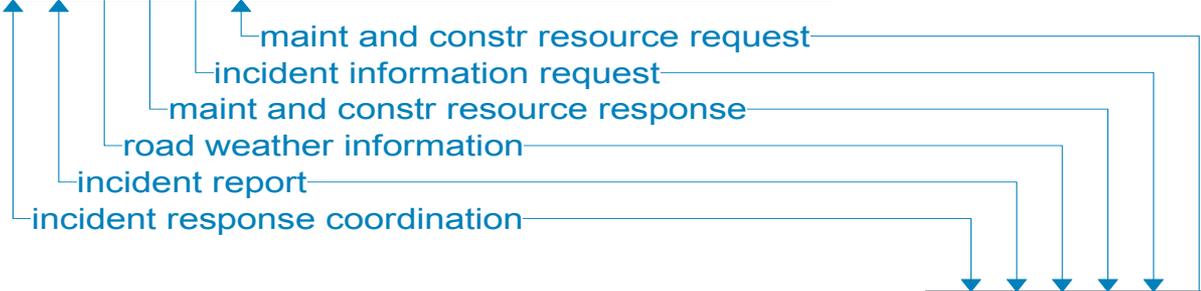


———— Existing
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Pennsylvania Department of
Transportation (PennDOT)

PennDOT D10 County Maintenance
Offices

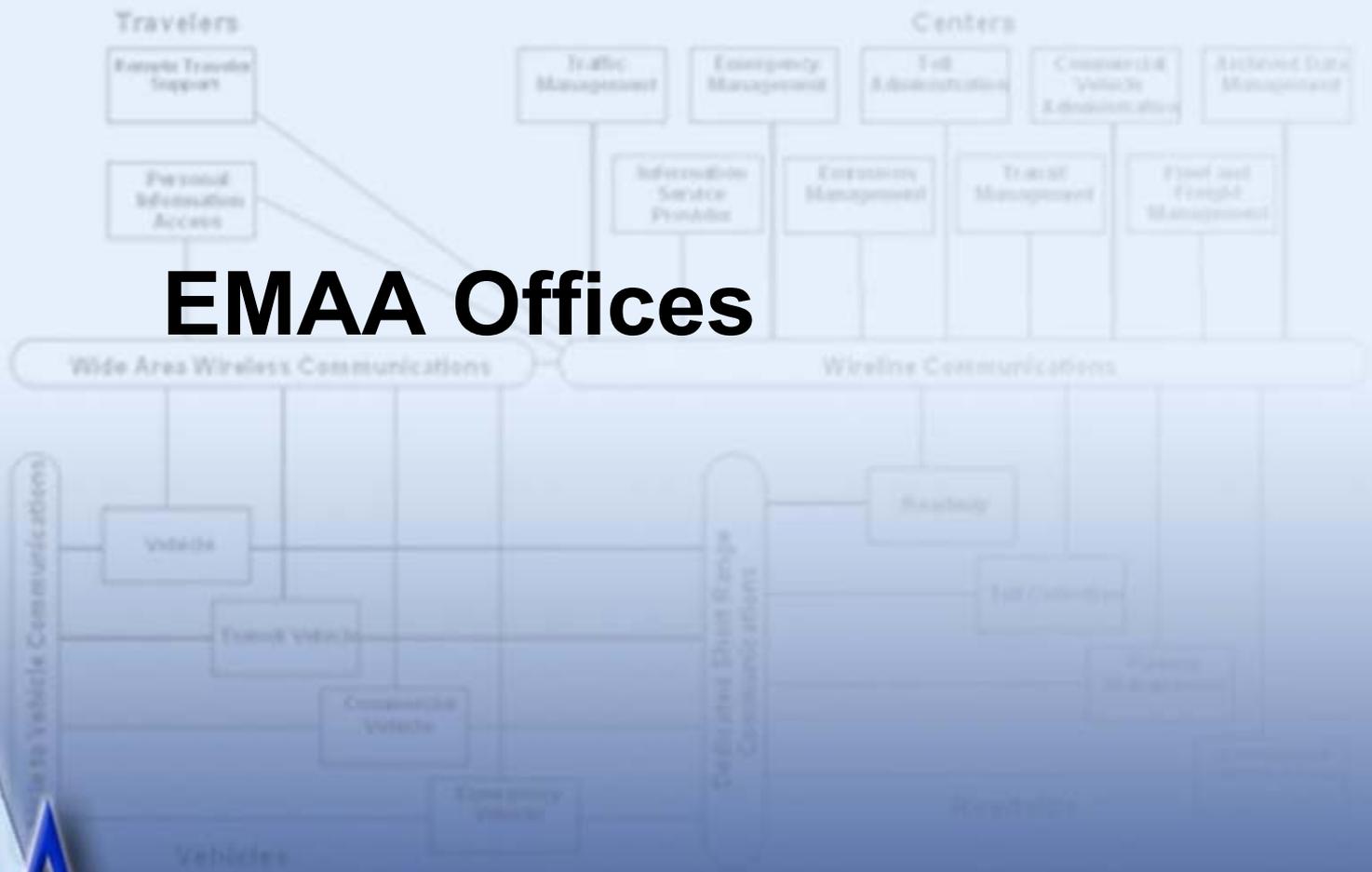


Counties

County EMA Centers

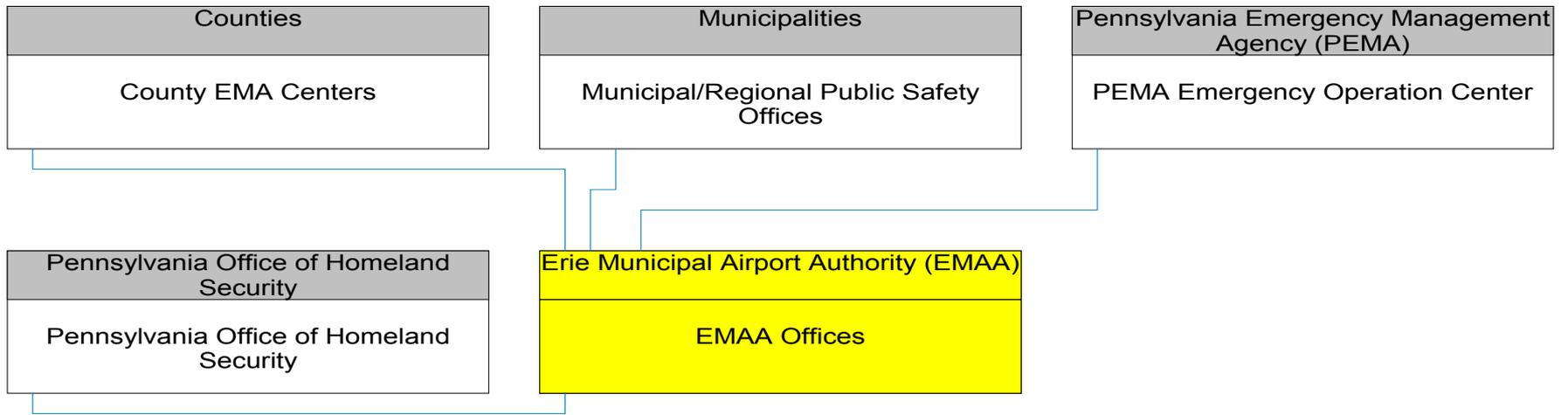
Existing
Planned

EMAA Offices

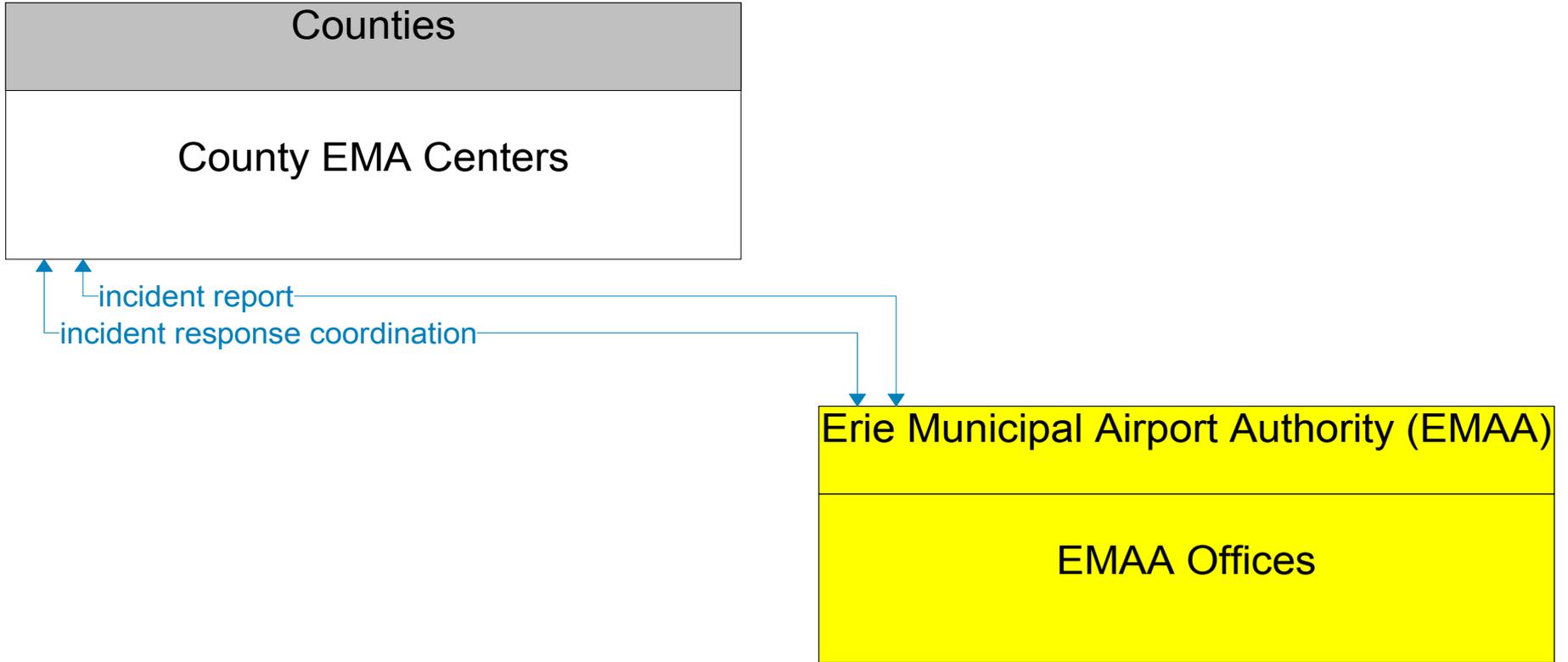


PA

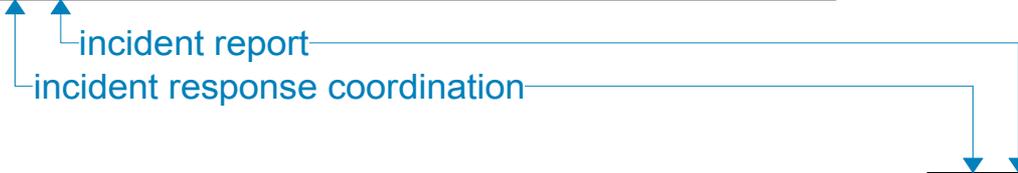
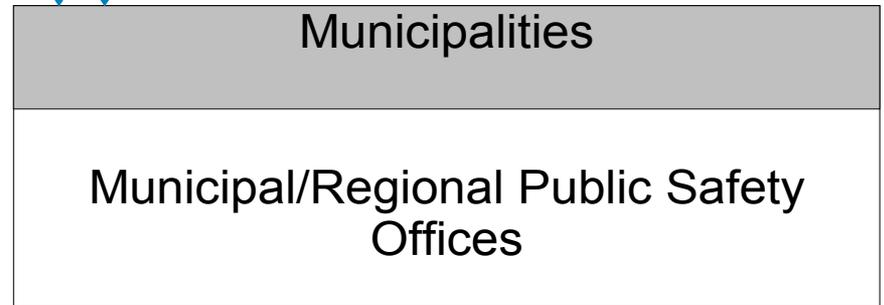
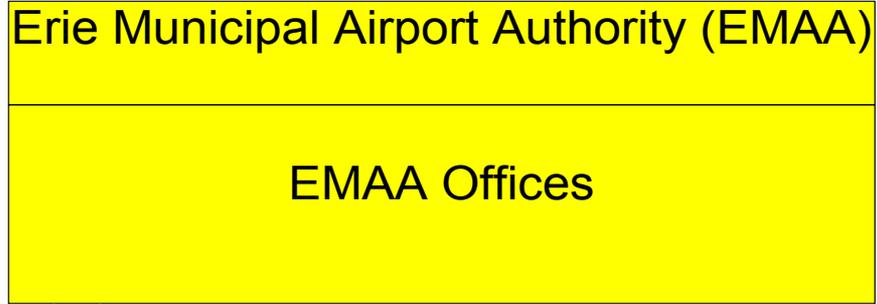
EMAA Offices Interconnect Diagram



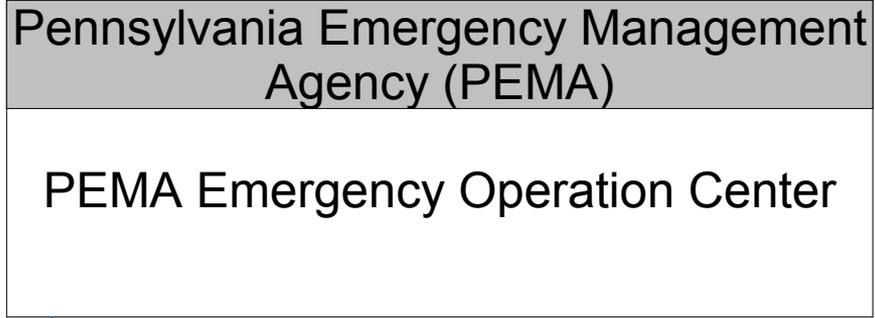
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- - - Planned



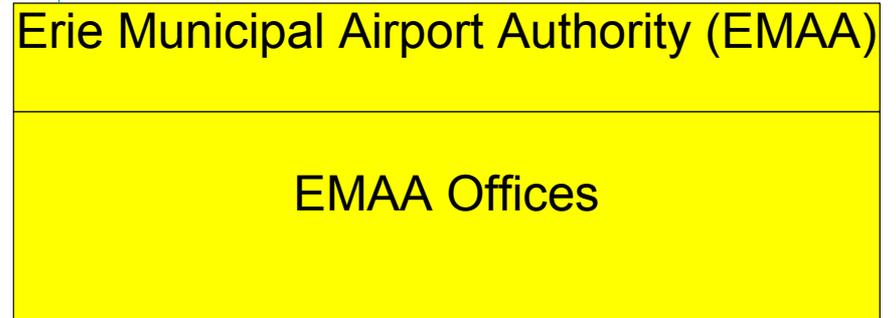
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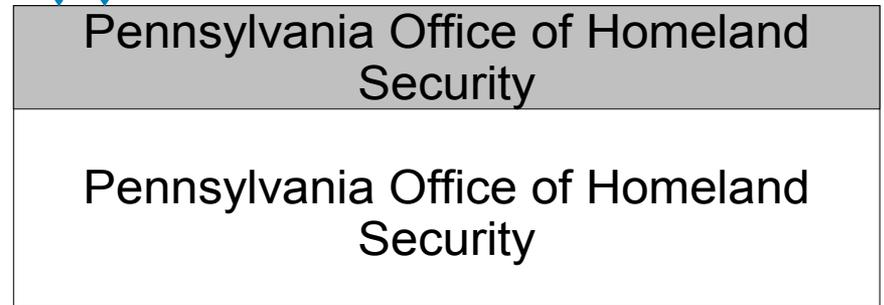
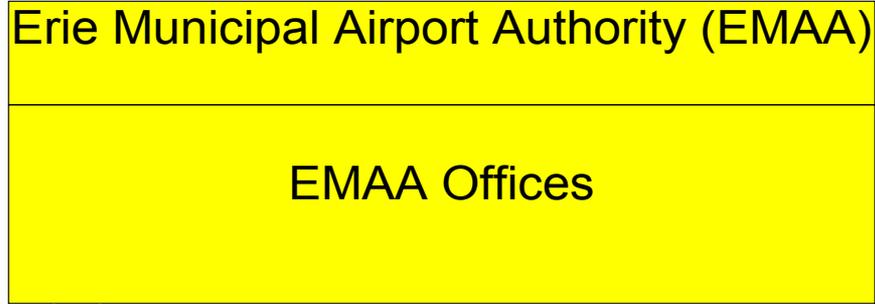
Existing
Planned



incident report

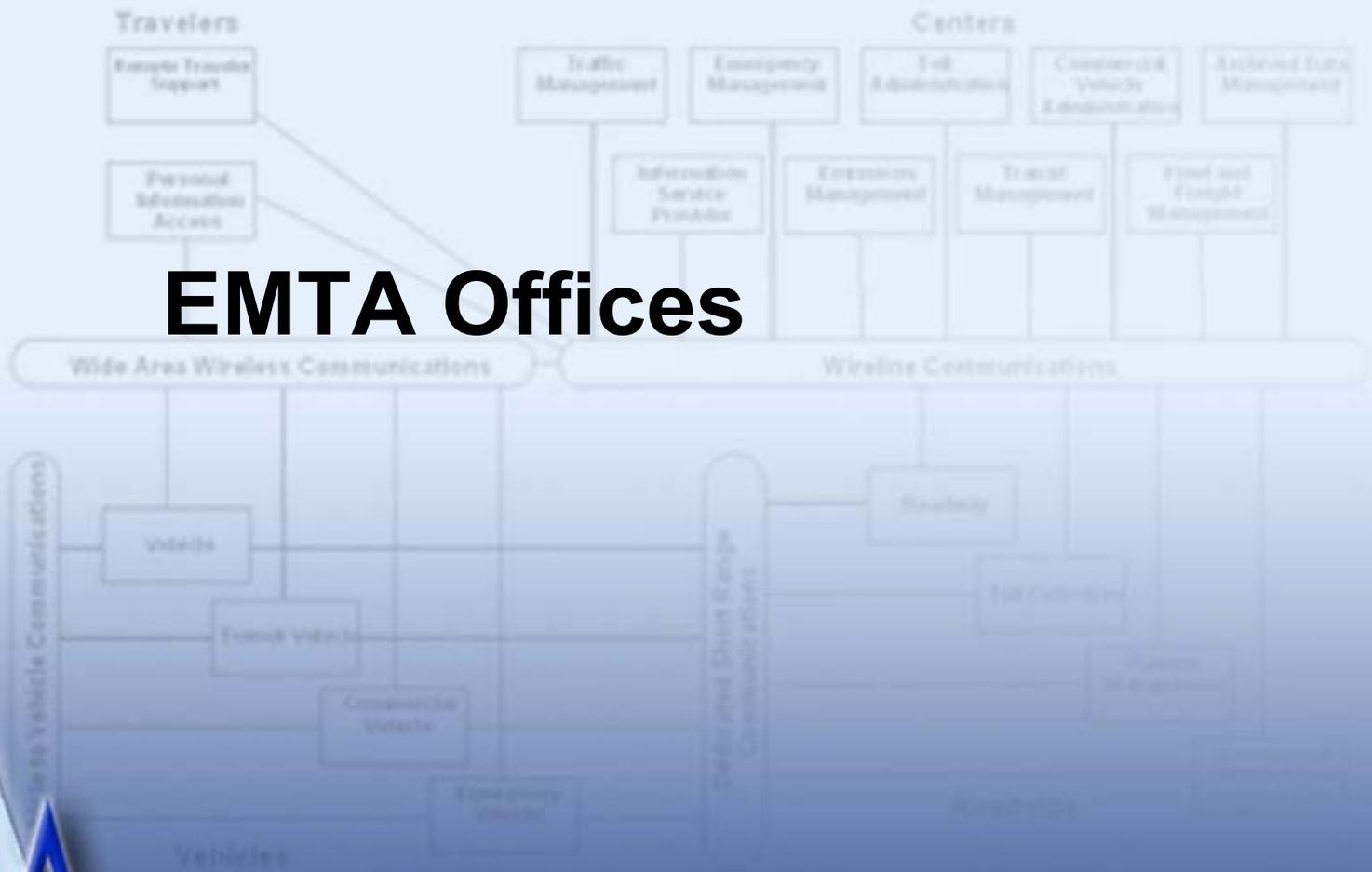


Existing
Planned



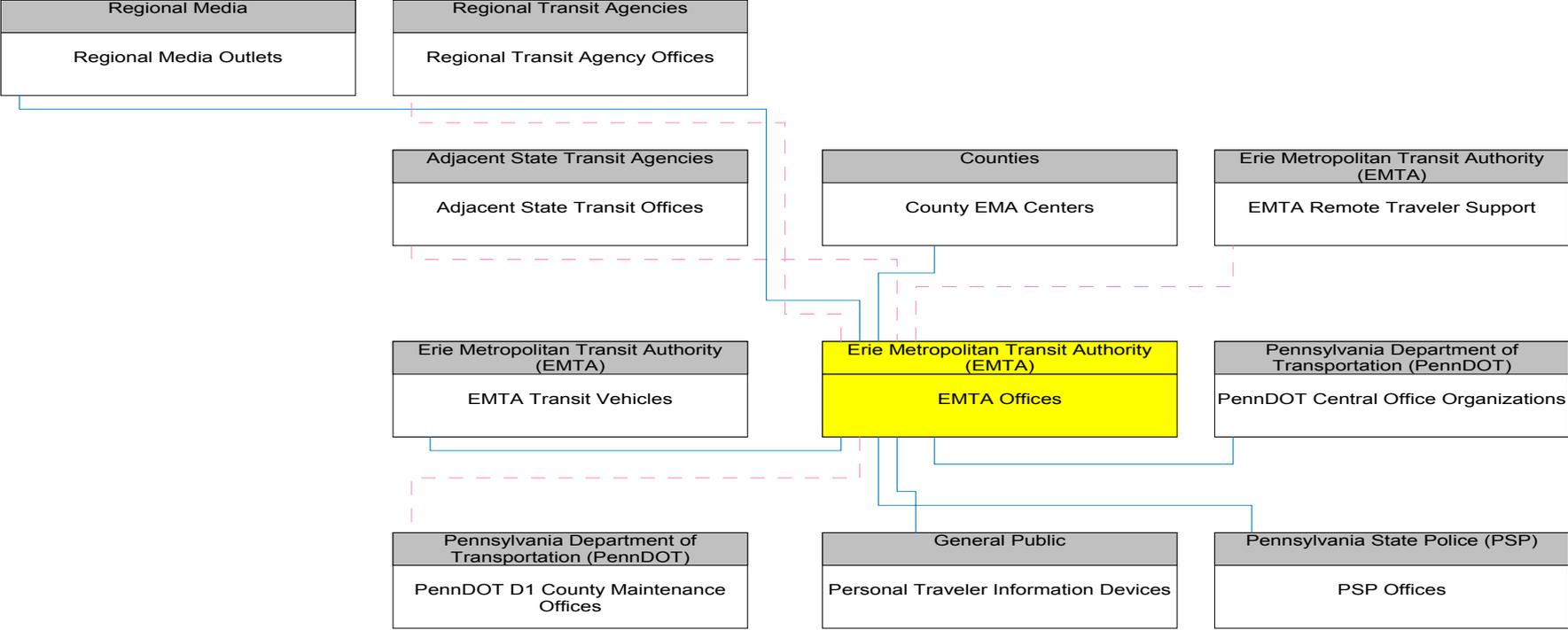
Existing
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EMTA Offices

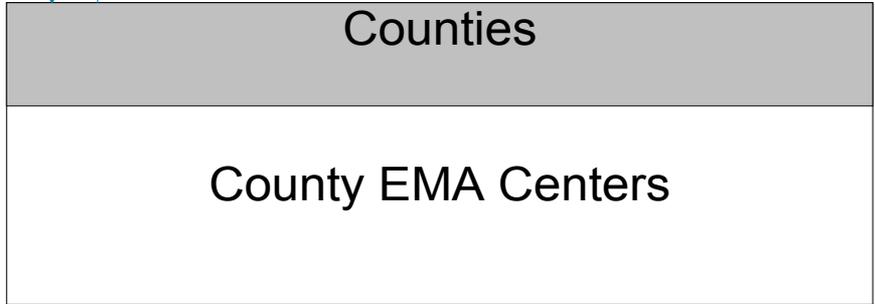
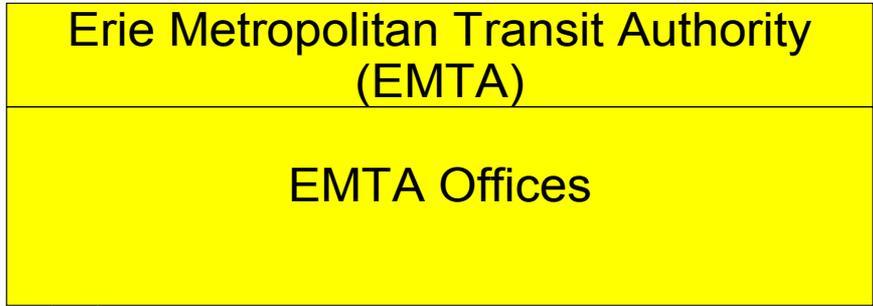


PA

EMTA Offices Interconnect Diagram

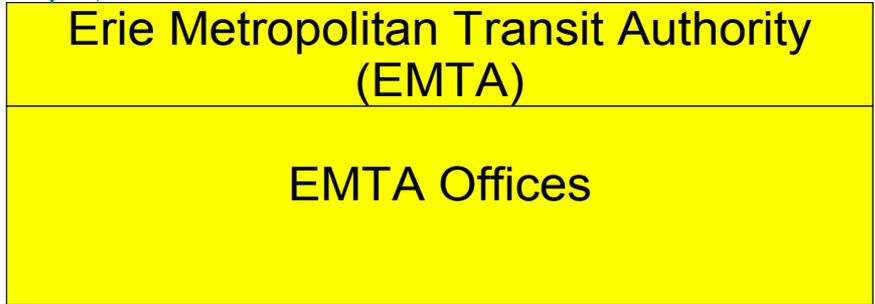
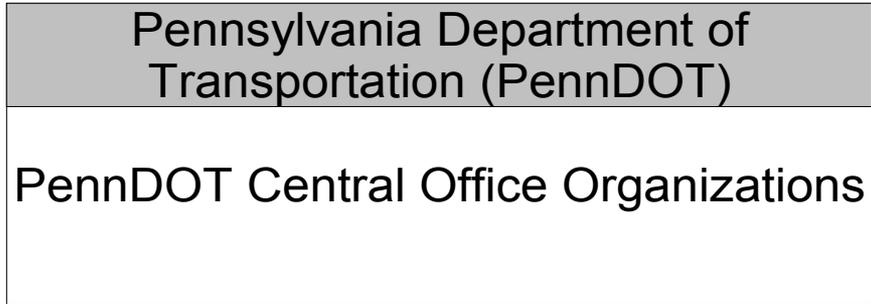


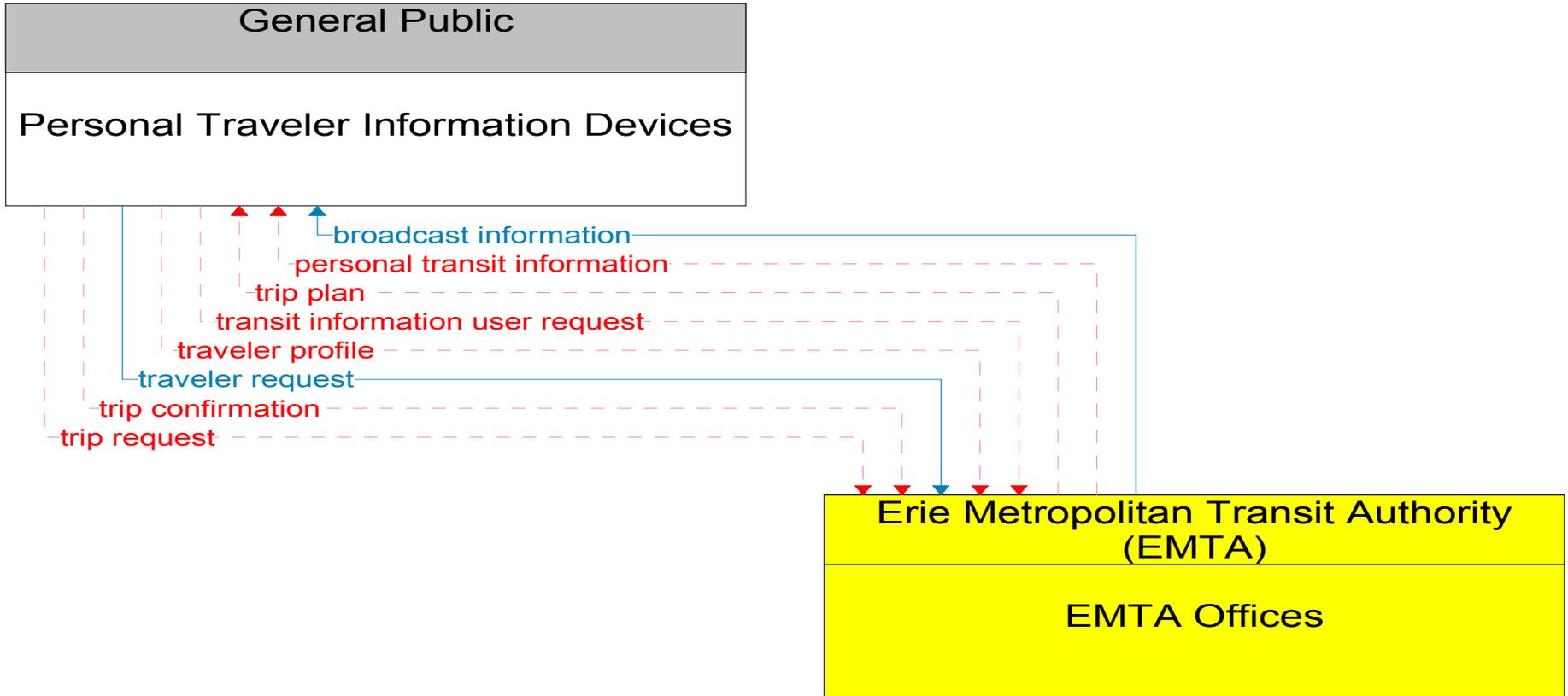
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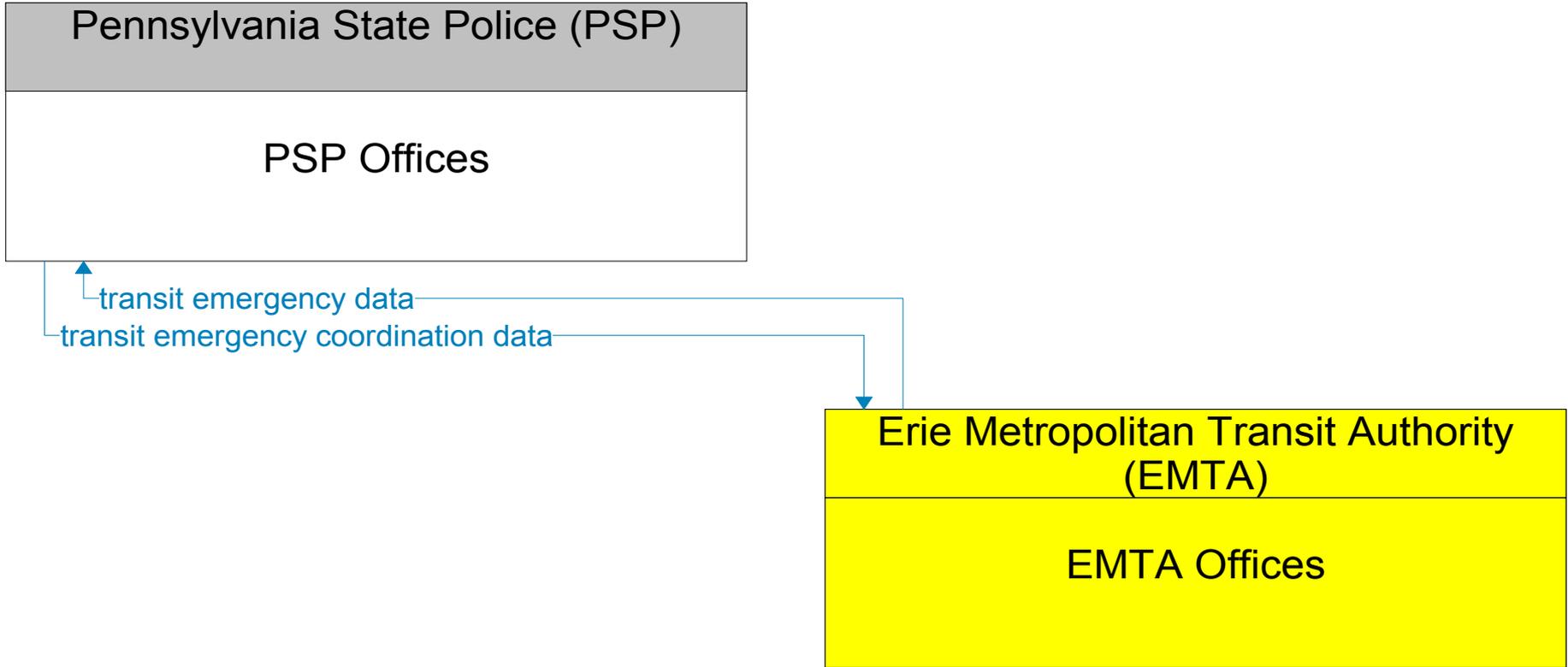


transit emergency coordination data
transit emergency data

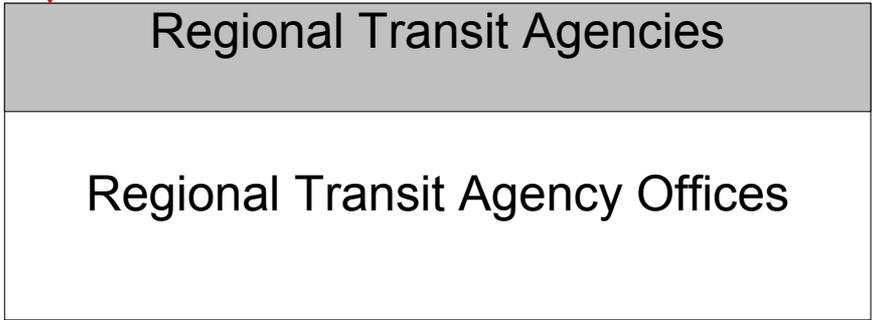
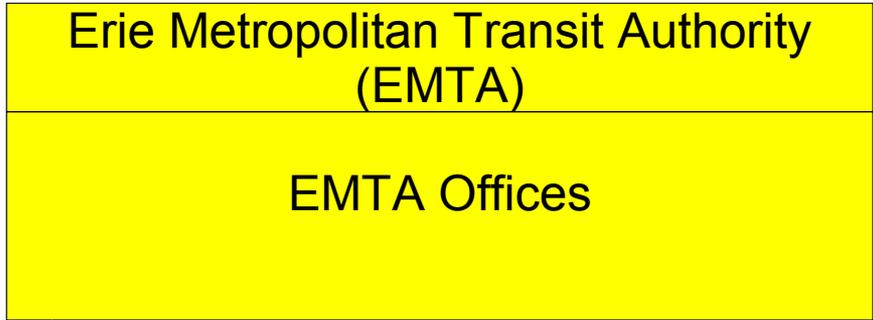
Existing
Planned



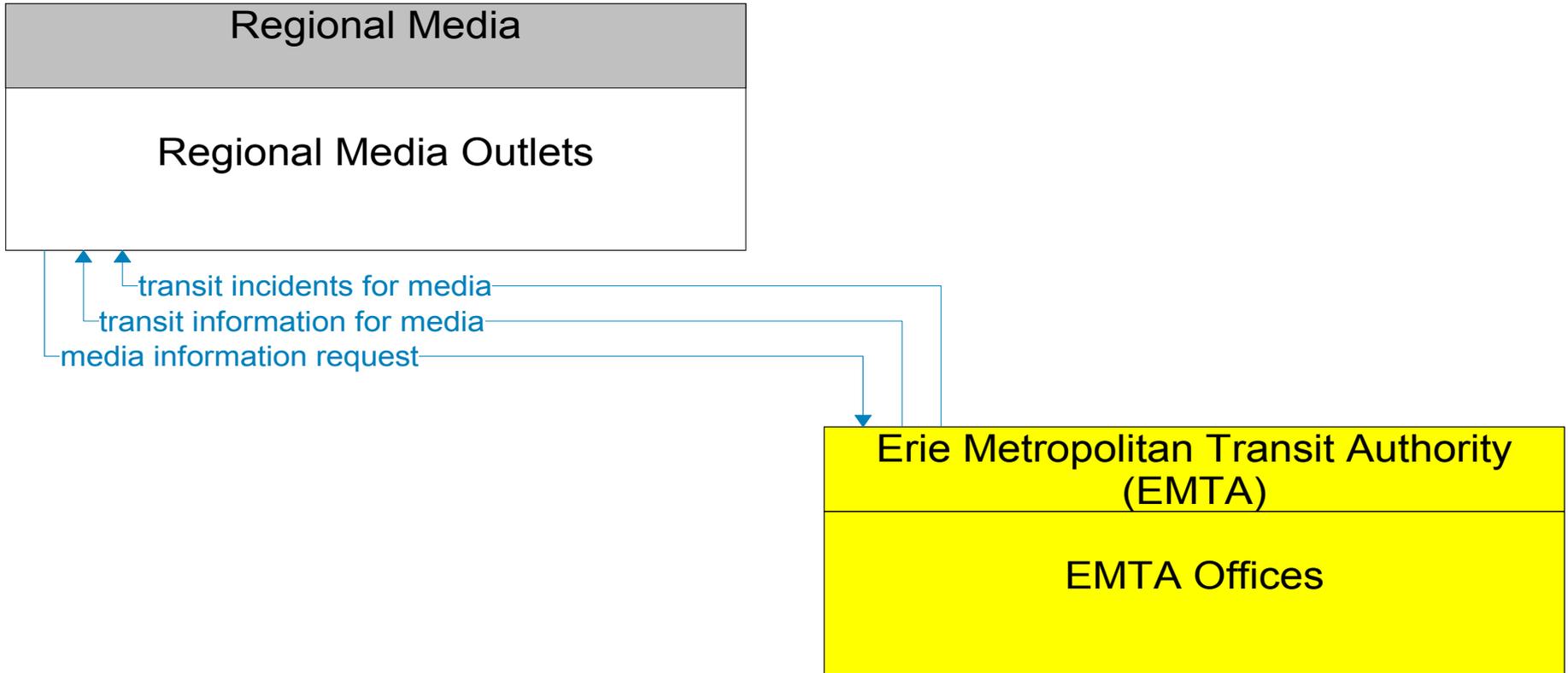




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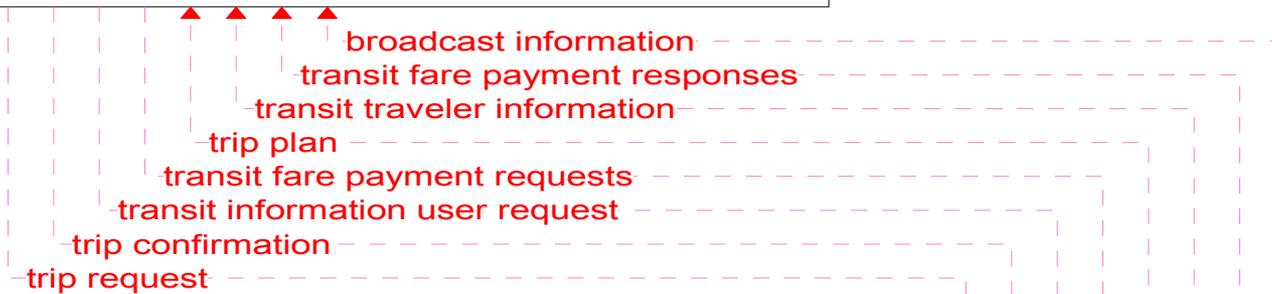


Existing
Planned



Erie Metropolitan Transit Authority
(EMTA)

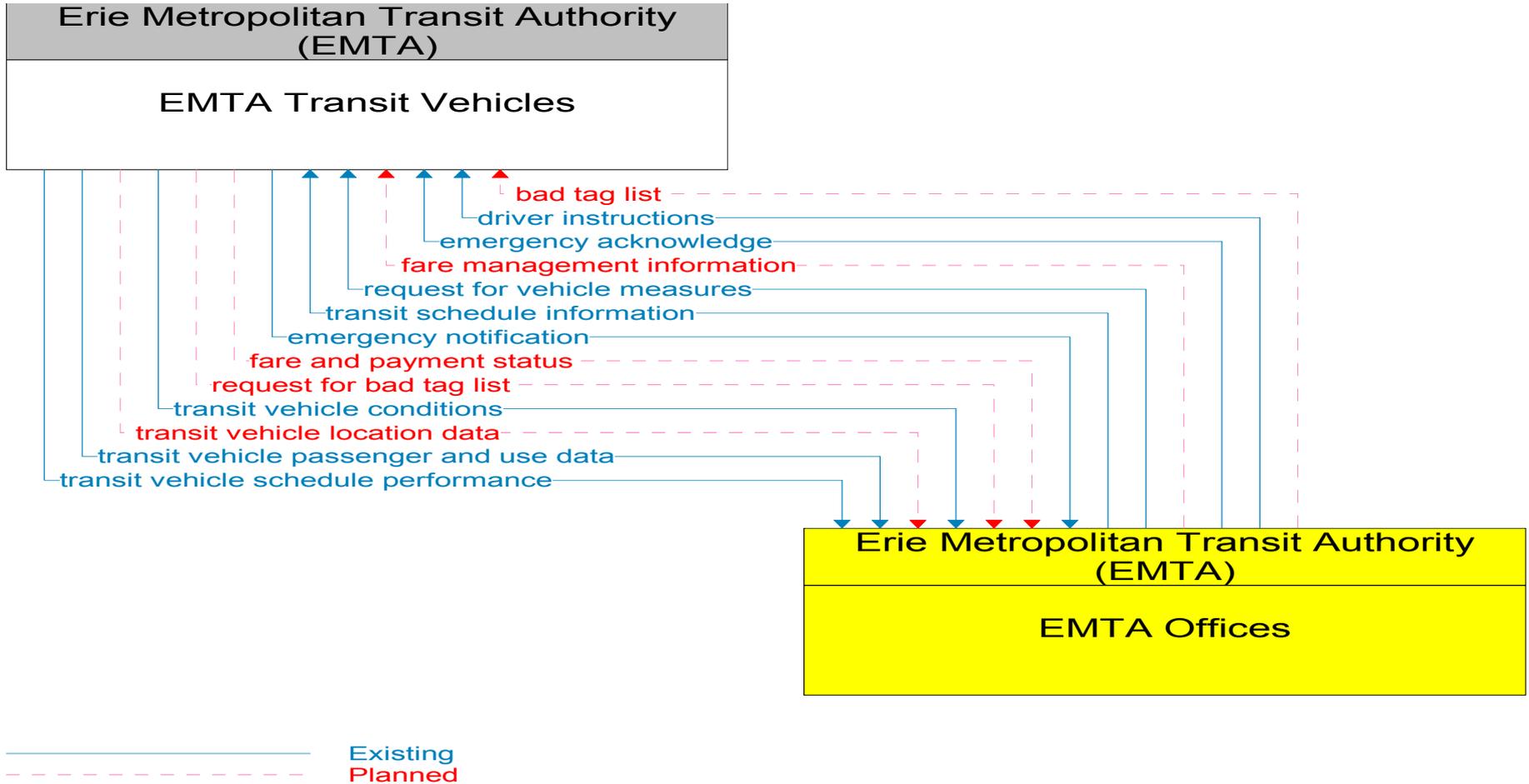
EMTA Remote Traveler Support



Erie Metropolitan Transit Authority
(EMTA)

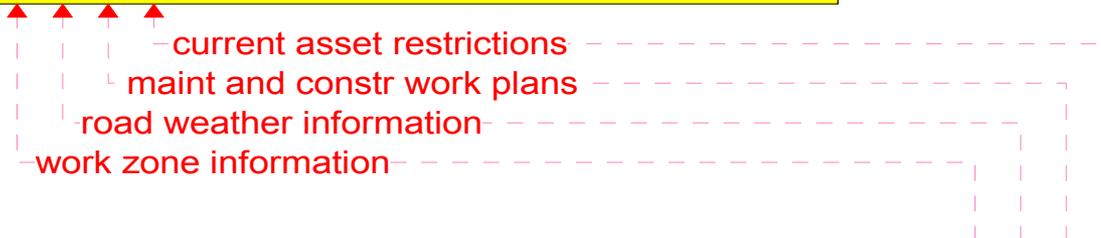
EMTA Offices

———— Existing
- - - - - Planned



Erie Metropolitan Transit Authority
(EMTA)

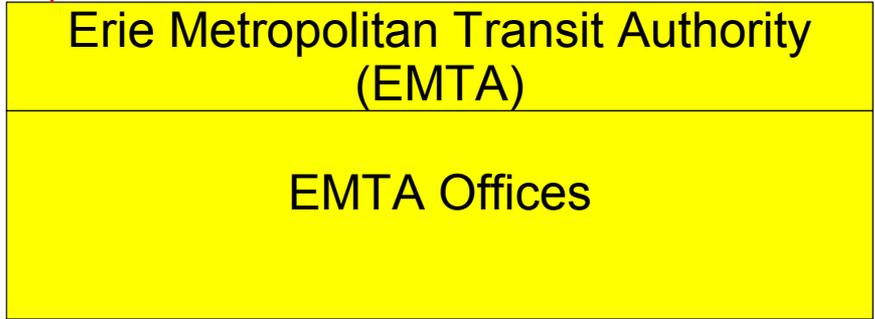
EMTA Offices



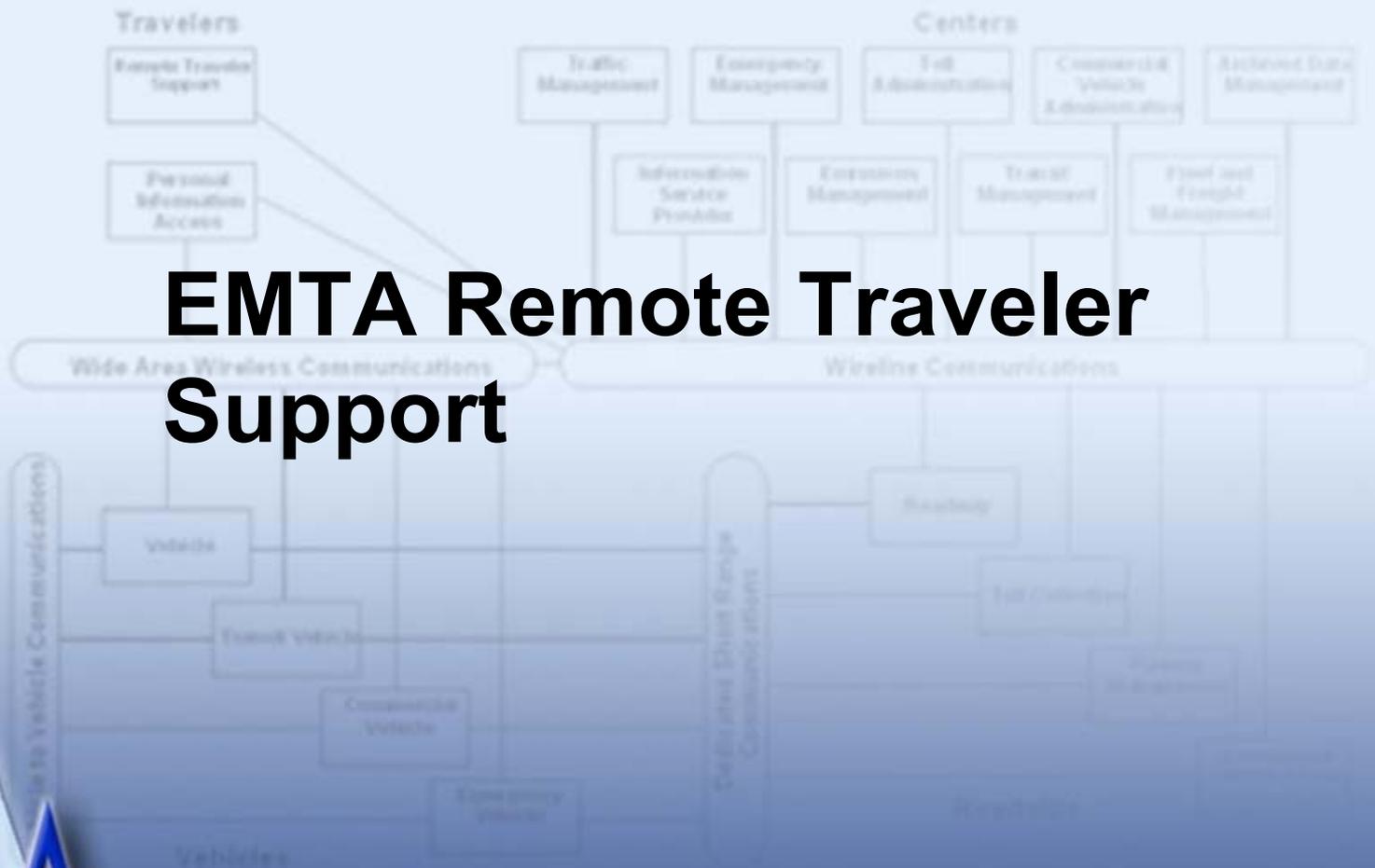
Pennsylvania Department of
Transportation (PennDOT)

PennDOT D1 County Maintenance
Offices

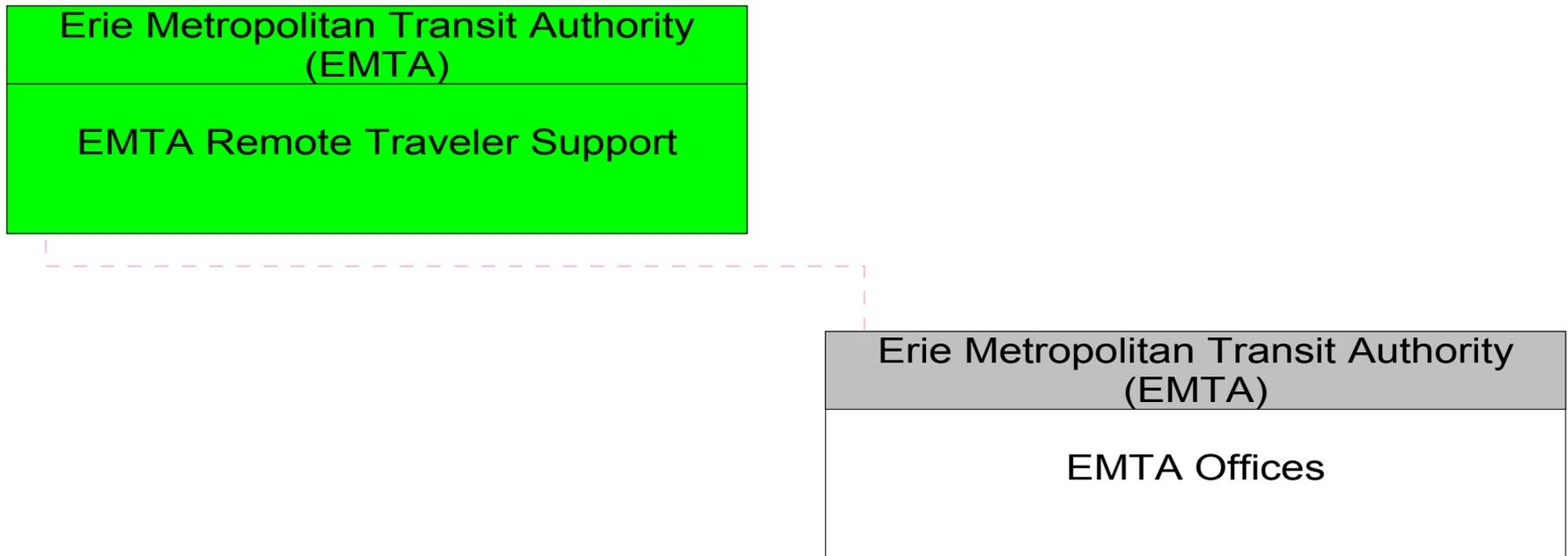
Existing
Planned



EMTA Remote Traveler Support

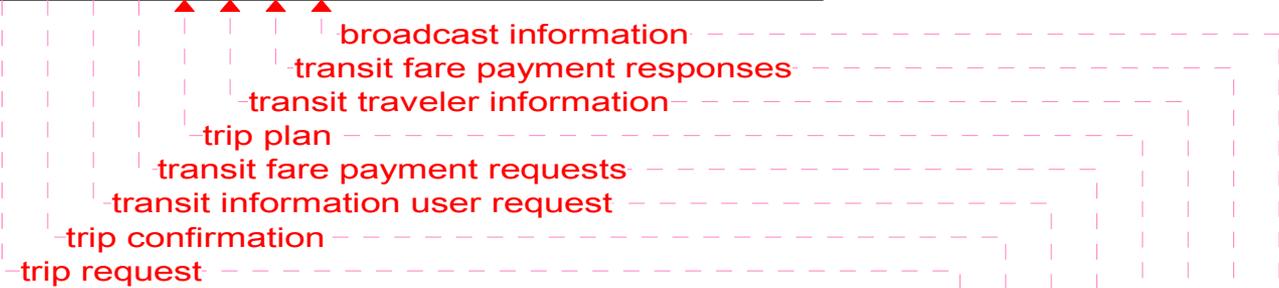


EMTA Remote Traveler Support Interconnect Diagram



**Erie Metropolitan Transit Authority
(EMTA)**

EMTA Remote Traveler Support

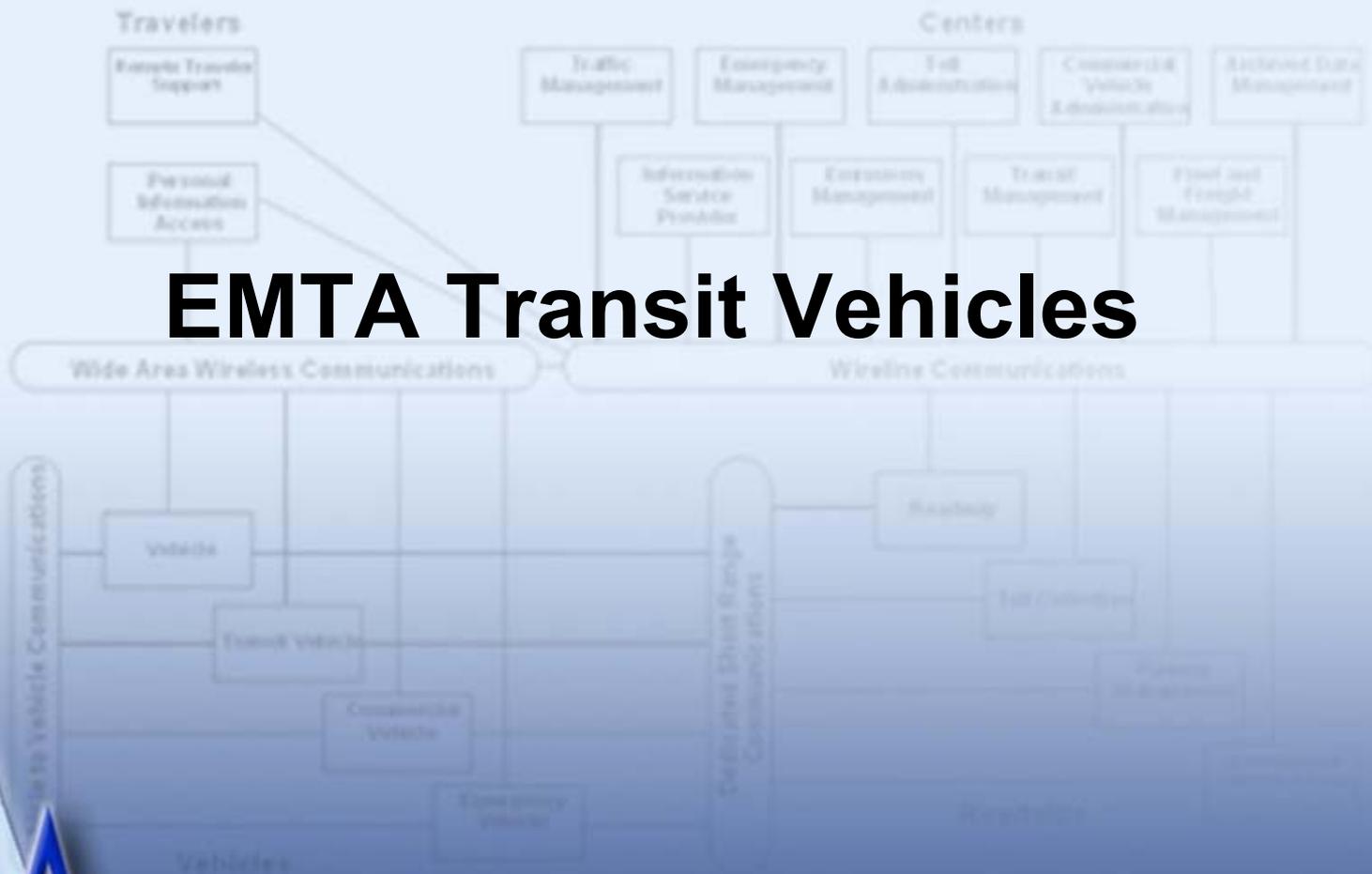


**Erie Metropolitan Transit Authority
(EMTA)**

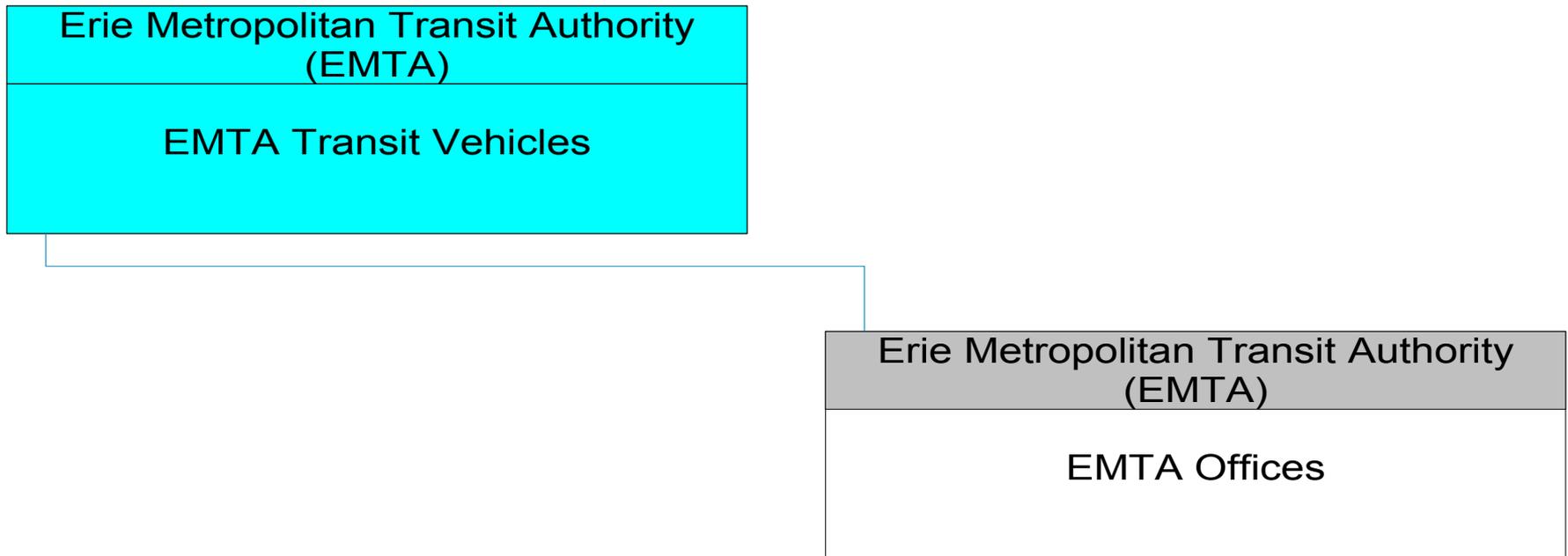
EMTA Offices

———— Existing
- - - - - Planned

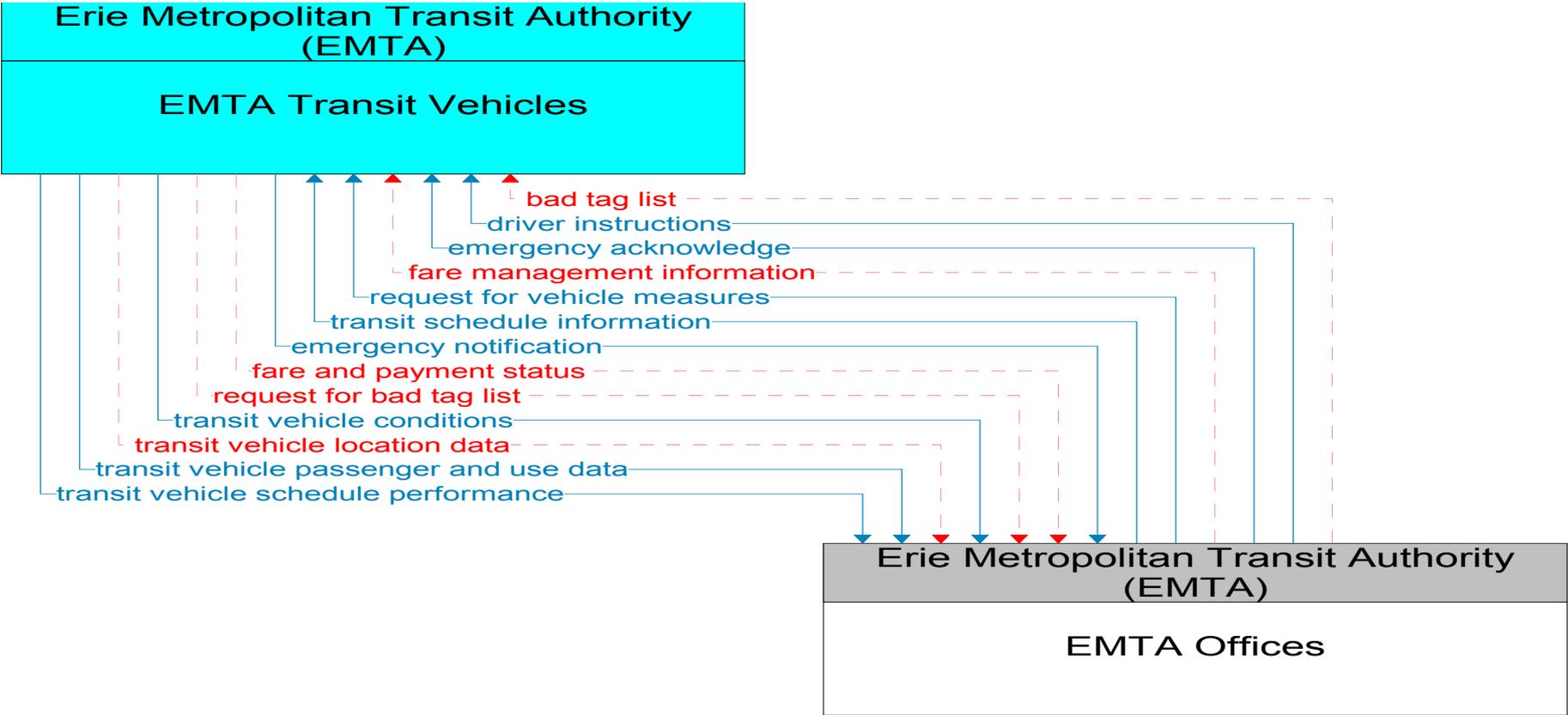
EMTA Transit Vehicles



EMTA Transit Vehicles Interconnect Diagram



———— Existing
- - - - - Planned

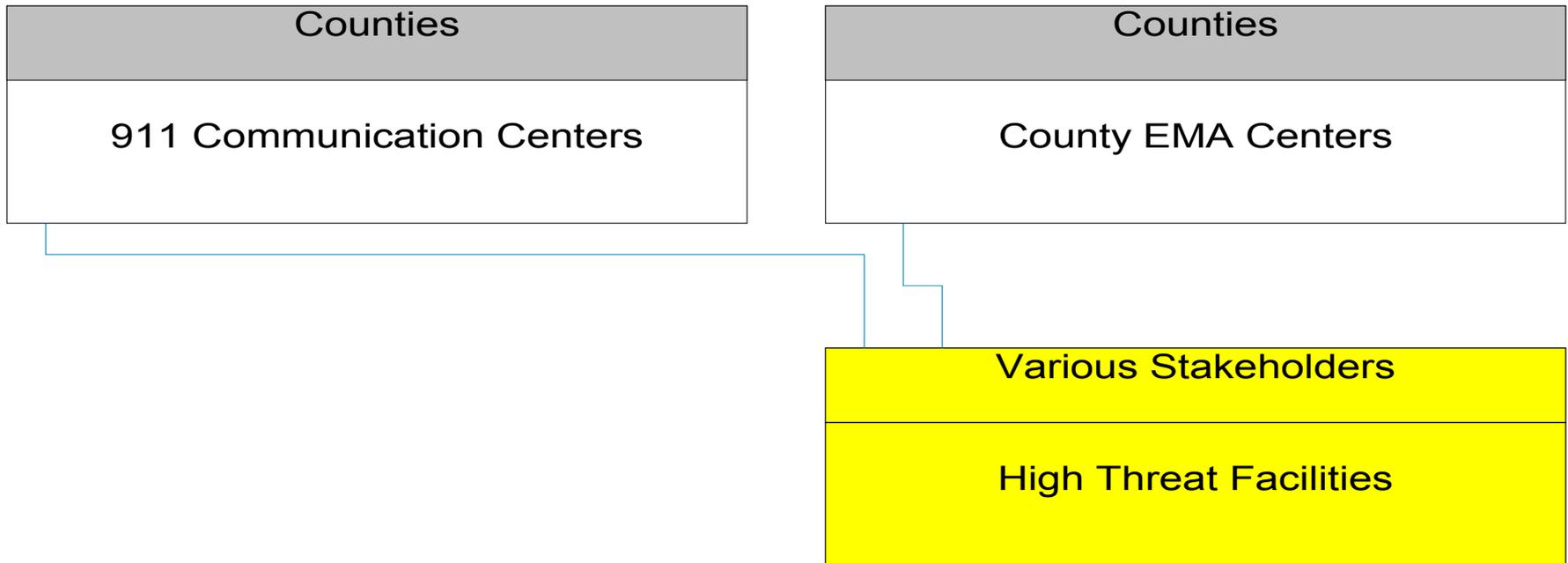


High Threat Facilities

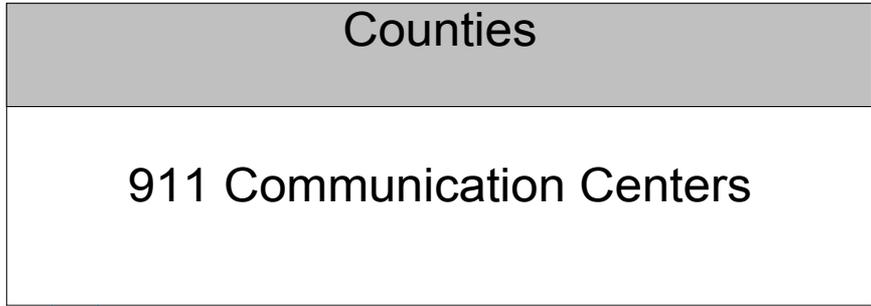


PA

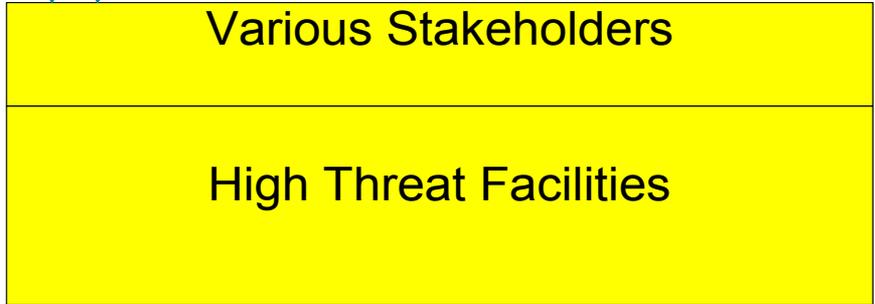
High Threat Facilities Interconnect Diagram



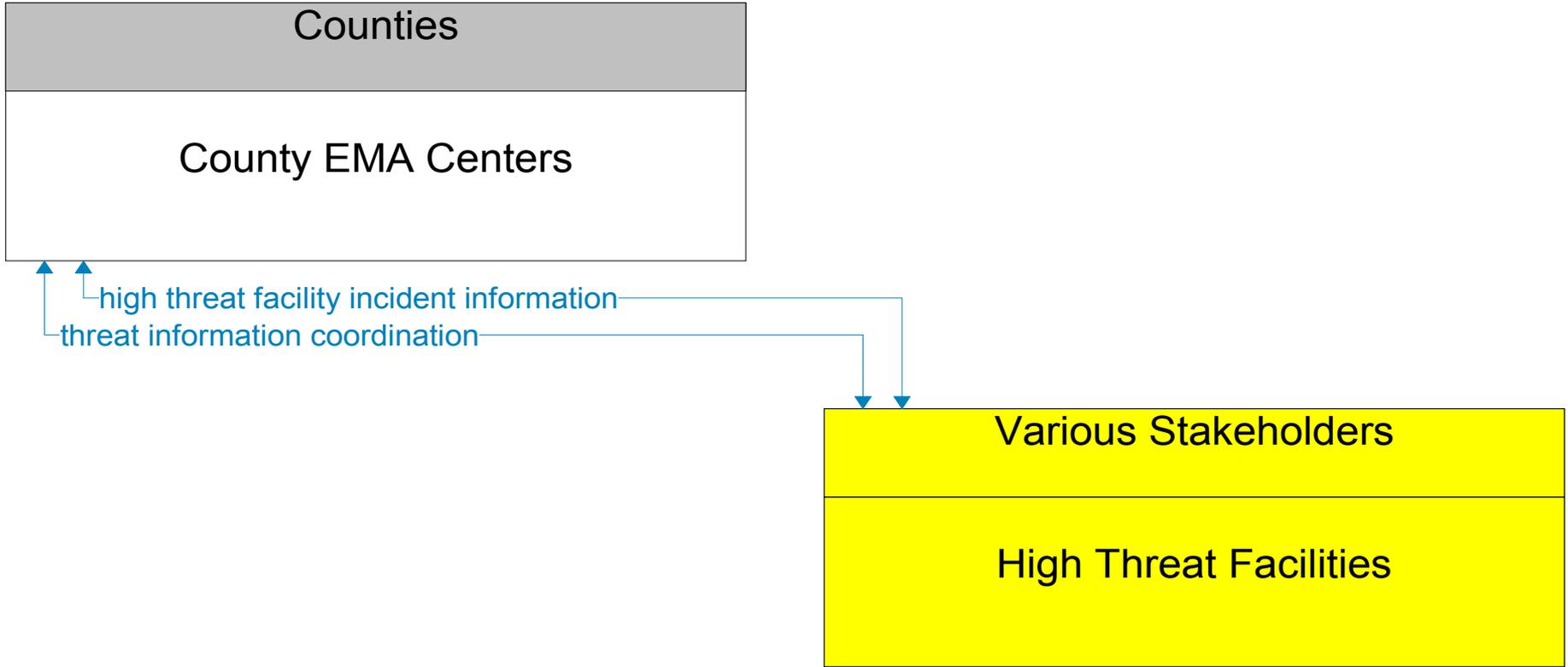
———— Existing
- - - - - Planned



high threat facility incident information
threat information coordination

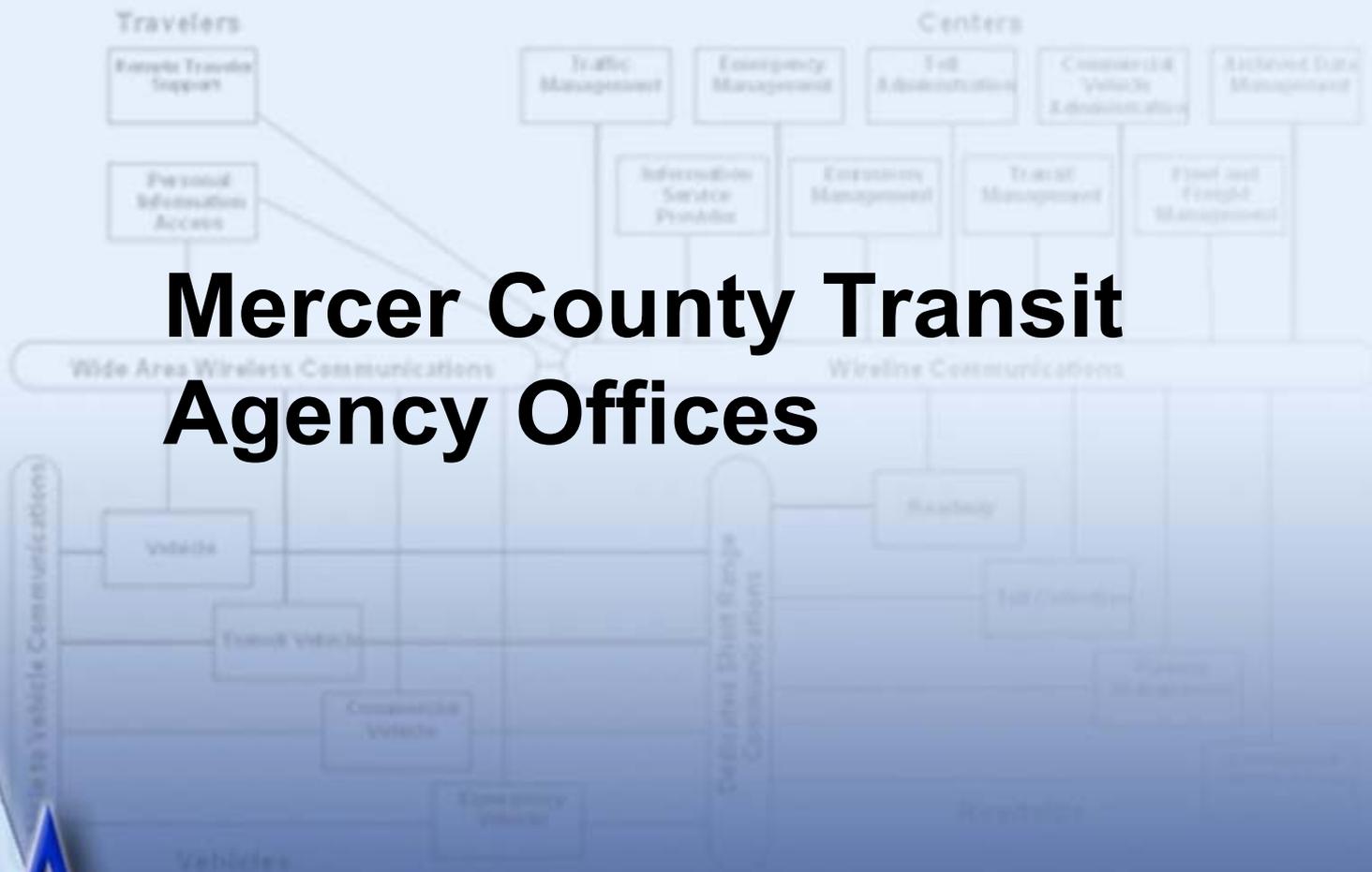


Existing
Planned

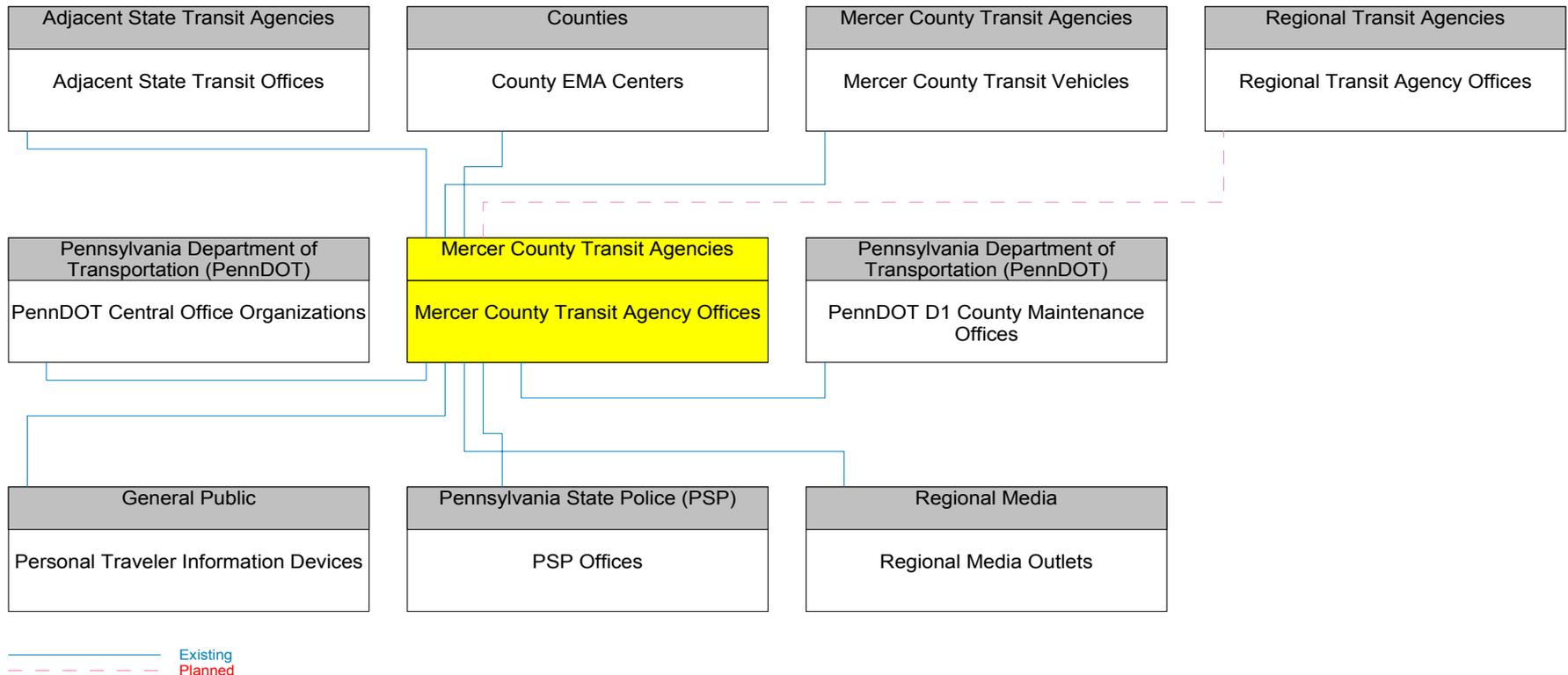


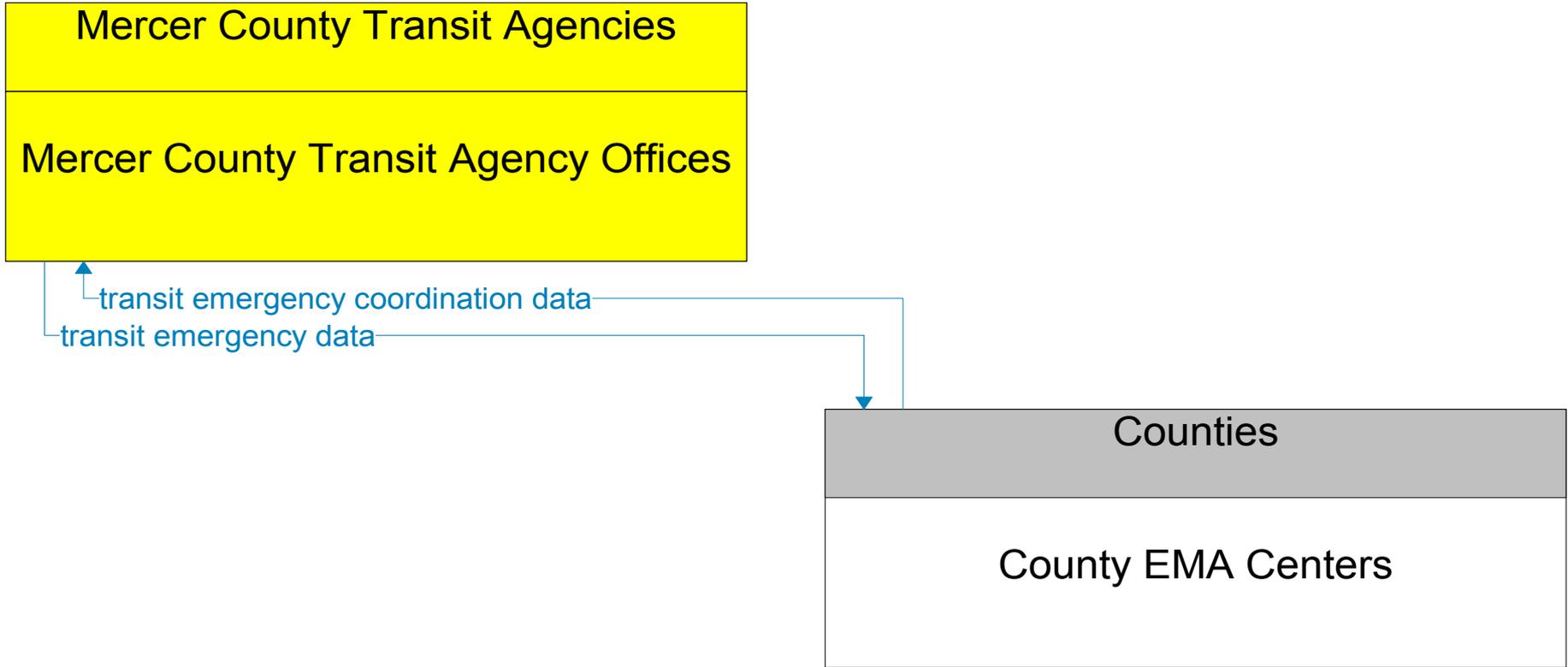
———— Existing
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Mercer County Transit Agency Offices

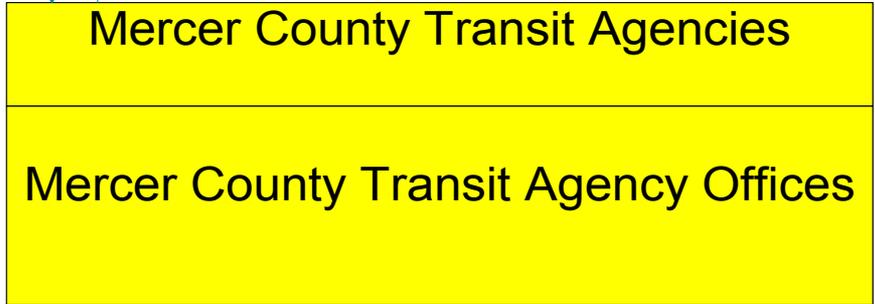
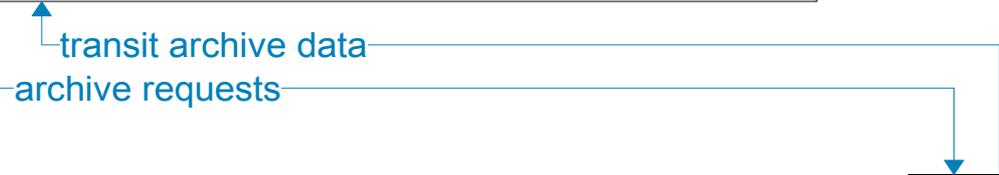
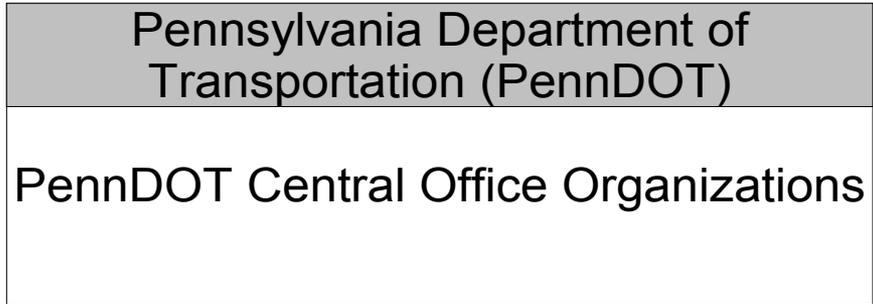


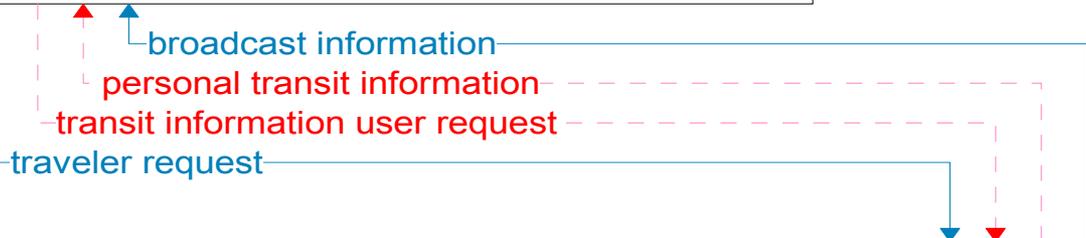
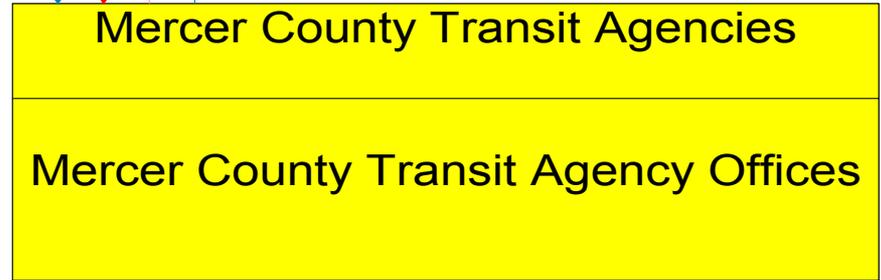
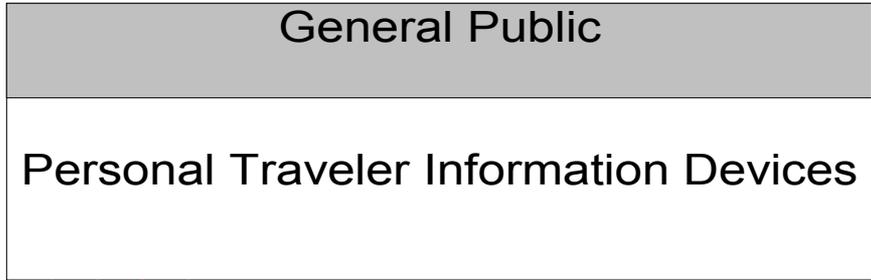
Mercer County Transit Agency Offices Interconnect Diagram



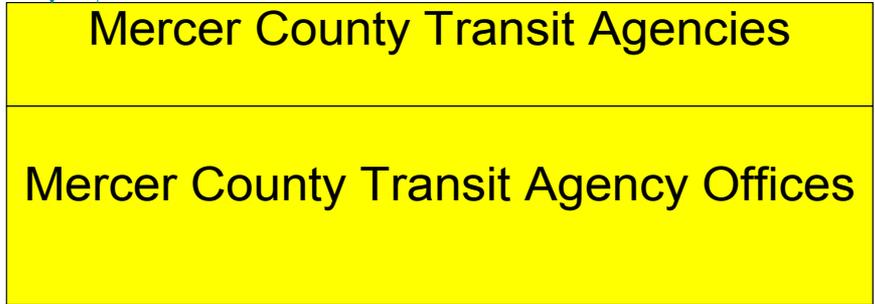
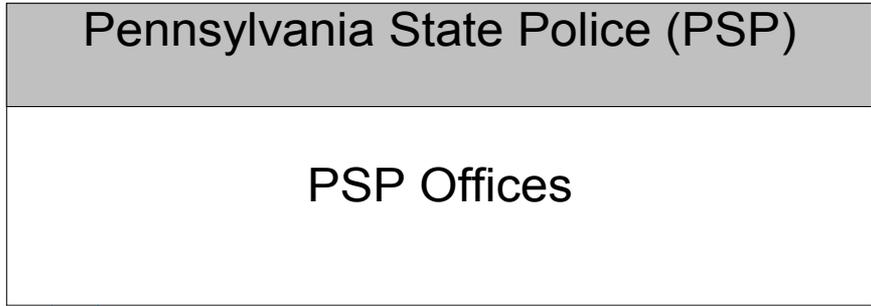


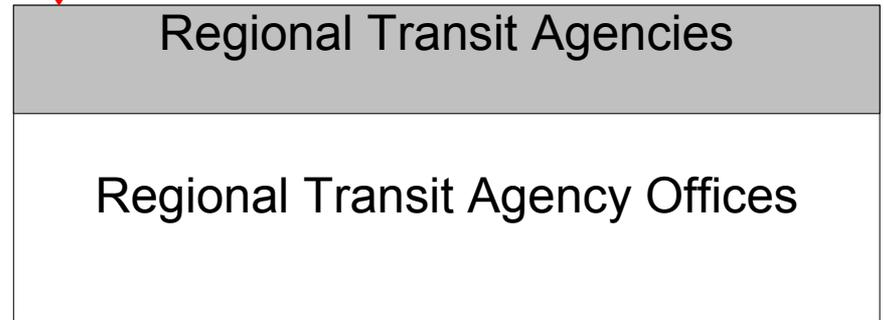
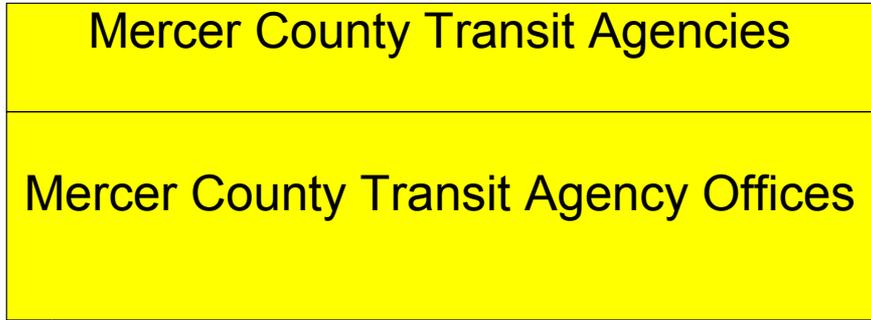
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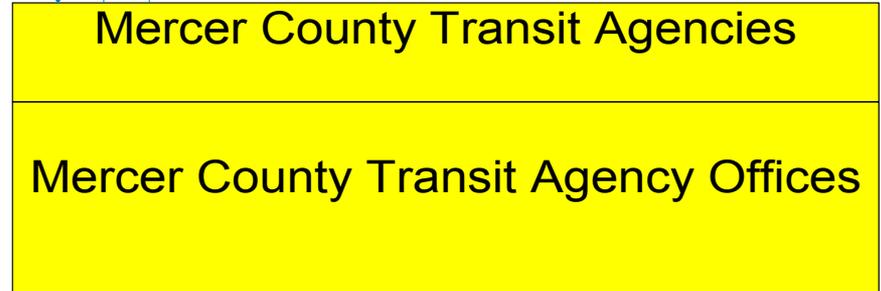
Existing
Planned



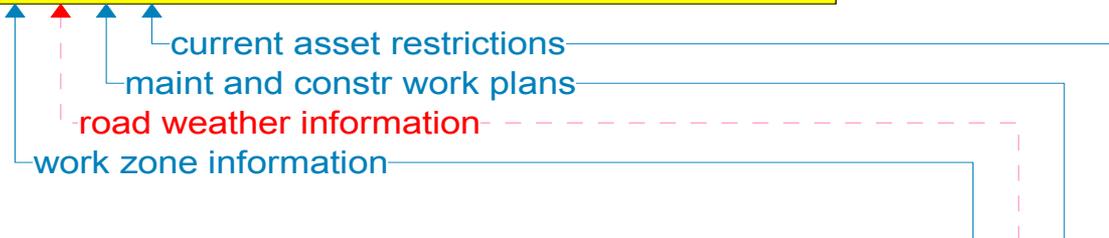
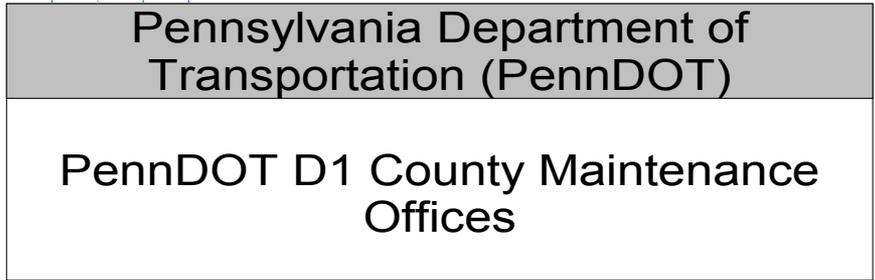
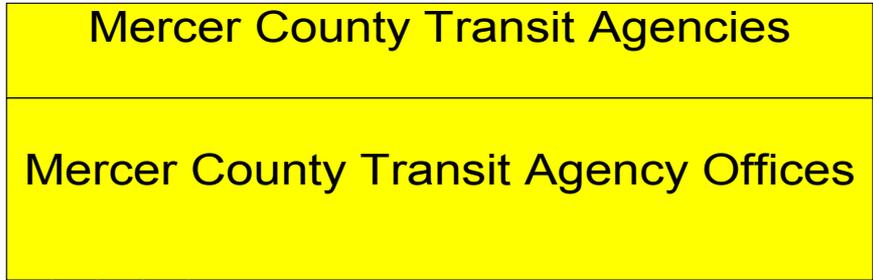




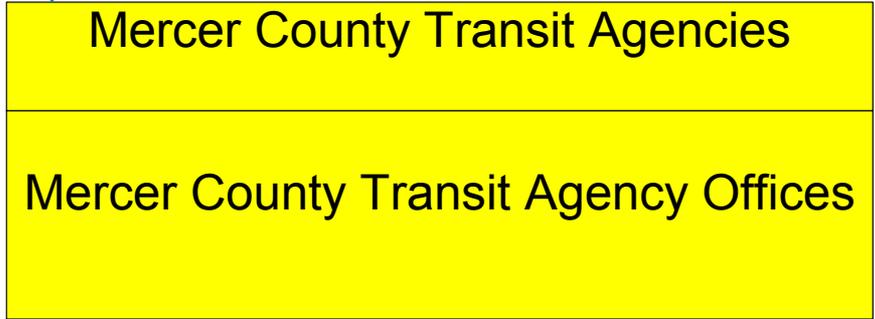
transit incidents for media
transit information for media
media information request

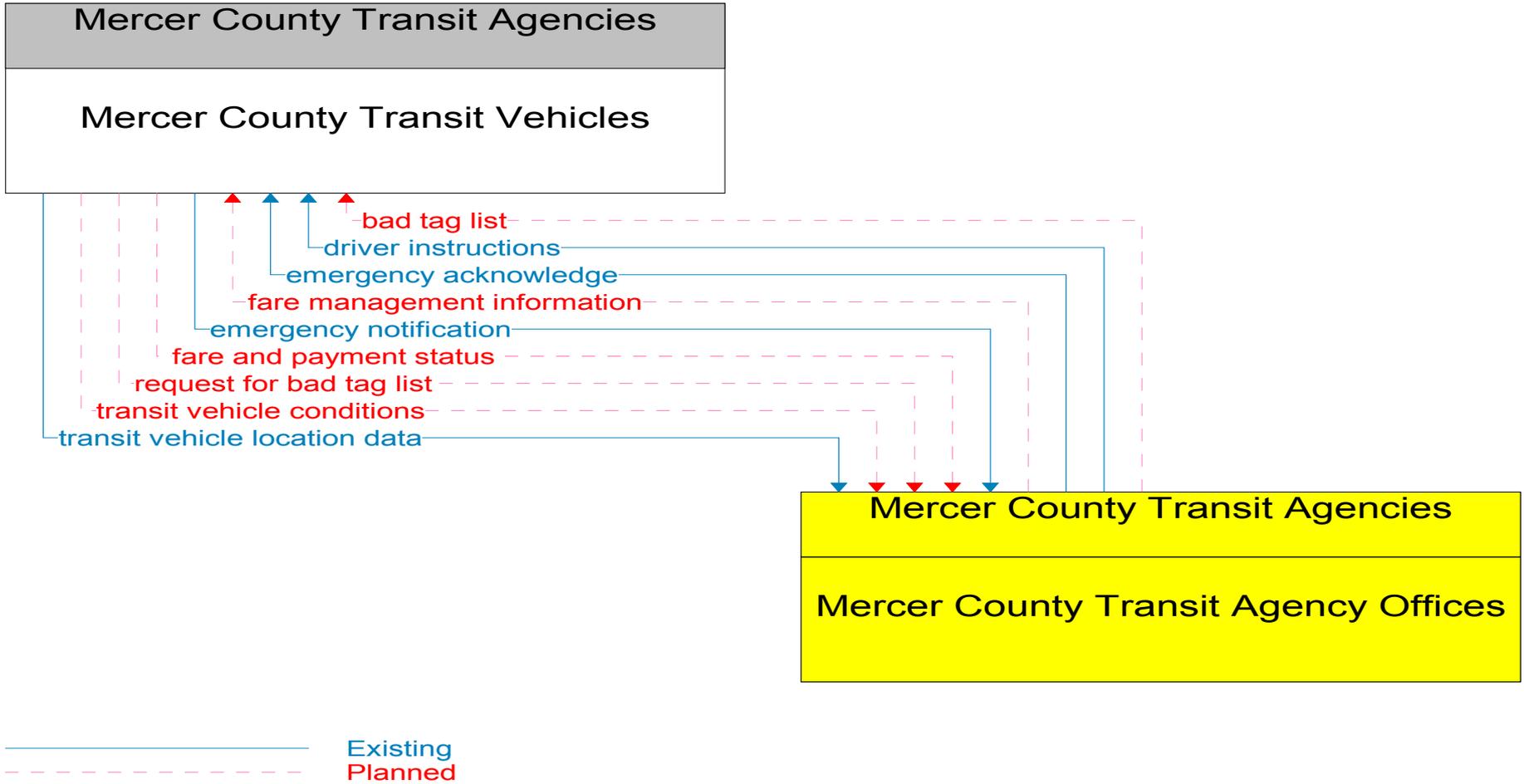


Existing
Planned

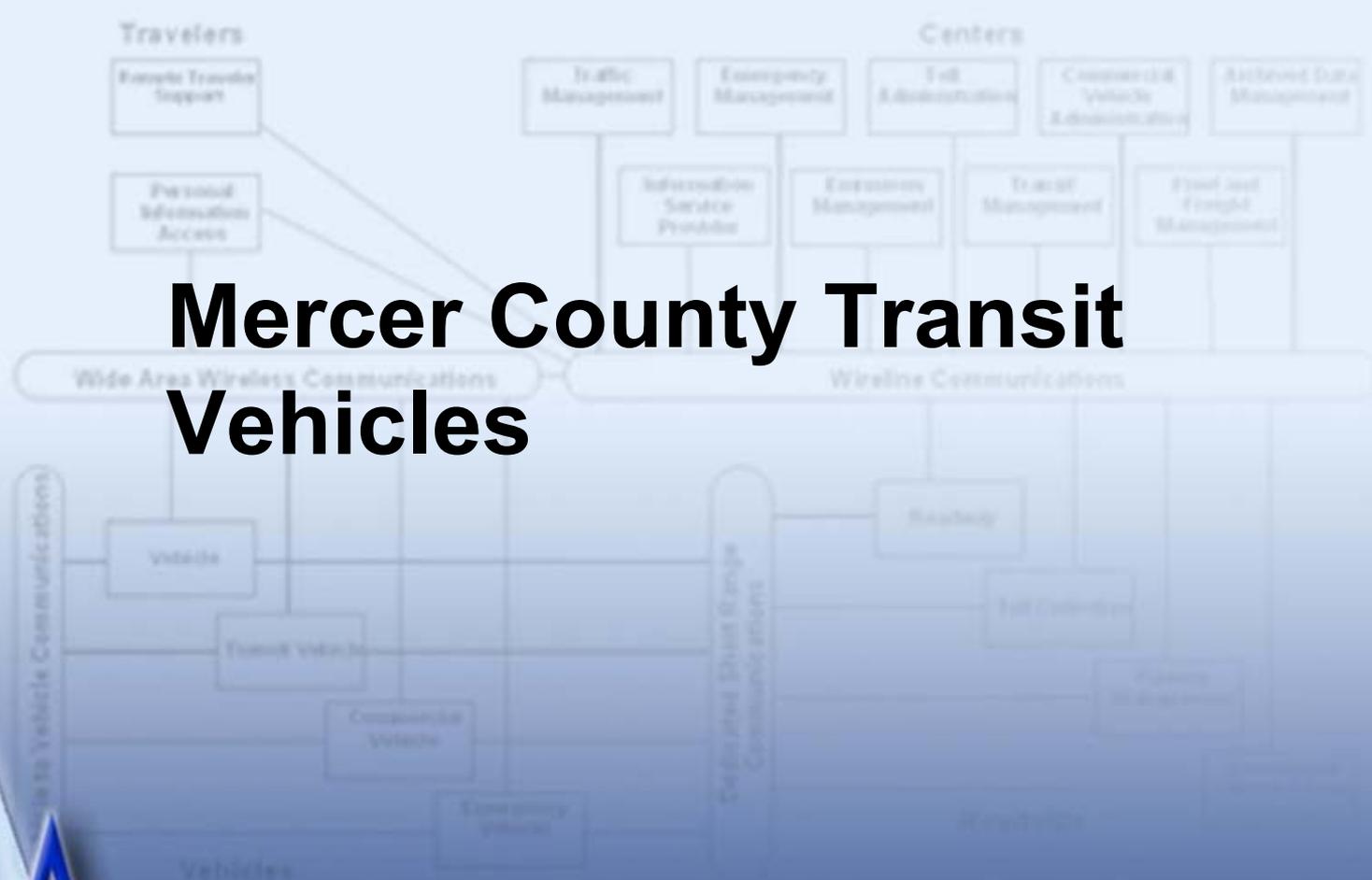


———— Existing
- - - - - Planned

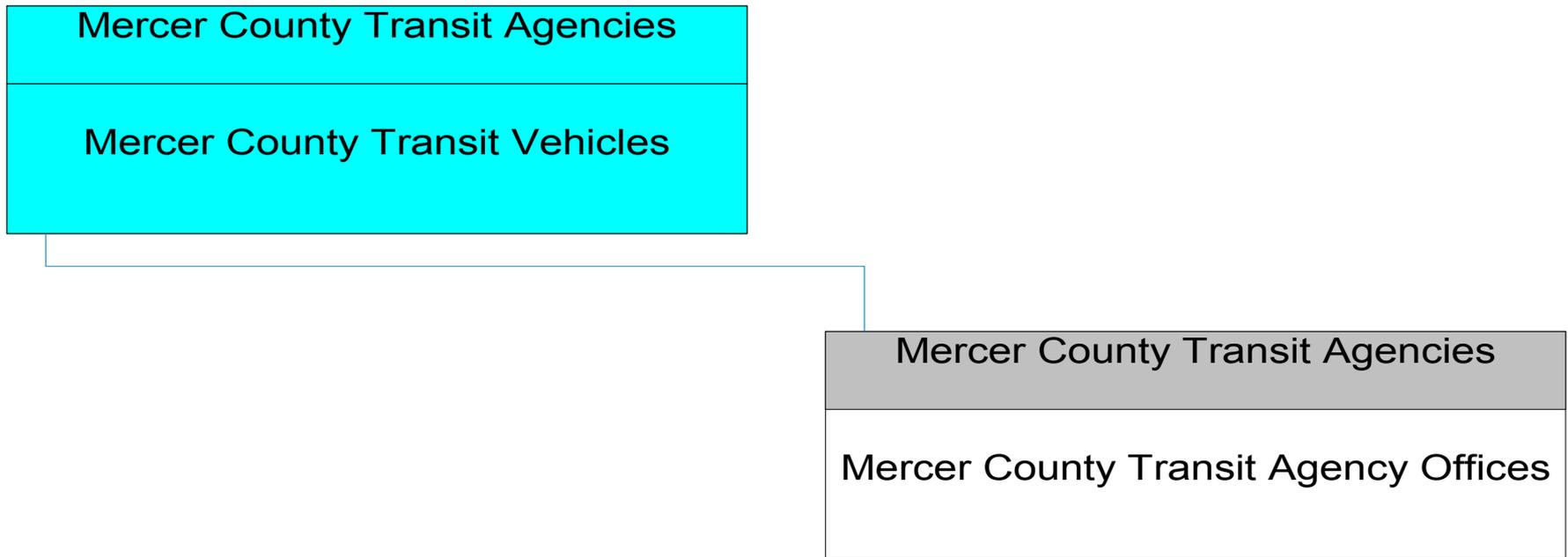




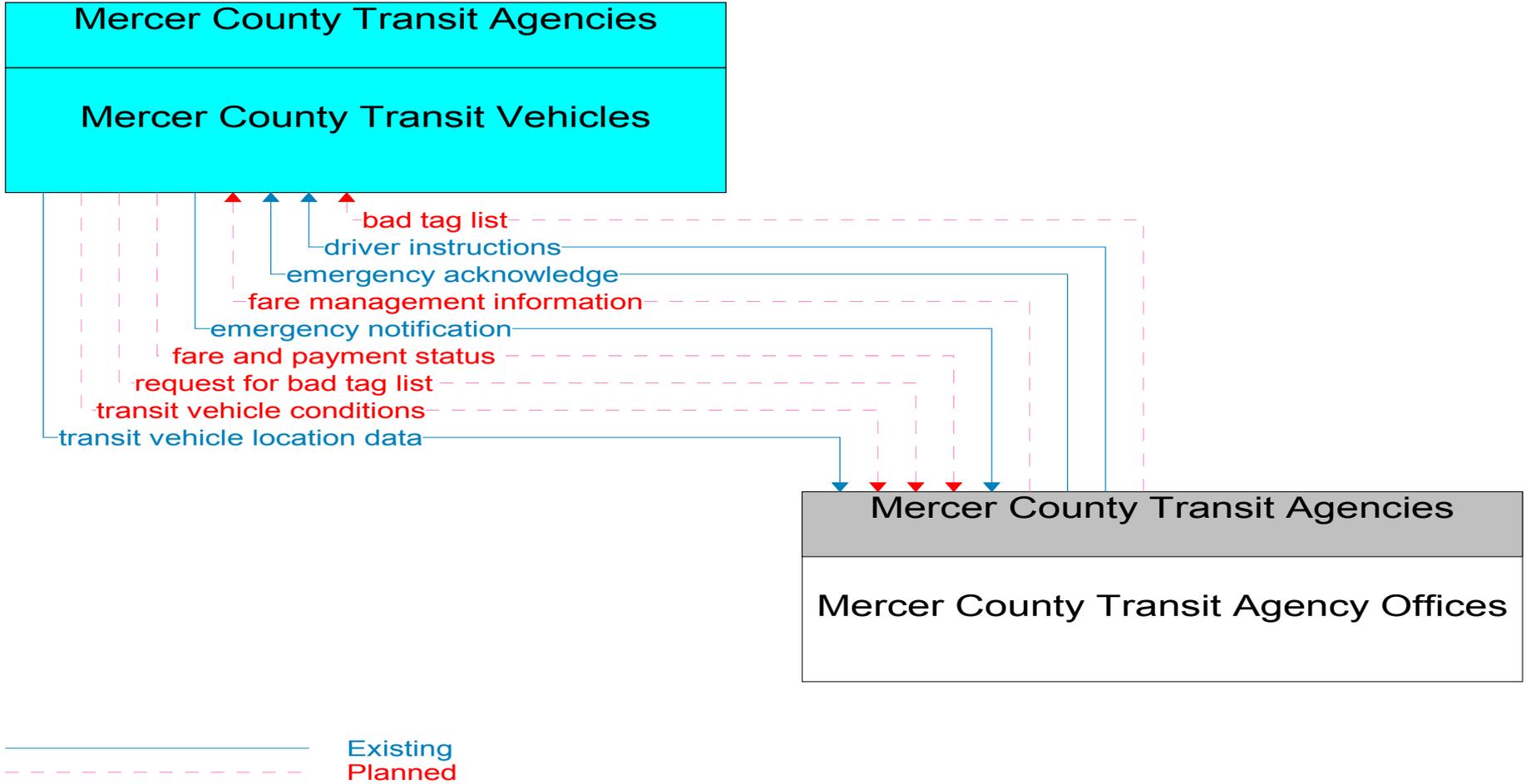
Mercer County Transit Vehicles



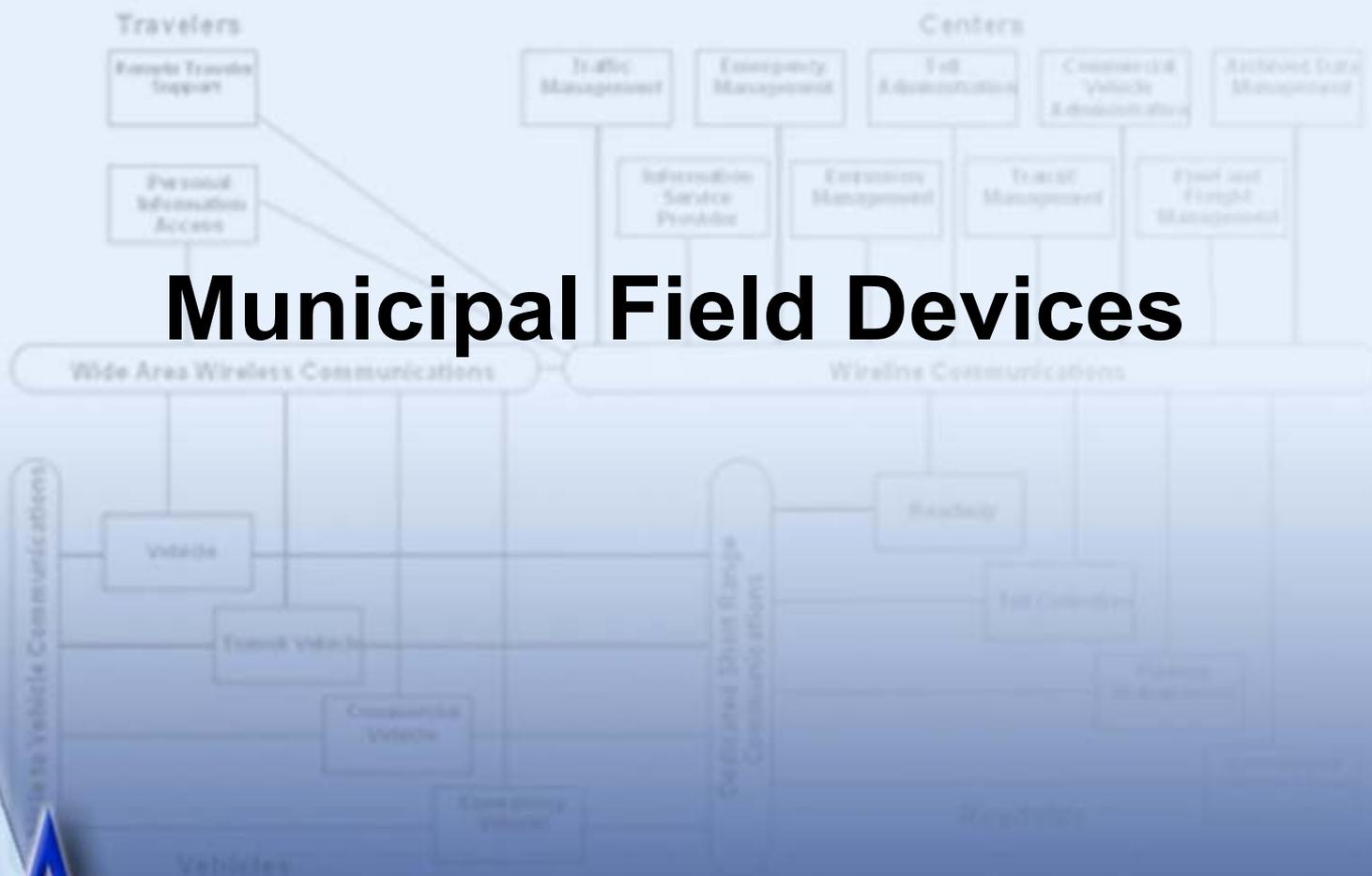
Mercer County Transit Vehicles Interconnect Diagram



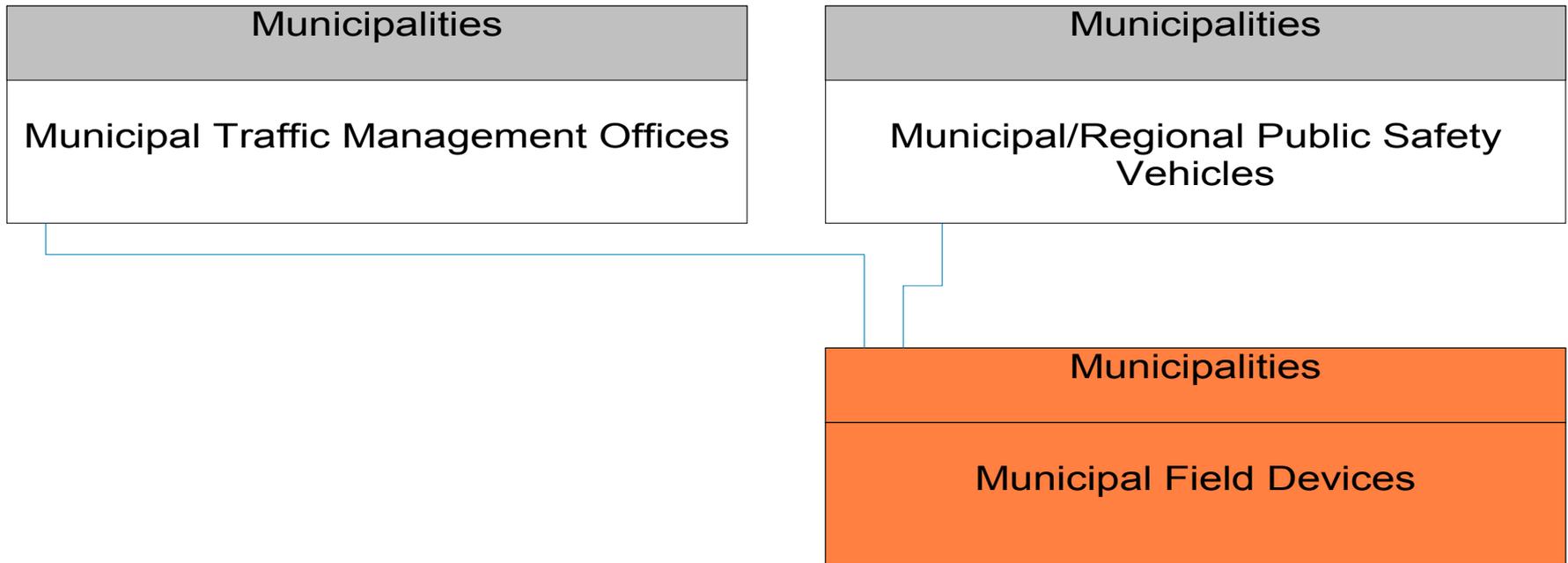
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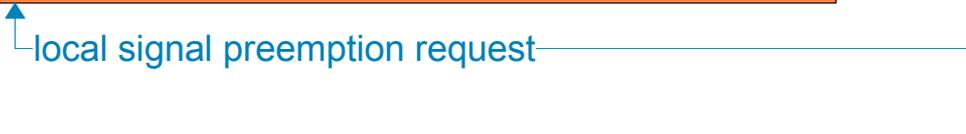
Municipal Field Devices

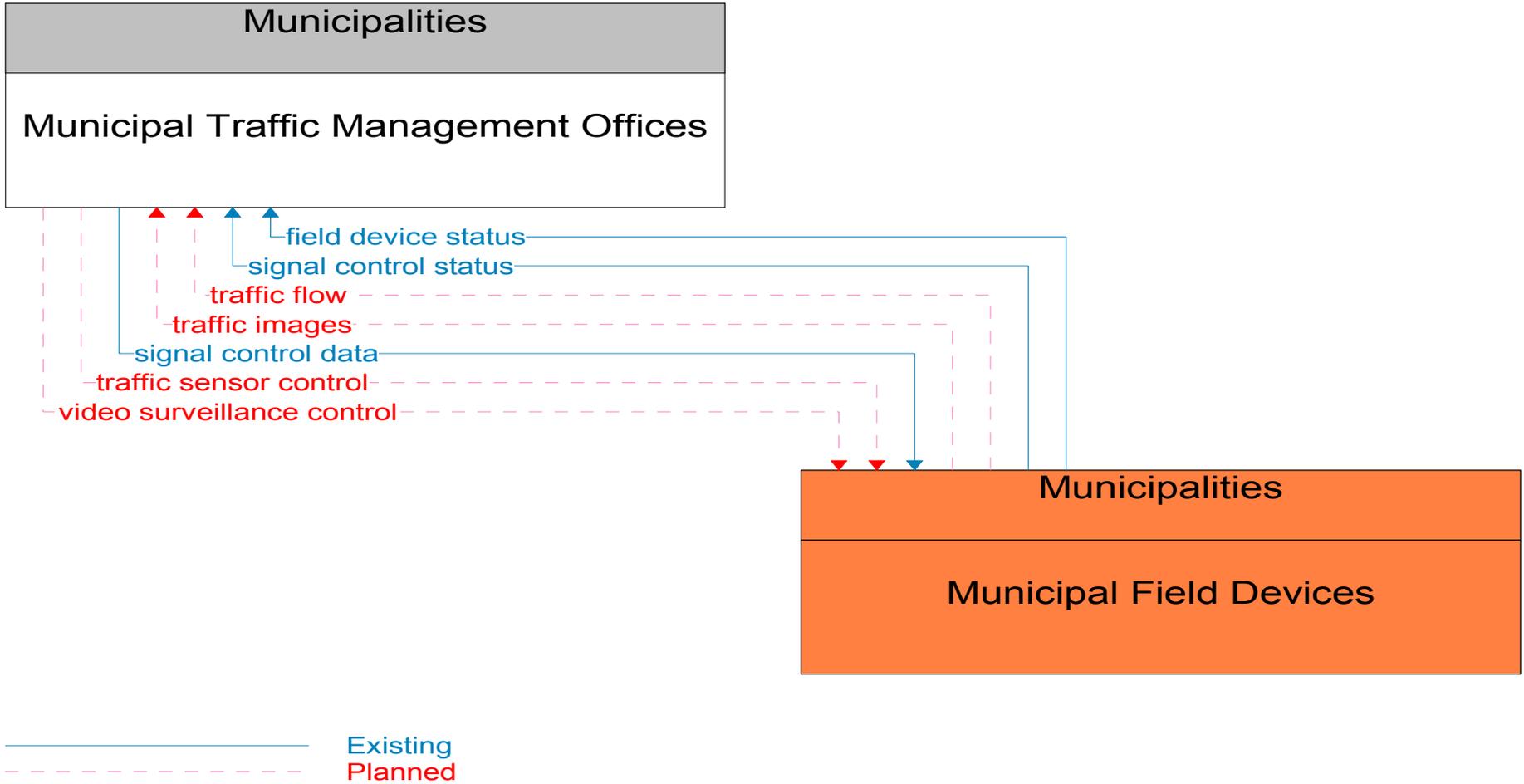


Municipal Field Devices Interconnect Diagram

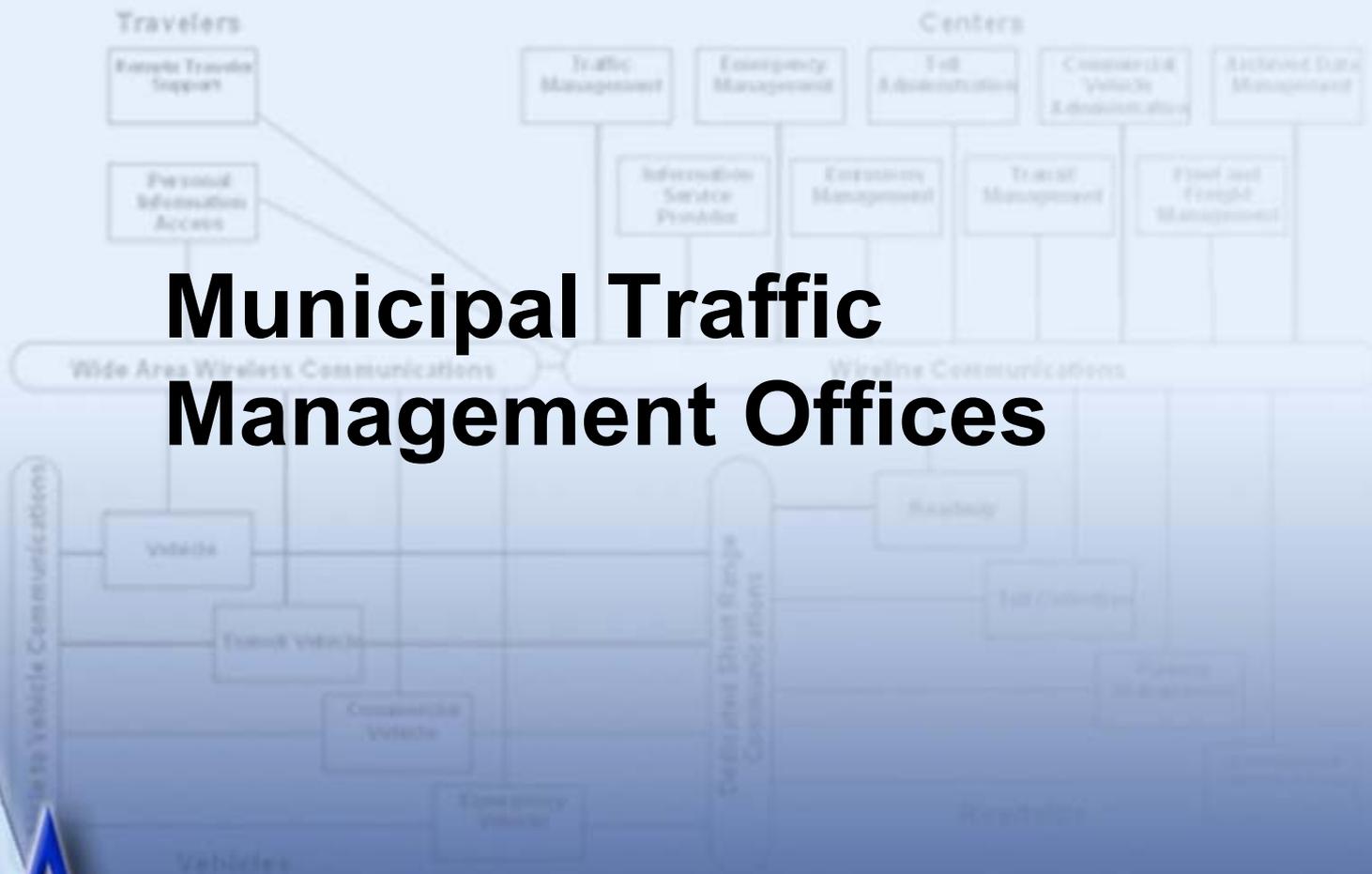


———— Existing
- - - - - Planned

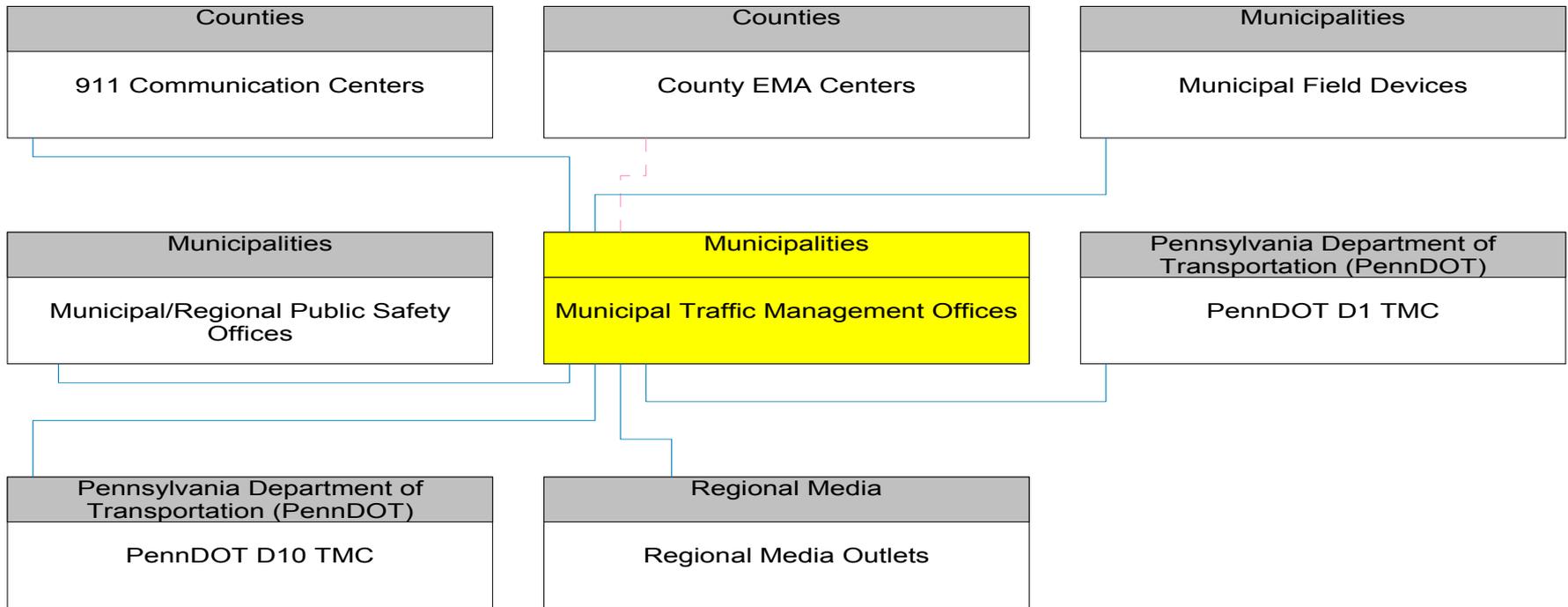




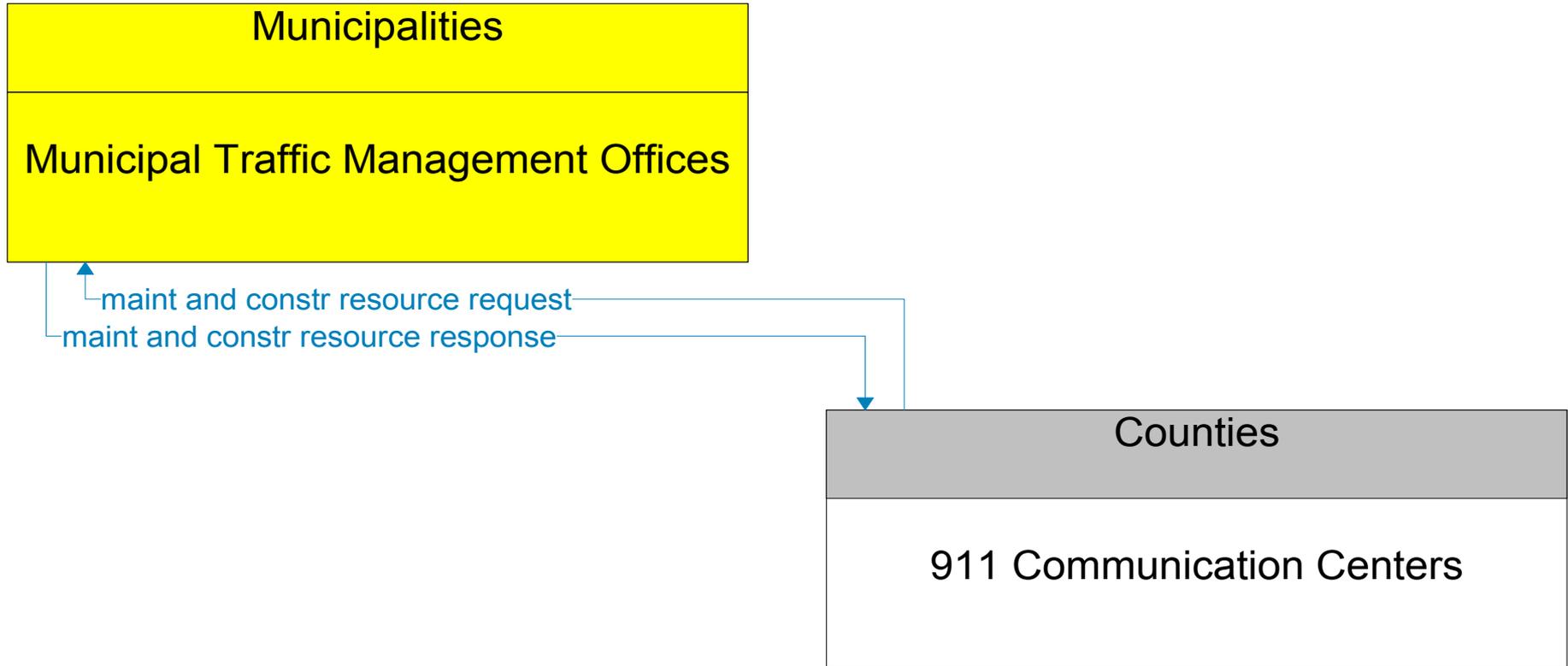
Municipal Traffic Management Offices



Municipal Traffic Management Offices Interconnect Diagram



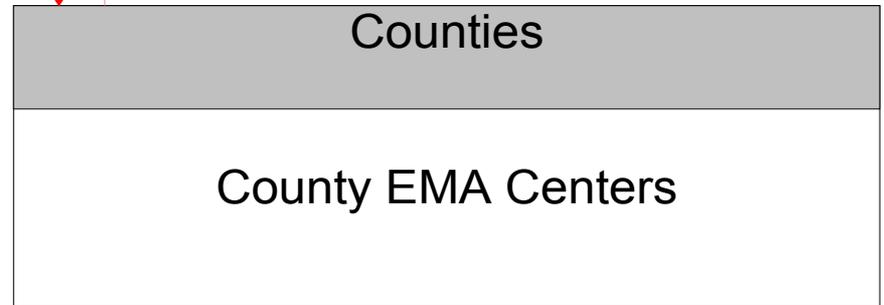
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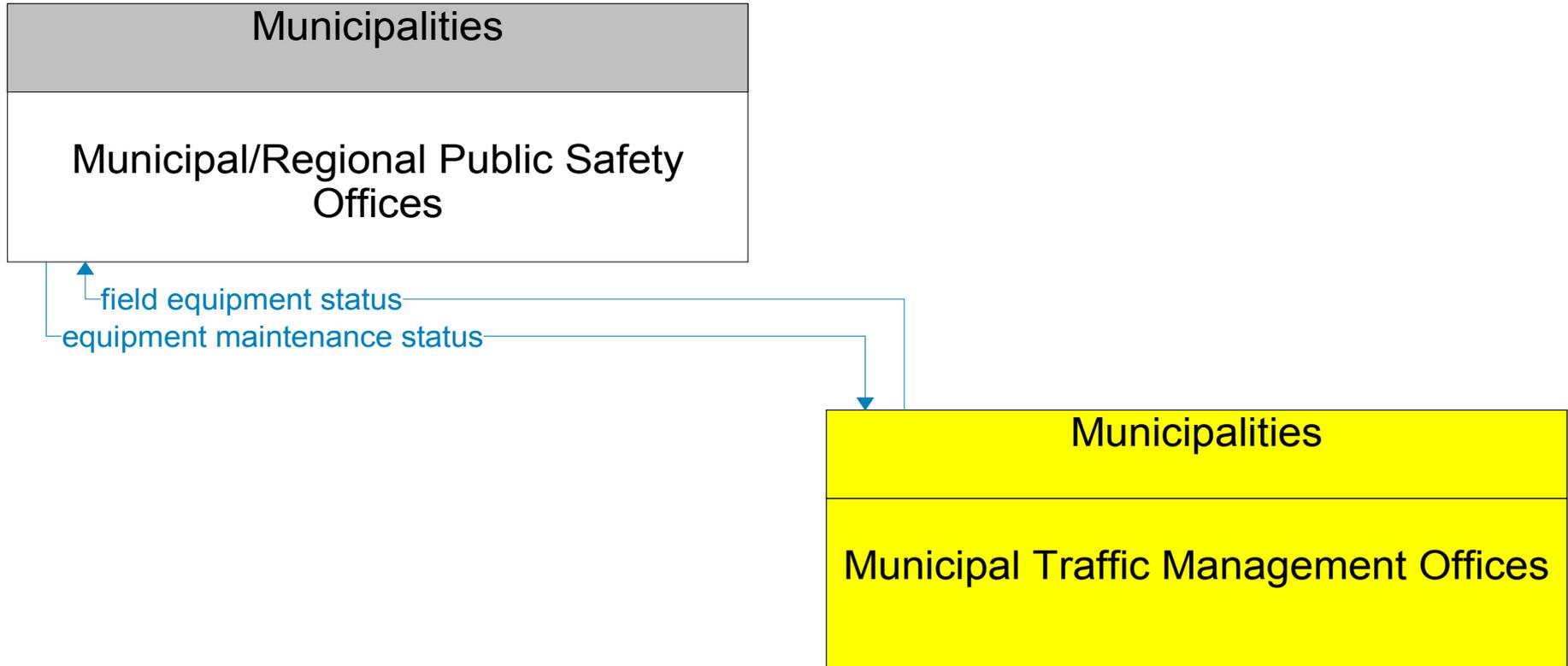
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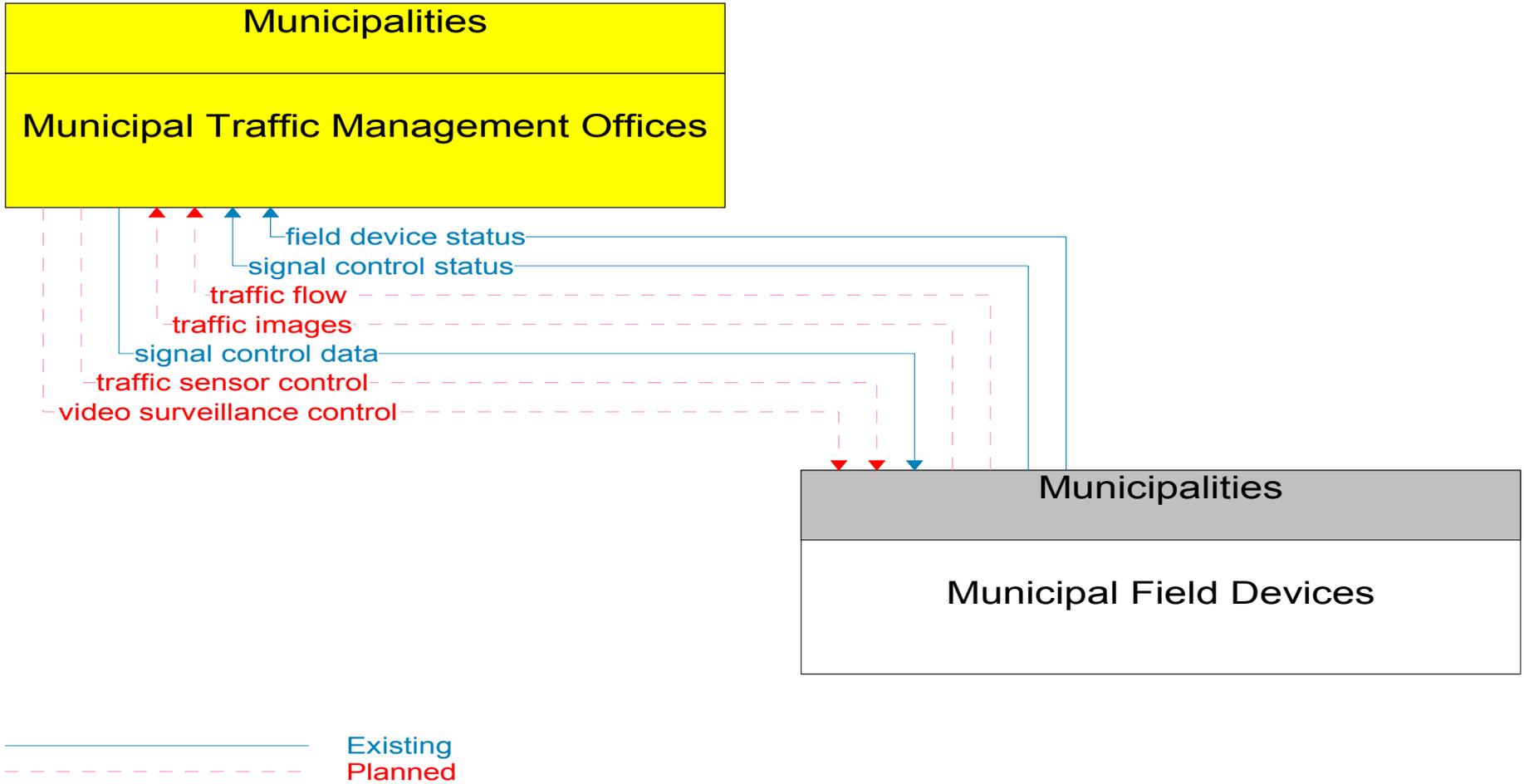


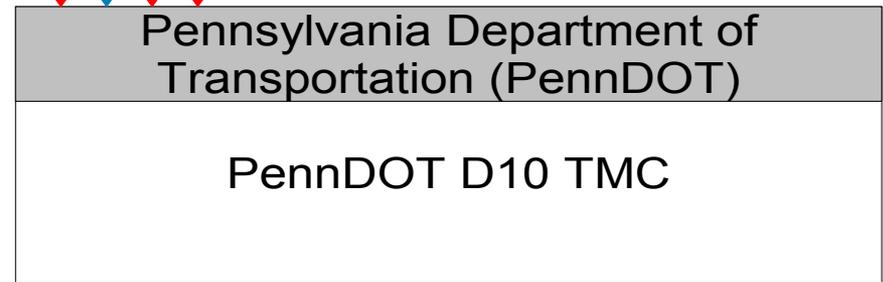
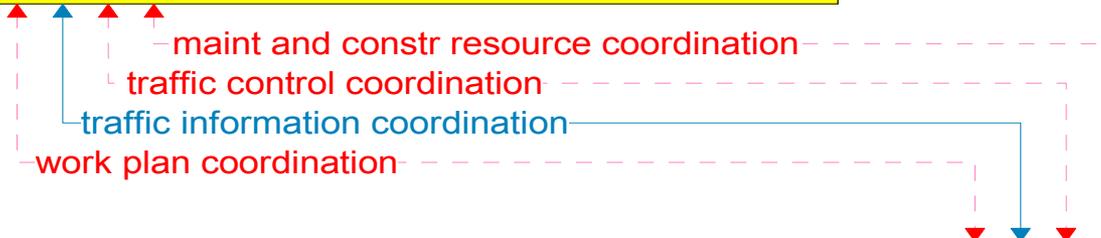
emergency traffic control request
emergency traffic control response



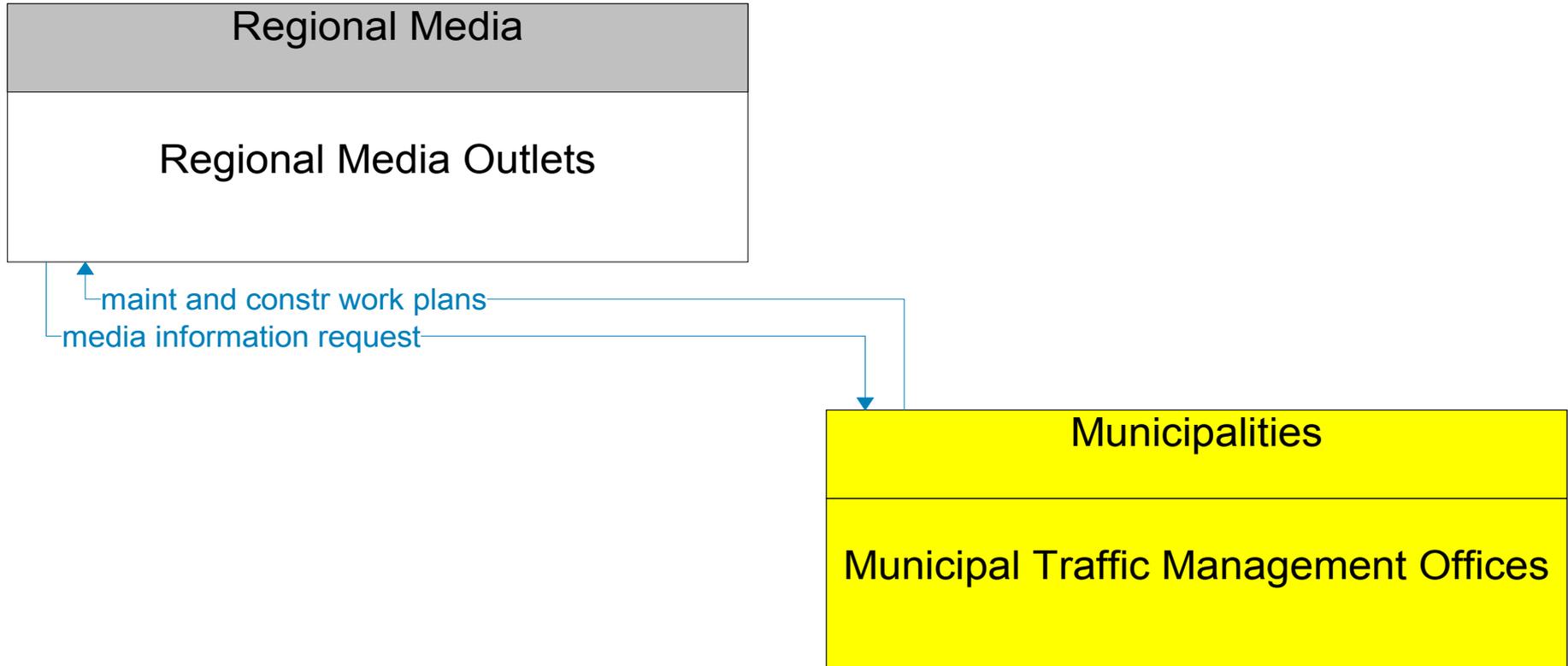
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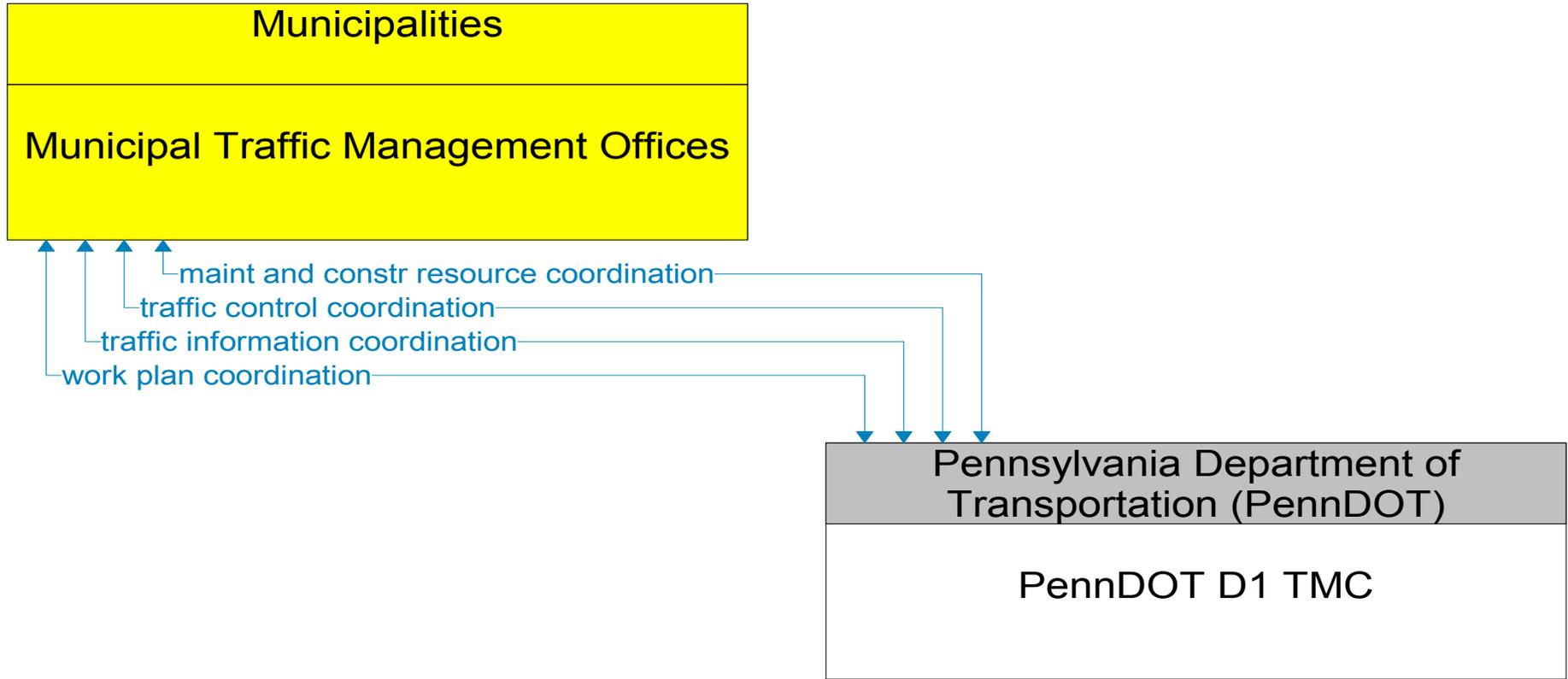




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Planned



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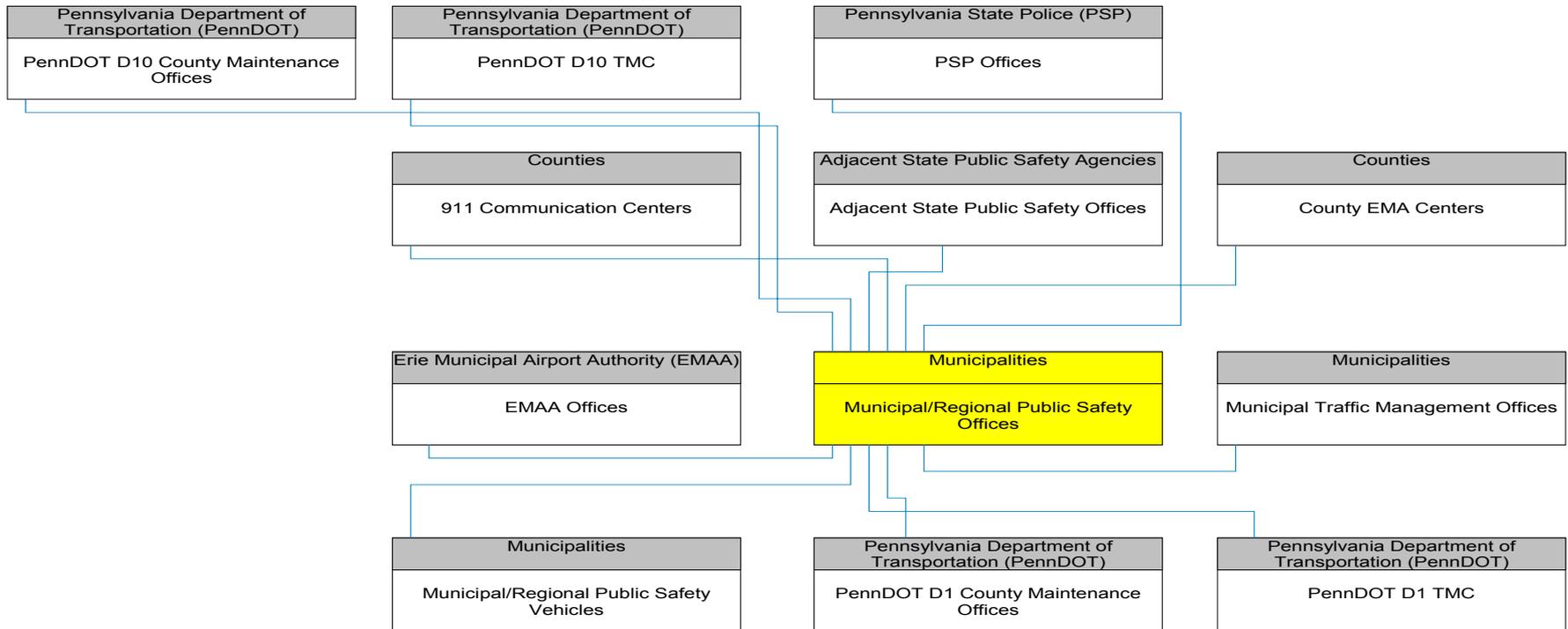


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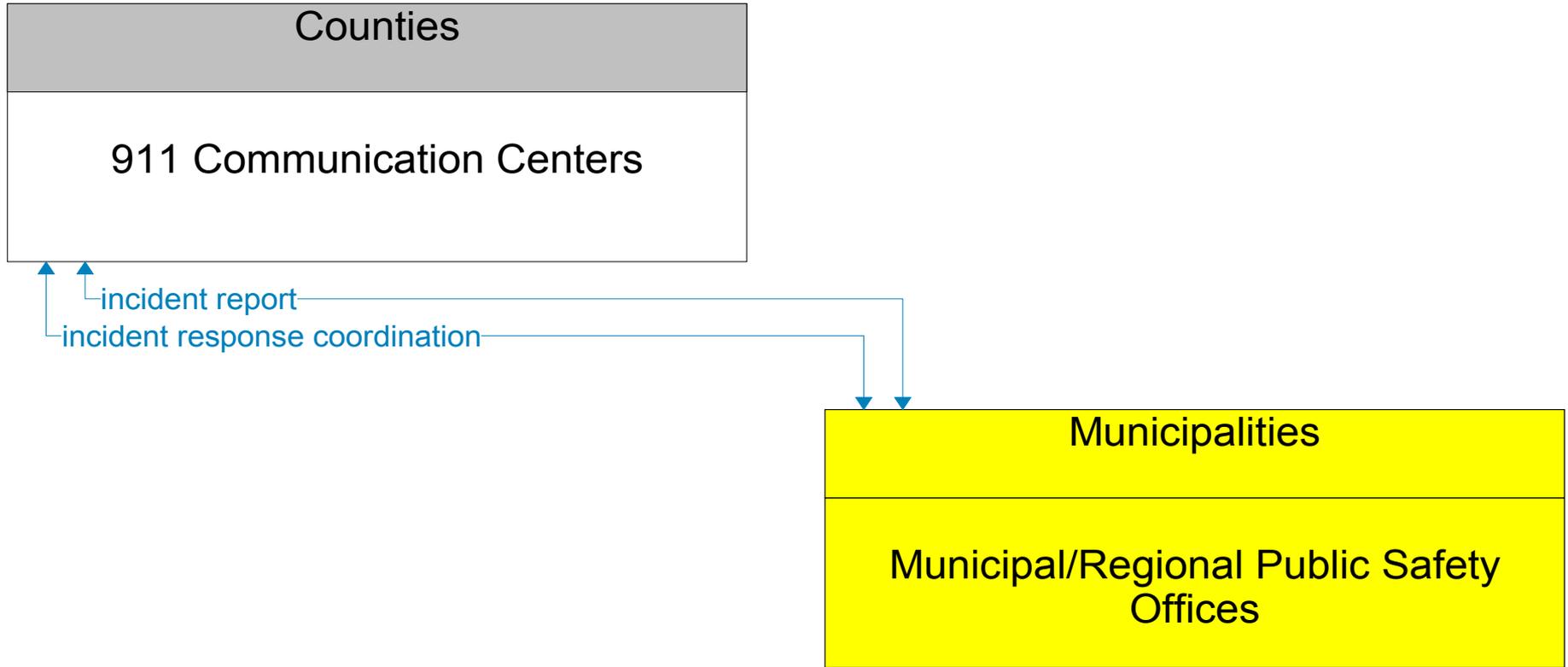
Municipal/Regional Public Safety Offices



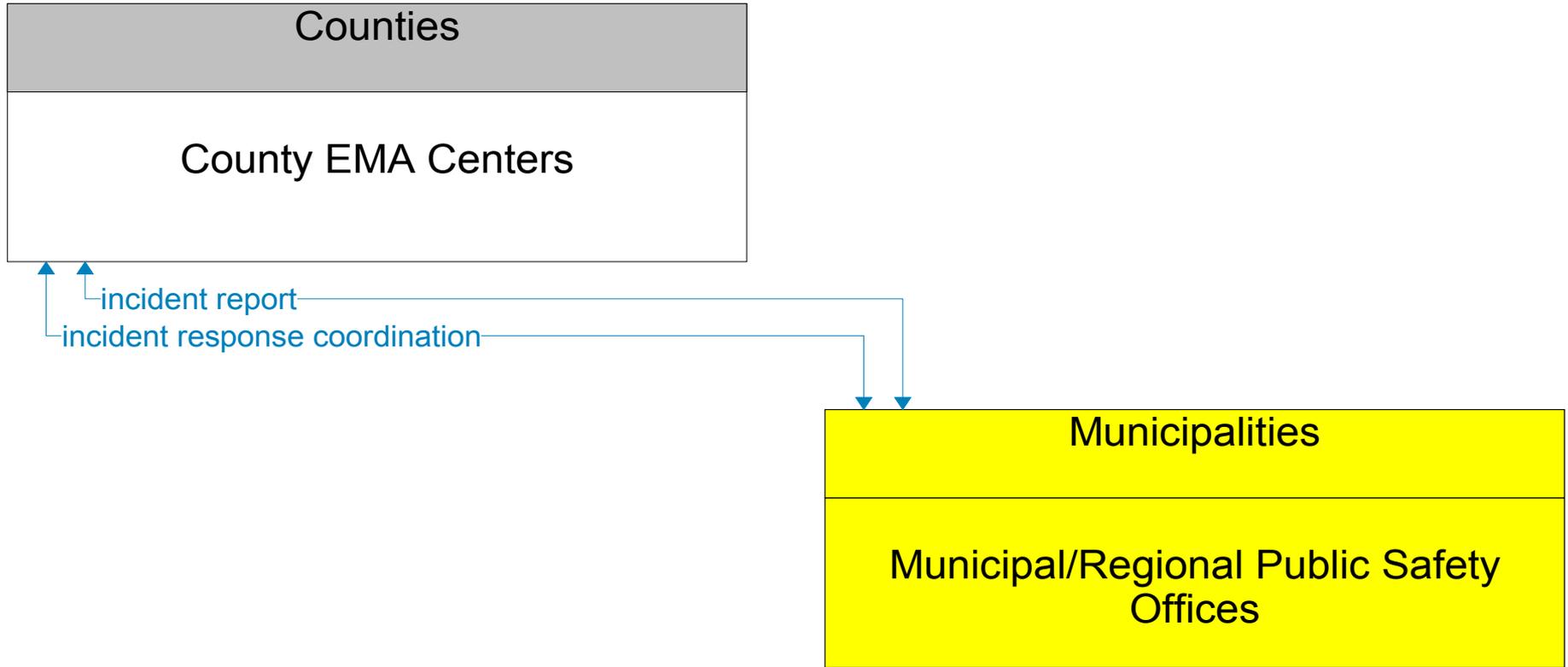
Municipal/Regional Public Safety Offices Interconnect Diagram



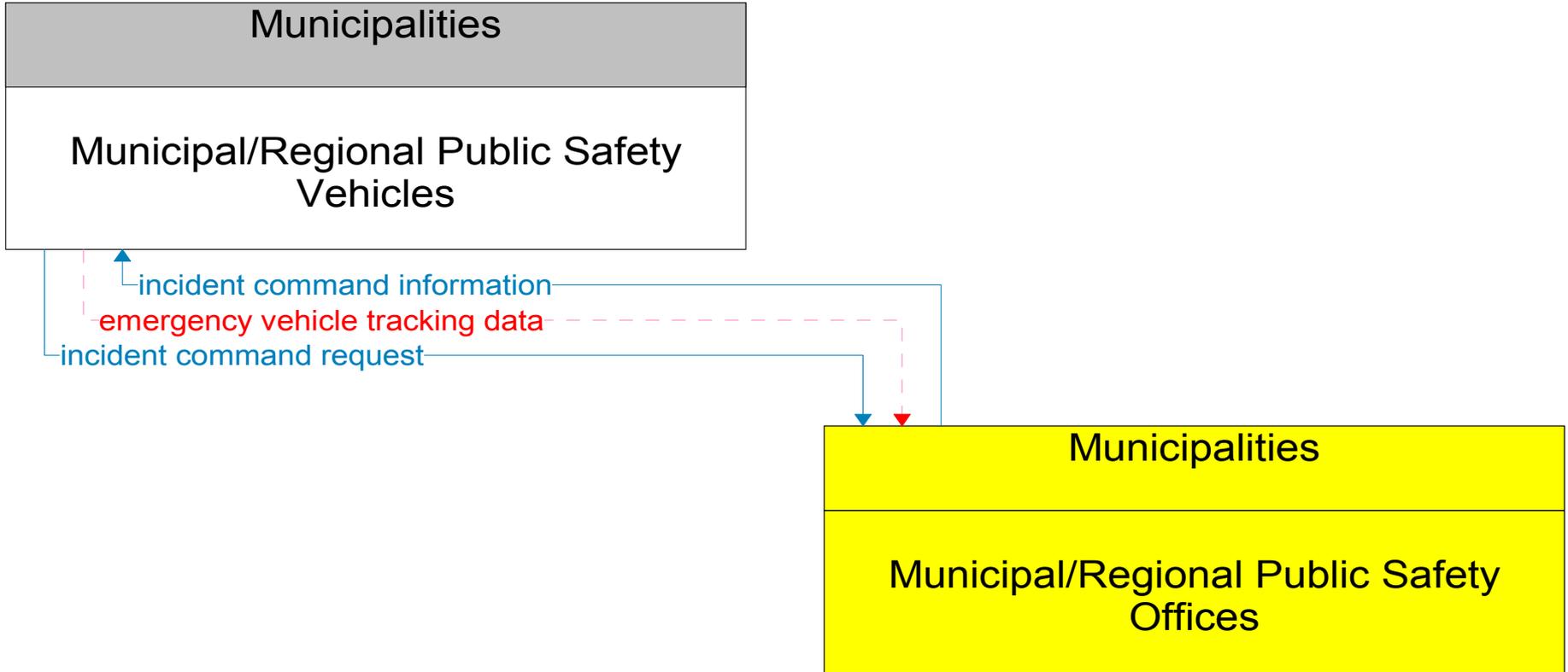
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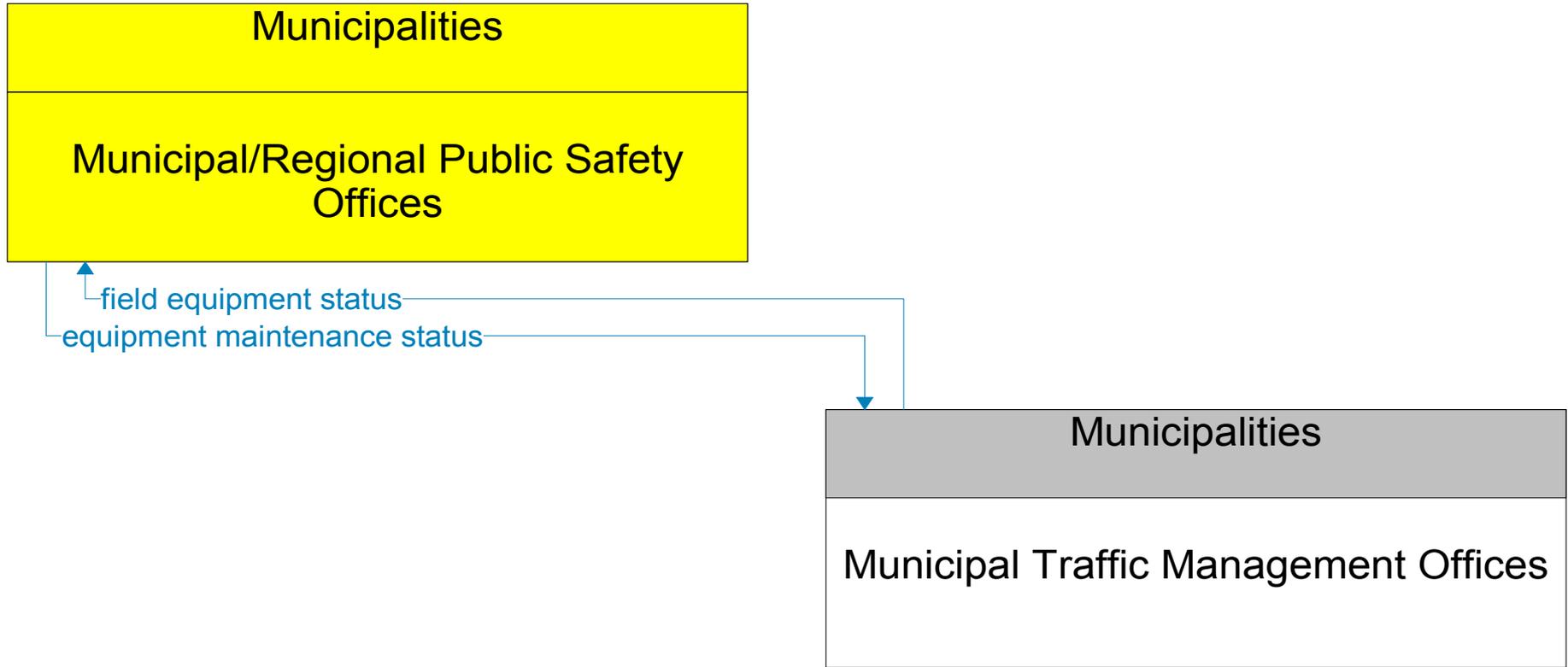
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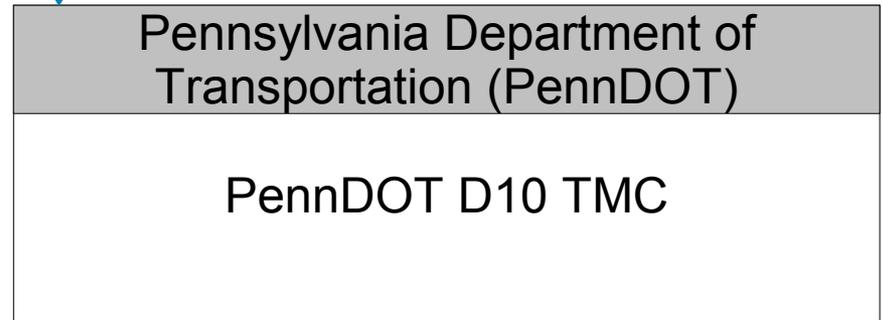
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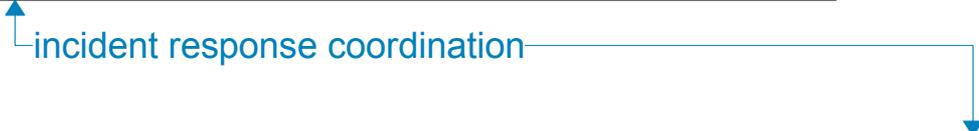
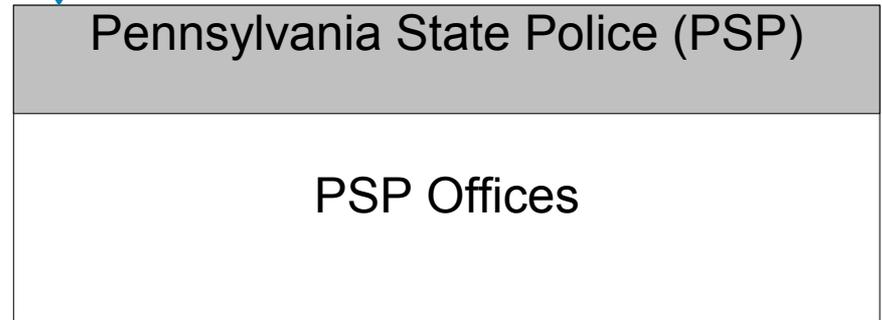
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Planned



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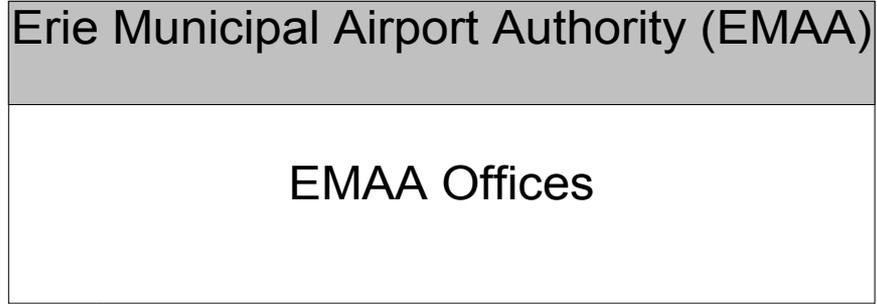


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- - - - - Planned

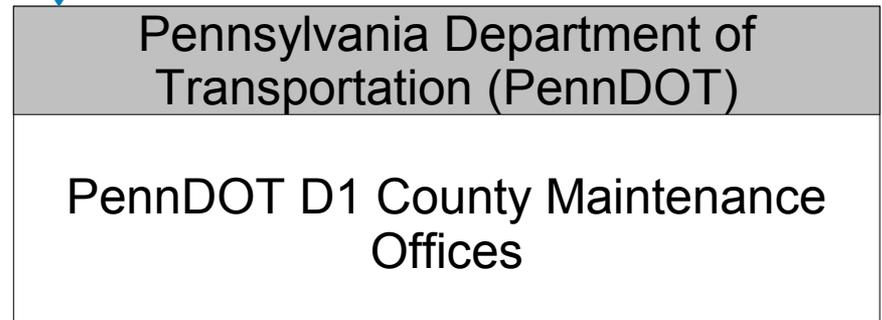




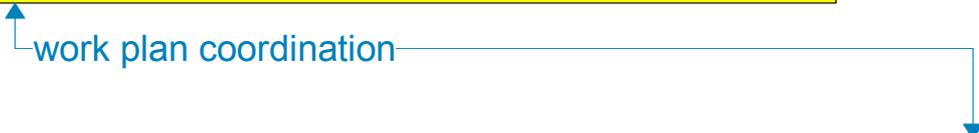
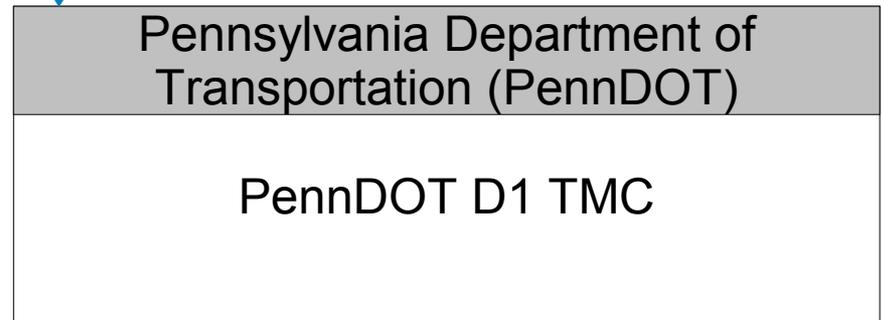
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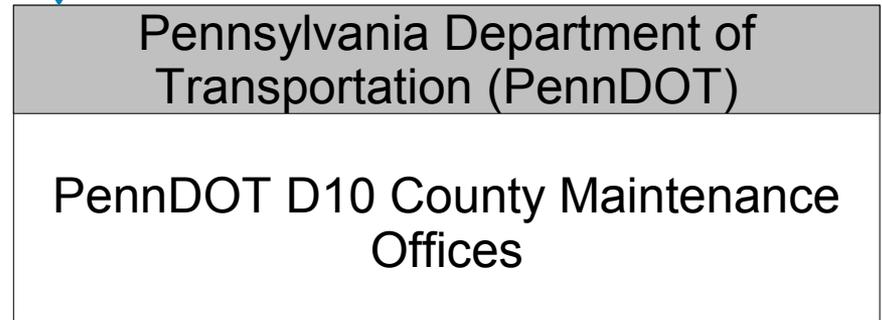
maint and constr resource coordination



Existing
Planned



———— Existing
- - - - - Planned

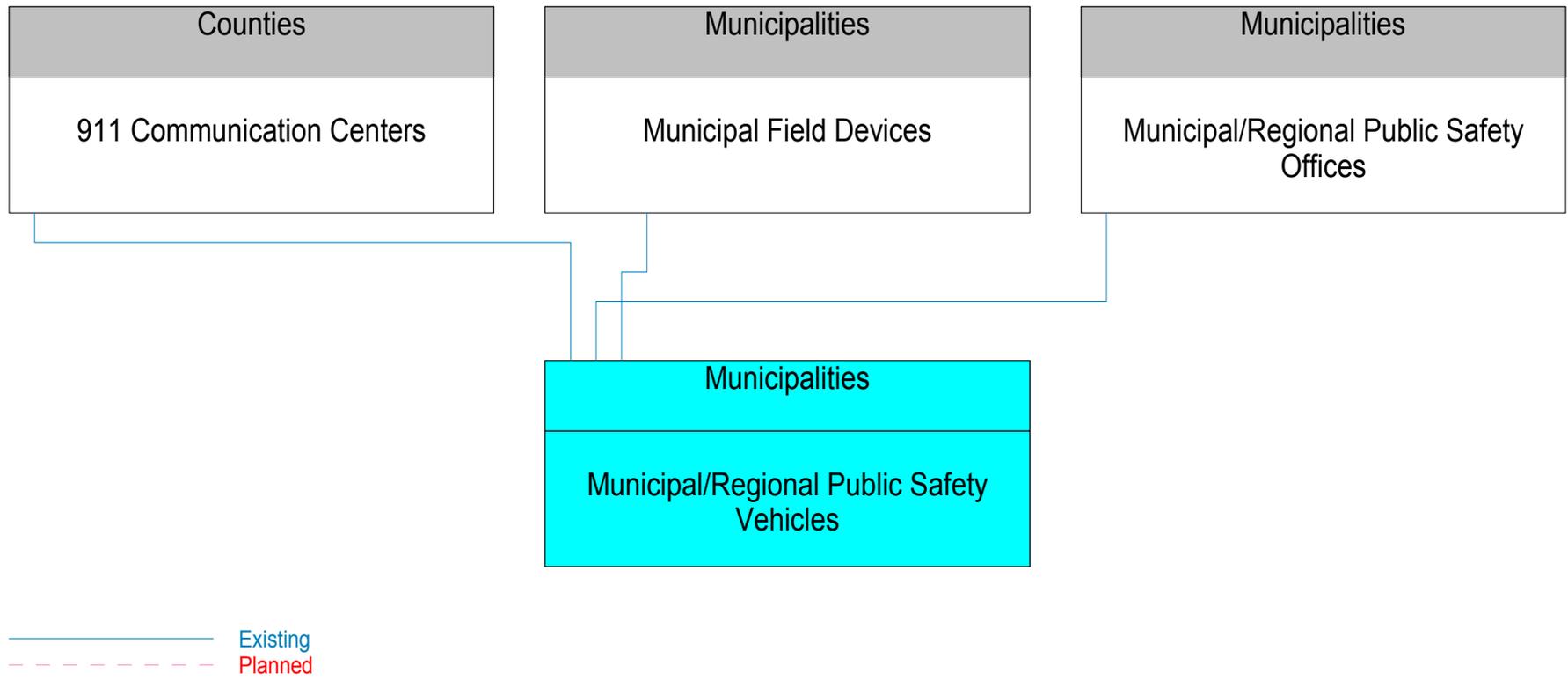


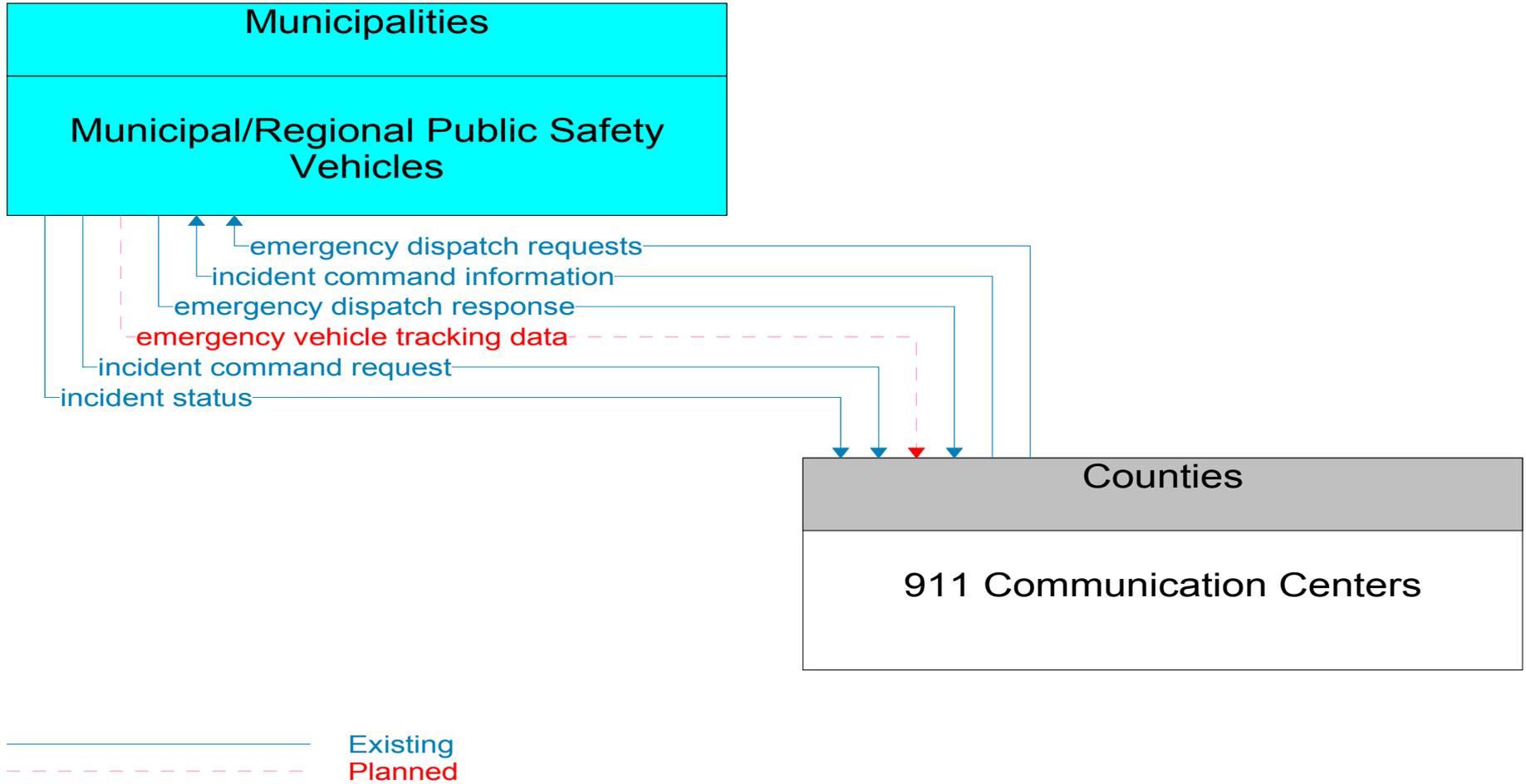
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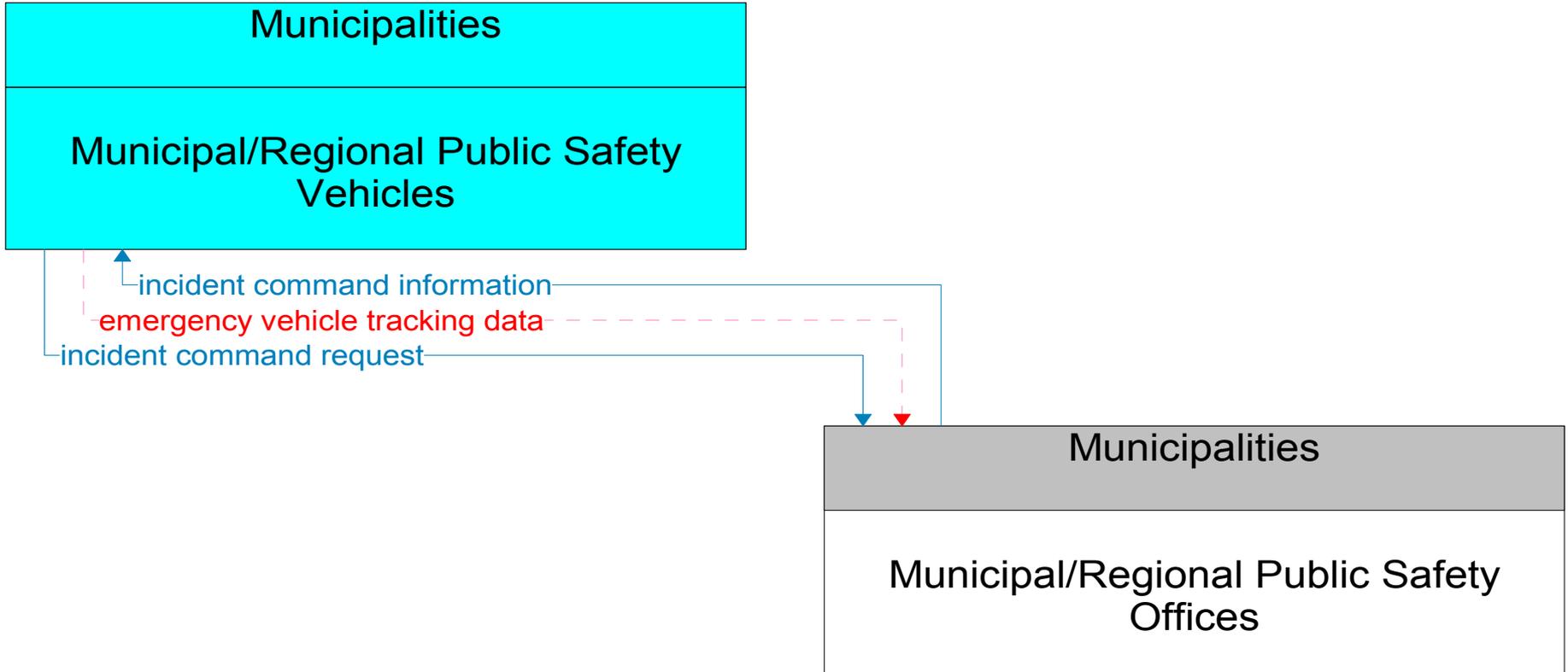
Municipal/Regional Public Safety Vehicles



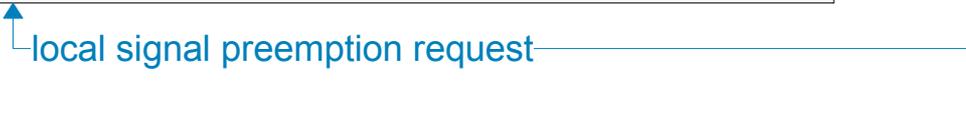
Municipal/Regional Public Safety Vehicles Interconnect Diagram





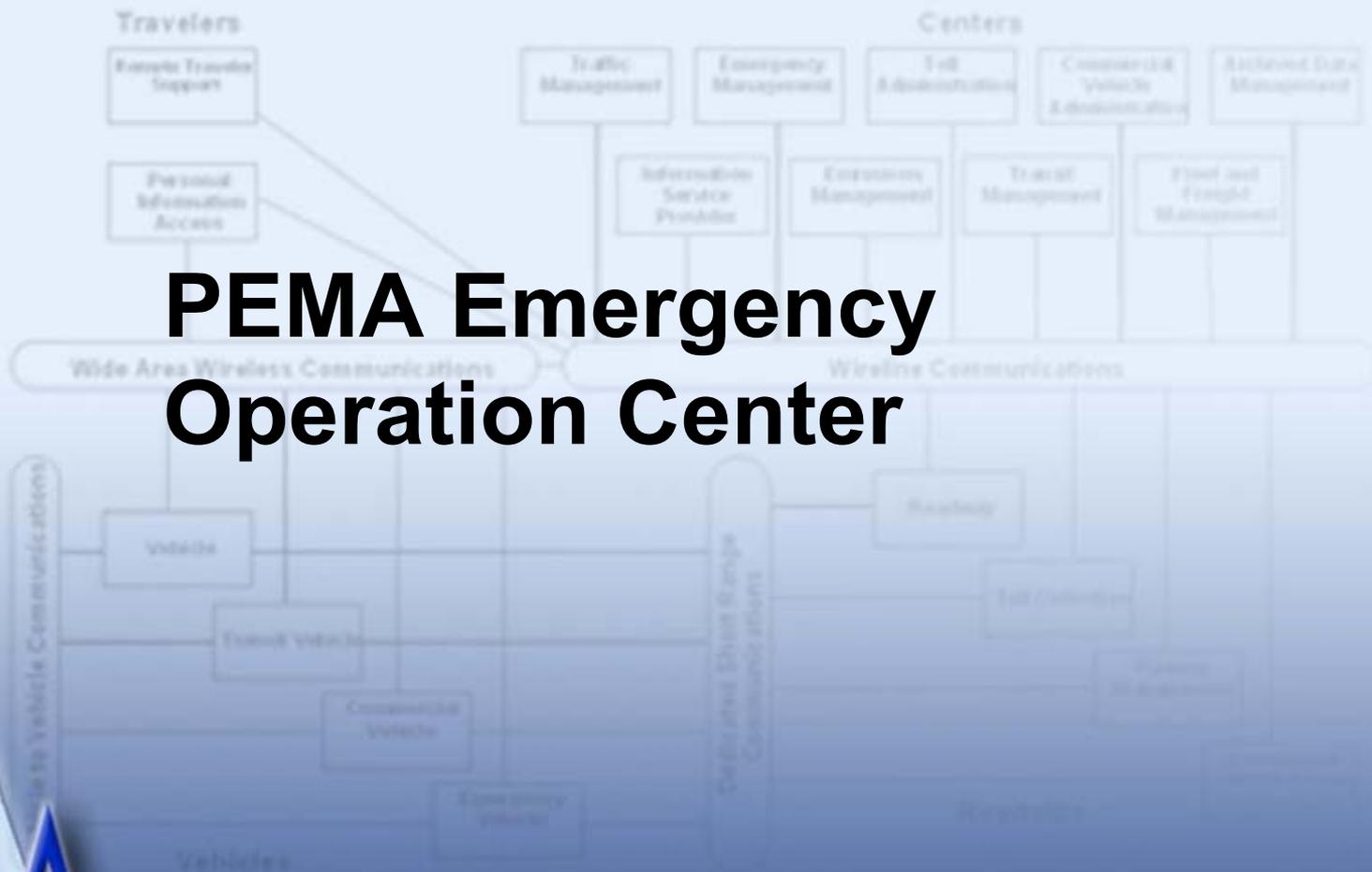


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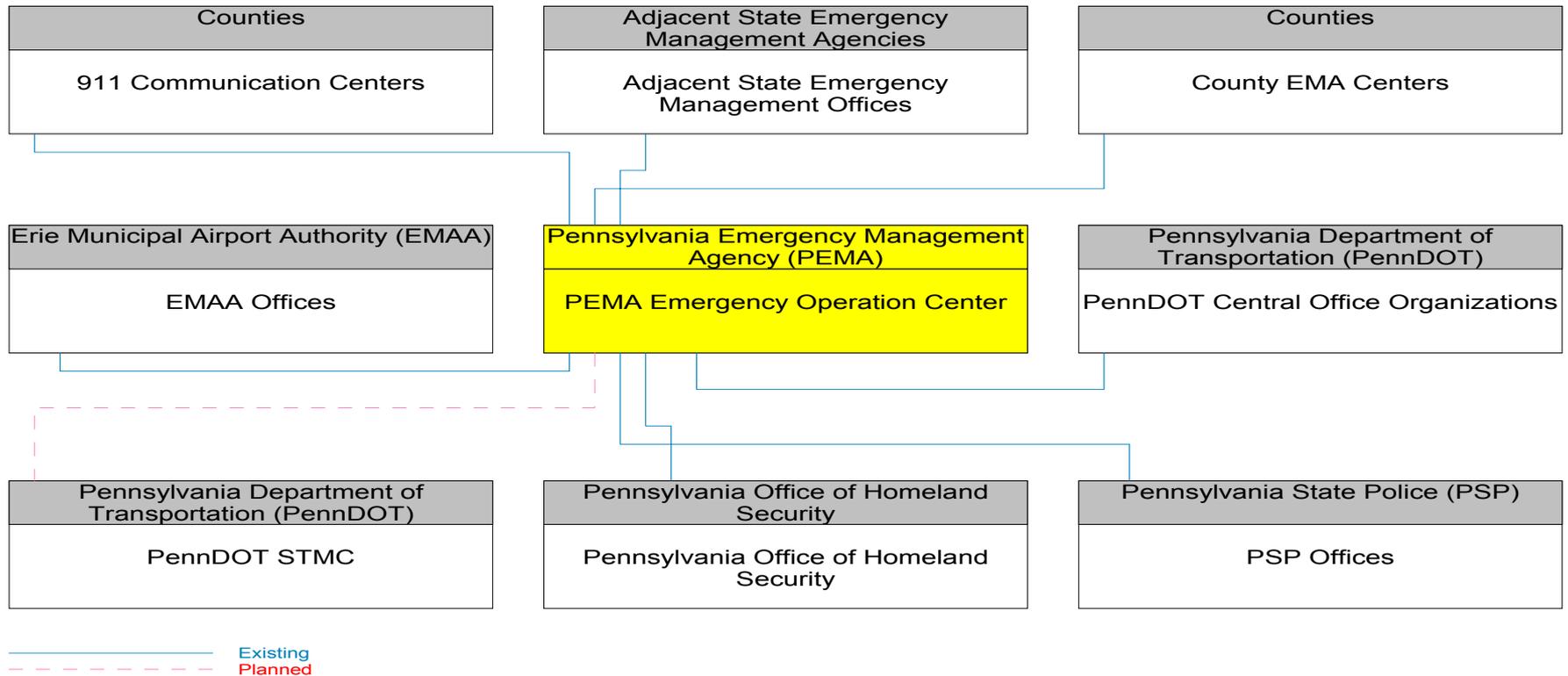


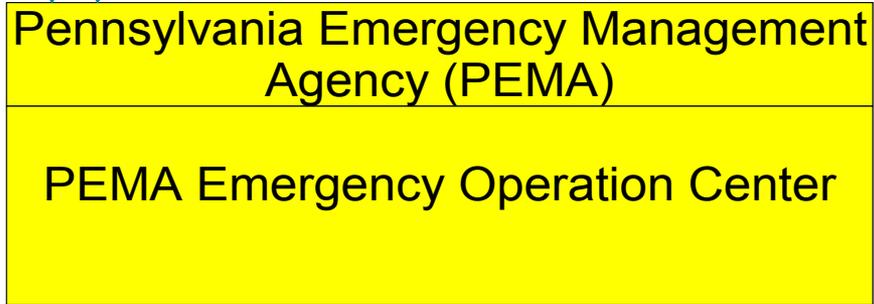
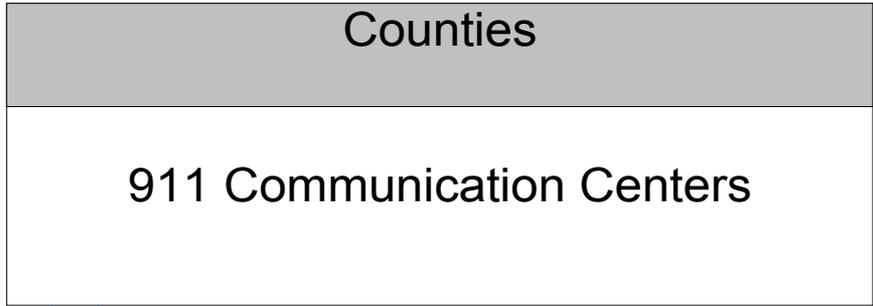
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- - - - - Planned

PEMA Emergency Operation Center

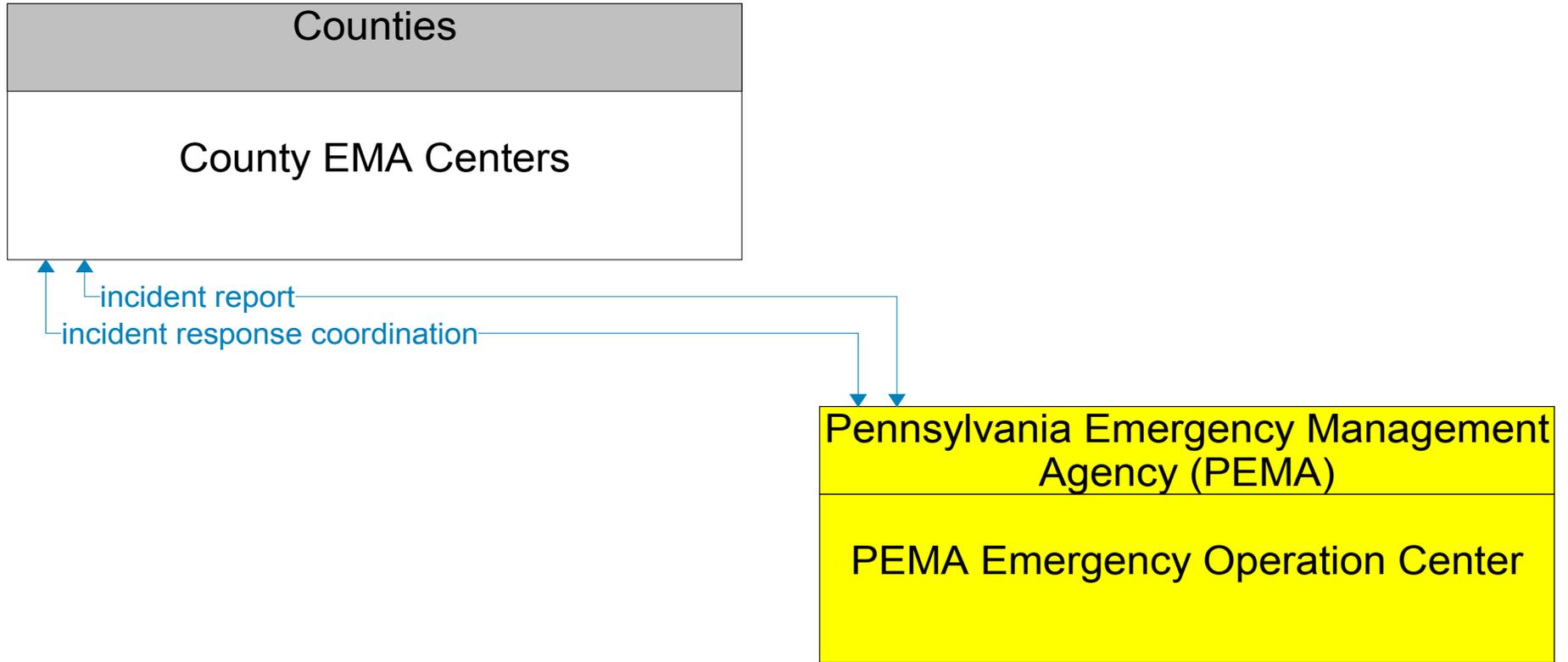


PEMA Emergency Operation Center Interconnect Diagram

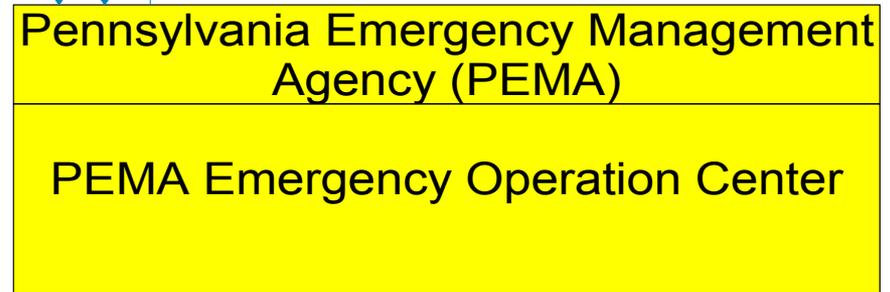
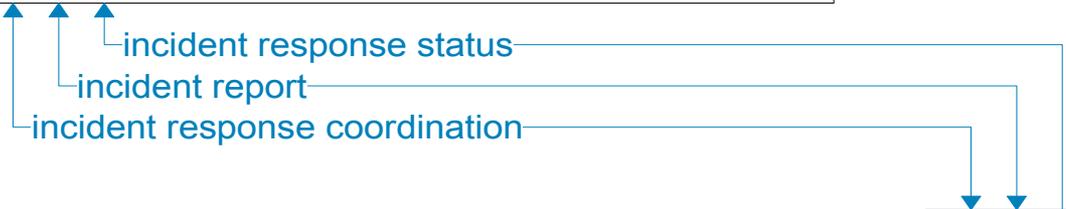
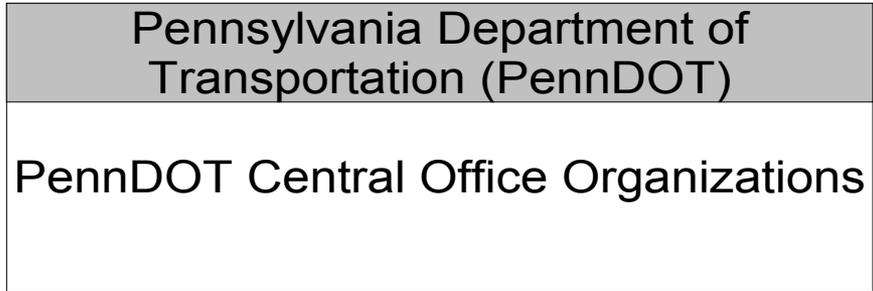


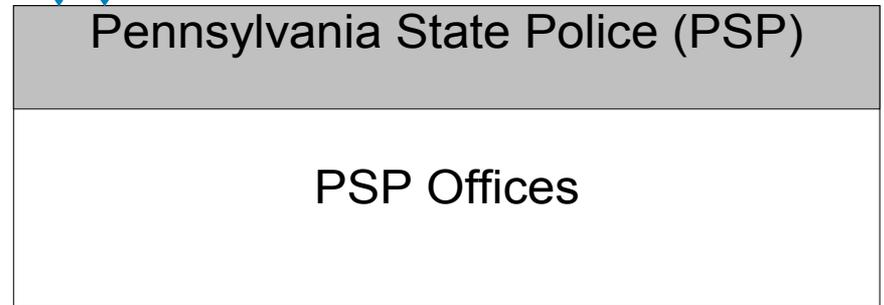
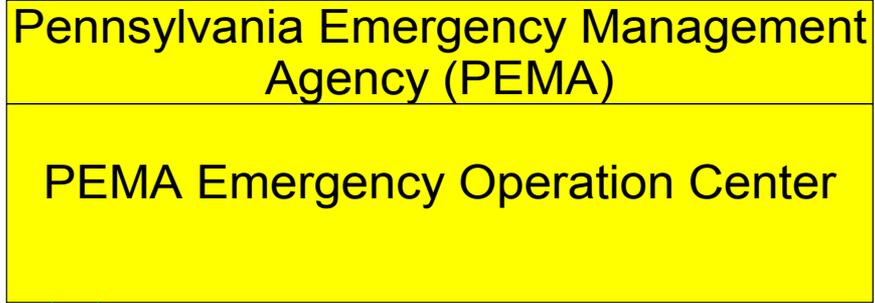


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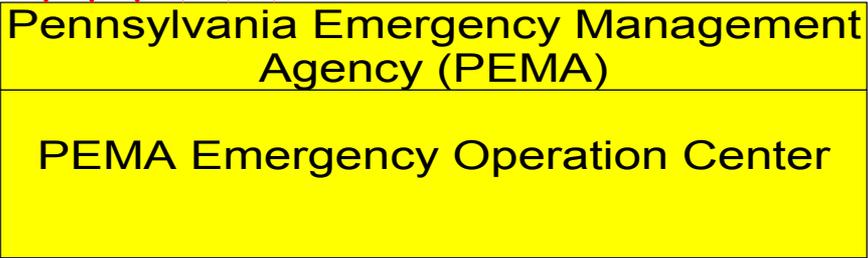
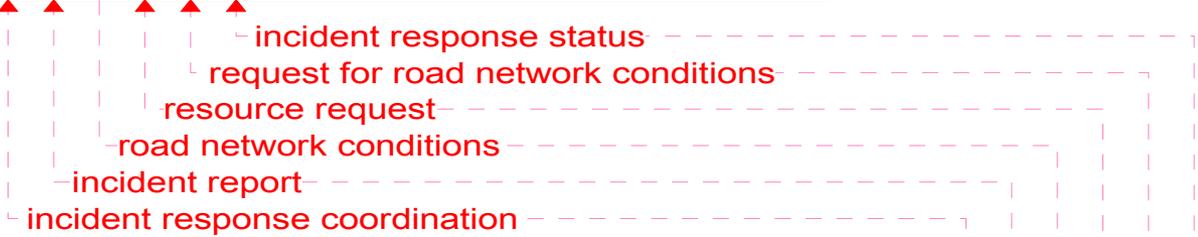
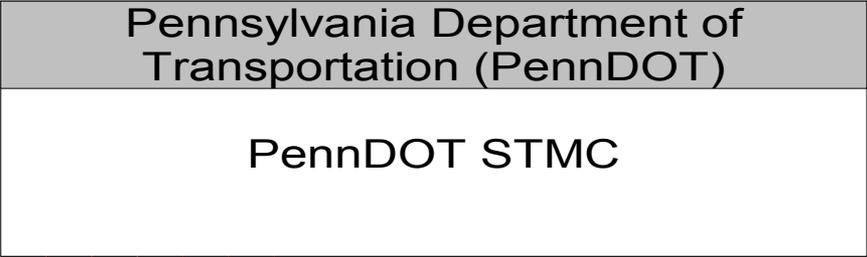


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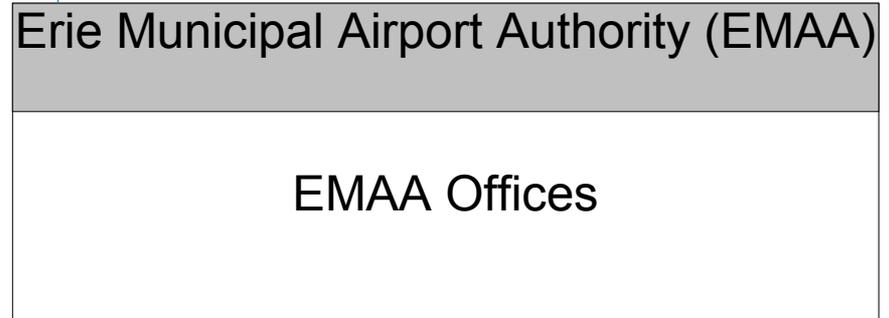
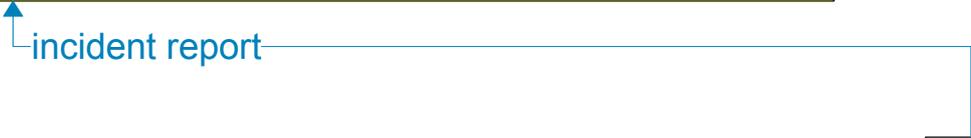
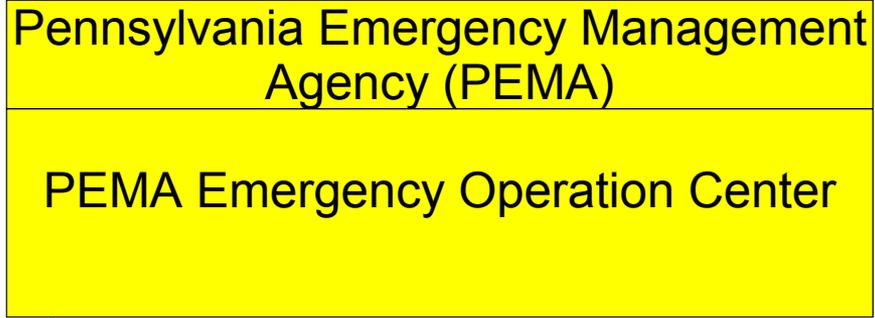


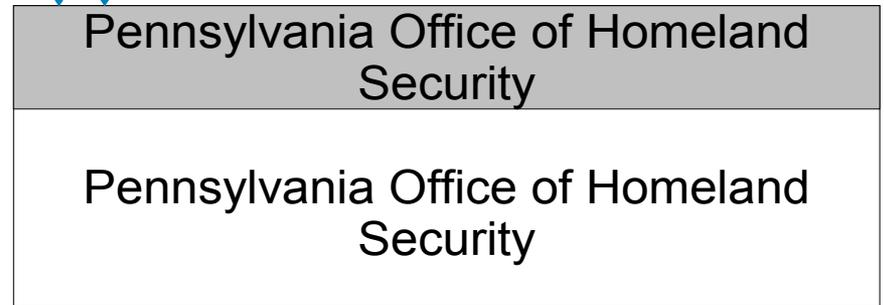
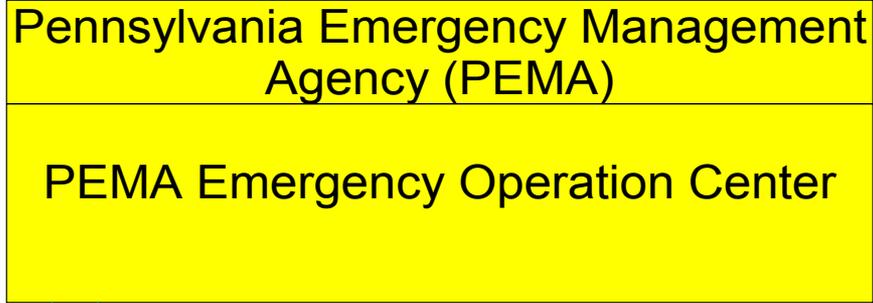


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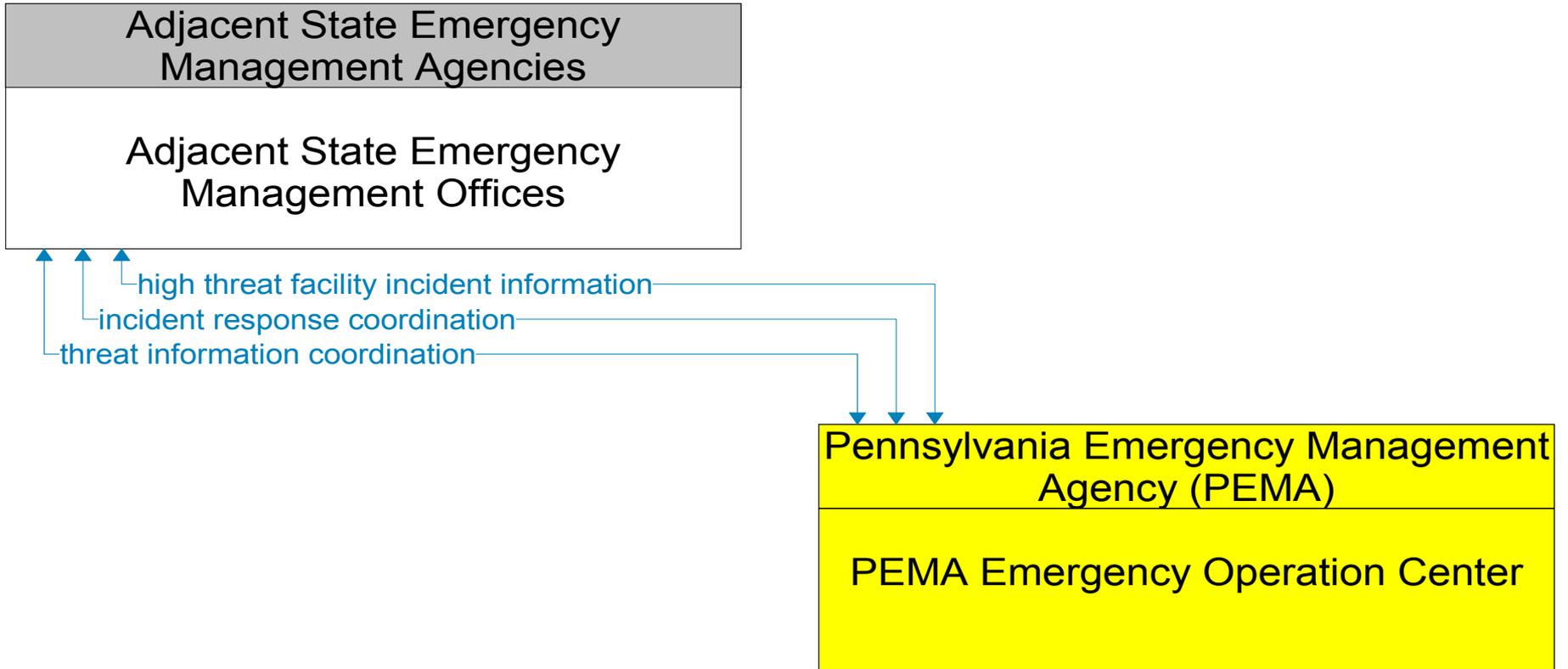


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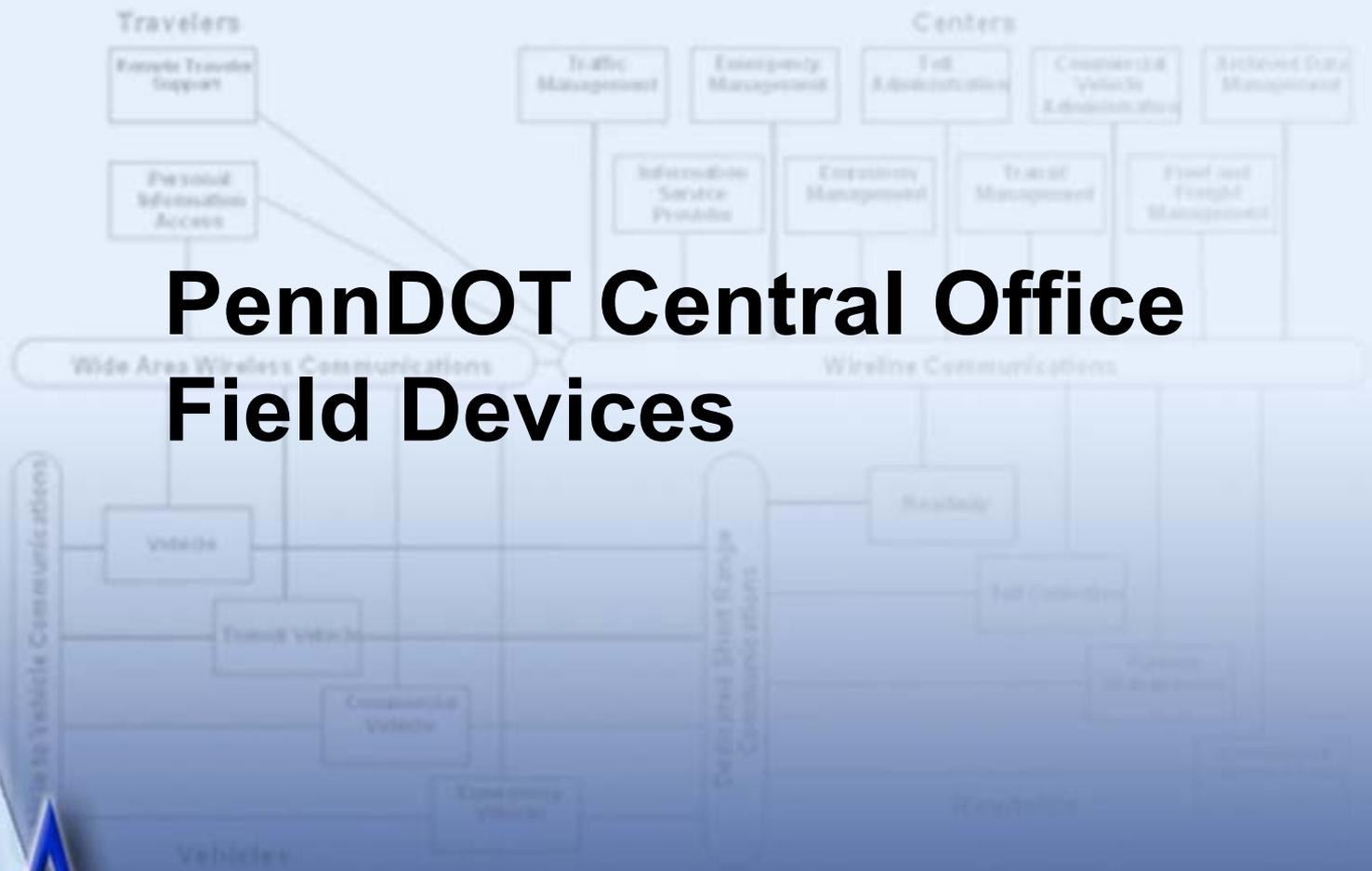




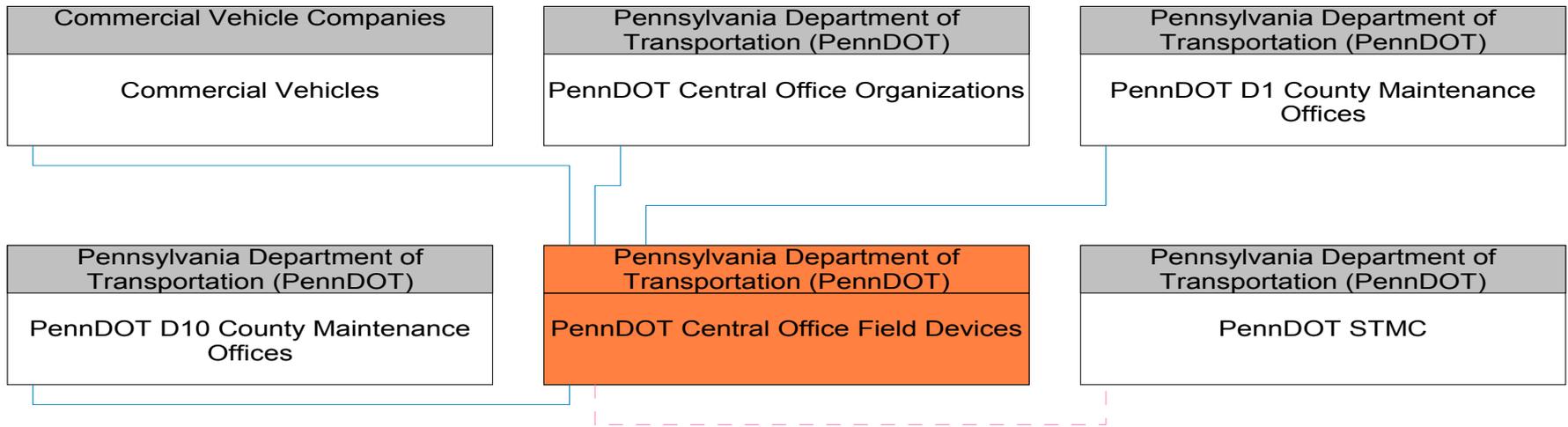
———— Existing
- - - - - Planned



PennDOT Central Office Field Devices



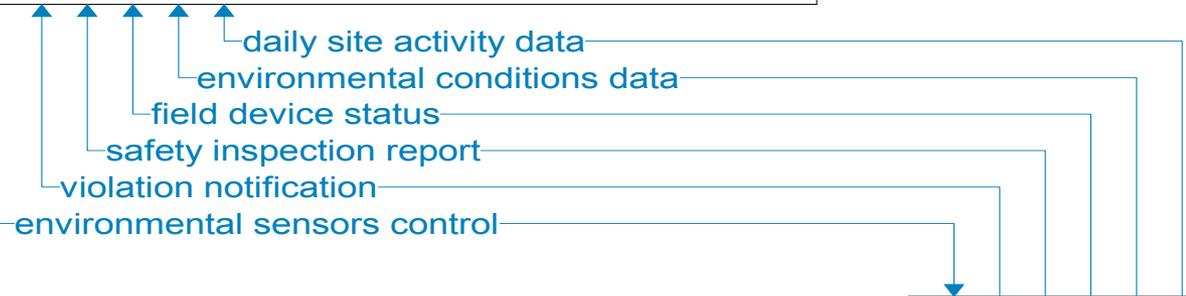
PennDOT Central Office Field Devices Interconnect Diagram



Existing
Planned

Pennsylvania Department of
Transportation (PennDOT)

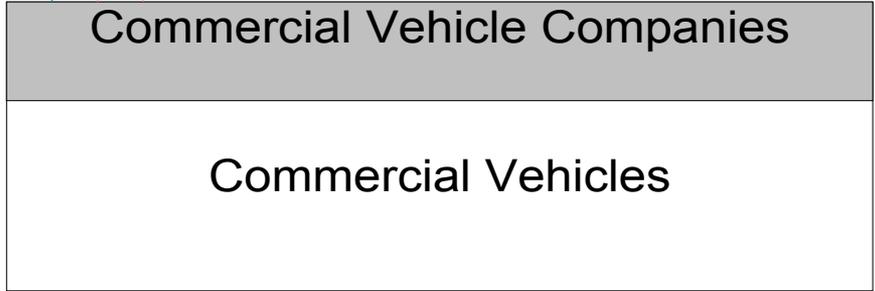
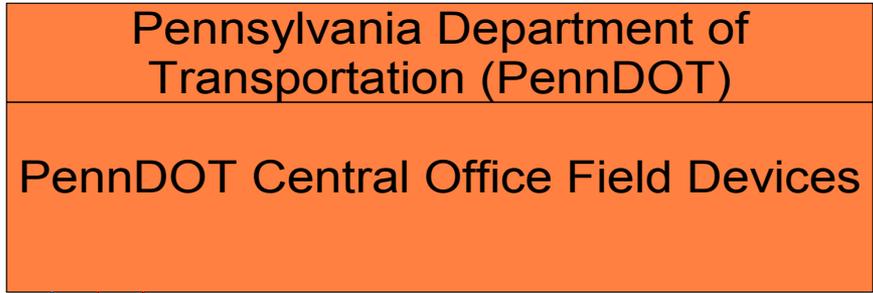
PennDOT Central Office Organizations



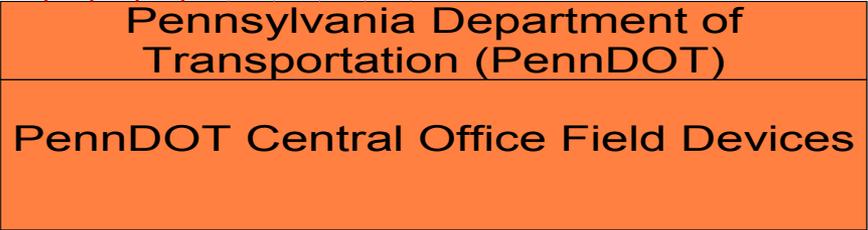
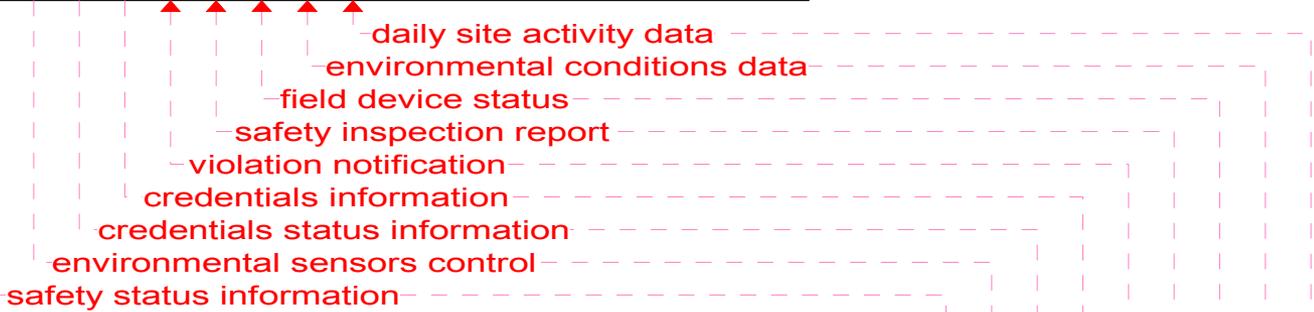
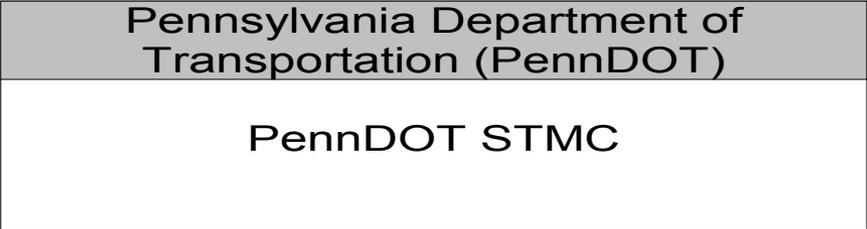
Pennsylvania Department of
Transportation (PennDOT)

PennDOT Central Office Field Devices

Existing
Planned



Existing
Planned



———— Existing
- - - - - Planned

Pennsylvania Department of
Transportation (PennDOT)

PennDOT D1 County Maintenance
Offices

environmental conditions data

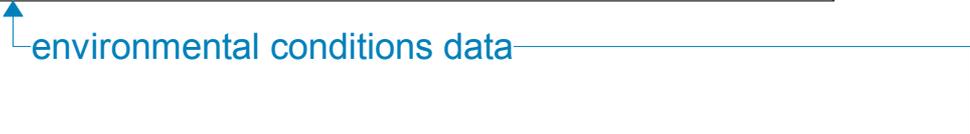
Pennsylvania Department of
Transportation (PennDOT)

PennDOT Central Office Field Devices

Existing
Planned

Pennsylvania Department of
Transportation (PennDOT)

PennDOT D10 County Maintenance
Offices

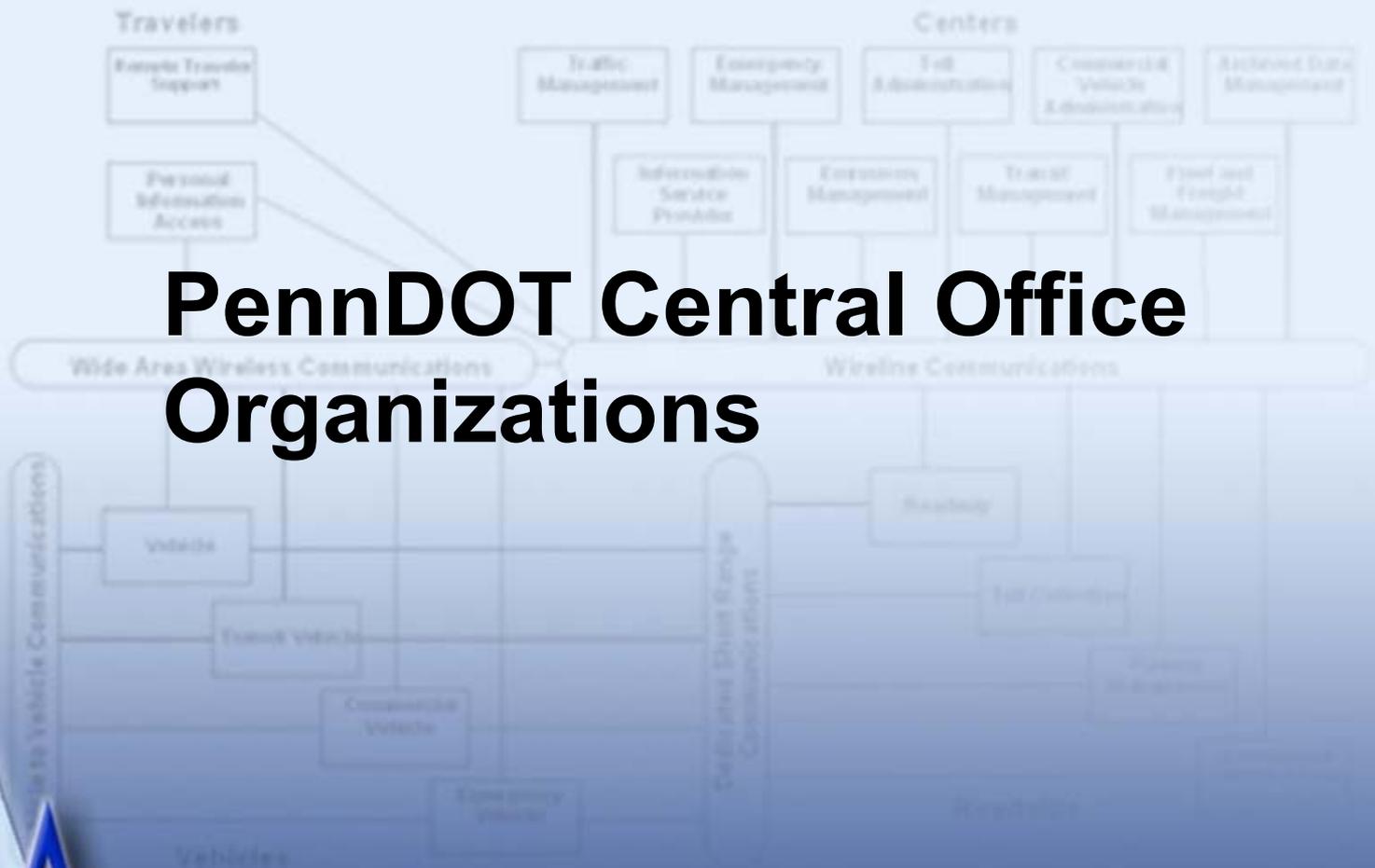


Pennsylvania Department of
Transportation (PennDOT)

PennDOT Central Office Field Devices

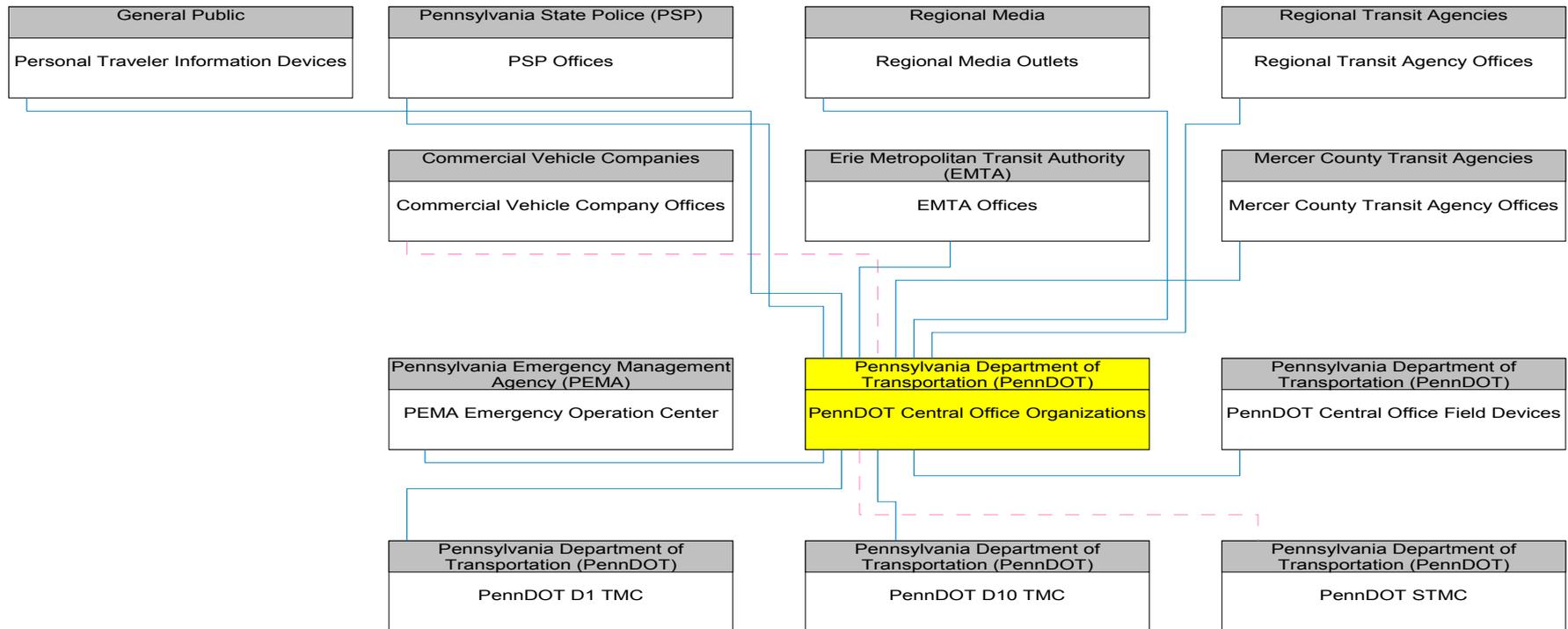
———— Existing
- - - - - Planned

PennDOT Central Office Organizations



PA

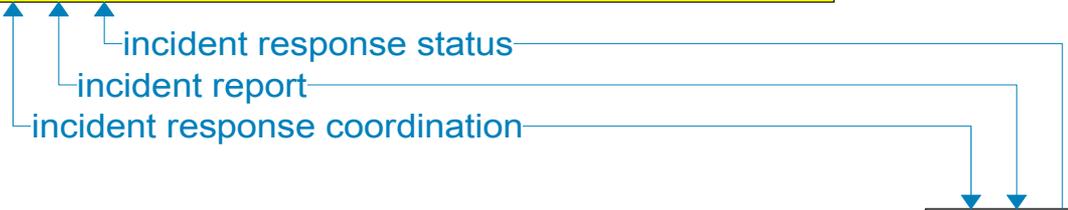
PennDOT Central Office Organizations Interconnect Diagram



— Existing
- - - Planned

Pennsylvania Department of
Transportation (PennDOT)

PennDOT Central Office Organizations



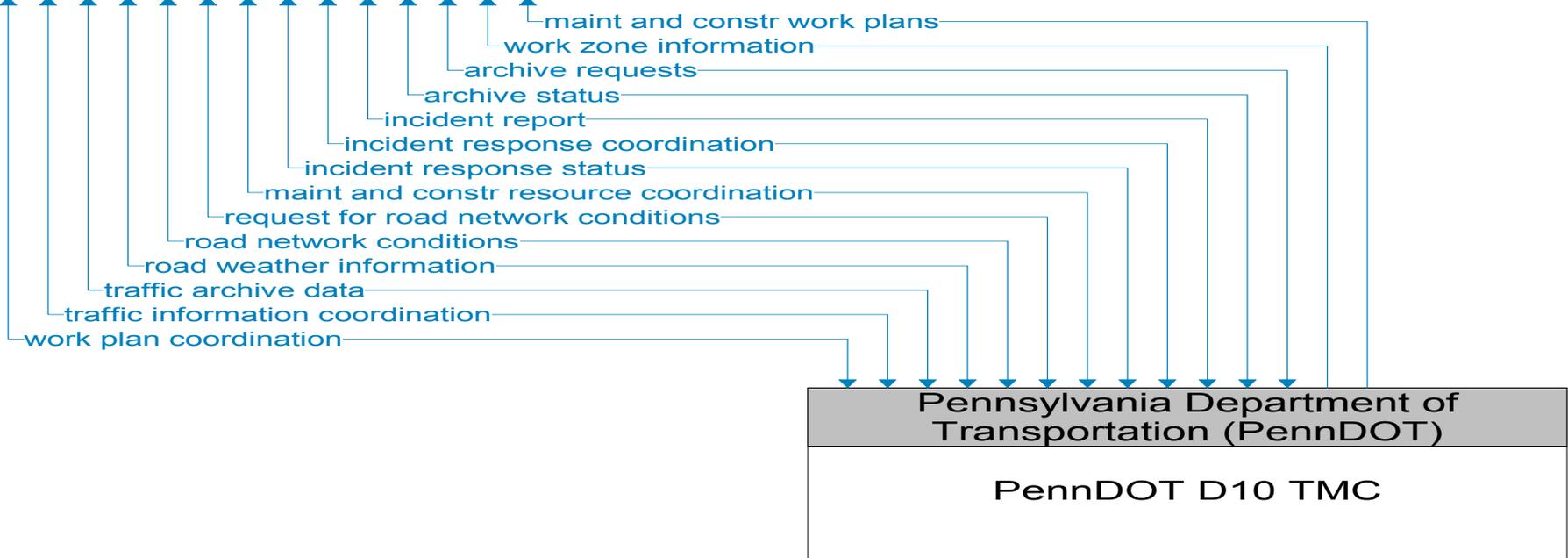
Pennsylvania Emergency Management
Agency (PEMA)

PEMA Emergency Operation Center

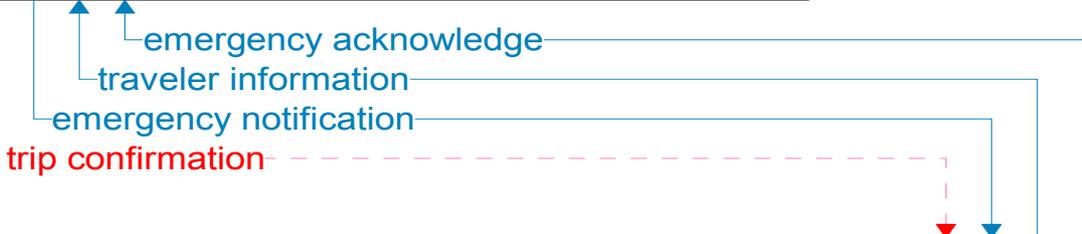
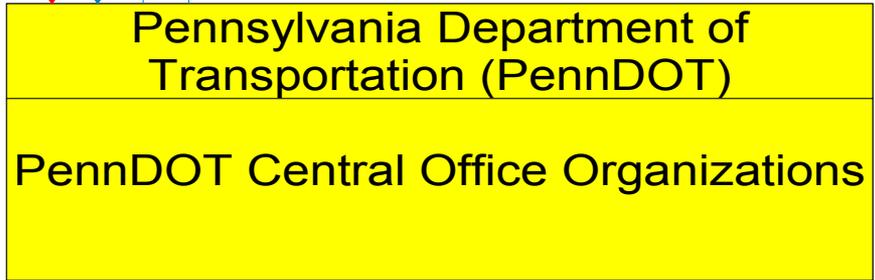
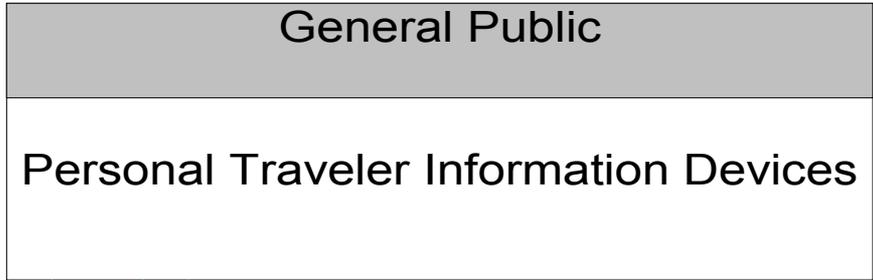
———— Existing
- - - - - Planned

Pennsylvania Department of Transportation (PennDOT)

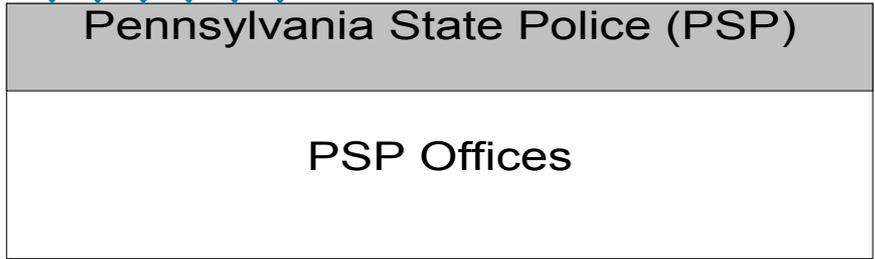
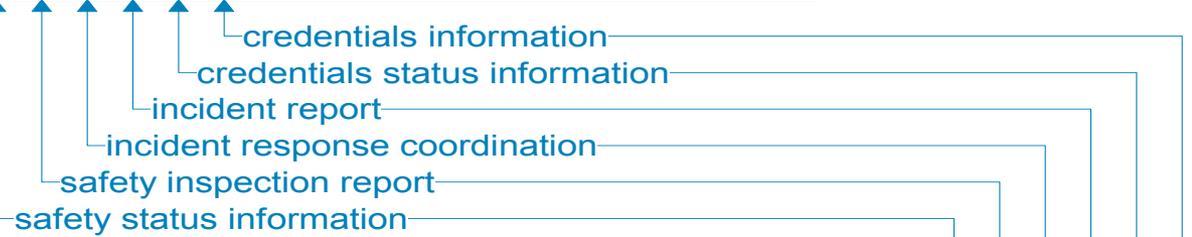
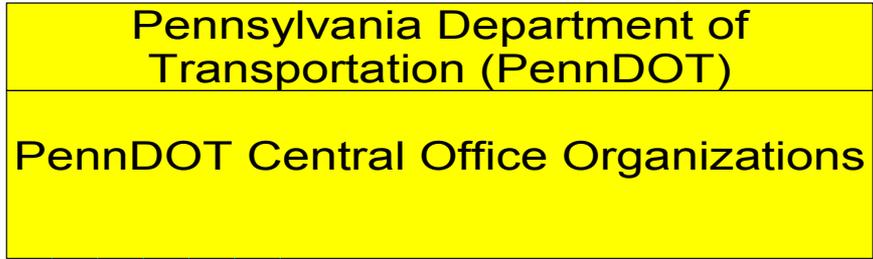
PennDOT Central Office Organizations

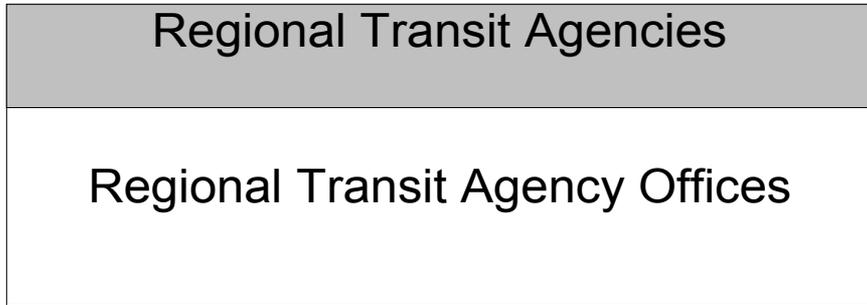


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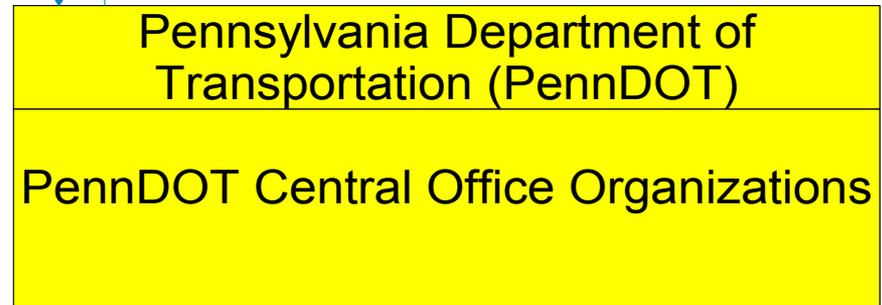


Existing
Planned

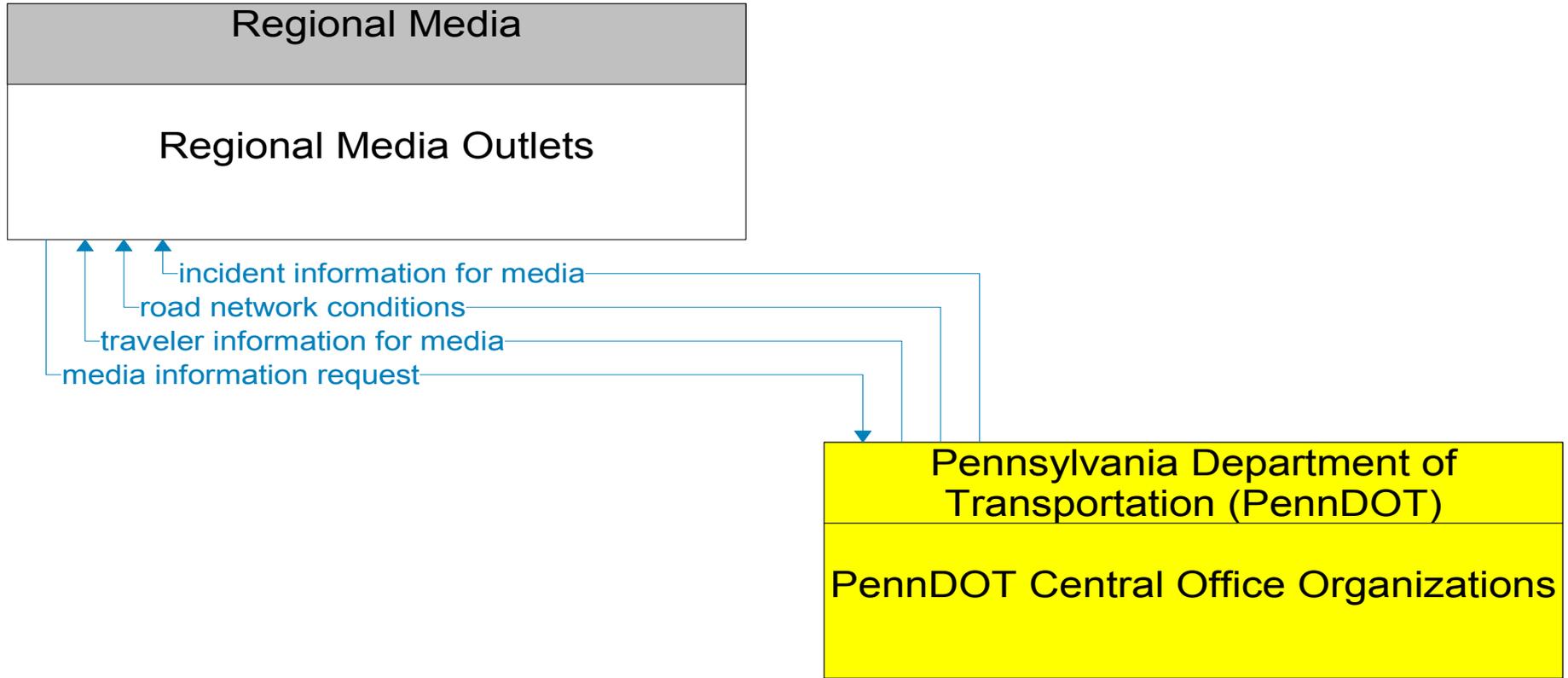




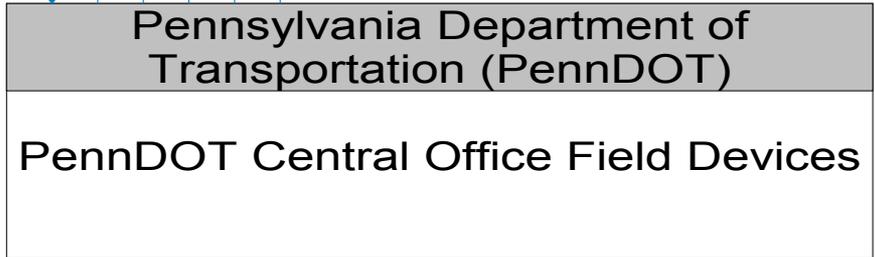
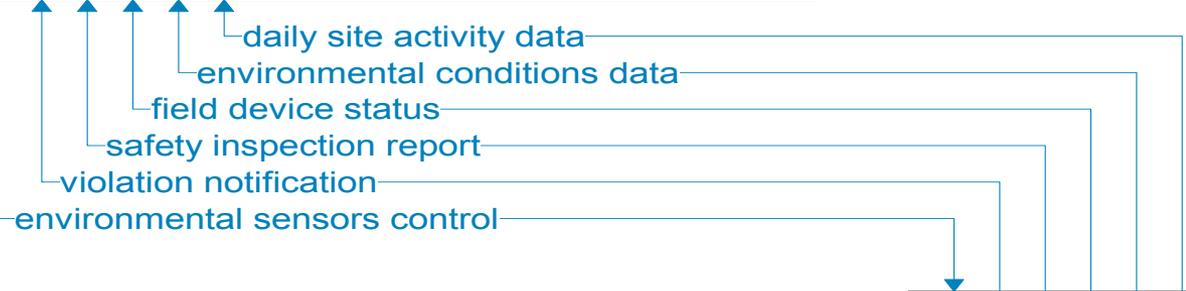
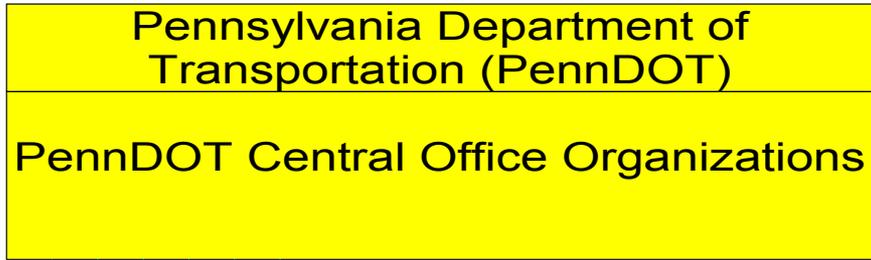
archive requests
transit archive data



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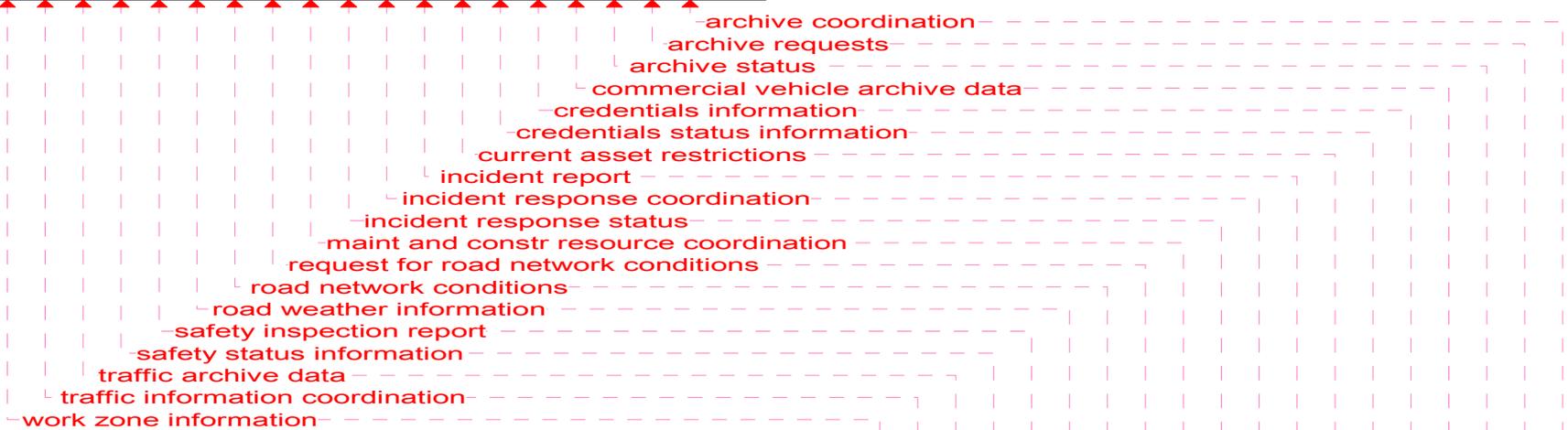


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**Pennsylvania Department of Transportation
(PennDOT)**

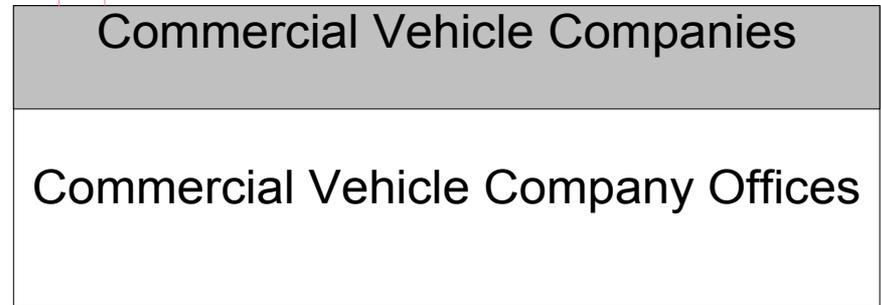
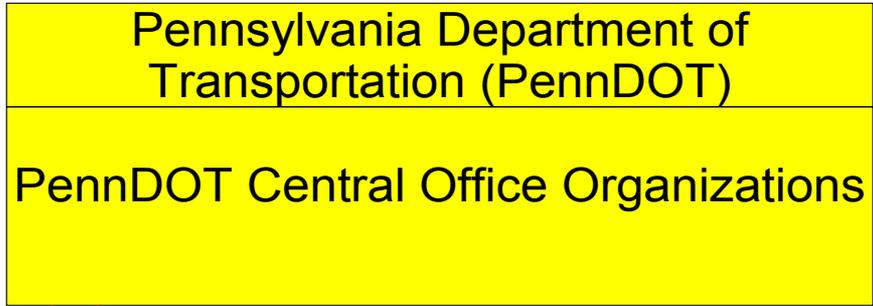
PennDOT Central Office Organizations



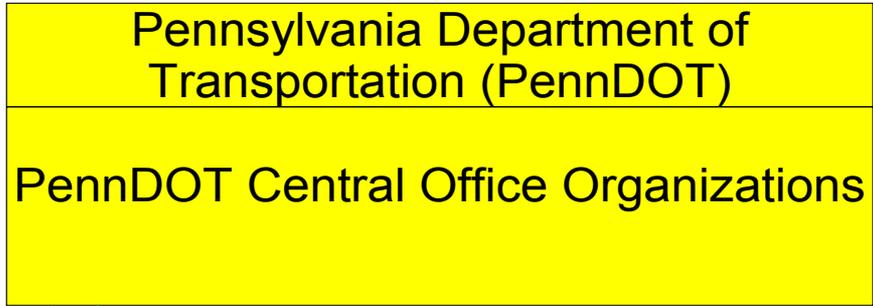
**Pennsylvania Department of Transportation
(PennDOT)**

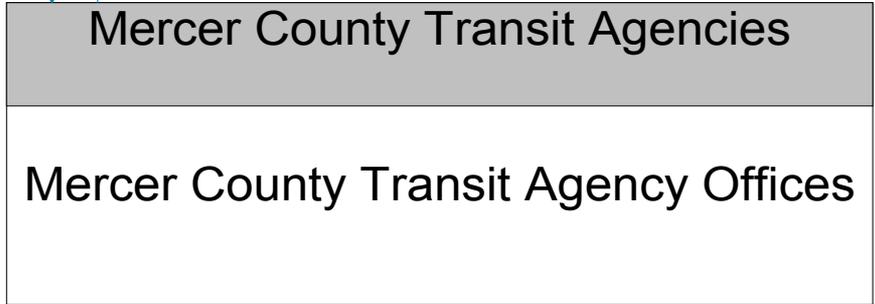
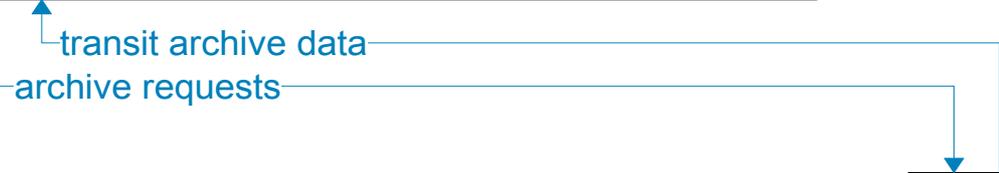
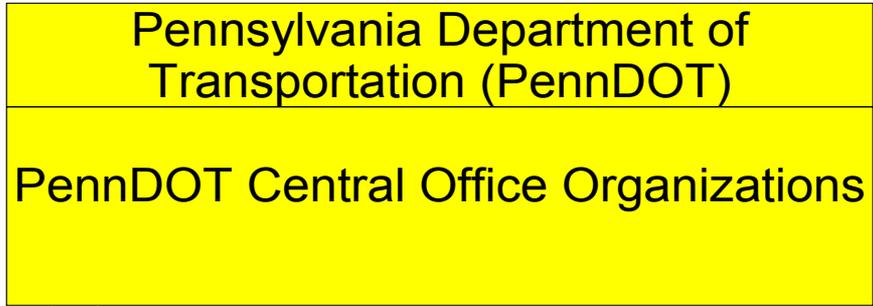
PennDOT STMC

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- - - - - Planned

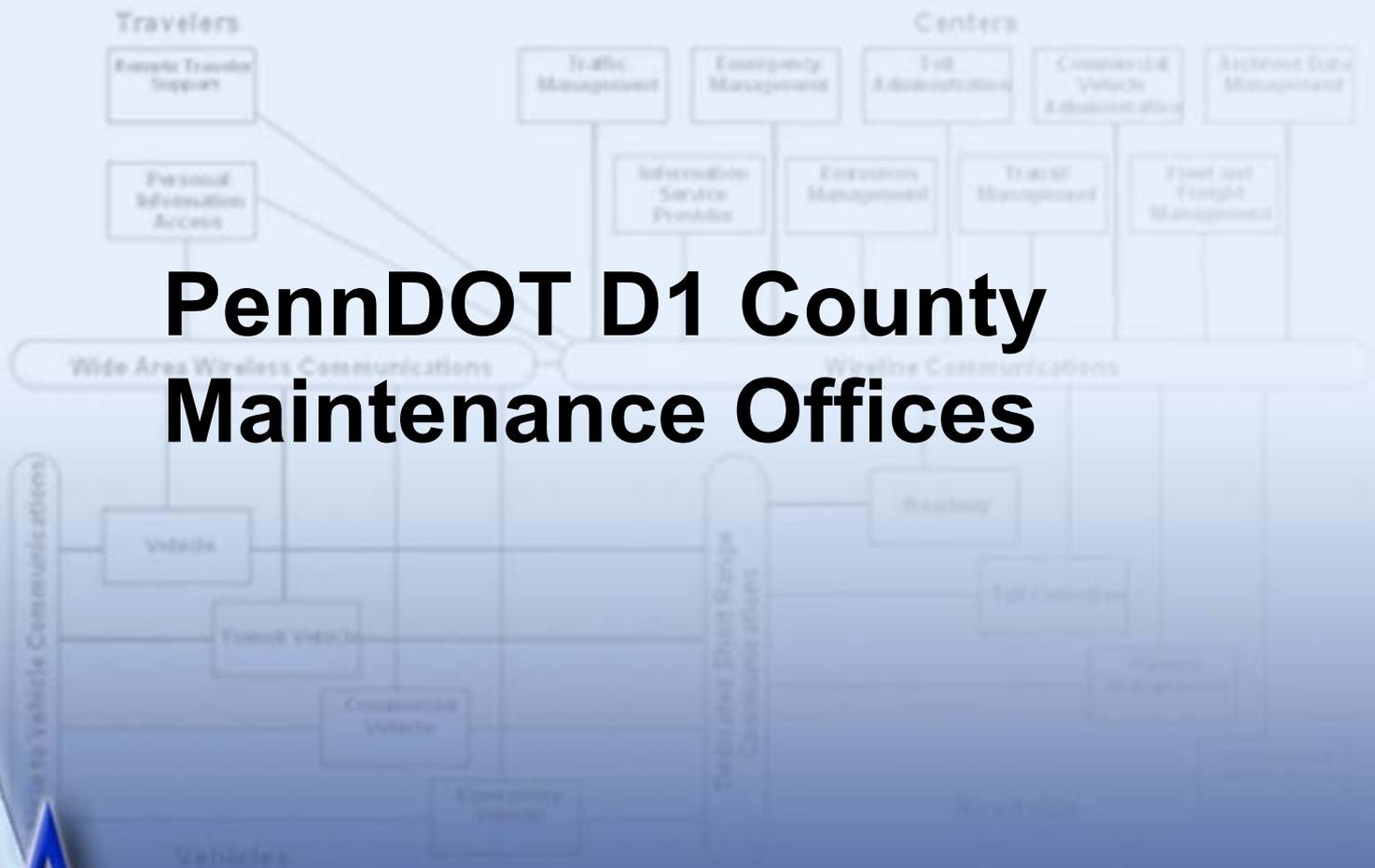


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- - - - - Planned

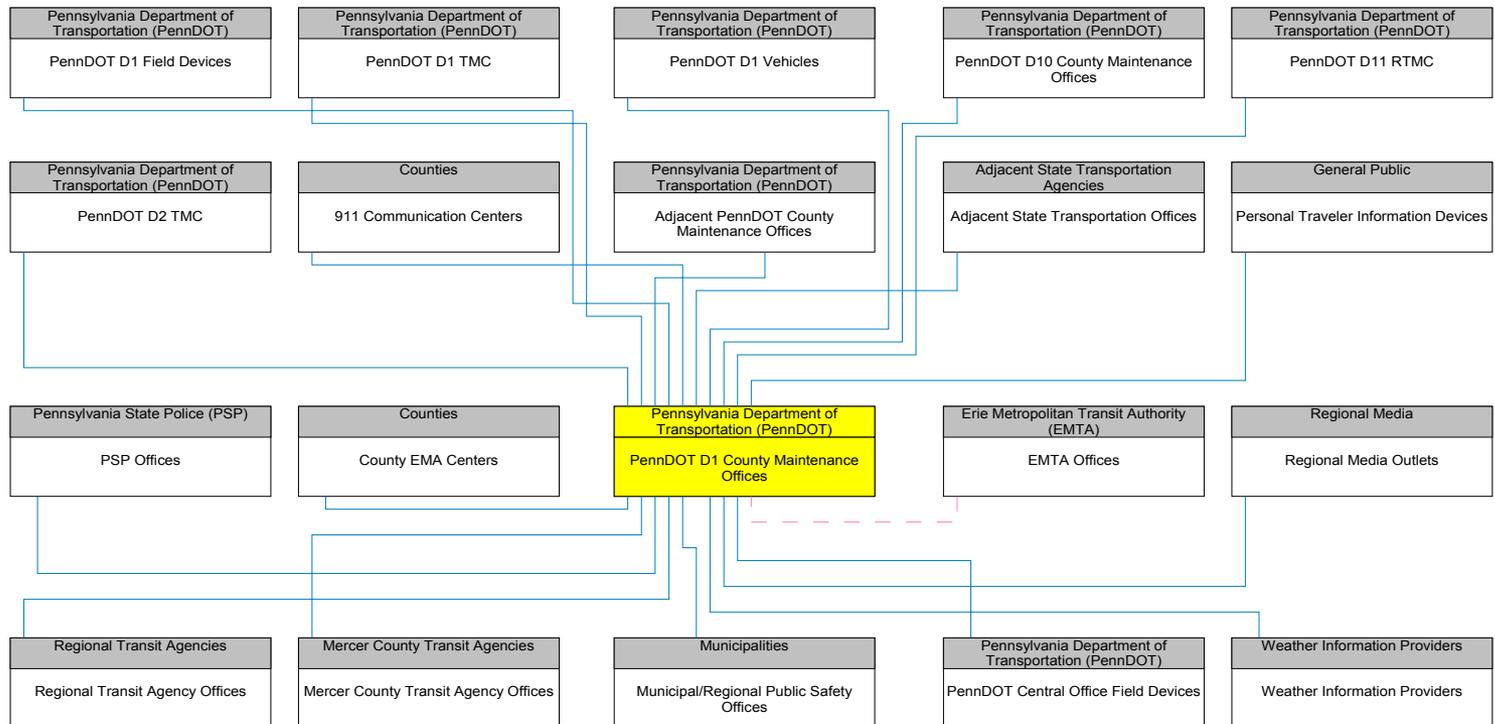


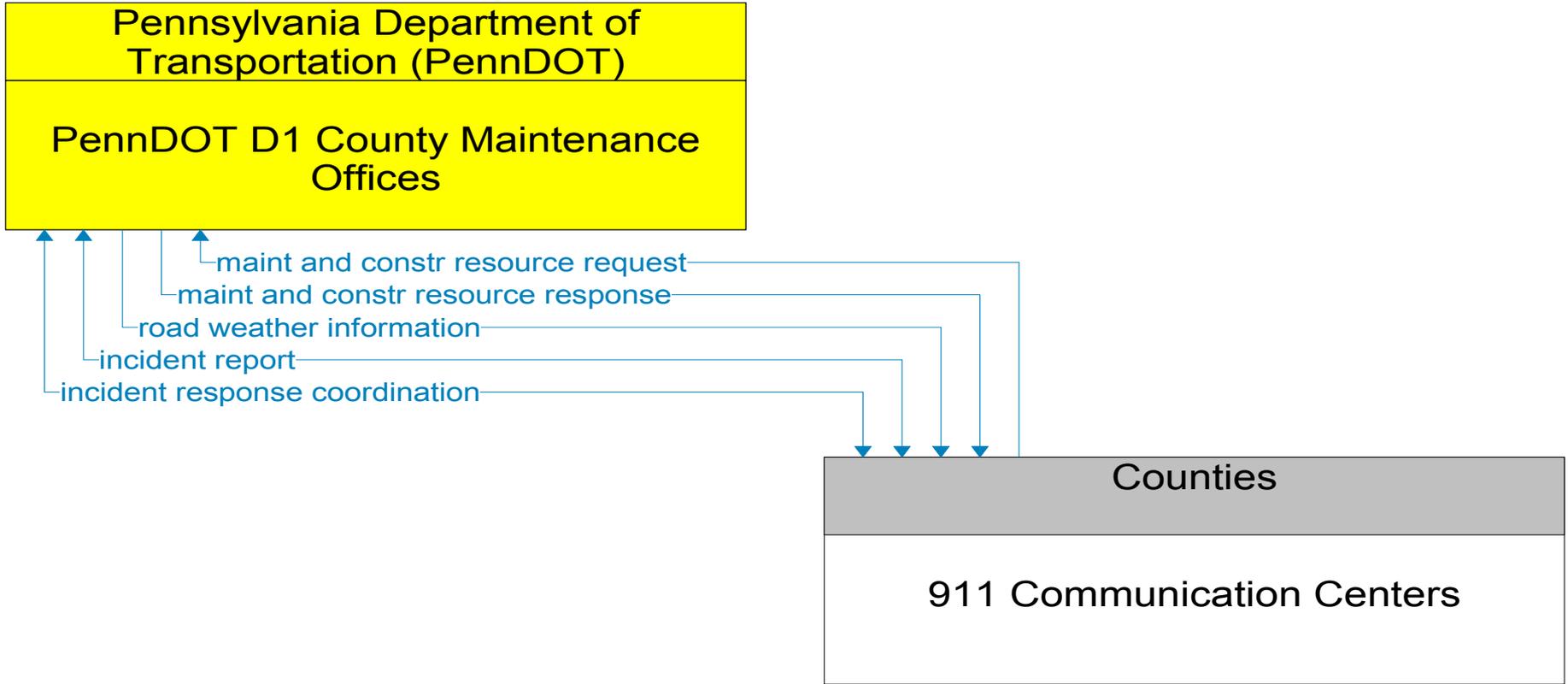


PennDOT D1 County Maintenance Offices

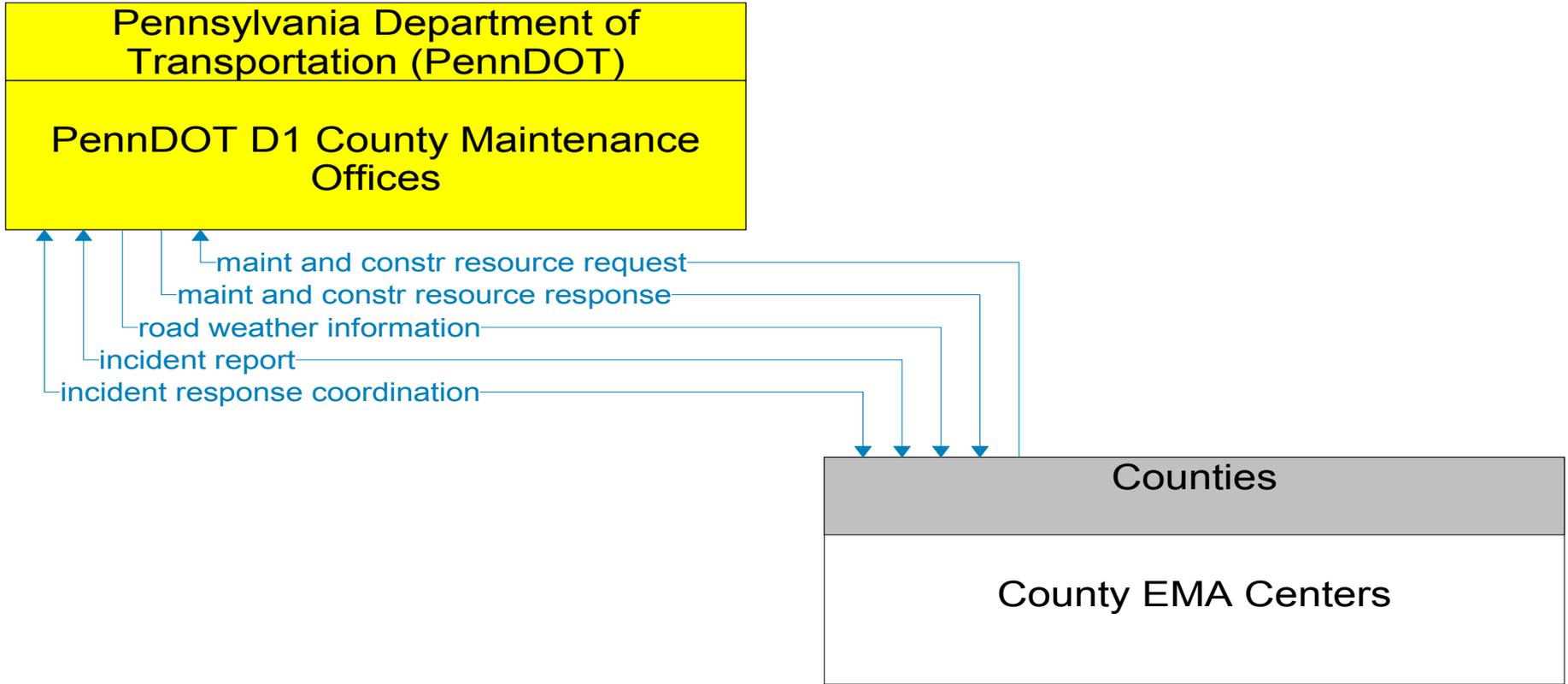


PennDOT D1 County Maintenance Offices Interconnect Diagram

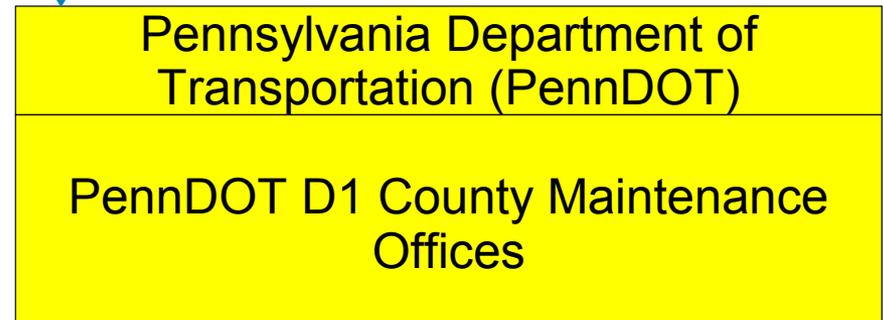
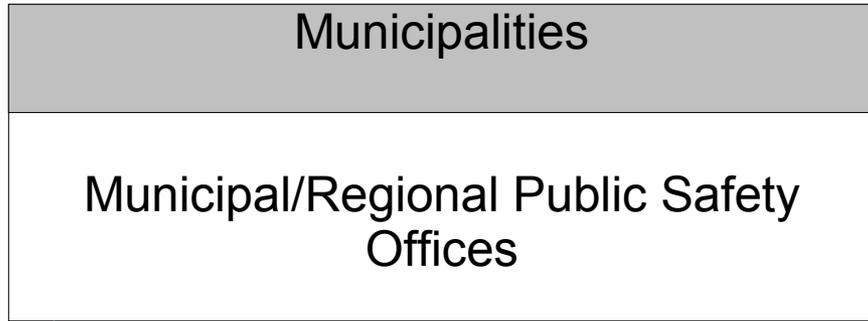




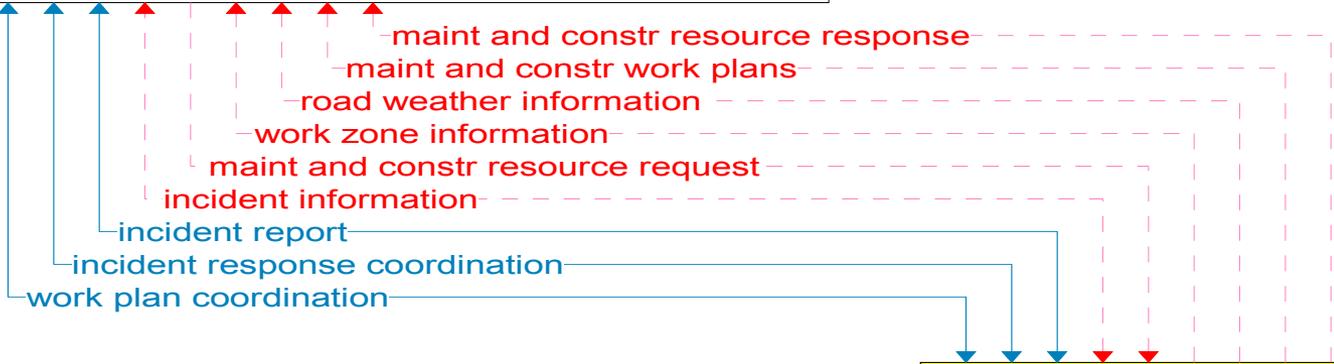
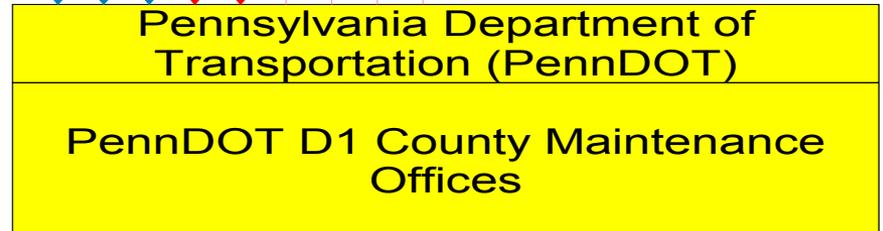
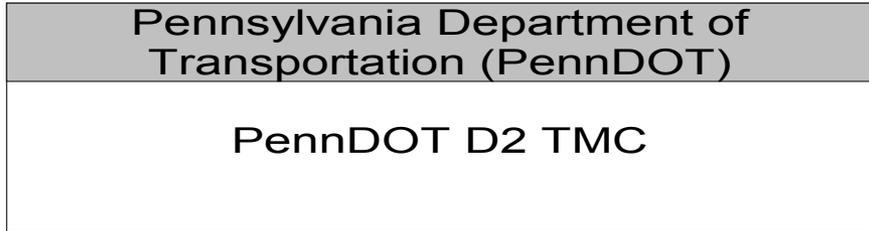
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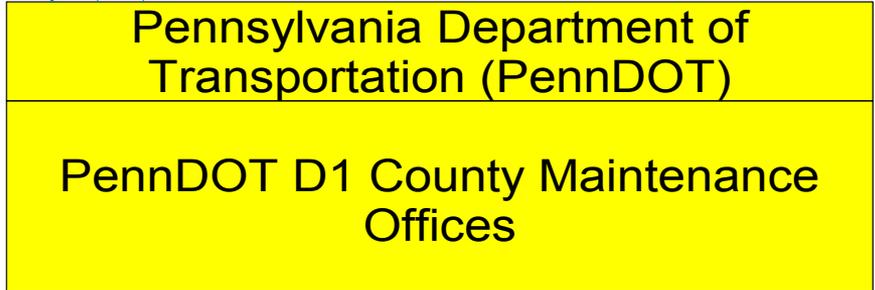
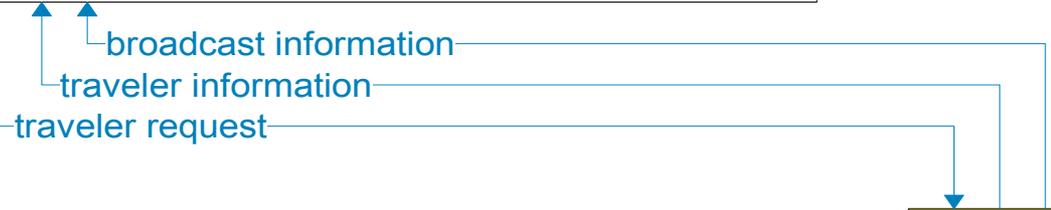
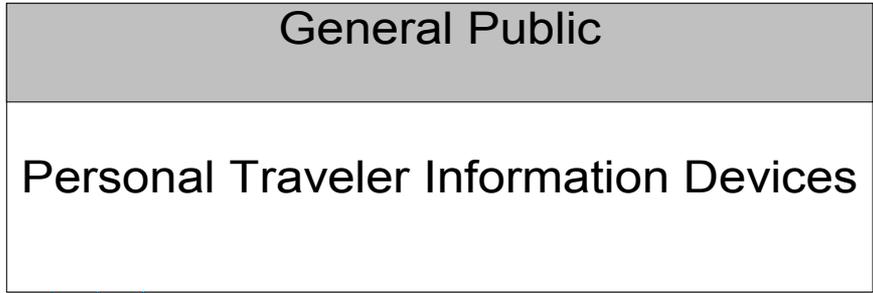
———— Existing
- - - - - Planned



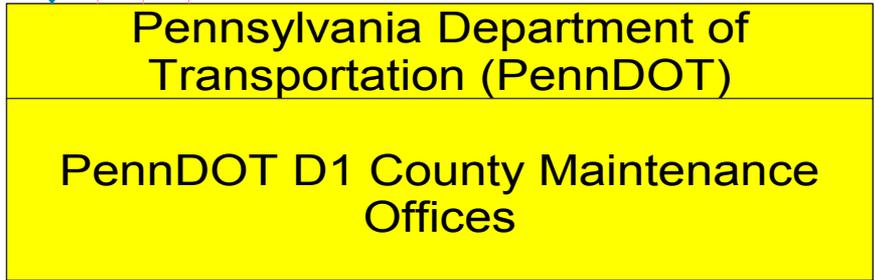
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- - - - - Planned



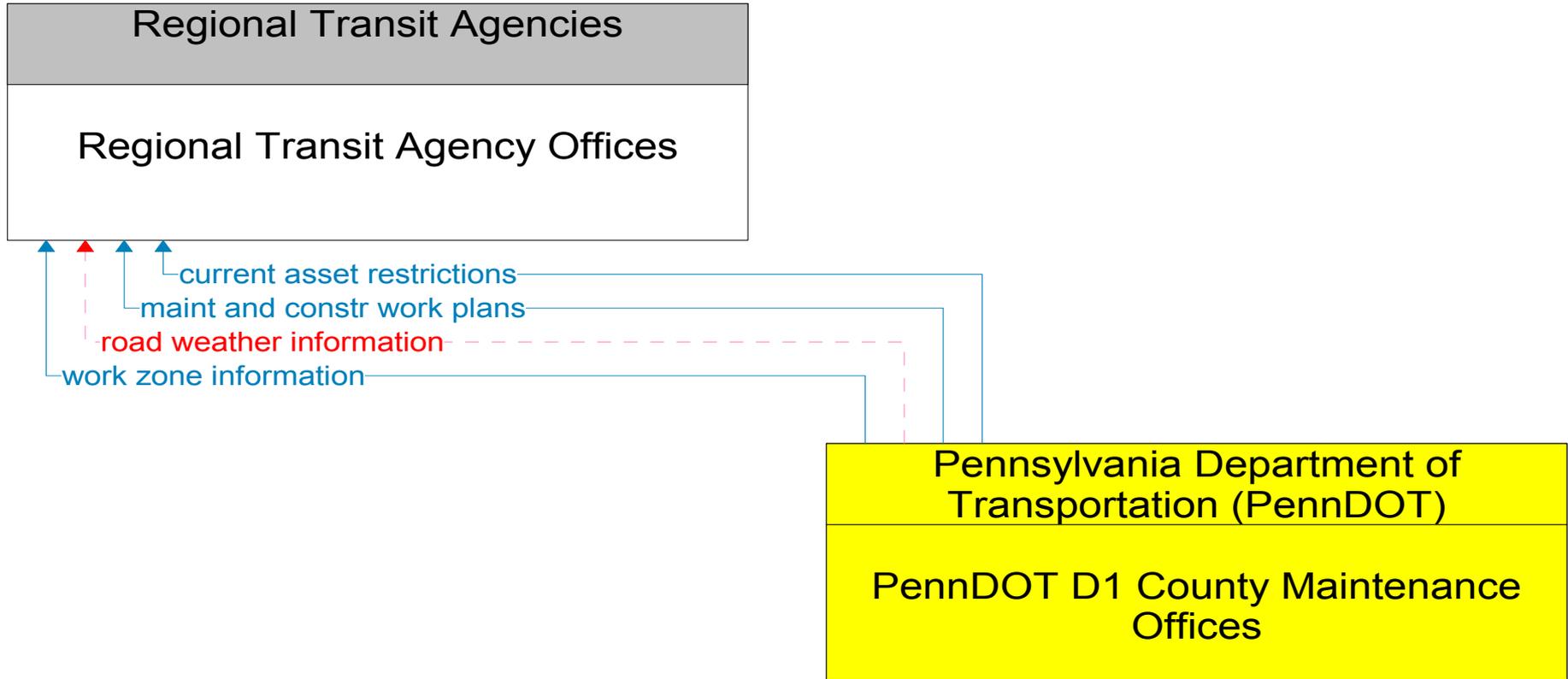
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Planned



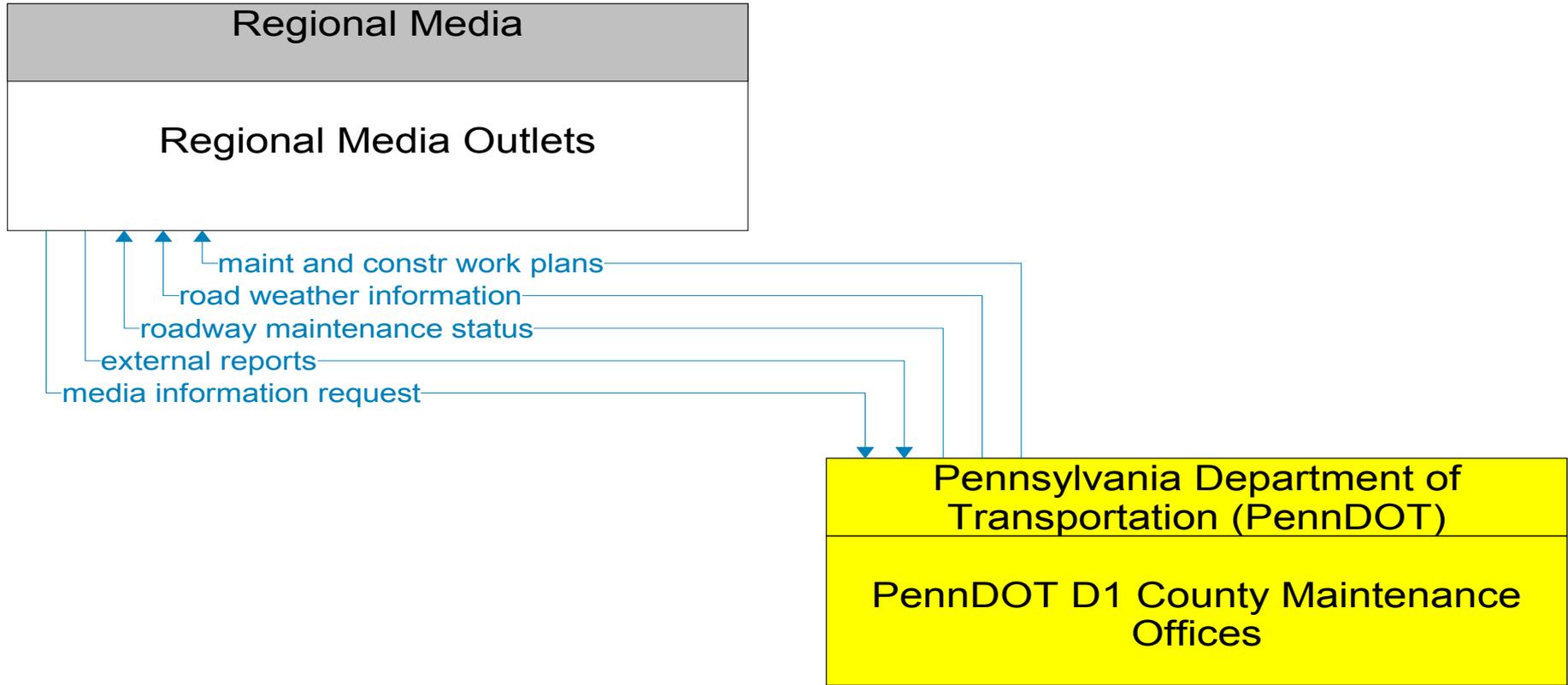
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Planned



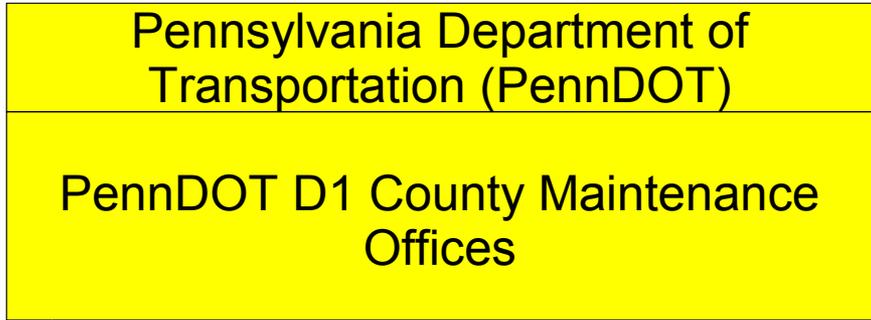
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Planned



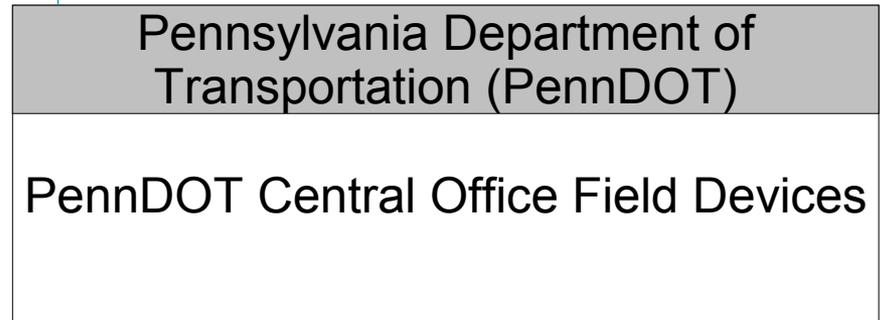
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- - - - - Planned



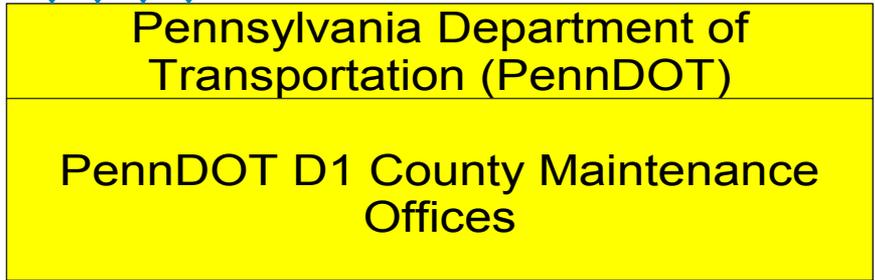
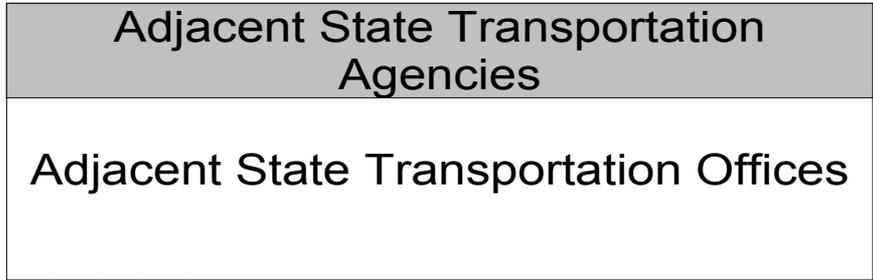
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- - - - - Planned



environmental conditions data



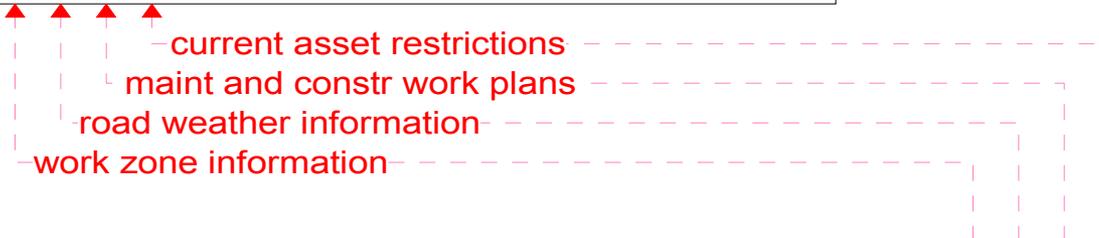
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———— Existing
----- Planned

Erie Metropolitan Transit Authority
(EMTA)

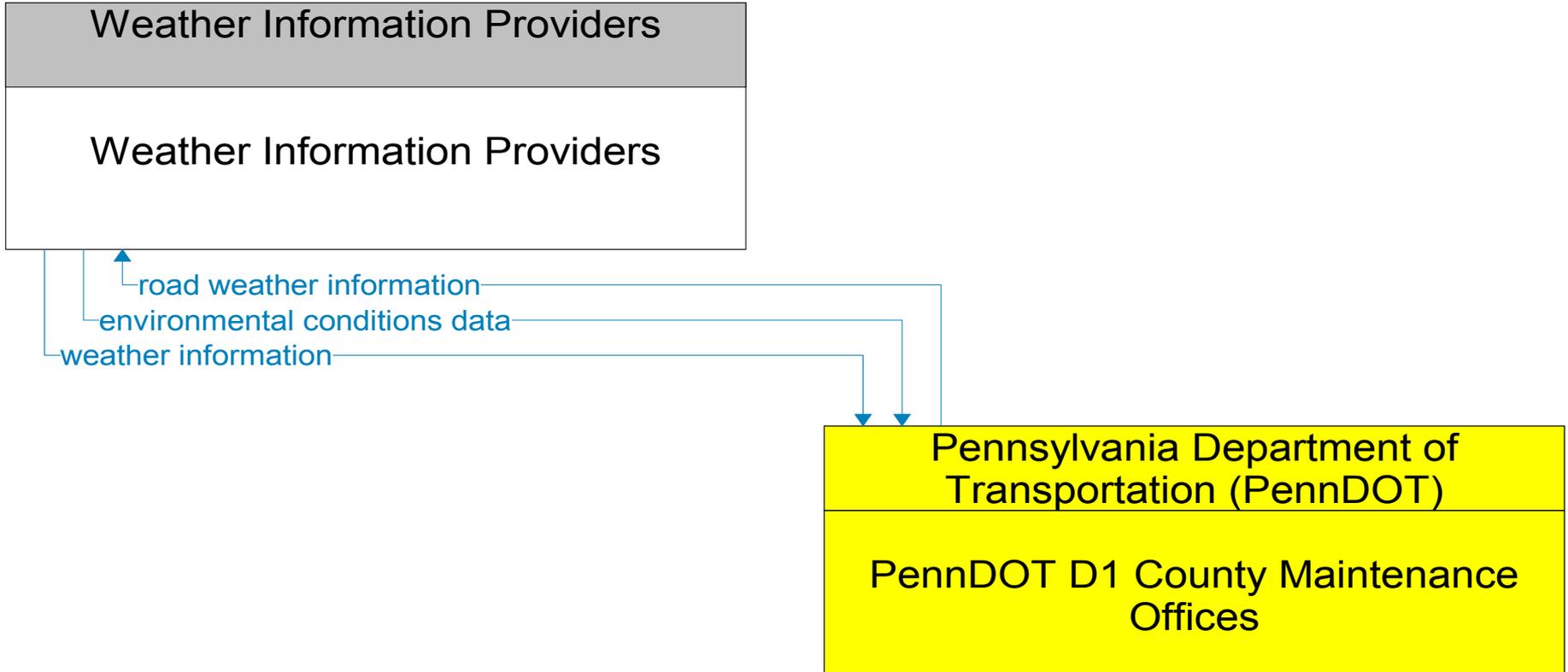
EMTA Offices



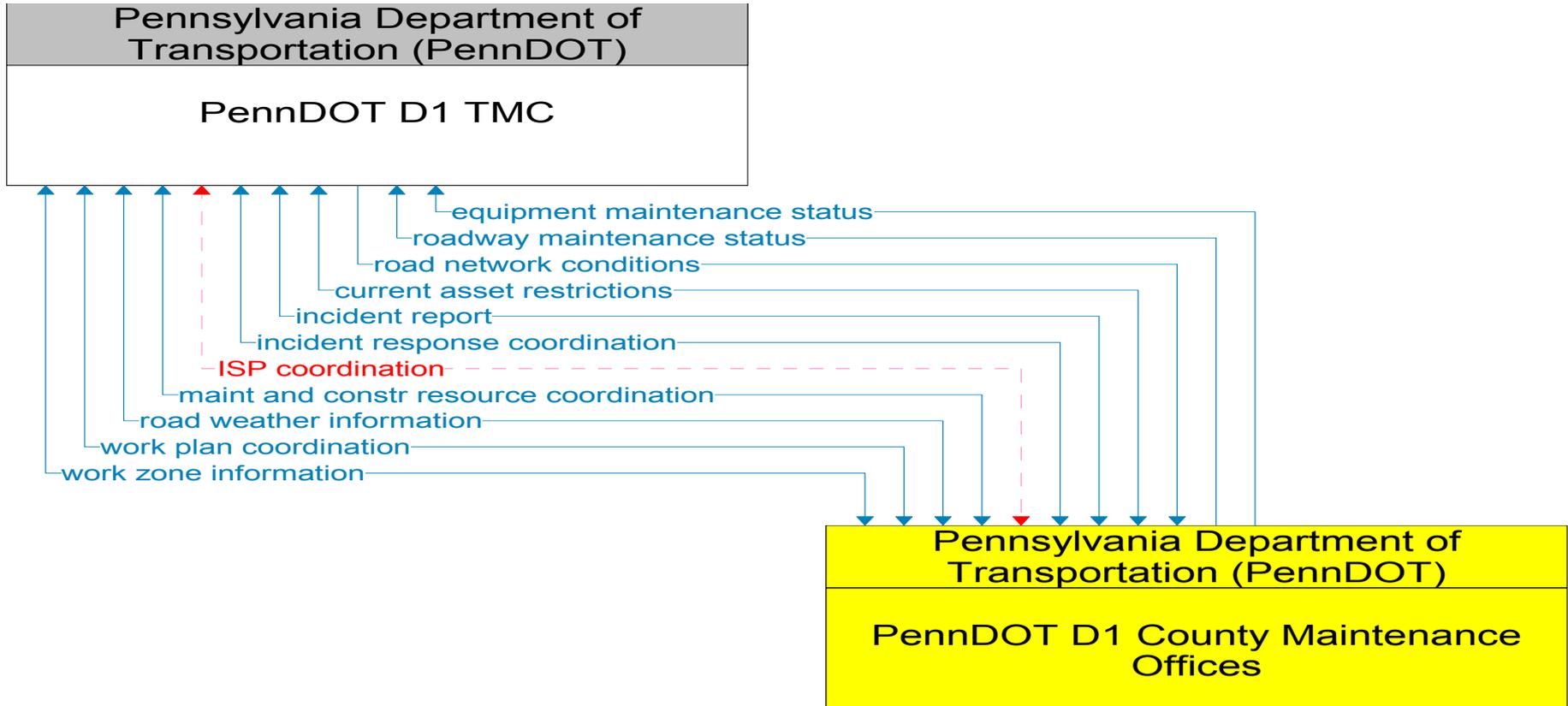
Pennsylvania Department of
Transportation (PennDOT)

PennDOT D1 County Maintenance
Offices

Existing
Planned

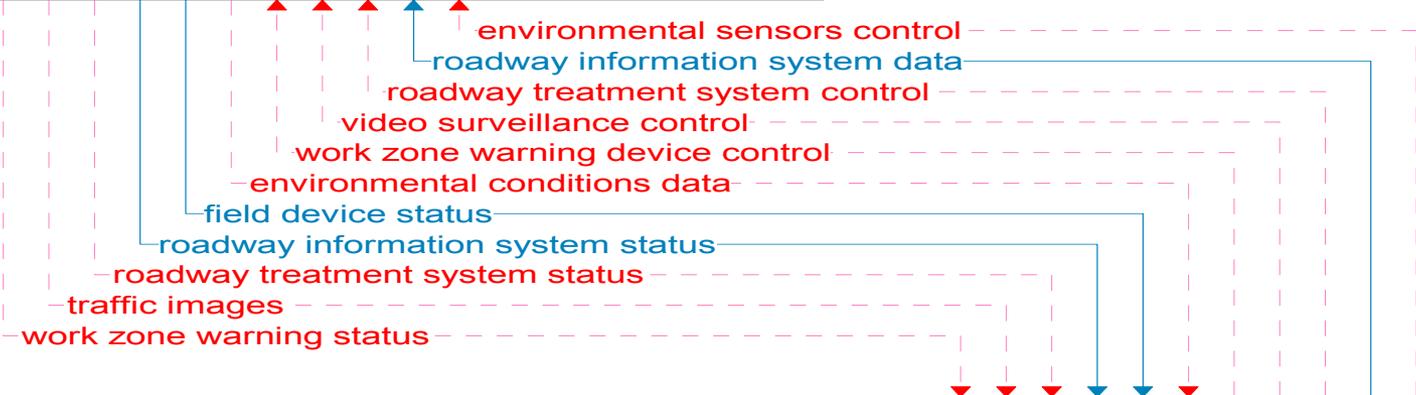


———— Existing
----- Planned



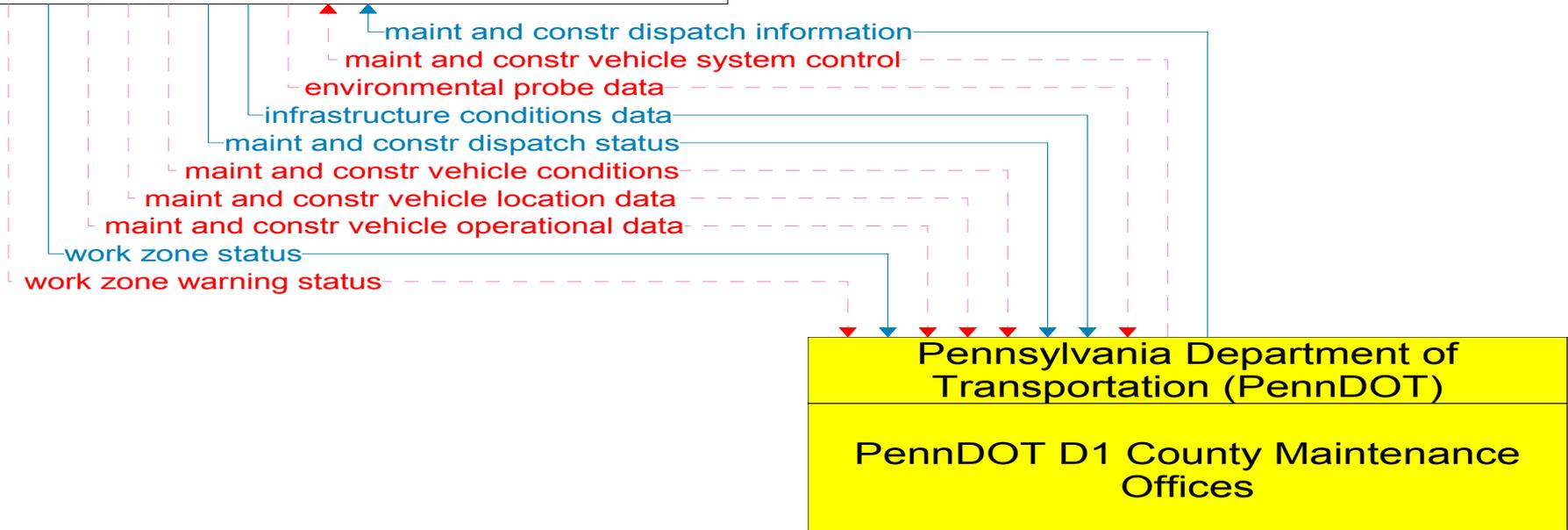
Pennsylvania Department of Transportation (PennDOT)
PennDOT D1 Field Devices

Pennsylvania Department of Transportation (PennDOT)
PennDOT D1 County Maintenance Offices



Existing
Planned

Pennsylvania Department of Transportation (PennDOT)
PennDOT D1 Vehicles



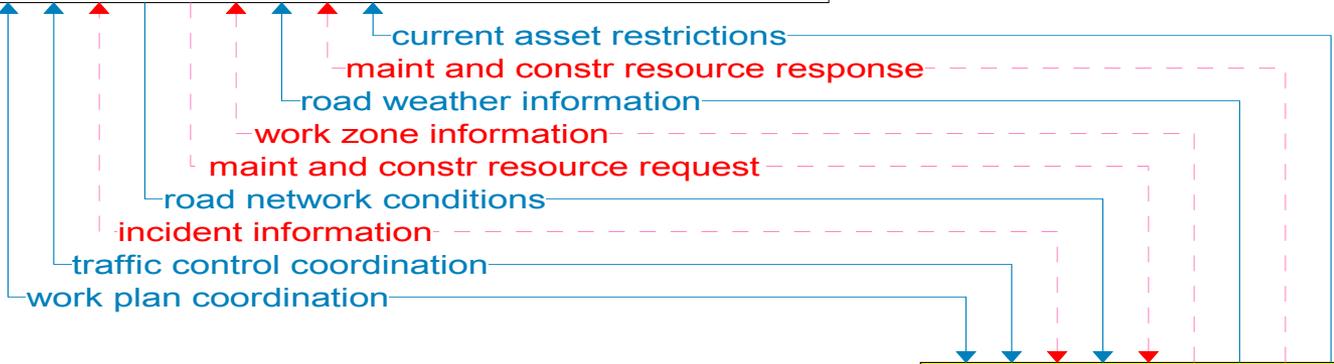
Existing
Planned

Pennsylvania Department of
Transportation (PennDOT)

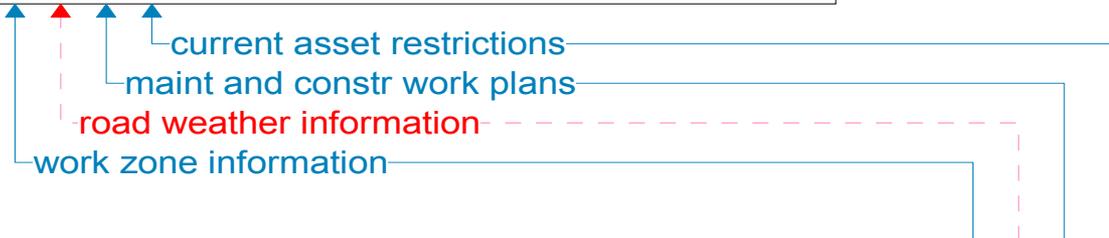
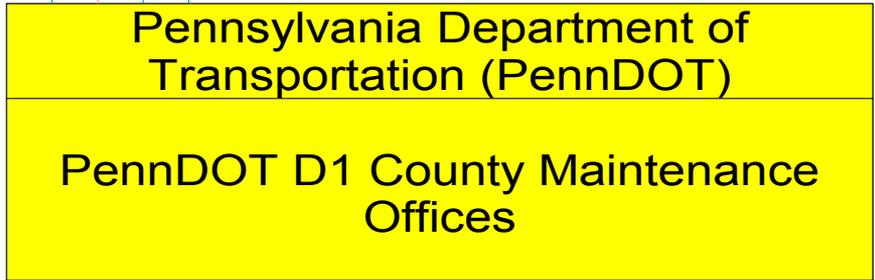
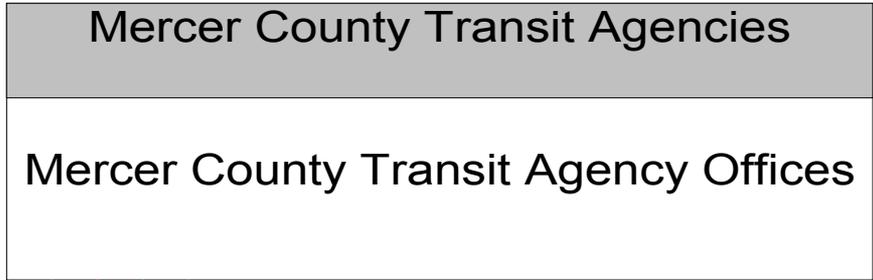
PennDOT D11 RTMC

Pennsylvania Department of
Transportation (PennDOT)

PennDOT D1 County Maintenance
Offices



———— Existing
- - - - - Planned

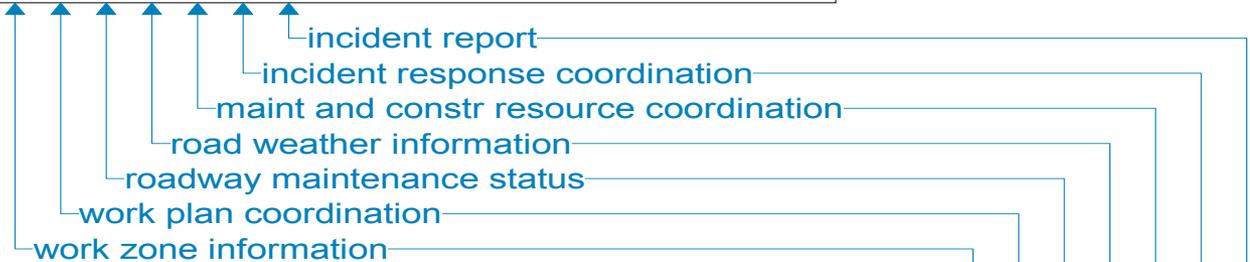


Existing

Planned

Pennsylvania Department of
Transportation (PennDOT)

Adjacent PennDOT County
Maintenance Offices



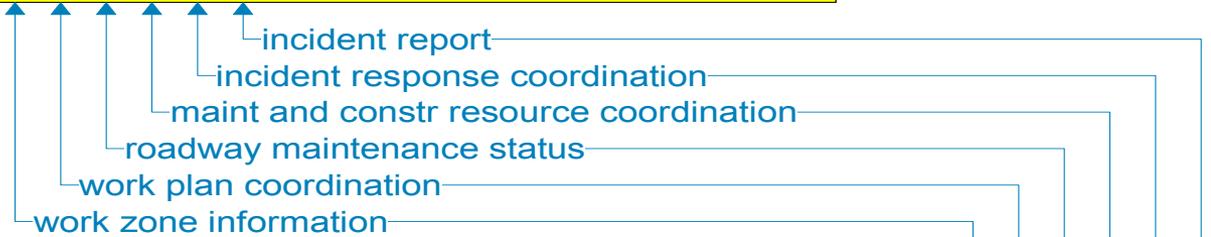
Pennsylvania Department of
Transportation (PennDOT)

PennDOT D1 County Maintenance
Offices

Existing
Planned

Pennsylvania Department of
Transportation (PennDOT)

PennDOT D1 County Maintenance
Offices

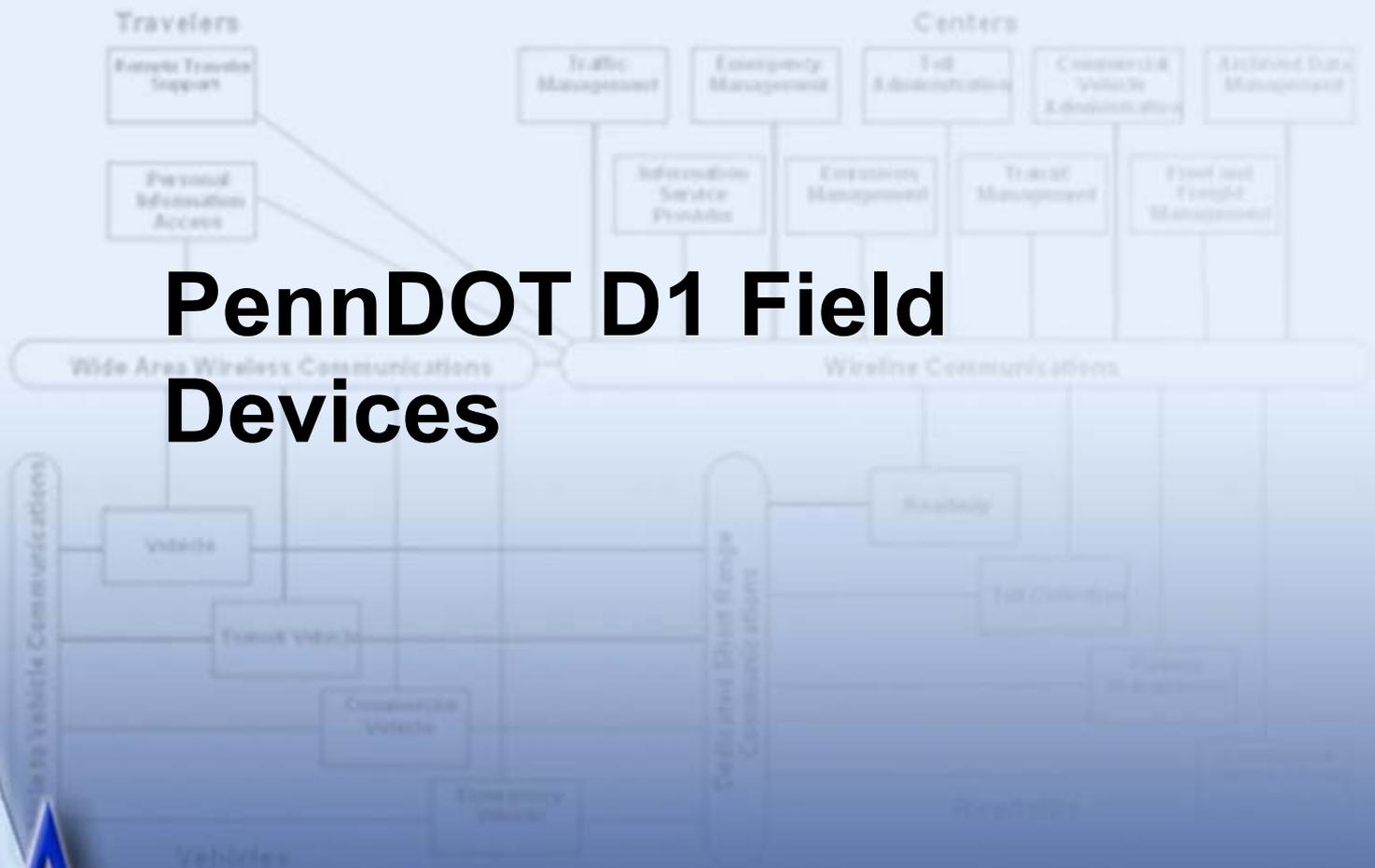


Pennsylvania Department of
Transportation (PennDOT)

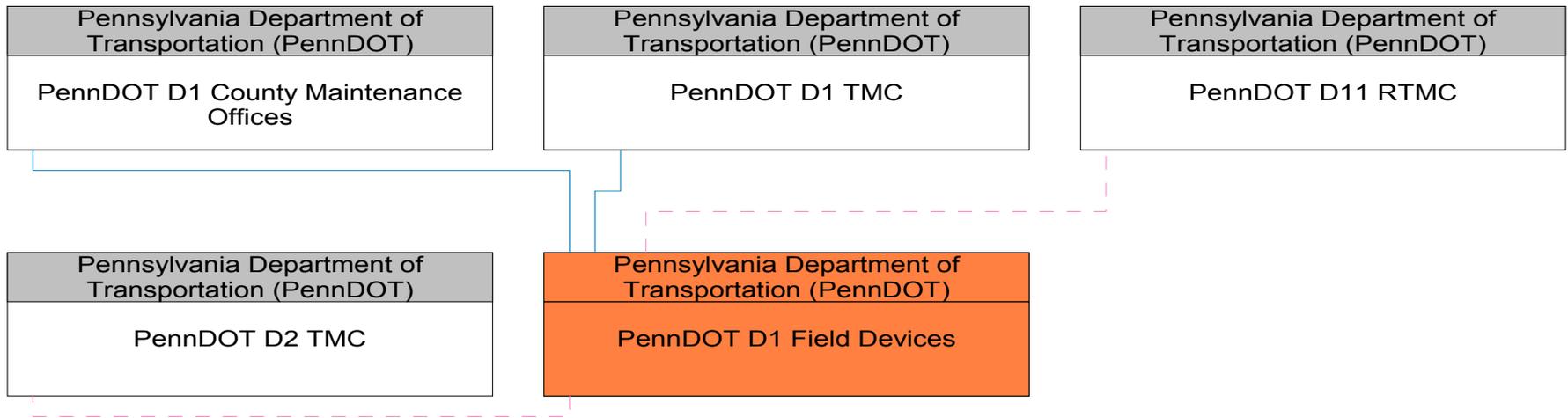
PennDOT D10 County Maintenance
Offices

———— Existing
- - - - - Planned

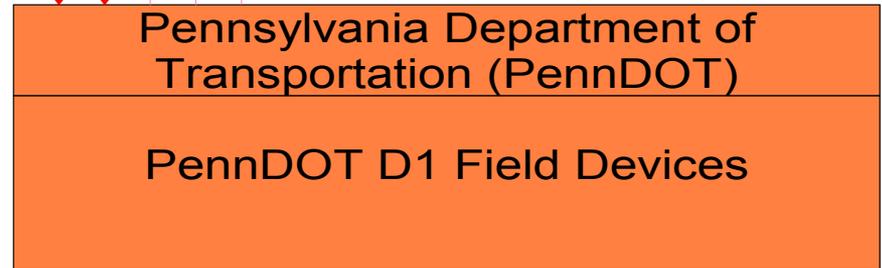
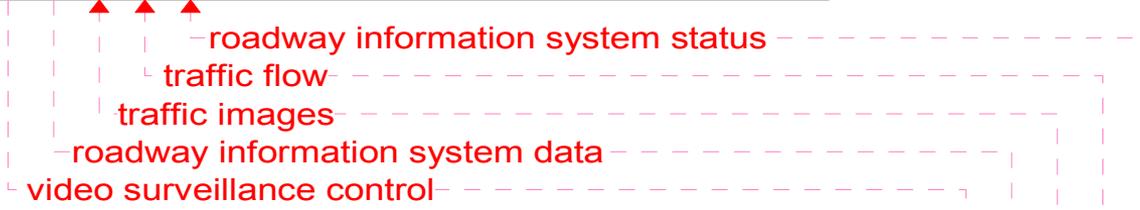
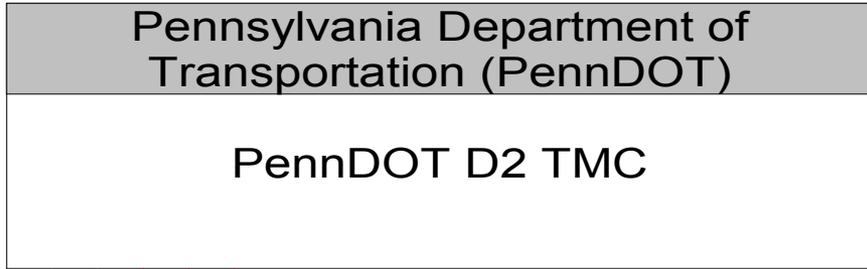
PennDOT D1 Field Devices



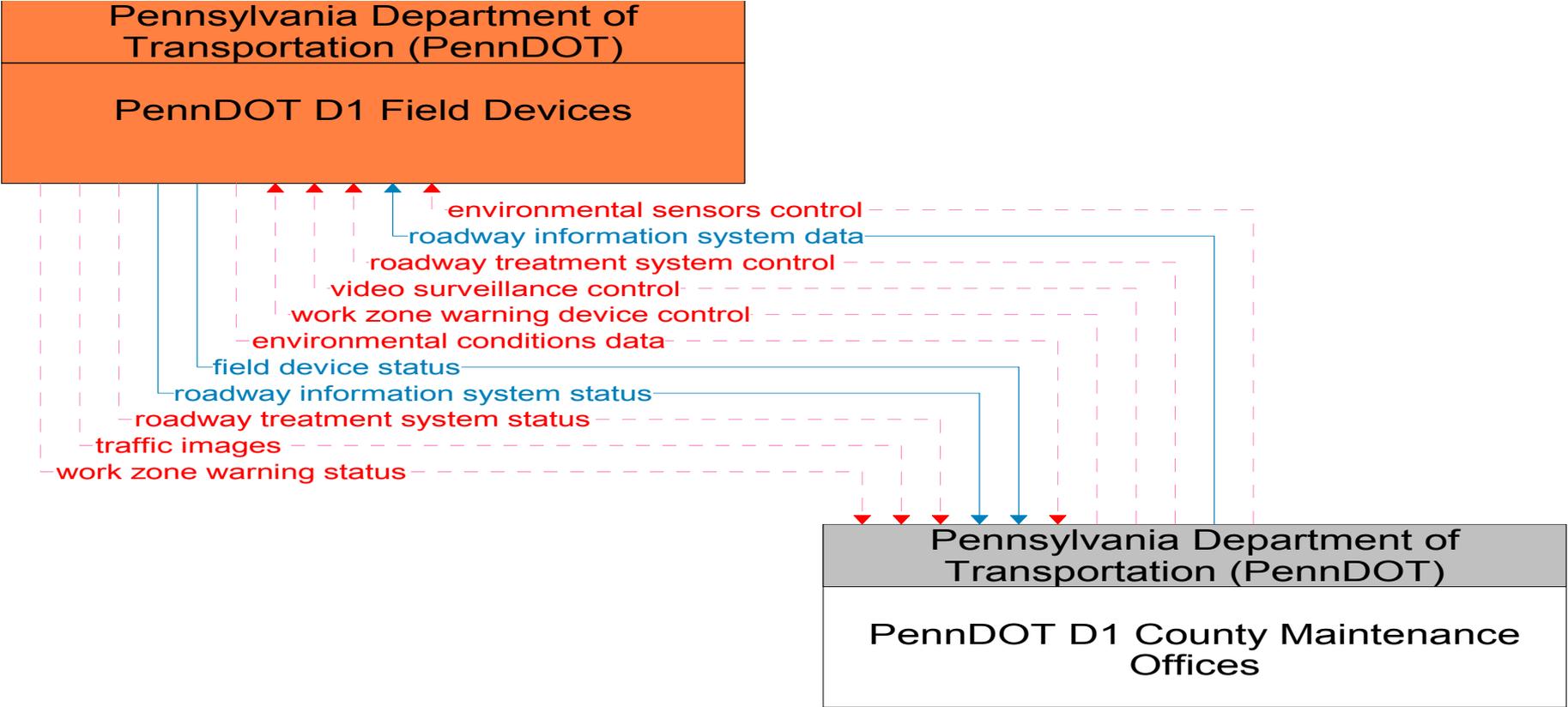
PennDOT D1 Field Devices Interconnect Diagram



— Existing
- - - Planned



Existing
Planned



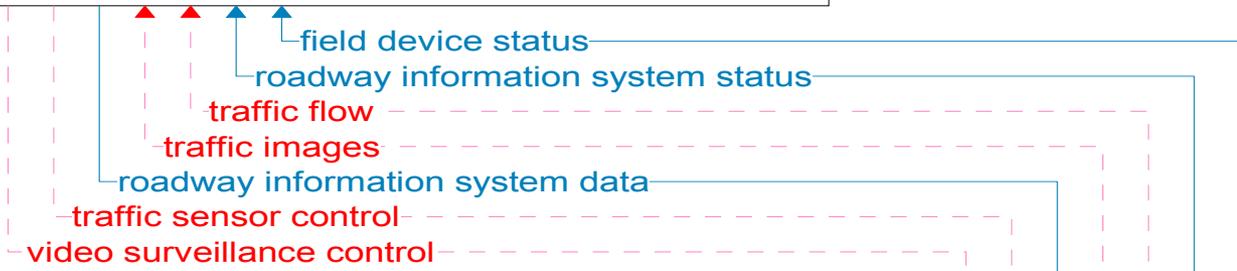
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- - - - - Planned

Pennsylvania Department of
Transportation (PennDOT)

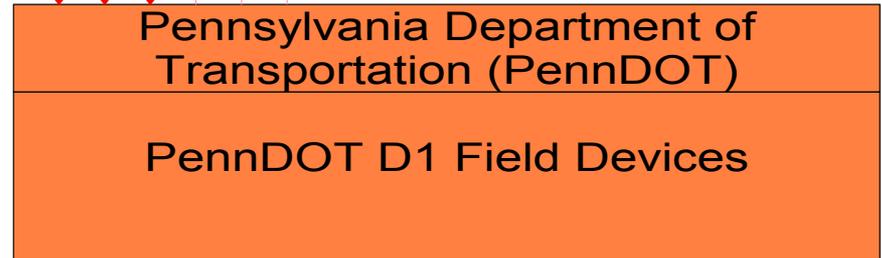
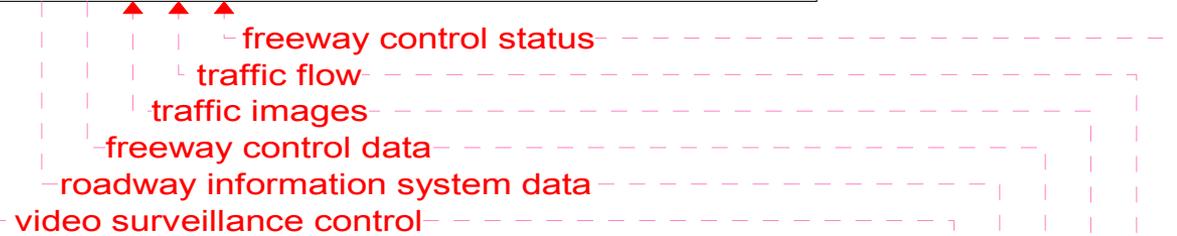
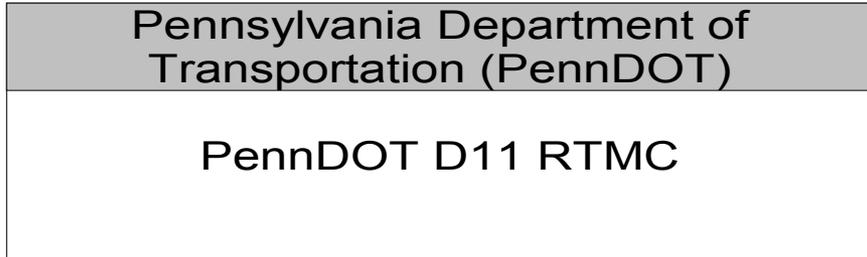
PennDOT D1 TMC

Pennsylvania Department of
Transportation (PennDOT)

PennDOT D1 Field Devices

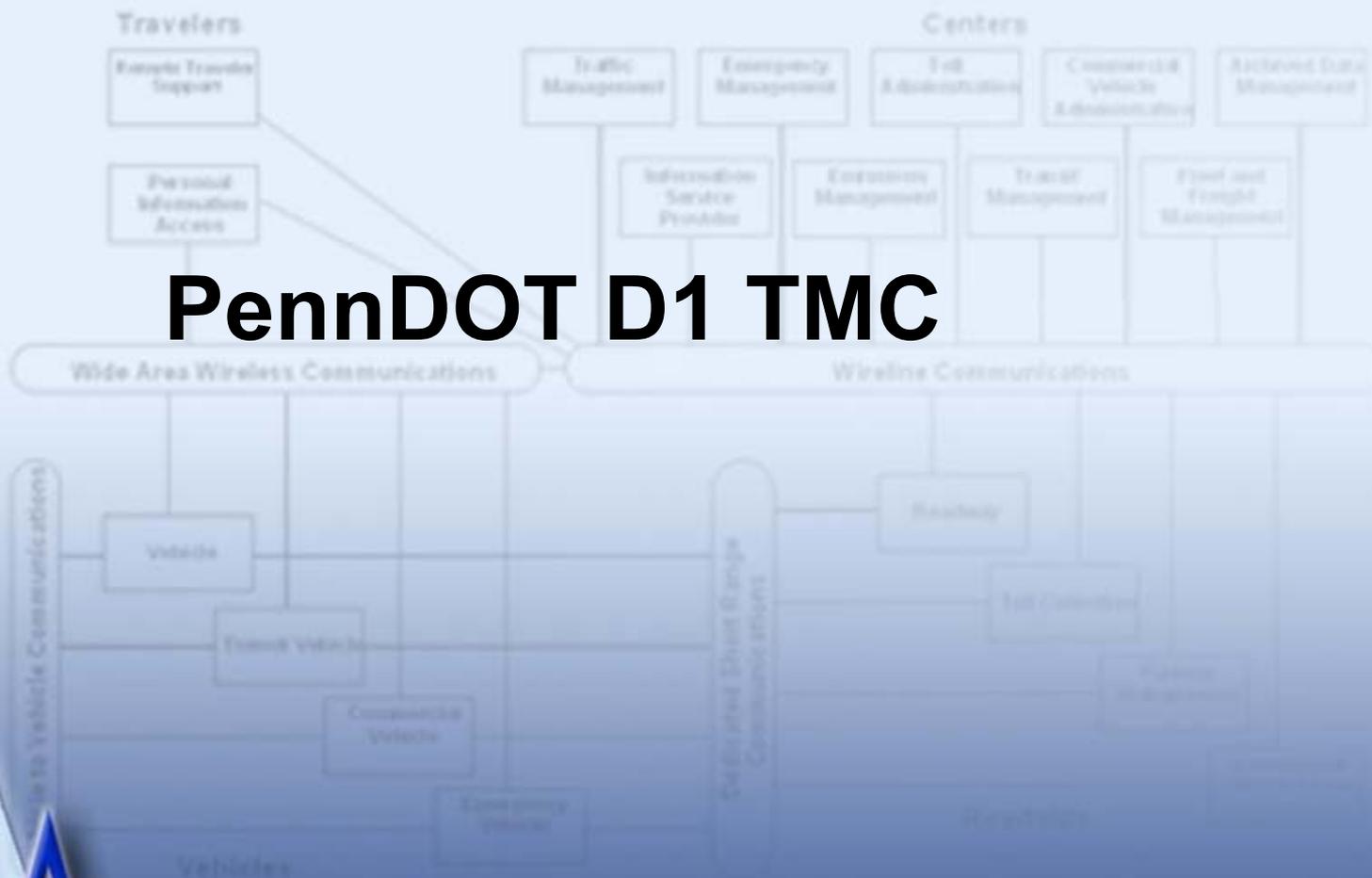


Existing
Planned



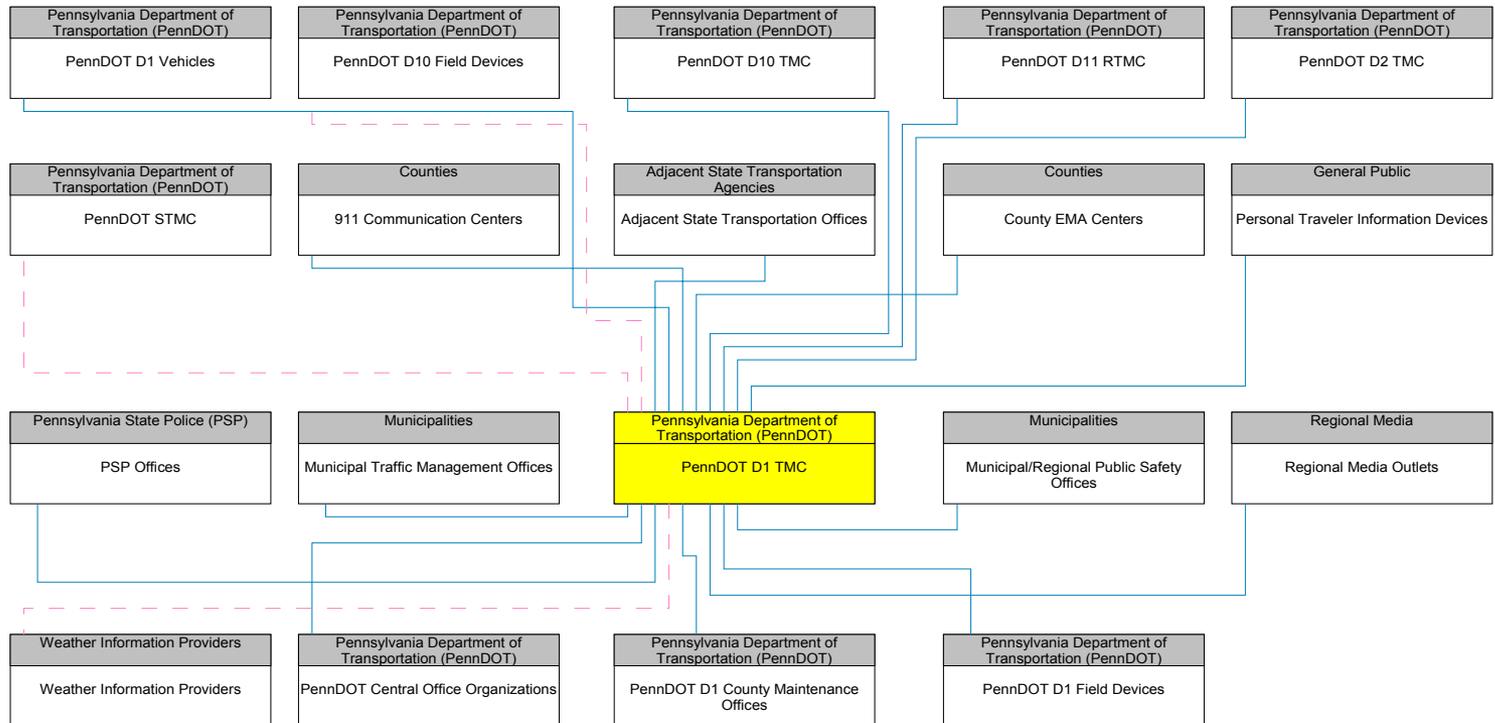
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PennDOT D1 TMC

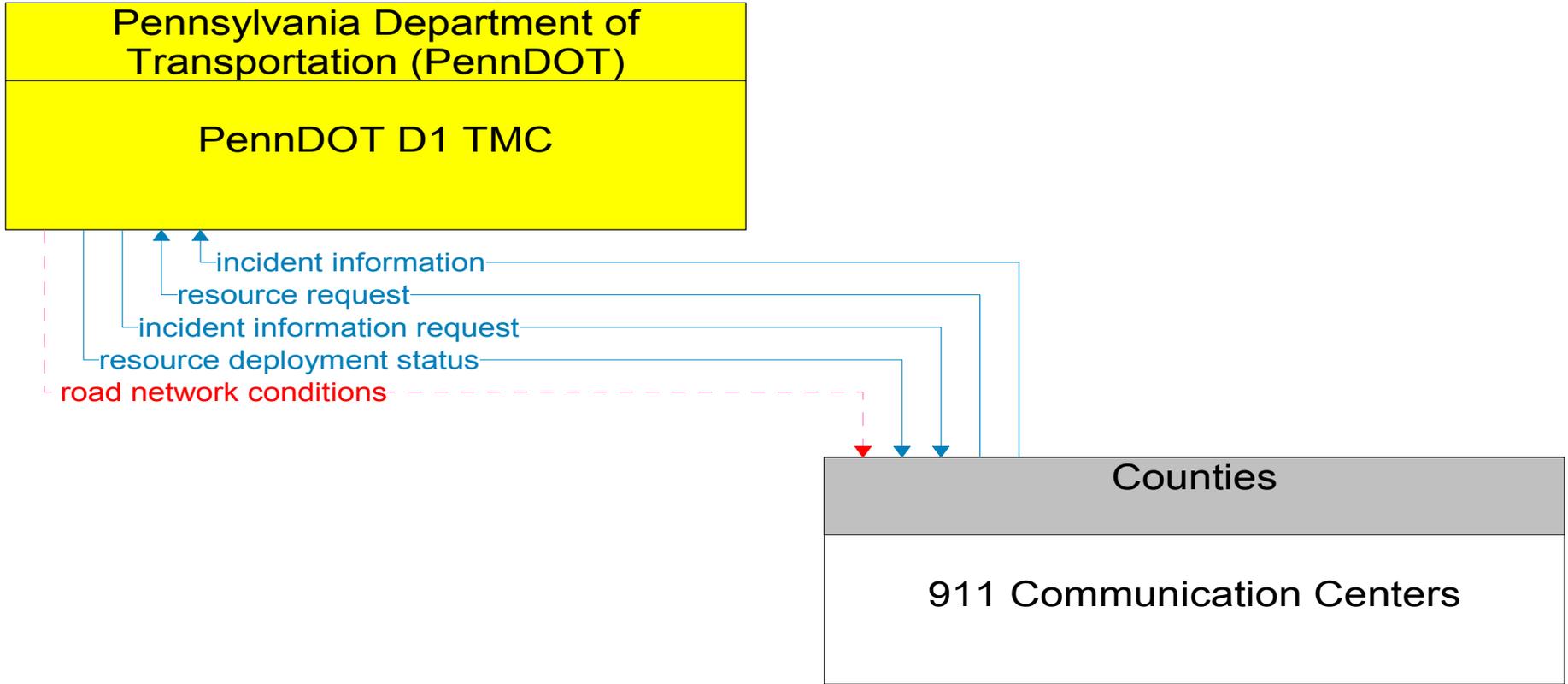


PA

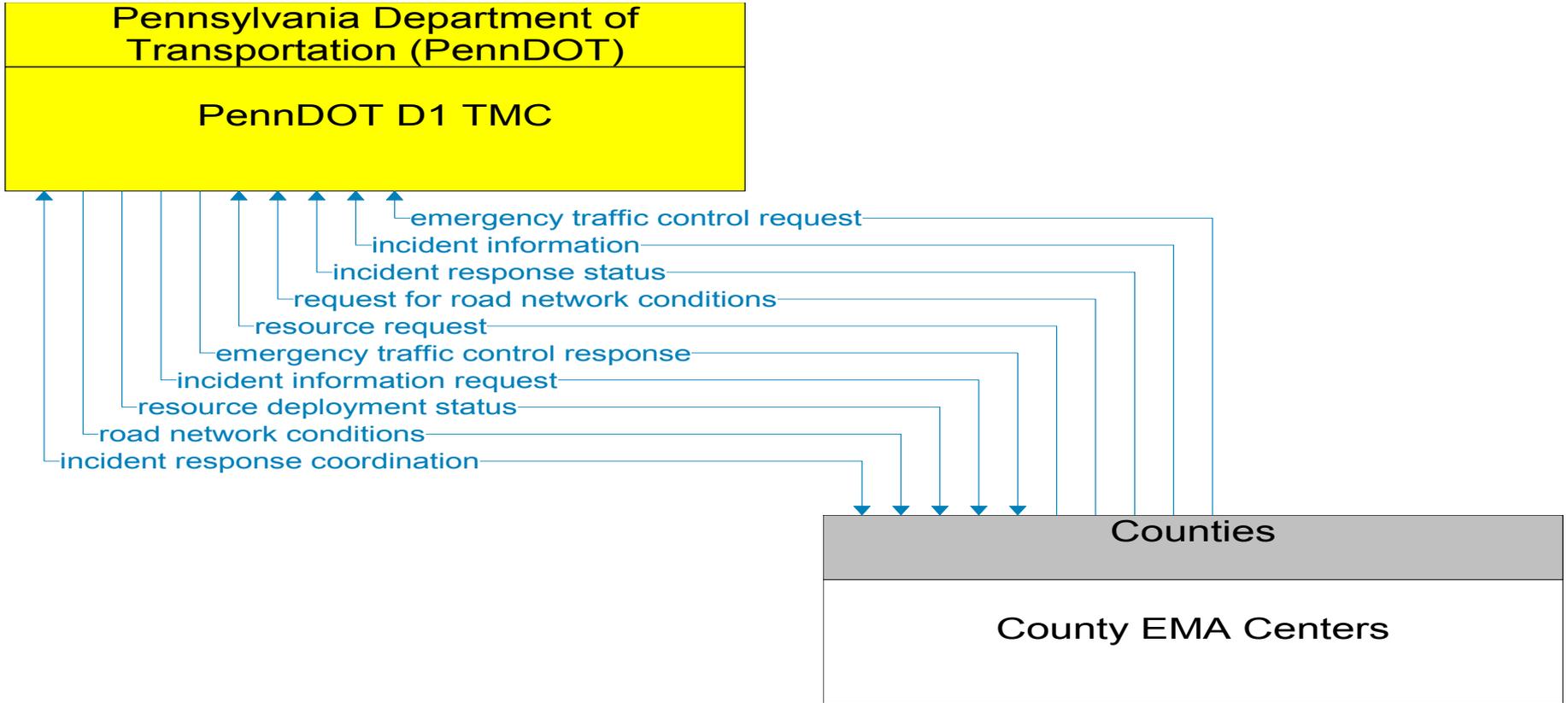
PennDOT D1 TMC Interconnect Diagram



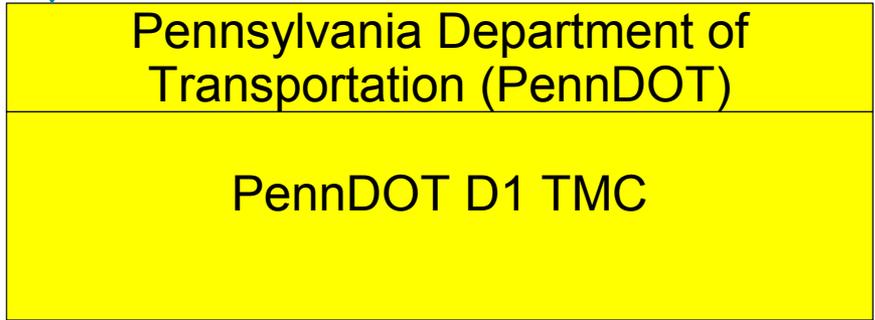
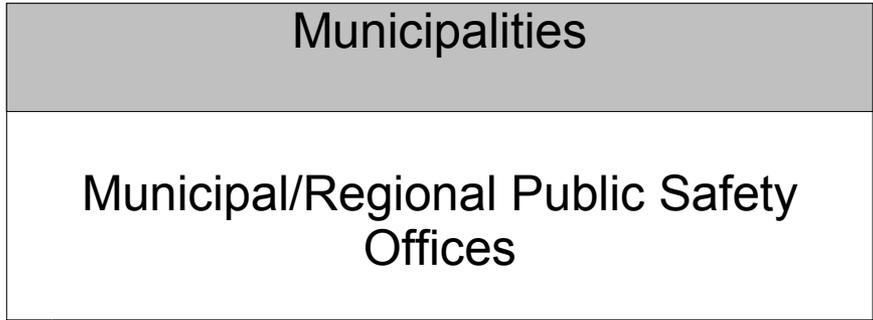
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- - - Planned



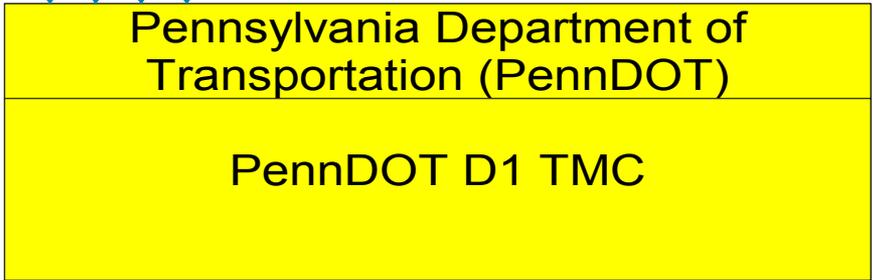
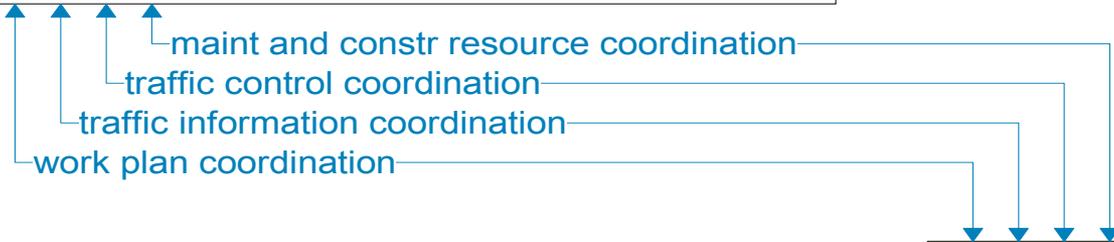
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- - - - - Planned



———— Existing
- - - - - Planned

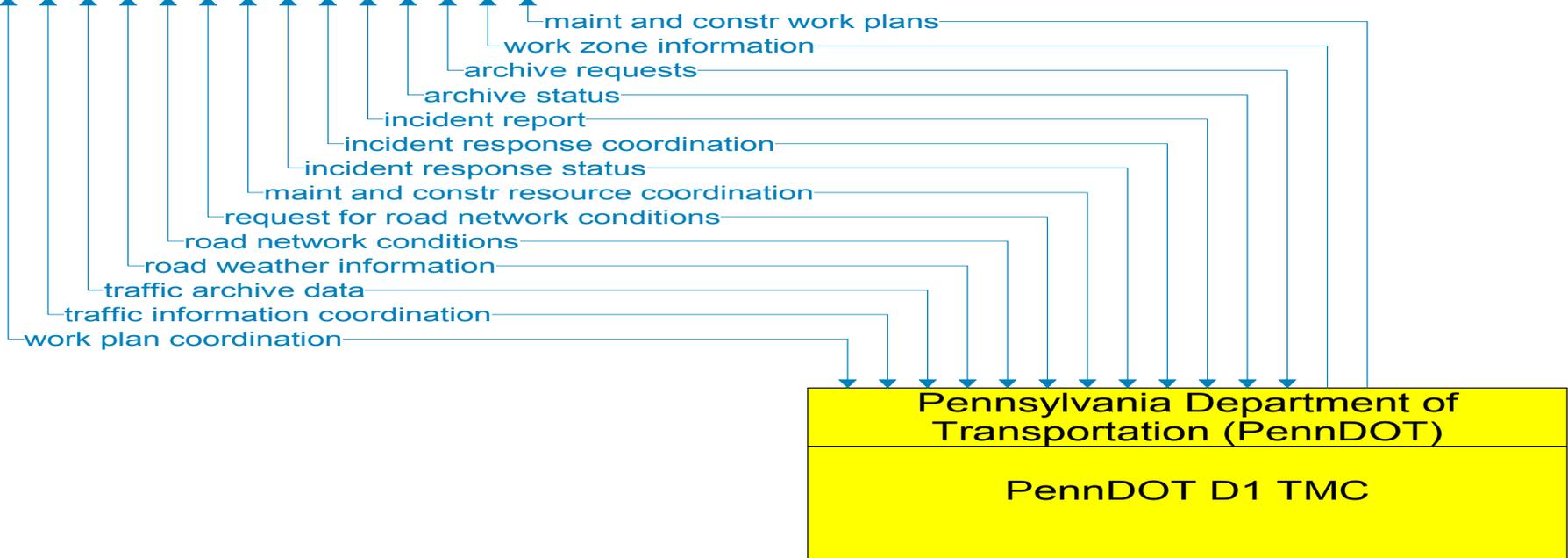


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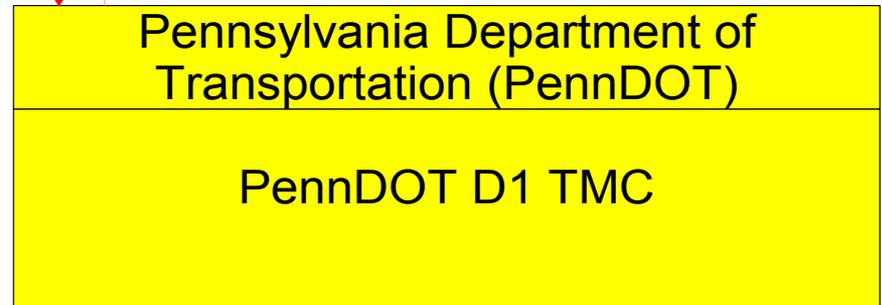
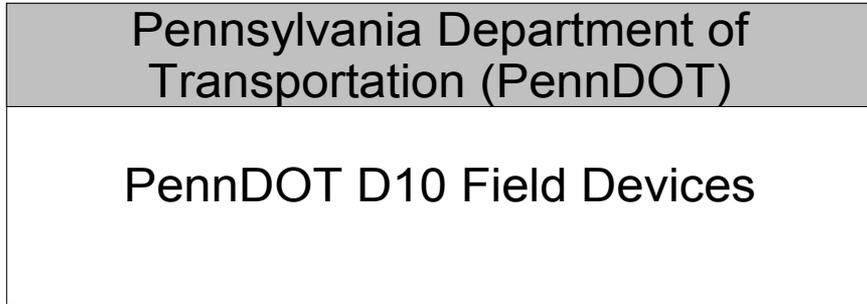


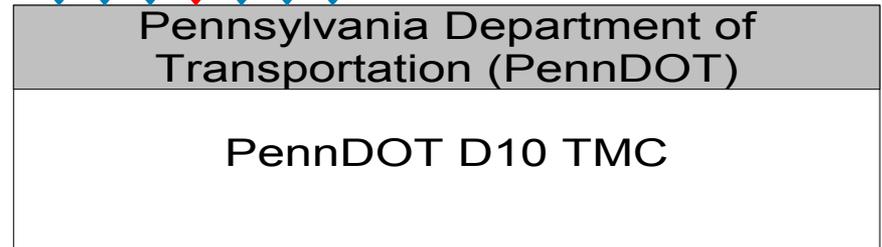
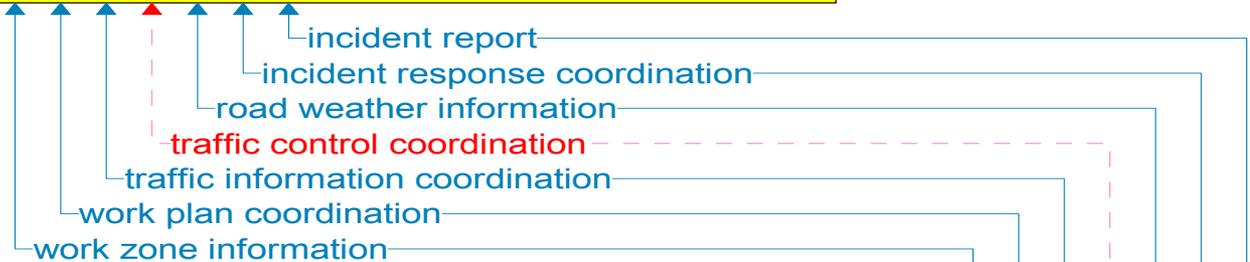
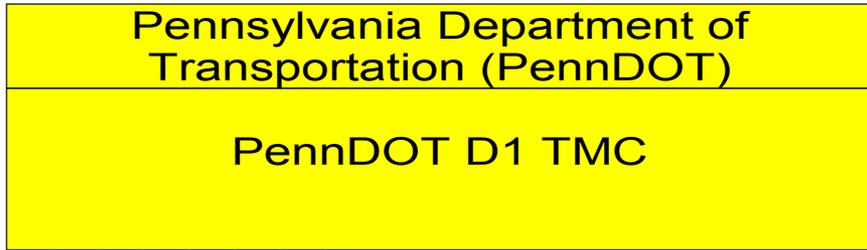
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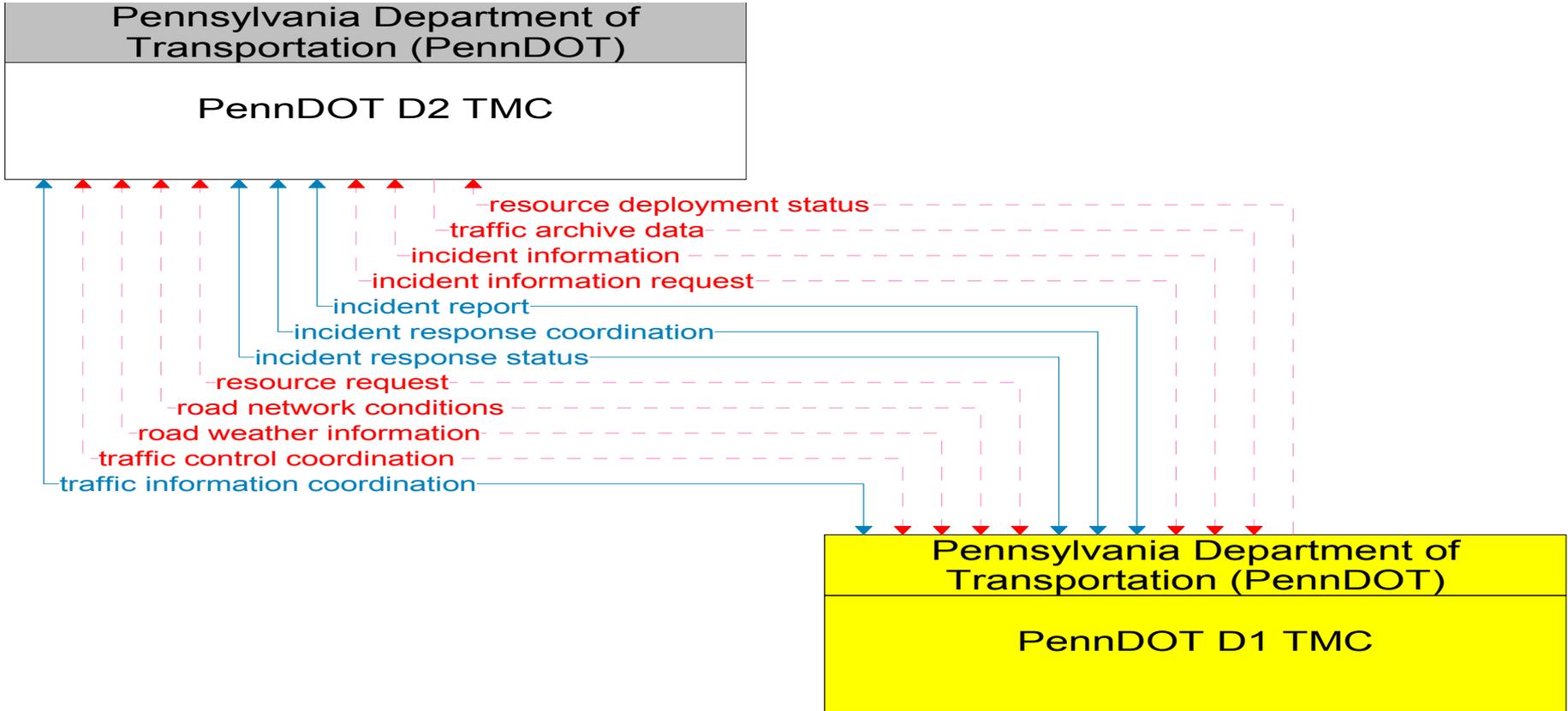
Pennsylvania Department of Transportation (PennDOT)
PennDOT Central Office Organizations



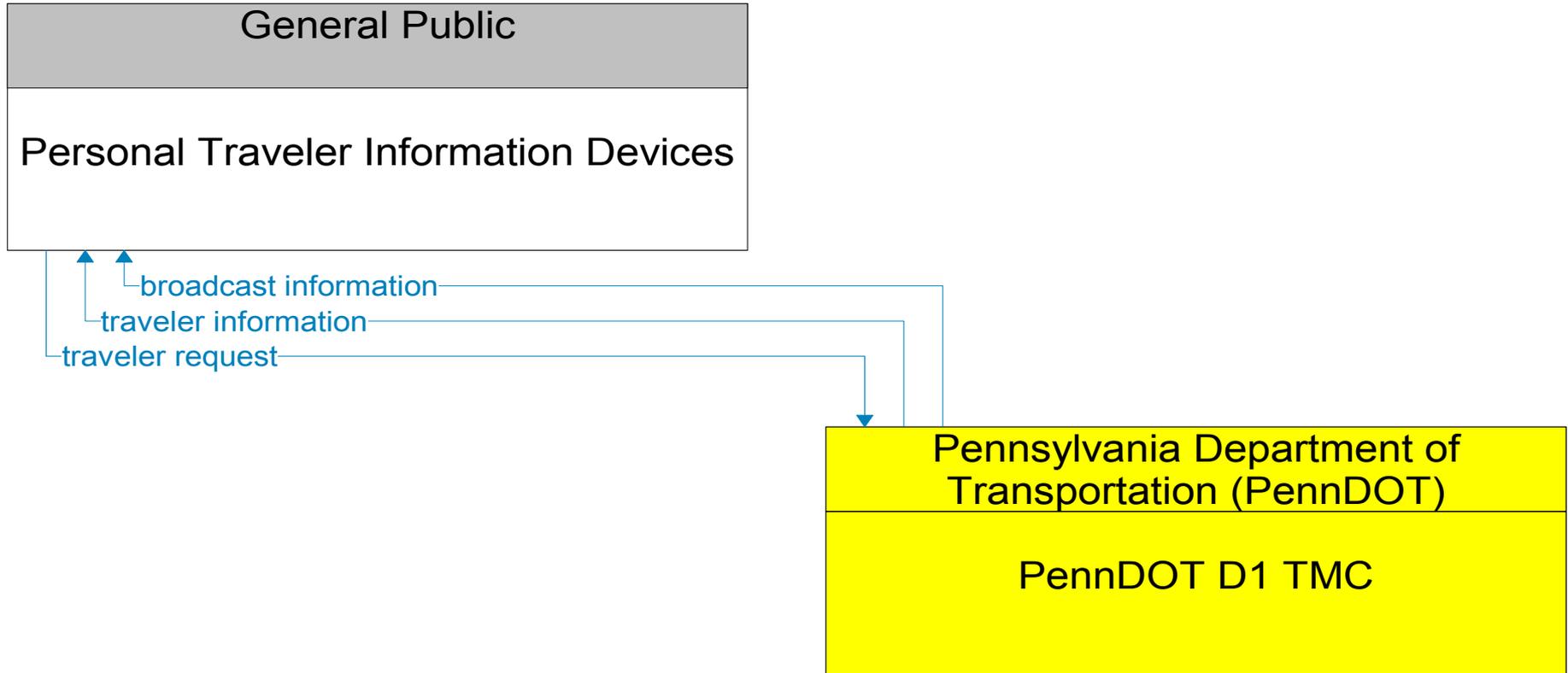
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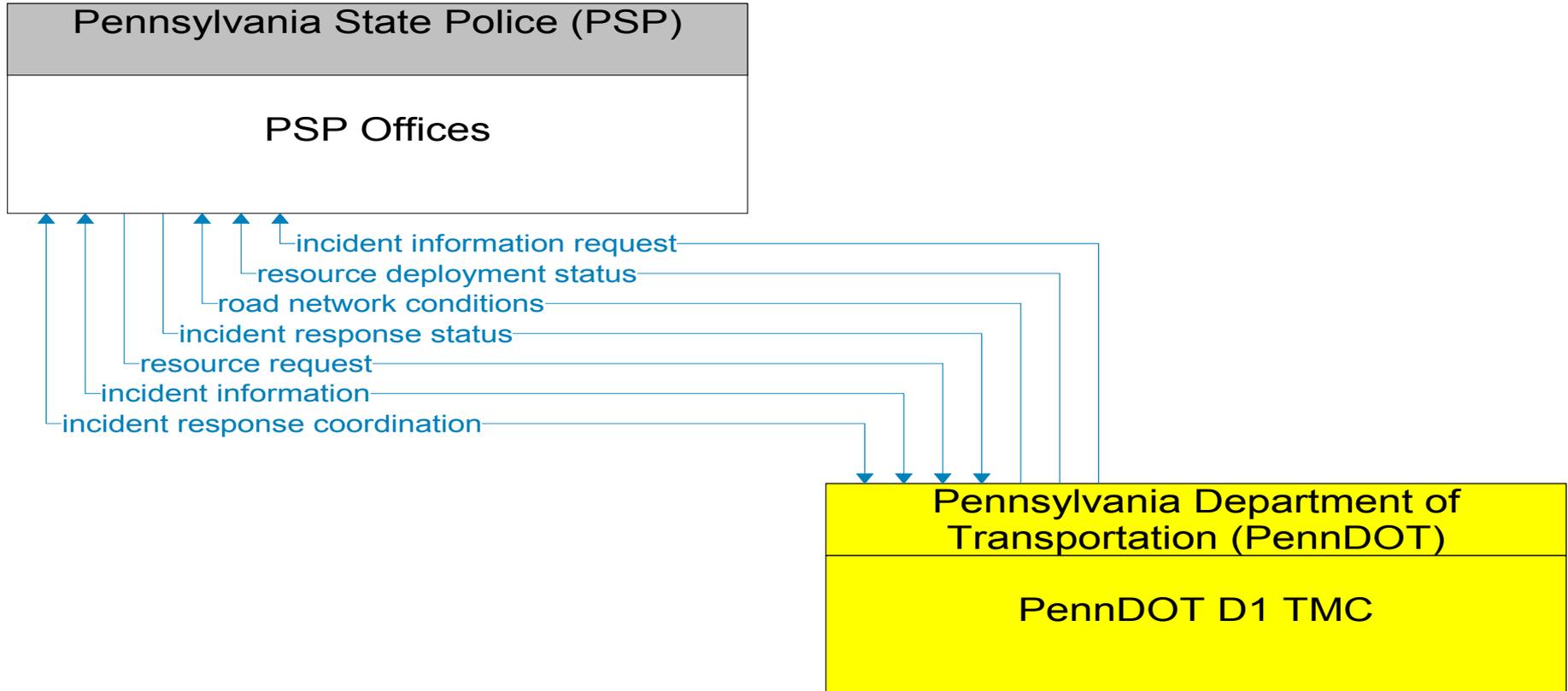


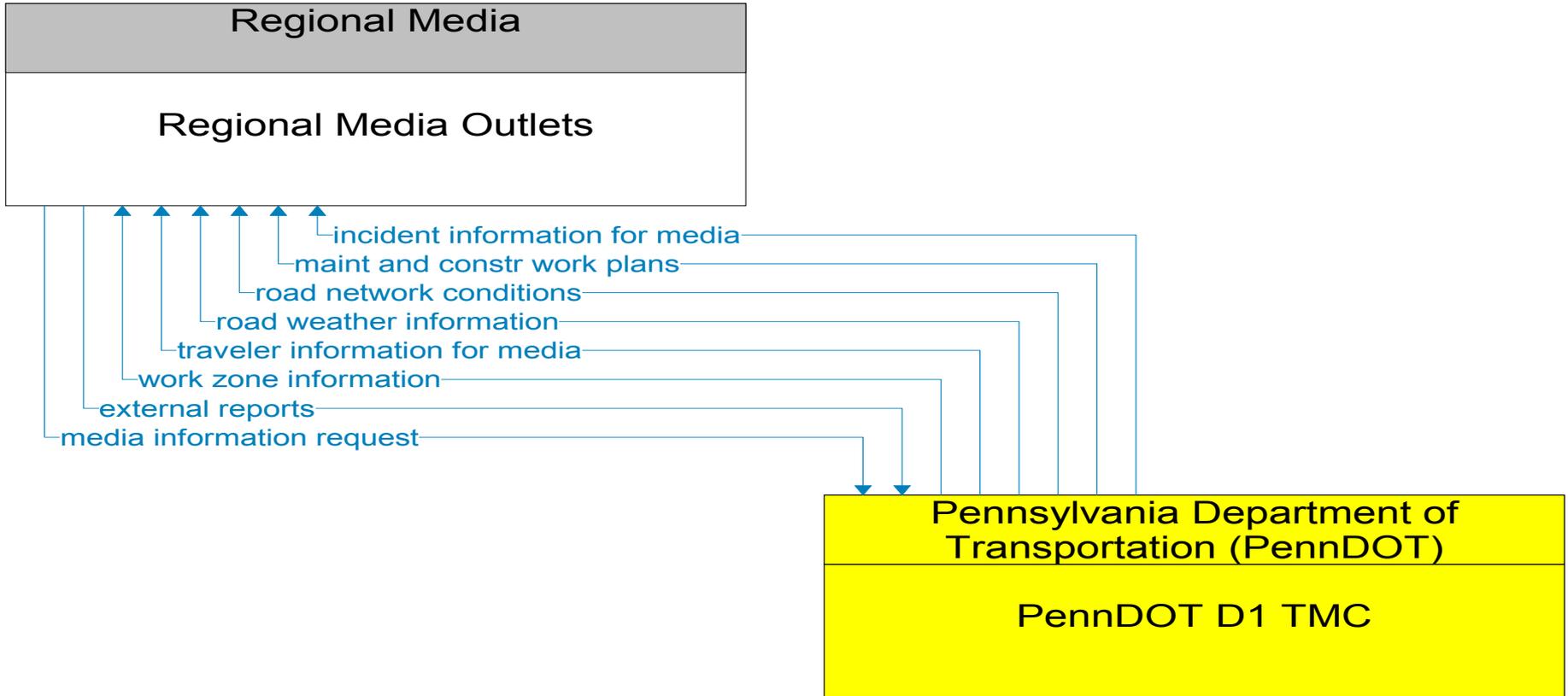


Existing
Planned

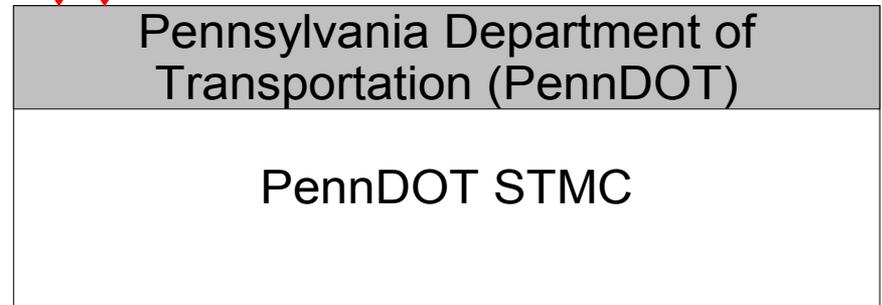
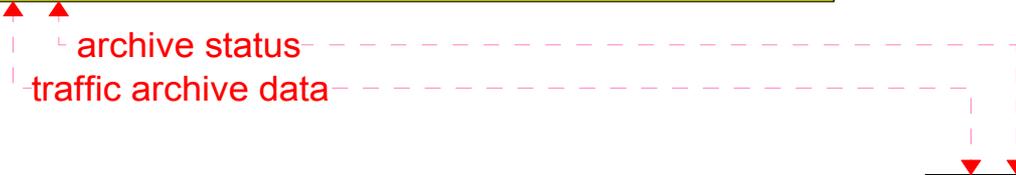
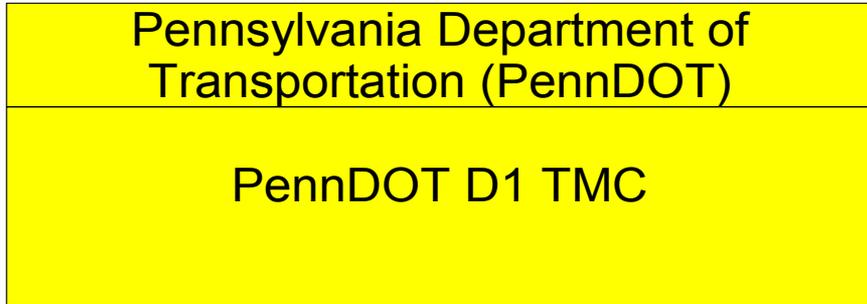


— Existing
- - - Planned

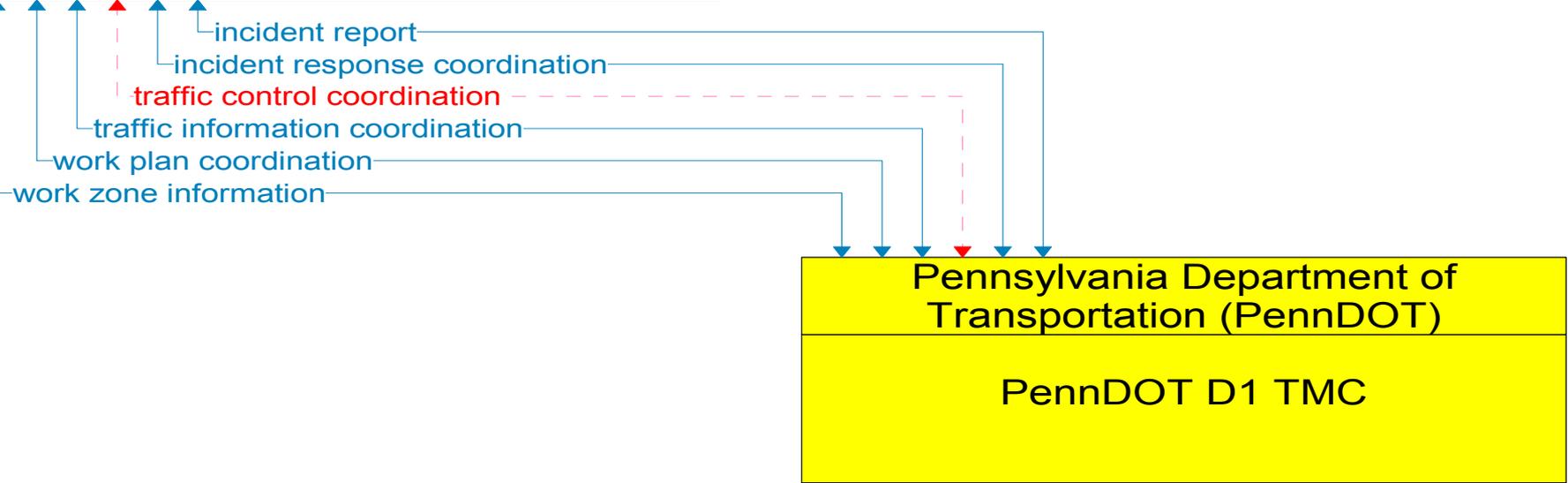




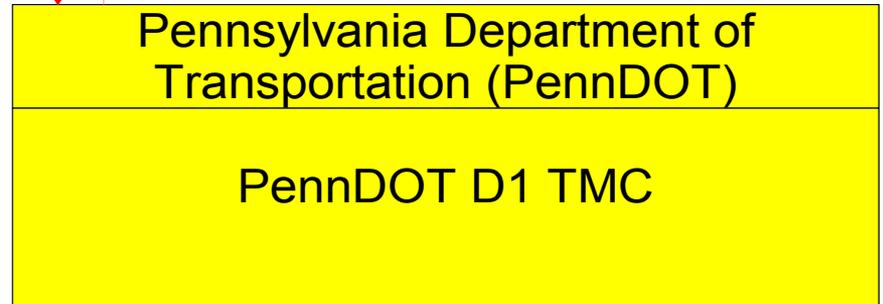
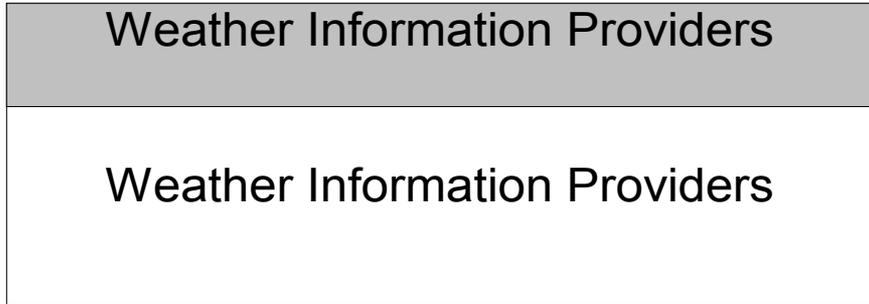
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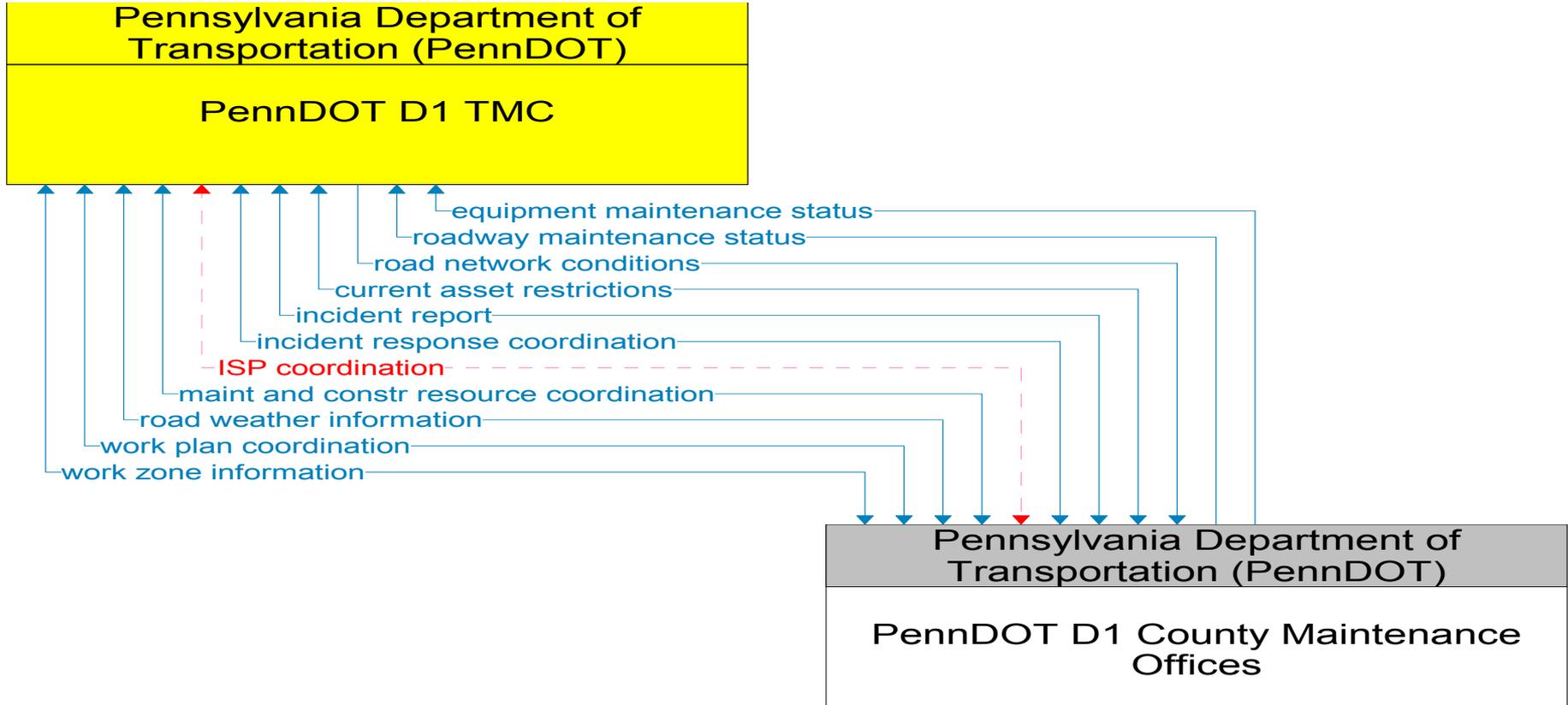
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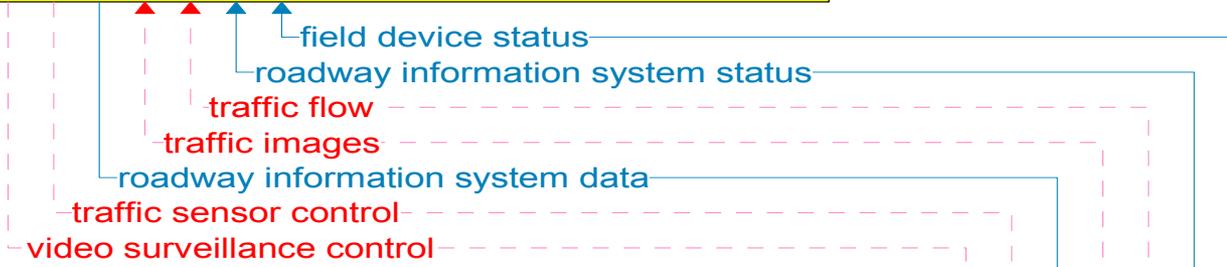
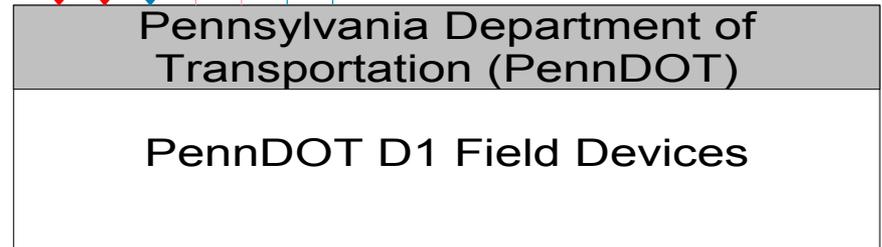
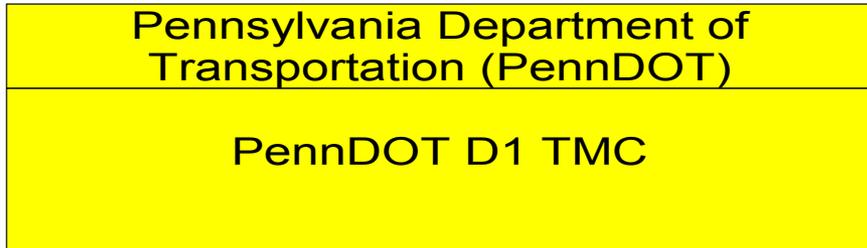
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Planned



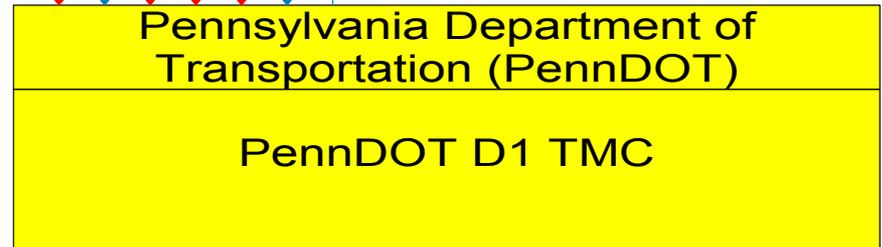
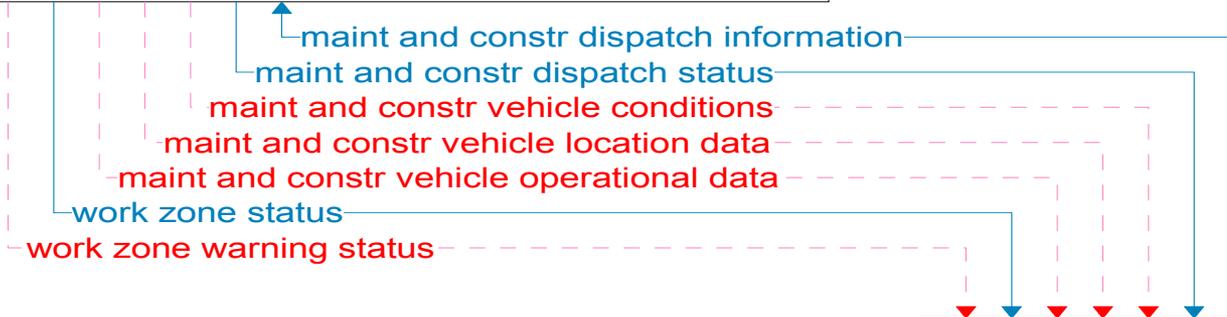
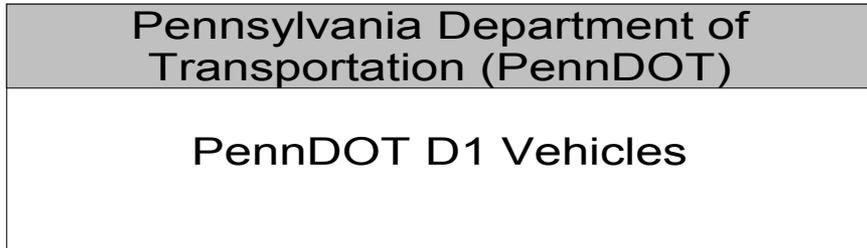
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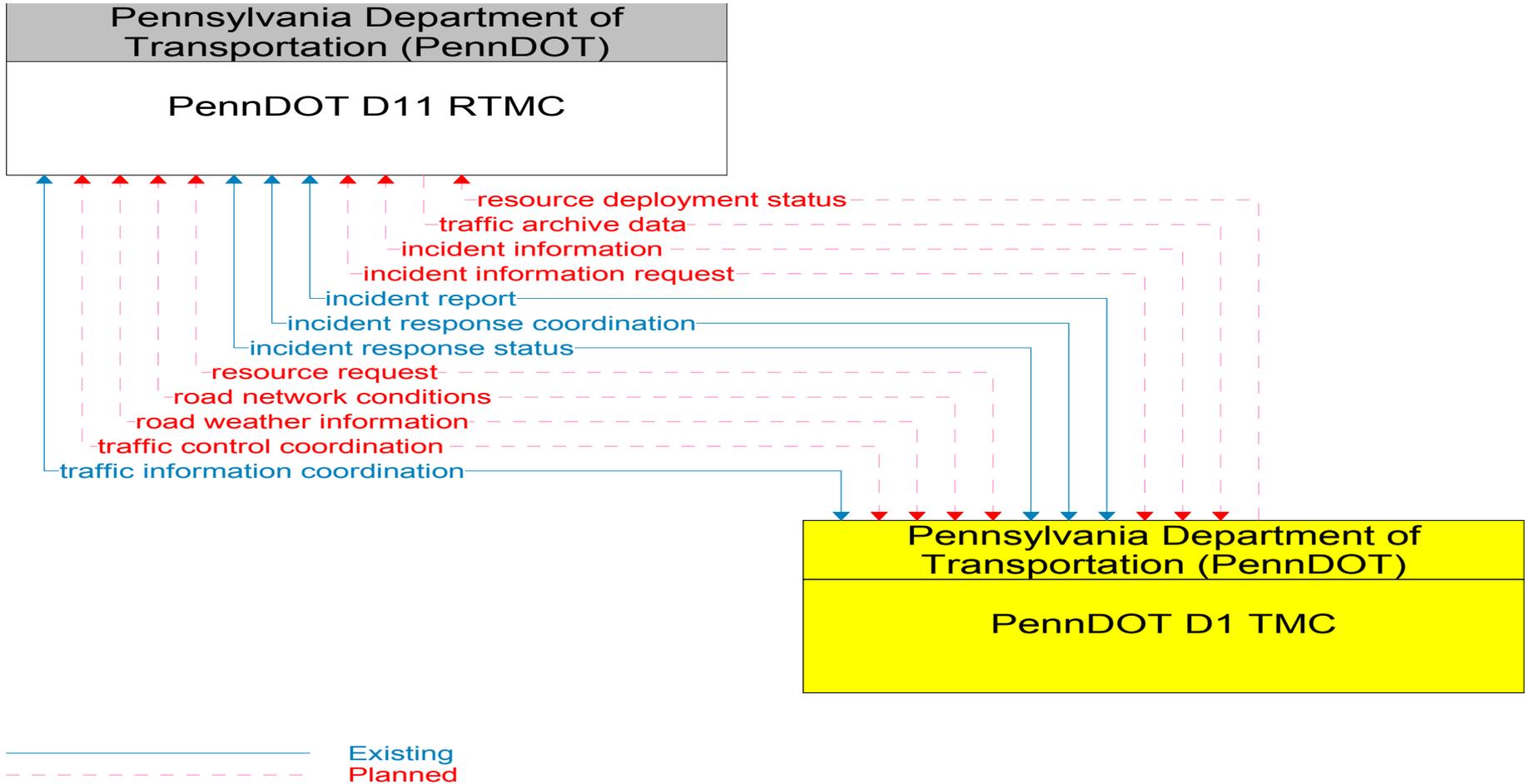
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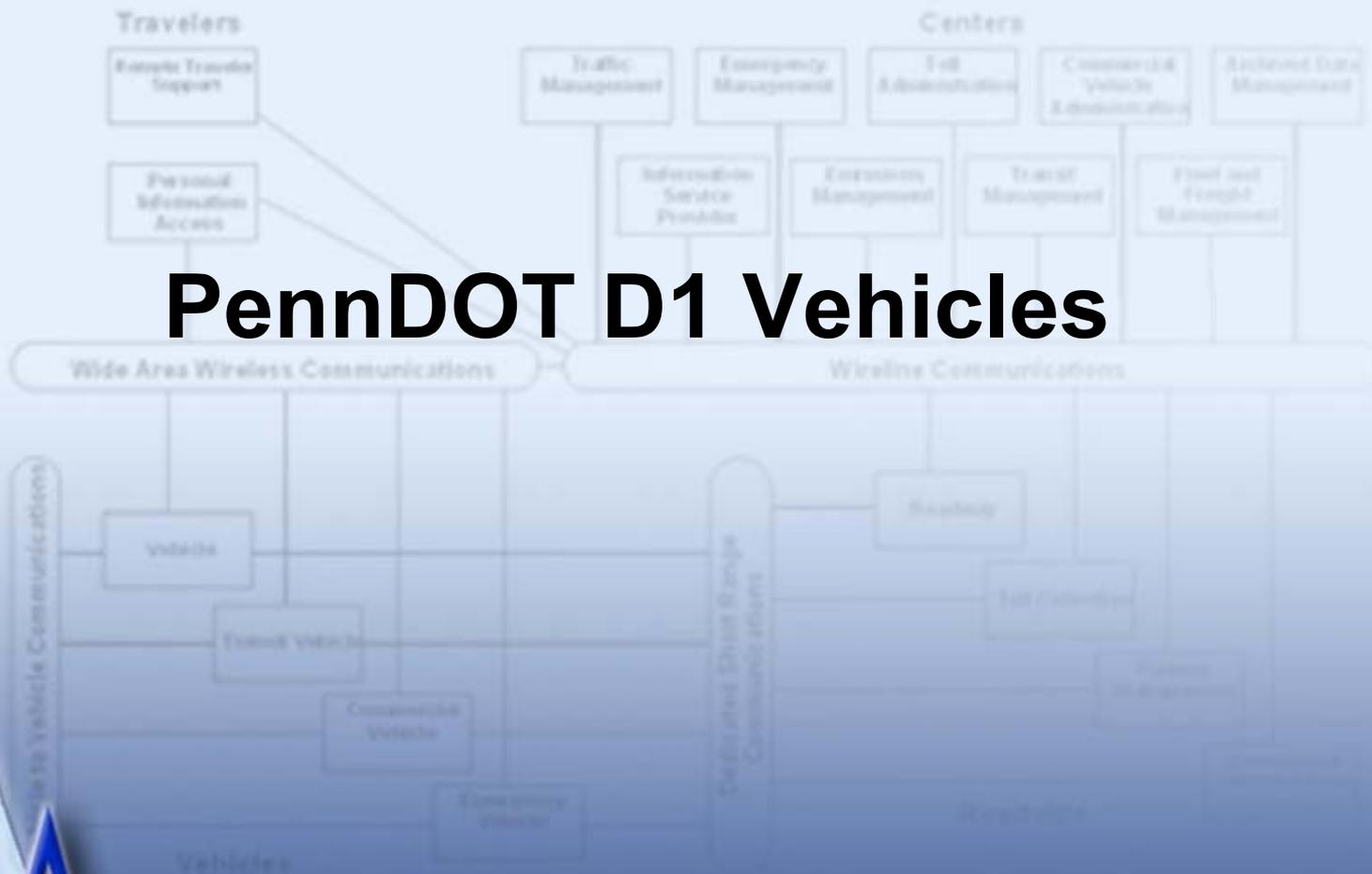
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Planned



Existing
Planned

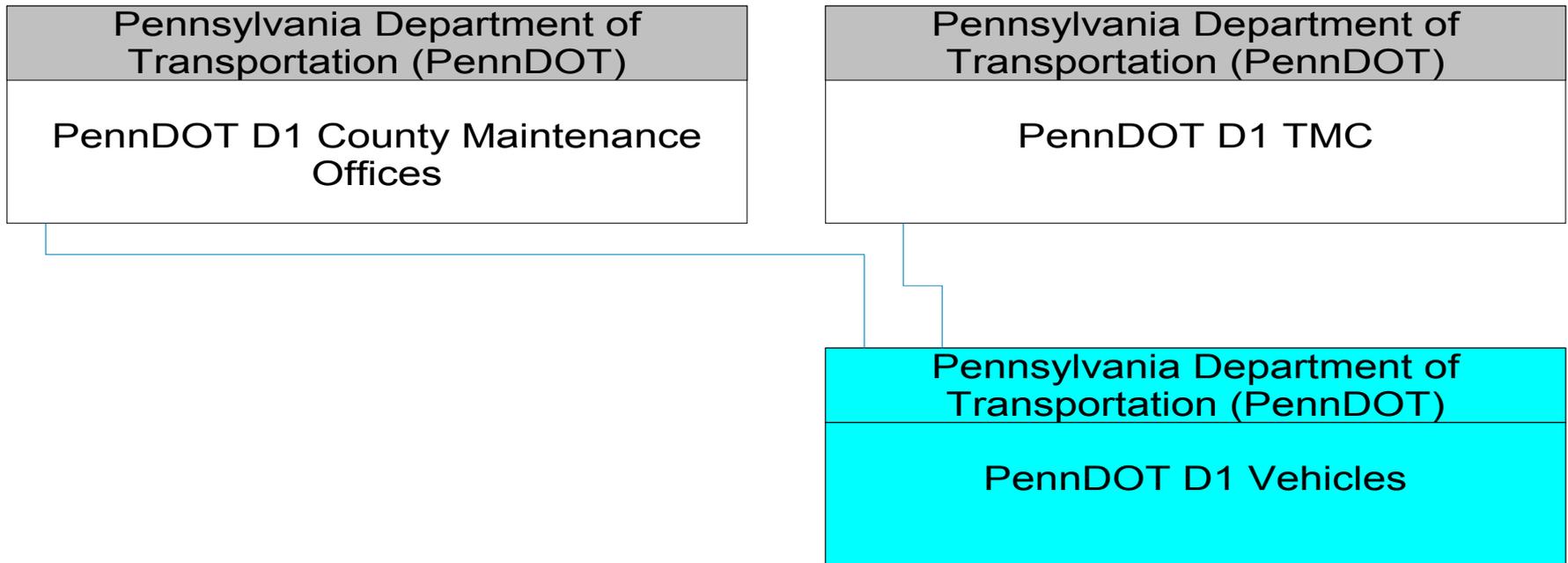


PennDOT D1 Vehicles



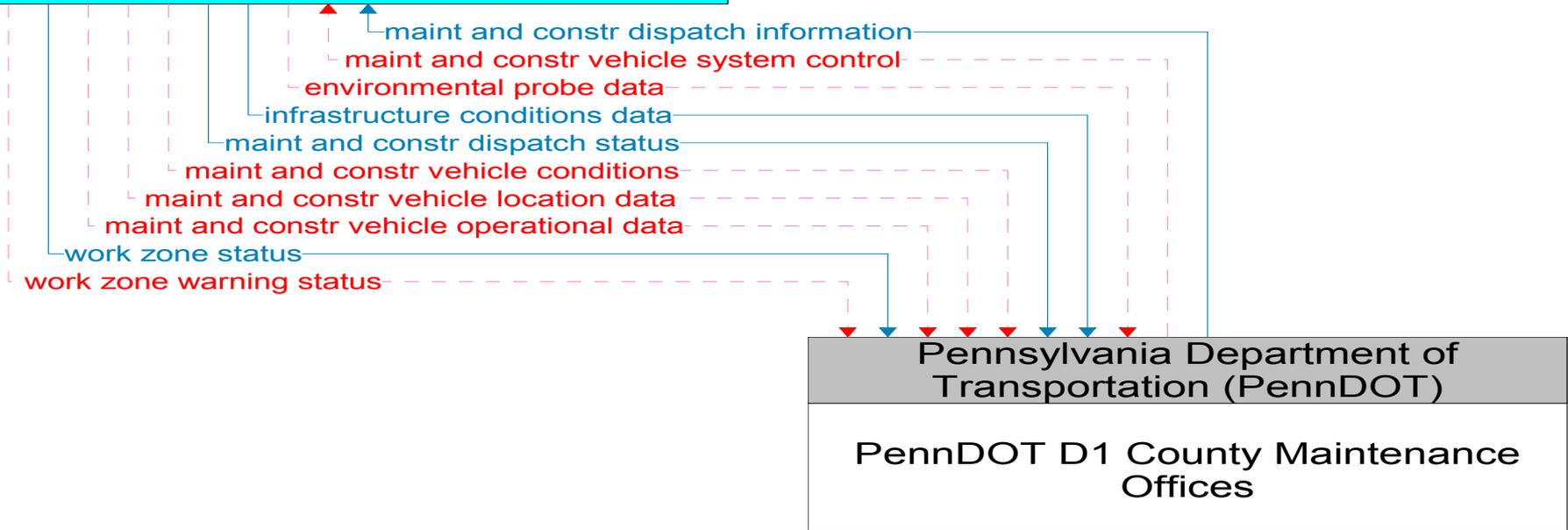
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PennDOT D1 Vehicles Interconnect Diagram

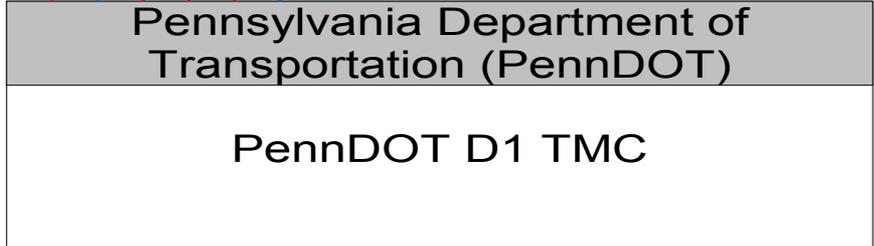
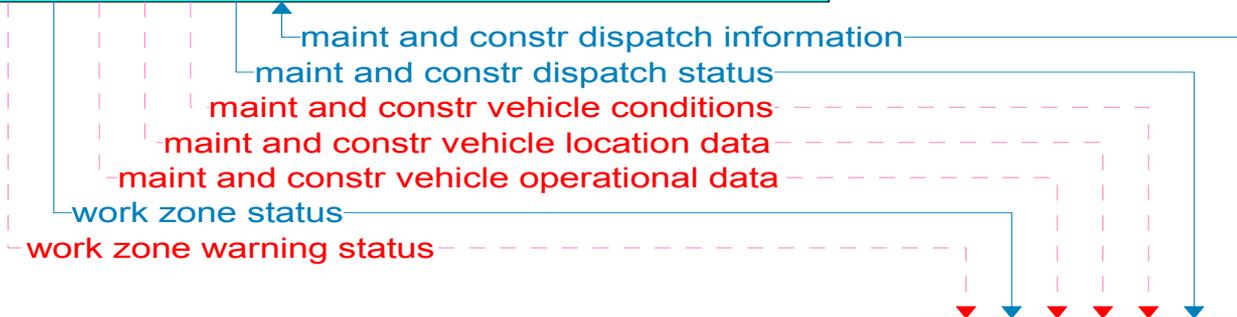
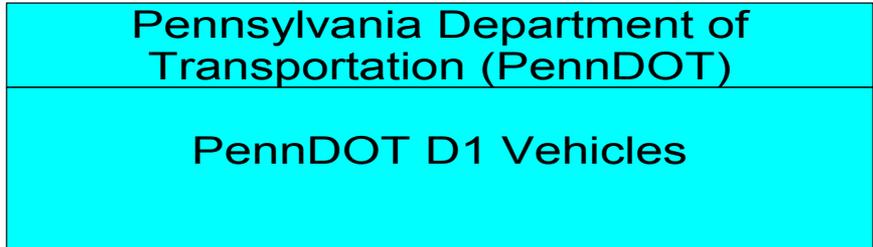


———— Existing
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Pennsylvania Department of Transportation (PennDOT)
PennDOT D1 Vehicles

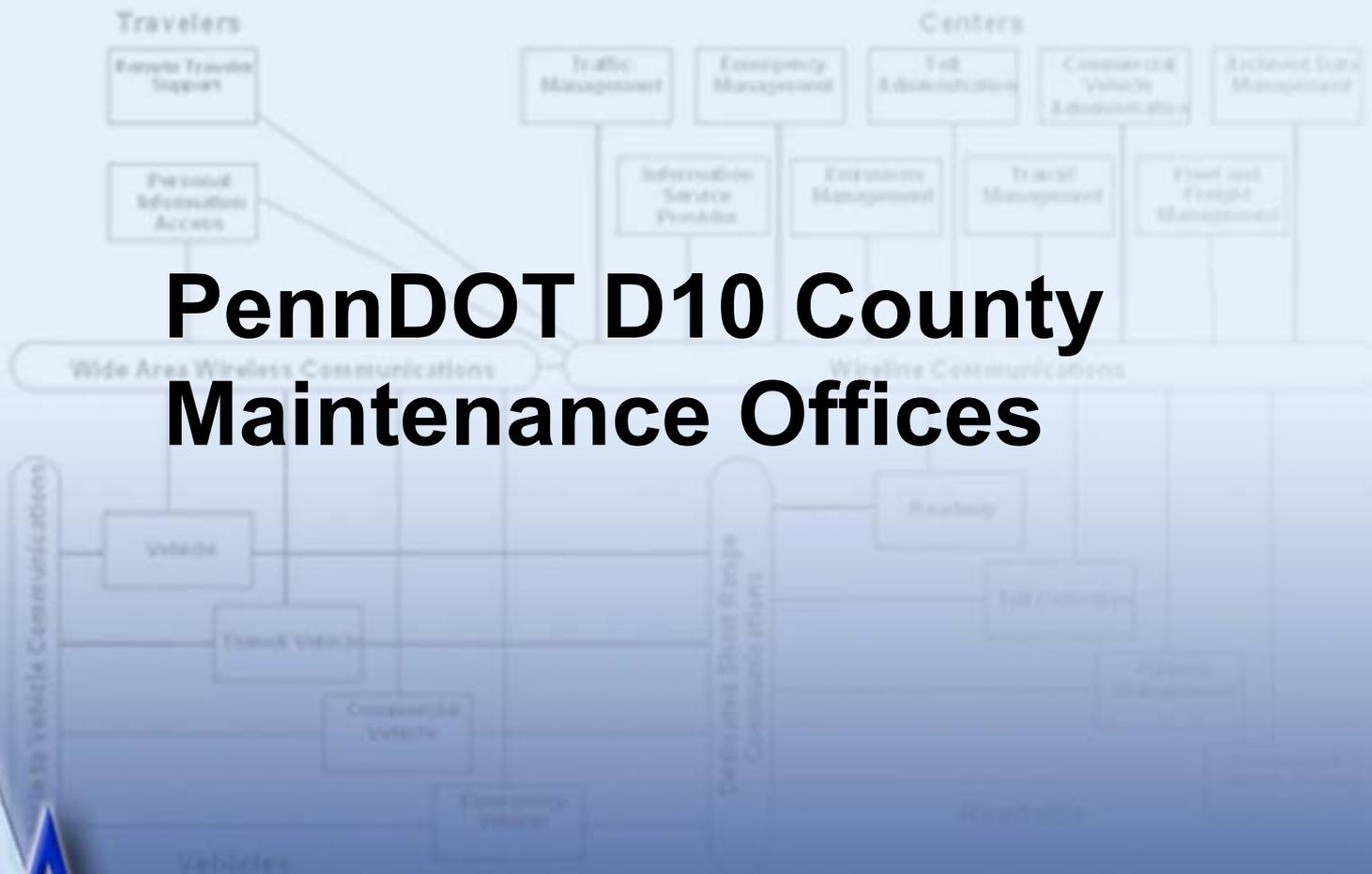


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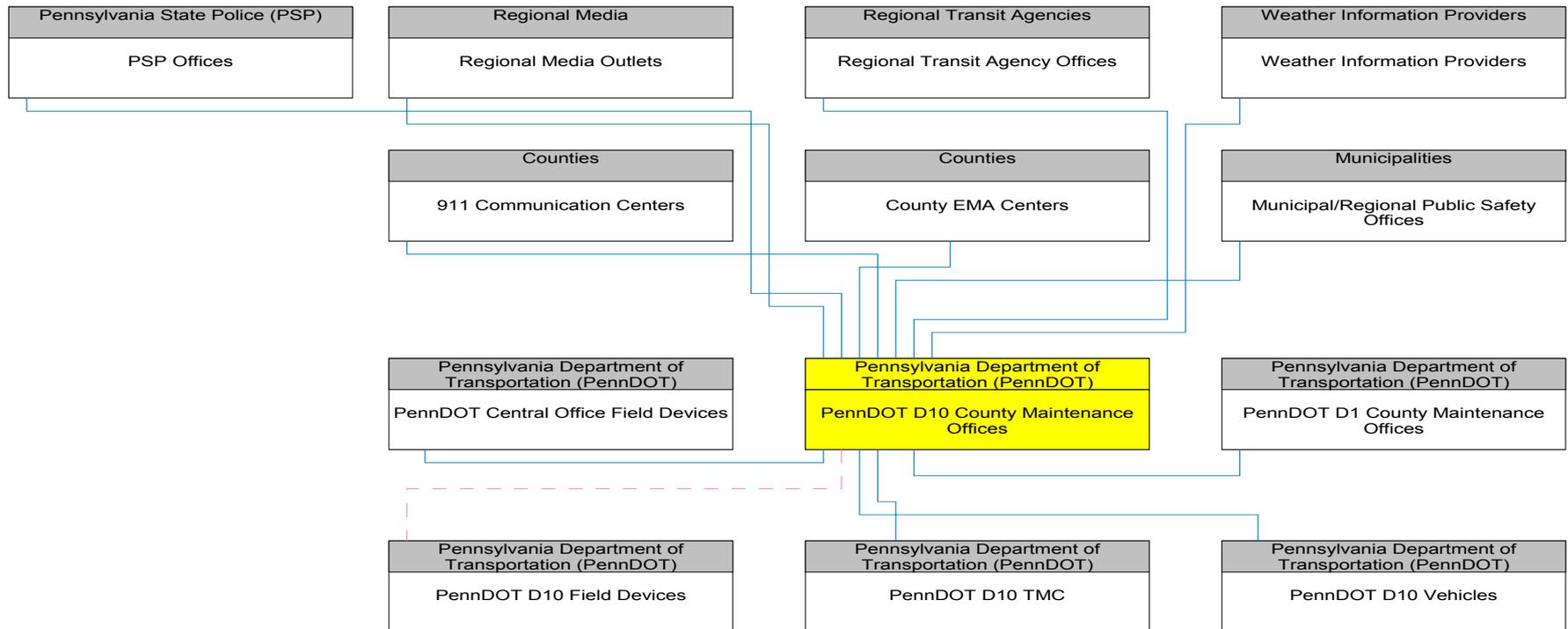


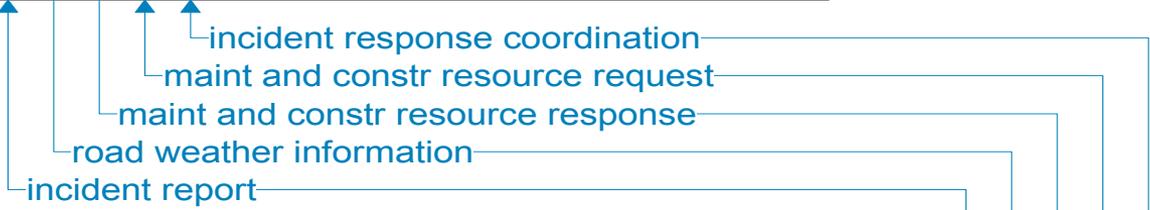
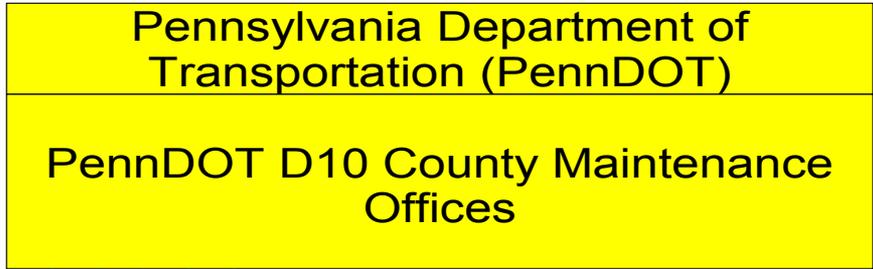
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- - - - - Planned

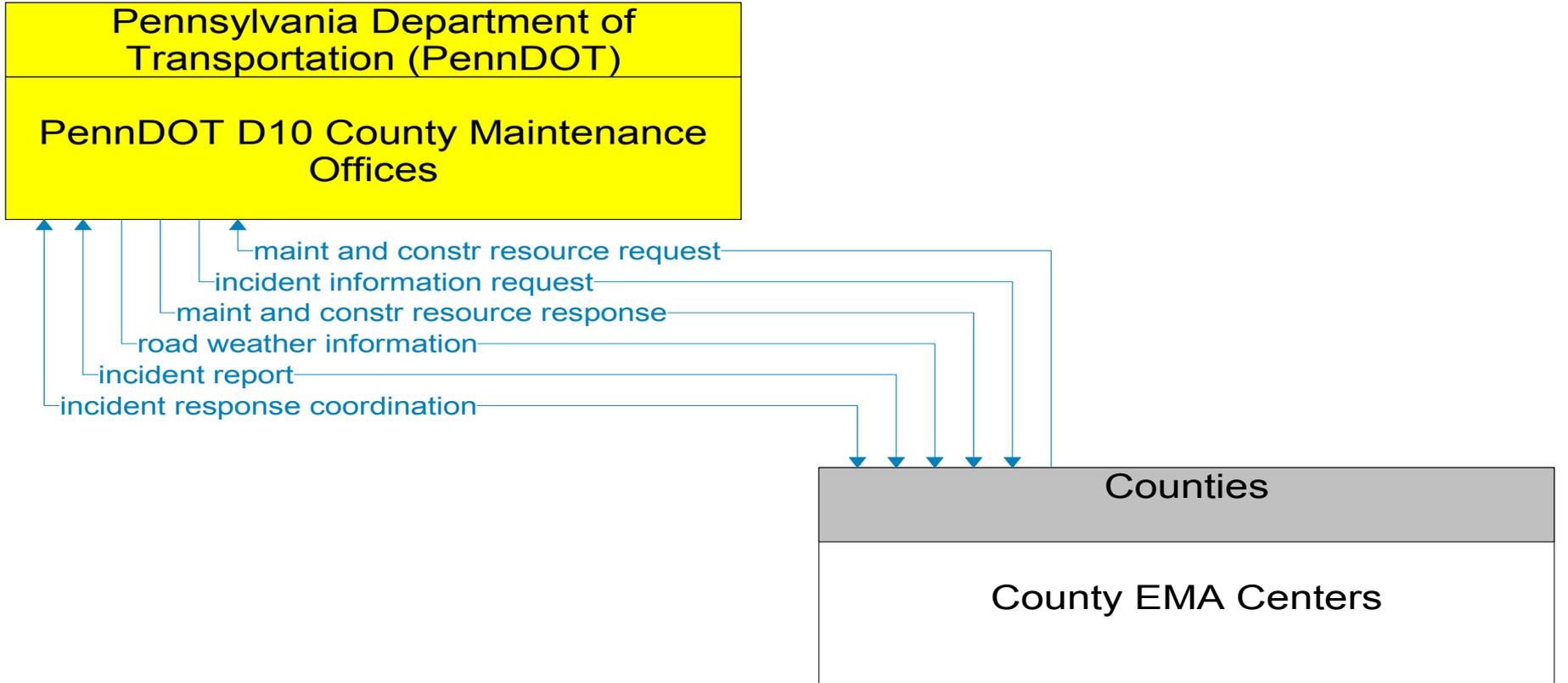
PennDOT D10 County Maintenance Offices



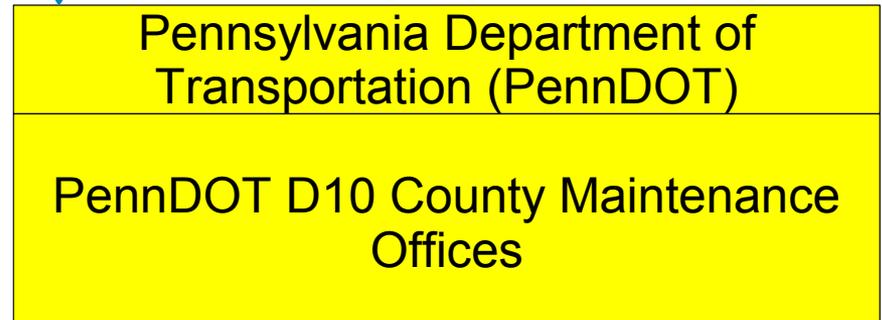
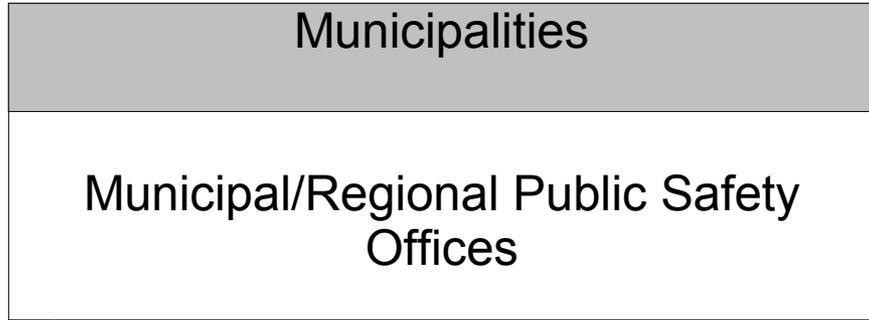
PennDOT D10 County Maintenance Offices Interconnect Diagram







———— Existing
- - - - - Planned



Existing
Planned

Pennsylvania Department of
Transportation (PennDOT)

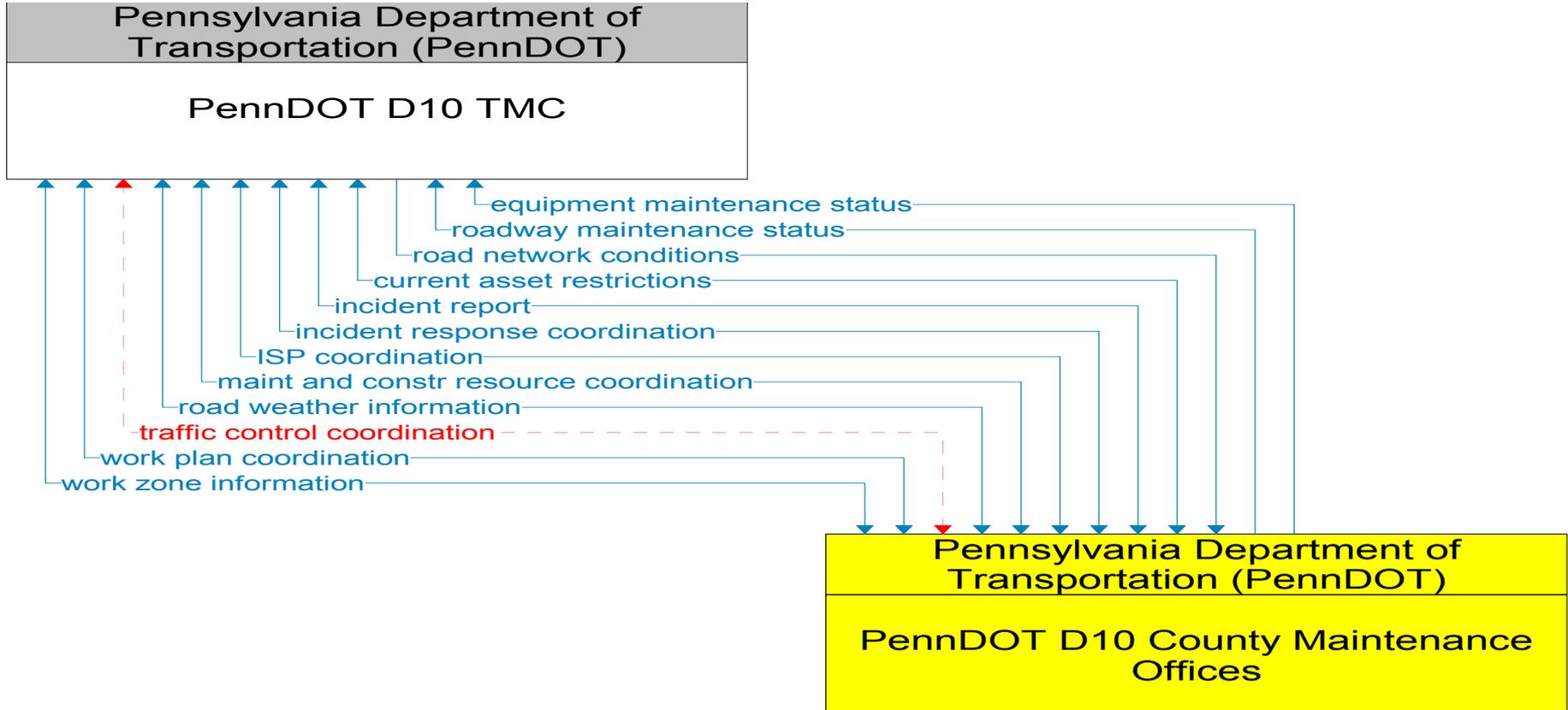
PennDOT D10 Field Devices

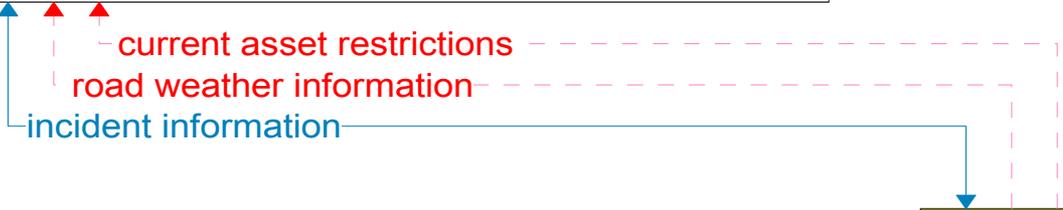
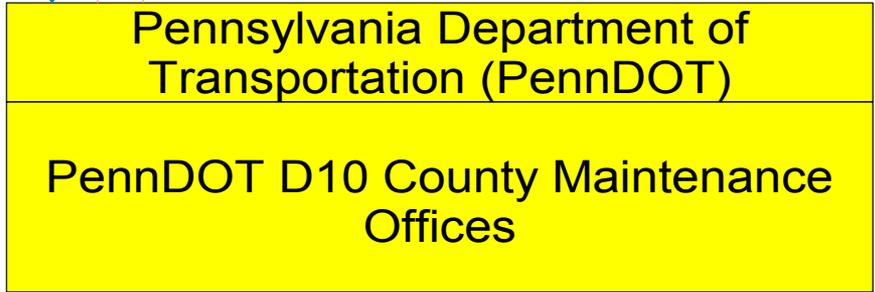
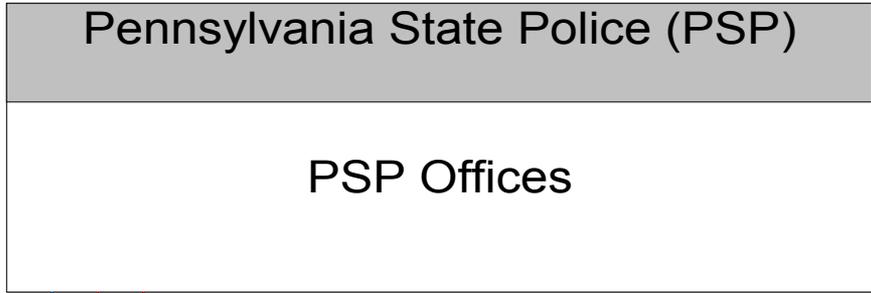
- roadway information system data
- roadway treatment system control
- video surveillance control
- work zone warning device control
- field device status
- roadway information system status
- roadway treatment system status
- traffic images
- work zone warning status

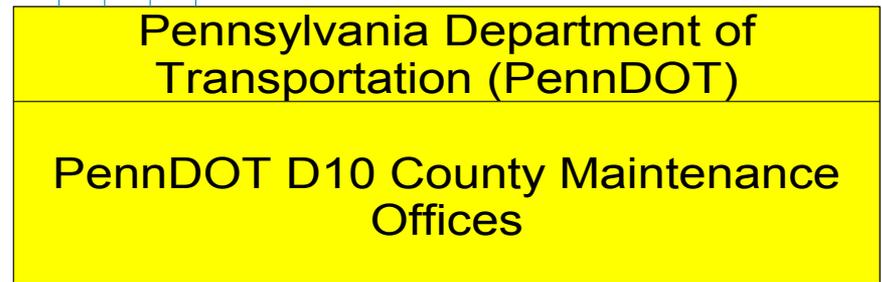
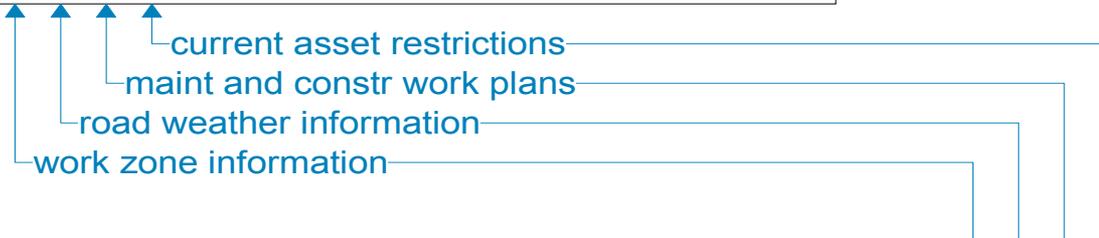
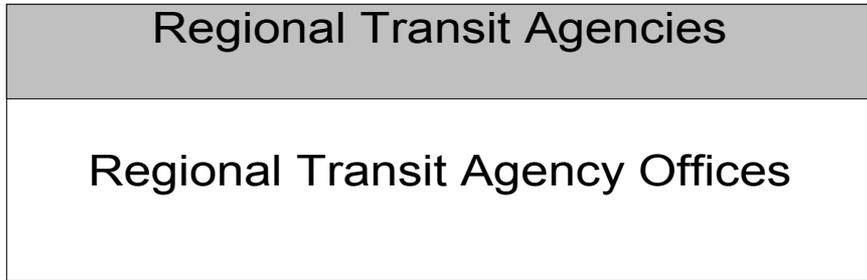
Pennsylvania Department of
Transportation (PennDOT)

PennDOT D10 County Maintenance
Offices

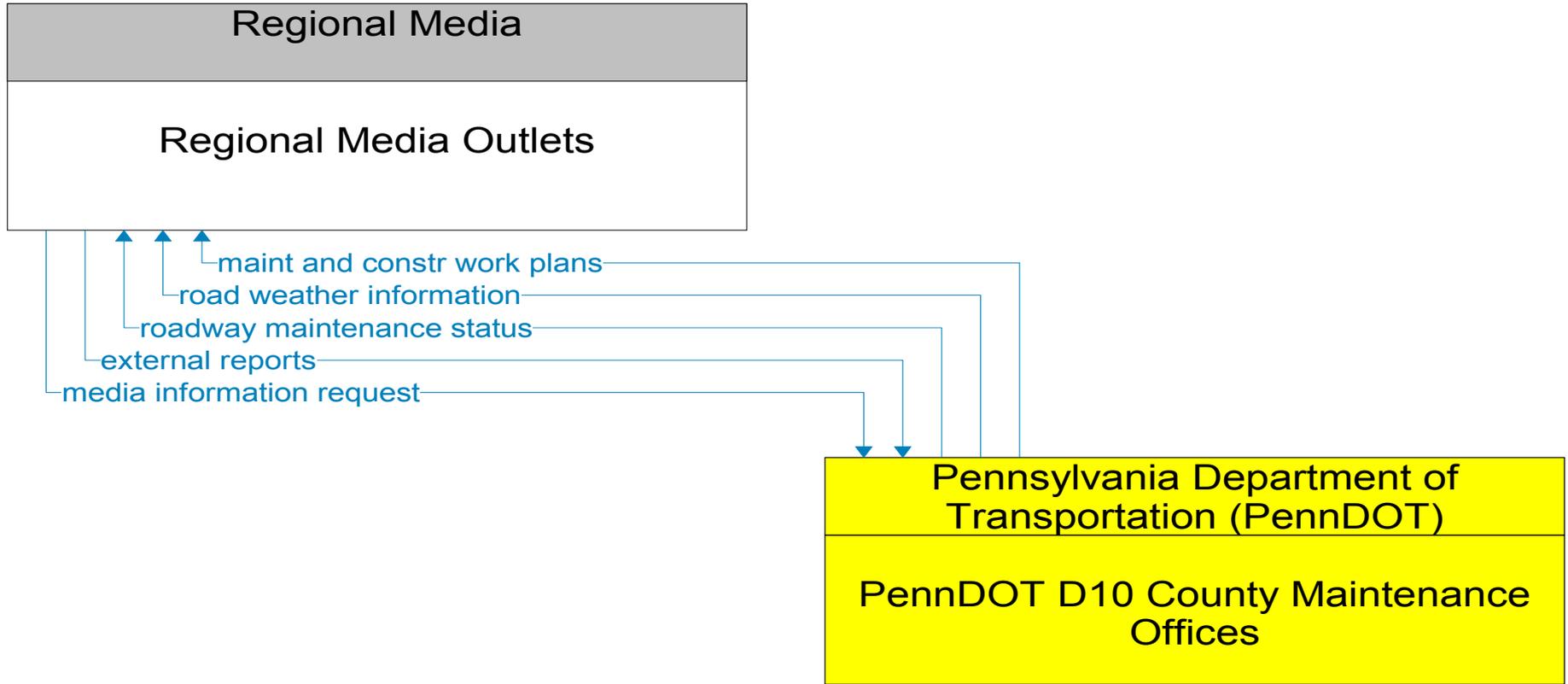
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- - - - - Planned





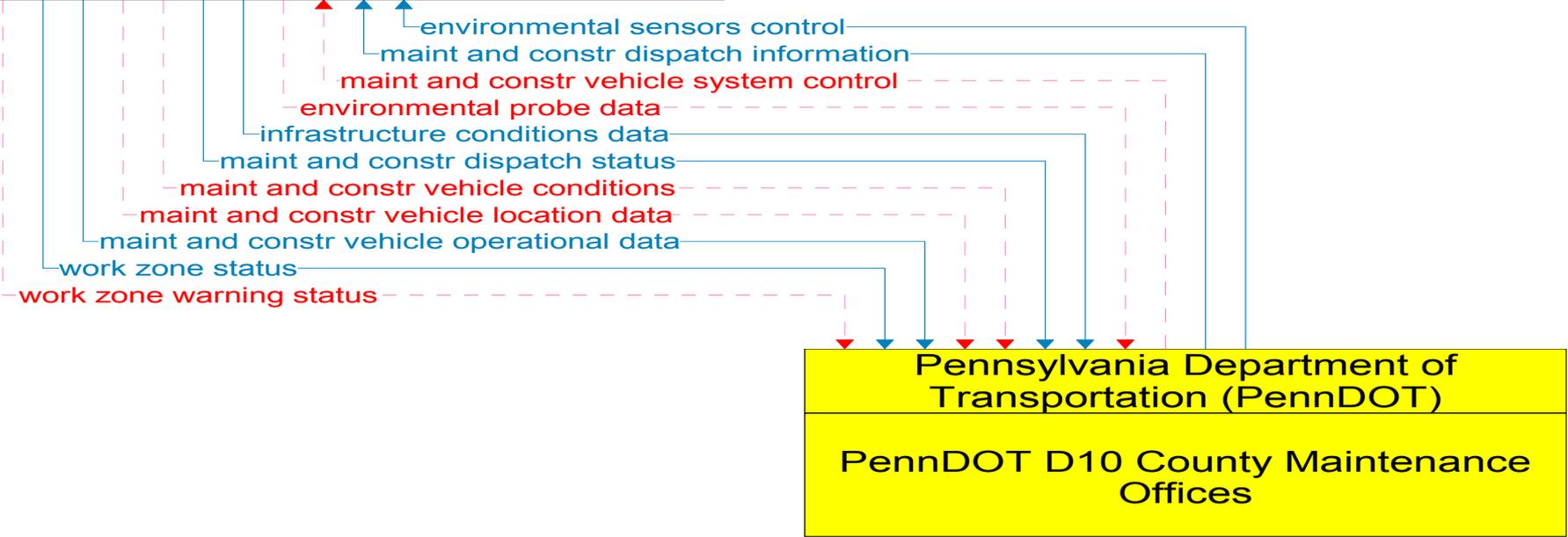


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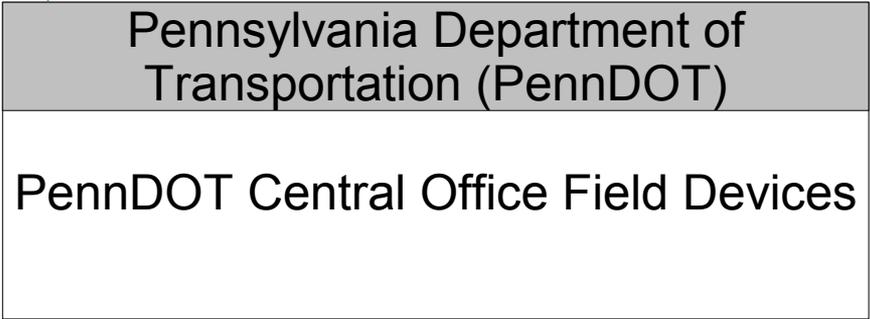
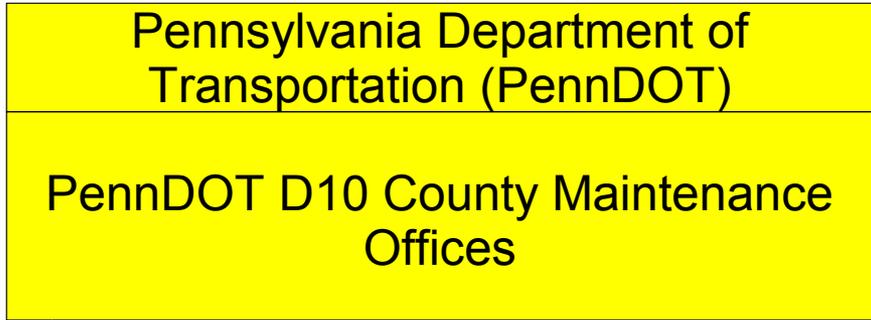


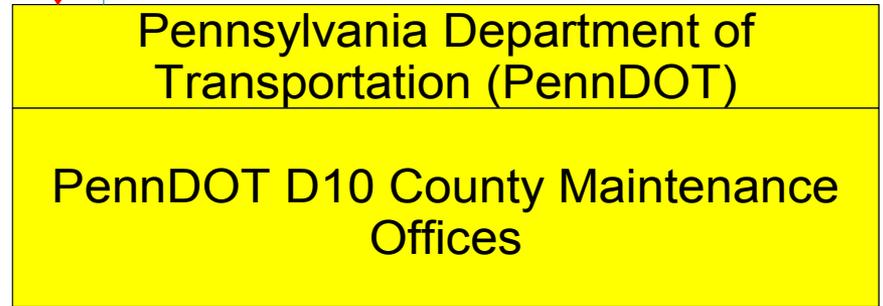
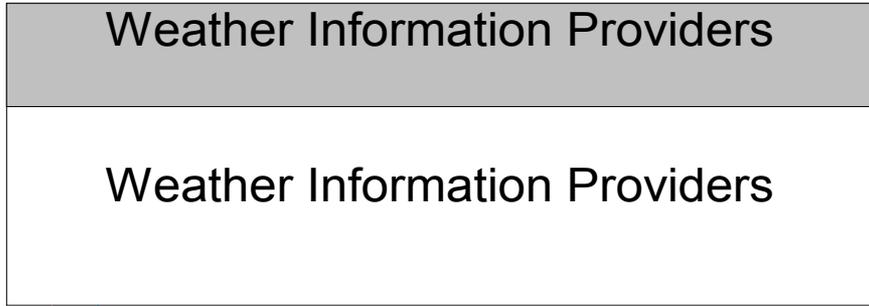
———— Existing
- - - - - Planned

Pennsylvania Department of Transportation (PennDOT)
PennDOT D10 Vehicles



Existing
Planned

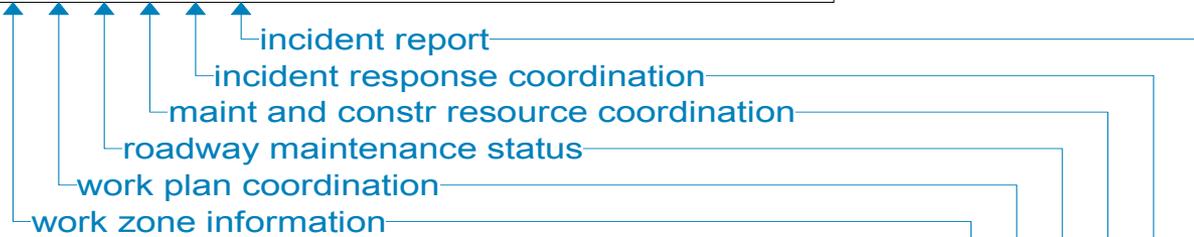




Existing
Planned

Pennsylvania Department of
Transportation (PennDOT)

PennDOT D1 County Maintenance
Offices

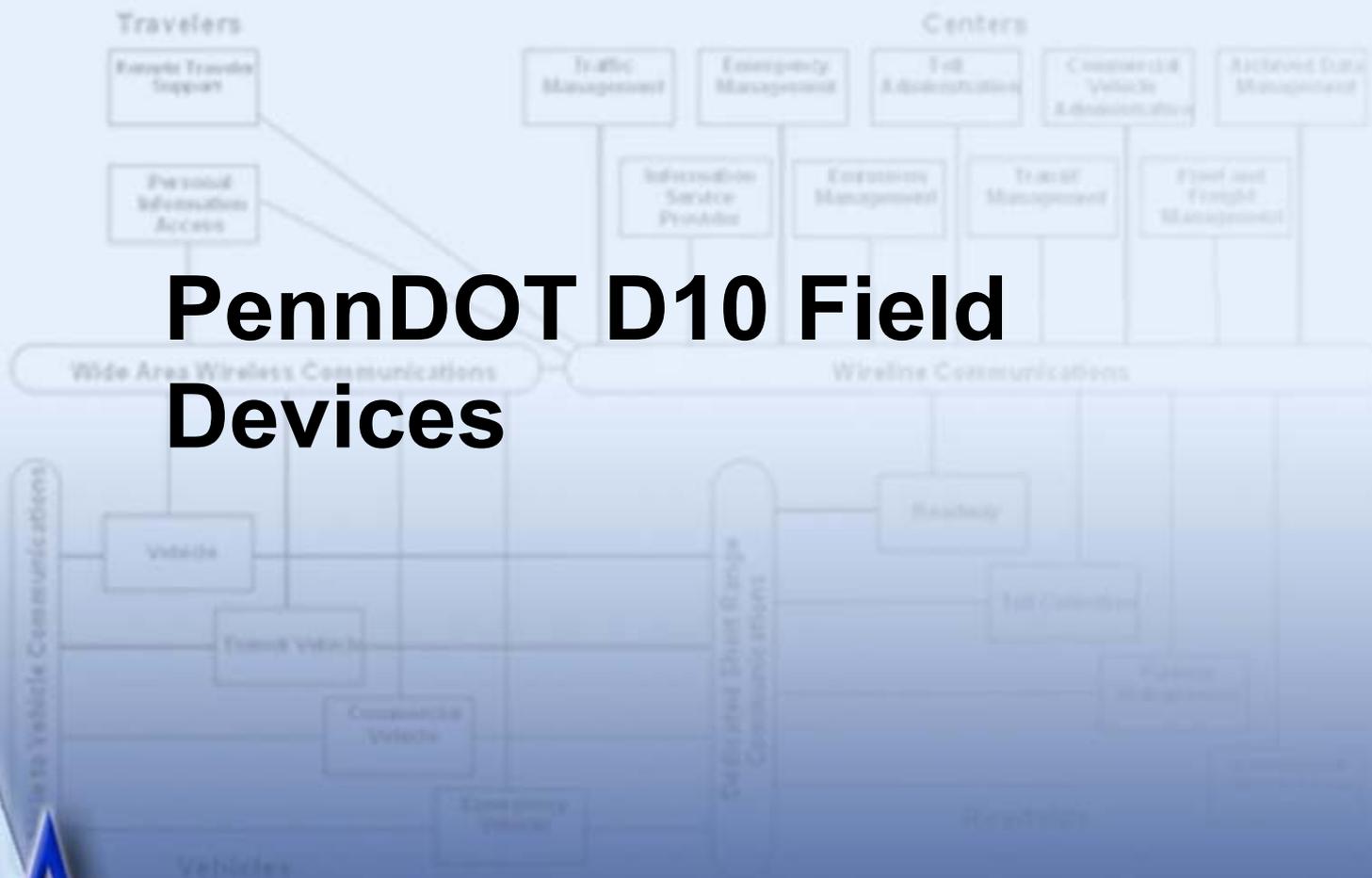


Pennsylvania Department of
Transportation (PennDOT)

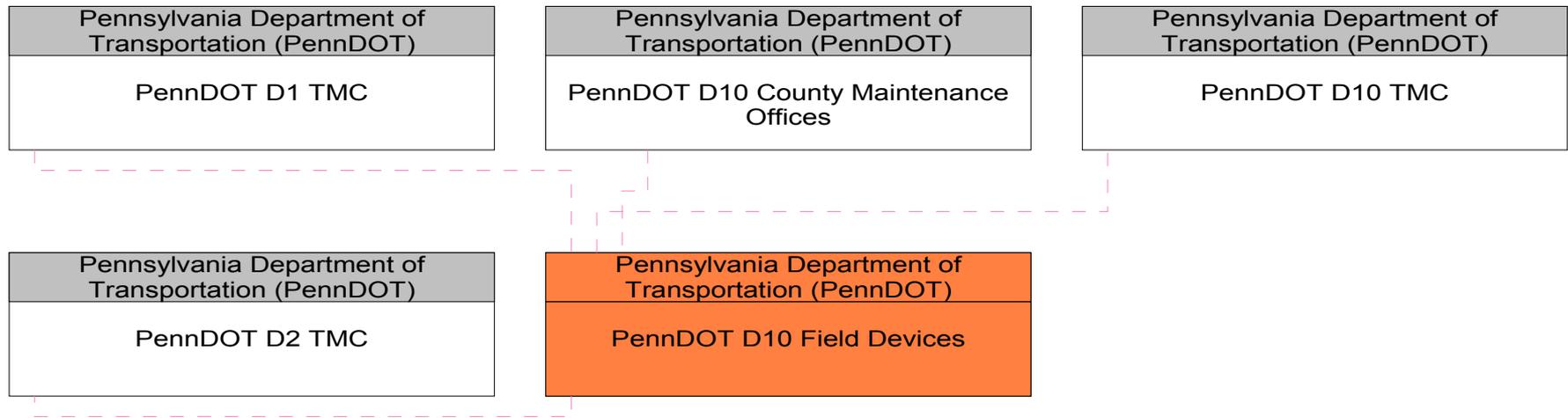
PennDOT D10 County Maintenance
Offices

———— Existing
- - - - - Planned

PennDOT D10 Field Devices



PennDOT D10 Field Devices Interconnect Diagram



———— Existing
- - - - - Planned

Pennsylvania Department of
Transportation (PennDOT)

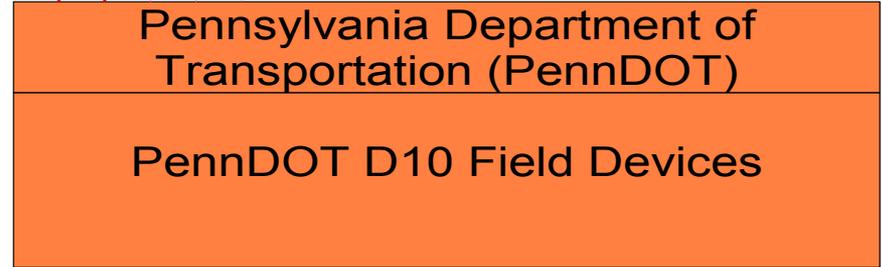
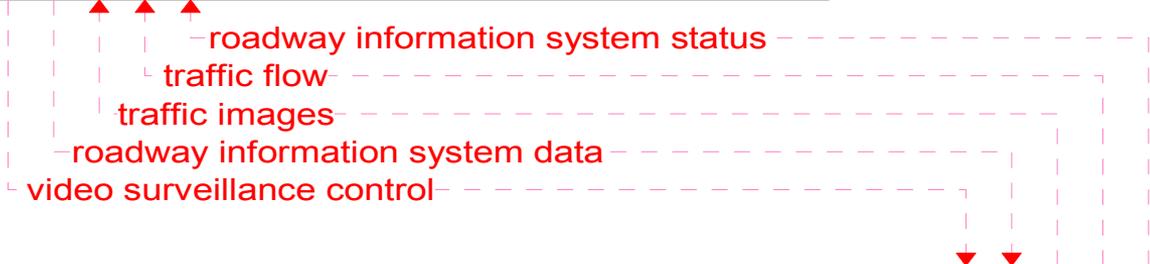
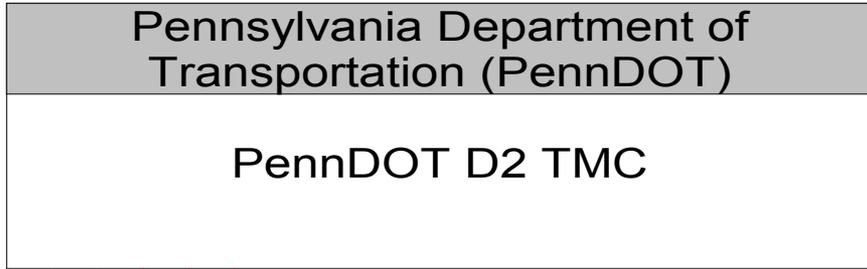
PennDOT D10 TMC

- ▲ field device status
- ▲ roadway information system status
- ▲ traffic flow
- ▲ traffic images
- ▲ roadway information system data
- ▲ traffic sensor control
- ▲ video surveillance control

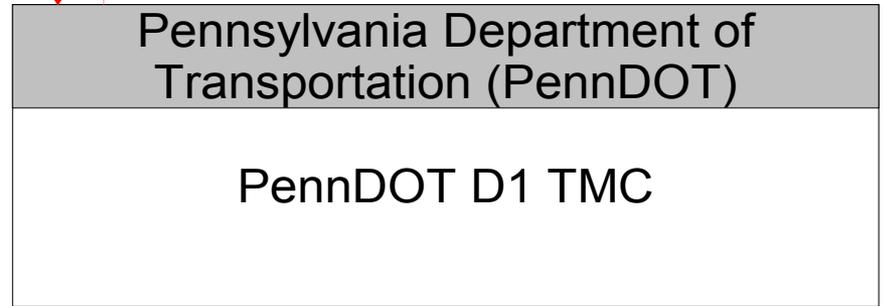
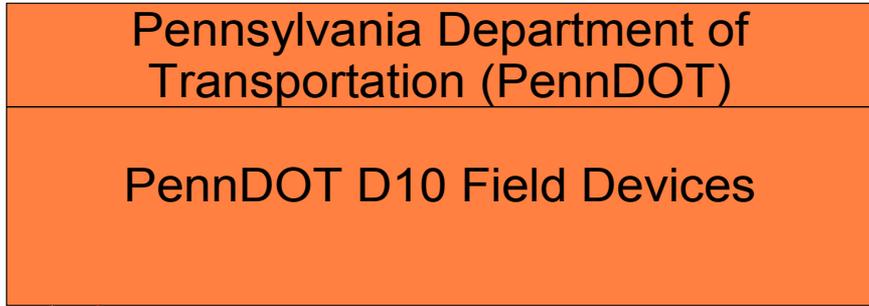
Pennsylvania Department of
Transportation (PennDOT)

PennDOT D10 Field Devices

———— Existing
- - - - - Planned



———— Existing
- - - - - Planned

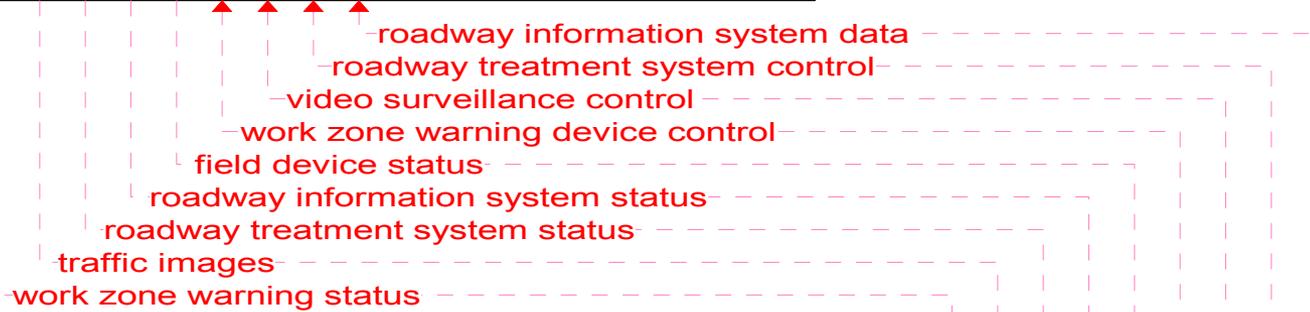


roadway information system data
roadway information system status

———— Existing
- - - - - Planned

Pennsylvania Department of
Transportation (PennDOT)

PennDOT D10 Field Devices

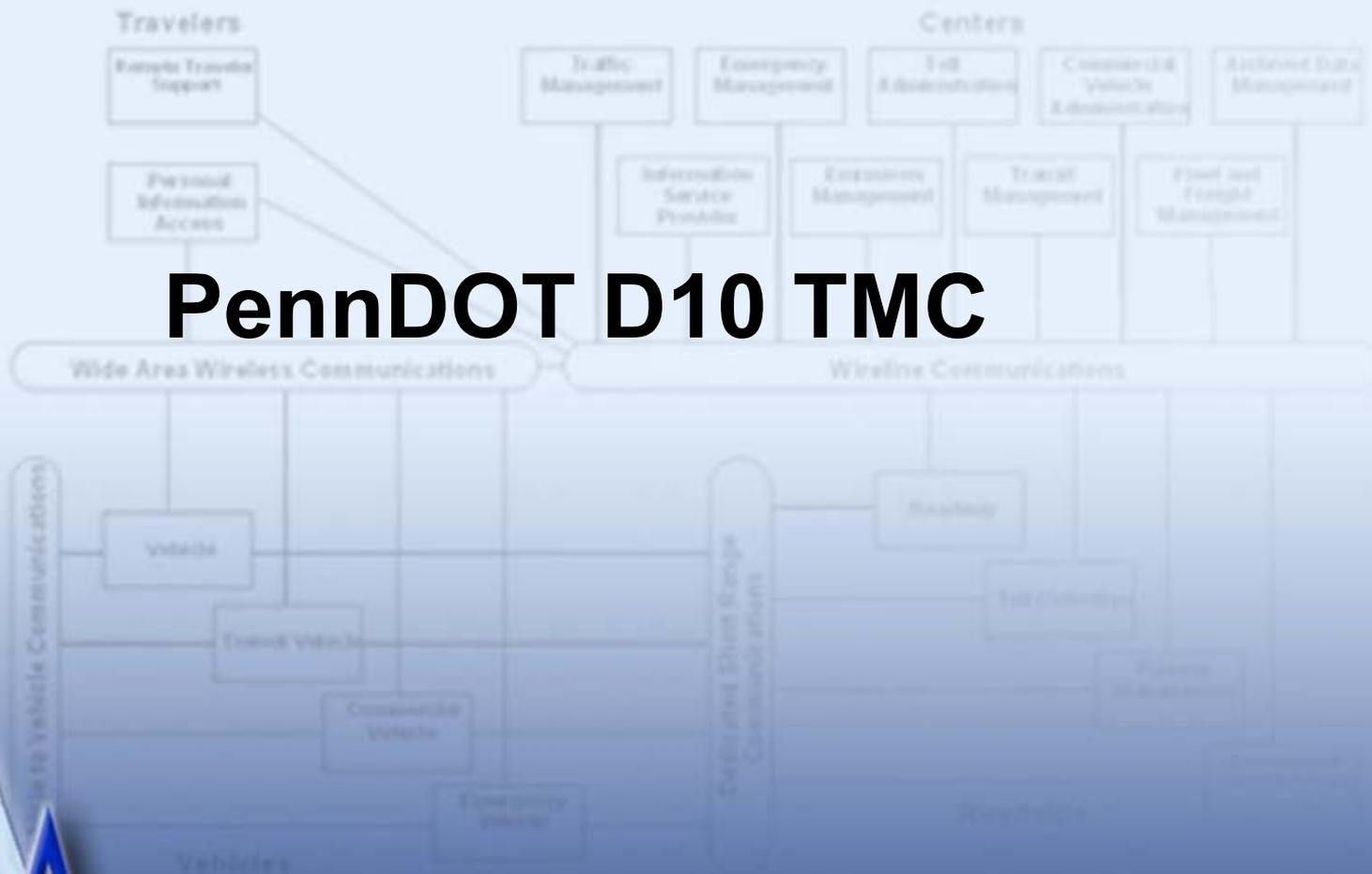


Pennsylvania Department of
Transportation (PennDOT)

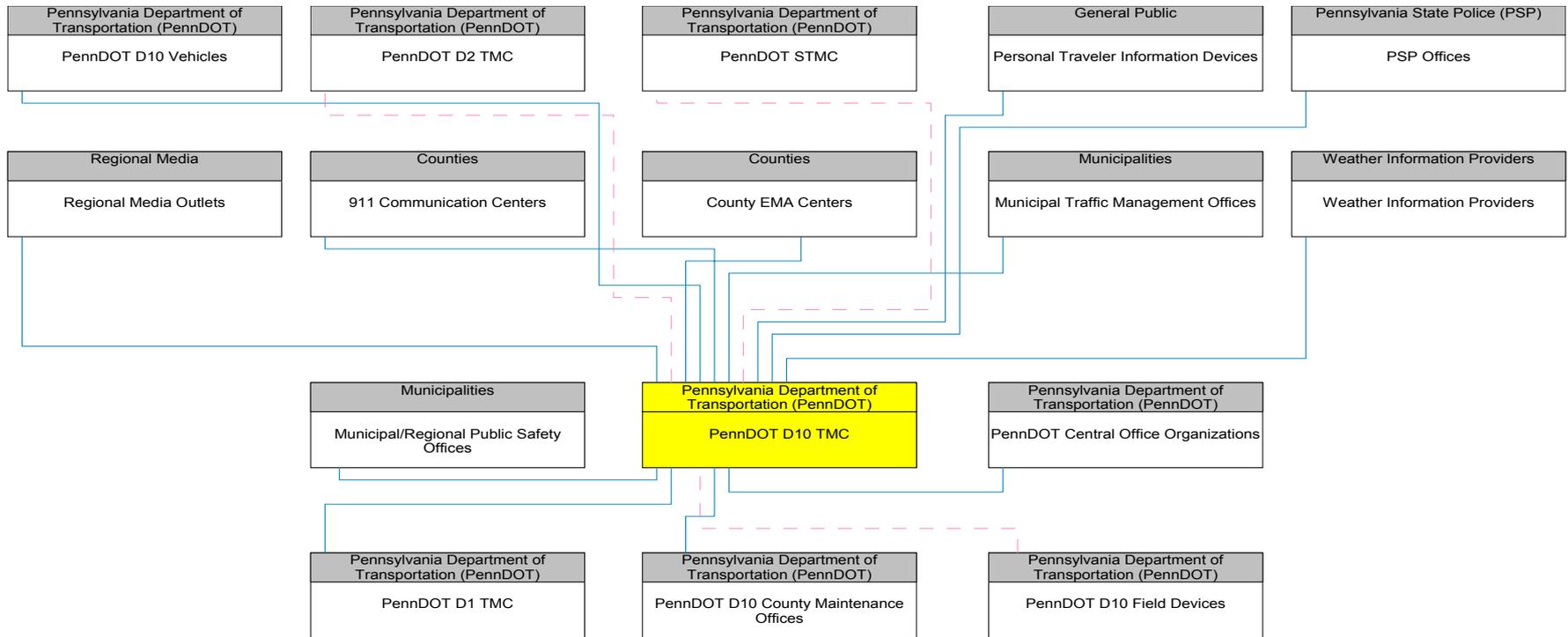
PennDOT D10 County Maintenance
Offices

Existing
Planned

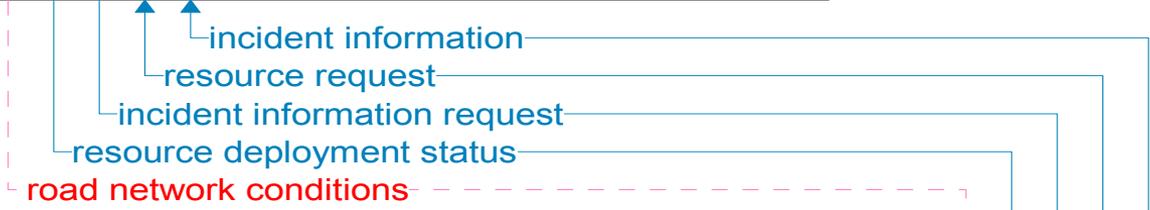
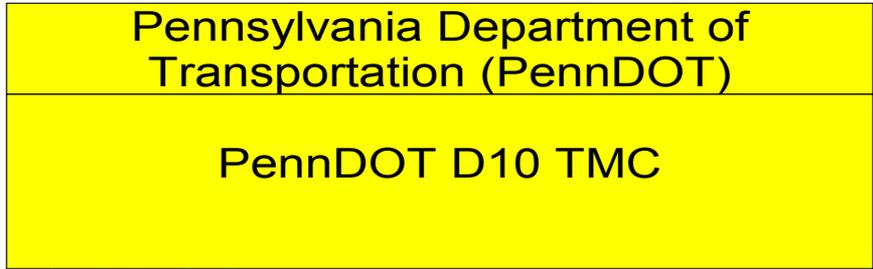
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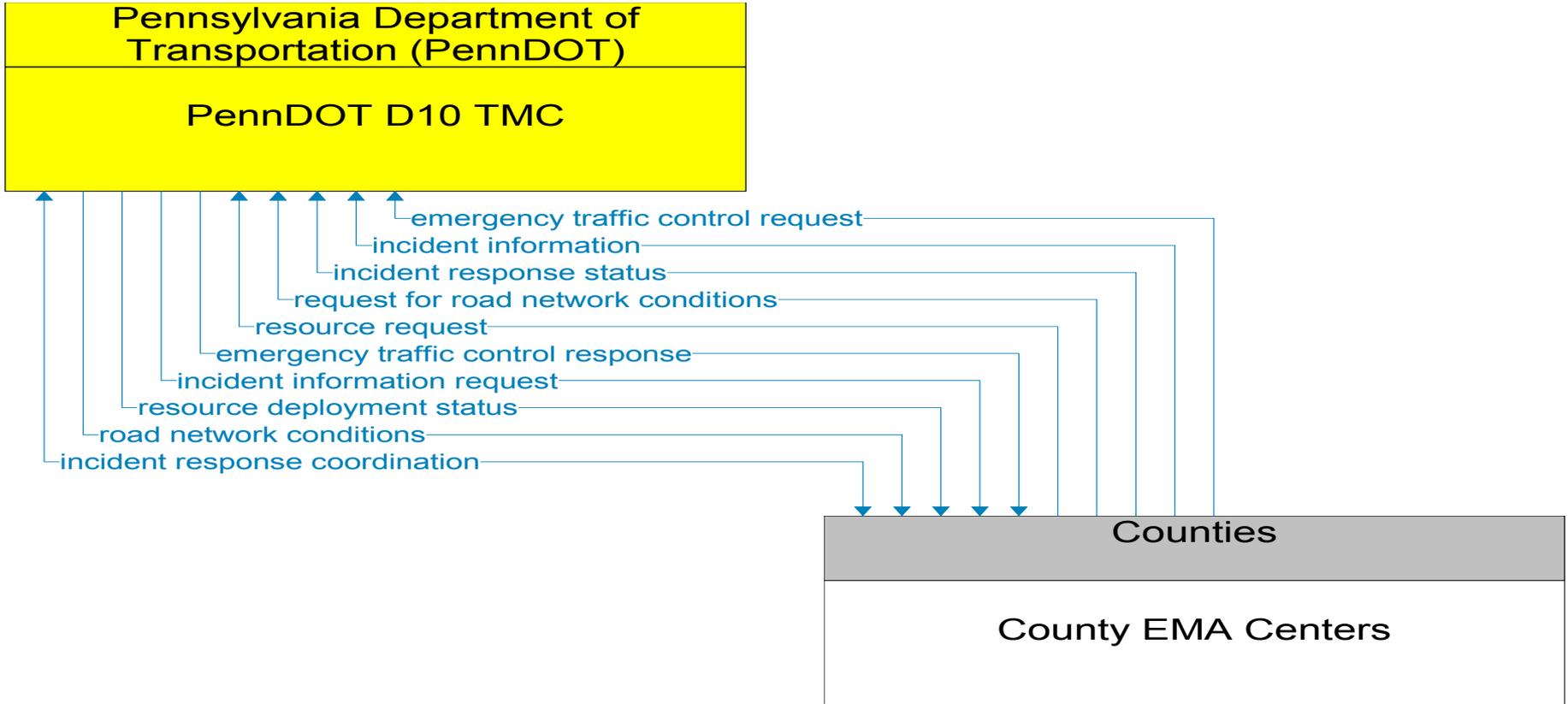


PennDOT D10 TMC Interconnect Diagram

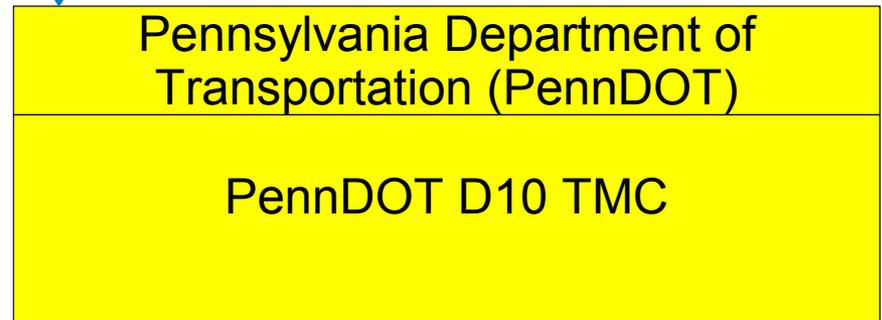
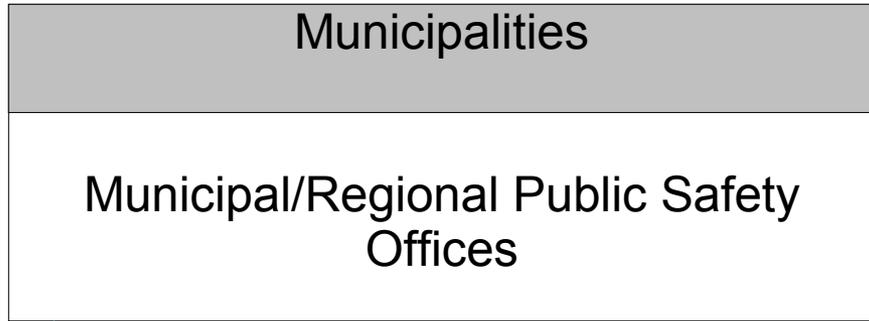


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- - - Planned

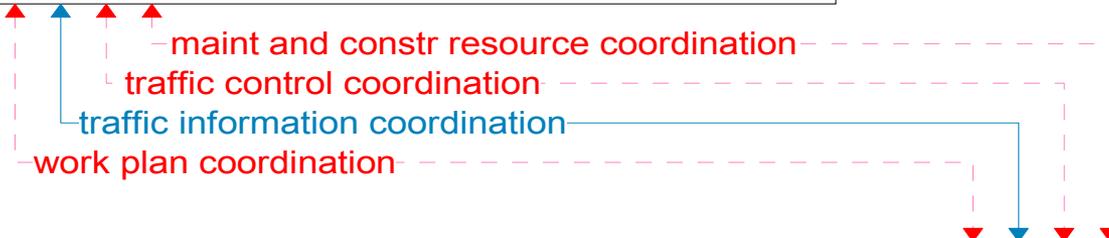
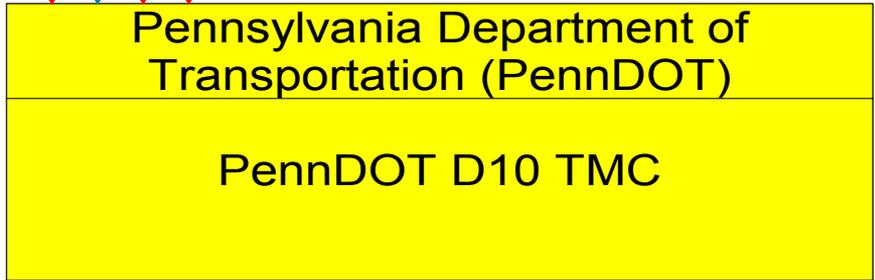




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- - - - - Planned



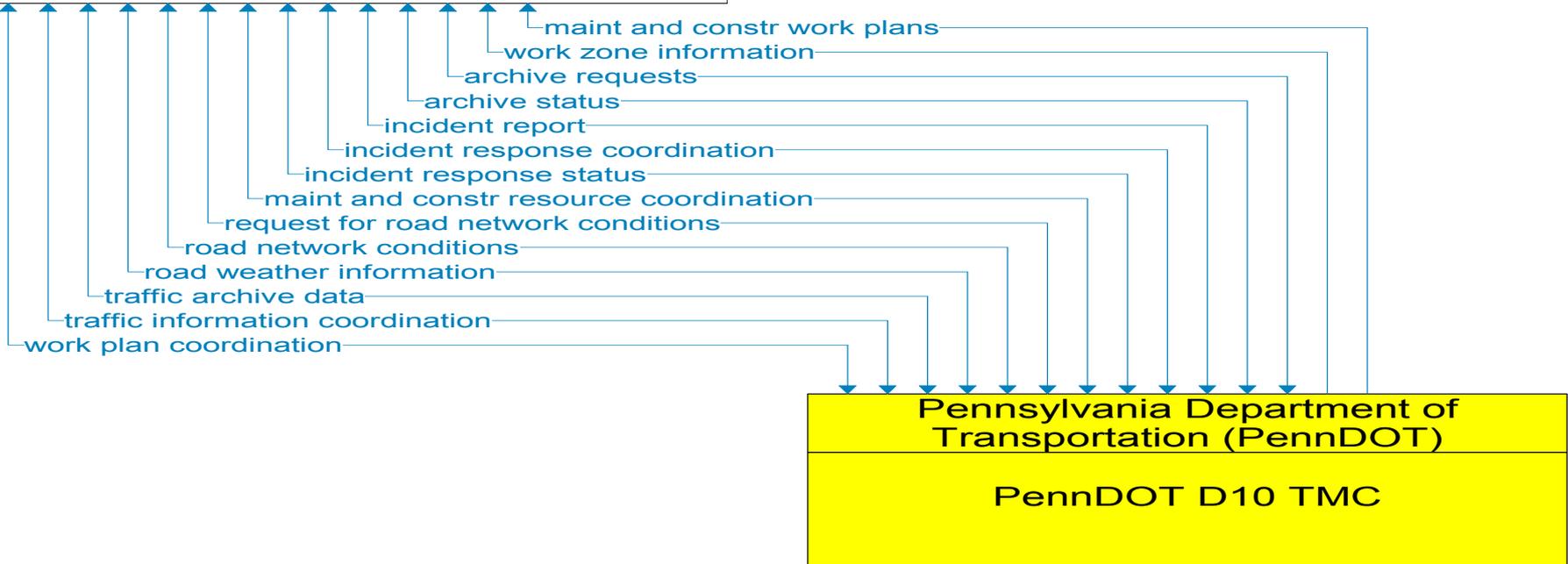
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- - - - - Planned



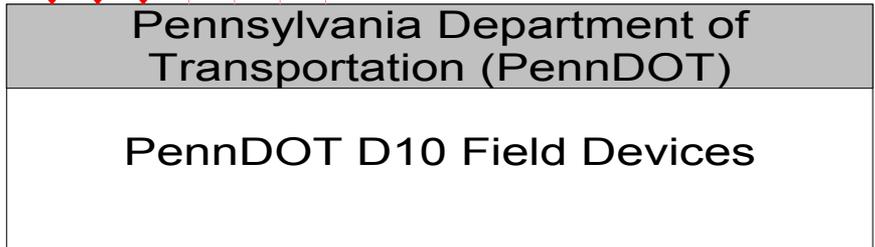
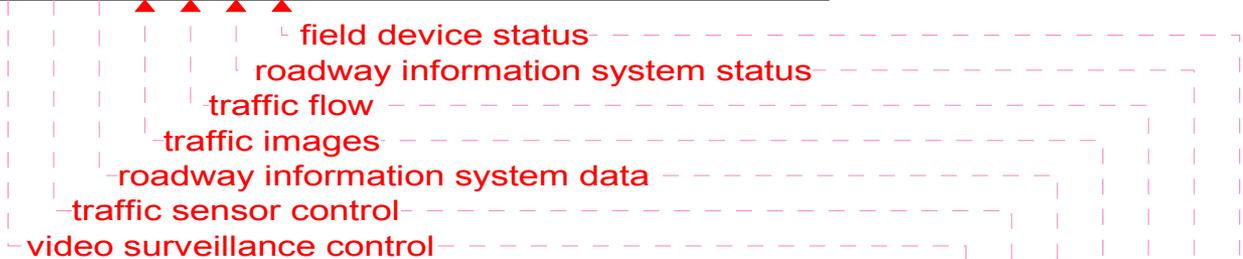
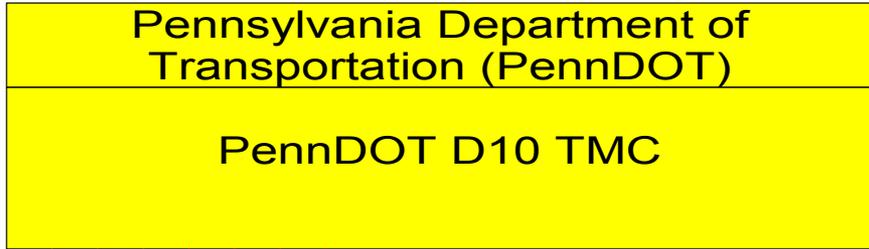
Existing
Planned

Pennsylvania Department of Transportation (PennDOT)

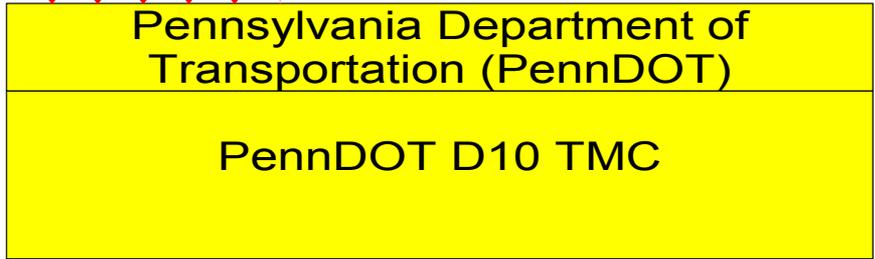
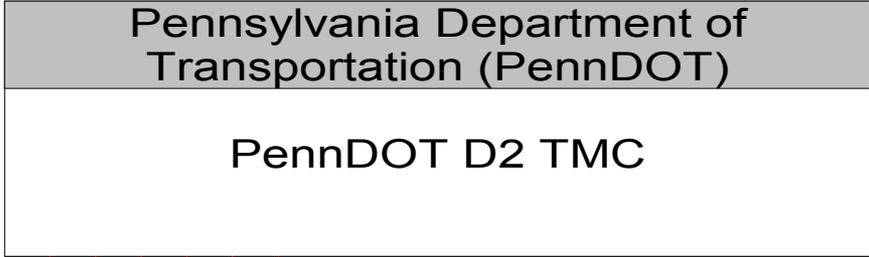
PennDOT Central Office Organizations



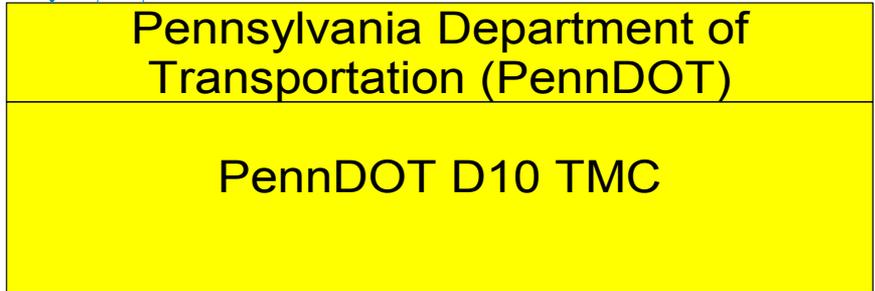
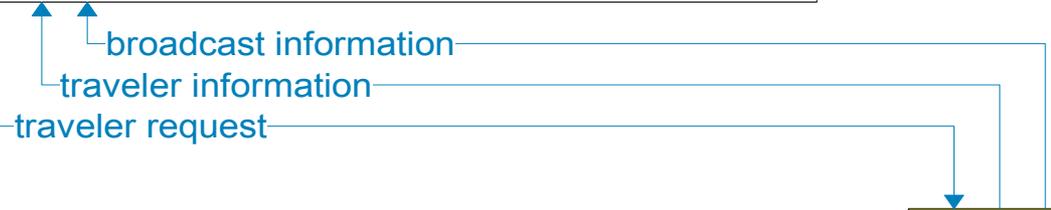
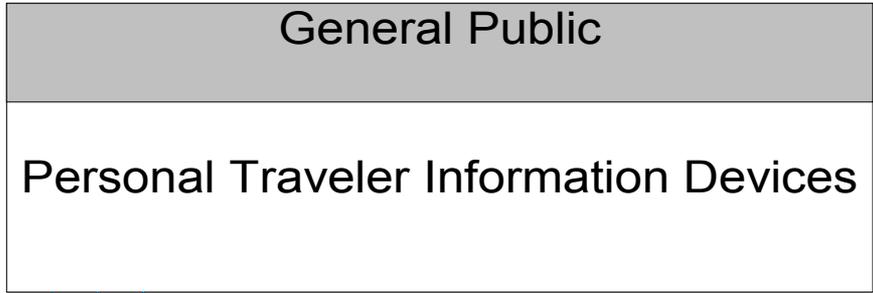
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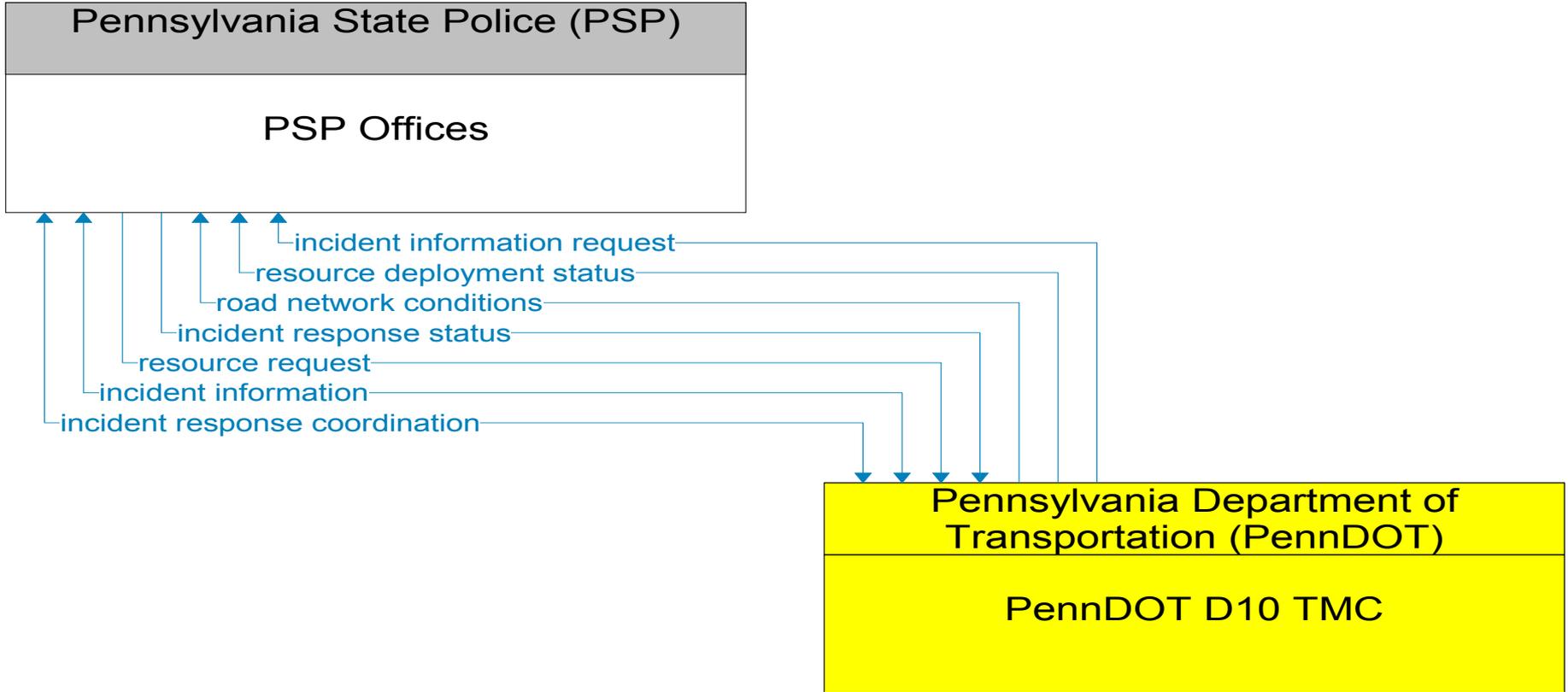
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- - - - - Planned



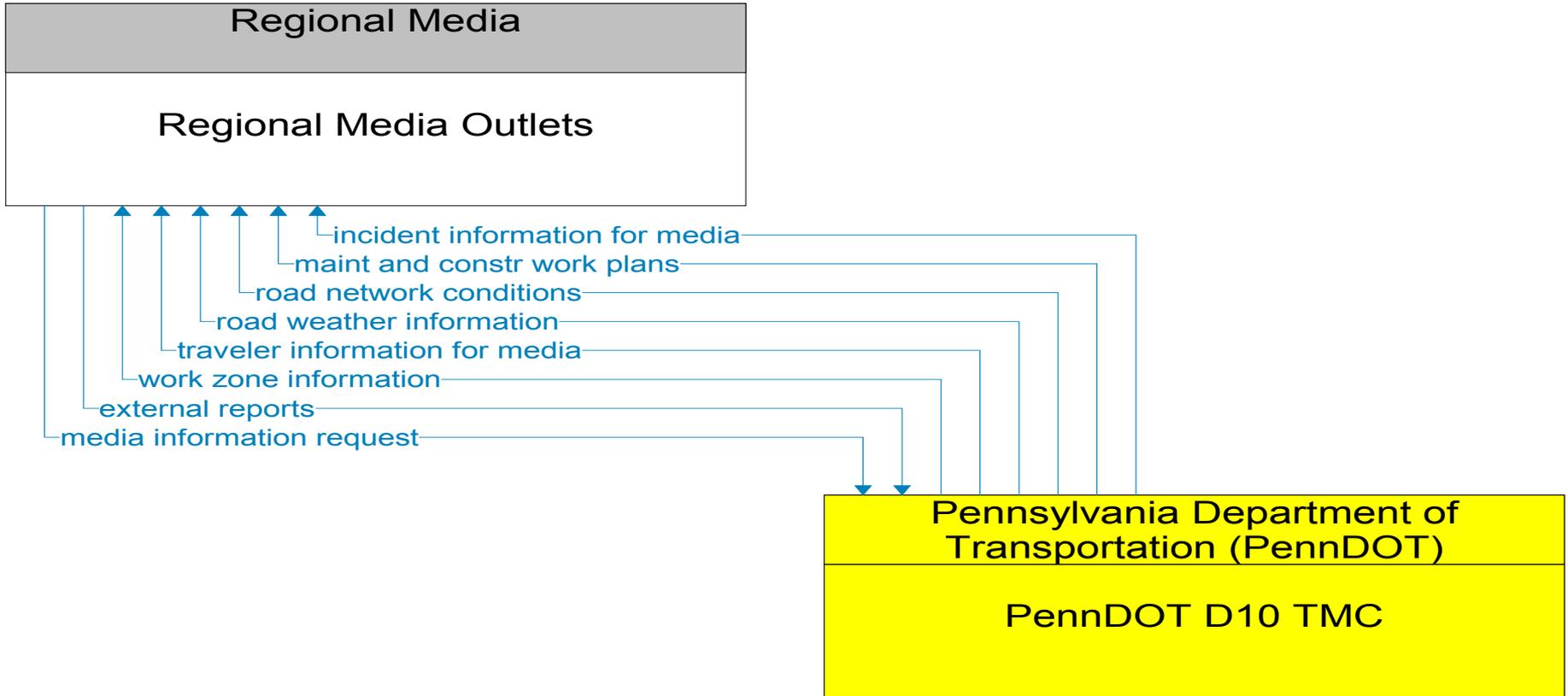
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- - - - - Planned



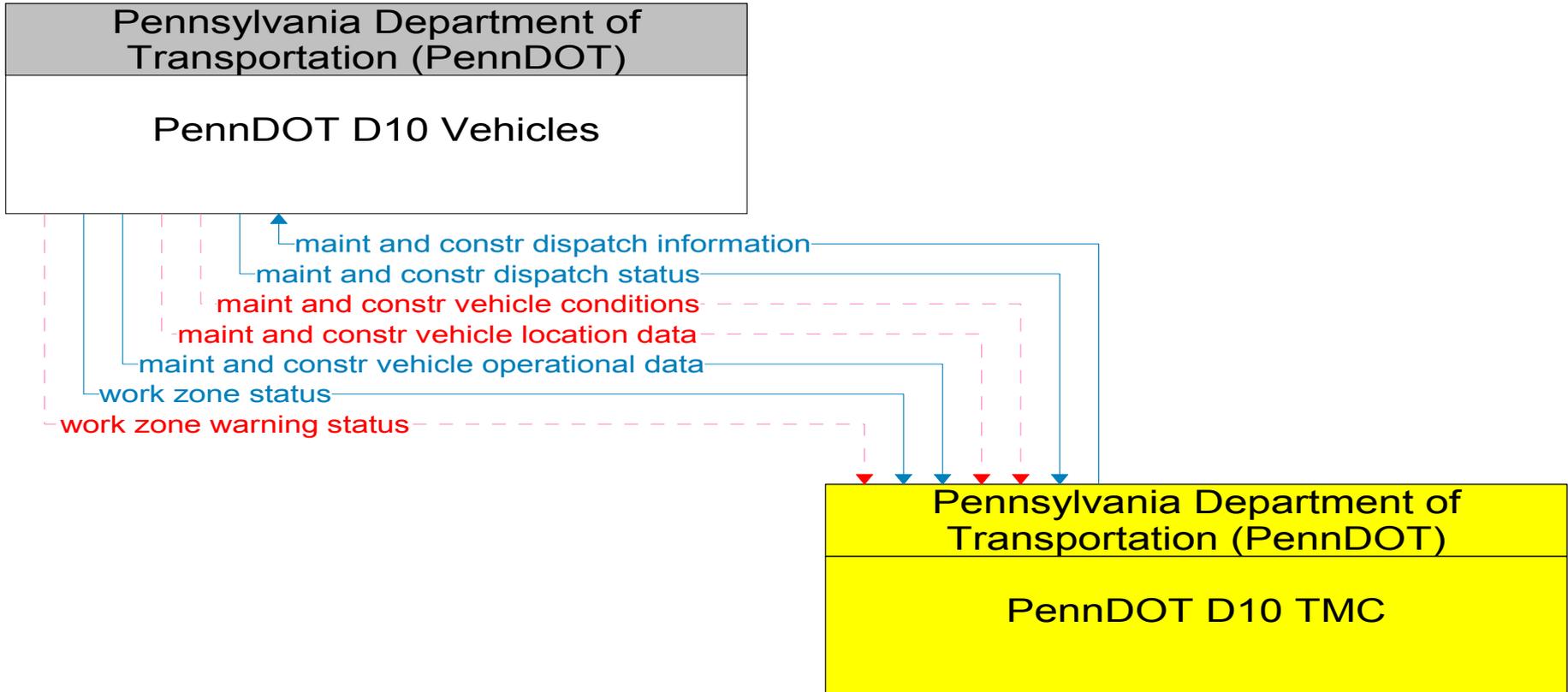
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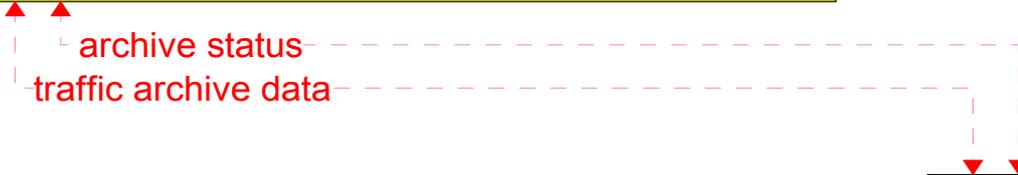
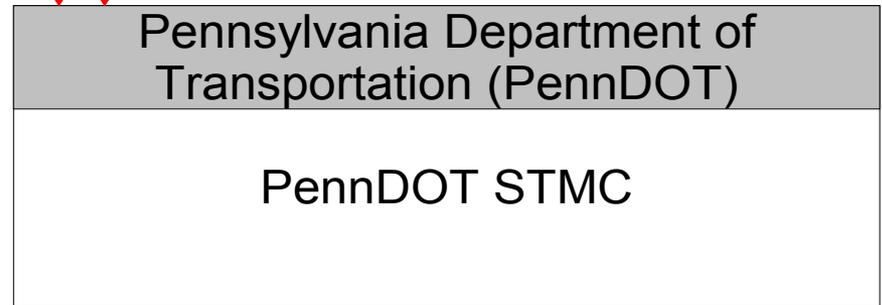
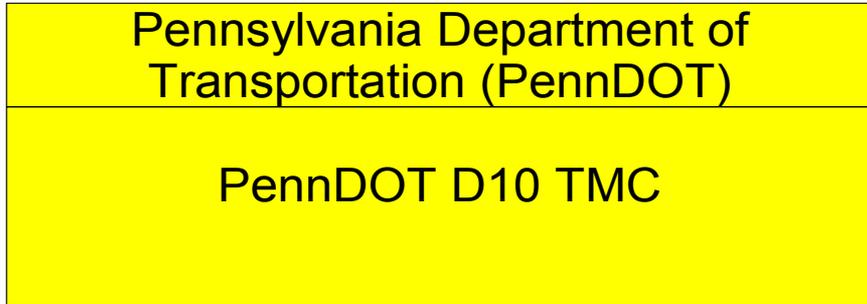
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Planned



———— Existing
- - - - - Planned

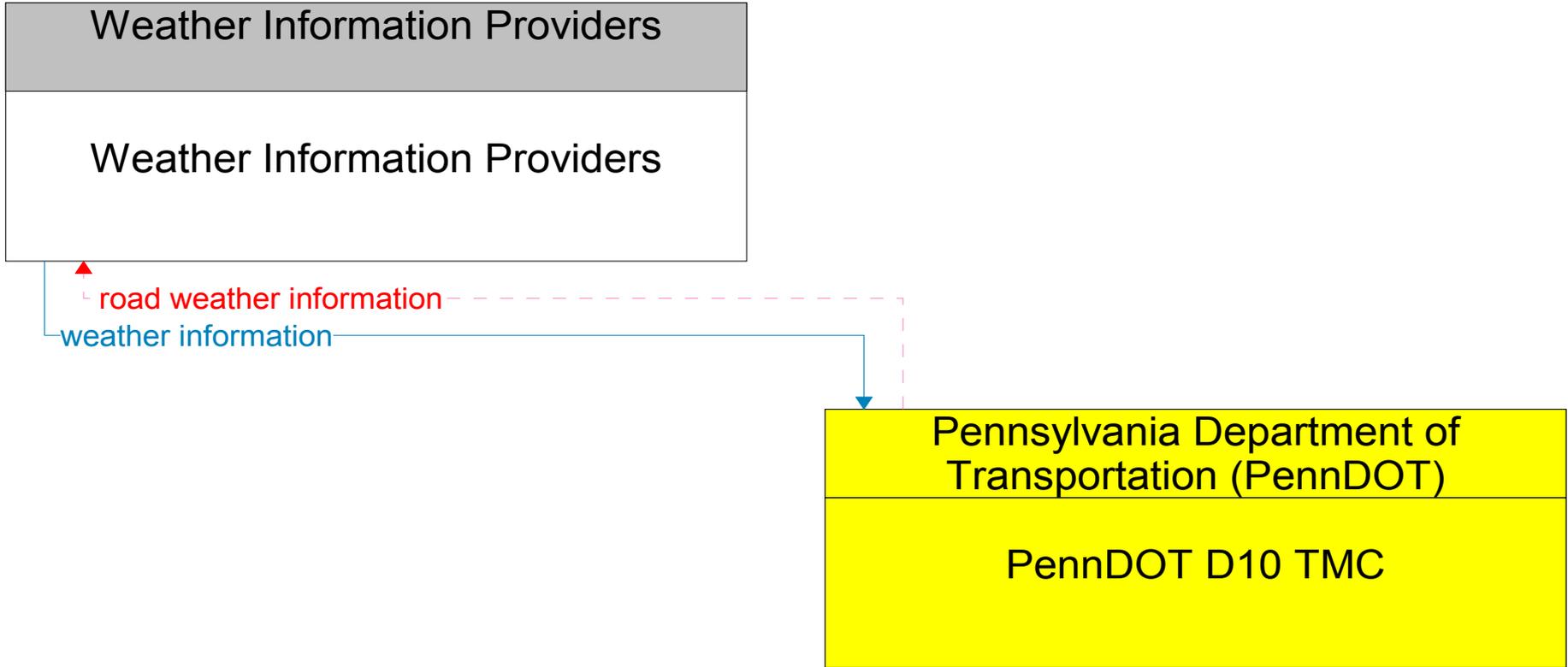


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----- Planned



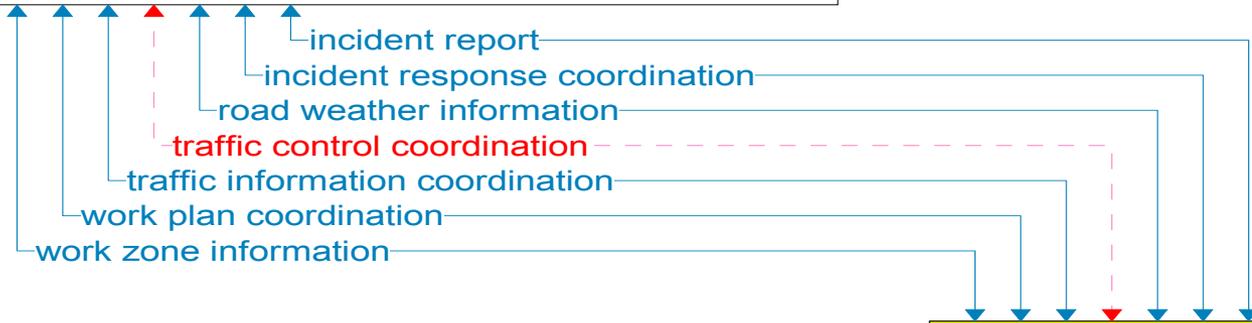
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- - - - - Planned



Pennsylvania Department of
Transportation (PennDOT)

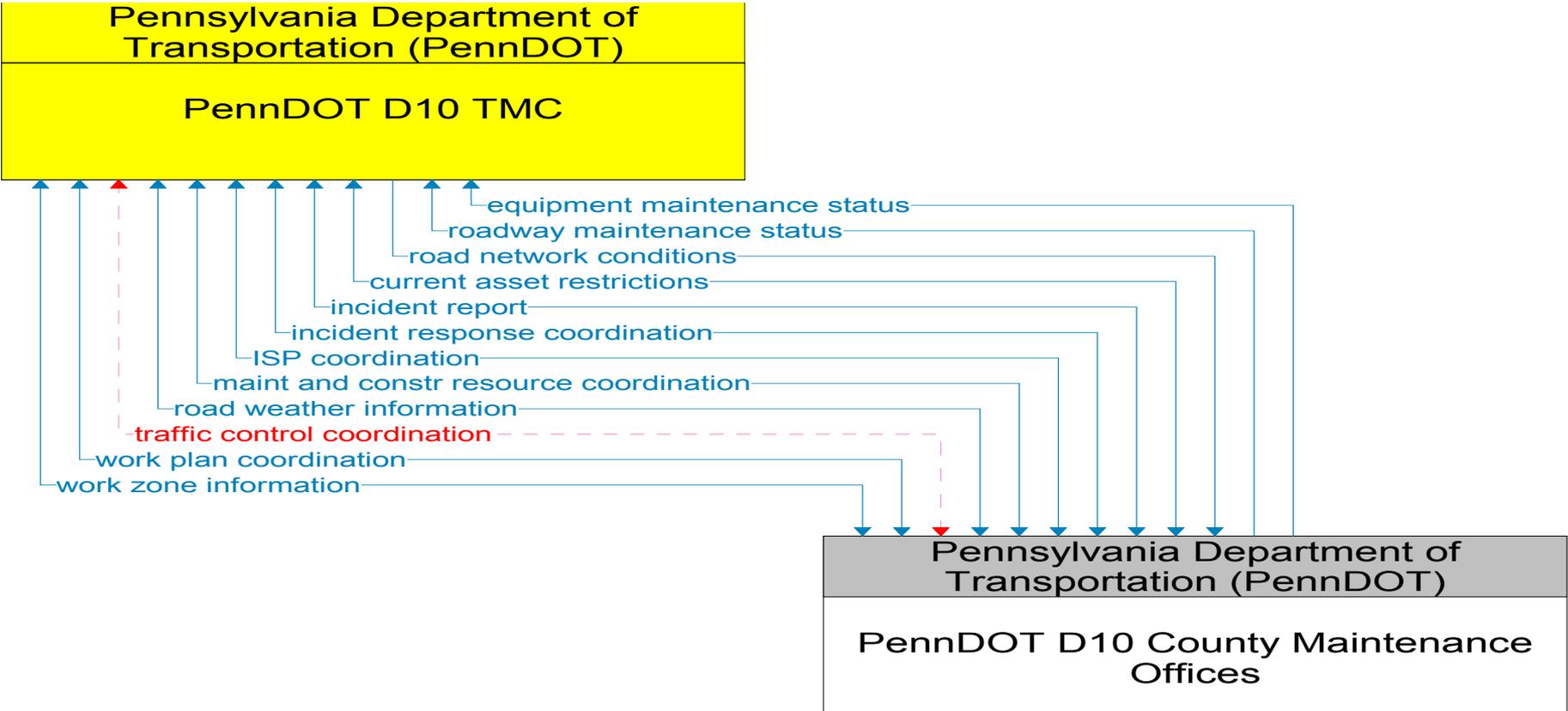
PennDOT D1 TMC



Pennsylvania Department of
Transportation (PennDOT)

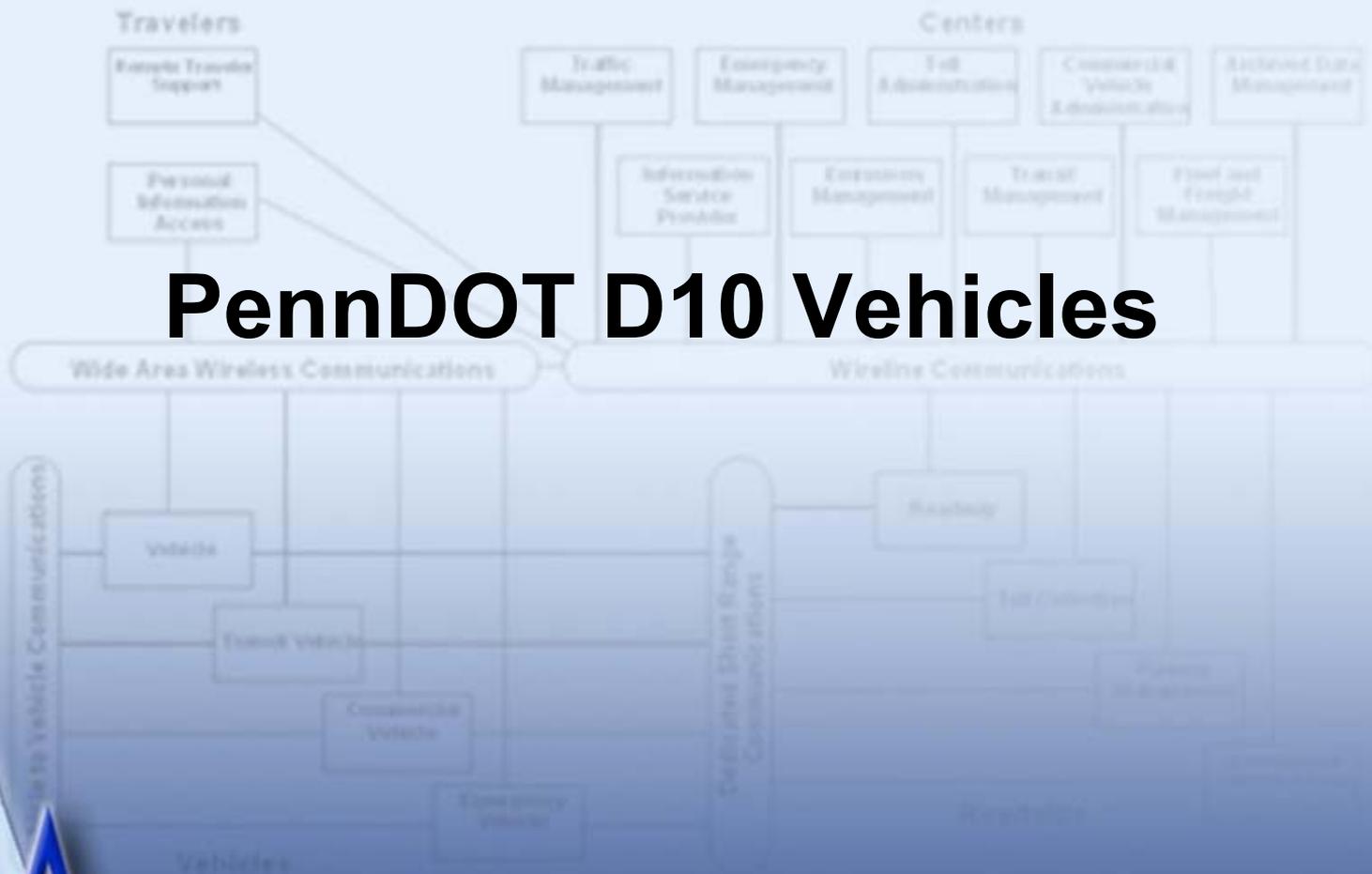
PennDOT D10 TMC

Existing
Planned



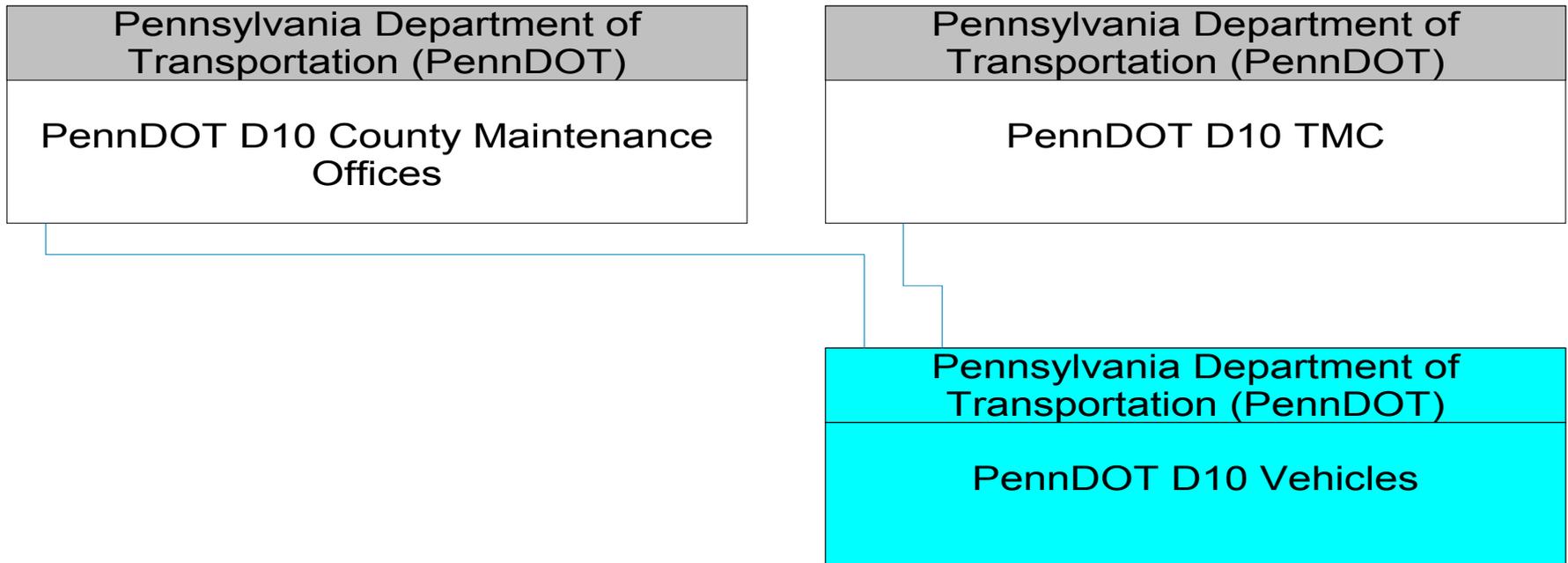
———— Existing
- - - - - Planned

PennDOT D10 Vehicles

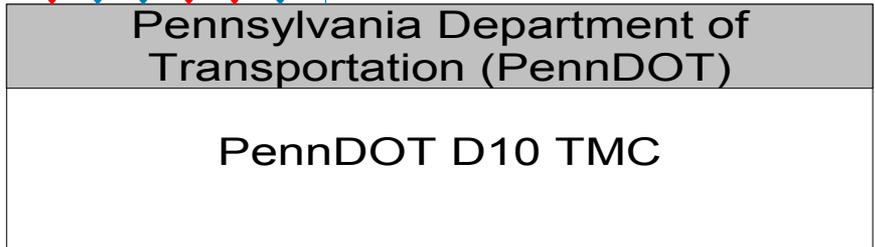
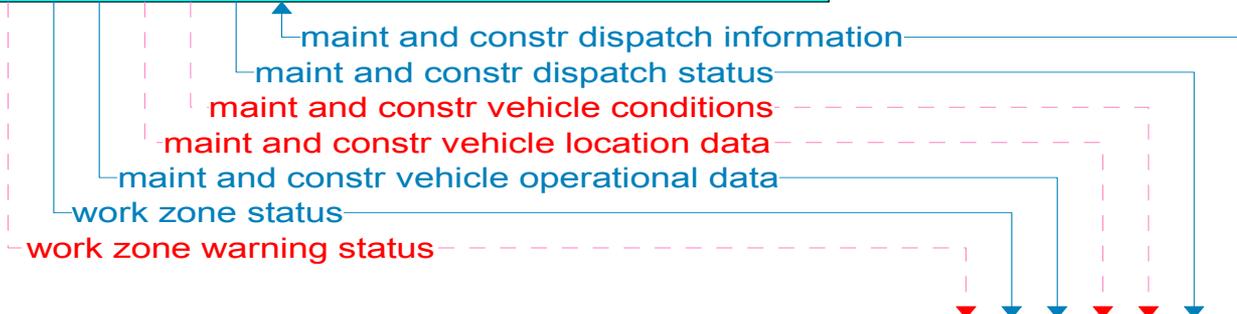
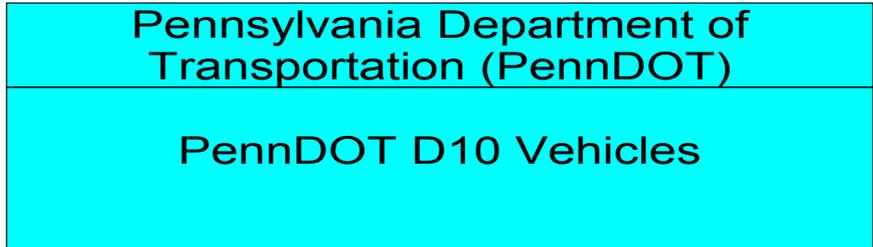


PA

PennDOT D10 Vehicles Interconnect Diagram

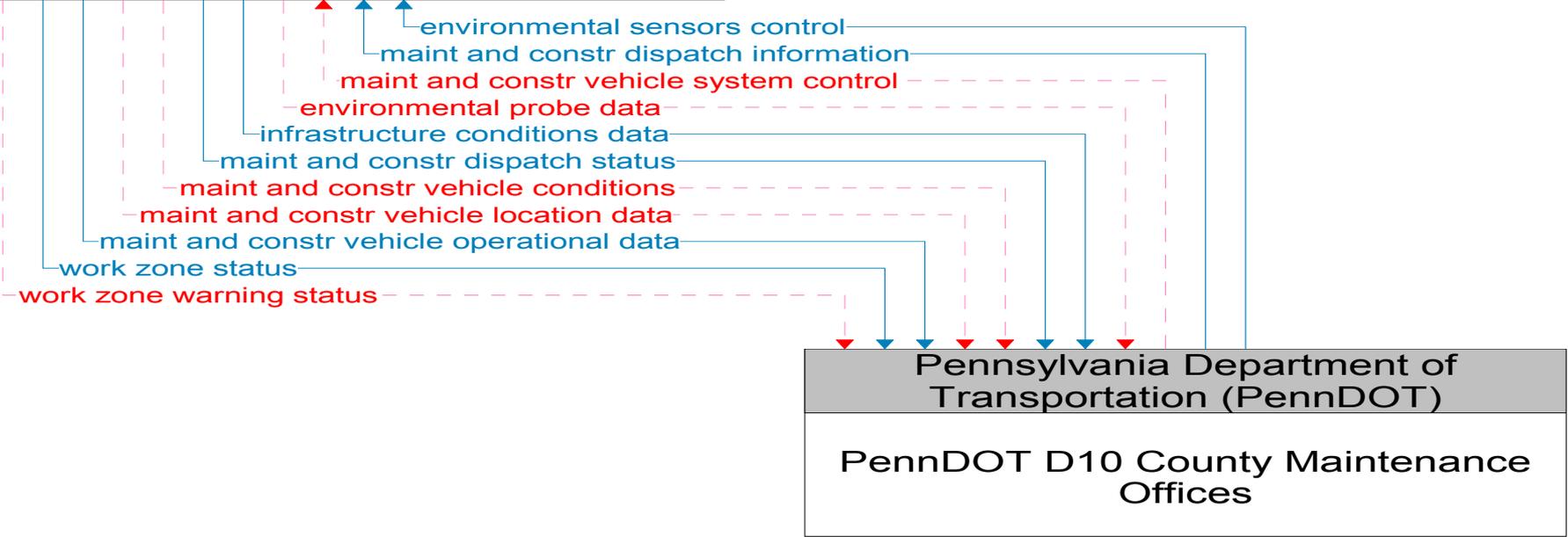


———— Existing
----- Planned

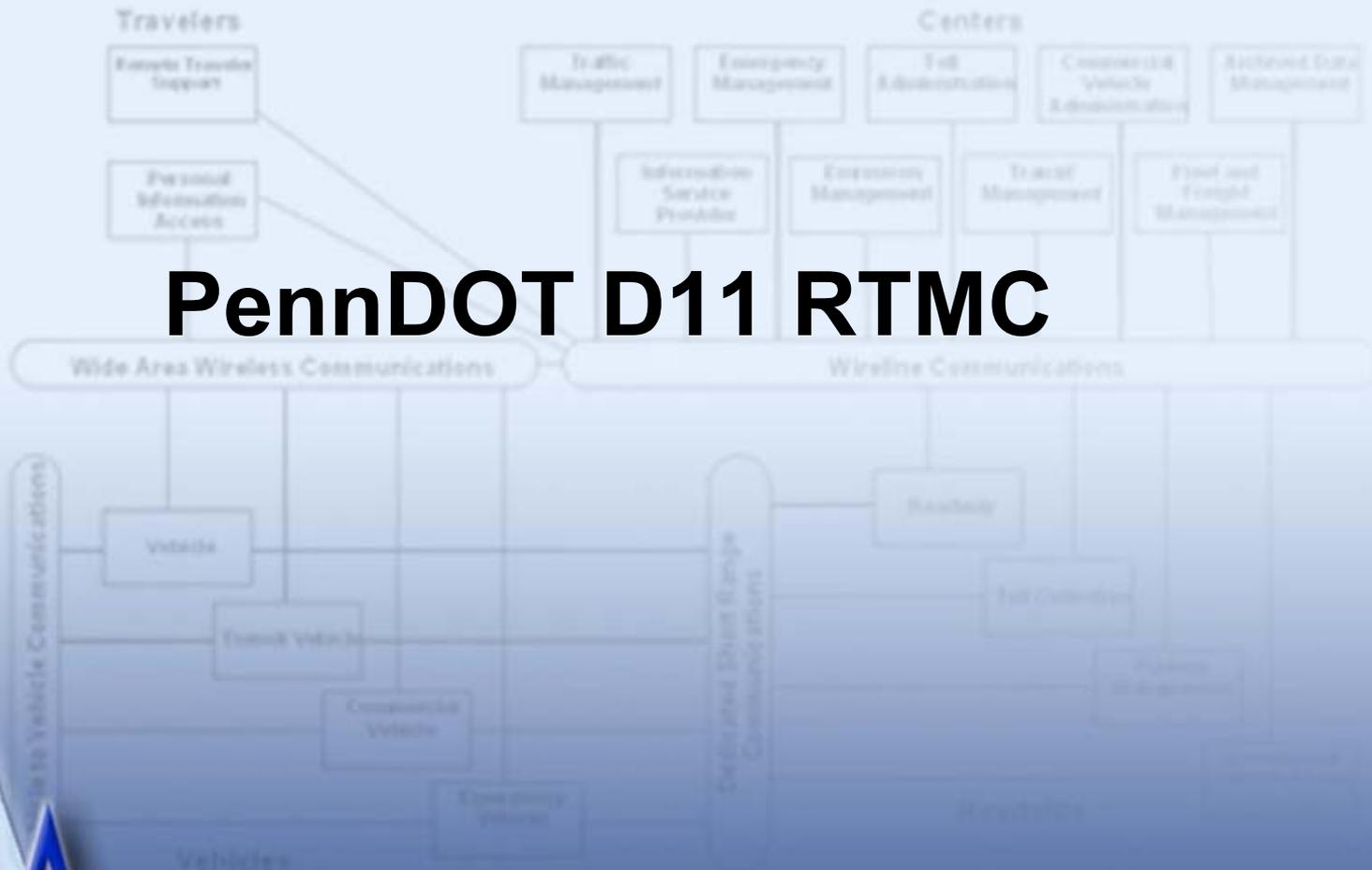


Existing
Planned

Pennsylvania Department of Transportation (PennDOT)
PennDOT D10 Vehicles

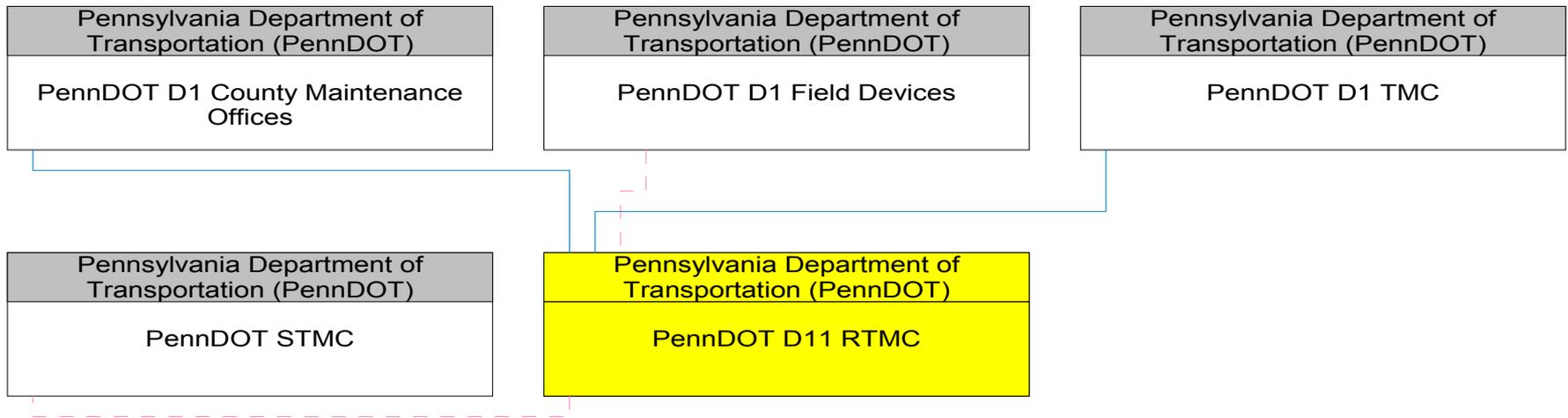


PennDOT D11 RTMC



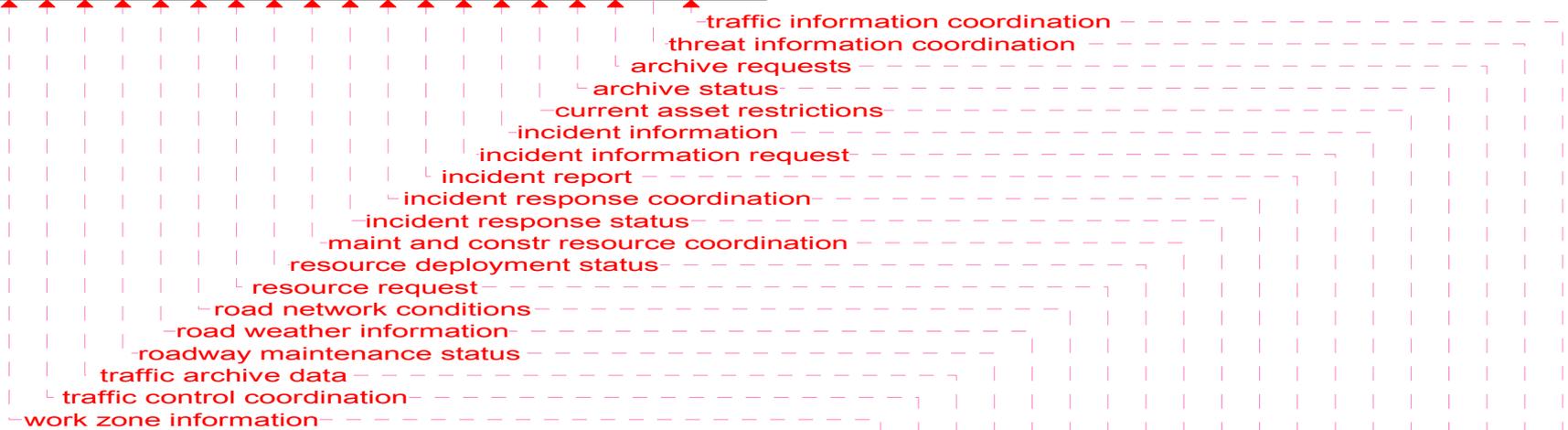
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PennDOT D11 RTMC Interconnect Diagram



— Existing
- - - Planned

Pennsylvania Department of Transportation
(PennDOT)
PennDOT STMC

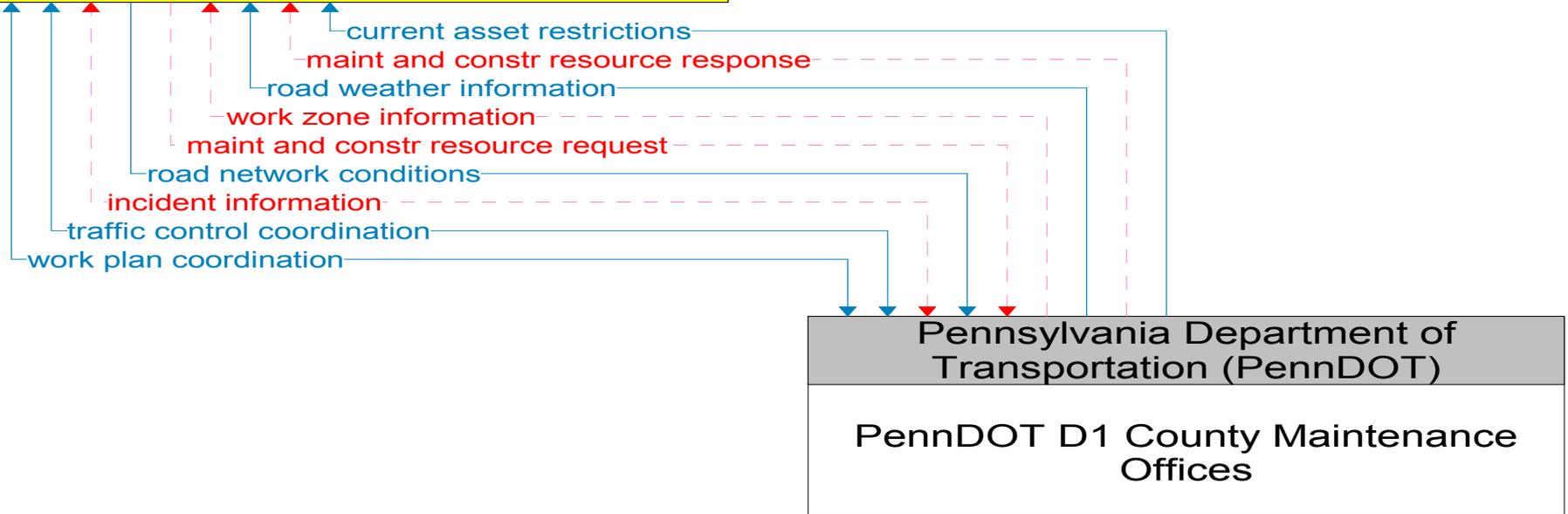


Pennsylvania Department of Transportation
(PennDOT)
PennDOT D11 RTMC

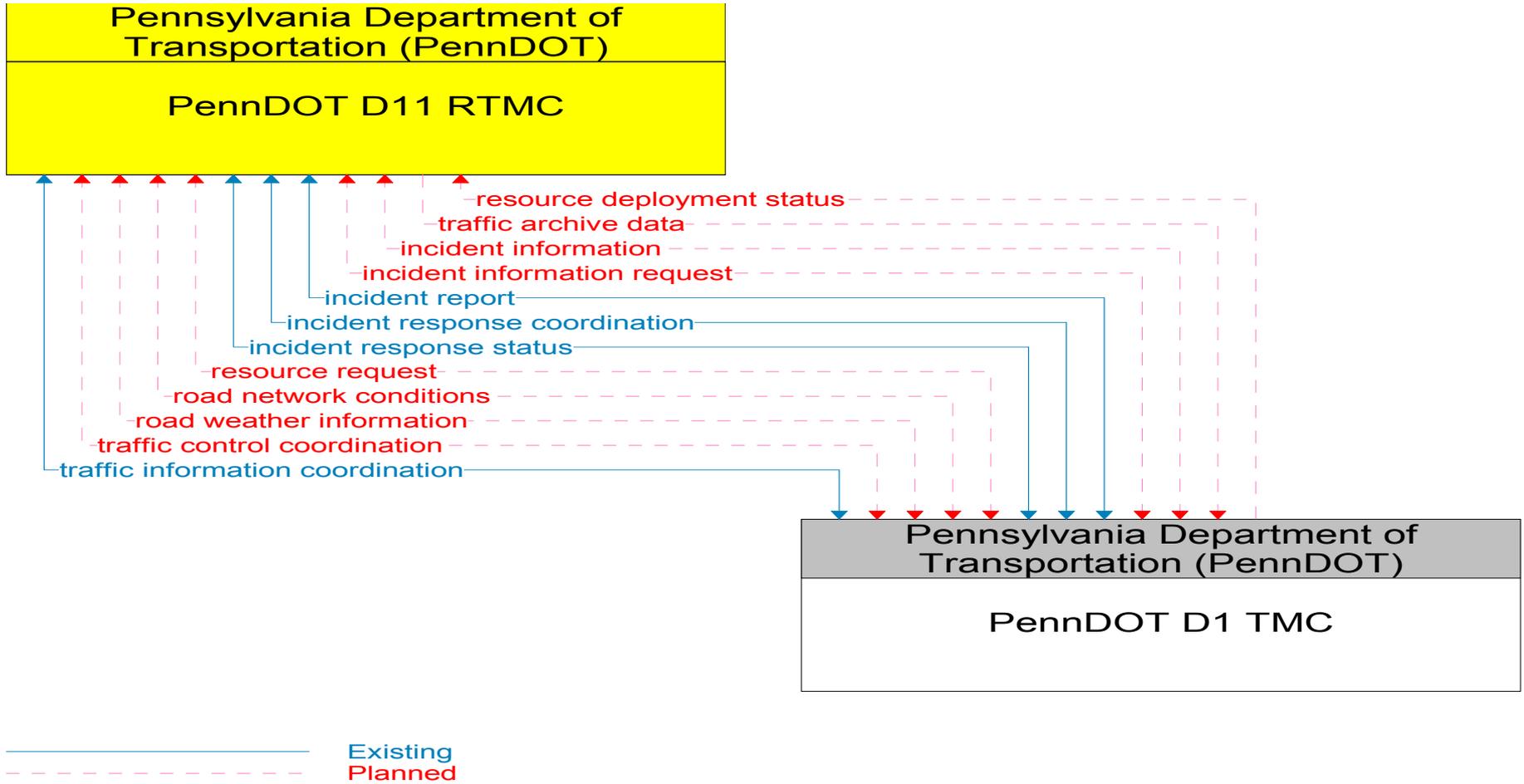
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Planned

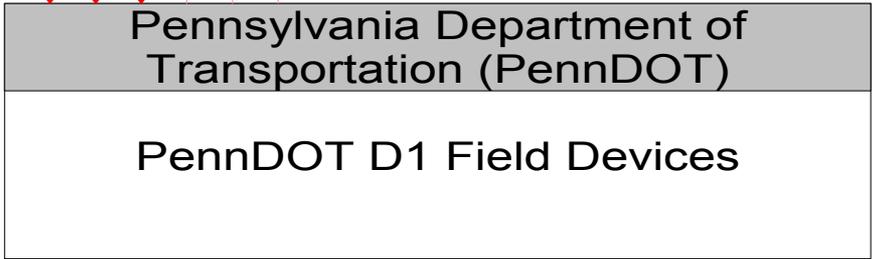
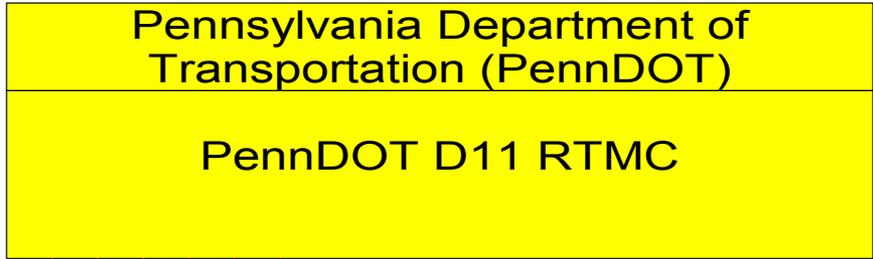
Pennsylvania Department of
Transportation (PennDOT)

PennDOT D11 RTMC

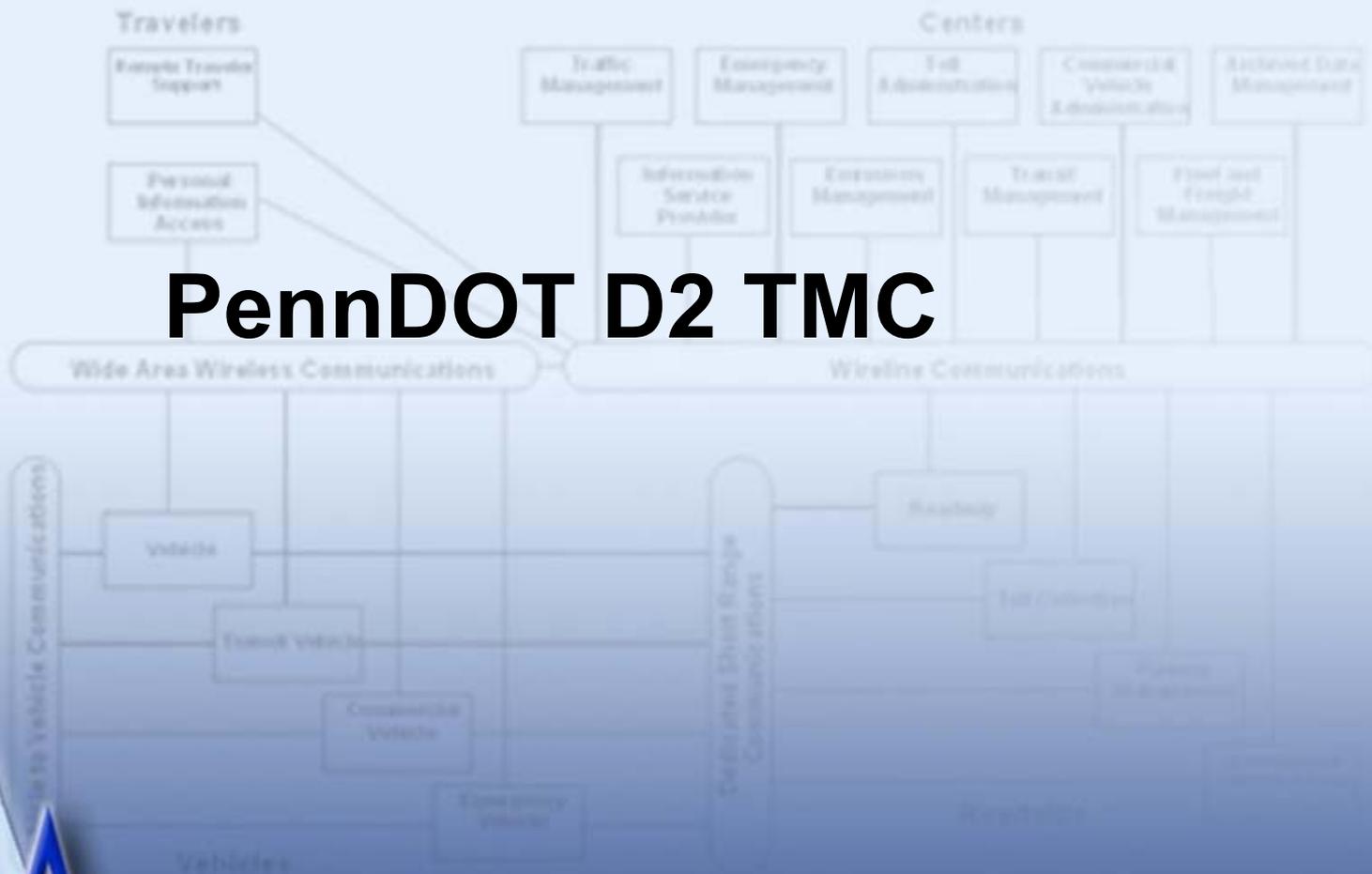


———— Existing
- - - - - Planned



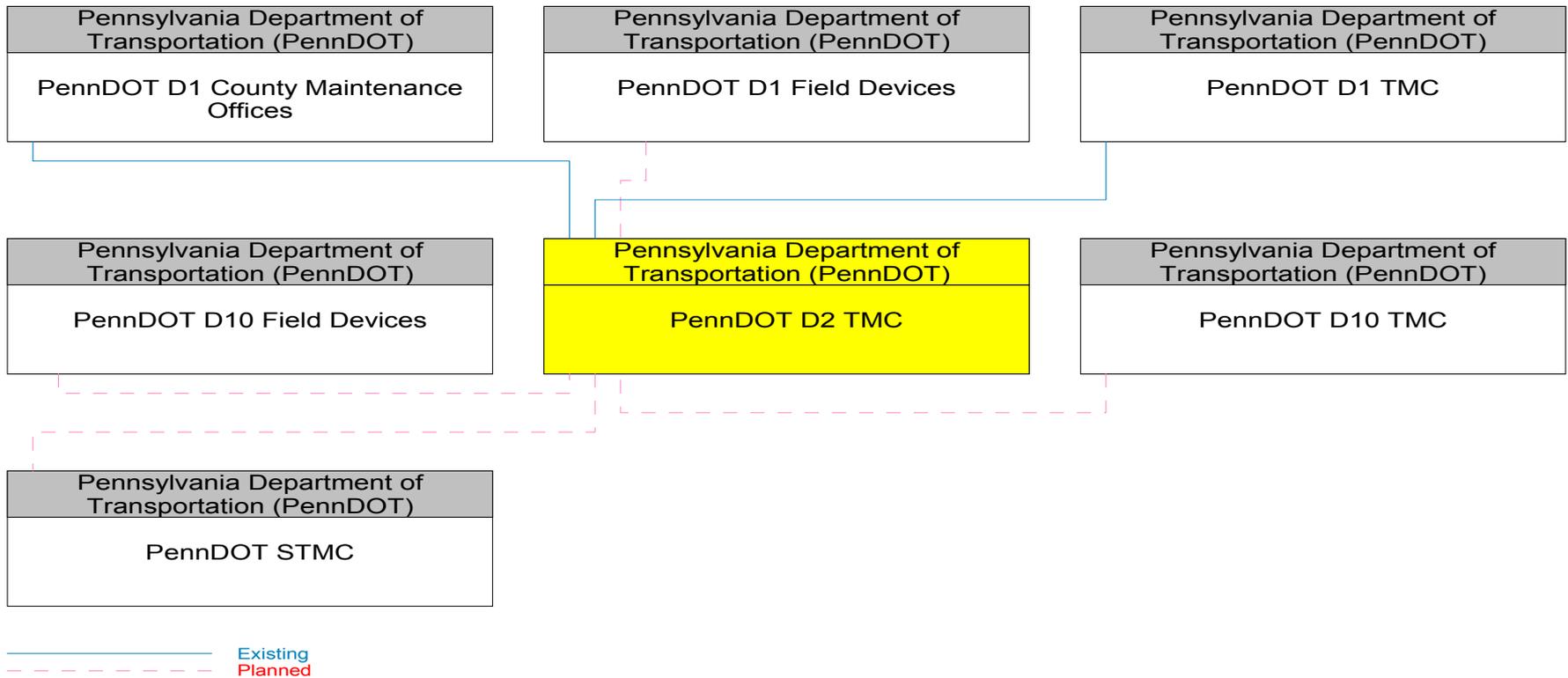


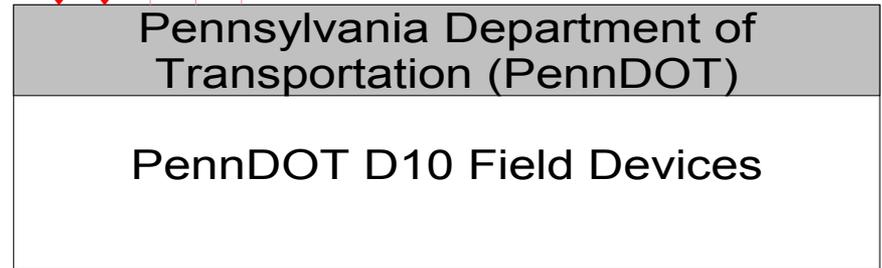
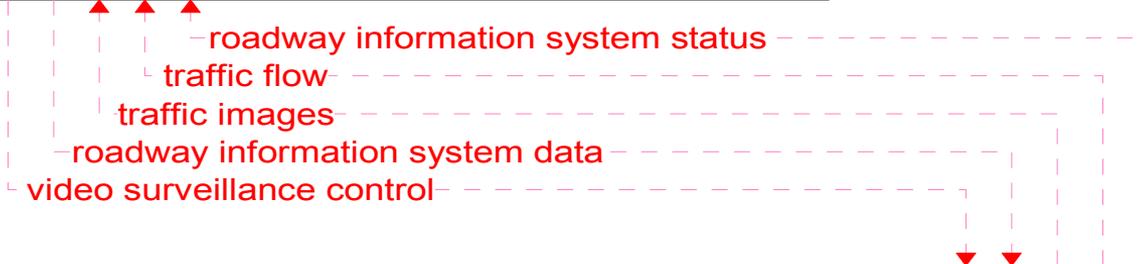
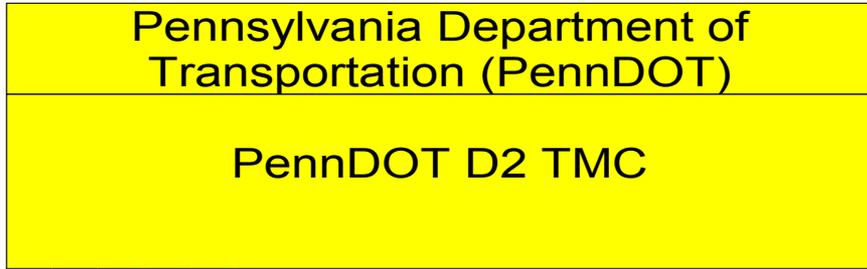
PennDOT D2 TMC



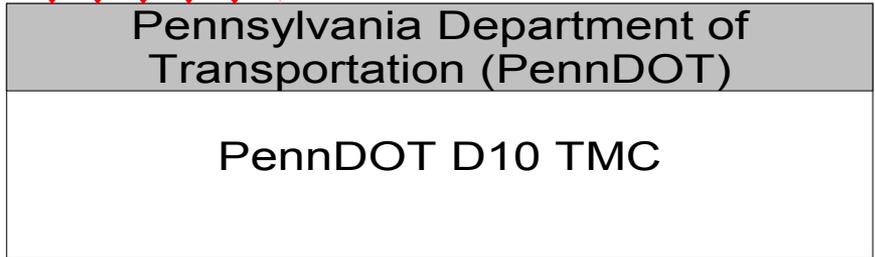
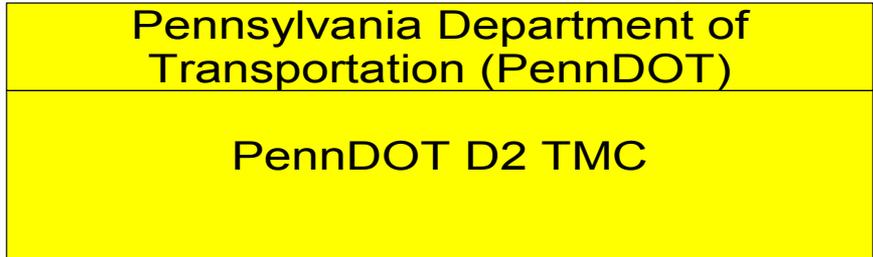
PA

PennDOT D2 TMC Interconnect Diagram





———— Existing
- - - - - Planned



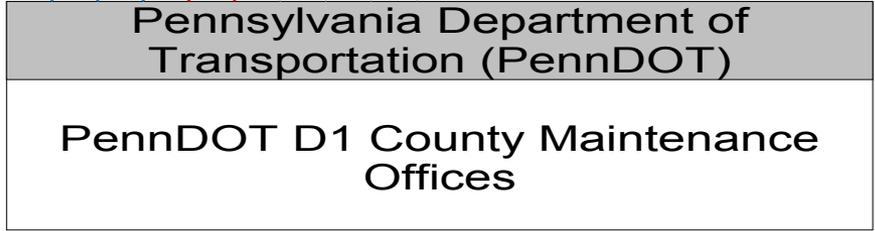
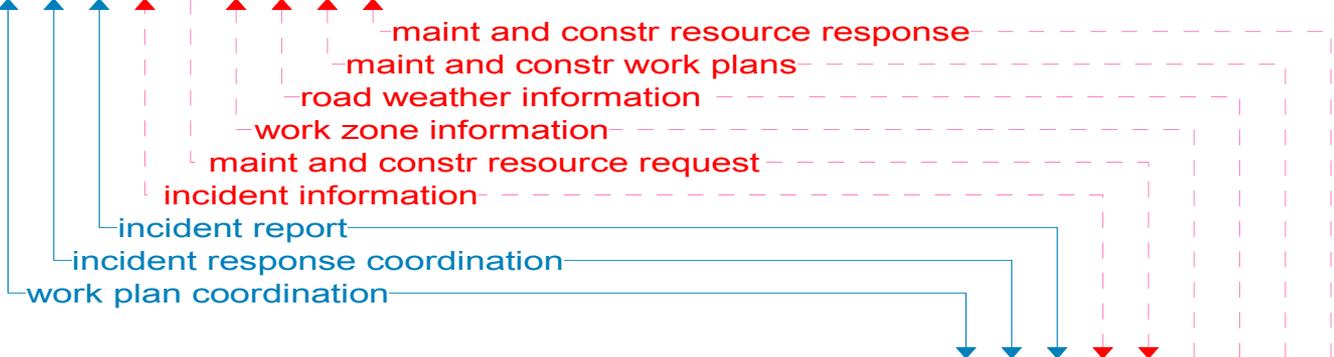
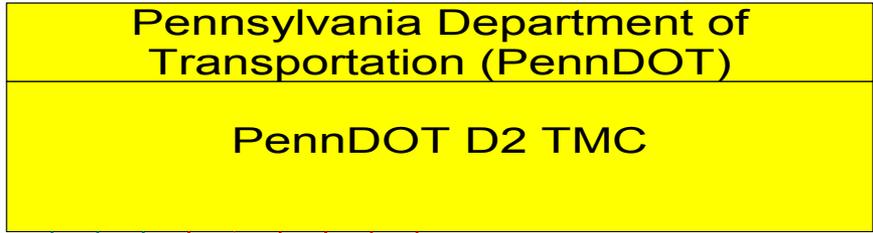
———— Existing
- - - - - Planned

Pennsylvania Department of
Transportation (PennDOT)
PennDOT D2 TMC

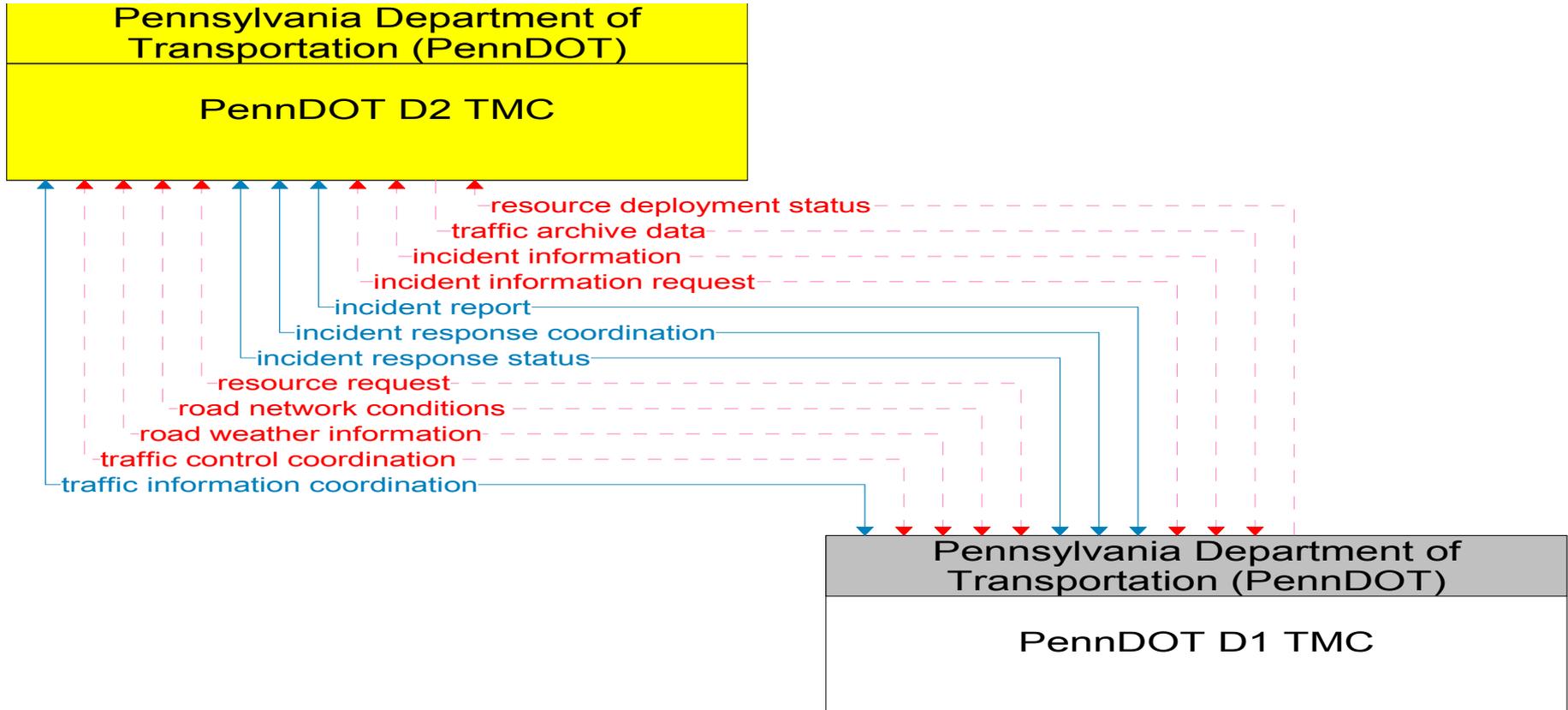
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- archive status
- current asset restrictions
- incident information
- incident information request
- incident report
- incident response coordination
- incident response status
- maint and constr resource coordination
- resource deployment status
- resource request
- road network conditions
- road weather information
- roadway maintenance status
- traffic archive data
- traffic control coordination
- traffic information coordination
- work zone information

Pennsylvania Department of
Transportation (PennDOT)
PennDOT STMC

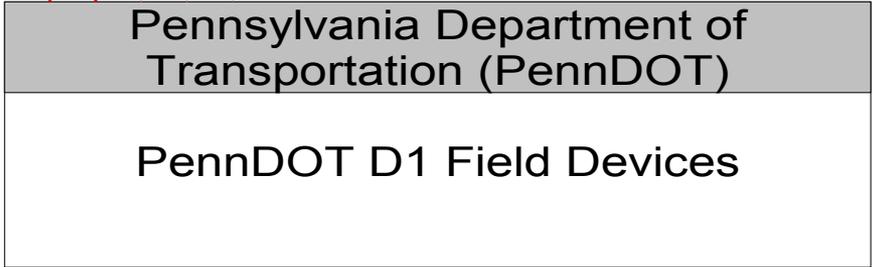
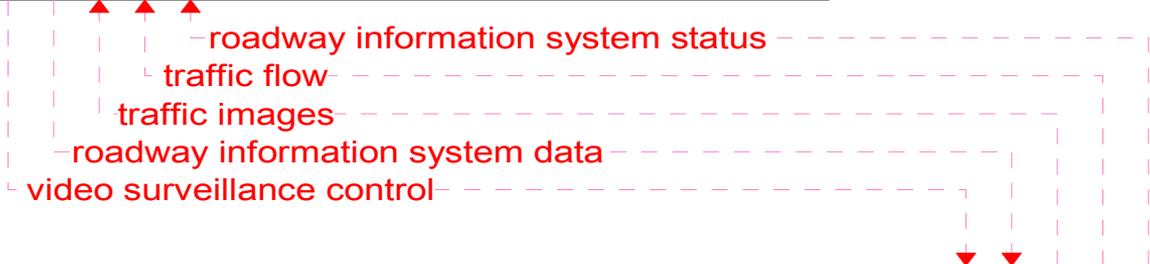
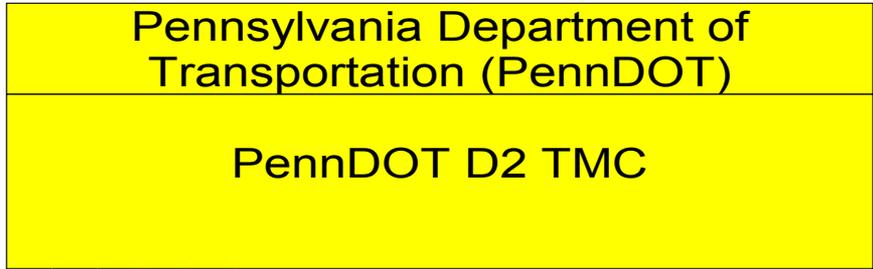
Existing
Planned



Existing
Planned

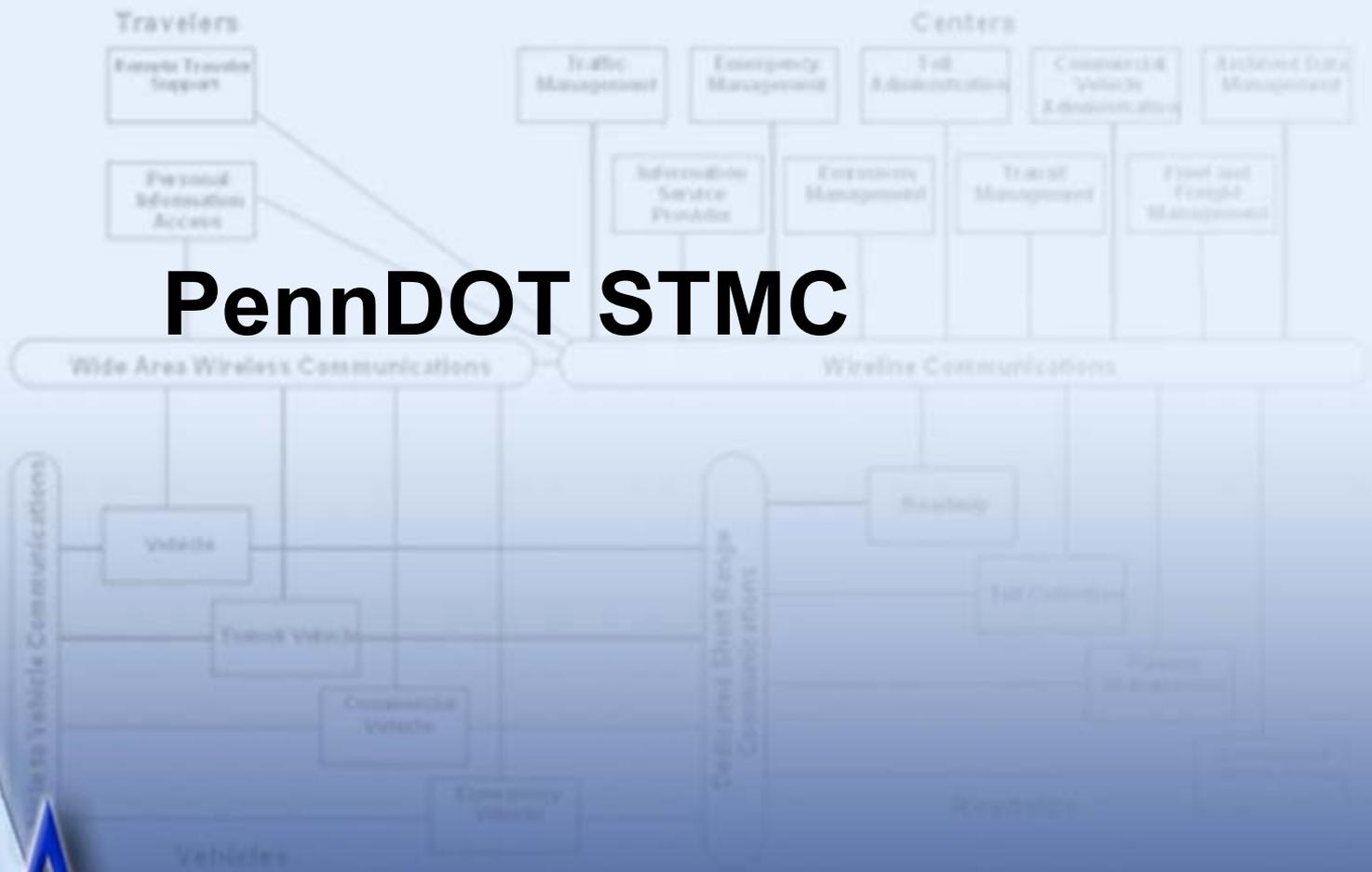


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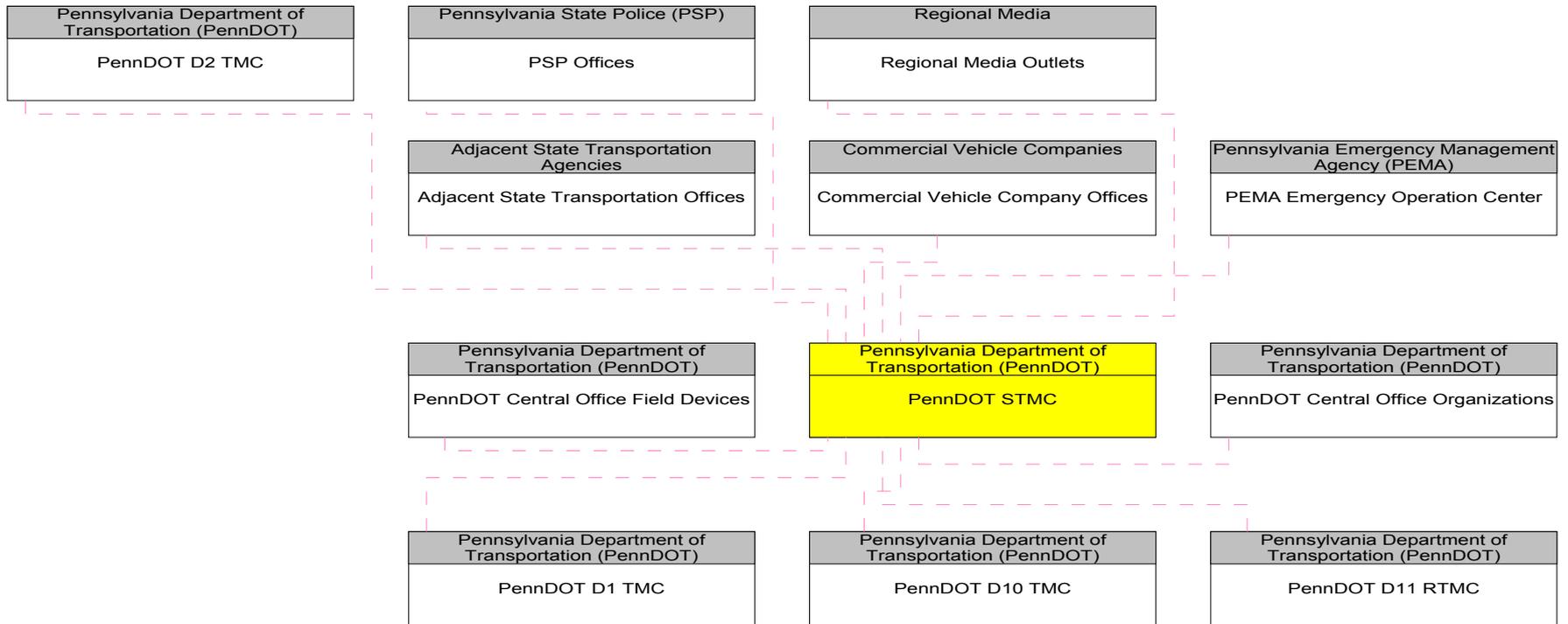
———— Existing
- - - - - Planned

PennDOT STMC

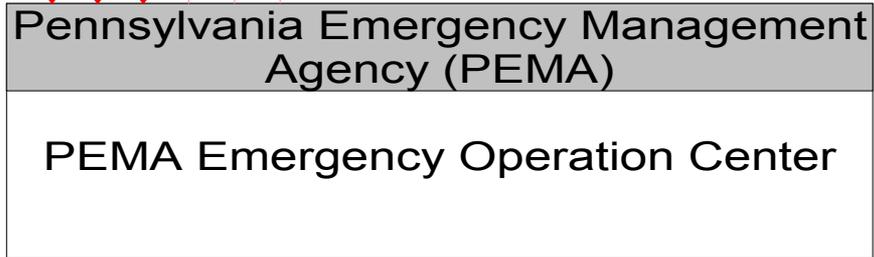
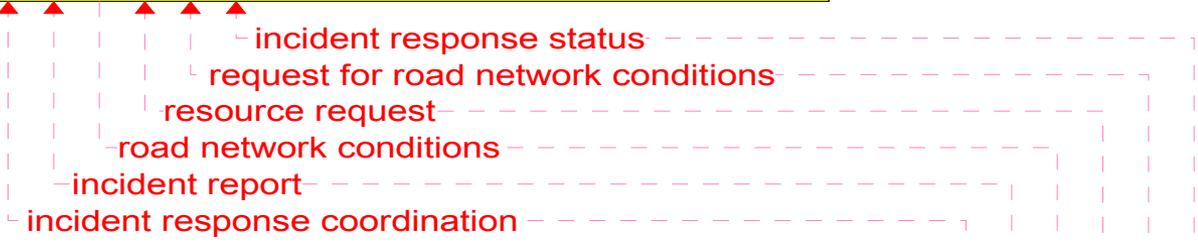
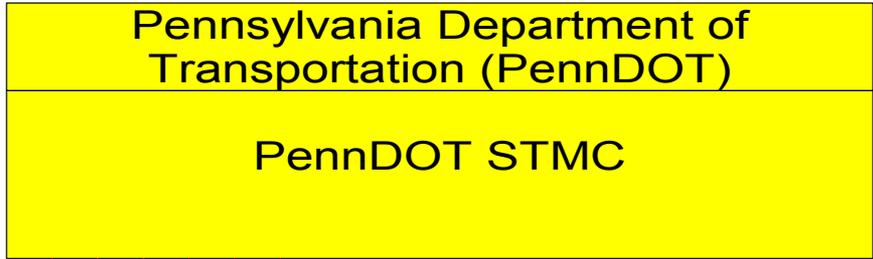


PA

PennDOT STMC Interconnect Diagram



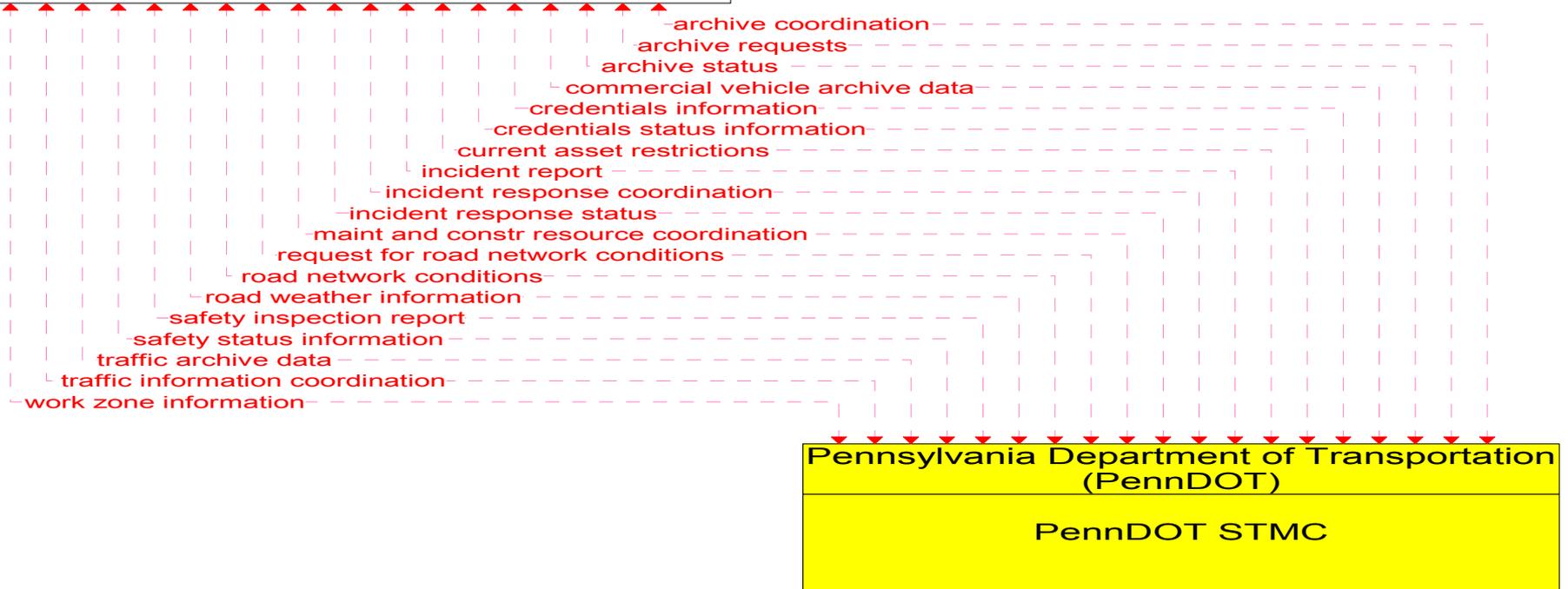
Existing
Planned



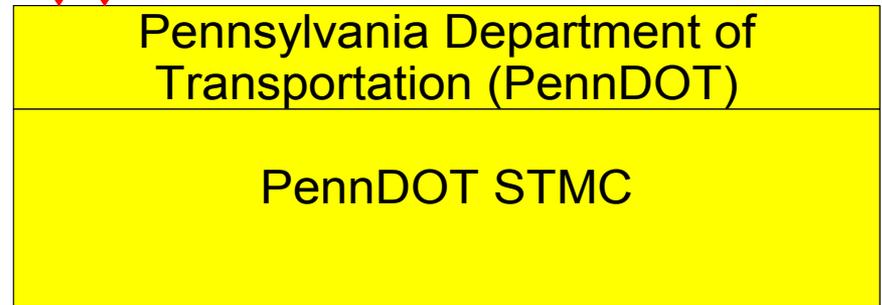
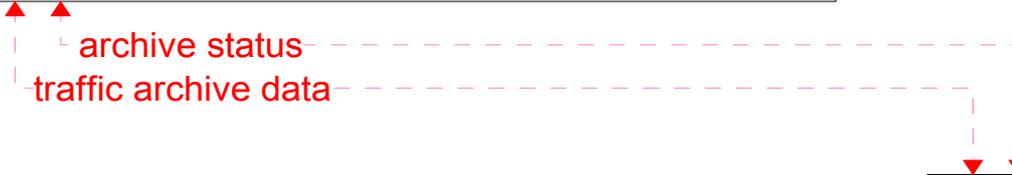
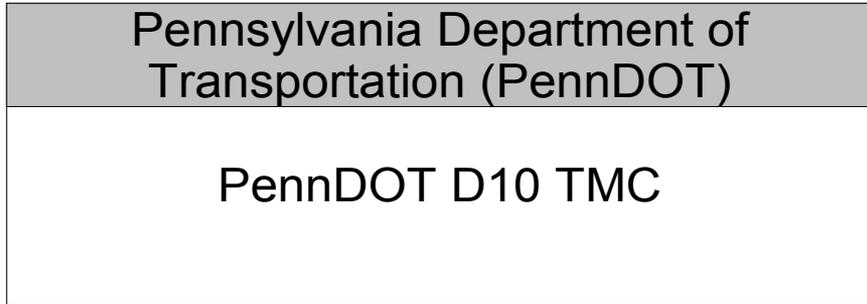
Existing
Planned

**Pennsylvania Department of Transportation
(PennDOT)**

PennDOT Central Office Organizations



———— Existing
- - - - - Planned

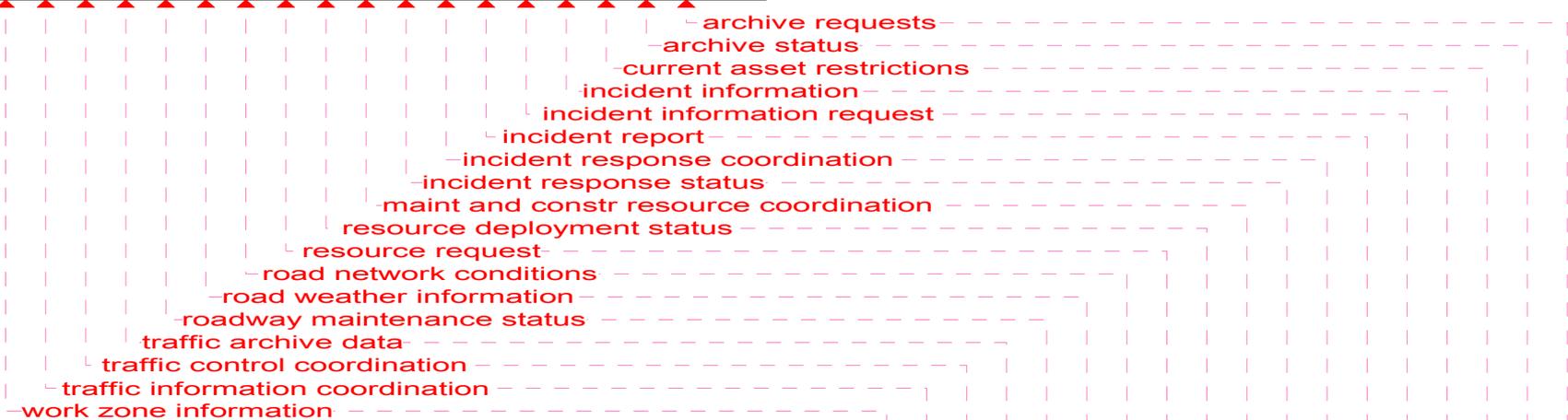


———— Existing

- - - - - Planned

Pennsylvania Department of
Transportation (PennDOT)

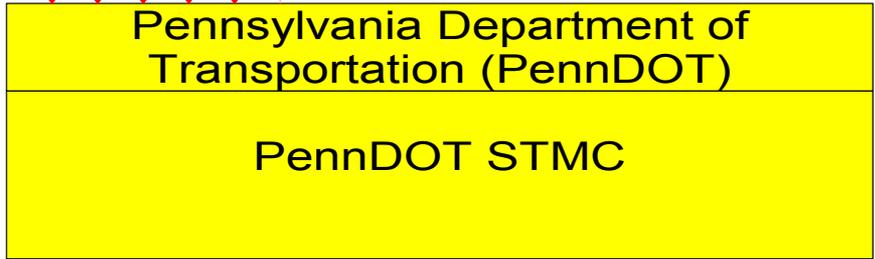
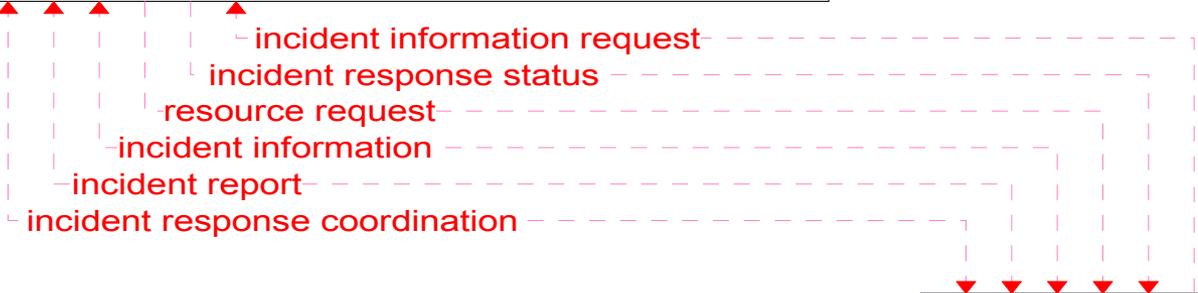
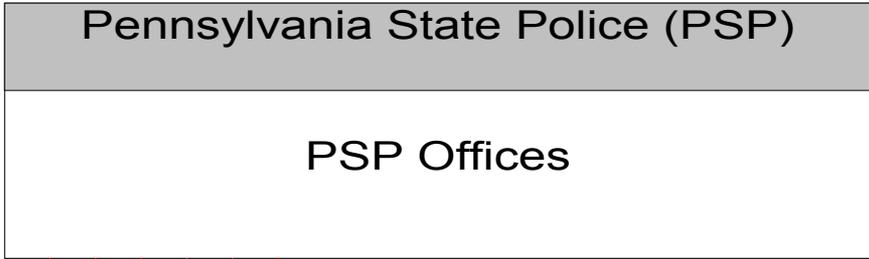
PennDOT D2 TMC



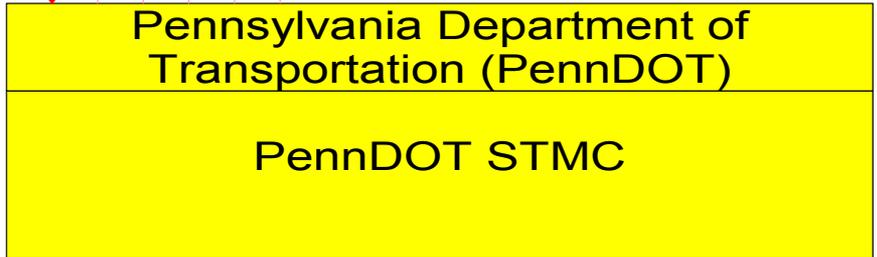
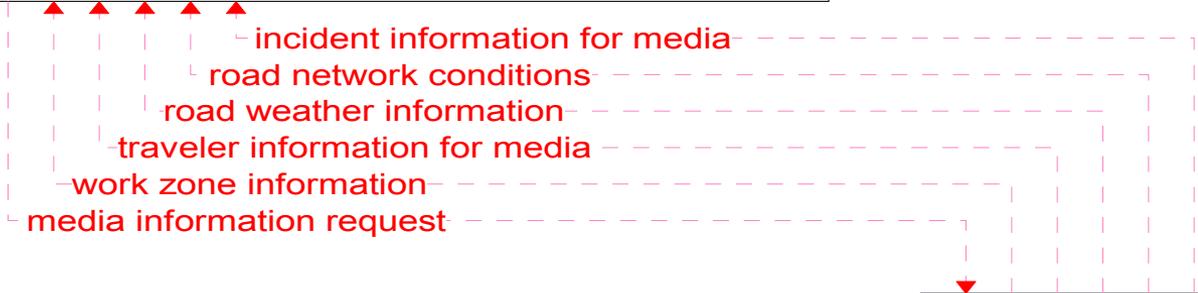
Pennsylvania Department of
Transportation (PennDOT)

PennDOT STMC

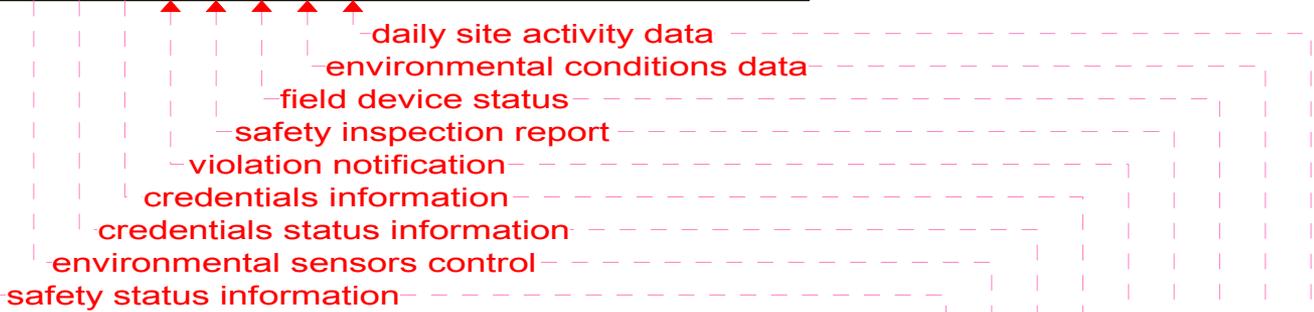
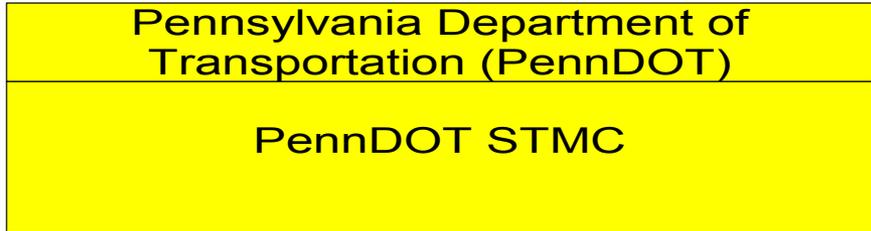
Existing
Planned



Existing
Planned



———— Existing
- - - - - Planned



———— Existing
- - - - - Planned

Pennsylvania Department of
Transportation (PennDOT)

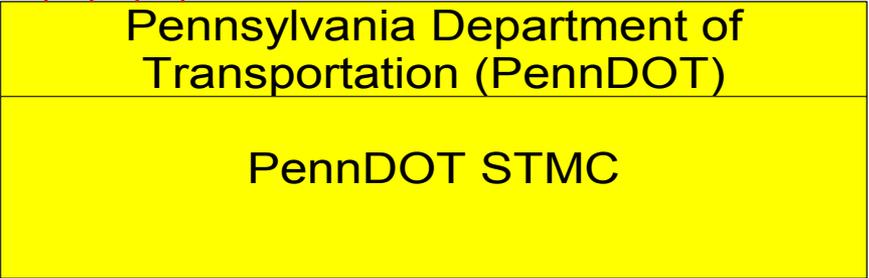
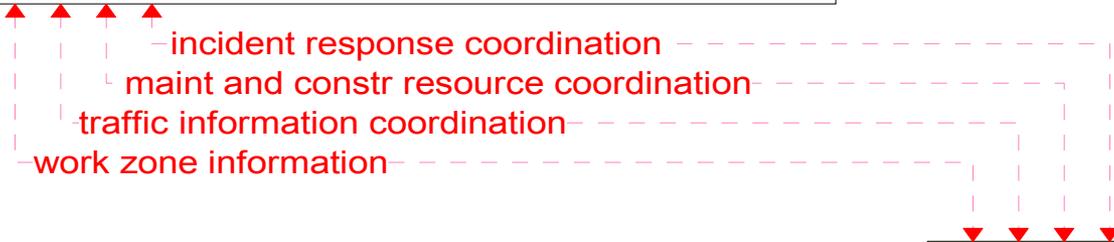
PennDOT STMC



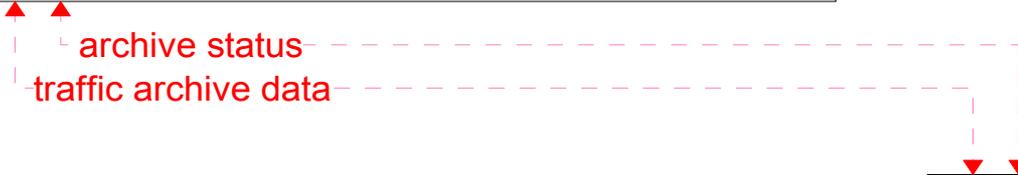
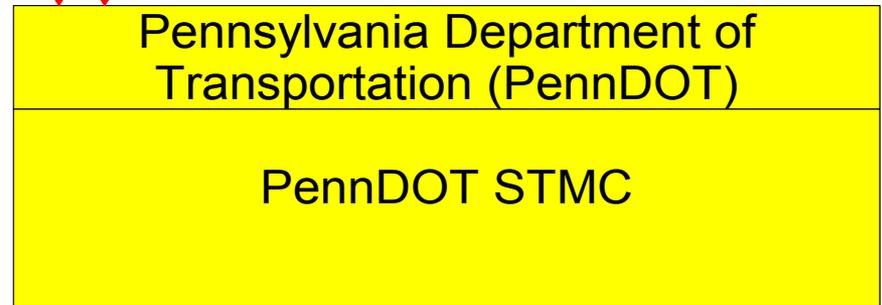
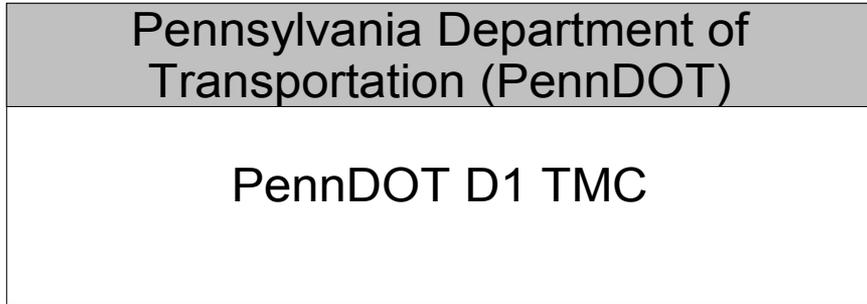
Commercial Vehicle Companies

Commercial Vehicle Company Offices

———— Existing
- - - - - Planned



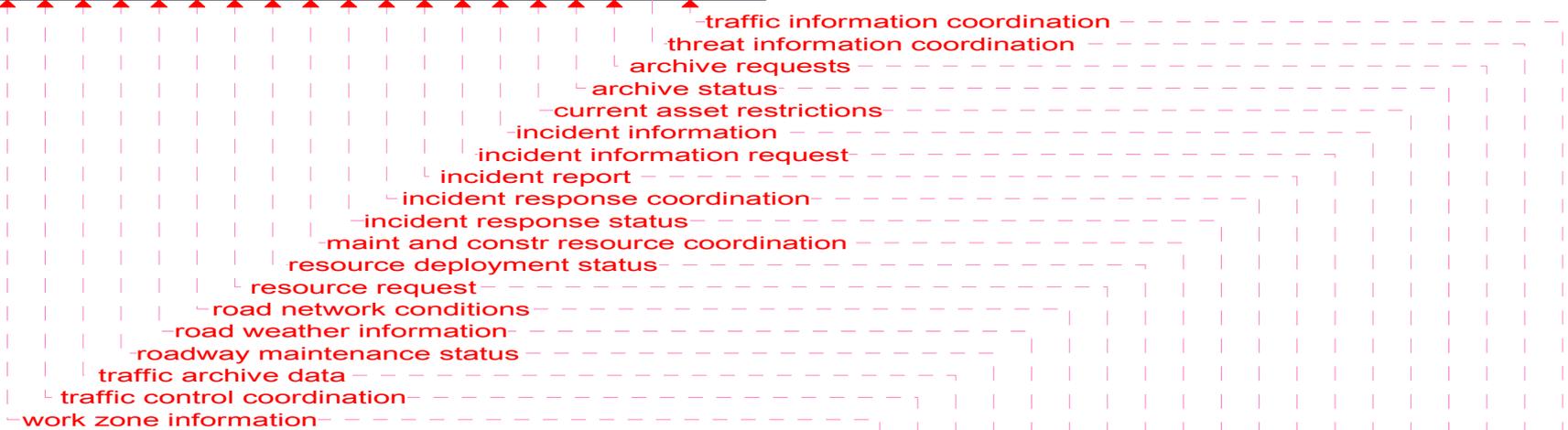
Existing
Planned



———— Existing

- - - - - Planned

Pennsylvania Department of Transportation
(PennDOT)
PennDOT STMC



Pennsylvania Department of Transportation
(PennDOT)
PennDOT D11 RTMC

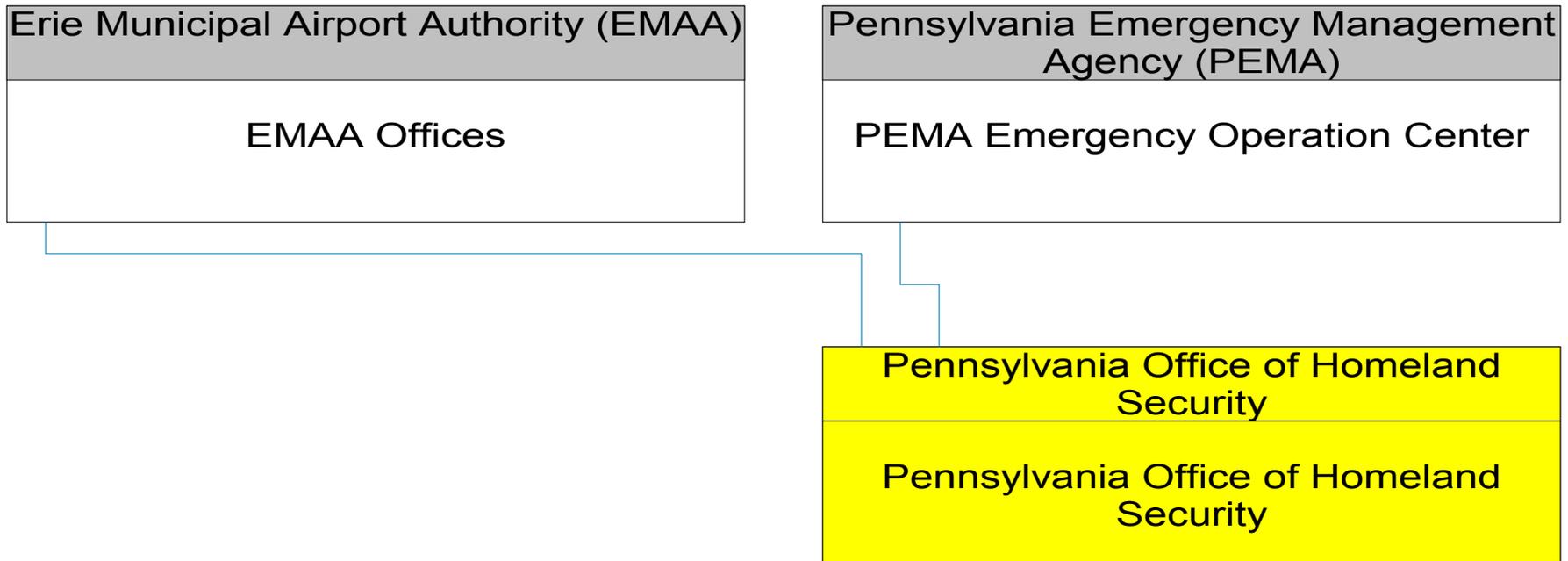
Existing
Planned

Pennsylvania Office of Homeland Security

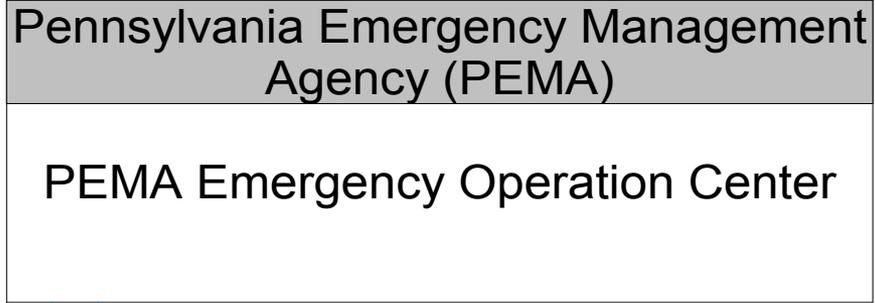


PA

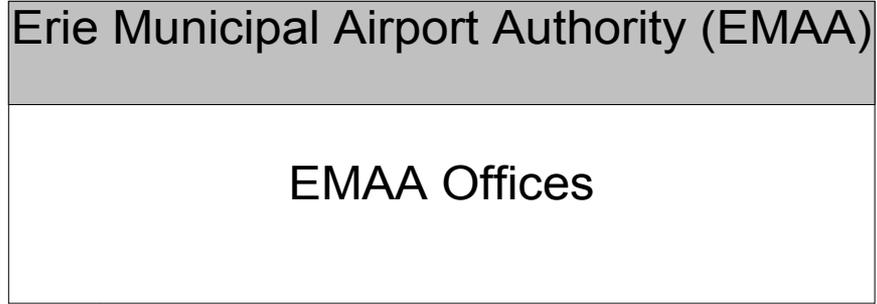
Pennsylvania Office of Homeland Security Interconnect Diagram



———— Existing
----- Planned



— Existing
- - - Planned

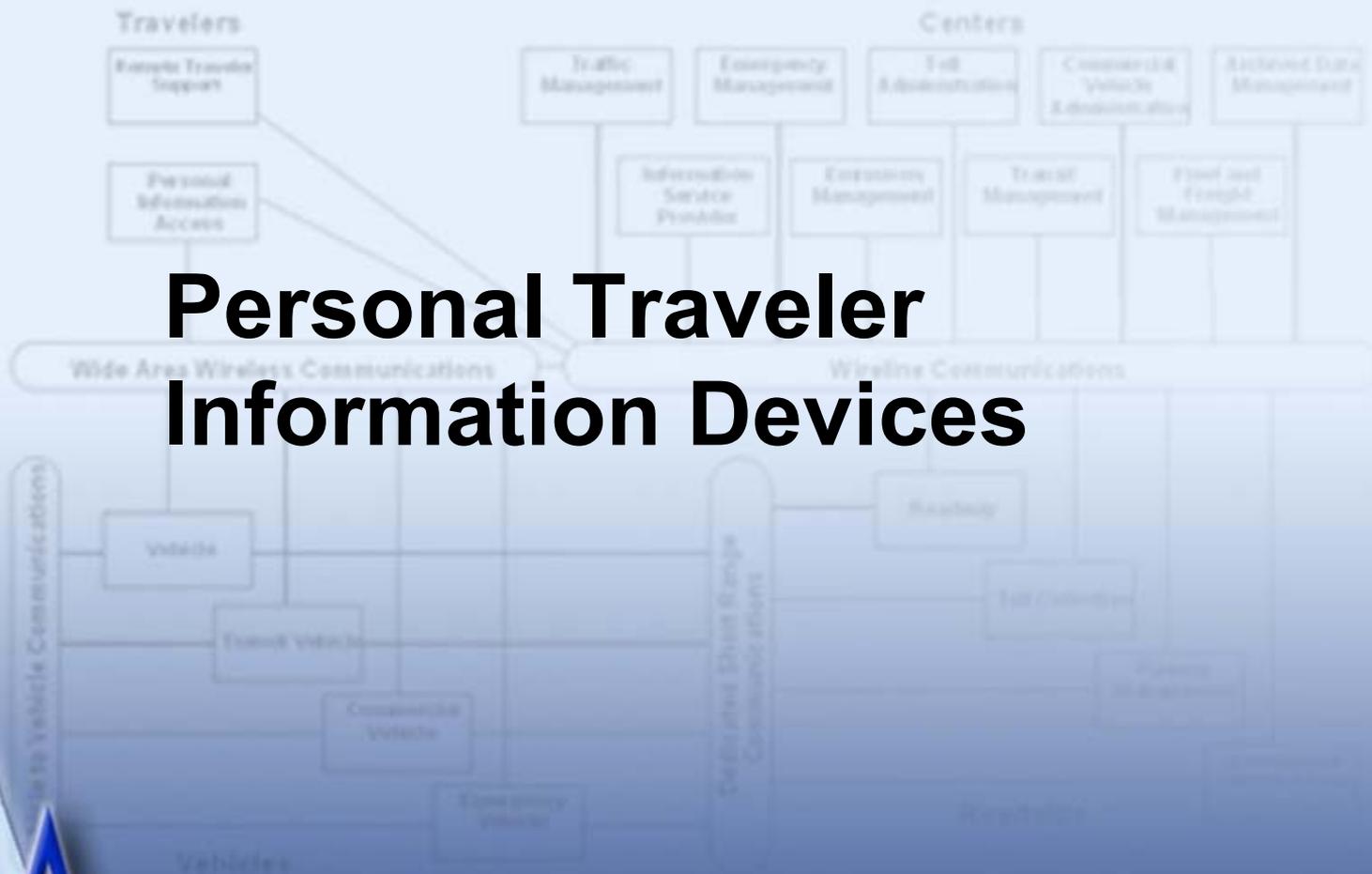


high threat facility incident information
threat information coordination



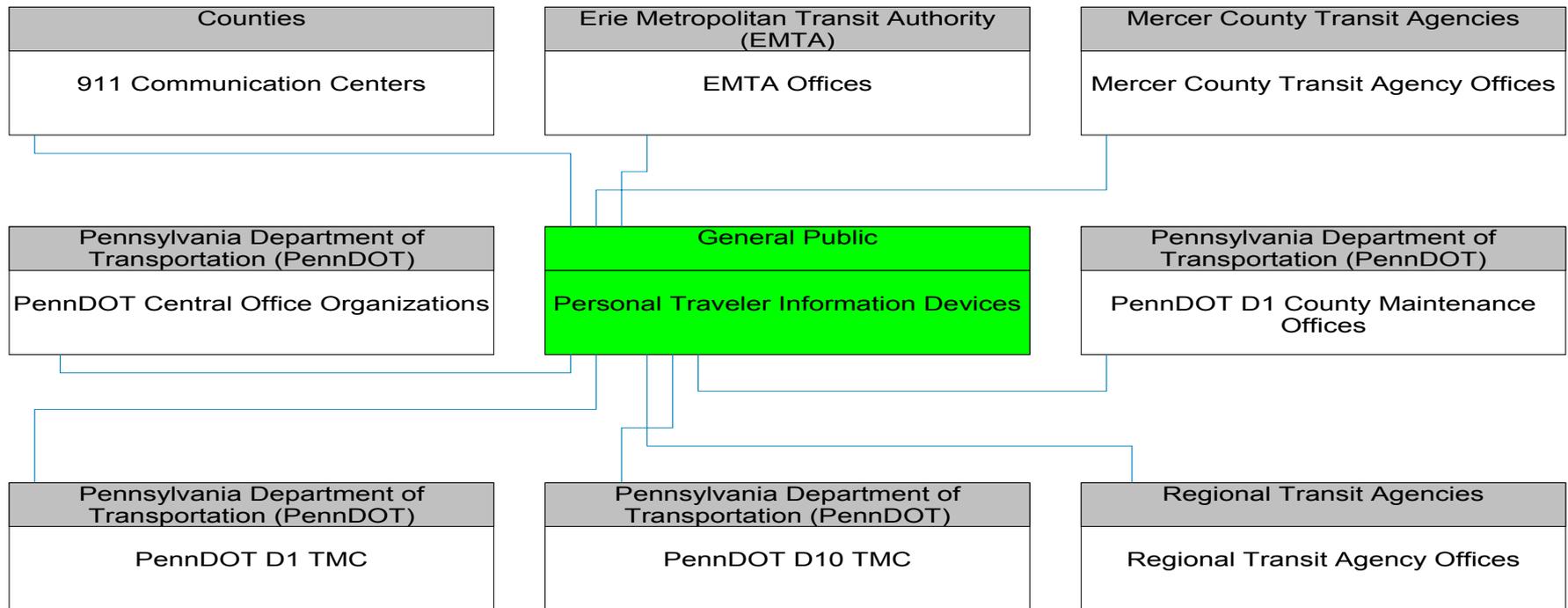
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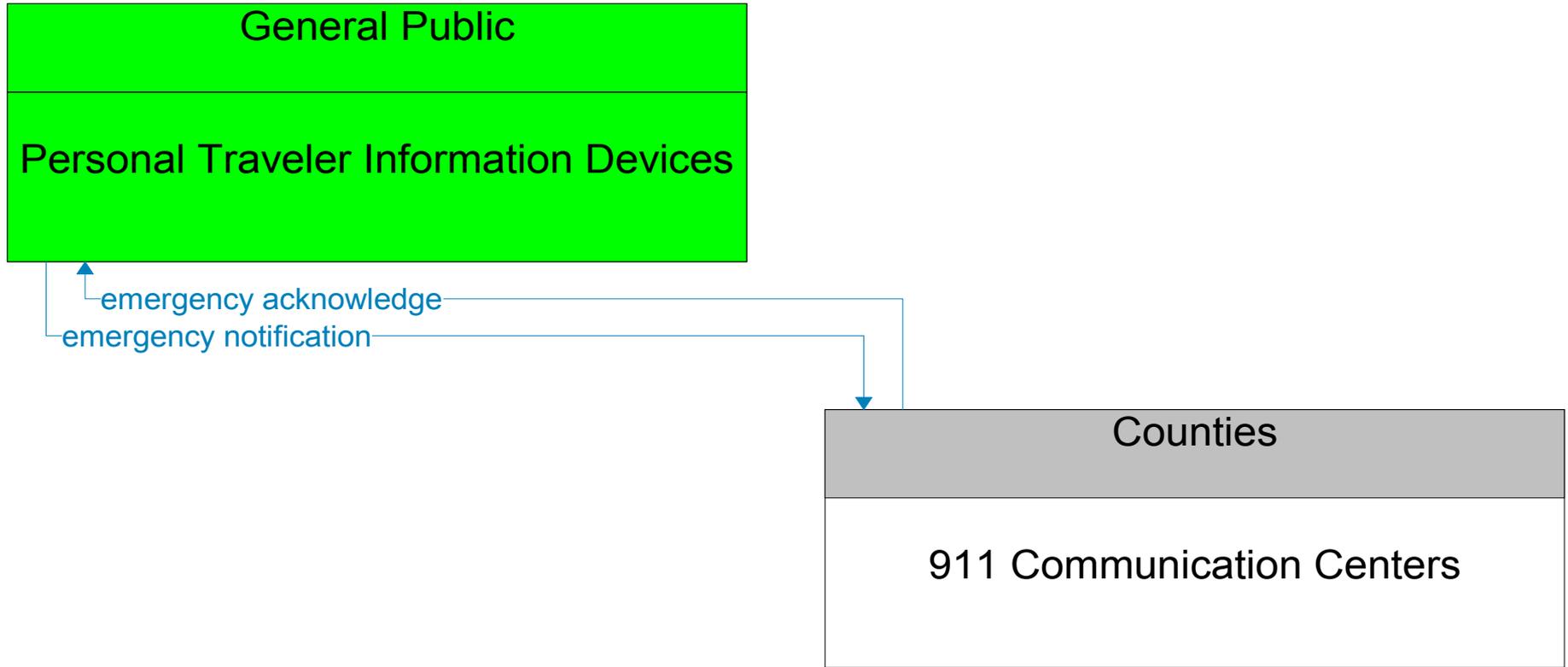
Personal Traveler Information Devices



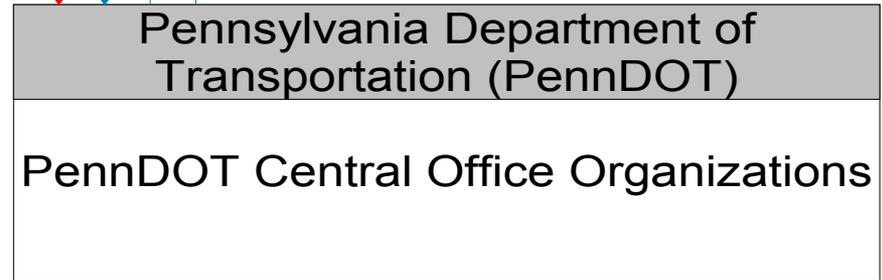
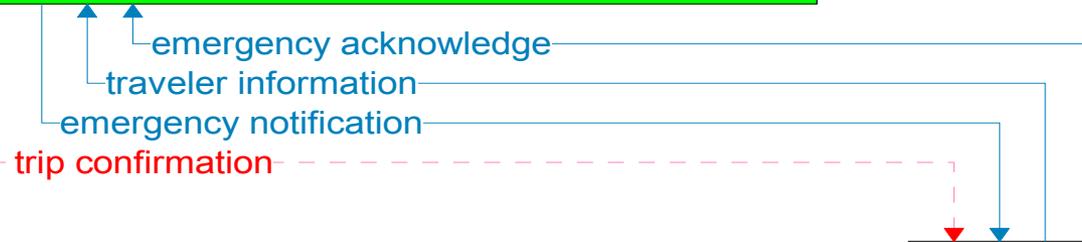
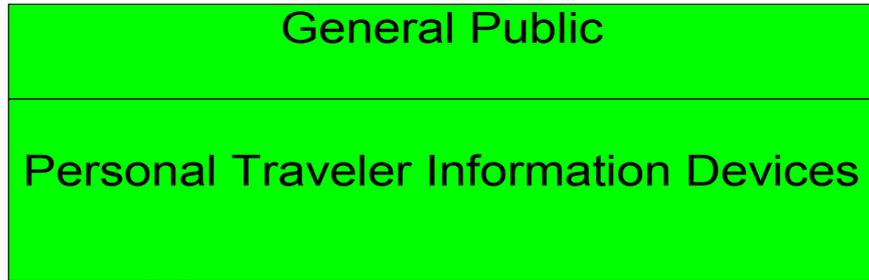
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Personal Traveler Information Devices Interconnect Diagram

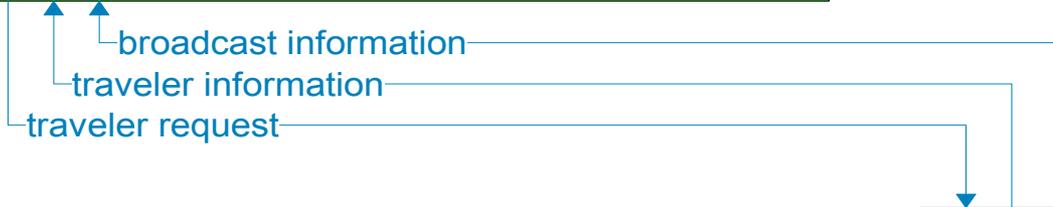
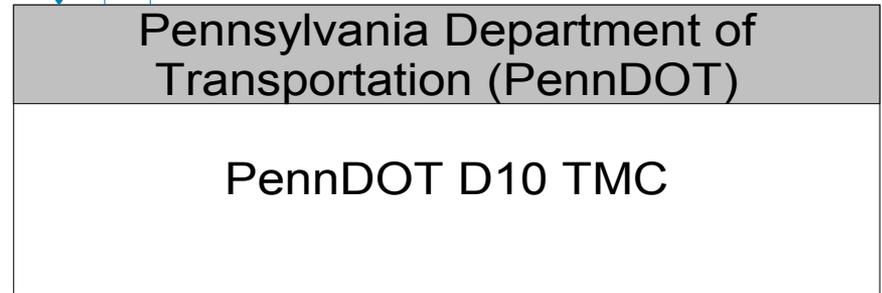
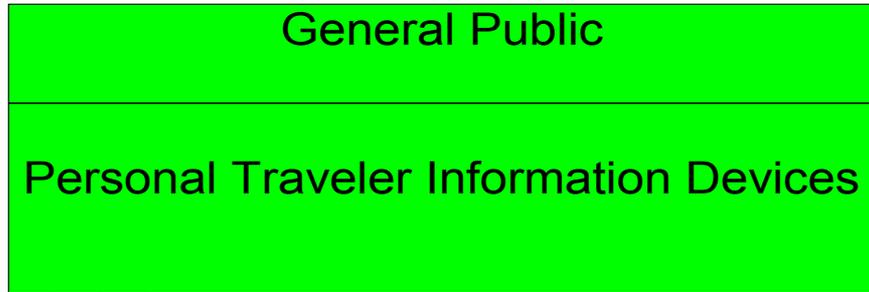




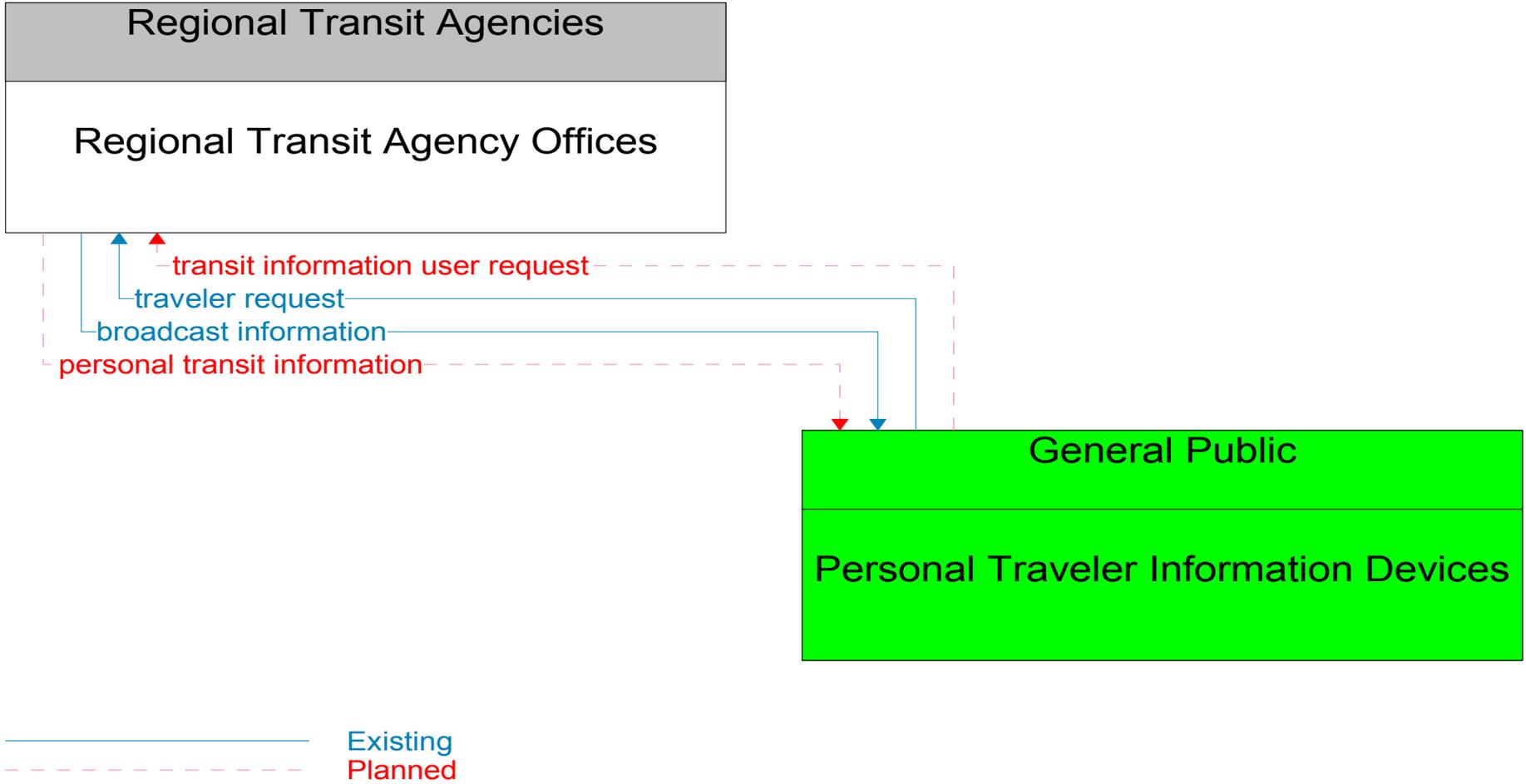
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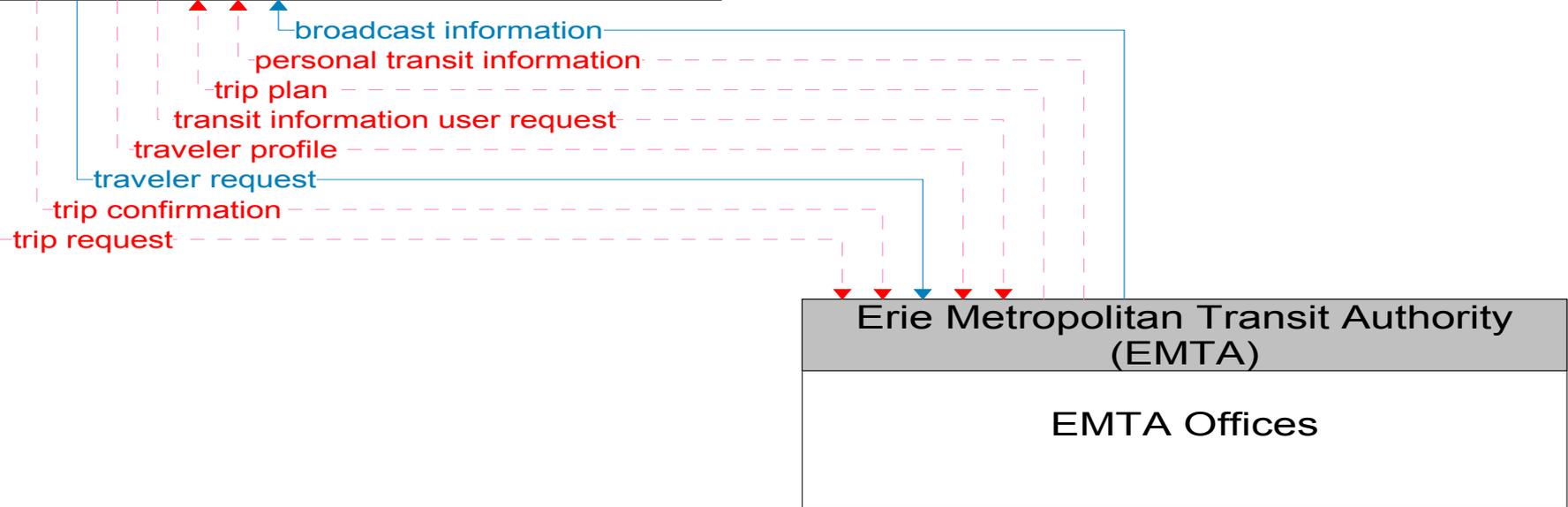
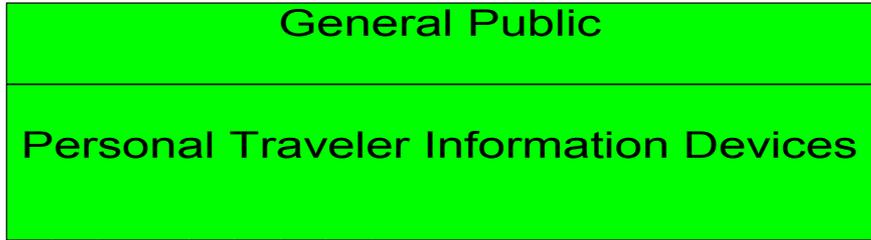


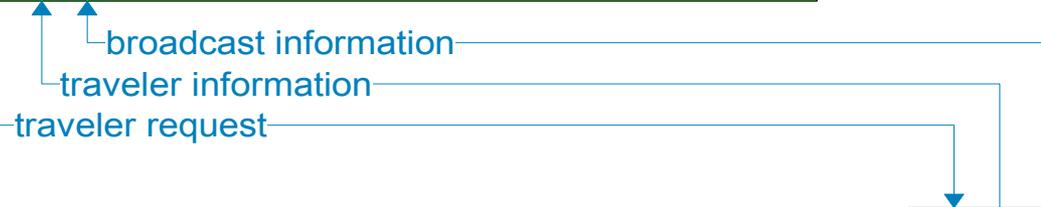
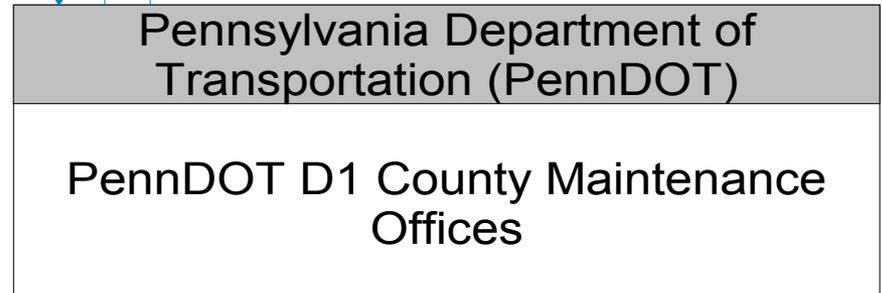
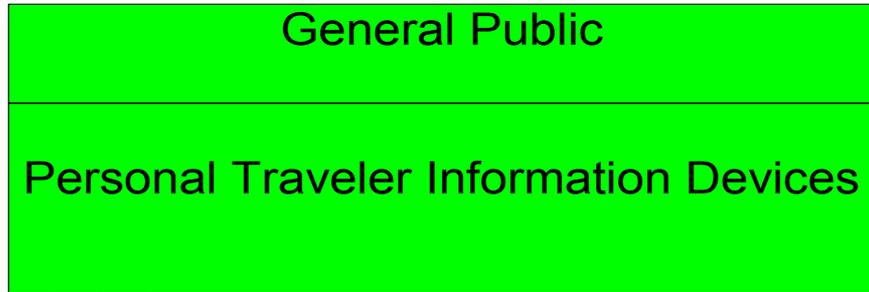
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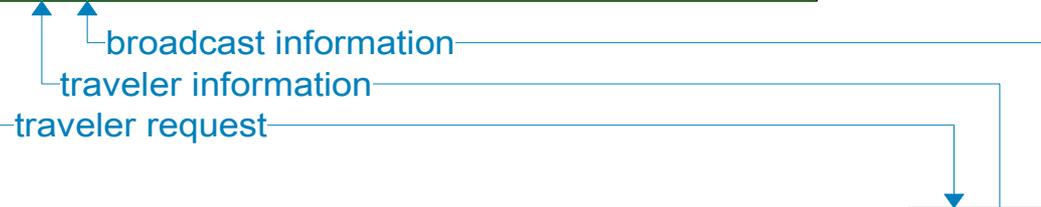
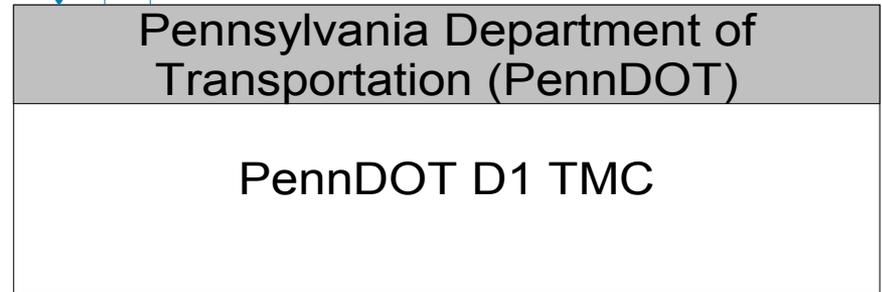
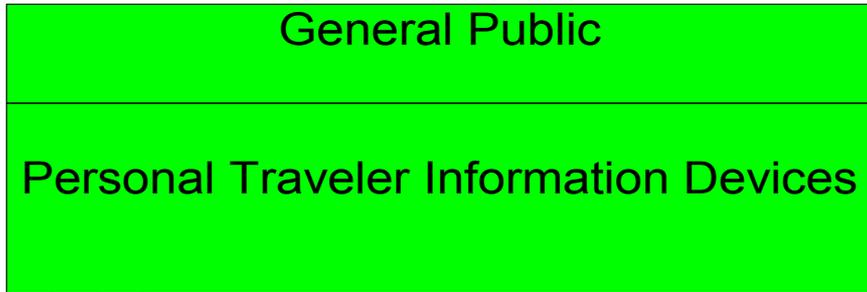
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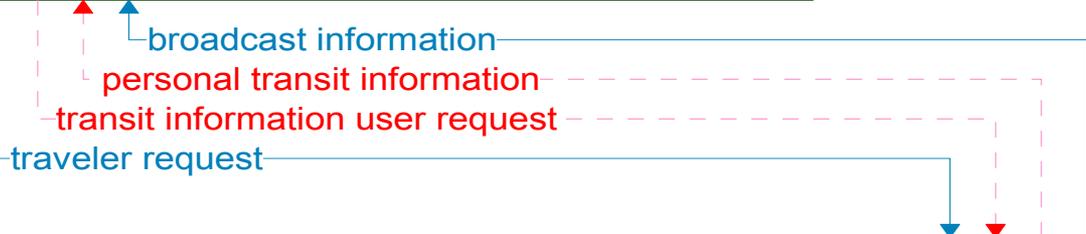
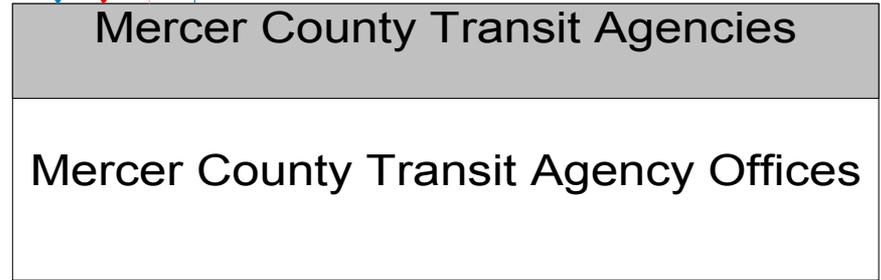
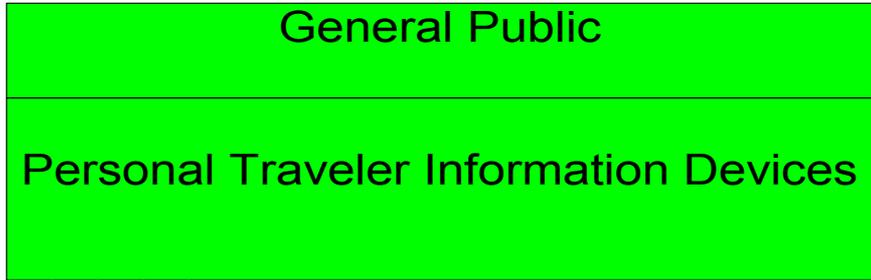




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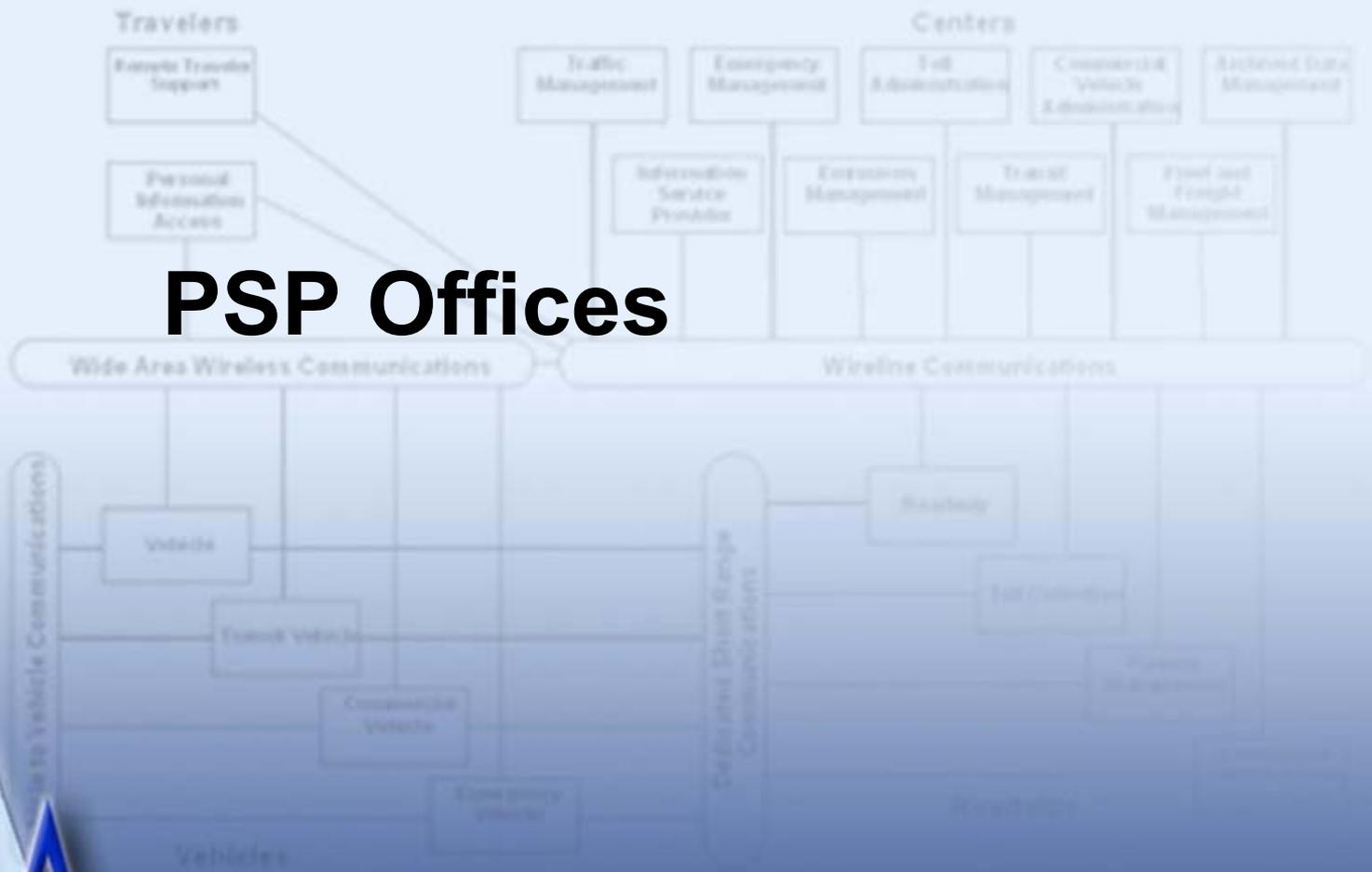


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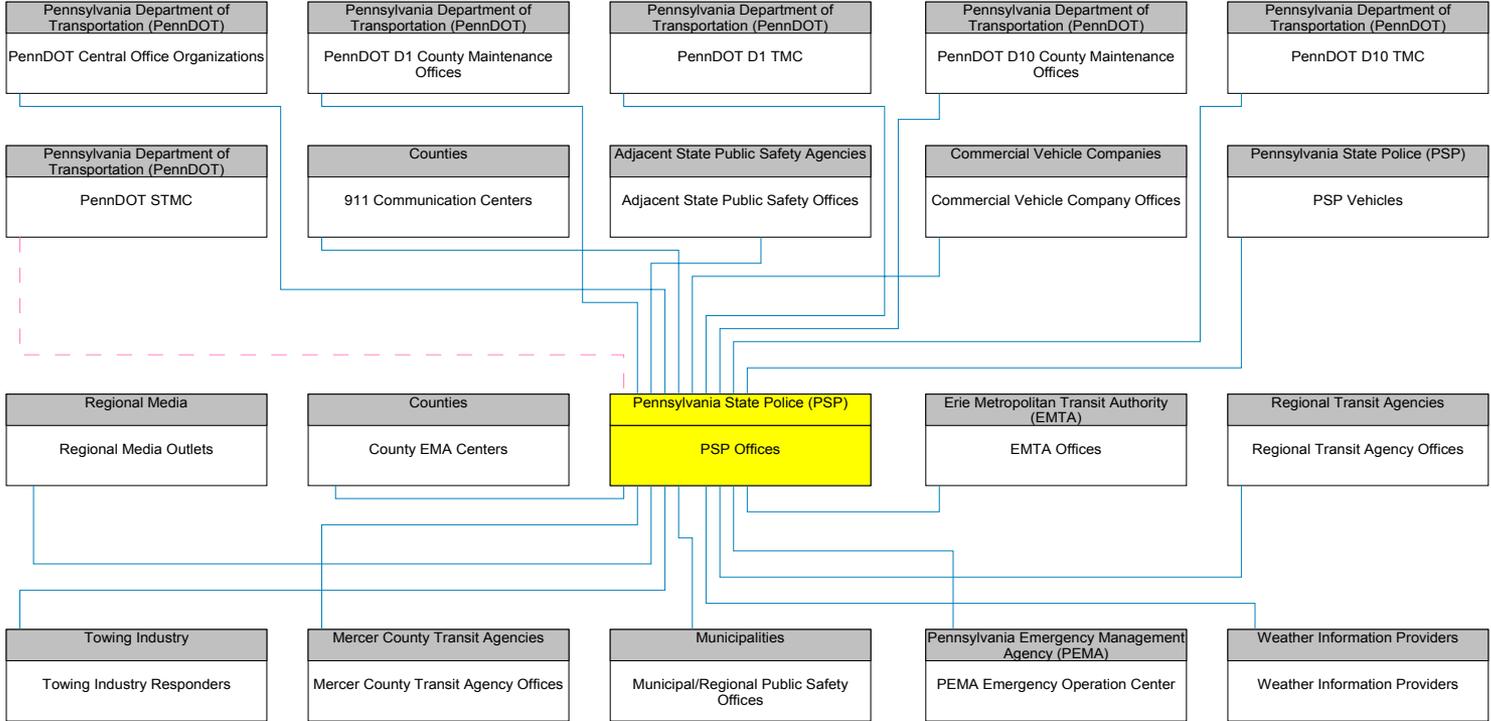
Existing
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PSP Offices

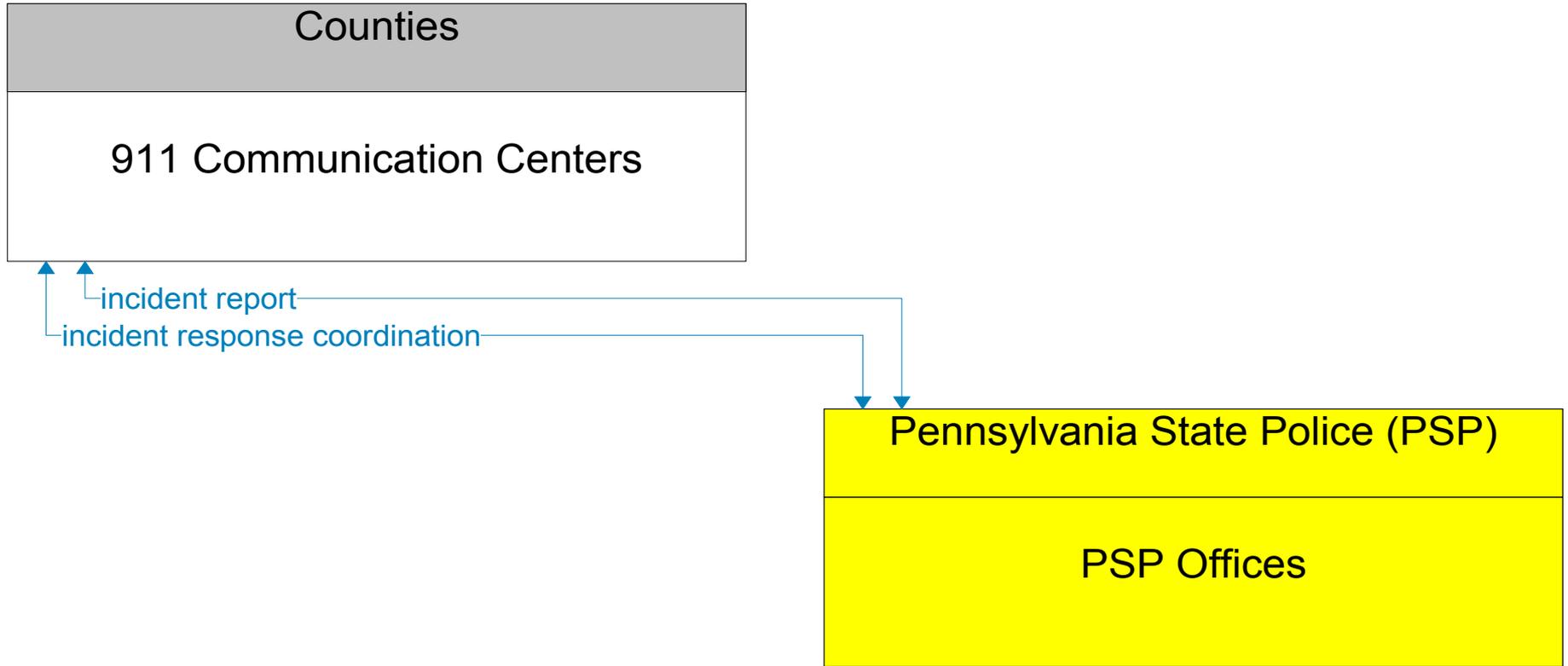


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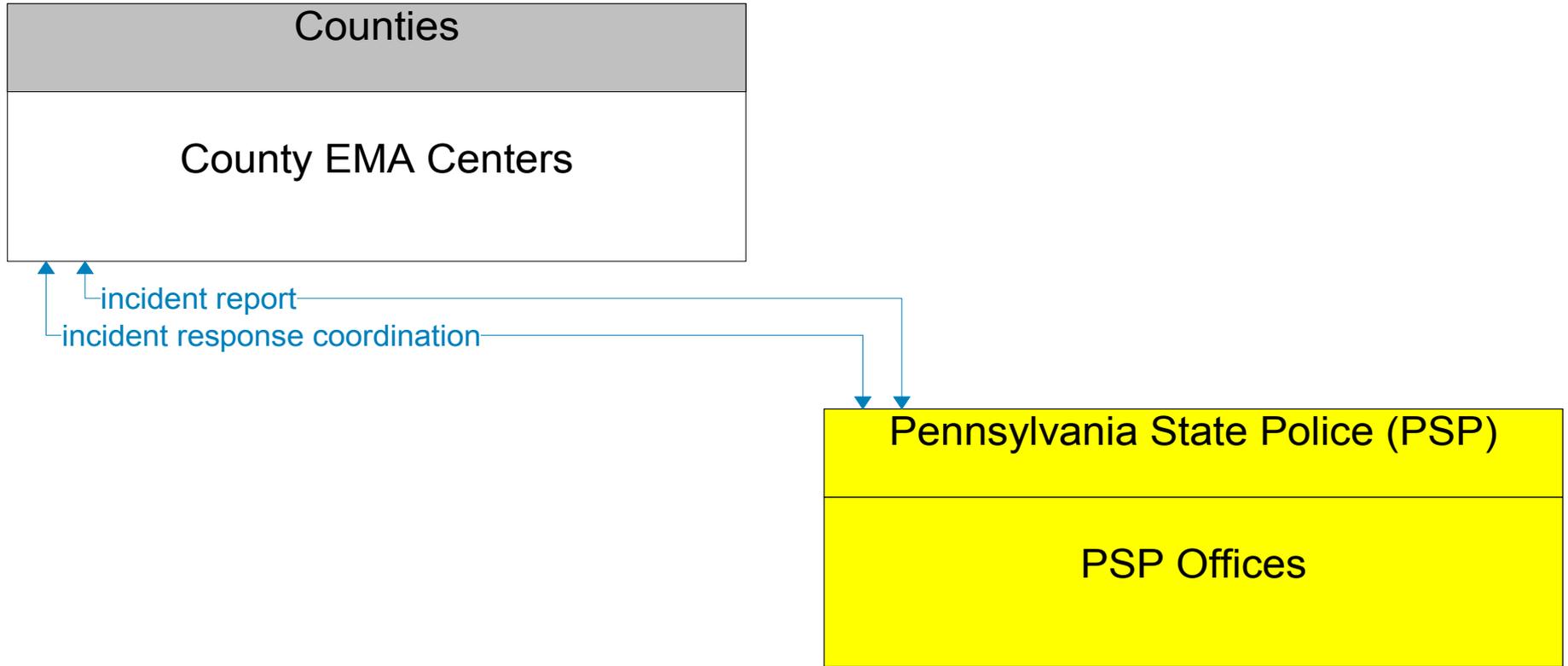
PSP Offices Interconnect Diagram



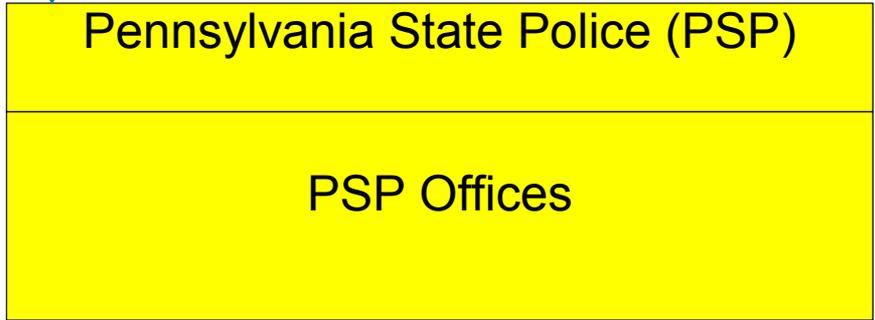
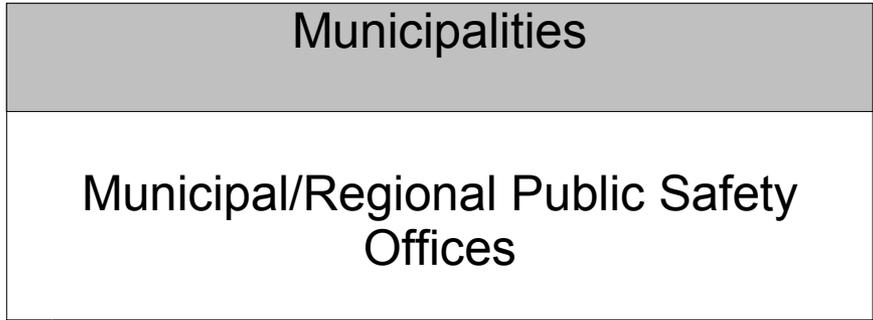
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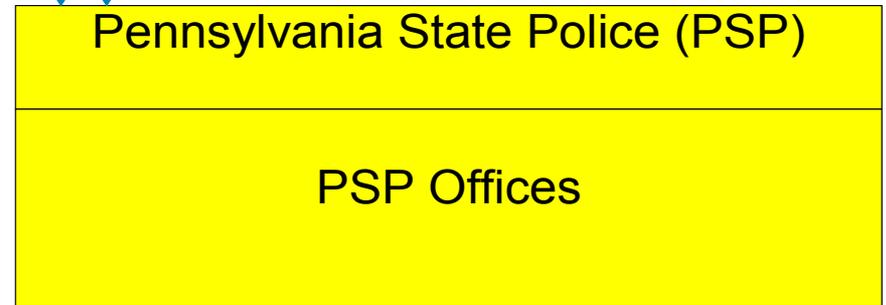
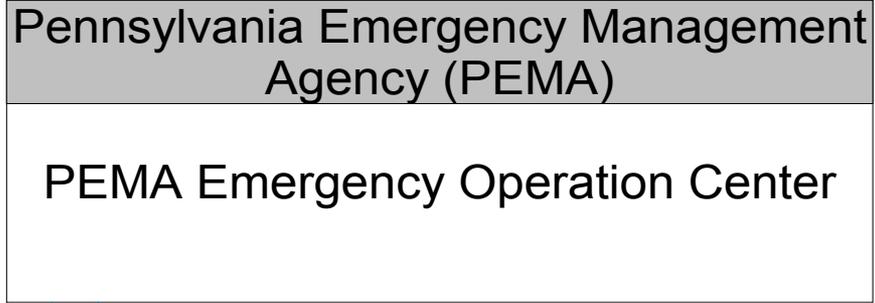
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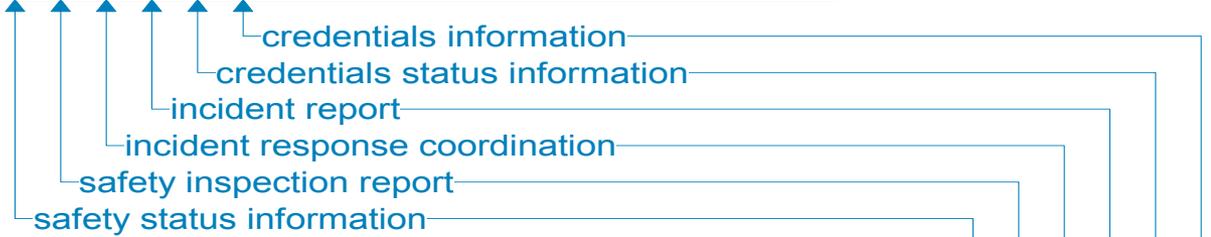
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— Existing
- - - Planned

Pennsylvania Department of
Transportation (PennDOT)

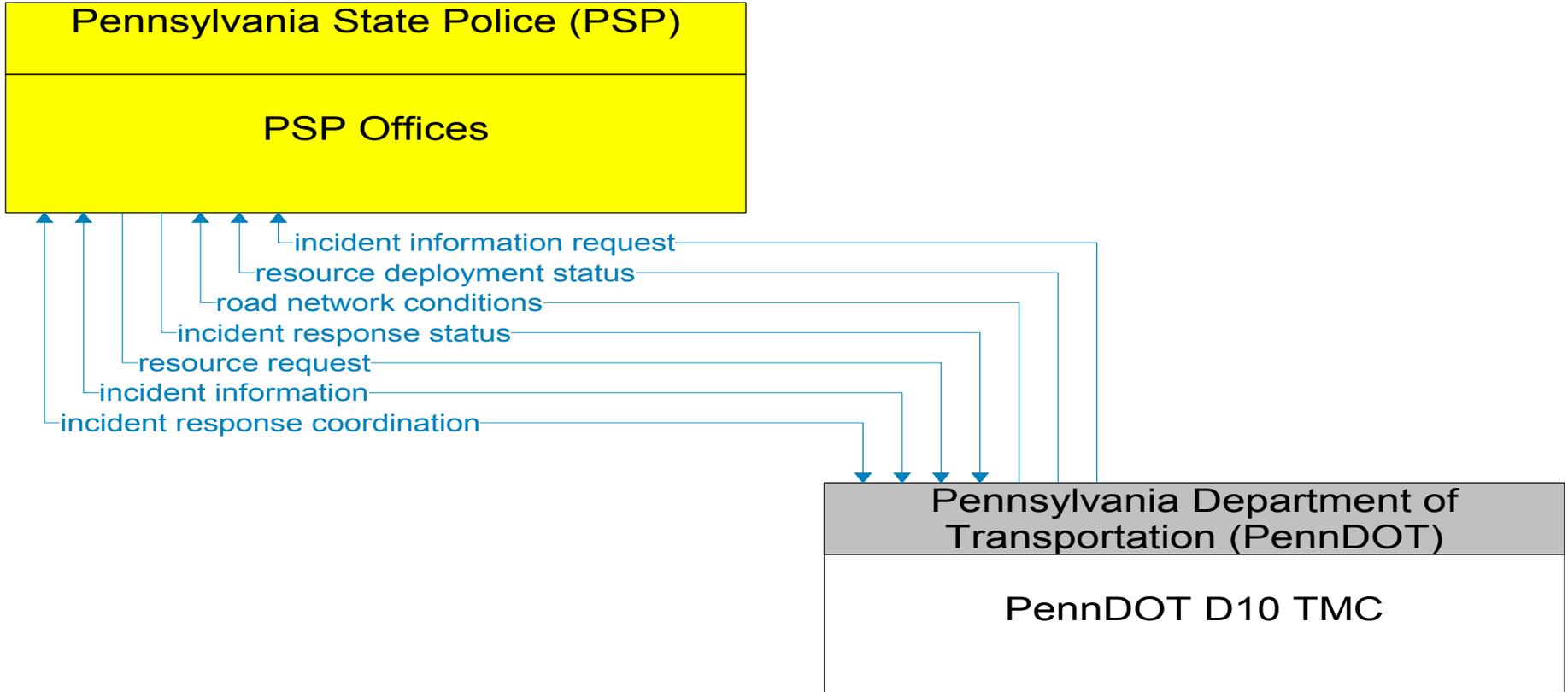
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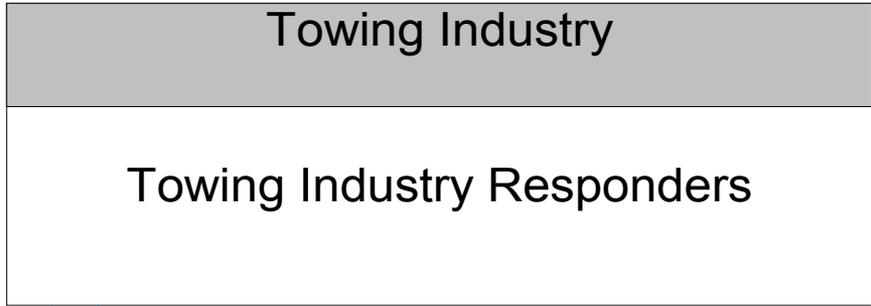
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PSP Offices

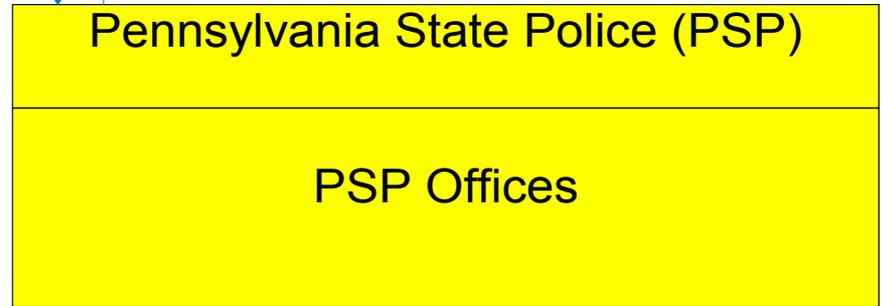
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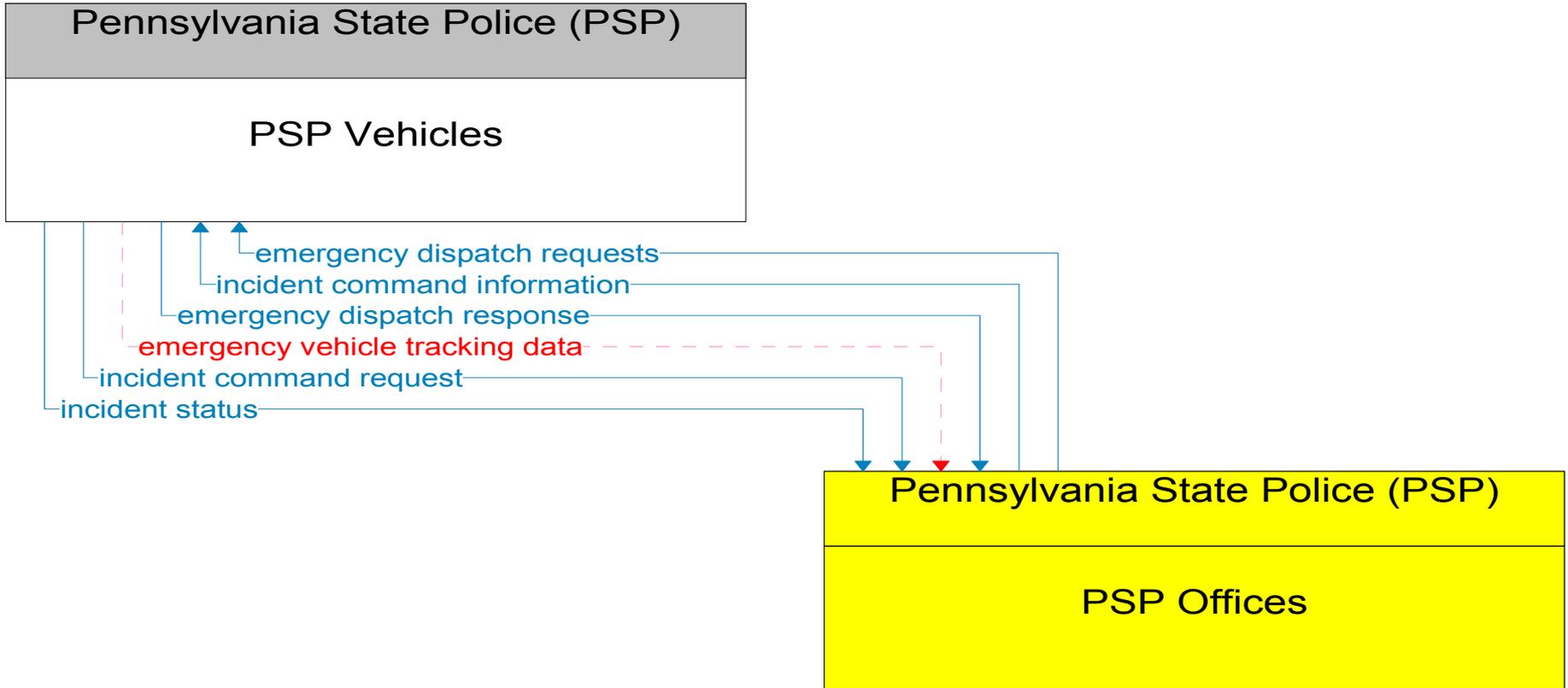
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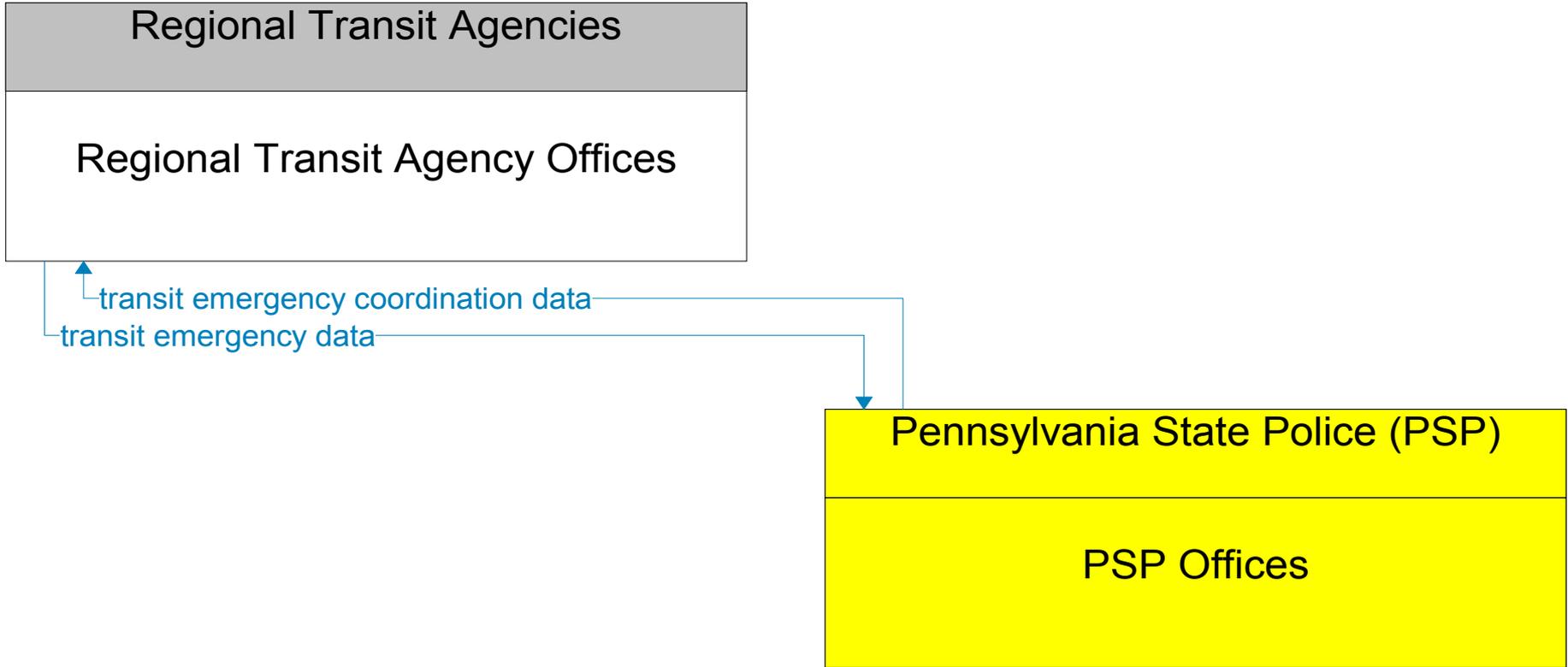
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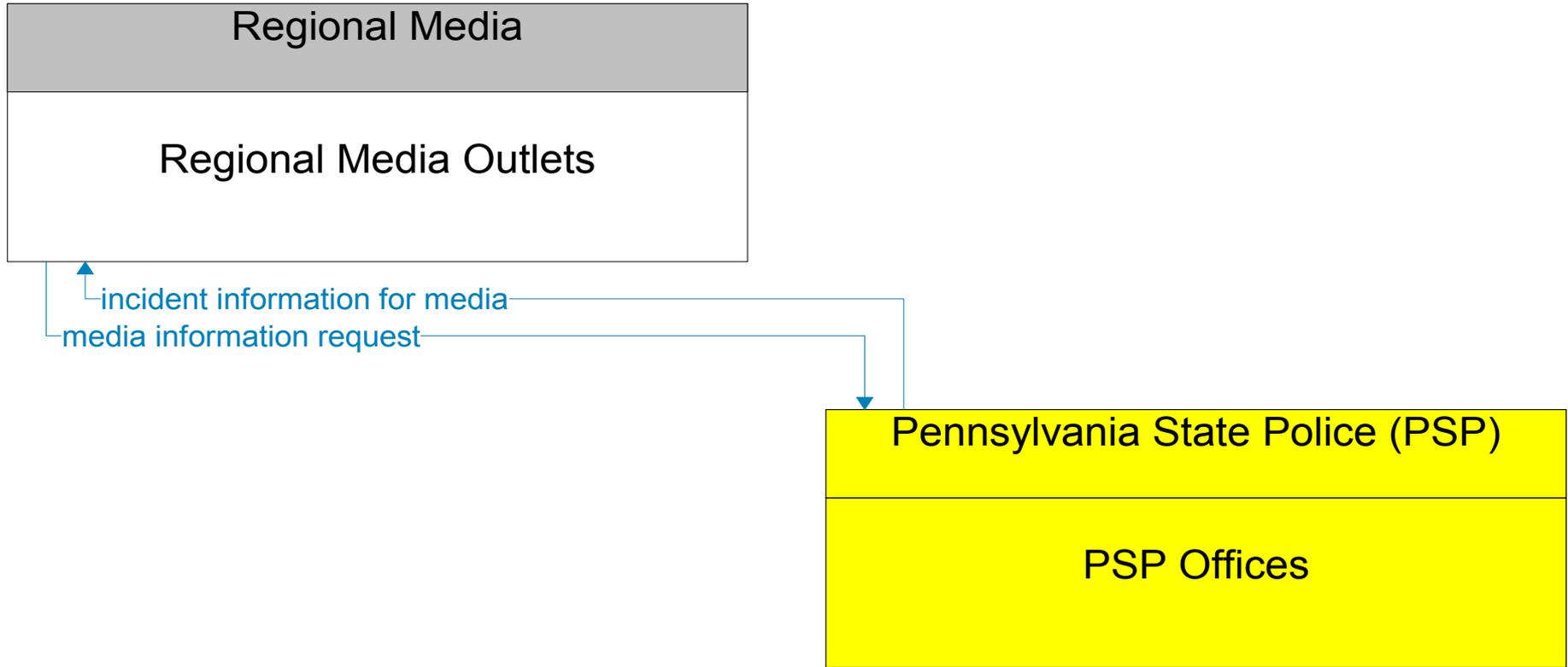
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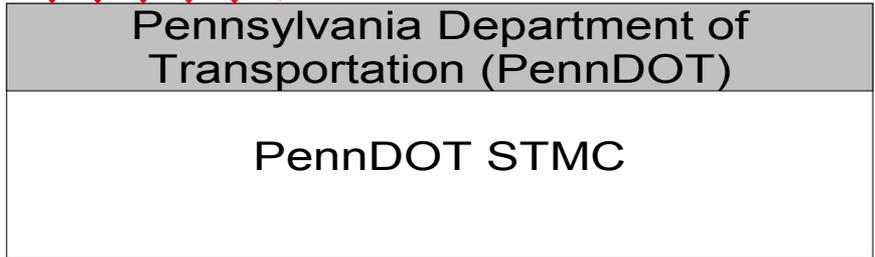
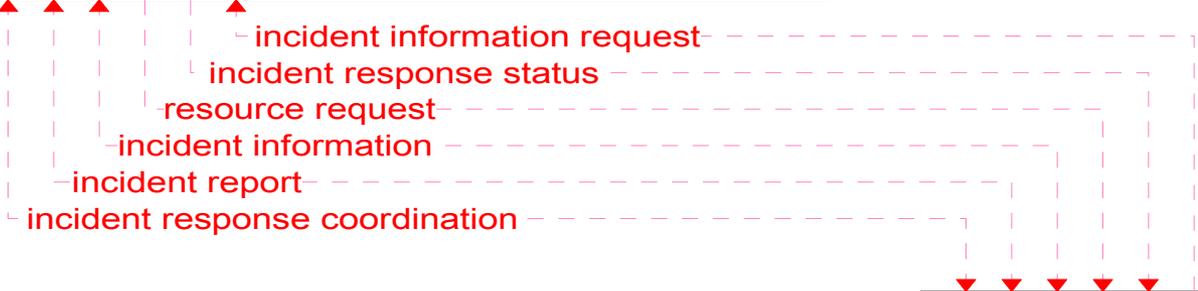
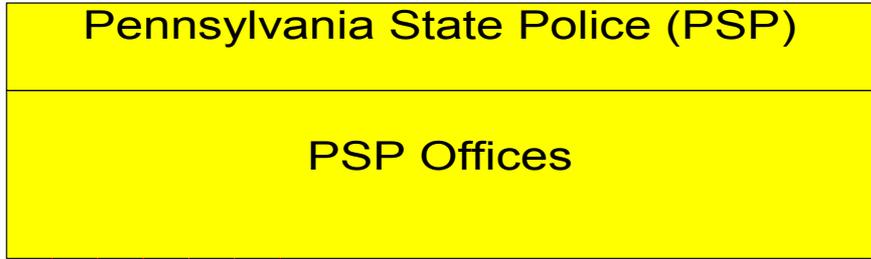
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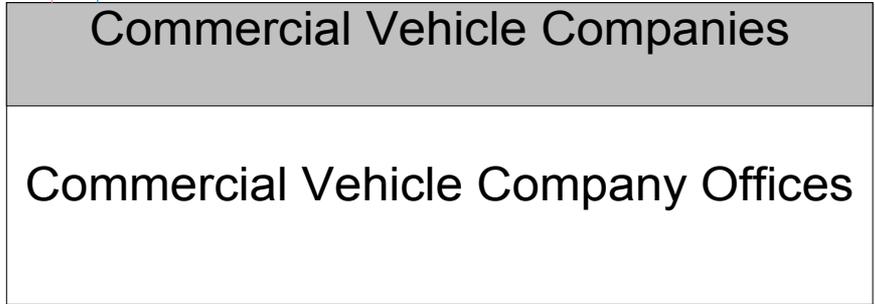
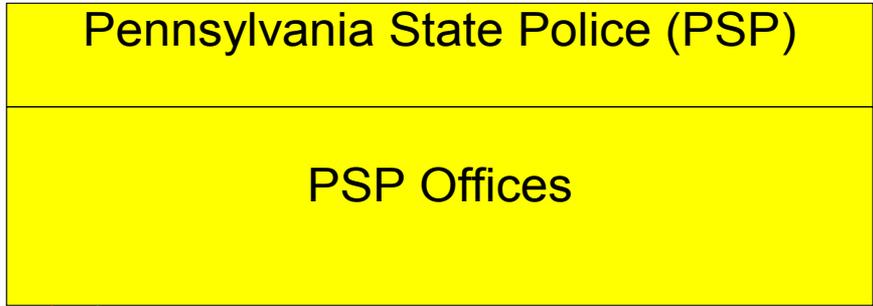
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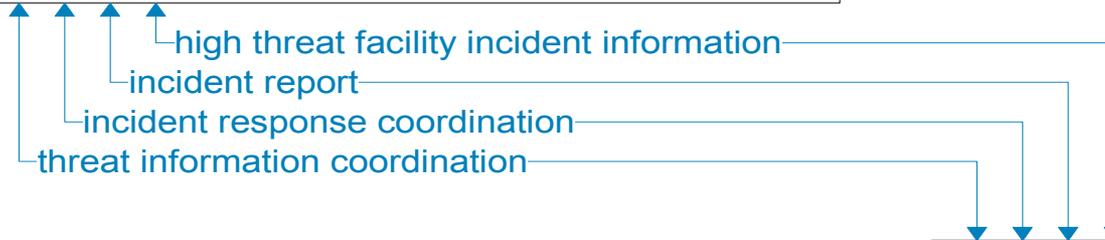
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———— Existing
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Adjacent State Public Safety Agencies

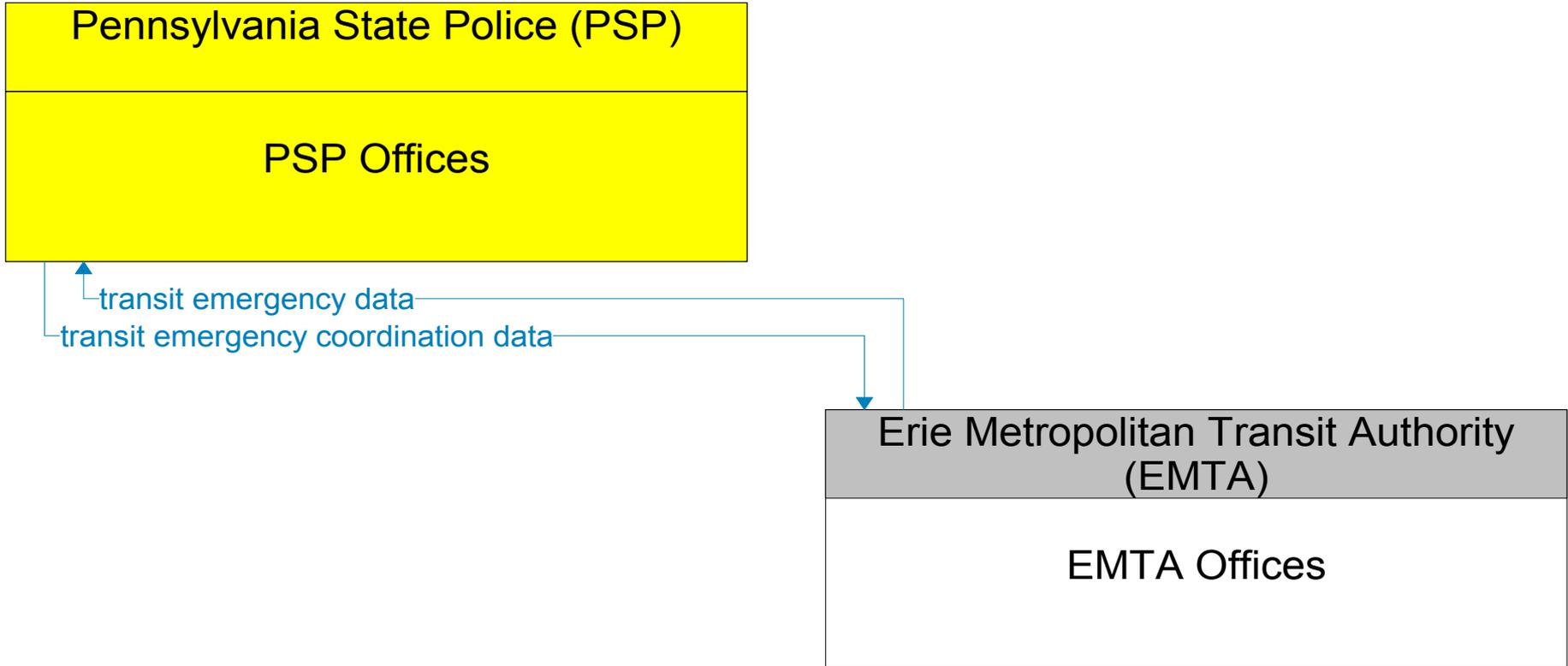
Adjacent State Public Safety Offices



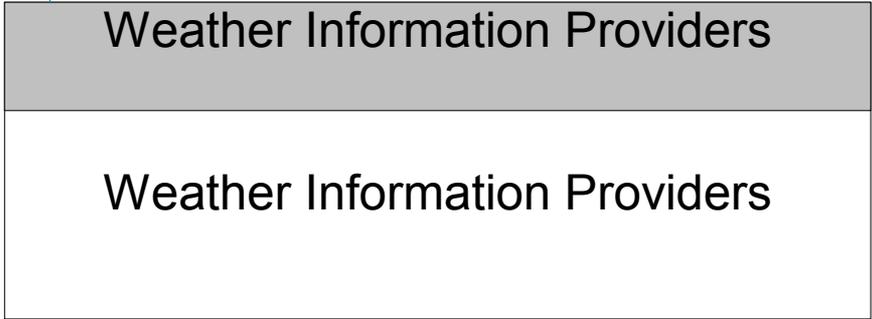
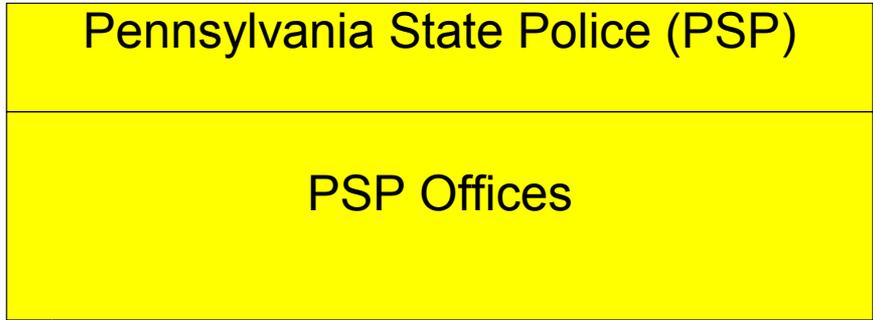
Pennsylvania State Police (PSP)

PSP Offices

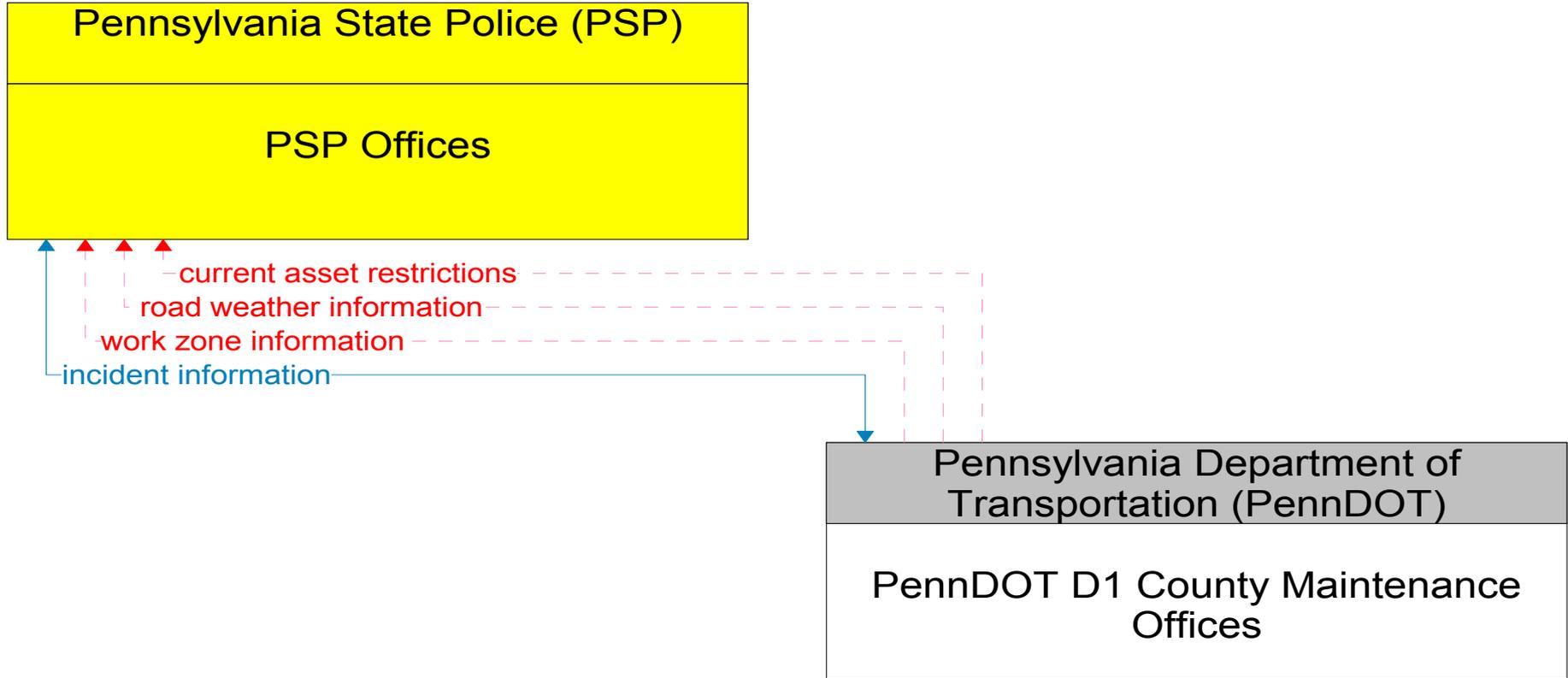
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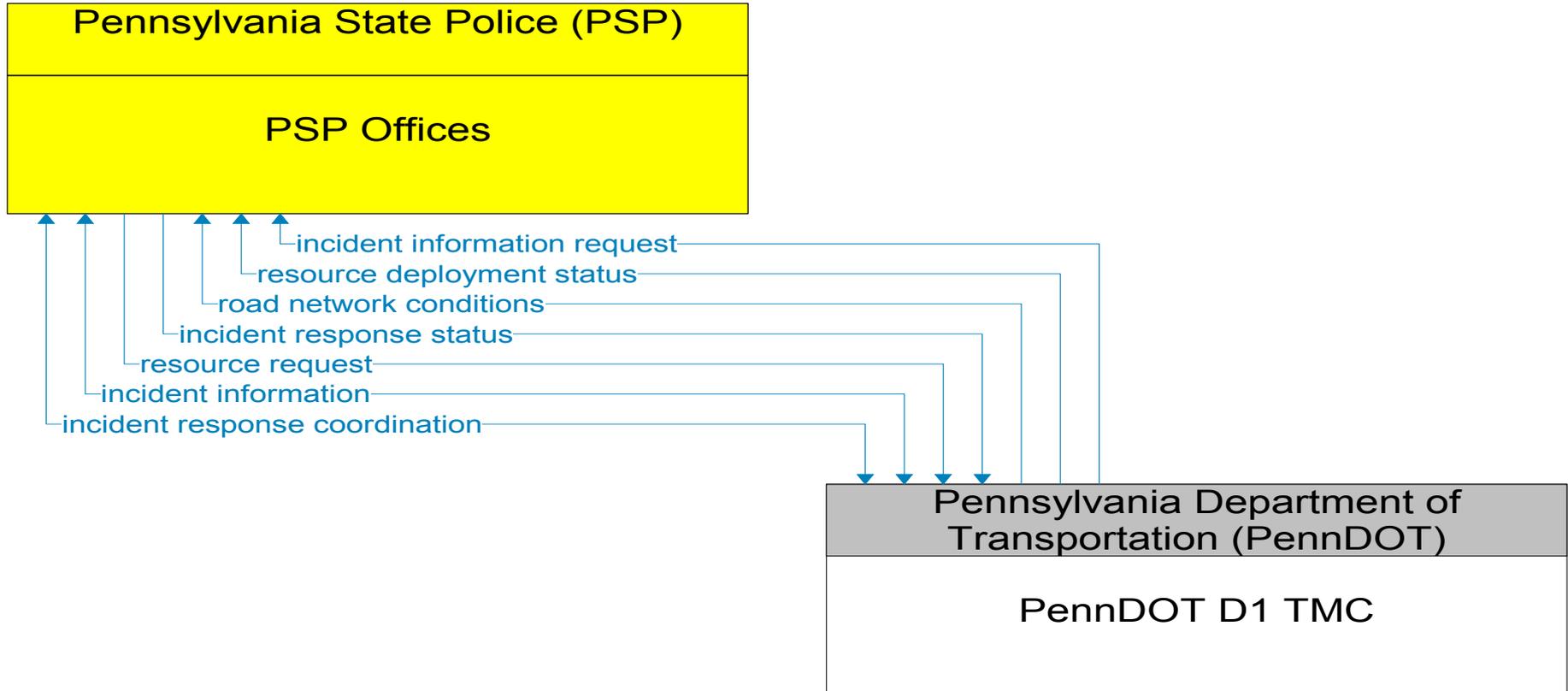
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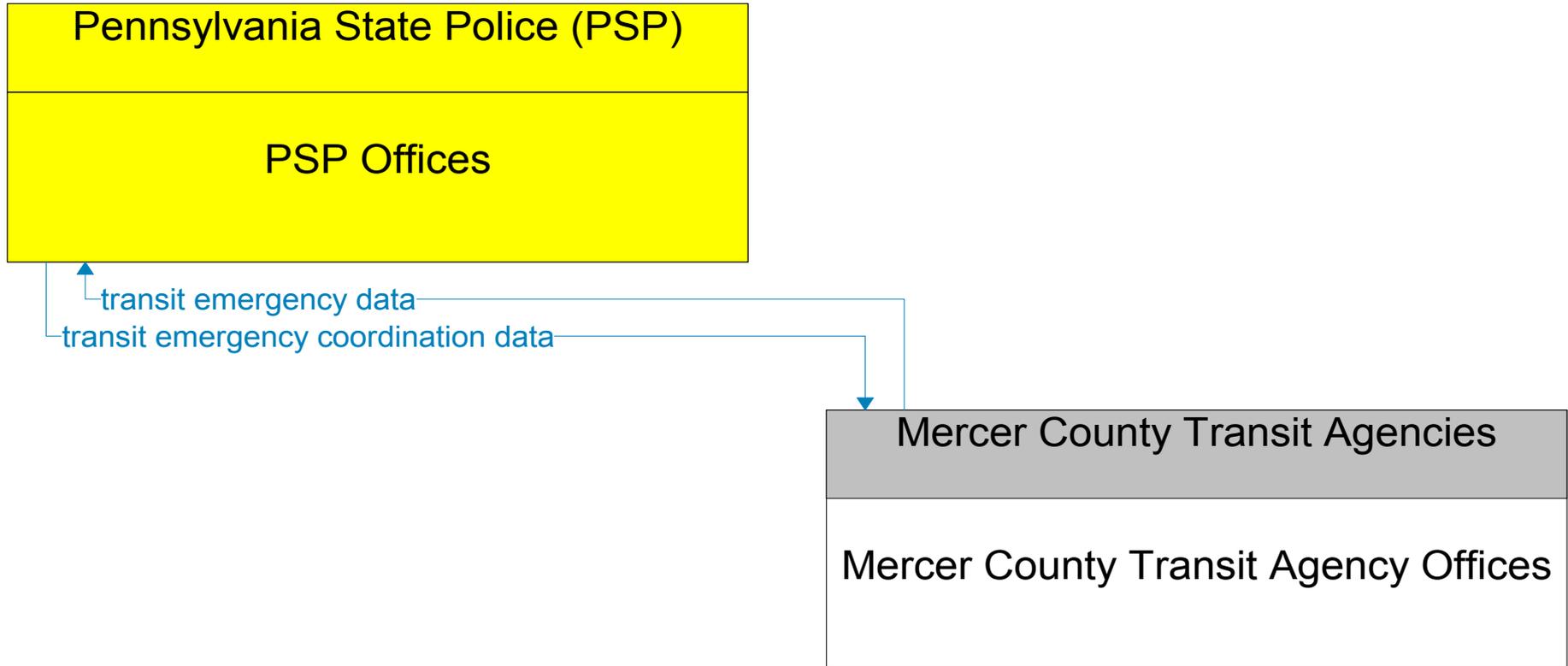
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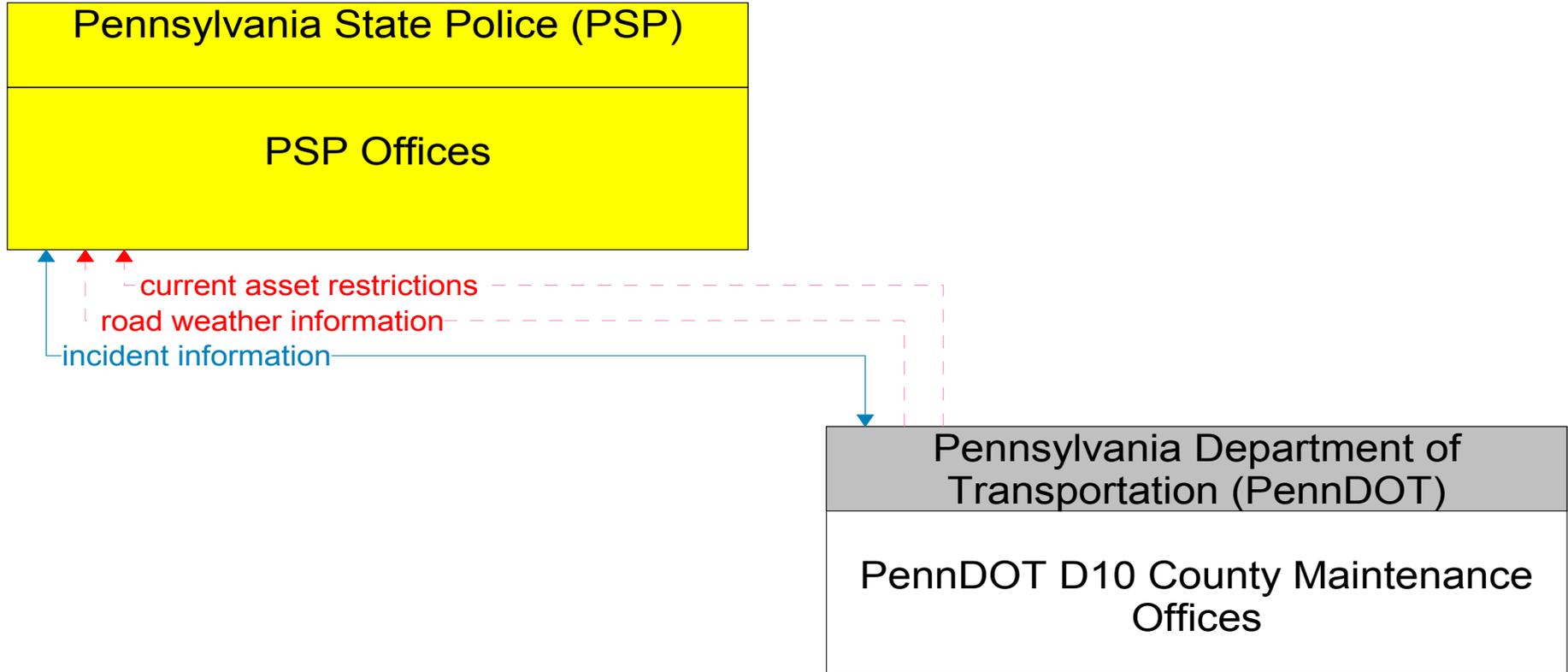
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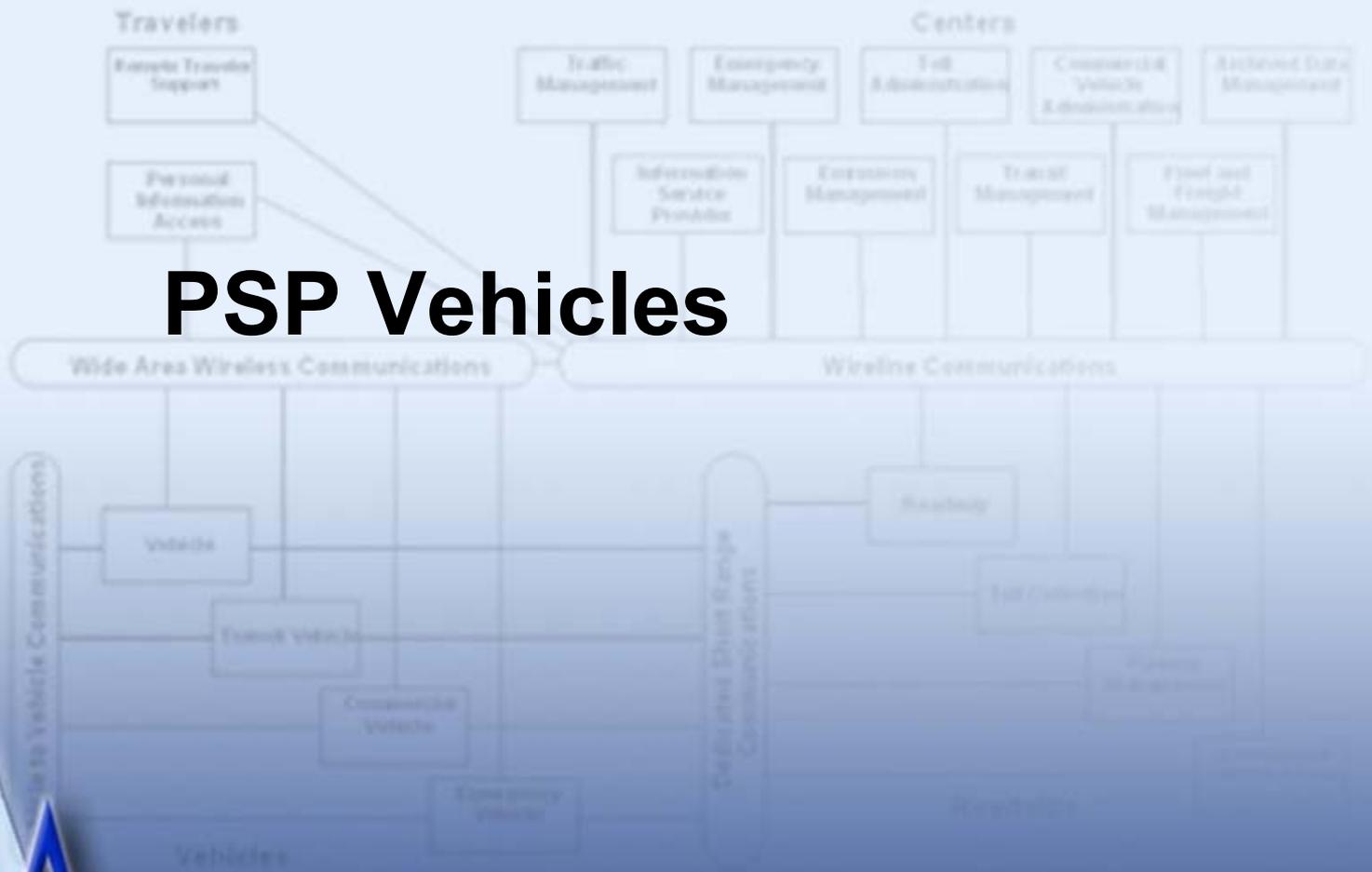


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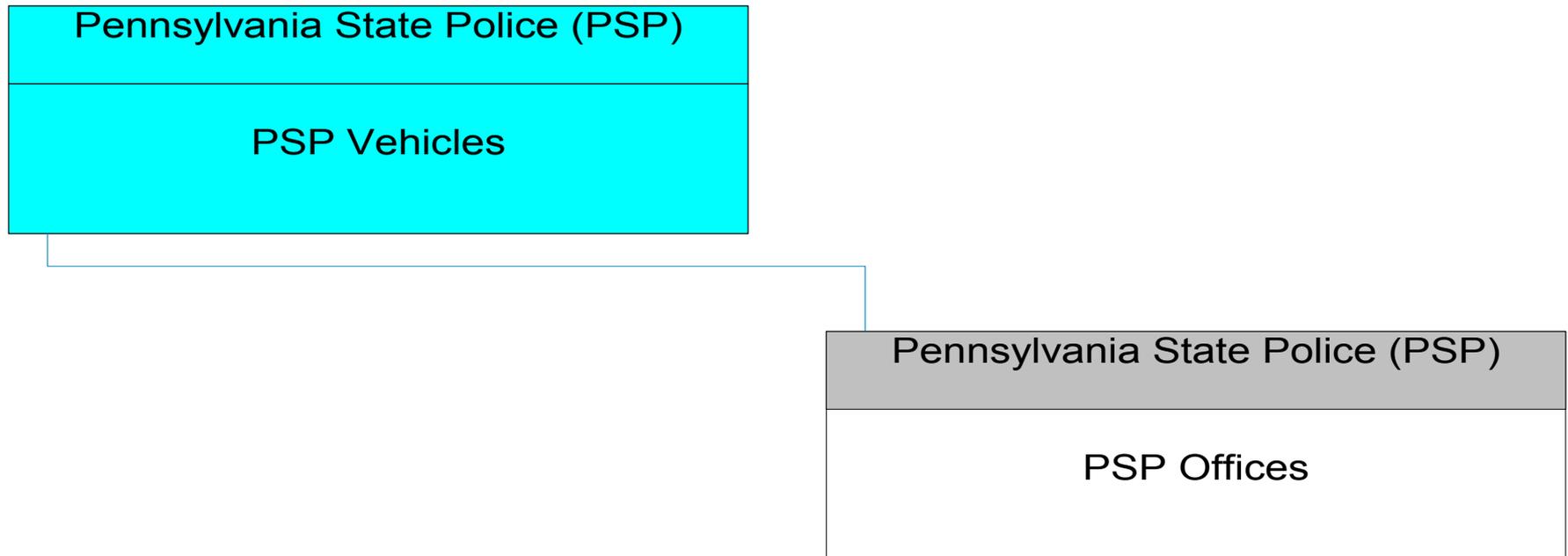
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PSP Vehicles

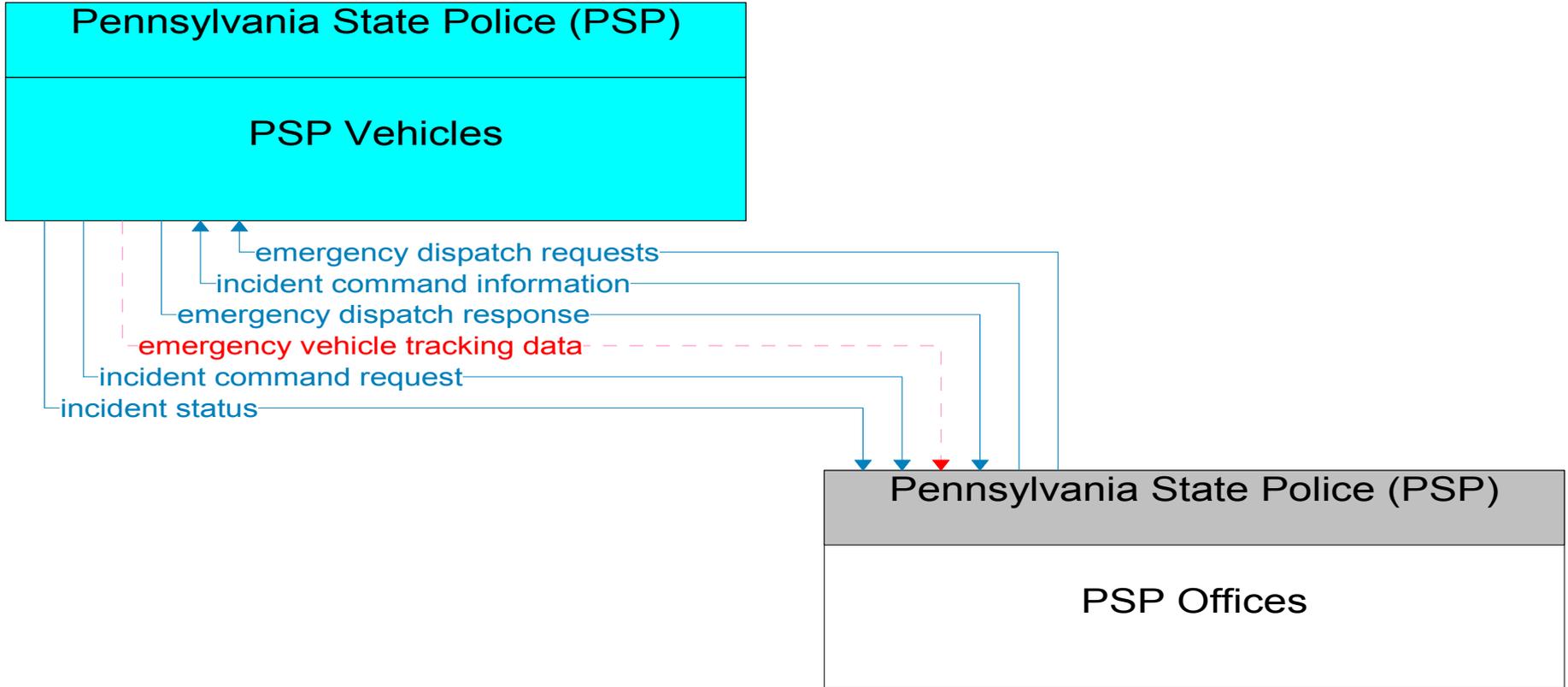


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PSP Vehicles Interconnect Diagram



———— Existing
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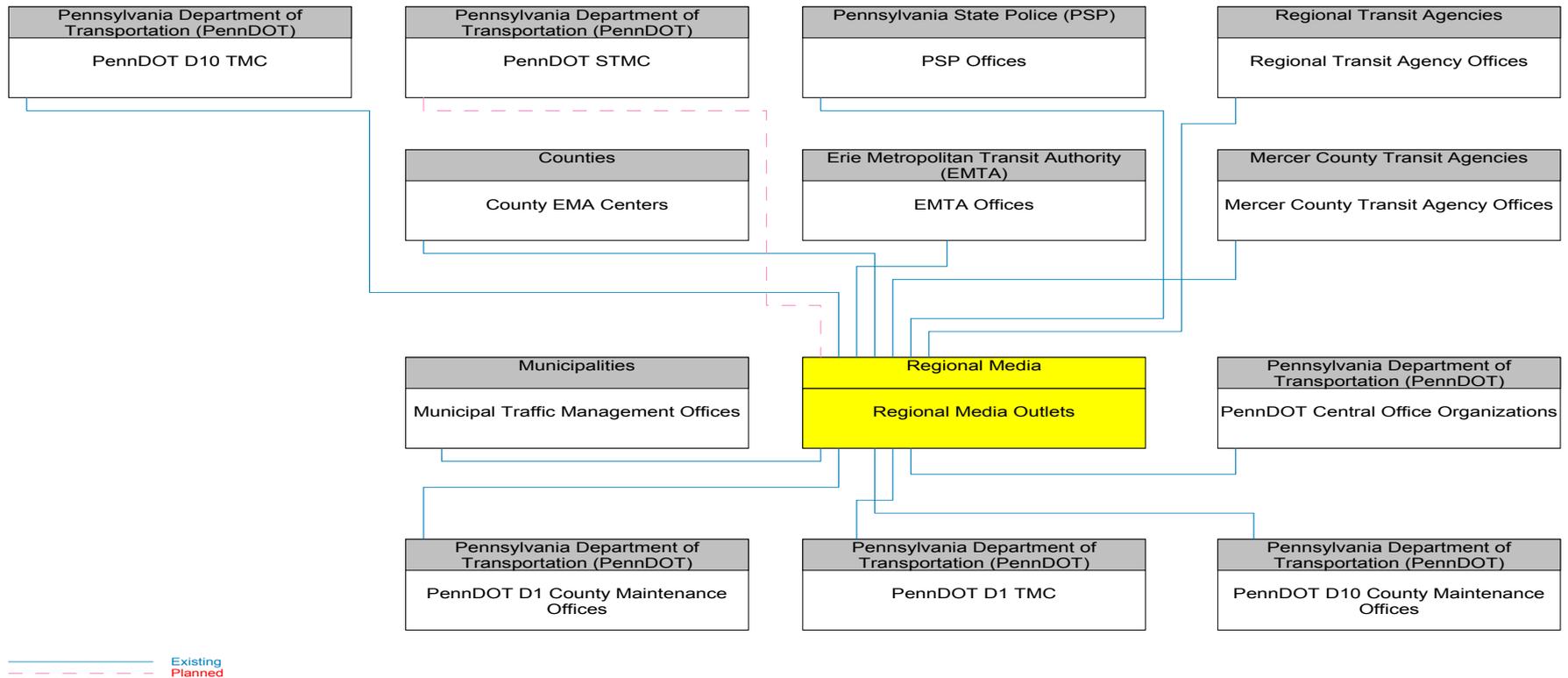


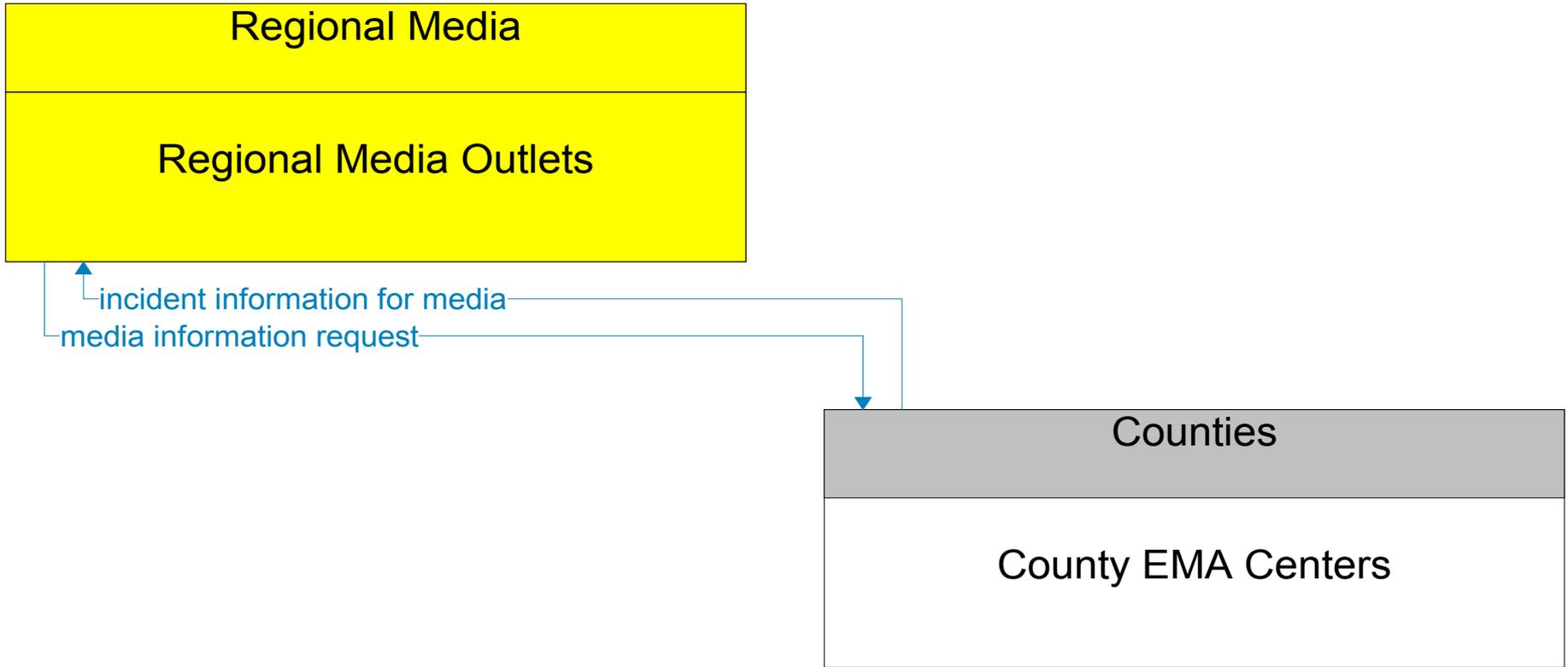
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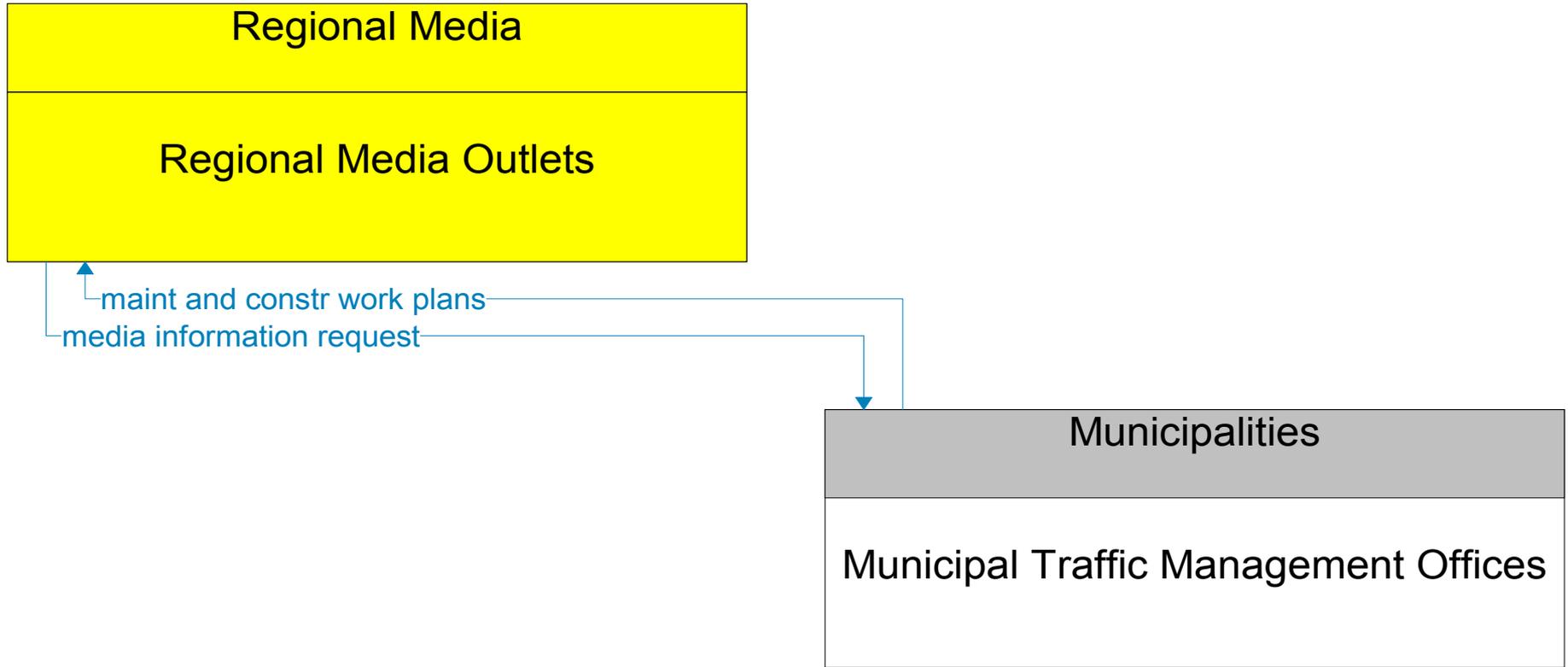
Regional Media Outlets



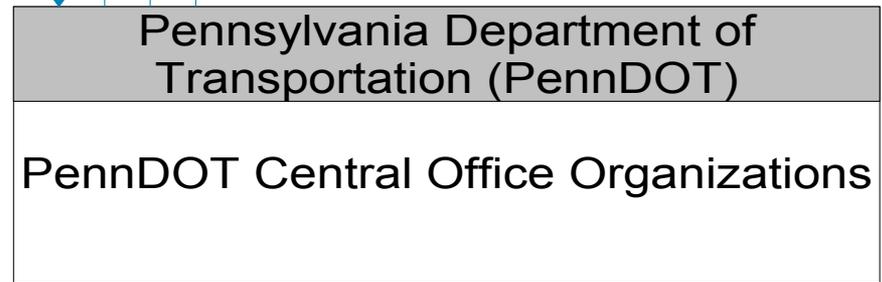
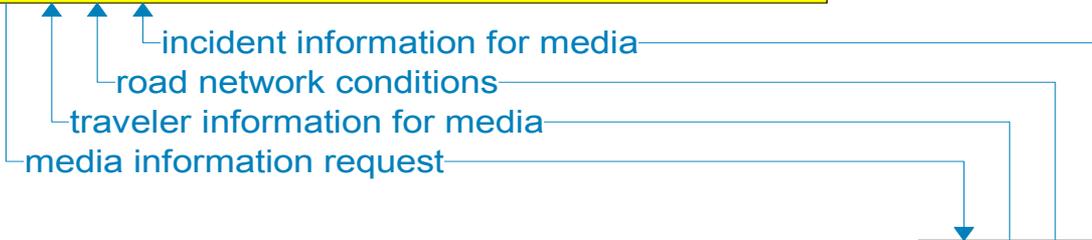
Regional Media Outlets Interconnect Diagram



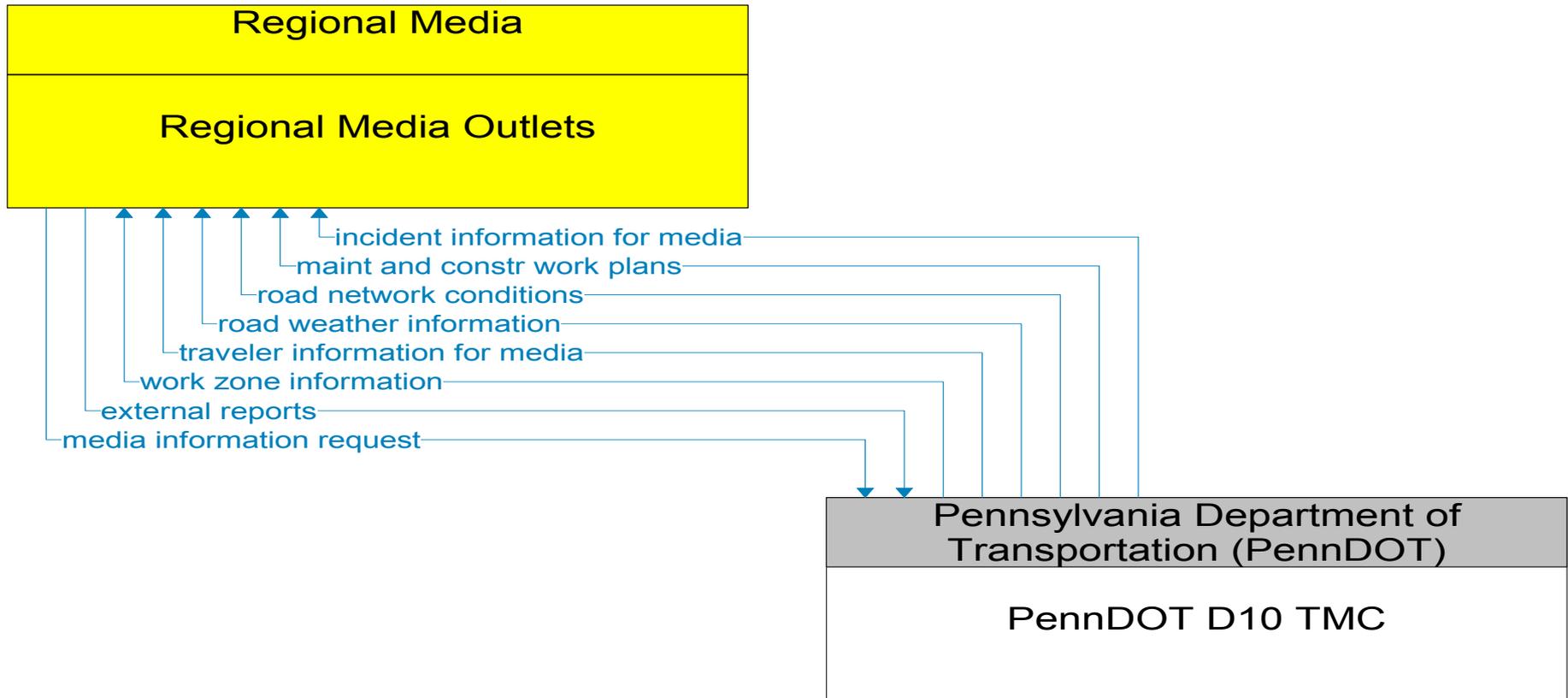




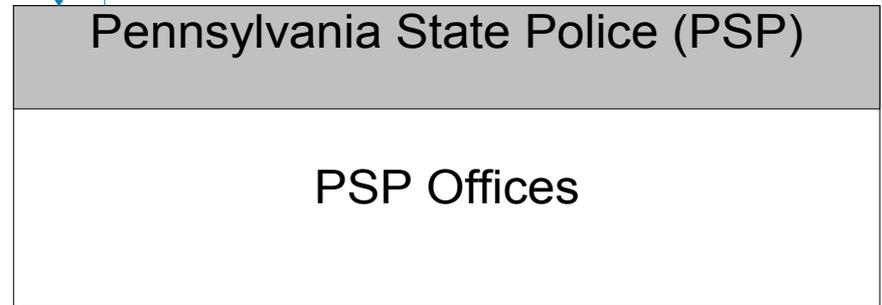
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Existing
Planned



Existing
Planned

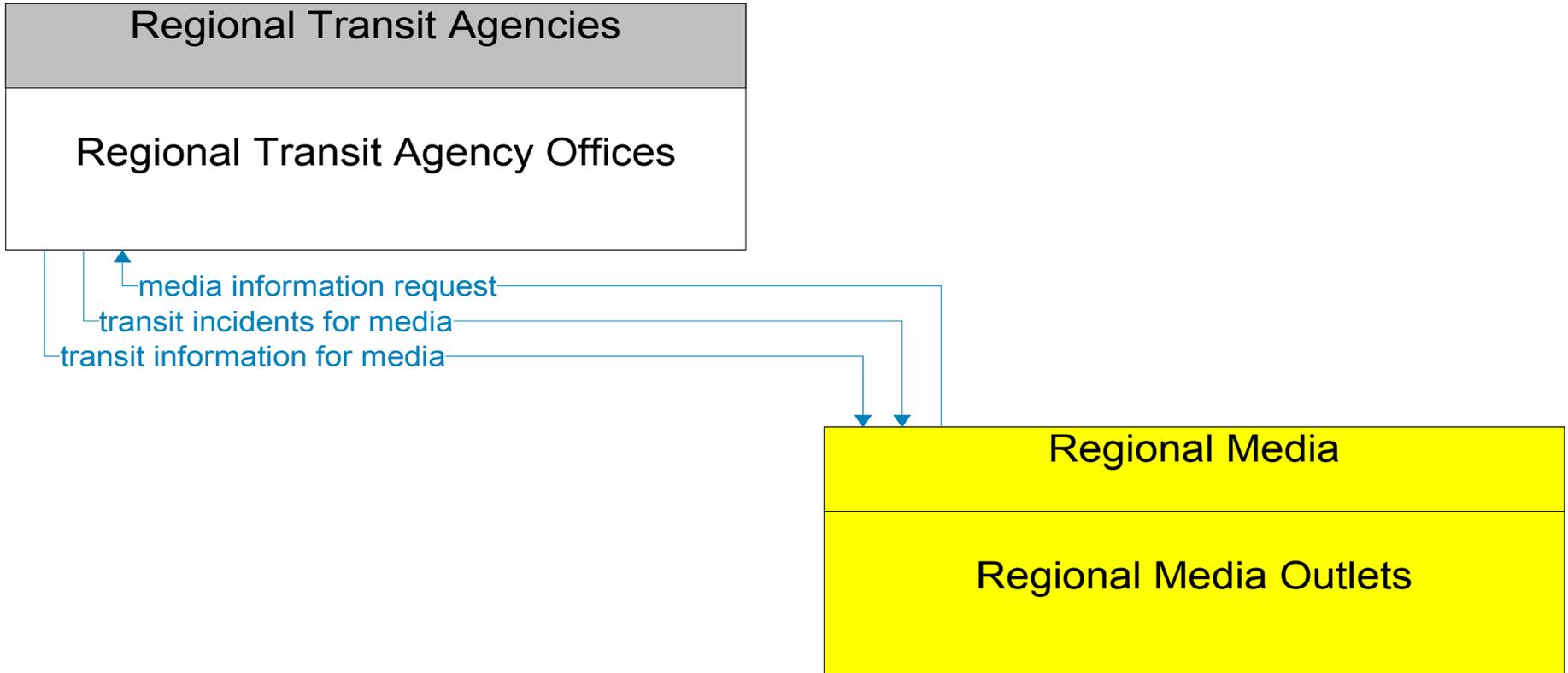


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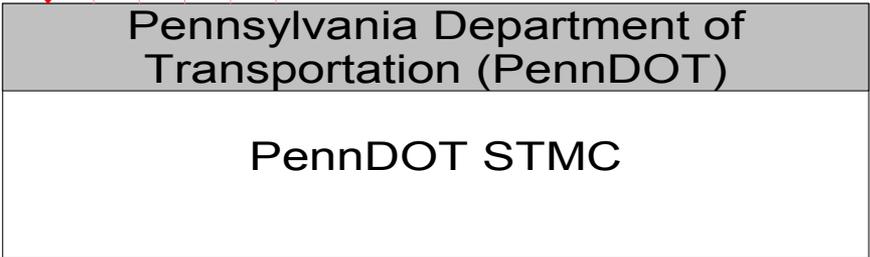
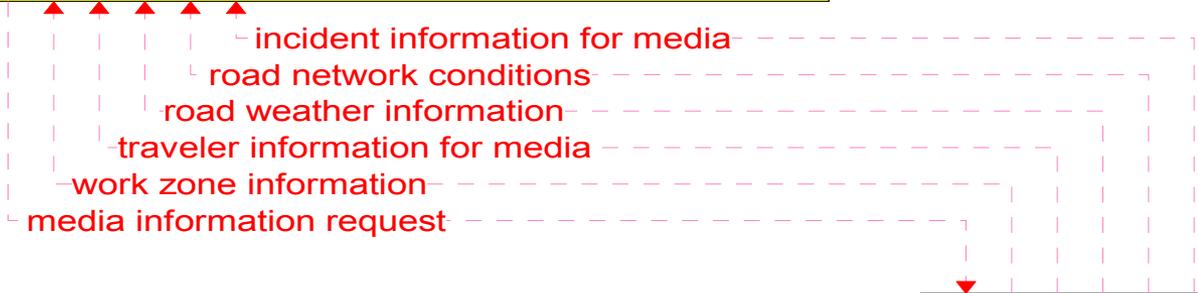
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Existing

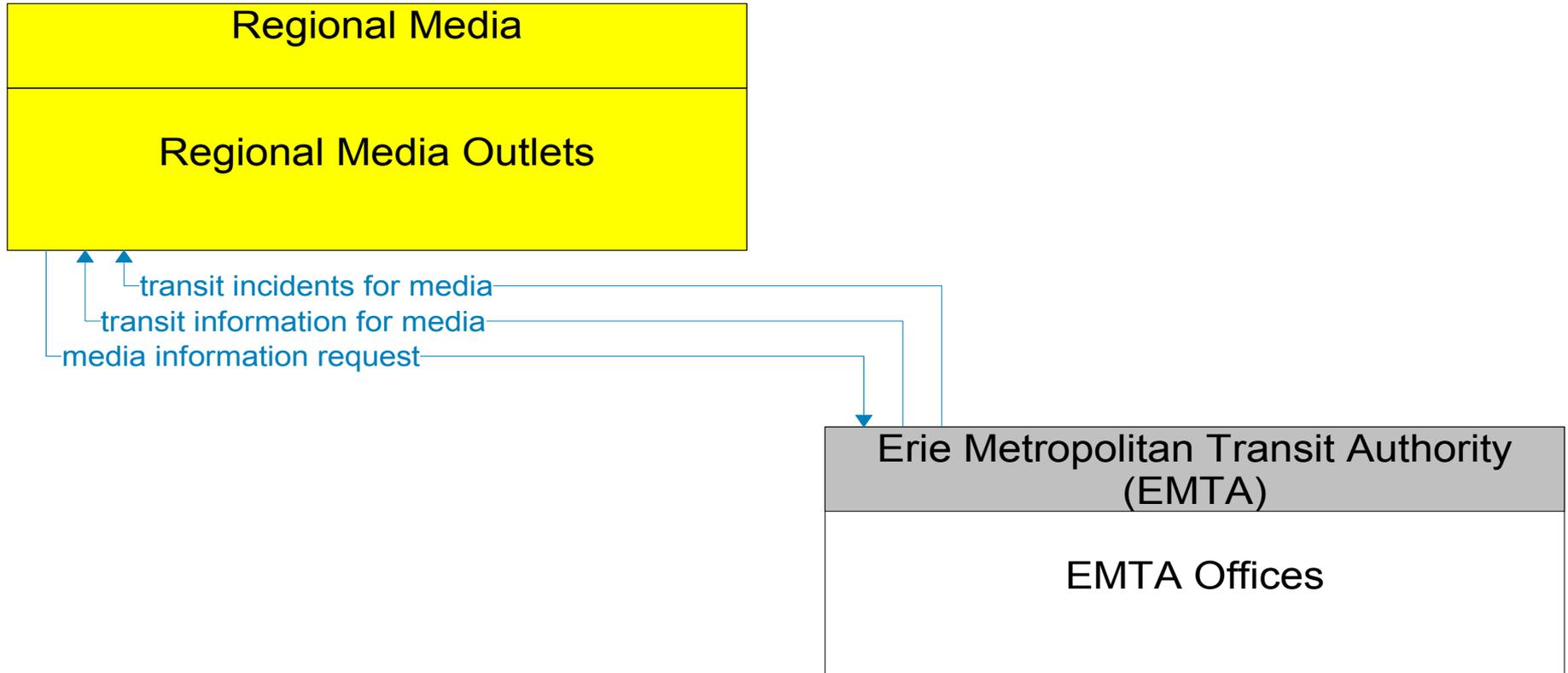
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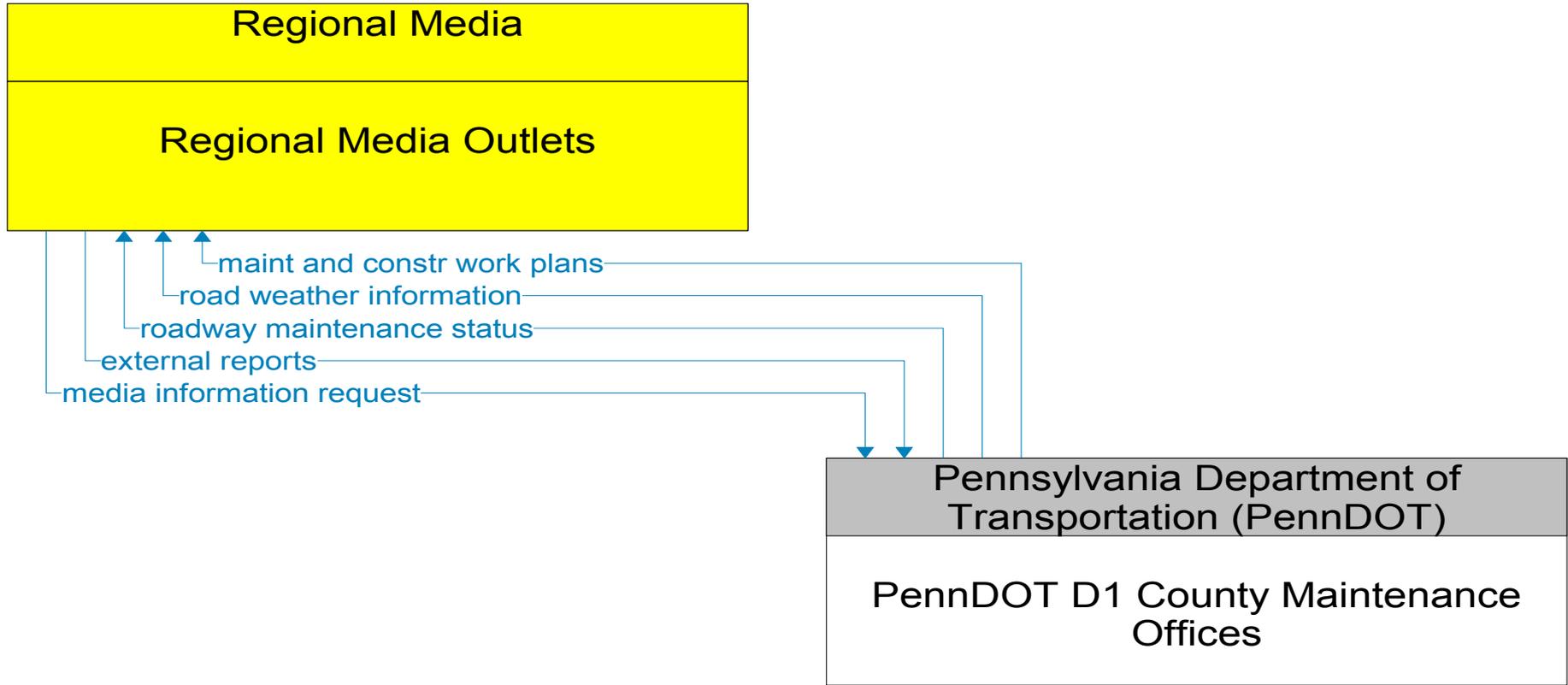
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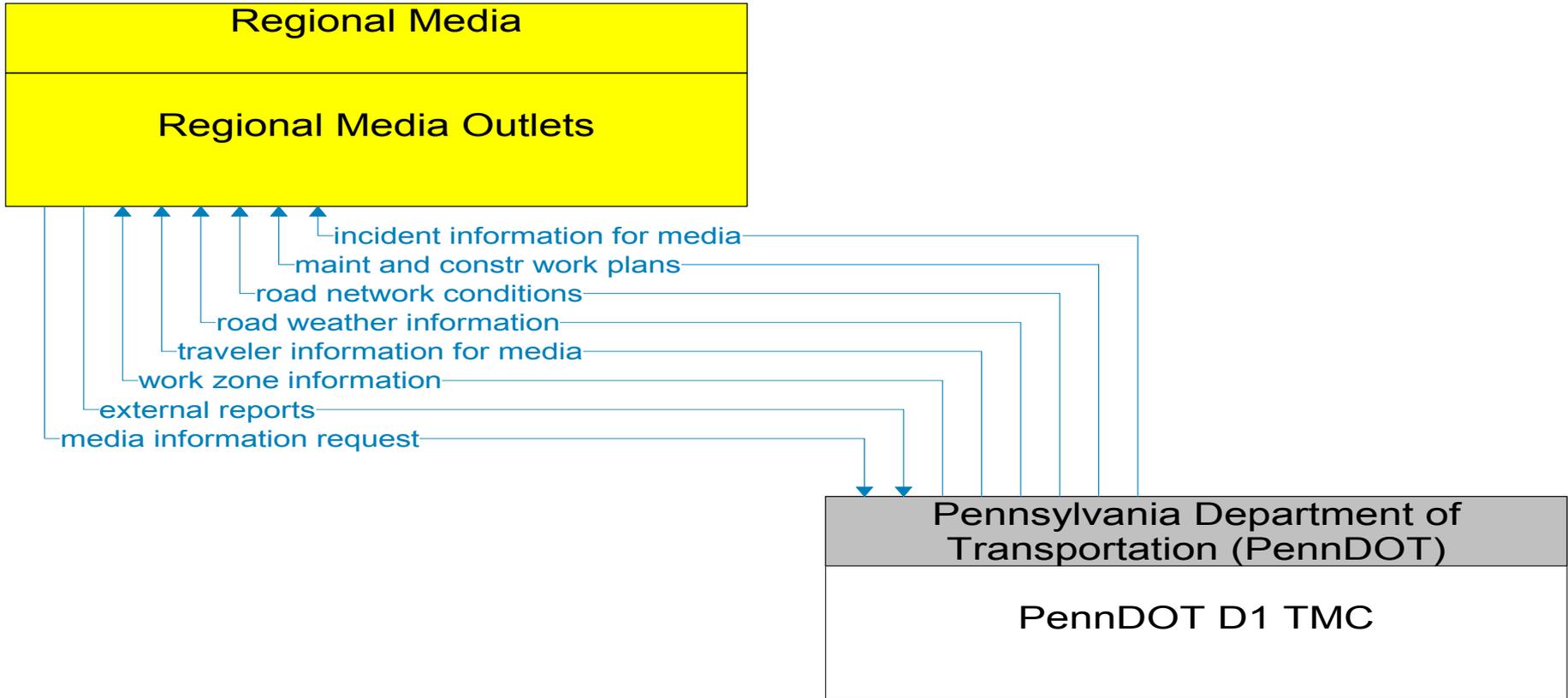
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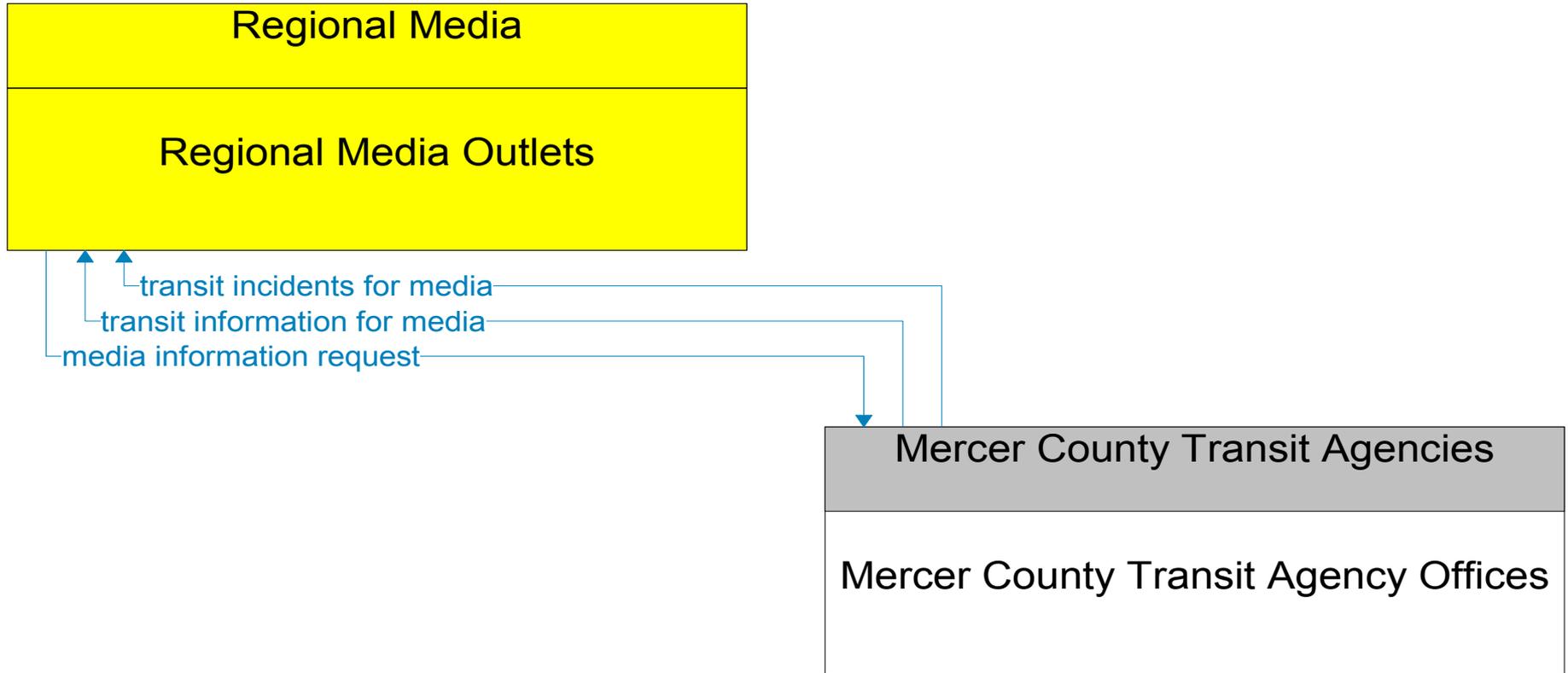
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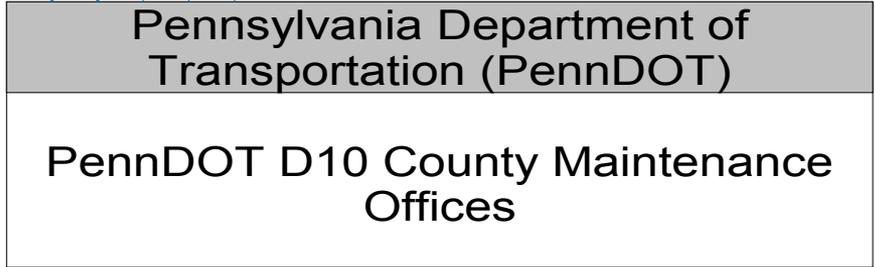
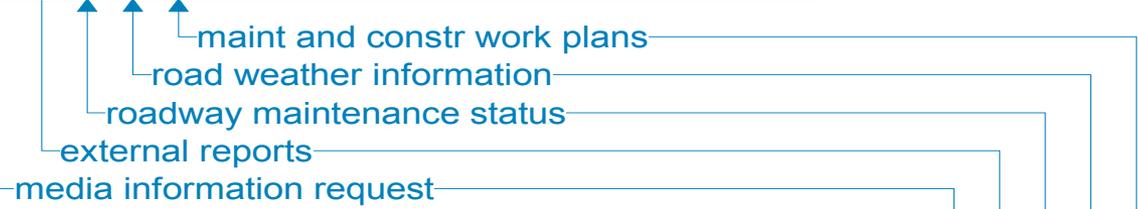


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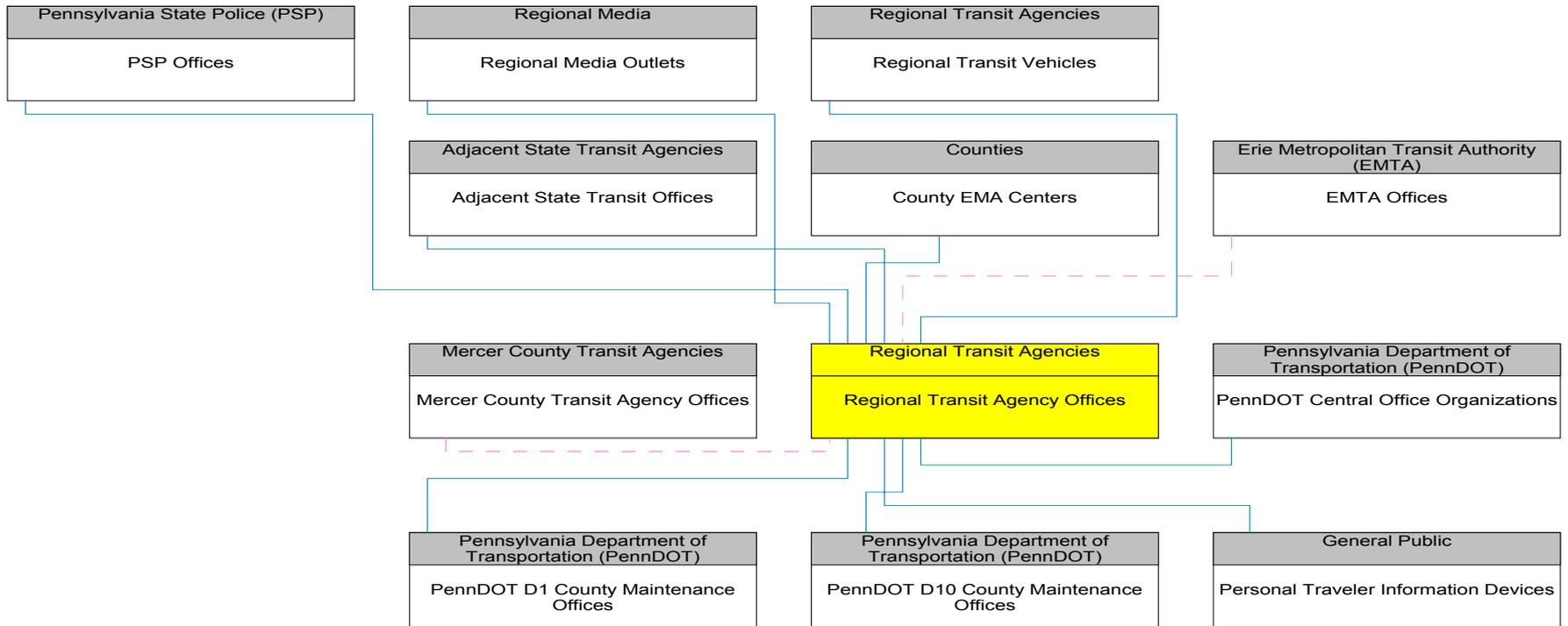




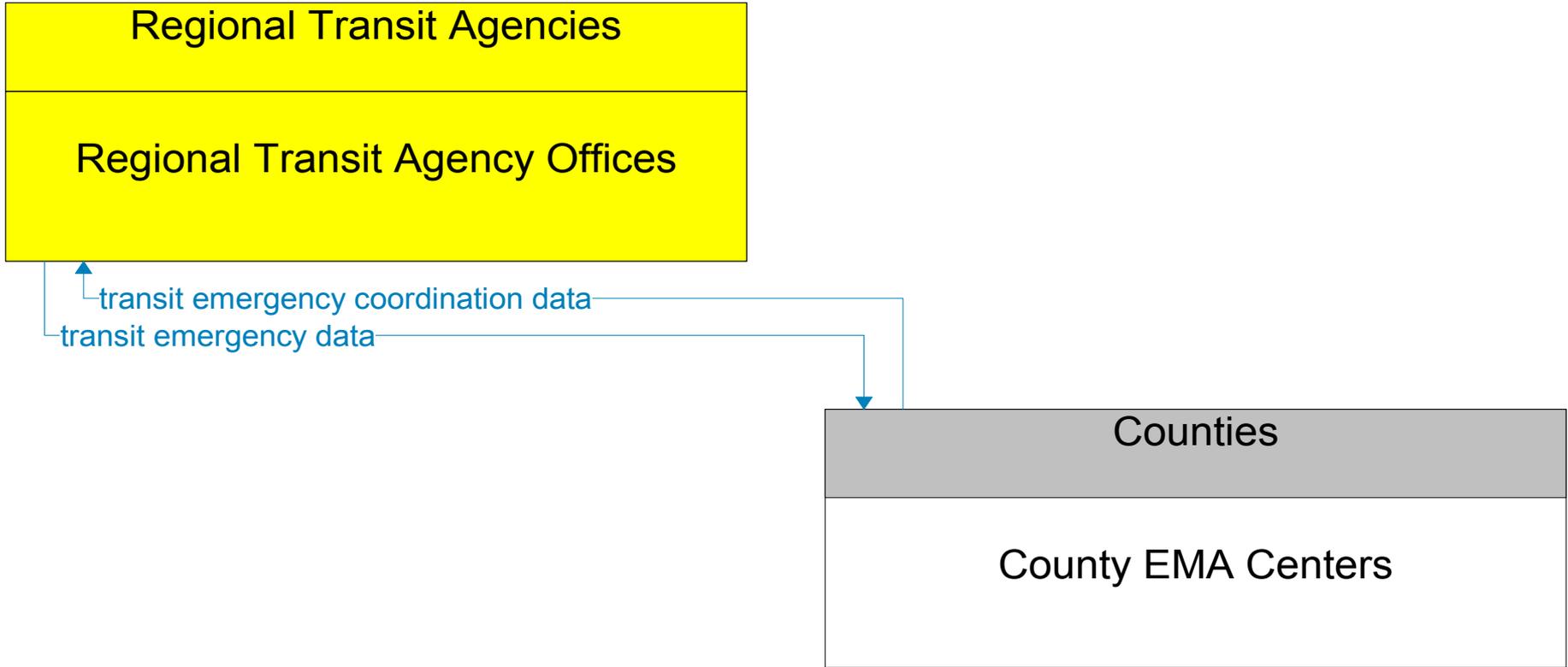
Regional Transit Agency Offices



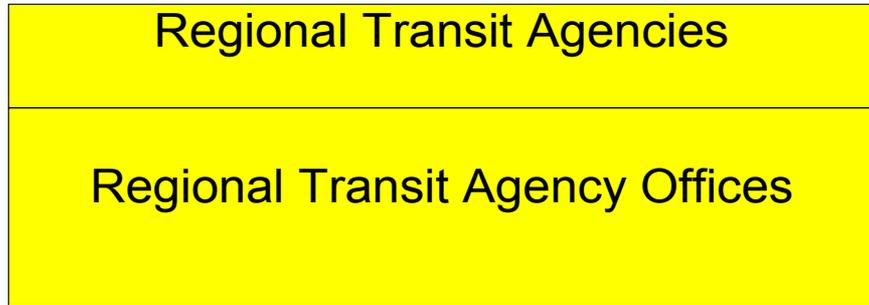
Regional Transit Agency Offices Interconnect Diagram



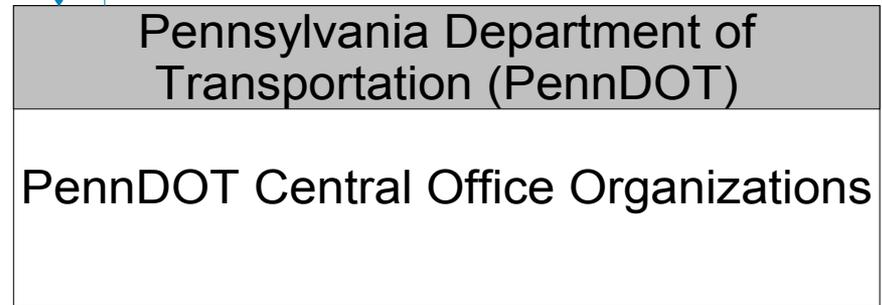
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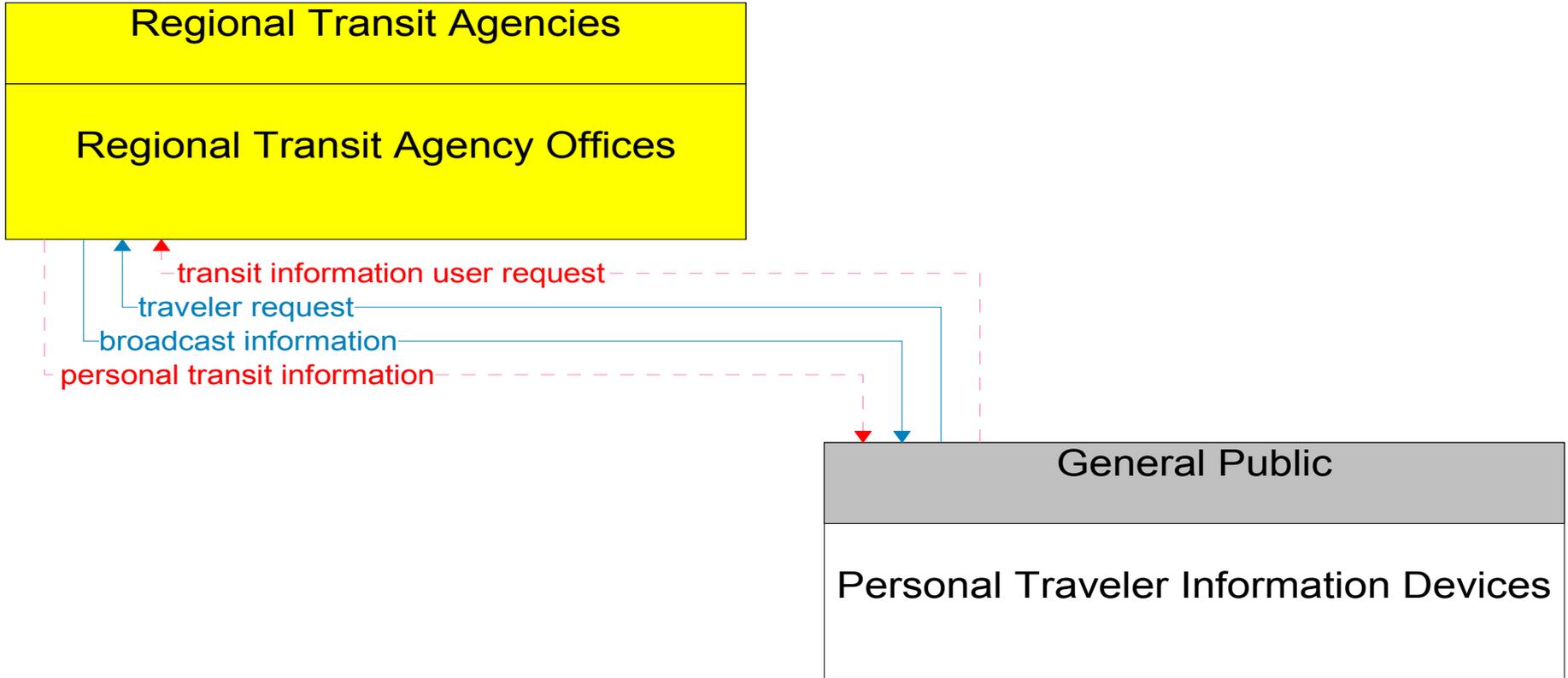
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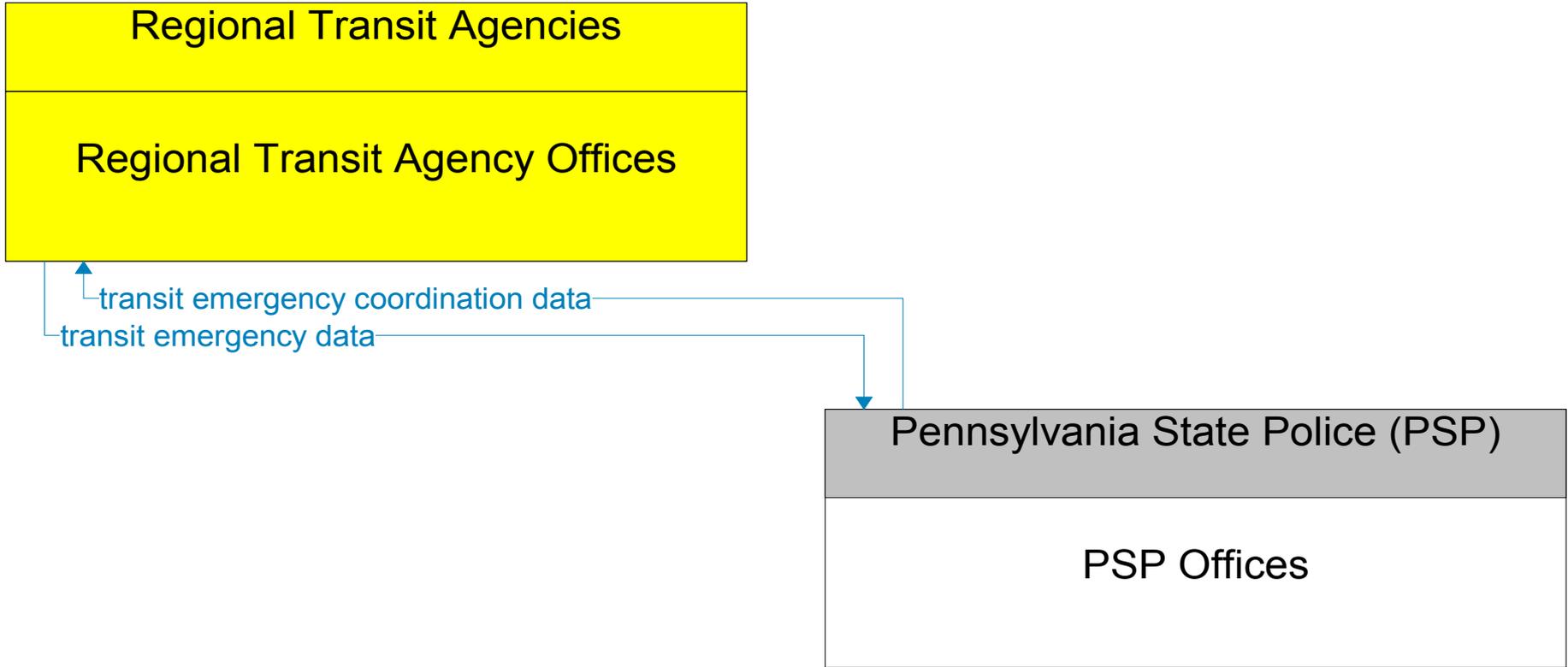
archive requests
transit archive data



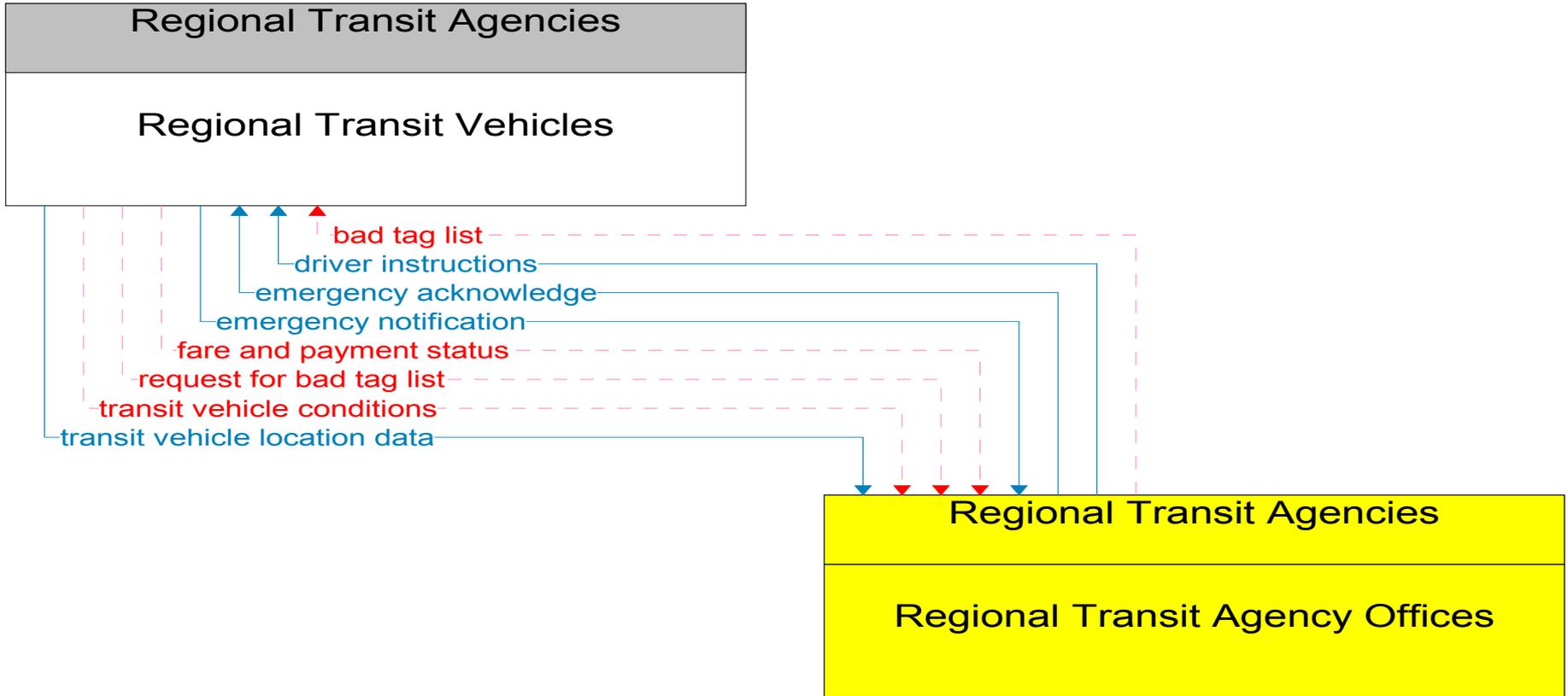
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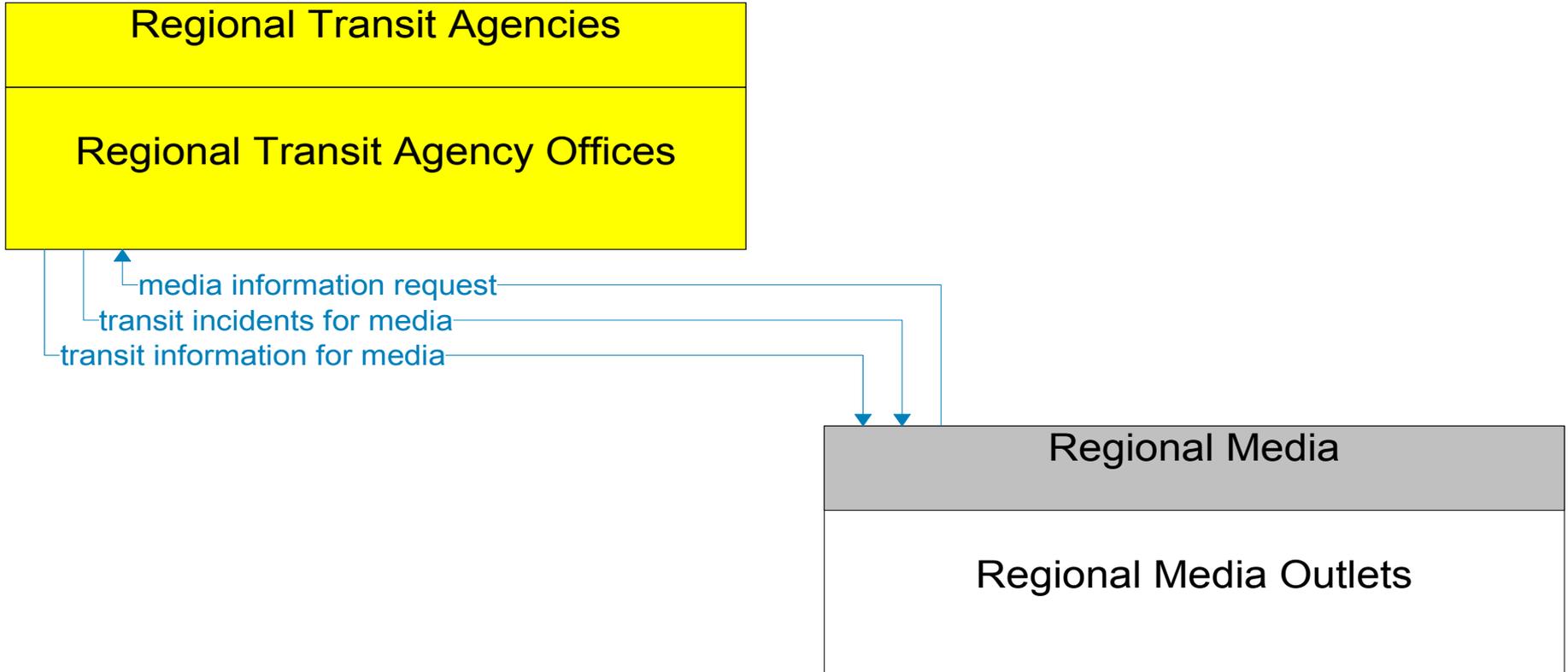
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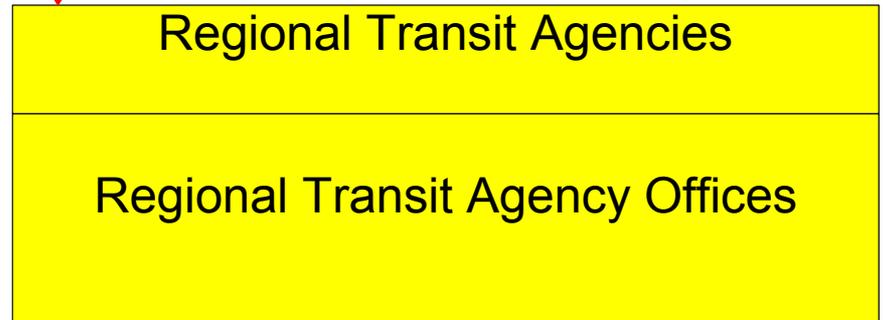
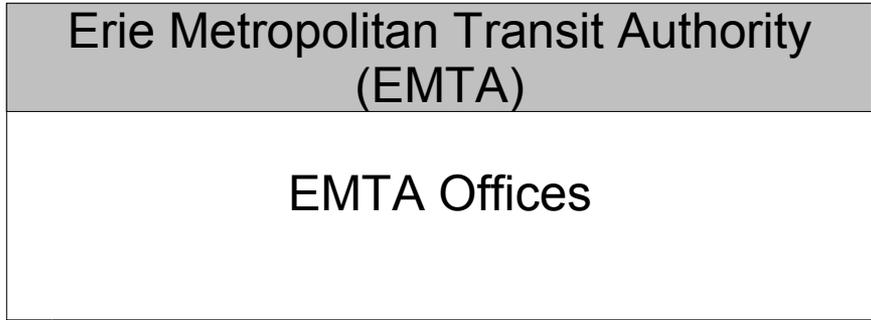
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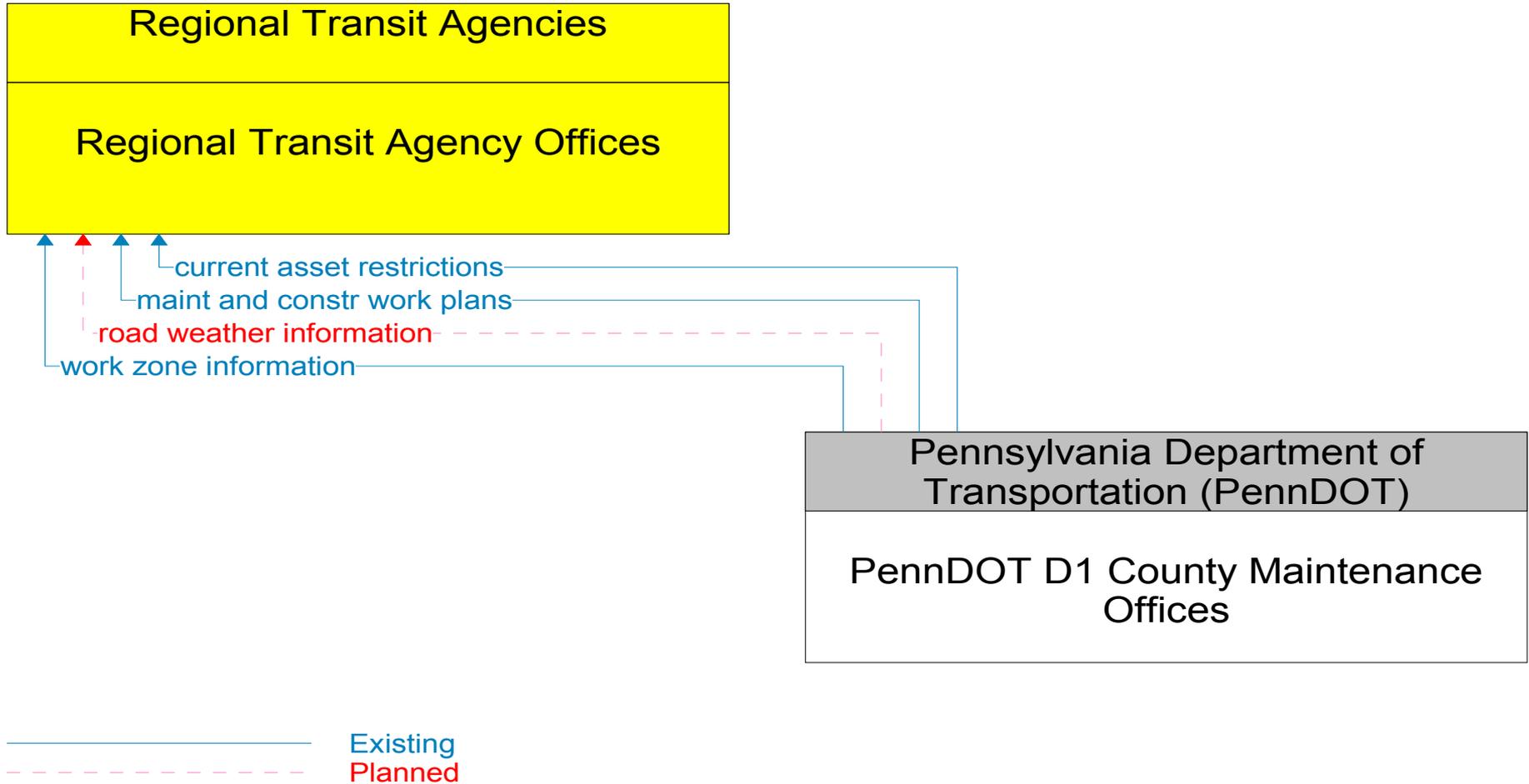
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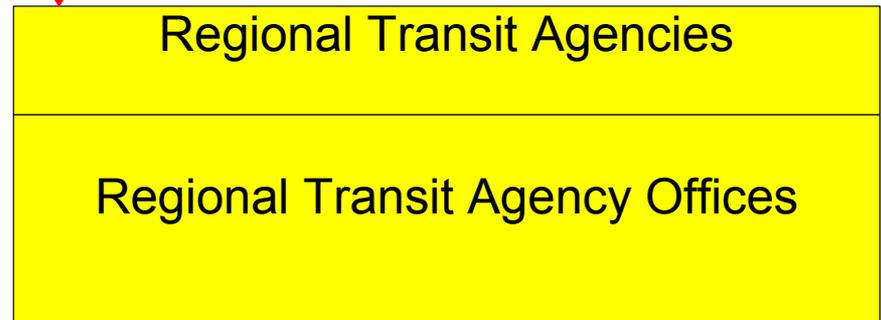
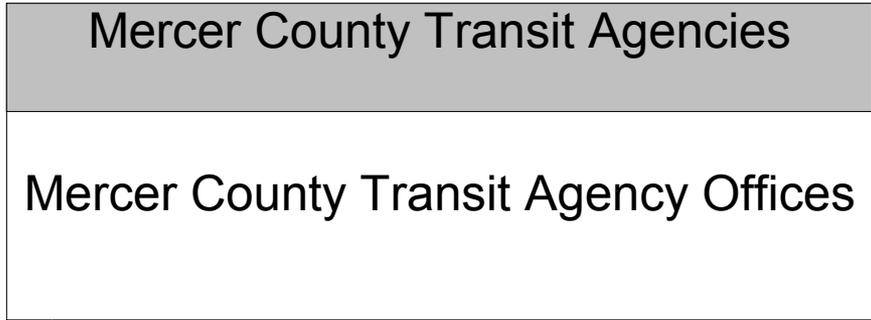


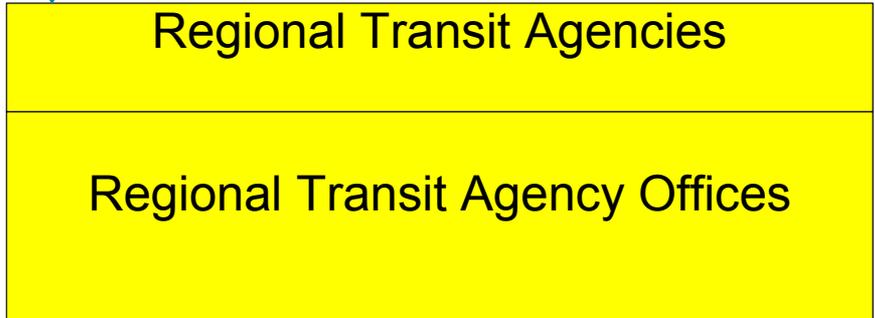
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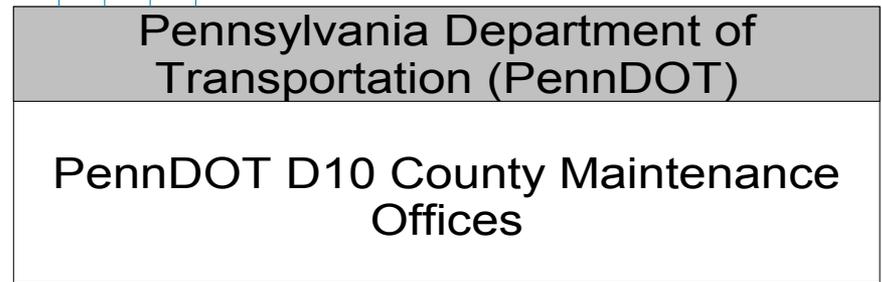


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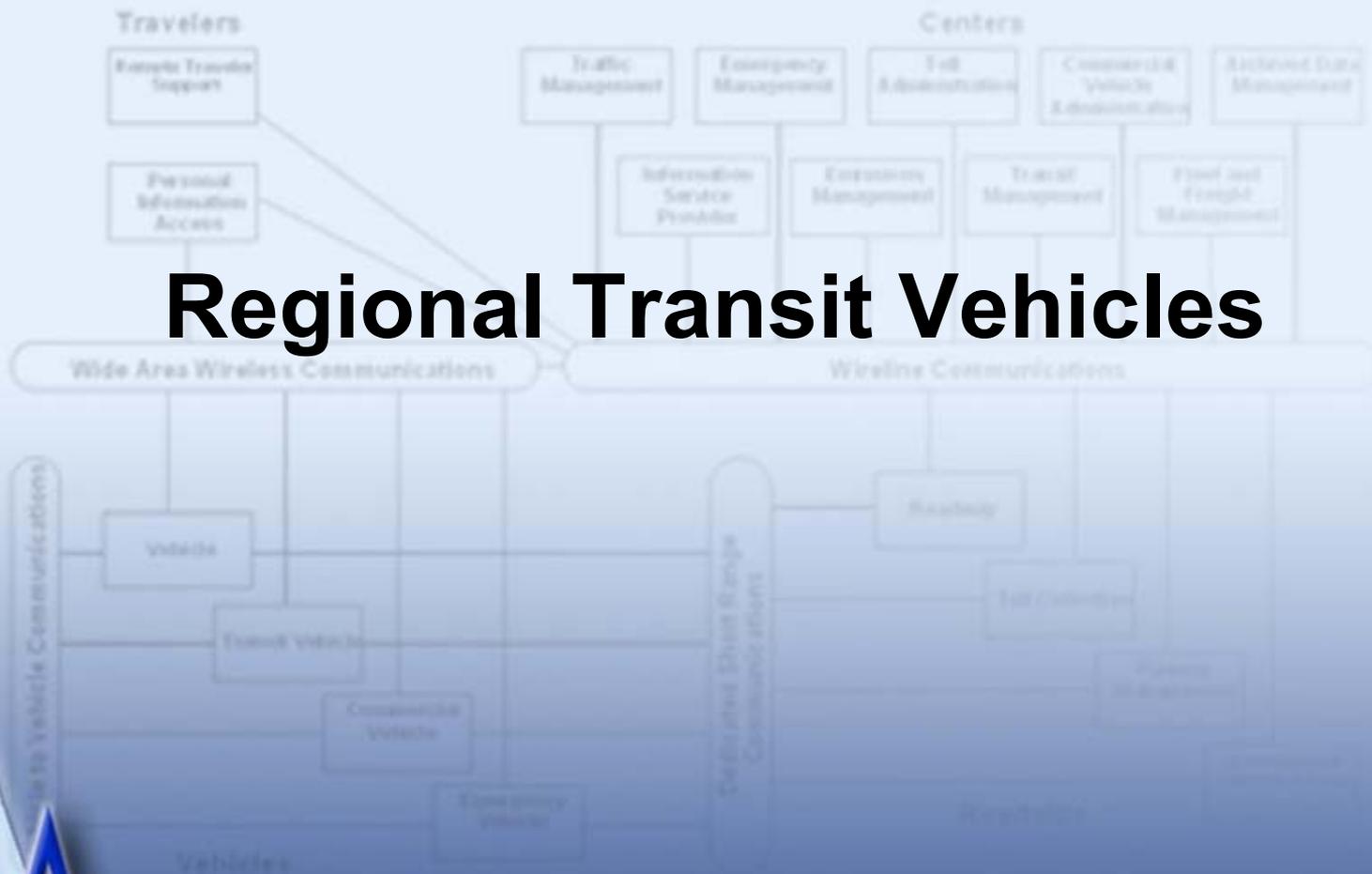




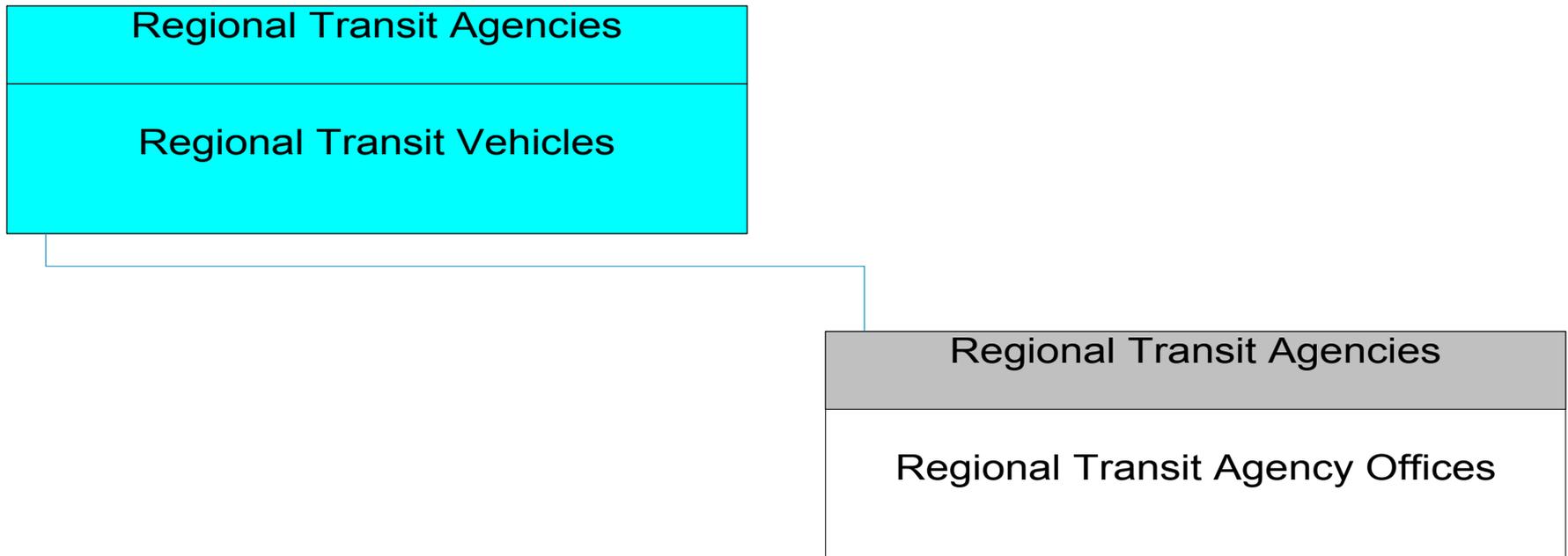


Existing
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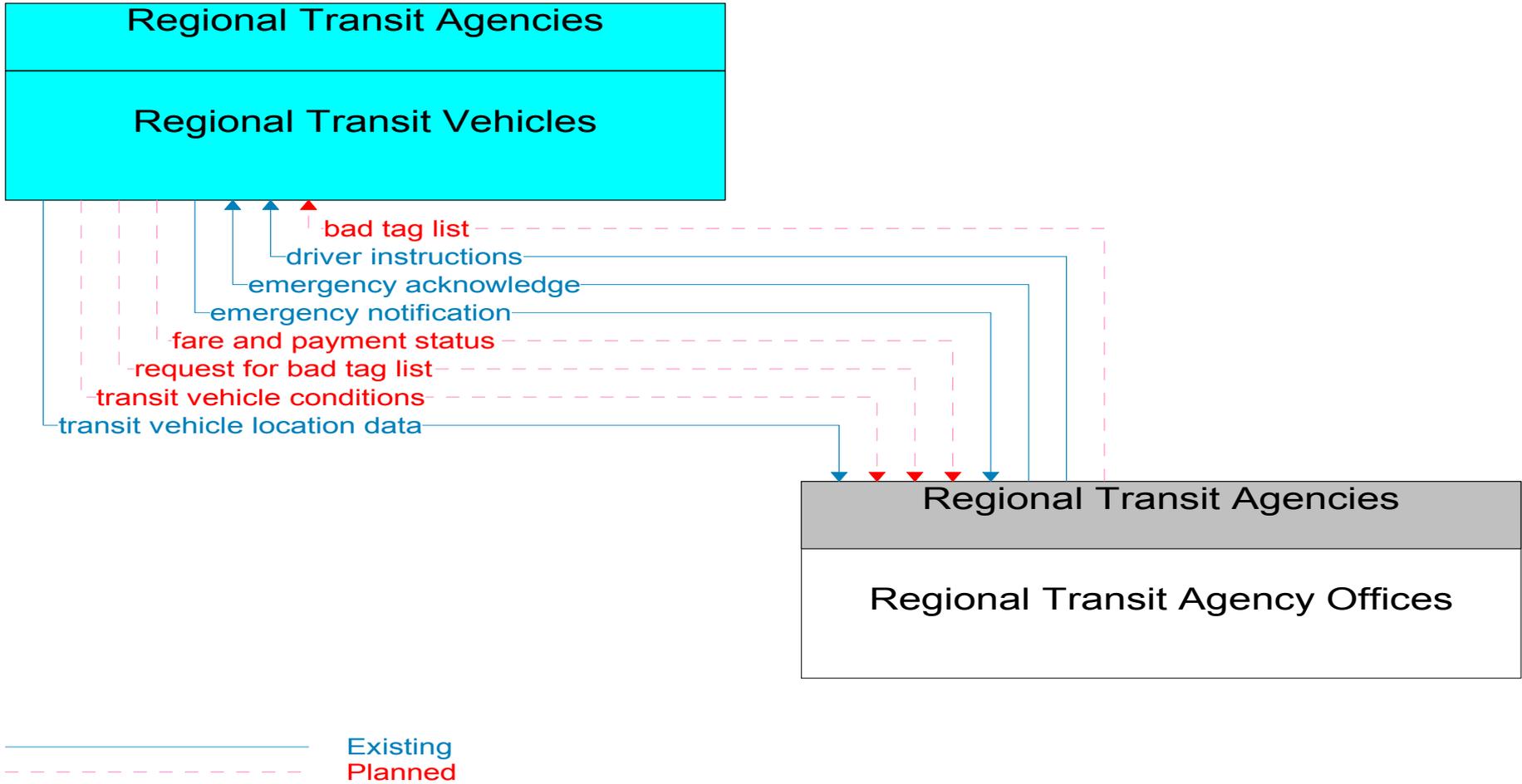
Regional Transit Vehicles



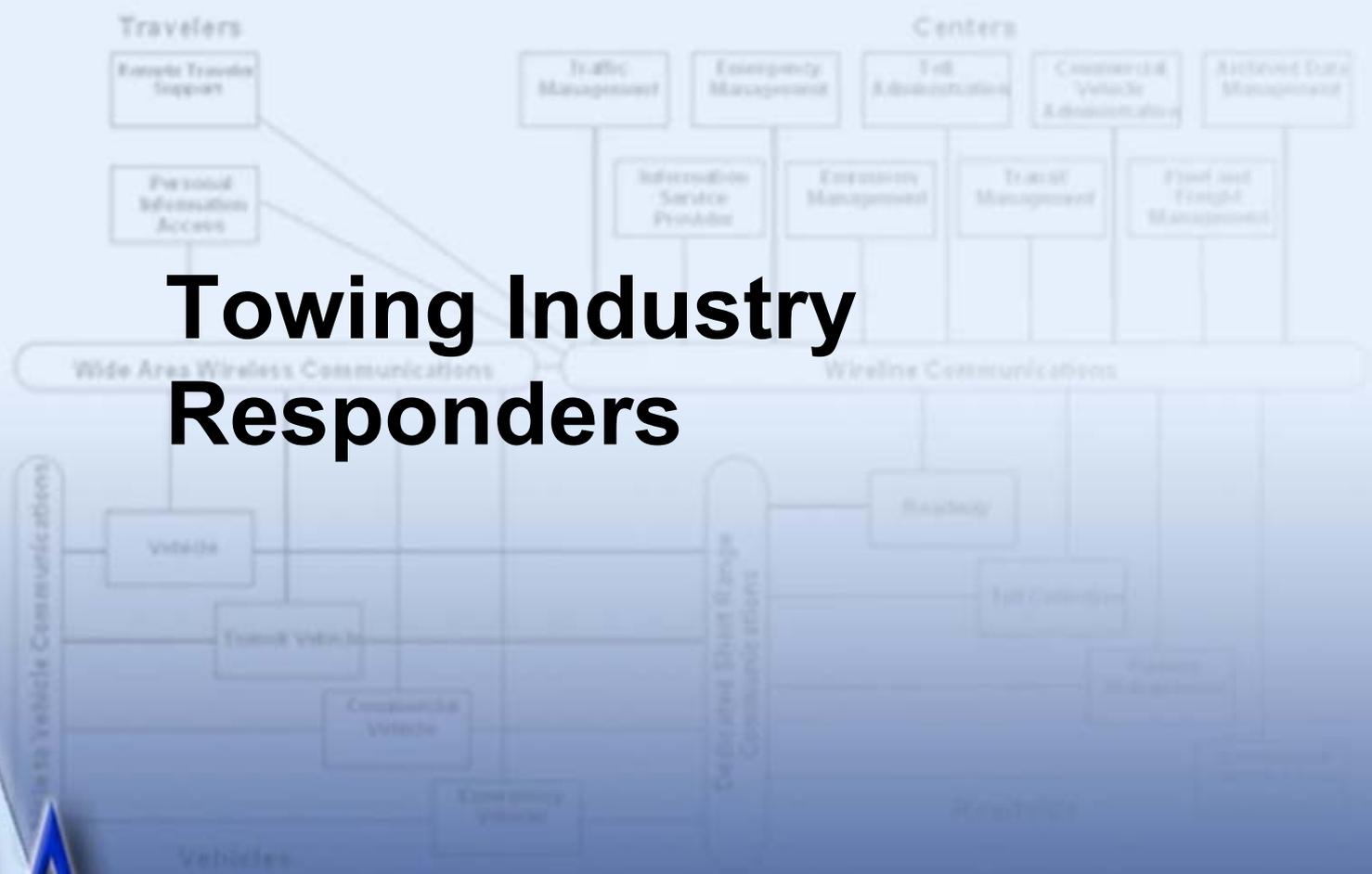
Regional Transit Vehicles Interconnect Diagram



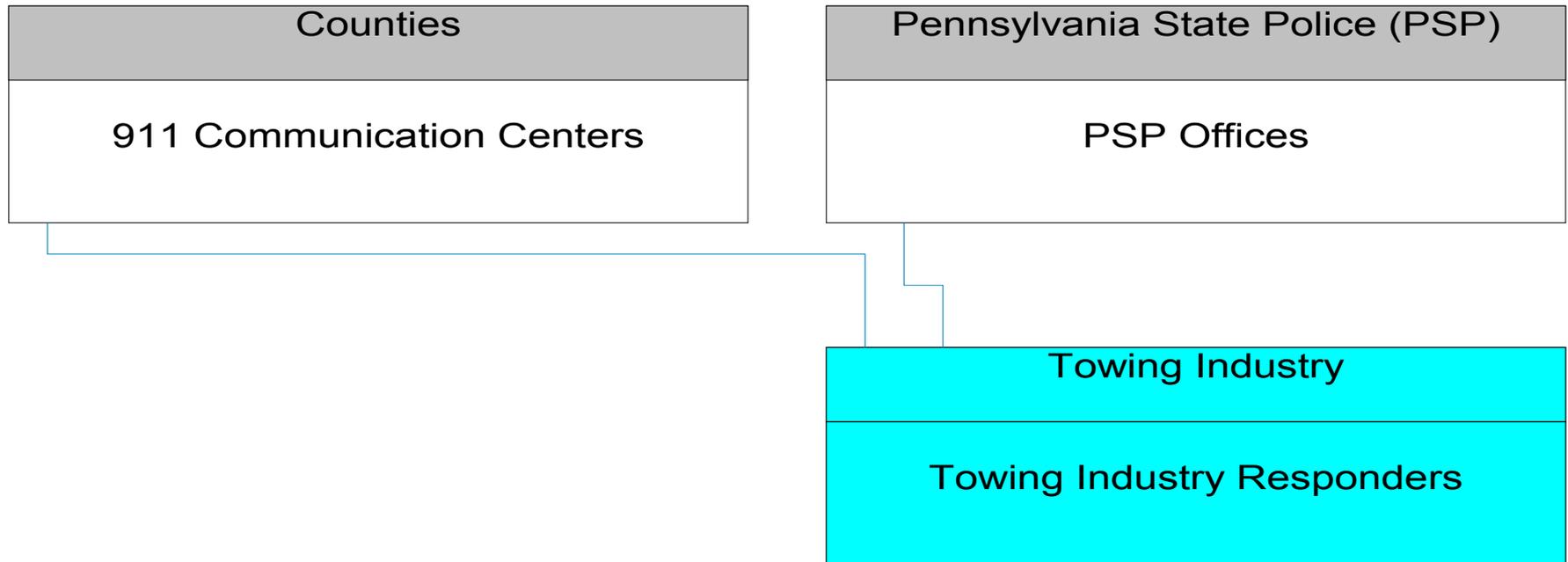
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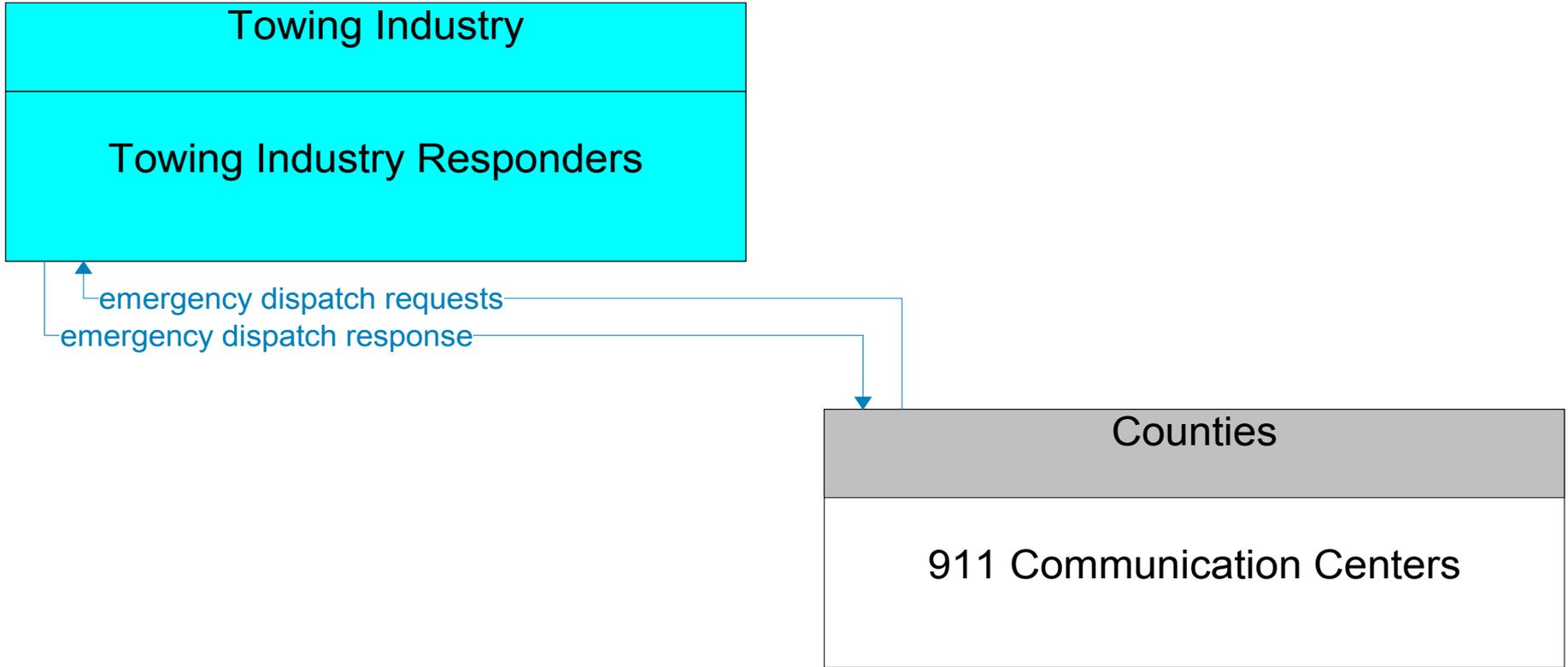
Towing Industry Responders



Towing Industry Responders Interconnect Diagram

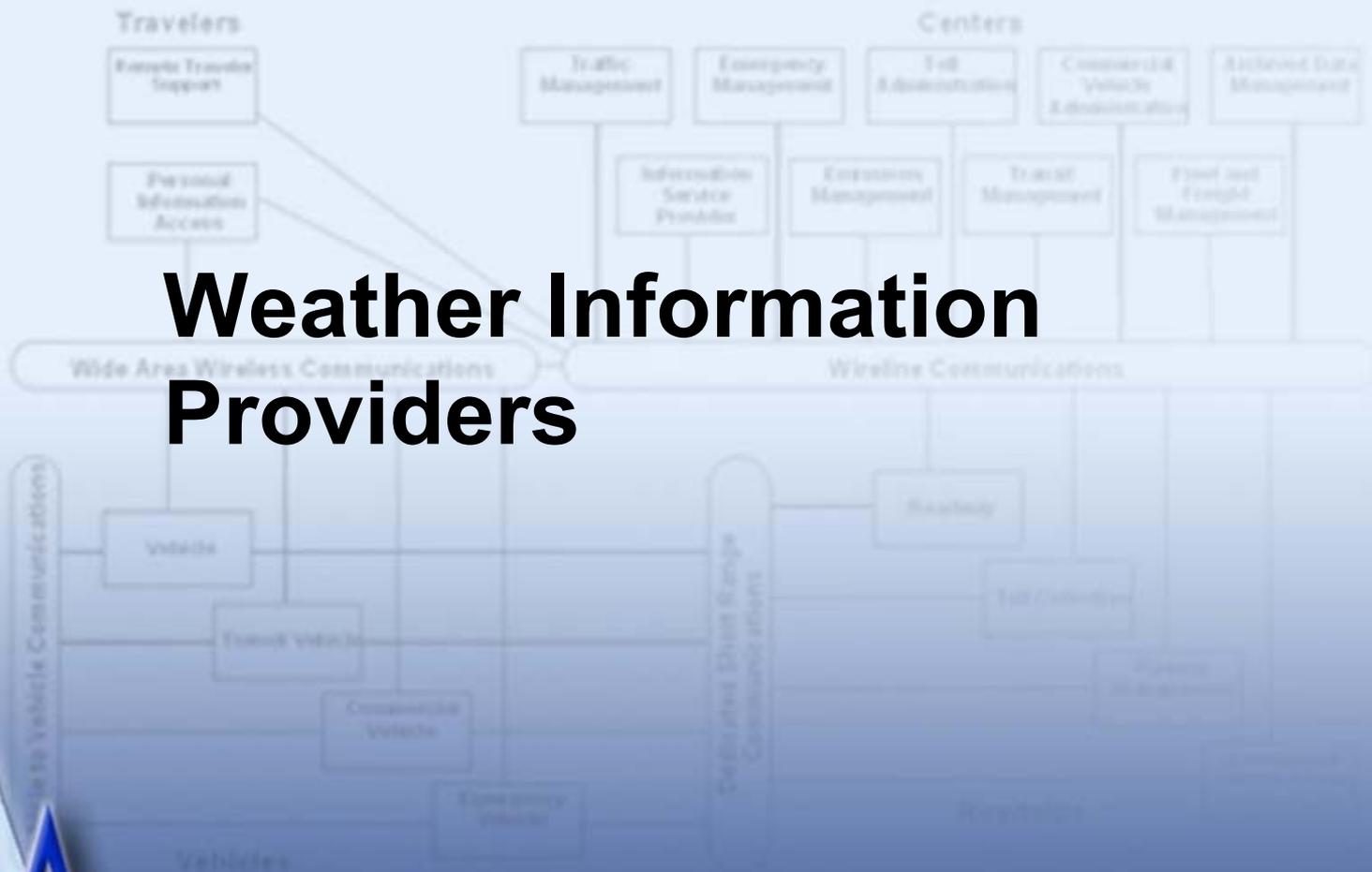


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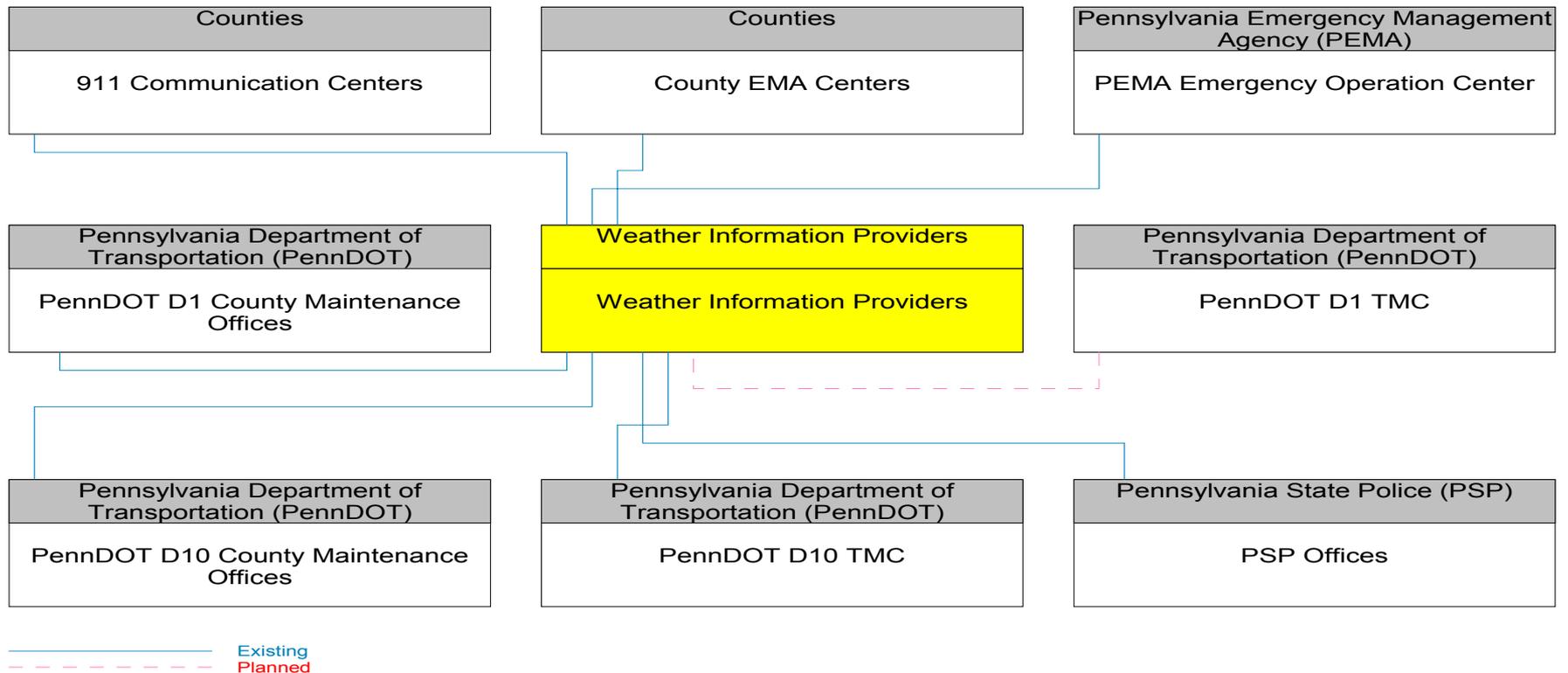


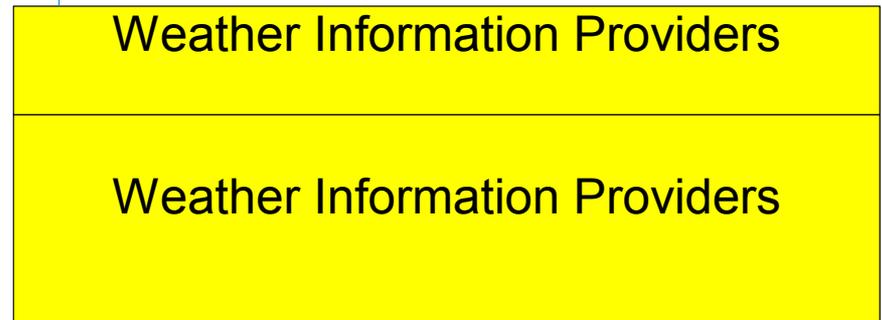
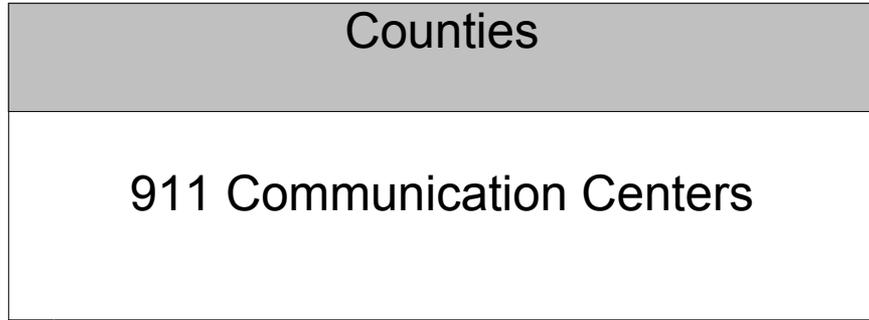
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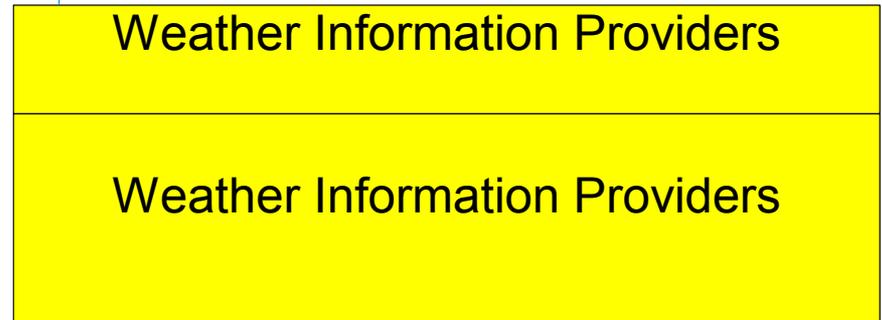
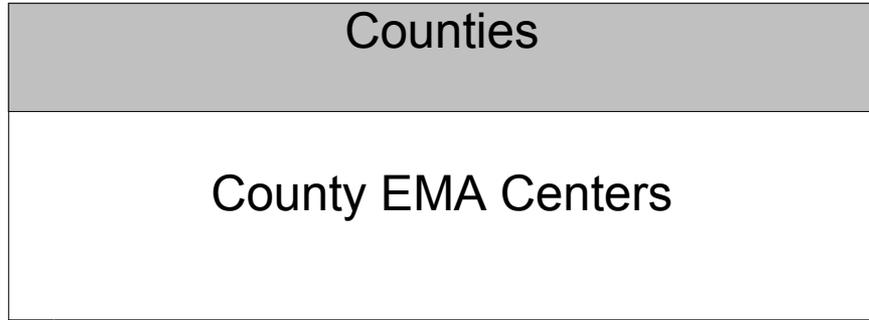
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Weather Information Providers Interconnect Diagram





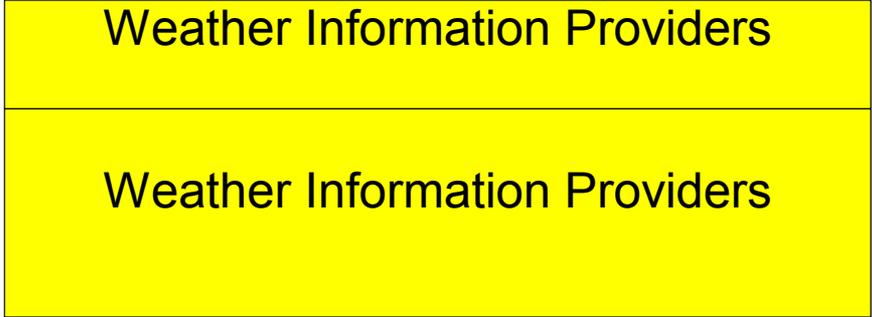
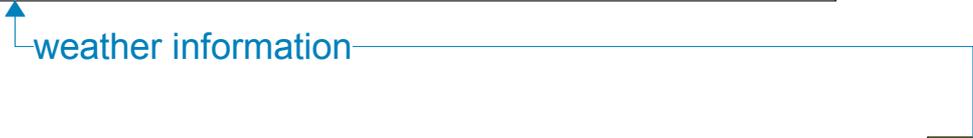
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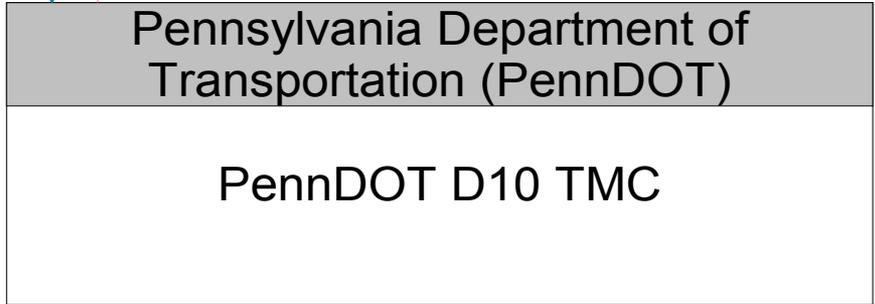
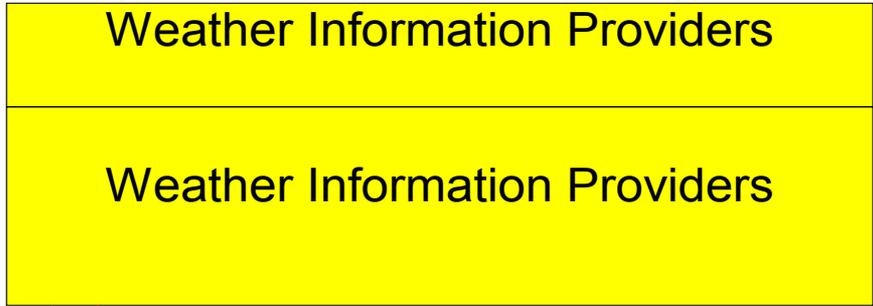
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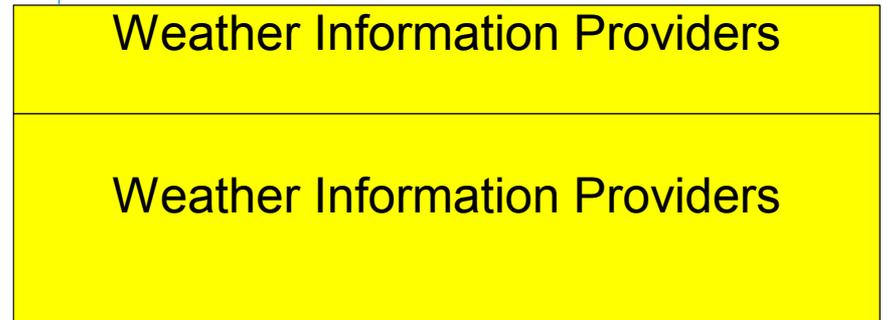
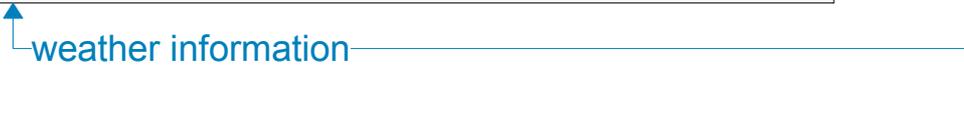
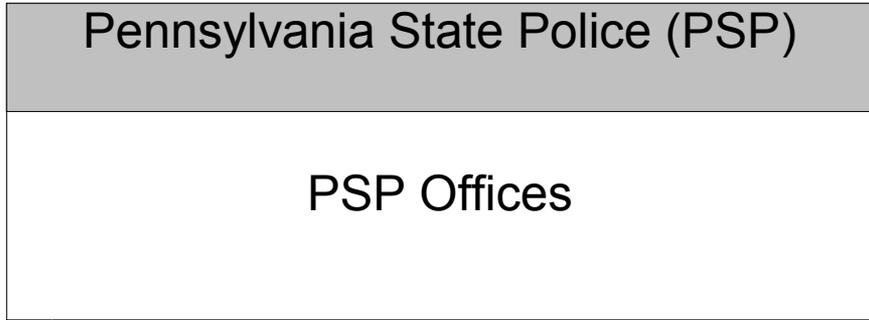
PEMA Emergency Operation Center



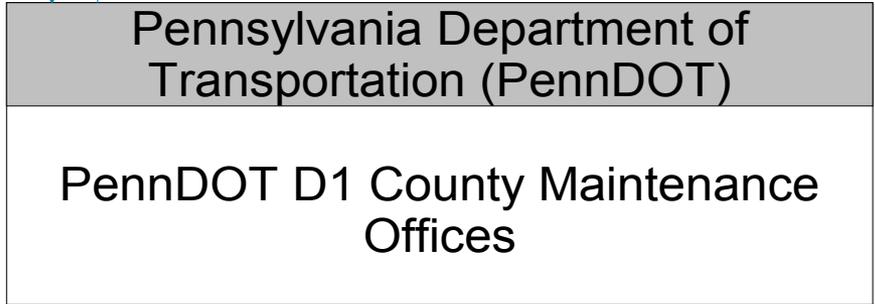
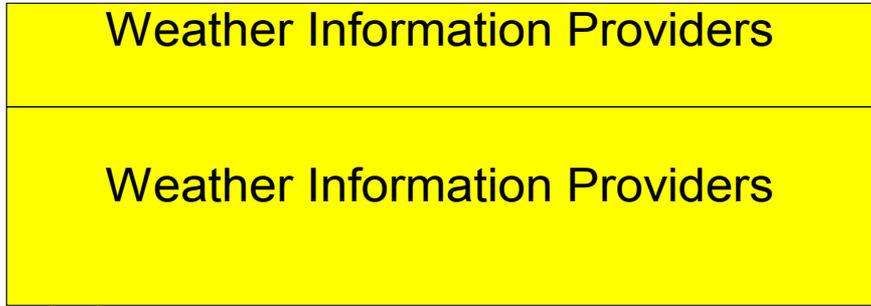
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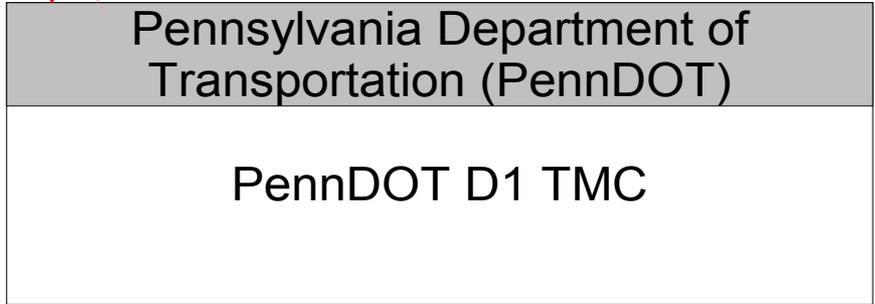
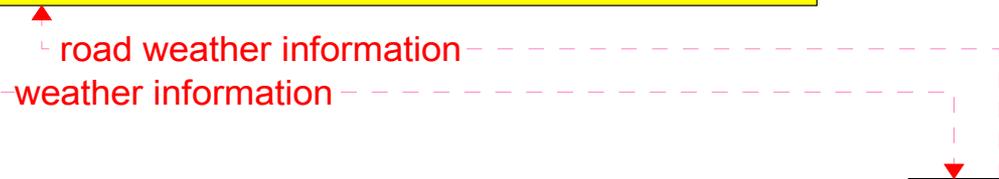
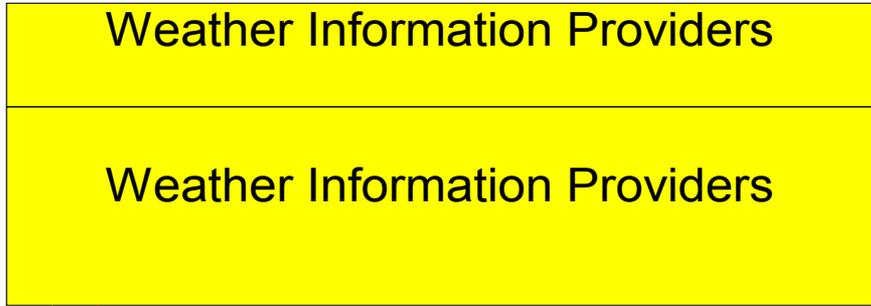


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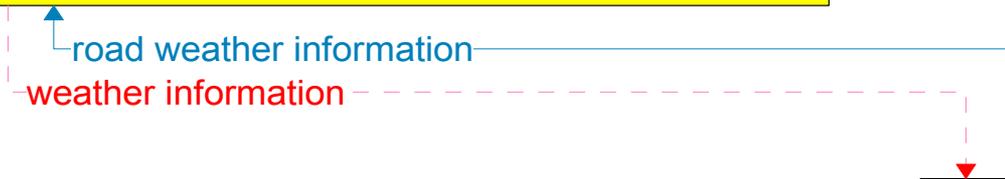
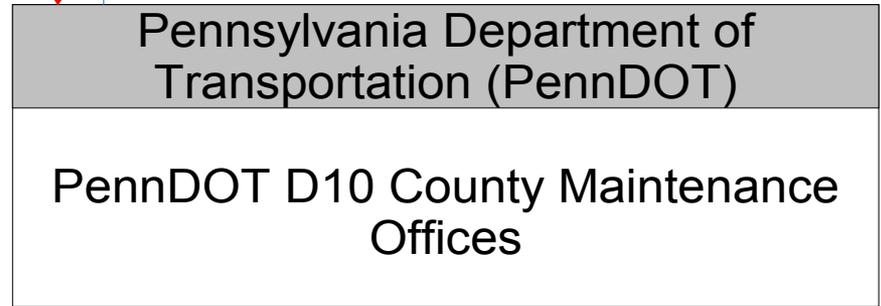
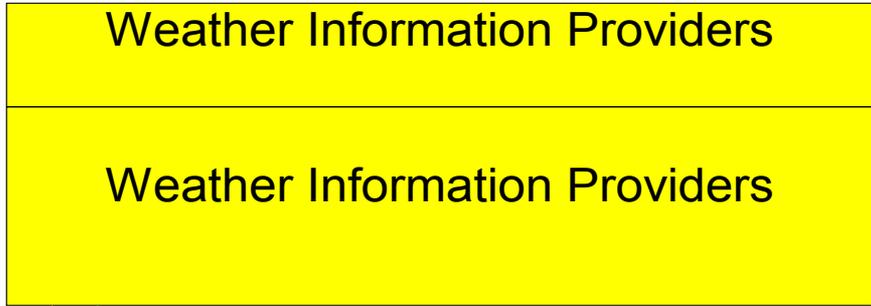


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Appendix A: Acronyms

24x7	Twenty Four Hours of Operation, Seven Days a Week
AAA	American Automobile Association
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
AHS	Automated Highway System
ANSI	American National Standards Institute
ARMS	Automatic Real-Time Messaging
ASTM	American Society of Testing and Materials
ATIS	Advanced Traveler Information System
ATR	Automatic Traffic Recorders
AVL	Automatic Vehicle Location
BHSTE	Bureau of Highway Safety and Traffic Engineering
BOMO	Bureau of Maintenance and Operations
BPR	Bureau of Planning and Research
BRT	Bus Rapid Transit
CATA	Crawford Area Transportation Authority
CCTV	Closed Circuit Television
CDC	Consolidated Dispatch Centers
CDL	Commercial Drivers License
CVC	Commercial Vehicle Check
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations
DARC	Data Radio Channel
DMS	Dynamic Message Signs
DMV	Department of Motor Vehicles
DOT	Department of Transportation
DSRC	Designated Short Range Communication
EMA	Emergency Management Agency
EMS	Emergency Medical Services
EMAA	Erie Municipal Airport Authority
EMTA	Endless Mountains Transportation Authority
ESP	Emergency Service Patrol
ETC	Electronic Toll Collection
FCC	Federal Communication Commission
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GIS	Geographic Information System
GPS	Global Positioning System
HAR	Highway Advisory Radio
HAT	Highway Advisory Telephone System
HAZMAT	Hazardous Materials
HIA	Harrisburg International Airport
HOV	High Occupancy Vehicle

HRI	Highway Rail Intersection
IEEE	Institute of Electrical and Electronics Engineers
IEN	Information Exchange Network
IM	Incident Management
IIMS	Incident Information Management System
IMMS	Incident Management Message Sets
ISP	Information Service Provider
ITS	Intelligent Transportation System
MCCT	Mercer County Community Transit
MCSAP	Motor Carrier Safety Assistance Program
MOE	Measures of Effectiveness
MOU	Memorandum of Understanding
m.p.	Milepost
NEMA	National Electrical Manufacturers Association
NHI	National Highway Institute
NTCIP	National Transportation Communications for ITS Protocols
NWS	National Weather Service
OB	Onboard
OER	Octet Encoding Rules
O&M	Operations and Maintenance
OEM	Office of Emergency Management
PDA	Personal Digital Assistant
PEIRS	Pennsylvania Emergency Information Reporting System
PEMA	Pennsylvania Emergency Management Agency
PennDOT	Pennsylvania Department of Transportation
PRISM	Performance and Registration Information Systems Management
PSP	Pennsylvania State Police
PSAP	Public Safety Answering Point
RAP	Regional Advisory Panel
RAPID	Regional Agile Port Intermodal Distribution System
RPO	Rural Planning Organization
RTMC	Regional Transportation Management Center
RWIS	Road Weather Information System
SAFER	Safety and Fitness Electronic Record
SATIN	Service Area Travelers Interactive Network
SCADA	Supervisory Control and Data Acquisition
SCH	Scheduling/Run Cutting
SFA	Strategic Focus Area
STMC	Statewide Transportation Management Center
STMF	Simple Transportation Management Framework
T-1	High Bandwidth Telephone Line
TAWC	Transit Authority of Warren County
TIP	Transportation Improvement Plan
TMC	Transportation Management Center
WIM	Weigh in Motion

Appendix B: ITS Definitions

(Source: DVRPC Regional ITS Architecture)

The following definitions for ITS terms may or may not apply specifically to the Region. They are provided as reference material to support ITS terminology found in and outside of this report.

Automatic Vehicle Location: This technology is used by various agencies, including transit and emergency management agencies, to constantly monitor the location of their vehicles. Transit agencies utilize AVL as a management tool to track the progress of buses and to determine when remedial action is required if buses are not adhering to schedule. Emergency dispatchers rely upon AVL to help guide their selection of which vehicle to dispatch to a call. AVL technology relies upon GPS or triangulation as the mechanism for locating vehicles.

Cellular Phone Number for Incident Reporting: Several toll authorities have reserved cellular phone numbers, such as *11 for the Pennsylvania Turnpike, for use by motorists to report disabled vehicles or incidents while en-route. The numbers are usually toll-free and go directly to the agency's operations center. Several highway departments have posted signs directing motorists to dial cellular 911 to report incidents.

Closed Circuit Television: CCTV is real-time video surveillance equipment, monitored and manipulated by operations personnel. For highways, CCTV's are installed at locations where accident rates and/or congestion levels are known to be high. The cameras dispatch real-time video images to the traffic operation centers so that in emergency situations a quicker response can be provided. Transit agencies deploy CCTV cameras to observe transit passengers for transit management (crowding levels), fare collection, and security purposes.

Closed Loop Traffic Signal System: For this system, traffic signals are interconnected along specified corridors to provide for ease in traffic flow. The signals may be monitored by detectors and adjusted according to current traffic conditions, or preprogrammed with a number of signal timing plans that vary by time of day and day of week.

Commercial Vehicle Electronic Administration Processes: This process allows commercial vehicle operators to obtain necessary permits via computer and supports the exchange of safety and credentials data among multiple jurisdictions and between agencies within a single jurisdiction.

Dynamic Message Sign: The purpose of the DMS's is to provide real-time en-route travel advisories to travelers. For highways, the DMS signs are either centered over travel lanes or placed alongside the roadway. Messages on permanent DMS signs typically originate from a traffic control center. For transit systems, DMS's take the form of dynamic message boards located in waiting areas and/or platforms to provide information on train arrivals, departures, and platform locations.

Emergency Call Boxes: Emergency call boxes permit travelers who do not have cellular phones a mechanism to report accidents and other emergency situations. They are used by both highway and transit travelers. Call boxes are typically located along the side of an expressway at mile or half mile intervals. Transit agencies place them in waiting areas and on platforms to improve the security of passengers.

E-Z Pass: E-Z Pass is an electronic toll collection system developed by a consortium of toll agencies located in the northeast United States. When a vehicle passes through an E-Z Pass designated toll lane, an electronic tag, in the form of a small box mounted on a vehicle windshield, is detected by an antenna and the appropriate toll is deducted from the customer's prepaid E-Z Pass account. Because of the alliance, E-Z Pass will eventually be employed on all toll bridges and roads in the region.

Highway Advisory Radio: HAR provides travelers with real-time roadway information, including weather information, agency hotline numbers, incident information, and roadway construction advisories, directly over their car radio. The FCC reserves certain AM and FM frequencies specific to whatever jurisdiction in which they are located for public agencies to broadcast these special travel advisories.

Kiosks: A number of organizations have plans to install travel information kiosks at tourist centers, government buildings, and highway service areas. Travelers will be able to obtain current traffic and transit information, information about places to visit, route planning information, and hotel reservations. Generally kiosks will be more interactive and offer more choices than the static traveler information services currently available.

Management Center: Management centers are the focal point and communications hub of an agency's operation. Almost all transit, highway and bridge agencies in the region have their own control centers. These facilities monitor and control an agency's highway or transit network and are responsible for incident management. While the equipment in each operating center varies by agency, the typical control center consists of any number of computer workstations, radio scanners, TV monitors, audio text recording booths to record HAR messages, and fax machines for broadcasting information to other agencies. Depending on agency needs, a highway control center can include capabilities to operate computerized traffic signal systems, Dynamic message signs and highway advisory radios, monitor CCTV's, manage emergency service patrols, and coordinate incident management response teams. Composition of transit operation centers vary based upon whether rail or bus operations are involved.

Ramp Metering: Ramp metering is designed to control the rate of traffic entering a freeway. The objective is to maintain a predetermined level of service on the freeway by adjusting the on-ramp traffic volume with a traffic control signal. Typical waiting times at ramp metering signals are between 5 to 6 seconds per vehicle.

Road Weather Information System: RWIS are typically installed at locations that experience a higher-than-average number of accidents attributable to fog, snow or icy

conditions. Sensor information can be used to more effectively deploy road maintenance resources, issue weather-specific warnings to drivers and general advisories to motorists. Weather sensors are connected to remote processing units located in the field which measure, collect, and pre-process environmental data and then transmit the information to an operations center where staff can act on the information.

Signal Priority: This technology allows transit vehicles to send direct control requests to signalized intersections. These messages result in preemption of the current signal control plan and grants right-of-way to the requesting transit and emergency vehicles.

Service Patrols: The Service Patrol program is designed to improve the efficiency of the highway system through the quick resolution of minor incidents, including disabled vehicles, vehicles out of gas, and minor accidents that impact traffic flow. Service Patrol vans patrol along highways and provide assistance to disabled vehicles. Service Patrol operators are equipped to perform minor repairs such as changing a flat tire or providing gasoline. When major repairs are needed, Service Patrol operators can assist the motorist in contacting a towing company to remove the disabled vehicle. Service Patrol's also reduce the risk of secondary accidents by deploying appropriate warning devices.

Traveler Cards: This technology provides the capability for the traveler to use a common fare instrument for all surface transportation services (i.e., multiple transit agencies, parking facilities, toll roads), to pay without stopping, and have the payment media automatically identified as invalid or its eligibility verified. In addition, smart cards have the capability to provide expansion into other uses as payment for retail purchases, telephone services and for off-line billing for fares paid to agencies.

Traveler Information Website: This type of website is used to access traveler information prior to starting a trip. Currently, most of the existing travel websites in the region offer only construction or special event information. Eventually, real-time, route-specific travel reports will be found on the websites. SmartRoute, under contract to PennDOT, provides real-time travel information on selected highways and transit facilities in the region.

Weigh-In-Motion Station: Weight measuring equipment, including fixed sensors embedded in the pavement, can ascertain the weight of a commercial vehicle at highway speeds to ensure the vehicle is operating within legal weight limits. Ultimately, WIM stations will be utilized to assess motor vehicle taxes on commercial carriers.

Appendix C: Subsystem and Terminator Definitions

(Source: National ITS Architecture)

Appendix C contains the subsystems and terminators from the National ITS Architecture exclusive to the Regional ITS Architecture:

Archived Data Management: The Archived Data Management Subsystem collects, archives, manages, and distributes data generated from ITS sources for use in transportation administration, policy evaluation, safety, planning, performance monitoring, program assessment, operations, and research applications. The data received is formatted, tagged with attributes that define the data source, conditions under which it was collected, data transformations, and other information (i.e. meta data) necessary to interpret the data. The subsystem can fuse ITS generated data with data from non-ITS sources and other archives to generate information products utilizing data from multiple functional areas, modes, and jurisdictions. The subsystem prepares data products that can serve as inputs to Federal, State, and local data reporting systems. This subsystem may be implemented in many different ways. It may reside within an operational center and provide focused access to a particular agency's data archives. Alternatively, it may operate as a distinct center that collects data from multiple agencies and sources and provides a general data warehouse service for a region.

Archived Data User Systems: This terminator represents the systems users employ to access archived data. The general interface provided from this terminator allows a broad range of users (e.g. planners, researchers, analysts, operators) and their systems (e.g. databases, models, analytical tools, user interface devices) to acquire data and analyses results from the archive.

Commercial Vehicle Administration: The Commercial Vehicle Administration Subsystem will operate at one or more fixed locations within a region. This subsystem performs administrative functions supporting credentials, tax, and safety regulations. It issues credentials, collects fees and taxes, and supports enforcement of credential requirements. This subsystem communicates with the Fleet Management Subsystems associated with the motor carriers to process credentials applications and collect fuel taxes, weight/distance taxes, and other taxes and fees associated with commercial vehicle operations. The subsystem also receives applications for, and issues special Oversize/Overweight and HAZMAT permits in coordination with other cognizant authorities. The subsystem coordinates with other Commercial Vehicle Administration Subsystems (in other states/regions) to support nationwide access to credentials and safety information for administration and enforcement functions. This subsystem supports communications with Commercial Vehicle Check Subsystems operating at the roadside to enable credential checking and safety information collection. The collected safety information is processed, stored, and made available to qualified stakeholders to identify carriers and drivers that operate unsafely.

Commercial Vehicle Check: The Commercial Vehicle Check Subsystem supports automated vehicle identification at mainline speeds for credential checking, roadside safety inspections, and weigh-in-motion using two-way data exchange. These capabilities include providing warnings to the commercial vehicle drivers, their fleet managers, and proper authorities of any safety problems that have been identified, accessing and examining historical safety data, and automatically deciding whether to allow the vehicle to pass or require it to stop with operator manual override. The Commercial Vehicle Check Subsystem also provides supplemental inspection services to current capabilities by supporting expedited brake inspections, the use of operator hand-held devices, on-board safety database access, and the enrollment of vehicles.

Commercial Vehicle: This subsystem resides in a commercial vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient commercial vehicle operations. The Commercial Vehicle Subsystem provides two-way communications between the commercial vehicle drivers, their fleet managers, and roadside officials, and provides HAZMAT response teams with timely and accurate cargo contents information after a vehicle incident. This subsystem provides the capability to collect and process vehicle, cargo, and driver safety data and status and alert the driver whenever there is a potential safety problem. Basic identification and safety status data are supplied to inspection facilities at mainline speeds. In addition, the subsystem will automatically collect and record mileage, fuel usage, etc.

Emergency Management: The Emergency Management Subsystem represents public safety and other allied agency systems that support coordinated traffic incident management and emergency response. The subsystem includes the functions associated with fixed and mobile public safety communications centers includes various public safety call taker and dispatch centers operated by police, fire, and emergency medical services. This subsystem also represents other allied systems including centers associated with towing and recovery, freeway service patrols, HAZMAT response teams, mayday service providers, and security/surveillance services that improve traveler security in public areas. This subsystem interfaces with other Emergency Management Subsystems to support coordinated emergency response involving multiple agencies. The subsystem creates, stores, and utilizes emergency response plans to facilitate coordinated response. The subsystem tracks and manages emergency vehicle fleets using automated vehicle location technology and two way communications with the vehicle fleet. Real-time traffic information received from the other center subsystems is used to further aide the emergency dispatcher in selecting the emergency vehicle(s) and routes that will provide the most timely response. Interface with the Traffic Management Subsystem allows strategic coordination in tailoring traffic control to support en-route emergency vehicles. Interface with the Transit Management Subsystem allows coordinated use of transit vehicles to facilitate response to major emergencies.

Emergency Telecommunications System: This terminator represents the telecommunications systems that connect a caller with a Public Safety Answering Point (PSAP). These systems transparently support priority wireline and wireless caller access to the PSAP through 9-1-1 and other access mechanisms like 7 digit local

access numbers, and motorist aid call boxes. The calls are routed to the appropriate PSAP, based on caller location when this information is available. When available, the caller's location and call-back number are also provided to the PSAP.

Emergency Vehicle: This subsystem resides in an emergency vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient incident response. The subsystem represents a range of vehicles including those operated by police, fire, and emergency medical services. In addition, this subsystem represents other incident response vehicles including towing and recovery vehicles and freeway service patrols. The Emergency Vehicle Subsystem includes two-way communications to support coordinated response to emergencies in accordance with an associated Emergency Management Subsystem. Emergency vehicles are equipped with automated vehicle location capability for monitoring by vehicle tracking and fleet management functions in the Emergency Management Subsystem. Using these capabilities, the appropriate emergency vehicle to respond to each emergency is determined. Route guidance capabilities within the vehicle enable safe and efficient routing to the emergency. In addition, the emergency vehicle may be equipped to support signal preemption through communications with the Roadway Subsystem.

Event Promoters: This terminator represents Special Event Sponsors that have knowledge of events that may impact travel on roadways or other modal means. Examples of special event sponsors include sporting events, conventions, motorcades/parades, and public/political events. These promoters interface to the ITS to provide event information such as date, time, estimated duration, location, and any other information pertinent to traffic movement in the surrounding area.

Fleet and Freight Management: The Fleet and Freight Management Subsystem provides the capability for commercial drivers and dispatchers to receive real-time routing information and access databases containing vehicle and cargo locations as well as carrier, vehicle, cargo and driver information. In addition, the capability to purchase credentials electronically shall also be provided, with automated and efficient connections to financial institutions and regulatory agencies, along with post-trip automated mileage and fuel usage reporting. The Fleet Management Subsystem also provides the capability for fleet managers to monitor the safety of their commercial vehicle drivers and fleet. The subsystem also supports application for hazmat credentials and makes information about hazmat cargo available to agencies as required. Within this subsystem lies all the functionality associated with subsystems and components necessary to enroll and participate in international goods movement programs aimed at enhancing trade and transportation safety.

Information Service Provider: This subsystem collects, processes, stores, and disseminates transportation information to system operators and the traveling public. The subsystem can play several different roles in an integrated ITS. In one role, the ISP provides a general data warehousing function, collecting information from transportation system operators and redistributing this information to other system operators in the region and other ISPs. In this information redistribution role, the ISP provides a bridge between the various transportation systems that produce the

information and the other ISPs and their subscribers that use the information. The second role of an ISP is focused on delivery of traveler information to subscribers and the public at large. Information provided includes basic advisories, traffic and road conditions, transit schedule information, yellow pages information, ridematching information, and parking information. The subsystem also provides the capability to provide specific directions to travelers by receiving origin and destination requests from travelers, generating route plans, and returning the calculated plans to the users. In addition to general route planning for travelers, the ISP also supports specialized route planning for vehicle fleets. In this third role, the ISP function may be dedicated to, or even embedded within, the dispatch system. Reservation services are also provided in advanced implementations. The information is provided to the traveler through the Personal Information Access Subsystem, Remote Traveler Support Subsystem, and various Vehicle Subsystems through available communications links. Both basic one-way (broadcast) and personalized two-way information provision is supported. The subsystem provides the capability for an informational infrastructure to connect providers and consumers, and gather that market information needed to assist in the planning of service improvements and in maintenance of operations.

Maintenance and Construction Management: The Maintenance and Construction Management Subsystem monitors and manages roadway infrastructure construction and maintenance activities. Representing both public agencies and private contractors that provide these functions, this subsystem manages fleets of maintenance, construction, or special service vehicles (e.g., snow and ice control equipment). The subsystem receives a wide range of status information from these vehicles and performs vehicle dispatch, routing, and resource management for the vehicle fleets and associated equipment. The subsystem participates in incident response by deploying maintenance and construction resources to an incident scene, in coordination with other center subsystems. The subsystem manages equipment at the roadside, including environmental sensors and automated systems that monitor and mitigate adverse road and surface weather conditions. The subsystem manages the repair and maintenance of both non-ITS and ITS equipment including the traffic controllers, detectors, dynamic message signs, signals, and other equipment associated with the roadway infrastructure. Additional interfaces to weather information providers (the weather service and surface transportation weather service providers) provide current and forecast weather information that can be fused with other data sources and used to support advanced decision support systems that increase the efficiency and effectiveness of maintenance and construction operations.

The subsystem remotely monitors and manages ITS capabilities in work zones, gathering, storing, and disseminating work zone information to other systems. It manages traffic in the vicinity of the work zone and advises drivers of work zone status (either directly at the roadside or through an interface with the Information Service Provider or Traffic Management subsystems.) It schedules and manages the location and usage of maintenance assets (such as portable dynamic message signs).

Construction and maintenance activities are tracked and coordinated with other systems, improving the quality and accuracy of information available regarding closures and other roadway construction and maintenance activities.

Maintenance and Construction Vehicle: This subsystem resides in a maintenance, construction, or other specialized service vehicles or equipment and provides the sensory, processing, storage, and communications functions necessary to support highway maintenance and construction. All types of maintenance and construction vehicles are covered, including heavy equipment and supervisory vehicles. The subsystem provides two-way communications between drivers/operators and dispatchers and maintains and communicates current location and status information. A wide range of operational status is monitored, measured, and made available, depending on the specific type of vehicle or equipment. For example, for a snow plow, the information would include whether the plow is up or down and material usage information. The subsystem may also contain capabilities to monitor vehicle systems to support maintenance of the vehicle itself and other sensors that monitor environmental conditions including the road condition and surface weather information. This subsystem can represent a diverse set of mobile environmental sensing platforms, including wheeled vehicles and any other vehicle that collects and reports environmental information.

Media: This terminator represents the information systems that provide traffic reports, travel conditions, and other transportation-related news services to the traveling public through radio, TV, and other media. Traffic and travel advisory information that are collected by ITS are provided to this terminator. It is also a source for traffic flow information, incident and special event information, and other events which may have implications for the transportation system.

Personal Information Access: This subsystem provides the capability for travelers to receive formatted traffic advisories from their homes, place of work, major trip generation sites, personal portable devices, and over multiple types of electronic media. These capabilities shall also provide basic routing information and allow users to select those transportation modes that allow them to avoid congestion, or more advanced capabilities to allow users to specify those transportation parameters that are unique to their individual needs and receive travel information. This subsystem shall provide capabilities to receive route planning from the infrastructure at fixed locations such as in their homes, their place of work, and at mobile locations such as from personal portable devices and in the vehicle or perform the route planning process at a mobile information access location. In addition to end user devices, this subsystem may also represent a device that is used by a merchant or other service provider to receive traveler information and relay important information to their customers. This subsystem shall also provide the capability to initiate a distress signal and cancel a prior issued manual request for help.

Remote Traveler Support: This subsystem provides access to traveler information at transit stations, transit stops, other fixed sites along travel routes (e.g., rest stops, merchant locations), and at major trip generation locations such as special event centers, hotels, office complexes, amusement parks, and theaters. Traveler information access points include kiosks and informational displays supporting varied levels of interaction and information access. At transit stops, simple displays providing schedule information and imminent arrival signals can be provided. This basic

information may be extended to include multi-modal information including traffic conditions and transit schedules along with yellow pages information to support mode and route selection at major trip generation sites. Personalized route planning and route guidance information can also be provided based on criteria supplied by the traveler. In addition to traveler information provision, this subsystem also supports public safety monitoring using CCTV cameras or other surveillance equipment and emergency notification within these public areas. Fare card maintenance, and other features which enhance traveler convenience may also be provided at the discretion of the deploying agency.

Roadway: This subsystem includes the equipment distributed on and along the roadway which monitors and controls traffic and monitors and manages the roadway itself. Equipment includes traffic detectors, environmental sensors, traffic signals, highway advisory radios, dynamic message signs, CCTV cameras and video image processing systems, grade crossing warning systems, and freeway ramp metering systems. HOV lane management and reversible lane management functions are also available. This subsystem also provides the capability for environmental monitoring including sensors that measure road conditions, surface weather, and vehicle emissions. In adverse conditions, automated systems can be used to apply anti-icing materials, disperse fog, etc. Work zone systems including work zone surveillance, traffic control, driver warning, and work crew safety systems are also included. In advanced implementations, this subsystem supports automated vehicle safety systems by safely controlling access to and egress from an Automated Highway System through monitoring of, and communications with, AHS vehicles. Intersection collision avoidance functions are provided by determining the probability of a collision in the intersection and sending appropriate warnings and/or control actions to the approaching vehicles.

Toll Administration: The Toll Administration Subsystem provides general payment administration capabilities and supports the electronic transfer of authenticated funds from the customer to the transportation system operator. This subsystem supports traveler enrollment and collection of both pre-payment and post-payment transportation fees in coordination with the existing, and evolving financial infrastructure supporting electronic payment transactions. The system may establish and administer escrow accounts depending on the clearinghouse scheme and the type of payments involved. This subsystem posts a transaction to the customer account and generates a bill (for post-payment accounts), debits an escrow account, or interfaces to the financial infrastructure to debit a customer designated account. It supports communications with the Toll Collection Subsystem to support fee collection operations. The subsystem also sets and administers the pricing structures and includes the capability to implement road pricing policies in coordination with the Traffic Management Subsystem. The electronic financial transactions in which this subsystem is an intermediary between the customer and the financial infrastructure shall be cryptographically protected and authenticated to preserve privacy and ensure authenticity and auditability.

Toll Collection: The Toll Collection Subsystem provides the capability for vehicle operators to pay tolls without stopping their vehicles using locally determined pricing structures and including the capability to implement various variable road pricing

policies. Each transaction is accompanied by feedback to the customer which indicates the general status of the customer account. A record of the transactions is provided to the Toll Administration subsystem for reconciliation.

Traffic Management: The Traffic Management Subsystem operates within a traffic management center or other fixed location. This subsystem communicates with the Roadway Subsystem to monitor and manage traffic flow. Incidents are detected and verified and incident information is provided to the Emergency Management Subsystem, travelers (through Roadway Subsystem Highway Advisory Radio and Dynamic Message Signs), and to third party providers. The subsystem supports HOV lane management and coordination, road pricing, and other demand management policies that can alleviate congestion and influence mode selection. The subsystem monitors and manages maintenance work and disseminates maintenance work schedules and road closures. The subsystem also manages reversible lane facilities, and processes probe vehicle information. The subsystem communicates with other Traffic Management Subsystems to coordinate traffic information and control strategies in neighboring jurisdictions. It also coordinates with rail operations to support safer and more efficient highway traffic management at highway-rail intersections. Finally, the Traffic Management Subsystem provides the capabilities to exercise control over those devices utilized for AHS traffic and vehicle control.

Transit Management: The transit management subsystem manages transit vehicle fleets and coordinates with other modes and transportation services. It provides operations, maintenance, customer information, planning and management functions for the transit property. It spans distinct central dispatch and garage management systems and supports the spectrum of fixed route, flexible route, paratransit services, and bus rapid transit (BRT) service. The subsystem's interfaces allow for communication between transit departments and with other operating entities such as emergency response services and traffic management systems. This subsystem receives special event and real-time incident data from the traffic management subsystem. It provides current transit operations data to other center subsystems. The Transit Management Subsystem collects and stores accurate ridership levels and implements corresponding fare structures. It collects operational and maintenance data from transit vehicles, manages vehicle service histories, and assigns drivers and maintenance personnel to vehicles and routes. The Transit Management Subsystem also provides the capability for automated planning and scheduling of public transit operations. It furnishes travelers with real-time travel information, continuously updated schedules, schedule adherence information, transfer options, and transit routes and fares. In addition, the monitoring of key transit locations with both video and audio systems is provided with automatic alerting of operators and police of potential incidents including support for traveler activated alarms.

Transit Vehicle: This subsystem resides in a transit vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient movement of passengers. The Transit Vehicle Subsystem collects accurate ridership levels and supports electronic fare collection. An optional traffic signal prioritization function communicates with the roadside subsystem to improve on-schedule performance. Automated vehicle location functions enhance the information

available to the Transit Management Subsystem enabling more efficient operations. On-board sensors support transit vehicle maintenance. The Transit Vehicle Subsystem also furnishes travelers with real-time travel information, continuously updated schedules, transfer options, routes, and fares.

Vehicle: This subsystem provides the sensory, processing, storage, and communications functions necessary to support efficient, safe, and convenient travel. These functions reside in general vehicles including personal automobiles, commercial vehicles, emergency vehicles, transit vehicles, or other vehicle types. Information services provide the driver with current travel conditions and the availability of services along the route and at the destination. Both one-way and two-way communications options support a spectrum of information services from low-cost broadcast services to advanced, pay for use personalized information services. Route guidance capabilities assist in formulation of an optimal route and step by step guidance along the travel route. Advanced sensors, processors, enhanced driver interfaces, and actuators complement the driver information services so that, in addition to making informed mode and route selections, the driver travels these routes in a safer and more consistent manner. Initial collision avoidance functions provide “vigilant co-pilot” driver warning capabilities. More advanced functions assume limited control of the vehicle to maintain safe headway. Ultimately, this subsystem supports completely automated vehicle operation through advanced communications with other vehicles in the vicinity and in coordination with supporting infrastructure subsystems. Pre-crash safety systems are deployed and emergency notification messages are issued when unavoidable collisions do occur.

Weather Service: This terminator provides weather, hydrologic, and climate information and warnings of hazardous weather including thunderstorms, flooding, hurricanes, tornadoes, winter weather, tsunamis, and climate events. It provides atmospheric weather observations and forecasts that are collected and derived by the National Weather Service, private sector providers, and various research organizations. The interface provides formatted weather data products suitable for on-line processing and integration with other ITS data products as well as Doppler radar images, satellite images, severe storm warnings, and other products that are formatted for presentation to various ITS users.

Appendix D: Architecture Flow Definitions

(Source: National ITS Architecture)

Appendix D contains the architecture flow definitions from the National ITS Architecture exclusive to the Regional ITS Architecture:

archive coordination: Catalog data, meta data, published data, and other information exchanged between archives to support data synchronization and satisfy user data requests.

archive requests: A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request.

archive status: Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.

audit data: Information to support a tax audit.

bad tag list: List of invalid transit user tags which may have previously failed a fare payment transaction.

broadcast information: General broadcast information that contains link travel times, incidents, advisories, transit services and a myriad of other traveler information.

commercial vehicle archive data: Information describing commercial vehicle travel and commodity flow characteristics. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

compliance review report: Report containing results of carrier compliance review, including concomitant out-of-service notifications, carrier warnings/notifications. The information may be provided as a response to a real-time query of proactively by the source.

credential application: Application for commercial vehicle credentials. Authorization for payment is included.

credentials information: Response containing full credentials information. "Response" may be provided in reaction to a real-time query or a standing request for updated information. The query flow is not explicitly shown.

credentials status information: Credentials information such as registration,

licensing, insurance, check flags, and electronic screening enrollment data. A unique identifier is included. Corresponds to the credentials portion of CVISN "snapshots."

current asset restrictions: Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions.

daily site activity data: Record of daily activities at commercial vehicle check stations including summaries of screening events and inspections.

driver instructions: Transit service instructions, traffic information, road conditions, and other information for both transit and paratransit drivers.

driver to fleet request: Requests from the driver and vehicle for routing, payment, and enrollment information.

emergency acknowledge: Acknowledge request for emergency assistance and provide additional details regarding actions and verification requirements.

emergency dispatch requests: Emergency vehicle dispatch instructions including incident location and available information concerning the incident.

emergency dispatch response: Request for additional emergency dispatch information (e.g., a suggested route) and provision of en route status.

emergency notification: An emergency request for assistance originated by a traveler using an in-vehicle, public access, or personal device.

emergency traffic control request: Special request to preempt the current traffic control strategy in effect at one or more signalized intersections or highway segments. For example, this flow can request all signals to red-flash, or request a progression of traffic control preemptions.

emergency traffic control response: Status of the special traffic signal control strategy implemented in response to the emergency traffic control request.

emergency vehicle tracking data: The current location and operating status of the emergency vehicle.

environmental conditions data: Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by environmental sensors.

environmental probe data: Current environmental conditions (e.g., air temperature, wind speed, surface temperature) as measured by vehicle-based

environmental sensors. In addition to environmental sensor inputs, this flow may also include vehicle control system information.

environmental sensors control: Data used to configure and control environmental sensors.

equipment maintenance status: Current status of field equipment maintenance actions.

external reports: Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).

fare and payment status: Current fare collection information including the operational status of the fare collection equipment and financial payment transaction data.

fare management information: Transit fare information and transaction data used to manage transit fare processing on the transit vehicle.

field device status: Reports from field equipment (sensors, signals, signs, controllers, etc.) which indicate current operational status.

field equipment status: Identification of field equipment requiring repair and known information about the associated equipment.

fleet to driver update: Updated instructions to the driver including dispatch, routing, and special instructions.

freeway control data: Control commands and operating parameters for ramp meters, mainline metering/lane controls and other systems associated with freeway operations.

freeway control status: Current operational status and operating parameters for ramp meters, mainline metering/lane controls and other control equipment associated with freeway operations.

hazmat information: Information about a particular hazmat load including nature of the load and unloading instructions. May also include hazmat vehicle route and route update information.

hazmat information request: Request for information about a particular hazmat load.

high threat facility incident information: Threats regarding transportation infrastructure, facilities, or systems detected by a variety of methods (sensors, surveillance, threat analysis of advisories from outside agencies, etc).

incident command information: Information that supports local management of an incident. It includes resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information.

incident command request: Request for resources, commands for relay to other allied response agencies, and other requests that reflect local command of an evolving incident response.

incident information: Notification of existence of incident and expected severity, location, time and nature of incident.

incident information for media: Report of current desensitized incident information prepared for public dissemination through the media.

incident information request: Request for incident information, clearing time, severity. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

incident report: Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.

incident response coordination: Incident response procedures, resource coordination, and current incident response status that are shared between allied response agencies to support a coordinated response to incidents.

incident response status: Status of the current incident response including traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides).

incident status: Information gathered at the incident site that more completely characterizes the incident and provides current incident response status.

infrastructure conditions data: Current condition of pavement, bridges, culverts, signs, and other roadway infrastructure as measured by on-board sensors or read from infrastructure-based sensors. The data may include raw data or images (e.g., photo logs) that indicate the current status.

ISP coordination: Coordination and exchange of transportation information between centers. This flow allows a broad range of transportation information collected by one ISP to be redistributed to many other ISPs and their clients.

local signal preemption request: Direct control signal or message to a signalized intersection that results in preemption of the current control plan and grants right-of-way to the requesting vehicle.

maint and constr dispatch information: Information used to dispatch maintenance and construction vehicles, equipment, and crews. This information

includes routing information, traffic information, road restrictions, incident information, environmental information, and decision support information.

maint and constr dispatch status: Current maintenance and construction status including work data, operator status, crew status, and equipment status.

maint and constr resource coordination: Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response.

maint and constr resource request: Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response.

maint and constr resource response: Current status of maintenance and construction resources including availability and deployment status.

maint and constr vehicle conditions: Vehicle diagnostics information that is collected, filtered, and selectively reported by a maintenance and construction vehicle. The information includes engine temperature, mileage, tire wear, brake wear, belt wear, and any warnings or alarms.

maint and constr vehicle location data: The current location and related status (e.g., direction and speed) of the maintenance/construction vehicle.

maint and constr vehicle operational data: Data that describes the maintenance and construction activity performed by the vehicle. Operational data includes materials usage (amount stored and current application rate), operational state of the maintenance equipment.

maint and constr vehicle system control: Configure and control data that supports remote control of on-board maintenance and construction vehicle systems and field equipment that is remotely controlled by the vehicle. For example, the data can be used to adjust material application rates.

maint and constr work plans: Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

media information request: Request from the media for current transportation information.

on-board safety data: Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver.

on-board safety request: Request for on-board vehicle safety data by the roadside equipment.

on-board vehicle data: Information about the commercial vehicle stored on-board (for maintenance purposes, gate access, cargo status, lock status, etc.).

on-board vehicle request: Request for on-board vehicle data.

personal transit information: General and personalized transit information for a particular fixed route, flexible route, or paratransit system.

request for bad tag list: Request for list of bad vehicle tag IDs.

request for road network conditions: Request for traffic information, road conditions, surface weather conditions, incident information, and other road network status. The request specifies the region/route of interest, the desired effective time period, and other parameters.

request for vehicle measures: Request for vehicle performance and maintenance data collected by onboard sensors.

resource deployment status: Status of traffic management center resource deployment identifying the resources available and their current deployment status.

resource request: A request for traffic management resources to implement special traffic control measures, assist in clean up, verify an incident, etc.

road network conditions: Current and forecasted traffic information, road and weather conditions, incident information, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow.

road weather information: Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.

roadway information system data: Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes.

roadway information system status: Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.

roadway maintenance status: Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow

schedule and current status).

roadway treatment system control: Control data for remotely located, automated devices, that affect the roadway surface (e.g. de-icing applications).

roadway treatment system status: Current operational status of automated roadway treatment devices (e.g., anti-icing systems).

safety inspection record: Record containing results of commercial vehicle safety inspection.

safety inspection report: Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

safety status information: Safety information such as safety ratings, inspection summaries, and violation summaries. A unique identifier is included. Corresponds to the safety portion of CVISN "snapshots." The status information may be provided as a response to a real-time query.

screening event record: Results of CVO electronic screening activity.

signal control data: Information used to configure and control traffic signal systems.

signal control status: Status of surface street signal controls.

tag data: Unique tag ID and related vehicle information.

tax filing: Commercial vehicle tax filing data. Authorization for payment is included.

threat information coordination: Sensor, surveillance, and threat data including raw and processed data that is collected by sensor and surveillance equipment located in secure areas.

traffic archive data: Information describing the use and vehicle composition on transportation facilities and the traffic control strategies employed. Content may include a catalog of available information, the actual information to be archived, and associated meta data.

traffic control coordination: Information transfers that enable remote monitoring and control of traffic management devices. This flow is intended to allow cooperative access to, and control of, field equipment during incidents and special events and during day-to-day operations.

traffic flow: Raw and/or processed traffic detector data which allows derivation of traffic flow variables (e.g., speed, volume, and density measures) and associated

information (e.g., congestion, potential incidents).

traffic images: High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications. This flow includes the images and the operational status of the surveillance system.

traffic information coordination: Traffic information exchanged between TMC's. Normally would include incidents, congestion data, traffic data, signal timing plans, and real-time signal control information.

traffic sensor control: Information used to configure and control traffic sensor systems.

transit archive data: Data used to describe and monitor transit demand, fares, operations, and system performance. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.

transit emergency coordination data: Data exchanged between centers dealing with a transit-related incident.

transit emergency data: Initial notification of transit emergency at a transit stop or on transit vehicles and further coordination as additional details become available and the response is coordinated.

transit fare payment requests: Information provided from the transit user location that supports fare payments and associated record-keeping.

transit fare payment responses: Information provided by transit management that supports a fare payment transaction.

transit incidents for media: Report of an incident impacting transit operations for public dissemination through the media.

transit information for media: Report of transit schedule deviations for public dissemination through the media.

transit information user request: Request for special transit routing, real-time schedule information, and availability information.

transit schedule information: Current and projected transit schedule adherence.

transit traveler information: Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, and general transit service information.

transit vehicle conditions: Operating conditions of transit vehicle (e.g., mileage).

transit vehicle location data: Current transit vehicle location and related operational conditions data provided by a transit vehicle.

transit vehicle passenger and use data: Data collected on board the transit vehicle pertaining to availability and/or passenger count.

transit vehicle schedule performance: Estimated times of arrival and anticipated schedule deviations reported by a transit vehicle.

traveler information: Traveler information comprised of traffic status, advisories, incidents, payment information and many other travel-related data updates and confirmations.

traveler information for media: General traveler information regarding incidents, unusual traffic conditions, transit issues, or other advisory information that has been desensitized and provided to the media.

traveler profile: Information about a traveler including equipment capabilities, personal preferences and recurring trip characteristics.

traveler request: Request by a traveler to summon assistance, request information, make a reservation, or initiate any other traveler service.

trip confirmation: Acknowledgement by the driver/traveler of acceptance of a route.

trip identification number: The unique trip load number for a specific cross-border shipment.

trip log: Driver's daily log, vehicle location, mileage, and trip activity (includes screening, inspection and border clearance event data as well as fare payments).

trip log request: Request for trip log.

trip plan: A sequence of links and special instructions comprising of a trip plan indicating efficient routes for navigating the links. Normally coordinated with traffic conditions, other incidents, preemption and prioritization plans.

trip request: Request by a driver/traveler for special routing.

TRMS coord: Coordination information between local/regional transit organizations including schedule, on-time information, incident information, and ridership.

video surveillance control: Information used to configure and control video surveillance systems.

violation notification: Notification to enforcement agency of a violation. The violation notification flow describes the statute or regulation that was violated and how it was violated (e. g., overweight on specific axle by xxx pounds).

weather information: Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).

work plan coordination: Coordination of work plan schedules and activities between maintenance and construction organizations or systems. This information includes the work plan schedules and comments and suggested changes that are exchanged as work plans are coordinated.

work zone information: Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, etc.

work zone status: Current work zone status including current location (and future locations for moving work zones), impact to the roadway, required lane shifts, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits.

work zone warning device control: Data used to configure and control work zone safety monitoring and warning devices.

work zone warning status: Status of a work zone safety monitoring and warning devices. This flow documents system activations and includes additional supporting information (e.g., an image) that allows verification of the alarm.

Appendix E: Operations Coverage

The following table summarizes the operations on key highway facilities within the Region. Operations centers, whether they are a personal computer or an entire building, accommodate the intelligence for the majority of ITS applications. The location and operation of the TMC's within the Commonwealth of Pennsylvania are currently being explored through other statewide efforts. This section takes roadways of regional significance developed by the RAP in each work plan (prior project working document) and assigns ITS operations coverage for the primary and secondary role. This section although useful for other Statewide ITS effort, was not needed for the creation of the Regional ITS Architecture.

County	Highway Corridor	Primary Operations	Secondary Operations
Clarion	I-80	PennDOT District 10-0	PennDOT District 2-0, PennDOT D10 County Maintenance Offices
	US-322	PennDOT District 10-0	
	PA-28	PennDOT District 10-0	
Crawford	I-79	PennDOT District 1-0	PennDOT District 11-0
	US-322	PennDOT District 1-0	
	US-19	PennDOT District 1-0	
	PA-8	PennDOT District 1-0	
	PA-18	PennDOT District 1-0	
Erie	I-79	PennDOT District 1-0	PennDOT District 11-0
	I-90	PennDOT District 1-0	PennDOT District 11-0
	I-86	PennDOT District 1-0	PennDOT District 11-0
	US-6	PennDOT District 1-0	
	US-19	PennDOT District 1-0	
	US-20	PennDOT District 1-0	
	PA-8	PennDOT District 1-0	
	PA-97	PennDOT District 1-0	
Forest	US-62	PennDOT District 1-0	
Mercer	I-80	PennDOT District 1-0	PennDOT District 11-0
	I-79	PennDOT District 1-0	PennDOT District 11-0
	PA-18	PennDOT District 1-0	

County	Highway Corridor	Primary Operations	Secondary Operations
	PA-58	PennDOT District 1-0	
	PA-60	PennDOT District 1-0	

Appendix F: Bookend Meeting I Minutes

Date: Tuesday, August 21, 2004
Meeting of: PennDOT District 1-0 Stakeholders' Meeting
Location: Quality Inn – Erie, PA

Presentation

- Welcome and introductory remarks were provided by Jake Welsh, Secretary of the Erie Metropolitan Planning Organization. He described the region and existing and planned ITS infrastructure. Some of the transportation challenges in the region were discussed and that a goal was to manage the system better through increased communications. He asked the group for their help to define who needs to be talking to each other in the event of an incident.
- Michael Harris of PB Farradyne then went over the background of the project. He stated that ITS is a tool that can help to improve safety, mobility and help to manage capacity. ITS was defined and described as a system to help improve mobility. He also stated that cell phones have greatly increased the means of communication to and from the traveling public. The various types of ITS were described and then he helped to define how the term 'architecture' was being used in this planning effort. He covered the issues, the expectations and the benefits.
- Next, Dan Leonard of the PennDOT Bureau of Highway Safety and Traffic Engineering discussed the statewide vision and tried to put interoperability and ITS into context. While the industry focus had been on road building during the 50's and 60's, people started to think about maintenance in the 70's and 80's. One of the reasons ITS has become a focus is that the money does not exist to continue to build roads and maintaining the system has become more and more difficult. One of the goals of this effort is to maximize the investment in the system and to keep it functioning safely and efficiently in order to maintain a high quality of life.
- At this point, Dennis Lebo of the PennDOT Central Office Center for Program Development and Management took the podium to discuss statewide planning. He described the involvement of MPOs and RPOS and went over the project objectives and scope of work. He also covered the regional architecture boundaries, how it would be used, what the expected results would be and what remains to be done in order to fully implement the program.
- Next, Tom McClelland of PennDOT District 1-0 discussed current and future ITS operations in the region. He described some of the ITS hardware currently available in the district; portable Variable Message Signs, RWIS weather stations, HAR radio stations, bridge deck anti-icing systems and the existing

traffic operations control computer. He also covered winter, Amber Alert and other maintenance and construction operations.

- Next, Lt. Thomas McDaniel of the Pennsylvania State Police spoke to the audience about Incident Management and ITS. He offered that the majority of incident calls that they receive come from cell phones, that they typically receive up to 50 calls within 5 minutes of an event and that roadside call boxes have been underutilized. Freeway patrol service provides non-trooper gasoline and other aid services and help to keep the system running by providing support and helping to clear queue incidents. ITS is being used to help share information within MPOs and even to upstream locations outside of the region depending on the severity of the incident. He described the scene management methods used by the PSP such as the first responding office being responsible for the incident and the second responsible for managing the queue. He also said that bulldozers may be used to clear the lanes of a crash in order to allow traffic flow to resume.
- Bob Gray of the Pennsylvania Transportation Institute at Pennsylvania State University took the podium to describe some of the leading research in ITS technologies. He described the mission and objectives of the institute and listed some of the applications currently being studied. He also shared two short videos on Synthetic Vision Systems currently being tested on snowplows in the Midwest and their application to consumer vehicles.
- Wayne Spaulding of PB Farradyne closed the presentations with a discussion of the ITS Strawman Architecture. He stressed the need for stakeholder participation in defining the architecture and for validating the planning work. He gave several examples of incident information flows and how different organizations would communicate. He described the next steps and the upcoming validation meeting schedule in the region and closed with a description of future tasks and planned regional actions.

Questions and Answers

A gentleman from the audience asked how the Synthetic Vision System worked and if it would be possible to use a video survey instead of line data.

- Bob Gray answered that the current system uses a heads-up display to show lane markings that come from a commercial package and are drawn with the help of an onboard GPS receiver. He said that a video survey could be used instead, as long as it had been properly geo-coded. He also described a system that he had developed using a \$150 GPS receiver and a laptop that used an animated roadway to allow the driver to drive solely by looking at the computer screen.
- Brenda Murphy of PennDOT offered that anyone in the audience would be welcome to visit the Pennsylvania State Police Transportation Management Center.

- Scott Snyder of PennDOT District 10-0 described several of the ITS systems currently in use there. He covered the 4 Variable Message Signs on I-79, the crash avoidance system on PA 380 and the fixed VMS and HAR on I-80. District 1-0 currently has 8 mobile VMS systems, 4 HAR signs and are looking to improve communications.

Emily Beck of the Erie Convention and Visitors Bureau asked if visitor centers would be integrated.

- Mike Harris answered that it was hoped so and that he was glad to hear her question and would like to hear her ideas on how best to implement such a system. Jake Welsh offered that perhaps there could be touch screen RWIS terminals at the centers. Wayne Spaulding added that this is the very type of information that needs to be disseminated to the traveling public.

Mike Harris posed an open question to the group on how best to communicate with neighboring states.

- Someone from the audience offered that Youngstown Ohio and Mercer County, PA are already communicating on cross-border issues.

Wayne Spaulding closed the meeting by mentioning that the Strawman Architecture document has been posted to the project website, www.paits.org.

List of Attendees

Last Name	First Name	Agency	Email	Phone
Allen	Bradley	Pennsylvania State Police	brallen@state.pa.us	(814) 663-2043
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Snyder	Scott	PennDOT District 10-0	scotsnyder@state.pa.us	(724) 357-2844
Solensky	Dennis	Erie Metropolitan Transit Authority	dsolensky@emtaerie.com	(814) 459-4287
Sterrett	David	Herbert, Rowland & Grubic, Inc.	dsterrett@hrg-inc.com	(814) 881.4786
Waid	Morris	Crawford County Commissioner		
Welsh	Jake	Erie County Department of Planning	jwelsh@stargate.net	(814) 451-6336
Wightman	Rose	Chautauqua County Department of Planning		

Pennsylvania Intelligent Transportation Systems (ITS) Architecture

Northwest Region
Stakeholders' Meeting
September 21, 2004



Welcome

Jake Welsh
MPO Secretary
Erie Metropolitan Planning Organization



Agenda

- Welcome – Jake Welsh, Erie MPO
- Background – Michael Harris, PB Farradyne
- Statewide Vision – Dan Leonard, PennDOT
- Statewide Planning – Dennis Lebo, PennDOT
- Regional Operations – Tom McClelland, PennDOT District 1-0
- Enforcement Approach – Lt. Thomas McDaniel, Pennsylvania State Police
- Winter Operations Technologies – Bob Gray, PA Transportation Institute
- ITS Architecture – Wayne Spaulding, PB Farradyne
- Questions and Answers



Welcome

- PennDOT
- PA State Police
- Transit Operators
- National Weather Service
- Counties
- Cities
- Townships
- Emergency Management Agencies
- Planning Offices
- Enforcement Community
- Media
- Tourism and Event Destinations
- Economic Development Agencies
- Policy
- Ports
- Planning Committees
- Partnership Organizations



Northwest Pennsylvania Regional Description

- 7 County Region; 1 RPO, 2 MPOs
- Borders Ohio and New York
- Regional Long-Range Transportation Plans
 - ITS referenced in Long-Range Plans
 - ITS Architecture required to meet Federal Mandate enabling Region to use Federal Funds for ITS
- ITS line items/investments in regional Transportation Improvement Programs
- Regions and State responsible for preparing ITS Architectures



Northwest Pennsylvania Transportation Challenges

- Develop, maintain, and manage an adequate, safe, accessible, and environmentally-sound intermodal transportation network that provides for the efficient movement of people and goods
- Identify and respond, safely and efficiently, to roadway emergencies and incidents
- Accommodate increased roadway congestion, even when resources for system expansion are limited
- Furnish road and traffic conditions data, transit data, travel advisories, routing information, etc. to travelers and commuters
- Increased winter weather monitoring coordination to reduce number of weather-related incidents



We need your help because...

- **Your knowledge is required to validate critical baseline information**
- Your insights and perspectives on regional conditions and activities are needed
- Some of you operate a piece of the transportation system
- Some of you are involved in planning and programming for regional transportation
- Some of you help set transportation policy in the Region
- **All of you have a stake in transportation conditions and performance in the Region**



What we need from you...

- Attend meetings on this effort
- Validate the work presented to you
- Champion ITS
- Outreach to other stakeholders and organizations about ITS
- Continue the ITS regional dialogue beyond this effort



Background

Michael Harris
PB Farradyne



ITS?

Intelligent Transportation Systems (ITS) is simply technology being used in the transportation environment

ITS:

- Improve Safety
- Maximize Mobility
- Fulfill Traveler Needs
- Support Enhanced Security
- Manage Capacity



Types of ITS

- Freeway
 - Highway Advisory Radio
 - Dynamic Message Signs
 - 511
 - CCTV
 - HOV
 - Freeway Service Patrol
- Arterial
 - Advanced Signal Systems
- Transit
 - Advanced Vehicle Location
 - Automated Dispatching



Types of ITS

- Emergency
 - Incident Management
 - E911
- Road Weather Information
- Electronic Payment
 - EZPass
 - Smart Cards



Architecture?

Architecture – the plan for design and construction

Deploying ITS technology is good, but we need to do it efficiently through better planning, coordination, and integration



In context

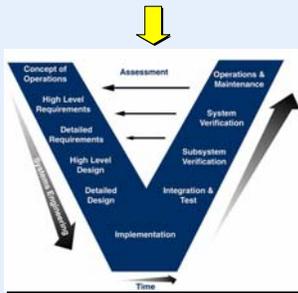


Projects



In context

ITS Project



At Issue ...

- ITS investments are made before plans are set
- Lack of interoperability of ITS systems
- Limited forum for regional agencies to plan for ITS capital and ITS Operations and Maintenance
- Federal mandate



An Opportunity ...

- Conduct Regional ITS Architectures to:
 - Provide a framework for regional integration
 - Create a forum for stakeholders to address ITS operations and functions to validate how operations will interconnect and why
 - Allow integration options to be considered before investment decisions are made
 - Conform to Federal mandate



The Federal Mandate

Regional ITS Architectures must be completed in partnership with the State and regional planning partners by April 8, 2005 for use of Federal funds for ITS



The Expectation ...

- The State and metropolitan planning organizations are ultimately responsible for ensuring that the mandates' conditions are met
- A process must be put in place for initial Architecture development and for revisiting and updating the regional Architecture as necessary



Regional Benefits

- Ensures institutional agreement among ITS stakeholder agencies
- Implements a process for planning ITS integration
- Enhances interoperability



Regional Benefits

- Allows integration options to be considered before investments are made
- Ensures that ITS activities are consistent with State and metropolitan planning processes
- Establishes a common framework for future ITS operations across the Region and State



Statewide Vision

Dan Leonard
PennDOT Bureau of Highway Safety
and Traffic Engineering



Transportation

- Industry evolution
 - Build
 - Build and Maintain
 - Build, Maintain, and Operate
- Efficiency is required for economic vitality
 - Results focused on transportation operations



Transportation Operations

- Safety
- Security
- Mobility (Congestion)

*All are challenges for today and
the foreseeable future*



Congestion Solution

- Comprehensive, coordinated, and long-term commitment to balanced investment in:
 - Building Capacity
 - Better Managing Capacity
 - Reducing Demand, through modal alternatives and changes in land-use patterns

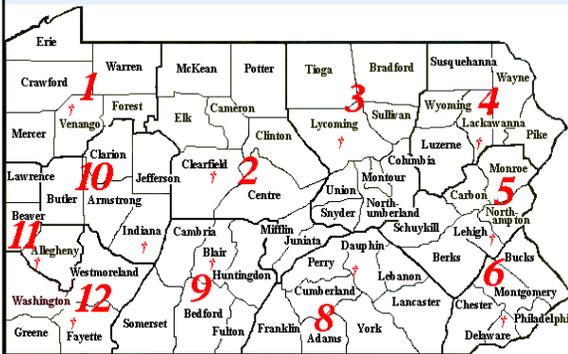


Regional Tool

- Regional ITS Architectures
 - Form the building blocks of transportation operations
 - ITS supports managing capacity and improves safety and security
 - Supports a balanced look at congestion improvement investments



PennDOT District Map



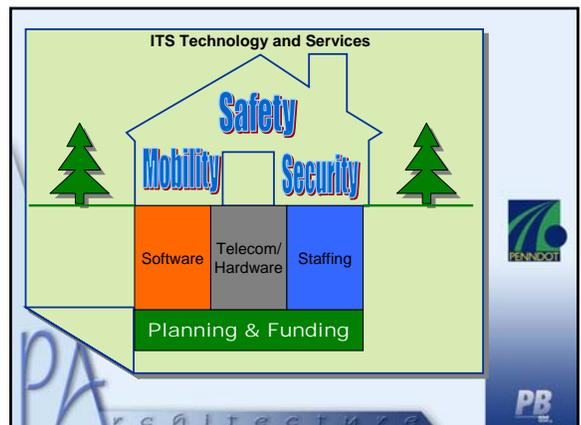
Statewide Vision

- Transportation Management Centers in each Region
- Incident Management and Reporting Software
- Incident Management Program for All Interstate Highways
- ITS Data Integration and Information Sharing
 - Voice
 - Data
 - Video
- PA Mobility (Congestion Management) Strategy
24 X 7 Operations



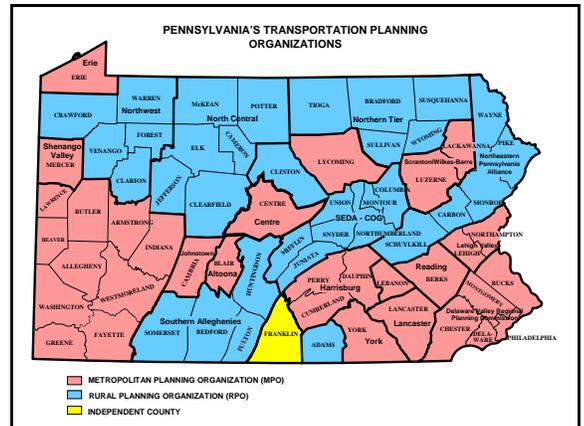
Statewide Vision

- Transportation Operations
 - Safety
 - Security
 - Mobility
 - Economic Vitality
 - Quality of Life
- ITS
 - Tools, Techniques, and Technology



Statewide Planning

Dennis Lebo
PennDOT Center for Program
Development and Management



MPO / RPO Involvement

Need for ITS Planning at regional (MPO/RPO) level:

- Mandate to receive Federal funds for ITS projects in future
 - Public expectations
 - Need to make existing transportation system more efficient
 - Better communication between the Program and those who operate the transportation systems
- Priorities for limited Funding



Project Objective

Complete Regional ITS Architectures in partnership with planning organizations throughout the State to meet the Federal mandate by April 8, 2005 for use of Federal funds for ITS operations



Scope of Work

- Champions
- Regional Advisory Panels
- "Strawman"
- Validation
- Regional Meetings
- Finalize



Project Organization

- Guided by a Statewide Working Group
- Each Region is led by a Regional Advisory Panel (RAP)
- Each Region has identified ITS Architecture Champions



Regional Architecture Boundaries



How will the Architecture be used?

- Provides a foundation for future ITS investment discussions among stakeholders
- Provides a State business case for ITS investment in:
 - Long-range plans
 - Transportation improvement programs
 - Annual programs



What we will have ...

- Validated, accepted ITS Architecture for every Region in the State
- List of projects for each Region
- Working groups/stakeholders discussing ITS per Region
- ITS Champions in every Region
- Federal Partnership



What we will need to do ...

- Statewide Transportation System Operations Plan
- Regional ITS Implementation Plans
 - Project priorities
 - Cost analysis for Business Planning
 - Available for 2007 Program Update



Regional Operations

Tom McClelland
PennDOT District 1-0



PENNDOT District 1-0 ITS Operations



ITS Equipment in District 1-0

- DMS (Dynamic Message Signs)
- HAR (Highway Advisory Radios)
- RWIS (Roadway Weather Information Systems)
- Bridge Deck Anti-icing System



Portable & Permanent VMS (Variable Message Signs)



Currently there are 10 movable VMS units which can be programmed remotely, via cell phone, by the ITS operator when placed in the field by county personnel.

There are 5 movable VMS units permanently mounted along the District's Interstate and traffic route system.



Currently 4 overhead VMS units are operational



HAR



- District currently has 4 HAR stations
- Timely information via radio that can give travelers up-to-date road, weather, or traffic conditions.
- Detailed instructions for standard detour routes in the event of interstate closure.



RWIS

(Roadway Weather Information System)



- There are 17 RWIS located within District 1-0.
- Information gathered includes: air temperature, wind speed and direction, road temperature, and freeze point of the road.



Bridge Deck Anti-Icing System

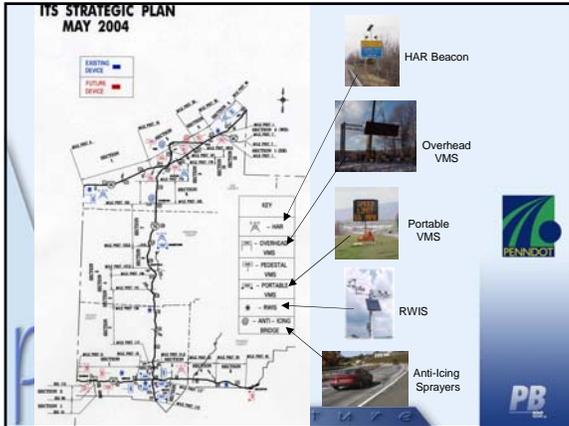


- Active roadway sensors detect possible icing conditions BEFORE they happen, and spray a deicing solution to prevent freezing.
- Currently 4 Anti-Icing Stations in District 1-0



Existing District 1-0 Device Control





PennDOT District 1-0 Operations

- Coordination of several functions that PennDOT is responsible for
 - Currently, operations are handled through voice communications and other basic methods
 - Future potential in systematic information exchange
- PennDOT also coordinates with other agencies

PENNDOT

PB

Incident Management

VMS and HAR Messages for Incidents along I-90

PENNDOT

PB

AMBER Alert Operations

- Coordinated with State Police and other agencies
- Use Variable Message Signs to post AMBER messages
- Message comes from State Police to PennDOT

PENNDOT

PB

Winter Operations

- Transplanted construction staffing during winter months
- Currently monitor weather using NWS and RWIS
- Crews are dispatched when needed.
- Send daily weather report to Pittsburgh area TMC

PENNDOT

PB

Other Maintenance and Construction Operations

- Scheduling of maintenance and construction (M&C)
- Public outreach for M&C work zones and closures
 - Website
 - Media

PENNDOT

PB

Other Development in ITS

- ITS Task Force
- Future Locations Planned for ITS
- Bidding a Maintenance Contract
- Statewide Architecture Development
- Snow Plow / Salt Usage
- RWIS / DMS Pilot Project



Pennsylvania State Police

Lt. Thomas McDaniel



Incident Management and ITS



Highway Incident Management

- Detection
- Verification
- Response
- Scene Management and Information to Motorists
- Clearance and Restoration



Detection

- Cell Phones (911)
- ITS Technology
 - Microwave or Loop Detectors
 - CCTV
- Freeway Service Patrols
- "Eyes on the Road"



Verification

- Determine precise location of the incident
- Determine nature of incident
- What resource agencies are needed



Response

- Law Enforcement
- Fire and Rescue
- EMS
- Transportation
- Towing and Recovery



Incident Scene Management

- Safety (responders, public and injured)
- Stabilize the incident scene
- Traffic Control (backlogs and secondary crashes)
- Investigation and evidence preservation
- Clear the lanes of crash debris
- Removal of responders from lanes



Scene Management

- Motorcycle Patrols
- Clear the Lane
- Crash Investigation
- Secondary Crashes
- Unified Command Training (PSP participation and trainers)
- Highway Incident Scene Safety and Traffic Control Training



The Five Functional Sections of the ICS

- Command
- Operations
- Planning
- Logistics
- Finance/Administration



Information to Motorists

- VMS
- District TMC
- Upstream traffic diversion (ahead of the detour point)
- Local media/traffic reporting



Clearance and Restoration

- Clear the lanes of:
 - Crashes
 - Crash debris (T&R, may be done off-peak)
 - Roadway infrastructure damage repair
 - Other hazards (apply non-skid material)
- Restore traffic to normal flow conditions



Pre-Planning and Coordination

- Detour routes for major highways
- Special Events
- Incident Management meetings
 - Regions and Corridors
 - IM Plans
 - IM Plans for construction projects



Winter Operations Technologies

Bob Gray
 Pennsylvania Transportation Institute
 Pennsylvania State University



Overview

- PTI-CNCIS Mission & Objectives
- Technology Systems for Winter Operations
 - GIS
 - Remote Monitoring and Diagnostics
 - Synthetic Vision
 - Wireless Weather & 2-Way Driver Communications
 - Road Friction Sensor System
 - Radar Collision Avoidance



CNCIS Mission and Objectives

- Provide holistic support in intelligent vehicle systems technologies:
 - Design
 - Integration
 - Field validation and verification test
 - Education and Training (Business and Technical Subjects)
- Enhance core technical competencies
- Expedite the commercialization of products
- Move a larger segment of Pennsylvania business from being commodity manufacturers to becoming technology product industries
- Provide ready access to CNCIS system engineering technology resources



Core Technical Areas:

- Radio frequency identification (RFID)
- Surveillance Radar
- Systems design and integration experience
- Global positioning systems (GPS)
- Geographic information systems (GIS)
- Inertial Navigation systems, Micro electro mechanical (MEMS) sensors
- Field test expertise
- RF interference, field tests and antenna suite modeling
- Wireless communications
- Navigation performance analysis and error modeling
- Made up of: undergraduate, graduate and faculty researchers
- Now developing short courses that can be used to help educate both technical and management positions in the transportation sector
- CNCIS is part of the Pennsylvania Transportation Institute (PTI) at Penn State main campus



2004 CNCIS Total Funding: \$949K

- Great Lakes C4I
- USMC Enabling Wireless for Enhanced Supply Chain Logistics
- Outreach: Math Options
- PSU-Erie CNCIS Airport Luggage RFID System for Tracking and Traceback
- MEMs Inertial for Rail Locomotive Use
- Rail Synthetic Vision
- Rail Hazardous Material Tracking Using GPS and SATCOM
- Power Consumption Analysis for Rail Car Wireless Technology
- Satellite Communication transmission delay analysis
- PSU/PTI Equipment Grant #: Computer, Digital Photo and Video
- PSU/PTI Equipment Grant #2: Test track wireless telemetry
- Faculty Involved: 25
 - University Park: EE (3), Business (1), IST (2), IE (3), ME (2), USMC (2)
 - Behrend: EE (2), Business, (2), EET (1), MET (2), Geology (1), Psych (2), Research Asst (1)
 - Mercyhurst: (1)
- Students Involved: 14
 - University Park: MSEE (2), MSIE (5)
 - Behrend: EET (4) + *MSEE (3)



Penn State Pennsylvania Transportation Institute PSU-Erie Center for Navigation, Communication and Information Systems

GIS

- Snowplow Fleet Monitoring

Example: I-90 Snow Operations Management can visualize snowplow movement

Green < 1 hr
Yellow < 2 hr
Red > 2 hr

• 0.75 mi > 2hr
• Static > 30 minutes no movement

Penn State Pennsylvania Transportation Institute PSU-Erie Center for Navigation, Communication and Information Systems

GIS

- Snowplow Fleet Monitoring with Weather Overlay

Example: I-90 Snow Operations Management can visualize snowplow movement

RED: 6-12 inches
YELLOW: 3-6 inches
GREEN: < 3 inches

Penn State Pennsylvania Transportation Institute PSU-Erie Center for Navigation, Communication and Information Systems

Remote Monitoring and Diagnostics

- Snow Plow calls home when sick
- Goal is to increase system reliability – prevent downtime by predicting a snow plow heart attack!
- How?
 - Provide a system that assumes the role of an on-board mechanic (physician): monitor important vehicle parameters;
 - Compare onboard parameters with expert failure models
- Also can monitor vehicle parameters such as:
 - Salt on board
 - Fuel on board
 - Plow Down/Up
 - Salt dispensing rates
 - Engine hours
 - Vehicle speed
 - Static Time
 - Road friction

Penn State Pennsylvania Transportation Institute PSU-Erie Center for Navigation, Communication and Information Systems

Synthetic Vision System (SVS) Overview

- Ability to digitally render your surroundings
- Often made up of three integrated pieces
 - Navigation
 - Communication
 - Information
- SVS is an excellent application for vehicles in poor visibility

Real time guidance, traffic, and aircraft state data super imposed on a photo realistic representation of terrain, obstacle, and cultural features.

Penn State Pennsylvania Transportation Institute PSU-Erie Center for Navigation, Communication and Information Systems

Synthetic Vision System (SVS) for Snowplows

- Excellent for snowplows in white-out conditions
- Snowplow uses lane keeping head-up-display
- Can be used in a specific corridor
- Radar can be used to "look ahead" and to the "sides" to avoid a collision

Example: MDOT SAFEPLow

Penn State Pennsylvania Transportation Institute PSU-Erie Center for Navigation, Communication and Information Systems

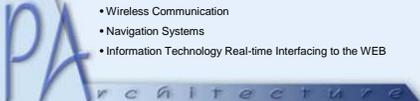
Additional Winter Technologies

- Wireless Cockpit Weather
- Road Friction
- 2-Way Wireless Driver Data-Communications
-

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 Pennsylvania Transportation Institute
 PSU-Erie Center for Navigation, Communication and Information Systems

Summary

- Technology for Winter Operations:
 - GIS
 - Remote Monitoring and Diagnostics
 - Synthetic Vision
 - Wireless Weather & 2-Way Driver Data Communications
 - Road Friction Sensor System
 - Radar Collision Avoidance
- Inexpensive Prototype Friction Measurement Equipment
- Significant Experience in
 - Winter Operations, Snow and Ice Control, Friction Measurement
 - Synthetic Vision Systems
 - Wireless Communication
 - Navigation Systems
 - Information Technology Real-time Interfacing to the WEB


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Questions?

rxg31@psu.edu
 814-898-6184
<http://www.pti.psu.edu/CNCIS/Research.htm>





Validation Outreach

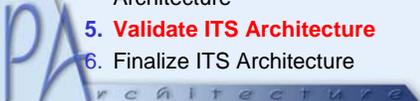
Wayne Spaulding, PB Farradyne





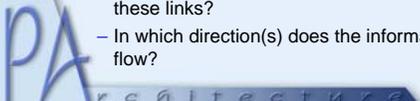
ITS Strawman Architecture Process

1. Prepare Work Plan
2. Appoint Regional Advisory Panel and ITS Regional Champion to Oversee Process
3. Inventory Systems and Gather Information on Existing and Planned ITS Activities
4. Generate ITS Strawman Architecture
5. **Validate ITS Architecture**
6. Finalize ITS Architecture

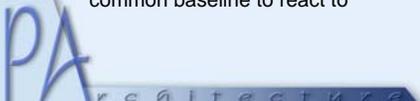

Characteristics of the ITS Architecture

- Identifies the ITS projects and activities across the Region
- Inventories the ITS systems – both existing and planned – associated with those projects
- Describes the inter-relationships among the Region's ITS systems:
 - Which systems are linked?
 - What types of information pass over these links?
 - In which direction(s) does the information flow?


Characteristics of the Strawman Document

- The *Strawman* is a draft document
- The *Strawman* is a temporary document to be refined and eventually replaced by a more permanent document
- The *Strawman* is designed to be “knocked down,” reconstituted, and reconfigured
- The *Strawman* gives stakeholders a common baseline to react to


We Need Your Help Because...

- **Your knowledge is required to validate the contents of the Strawman Architecture**
- Your insights and perspectives on regional conditions and activities are needed
- Some of you operate a piece of the transportation system
- Some of you are involved in planning and programming for regional transportation
- Some of you help set transportation policy in the Region
- **All of you have a stake in transportation conditions and performance in the Region**



Validation Meeting Groups

- Transit Management
 - Transit agencies within Region, and other supporting/coordinating agencies
- Arterial Traffic Management
 - Municipal traffic departments with significant signal system deployments
- Emergency/Incident Management
 - Public safety agencies, including state/county/municipal police, fire, EMS, 911, and emergency management
- PennDOT District 1
- PennDOT District 10



Validation Meeting Activities

- Review pertinent ITS Architecture diagrams
- Help identify and clarify:
 - *Interconnections*: Who do you connect with, or want to connect with in the future?
 - *Information flows*: What information do you pass over the connection, or want to pass in the future?
 - *Directional flow*: In what direction(s) does the information flow – now and in the future?
 - *Planned/Existing*: Is the information being exchanged now, or is there a need for future?
- Brainstorm about potential ITS projects for the Region



Sample Package

PA State Police Stakeholder

Part of Emergency/Incident Management Validation Meeting

District 1-0 Regional ITS Architecture

9 2004

Stakeholder Validation

Contact Name : Joe Police
Agency : Pennsylvania State Police
Architecture Elements To Review: PSP Dispatch Centers
 PSP Vehicles

Architecture Element

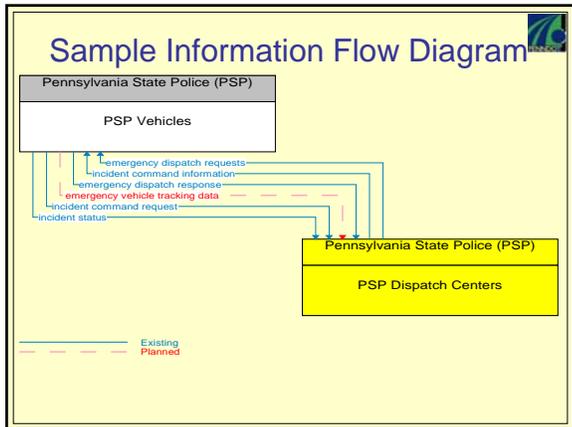
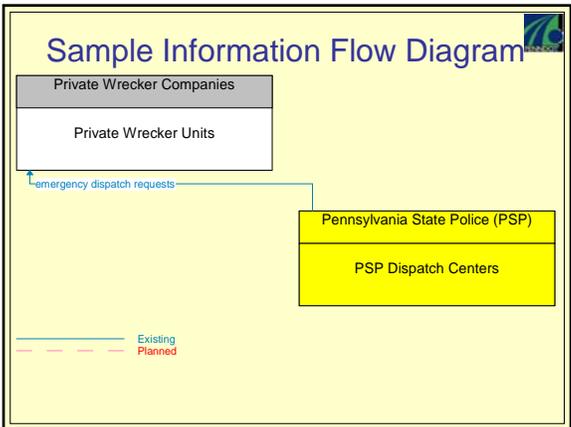
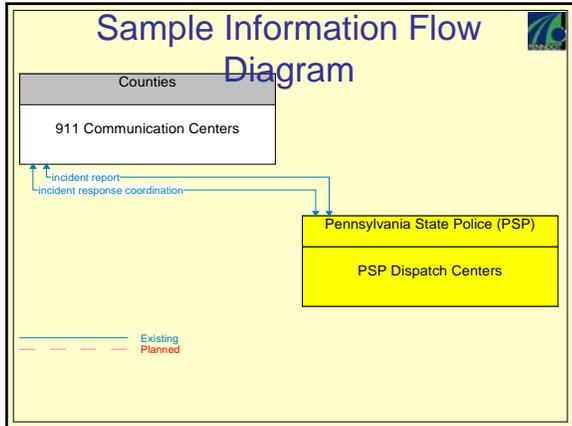
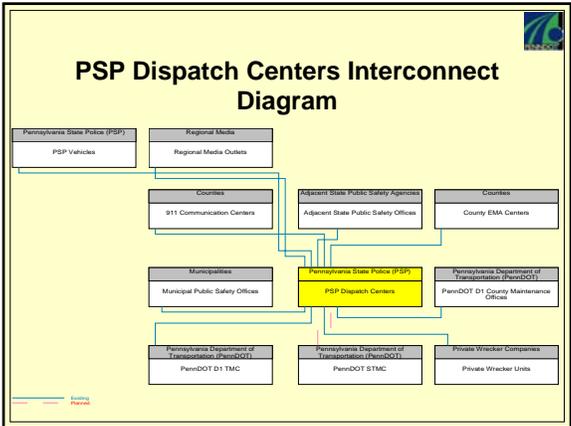
PSP Dispatch Centers

Element Description

Existing Pennsylvania State Police barracks currently dispatching PSP units, and future Consolidated Dispatch Centers that will combine dispatching operations throughout the entire Region. PSP Dispatch Centers represents public safety systems that support incident management, disaster response and evacuation, security monitoring, and other security and public safety-oriented ITS applications. PSP Dispatch Centers interface with other Emergency Management agencies to support coordinated emergency response.

Stakeholder

Pennsylvania State Police (PSP)



- ### Next Steps
- RSVP for Validation Meeting once email invite is received
 - For others, determine what/if validation meeting is appropriate
 - Bring today's packet to the Validation Meetings; if not issued, pick up packet from reception area
 - Attend the Validation Meetings in October
-

- ### Validation Meeting Schedule
- | | |
|--|--|
| • <i>Transit Management</i> | October 12, 10:00 AM
Erie Intermodal Center |
| • <i>Arterial Traffic Management</i> | October 12, 1:00 PM
Erie Intermodal Center |
| • <i>Emergency/Incident Management</i> | October 13, 9:00 AM
Meadville Fire House |
| • <i>PennDOT District 1</i> | October 19, 9:00 AM
District 1-0 Office |
| • <i>PennDOT District 10</i> | October 20, 9:00 AM
District 10-0 Office |
-

Moving Forward

- Consolidate Validation Meeting inputs and comments
- Reconcile conflicts with the Regional Advisory Panel
- Finalize ITS Architecture
- Convene 2nd Stakeholder Session (February 2005 tentative)



Planned Regional Actions

- Utilize ITS concepts and projects in Regional Long-Range Plans
- Continue the ITS regional dialogue
- Institutionalize ITS
- Develop an ITS Implementation Plan for the Region



Key Contacts

Jake Welsh
Regional Co-Champion
Erie MPO
814-451-6012
jwelsh@stargate.net

Bob Skarada
Regional Co-Champion
Northwest RPO
814-677-4800
bobs@nwcommission.org

Wayne Spaulding
Northwestern Region Team Leader
PB Farradyne
302-438-1306
spaulding@pbworld.com

Steve Kimble
Northwestern Region Technical Leader
PB Farradyne
301-816-4356
kimble@pbworld.com



Project Website: <http://www.paits.org>

Discussion



Appendix G: Validation Meeting Minutes

Date: October 12th, 2004

Location: Erie Intermodal Transportation Facility; Erie, PA

Attendees:

Israel Gray, City of Erie Traffic
Jake Welsh, Erie County MPO
Brenda Murphy, PennDOT Central Office
Wayne Spaulding, PB Farradyne
Steve Kimble, PB Farradyne

Minutes Prepared By: Steve Kimble, PB Farradyne

A meeting was held on October 12th, 2004 between 1:00 PM to and 3:00 PM at the Erie Intermodal Transportation Facility conference room to validate the following elements in the Northwest Pennsylvania Regional ITS Architecture:

- Municipal Field Devices
- Municipal Traffic Management Offices

A “package” was developed for each of the above elements in order to portray how an element (i.e., the “subject” element) fits into the regional architecture. The packages were then combined into a MS PowerPoint presentation and reviewed with the stakeholders in attendance. Copies of each element package are attached with these minutes. Specifically, the element packages consisted of:

- Pennsylvania Northwest Regional ITS Architecture Framework – a copy of the National ITS Architecture “Sausage Diagram”.
- Element Cover Sheets – The name, description and stakeholder of the subject element as defined in the DRAFT Regional ITS Architecture.
- “Sausage Diagrams” showing the context of the subject element and the relationship between other elements in the DRAFT Regional ITS Architecture – the subject element was shown alone within the “Sausage Diagram” framework to provide a sense of context as to where that particular element fits within the National ITS Architecture framework. In addition, a second drawing was provided to show the relationship (i.e., interconnects) between the subject element and other elements in the Northwest Pennsylvania Regional ITS Architecture.

- Interconnect Diagram – An Interconnect Diagram showing existing and planned interconnects between the subject element and other elements in the Regional Architecture was provided.
- Information Flow Diagrams – Existing and planned information flows by direction were shown on drawings for the subject element and each of the elements it interconnects with.
- Appendices – Definitions for the elements and architecture flows were provided.

The following is a list of comments that we're provided at the meeting. Comments are organized around additions and deletions by element, as well as general discussion items.

Municipal Field Devices

Additions

1. Camera detection and CCTV monitoring flows to/from Municipal Traffic Management Offices – planned.
2. Message board flows to/from Municipal Traffic Management Offices and PennDOT D1 TMC – planned.

Changes

1. "Traffic Flow" flow to Municipal Traffic Management Offices – planned.

Municipal Traffic Management Offices

Additions

1. Interconnect with Municipal Public Safety Offices for flows in coordinating maintenance of signals – existing.

Changes

1. Incident and emergency coordination flows to/from 911 Communication Centers – planned.
2. "Traffic Control Coordination" and "Traffic Information Coordination" flows to/from PennDOT D1 TMC – existing.
3. Interconnect with County EMA Centers – planned.

General Discussion

- PennDOT D1 Office can currently monitor City of Erie signal system.

Attachments: Northwest Arterial Traffic Management Validation Meeting Handout

Date: October 19th, 2004

Location: PennDOT District 1-0 Office; Oil City, PA

Attendees:

Tom McClelland, PennDOT District 1-0
Dominic Munizza, PennDOT District 11-0
Deborah Schreckengost, PennDOT District 1-0
Jeff Karr, PennDOT District 1-0
Randy Brink, PennDOT District 1-0
George White, NY State Thruway Authority
Wayne Spaulding, PB Farradyne
Steve Kimble, PB Farradyne

Minutes Prepared By: Steve Kimble, PB Farradyne

A meeting was held on October 19th, 2004 between 10:00 AM and Noon at the PennDOT District 1-0 DE Conference Room to validate the following elements in the Northwest Pennsylvania Regional ITS Architecture:

- PennDOT District 1-0 County Maintenance Offices
- PennDOT District 1-0 Field Devices
- PennDOT District 1-0 TMC
- PennDOT District 1-0 Vehicles
- PennDOT District 11-0 RTMC
- Adjacent State Transportation Offices

A “package” was developed for each of the above elements in order to portray how an element (i.e., the “subject” element) fits into the regional architecture. The packages were then combined into a MS PowerPoint presentation and reviewed with the stakeholders in attendance. Copies of each element package are attached with these minutes. Specifically, the element packages consisted of:

- Pennsylvania Northwest Regional ITS Architecture Framework – a copy of the National ITS Architecture “Sausage Diagram”.
- Element Cover Sheets – The name, description and stakeholder of the subject element as defined in the DRAFT Regional ITS Architecture.
- “Sausage Diagrams” showing the context of the subject element and the relationship between other elements in the DRAFT Regional ITS Architecture –

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- Appendices – Definitions for the elements and architecture flows were provided.

The following is a list of comments that we’re provided at the meeting. Comments are organized around additions and deletions by element, as well as general discussion items.

PennDOT District 1-0 County Maintenance Offices

Additions

1. Narrative for coordination of incidents and emergencies to Element description.
2. Interconnect to Adjacent State Public Safety Offices for coordinating incidents at state border areas – existing.
3. Interconnect for Regional Media Outlets for relaying work zone information to public – existing.
4. Interconnect for Weather Service Providers for coordinating weather events – existing.
5. Interconnect with County EMA for emergency management – existing.
6. Flows for coordinating incidents with 911 Communication Centers – existing.
7. Flows for coordinating incidents with PennDOT Central Office Organizations – existing.
8. Road Weather Information flow to PennDOT Central Office Organizations – existing.
9. Flows for coordinating incidents with PennDOT D10 County Maintenance Offices – existing.

10. Flows for coordinating incidents with PennDOT D10 TMC – existing.
11. “Traveler Information” flow to Personal Traveler Information Devices – existing.
12. Flows for coordinating incidents with PennDOT D1 TMC – existing.
13. “Environmental Probe Data” flow from PennDOT D1 Vehicles - planned.

Deletions

1. “Environmental Sensors Control” flow to PennDOT D1 Vehicles (is not planned).

Changes

1. Element should be existing (many of the flows are subsequently programmed in error, and should be changed from planned to existing as well).
2. “Environmental Sensors Control” and “Roadway Information System” Data flows to/from PennDOT D1 Field Devices (rest are planned) – existing.

PennDOT District 1-0 Field Devices

Additions

1. Narrative for RWIS and bridge sprayers (AFLADS) to Element description.

PennDOT District 1-0 TMC

Additions

1. Flows for coordinating and sharing work plans with Municipal Public Safety Offices – existing.
2. Flows for coordinating incidents with PennDOT D1 County Maintenance Offices – existing.
3. Flows for coordinating incidents with PennDOT D2 RTMC – existing.
4. “Traveler Information” flow to Personal Traveler Information Devices – existing.
5. Flows for work zone information to and from PSP Dispatch Centers – existing.
6. Flows for weather information from Regional Media Outlets – existing.

7. “Work Zone Information” and “Maintenance and Construction Work Plans” flows from Adjacent State Transportation Offices – existing.
8. “Work Plan Feedback” flow to Adjacent State Transportation Offices – existing.
9. Flows for coordinating incidents with Adjacent State Transportation Offices – existing.

Deletions

1. All incident coordination flows to/from PennDOT Central Office Organizations. Keep “Work Zone Information” and “Archive Analysis Requests” flows.
2. Flows for coordinating incidents with PSP Dispatch Centers.
3. “Environmental Probe Data” flow from PennDOT D1 Vehicles.

Changes

1. All flows to/from Regional Media Outlets – existing.
2. All flows to/from Weather Service Providers – planned.

PennDOT District 11 RTMC

Deletions

1. Interconnect with PennDOT District 10-0 TMC (operations not coordinated for Clarion County)

Adjacent State Transportation Offices

Additions

1. Narrative about the NYSTA Thruway Statewide Operations Center (TSOC) in Albany to Element description.

General Discussion

- District 1-0 County Maintenance offices are the primary point of PennDOT contact for incidents and weather response between PSP, 911 Centers, County EMA, PennDOT Central Office, Adjacent PennDOT Districts, and Adjacent State

Transportation Agencies. Currently District 1-0 office only gets involved with major incidents and weather response operations.

- Existing systems at County Maintenance Offices and Stockpiles download information about salt/chemical distribution, mileage, and other data that is stored in on-board vehicle system.
- Currently, information exchanged between PennDOT D1 vehicles and District 1-0 office is for those personnel located at construction zones.
- Currently, updated weather fax to PennDOT District 11-0 TMC is sent by PennDOT D1 County Maintenance offices, rather than District 1-0 TMC.
- PennDOT D11 TMC supports posting messages on VMS in Mercer County, as well as incident management support.

Attachments: PennDOT District 1-0 Validation Meeting Handout

Date: October 20th, 2004

Location: PennDOT District 10-0 Office; Indiana, PA

Attendees:

Scott Snyder, PennDOT District 10-0
Timothy R Pieples, PennDOT District 10-0
Wayne Spaulding, PB Farradyne
Steve Kimble, PB Farradyne

Minutes Prepared By: Steve Kimble, PB Farradyne

A meeting was held on October 20th, 2004 between 9:00 AM and 11:00 AM at the PennDOT District 10-0 Conference Room to validate the following elements in the Northwest Pennsylvania Regional ITS Architecture:

- PennDOT District 10-0 County Maintenance Offices
- PennDOT District 10-0 Field Devices
- PennDOT District 10-0 TMC
- PennDOT District 10-0 Vehicles
- PennDOT District 2-0 RTMC

A “package” was developed for each of the above elements in order to portray how an element (i.e., the “subject” element) fits into the regional architecture. The packages were then combined into a MS PowerPoint presentation and reviewed with the stakeholders in attendance. Copies of each element package are attached with these minutes. Specifically, the element packages consisted of:

- Pennsylvania Northwest Regional ITS Architecture Framework – a copy of the National ITS Architecture “Sausage Diagram”.
- Element Cover Sheets – The name, description and stakeholder of the subject element as defined in the DRAFT Regional ITS Architecture.
- “Sausage Diagrams” showing the context of the subject element and the relationship between other elements in the DRAFT Regional ITS Architecture – the subject element was shown alone within the “Sausage Diagram” framework to provide a sense of context as to where that particular element fits within the National ITS Architecture framework. In addition, a second drawing was provided to show the relationship (i.e., interconnects) between the subject element and other elements in the Northwest Pennsylvania Regional ITS Architecture.

- Interconnect Diagram – An Interconnect Diagram showing existing and planned interconnects between the subject element and other elements in the regional architecture was provided.
- Information Flow Diagrams – Existing and planned information flows by direction were shown on drawings for the subject element and each of the elements it interconnects with.
- Appendices – Definitions for the elements and architecture flows were provided.

The following is a list of comments that we're provided at the meeting. Comments are organized around additions and deletions by element, as well as general discussion items.

PennDOT District 10-0 County Maintenance Offices

Additions

1. Narrative for PennDOT D10 Stockpile locations, and D10 County Maintenance Office coordination of incidents and emergencies to Element description.
2. "Road Weather Information" flow to PennDOT Central Office Organizations – existing.
3. "Current Asset Restrictions" flow from PennDOT D10 TMC – existing (for permits).
4. Flows for coordinating incidents with PennDOT D10 TMC – existing.
5. Flows for coordinating incidents with PennDOT D12 RTMC – existing.
6. Flows for coordinating incidents with PennDOT D1 County Maintenance Offices– existing.
7. Flows for coordinating incidents with PennDOT D1 TMC – existing.

Deletions

1. "Maintenance and Construction Resource Request" and "Maintenance and Construction Resource Response" flows to/from Municipal Public Safety Offices.
2. Interconnect with Personal Traveler Information Services.

Changes

1. "Maintenance and Construction Resource Coordination" flow to and from Municipal Public Safety Offices – existing.

2. “Environmental Sensors Control” and “Environmental Conditions Data” flows to/from PennDOT D10 Field Devices – existing.
3. “Maintenance and Construction Vehicle Operational Data” flow from PennDOT D10 Vehicles – existing.
4. All flows to/from PennDOT D1 County Maintenance Offices – existing.

PennDOT District 10-0 Field Devices

Additions

1. Narrative for CCTV, construction field devices, and work zone safety monitoring to Element description narrative.
2. Interconnect with PennDOT D1 TMC for control of planned VMSs.

Changes

1. Element should be existing (many of the flows are subsequently programmed in error, and should be changed from planned to existing as well).

PennDOT District 10-0 TMC

Additions

1. “Traveler Information” flow to Personal Traveler Information Devices – existing.
2. Flows for coordinating incidents with PennDOT D11 RTMC – existing.

Deletions

1. Interconnect with PennDOT D1 County Maintenance Offices (rather see portrayed as county-to-county coordination).

Changes

1. “Maintenance and Construction Resource Request/Response” flows to/from Municipal Public Safety Offices – planned.
2. “Maintenance and Construction Resource Coordination” and “Work Plan Coordination” flows to/from Municipal Traffic Management Offices – planned.
3. “Archive Analysis Requests” flow to PennDOT Central Office Organizations – existing.

4. "Field Device Status" flow from PennDOT D10 Field Devices – existing (currently bridge sprayers provide device status, but control is automated).
5. "Road Weather Information" and "Roadway Maintenance Status" flows to/from PennDOT D1 TMC – existing.

PennDOT District 2 RTMC

Changes

1. Delete County in "Clearfield County" in Element description because in Clearfield City.
2. Make District 2-0 RTMC in Element description.
3. Second sentence in element description should read "... capabilities for PennDOT Districts 1-0 and 10-0 field devices.

General Discussion

- District 10-0 County Maintenance offices only currently coordinate detour and re-routing field operations with Municipal public safety agencies.
- District construction and maintenance activity database is maintained at PennDOT District 10-0 Office, and posted on public Website. District office collects data from County Maintenance Offices.

Attachments: PennDOT District 10-0 Validation Meeting Handout

Date: October 19th, 2004

Location: PennDOT District 1-0 Office; Oil City, PA

Attendees:

Tom McClelland, PennDOT District 1-0
Lt. T.P. Johnson, PA State Police
Todd Crago, Crawford County EMA
Dianne Fuller, Crawford County 911
Wayne Spaulding, PB Farradyne
Steve Kimble, PB Farradyne

Minutes Prepared By: Steve Kimble, PB Farradyne

A meeting was held on October 19th, 2004 between 1:00 PM to and 3:00 PM at the PennDOT District 1-0 DE Conference Room to validate the following elements in the Northwest Pennsylvania Regional ITS Architecture:

- 911 Communication Centers
- Adjacent State Public Safety Centers
- County EMA Centers
- EMAA Offices
- Municipal Public Safety Offices
- Municipal Public Safety Vehicles
- PSP Dispatch Centers
- PSP Vehicles

A “package” was developed for each of the above elements in order to portray how an element (i.e., the “subject” element) fits into the regional architecture. The packages were then combined into a MS PowerPoint presentation and reviewed with the stakeholders in attendance. Copies of each element package are attached with these minutes. Specifically, the element packages consisted of:

- Pennsylvania Northwest Regional ITS Architecture Framework – a copy of the National ITS Architecture “Sausage Diagram”.
- Element Cover Sheets – The name, description and stakeholder of the subject element as defined in the DRAFT Regional ITS Architecture.

- “Sausage Diagrams” showing the context of the subject element and the relationship between other elements in the DRAFT Regional ITS Architecture – the subject element was shown alone within the “Sausage Diagram” framework to provide a sense of context as to where that particular element fits within the National ITS Architecture framework. In addition, a second drawing was provided to show the relationship (i.e., interconnects) between the subject element and other elements in the Northwest Pennsylvania Regional ITS Architecture.
- Interconnect Diagram – An Interconnect Diagram showing existing and planned interconnects between the subject element and other elements in the regional architecture was provided.
- Information Flow Diagrams – Existing and planned information flows by direction were shown on drawings for the subject element and each of the elements it interconnects with.
- Appendices – Definitions for the elements and architecture flows were provided.

The following is a list of comments that we’re provided at the meeting. Comments are organized around additions and deletions by element, as well as general discussion items.

911 Communication Centers

Additions

1. “Incident Information” flow from Private Wrecker Units – existing.
2. Weather information flows to Weather Service Providers – existing.
3. “Road Weather Information” flow to PennDOT D1 TMC and County Maintenance Offices – existing.

Deletions

1. Interconnect with PSP Vehicles.

Changes

1. Flows to/from PennDOT D10 TMC should be moved/copied to PennDOT D10 County Maintenance Offices because they are the primary source of PennDOT contact for 911 operators.
2. Flows to/from PennDOT D1 County Maintenance Offices – existing.
3. Interconnect with High Threat Facilities – existing.

County EMA Centers

Additions

1. "Weather Information" flow to Weather Service Providers – existing.

Deletions

1. "Resource Request" and "Resource Deployment Status" flows to/from Municipal Traffic Management Offices.

Changes

1. All flows to/from PennDOT D10 TMC to PennDOT County Maintenance Offices.
2. "Transit Emergency Coordination Data" to Regional Transit Agency Offices – existing.

EMAA Offices

Deletions

1. Element since public safety personnel at airport are part of City of Erie public safety, and therefore add to Element description for Municipal Public Safety Offices.

Municipal Public Safety Offices

Deletions

1. "Resource Request" and "Resource Deployment Status" flow to/from PennDOT D1 TMC.

Changes

1. Interconnect with PennDOT D1 County Maintenance Offices – existing.

Municipal Public Safety Vehicles

No Comments

PSP Dispatch Centers

Additions

1. Flow for incident notification information from Private Wrecker Units – existing.
2. Interconnect and appropriate flows for D10 TMC and County Maintenance Offices

Changes

1. Incident response coordination flows to/from PennDOT D1 TMC should be moved to D1 County Maintenance Offices.

PSP Vehicles

No Comments

General Discussion

- 911 centers contact municipal traffic office crews to fix signals and other field operations if they received calls from the public.
- 911 centers coordinate with PEMA during day-to-day operations when the EOC is not activated.
- PennDOT County Maintenance Office personnel currently inform 911 centers if they encounter incidents/events that require additional resources.
- Private wrecker companies very often find out about accidents and breakdowns along roadways first, and then relay incident information to 911 centers for dispatch.
- Public often reports weather roadway conditions and problems to 911 centers, who then relay information to others.
- Vehicle tracking data from Municipal Public Safety Vehicles is needed at Municipal Public Safety Offices.
- PSP AVL tracking for vehicles is planned for in NW Region.
- Requests for PSP coverage in work zones is done through PSP Headquarters in Harrisburg, and then handed down to local barracks.
- PSP coordinates incident response with PennDOT County Maintenance Offices.

Attachments: Northwest Emergency Management Validation Meeting Handout

Date: October 12th, 2004

Location: EMTA Office at Erie Intermodal Transportation Facility; Erie, PA

Attendees:

Lorene McGuire, EMTA
Bill Jones, SUSS/MCCT
Dennis Zahora, CATA
Dennis Solensky, EMTA
Wayne Spaulding, PB Farradyne
Steve Kimble, PB Farradyne

Minutes Prepared By: Steve Kimble, PB Farradyne

A meeting was held on October 12th, 2004 between 9:00 AM to and 11:00 AM at the Erie Intermodal Transportation Facility EMTA conference room to validate the following elements in the Northwest Pennsylvania Regional ITS Architecture:

- Adjacent State Transit Offices
- EMTA Offices
- EMTA Remote Traveler Support
- EMTA Transit Vehicles
- Regional Transit Agency Offices
- Regional Transit Agency Vehicles
- Shenango Valley Shuttle Service Offices
- Shenango Valley Shuttle Service Vehicles

A “package” was developed for each of the above elements in order to portray how an element (i.e., the “subject” element) fits into the regional architecture. The packages were then combined into a MS PowerPoint presentation and reviewed with the stakeholders in attendance. Copies of each element package are attached with these minutes. Specifically, the element packages consisted of:

- Pennsylvania Northwest Regional ITS Architecture Framework – a copy of the National ITS Architecture “Sausage Diagram”.
- Element Cover Sheets – The name, description and stakeholder of the subject element as defined in the DRAFT Regional ITS Architecture.

- “Sausage Diagrams” showing the context of the subject element and the relationship between other elements in the DRAFT Regional ITS Architecture – the subject element was shown alone within the “Sausage Diagram” framework to provide a sense of context as to where that particular element fits within the National ITS Architecture framework. In addition, a second drawing was provided to show the relationship (i.e., interconnects) between the subject element and other elements in the Northwest Pennsylvania Regional ITS Architecture.
- Interconnect Diagram – An Interconnect Diagram showing existing and planned interconnects between the subject element and other elements in the regional architecture was provided.
- Information Flow Diagrams – Existing and planned information flows by direction were shown on drawings for the subject element and each of the elements it interconnects with.
- Appendices – Definitions for the elements and architecture flows were provided.

The following is a list of comments that we’re provided at the meeting. Comments are organized around additions and deletions by element, as well as general discussion items.

Adjacent State Transit Offices

Additions

1. Interconnect for coordinating transit operations with EMTA Offices (Ashtabula County) – planned.

EMTA Offices

Additions

- Flows for road work schedules and information from PennDOT D1 County Maintenance Offices – planned

Changes

1. “TRMS Coordination” flow to/from Regional Transit Agency Offices – planned.
2. “Transit Information for Media” and “Transit Incidents for Media” to Regional Media Outlets – existing.

EMTA Remote Traveler Support

No Comments

EMTA Transit Vehicles

Additions

1. "Emergency Notification" flow to EMTA Offices – existing.

Regional Transit Agency Offices

Additions

1. Flows for road work schedules and information from PennDOT D1 County Maintenance Offices – existing.
2. Interconnects with Regional Media Outlets and PennDOT D1 and D10 County Maintenance Offices – existing.
3. Narrative about Clarion County paratransit and ATA to Element Description.
4. Flows for vehicle diagnostic tracking and automated fare payment systems – planned.

Changes

1. "Transit Emergency Coordination Data" flow from County EMA Centers – existing.
2. Vehicle tracking flows to/from Regional Transit Agency Vehicles – existing (Crawford paratransit).
3. Interconnect for coordinating transit with Adjacent State Transit Offices – existing.

Regional Transit Agency Vehicles

Additions

1. "Emergency Notification" and "Emergency Acknowledge" flows to/from Regional Transit Agency Offices – existing.

Shenango Valley Shuttle Service Office

Additions

1. Flows for road work schedules and information from PennDOT D1 County Maintenance Offices – existing.
2. Narrative “based in Shenango Valley, serving 5 municipalities” to Shenango Valley Service Element description.
3. Interconnects for PennDOT D1 County Maintenance Offices, and Regional Media Outlets.
4. Flows for vehicle diagnostics and maintenance tracking, automated fare payment

Changes

1. Element to include Mercer County Community Transit.

Shenango Valley Shuttle Service Vehicles

Additions

1. Vehicle tracking, passenger tracking data, and emergency notification flows to Shenango Valley Shuttle Service Office – existing.

General Discussion

- Users can currently request paratransit service on EMTA LIFT website.
- Delete all “ISP Coordination” flows as these are part of “TRMS Coordination”.
- EMTA currently provides media sources with changes in schedule and event information.
- EMTA currently has need to have kiosks in public areas that provide trip scheduling and information, as well as fare payment machines.
- Add element for planned regional transit fare payment cards. Interconnect with transit vehicle elements, and EMTA Remote Traveler Support.
- Currently, EMTA vehicles transfer fare payment data to EMTA office garage system at end of route.
- Crawford County paratransit service currently has AVL tracking and distress signal system on buses.

- CATA has need to track vehicle diagnostics and automated fare collection.

Attachments: Northwest Transit Validation Meeting Handout

Appendix H: Bookend Meeting II Minutes

Date: Thursday, February 3, 2005
Meeting of: PennDOT Northwest Region – Second Meeting
Location: Courtyard Marriott -- Erie, PA

Presentation

- Tom McClelland from PennDOT welcomed everyone to the meeting. Stakeholders include PA State Police, transit operators, national weather service, counties, cities, townships, emergency management agencies, planning offices, economic development agencies, and many more entities. Tom explained that this meeting is the final regional stakeholder meeting of the ITS Architecture effort. The first regional meeting was held in September 2004; it was followed by a series of smaller working meetings in October 2004. Material from the first regional meeting is available upon request or via the web at www.paits.org. The purposes of the meeting include concluding the ITS Architecture effort, meeting the federal mandate for architecture conformity, discussing next steps, and discussing continuing regional operations dialogue. Tom quickly listed the agenda for the meeting. First, Steve Kimble from PB would give an overview of the ITS Architecture. Then, Noah Goodall, also from PB, would describe the website and how users would access information and provide input for updating the architecture. Next, Dennis Lebo from PennDOT would talk about next steps. Jake Welsh, from Erie MPO, would explain the role of the regional planning bodies for a local perspective. Tom mentioned that Jake is spearheading the effort for the planning commissions in that region. Brenda Murphy from PennDOT would facilitate discussion at the end.
- Steve Kimble from PB began his section on ITS Architecture by showing an outline of some of the questions that he would be answering during his part of the presentation. The mandate for conformity is reflected in this statement “The Intelligent Transportation System Architecture and Standards final rule issued by the Federal Highway Administration (FHWA), USDOT, Section: 940.5 (and 49 CFR Part 613 and 621) has been met for this region in Pennsylvania”. This means that federal rules from FTA and FHWA have been met. The federal funds can continue to be used for ITS projects in the Northwest Region because the regional ITS Architecture has been successfully completed. Then, Steve explained the process for creating the ITS Architecture. He started by showing the regional architecture boundaries for the entire state of Pennsylvania. The Northwest region includes seven counties. Steve showed a diagram which detailed the different steps in the process of generating the ITS Architecture. The process is based on information sharing. The pre-planning stage includes developing the process for generating this ITS Architecture and identifying the champions and the regional advisory panel. In the information gathering stage, stakeholders are identified and information on regional projects are gathered. In the analysis stage, interconnects and flows are identified. The strawman

architecture results from the analysis. In the outreach stage, stakeholders are invited to regional meetings and validation meetings. Afterwards, the information gathering stage is revisited. The architecture is rebuilt and is used to populate the website. A second regional meeting is held, and finally, the ITS Architecture is presented.

- Steve continued by summarizing each of the chapters in the Northwest Regional ITS Architecture Document. The new sections include using the architecture document, ITS Standards, utility of the architecture, maintenance of the architecture, and mainstreaming ITS. Steve showed a slide on “Using It [ITS Architecture]”. This included the architecture scope section, which summarizes the scope and magnitude of the architecture, defines the stakeholders, and lists projects. Furthermore, ITS Standards are industry consensus standards that define the operations of the system components within a consistent framework. Interoperability is promoted, and participating standards development organizations include AASHTO, ANSI, ASTM, IEEE, ITE, NEMA, and SAE. More than 50 standards exist for Pennsylvania Regional ITS Architecture. The ITS architecture provides structure for ITS planning and deployments. Also, an institutional mechanism that promotes development and deployment of ITS is established. ITS Architecture helps to promote interoperability, encourages efficient investment, and satisfies the federal mandate. In the following slide, Steve talked about how the ITS Architecture is to be maintained. The ITS Architecture is to be updated every four years, and the next update should be Fall 2008. In order to maintain statewide consistency, the ITS Architecture updates will most likely be led by PennDOT Central office. Elements that will be maintained include the following: a description of the region, stakeholders, ITS architecture elements, system inventory, needs and services, interconnect diagrams, architecture flows, and applicable ITS standards. To move forward and mainstream ITS, the regional stakeholders and PennDOT Central Office ITS Partnership will work together. They will work to get transportation technology issues in front of decision makers, incorporate ITS in long range plans, modify TIP project selection criteria to more fairly evaluate technology and ITS, give regular updates to elected officials, and set up regional ITS/Operations Coordination Committees. Furthermore, educational training courses may be provided to introduce practitioners to systems engineering, ITS procurement, and managing traffic incidents for roadway emergencies. A helpful website for the training is www.nhi.fhwa.dot.gov. Educational scanning tours may also be provided to county commissioners, executive boards, managers, operations staff, and public safety officials.
- Noah Goodall gave a demonstration for using the website to update the ITS Architecture. The website will become the historical library and also will provide forms for filling out new information on stakeholder and project updates. The website is www.paits.org. Noah guided the users through the website links by using the menus on the left-hand side and across the top of the screen. Elements on the menu include a description of the northwest region, list of the organizational entities that operate in the transportation environment,

interconnect diagrams, definitions and acronyms, full architecture document, help on using the architecture, and forms for updating the architecture.

- Dennis Lebo from the PennDOT Central Office, Center for Program Development and Management talked about next steps. He began with a picture identifying the various planning bodies within Pennsylvania. Then, he explained the role of ITS Architecture in the context of planning. The regional architecture sits between the vision and the long range plans / transportation improvement plans. For regional next steps, he suggested that each MPO/RPO in the region needs to formally adopt the ITS Architecture. The region needs to prioritize projects documented in the architecture, and incorporate projects into regional long range plans and the transportation improvement program. For PennDOT, the next step is to develop a Statewide Mobility Plan (SMP). The SMP will focus mainly on mobility. Developing a Transportation System Operations Plan (TSOP) is one of the components of the SMP. Prioritized statewide PennDOT projects are focused in incident management, telecommunications, ITS and operations. The draft of the TSOP may be available as early as May 2005. A regional outreach on this plan is proposed to identify the Statewide priorities.
- Jake Welsh, secretary of Erie MPO, continued the discussion about the Role of the Regional Planning Bodies. To move forward, the region must adopt the ITS architecture and incorporate it into their long range plan. The region needs to support the ITS/Operations project in the TIP and the PennDOT statewide TSOP. The region should continue regional discussions to address ITS/operations at regional level. In the current ITS planning process, ITS deployments have been incorporated into construction contracts. Discussions and coordination have taken place between ongoing transportation operations. The architecture provides a useful template for identifying project, stakeholders, and the operational context. One of the next steps in this region is to continue these discussions in MPO/RPO committees. These discussions can be moved into existing MPO/RPO technical committees. Finally, processes need to be developed for adding specific ITS/Operations deployments into plans.
- Brenda Murphy facilitated the open discussion. She thanked the participants for helping the team to successfully complete the Regional ITS Architecture. She emphasized the themes that the ITS Architecture document is a living document, and it needs everyone's support in the region.
- Jake Welsh asked if the user needed to log on to the website in order to fill out forms to update the architecture. Mike Harris responded that the website is open right now. The future of the website (e.g., where it is hosted) is currently in discussion.
- Will CDs of the ITS Architecture be provided? Yes, the finalized ITS Architecture document will be burned onto CDs in pdf and Word format. Currently, the printout fills up two big notebooks. Steve Kimble will deliver the CDs to the RAP members once the ITS Architecture is finalized.

- Is there TOC development for District 1-0? Mike Harris responded that a TOC element will be included in every regional architecture around the state. The TOC element may be as simple as a laptop or as complex as traffic management centers in more metropolitan regions. It is likely that the TOC may be a more modest size in Erie. This is something that they need to talk about. If they want to build something, District 1-0 may consider coordinating with the state police for co-location.
- Also, if a regional does not have a TMC/TOC, it may be able to share with a neighboring district. This avoids redundancy, but a common communication platform would need to be developed. Perhaps the region can have a 24x7 TMC access if the TMC is in a larger neighboring region.
- Is there any communication and coordination with the Office of Homeland Security? They have a contact with someone at the Office of Homeland Security, but there has not been significant involvement. Right now, the Office of Homeland Security is purchasing their own equipment. They did give a grant to Pittsburgh. Coordinating with Homeland Security would probably make the architecture more robust.
- Steve Kimble mentioned that there is documentation on interactions with Ohio and New York.
- Steve Kimble is available to go to MPO/RPO meetings to give a 10-minute explanation of the architecture.

List of Attendees

Last Name	First Name	Agency	Email	Phone
Brink	Randy	PENNDOT District 1-0	rabrink@dot.state.pa.us	(814) 678-7181
Button	Don	Erie International Airport	dwbutton@erieairport.org	
Crago	Todd	Crawford County OES	TCrago@co.crawford.pa.us	
Gray	Israel	City of Erie	igray@ci.erie.pa.us	(814) 870-1375
Hoffman	Thomas	Erie County MPO	tchoffman1@earthlink.net	
Jones	Bill	Mercer County Community Transit	wajones@mccog.com	
Karr	Jeffrey	PennDOT District 1-0	jkarr@state.pa.us	
King	Shirley	Summit Township Erie County		
Kukla	Mark	City of Erie	mkukla@ci.erie.pa.us	(814) 870-1373
Lebo	Dennis	PENNDOT Central Office	dlebo@state.pa.us	(717) 787-5246
McClelland	Thomas	PENNDOT District 1-0	thmcclella@state.pa.us	(814) 678-7157

Last Name	First Name	Agency	Email	Phone
McGuire	Lorene	Erie Metropolitan Transit Authority	lmcguire@emtaerie.com	(814) 459-4287
Morris	Rick	Millcreek Township	rmorris@millcreektownship.com	
Munizza	Dominic	PennDOT District 11-0	dmunizza@state.pa.us	(412) 429-6034
Murphy	Brenda	PENNDOT	bremurphy@state.pa.us	(412) 429-6038
Rankin	Bill	PennDOT District 10-0	wrankin@state.pa.us	(724) 357-0131
Schreckengost	Deborah	PennDOT District 1-0 - Public Relations	dschrecken@state.pa.us	(814) 455-7557
Skarada	Bob	Northwest Pennsylvania Regional Planning and Development Commission	bobs@nwcommission.org	(724) 357-2845
Spaulding	Jeffrey	City of Erie, Economic & Community Development Department		
Stover	Charity	Urban Engineers of Erie, Inc.	cestover@urbanengineers.com	
Walters	Matt	Crawford County	mwalters@co.crawford.pa.us	
Welsh	Jake	Erie County Department of Planning	jwelsh@stargate.net	(814) 451-6336

Pennsylvania ITS Architecture - Update and Next Steps

Northwest Pennsylvania Region

Second Regional Meeting

1/13/05



Welcome

PennDOT District 1-0

Tom McClelland



Welcome

- PennDOT
- PA State Police
- Transit Operators
- National Weather Service
- Counties
- Cities
- Townships
- Emergency Management Agencies
- Planning Offices
- Enforcement Community
- Media
- Tourism and Event Destinations
- Economic Development Agencies
- Policy
- Ports
- Planning Committees
- Partnership Organizations



Meeting Series

- This is the final regional stakeholder meeting of the ITS Architecture effort
 - First Regional stakeholder meeting was held in September 2004
 - Followed by a series of smaller working meetings in October 2004
- Material from the first regional meeting is available upon request or via the web at: www.paits.org



Meeting Purpose

- Conclude the ITS Architecture effort
- Meet the Federal Mandate for Architecture Conformity
- Discuss next steps
- Discuss regional ITS operations dialogue



Agenda

- **Steve Kimble**, PB – ITS Architecture
- **Noah Goodall**, PB – Web Site
- **Dennis Lebo**, PennDOT – Next Steps
- **Jake Welsh**, Erie MPO – Role of the Regional Planning Bodies
- **Brenda Murphy**, PennDOT – Discussion Facilitator



ITS Architecture

Steve Kimble, PB



PB

Mandate Conformity

Conformity Statement

The Intelligent Transportation System Architecture and Standards final rule issued by the United States Department of Transportation, USDOT, Section: 940.5 (and 49 CFR Part 613 and 621) has been met for this region in Pennsylvania.



PB

Meaning

- FHWA rule and FTA policy have been met
- Federal funds can continue to be used for ITS projects in this region
- The region has been successful



PB

Regional Boundaries



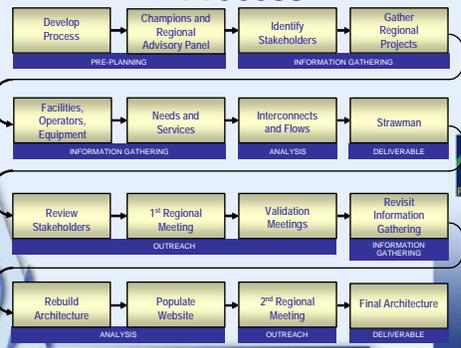
Northwest Region Description

- 7 County Region
- Northwest RPO, Erie County MPO, Mercer County MPO
- PennDOT District 1-0, Clarion County in PennDOT District 10-0



PB

Process



PB

Regional ITS Architecture
PennDOT Northeast ITS Architecture Report

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New Sections

Updated from Strawman/Draft Version

- Using the Architecture Document
- ITS Standards
- Utility of the Architecture
- Maintenance of the Architecture
- Mainstreaming ITS





Using It

- Architecture Scope Section
 - Summarizes the Scope and Magnitude of the Architecture
 - Defines Stakeholders
 - Lists Projects





ITS Standards

- ITS Standards
 - Industry Consensus Standards
 - Define How System Components Operate within a Consistent Framework
 - Promote Interoperability
 - Participating Standards Development Organizations Include AASHTO, ANSI, ASTM, IEEE, ITE, NEMA, SAE
- More than 50 Standards for Pennsylvania Regional ITS Architectures





Utility of the Architecture

The Regional ITS Architecture . . .

- Provides Structure for ITS Planning and Deployment
- Establishes an Institutional Mechanism That Promotes Development and Deployment of ITS
- Promotes Interoperability
- Encourages Efficient Investment
- Satisfies the Federal Mandate





ITS Architecture Maintenance

- When - ITS Architecture to be updated every four (4) years – next update 2008
- Who - ITS Architecture updates most likely will be led by PennDOT Central office for statewide consistency





ITS Architecture Maintenance

What - Will be Maintained?

- Description of the Region
- Stakeholders
- Elements
- System Inventory
- Needs and Services
- Interconnect Diagrams
- Architecture Flows
- Applicable ITS Standards



Mainstreaming ITS

Regional Stakeholders

- Get Transportation Technology Issues in Front of Decision Makers
- ITS in Long Range Plans
- Modify TIP Project Selection Criteria to More Fairly Evaluate Technology and ITS
- Regular Updates to Elected Officials
- Regional ITS / Operations Coordination Committees



Mainstreaming ITS

- Educational Training Courses (e.g., National Highway Institute Training Courses)
 - Introduction to Systems Engineering
 - ITS Procurement
 - Managing Traffic Incidents for Roadway Emergencies
 - Others
- www.nhi.fhwa.dot.gov



Mainstreaming ITS

Educational Scanning Tours

- County Commissioners
- Executive Boards
- Managers
- Operations Staff
- Public Safety Officials
- Others



ITS Architecture Web Site

Noah Goodall
Parsons Brinckerhoff



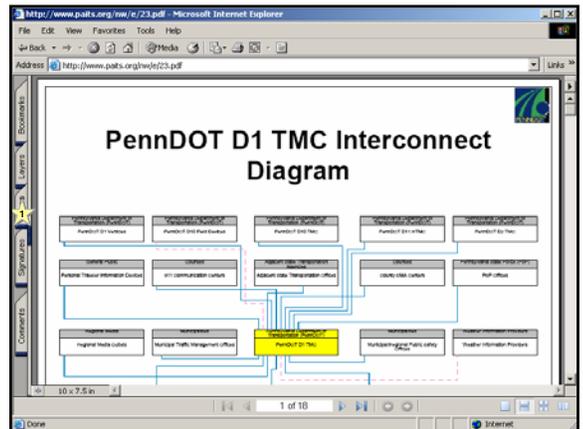
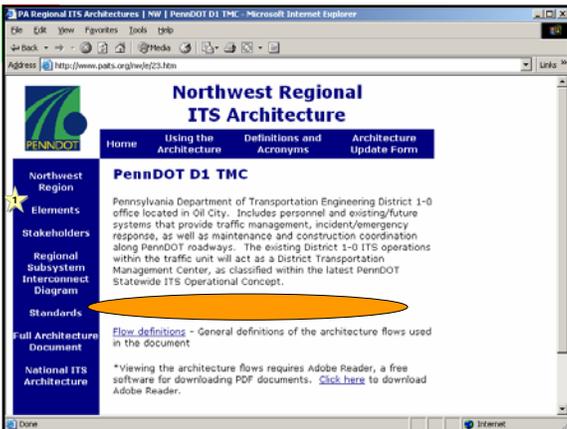
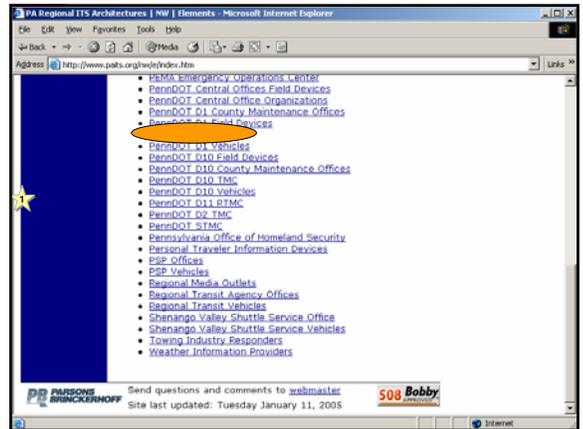
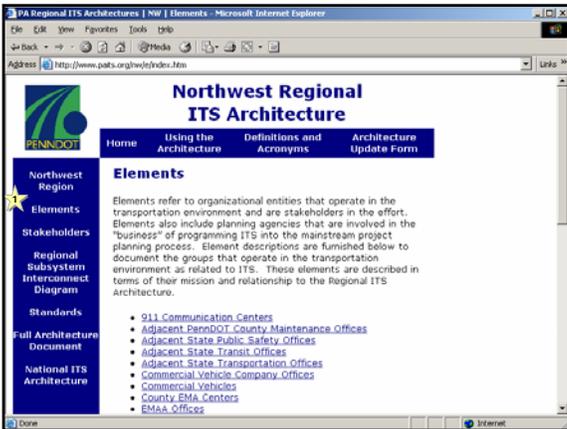
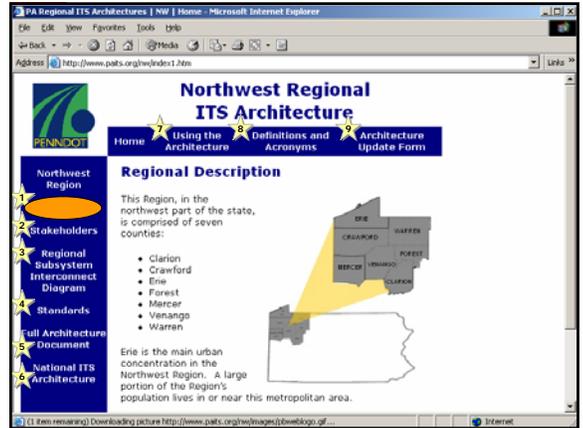
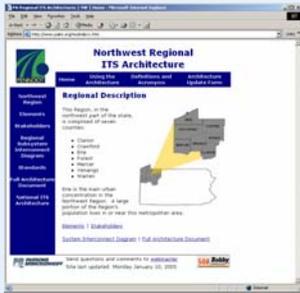
How to Use the Architecture

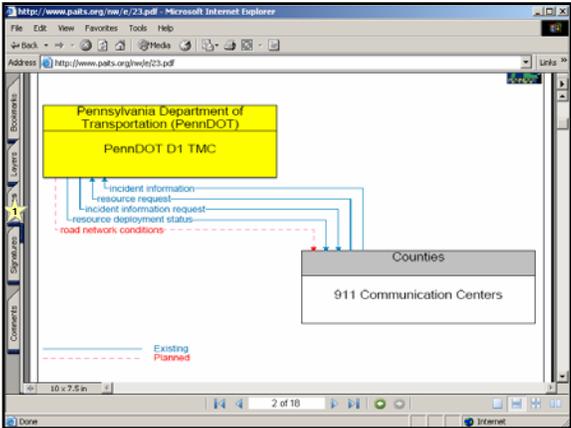
- Web-based
- Easy to use
- Will serve as the historical library
- Submittal form for new information
 - Stakeholder updates
 - Project updates

<http://www.paits.org/>



PA ITS Architecture Web Site Example Slides...





PA Regional ITS Architectures | NW | Stakeholders

Northwest Regional ITS Architecture

Home Using the Architecture Definitions and Acronyms Architecture Update Form

Northwest Region

Elements

Regional Subsystem Interconnect Diagram

Standards

Full Architecture Document

National ITS Architecture

Stakeholders

Stakeholders are mainly identified as agencies and then individuals responsible in those agencies for policy and operations.

- Adjacent State Public Safety Agencies
- Adjacent State Transit Agencies
- Adjacent State Transportation Agencies
- Commercial Vehicle Companies
- Counties
- Erie Metropolitan Transit Authority (EMTA)
- Erie Municipal Airport Authority (EMAA)
- General Public
- Municipalities
- Pennsylvania Emergency Management Agency (PEMA)
- Pennsylvania Office of Homeland Security
- Pennsylvania State Police (PSP)
- Regional Media
- Regional Transit Agencies
- Shenango Valley Shuttle Service

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Pennsylvania Department of Transportation (PennDOT)

The Pennsylvania Department of Transportation is the Commonwealth's statewide transportation agency responsible for building, maintaining, and operating the state's roads, bridges and tunnels. PennDOT consists of a single Central Office and 11 District Offices throughout the state.

PennDOT's Central Office consists of several divisions, including the Bureau of Maintenance and Operations (BOMO), Bureau of Planning and Research (BPR), Bureau of Highway Safety and Traffic Engineering (BHSTE), and the Motor Carrier Division. PennDOT's Central Office oversees statewide operations and is responsible for coordination of transportation services between the 11 Districts.

PennDOT's District Offices are responsible for the design, operation, maintenance, and construction of state highways and

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National ITS Architecture

National ITS Architecture

coordination of transportation services between the 11 Districts.

PennDOT's District Offices are responsible for the design, operation, maintenance, and construction of state highways and bridges in their respective districts.

Elements

- Adjacent PennDOT County Maintenance Offices
- PennDOT Central Offices Field Devices
- PennDOT Central Office Organizations
- PennDOT D1 County Maintenance Offices
- PennDOT D10 Vehicles
- PennDOT D10 Field Devices
- PennDOT D10 County Maintenance Offices
- PennDOT D10 TMC
- PennDOT D10 Vehicles
- PennDOT D11 RTMC
- PennDOT D2 TMC
- PennDOT STMC

Send questions and comments to [webmaster](#)
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PA Regional ITS Architectures | NW | PennDOT D1 TMC

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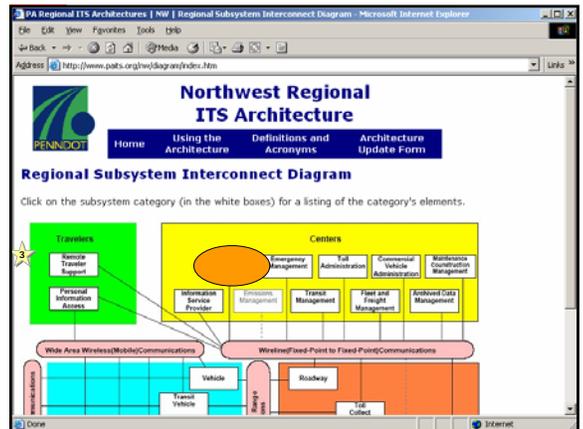
PennDOT D1 TMC

Pennsylvania Department of Transportation Engineering District 1-0 office located in Oil City. Includes personnel and existing/future systems that provide traffic management, incident/emergency response, as well as maintenance and construction coordination along PennDOT roadways. The existing District 1-0 ITS operations within the traffic unit will act as a District Transportation Management Center, as classified within the latest PennDOT Statewide ITS Operational Concept.

PennDOT D1 TMC Element Architecture (112KB PDF)*

Flow definitions - General definitions of the architecture flows used in the document

*Viewing the architecture flows requires Adobe Reader, a free software for downloading PDF documents. [Click here](#) to download Adobe Reader.



PA Regional ITS Architectures | NW | Traffic Management - Microsoft Internet Explorer

Address: http://www.pats.org/nw/trafficm/traffic.htm

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Traffic Management

The Traffic Management Subsystem monitors and controls traffic and the road network. It represents centers that manage a broad range of transportation facilities including freeway systems, rural and suburban highway systems, and urban and suburban traffic control systems. This subsystem communicates with the Roadway Subsystem to monitor and manage traffic flow and monitor the condition of the roadway, surrounding environmental conditions, and field equipment status. This subsystem coordinates with the Maintenance and Construction Management Subsystem to maintain the road network and coordinate and adapt to maintenance activities, closures, and detours. Incidents are detected, verified, and incident information is provided to all agencies, drivers (through Roadway Subsystem highway advisory radio and dynamic message signs), and information service providers. This subsystem also manages traffic and transportation resources to support all agencies in responding to, and recovering from, incidents ranging from minor traffic incidents through major disasters. When required, special traffic management strategies are implemented to support evacuation and reentry. The Traffic Management Subsystem

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Opening page http://www.pats.org/nw/trafficm/traffic.htm...

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Address: http://www.pats.org/nw/trafficm/traffic.htm

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Elements

- Adjacent PennDOT County Maintenance Offices
- Municipal Traffic Management Offices
- PEMA Emergency Operations Center
- PennDOT District Office Organizations
- PennDOT D11 TMC
- PennDOT D11 RTMC
- PennDOT D2 TMC
- PennDOT STMC

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Address: http://www.pats.org/nw/d1.htm

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PennDOT D1 TMC

Pennsylvania Department of Transportation Engineering District 1-0 office located in Oil City. Includes personnel and existing/future systems that provide traffic management, incident/emergency response, as well as maintenance and construction coordination along PennDOT roadways. The existing District 1-0 ITS operations within the traffic unit will act as a District Transportation Management Center, as classified within the latest PennDOT Statewide ITS Operational Concept.

[PennDOT D1 TMC Element Architecture \(112KB PDF\)*](#)

[Flow definitions](#) - General definitions of the architecture flows used in the document.

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Full Architecture Document

The Northwest Regional ITS Architecture Final Report is available for download in PDF format by clicking the link below.

Warning: File size is very large. Right click on the link and select "Save As" to save to your hard drive for easier viewing.

[Northwest Regional ITS Architecture Final Report \(3.4MB PDF\)](#)

The same architecture can be navigated via the web by clicking on [Elements](#), [Stakeholders](#), or [Regional Subsystem Interconnect Diagram](#) on the left side bar.

*Viewing the architecture flows requires Adobe Reader, a free software for downloading PDF documents. [Click here](#) to download Adobe Reader.

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Address: http://www.pats.org/nw/help.htm

Northwest Regional ITS Architecture

Home Using the Architecture Definitions and Acronyms Architecture Update Form

Using the Architecture

This section will help guide you through the Regional ITS Architecture website to find the information you want.

Searching by Elements

An element is the basic building block of the Architecture, and is used by stakeholders to describe a system or piece of a system. If you know your element's name, click on "Elements" on the left side of the page. This will take you to an alphabetical listing of all elements. Choose yours and go to the element's homepage, from which you can find a link to a PDF file with detailed information about the element's information flows to other elements.

Searching by Stakeholders

A stakeholder is a public agency, private organization, or the traveling public with a vested interest in the transportation elements of the Architecture. If you know the name of your stakeholder, you may click on "Stakeholders" on the left side of the

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Address: http://www.pats.org/nw/def/acron/index.htm

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Definitions and Acronyms

Definitions are grouped into four categories. Choose yours from the list below.

- Acronyms** - An alphabetical listing of all acronyms between elements
- ITS Definitions** - Terms that relate specifically to the Intelligent Transportation Systems (ITS) field
- Subsystem and Terminator Definitions** - The individual pieces of the Intelligent Transportation System as defined by the National ITS Architecture

Send questions and comments to [webmaster](#)
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PA Regional ITS Architectures | NW | Architecture Flow Definitions - Microsoft Internet Explorer

Address: http://www.pats.org/nw/definitions/def-flows.htm

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Architecture Flow Definitions

(Source: National ITS Architecture)

Below are the architecture flow definitions from the National ITS Architecture exclusive to the Regional ITS Architecture:

accident report: Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.

archive analysis requests: A user request that initiates data mining, analytical processing, aggregation or summarization, report formulation, or other advanced processing and analysis of archived data.

archive analysis results: Processed information products, supporting meta data, and any associated transaction information resulting from data mining, analytical processing, aggregation or summarization.

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Address: http://www.pats.org/nw/index1.htm

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Regional Description

This Region, in the northwest part of the state, is comprised of seven counties:

- Clarion
- Crawford
- Erie
- Forest
- Mercer
- Venango
- Warren

Erie is the main urban concentration in the Northwest Region. A large portion of the Region's population lives in or near this metropolitan area.

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Address: http://www.pats.org/nw/update.htm

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Updating the Architecture

To suggest an update to the architecture, such as a new project, fill out the form below as thoroughly as possible. All suggestions will reviewed by a moderator and added to the [updated list](#).

All forms are time-stamped and retained as part of the architecture's Configuration Management (CM) process. The Configuration Management process will create a historical record of the proposed changes to the architecture. For more information on Configuration Management, visit the Federal Highway Administration's information page: <http://www.ops.fhwa.dot.gov/Travel/Traffic/cm/index.htm>

[View all updates since December 2004](#)

Contact Information

Name of Submitter:	Submission Date:
Organization:	Phone Number:

PA Regional ITS Architectures | SA | Architecture Update Form - Microsoft Internet Explorer

Address: http://www.pats.org/nw/update.htm

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New ITS Project

Project Name: Consolidated Transit Manage Project Stakeholder: Erie Metropolitan Tr

Stakeholders Involved: City of Erie Traffic, PennDOT

Funding:
 Local Funding
 State Funding
 Federal Funding

Location: Erie Deployment Date: December 2007

Project Description:

EMTA has plans for multi-modal learning/transit management center (Glenwood Center), which will have centralized management of transit operations, and possibly other modes (e.g., traffic management).

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Address: http://www.pats.org/nw/update.htm

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New Stakeholder

Stakeholder Name: None

Status: Existing Planned

Stakeholder Description: None

New Element

Element Name: Consolidated Transit Mana Stakeholder: Erie Metropolitan Transit Auth

Status: Existing Planned

Element Description:

A multi-modal learning/transit management center, which will have centralized management of transit operations, and possibly other modes (e.g., traffic

Other Changes

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Address: http://www.pats.org/web/update.htm

New Element

Element Name: Consolidated Transit Mana Stakeholder: Erie Metropolitan Transit Auth

Status: Existing Planned

Element Description:
A multi-modal learning/transit management center, which will have centralized management of transit operations, and possibly other modes (e.g., traffic)

Other Changes
Other Changes: None

Submit Reset

Send questions and comments to [webmaster](mailto:webmaster@pats.org)
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PA Regional ITS Architectures | NW | Current Update List - Microsoft Internet Explorer

Address: http://www.pats.org/web/display-updates.htm

Northwest Regional ITS Architecture

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Current Architecture Update List

The following list includes all of the suggested updates to the architecture to date since November 2004.

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Contact Information

Date Submitted	December 20, 2004
Submitter	Tom Klevan
Organization	Altoona Metro Transit (AMTRAN)
Email	tom.klevan@amtran.org

New ITS Project

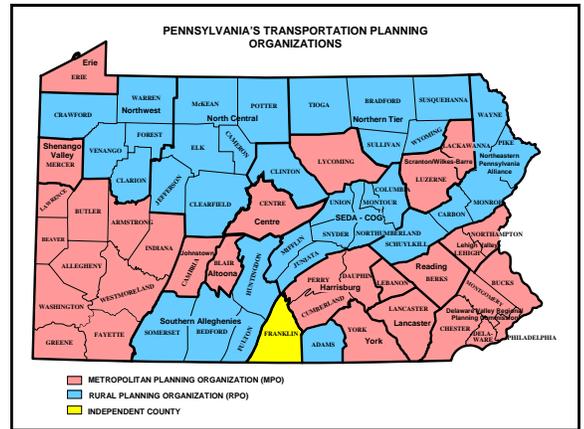
Project Name	Altoona Metro Transit (AMTRAN) Automated Vehicle Location (AVL) System
Project Stakeholder	Altoona Metro Transit

Moving Forward – Next Steps

Dennis Lebo

PennDOT Central Office
Center for Program Development and Management



- ## Regional Next Steps
- Adopt Architectures at Each MPO/RPO
 - Regionally prioritize projects documented in Architecture
 - Incorporate into regional long range plans
 - Incorporate into regional transportation improvement programs (TIP)
- 
- 
- 

PennDOT Next Steps

- Statewide Mobility Plan (SMP)
 - One of these components of the SMP is the Transportation Systems Operations Plan (TSOP)
 - Prioritized statewide PennDOT projects focused in:
 - Incident Management
 - Telecommunications
 - ITS and Operations
 - Draft TSOP by May 2005
 - Regional outreach on this plan is proposed



Regional Planning and Operations Dialog

Jake Welsh, Erie MPO Secretary



To move forward ...

- MPOs/RPOs adopt the ITS Architecture
- Incorporate ITS Architecture into long-range plan
- Support ITS/operations projects in TIP
- Support the PennDOT statewide TSOP as needed
- Continue regional discussions to address ITS/operations at regional level



Current ITS Planning Process

- Ongoing transportation operations discussions and coordination
- ITS deployments have been incorporated into construction contracts
- Architecture provides useful template for identifying:
 - Projects
 - Who to get involved
 - Operational context



Next Steps in NW

- Continue these discussions in MPO/RPO committees
- Can improve – Move these discussions into existing MPO/RPO Technical Committees
- Develop process for adding specific ITS/Operations deployments into plans
- Initiate annual ITS/operations dialogue in MPO/RPO committees
 - Engage non-MPO stakeholders
 - Educate/train stakeholders
 - Identify and prioritize future ITS projects
 - Consider regional ITS-specific committees



Discussion

Facilitated by:

Brenda Murphy, PennDOT
Central Office

