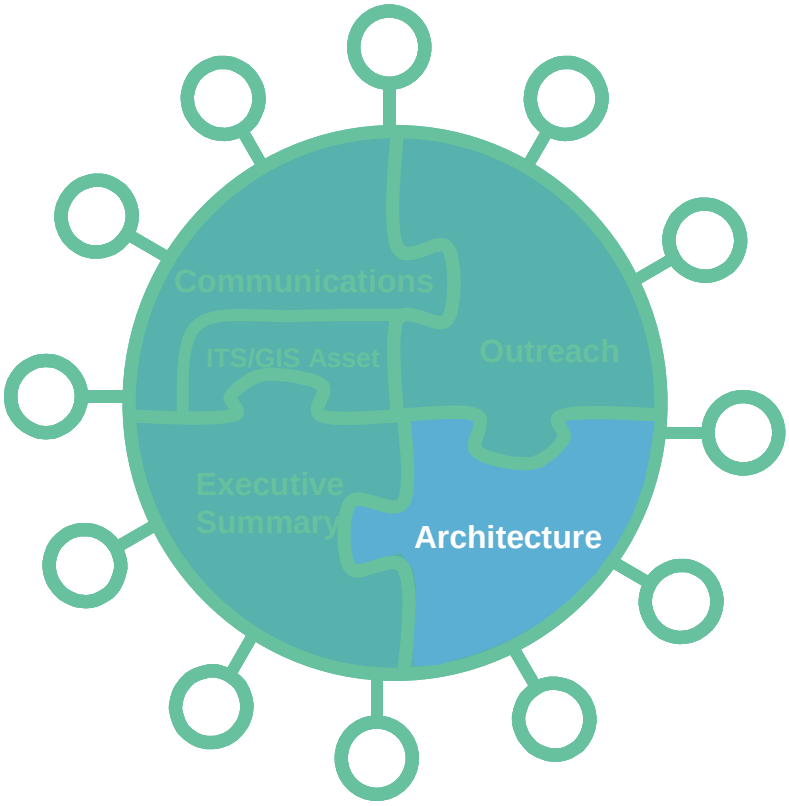
VDOT NOVA – Centric ITS Architecture

ARCHITECTURE v1.0



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May 2002

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1 INTRODUCTION

According to an article in Government Computer News, November 2001, studies show Northern Virginia (NOVA) residents spend an average of 46 hours a year stuck in traffic. A recent study performed by the Texas Transportation Institute, identified NOVA as being part of the 3rd most congested area in the nation. Figures like these from the Texas Transportation Institute have prompted many state and local governments to use Intelligent Transportation Systems (ITS) to try to ease congestion and improve safety on the roadways by alerting drivers about accidents, road work or congestion areas.

The Virginia Department of Transportation (VDOT) has numerous ITS activities that are underway and are planned for the NOVA area. These activities are targeted toward making travel in the NOVA area safer, easing the congestion, providing the transportation system operators with better information to manage the transportation network, and developing services that will make available to the traveler reliable and accurate information about the travel options available to them.

The Commonwealth of Virginia is divided into nine VDOT transportation districts and NOVA is in District 9. The NOVA District contains four counties (Fairfax, Prince William, Arlington, and Loudoun). The NOVA District builds, maintains, and operates freeways and primary roads within the district, and operates traffic signals throughout Fairfax, Loudoun, and Prince William Counties. In addition to VDOT, there are numerous local governments, transit, local law enforcement, commercial vehicle operations, emergency services, parks and recreations centers, and many other organizations that influence or depend on the transportation system to deliver services and conduct business in and around the NOVA region.

With all these stakeholders participating with VDOT in the delivery and use of transportation services, VDOT launched the development of a VDOT NOVA ITS Architecture. This ITS Architecture identifies the interfaces between VDOT and other transportation- and safety-related organizations in the region, primarily the VDOT NOVA District. It is intended to maximize the exchange of information between VDOT and other transportation and safety systems in the NOVA region to facilitate integration of the transportation system and to deliver ITS services to travelers in the region.

The ITS Architecture development process involved the gathering of transportation system information from VDOT as well as other stakeholders. Services such as freeway management or emergency response were identified to establish the needs in the region. As described in the VDOT NOVA ITS Architecture Outreach document, stakeholder outreach forums were conducted with 9 different groups to validate the information exchanges identified in the architecture. Changes identified in the stakeholder outreach forums were incorporated into the architecture definition. This process took a year to accomplish. It would not have been possible without the participation and feedback from the NOVA stakeholders.

The resulting NOVA ITS Architecture is documented in the following pages. The architecture definition will continue to evolve as ITS deployments occur and new needs are identified in the region. The Architecture is intended to be used in the planning of ITS projects in VDOT and the identification of the sequence of ITS projects that are required to enable future ITS services.

ITS projects would be required to use the ITS Architecture as a reference and be consistent with the NOVA ITS Architecture.

The NOVA ITS architecture illustrates the opportunities for interagency communication to better coordinate deployment efforts and to support integration activities of multimodal transportation services.

In order to allow users to easily navigate through the NOVA ITS Architecture, a brief description of each section is presented below:

Introduction – Describes the scope and purpose of the NOVA ITS Architecture and the overall layout of the document. It explains the breadth of the architecture context and what it is intended to serve (project definition, regional integration, etc).

Architecture Development Process – Describes the development process used which will assist readers in understanding how the architecture was developed for NOVA.

Stakeholders – Provides a list of stakeholders and describes their roles in the region.

Transportation Services/Functional Analysis – Lists the services and functions that the architecture supports.

NOVA ITS Architecture – Presents the result of the architecture development process. This section identifies the system inventory and how it relates to elements of the National ITS Architecture. Illustrations and descriptions of the system interconnects and information flows are also presented.

Linkages to Communication Plan – Describes the linkage between the architecture and the communications plan. Explains how the architecture fed the communications plan development and describes how the architecture and the communication plan were important in helping to define ITS in the NOVA region.

ITS Standards to Consider – This section lists the applicable standards based on the interfaces defined in the architecture. The list provides a starting point for a project developer to begin the standards analysis that must be done for each project. It focuses primarily on center-to-center and center-to-field standards. This section also provides a list of web site references where readers can access additional information about ITS-related standards.

Using the Architecture - This section provides an explanation of how to use the NOVA ITS Architecture in the definition of ITS projects and how the architecture is used in the planning process.

Maintaining the Architecture - This section provides an explanation of how the NOVA ITS Architecture will be maintained as projects are implemented and the architecture evolves to address new requirements.

Appendix A, Functional Analysis Matrix – This section provides a table of the transportation services identified for the NOVA ITS Architecture describing what NOVA functions are being addressed.

Appendix B, System Interconnects – Domain-specific interconnect diagrams.

Appendix C, Interface Diagrams – Interface diagrams of pairs of systems identified in the inventory.

Appendix D, Information Flow Definitions – Information flow definition table that can be referenced for the flows illustrated in Appendix C.

Appendix E, NOVA ITS Project Architectures - As projects are defined and deployed, their project architectures will be included in Appendix E for reference in future projects.

1.1 SCOPE AND PURPOSE

The NOVA ITS Architecture is bounded geographically by the VDOT NOVA District boundaries as illustrated in Figure 1. It includes Fairfax, Loudoun, Prince William, and Arlington counties. It borders with Maryland and the District of Columbia.

Figure 1 – Northern Virginia Region

The NOVA ITS Architecture was developed by VDOT and focuses on VDOT interfaces to other transportation systems within and adjacent to the NOVA region. The formal name of this

project, the VDOT NOVA-Centric ITS Architecture, highlights this focus on VDOT interfaces. For the purposes of this architecture document, the architecture will be referred to as the NOVA ITS Architecture The architecture does not identify non-VDOT to non-VDOT interfaces. The purpose of the architecture is to establish a framework that will guide regional transportation planning and project development and execution to achieve increased integration of VDOT's transportation system with other transportation systems by supporting and establishing center-to-center information exchange.

Two other regional ITS architecture efforts are underway in the NOVA area. Maryland is developing a statewide ITS architecture and the Metropolitan Washington Council of Governments (MWCOG) is developing a regional ITS architecture that includes NOVA, parts of Maryland, and the District of Columbia. The VDOT NOVA ITS Architecture identifies interfaces with the Maryland Statewide ITS Architecture and has reconciled any overlaps with the work being done to develop a regional ITS architecture for the Metropolitan Washington area. The NOVA ITS Architecture Team held frequent meetings with Maryland and MWCOG to coordinate the architecture efforts and resolve nomenclature and approach issues.

2 ARCHITECTURE DEVELOPMENT PROCESS

The NOVA ITS Architecture Team followed the process identified in the Federal Highway Administration's (FHWA) Regional ITS Architecture Guidance Document for Developing, Using, and Maintaining ITS Architectures. The process was slightly tailored to fit the needs of NOVA. The FHWA process, illustrated in Figure 2 is represented by a series of steps which are described below.

Step #1: Get Started: The first step in the process focuses on identifying the institutions and organizations that will be impacted by the NOVA ITS architecture and informing them of the upcoming efforts while encouraging their participation.

Step #2 Gather Data: Once the stakeholders were identified, the existing and planned ITS systems in the region were inventoried, and the roles and responsibilities of each stakeholder in developing, operating, and maintaining these ITS systems were defined. Functional requirements derived from the NOVA Smart Travel Plan[1] and ITS Early Deployment Study[2] were used to better understand the needs and the desired ITS services for the NOVA region. These documents also provided operational concepts for VDOT systems in the NOVA region.
This ITS architecture is institutionally complex given the number of agencies and transportation facilities in the region and consequently overlaps with other ITS architecture efforts. As a result of NOVA being so closely connected to the Metropolitan Washington Regional ITS Architecture and the Maryland Statewide ITS Architecture, several coordination meetings were necessary with those developing the architectures to achieve an understanding of regional ITS efforts and to establish a synchronization among the various ITS architectures (e.g., common nomenclatures among inventoried systems).

The ITS systems that were identified as part of the NOVA ITS Architecture were mapped to the National ITS Architecture subsystems. This allowed for further definition of the systems as well as setting the stage for the next analysis step.

Step #3 Define Interfaces: Once the ITS systems in the region were identified, the existing and planned interfaces between these systems were defined. The National ITS Architecture contains interface definitions between subsystems. Since the NOVA inventory was mapped to subsystems in the National ITS Architecture, the interfaces defined in the National ITS Architecture were used as a starting point to define the interfaces for the NOVA ITS Architecture. The applicable National ITS Architecture interfaces present integration opportunities to be considered for the NOVA region. These connections (or "Interconnects") between systems were evaluated for whether they existed in the NOVA Region or were an interface that was being planned or considered for future implementation. This simplified the next step (information flows) by eliminating connections that do not exist and are not planned for the future.
The next level of detail in defining the interfaces was to examine each interconnect and determine which information flows existed or were planned for the future between pairs of

[1] Smart Travel Program in the Virginia Department of Transportation Northern Virginia District, December, 1999. Technical support provided by Odetics ITS, PB Farradyne, and Dewberry & Davis.
[2] Northern Virginia Intelligent Transportation System (ITS) Early Deployment Study; Final Report: Strategic Deployment Plan; May, 1996. Prepared by De Leuw, Cather & Company of Virginia.

systems. This was accomplished by examining the information flows that the National ITS Architecture suggested between the mapped subsystems, examination of the NOVA ITS Early Deployment Study, and the Team's knowledge of VDOT and regional systems and needs. The results were coordinated with the Metropolitan Washington Regional ITS Architecture and the Maryland Statewide ITS Architecture development efforts to maintain continuity among the architectures. After the initial draft of the Architecture, the strawman architecture, was complete, the information was presented to the stakeholder groups.

Step #4 Outreach: In order to obtain feedback and consensus regarding the interconnects and information flows within the NOVA region, outreach sessions were held with stakeholders. Nine outreach sessions were held with domain-specific groups in the region such as transit, traffic management, emergency management, VDOT district offices, toll collection, planning and maintenance. The first step of the outreach effort was to identify Champions for each stakeholder group. For more information on the selection of champions and the outreach process, refer to the VDOT NOVA-Centric Outreach Report available from VDOT or on the web at www.vdot-itsarch.com. Recognizing that the stakeholders' time was limited, outreach sessions were structured to focus stakeholder participation appropriately. Stakeholders were engaged at various stages of the NOVA ITS architecture development process based on their expertise and interest. However, a primary effort was engaged to meet with all of the stakeholder groups over the course of a few weeks to get their feedback in a short period of time.

The interconnects and information flows that describe the NOVA ITS Architecture were updated based on the feedback from stakeholders at these outreach meetings and additional information collected from follow-up phone calls afterward. Stakeholder feedback was incorporated into the NOVA ITS Architecture definition and updated material was provided to the stakeholders for final review.

An additional development aspect of the NOVA ITS Architecture was the use of the physical system architecture to develop the NOVA ITS Communications Plan. The identified Interconnects and subsequent Information Flows presented in the system architecture provided insight to anticipated high-level bandwidth requirements. Based on this projected communications demand between VDOT and other stakeholder facilities, and an analysis of communications media, a Communications Plan was developed for NOVA. This plan presents a communications architecture that leverages, to the extent possible, existing and/or planned infrastructure and provides guidance to VDOT and regional stakeholders on the investment in communications to directly support the ITS system architecture. For additional information about the communication plan, refer to the VDOT NOVA-Centric ITS Communications Plan Report available from VDOT or on the web at www.vdot-itsarch.com.

While this process may seem to be a sequential process where one step is completed before beginning the next, the actual development process is iterative and tasks were frequently performed in parallel. For example, in step #1, the scope of the region was adjusted due to the identification of new stakeholders throughout the development process. As a result of new stakeholders being identified, there were iterations between step #2 and step #1. There were situations where changes to the inventory needed to be made as interfaces were defined, causing iteration between steps #3 and #2.

Figure 2 below illustrates the process used to develop the NOVA ITS Architecture. The 2 final steps deal with the use and maintenance of the architecture. These steps are addressed further in this document.

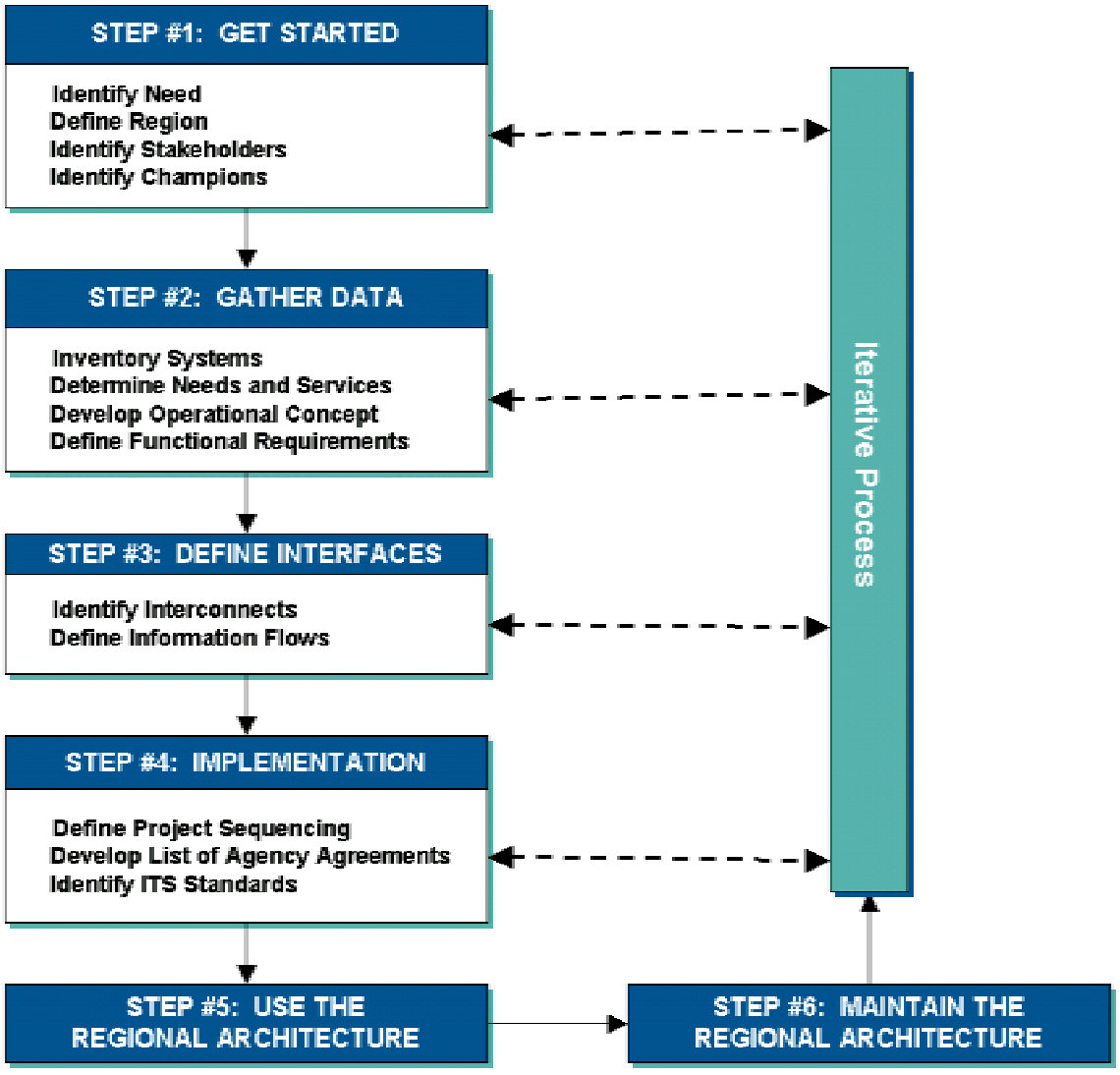


Figure 2 – ITS Architecture Development Process

3 TRANSPORTATION SERVICES/FUNCTIONAL ANALYSIS

Appendix A provides a table that defines the functions of each subsystem within the NOVA ITS Architecture.

These functionality definitions provided requirements for the NOVA ITS Architecture definition. They were a starting point for analyzing the services supported and needed by the region for ITS. The functionality described in the Appendix was extracted from the VDOT NOVA ITS Strategic Plan and from the Team's knowledge of the systems in the NOVA region. This information provided the Team with an understanding of the distributed activities and roles of each system in the region. It organized the information sources and led to the development of the initial strawman architecture for the region. The NOVA ITS Architecture is linked to the Strategic Plan through the functions defined for each system.

4 NOVA ITS ARCHITECTURE

4.1 STAKEHOLDERS

Understanding the stakeholders who are going to be interacting within the NOVA region is very important to developing and integrating an effective system. It is also important to know which stakeholders are involved in order to establish agreements among the stakeholders who will be exchanging data.

Table 1 lists the stakeholders that have been identified as participants in the NOVA ITS Architecture. The stakeholders identified are responsible for systems or services, listed in column 2 of the table, that interact or exchange information with VDOT within the NOVA region.

Table 1 – NOVA Stakeholder List

Stakeholder Name	NOVA ITS Architecture System Responsibility
Virginia Department of Transportation (VDOT) Districts	• Adjacent VDOT Smart Traffic Centers (STC) • Other STCs
Capital Area Wireless Information Network (CAPWIN)	• Baltimore-Washington High-Intensity Drug Traffic Area (HIDTA)
Department of Motor Vehicles (DMV)	• Commercial Vehicle Management System
District of Columbia Public Safety Agencies	• District of Columbia (DC) Emergency Preparedness Center
District of Columbia Department of Transportation (DC DOT)	• DC Integrated Transportation Management System (ITMS)
Federal Agencies	• Federal Installations • Federal Law Enforcement
Dulles Greenway	• Greenway Center
I-95 Corridor Coalition	• Information Exchange Network (IEN)
VDOT Maintenance Division	• Integrated Maintenance Management Program (IMMP)
Regional Information Service Providers (ISP)	• ISP Centers
VDOT	• Laptop Computers • Unified Command • VDOT Northern Virginia (NOVA) Dulles Toll Road • VDOT NOVA Parking Management • VDOT Public Affairs

Table 1 – NOVA Stakeholder List

Stakeholder Name	NOVA ITS Architecture System Responsibility
Maryland State Highway Administration	• Maryland Coordinated Highways Action Response Team (CHART)
Media	• Media Centers
Metropolitan Washington Council of Governments (MWCOG)	• Metropolitan Washington COG Center
Metropolitan Washington Airport Authority (MWAA)	• MWAA Center
Federal Emergency Management Agency (FEMA)	• National Advisory Warning System
District of Columbia (DC) / Virginia (VA) / Maryland (MD)	• National Park Services • Regional Transit Electronic Clearinghouse

NOVA Local Public Safety Agencies	• NOVA Local Public Safety Centers
	  • Arlington County Police and Fire
	  • Herndon Police Department
	  • Fairfax County Police and Fire
	  • Leesburg Police Department
	  • Loudoun County Fire and Rescue
	  • Manassas Police Department
	  • Prince William County Police and Fire
	  • Fairfax City Police and Fire
	  • Falls Church Police and Fire
	  • City of Alexandria Police and Fire
	  • Loudoun Sheriff
	  • Vienna Police Department

NOVA Local Signal Agencies	• NOVA Local Signal Centers
	  • City of Alexandria
	  • City of Fairfax
	  • City of Falls Church
	  • City of Manassas
	  • City of Manassas Park
	  • Arlington County
	  • Town of Herndon
	  • Town of Leesburg
	  • Town of Vienna

NOVA Local Transit Agencies	NOVA Local Transit Centers
	  • Washington Metropolitan Area Transit Authority (WMATA)
	  • Potomac and Rappahannock Transportation Commission (PRTC)
	  • City of Alexandria (DASH)
	  • City of Fairfax (CUE)
	  • Fairfax County (Fairfax Connector Transit)
	  • Arlington County (ART and STAR)
	  • Loudoun (LCTA and Express Bus)
	  • Springfield (TAGS Metro Springfield Circulator)
	  • Falls Church Bus

Table 1 – NOVA Stakeholder List

Stakeholder Name	NOVA ITS Architecture System Responsibility
VDOT NOVA District	• NOVA Sections • VDOT NOVA Geographic Information System (GIS) • VDOT NOVA Maintenance & Construction Operations • VDOT NOVA Safety Service Patrol • VDOT NOVA Smart Traffic Center (STC) • VDOT NOVA Snow Operations • VDOT NOVA Snow Plow Vehicles • VDOT NOVA STC Field Equipment • VDOT NOVA Smart Traffic Signal System (STSS) • VDOT NOVA STSS Field Equipment • VDOT NOVA Transportation Communications Center (TCC)
Northern Virginia Transportation Commission (NVTC)	• NVTC Center
Parking Management Agencies	• Other Parking Management
Rail Operators	• Rail Operations
Local Universities and Research Facilities	• Research and Data Collection Centers
Electronic Payment Smart Tag Clearinghouse	• Smart Tag Center
University of Virginia	• Smart Travel Lab
Event Promoters	• Special Event Promoters
Partners in Motion	• Transportation Information Clearinghouse
VDOT Traffic Engineering Division	• VDOT Mobility Data Store
VDOT Central Office	• VDOT Transportation Emergency Operations Center (TEOC) • Road Weather Information System (RWIS)
Virginia State Police	• Virginia State Police Center
Virginia Smart Travel Program	• Virginia Statewide Advanced Traveler Information System (ATIS) Clearinghouse
Virginia Toll Facilities	• Virginia Toll Facility Centers
Virginia Railway Express (VRE)	• VRE Center

4.2 SYSTEM INVENTORY

Table 2 represents the ITS systems in the NOVA ITS Architecture. The first column lists the systems that comprise the NOVA ITS Architecture. The second column provides a description of the system and the role it plays in the NOVA region.

The third column indicates the status of the system as existing or planned. For instance, a system is labeled as existing if it is currently operational. An existing system may not have all the functionality required to support the information exchanges defined in the ITS architecture.

The additional functionality will be added as part of projects that implement the interfaces defined in the ITS architecture. A system is labeled as planned if the need has been identified by the appropriate stakeholders. In this context, “planned” does not mean that the system is programmed and funded in the transportation plan or that a commitment has been made to implement it by an agency, it means there is an identified need for this system and it may be implemented in the future.

The fourth column indicates the relationship the system has with the National ITS Architecture. This relationship is illustrated by matching/mapping the system functionality to the National ITS Architecture subsystem or terminator that best represents the system. The fifth column identifies the stakeholder that is either the owner and/or responsible for operating the system. The system inventory will aid users of the NOVA ITS Architecture in understanding the capabilities and/or interfaces that are supported by systems in the NOVA region or are planned for the future. A user’s association with a particular inventory item provides them with a vantage point from which to view the interfaces of that system with other systems in the architecture, thus providing a better understanding of the integration opportunities available.

Table 2 – NOVA System Inventory

Name	Description	Status	Architecture Element	Stakeholder/Owner
Adjacent VDOT STCs	This element represents other Smart Traffic Centers that are adjacent to Northern Virginia. Examples of these centers are Richmond STC, Fredricksburg STC, Culpepper STC, and Staunton STC. This element is labeled as existing because the Richmond STC exists. Capabilities supported by the Richmond STC to support interfaces in the architecture should be similar to those in the other adjacent STCs when they are implemented.	Exisiting	• Other TM	VDOT Districts
Baltimore-Washington HIDTA	This element represents a communication network that allows several emergency agencies across multiple jurisdictions to communicate with one another. For example, various police agencies can access information regarding high intensity drug trafficking areas in multiple jurisdictions.	Planned	• Emergency Management • Emergency Vehicle Subsystem	CAPWIN
Commercial Vehicle Management System	This system determines if commercial vehicles are overweight and/or overheight the limits for bridge traffic set by the DMV.	Planned	• Archived Data Management Subsystem • Commercial Vehicle Administration • Commercial Vehicle Check • Roadway Subsystem	DMV
DC Emergency Preparedness Center	Duties include providing public through police and fire agencies and also responding various emergency situations throughout the DC area. The FBI is also among this group which is responsible for domestic terrorism.	Existing	• Other EM	District of Columbia Public Safety Agencies
DC ITMS	The Integrated Transportation Management System (ITMS) element is operated by the District of Columbia Department of Transportation. The ITMS controls the Signal System in the District along with controlling VMS on the DC section of I-395.	Existing	• Other TM	DC DOT

Table 2 – NOVA System Inventory

Name	Description	Status	Architecture Element	Stakeholder/Owner
Federal Installations	This element represents major employment centers within the region as well as agencies that respond to major disasters that will impact the VA/DC/MD area. Examples of federal installations are GAO and the Military. (Note: the list is not inclusive but provides the reader with a general idea of the type of organizations).	Existing	• Emergency Management	Federal Agencies
Federal Law Enforcement	This element represents federal law enforcements (e.g., FBI) that may require information exchange with traffic management agencies (e.g., STC) allowing them to view CCTV images but not have control. This capability will only be exercised during emergency situations.	Planned	• Other TM	Federal Agencies
Greenway Center	This center is responsible for the administration of the Greenway toll system. This center also reports incidents that occur on the Greenway Toll system to the Virginia State Police (VSP).	Existing	• Toll Administration • Toll Collection • Other EM	Dulles Greenway
IEN	The Information Exchange Network (IEN) is a separate computer system from the traffic controller's workstation and allows traffic controllers to input incident information along I-95/395/495. This information is used by members of the I-95 corridor coalition to allow them to be informed of incidents from the states of Virginia to Maine. This station must be monitored and updated for accuracy.	Existing	• Other TM	I-95 Corridor Coalition
IMMP	This system is an Integrated Maintenance Management Program/Asset Management. This system is used to coordinate maintenance and construction activities. This system covers all aspect of operations such as the Inventory and Condition Assessment System (ICAS), the Integrated Maintenance Management System (IMMS), the Bridge Management System (BMS), and the Virginia Operational Information System (VOIS).	Planned	• Construction and Maintenance	VDOT Maintenance Division

Table 2 – NOVA System Inventory

Name	Description	Status	Architecture Element	Stakeholder/Owner
ISP Centers	These Information Service Provider (ISP) centers provide value added transportation information to the public. Examples of existing centers in operation are Partners in Motion and VF (Vision Factory).	Existing	• Information Service Provider	Regional ISPs
Laptop Computers	This element represents laptop computers the STC and STSS use to dial into their system to control their traffic management system from remote locations. This element also represents VDOT's Camp 30 in the NOVA District having control of the STSS during emergency situations. Camp 30 has a back up computer system that can control the signal system. To date, the STSS and Camp 30 remote laptop control capabilities are exist and the STC laptop control capabilities are planned.	Existing (STC laptop remote control is planned)	• Other TM	VDOT
Maryland CHART	Generic name for Maryland State Highway Administration Traffic Operation Centers - Includes Statewide Operations Center and Regional Traffic Operation Centers.	Existing	• Other EM • Other TM	Maryland State Highway Administration
Media Centers	Theses centers are responsible for obtaining and sharing transportation information to the public via news, radio, and cable networks.	Existing	• Media	Media
Metropolitan Washington COG Center	A regional metropolitan planning organization that provides transportation information along with ozone alerts to the STC so operators will know when to post ozone warning messages on VMS.	Existing	• Archived Data Management Subsystems • Emissions Management • Archived Data User Systems	Metropolitan Washington Council of Governments (MWCOG)
MWAA Center	This element represents the Metropolitan Washington Airport Authority that provides parking information and road congestion information at airports.	Existing	• Fleet and Freight Management • Information Service Provider • Parking Management • Transit Management	Metropolitan Washington Airport Authority (MWAA)

Table 2 – NOVA System Inventory

Name	Description	Status	Architecture Element	Stakeholder/Owner
National Advisory Warning System	The National Advisory WArning System (NAWAS) is an emergency system that is operated by the Washington, DC emergency management that obtains and disseminates information regarding major incidents impacting traffic flow into and out of Washington, DC as well as the Wilson Bridge. NOVA STC periodically contacts NAWAS to confirm incidents that impact Virginia's roadway systems and to confirm national weather information.	Existing	• Emergency Management • Weather Service	FEMA
National Park Services	Responds to incidents and provide traffic management centers with incident data on parkways. Park police is also included here because they respond to incidents that occur on the parkways. Park police are also associated with CAPWIN.	Existing	• Emergency Management • Traffic Management	DC/VA/MD
NOVA Local Public Safety Centers	These centers are responsible for providing public safety in the forms of police and fire for the various counties in the state of Virginia. Examples are • Arlington County Police and Fire • Herndon Police Department • Fairfax County Police and Fire • Leesburg Police Department • Loudoun County Fire and Rescue • Manassas Police Department • Prince William County Police and Fire • Fairfax City Police and Fire • Falls Church Police and Fire • City of Alexandria Police and Fire • Loudoun Sheriff • Vienna Police Department. This element also represents Virginia Emergency Management.	Existing	• Emergency Management	NOVA Local Public Safety Agencies

Table 2 – NOVA System Inventory

Name	Description	Status	Architecture Element	Stakeholder/Owner
NOVA Local Signal Centers	The element captures agencies that operate signal systems in Northern Virginia with similar functionality. Examples of these agencies are • City of Alexandria • City of Fairfax • City of Falls Church • City of Manassas • City of Manassas Park • Arlington County • Town of Herndon • Town of Leesburg • Town of Vienna	Existing	• Emergency Management • Traffic Management	NOVA Local Signal Agencies
NOVA Local Transit Centers	Basic transit service and paratransit service are provided by the following agencies in Northern Virginia: • Washington Metropolitan Area Transit Authority (WMATA - metro access) • Potomac and Rappahannock Transportation Commission (PRTC - services offered are fixed and paratransit) • City of Alexandria – DASH • City of Fairfax – CUE • Fairfax County - Fairfax Connector Transit • Arlington County - ART and STAR • Loudoun (LCTA and Express Bus) • Springfield (TAGS Metro Springfield Circulator) • Falls Church Bus	Existing	• Transit Management • Transit Vehicle Subsystem	NOVA Local Transit Agencies

Table 2 – NOVA System Inventory

Name	Description	Status	Architecture Element	Stakeholder/Owner
NOVA Sections	This element represents the various NOVA internal sections. The sections that are within this group are • Location and Design (L&D) • Land Development • Traffic Engineering • VDOT NOVA Residencies • Transportation Planning • Environmental Also note that some archiving may be paper files initially, while the ultimate goal may be for all files to be in an electronic format.	Existing	• Archived Data Management Subsystems • Archived Data User Systems	VDOT NOVA District
NVTC Center	This center is responsible for collecting and using transit data for policy development and operational analysis.	Existing	• Archived Data User Systems	Northern Virginia Transportation Commission (NVTC)
Other Parking Management	This element represents systems that provide parking availability information for either Transit lots, Retail lots, or non-VDOT Park and Ride lots.	Planned	• Parking Management	Parking Management Agencies
Other STCs	This element represents other Smart Traffic Centers that are not adjacent to NOVA STC and have potential to share traffic information with traffic management systems in Northern Virginia through Transportation Emergency Operation Center (TEOC). Examples of these centers are STCs in Bristol, Salem, Lynchburg, and Hampton Roads. Of these STCs, only the Hampton Roads STC exists.	Existing	• Other TM	VDOT Districts
Rail Operations	This element represents rail agencies that are primary responsible for freight movements. Examples are CSX and Norfolk Southern.	Existing	• Multimodal Crossings • Rail Operations	Rail Operators

Table 2 – NOVA System Inventory

Name	Description	Status	Architecture Element	Stakeholder/Owner
Regional Transit Electronic Clearinghouse	This element represents a planned back office environment for housing electronic data of passenger usage information for the VA/DC/MD areas across the may transit properties in the region. WMATA currently has a smart card system but a regional clearinghouse system that provides access for all properties does not exist at this time..	Planned	• Transit Management	DC/VA/MD
Research and Data Collection Centers	These centers collect transportation data for research and operational analysis. Examples of these centers are the FHWA Turner Fairbanks Research Center, George Mason University, and Virginia Tech Falls Church Campus.	Existing	• Archived Data User Systems	Local Universities and Research Facilities
RWIS	This element is a Road Weather Information System that obtains environmental conditions information from sensors in the road.	Existing	• Roadway Subsystem	VDOT TEOC
Smart Tag Center	This center is responsible for the back office administration of all Virginia toll systems, Dulles Toll Road, and the Greenway.	Existing	• Toll Administration	Electronic Payment Smart Tag Clearinghouse
Smart Travel Lab	The Smart Travel Lab at UVA are responsible for research and provides archive data to the STC and STSS as stated in VDOT Policy along with NOVA sections, transit and COG clearinghouses. The Smart Travel Lab will also be users of archive data obtained by the NOVA Section and the Mobility Data Store.	Existing	• Archived Data Management Subsystem • Information Service Provider • Archived Data User Systems	University of Virginia
Special Event Promoters	This element represents special event promoters in the VA/DC/MD areas. It includes functions at stadiums or universities, and also includes activities such as parades or visiting the Smithsonian, etc.	Existing	• Event Promoters	Event Promoters

Table 2 – NOVA System Inventory

Name	Description	Status	Architecture Element	Stakeholder/Owner
Transportation Information Clearinghouse	This element is responsible for housing all transportation information in the VA/DC/MD area that can be used for traveler information and/or agency management data coordination.	Planned	• Information Service Provider	Partners in Motion (this organization may change in the future with the implementation of a new transportation information system)
Mobile Unified Command	This element represents a command structure that allows several agencies to coordinate their activities for major incidents at the incident site in a mobile unit (incidents that closed two or more lanes and/or last longer than two hours).	Existing	• Emergency Management • Traffic Management	Virginia State Police
VDOT Mobility Data Store	This element will be a central location for storing ITS and non-ITS data at some point in the future.	Planned	• Archived Data Management Subsystem	VDOT Traffic Engineering Division
VDOT NOVA Dulles Toll Road (DTR)	This center is responsible for the administration of the Dulles toll system. Incidents are also identified and reported to the STC and SSP.	Existing	• Toll Collection	VDOT
VDOT NOVA GIS	This element represents a database that maps the locations of VDOT's ITS equipment.	Existing	• Traffic Management • Map Update Provider	VDOT NOVA District
VDOT NOVA Maintenance & Construction Operations	Agencies that are associated with this element are VDOT local utility organizations and other construction agencies who's work activity will impact traffic operations.	Existing	• Construction and Maintenance	VDOT NOVA District
VDOT NOVA Parking Management	This element represents a system that monitors the number of vehicles that are entering and exiting VDOT parking facilities (e.g., VDOT's park and ride lots).	Planned	• Parking Management	VDOT
VDOT NOVA Safety Service Patrol (SSP)	The safety service patrol is responsible for identifying and responding to incidents and clearing incidents that occur on VDOT's roadway system.	Existing	• Emergency Management • Emergency Vehicle Subsystem	VDOT NOVA District

Table 2 – NOVA System Inventory

Name	Description	Status	Architecture Element	Stakeholder/Owner
VDOT NOVA Smart Traffic Center (STC)	VDOT Northern Virginia Smart Traffic Center is responsible for monitoring and managing traffic conditions on I-495, I-95/395, I-66, and DTR (in the future).	Existing	• Archived Data Management Subsystem • Information Service Provider • Emergency Management • Traffic Management	VDOT NOVA District
VDOT NOVA Snow Operations	The electronic snow plow reporting systems aids VDOT in deploying snow operations. This is an AVL and website operation.	Existing	• Emergency Management	VDOT NOVA District
VDOT NOVA Snow Plow Vehicles	These are vehicles that are equipped to manage snow and ice conditions.	Existing	• Emergency Vehicle Subsystem • Vehicle	VDOT NOVA District
VDOT NOVA STC Field Equipment	These devices are typically located along the roadside and are controlled by operators in the STC which aids them in monitoring and managing traffic conditions. The field that aids operators in performing their functions are: VMS, Reversible HOV, HAR, Ramp Meters, Vehicle Detection, Lane Control Signals, Call Boxes, CCTV, and truck rollover systems that monitor the height and speed of trucks to determine potential rollovers on road curves.	Existing	• Roadway Subsystem	VDOT NOVA District
VDOT NOVA Smart Traffic Signal System (STSS)	This element represents the VDOT Northern Virginia Smart Traffic Signal System that is responsible for controlling signals in Fairfax, Prince William and Loudoun Counties.	Existing	• Emergency Management • Traffic Management	VDOT NOVA District
VDOT NOVA STSS Field Equipment	These devices are typically located along the roadside and are controlled by operators in the STSS which aids them in monitoring and managing conditions. Examples include traffic controllers for the traffic signal system, CCTV, and vehicle detection.	Existing	• Roadway Subsystem	VDOT NOVA District

Table 2 – NOVA System Inventory

Name	Description	Status	Architecture Element	Stakeholder/Owner
VDOT NOVA Transportation Communication Center (TCC)	VDOT Northern Virginia Transportation Communications Center is responsible for providing transportation information to the public and refer the public to VDOT staff in responding to public inquires. TCC operates the (703) 383-VDOT call center Monday to Friday from 8am to 5pm and the calls are transferred to STC after TCC's operating hours. TCC provides snow operation update during snow operations. TCC also provides VDOT internal business needs on telecommunications (i.e. phone, cell phone, video conferencing, etc.)	Existing	• Emergency Management • Information Service Provider • Other EM • Other TM	VDOT NOVA District
VDOT Public Affairs	This office is responsible for providing transportation information to the public and media.	Existing	• Other TM	VDOT
VDOT TEOC	Transportation Emergency Operations Center (TEOC) in Richmond is responsible for coordinating and responding to statewide emergencies.	Existing	• Emergency Management • Traffic Management	VDOT Central Office
Virginia State Police Center	This center is responsible for providing public safety in the state of Virginia by responding to incidents that occur on VDOT's roadway system.	Existing	• Emergency Management	Virginia State Police
Virginia Statewide ATIS Clearinghouse	This element represents a planned back office environment for housing traveler information data of its customers.	Planned	• Information Service Provider	Virginia Smart Travel Program
Virginia Toll Facility Centers	These centers are responsible for the administration of Virginia toll systems. Examples are Powhite, Parkway George P. Coleman Bridge, and Other Toll Facilities other than NOVA DTR.	Existing	• Toll Collection	Virginia Toll Facilities
VRE Center	Virginia Railway Express - Rail transportation. AMTRAK is also part of this element since its functions are similar to VRE's.	Existing	• Multimodal Transportation Service Provider • Other TRM	Virginia Railway Express (VRE)

4.3 SYSTEM INTERCONNECTS

Figure 3 is a high level interconnect diagram that identifies the elements of the National ITS Architecture that support the NOVA ITS Architecture. The unshaded boxes in the diagram highlight the National ITS Architecture subsystems that are applicable to the NOVA ITS Architecture. While this illustration provides a very high level view of the components in the NOVA ITS Architecture, it does not provide enough detail to understand the myriad of interconnections in the architecture.

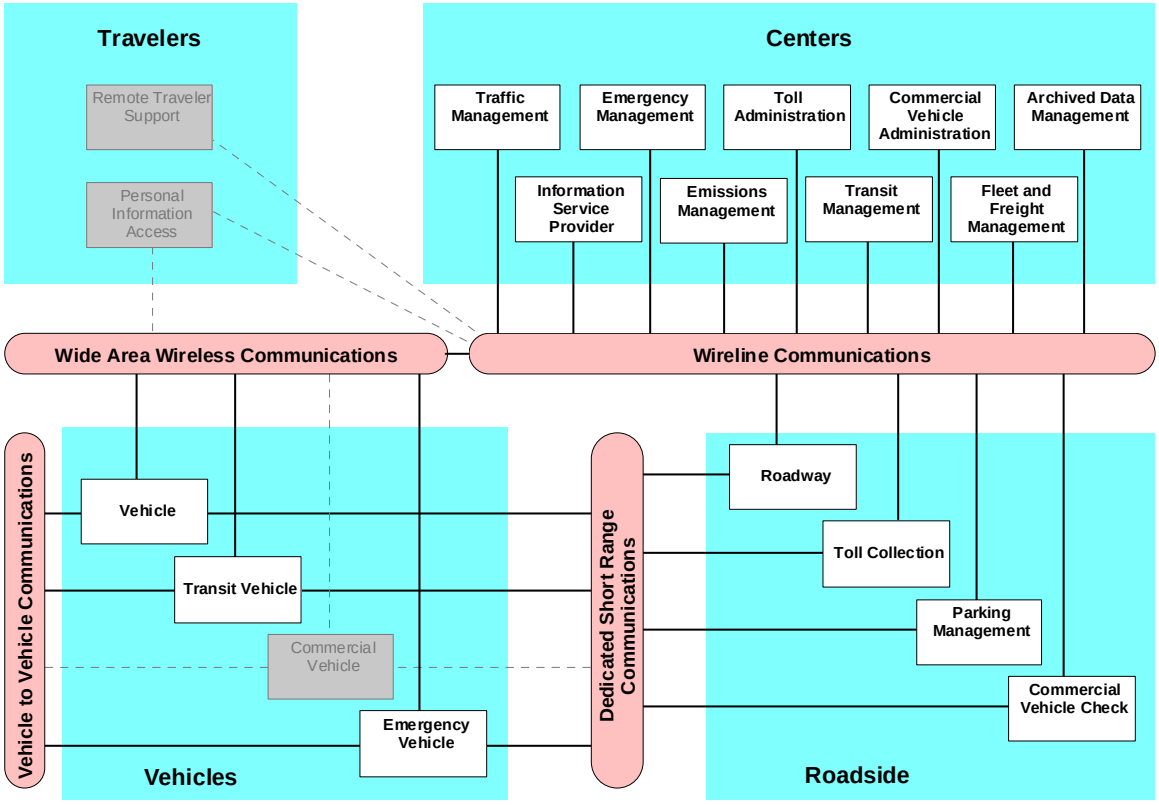


Figure 3 – NOVA ITS Interconnect Diagram

System interconnections describe which agencies are currently exchanging information or have plans to exchange information in the future. The interconnections between the various systems are shown in Appendix B. Appendix B contains system interconnect diagrams for each system identified in the NOVA system inventory (Table 2). Each diagram displays a domain specific system and indicates if a particular agency is currently sharing data or plans to share data in the future. Figure 4 illustrates this diagram format.

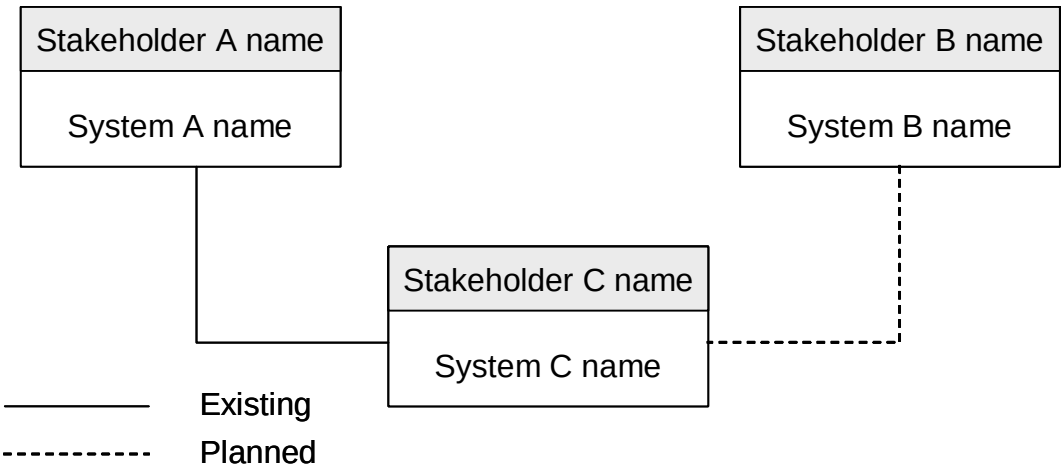


Figure 4 – Example Interconnect Diagram

System A that is owned or operated by Stakeholder A is currently connected to System C. This interconnection is "existing" as represented by the solid line interconnecting the systems. System B does not have a connection with System C but an interconnection is planned in the future as represented by the dashed line interconnecting the systems.

To further illustrate interconnections between systems, in Appendix B Figure B1 Adjacent VDOT STCs is currently sharing data with VDOT NOVA Smart Traffic Center and has plans to share data with the VDOT TEOC and NOVA Local Public Safety Centers in the future. Although there is a single line that is shown between a pair of systems it should be noted that the information exchange can be bi-directional.

System Interconnects are the starting point for stakeholders to become familiar with the overall environment in which they operate. The system interfaces and information flows, described in the next section, provide each interconnection's information content.

4.4 SYSTEM INTERFACES AND INFORMATION EXCHANGES

To understand the interfaces between a pair of systems, the information exchanges between interconnected systems should be examined. At the information exchange level, it is evident what information is shared over the system interconnects identified in Appendix B. Appendix C contains diagrams illustrating the information exchanges among the systems in the NOVA ITS Architecture. Each diagram displays the following information shown below:

- **Box** – top part of box identifies the stakeholder/owner, and the bottom part of the box identifies the system name (as described in the system inventory).

- **Flow Name** – the name of the information flow carrying the content information. In order view the Flow Description, the reader is referred to Appendix D, which is an alphabetical listing of the flow name and description of the information contents of the flow. In most cases, information flows names are taken directly from the National ITS Architecture

definition, however, some information flows were defined as unique to the NOVA ITS Architecture and are identified with an asterisk (*).

- **Legend indicating the Flow Status** – indication of the flow name as being an existing information exchange (solid line) or an exchange that is planned (hashed line) at a later date.

Below each diagram in Appendix C is a brief description of the interfaces in the NOVA ITS Architecture. Figure 5 illustrates the information exchange diagram format described above. In this example, System A, owned or operated by Stakeholder A, plans to send information labeled "Information Flow A" to System C. This is a planned information exchange as represented by the dashed line. The arrow on the line also illustrates the direction of the information flow or the source and destination of the information. "Information Flow B" is currently being exchanged between System C and System A as represented by the solid line.

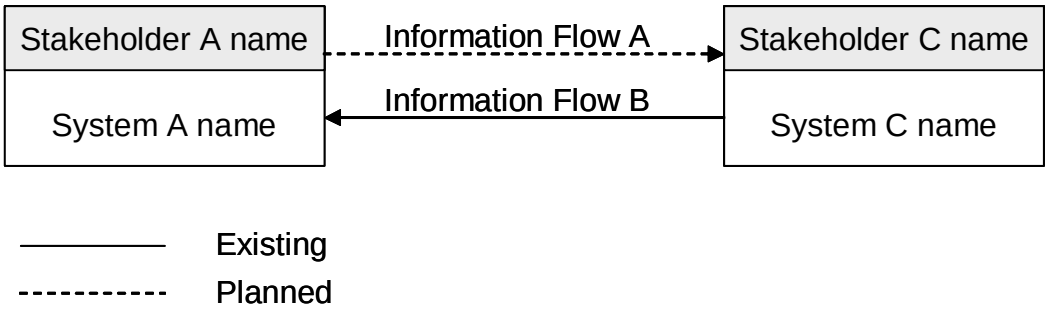


Figure 5 – Example Information Flow Diagram

5 ITS STANDARDS TO CONSIDER

For each information exchange between systems interconnect in the NOVA ITS Architecture, there are *potential* standards that can be examined to aid in deploying system interfaces. The following tables summarize the potential center-to-field and center-to-center ITS standards for the NOVA ITS Architecture.

An example of a center-to-field interface is the VDOT NOVA Smart Traffic Center (representing the center) to VDOT NOVA STC Field Equipment (representing the field). An example of a center-to-center interface is the VDOT NOVA Smart Traffic Center to Maryland CHART.

The intent of this section on standards is to highlight standards for consideration either on a region-wide basis or when defining ITS projects based on the NOVA ITS Architecture. One of the benefits of standards is establishing common ways of exchanging information across interfaces between systems. On a region-wide basis, interfaces such as those between center systems, for example the VDOT NOVA STC and the NOVA Local Transit Agencies, may benefit by establishing a standard interface that allows information exchange between interconnected centers to be done in the same way. In this manner, for example, the STC would not have to develop individual interface definitions for each transit system if a standard was selected on a region-wide basis. This would reduce costs and allow for efficient integration of the systems. Agreements could be established between the appropriate organizations documenting what standards will be used for particular interfaces so that the interface scope is somewhat defined in advance.

When defining projects based on the NOVA ITS Architecture, the use of particular interface standards should be identified and documented so that other projects are aware of the standards being used and can expand on their use. For instance, the implementation of Message Sets for External TMC Communication standards on a STC project would provide message set definition for the project and also provide guidance to other projects in the future about how to communicate with the STC.

During project definition, as the project architecture is defined using the Turbo Architecture software tool, reports can be generated linking the information flows chosen to potential ITS standards. The project developer would then investigate the status of the potential standards provided in the report and determine which standards are beneficial to the project.

5.1 CENTER-TO-FIELD ITS STANDARDS

Table 3 is a summary of the center-to-field ITS Standards for the NOVA ITS Architecture. The first column identifies the ITS Standard document identification number and the second column lists the associated title of the ITS Standard.

Table 3 – Center-to-Field ITS Standards Summary

Document ID	Title
NTCIP 1101	Simple Transportation Management Framework (STMF)
NTCIP 1103	Simple Transportation Management Protocol (STMP)
NTCIP 1201	Global Object Definitions
NTCIP 1202	Object Definitions for Actuated Traffic Signal Controller Units
NTCIP 1203	Object Definitions for Dynamic Message Signs
NTCIP 1204	Object Definitions for Environmental Sensor Stations & Roadside Weather Information System
NTCIP 1205	Data Dictionary for Closed Circuit Television (CCTV)
NTCIP 1206	Data Collection & Monitoring Devices
NTCIP 1207	Ramp Meter Controller Objects
NTCIP 1208	Object Definitions for Video Switches
NTCIP 1209	Transportation System Sensor Objects
NTCIP 1210	Objects for Signal Systems Master
NTCIP 1211	Objects for Signal Control Priority
NTCIP 2001	Class B Profile
NTCIP 2101	Point to Multi-Point Protocol Using RS-232 Subnetwork Profile
NTCIP 2102	Subnet Profile for PMPP Over FSK modems
NTCIP 2103	Subnet Profile for Point-to-Point Protocol using RS 232
NTCIP 2201	Transportation Transport Profile
NTCIP 2301	Application Profile for Simple Transportation Management Framework (STMF)

5.2 CENTER-TO-CENTER ITS STANDARDS

Table 4 is a summary of the center-to-center ITS Standards for the NOVA ITS Architecture. The first column identifies the ITS Standard document identification number and the second column lists the associated title of the ITS Standard.

Table 4 – Center-to-Center ITS Standards Summary

Document ID	Title
ASTM AG	ADMS Standard Guidelines
ASTM DD	ADMS Data Dictionary Specifications
IEEE P1512-2000	Standard for Common Incident Management Message Sets (IMMS) for use by EMCs
IEEE P1512.1	Standard for Traffic Incident Management Message Sets for Use by EMCs
IEEE P1512.2	Standard for Public Safety IMMS for use by EMCs
IEEE P1512.a	Standard for Emergency Management Data Dictionary
ITE TM 1.03	Standard for Functional Level Traffic Management Data Dictionary (TMDD)
ITE TM 2.01	Message Sets for External TMC Communication (MS/ETMCC)
ITE TS 3.TM	TCIP - Traffic Management (TM) Business Area Standard
NTCIP 1102	Base Standard: Octet Encoding Rules (OER)
NTCIP 1301	Message Set for Weather Reports
NTCIP 1401	TCIP - Common Public Transportation (CPT) Business Area Standard
NTCIP 1402	TCIP - Incident Management (IM) Business Area Standard
NTCIP 1403	TCIP - Passenger Information (PI) Business Area Standard
NTCIP 1405	TCIP - Spatial Representation (SP) Business Area Standard
NTCIP 1406	TCIP - Onboard (OB) Business Area Standard
NTCIP 1407	TCIP - Control Center (CC) Business Area Standard
NTCIP 1408	TCIP - Fare Collection (FC) Business Area Standard
NTCIP 2104	Subnet Profile for Ethernet
NTCIP 2202	Internet (TCP/IP and UDP/IP) Transport Profile
NTCIP 2302	Application Profile for Trivial File Transfer Protocol
NTCIP 2303	Application Profile for File Transfer Protocol (FTP)
NTCIP 2304	Application Profile for Data Exchange ASN.1 (DATEX)
NTCIP 2305	Application Profile for Common Object Request Broker Architecture (CORBA)

Table 4 – Center-to-Center ITS Standards Summary

Document ID	Title
NTCIP 2501	Information Profile for DATEX
NTCIP 2502	Information Profile for CORBA
SAE J2353	Data Dictionary for Advanced Traveler Information System (ATIS)
SAE J2354	Message Set for Advanced Traveler Information System (ATIS)
SAE J2529	Rules for Standardizing Street Names and Route IDs
SAE J2540	Messages for Handling Strings and Look-Up Tables in ATIS Standards

The potential ITS Standards summary for the NOVA ITS Architecture was created by summarizing all ITS Standards by the information flow. Each information flow in the National ITS Architecture has a corresponding ITS Standards activity if such an activity exists. Some of the standards in the Center-to-Center table can also be utilized in Center-to-Field scenarios (e.g., NTCIP 2303 - File Transfer Protocol (FTP)). It is important to note that interrelationships exist among the various standards, and agencies may need to select more than one standard from the list of choices. For example if a center-to-center standard is being considered for the information flow “media information request” it might be determined that DATEX is the protocol of choice. However, those responsible for selecting an ITS Standard should investigate the following standards for the” media information request” architecture flow:

- Standard for Emergency Management Data Dictionary
- Standard for Common Incident Management Message
- Base Standard: Octet Encoding Rules (OER)
- Subnet Profile for Ethernet
- Internet (TCP/IP and UDP/IP) Transport Profile
- Application Profile for Data Exchange ASN.1 (DATEX)
- Information Profile for DATEX

Keep in mind that a suite of ITS Standards is needed to fully standardize the communications protocol, message sets and data elements. The goal is to end up with protocols, message sets, and data dictionaries that all work together. Also future design decisions should take the chosen standards into account and each standard needs to be fully understood when specifying it. ITS Standards have many mandatory and option capabilities that each need to be rigorously specified in order to achieve proper integration of systems.

Standards are an essential part of system integration. Several ITS standards activities are currently in development by the Standard Development Organizations (SDO). These standards address particular interfaces identified in the National ITS Architecture.

In ITS, standards development activities have been allocated to the following organizations:

- AASHTO (American Association of State Highway and Transportation Officials)
- ANSI (American National Standards Institute)

- 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)

Although each standards activity is allocated to a single SDO, it should be noted that many of the standards efforts are collaborative between multiple SDOs (e.g., NTCIP Joint Steering Committee is comprised of representatives from AASHTO, ITE and NEMA).
Table 5 lists the web sites of the SDO home pages (e.g., IEEE) as well as specific ITS Standards efforts (e.g., TMDD). Note: The ITS Standards specific Internet addresses may change in the future.

Table 5 – Standards Information Sources

Standard Development Organizations (SDO) Home Page	ITS Standards Specific Sites
AASHTO (www.aashto.org)	NTCIP website (www.ntcip.org) *
ASTM (www.astm.org)	Select the link for standardization news
IEEE (stdsbbs.ieee.org)	Standards Coordinating Committee on ITS (grouper.ieee.org/groups/scc32/index.html)
ITE (www.ite.org)	Traffic Management Data Dictionary and Message Sets for External Traffic Management Center Communications (www.ite.org/tmdd/)
SAE (www.sae.org)	www.sae.org/TECHCMTE/gits.htm

* Website also has an NTCIP guide that presents a framework on how NTCIP standards work.

There are several excellent resources about ITS standards on the World Wide Web. The ITS America Standards Home Page (www.itsa.org/standards.html) provides access to standards information relating to all aspects of ITS. It also contains links to the organizations involved and, where possible, provides rapid access to published standards documents. The U.S. DOT Joint Program Office Standards site (www.its-standards.net) provides current status on the standards acceleration program. The identified web site links may change from time-to-time. A current set of links to these sites will be maintained on the National ITS Architecture website at www.iteris.com/itsarch.

6 USING THE ARCHITECTURE

The work done to develop the NOVA ITS Architecture is valuable only if it contributes to improving the integration of transportation systems in Northern Virginia, particularly VDOT systems. VDOT transportation planning is a process that involves project definition, review, prioritization, approval, funding allocation, and incorporation into the transportation plan. The path a project follows in the planning process is dependent on the funding source being sought for the project. There are a few basic funding sources that the planning process supports: ITS Earmark funds, Federal, State, Congestion Mitigation and Air Quality (CMAQ), and Surface Transportation Program (STP) funds, and Special Grant funds. The planning process was examined in light of these various funding sources to determine how the NOVA ITS Architecture and the Communications Plan could be used as a reference in the pursuit of integration opportunities.

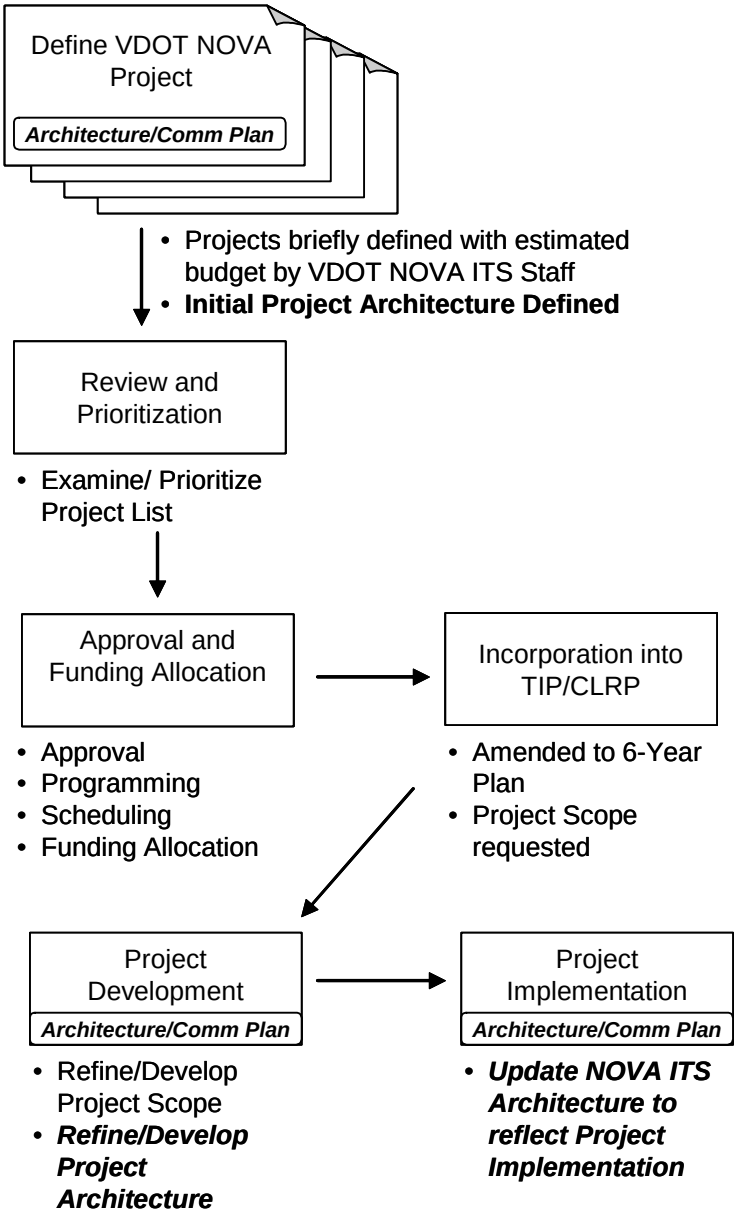


Figure 6 – General Project Initiation Process

Figure 6 illustrates a process that reflects the general steps required to define a project in VDOT's NOVA District. The points where the NOVA ITS Architecture and Communications Plan are beneficial are highlighted.

The process for defining, planning, and implementing projects involves several VDOT and non-VDOT organizations. In short, a project is defined at a high level and a cost estimate is associated with it.

There are three areas in the process that the NOVA ITS Architecture and Communications Plan should be used. First, as projects are initially

defined, the project initiators and the NOVA Smart Travel Manager, who is responsible for the NOVA ITS Architecture, can use the architecture to define a project architecture to better illustrate the project definition. At this point the definition of the project can include integration opportunities that the architecture identifies. The project then is reviewed and prioritized with other projects and funding is allocated. The Transportation Improvement Plan (TIP) and Constrained Long Range Plan (CLRP) are amended for the project and its funding. The project scope will be further defined and the project architecture will be updated with more detail to reflect any changes that occur during the planning process. This is an opportunity to reference the NOVA ITS Architecture and Communications Plan again to further detail the project and its architecture. Following project implementation, the project architecture will be incorporated into the NOVA ITS Architecture definition to reflect its implementation and make sure its other projects are aware of the interfaces and information that is available from the implemented system.

The goal of this effort is not to impose more work upon the NOVA Staff managing the ITS project development, but to ensure that the projects are defined with integration in mind. Each project should consider all potential integration possibilities. FHWA policy requires the definition of ITS projects that are consistent with a regional plan or architecture to better support integration. The architecture and communications plan provide a guide to integration opportunities between VDOT and regional stakeholders. Projects defined without considering integration opportunities will be found to be more costly in the long run due to the cost of redesign in the future. These tools will allow VDOT to better financially plan ITS investments and assist VDOT managers in understanding the priorities of ITS deployment in the NOVA District.

The various funding sources for different projects present variations on the general project initiation process illustrated in Figure 6. The first variation is the 6-year or Virginia Transportation Development Plan (VTDP) process illustrated in Figure 7. The proposed projects for the NOVA District are prioritized and sent to the Central Office and Transportation Board for approval, programming, scheduling and allocation of funding. The approved projects make up the 6-year plan which is sent back to the District offices. Each project manager who is responsible for a project in the 6-year plan develops a project scope and implements the project.

As the projects are processed through the 6-Year Plan, the project managers would use the NOVA ITS Architecture and Communications Plan to scope and define their projects. They would have access to the Turbo Architecture database and application software to develop project architectures based on the NOVA ITS Architecture. They would provide their project architectures to the NOVA Smart Travel Manager for review and approval for consistency with the NOVA ITS Architecture.

For local government projects receiving funding for projects with VDOT, the local government project manager would use the NOVA ITS Architecture and Communications Plan for those projects involving the local government and VDOT. Following project definition, the local government projects are forwarded to VDOT for approval and inclusion in the NOVA District's submittal to the VDOT Central Office for programming and scheduling. When other agencies are involved with the local government projects, the local governments are encouraged to use the DC Regional ITS Architecture to define their project interfaces.

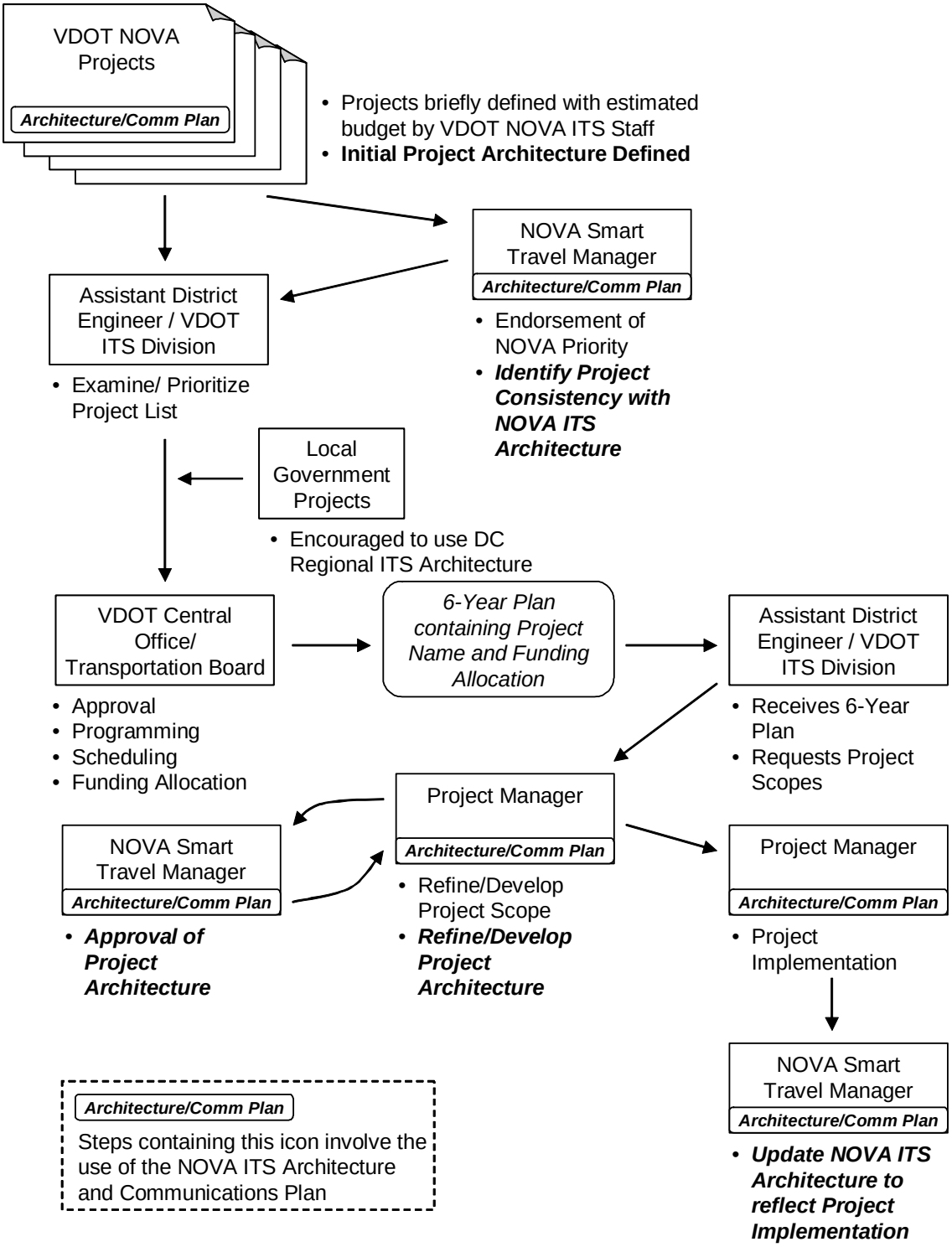


Figure 7 – VDOT NOVA District ITS Project Initiation Process through the Virginia Transportation Development Plan (6-Year Plan)

Following implementation, the final project architecture reflecting the actual state of the project implementation will be provided to the NOVA Smart Travel Manager for incorporation into the NOVA ITS Architecture. The completion of this cycle will make the most accurate architecture data available to the NOVA District, reflecting what exists and what is planned for future project definition and planning.

Ideally, the NOVA ITS Architecture should be used at the very beginning of this process when projects are first being defined. This may be an evolutionary step to be taken in the future as the use of the architecture and communications plan in the process becomes more mature.

A benefit of using the NOVA ITS Architecture and Communications Plan in this process will be more comprehensively defined projects with attention being paid to integration opportunities. By referencing a larger plan for ITS in the NOVA District, projects may be able to take advantage of other information that exists or will be made available in the future. In addition, a more focused plan will be made available across the District and those VDOT organizations from outside of NOVA that are involved in the project planning process will be able to make more informed decisions based on the information available in the architecture and communications plan.

Figure 8 illustrates the Project Initiation Process for ITS Earmark Funds. In this process, FHWA requires a project architecture at the initial proposal step and before an agreement is signed between the state and the FHWA. ITS projects are defined and proposed to US DOT in a Virginia statewide and DC Regional proposal. Upon completion of the review process at US DOT, Congress earmarks the funding for the state and the project is amended to the TIP/CLRP. The use of the NOVA ITS Architecture and Communications Plan in the development of an earmark project should highlight the integration opportunities and make them evident to the US DOT that the earmark funds are being targeted to a worthwhile project.

Figure 9 illustrates the Project Initiation Process for Special Grant Funds. This process is not as involved as the previously discussed processes. Projects are proposed to VDOT's Central Office. A VDOT Committee, of which the NOVA District is a member, reviews, scores, and selects the projects to receive the grant funding. Grant categories include enhancement, safety, and rail safety.

As can be seen in each of these process variations, the NOVA ITS Architecture and Communications Plan are consistently applied at key steps of the project definition and implementation.

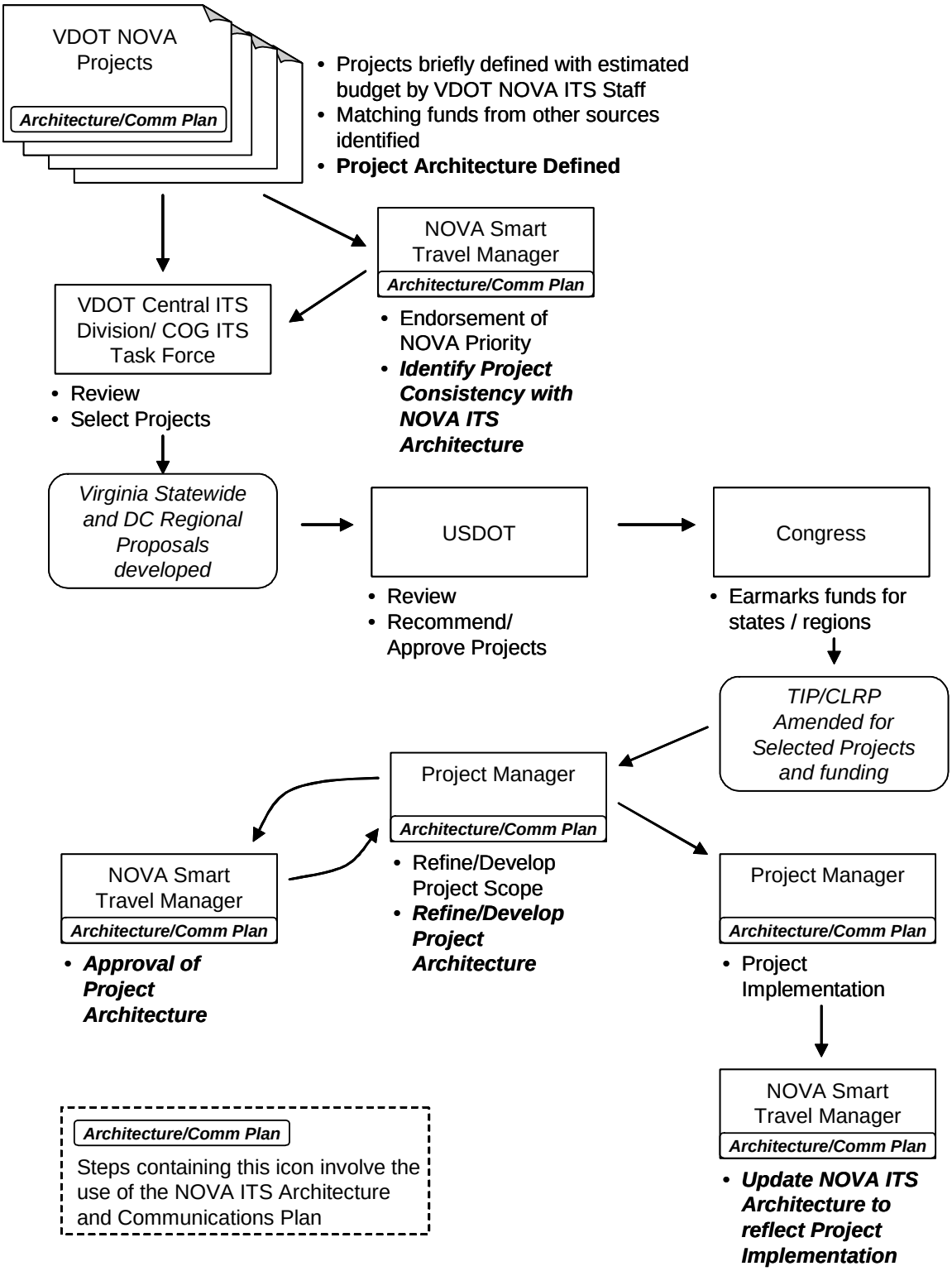

VDOT NOVA Projects
Architecture/Comm Plan
• Projects briefly defined with estimated budget by VDOT NOVA ITS Staff
• Matching funds from other sources identified
• Project Architecture Defined
NOVA Smart Travel Manager
Architecture/Comm Plan
• Endorsement of NOVA Priority
• Identify Project Consistency with NOVA ITS Architecture
VDOT Central ITS Division/ COG ITS Task Force
• Review
• Select Projects
Virginia Statewide and DC Regional Proposals developed
USDOT
• Review
• Recommend/ Approve Projects
Congress
• Earmarks funds for states / regions
TIP/CLRP Amended for Selected Projects and funding
Project Manager
Architecture/Comm Plan
• Refine/Develop Project Scope
• Refine/Develop Project Architecture
NOVA Smart Travel Manager
Architecture/Comm Plan
• Approval of Project Architecture
Project Manager
Architecture/Comm Plan
• Project Implementation
NOVA Smart Travel Manager
Architecture/Comm Plan
• Update NOVA ITS Architecture to reflect Project Implementation
Architecture/Comm Plan
Steps containing this icon involve the use of the NOVA ITS Architecture and Communications Plan

Figure 8 – VDOT NOVA District ITS Project Initiation Process for ITS Earmark Funds

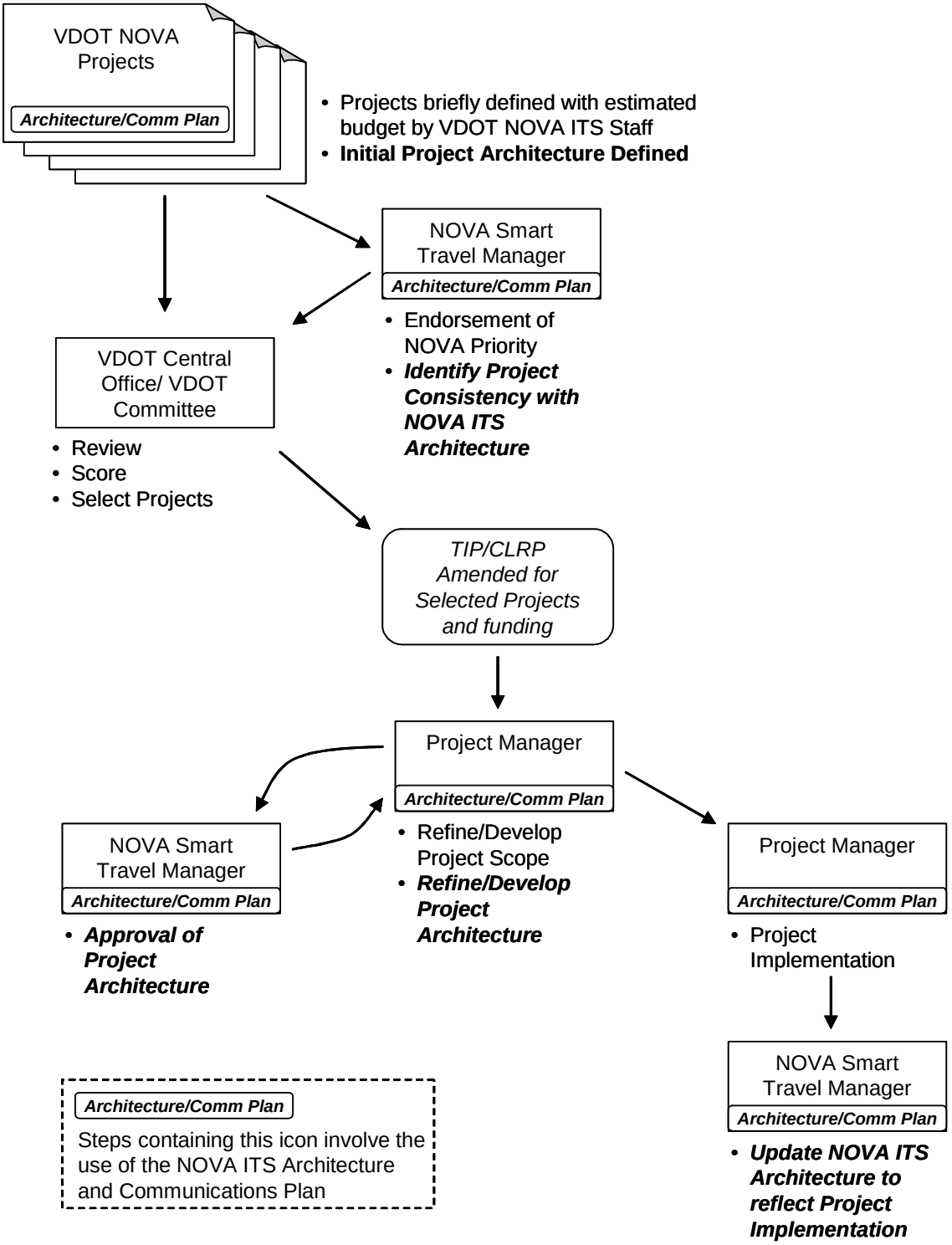
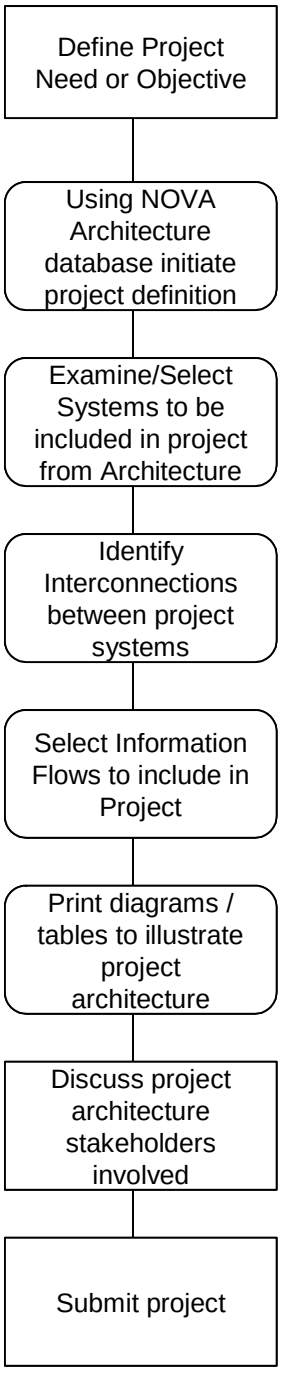


Figure 9 – VDOT NOVA District ITS Project Initiation Process for Special Grant Funds

7 DEFINING PROJECTS



The NOVA ITS Architecture describes subsystems, interconnects, and information flows necessary to deploy an integrated transportation system in NOVA. The architecture will be used by VDOT project managers to define ITS projects that implement portions of the architecture in a phased manner. Based on priorities established by VDOT concerning the immediate goals for ITS in the NOVA District, projects will be defined that incrementally deploy the required elements over time.

A need such as an improvement to fully utilize the Mobile Command Unit (MCU) would require an examination of the MCU's interfaces as described in the NOVA ITS Architecture. All interfaces would be analyzed and a priority would be established for the key elements identified in the architecture. While some projects may be able to fully deploy all interfaces within the project, other implementations may require a more phased approach that maximizes the use of available funding over many years or requires that significant deployments take place before the primary objective can be made operational.

In particular, a NOVA District Project Manager who has identified a need for the transportation system will note the primary systems involved such as the NOVA STC, Local Public Safety Systems such as emergency services, or the NOVA Safety Service Patrol. Figure 10 illustrates a basic process to develop a project architecture using Turbo Architecture, the software application that was used to build the NOVA ITS Architecture. The boxes with the rounded corners are steps that use the Turbo Architecture Tool. Using Turbo Architecture, the Project Manager will examine the NOVA ITS Architecture database and analyze the interconnections and information flows pertaining to each of the subsystems of interest. This analysis may identify other subsystems that should be included in the project. The Project Manager will then create a project architecture using Turbo Architecture and the NOVA ITS Architecture. By creating a project Architecture in this manner, the Project Manager is using the NOVA ITS Architecture as a reference and defining a project that is consistent with the NOVA ITS Architecture. This maximizes the possible integration opportunities that can be considered for the project. The Project Manager can make informed decisions about the integration boundaries of the project in the initial implementation and what will need to be supported in the future,

Figure 10 – Using Turbo Architecture

therefore defining a project that will support expanded capabilities in the future as the need or funding becomes available. The Turbo Architecture tools can be used to examine and select which systems will be interconnected and the information exchanges that will take place between them. Turbo Architecture also contains several reporting formats that allow the user to produce diagrams and tables to convey the architecture to others for review and approval.

Upon completion of the project architecture, the Project Manager will provide it to reviewers in the appropriate project initiation process. By using a common reference point across the District, the understanding of the components being implemented in each project should be better understood making the validation of the project much easier.

Following project completion, the NOVA ITS Architecture must be updated to reflect the establishment of interconnects and/or information flows or new subsystems in the architecture. If portions of the project architecture were not implemented as planned, they should not be reflected in the updated architecture so they may be considered as an aspect of another project in the future.

The Communications Plan should also be used when planning a project using the NOVA ITS Architecture. The Communications Plan and the Architecture are linked by the information flows. When a Project Manager has selected the information flows that will be included in a project, the Communications Plan should be examined pertaining to the selected information flows. The Communications Plan identifies the communications systems that are either available or planned for that particular information flow. This analysis will add more information to the project architecture increasing the knowledge the Project Manager has about the interfaces and infrastructure available and the costs involved with the project being defined.

8 MAINTAINING THE NOVA ITS ARCHITECTURE

As mentioned in the previous section, it is very important that the NOVA ITS Architecture be kept as up-to-date as possible so that the project managers using the architecture to define projects in the NOVA District have the most accurate information available. To maintain the NOVA ITS Architecture definition as accurately as possible, each project manager will provide the NOVA Smart Travel Manager with project architectures that reflect the projects implemented state when the project is completed. These project architectures should be defined using Turbo Architecture and the resulting database will be imported into the master NOVA ITS Architecture that is under the control of the NOVA Smart Travel Manager. The NOVA Smart Travel Manager will be responsible for making the NOVA ITS Architecture database available to all Project Managers and sending out notification about any updates.

The NOVA Smart Travel Manager plans to implement an NOVA ITS Architecture website at www.vdot-itsarch.com that will provide the latest NOVA ITS Architecture definition and Communications Plan information as well as alternative methods of quickly examining the Architecture database information. This site will be interactive and allow the user to examine architecture subsystems, information flows, and related communications plan elements.

APPENDIX A – FUNCTIONAL ANALYSIS MATRIX

Table A1 – Functional Analysis Matrix

Stakeholders	Inventory	Function	Traceability
DC/VA/MD	National Park Service	• Operate and maintain George Washington Parkway • Emergency Management on GW Parkway • Traffic Control at Incident Sites on GW Parkway • Incident Management on GW Parkway	Team knowledge from working on other projects.
FEMA	National Advisory Warning System	Emergency Management during major events	Discussions with VDOT Staff
NOVA Local Public Safety Agencies	NOVA Local Public Safety Centers • Arlington Co. Police Dept. • Arlington Co. Fire Dept. • Fairfax Co. Police Dept. • Fairfax Co. Fire Dept. • Loudoun Co. Fire & Rescue Services • Prince William Co. Police Dept. • Prince William County Fire Dept. • City of Alexandria Police Dept. • Fairfax City Police & Fire Departments • Falls Church Police & Fire Department • City of Alexandria Fire Department • Loudoun County Sheriff • Vienna Police Department	• Emergency Management • Traffic Control at Incident Sites • Incident Management • Aerial Video (helicopter) • Incident Management. for HAZMAT events	Team knowledge from working on other projects and discussions with VDOT Staff.
NOVA Local Transit Agencies	NOVA Local Transit Centers • Potomac and Rappahannock Transportation Commission (PRTC) • Washington Metropolitan Area Transit Authority (WMATA) • Fairfax Connector Transit • ART and STAR - Arlington County • CUE - City of Fairfax • DASH - City of Alexandria • Loudoun (LCTA and Express Bus)	• Planning • Data collection and analysis • Transit Management • AVL activities • Transit fleet vehicle management • Electronic Payment • Multi-modal support (information on travel modes) • Signal Priority	Team knowledge from working on other projects and discussions with VDOT Staff

Table A1 – Functional Analysis Matrix

Stakeholders	Inventory	Function	Traceability
Virginia State Police	Virginia State Police Center	• Emergency Management • Traffic Control at Incident Sites • Aerial Video (helicopter) • Communications/Dispatch • Incident Management • Customer Services	Team knowledge from working on other projects and discussions with VDOT Staff
VDOT Central Office	VDOT TEOC	• Emergency Management • Customer Services • Communications/Dispatch	Team knowledge from working on other projects and discussions with VDOT Staff
	VDOT Data Management Division	• Policy -- databases • May provide data warehousing function	
VDOT Central Office - Traffic Engineering	VDOT Mobility Data Store	• Policy	Discussions with VDOT Staff
VDOT Maintenance Division	IMMP	• Policy • Planning	NOVA District Smart Travel Program Summary Report -- 1999, Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with VDOT Staff
VDOT Districts	Adjacent STCs and Other STCs • Hampton Roads STC • Richmond STC • Culpeper STC • Staunton STC • Lynchburg STC • Salem STC • Bristol STC	• Emergency Management • Traffic Management • Freeway Management • Customer Services • Communications/Dispatch	VDOT Smart Travel Strategic Plan – 2001

Table A1 – Functional Analysis Matrix

Stakeholders	Inventory	Function	Traceability
VDOT NOVA District	VDOT NOVA Smart Traffic Center	• Emergency Management • Traffic Control • Monitor Traffic • Incident Detection • Communications/Dispatch • Freeway Management • Customer Services • ISP Data Dissemination	Team knowledge from working on other projects and discussions with VDOT Staff.
	VDOT NOVA STC Field Equipment • VMS Reversible • HOV • HAR • Ramp Meters • Vehicle Detection • Lane Control • Call Boxes	• Traffic Control • Incident Detection • Traffic Information Dissemination • Customer Services	NOVA District Smart Travel Program Summary Report -- 1999, NOVA Summary of 1999 Activities, Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with NOVA VDOT Staff
	VDOT NOVA Smart Traffic Signal System	• Traffic Management • Customer Services	NOVA District Smart Travel Program Summary Report -- 1999, NOVA Summary of 1999 Activities, Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with NOVA VDOT Staff
	VDOT NOVA STSS Field Equipment • Traffic Signal System • CCTV • Vehicle Detection	• Traffic Control • Traffic Management • Incident Detection	NOVA District Smart Travel Program Summary Report -- 1999, NOVA Summary of 1999 Activities, Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with NOVA VDOT Staff
	VDOT NOVA TCC	• Communications/Dispatch • Customer Services • Public Affairs	NOVA Summary of 1999 Activities, Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with NOVA VDOT Staff

Table A1 – Functional Analysis Matrix

Stakeholders	Inventory	Function	Traceability
VDOT NOVA District	VDOT NOVA Safety & Service Patrol	• Emergency Management • Maintenance vehicle fleet control – AVL • Disabled vehicle assistance • Incident management • Traffic Control at Incident Sites • Customer Services • Communications/Dispatch	NOVA District Smart Travel Program Summary Report -- 1999, NOVA Summary of 1999 Activities, Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with NOVA VDOT Staff
	VDOT NOVA Snow Operations	• Emergency Management Maintenance vehicle fleet control -- AVL • Customer Services • Communications/Dispatch • Information dissemination -- media and the public	NOVA District Smart Travel Program Summary Report -- 1999, NOVA Summary of 1999 Activities, Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with NOVA VDOT Staff
	VDOT NOVA Residencies	• Emergency Management • Maintenance site traffic control • Maintenance vehicle fleet control • Customer Services • Communications/Dispatch	Discussions with VDOT
	VDOT NOVA Maintenance and Construction Operations	• Construction vehicle fleet control • Construction site traffic control • Customer Services • Inspection of ALL construction/deployment	Team knowledge from working on other projects and discussions with VDOT Staff.
	VDOT NOVA GIS	• Maintains GIS database	NOVA District Smart Travel Program Summary Report -- 1999, NOVA Summary of 1999 Activities, Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with NOVA VDOT Staff

Table A1 – Functional Analysis Matrix

Stakeholders	Inventory	Function	Traceability
	NOVA Sections	• Archiving	NOVA District Smart Travel Program Summary Report -- 1999, Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with NOVA VDOT Staff
VDOT NOVA District	VDOT NOVA Dulles Toll Road (DTR)	• Toll Administration • Customer Services • Emergency Management • Maintenance site traffic control • Maintenance vehicle fleet control • Communications/Dispatch	NOVA District Smart Travel Program Summary Report -- 1999, Mapping of ten Smart Travel Systems to NOVA ITS Vision and knowledge gained through implementation of Smart Tag
	VDOT NOVA Parking Management	• Parking Management	Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with NOVA VDOT Staff
	Laptop Computers	• Traffic Management	Discussions with VDOT Staff
	VDOT Public Affairs	• Customer Service	Discussions with VDOT Staff
University of Virginia	Smart Travel Lab	• Data collection, analysis, & feedback • Research • Training	Discussions with VDOT Staff
Local Universities and Research Facilities	Research and Data Collection Centers • GMU • Virginia Tech's Falls Church Campus • FHWA Turner Fairbanks Research Center	• Data collection, analysis, & evaluation • Research	Discussions with VDOT Staff
DC DOT	DC ITMS	• Traffic Management • Arterial / Surface Street Management	Discussions with the DC regional architecture development team.
Maryland State Highway Administration	Maryland CHART	• Traffic Management • Emergency Management	Discussions with the Maryland statewide architecture development team.

Table A1 – Functional Analysis Matrix

Stakeholders	Inventory	Function	Traceability
District of Columbia Public Safety Agencies	DC Emergency Preparedness Center	• Emergency Management	Team knowledge from working on other projects and discussions with the DC regional architecture development team.
NOVA Local Signal Agencies	NOVA Local Signal Centers • City of Alexandria • City of Fairfax • City of Falls Church • City of Manassas • City of Manassas Park • Arlington County • Town of Herndon • Town of Leesburg • Town of Vienna • Fairfax County • Loudoun County • Prince William County	• Emergency Management • Transit Management • Traffic monitoring • Arterial / Surface Street Management	Team knowledge from working on other projects and discussions with VDOT Staff.
Metropolitan Washington Council of Governments (MWCOG)	Metropolitan Washington COG Center	• Planning • Data collection and analysis	Team knowledge from working on other projects and discussions with the DC regional architecture development team.
Northern Virginia Transportation Commission (NVTC)	NVTC	• Transit Policy Development • Transit Data collection and analysis	Discussions with VDOT Staff.
Virginia Railway Express (VRE)	VRE Center	• Transit Management • Rail fleet management • Multi-modal support (information on travel modes) • Electronic Payment	Discussions with VDOT Staff.

Table A1 – Functional Analysis Matrix

Stakeholders	Inventory	Function	Traceability
Metropolitan Washington Airport Authority (MWAA)	MWAA Center	• Fleet & Freight Management • Planning • Electronic Payment • Parking Management	Team knowledge from working on other projects and discussions with VDOT Staff.
Federal Agencies	Federal Installations	• Major Employer	Team knowledge from working on other projects and discussions with VDOT Staff.
	Federal Law Enforcement	• Respond to major disasters • View CCTV images	
Dulles Greenway	Greenway Center	• Toll Administration	Discussions with VDOT Staff.
Electronic Payment Smart Tag Clearinghouse	Smart Tag Center	• Financial Toll Administration	Mapping of ten Smart Travel Systems to NOVA ITS Vision and knowledge gained through implementation of Smart Tag Center and interfaces
I-95 Corridor Coalition	IEN	• Communications backbone	Team knowledge from working on other projects and discussions with VDOT Staff.
Partners in Motion	Transportation Information Clearinghouse	• Information Service Provider	Discussions with VDOT Staff.
Regional ISPs	ISP Centers • VF (Vision Factory) • Partners in Motion	• Information Service Provider • Data collection and analysis • Multi-modal support (information on travel modes)	Team knowledge from working on other projects and discussions with VDOT Staff.
Media	Media Centers	• Information Service Provider	Team knowledge from working on other projects and discussions with VDOT Staff.
Virginia Smart Travel Program	Virginia Statewide ATIS Clearinghouse	• Information Service Provider	Discussions with VDOT Staff

Table A1 – Functional Analysis Matrix

Stakeholders	Inventory	Function	Traceability
DMV	Commercial Vehicle Management System	• Emissions Management • Commercial Vehicle Administration • Fleet & Freight Management • Planning • CVO Enforcement & Regulation • Develops Policy • Data collection and analysis	Mapping of ten Smart Travel Systems to NOVA ITS Vision and discussions with VDOT Staff
Virginia Toll Facilities	Virginia Toll Facility Centers • Powhite Parkway • George P. Coleman Bridge	• Toll Administration	Knowledge gained through implementation of Smart Tag

APPENDIX B – SYSTEM INTERCONNECTS

To assist the reader in finding information about a particular system, the Table B1 is provided to identify the applicable figures that each system is contained in.

Table B1 – Appendix B System to Figure Interconnect Diagram Index

System Name	Appendix B Figure Number
Adjacent VDOT STCs	• Figure B1. Adjacent VDOT STCs Interconnects • Figure B19. NOVA Local Public Safety Centers Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B48. VDOT TEOC Interconnects
Baltimore-Washington HIDTA	• Figure B2. Baltimore-Washington HIDTA Interconnects • Figure B19. NOVA Local Public Safety Centers Interconnects • Figure B40. VDOT NOVA Safety Service Patrol Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B49. Virginia State Police Center Interconnects
Commercial Vehicle Management System	• Figure B3. Commercial Vehicle Management System Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects
DC Emergency Preparedness Center	• Figure B4. DC Emergency Preparedness Center Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects
DC ITMS	• Figure B5. DC ITMS Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects
Federal Installations	• Figure B6. Federal Installations Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B46. VDOT NOVA TCC Interconnects
Federal Law Enforcement	• Figure B7. Federal Law Enforcement Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects
Greenway Center	• Figure B8. Greenway Center Interconnects • Figure B30. Smart Tag Center Interconnects • Figure B36. VDOT NOVA Dulles Toll Road Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B49. Virginia State Police Center Interconnects
IEN	• Figure B9. IEN Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects
IMMP	• Figure B10. IMMP Interconnects • Figure B37. VDOT NOVA GIS Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects
ISP Centers	• Figure B11. ISP Centers Interconnects • Figure B16. MWAA Center Interconnects • Figure B24. Other Parking Management Interconnects • Figure B38. VDOT NOVA Maintenance & Construction Operations Interconnects • Figure B39. VDOT NOVA Parking Management Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B46. VDOT NOVA TCC Interconnects • Figure B50. Virginia Statewide ATIS Clearinghouse Interconnects

Table B1 – Appendix B System to Figure Interconnect Diagram Index

System Name	Appendix B Figure Number
Laptop Computers	• Figure B12. Laptop Computer Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects
Maryland CHART	• Figure B13. Maryland CHART Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects
Media Centers	• Figure B14. Media Centers Interconnects • Figure B15. Metropolitan Washington COG Center Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B46. VDOT NOVA TCC Interconnects • Figure B50. Virginia Statewide ATIS Clearinghouse Interconnects
Metropolitan Washington COG Center	• Figure B14. Media Centers Interconnects • Figure B15. Metropolitan Washington COG Center Interconnects • Figure B31. Smart Travel Lab Interconnects • Figure B35. VDOT Mobility Data Store Interconnects • Figure B37. VDOT NOVA GIS Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects
MWAA Center	• Figure B11. ISP Centers Interconnects • Figure B16. MWAA Center Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B50. Virginia Statewide ATIS Clearinghouse Interconnects
National Advisory Warning System	• Figure B17. National Advisory Warning System Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects
National Park Services	• Figure B18. National Park Services Interconnects • Figure B32. Special Event Promoters Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects
NOVA Local Public Safety Centers	• Figure B1. Adjacent VDOT STCs Interconnects • Figure B2. Baltimore-Washington HIDTA Interconnects • Figure B19. NOVA Local Public Safety Centers Interconnects • Figure B20. NOVA Local Signal Centers Interconnects • Figure B32. Special Event Promoters Interconnects • Figure B40. VDOT NOVA Safety Service Patrol Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B48. VDOT TEOC Interconnects
NOVA Local Signal Centers	• Figure B19. NOVA Local Public Safety Centers Interconnects • Figure B20. NOVA Local Signal Centers Interconnects • Figure B32. Special Event Promoters Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B50. Virginia Statewide ATIS Clearinghouse Interconnects

Table B1 – Appendix B System to Figure Interconnect Diagram Index

System Name	Appendix B Figure Number
NOVA Local Transit Centers	• Figure B21. NOVA Local Transit Centers Interconnects • Figure B35. VDOT Mobility Data Store Interconnects • Figure B38. VDOT NOVA Maintenance & Construction Operations Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B45. VDOT NOVA STSS Field Equipment Interconnects
NOVA Sections	• Figure B22. NOVA Sections Interconnects • Figure B31. Smart Travel Lab Interconnects • Figure B35. VDOT Mobility Data Store Interconnects • Figure B37. VDOT NOVA GIS Interconnects
NVTC Center	• Figure B23. NVTC Center Interconnects • Figure B31. Smart Travel Lab Interconnects • Figure B35. VDOT Mobility Data Store Interconnects
Other Parking Management	• Figure B11. ISP Centers Interconnects • Figure B24. Other Parking Management Interconnects • Figure B50. Virginia Statewide ATIS Clearinghouse Interconnects
Other STCs	• Figure B25. Other STC's Interconnects • Figure B48. VDOT TEOC Interconnects
Rail Operations	• Figure B26. Rail Operations Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B45. VDOT NOVA STSS Field Equipment Interconnects
Regional Transit Electronic Clearinghouse	• Figure B27. Regional Transit Electronic Clearinghouse Interconnects • Figure B35. VDOT Mobility Data Store Interconnects • Figure B52. VRE Center Interconnects
Research and Data Collection Centers	• Figure B28. Research and Data Collection Centers Interconnects • Figure B35. VDOT Mobility Data Store Interconnects
RWIS	• Figure B29. RWIS Interconnects • Figure B48. VDOT TEOC Interconnects
Smart Tag Center	• Figure B8. Greenway Center Interconnects • Figure B30. Smart Tag Center Interconnects • Figure B31. Smart Travel Lab Interconnects • Figure B36. VDOT NOVA Dulles Toll Road Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B51. Virginia Toll Facility Centers Interconnects
Smart Travel Lab	• Figure B15. Metropolitan Washington COG Center Interconnects • Figure B22. NOVA Sections Interconnects • Figure B23. NVTC Center Interconnects • Figure B30. Smart Tag Center Interconnects • Figure B31. Smart Travel Lab Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects

Table B1 – Appendix B System to Figure Interconnect Diagram Index

System Name	Appendix B Figure Number
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VDOT Mobility Data Store	• Figure B15. Metropolitan Washington COG Center Interconnects • Figure B21. NOVA Local Transit Centers Interconnects • Figure B22. NOVA Sections Interconnects • Figure B23. NVTC Center Interconnects • Figure B27. Regional Transit Electronic Clearinghouse Interconnects • Figure B28. Research and Data Collection Centers Interconnects • Figure B35. VDOT Mobility Data Store Interconnects Figure B40. VDOT NOVA Safety Service Patrol Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B42. VDOT Snow Operations Interconnects • Figure B44. VDOT NOVA STSS Interconnects
VDOT NOVA Dulles Toll Road (DTR)	• Figure B8. Greenway Center Interconnects • Figure B30. Smart Tag Center Interconnects • Figure B36. VDOT NOVA Dulles Toll Road Interconnects • Figure B38. VDOT NOVA Maintenance & Construction Operations Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B49. Virginia State Police Center Interconnects
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VDOT NOVA Safety Service Patrol (SSP)	• Figure B2. Baltimore-Washington HIDTA Interconnects • Figure B19. NOVA Local Public Safety Centers Interconnects • Figure B34. Mobile Unified Command Interconnects • Figure B35. VDOT Mobility Data Store Interconnects • Figure B38. VDOT NOVA Maintenance & Construction Operations Interconnects • Figure B40. VDOT NOVA Safety Service Patrol Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B42. VDOT Snow Operations Interconnects • Figure B49. Virginia State Police Center Interconnects

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VDOT NOVA Snow Operations	• Figure B35. VDOT Mobility Data Store Interconnects • Figure B37. VDOT NOVA GIS Interconnects • Figure B40. VDOT NOVA Safety Service Patrol Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B42. VDOT Snow Operations Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B46. VDOT NOVA TCC Interconnects • Figure B47. VDOT Public Affairs Interconnects • Figure B48. VDOT TEOC Interconnects • Figure B49. Virginia State Police Center Interconnects
VDOT NOVA Snow Plow Vehicles	• Figure B42. VDOT Snow Operations Interconnects
VDOT NOVA STC Field Equipment	• Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B43. VDOT NOVA STC Field Equipment Interconnects
VDOT NOVA Smart Traffic Signal System (STSS)	• Figure B6. Federal Installations Interconnects • Figure B7. Federal Law Enforcement Interconnects • Figure B11. ISP Centers Interconnects • Figure B12. Laptop Computer Interconnects • Figure B14. Media Centers Interconnects • Figure B16. MWAA Center Interconnects • Figure B19. NOVA Local Public Safety Centers Interconnects • Figure B20. NOVA Local Signal Centers Interconnects • Figure B21. NOVA Local Transit Centers Interconnects • Figure B26. Rail Operations Interconnects • Figure B31. Smart Travel Lab Interconnects • Figure B32. Special Event Promoters Interconnects • Figure B33. Transportation Information Clearinghouse Interconnects • Figure B35. VDOT Mobility Data Store Interconnects • Figure B37. VDOT NOVA GIS Interconnects • Figure B38. VDOT NOVA Maintenance & Construction Operations Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B42. VDOT Snow Operations Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B45. VDOT NOVA STSS Field Equipment Interconnects • Figure B46. VDOT NOVA TCC Interconnects • Figure B49. Virginia State Police Center Interconnects • Figure B50. Virginia Statewide ATIS Clearinghouse Interconnects
VDOT NOVA STSS Field Equipment	• Figure B21. NOVA Local Transit Centers Interconnects • Figure B26. Rail Operations Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B45. VDOT NOVA STSS Field Equipment Interconnects

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VDOT Public Affairs	• Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B42. VDOT Snow Operations Interconnects • Figure B47. VDOT Public Affairs Interconnects
VDOT TEOC	• Figure B1. Adjacent VDOT STCs Interconnects • Figure B19. NOVA Local Public Safety Centers Interconnects • Figure B25. Other STC's Interconnects • Figure B29. RWIS Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B42. VDOT Snow Operations Interconnects • Figure B48. VDOT TEOC Interconnects • Figure B49. Virginia State Police Center Interconnects
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Virginia Statewide ATIS Clearinghouse	• Figure B11. ISP Centers Interconnects • Figure B14. Media Centers Interconnects • Figure B16. MWAA Center Interconnects • Figure B20. NOVA Local Signal Centers Interconnects • Figure B24. Other Parking Management Interconnects • Figure B39. VDOT NOVA Parking Management Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B44. VDOT NOVA STSS Interconnects • Figure B46. VDOT NOVA TCC Interconnects • Figure B50. Virginia Statewide ATIS Clearinghouse Interconnects
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VRE Center	• Figure B27. Regional Transit Electronic Clearinghouse Interconnects • Figure B41. VDOT NOVA Smart Traffic Center Interconnects • Figure B52. VRE Center Interconnects

Adjacent VDOT STCs

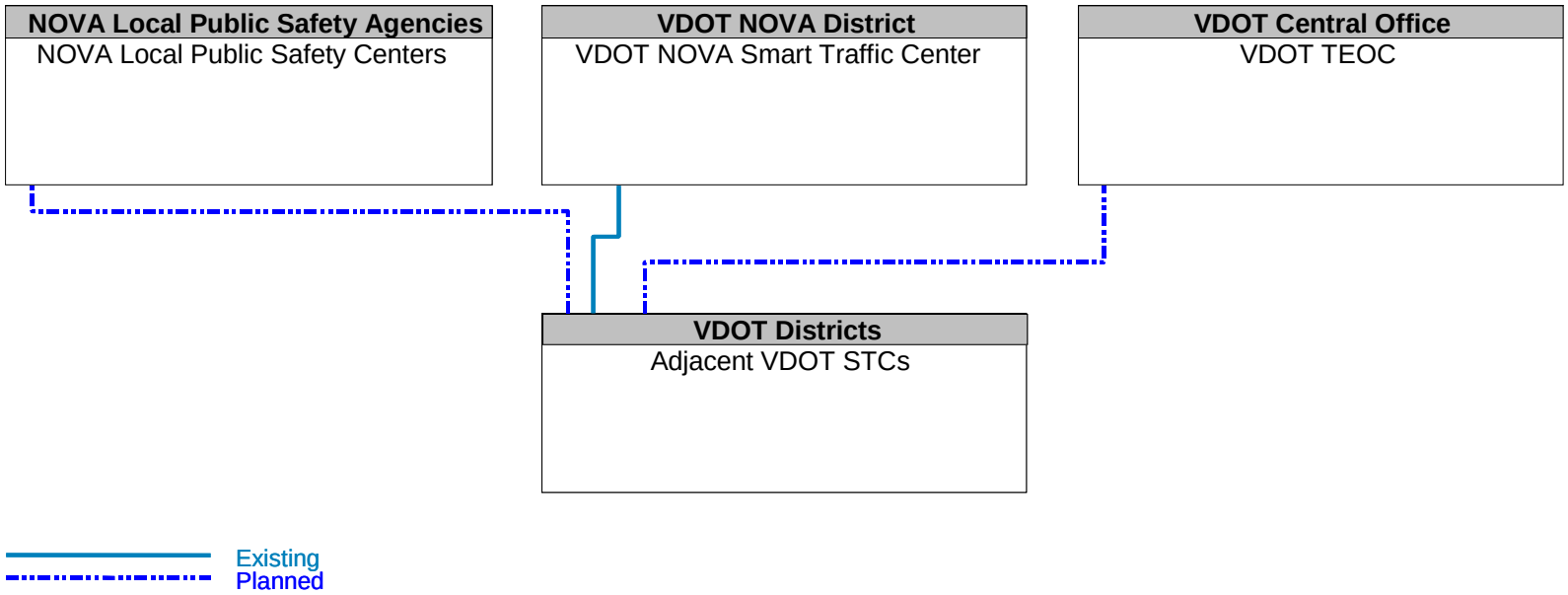

Figure B1 – Adjacent VDOT STCs Interconnects

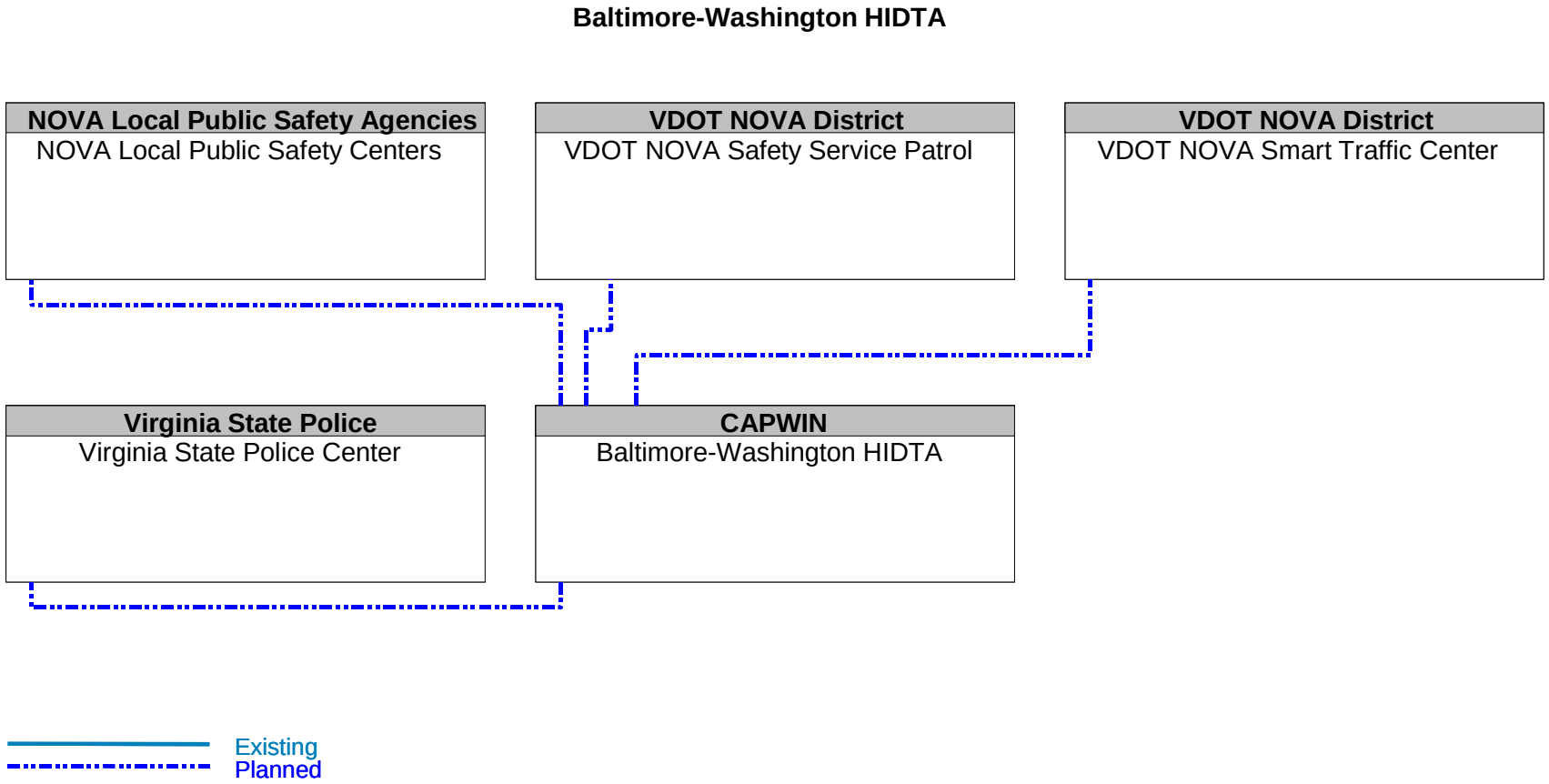

Figure B2 – Baltimore-Washington HIDTA Interconnects

Commercial Vehicle Management System

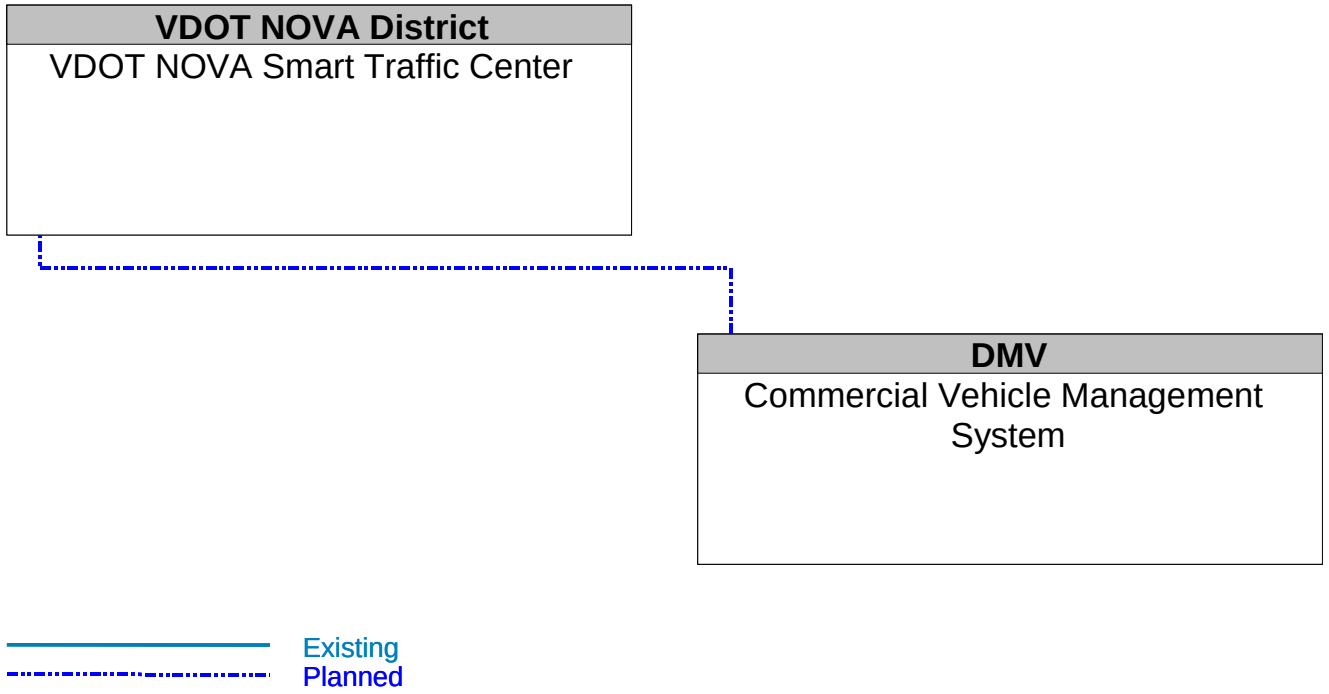

Figure B3 – Commercial Vehicle Management System Interconnects

DC Emergency Preparedness Center

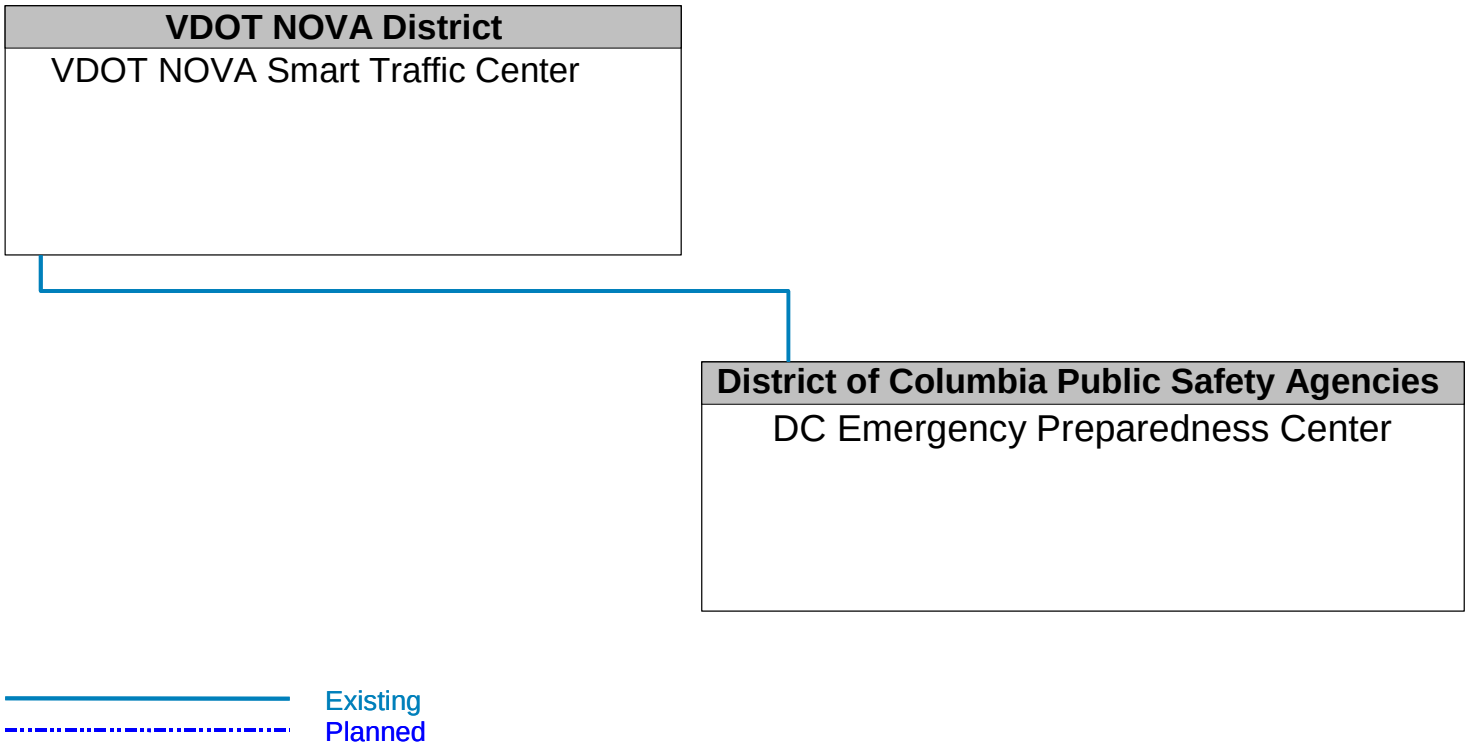

Figure B4 – DC Emergency Preparedness Center Interconnects

DC ITMS

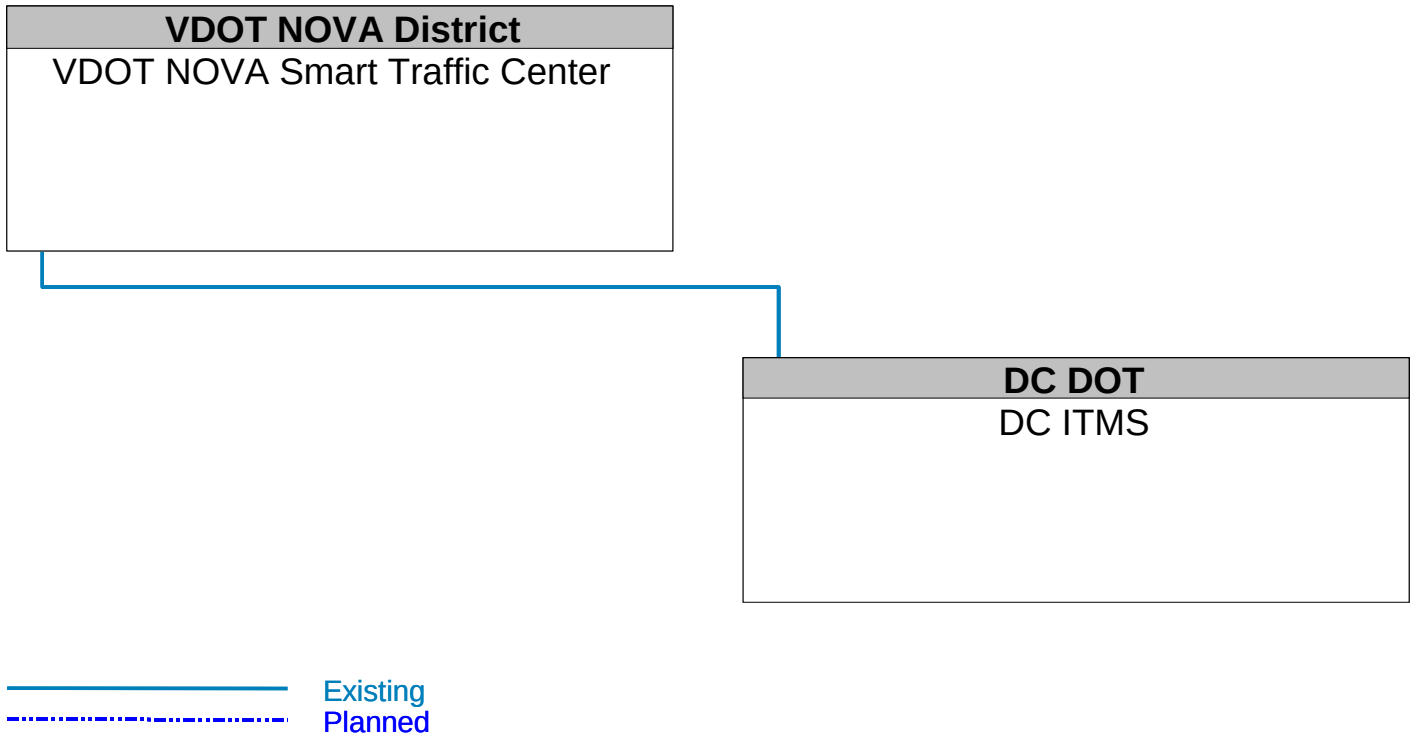

Figure B5 – DC ITMS Interconnects

Federal Installations

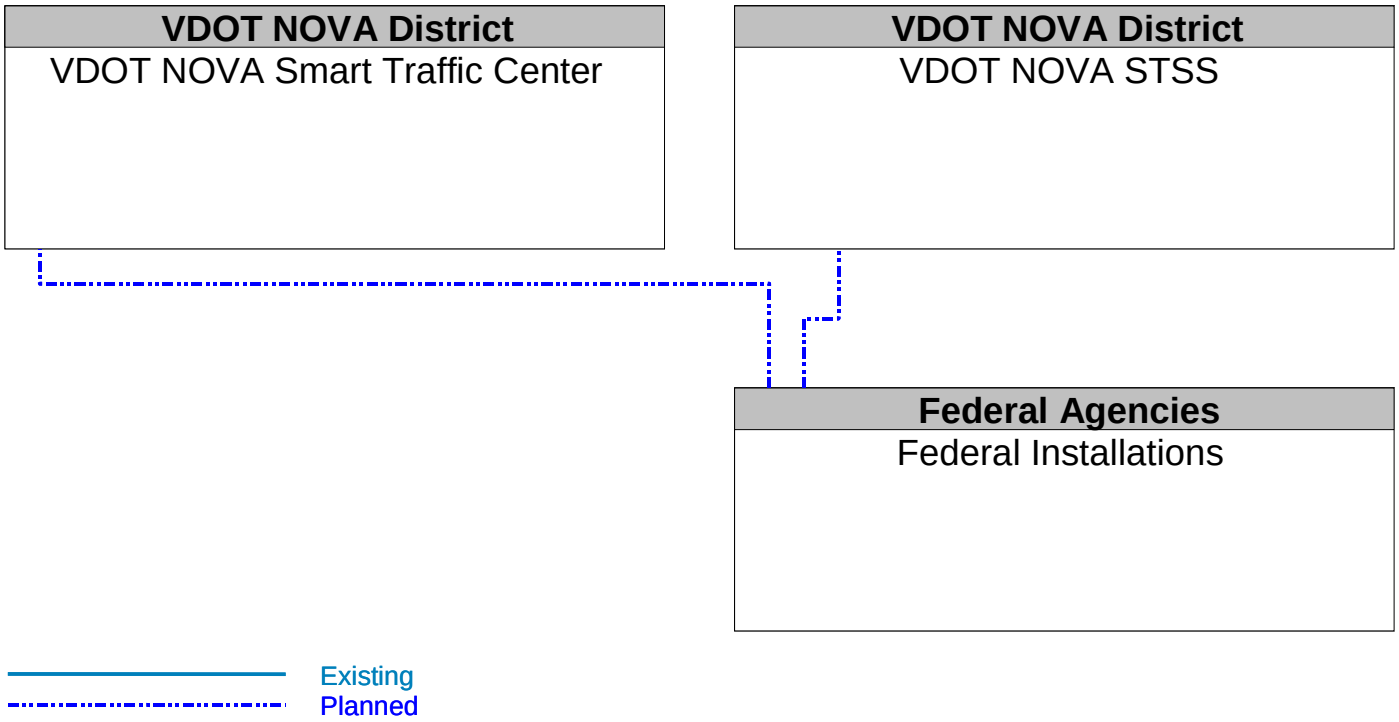

Figure B6 – Federal Installations Interconnects

Federal Law Enforcement

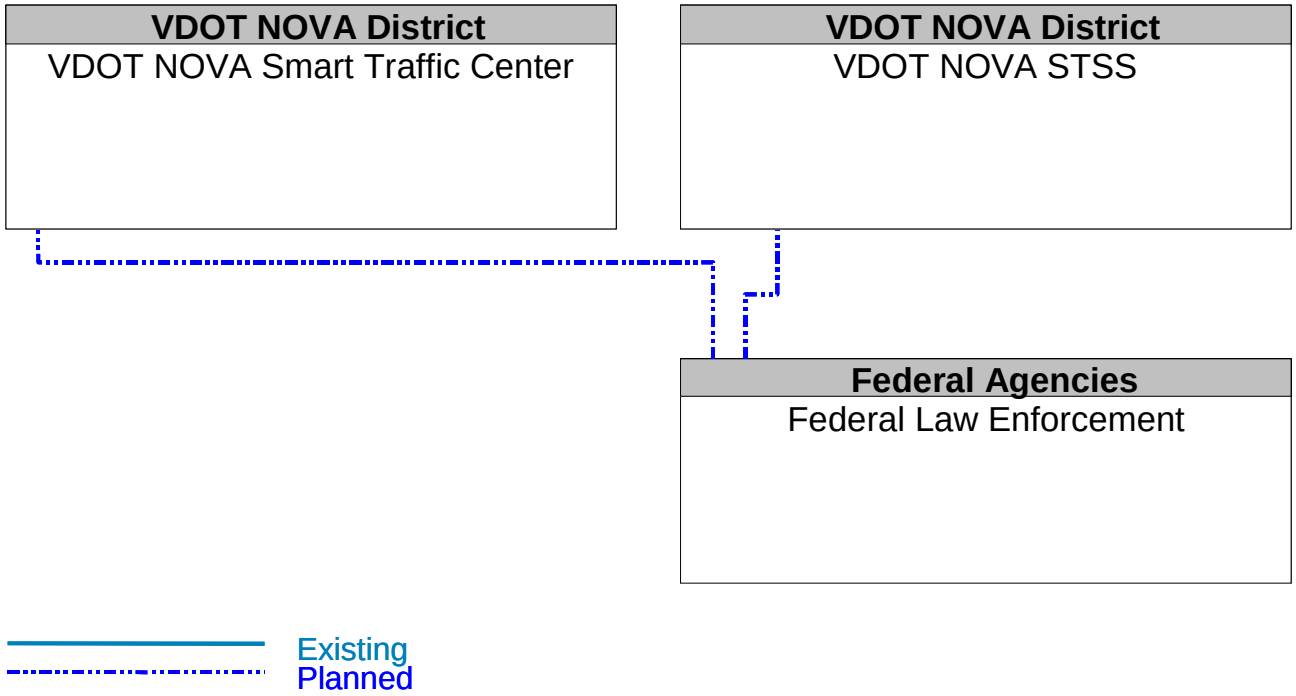

Figure B7 – Federal Law Enforcement Interconnects

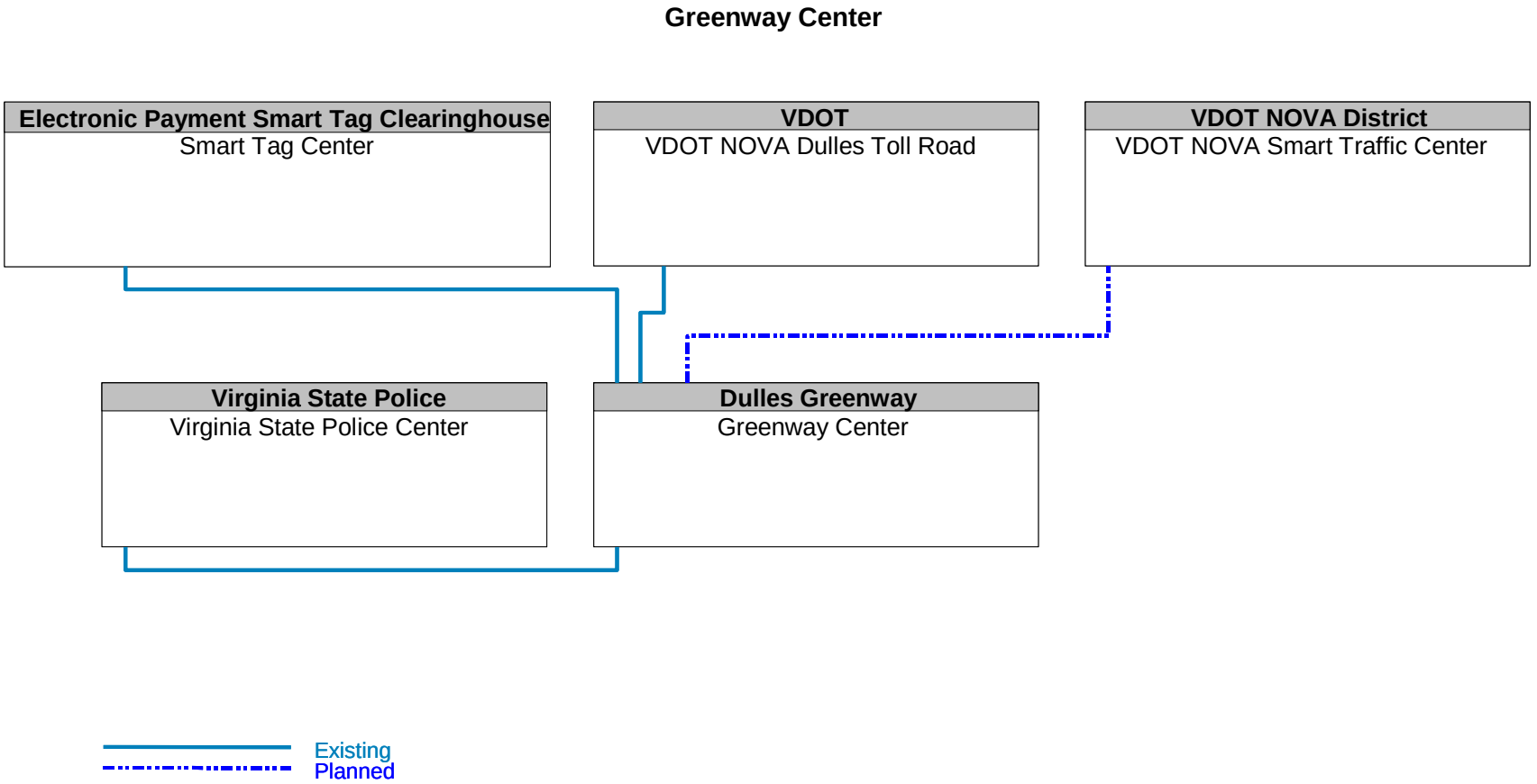

Figure B8 – Greenway Center Interconnects

IEN

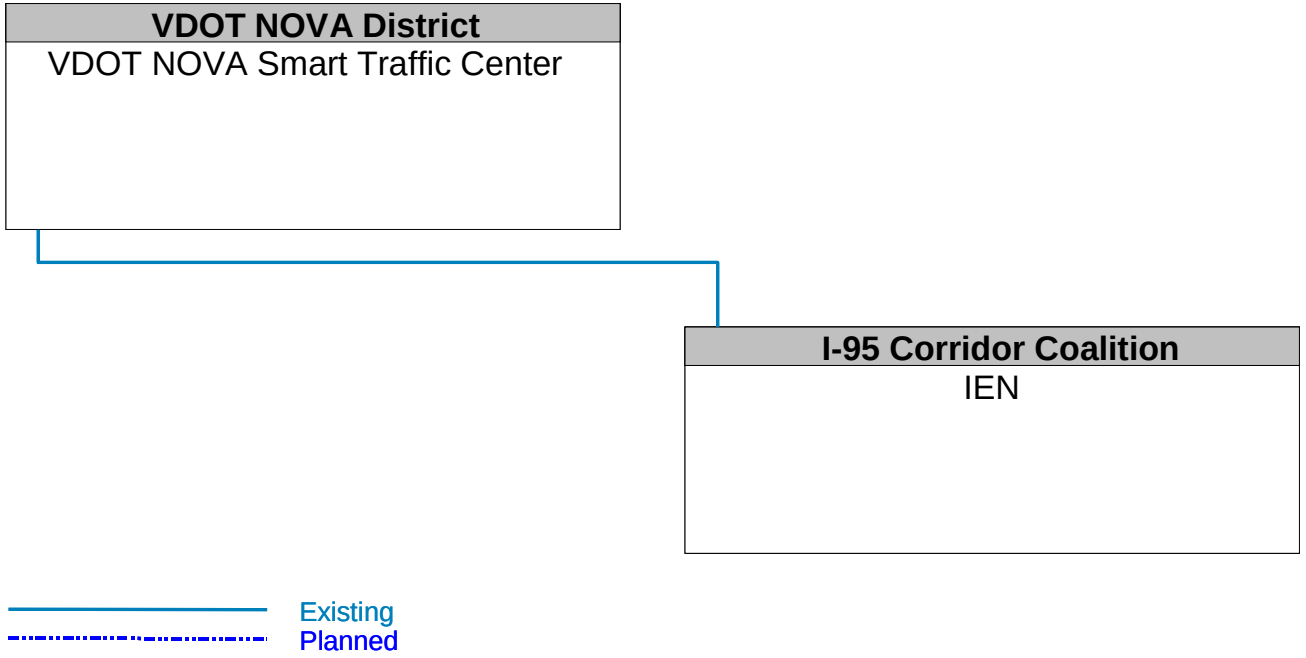

Figure B9 – IEN Interconnects

IMMP

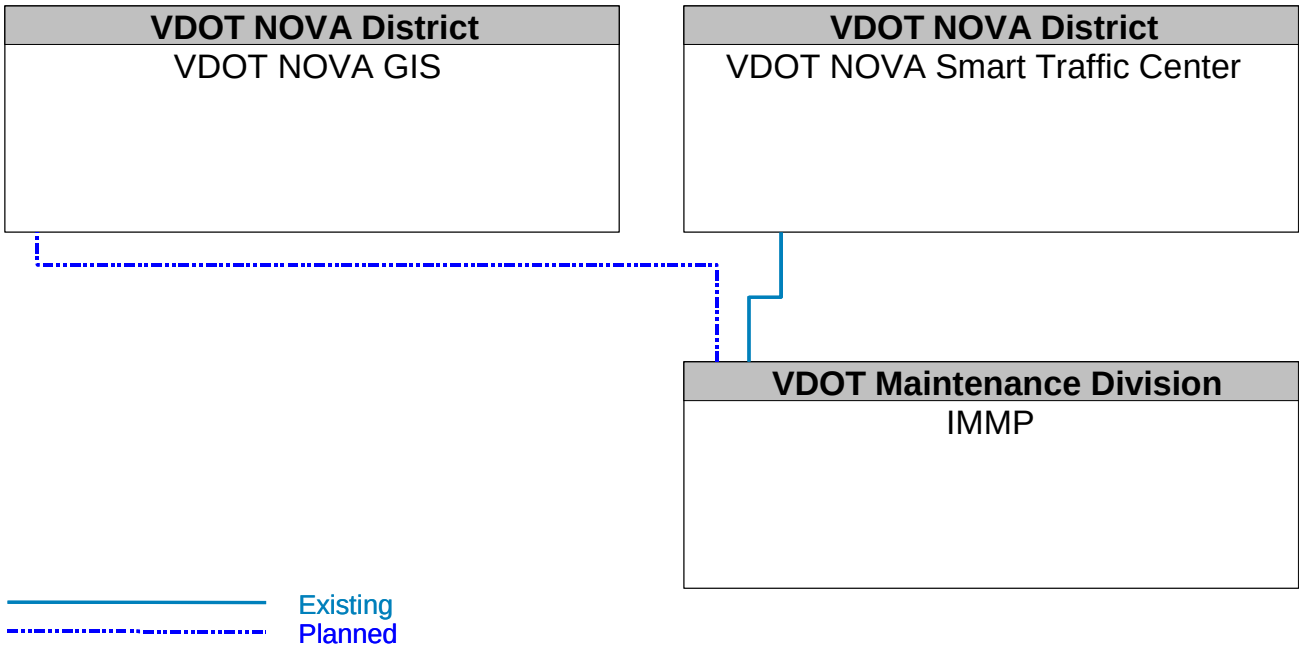

Figure B10 – IMMP Interconnects

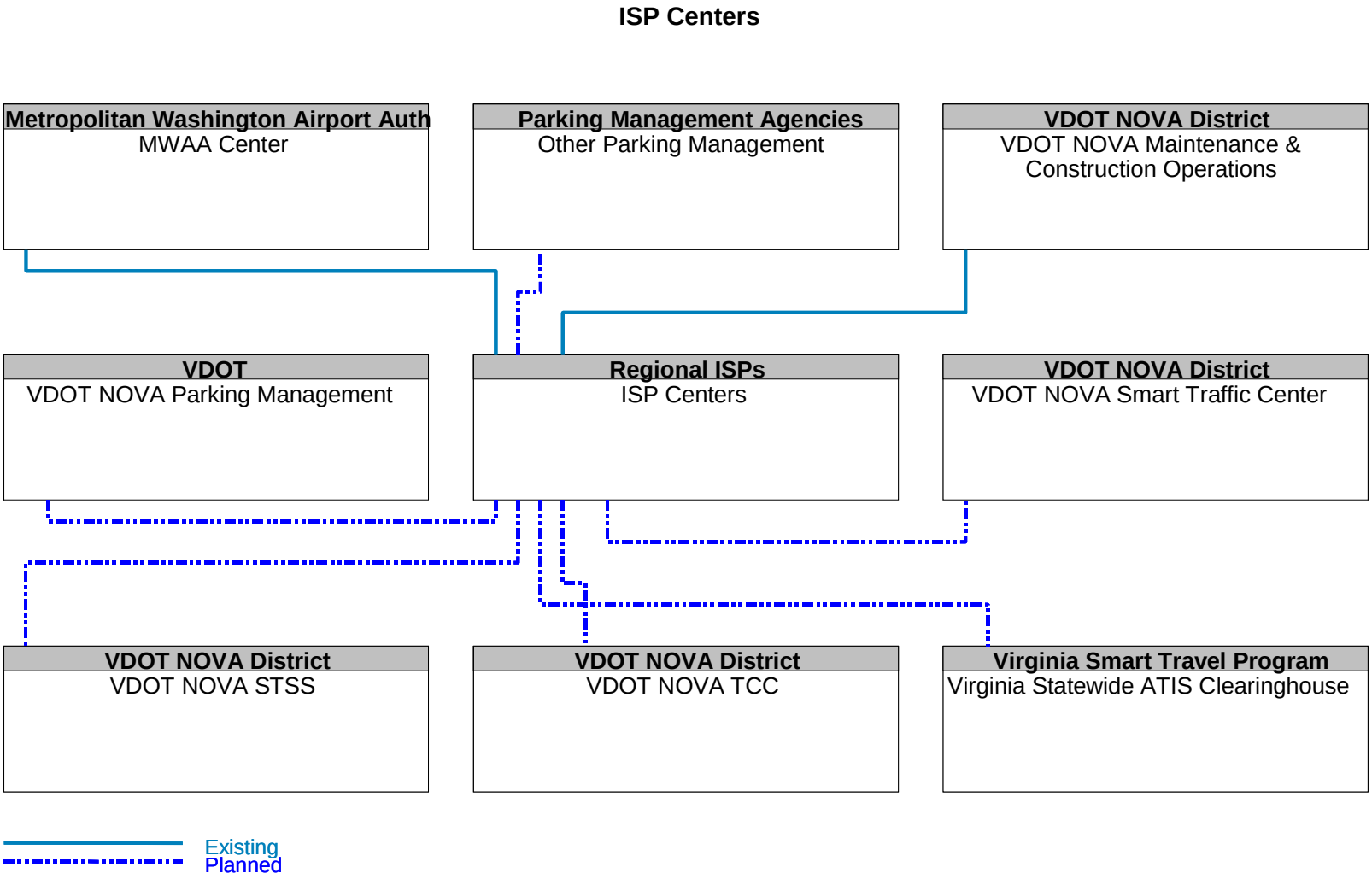

Figure B11 – ISP Centers Interconnects

Laptop Computers

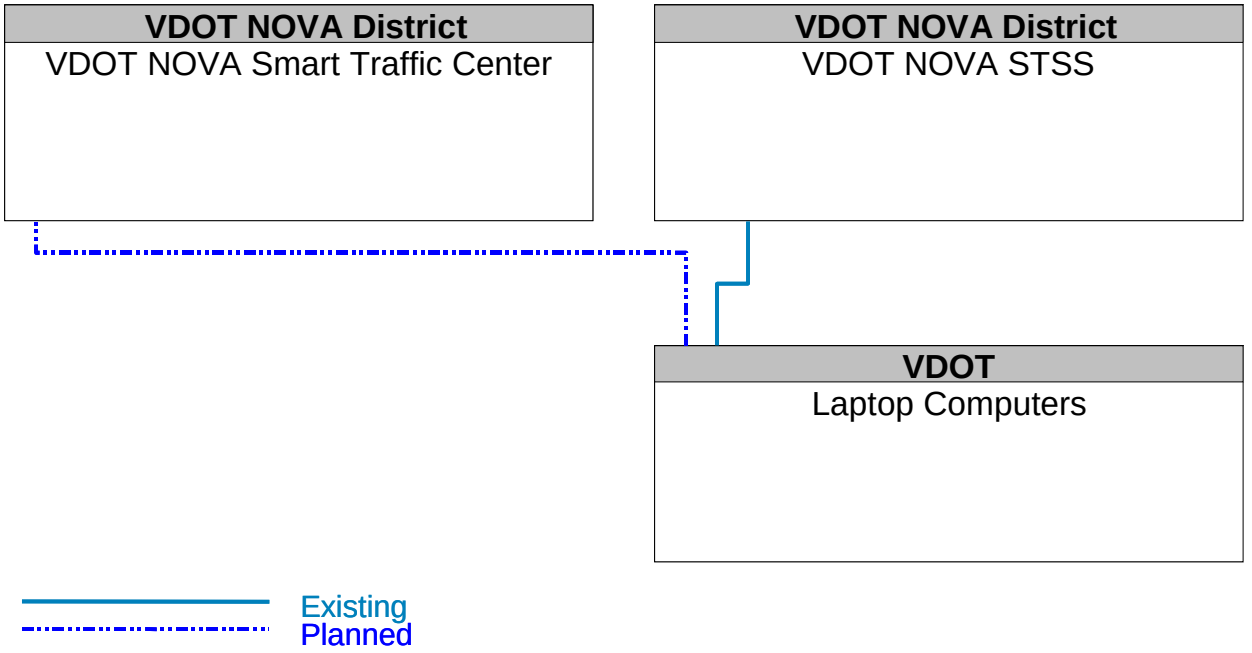

Figure B12 – Laptop Computer Interconnects

Maryland CHART

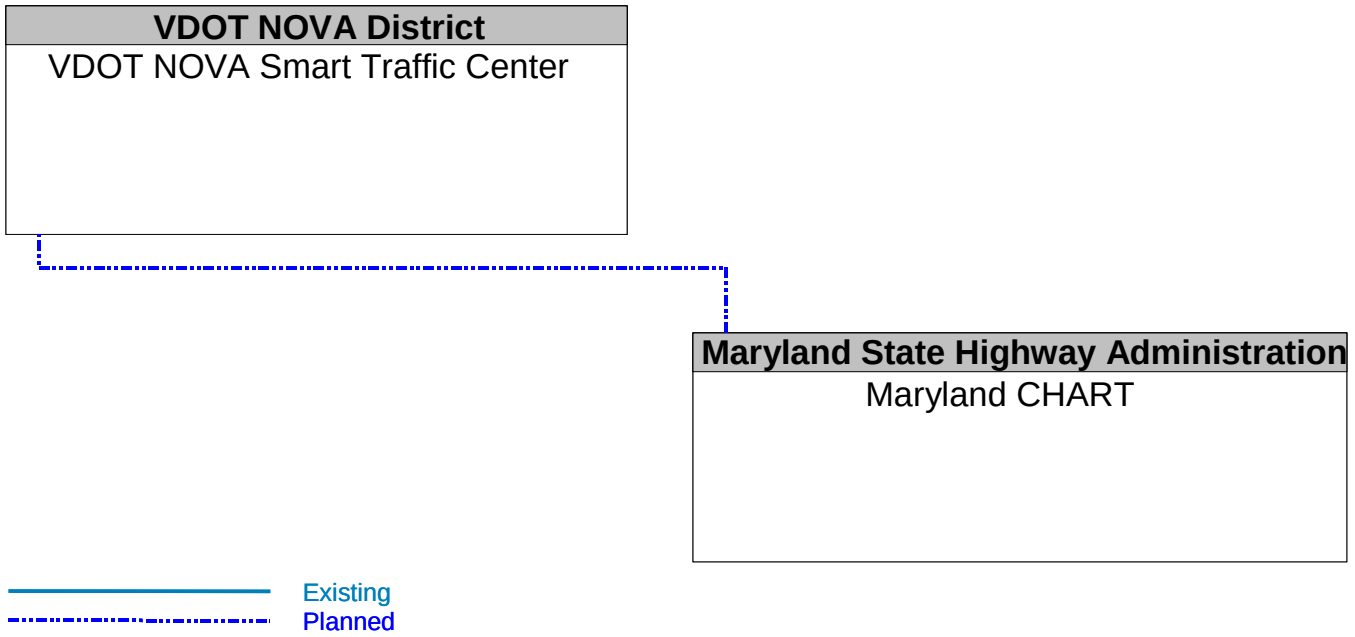

Figure B13 – Maryland CHART Interconnects

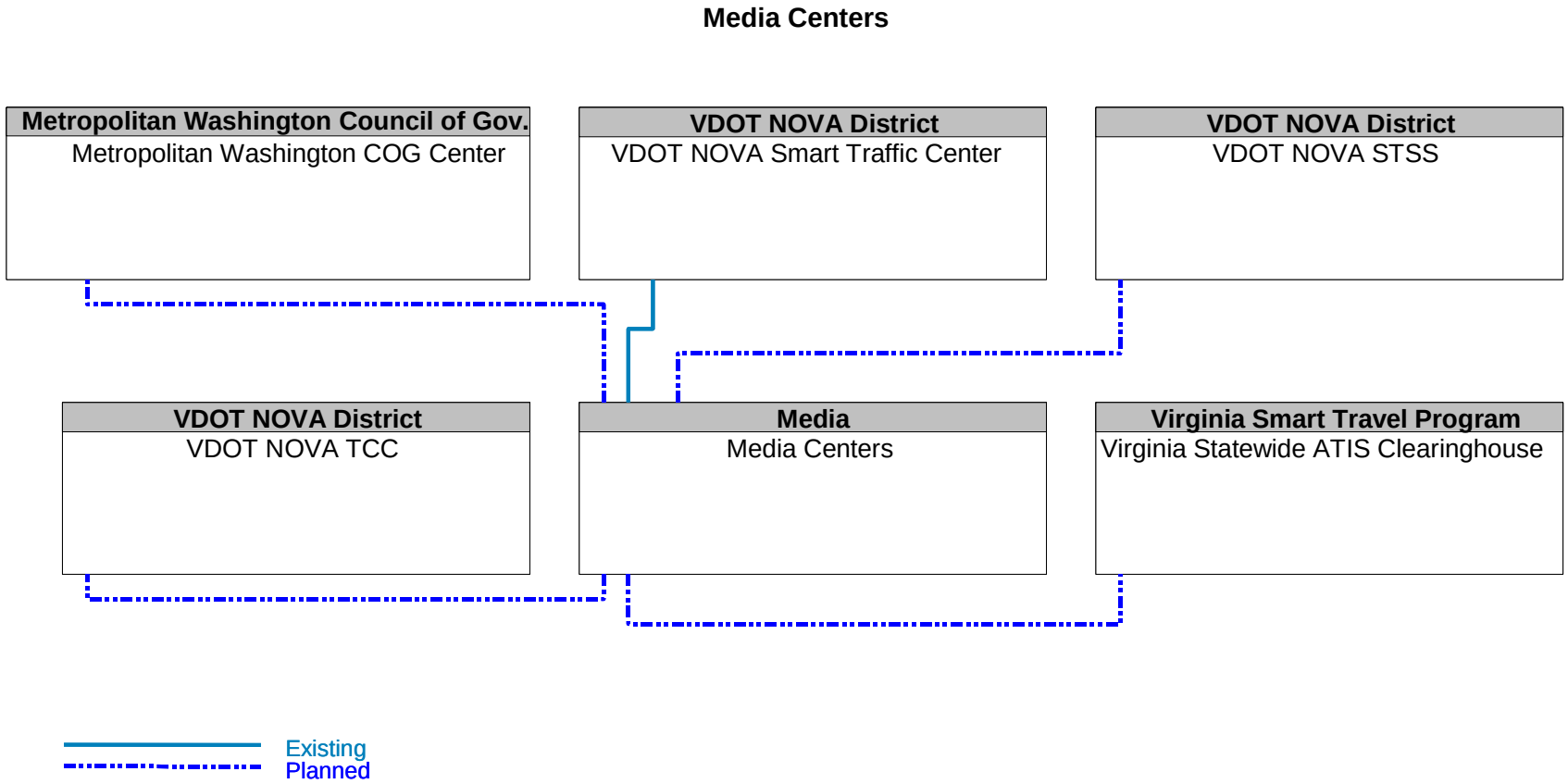

Figure B14 – Media Centers Interconnects

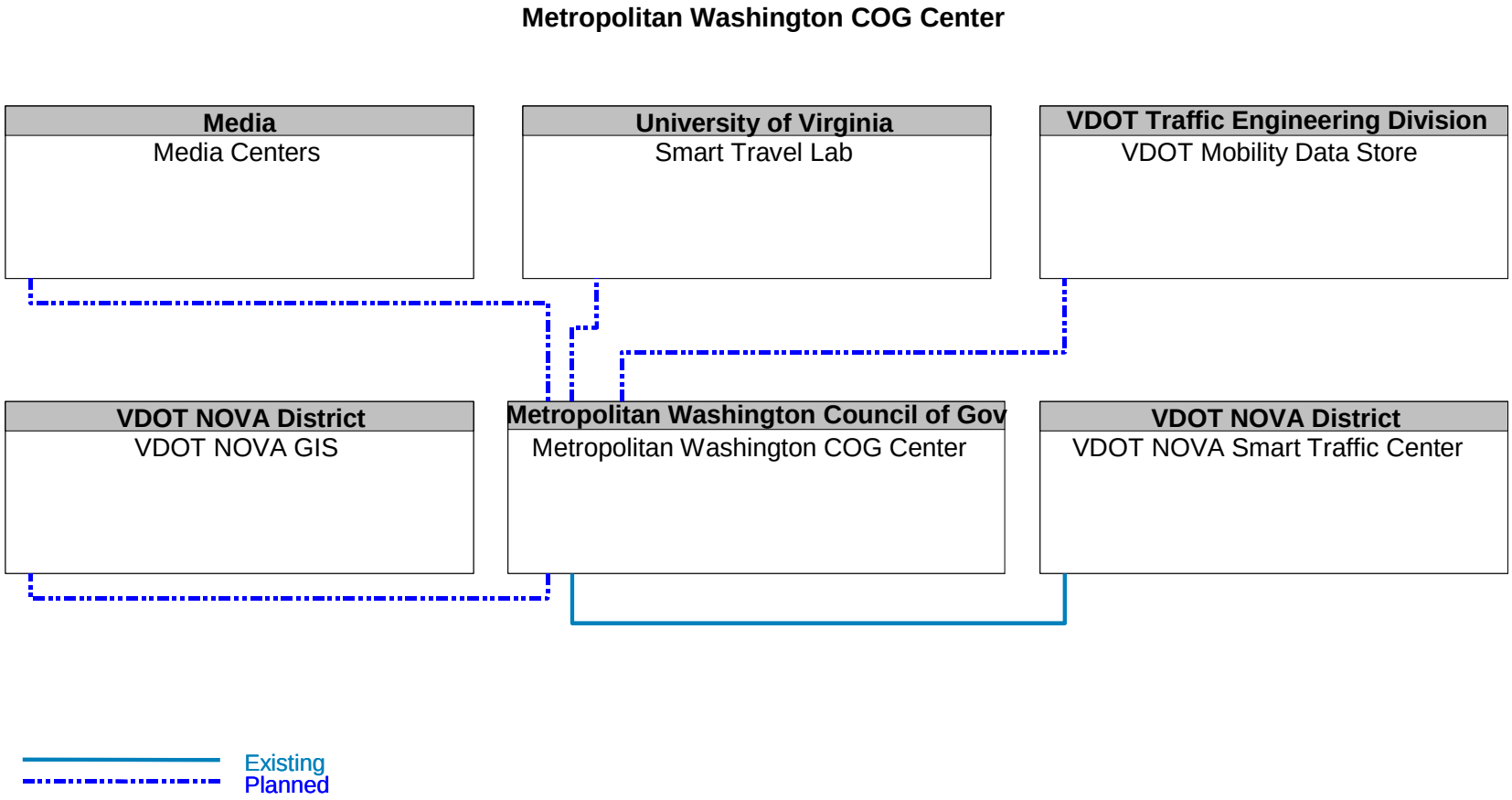

Figure B15 – Metropolitan Washington COG Center Interconnects

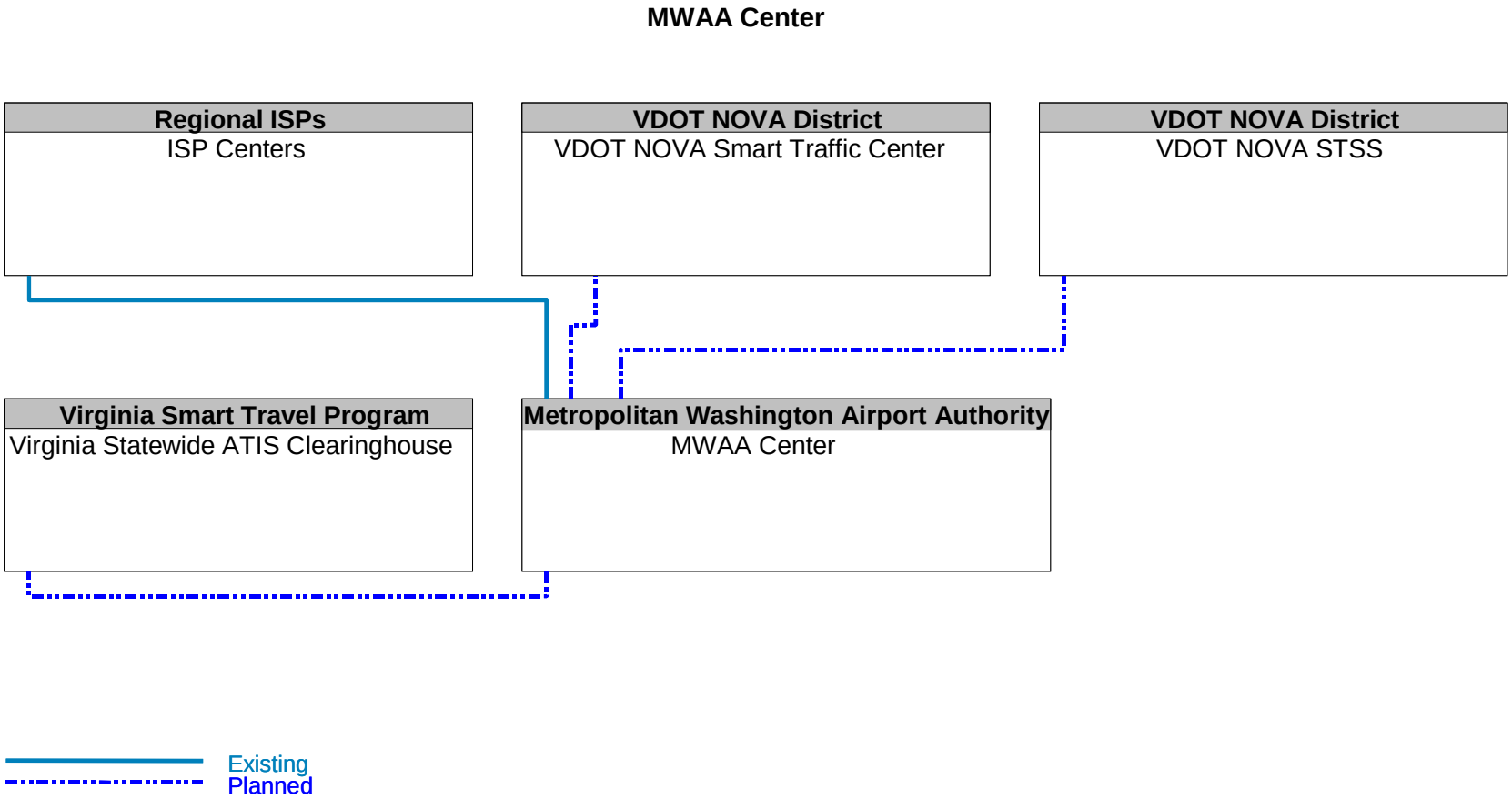

Figure B16 – MWAA Center Interconnects

National Advisory Warning System

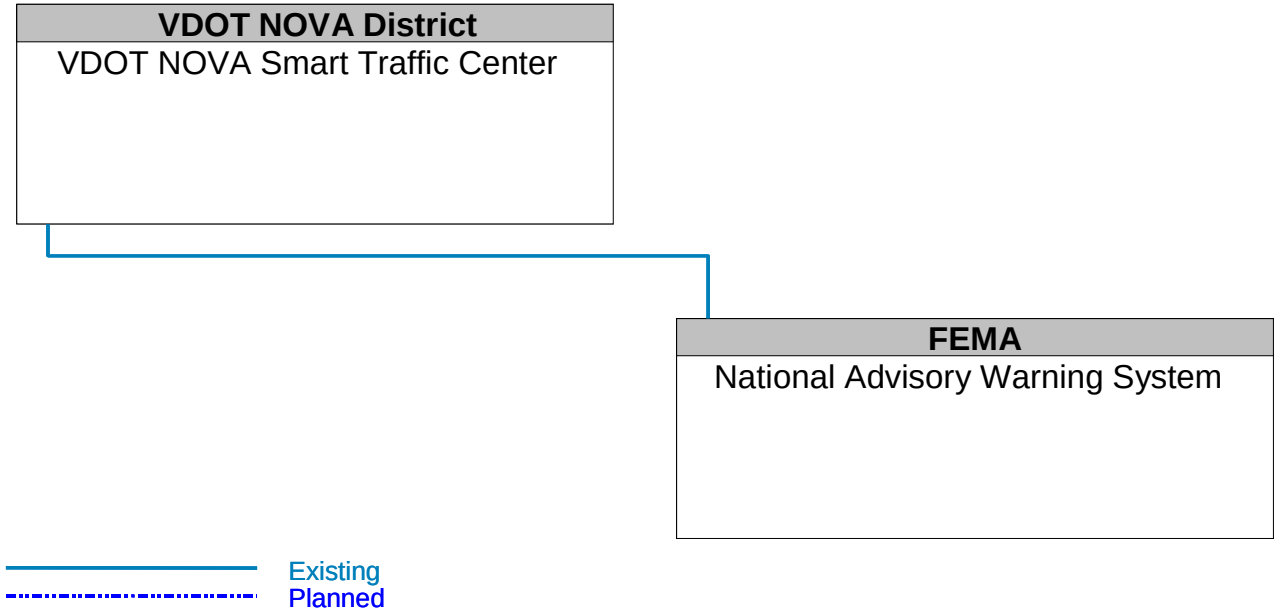

Figure B17 – National Advisory Warning System Interconnects

National Park Services

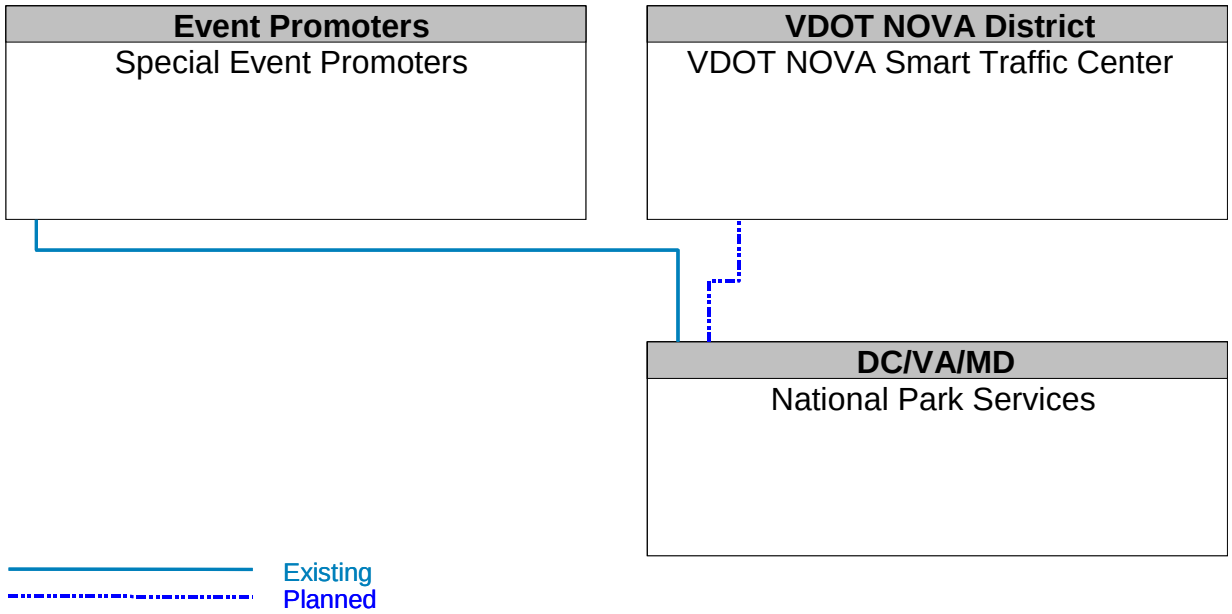

Figure B18 – National Park Services Interconnects

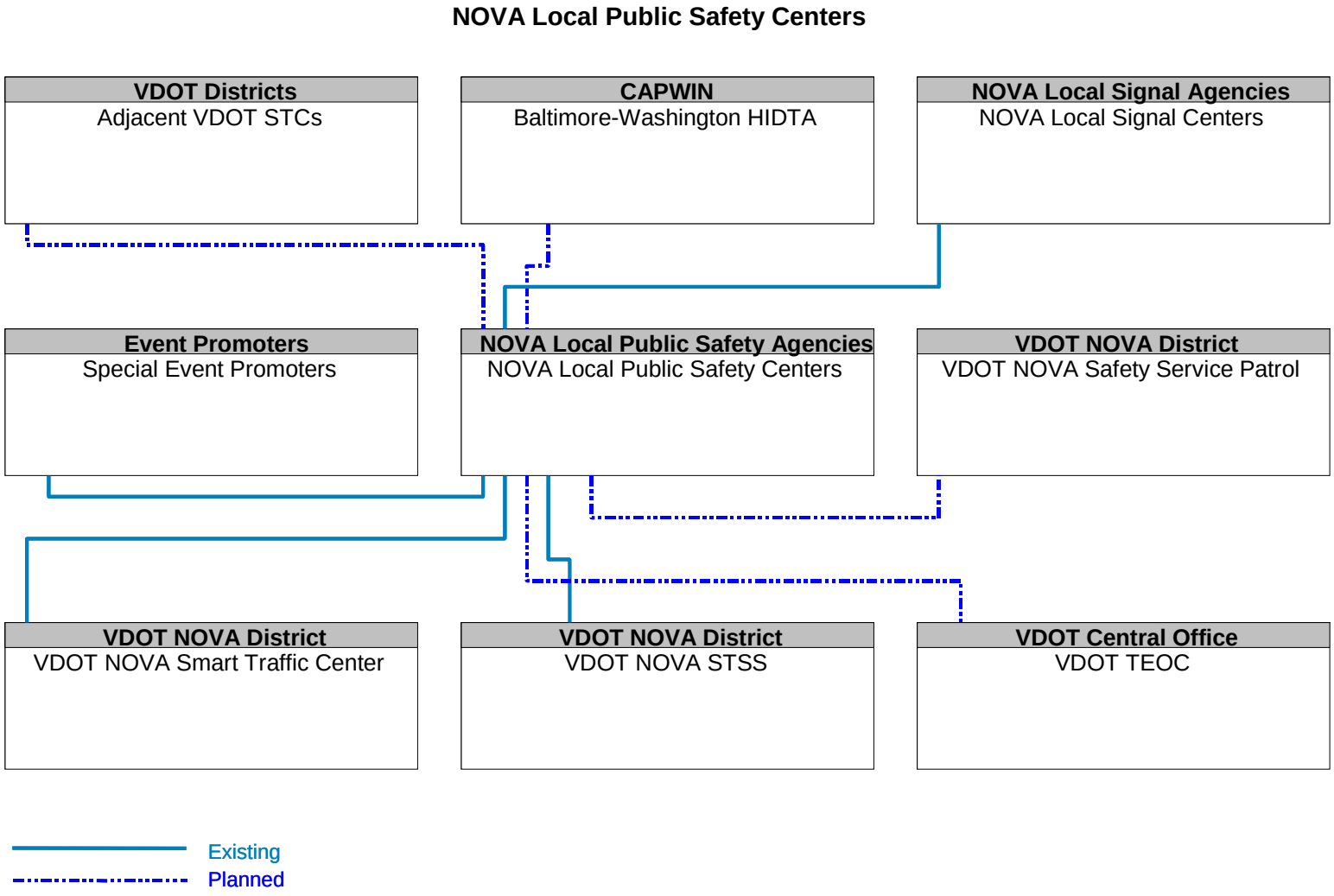

Figure B19 – NOVA Local Public Safety Centers Interconnects

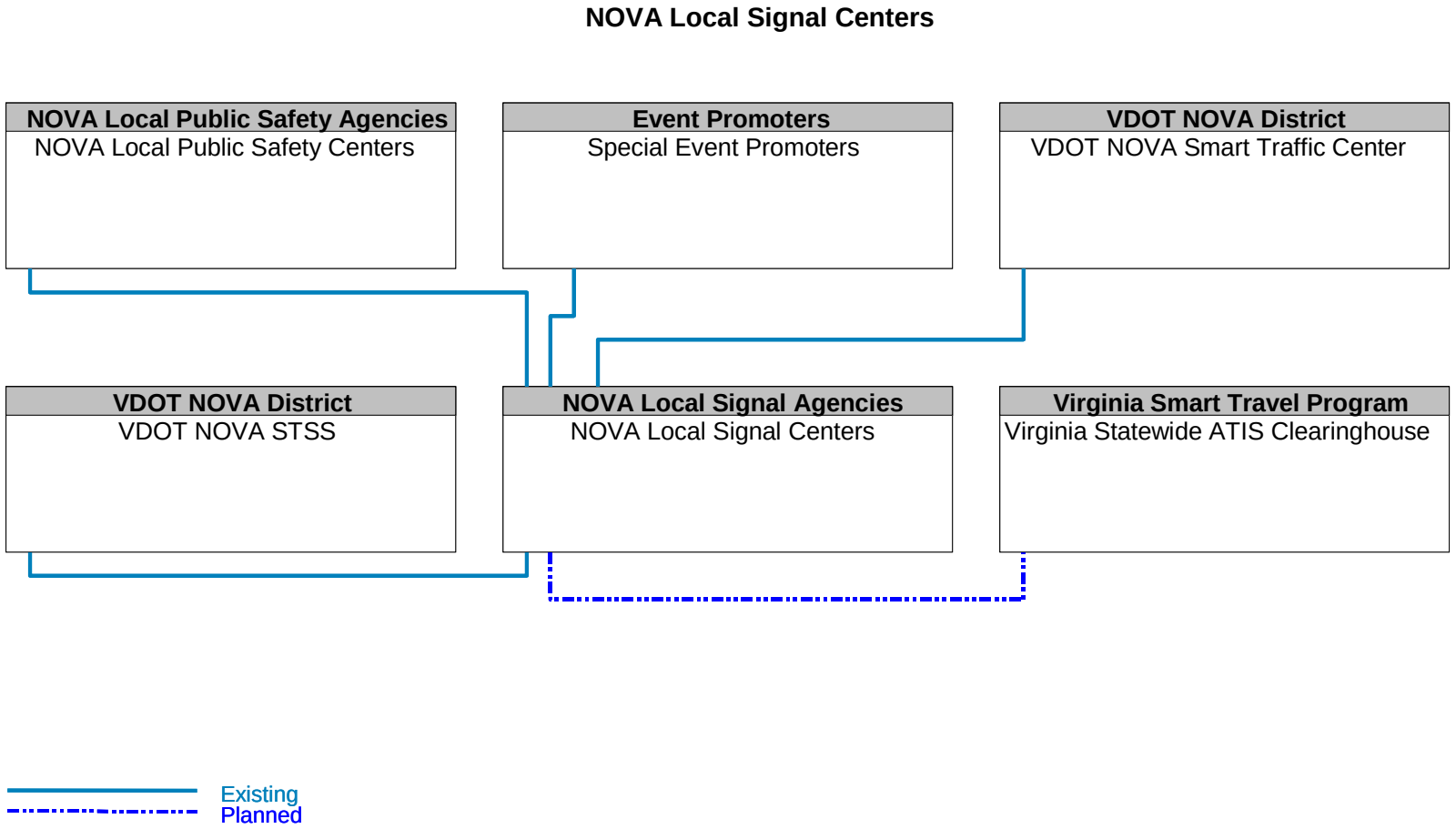

Figure B20 – NOVA Local Signal Centers Interconnects

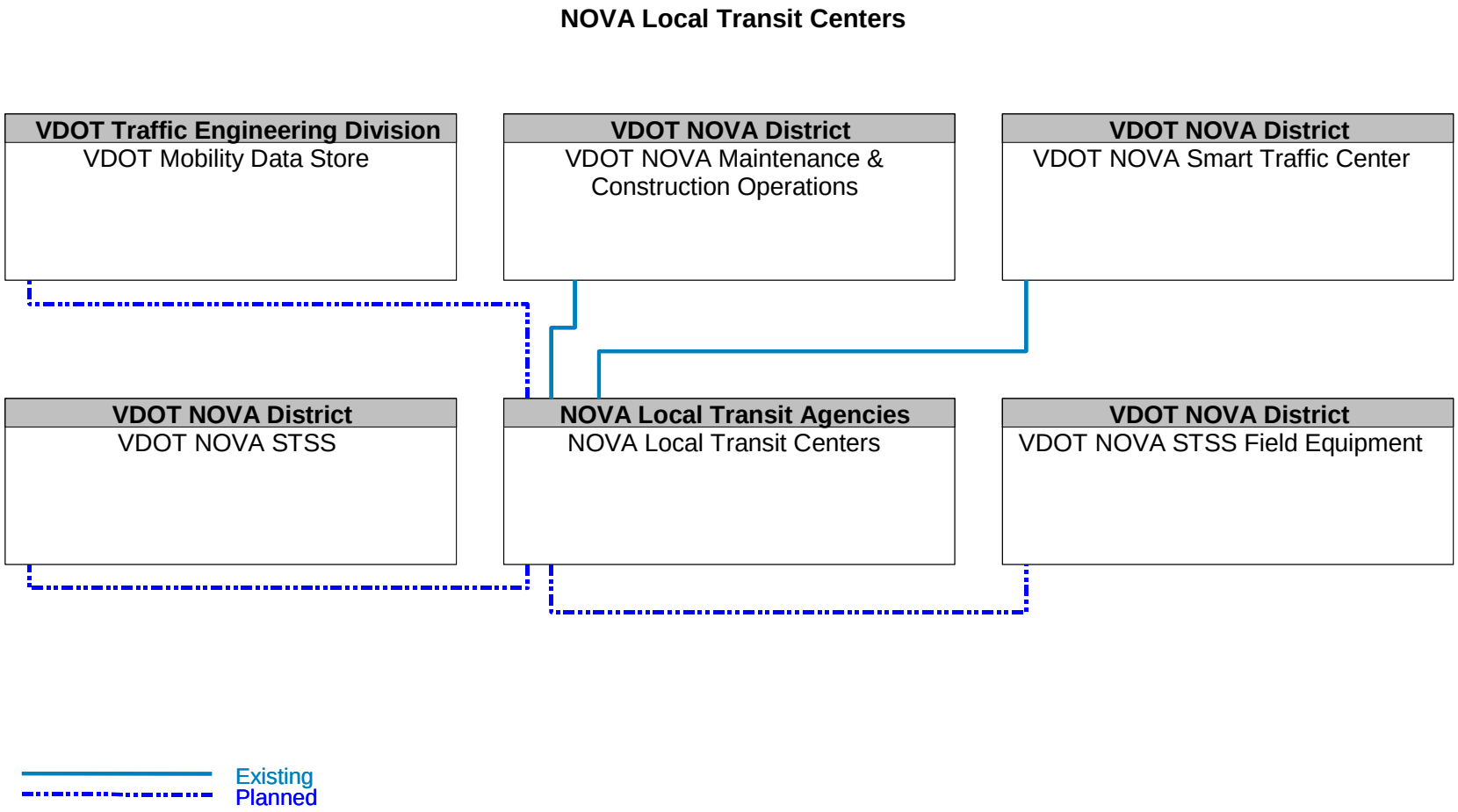

Figure B21 – NOVA Local Transit Centers Interconnects

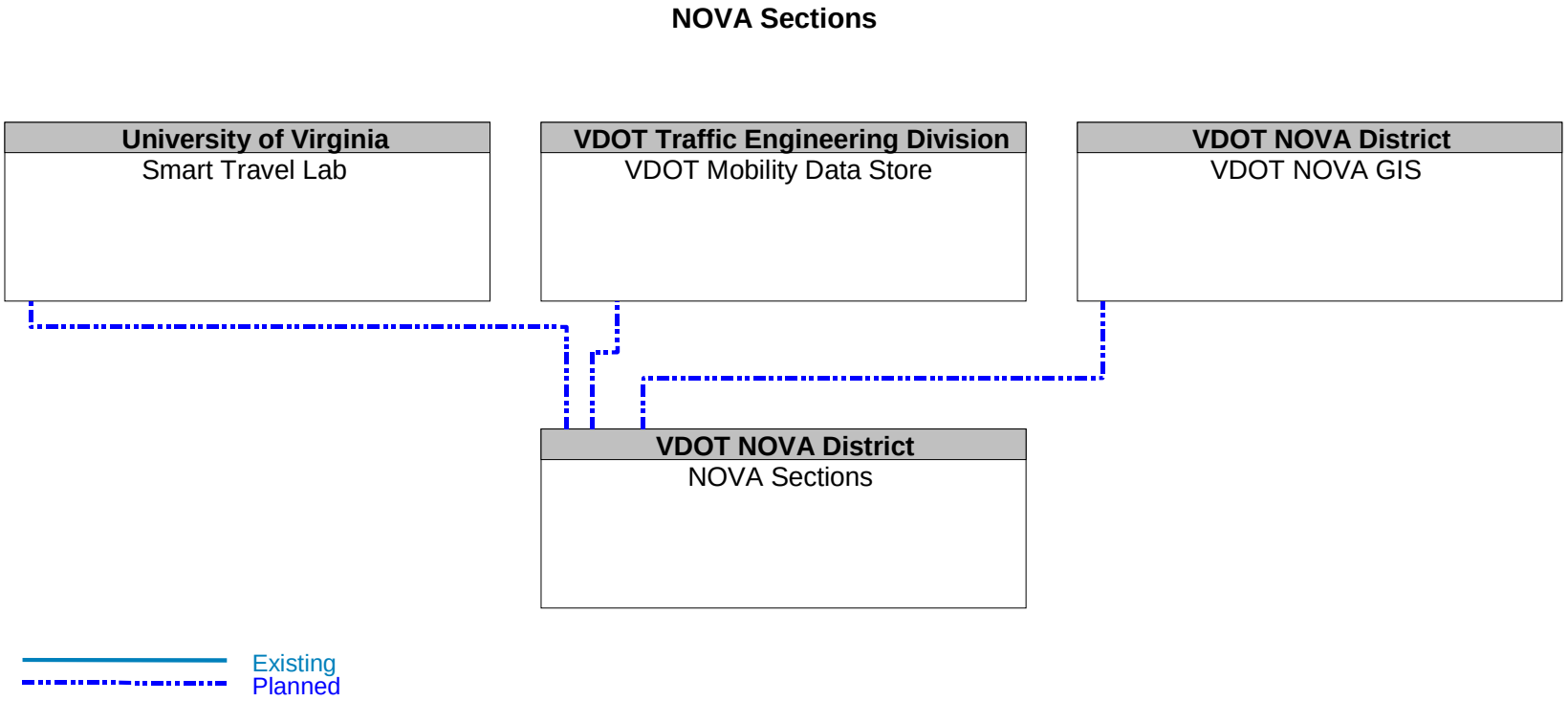

Figure B22 – NOVA Sections Interconnects

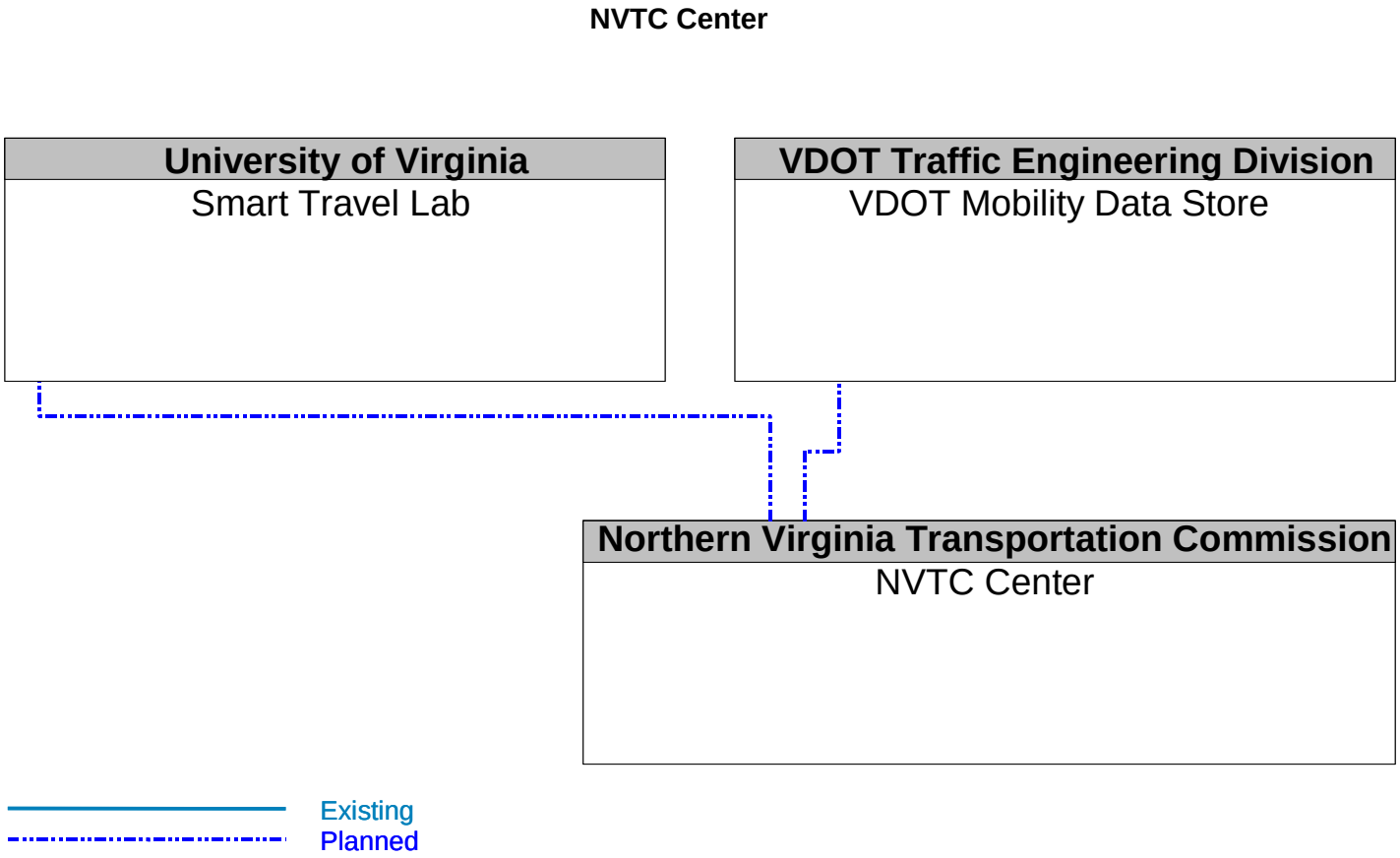

Figure B23 – NVTC Center Interconnects

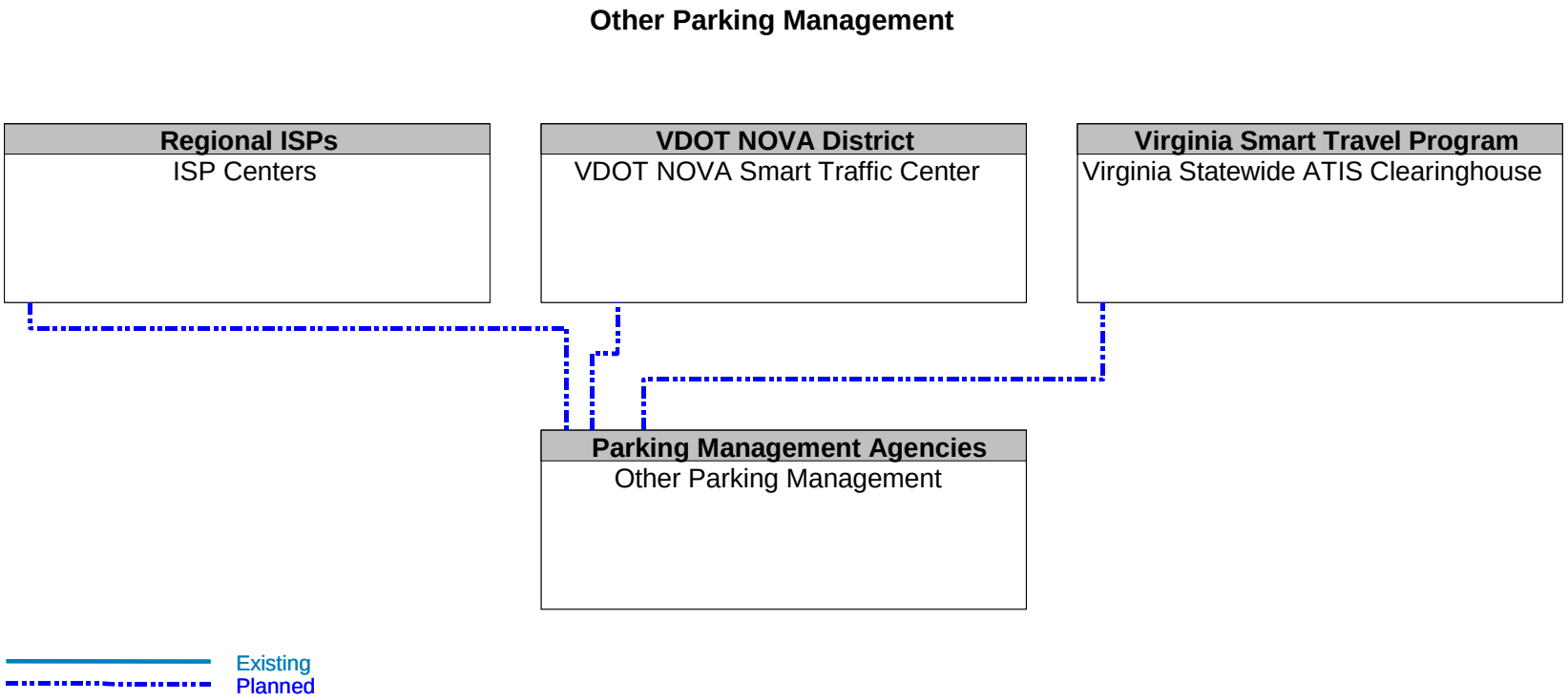

Figure B24 – Other Parking Management Interconnects

Other STCs

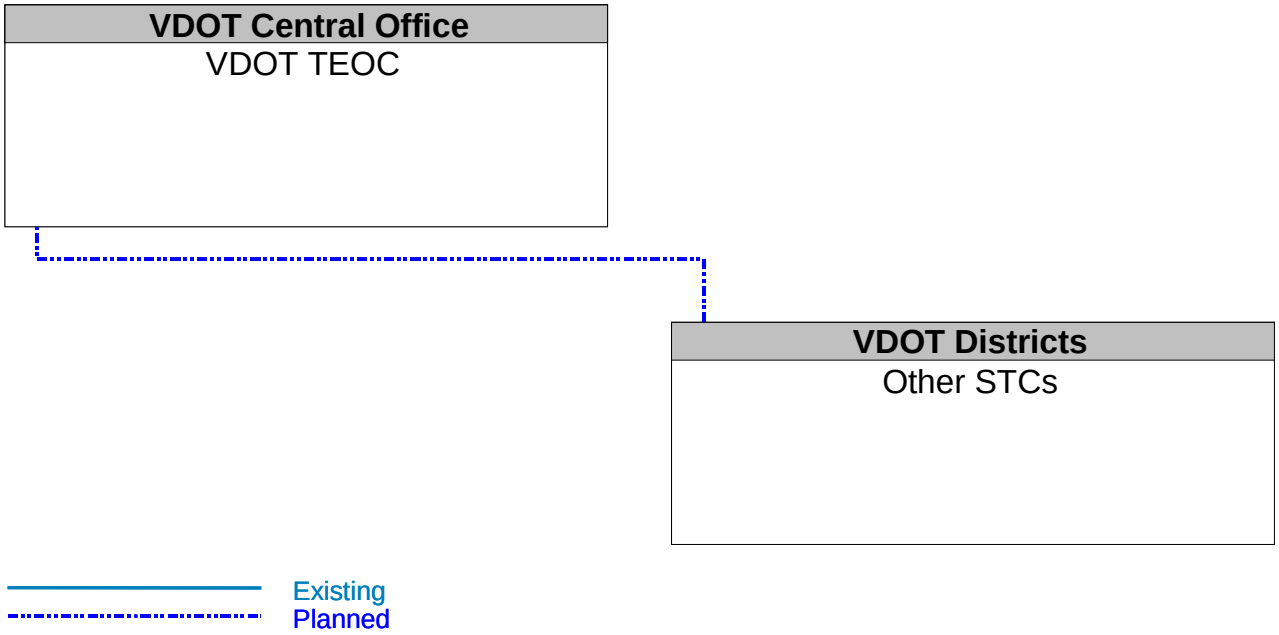

Figure B25 – Other STC's Interconnects

Rail Operations

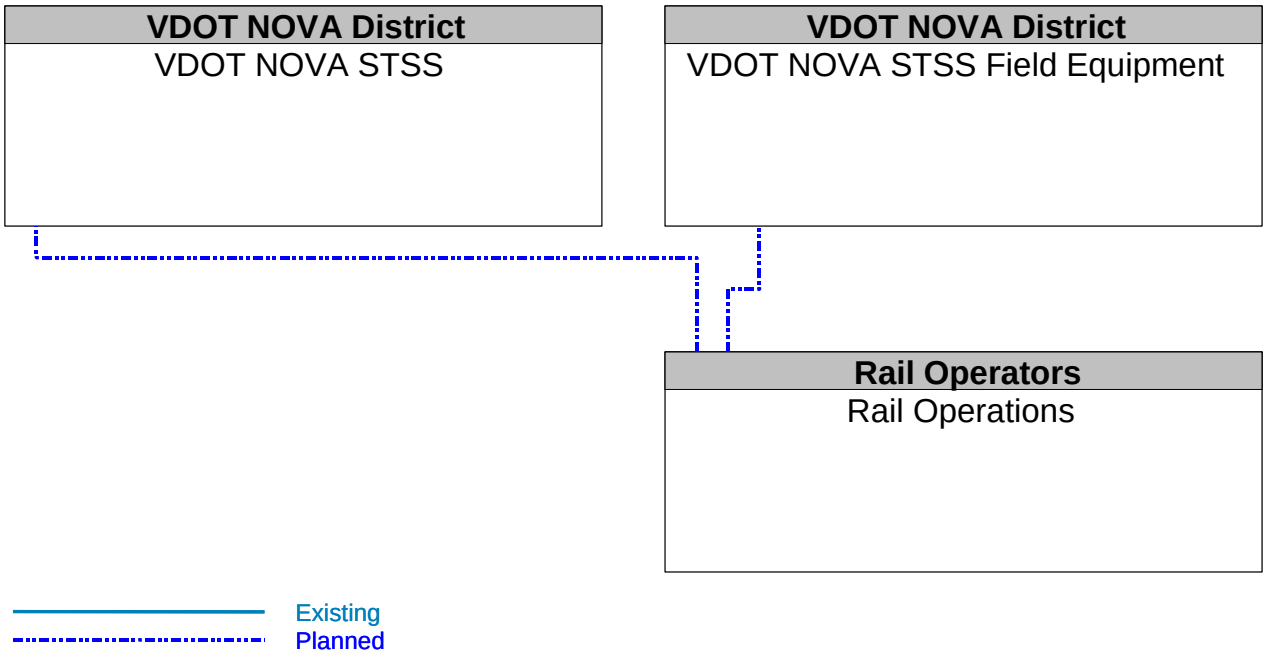

Figure B26 – Rail Operations Interconnects

Regional Transit Electronic Clearinghouse

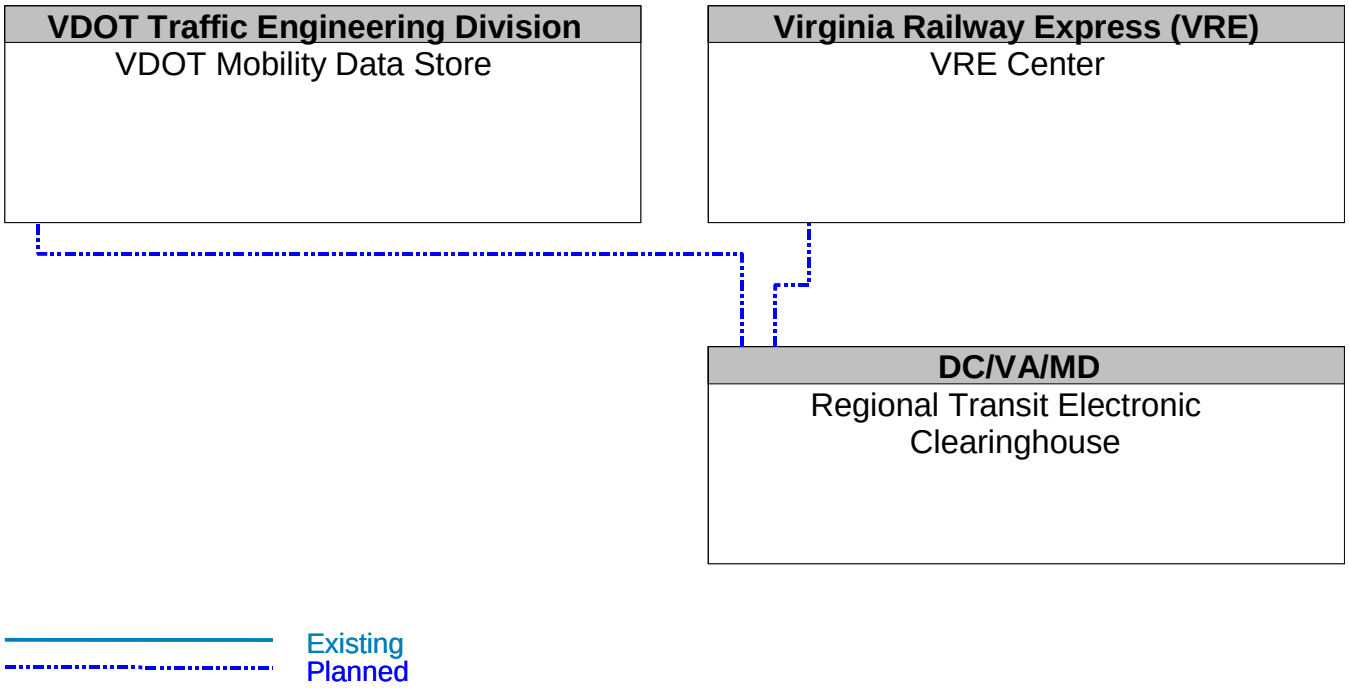

Figure B27 – Regional Transit Electronic Clearinghouse Interconnects

Research and Data Collection Centers

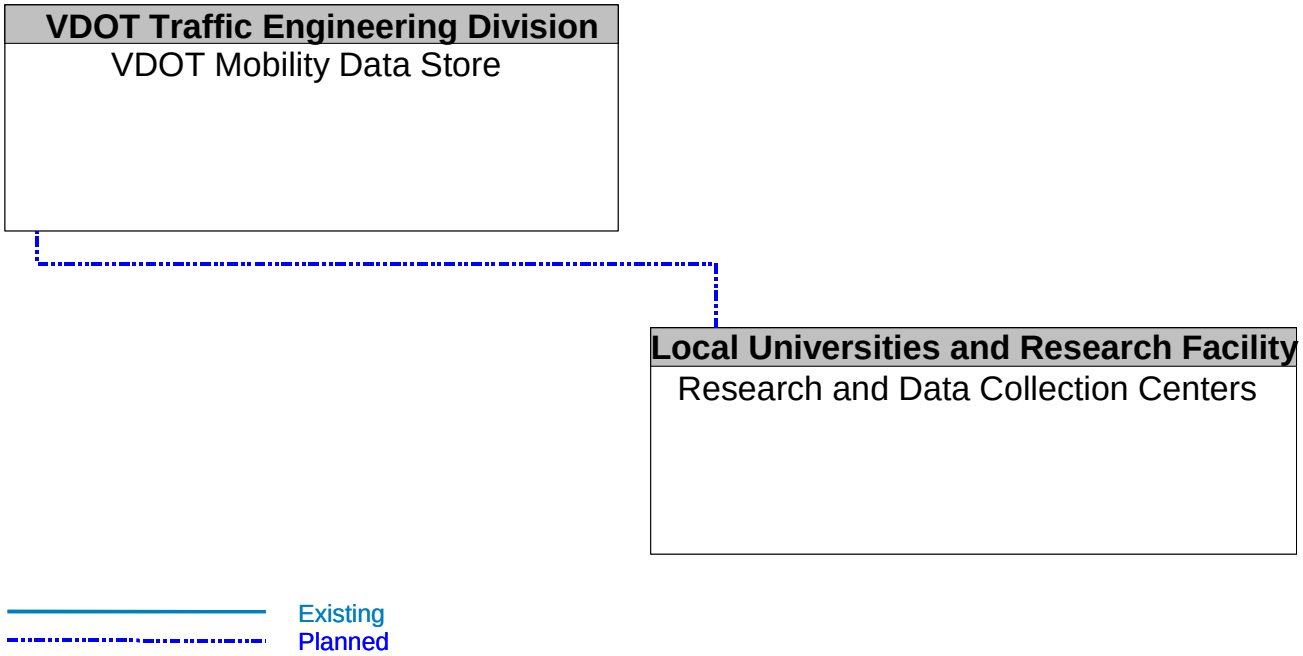

Figure B28 – Research and Data Collection Centers Interconnects

RWIS

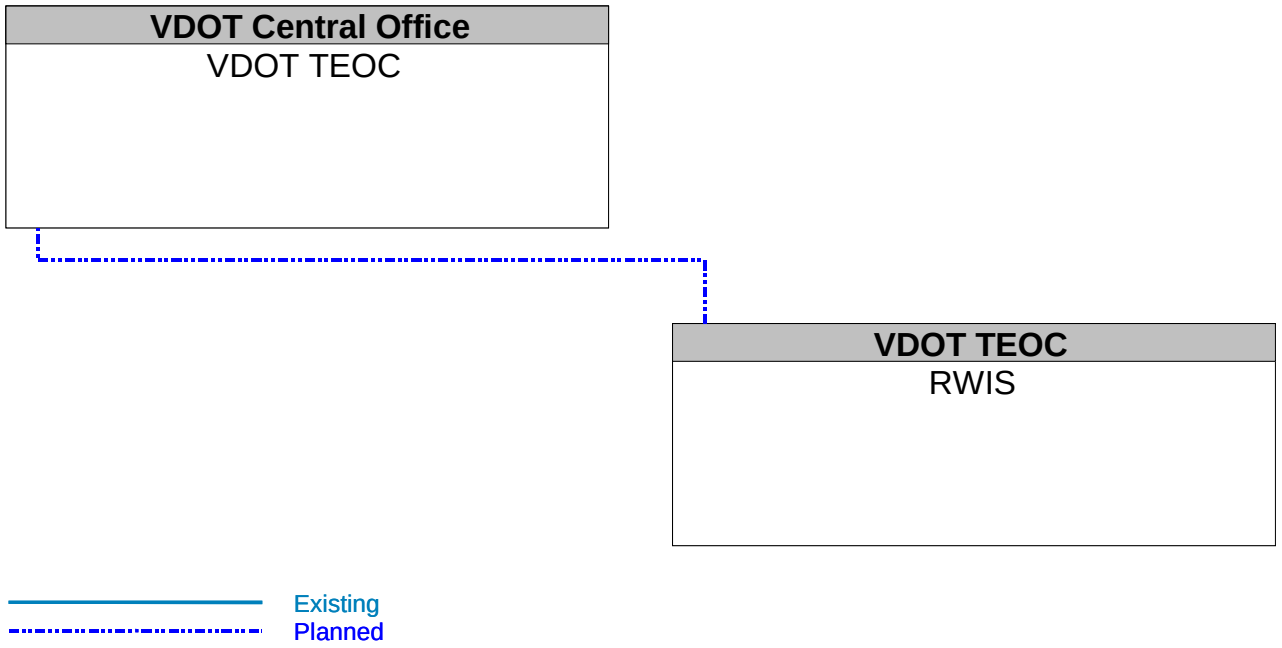

Figure B29 – RWIS Interconnects

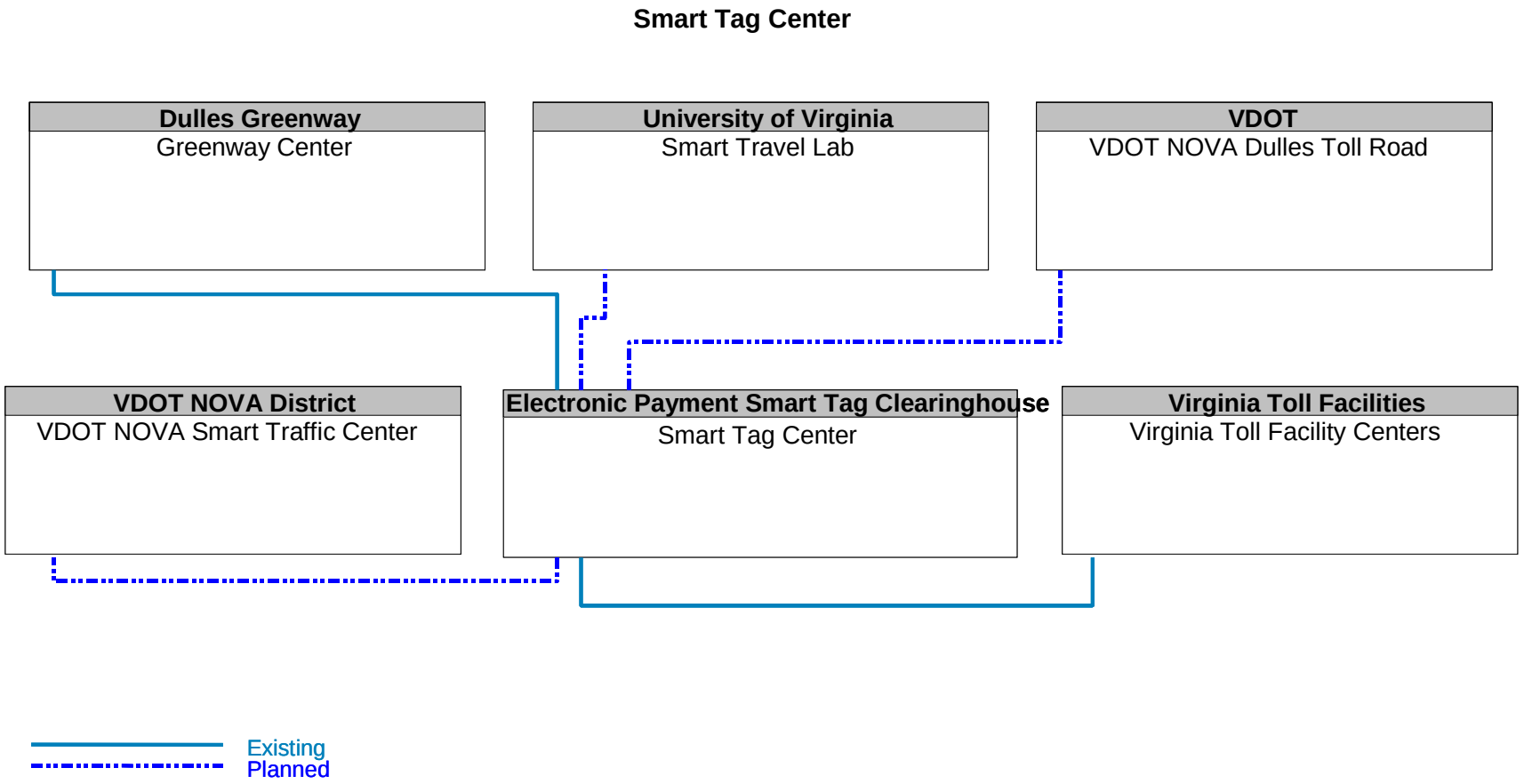

Figure B30 – Smart Tag Center Interconnects

Smart Travel Lab

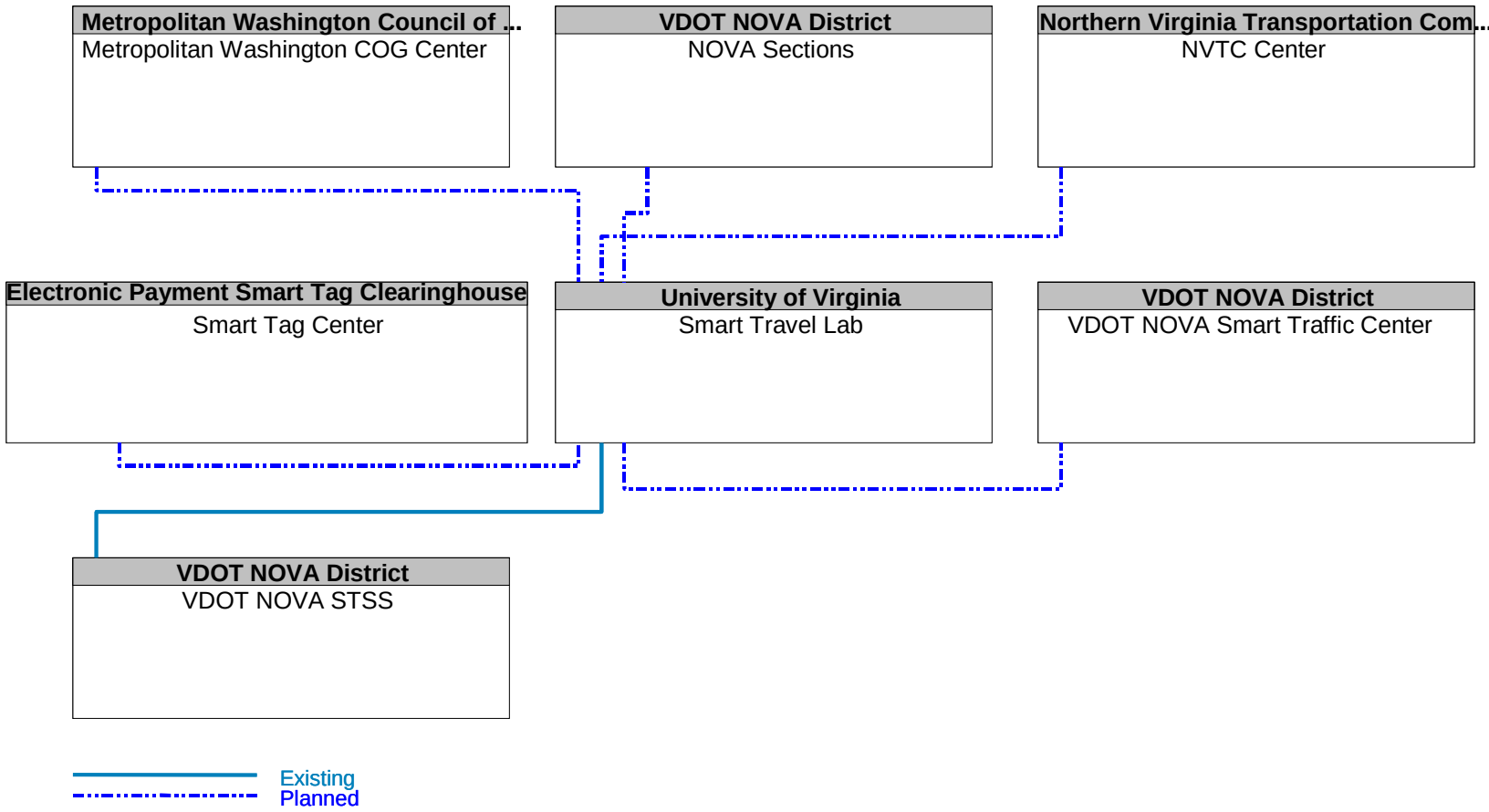

Figure B31 – Smart Travel Lab Interconnects

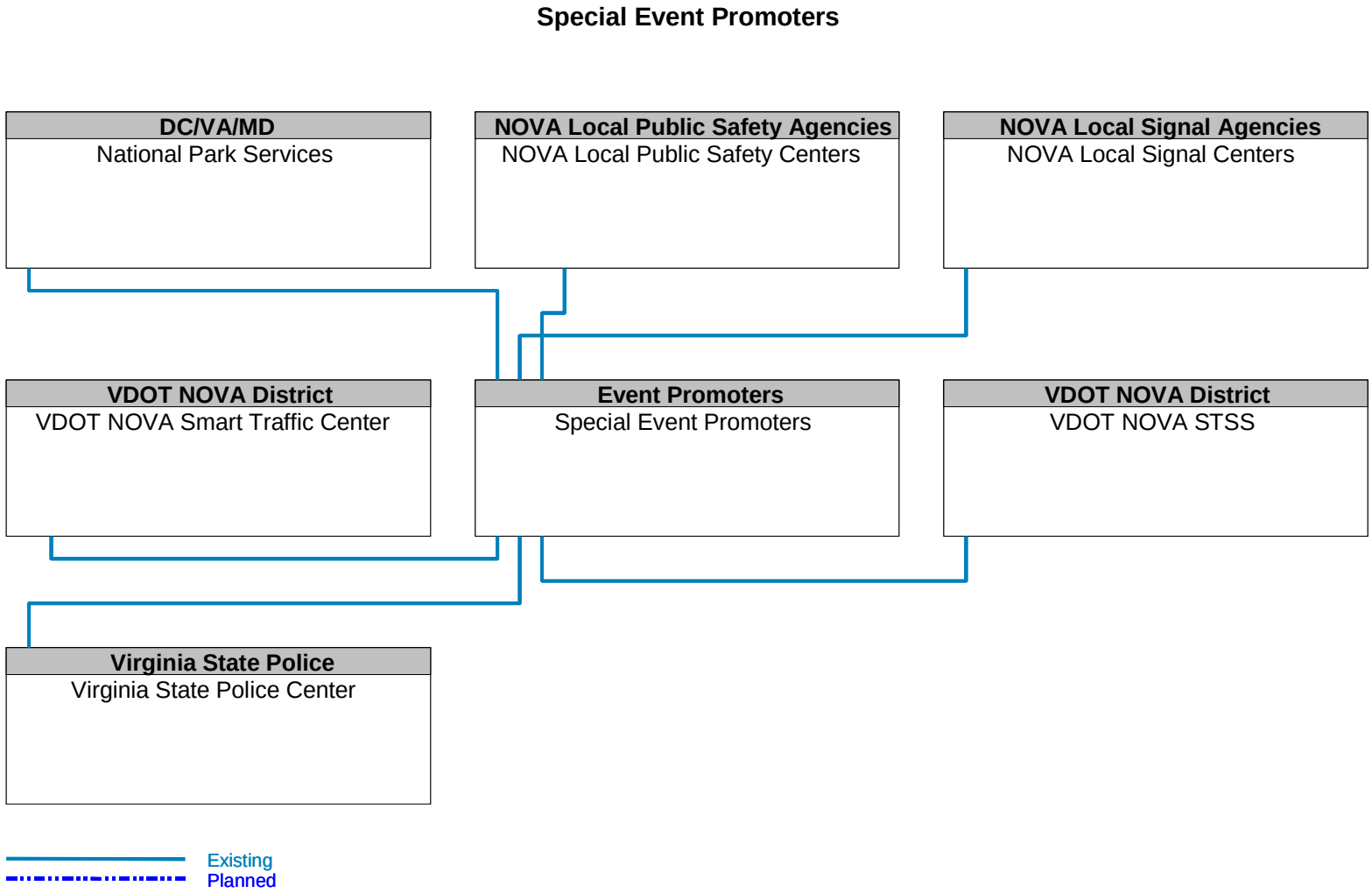

Figure B32 – Special Event Promoters Interconnects

Transportation Information Clearinghouse

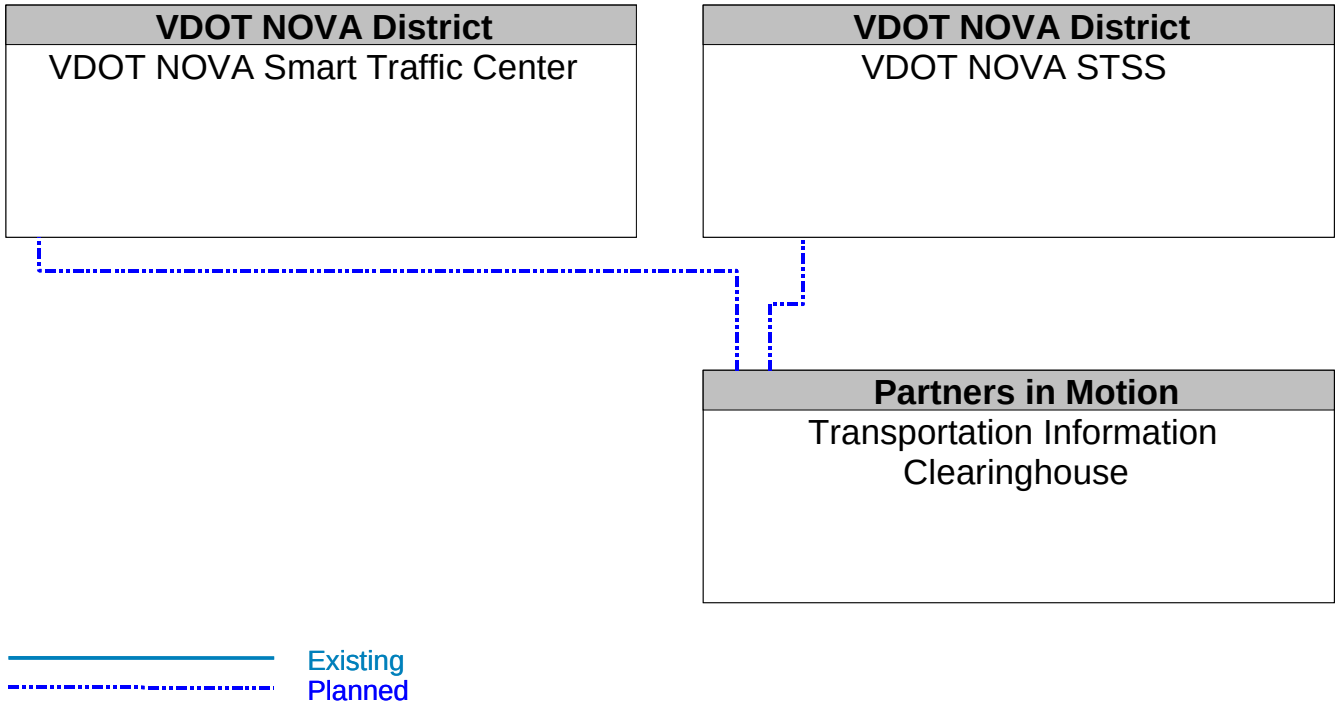

Figure B33 – Transportation Information Clearinghouse Interconnects

Mobile Unified Command

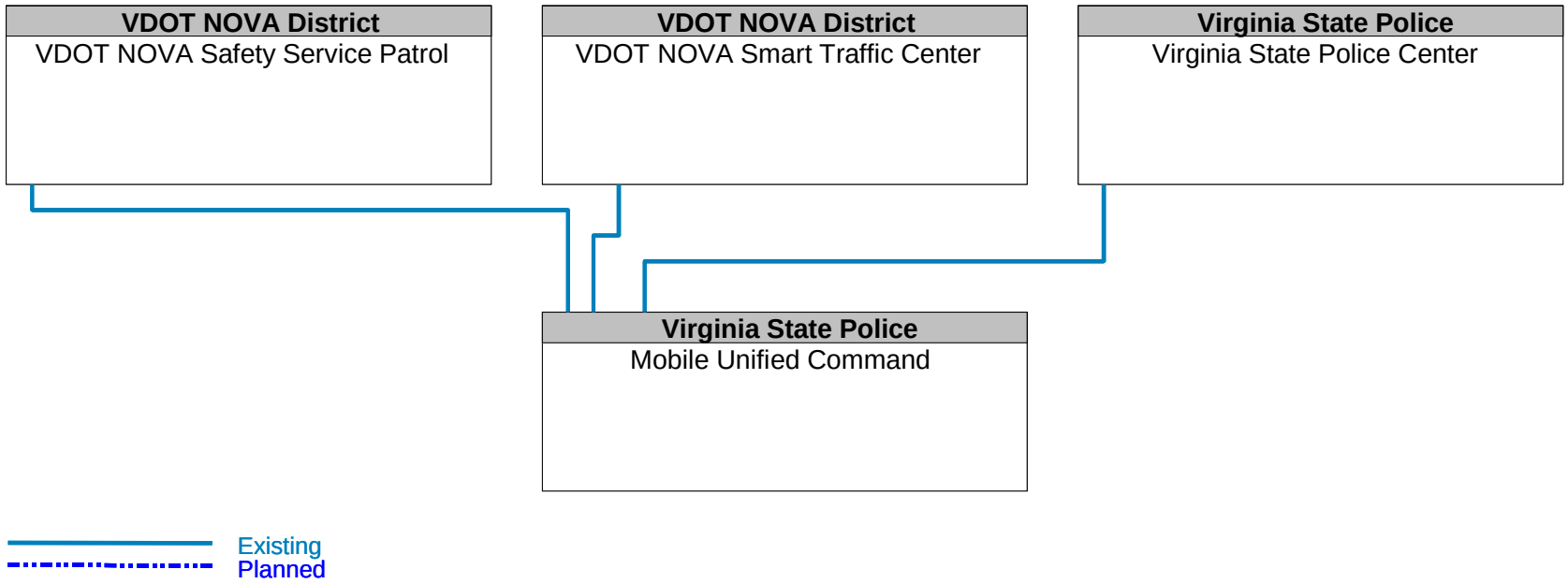

Figure B34 – Mobile Unified Command Interconnects

VDOT Mobility Data Store

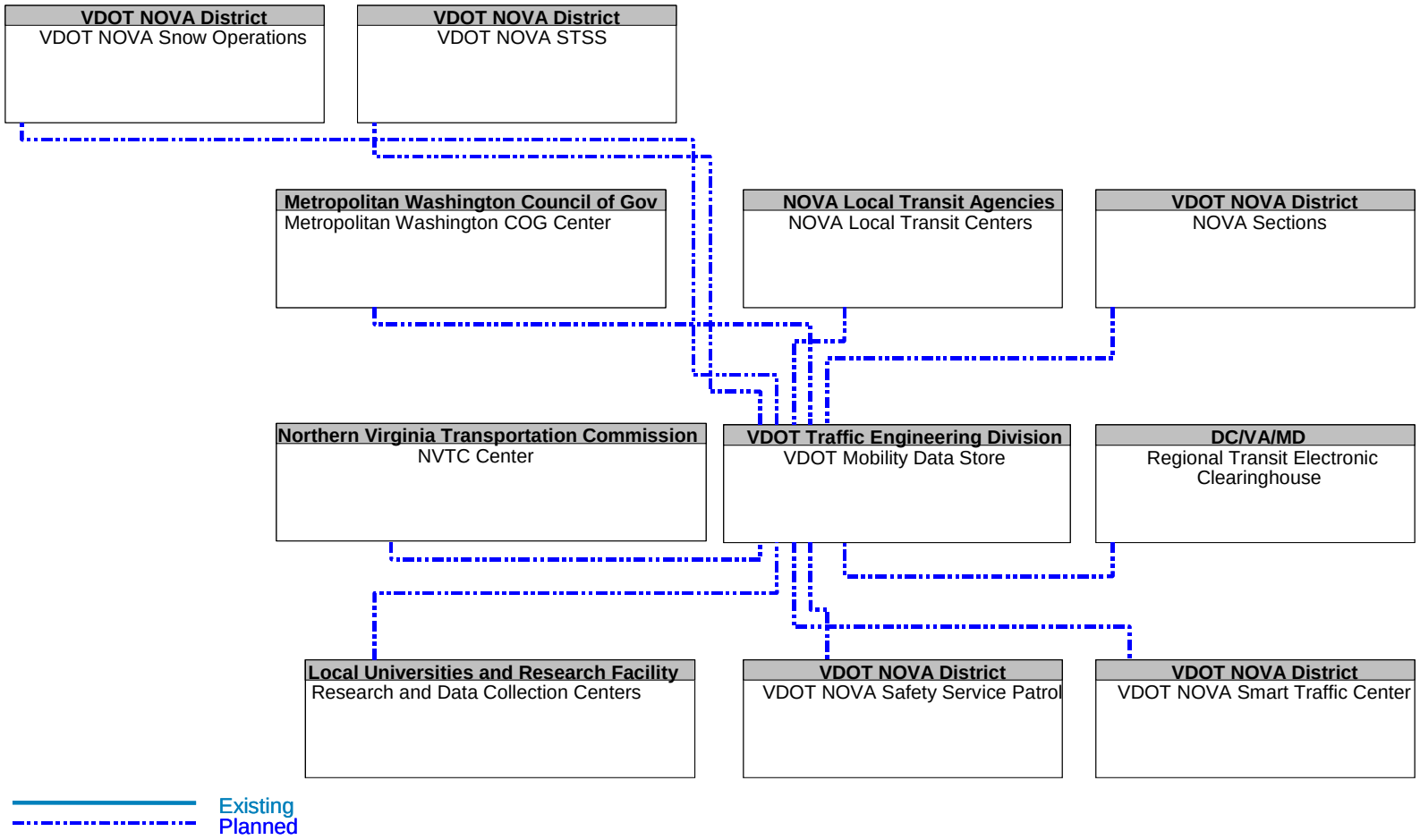

Figure B35 – VDOT Mobility Data Store Interconnects

VDOT NOVA Dulles Toll Road

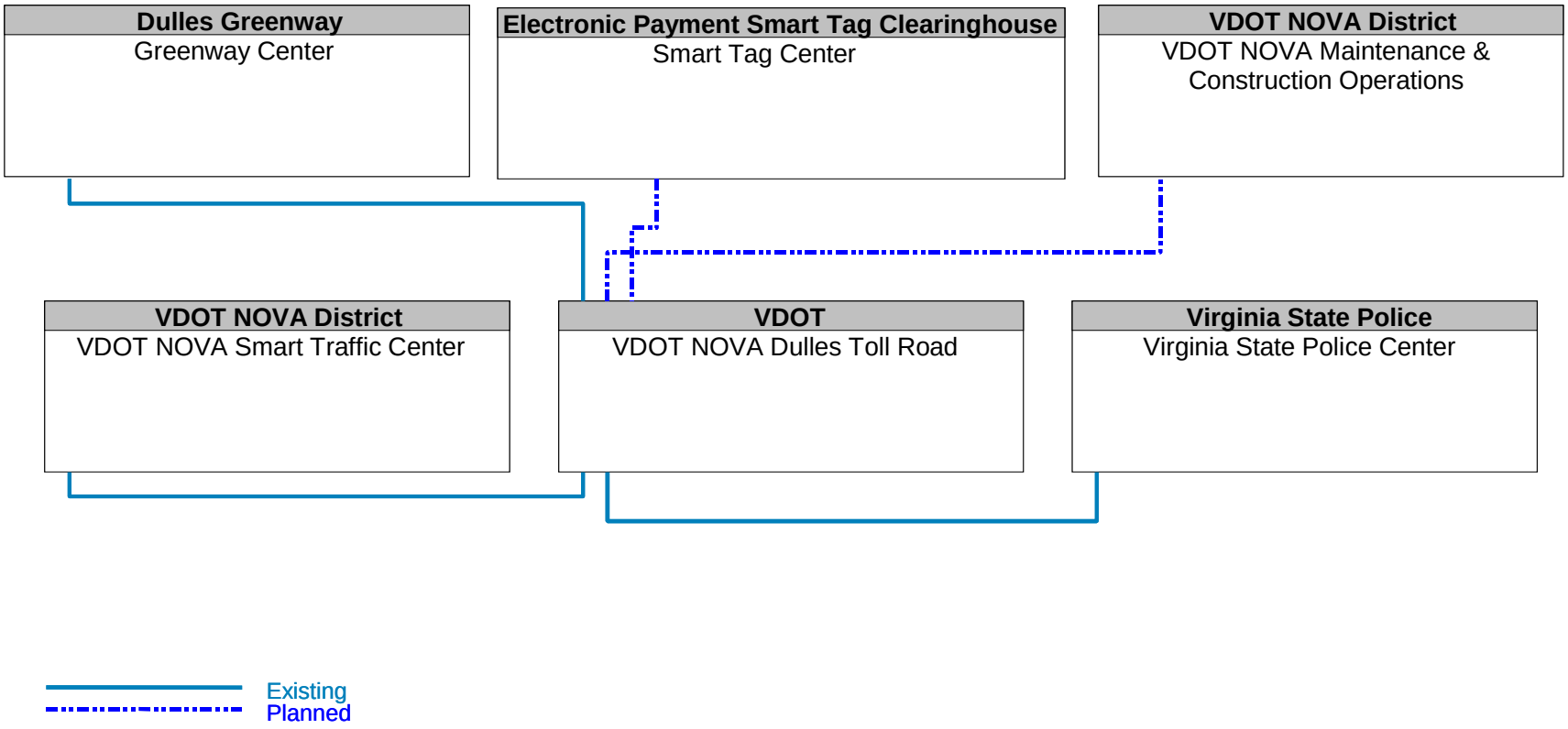

Figure B36 – VDOT NOVA Dulles Toll Road Interconnects

VDOT NOVA GIS

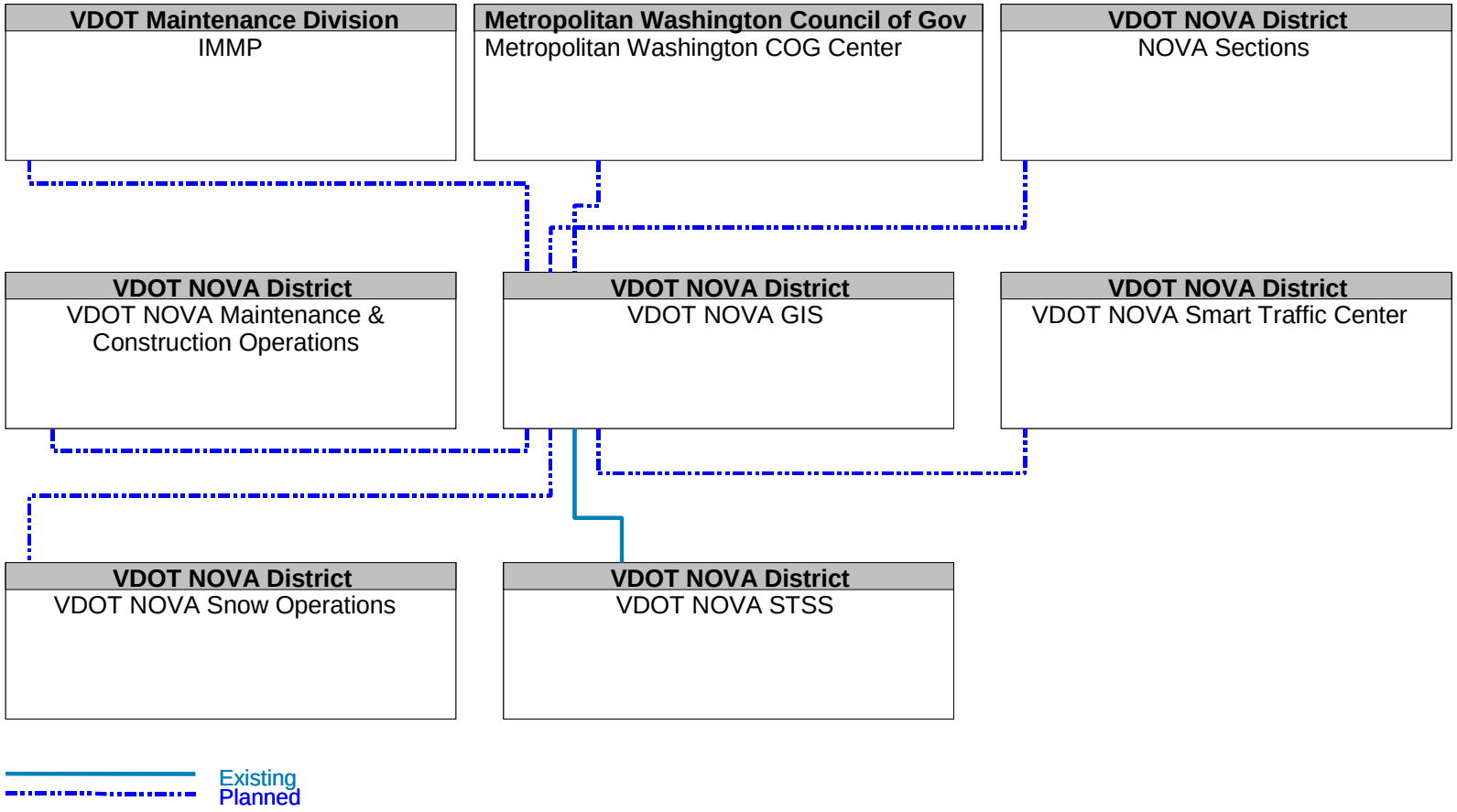

Figure B37 – VDOT NOVA GIS Interconnects

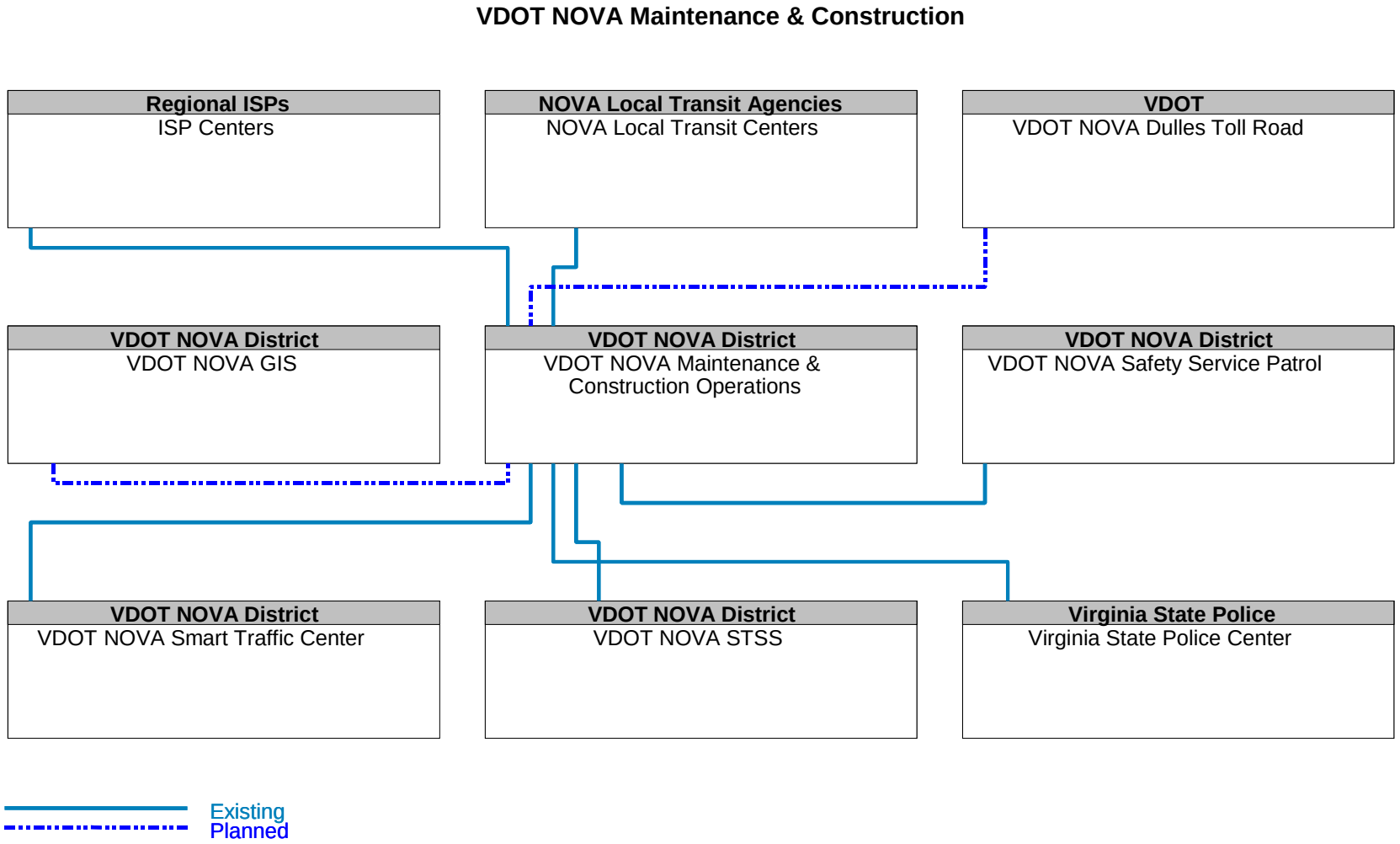

Figure B38 – VDOT NOVA Maintenance & Construction Operations Interconnects

VDOT NOVA Parking Management

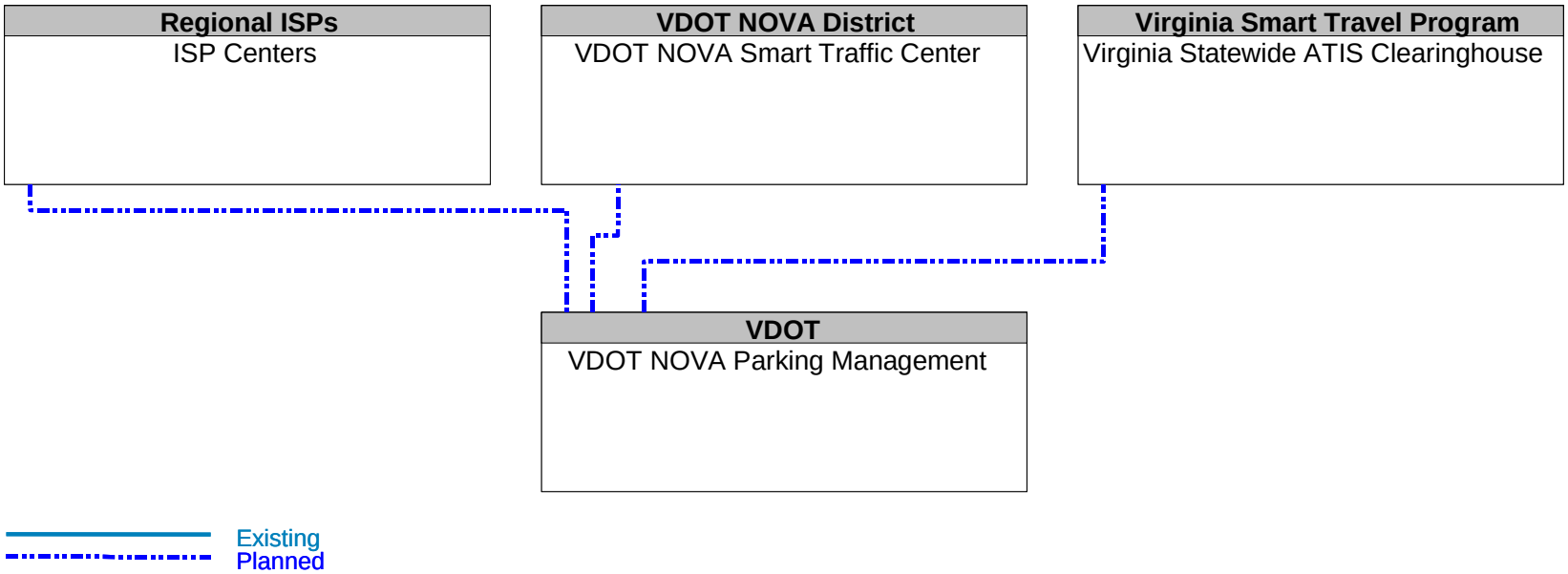

Figure B39 – VDOT NOVA Parking Management Interconnects

VDOT NOVA Safety Service Patrol

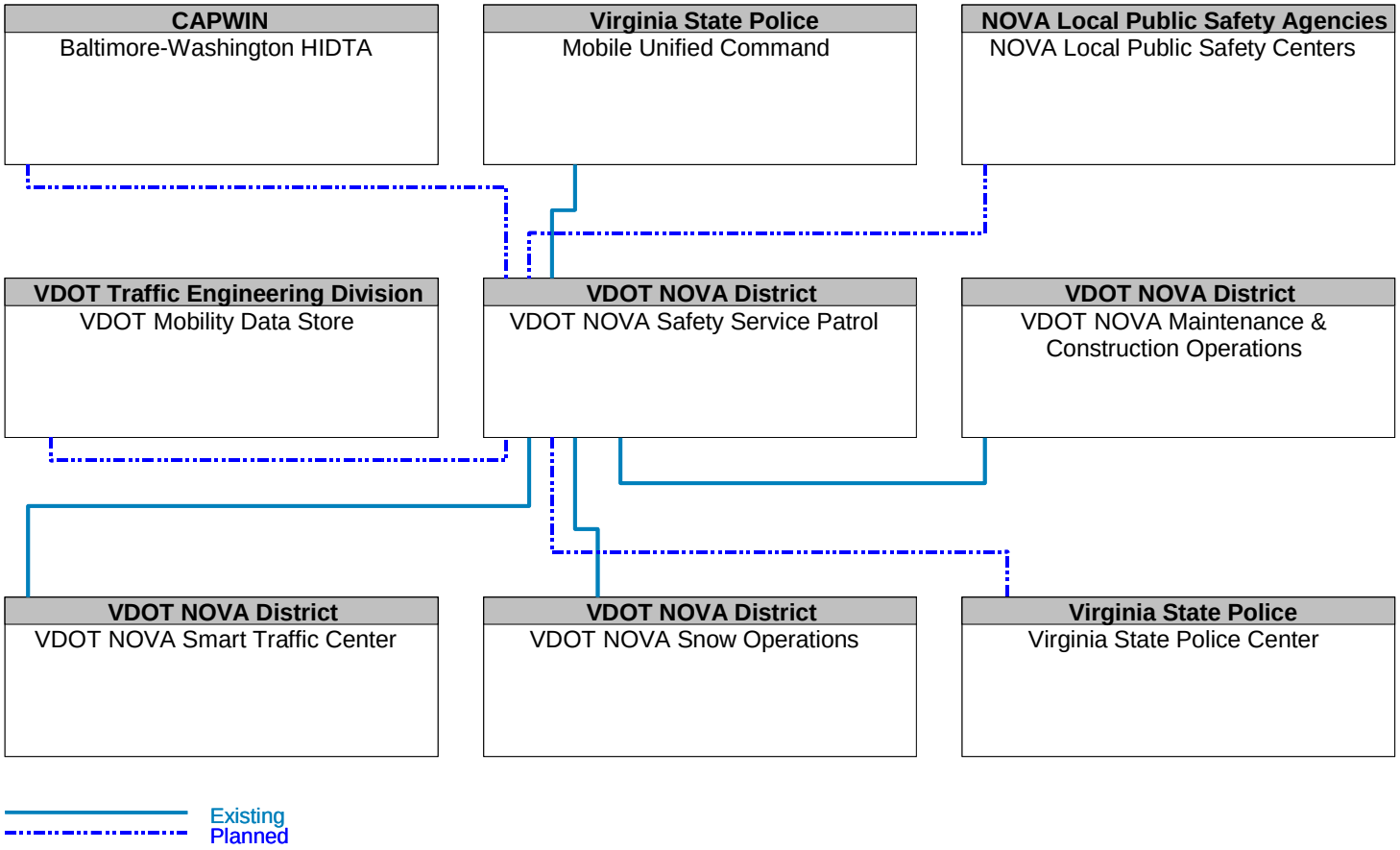

Figure B40 – VDOT NOVA Safety Service Patrol Interconnects

VDOT NOVA Smart Traffic Center

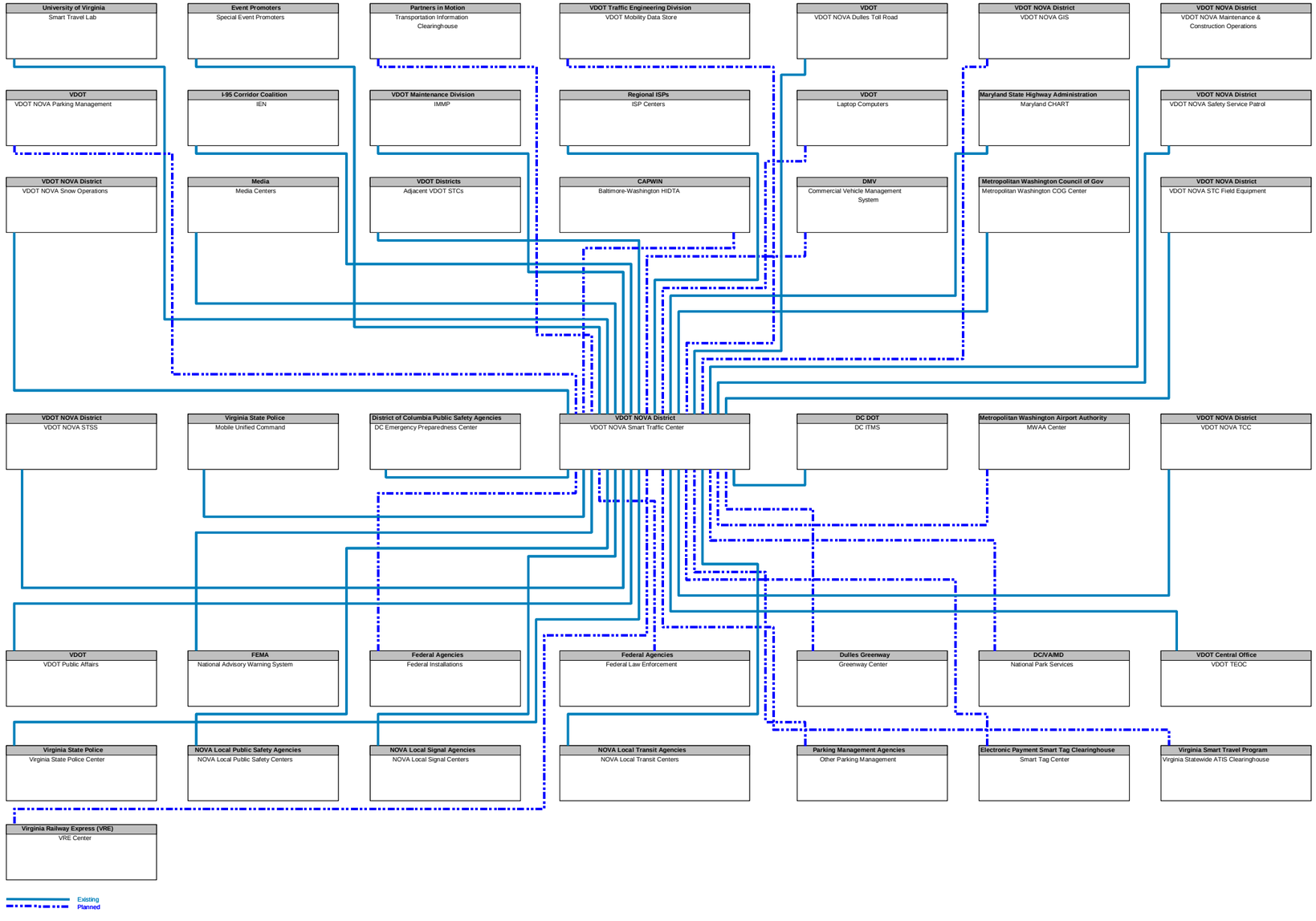

Figure B41 – VDOT NOVA Smart Traffic Center Interconnects

VDOT Snow Operations

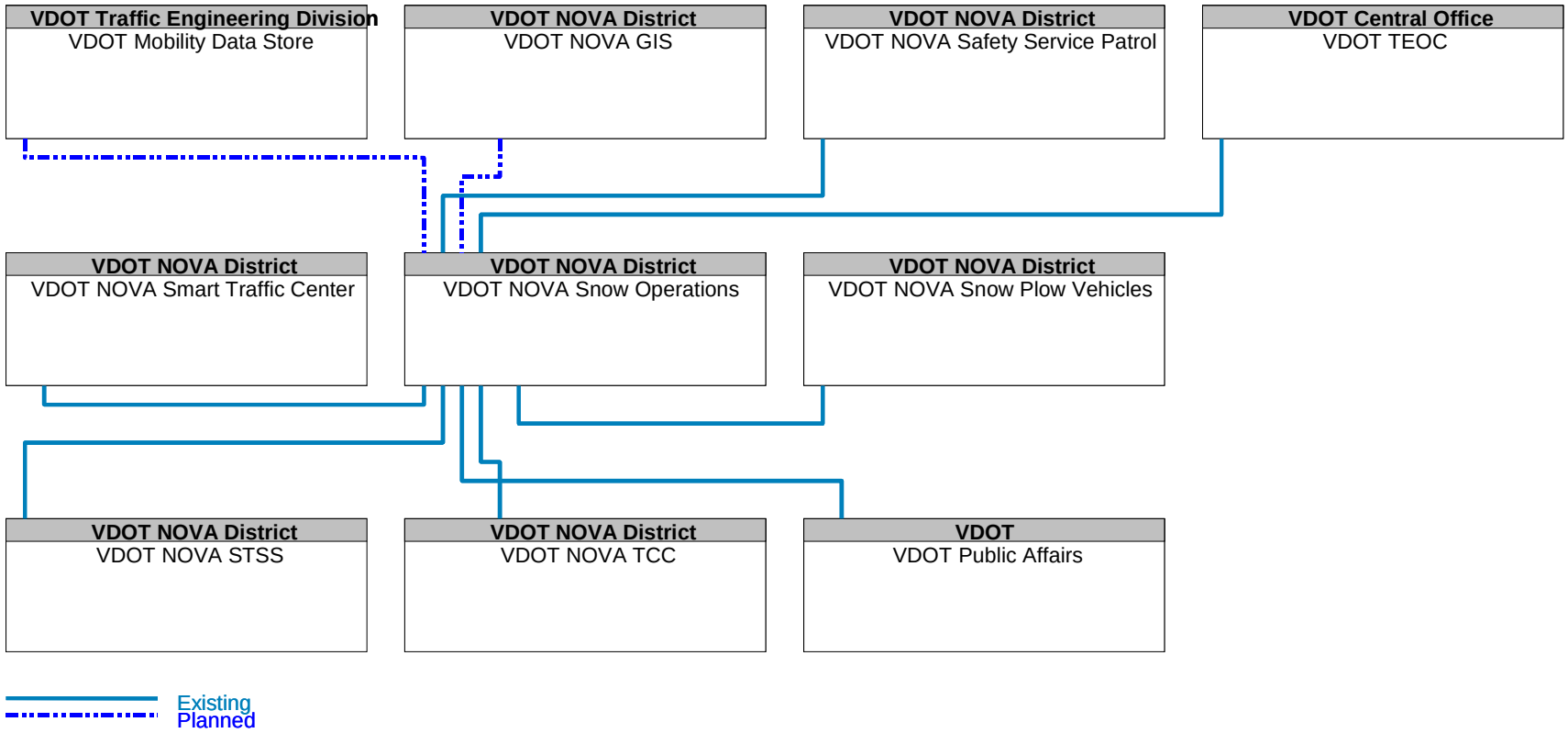

Figure B42 – VDOT Snow Operations Interconnects

VDOT NOVA STC Field Equipment

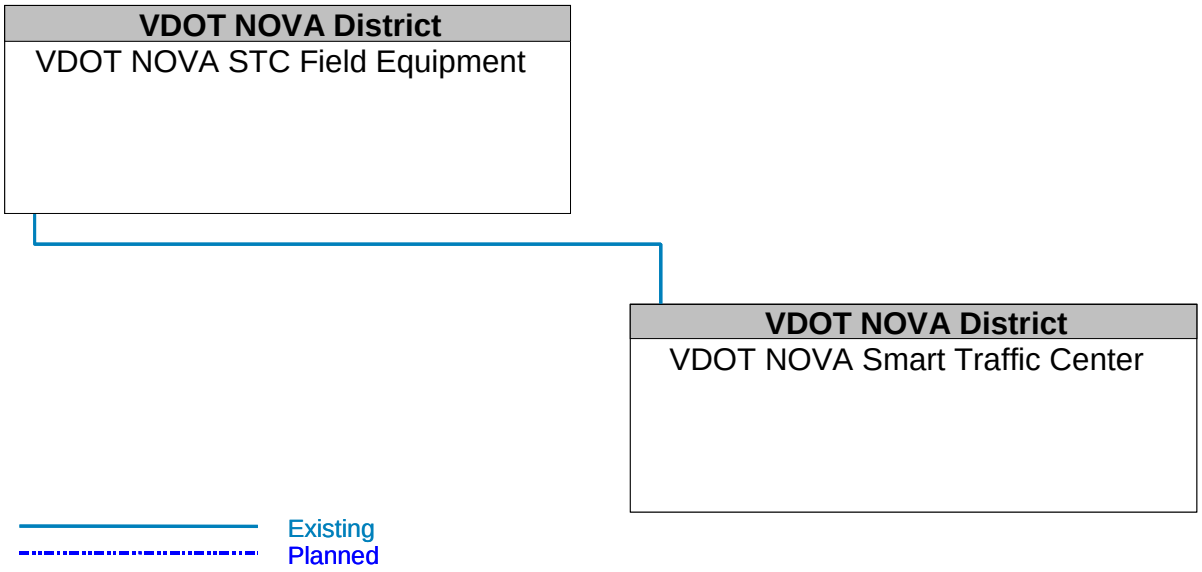

Figure B43 – VDOT NOVA STC Field Equipment Interconnects

VDOT NOVA STSS

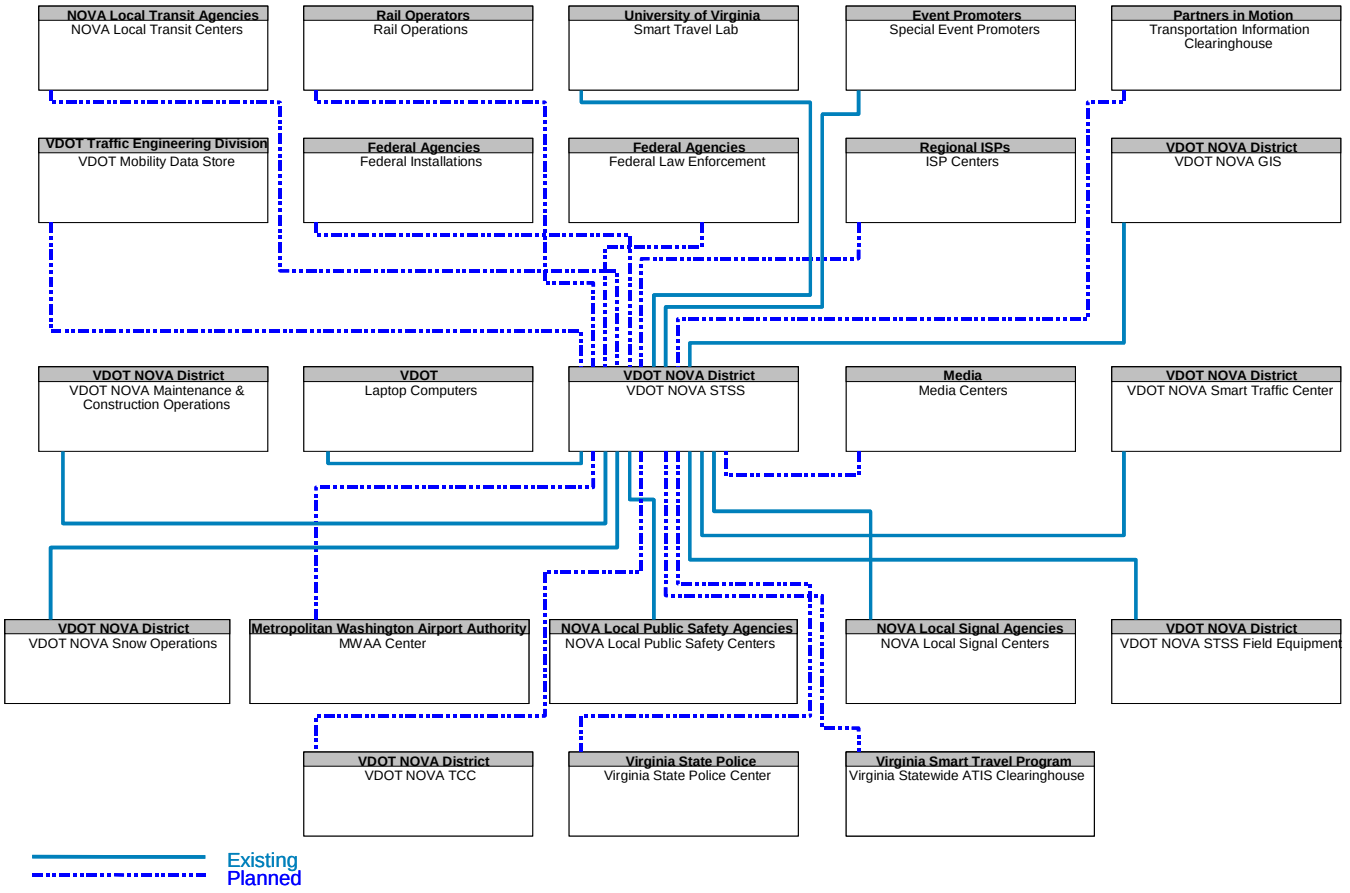

Figure B44 – VDOT NOVA STSS Interconnects

VDOT NOVA STSS Field Equipment

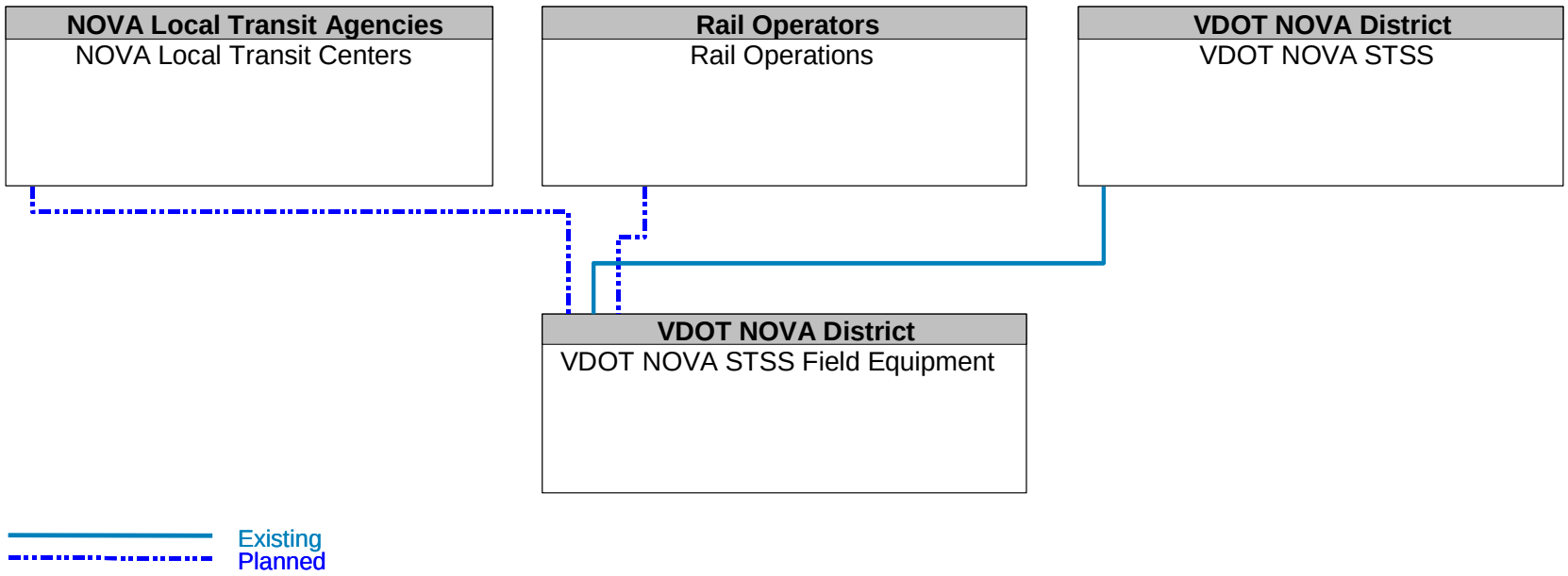

Figure B45 – VDOT NOVA STSS Field Equipment Interconnects

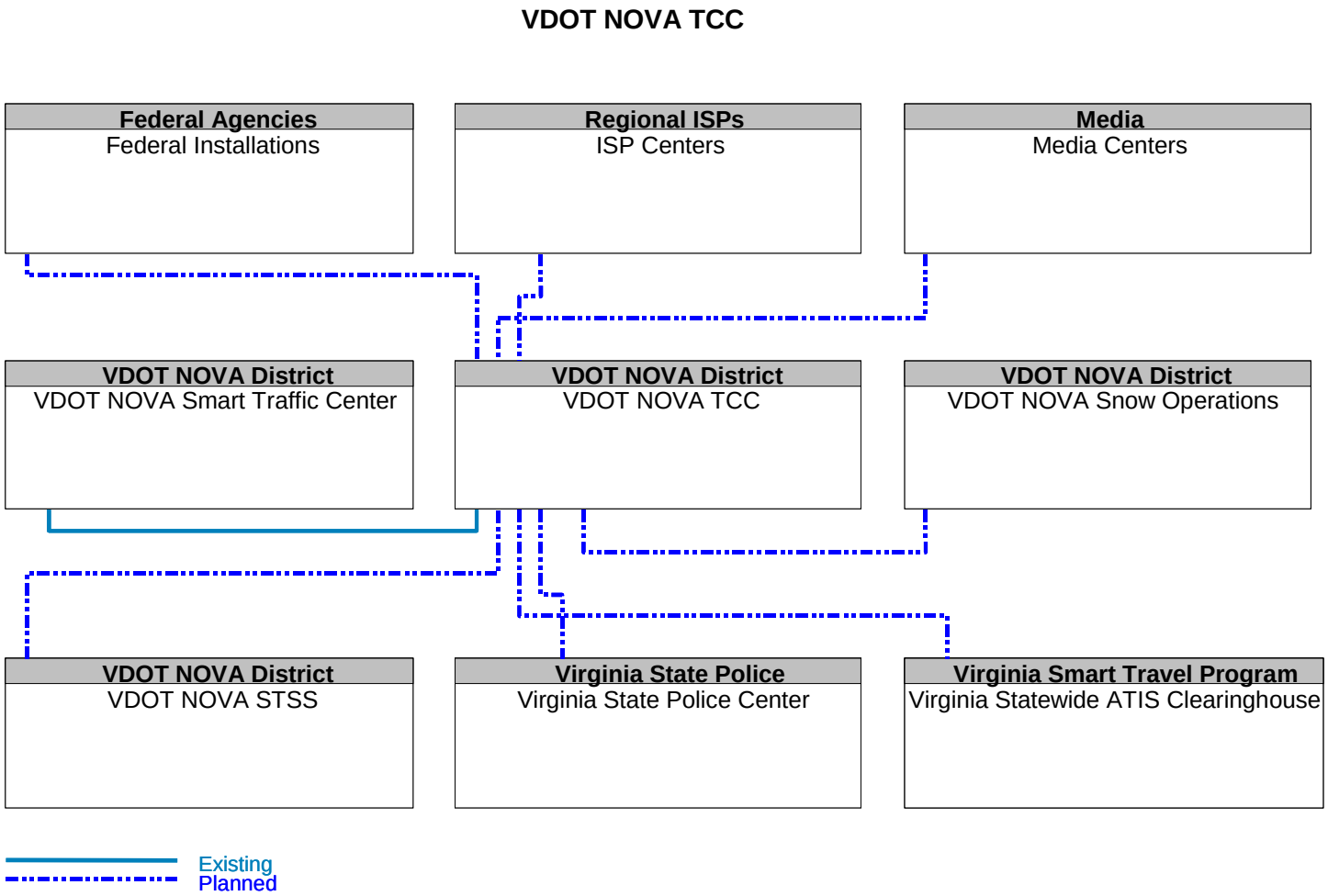

Figure B46 – VDOT NOVA TCC Interconnects

VDOT Public Affairs

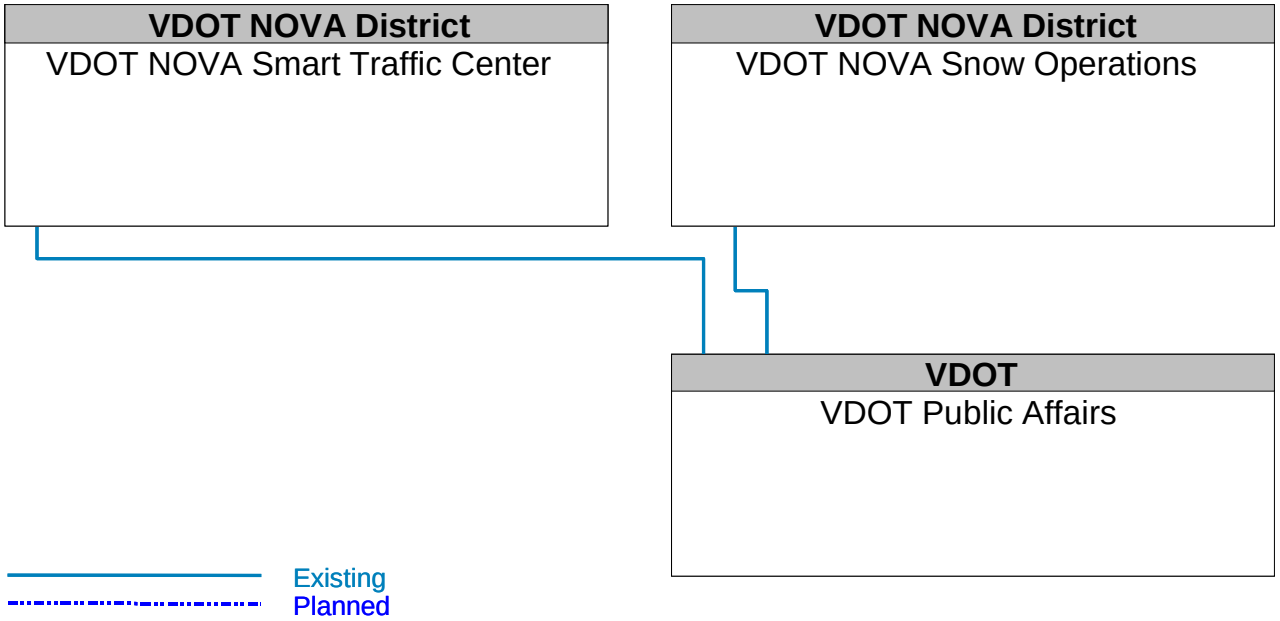

Figure B47 – VDOT Public Affairs Interconnects

VDOT TEOC

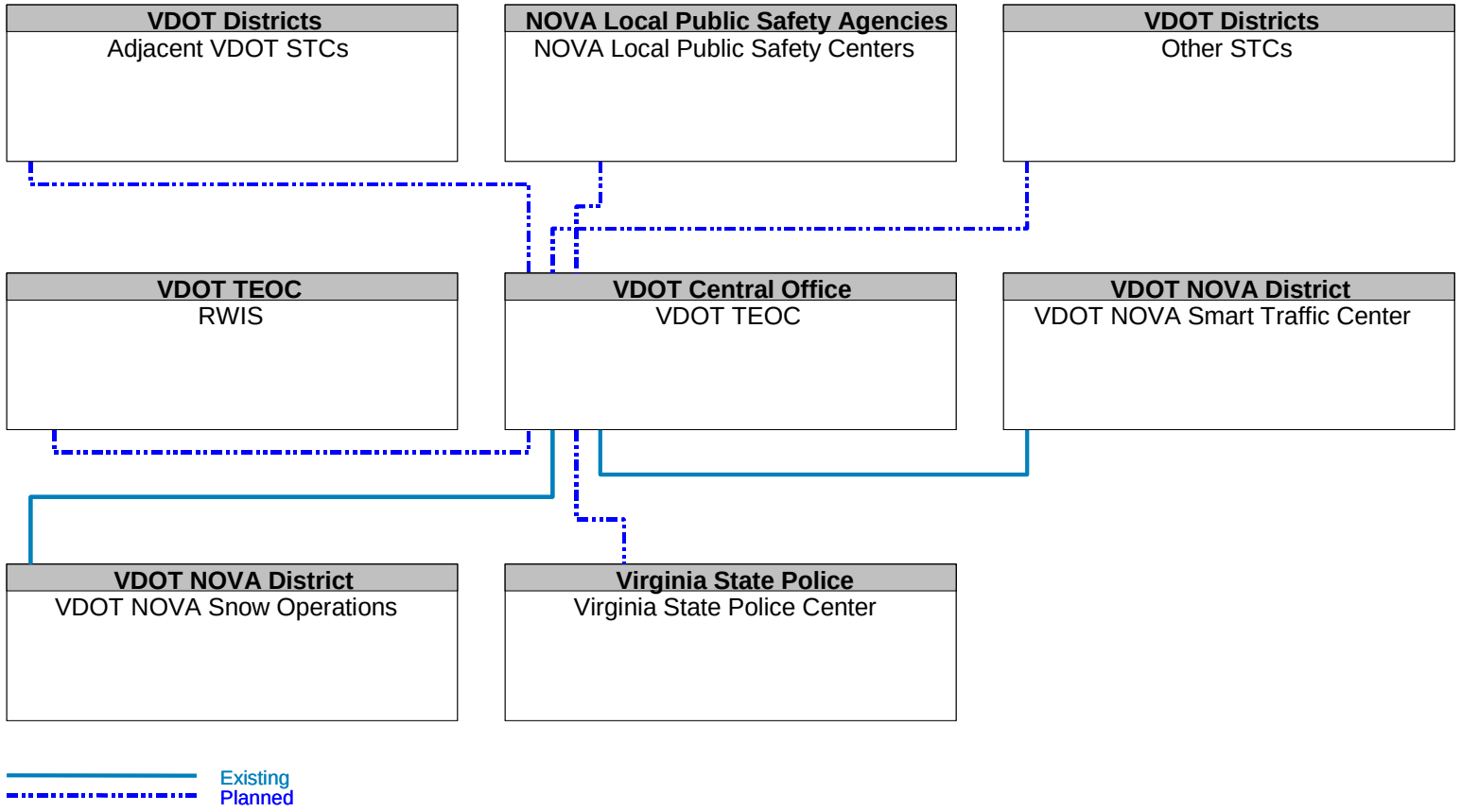

Figure B48 – VDOT TEOC Interconnects

Virginia State Police Center

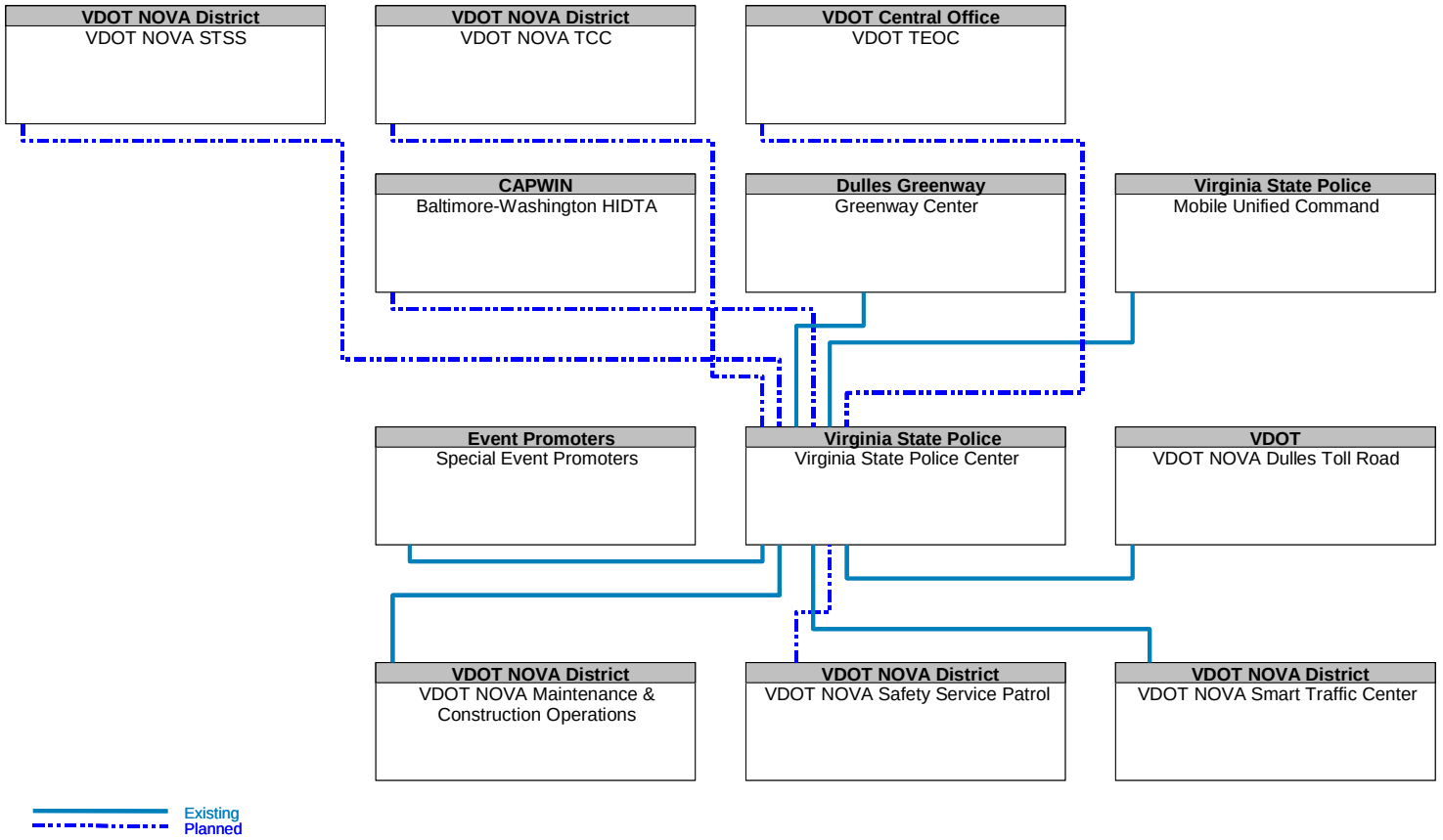

Figure B49 – Virginia State Police Center Interconnects

Virginia Statewide ATIS Clearinghouse

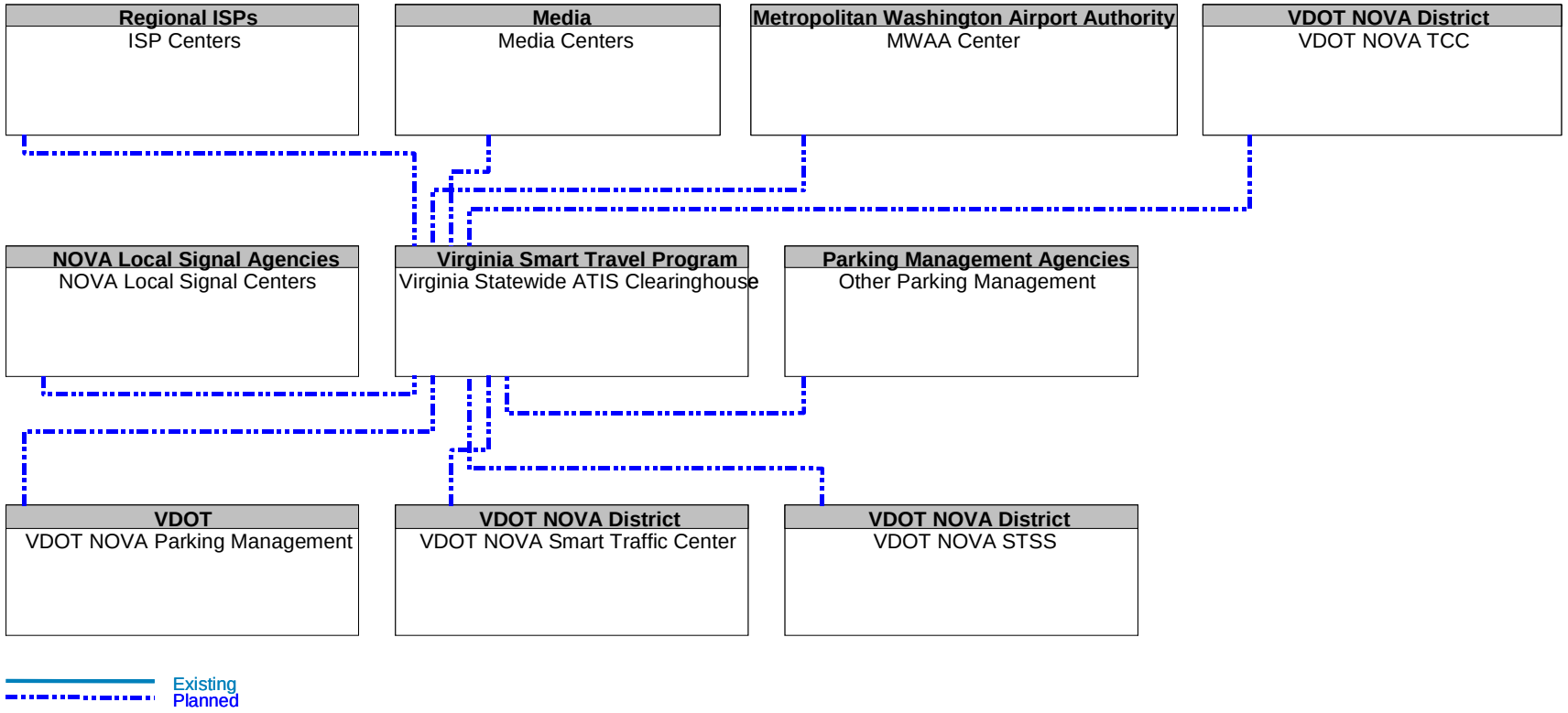

Figure B50 – Virginia Statewide ATIS Clearinghouse Interconnects

Virginia Toll Facility Centers

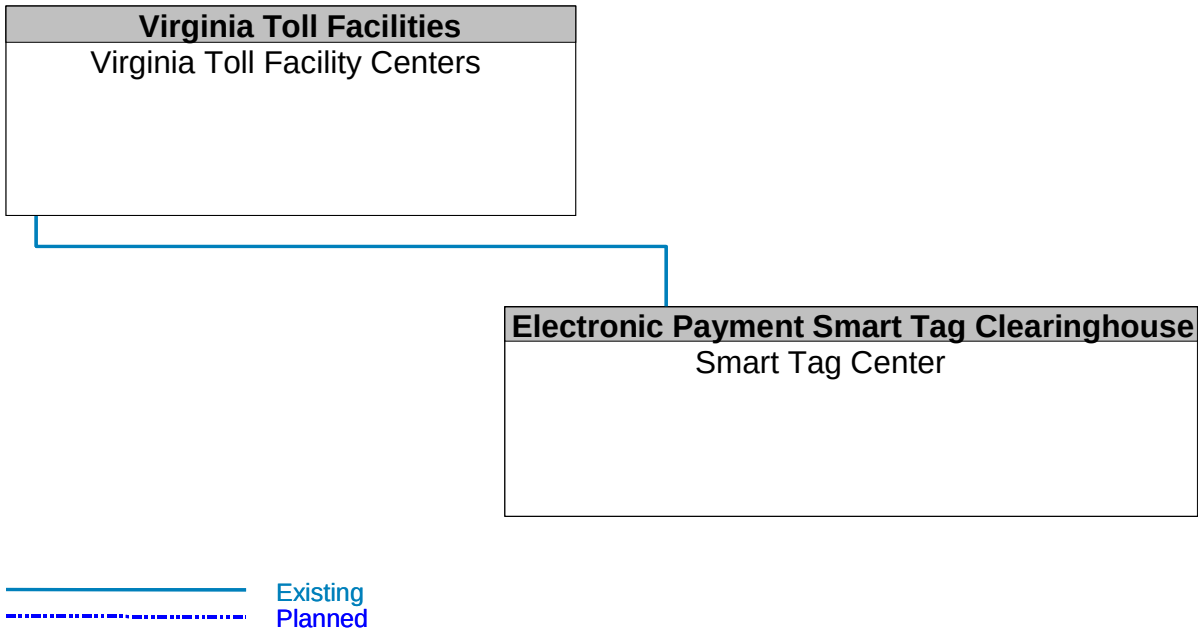

Figure B51 – Virginia Toll Facility Centers Interconnects

VRE Center

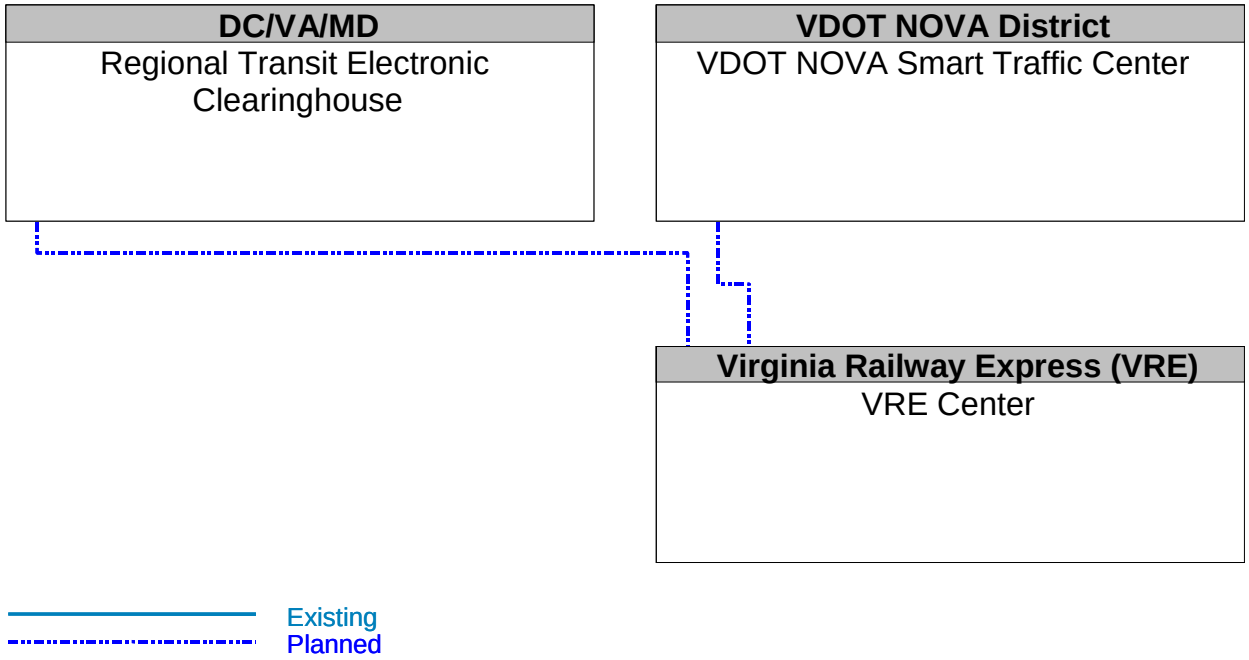

Figure B52 – VRE Center Interconnects

APPENDIX C – INTERFACE DIAGRAMS

To provide some guidance to specific information in this appendix two indices have been provided. The first index, Table C1, provides a grouping of interface diagrams based on the domain areas used for the outreach sessions during the architecture development. These domain areas are:

- VDOT NOVA STC
- Incident and Emergency Management
- Traffic Operations
- Transit
- Planning
- Internal VDOT Statewide
- Internal VDOT NOVA
- Regional Coordination
- Electronic Payment

The second index, Table C2, provides a cross reference by system linking each system to the diagrams in which it is included.

Table C1 – Appendix C Interface Diagram Index by Domain Area

Domain Area	Appendix C Diagram
VDOT NOVA STC	• Figure C1. Adjacent VDOT STCs to VDOT NOVA Smart Traffic Center Interface • Figure C2. VDOT NOVA Smart Traffic Center to VDOT NOVA STSS Interface • Figure C3. VDOT NOVA Smart Traffic Center to VDOT NOVA STC Field Equipment Interface • Figure C4. VDOT NOVA Smart Traffic Center to Virginia State Police Center Interface • Figure C5. VDOT NOVA STC to VDOT TEOC to Other STCs Interface • Figure C6. VDOT NOVA Smart Traffic Center to VDOT Public Affairs Interface • Figure C7. VDOT NOVA Smart Traffic Center to Virginia Statewide ATIS Clearinghouse and ISP Centers Interface • Figure C8. VDOT NOVA Smart Traffic Center to VDOT NOVA Snow Operations Interface • Figure C9. VDOT NOVA Safety Service Patrol to VDOT NOVA Smart Traffic Center Interface • Figure C10. VDOT NOVA Smart Traffic Center to VDOT NOVA Parking Management to and Other Parking Management Interface • Figure C11. VDOT NOVA Maintenance & Construction Operations to VDOT NOVA Safety Service Patrol and VDOT NOVA Smart Traffic Center Interface • Figure C12. VDOT NOVA GIS to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C13. VDOT NOVA STC and VDOT NOVA STSS to VDOT Mobility Data Store Interface • Figure C14. Unified Command to VDOT NOVA Smart Traffic Center Interface • Figure C15. Transportation Information Clearinghouse to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C16. Special Event Promoters to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface

Table C1 – Appendix C Interface Diagram Index by Domain Area

Domain Area	Appendix C Diagram
	• Figure C17 Smart Travel Lab to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C18. VDOT NOVA Smart Traffic Center to VDOT NOVA TCC Interface • Figure C19. Baltimore-Washington HIDTA to NOVA Public Safety Centers and VDOT NOVA STC Interface • Figure C20. Commercial Vehicle Management System to VDOT NOVA STC Interface • Figure C21. DC Emergency Preparedness Center to VDOT NOVA STC Interface • Figure C22. DC ITMS to VDOT NOVA STC Interface • Figure C23. Federal Installations to VDOT NOVA STC Interface • Figure C24. Federal Law Enforcement to VDOT NOVA Smart Traffic Center and NOVA STSS Interface • Figure C25. Smart Tag Center to VDOT NOVA Dulles Toll Road, VDOT NOVA STC, Greenway Center and Virginia Toll Facility Centers Interface • Figure C26. IEN to VDOT NOVA STC Interface • Figure C27. IMMP to VDOT NOVA GIS and VDOT NOVA STC Interface • Figure C28. Laptop Computers to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C29. Maryland CHART to VDOT NOVA STC Interface • Figure C30. Media Centers to VDOT NOVA STC Interface • Figure C31. Metropolitan Washington COG Center to VDOT NOVA GIS and VDOT NOVA STC Interface • Figure C32. MWAA Center to VDOT NOVA STC and VDOT NOVA STSS Interface • Figure C33. National Advisory Warning System to VDOT NOVA STC Interface • Figure C34. National Park Services to VDOT NOVA STC Interface • Figure C35. NOVA Local Signal Centers to VDOT NOVA STC Interface • Figure C36. VDOT NOVA STC to NOVA Local Transit Centers to VRE Center Interface
Incident and Emergency Management	• Figure C4. VDOT NOVA Smart Traffic Center to Virginia State Police Center Interface • Figure C8. VDOT NOVA Smart Traffic Center to VDOT NOVA Snow Operations Interface • Figure C9. VDOT NOVA Safety Service Patrol to VDOT NOVA Smart Traffic Center Interface • Figure C11. VDOT NOVA Maintenance & Construction Operations to VDOT NOVA Safety Service Patrol and VDOT NOVA Smart Traffic Center Interface • Figure C19. Baltimore-Washington HIDTA to NOVA Public Safety Centers and VDOT NOVA STC Interface • Figure C39. VDOT NOVA STSS to NOVA Local Public Safety Centers and Virginia State Police Center Interface • Figure C45. VDOT NOVA Maintenance & Construction Operations to VDOT NOVA STSS and Virginia State Police Center Interface • Figure C46. VDOT NOVA Snow Operations to VDOT NOVA STSS and VDOT TEOC Interface • Figure C48. Mobile Unified Command to VDOT NOVA Safety Service Patrol Interface • Figure C49. Baltimore Washington HIDTA to VDOT NOVA Safety Service Patrol

Table C1 – Appendix C Interface Diagram Index by Domain Area

Domain Area	Appendix C Diagram
	Interface • Figure C50. NOVA Local Public Safety Centers to VDOT NOVA Safety Service Patrol Interface • Figure C51. VDOT Mobility Data Store to VDOT NOVA Safety Service Patrol Interface • Figure C52. VDOT NOVA Safety Service Patrol to VDOT NOVA Snow Operations Interface • Figure C53. VDOT NOVA Safety Service Patrol to Virginia State Police Center Interface • Figure C52. VDOT NOVA Safety Service Patrol to VDOT NOVA Snow Operations Interface • Figure C59. Adjacent VDOT STCs to NOVA Public Safety Centers and VDOT TEOC Interface • Figure C60. VDOT NOVA Dulles Toll Road to Virginia State Police Center to Greenway Center Interface • Figure C65. VDOT NOVA GIS to VDOT NOVA Maintenance & Construction Operations and VDOT NOVA Snow Operations Interface • Figure C67. VDOT NOVA Snow Operations to VDOT NOVA Snow Plow Vehicles, VDOT Public Affairs and VDOT NOVA TCC Interface
Traffic Operations	• Figure C2. VDOT NOVA Smart Traffic Center to VDOT NOVA STSS Interface • Figure C12. VDOT NOVA GIS to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C13. VDOT NOVA STC and VDOT NOVA STSS to VDOT Mobility Data Store Interface • Figure C15. Transportation Information Clearinghouse to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C16. Special Event Promoters to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C17 Smart Travel Lab to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C28. Laptop Computers to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C32. MWAA Center to VDOT NOVA STC and VDOT NOVA STSS Interface • Figure C34. National Park Services to VDOT NOVA STC Interface • Figure C35. NOVA Local Signal Centers to VDOT NOVA STC Interface • Figure C37. VDOT NOVA STSS to VDOT NOVA STSS Field Equipment Interface • Figure C38. VDOT NOVA STSS to ISP Centers to Virginia Statewide ATIS Clearinghouse Interface • Figure C39. VDOT NOVA STSS to NOVA Local Public Safety Centers and Virginia State Police Center Interface • Figure C40. NOVA Local Signal Centers to VDOT NOVA STSS Interface • Figure C41. Federal Installations to the VDOT NOVA STSS Interface • Figure C42. Media Centers to VDOT NOVA STSS Interface • Figure C43. NOVA Local Transit Centers to VDOT NOVA STSS and VDOT NOVA STSS Field Equipment Interface

Table C1 – Appendix C Interface Diagram Index by Domain Area

Domain Area	Appendix C Diagram
	• Figure C44. VDOT NOVA STSS to Rail Operations to VDOT NOVA STSS Field Equipment Interface • Figure C45. VDOT NOVA Maintenance & Construction Operations to VDOT NOVA STSS and Virginia State Police Center Interface • Figure C46. VDOT NOVA Snow Operations to VDOT NOVA STSS and VDOT TEOC Interface • Figure C47. VDOT NOVA STSS to VDOT NOVA TCC Interface • Figure C25. Smart Tag Center to VDOT NOVA Dulles Toll Road, VDOT NOVA STC, Greenway Center and Virginia Toll Facility Centers Interface • Figure C60. VDOT NOVA Dulles Toll Road to Virginia State Police Center to Greenway Center Interface • Figure C66. VDOT NOVA Dulles Toll Road to VDOT NOVA Maintenance & Construction Operations Interface
Transit	• Figure C36. VDOT NOVA STC to NOVA Local Transit Centers to VRE Center Interface • Figure C43. NOVA Local Transit Centers to VDOT NOVA STSS and VDOT NOVA STSS Field Equipment Interface • Figure C55. NOVA Local Transit Centers to VDOT Mobility Data Store and VDOT NOVA Maintenance and Construction Interface • Figure C57. NVTC Center to Smart Travel Lab and VDOT Mobility Data Store Interface
Planning	• Figure C13. VDOT NOVA STC and VDOT NOVA STSS to VDOT Mobility Data Store Interface • Figure C17 Smart Travel Lab to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C31. Metropolitan Washington COG Center to VDOT NOVA GIS and VDOT NOVA STC Interface • Figure C51. VDOT Mobility Data Store to VDOT NOVA Safety Service Patrol Interface • Figure C54. Metropolitan Washington COG Center to Smart Travel Lab and VDOT Mobility Data Store Interface • Figure C55. NOVA Local Transit Centers to VDOT Mobility Data Store and VDOT NOVA Maintenance and Construction Interface • Figure C56. NOVA Sections to Smart Travel Lab and VDOT Mobility Data Store and VDOT NOVA GIS Interface • Figure C57. NVTC Center to Smart Travel Lab and VDOT Mobility Data Store Interface • Figure C58. Research and Data Collection Centers to VDOT Mobility Data Store Interface
Internal VDOT Statewide	• Figure C6. VDOT NOVA Smart Traffic Center to VDOT Public Affairs Interface • Figure C7. VDOT NOVA Smart Traffic Center to Virginia Statewide ATIS Clearinghouse and ISP Centers Interface • Figure C18. VDOT NOVA Smart Traffic Center to VDOT NOVA TCC Interface • Figure C38. VDOT NOVA STSS to ISP Centers to Virginia Statewide ATIS Clearinghouse Interface • Figure C47. VDOT NOVA STSS to VDOT NOVA TCC Interface • Figure C62. ISP Centers to VDOT NOVA TCC and Virginia Statewide ATIS Clearinghouse Interface

Table C1 – Appendix C Interface Diagram Index by Domain Area

Domain Area	Appendix C Diagram
	• Figure C63. Media Centers to Virginia Statewide ATIS Clearinghouse Interface Figure C64. MWAA Center to Virginia Statewide ATIS Clearinghouse Interface Figure C67. VDOT NOVA Snow Operations to VDOT NOVA Snow Plow Vehicles, VDOT Public Affairs and VDOT NOVA TCC Interface
Internal VDOT NOVA	• Figure C8. VDOT NOVA Smart Traffic Center to VDOT NOVA Snow Operations Interface • Figure C11. VDOT NOVA Maintenance & Construction Operations to VDOT NOVA Safety Service Patrol and VDOT NOVA Smart Traffic Center Interface • Figure C12. VDOT NOVA GIS to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C20. Commercial Vehicle Management System to VDOT NOVA STC Interface • Figure C27. IMMP to VDOT NOVA GIS and VDOT NOVA STC Interface • Figure C46. VDOT NOVA Snow Operations to VDOT NOVA STSS and VDOT TEOC Interface • Figure C45. VDOT NOVA Maintenance & Construction Operations to VDOT NOVA STSS and Virginia State Police Center Interface • Figure C52. VDOT NOVA Safety Service Patrol to VDOT NOVA Snow Operations Interface • Figure C55. NOVA Local Transit Centers to VDOT Mobility Data Store and VDOT NOVA Maintenance and Construction Interface • Figure C56. NOVA Sections to Smart Travel Lab and VDOT Mobility Data Store and VDOT NOVA GIS Interface • Figure C61. ISP Center to VDOT NOVA Maintenance and Construction and VDOT NOVA Parking Management Interface • Figure C65. VDOT NOVA GIS to VDOT NOVA Maintenance & Construction Operations and VDOT NOVA Snow Operations Interface • Figure C66. VDOT NOVA Dulles Toll Road to VDOT NOVA Maintenance & Construction Operations Interface • Figure C67. VDOT NOVA Snow Operations to VDOT NOVA Snow Plow Vehicles, VDOT Public Affairs and VDOT NOVA TCC Interface
Electronic Payment	• Figure C25. Smart Tag Center to VDOT NOVA Dulles Toll Road, VDOT NOVA STC, Greenway Center and Virginia Toll Facility Centers Interface

Table C2 – Appendix C Interface Diagram Index by System

System	Appendix C Interface Diagram Figure Number
Adjacent VDOT STCs	• Figure C1. Adjacent VDOT STCs to VDOT NOVA Smart Traffic Center Interface • Figure C59. Adjacent VDOT STCs to NOVA Public Safety Centers and VDOT TEOC Interface
Baltimore-Washington HIDTA	• Figure C19. Baltimore-Washington HIDTA to NOVA Public Safety Centers and VDOT NOVA STC Interface • Figure C49. Baltimore-Washington HIDTA to VDOT NOVA Safety Service Patrol Interface
Commercial Vehicle Management System	• Figure C20. Commercial Vehicle Management System to VDOT NOVA STC Interface
DC Emergency Preparedness Center	• Figure C21. DC Emergency Preparedness Center to VDOT NOVA STC Interface
DC ITMS	• Figure C22. DC ITMS to VDOT NOVA STC Interface
Federal Installations	• Figure C23. Federal Installations to VDOT NOVA STC Interface • Figure C41. Federal Installations to the VDOT NOVA STSS Interface
Federal Law Enforcement	• Figure C24. Federal Law Enforcement to VDOT NOVA Smart Traffic Center and NOVA STSS Interface
Greenway Center	• Figure C25. Smart Tag Center to VDOT NOVA Dulles Toll Road, VDOT NOVA STC, Greenway Center and Virginia Toll Facility Centers Interface • Figure C60. VDOT NOVA Dulles Toll Road to Virginia State Police Center to Greenway Center Interface
IEN	• Figure C26. IEN to VDOT NOVA STC Interface
IMMP	• Figure C27. IMMP to VDOT NOVA GIS and VDOT NOVA STC Interface
ISP Centers	• Figure C7. VDOT NOVA Smart Traffic Center to Virginia Statewide ATIS Clearinghouse and ISP Centers Interface • Figure C38. VDOT NOVA STSS to ISP Centers to Virginia Statewide ATIS Clearinghouse Interface • Figure C61. ISP Center to VDOT NOVA Maintenance and Construction and VDOT NOVA Parking Management Interface • Figure C62. ISP Centers to VDOT NOVA TCC and Virginia Statewide ATIS Clearinghouse Interface
Laptop Computers	• Figure C28. Laptop Computers to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface
Maryland CHART	• Figure C29. Maryland CHART to VDOT NOVA STC Interface
Media Centers	• Figure C30. Media Centers to VDOT NOVA STC Interface • Figure C42. Media Centers to VDOT NOVA STSS Interface • Figure C63. Media Centers to Virginia Statewide ATIS Clearinghouse Interface
Metropolitan Washington COG Center	• Figure C31. Metropolitan Washington COG Center to VDOT NOVA GIS and VDOT NOVA STC Interface • Figure C54. Metropolitan Washington COG Center to Smart Travel Lab and VDOT Mobility Data Store Interface
Mobile Unified Command	• Figure C14. Unified Command to VDOT NOVA Smart Traffic Center Interface • Figure C48. Mobile Unified Command to VDOT NOVA Safety Service Patrol Interface

Table C2 – Appendix C Interface Diagram Index by System

System	Appendix C Interface Diagram Figure Number
MWAA Center	• Figure C32. MWAA Center to VDOT NOVA STC and VDOT NOVA STSS Interface • Figure C64. MWAA Center to Virginia Statewide ATIS Clearinghouse Interface
National Advisory Warning System	• Figure C33. National Advisory Warning System to VDOT NOVA STC Interface
National Park Services	• Figure C34. National Park Services to VDOT NOVA STC Interface
NOVA Local Public Safety Centers	• Figure C19. Baltimore-Washington HIDTA to NOVA Public Safety Centers and VDOT NOVA STC Interface • Figure C39. VDOT NOVA STSS to NOVA Local Public Safety Centers and Virginia State Police Center Interface • Figure C50. NOVA Local Public Safety Centers to VDOT NOVA Safety Service Patrol Interface • Figure C59. Adjacent VDOT STCs to NOVA Public Safety Centers and VDOT TEOC Interface
NOVA Local Signal Centers	• Figure C35. NOVA Local Signal Centers to VDOT NOVA STC Interface • Figure C40. NOVA Local Signal Centers to VDOT NOVA STSS Interface • Figure C68. NOVA Local Signal Centers to Virginia Statewide ATIS Clearinghouse Interface
NOVA Local Transit Centers	• Figure C36. VDOT NOVA STC to NOVA Local Transit Centers to VRE Center Interface • Figure C43. NOVA Local Transit Centers to VDOT NOVA STSS and VDOT NOVA STSS Field Equipment Interface • Figure C55. NOVA Local Transit Centers to VDOT Mobility Data Store and VDOT NOVA Maintenance and Construction Interface
NOVA Sections	• Figure C56. NOVA Sections to Smart Travel Lab and VDOT Mobility Data Store and VDOT NOVA GIS Interface
NVTC Center	• Figure C57. NVTC Center to Smart Travel Lab and VDOT Mobility Data Store Interface
Other Parking Management	• Figure C10. VDOT NOVA Smart Traffic Center to VDOT NOVA Parking Management to and Other Parking Management Interface
Other STCs	• Figure C5. VDOT NOVA STC to VDOT TEOC to Other STCs Interface
Rail Operations	• Figure C44. VDOT NOVA STSS to Rail Operations to VDOT NOVA STSS Field Equipment Interface
Research and Data Collection Centers	• Figure C58. Research and Data Collection Centers to VDOT Mobility Data Store Interface
Smart Tag Center	• Figure C25. Smart Tag Center to VDOT NOVA Dulles Toll Road, VDOT NOVA STC, Greenway Center and Virginia Toll Facility Centers Interface
Smart Travel Lab	• Figure C17 Smart Travel Lab to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface • Figure C54. Metropolitan Washington COG Center to Smart Travel Lab and VDOT Mobility Data Store Interface • Figure C56. NOVA Sections to Smart Travel Lab and VDOT Mobility Data Store

Table C2 – Appendix C Interface Diagram Index by System

System	Appendix C Interface Diagram Figure Number
	and VDOT NOVA GIS Interface • Figure C57. NVTC Center to Smart Travel Lab and VDOT Mobility Data Store Interface
Special Event Promoters	• Figure C16. Special Event Promoters to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface
Transportation Information Clearinghouse	• Figure C15. Transportation Information Clearinghouse to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface
VDOT Mobility Data Store	• Figure C13. VDOT NOVA STC and VDOT NOVA STSS to VDOT Mobility Data Store Interface • Figure C51. VDOT Mobility Data Store to VDOT NOVA Safety Service Patrol Interface • Figure C54. Metropolitan Washington COG Center to Smart Travel Lab and VDOT Mobility Data Store Interface • Figure C55. NOVA Local Transit Centers to VDOT Mobility Data Store and VDOT NOVA Maintenance and Construction Interface • Figure C56. NOVA Sections to Smart Travel Lab and VDOT Mobility Data Store and VDOT NOVA GIS Interface • Figure C57. NVTC Center to Smart Travel Lab and VDOT Mobility Data Store Interface • Figure C58. Research and Data Collection Centers to VDOT Mobility Data Store Interface
VDOT NOVA Dulles Toll Road (DTR)	• Figure C25. Smart Tag Center to VDOT NOVA Dulles Toll Road, VDOT NOVA STC, Greenway Center and Virginia Toll Facility Centers Interface • Figure C60. VDOT NOVA Dulles Toll Road to Virginia State Police Center to Greenway Center Interface • Figure C66. VDOT NOVA Dulles Toll Road to VDOT NOVA Maintenance & Construction Operations Interface
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VRE Center	• Figure C36. VDOT NOVA STC to NOVA Local Transit Centers to VRE Center Interface

Adjacent VDOT STC to VDOT NOVA STC

Concept -
The Adjacent VDOT STCs, currently only the Richmond STC, are sharing traffic information with VDOT NOVA STC. These two centers would like to control each others operation center (e.g., VMS, CCTV) during emergency situations only. For instance, if an emergency event required evacuation of the VDOT NOVA STC and the remote control by NOVA STC laptop computer is not feasible, then control of the VDOT NOVA STC and its field devices would be turned over to the Adjacent VDOT STCs to remotely control the operations of that facility. This would maintain the services provided by the VDOT NOVA STC for the transportation system in NOVA even after an evacuation has taken place.

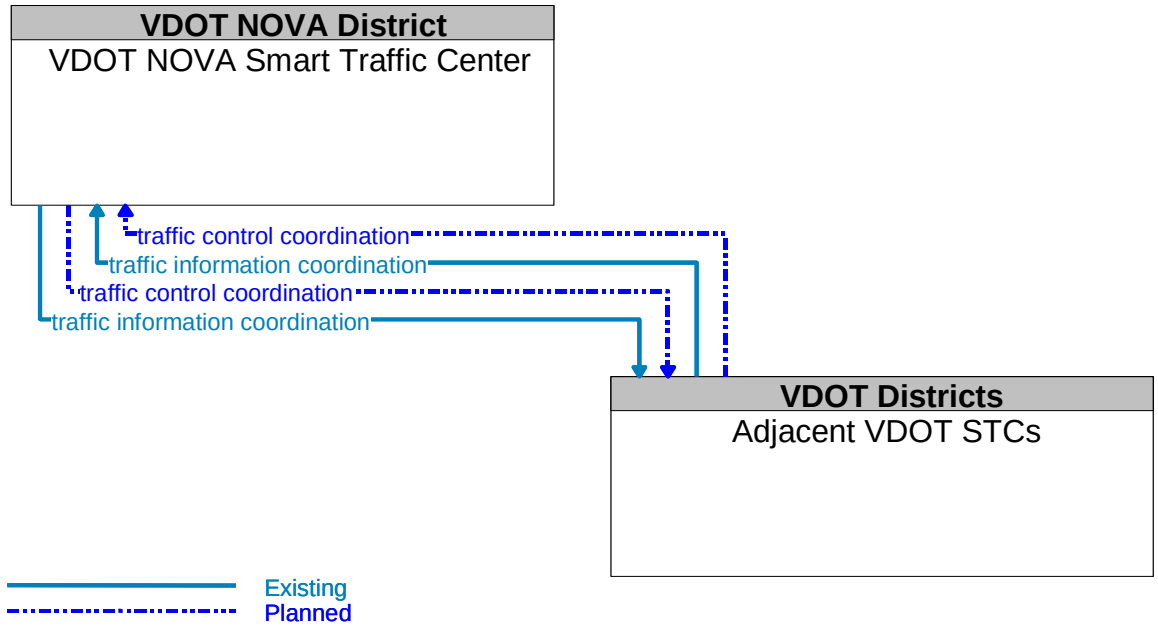

Figure C1 – Adjacent VDOT STCs to
VDOT NOVA Smart Traffic Center Interface Diagram

VDOT NOVA STSS to VDOT NOVA STC

Concept –
The VDOT NOVA STC is currently sharing traffic information with the VDOT NOVA STSS. The STSS plans to provide video information to the STC in the future. The STSS video will be made available to stakeholders through STC video interfaces.

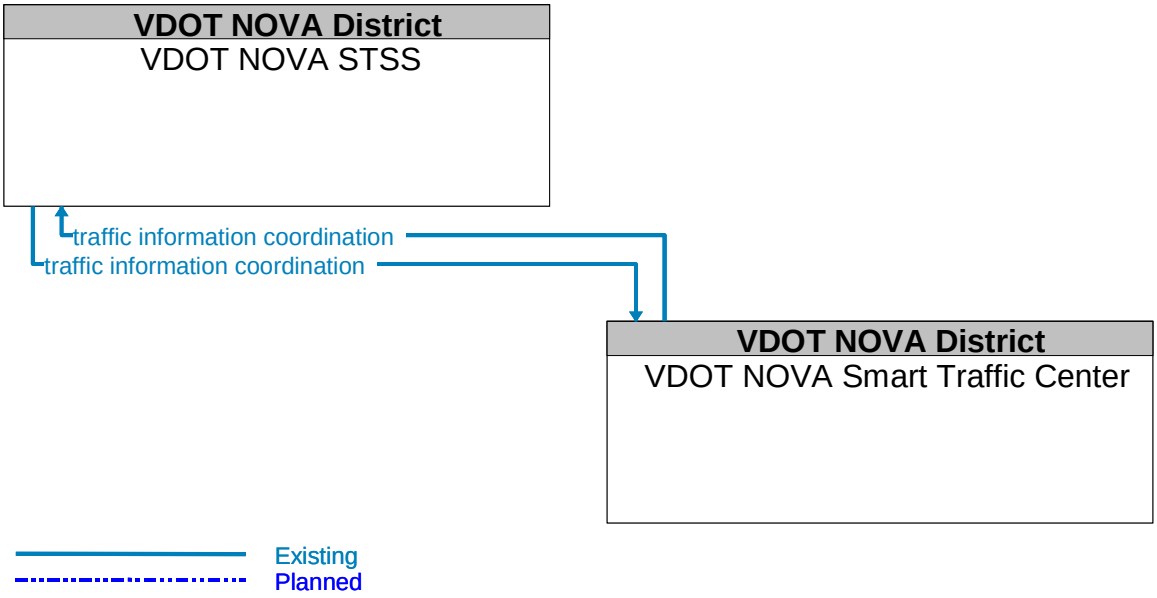

Figure C2 – VDOT NOVA Smart Traffic Center to
VDOT NOVA STSS Interface Diagram

VDOT NOVA STC Field Equipment to VDOT NOVA STC

Concept –
The VDOT NOVA STC is currently controlling various field ITS equipment (e.g., CCTV, VMS, HAR, Ramp Metering, Lane Control Signal, HOV Gates, Truck Rollover, etc.) which allows for the monitoring and management of traffic conditions on the NOVA freeway system. In the future, environmental sensor stations will provide data to the STC about the road conditions. Vehicle probe data may be collected using the numerous Smart Tags on the freeway system.

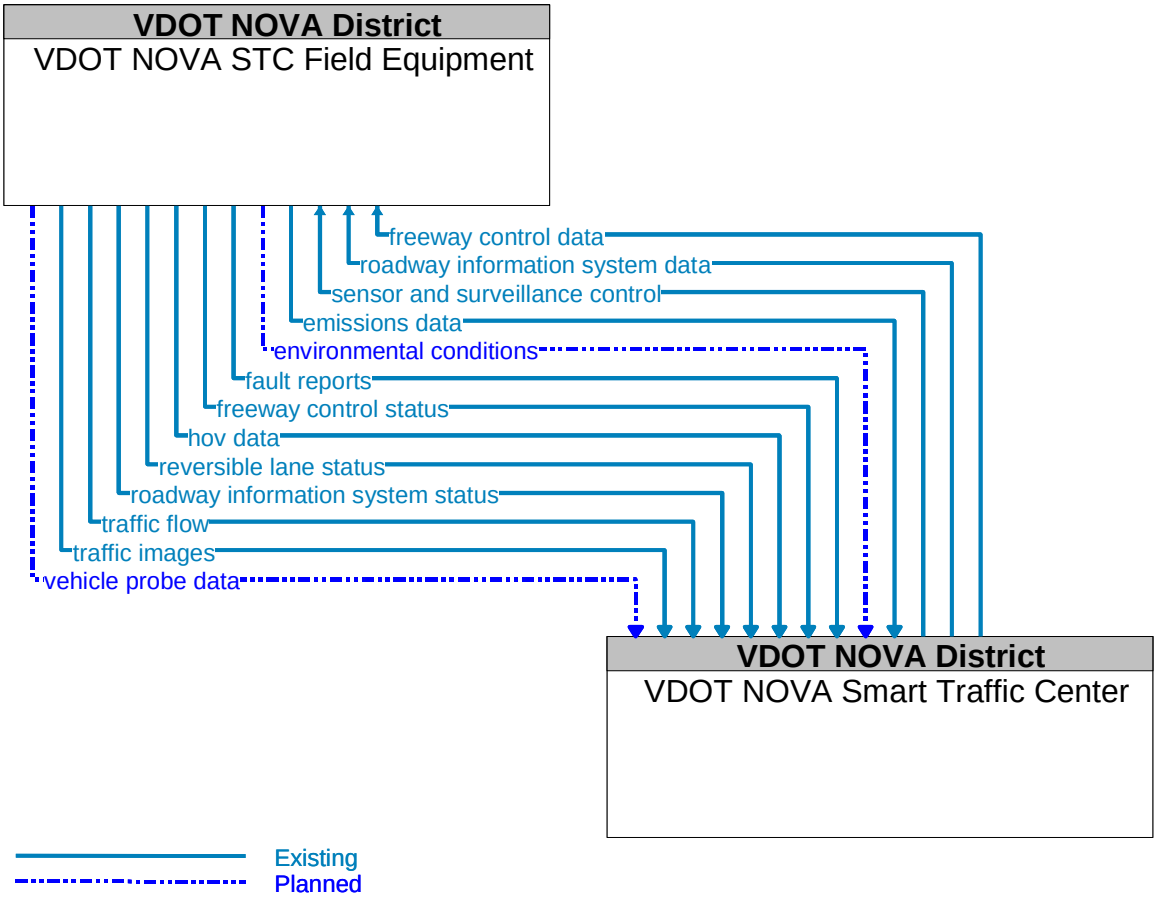

Figure C3 – VDOT NOVA Smart Traffic Center to
VDOT NOVA STC Field Equipment Interface Diagram

Virginia State Police Center to VDOT NOVA STC

Concept –
The VDOT NOVA STC is currently exchanging incident information and freeway system status with the Virginia State Police Center to allow for coordination of incident management activities.

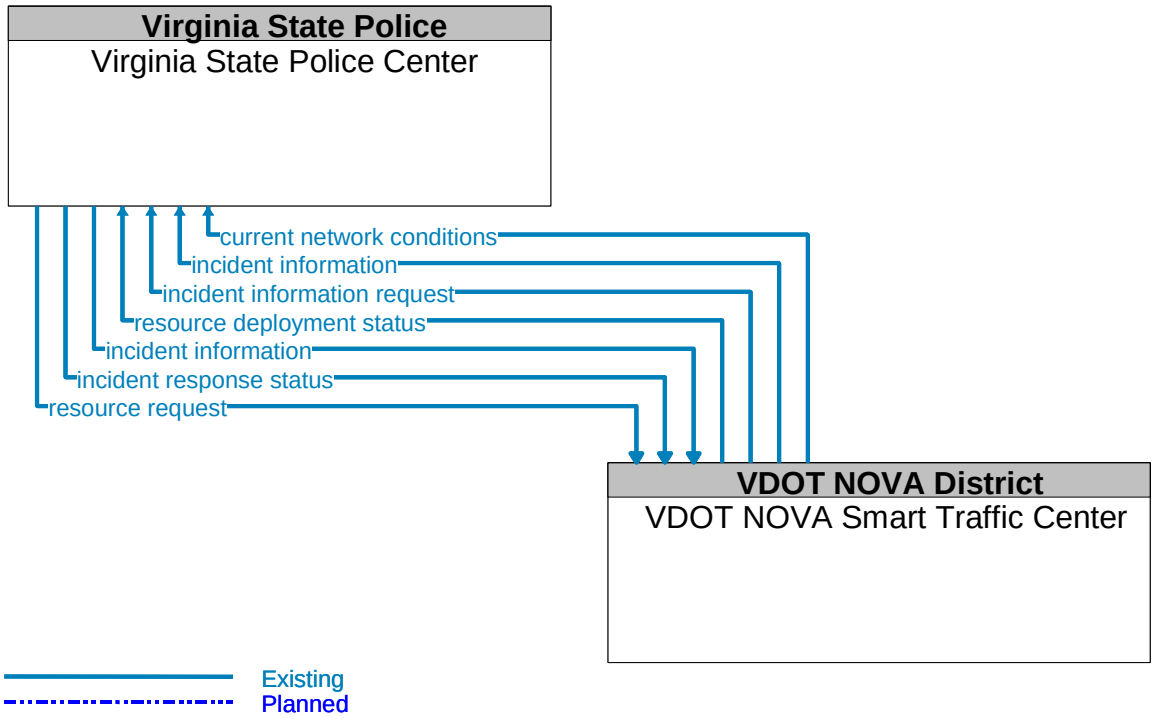

Figure C4 – VDOT NOVA Smart Traffic Center to
Virginia State Police Center Interface Diagram

VDOT NOVA STC to VDOT TEOC to Other STCs

Concept –
The VDOT NOVA STC is currently sharing traffic and incident information with the VDOT TEOC. The VDOT NOVA STC receives traffic and incident information from the Other STCs indirectly through its VDOT TEOC interface.

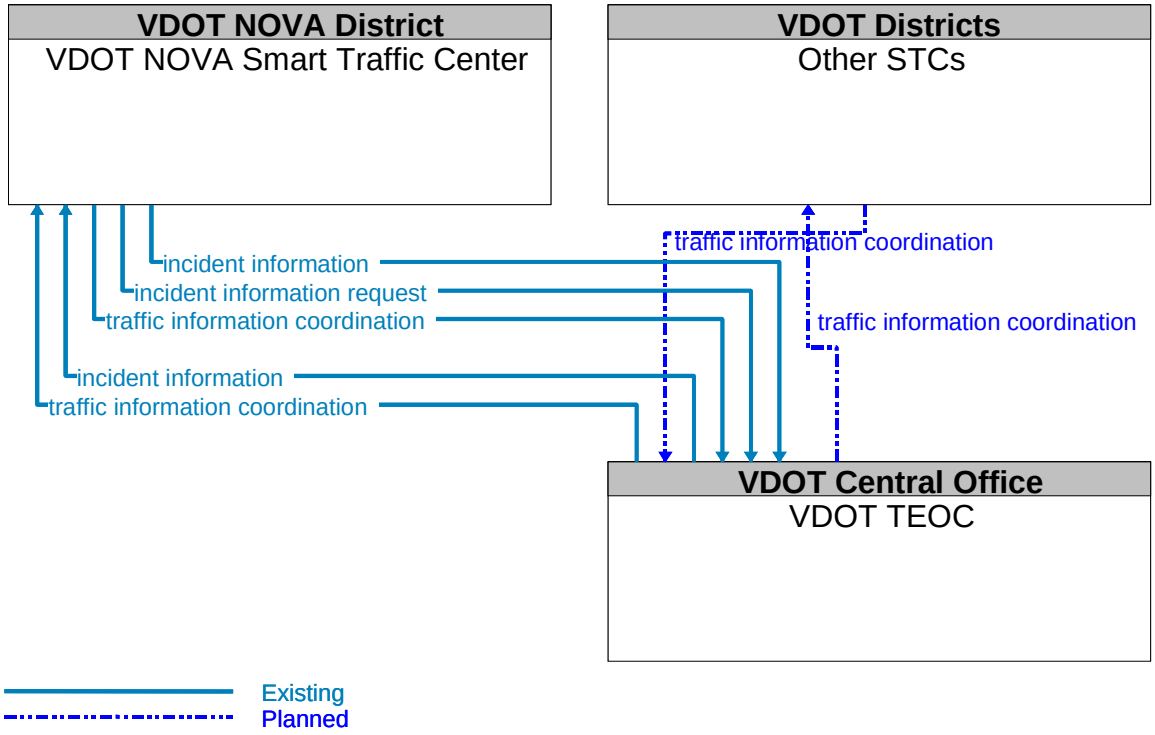

Figure C5 – VDOT NOVA STC to
VDOT TEOC to Other STCs Interface Diagram

VDOT Public Affairs to VDOT NOVA STC

Concept –
The VDOT NOVA STC provides traffic information and coordinates with VDOT Public Affairs to allow them to address customer service issues.

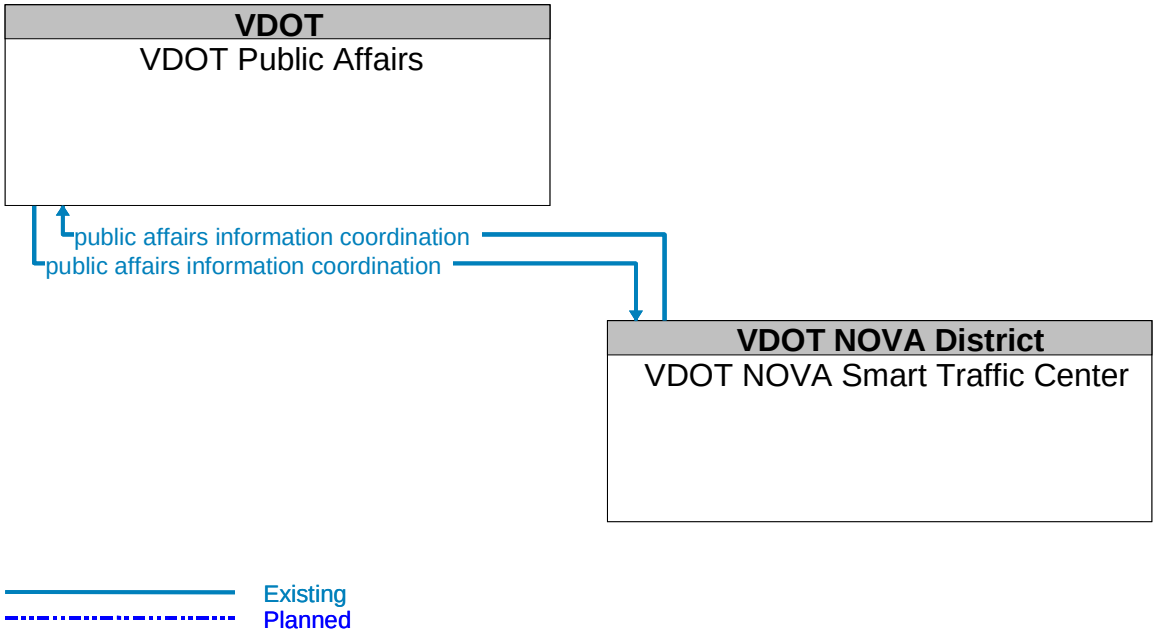

Figure C6 – VDOT NOVA Smart Traffic Center to
VDOT Public Affairs Interface Diagram

VDOT NOVA STC to Virginia Statewide ATIS Clearinghouse and ISP

Concept –

The VDOT NOVA STC plans to share traffic and incident information with the Virginia Statewide ATIS Clearinghouse to contribute to the regional traveler information. The STC currently exchanges video data through the traffic information flow with ISP Centers such as Partners in Motion and Vision Factory.

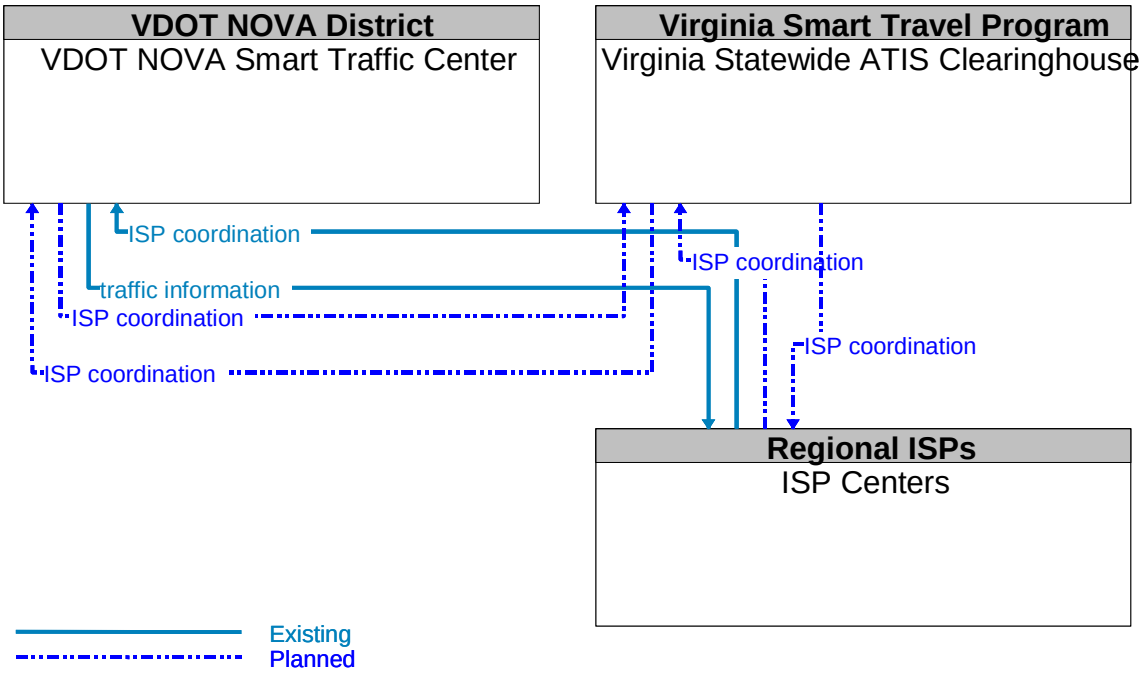

Figure C7 – VDOT NOVA Smart Traffic Center to
Virginia Statewide ATIS Clearinghouse and ISP Centers Interface Diagram

VDOT NOVA STC to VDOT NOVA Snow Operations

Concept –

The VDOT NOVA Snow Operations currently requests information from the VDOT NOVA STC concerning special traffic control measures or to provide information to travelers concerning snow operations activities. The STC plans to provide suggested routes to Snow Operations for plowing activities.

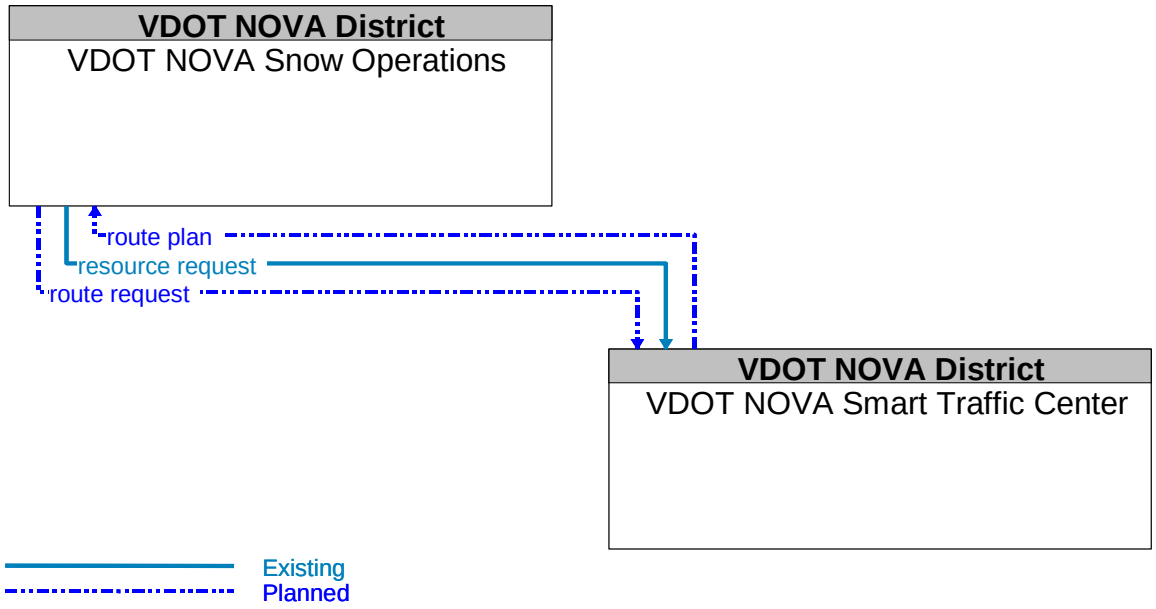

Figure C8 – VDOT NOVA Smart Traffic Center to
VDOT NOVA Snow Operations Interface Diagram

VDOT NOVA SSP to VDOT NOVA STC

Concept –

The VDOT NOVA Safety Service Patrol is currently sharing incident information with the VDOT NOVA STC for traffic and incident management. The Safety Service Patrol plans to provide vehicle tracking data to the STC to inform STC operators of the nearest available Safety Service Patrol vehicle when responding to incidents.

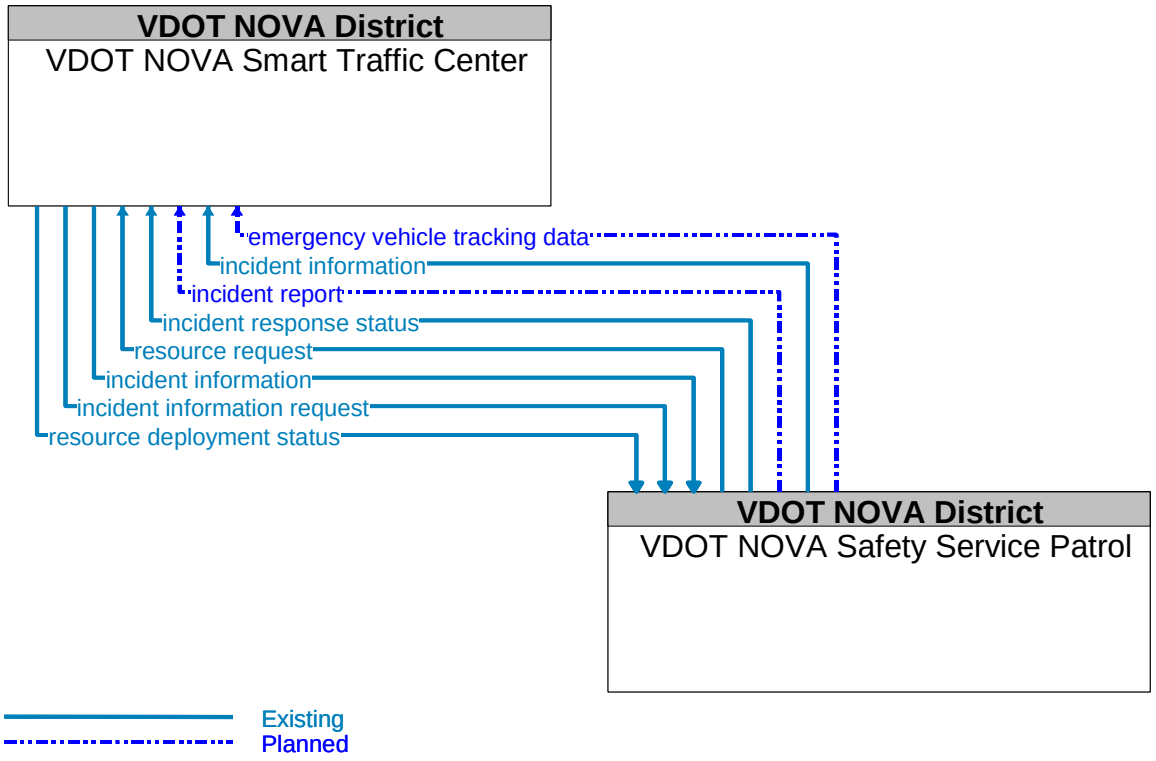

Figure C9 – VDOT NOVA Safety Service Patrol to
VDOT NOVA Smart Traffic Center Interface Diagram

VDOT NOVA STC to VDOT NOVA & Other Parking Managements

Concept –

The VDOT NOVA STC plans to receive parking availability information from VDOT NOVA Parking Management and Other Parking Management. The STC will use this information to better inform travelers via VMS and HAR when traffic conditions warrant alternate routes or diversion of traffic.

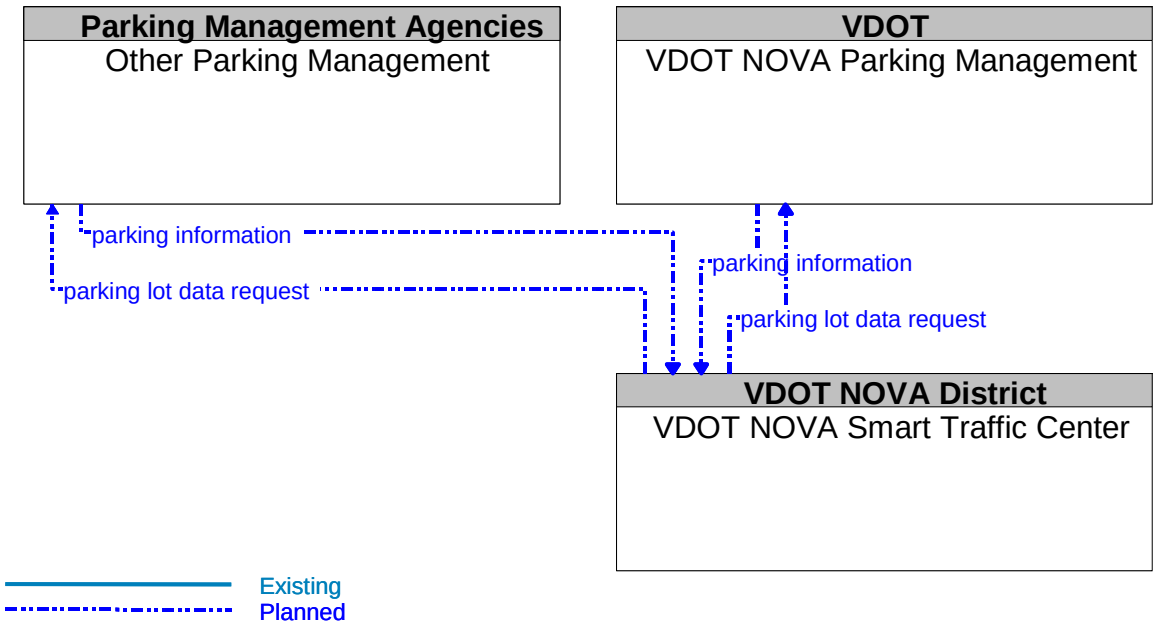

Figure C10 – VDOT NOVA Smart Traffic Center to
VDOT NOVA Parking Management to and Other Parking Management Interface Diagram

VDOT NOVA Maintenance & Construction Operations to VDOT NOVA SSP and VDOT NOVA STC

Concept –

The VDOT NOVA Maintenance and Construction Operations is currently sending work zone and maintenance and construction plans to the VDOT NOVA STC and the VDOT NOVA Safety Service Patrol in order to better manage the transportation system, respond to incidents in work zone areas, and inform motorist of traffic conditions. VDOT NOVA Maintenance and Construction Operations receives closure coordination data from the STC.

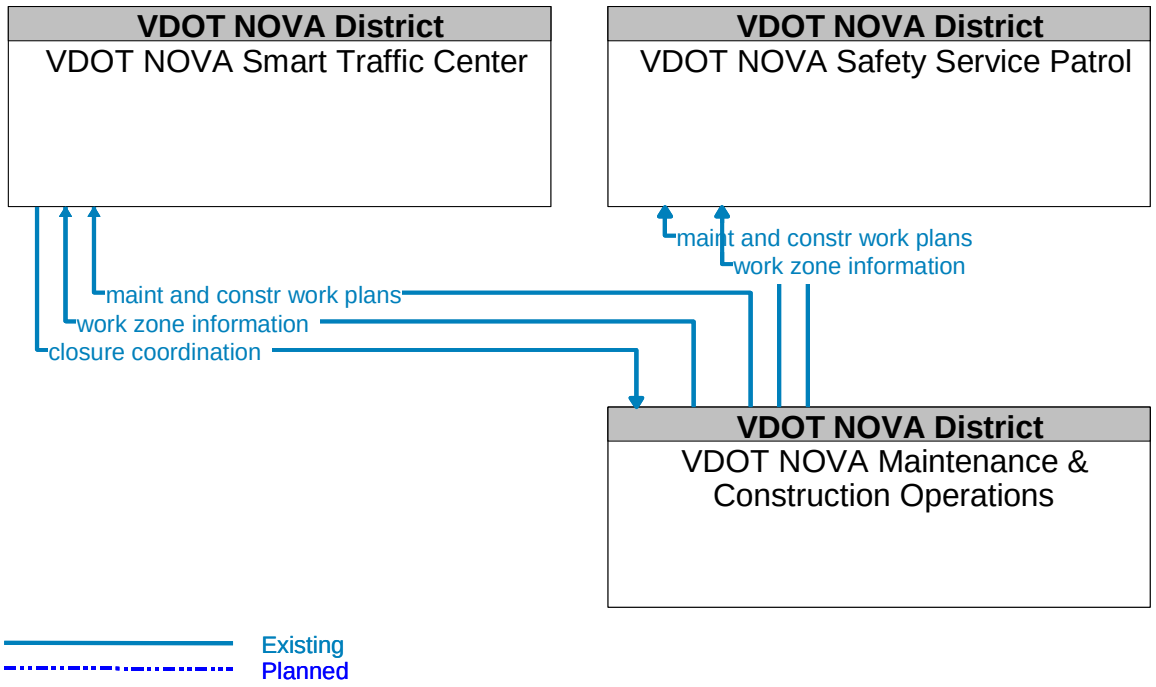

Figure C11 – VDOT NOVA Maintenance & Construction Operations to VDOT NOVA Safety Service Patrol and VDOT NOVA Smart Traffic Center Interface Diagram

VDOT NOVA GIS to VDOT NOVA STC and VDOT NOVA STSS

Concept –

The VDOT NOVA STC and VDOT NOVA STSS update ITS equipment and closure GIS databases. VDOT NOVA GIS will send GIS database information to the VDOT NOVA STSS and VDOT NOVA STC.

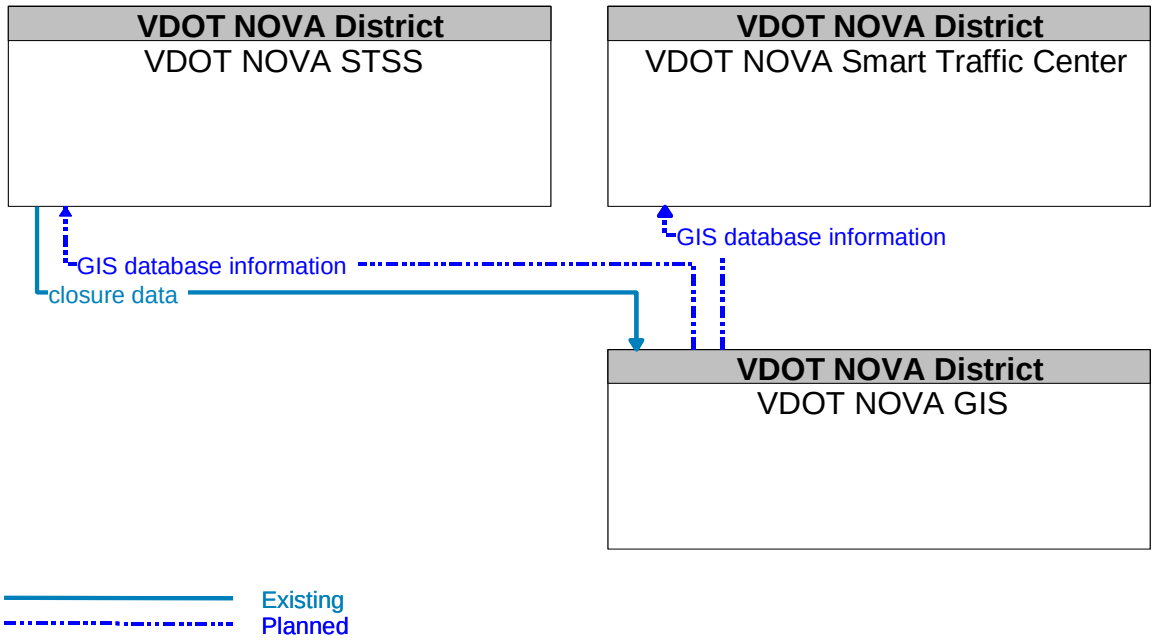

Figure C12 – VDOT NOVA GIS to
VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface Diagram

VDOT NOVA STC and VDOT NOVA STSS to VDOT Mobility Data Store

Concept –

The VDOT Mobility Data Store plans to receive traffic archive data from the VDOT NOVA STC and the VDOT NOVA STSS.

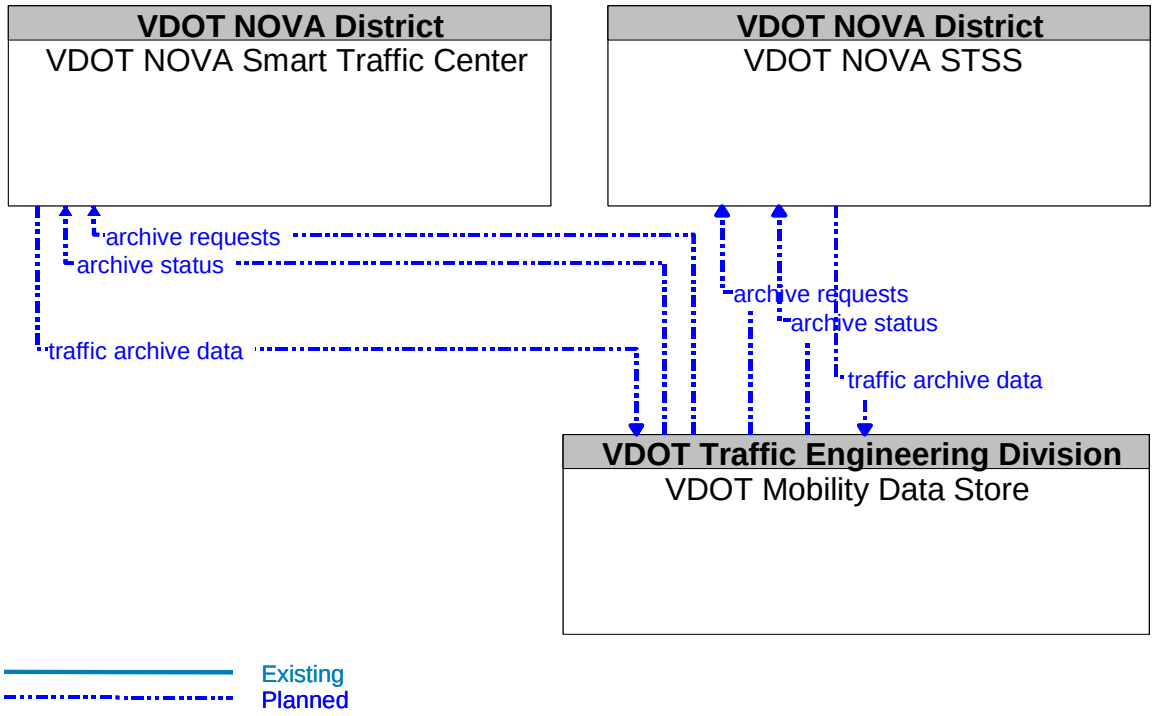

Figure C13 – VDOT NOVA STC and VDOT NOVA STSS to VDOT Mobility Data Store Interface Diagram

United Command to VDOT NOVA STC

Concept –

The Unified Command currently coordinates incident information with the VDOT NOVA STC to implement traffic management strategies to assist in the management of the incident.

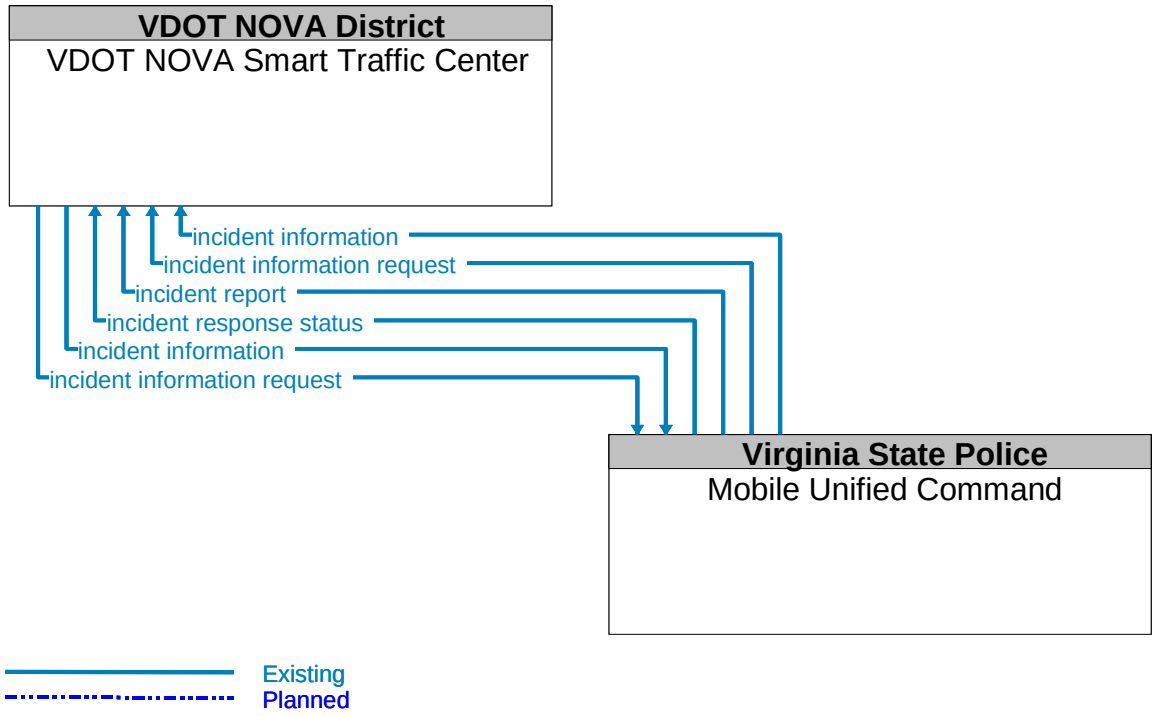

Figure C14 – Mobile Unified Command to
VDOT NOVA Smart Traffic Center Interface Diagram

Transportation Information Clearinghouse to VDOT NOVA STC and VDOT NOVA STSS

Concept –

The Transportation Information Clearinghouse plans to receive traffic information from the VDOT NOVA STC and STSS to allow the Clearinghouse to provide regional information. This clearinghouse will include a data fusion engine to consolidate all transportation data provided to the clearinghouse.

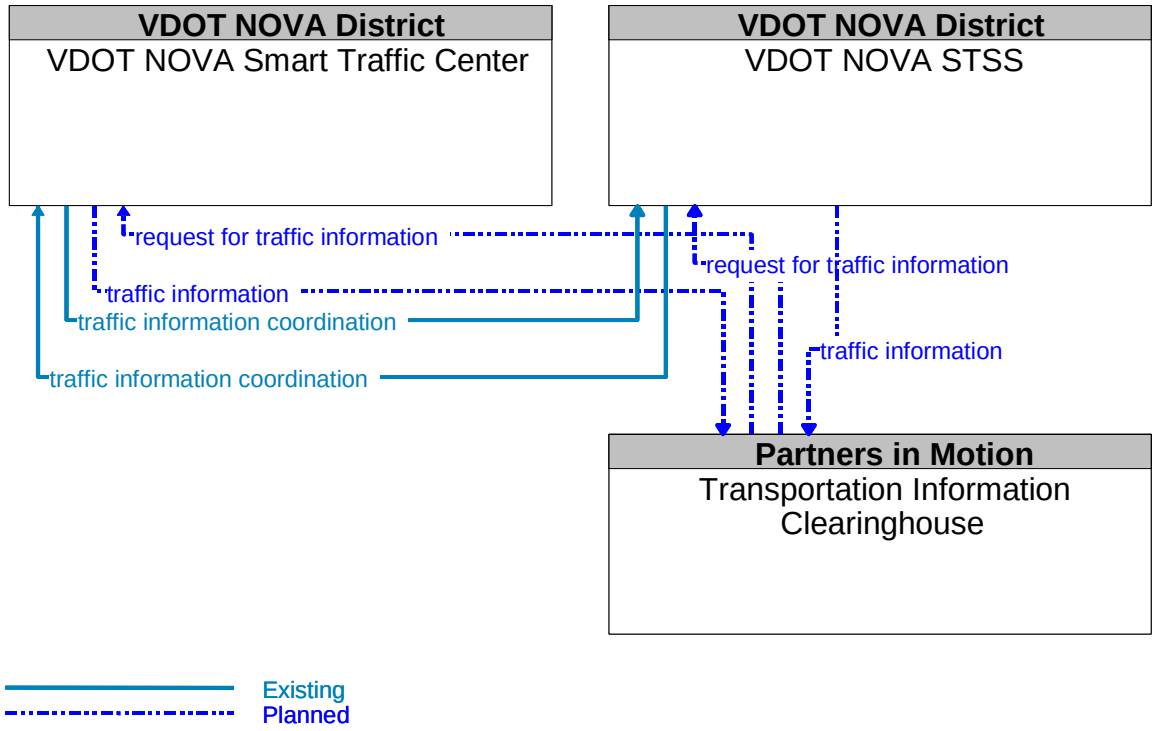

Figure C15 – Transportation Information Clearinghouse to VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface Diagram

Special Event Promoters to VDOT NOVA STC and VDOT NOVA STSS

Concept –

Special Event Promoters are currently informing the VDOT NOVA STC and STSS of events (parades, sporting events, rallies, etc) to allow the traffic management agencies to implement special event plans.

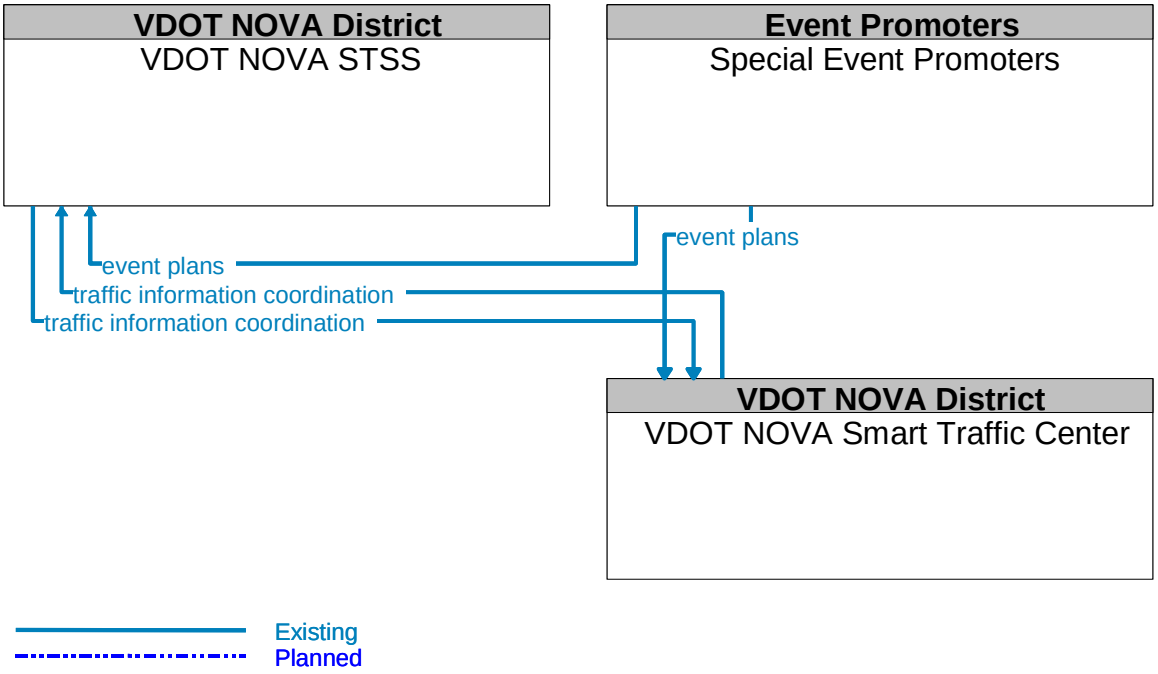

Figure C16 – Special Event Promoters to
VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface Diagram

Smart Travel Lab to VDOT NOVA STC and VDOT NOVA STSS

Concept –

The Smart Travel Lab is currently receiving and archiving data from the VDOT NOVA STC and the VDOT NOVA STSS. The archival function of the Smart Travel Lab will eventually be replaced by the Mobility Data Store.

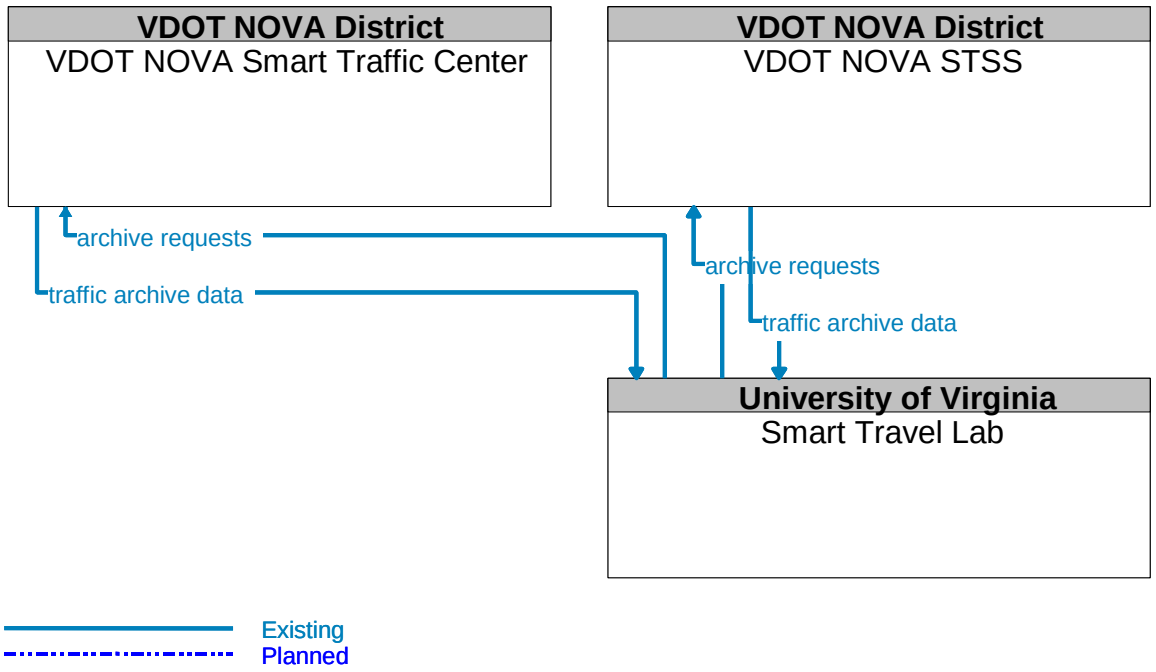

Figure C17 – Smart Travel Lab to
VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface Diagram

VDOT NOVA STC to VDOT NOVA TCC

Concept –

The VDOT NOVA STC is currently sharing video information with the VDOT NOVA TCC.

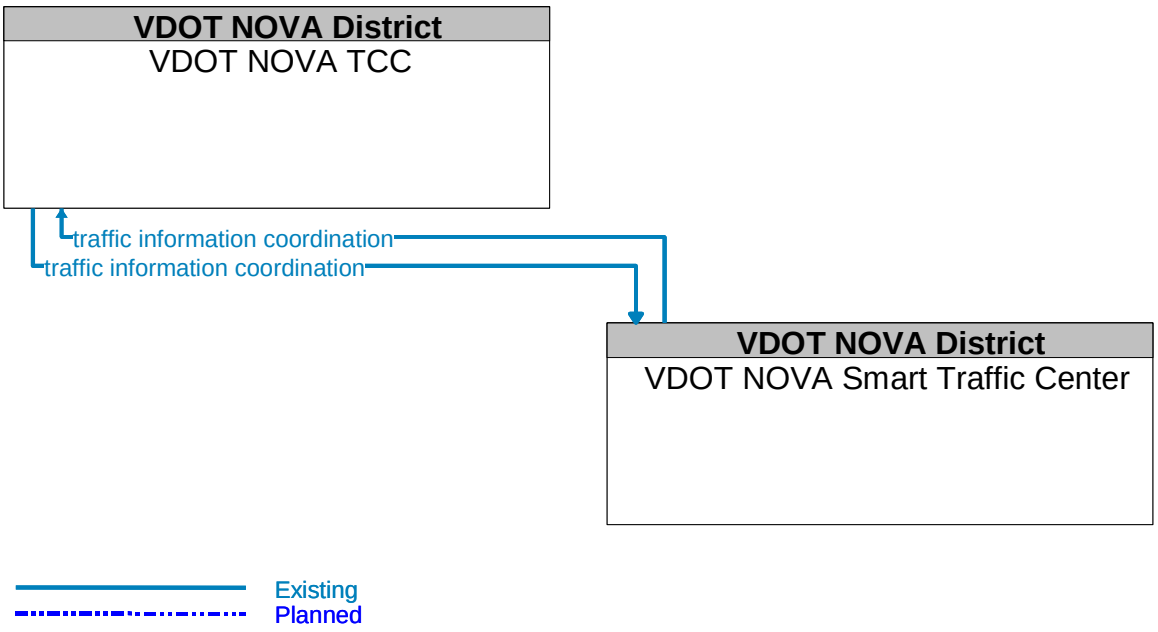

Figure C18 – VDOT NOVA Smart Traffic Center to
VDOT NOVA TCC Interface Diagram

Baltimore-Washington HIDTA to NOVA Public Safety Centers and VDOT NOVA STC

Concept –

The Baltimore-Washington HIDTA has plans to share emergency and incident information with the NOVA Local Public Safety Centers and VDOT NOVA STC once the CAPWIN project is completed. The interfaces between the STC, CAPWIN and the Local Public Safety Centers are focused on incident management. CAPWIN primarily focuses on communications among mobile law enforcement and emergency response units. By interfacing with CAPWIN, the NOVA STC and Local Public Safety Centers can provide and be provided incident information to engage the proper assistance as well as manage their respective systems more efficiently.

The NOVA Local Public Safety Centers currently exchange incident data with the VDOT NOVA STC.

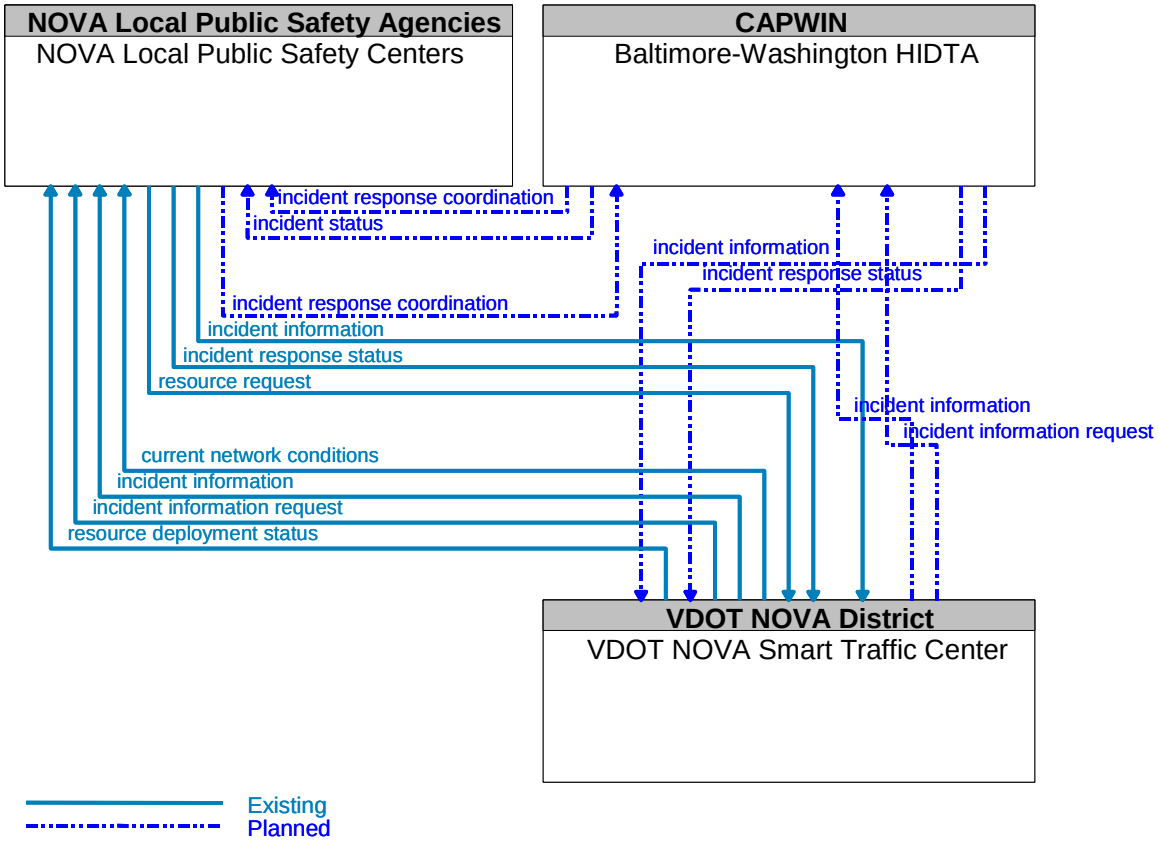

Figure C19 – Baltimore-Washington HIDTA to
NOVA Public Safety Centers and VDOT NOVA STC Interface Diagram

Commercial Vehicle Management System to VDOT NOVA STC

Concept –

The DMV has plans to share the data they collect regarding overweight and overheight trucks with the NOVA freeway system. The VDOT NOVA STC will control the roadside equipment such as variable message signs for the commercial vehicle management system in the future.

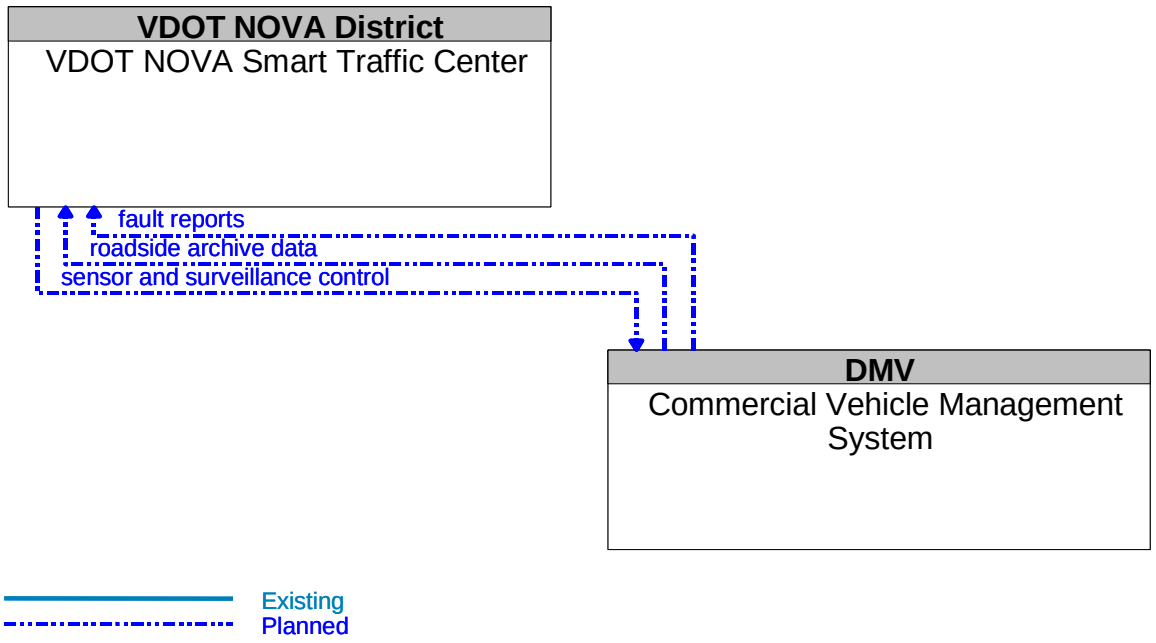

Figure C20 – Commercial Vehicle Management System to VDOT NOVA STC Interface Diagram

Emergency Preparedness to VDOT NOVA STC

Concept –

The DC Emergency Preparedness Center shares incident information with the VDOT NOVA STC so they can inform NOVA travelers of District incidents that may impact their commute. This interface also provides for better coordination between VDOT NOVA and DC Public Safety Agencies in response to major events that impact traffic between NOVA and DC.

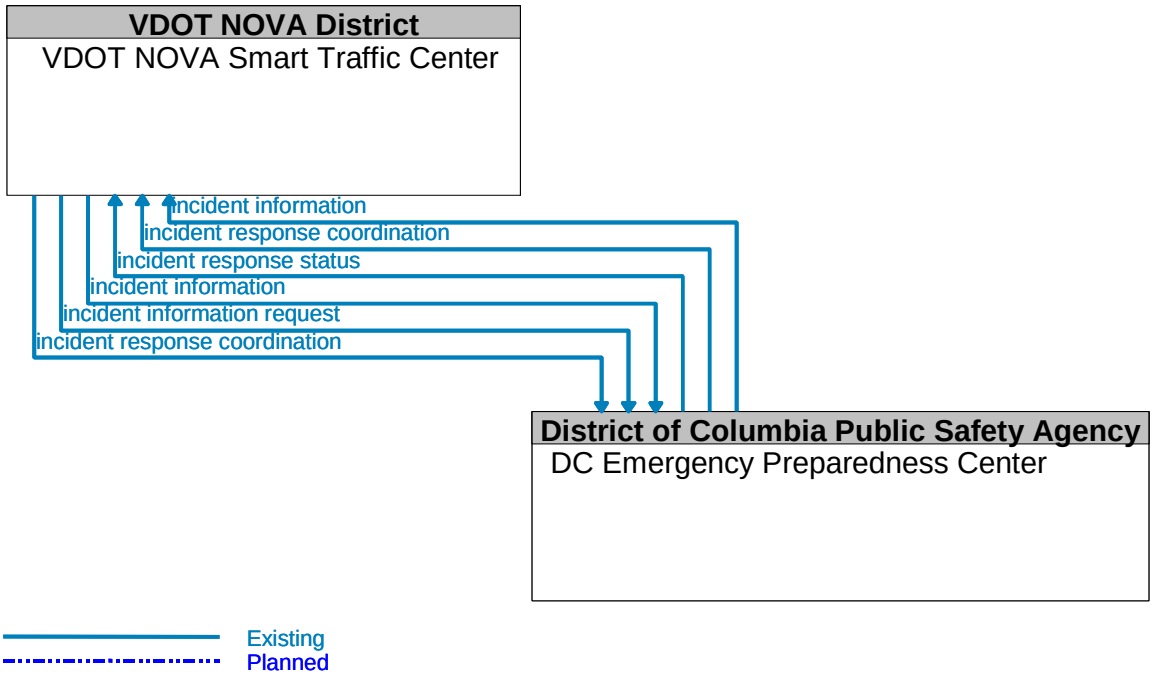

Figure C21 – DC Emergency Preparedness Center to
VDOT NOVA STC Interface Diagram

DC ITMS to VDOT NOVA STC

Concept –

The DC Integrated Transportation Management System (ITMS) is currently exchanging traffic-related information with the VDOT NOVA STC to better inform travelers between DC and NOVA of incidents in each area that may impact their commute. This information exchange is not an electronic exchange but is identified as an existing exchange since the information is being provided by phone. Future ITMS development will develop an electronic exchange capability.

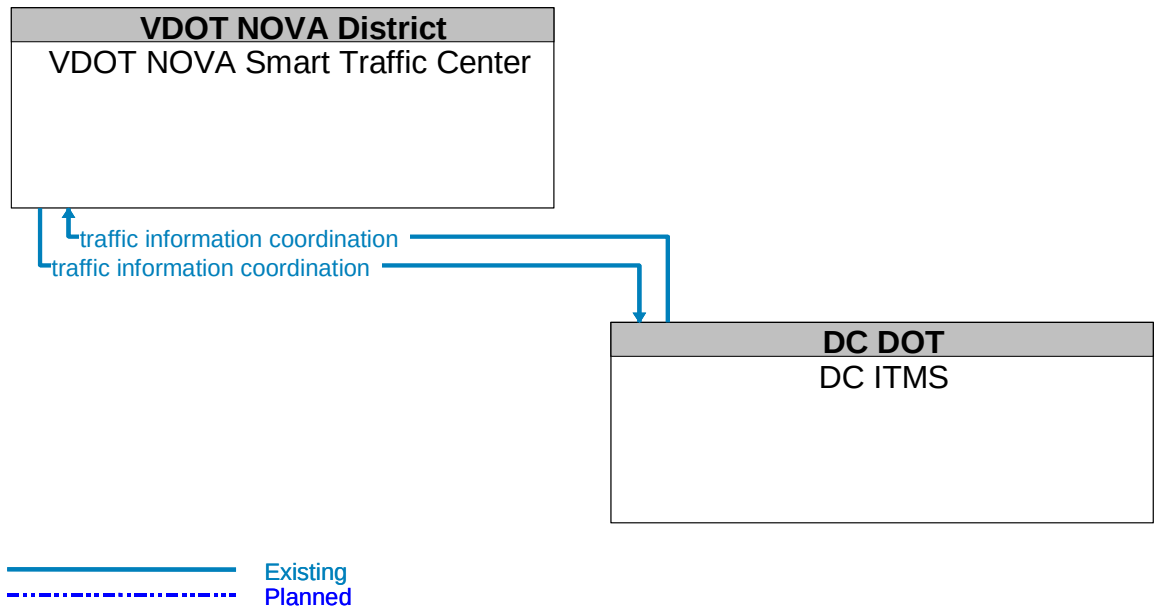

Figure C22 – DC ITMS to
VDOT NOVA STC Interface Diagram

Federal Installation to VDOT NOVA STC

Concept –

The Federal Installations have plans to exchange incident information with the VDOT NOVA STC during major incidents and events. This interface was initially focused on informing Federal Agencies as major employment centers in the DC Metropolitan Area of traffic-related events. In addition, events such as motorcades that impact the transportation system in NOVA would be communicated to the STC for proper coordination. This interface has expanded to informing and exchanging incident information for incident response and coordination including Emergency Response. A more specific interface with Federal Law Enforcement is illustrated in Figure C24.

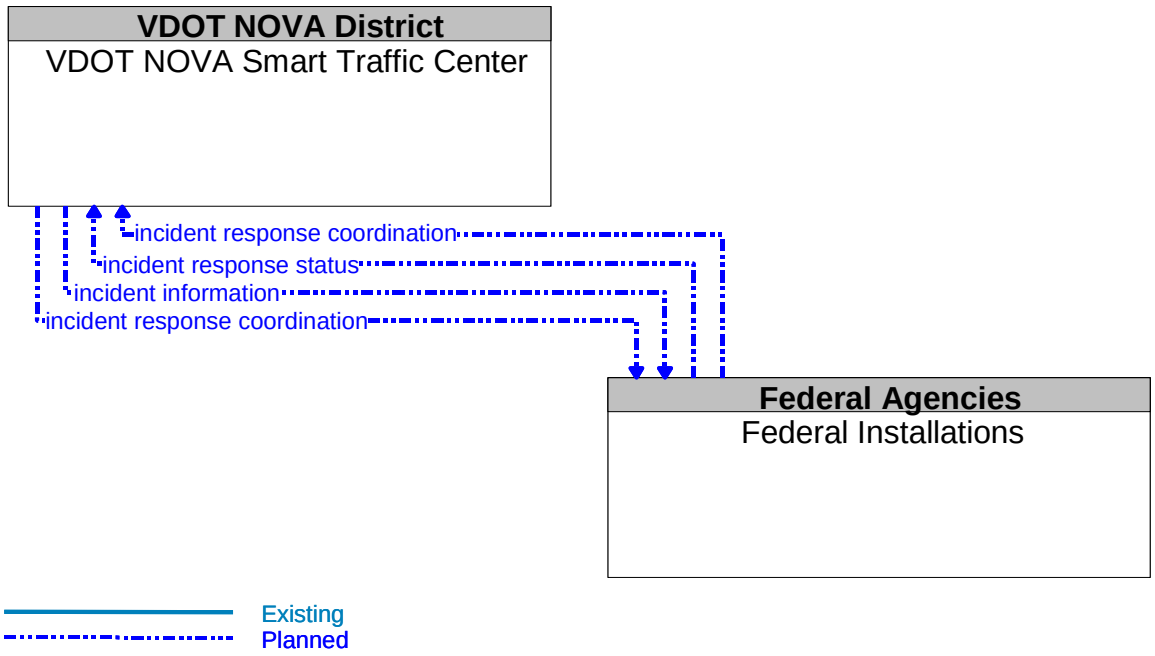

Figure C23 – Federal Installations to
VDOT NOVA STC Interface Diagram

Federal Law Enforcement to VDOT NOVA STC and VDOT NOVA STSS

Concept –

The VDOT NOVA STC and STSS have plans to provide information and video images of traffic conditions during major incidents with Federal Law Enforcement. Please note that this feature is only to be utilized during emergency situations where video feeds are shared with (e.g., FBI) while blocking the media from viewing images. This information exchange is a direct result of the September 11th events and the need for Federal Law Enforcement to have access to resources within VDOT for emergency response activities.

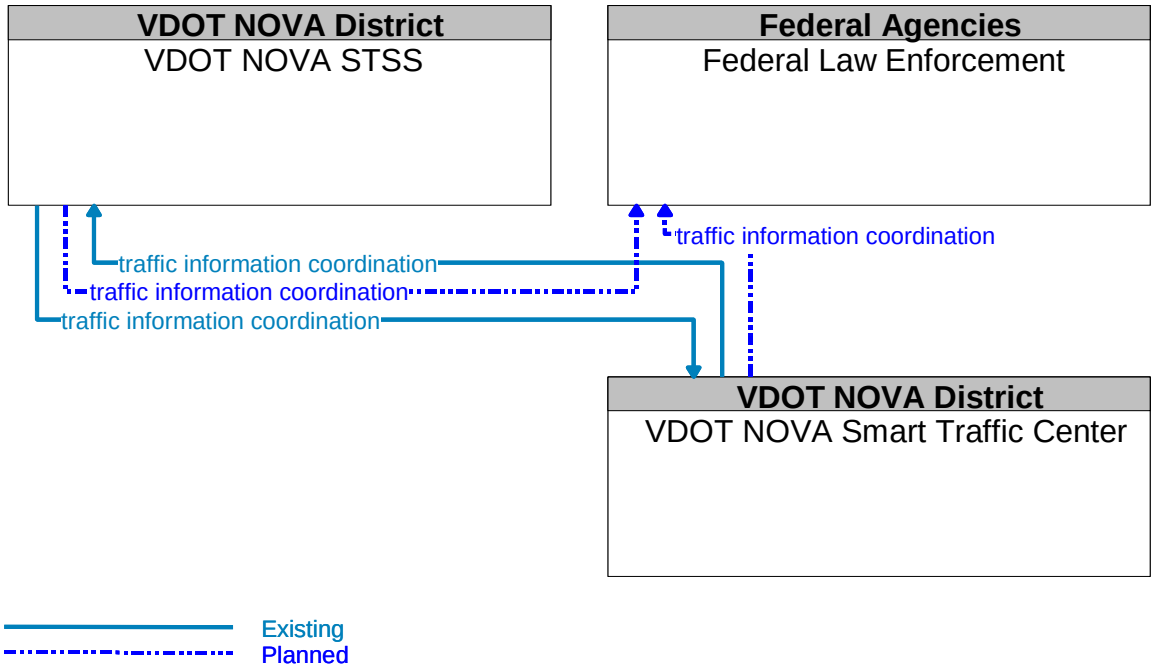

Figure C24 – Federal Law Enforcement to
VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface Diagram

Smart Tag Center to VDOT NOVA DTR, VDOT NOVA STC, Greenway Center and Virginia Toll Facility Centers

Concept –

The Smart Tag Center and the VDOT NOVA Dulles Toll Road plan to share vehicle probe data with the VDOT NOVA STC for traffic management purposes based on the vehicles equipped with electronic toll tags. These vehicles can be used as agents of surveillance to provide incident data and travel time information to the VDOT NOVA STC. In addition, the Greenway Center and the VDOT NOVA Dulles Toll Road will exchange incident response information with the VDOT NOVA STC for proper coordination. The Smart Tag Center currently exchanges toll transaction information with the Virginia Toll Facility Centers, VDOT NOVA Dulles Toll Road and the Greenway. When traffic conditions warrant, the NOVA STC makes requests to the VDOT NOVA Dulles Toll Road to suspend toll collection to relieve traffic conditions on other parts of the system or to manage major incidents.

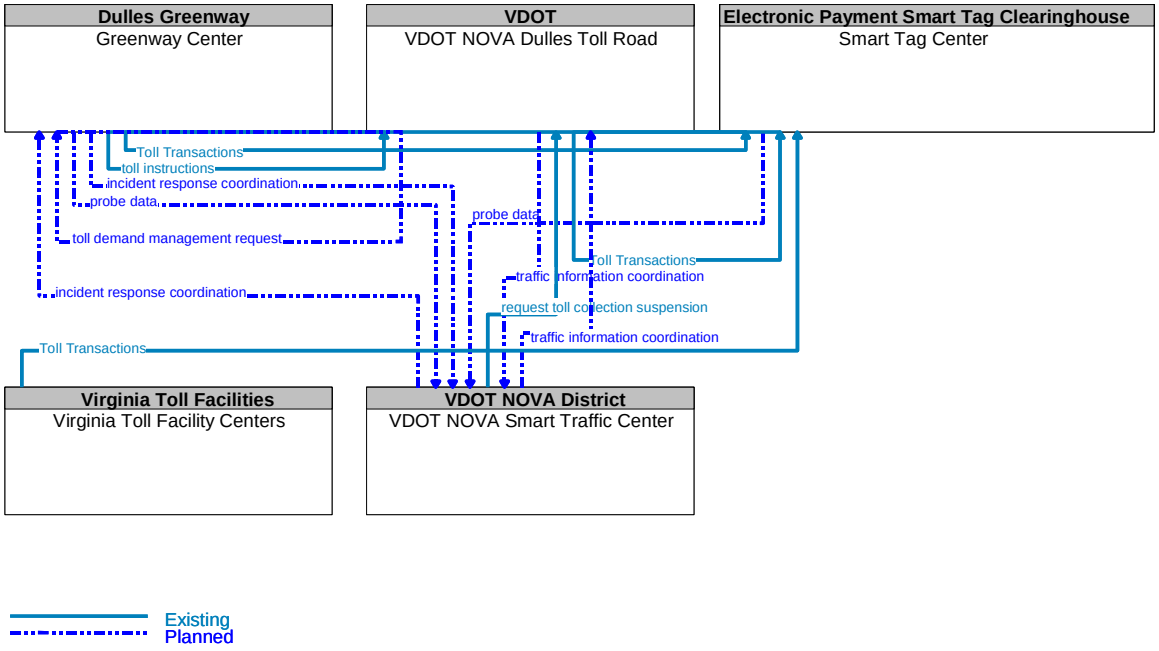

Figure C25 – Smart Tag Center to
VDOT NOVA Dulles Toll Road, VDOT NOVA STC, Greenway Center
and Virginia Toll Facility Centers Interface Diagram

IEN to VDOT NOVA STC

Concept –

The I-95 Corridor Coalition is exchanging reports of incidents that occur on I-95 and I-495 with the VDOT NOVA STC through the Information Exchange Network.

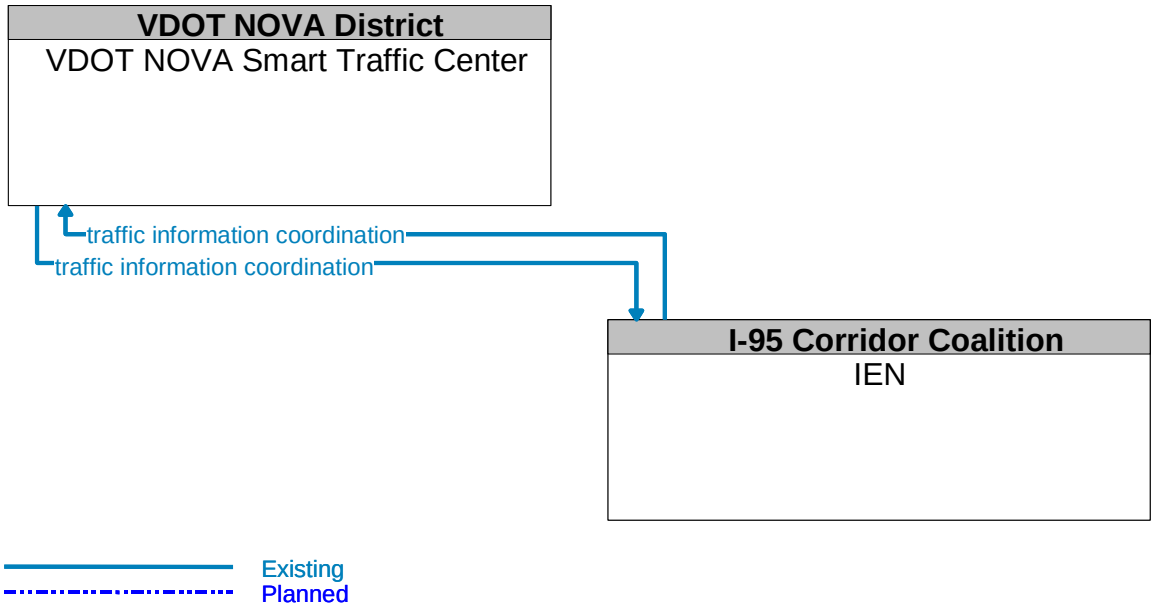

Figure C26 – IEN to
VDOT NOVA STC Interface Diagram

IMMP to VDOT NOVA GIS and VDOT NOVA STC

Concept –

The VDOT Maintenance Division is exchanging closure information with VDOT NOVA STC to allow them to better manage the system and inform Virginia motorists. There are also plans to expand the interface to include work zone information (e.g. location, duration) with the STC. The IMMP is also utilizing GIS information received from the VDOT NOVA GIS.

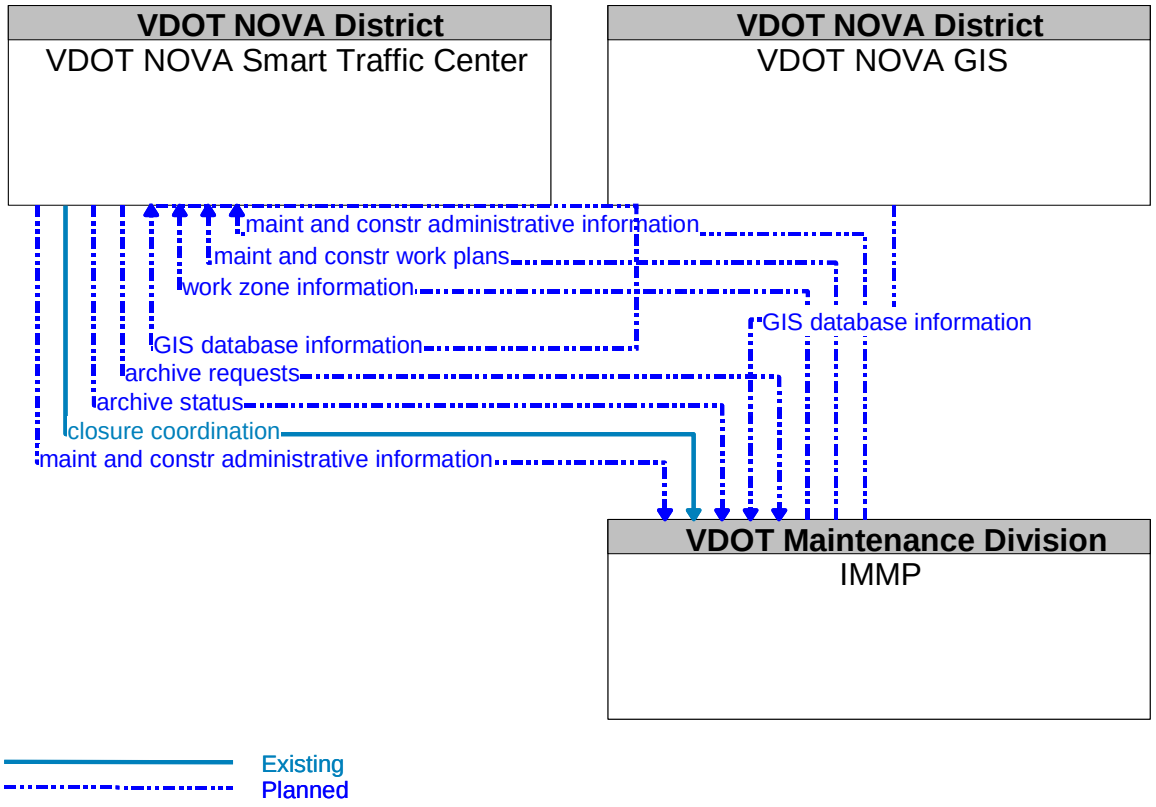

Figure C27 – IMMP to
VDOT NOVA GIS and VDOT NOVA STC Interface Diagram

Laptop Computers to VDOT NOVA STC and VDOT NOVA STSS

Concept –

VDOT laptop computers are currently being used to control the STSS from remote locations. VDOT Camp 30 can take control of the STSS during emergency situations. In the wake of September 11th, the NOVA STC has plans to establish a remote control capability which is represented by the "traffic control coordination" information exchange in this diagram. Note the control from the VDOT Laptop is through the STSS or STC centers not directly with the field equipment.

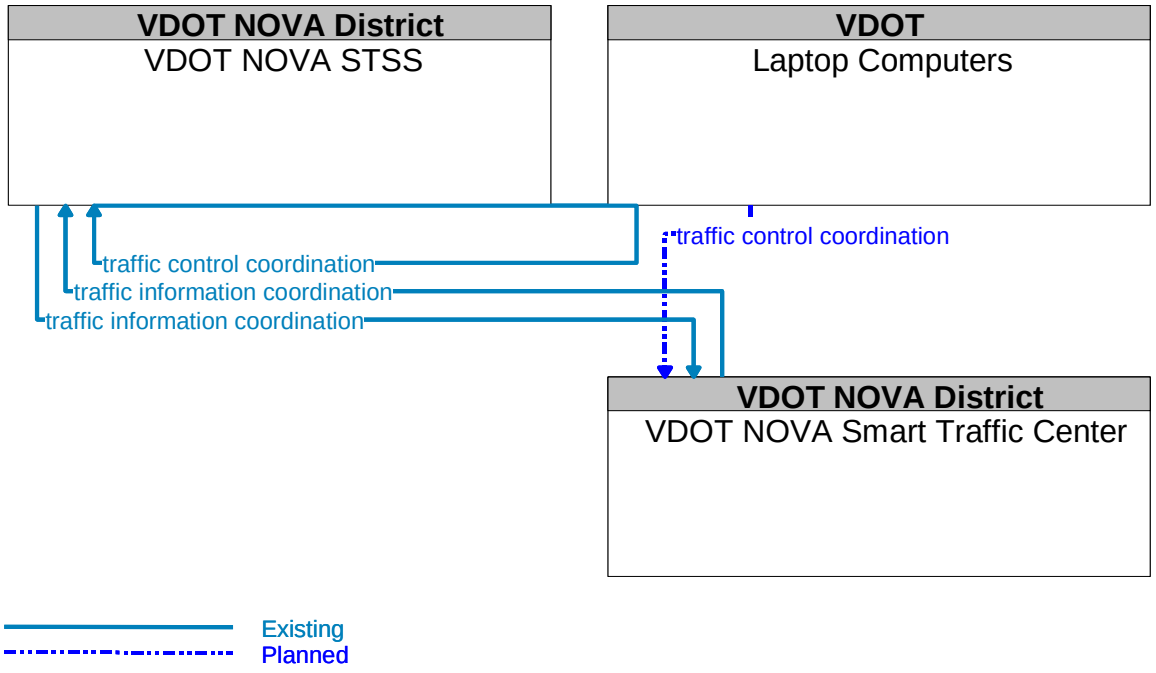

Figure C28 – Laptop Computers to
VDOT NOVA Smart Traffic Center and VDOT NOVA STSS Interface Diagram

Maryland CHART to VDOT NOVA STC

Concept –

Maryland CHART is currently exchanging traffic-related information with the VDOT NOVA STC to better manage the transportation system in NOVA and to coordinate responses to incidents. Maryland arterial information from Prince Georges and Montgomery Counties is planned to be made available to the VDOT NOVA STC through Maryland CHART.

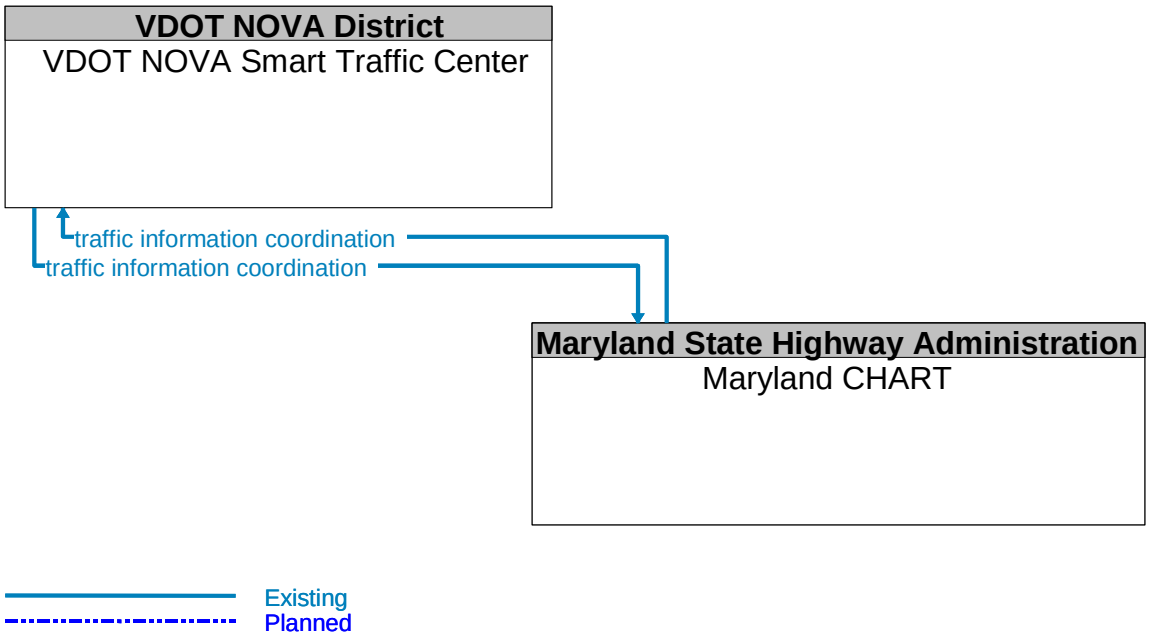

Figure C29 – Maryland CHART to
VDOT NOVA STC Interface Diagram

Media Centers to VDOT NOVA STC

Concept –

The local media centers are currently receiving traffic-related information including video from the VDOT NOVA STC to better inform Virginia motorists.

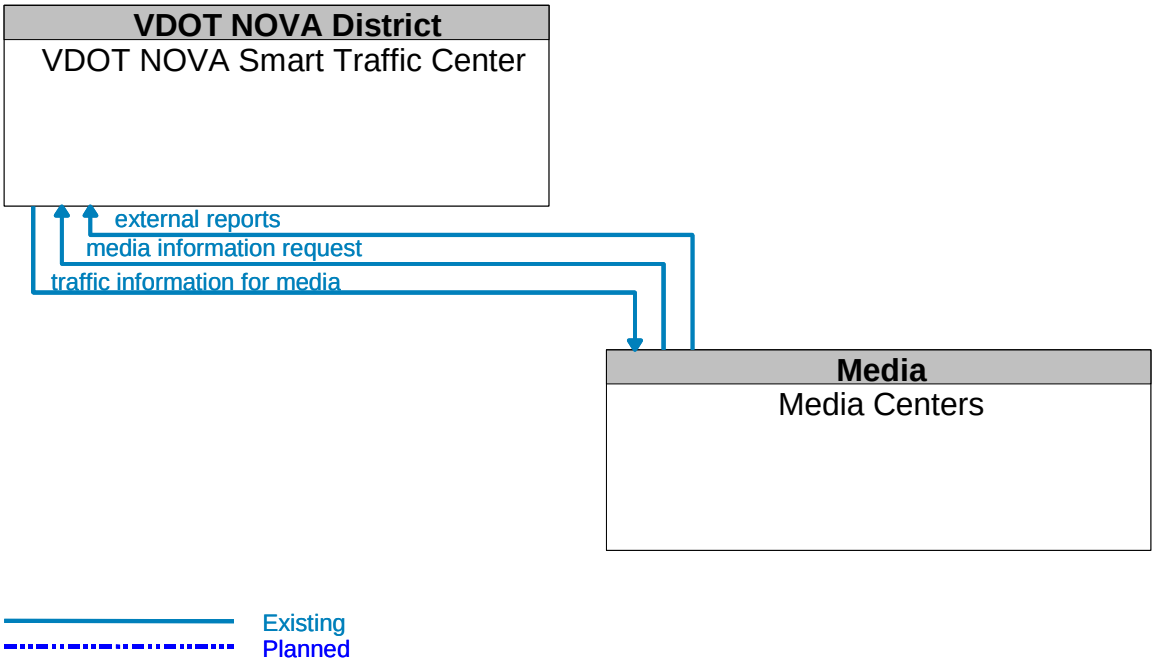

Figure C30 – Media Centers to
VDOT NOVA STC Interface Diagram

Metropolitan Washington COG Center to VDOT NOVA GIS and VDOT NOVA STC

Concept –

The Metropolitan Washington COG Center is currently sharing air quality information with VDOT NOVA STC so that STC can post ozone alert messages on VMS. The Metropolitan Washington COG Center also plans to utilize GIS information from the VDOT NOVA GIS.

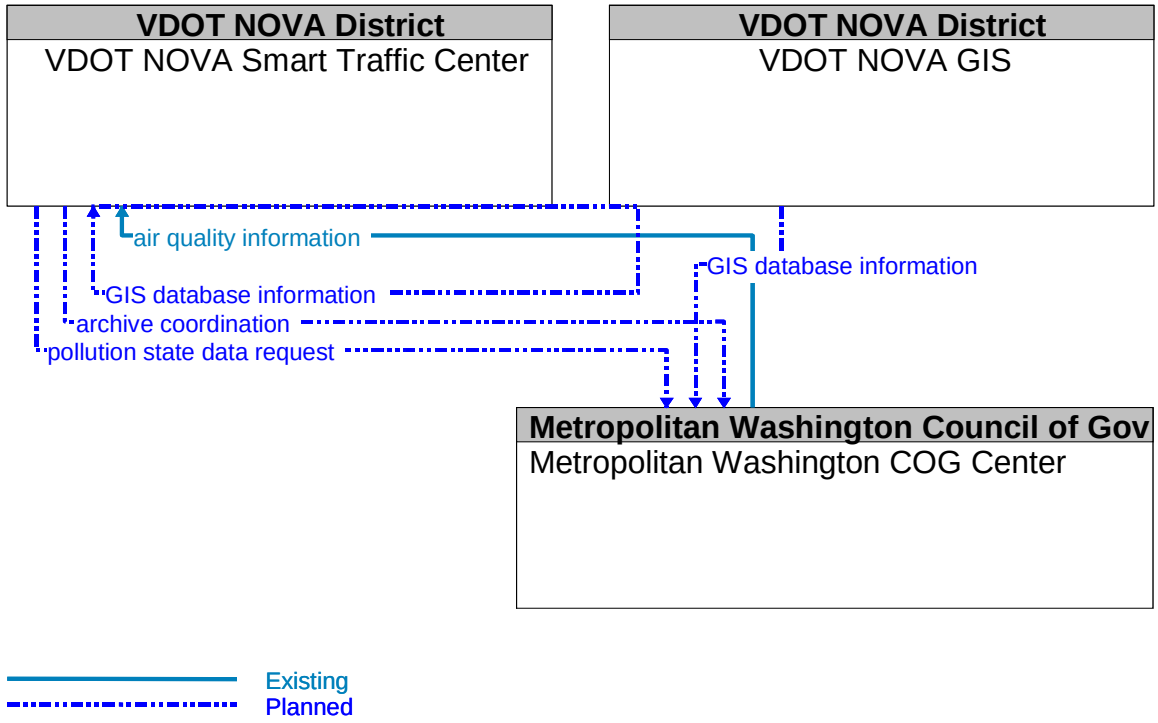

Figure C31 – Metropolitan Washington COG Center to
VDOT NOVA GIS and VDOT NOVA STC Interface Diagram

MWAA Center to VDOT NOVA STC and VDOT NOVA STSS

Concept –

The Metropolitan Washington Airports Authority (MWAA) Center plans to share traffic information with the VDOT NOVA STC and STSS. MWAA can use this information to better inform motorist leaving the airports of roadway conditions.

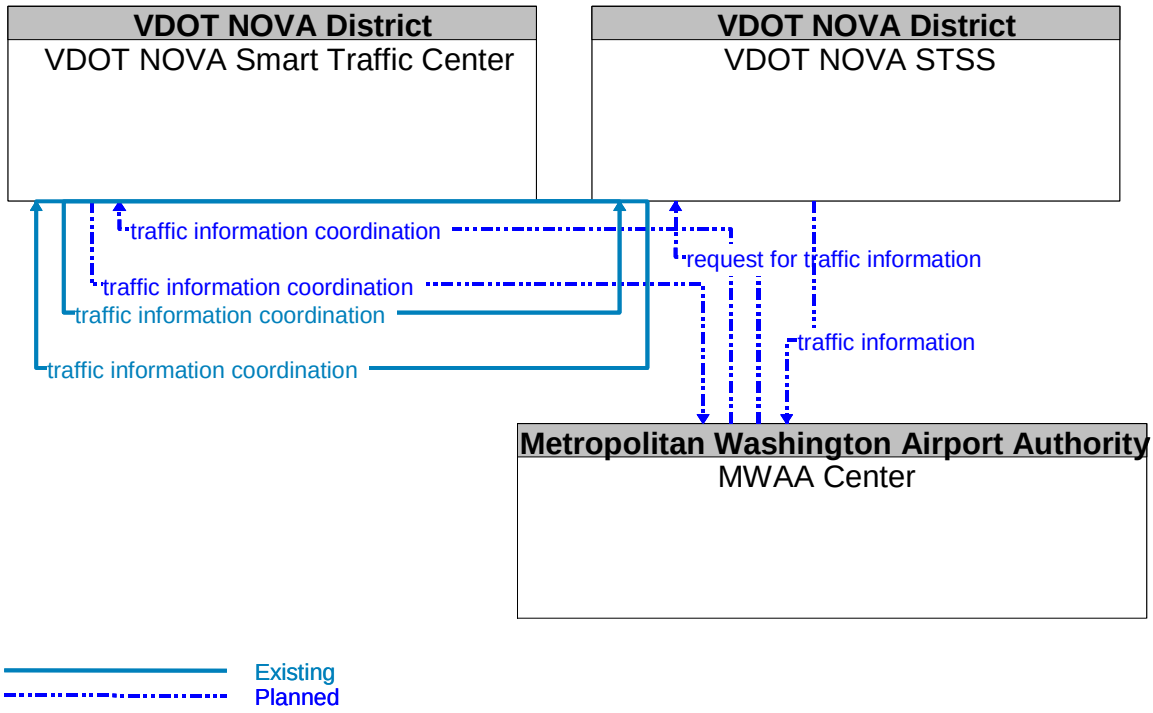

Figure C32 – MWAA Center to
VDOT NOVA STC and VDOT NOVA STSS Interface Diagram

National Advisory Warning System to VDOT NOVA STC

Concept –

The National Advisory Warning System is currently sharing incident and weather information with the VDOT NOVA STC to inform them of incidents and events in the region.

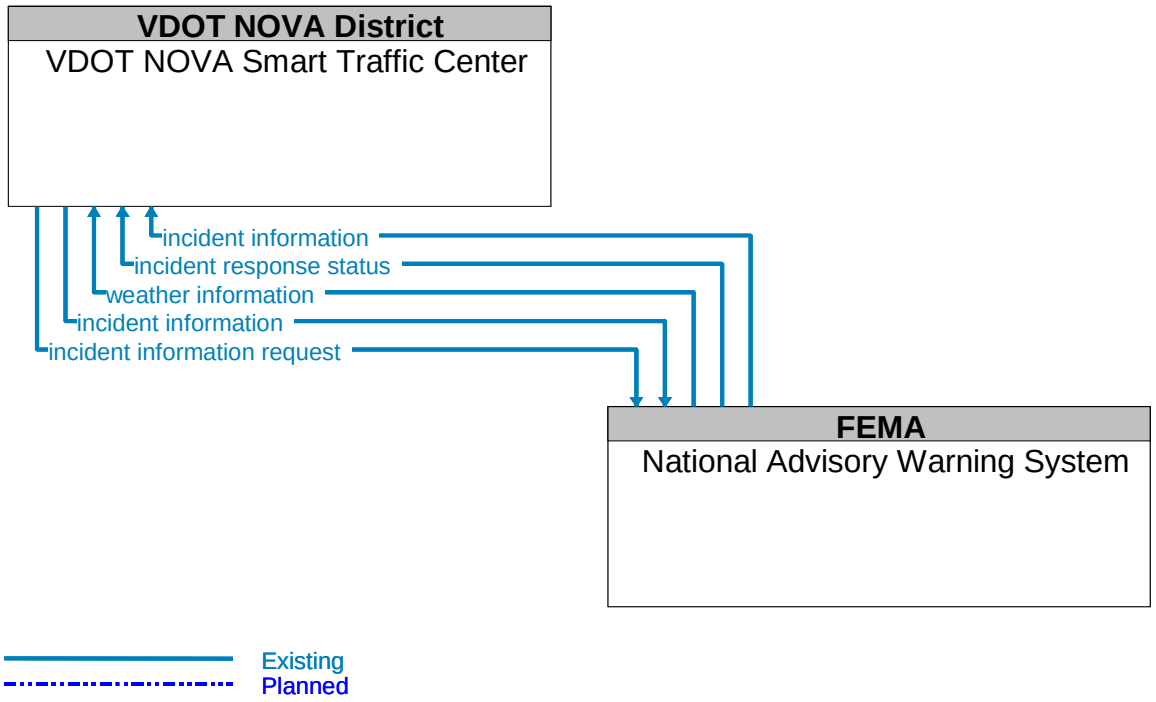

Figure C33 – National Advisory Warning System to VDOT NOVA STC Interface Diagram

National Park Services to VDOT NOVA STC

The National Park Services plans to receive/provide traffic information from/to the VDOT NOVA STC regarding the George Washington Parkway facility in the future. The National Park Services is currently working with Maryland CHART in deploying traffic management system along Baltimore-Washington Parkway. STC could follow the B-W Parkway model in implementing the traffic management system along George Washington Parkway in the future.

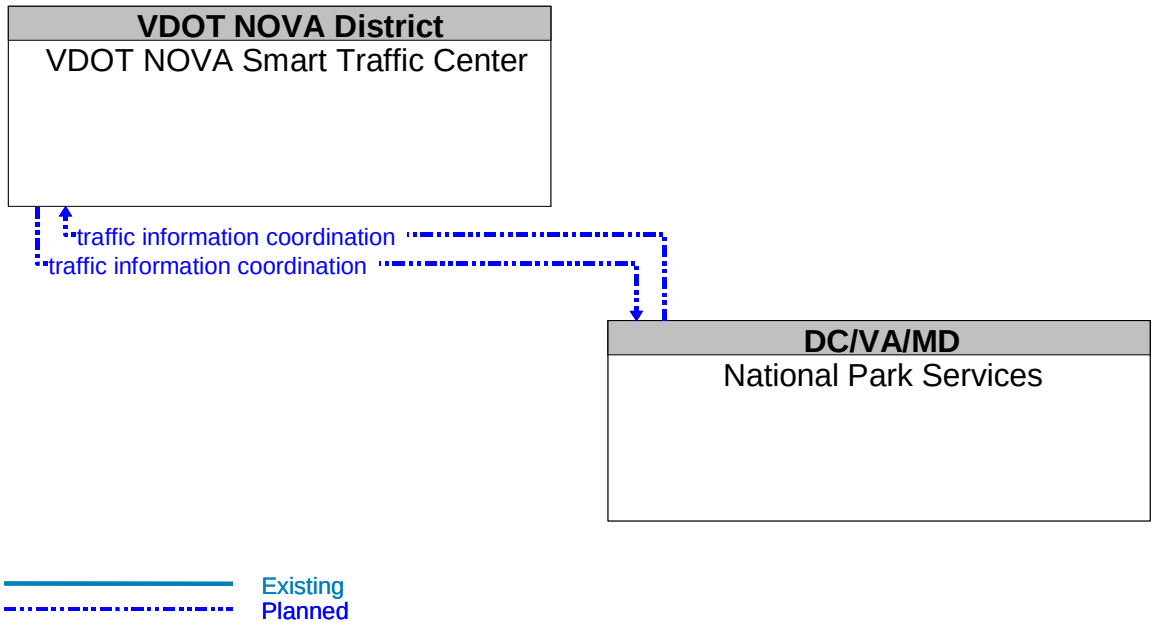

Figure C34 – National Park Services to
VDOT NOVA STC Interface Diagram

NOVA Local Signal Centers to VDOT NOVA STC

Concept –

The NOVA Local Signal Centers are currently exchanging traffic information via phone with the VDOT NOVA STC to better coordinate incident management activities. The VDOT NOVA STC plans to share video information with the NOVA Local Signal System Centers in the future.

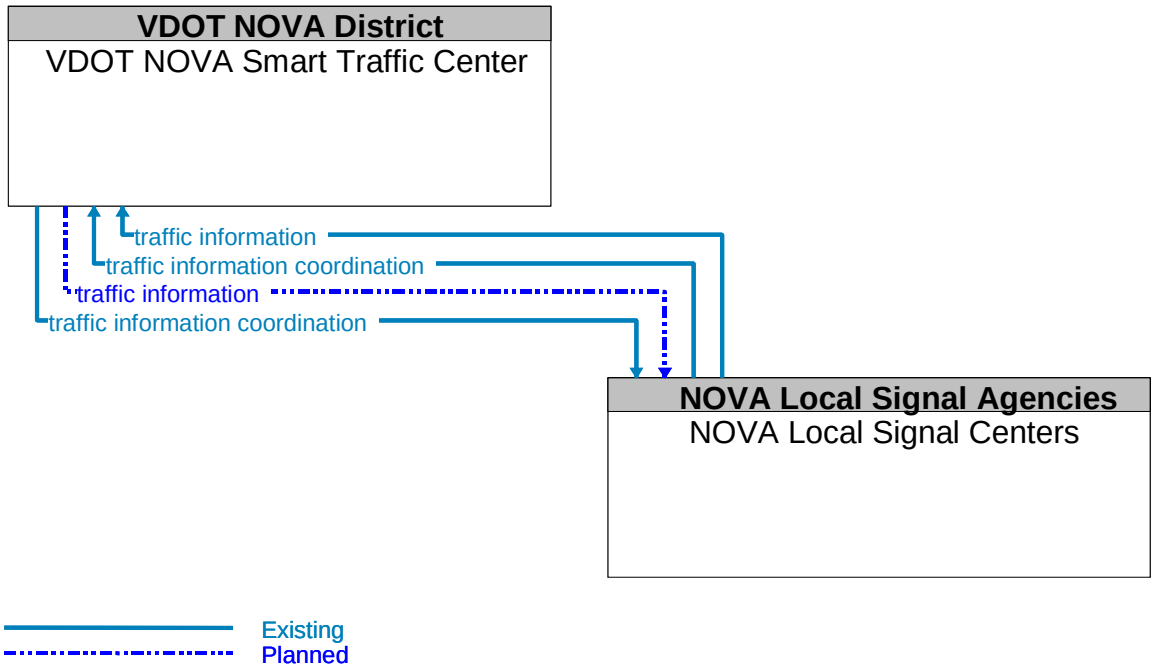

Figure C35 – NOVA Local Signal Centers to
VDOT NOVA STC Interface Diagram

VDOT NOVA STC to NOVA Local Transit Centers and to VRE Center

Concept –

The NOVA Local Transit Centers plan to share transit incident data with the VDOT NOVA STC if a transit incident has the potential to impact freeway operations. The VDOT NOVA STC is currently providing HOV restriction information to the various transit centers. When HOV restrictions are lifted transit services can be adjusted. The VRE plans to share incident information from the VRE system with the VDOT NOVA STC that may impact freeway operations.

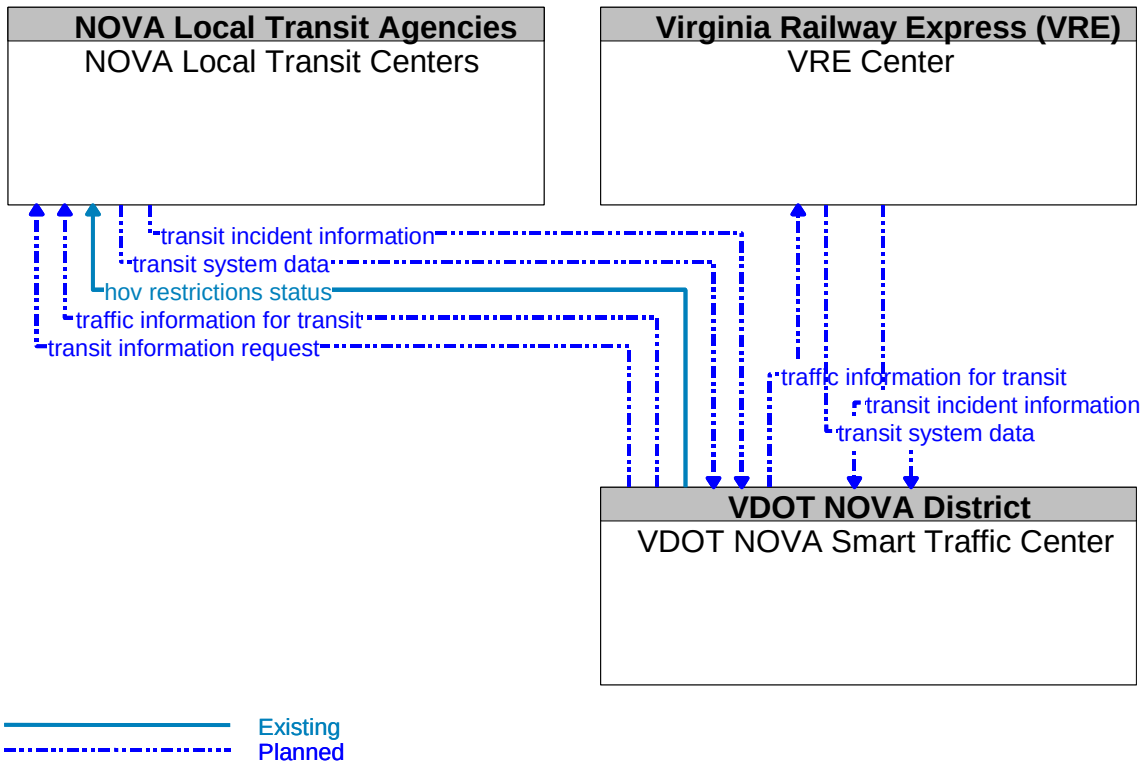

Figure C36 – VDOT NOVA STC to
NOVA Local Transit Centers and to VRE Center Interface Diagram

VDOT NOVA STSS to VDOT NOVA STSS Field Equipment

Concept –

The VDOT NOVA STSS controls its ITS field devices (traffic signals, detector data, CCTV (future) etc.) for monitoring and managing traffic conditions. Highway Rail Intersection monitoring and control are potential capabilities in the future.

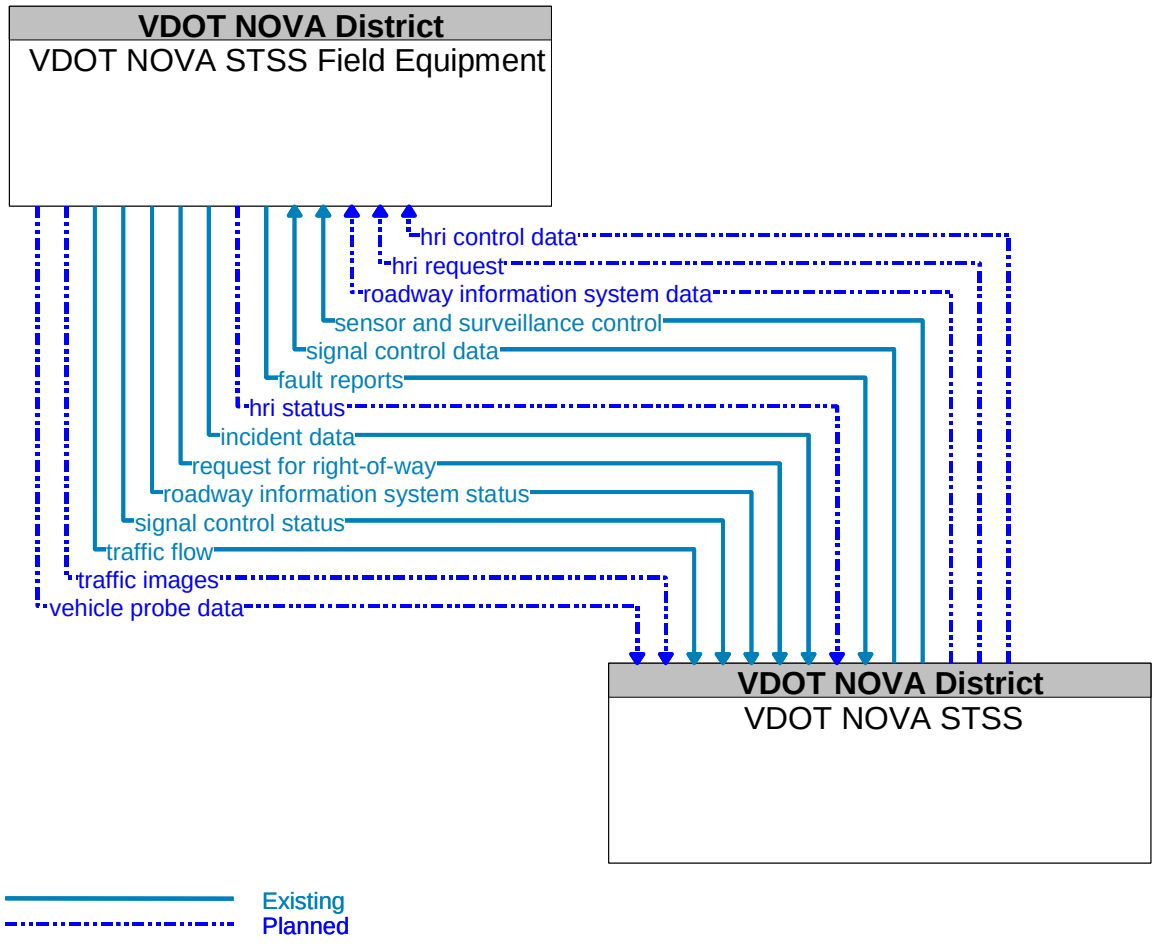

Figure C37 – VDOT NOVA STSS to
VDOT NOVA STSS Field Equipment Interface Diagram

VDOT NOVA STSS to ISP Centers and to Virginia Statewide ATIS Clearinghouse

Concept –

The VDOT NOVA STSS plans to exchange traffic and incident information with regional ISP Centers and the Virginia Statewide ATIS Clearinghouse.

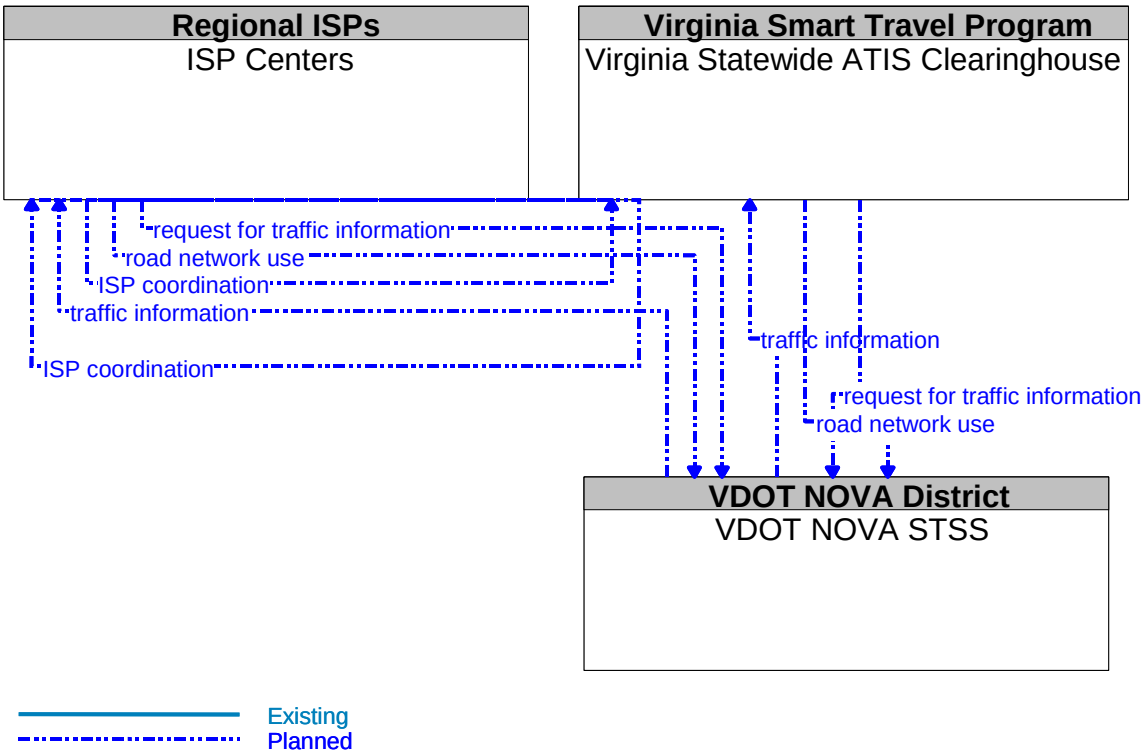

Figure C38 – VDOT NOVA STSS to
ISP Centers and to Virginia Statewide ATIS Clearinghouse Interface Diagram

VDOT NOVA STSS to NOVA Local Public Safety Centers and Virginia State Police Center

Concept –

The NOVA Local Public Safety Centers plan to exchange incident and emergency information with the VDOT NOVA STSS to better coordinate incident management activities. The interface between the VDOT NOVA STSS and the NOVA Local Public Safety Centers includes not only incident information but also remote surveillance control to provide NOVA Local Public Safety Centers with video images of an incident scene, when available, to better assess the emergency response needed. The VDOT NOVA STSS is currently receiving red light running system data from NOVA Local Public Safety Centers.

The VDOT NOVA STSS plans to exchange incident information with the Virginia State Police Center for coordination of incident management activities that impact the arterial system.

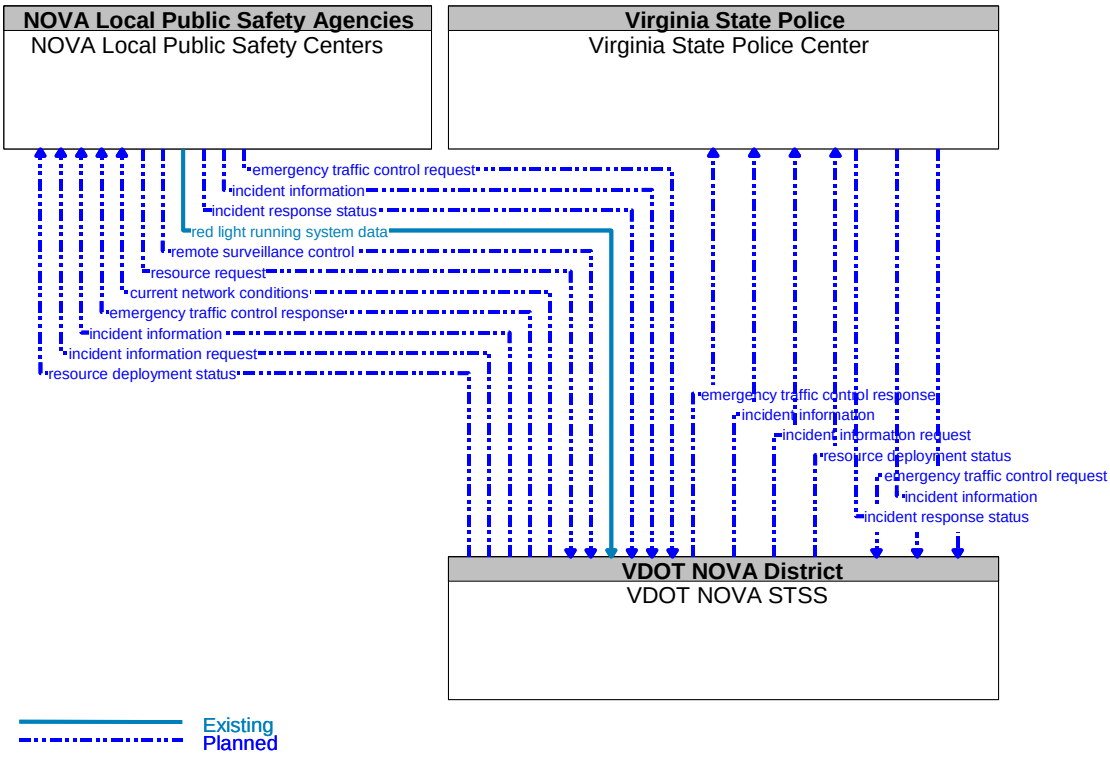

Figure C39 – VDOT NOVA STSS to
NOVA Local Public Safety Centers and Virginia State Police Center Interface Diagram

NOVA Local Signal Centers to VDOT NOVA STSS

Concept –

The VDOT NOVA STSS is currently working with NOVA Local Signal Centers to improve traffic flow across the region and to better support incident management activities through the exchange of traffic information. In some instances, these exchanges are already taking place.

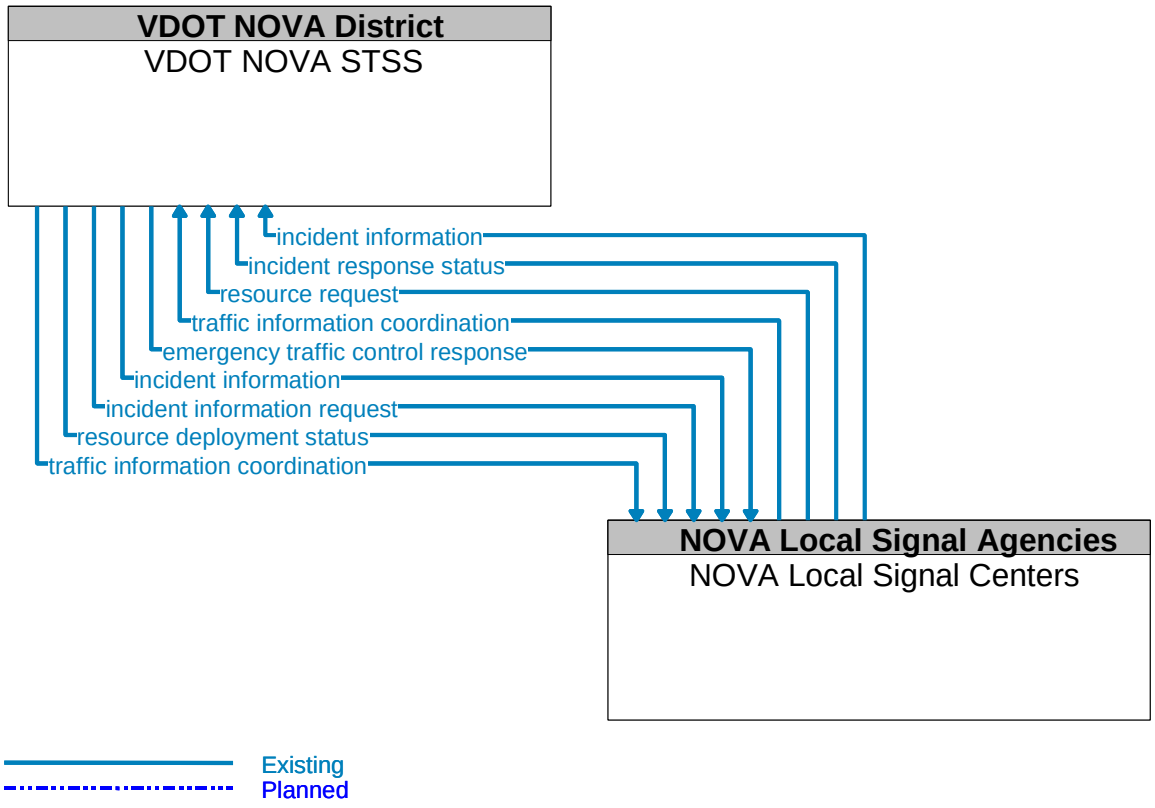

Figure C40 – NOVA Local Signal Centers to
VDOT NOVA STSS Interface Diagram

Federal Installations to VDOT NOVA STSS

Concept –

The Federal Installations have plans to exchange incident information with the VDOT NOVA STSS during major incidents and events. This interface was initially focused on informing Federal Agencies as major employment centers in the DC Metropolitan Area of traffic-related events. In addition, events such as motorcades that impact the NOVA signal system would be communicated to the STSS for proper coordination. This interface has expanded to informing and exchanging incident information for incident response and coordination including Emergency Response. A more specific interface with Federal Law Enforcement is illustrated in Figure C24.

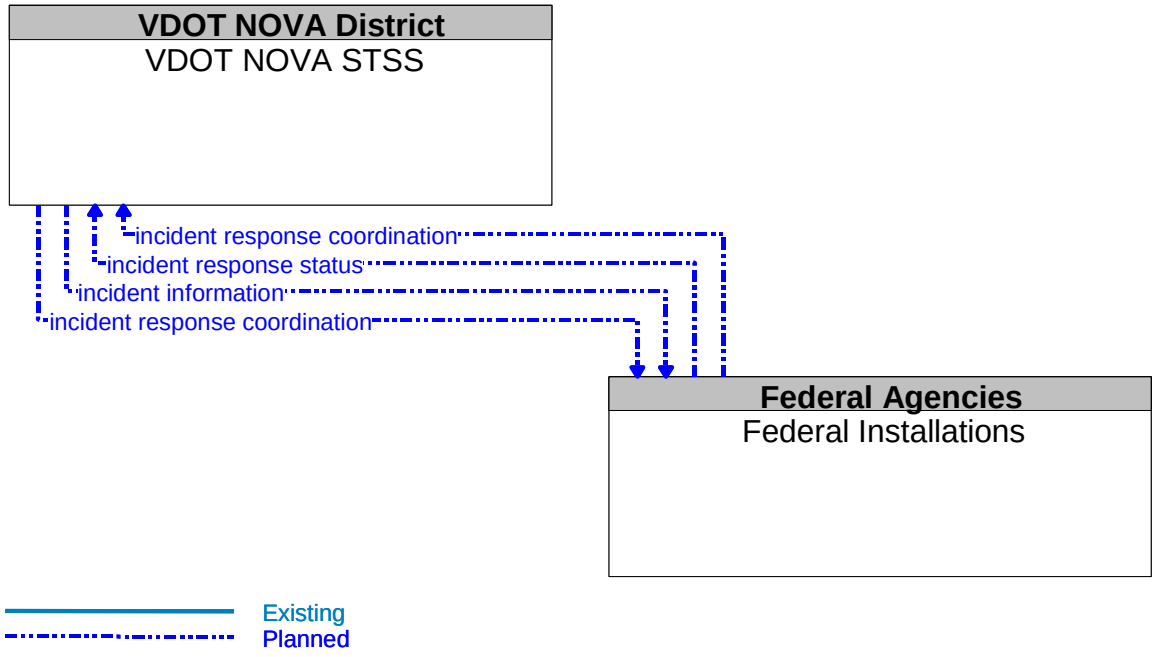

Figure C41 – Federal Installations to
VDOT NOVA STSS Interface Diagram

Media Centers to VDOT NOVA STSS

Concept –

The local media centers plan to receive traffic related information from the VDOT NOVA STSS to better inform Virginia motorists of arterial conditions.

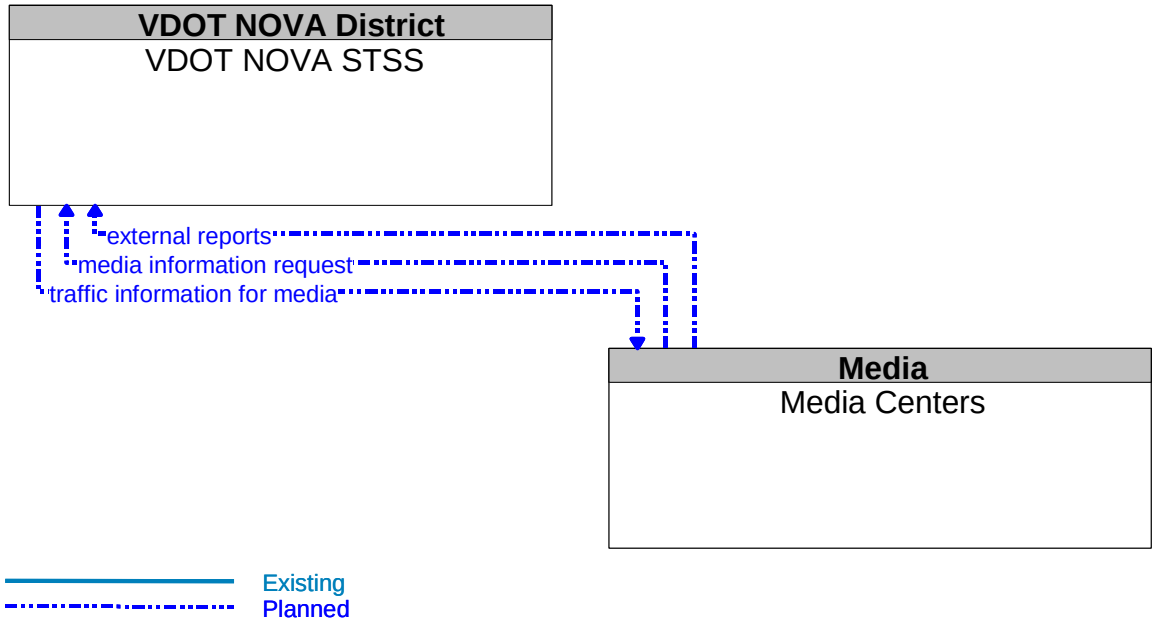

Figure C42 – Media Centers to
VDOT NOVA STSS Interface Diagram

NOVA Local Transit Centers to VDOT NOVA STSS and VDOT NOVA STSS Field Equipment

Concept –

The NOVA Local Transit Centers plan to share transit incident data with the VDOT NOVA STSS, if a transit incident has the potential to impact the arterial system. The transit centers are planning to establish information exchange with the STSS for signal priority. These requests will be center-to-center information exchanges for coordination across multiple intersections.

The NOVA Local Transit Centers system in the NOVA ITS Architecture contains functionality for a transit vehicle. This was done to simplify the architecture and the interface. Considering that the NOVA Local Transit Center could be a transit vehicle, there are plans to request signal priority locally from the transit vehicle through VDOT NOVA STSS roadside equipment. This approach provides an alternative to the center-to-center signal priority request discussed above.

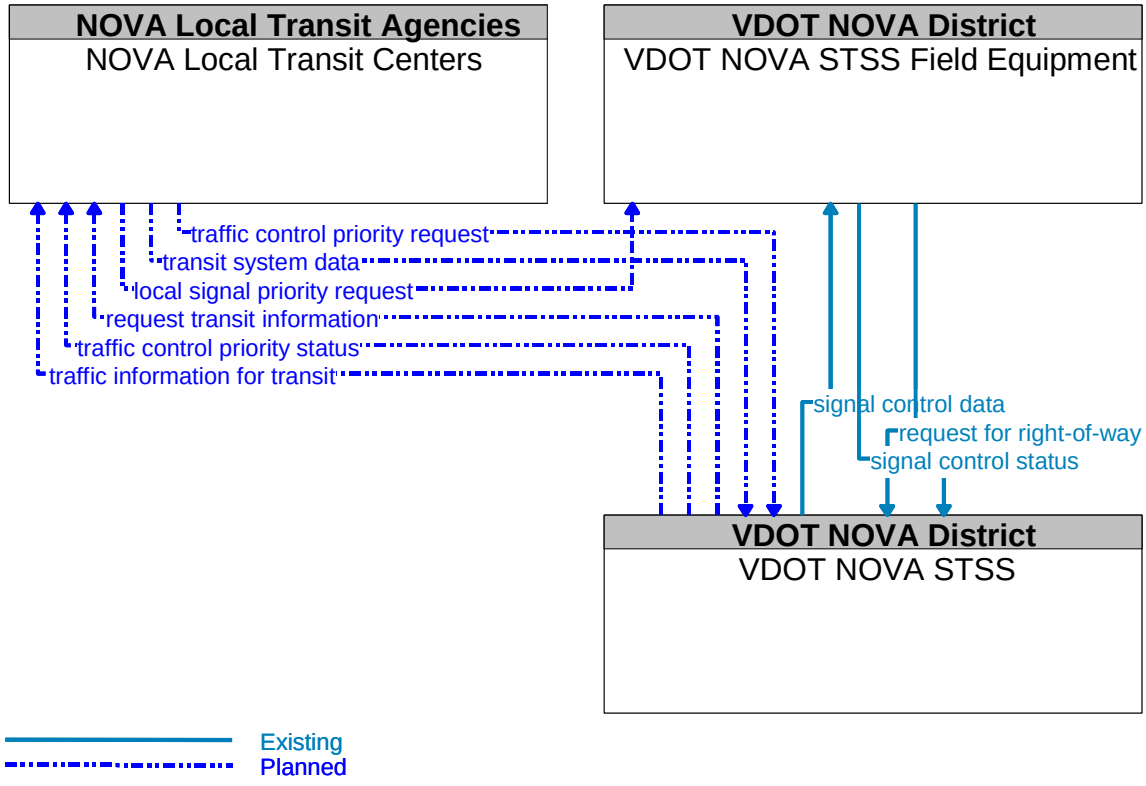

Figure C43 – NOVA Local Transit Centers to
VDOT NOVA STSS and VDOT NOVA STSS Field Equipment Interface Diagram

VDOT NOVA STSS to Rail Operations to VDOT NOVA STSS Field Equipment

Concept –

The Rail Operations serve the NOVA area plan to provide the VDOT NOVA STSS with railroad advisories to allow signal timing plans to be modified to maintain traffic progression. The VDOT NOVA STSS plans to provide information to Rail Operations concerning any roadway maintenance activities, incidents, or equipment failures at or near a highway rail intersection. The Rail Operations will exchange right-of-way and roadside equipment status information at multimodal crossings with VDOT NOVA STSS Field Equipment.

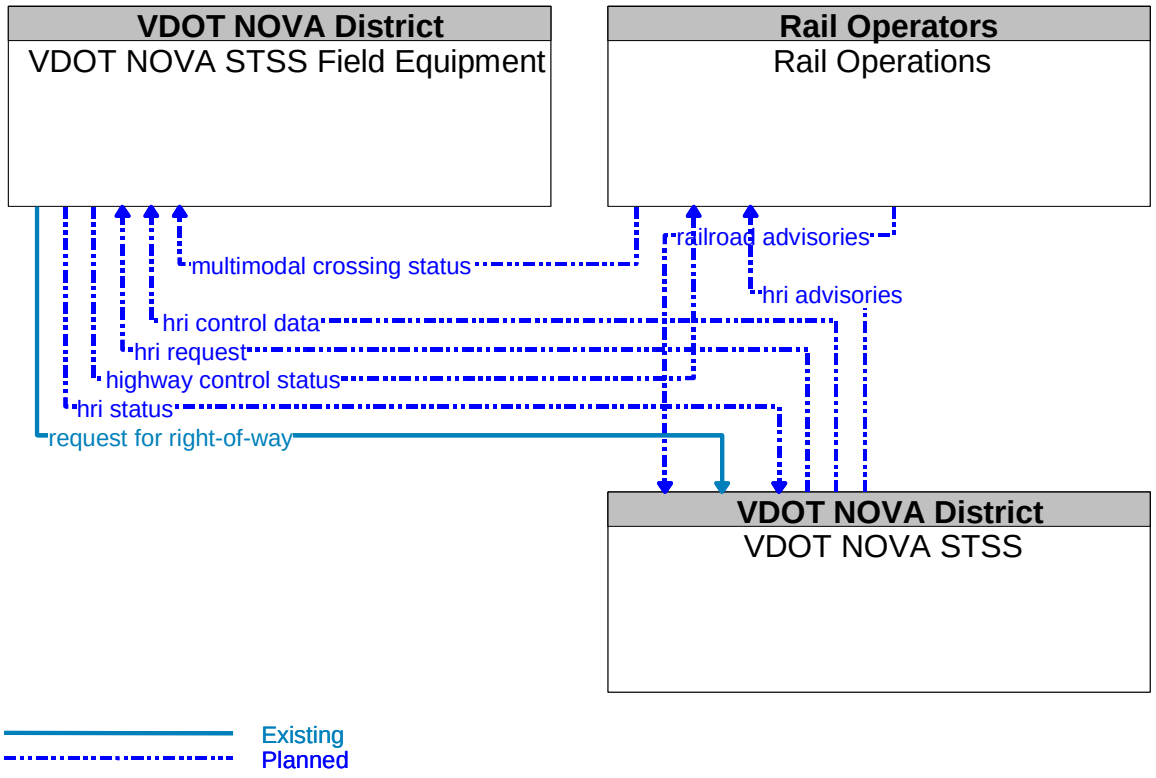

Figure C44 – VDOT NOVA STSS to
Rail Operations to VDOT NOVA STSS Field Equipment Interface Diagram

VDOT NOVA Maintenance & Construction Operations to VDOT NOVA STSS and Virginia State Police Center

Concept –

The VDOT NOVA Maintenance and Construction Operations is currently sending work zone and maintenance and construction plans to the VDOT NOVA STSS and the Virginia State Police to better manage the VDOT NOVA signal system and respond to incidents in work zone areas. The STSS sends closure coordination information to Maintenance and Construction Operations. In addition, traffic equipment status and maintenance status of repair activities is exchanged between the STSS and Maintenance and Construction Operations.

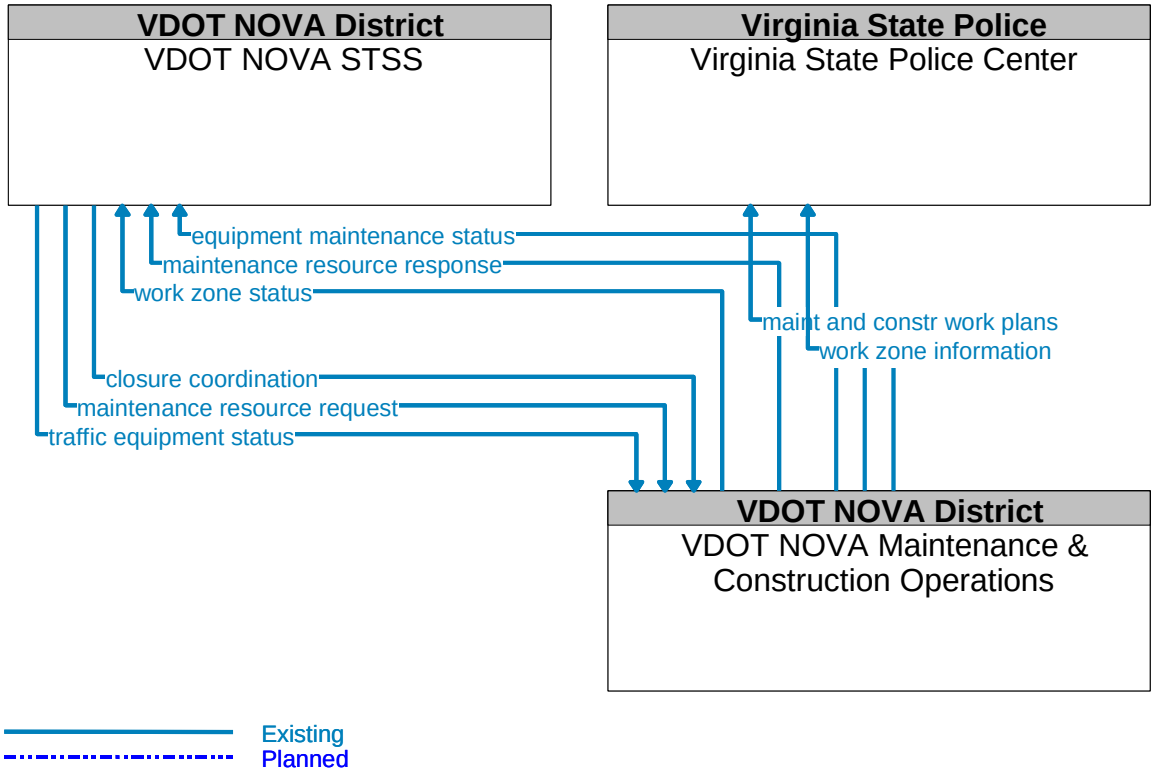

Figure C45 – VDOT NOVA Maintenance & Construction Operations to VDOT NOVA STSS and Virginia State Police Center Interface Diagram

VDOT NOVA Snow Operations to VDOT NOVA STSS and VDOT TEOC

Concept –

The VDOT NOVA Snow Operations is currently receiving requests from the VDOT TEOC to treat roads. While treating roadway segments, Snow Operations sometimes identifies traffic incidents and shares this information with the VDOT NOVA STSS. Snow Operations plans to provide snow plow location data to the STSS and TEOC.

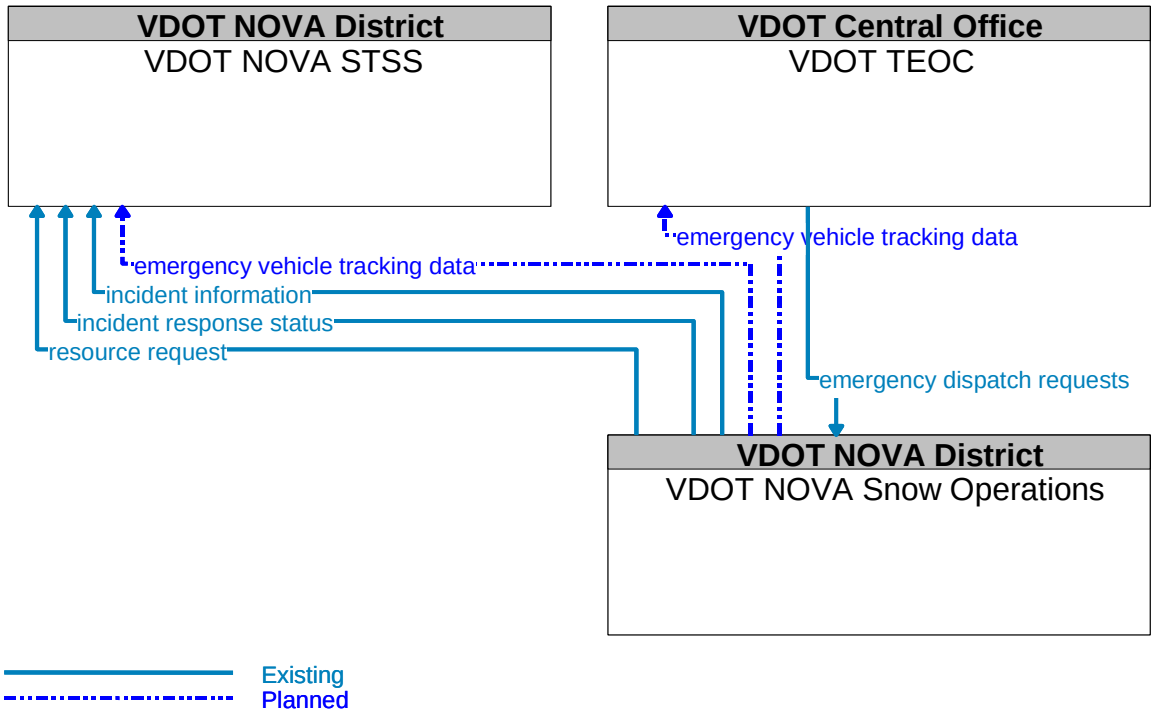

Figure C46 – VDOT NOVA Snow Operations to
VDOT NOVA STSS and VDOT TEOC Interface Diagram

VDOT NOVA STSS to VDOT NOVA TCC

Concept –

The VDOT NOVA STSS plans to share traffic information with the VDOT NOVA TCC to better respond to traffic information requests from public.

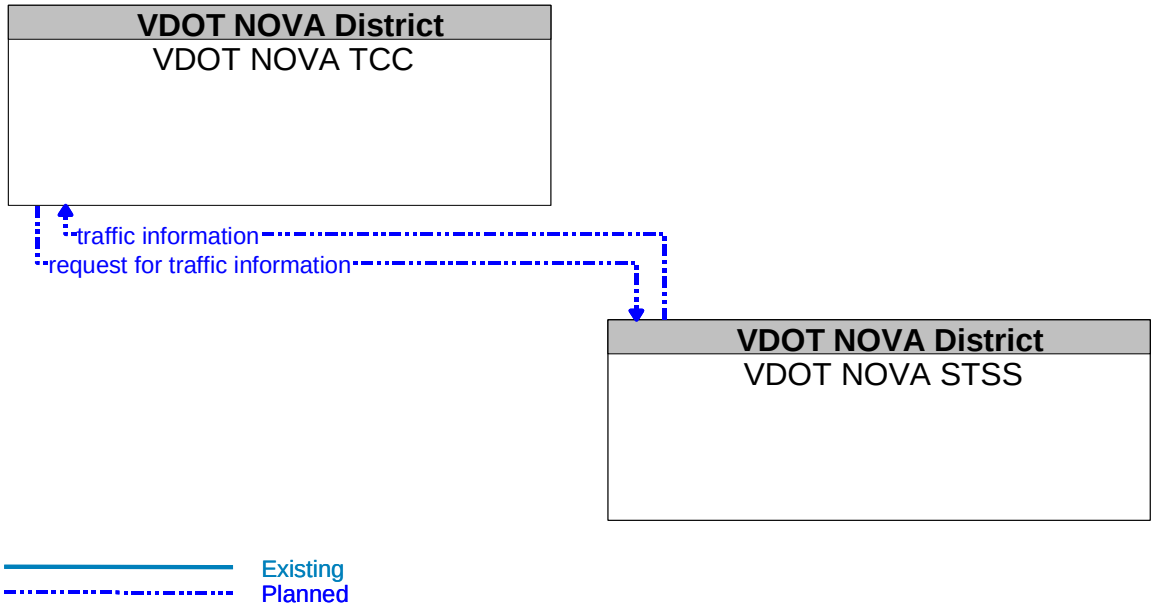

Figure C47 – VDOT NOVA STSS to
VDOT NOVA TCC Interface Diagram

Mobile Unified Command to VDOT NOVA SSP

Concept –

The Mobile Unified Command currently coordinates incident information and incident response at an incident site with the VDOT NOVA Safety Service Patrol during major incidents.

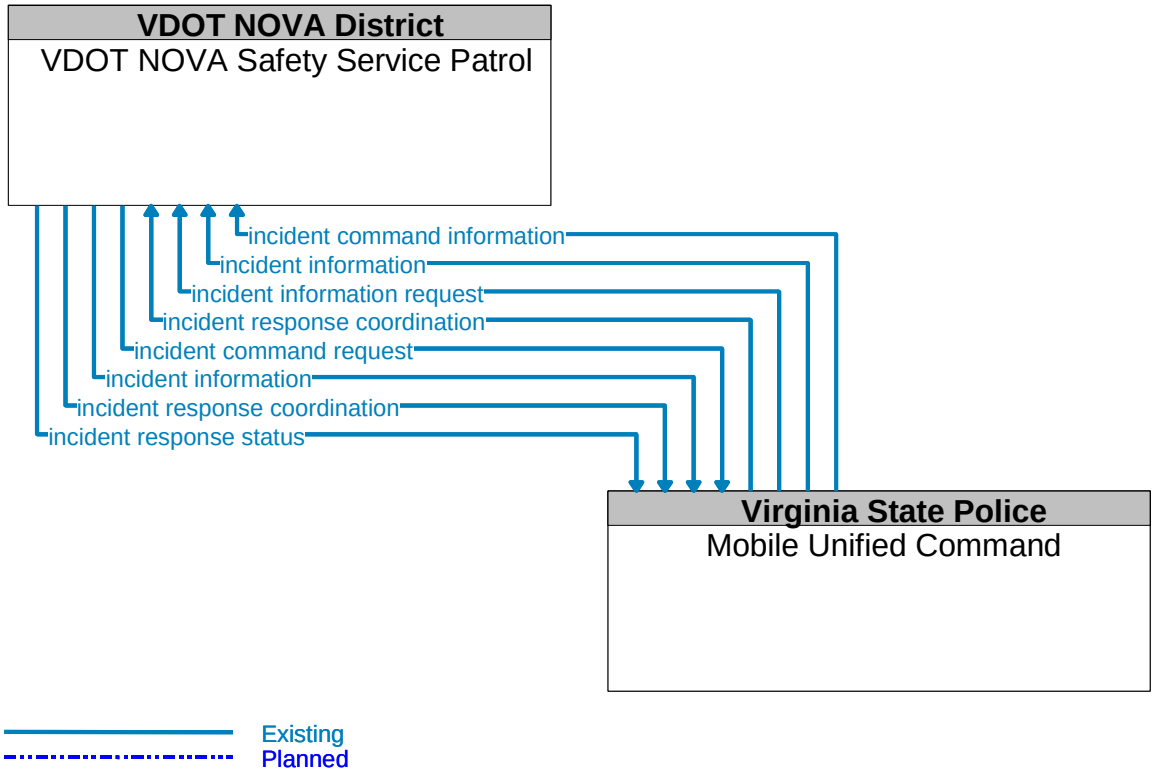

Figure C48 – Mobile Unified Command to
VDOT NOVA Safety Service Patrol Interface Diagram

Baltimore-Washington HIDTA to VDOT NOVA SSP

Concept –

The Baltimore-Washington HIDTA has plans to share emergency and incident information with the VDOT NOVA Safety Service Patrol to better coordinate incident management activities once the CAPWIN project is completed. The Safety Service Patrol works very closely with the Virginia State Police, participants in CAPWIN, to clear incidents as quickly as possible. The Safety Service Patrol will be a mobile VDOT participant in CAPWIN.

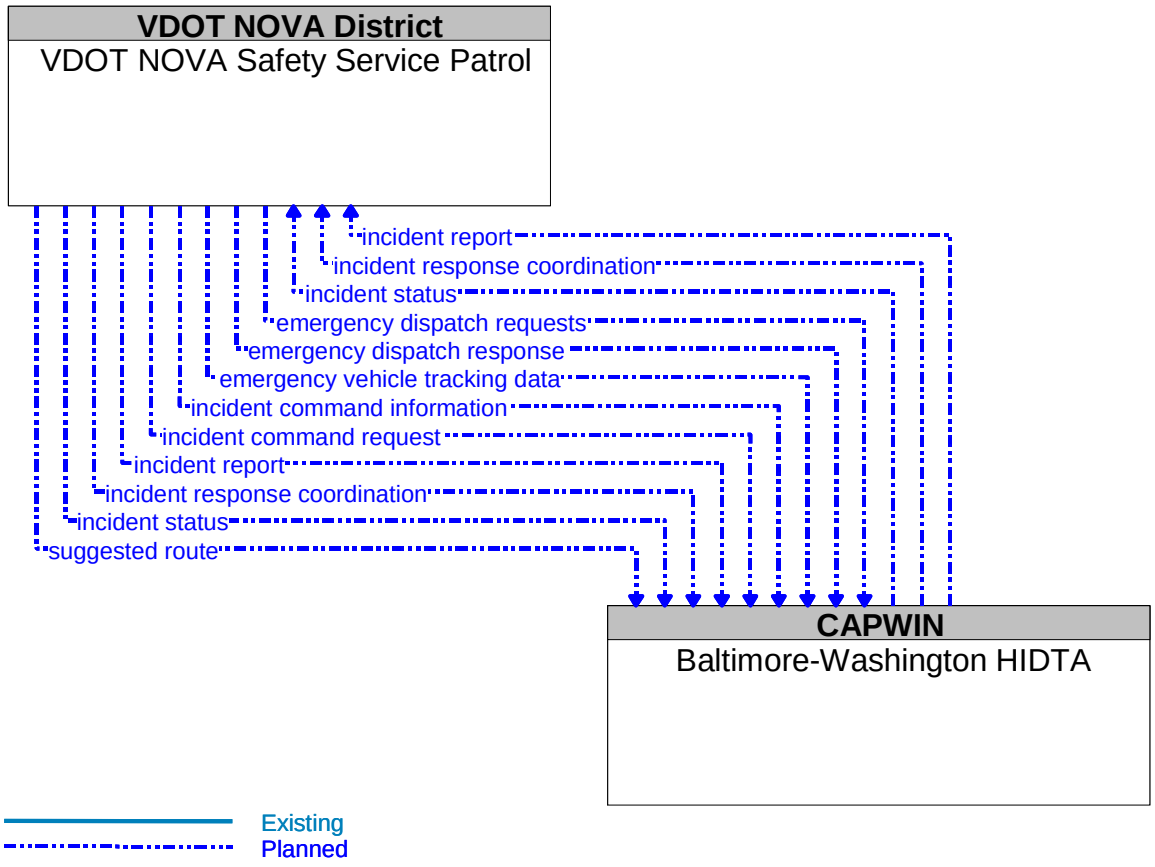

Figure C49 – Baltimore-Washington HIDTA to
VDOT NOVA Safety Service Patrol Interface Diagram

NOVA Local Public Safety Centers to VDOT NOVA SSP

Concept –

The NOVA Local Public Safety Centers plan to exchange incident and emergency information with the VDOT NOVA Safety Service Patrol to better coordinate incident management activities.

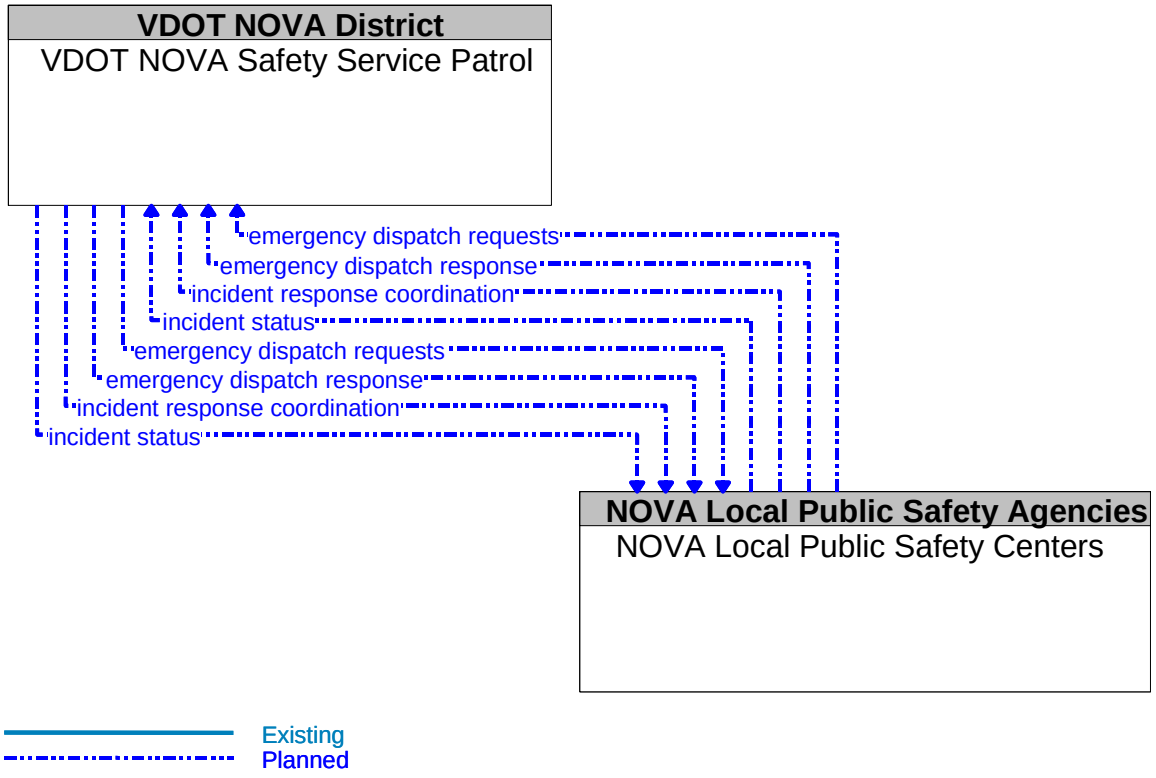

Figure C50 – NOVA Local Public Safety Centers to
VDOT NOVA Safety Service Patrol Interface Diagram

VDOT Mobility Data Store to VDOT NOVA SSP

Concept –

The VDOT Mobility Data Store plans to request and receive emergency archive data from the VDOT NOVA Safety Service Patrol.

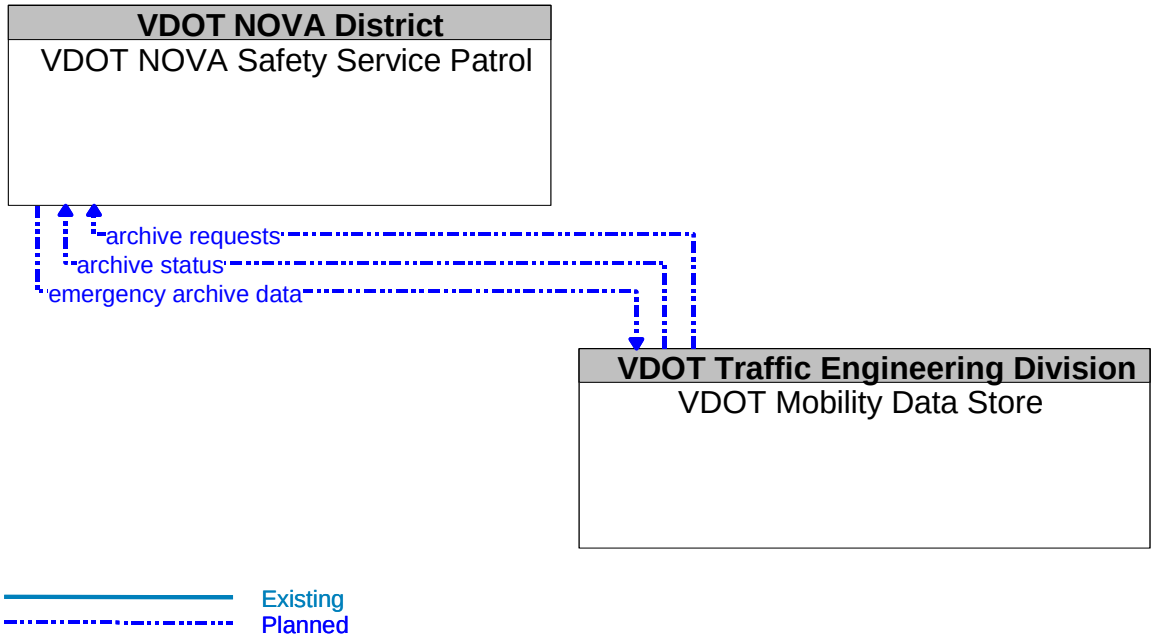

Figure C51 – VDOT Mobility Data Store to
VDOT NOVA Safety Service Patrol Interface Diagram

VDOT NOVA SSP to VDO TNOVA Snow Operations

Concept –

The VDOT NOVA Safety Service Patrol is currently sharing incident information with the VDOT NOVA Snow Operations to coordinate incident response activities. The VDOT NOVA Safety Service Patrol plans to receive snow plow tracking data to determine which roads have been plowed or for assistance in response to incidents.

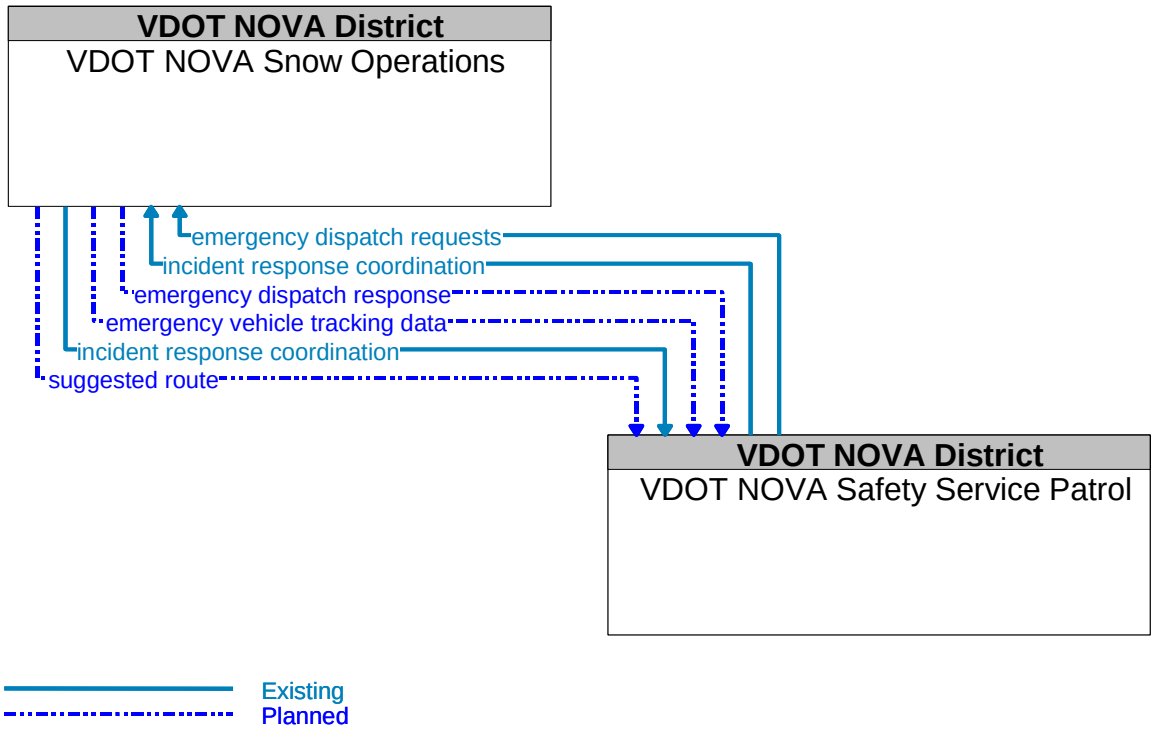

Figure C52 – VDOT NOVA Safety Service Patrol to VDOT NOVA Snow Operations Interface Diagram

VDOT NOVA Safety Service Patrol to Virginia State Police Center

Concept –

The VDOT NOVA Safety Service Patrol works closely with the Virginia State Police. The Safety Service Patrol plans to share incident information electronically to better coordinate incident management activities. In addition, the Safety Service Patrol plans to provide the Virginia State Police with Safety Service Patrol vehicle tracking data to better inform the State Police of the location of Safety Service Patrol vehicles for incident response.

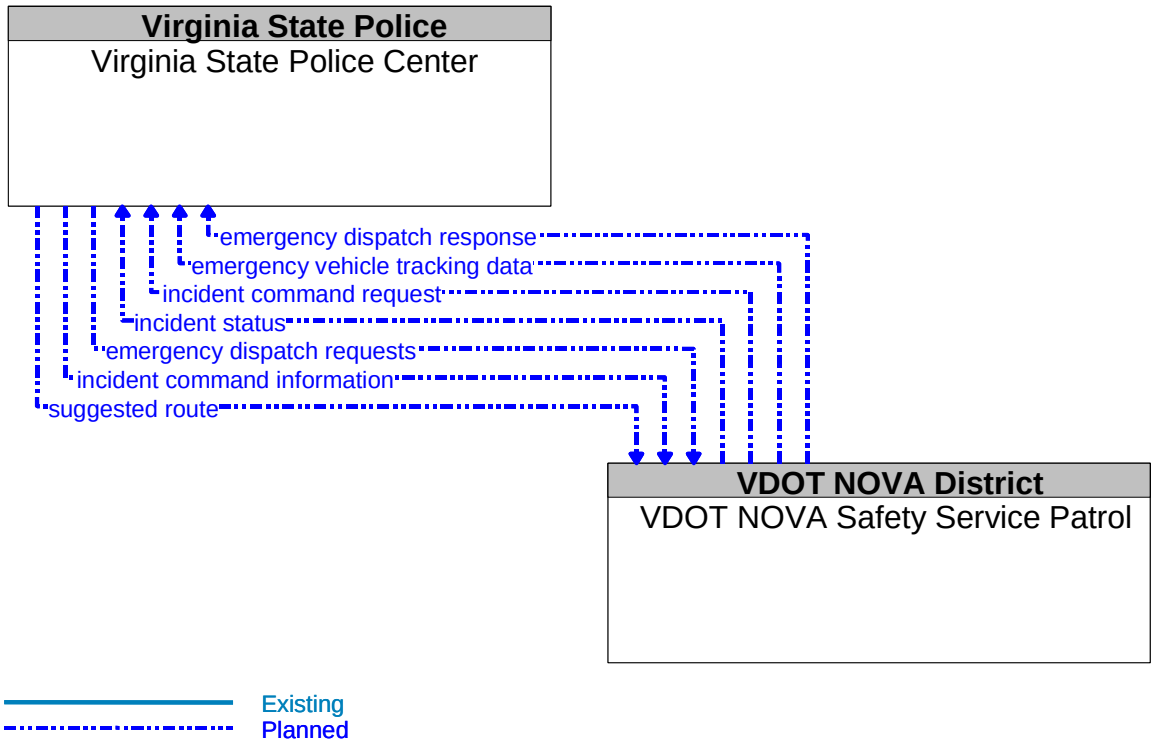

Figure C53 – VDOT NOVA Safety Service Patrol to Virginia State Police Center Interface Diagram

Metropolitan Washington COG Center to Smart Travel Lab and VDOT Mobility Data Store

Concept –

The Metropolitan Washington COG Center plans to exchange archive information with the Smart Travel Lab and the VDOT Mobility Data Store in the future. This data will be used for planning purposes in the COG region. The Smart Travel Lab is currently the only archive data source for the region. It archives data primarily for research purposes. The Mobility Data Store, when implemented, will take over archival functions from the Smart Travel Lab for the systems in NOVA.

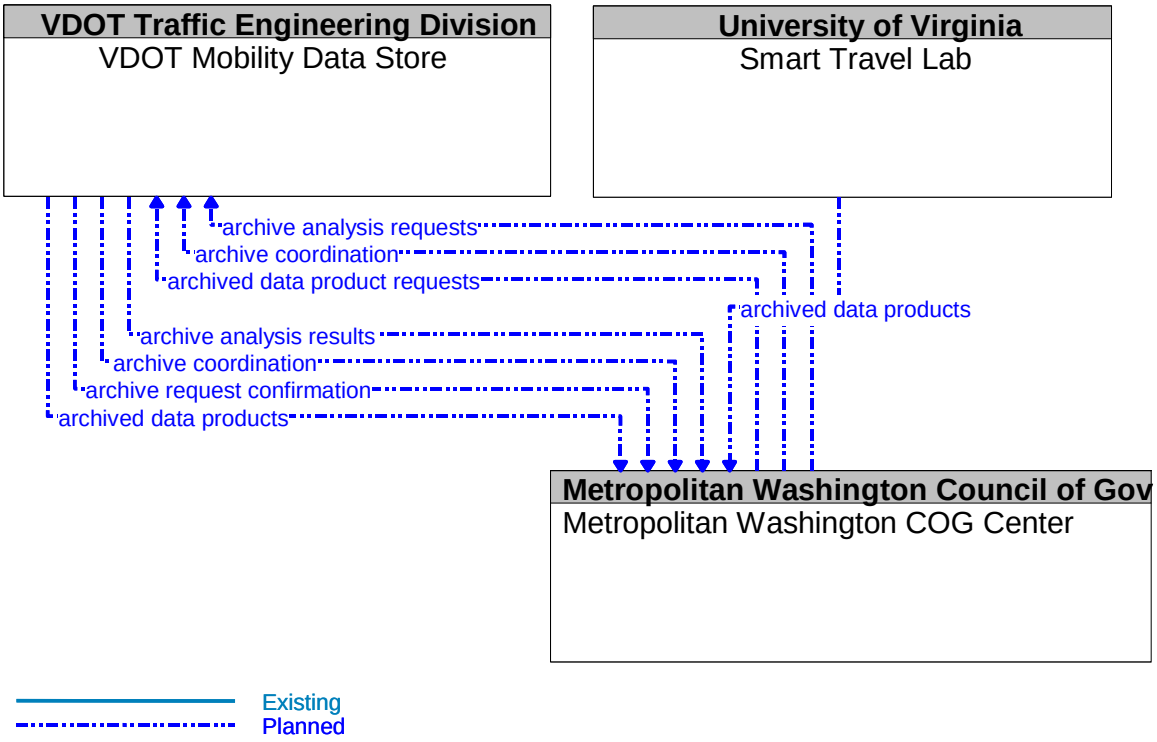

Figure C54 – Metropolitan Washington COG Center to Smart Travel Lab and VDOT Mobility Data Store Interface Diagram

NOVA Local Transit Centers to VDOT Mobility Data Store and VDOT NOVA Maintenance and Construction

Concept –

The NOVA Local Transit Centers are currently receiving maintenance and construction work plans from VDOT NOVA District's Maintenance and Construction Operations to allow the transit agencies to adjust their schedules around work plans. The NOVA Local Transit Centers also plan to send their archive data to the VDOT Mobility Data Store.

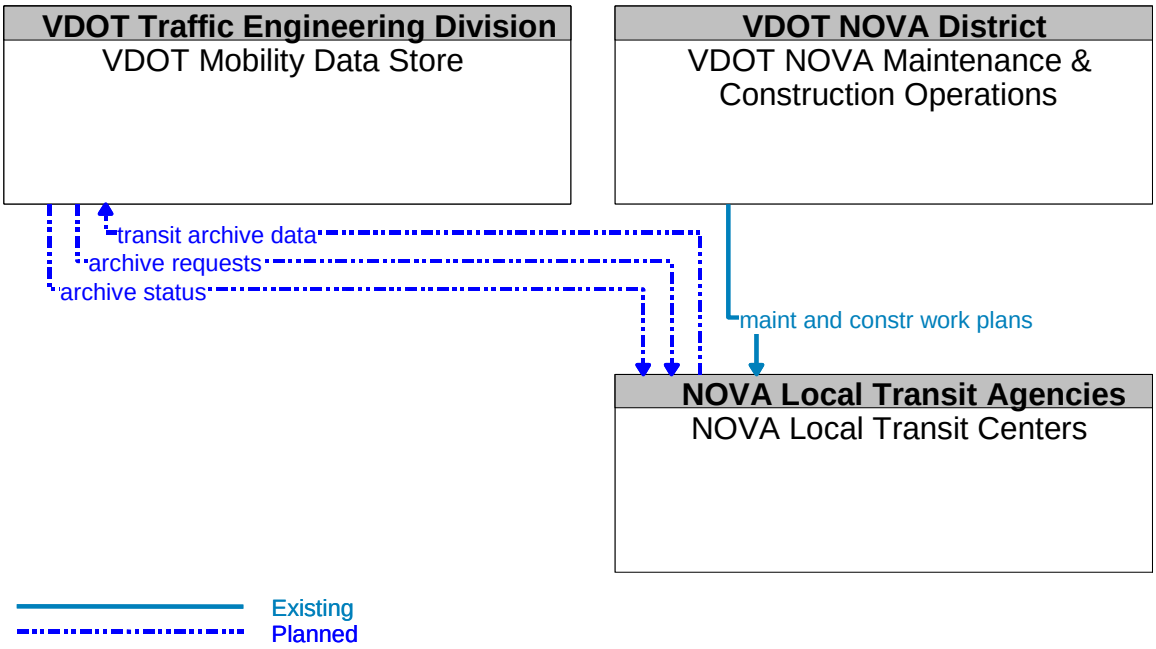

Figure C55 – NOVA Local Transit Centers to
VDOT Mobility Data Store and VDOT NOVA Maintenance and Construction Interface Diagram

NOVA Sections to Smart Travel Lab and VDOT Mobility Data Store and VDOT NOVA GIS

Concept –

The NOVA Sections plan to share archive data with the VDOT Mobility Data Store and also plan to utilize archive data and GIS data from the Smart Travel Lab and VDOT NOVA GIS, respectively.

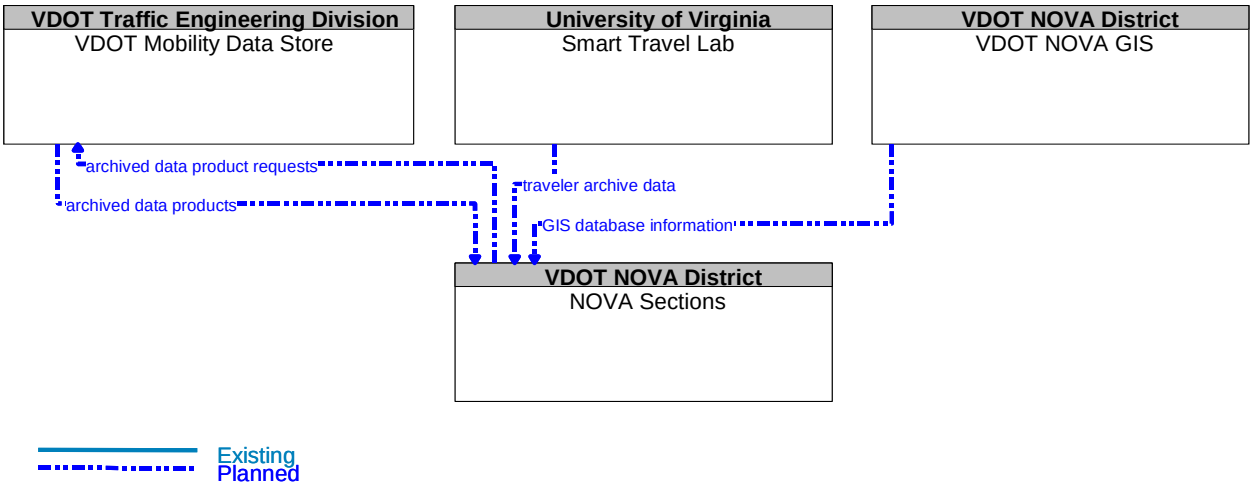

Figure C56 – NOVA Sections to
Smart Travel Lab and VDOT Mobility Data Store and VDOT NOVA GIS Interface Diagram

NVTC Center to Smart Travel Lab and VDOT Mobility Data Store

Concept –

The NVTC Center plans to share archive data with the VDOT Mobility Data Store and to use archive data from the Smart Travel Lab.

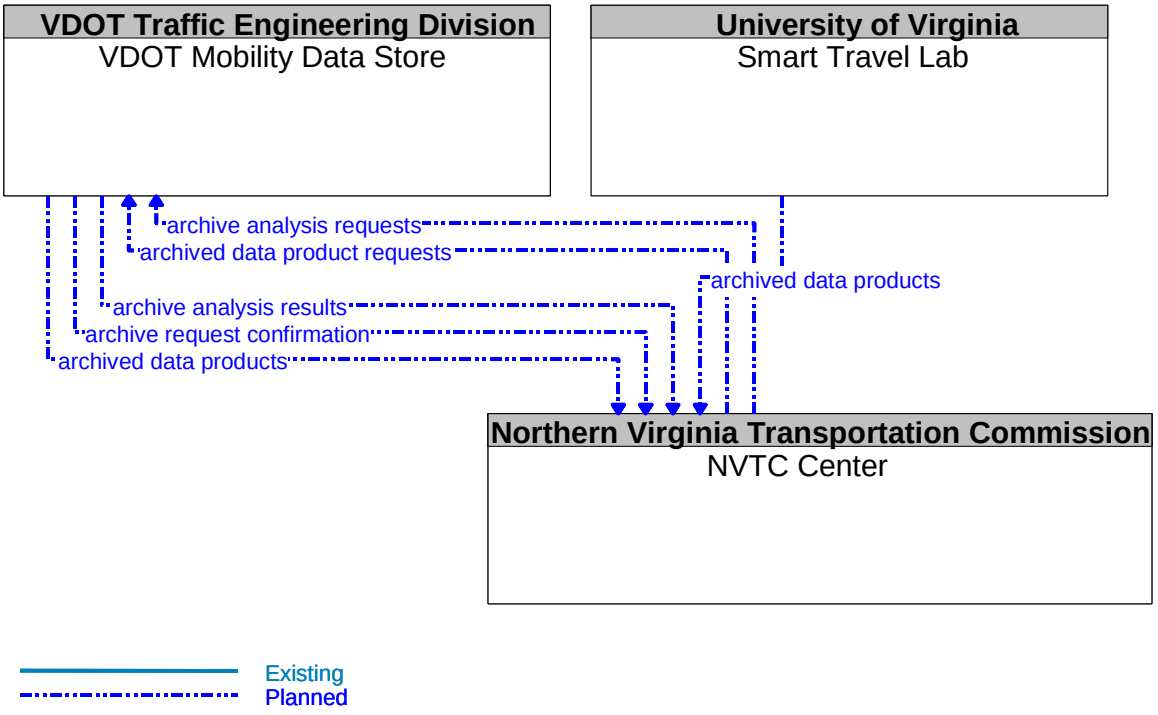

Figure C57 – NVTC Center to
Smart Travel Lab and VDOT Mobility Data Store Interface Diagram

Research and Data Collection Centers to VDOT Mobility Data Store

Concept –

The Research and Data Collection Centers plan to request and receive archived transportation data from the VDOT Mobility Data Store for research purposes.

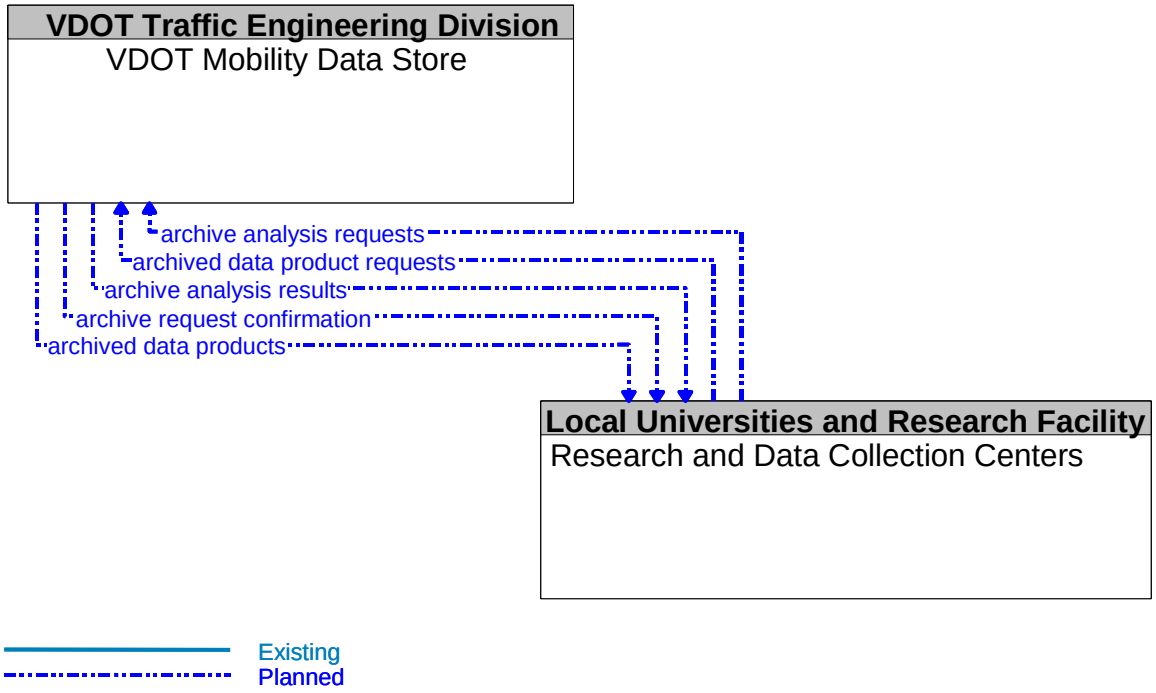

Figure C58 – Research and Data Collection Centers to VDOT Mobility Data Store Interface Diagram

Adjacent VDOT STCs to NOVA Public Safety Centers and VDOT TEOC

Concept –

The Adjacent VDOT STCs will exchange traffic information and incident information with the VDOT TEOC and the NOVA Local Public Safety Centers in the future. Exchange of incident information with NOVA Local Public Safety Agencies will improve traffic management and incident management at the boundaries of the NOVA District with the adjacent STCs. The TEOC interface with the NOVA Public Safety Centers provides local information to the TEOC for awareness at a statewide level concerning incident activity and provides a bigger statewide picture of activities to the local public safety agencies.

Note: the Adjacent VDOT STCs also interface with the VDOT NOVA STC as illustrated in the Figure C1.

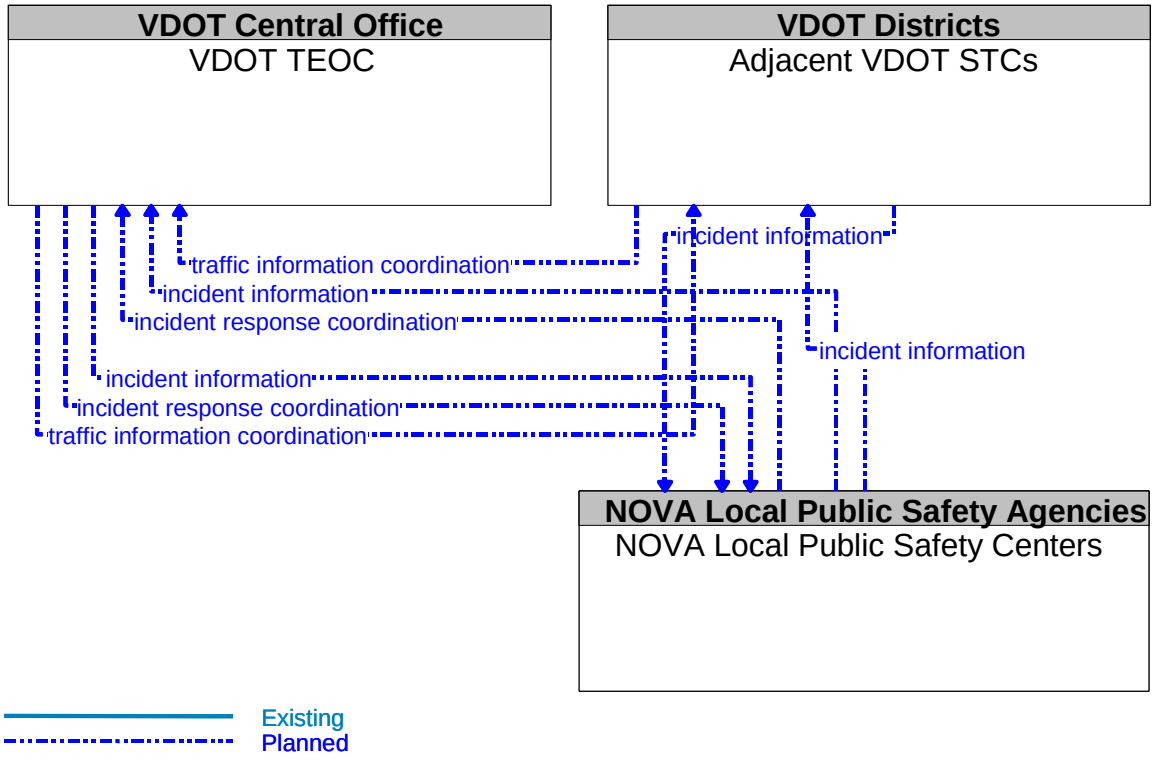

Figure C59 – Adjacent VDOT STCs to
NOVA Public Safety Centers and VDOT TEOC Interface Diagram

VDOT NOVA DTR to Virginia State Police Center to Greenway Center

Concept –

The VDOT NOVA Dulles Toll Road is currently receiving incident information from the Virginia State Police Center. The Dulles Toll Road plans to provide the Virginia State Police with incident information it collects from its own sensors and systems. The Greenway Center is providing reports of incidents that occur on the Greenway to the Virginia State Police. The Greenway has its own patrols and will receive incident reports, as appropriate, from the Virginia State Police in the future to improve coordination. The Greenway will eventually be turned back over to VDOT at the end of its contract.

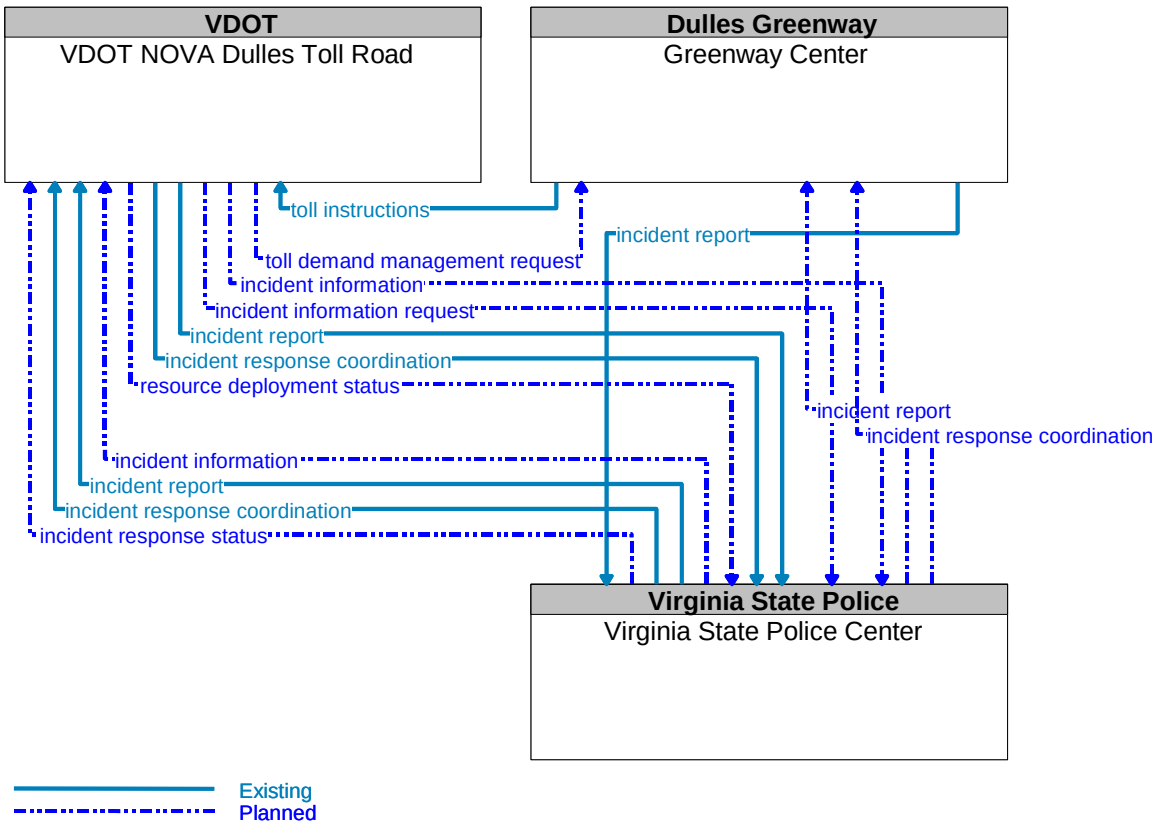

Figure C60 – VDOT NOVA Dulles Toll Road to
Virginia State Police Center to Greenway Center Interface Diagram

ISP Center to VDOT NOVA Maintenance and Construction and VDOT NOVA Parking Management

Concept –

The regional ISP Centers are currently receiving maintenance and construction and work zone information from the VDOT NOVA District. The ISP Centers are using this data to inform motorist of planned events to allow them to better plan their commute. There are also plans to provide the ISP Centers with parking information from other VDOT parking facilities in the NOVA region.

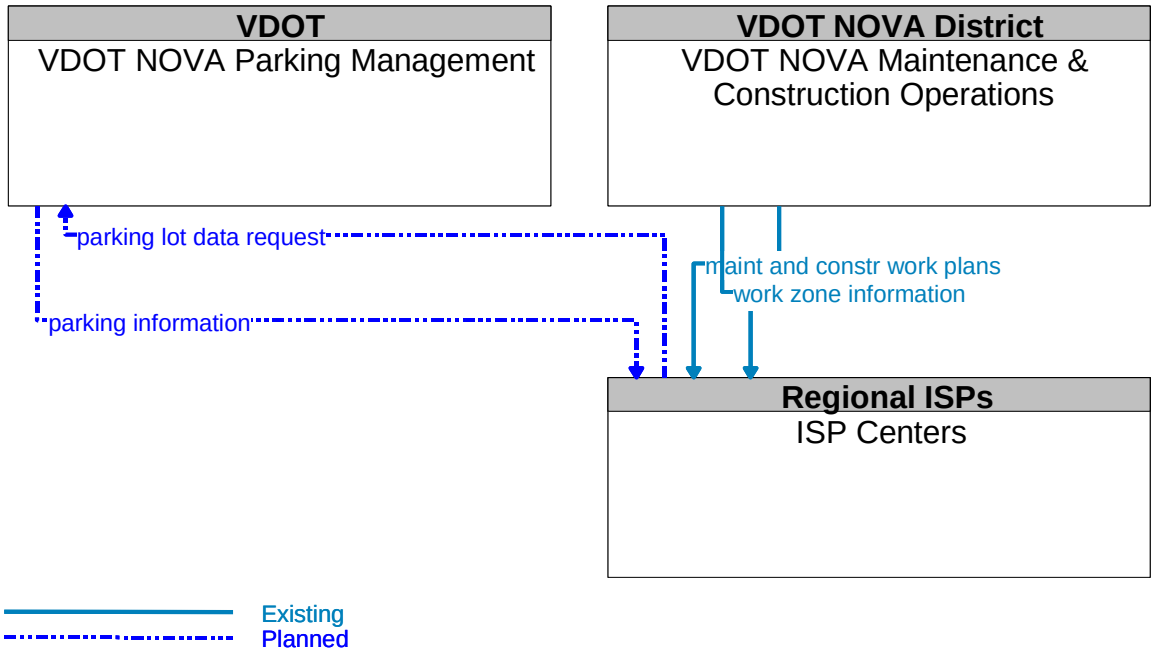

Figure C61 – ISP Center to
VDOT NOVA Maintenance and Construction
and VDOT NOVA Parking Management Interface Diagram

ISP Centers to VDOT NOVA TCC and Virginia Statewide ATIS Clearinghouse

Concept –

The regional ISP Centers plan to coordinate and exchange transportation information between VDOT NOVA TCC and the Virginia Statewide ATIS Clearinghouse. This exchange allows a broad range of transportation information collected by one ISP to be redistributed to many other ISPs and their clients. The VDOT NOVA TCC will provide snow operation status to the ISP Centers.

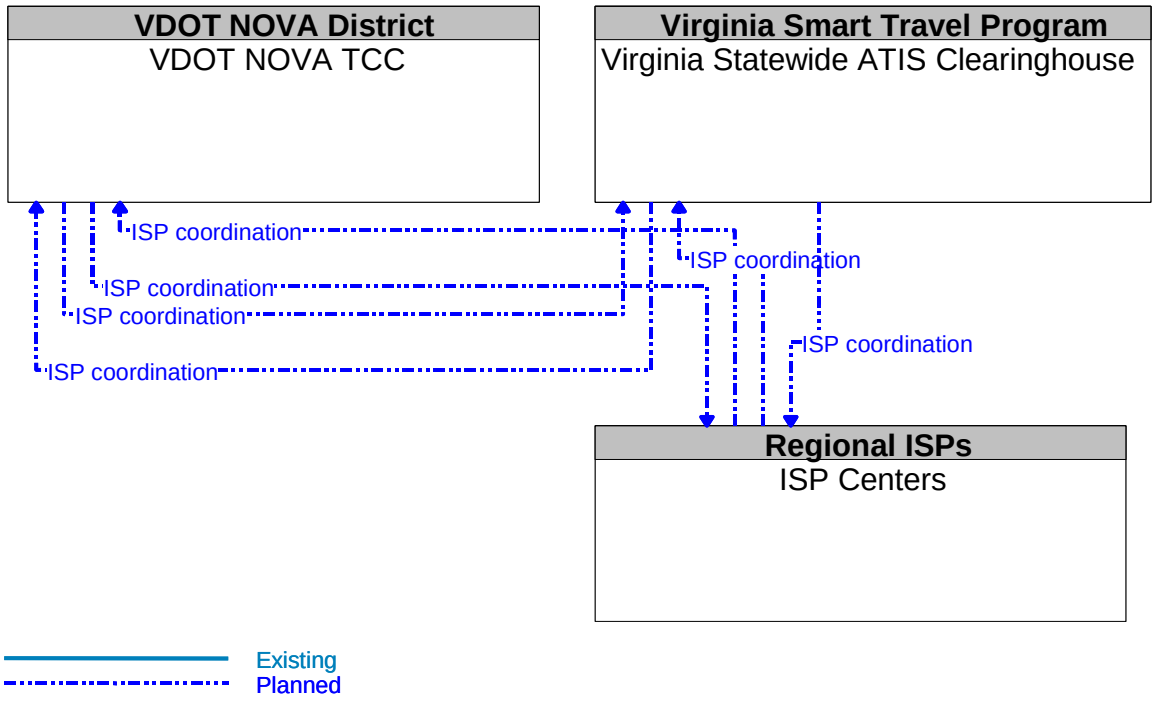

Figure C62 – ISP Centers to
VDOT NOVA TCC and Virginia Statewide ATIS Clearinghouse Interface Diagram

Media Centers to Virginia Statewide ATIS Clearinghouse

Concept –

The local media centers plan to receive traveler information from the Virginia Statewide ATIS Clearinghouse when it becomes operational. This will provide the media centers with a more centralized source for information across the state and simplify their interface with VDOT.

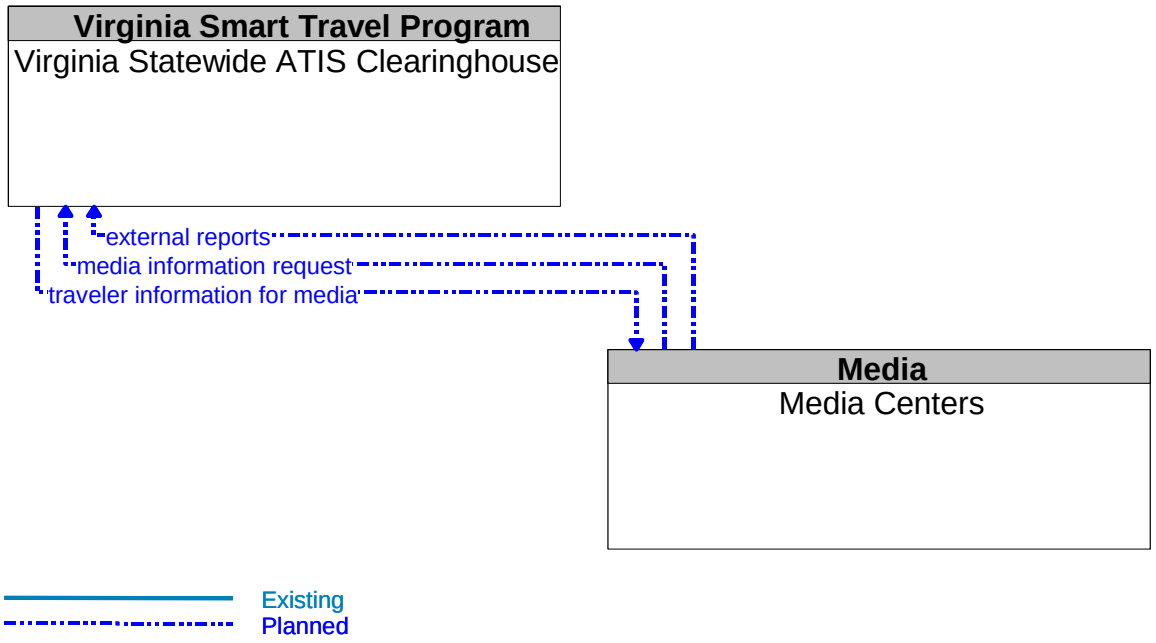

Figure C63 – Media Centers to
Virginia Statewide ATIS Clearinghouse Interface Diagram

MWAA Center to Virginia Statewide ATIS Clearinghouse

Concept –

The MWAA Center plans to share parking information with the Virginia Statewide ATIS Clearinghouse. This information will then be made available to ISPs who can inform travelers of parking conditions at the airports prior to their arrival.

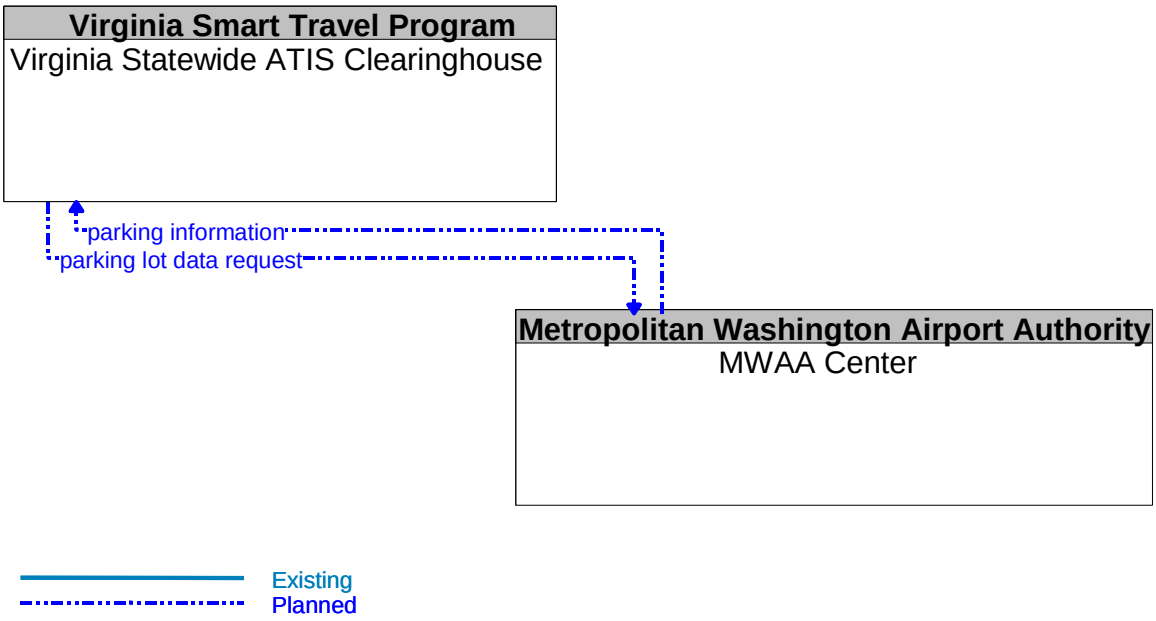

Figure C64 – MWAA Center to
Virginia Statewide ATIS Clearinghouse Interface Diagram

VDOT NOVA GIS to VDOT NOVA Maintenance & Construction Operations and VDOT NOVA Snow Operations

Concept –

The VDOT NOVA GIS plans to provide GIS database information to the VDOT NOVA Snow Operations and Maintenance and Construction Operations.

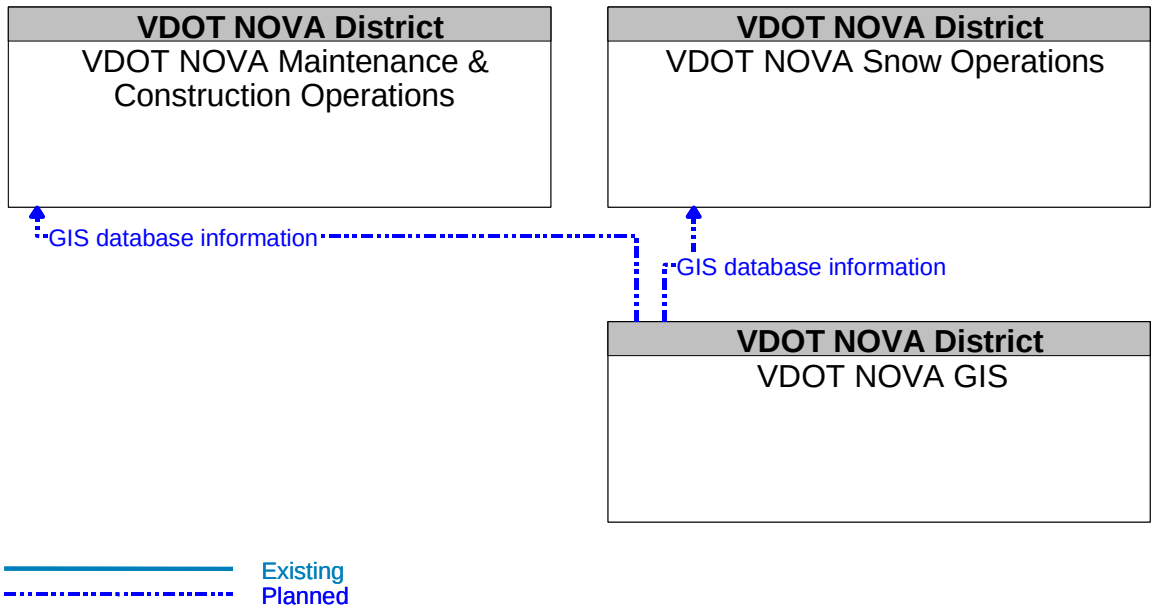

Figure C65 – VDOT NOVA GIS to
VDOT NOVA Maintenance & Construction Operations
and VDOT NOVA Snow Operations Interface Diagram

VDOT NOVA DTR to VDOT NOVA Maintenance & Construction Operations

Concept –

The VDOT NOVA Dulles Toll Road plans to exchange work zone status and road/lane closure information with the VDOT NOVA Maintenance & Construction Operations.

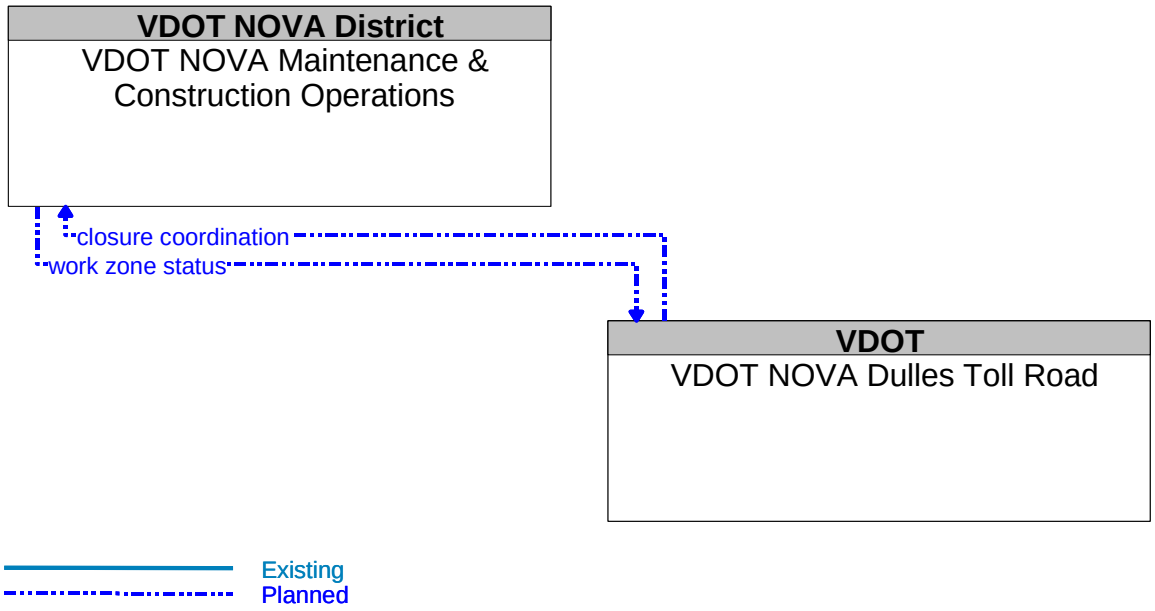

Figure C66 – VDOT NOVA Dulles Toll Road to
VDOT NOVA Maintenance & Construction Operations Interface Diagram

VDOT NOVA Snow Operations to VDOT NOVA Snow Plow Vehicles, VDOT Public Affairs and VDOT NOVA TCC

Concept –

The VDOT NOVA Snow Operations plans to electronically receive requests from the VDOT NOVA TCC to treat roads based on customer requests or TCC information. Snow Operations exchanges dispatch information with their vehicles to treat various roadway segments. Snow Operations plans to have Automatic Vehicle Location information from their vehicles to better manage the fleet and snow plowing activities. Snow Operations is providing their progress activity information to the VDOT Public Affairs and the VDOT NOVA TCC to allow them to address customer service issues.

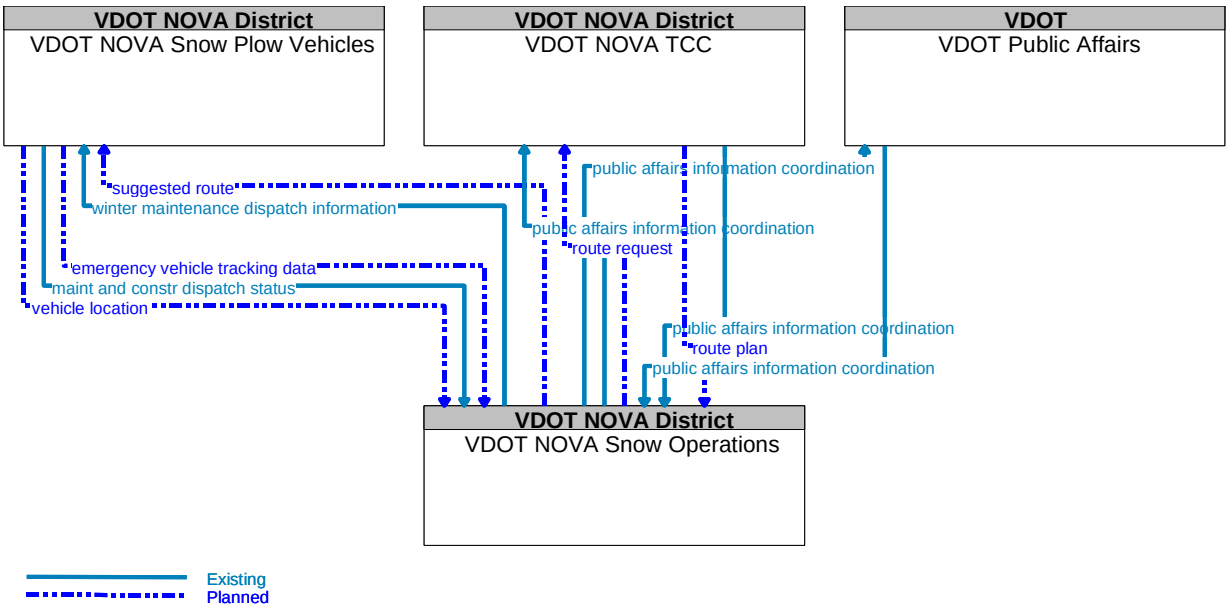

Figure C67 – VDOT NOVA Snow Operations to VDOT NOVA Snow Plow Vehicles, VDOT Public Affairs and VDOT NOVA TCC Interface Diagram

NOVA Local Signal Centers to Virginia Statewide ATIS Clearinghouse

Concept –

The NOVA Local Signal Centers plan to provide the Virginia Statewide ATIS Clearinghouse with traffic information from their signal systems and receive road network status information from the Clearinghouse.

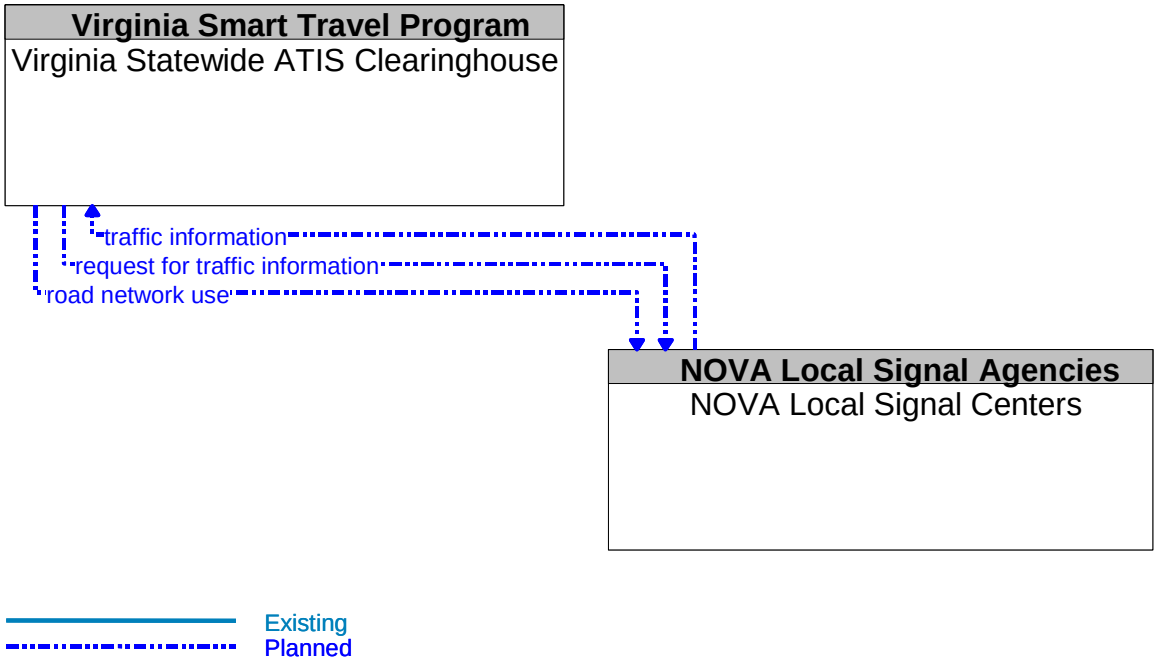

Figure C68 – NOVA Local Signal Centers to
Virginia Statewide ATIS Clearinghouse Interface Diagram

APPENDIX D – INFORMATION FLOW DEFINITIONS

NOTE: Flow names not defined by the National ITS Architecture are identified with an (*) because they are local functions that are important to VDOT.

Table D1 – Information Flow Definitions

Flow Name	Flow Description
air quality information	Aggregated region-wide measured air quality data and possible pollution incident information. Note this flow contains ozone data.
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. The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.
archive analysis results	Processed information products, supporting meta data, and any associated transaction information resulting from data mining, analytical processing, aggregation or summarization, report formulation, or other on-line processing and analysis of archived data.
archive coordination	Catalog data, meta data, published data, and other information exchanged between archives to support data synchronization and satisfy user data requests.
archive request confirmation	Confirmation that an archive request has been received and processed with information on the disposition of the request
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 intended to initiate a one-time response from the recipient.
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.
archived data product requests	A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.
archived data products	Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.
closure coordination	Coordination between subsystems regarding construction and maintenance closure times and durations.
closure data *	This flow represents road closure data that can be used to populate the GIS database.
current network conditions	Current traffic information, road conditions, and camera images that can be used to locate and verify reported incidents, and plan and implement an appropriate response.
emergency archive data	Logged incident information that characterizes the identified incidents and provides a record of the corresponding incident response. Content may include a catalog of available information, the actual information to be

Table D1 – Information Flow Definitions

Flow Name	Flow Description
	archived, and associated meta data that describes the archived information.
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 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, request a progression of traffic control preemptions along an emergency vehicle route, or request another special traffic control plan.
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.
emissions data	Emissions data and associated imagery collected by roadside equipment.
environmental conditions	Current environment conditions (e.g., air temperature, wind speed, surface temperature) as measured by environmental sensors and communicated by supporting field equipment.
equipment maintenance status	Current status of field equipment maintenance actions.
event plans	Plans for major events possibly impacting traffic.
external reports	Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).
fault reports	Reports from field equipment (sensors, signals, signs, controllers, etc.) which indicate current operational status.
freeway control data	Control commands and operating parameters for ramp meters, dynamic message signs, mainline metering/lane controls and other systems associated with freeway operations.
freeway control status	Current operational status and operating parameters for ramp meters, dynamic message signs, mainline metering/lane controls and other control equipment associated with freeway operations.
GIS database information *	The information provided through the GIS database are: Fiber optic duct locations, accident locations, speed information on county road segments, and map updates.
highway control status	Current traffic control equipment status that indicates operational status and right-of-way availability to the non-highway transportation mode at a multimodal crossing.
hov data	Current HOV lane information including both standard traffic flow measures and information regarding vehicle occupancy in HOV lanes.
hov restrictions status	This flow represents the STC providing NOVA Local Transit Centers with HOV restriction information to aid transit agencies in managing their routes.
hri advisories	Notification of Highway-Rail Intersection equipment failure, intersection blockage, or other condition requiring attention, and maintenance activities at or near highway rail intersections.
hri control data	Data required for HRI information transmitted at railroad grade crossings

Table D1 – Information Flow Definitions

Flow Name	Flow Description
	and within railroad operations.
hri request	A request for highway-rail intersection status or a specific control request intended to modify HRI operation.
hri status	Status of the highway-rail intersection equipment including both the current state or mode of operation and the current equipment condition.
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 that enables emergency personnel in the field to implement an effective, safe incident response.
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 data	Data and imagery from the roadside supporting incident detection and verification.
incident information	Notification of existence of incident and expected severity, location, time and nature of incident.
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. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.
incident response status	Status of the current incident response including 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.
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 priority request	Request from a vehicle to a signalized intersection for priority at that intersection.
maint and constr administrative information *	General administrative data interchanges between ITS and non-ITS maintenance and construction systems. This includes: interfaces to purchasing for equipment and consumables resupply, interfaces to human resources that manage training and special certification for field crews and other personnel, and interfaces to contract administration functions that administer and monitor the work performance for maintenance and construction contracts.

Table D1 – Information Flow Definitions

Flow Name	Flow Description
maint and constr dispatch status *	Current maintenance and construction status including work data, operator status, crew status, and equipment status.
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.
maintenance resource request *	Request for road maintenance resources that can be used in the diversion of traffic (cones, portable signs), clearance of an incident, and repair of ancillary damage.
media information request	Request from the media for current transportation information.
multimodal crossing status	Indication of operational status and pending requests for right-of-way from equipment supporting the non-highway mode at multimodal crossings.
parking information	General parking information and current parking availability.
parking lot data request	Request for parking lot occupancy, fares, and availability. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.
parking lot reservation confirmation	Confirmation for parking lot reservation.
parking reservations request	Reservation request for parking lot.
probe data	Aggregate data from probe vehicles including location, speed for a given link or collection of links.
public affairs information coordination *	Responsible for addressing the media during severe incident situations and providing an overall customer service roll for VDOT.
railroad advisories	Real-time notification of railway-related incident or advisory.
red light running system data *	This flow provides the STSS with data regarding the number of violations recorded at intersections equipment with red light running cameras.
remote surveillance control	The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.
request for right-of-way	Forwarded request from signal prioritization, signal preemption, pedestrian call, multi-modal crossing activation, or other source for right-of-way.
request for traffic information	Request for traffic information that specifies the region/route of interest, the desired effective time period, and other parameters that allow preparation of a tailored response. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.
request toll collection suspension	The STC can request to suspend toll collection based on an incident on the surface the requires motorist to utilize the Dulles Toll Road as an alternate route.
request transit information	Request for transit service information and current transit status.
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.
reversible lane status	Current reversible lane status including traffic sensor and surveillance data

Table D1 – Information Flow Definitions

Flow Name	Flow Description
	and the operational status and mode of the reversible lane control equipment.
road network use	Aggregated route usage and associated travel data from clients for planning and analysis.
roadside archive data	A broad set of data derived from roadside sensors that includes current traffic conditions, environmental conditions, and any other data that can be directly collected by roadside sensors. This data also indicates the status of the sensors and reports of any identified sensor faults.
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, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.
Route plan	Tailored route provided by ISP in response to a specific request.
Route request	Request for a tailored route based on given constraints.
Sensor and surveillance control	Information used to configure and control sensor and surveillance systems at the roadside.
Signal control data	Information used to configure and control traffic signal systems.
Signal control status	Status of surface street signal controls.
Suggested route	Suggested route for a dispatched emergency vehicle that may reflect current network conditions and the additional routing options available to en-route emergency vehicles that are not available to the general public.
Toll demand management request	Request to change the demand for toll road facility use through pricing or other mechanisms.
Toll instructions	Demand management toll pricing information based on current congestion.
Toll Transactions	Detailed list of transactions from a toll station. Note this flow contains good and bad tag data.
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 that describes the archived information.
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. This flow also allows 24-hour centers to monitor and control assets of other centers during off-hours, allows system redundancies and fail-over capabilities to be established, and otherwise enables integrated traffic control strategies in a region.
Traffic control priority request	Request for signal priority at one or more intersections along a particular route.
Traffic control priority status	Status of signal priority request functions at the roadside (e.g. enabled or disabled).
Traffic equipment status	Identification of field equipment requiring repair and known information

Table D1 – Information Flow Definitions

Flow Name	Flow Description
	about the associated faults.
Traffic flow	Raw and/or processed traffic detector information which allows derivation of traffic flow variables (e.g., speed, volume and density measures).
Traffic images	High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.
traffic information	Current and forecasted traffic information, road and weather conditions, incident information, and pricing data. Either raw data, processed data, or some combination of both may be provided by this architecture flow.
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 information for media	Report of current traffic conditions, incidents, maintenance activities and other traffic-related information prepared for public dissemination through the media.
Traffic information for transit	Current and forecasted traffic information and incident information.
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 incident information	Information on transit incidents that impact transit services for public dissemination.
Transit incident information	Information on transit incidents that impact transit services for public dissemination.
Transit information request	Request for transit operations information including schedule and fare information. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.
Transit multimodal information	Transit schedule information for coordination at modal interchange points.
Transit system data	Current transit system operations information indicating current transit routes, the level of service on each route, and the progress of individual vehicles along their routes for use in forecasting demand and estimating current transportation network performance.
Traveler archive data	Data associated with traveler information services including service requests, facility usage, rideshare, routing, and traveler payment transaction data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
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.
TRMS coord	Coordination information between local/regional transit organizations including schedule, on-time information and ridership.
Vehicle location	Location of vehicle and other vehicle characteristics which are exchanged between vehicle subsystems.
Vehicle probe data	Vehicle probe data indicating identity, route segment identity, link time and

Table D1 – Information Flow Definitions

Flow Name	Flow Description
	location.
weather information	Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).
winter maintenance dispatch information *	Information used to dispatch maintenance vehicles for winter maintenance and other special seasonal maintenance tasks. This information includes routing information, traffic information, road restrictions, incident information, weather information, maintenance schedule data, dispatch instructions, personnel assignments, and corrective actions.
work zone information *	Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits.
work zone status *	Status of maintenance work zone.

APPENDIX E – NOVA ITS PROJECT ARCHITECTURES

The following project architecture is intended to illustrate the definition of a project architecture from the VDOT NOVA ITS Architecture. Each project architecture that is defined from the VDOT NOVA ITS Architecture would be added to this document to maintain a complete set of project architectures and provide visibility into what each project has implemented.

The process of developing each project architecture will not be documented. The following discussion is provided to give the reader an idea of the steps that would be followed to develop the product below. The NOVA STC Program Manager defines a need for more CCTV camera coverage along I-495. Using Turbo Architecture and the NOVA ITS Architecture database, a project architecture is named and its creation begins. Using Turbo Architecture, the STC, which controls the existing cameras is identified and the systems that have interfaces in the architecture to the STC are examined to see which ones are applicable to this project. The first one is the STC Field Equipment where the CCTVs are functionally represented. Then the systems that the video images will be provided to outside of the STC are examined and selected. Next the information flows are examined to determine which ones are applicable to best represent the movement of video from the field to the STC to the outside destinations. Following this selection, diagrams and table reports are generated using the Output menu in Turbo Architecture. The reports and diagrams are pasted into a document and submitted for review and approval.

Example Project: ITS Field Equipment Deployment for Freeway Management in NOVA

Scope/Concept:

This project will deploy additional CCTV cameras, Variable Message Signs, and Vehicle Detection along I-495 in the NOVA District. Modifications will be made to the STC Freeway Management Software to integrate these field devices with the resources already deployed. CCTV images will be made available to the media and ISPs.

While the primary impact of the CCTV deployment will be on the VDOT NOVA STC, there are several destinations for the images that will require coordination and assessment for secondary impact due to receiving and displaying the new images. Table E1 lists the stakeholders and systems that will be involved in this project either directly or indirectly. The project champion will be the VDOT NOVA STC Manager.

Table E1 – Stakeholder and systems involved in CCTV Project Architecture Example

Stakeholders	Systems
VDOT NOVA District	VDOT NOVA Smart Traffic Center VDOT NOVA STC Field Equipment VDOT NOVA STSS
Regional ISPs	ISP Centers
Media	Media Centers
NOVA Local Public Safety Agencies	NOVA Local Public Safety Centers

Table E1 – Stakeholder and systems involved in CCTV Project Architecture Example

Stakeholders	Systems
NOVA Local Signal Agencies	NOVA Local Signal Centers
Partners in Motion	Transportation Information Clearinghouse
VDOT	Adjacent STCs
Virginia Smart Travel Program	Virginia Statewide ATIS Clearinghouse
University of Virginia	Smart Travel Lab
DC DOT	DC ITMS

Interconnections:

In Turbo Architecture using the VDOT NOVA ITS Architecture database, a project was created with the systems listed above. The interconnections between these systems that fall within the scope of this project are illustrated in Figure E1. Several of these interconnections are illustrated as existing interfaces. This project is actually expanding the current CCTV system and it is expected that this would be the proper representation for the project. This means that each of these existing interfaces must be examined in terms of available bandwidth to handle the additional images. The Communications Plan has been examined for these particular interfaces and some changes will be required to handle the additional data. In particular, the DC ITMS does not have an established video interface to exchange CCTV data with the STC. This will require that an agreement be established with the DC DOT before this interface can be implemented. If agreement is reached prior to the start of the project and funding is secured to implement the interface, the interface will be included in the project scope.

Information Flows:

Based on the interconnections, information flows would be examined in Turbo Architecture. The flows would be analyzed against the scope of the project. In this case, the focus is on information coming into the STC from new field devices, the notification of stakeholders that new information will be available, and the dissemination of the new information to stakeholders. Many of the flows in Figure E2 are existing because other devices similar to those being implemented already exist. Information exchanges that are planned may not be implemented in this project but should be taken into account as the software is updated for the new devices to allow for future expansion to deliver the information over the planned interfaces. The primary interfaces to be dealt with in the project would be the STC to STC Field Equipment. The others are for dissemination purposes and are important to properly integrate the new equipment with the other systems involved. In some cases, the receiving stakeholder merely needs to be made aware that new information is being made available. This may require some changes in the receiving system to accommodate the new information but that most likely would not be part of this VDOT project. The Communications Plan presents bandwidth capacities for each interface

that will be examined to determine the impact of additional data resulting from these information flows.

Standards:

Each interface should be examined for applicable interface standards. With legacy systems, standards may already be in place based on former deployments. However, a phase approach to new standards may be appropriate starting with this project. In this project, NTCIP center to field standards would be a good place to start looking at potential standards applicability for VMS and CCTV. In addition, NTCIP center to center standards should be monitored to determine if they are worth implementing.

Planning:

Following the development of the Project Architecture, this information would accompany any planning documents concerning this project to better explain the scope and system impact of this project as it moves through the planning process. After the project is completed, it should be updated to reflect its completed state. If interfaces were not implemented, they should be deleted from the project architecture. The completed project architecture should be given to the NOVA Smart Travel Manager for incorporation into the VDOT NOVA ITS Architecture. This will provide future projects with a better understanding of what has been deployed.

Example Project: ITS Field Equipment Deployment for Freeway Management in NOVA

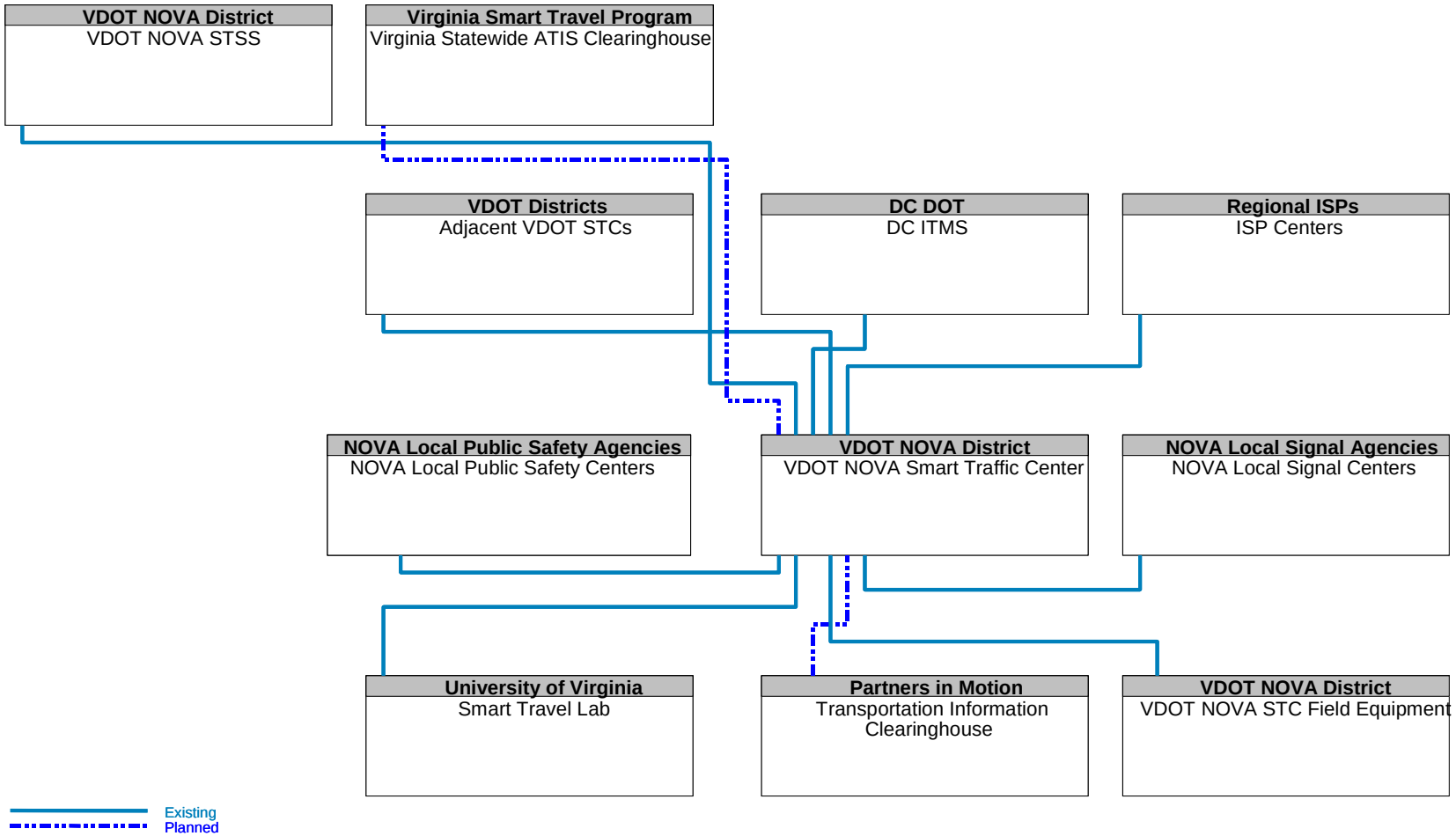

Figure E1 – STC Field Equipment Implementation Project Interconnect Diagram (Example)

Example Project: ITS Field Equipment Deployment for Freeway Management in NOVA

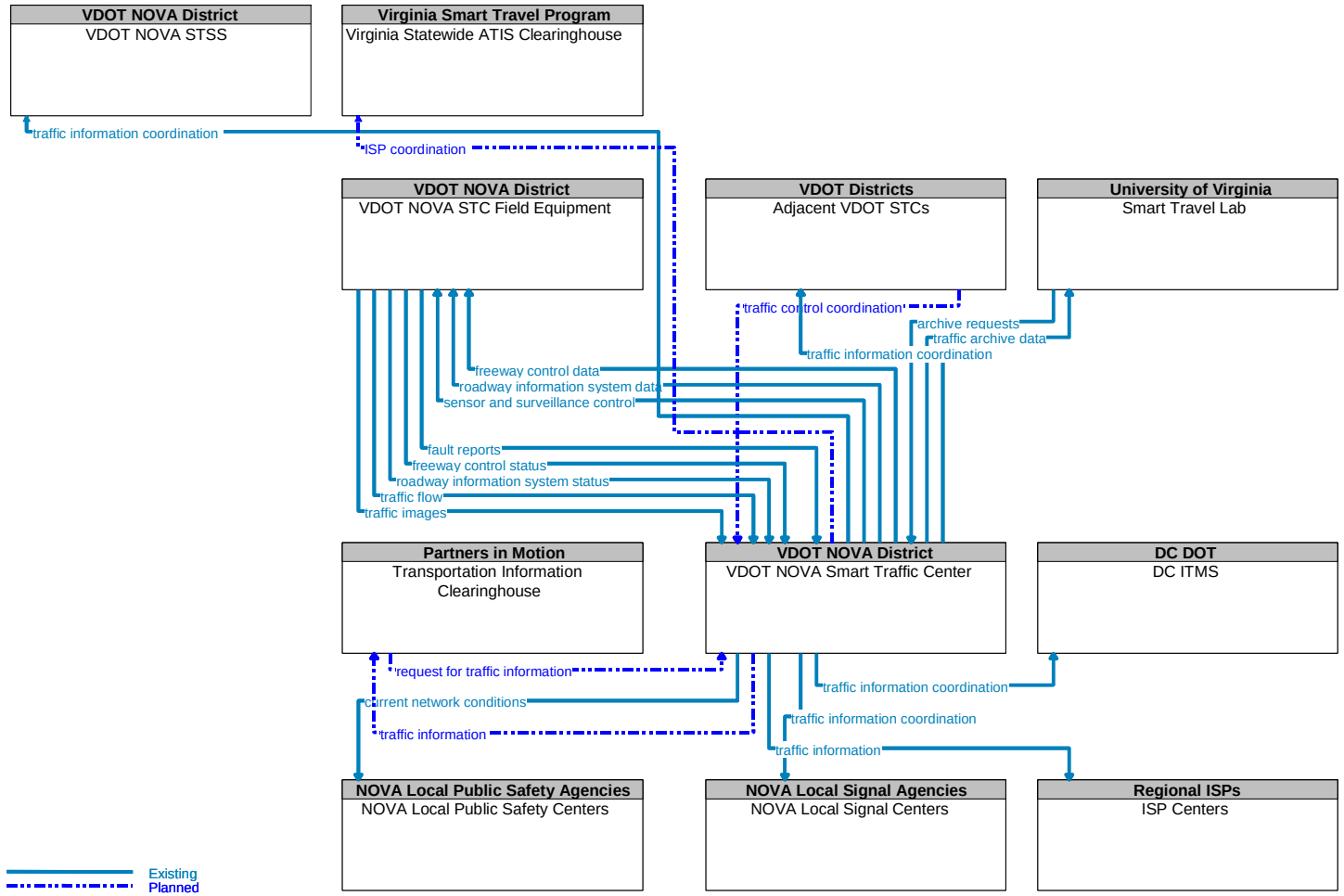

Figure E2 – STC Field Equipment Implementation Project Information Flow Diagram (Example)