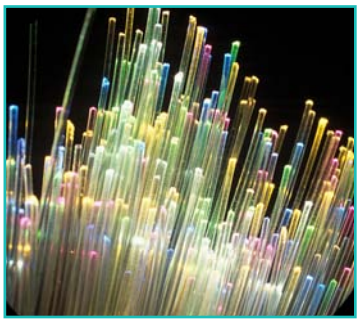
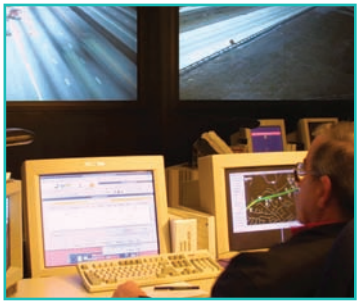
March 2006

# Executive Summary

# VDOT NOVA SMART TRAVEL PROGRAM PLAN

A plan for improving the utilization of advanced technologies to enhance transportation safety, mobility, and convenience.





Smart Travel™ VIRGINIA

# The VDOT NOVA Smart Travel Program Plan

This document summarizes the Virginia Department of Transportation (VDOT) Northern Virginia District (NOVA) Program Plan for Intelligent Transportation Systems (ITS), or the "VDOT NOVA Smart Travel" Program. The NOVA program resides within the context of the broader, statewide VDOT Smart Travel Program. Key elements of the VDOT NOVA Smart Travel Program include the Smart Traffic Center (STC) and field infrastructure such as variable message signs (VMS), closed-circuit television cameras (CCTV), and the Safety Service Patrol.

The Program Plan is a companion document to the NOVA ITS System Architecture. The System Architecture builds on the overall direction and high-level agency interactions (also known as the Regional Operating Concept) identified in the Program Plan. It provides additional technical detail regarding interactions among organizations, including specific data to be exchanged to support coordinated operations.

**Components of the VDOT NOVA Smart Travel Program Plan**

- The overall Smart Travel Vision
- Goals and Objectives
- ITS-related Needs identified by Stakeholders
- A Regional Operating Concept showing the major ITS roles and responsibilities of NOVA and how they interact with their ITS partners
- Guidance on developing ITS projects consistent with the VDOT NOVA Smart Travel Program
- A proposed process for evaluating and prioritizing candidate ITS projects

## Nova Smart Travel Vision

The VDOT NOVA Smart Travel Program Plan envisions that ITS will make travel "smart" through the application of technology, as well as through automated, streamlined agency processes and procedures. Smart Travel is geared toward a transportation system that revolves around providing better services to its customers, by improving the quality of their commute and by responding promptly to their issues. The focus is on attaining operating efficiencies from the existing roadway infrastructure, not necessarily building additional capacity.

**"Integrated deployment of Intelligent Transportation Systems will help VDOT NOVA optimize its services, supporting a secure, multimodal transportation system that improves quality of life and customer satisfaction by ensuring a safer and less congested transportation network."**

## Stakeholder Needs

Stakeholder needs have guided the development of the Program Plan and will guide its implementation. The needs were synthesized from a number of sources and confirmed with stakeholders at a workshop.

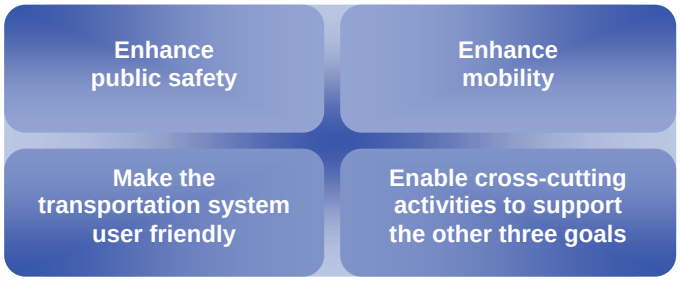
*Stakeholder needs were verified at a regional workshop.*

### Example Stakeholder Needs

- Automate inter-jurisdictional exchange of information
- Improve incident detection capability
- Enhance the coordinated traffic signal system
- Expand NOVA Smart Traffic Center coverage and capability to all freeways and critical arterial street corridors
- Improve VDOT and emergency responder field coordination during incidents
- Provide smart parking management and information systems
- Disseminate traveler information more quickly
- Improve weather information collection and dissemination

## Goals, Objectives and Strategies

Goals and objectives were synthesized from VDOT NOVA Sections and from statewide and regional transportation plans. For each objective, strategies were developed that that will be pursued in order to accomplish the objectives. The four NOVA Smart Travel Goals are:




Goals, objectives and strategies are presented on the following pages.

# Goal 1: Enhance Public Safety

## 1.A - Minimize Incidents

- Reduce crashes by implementing safety improvement projects.
- Integrate with other incident detection systems to speed detection and response.
- Minimize and manage impacts to safety and mobility in construction and maintenance work zones.

## 1.B - Respond Efficiently to Incidents

- Maintain a robust Safety Service Patrol Program.
- Improve and expand detection capability through new technologies, partnerships, and improvements to existing systems.
- Coordinate and cooperate across jurisdictional and agency lines using technology and best practices.

## 1.C - Improve Transportation Security

- Protect critical infrastructure such as bridges and choke points.
- Efficiently communicate and cooperate with local and regional jurisdictions regarding critical incidents and evacuation.
- Efficiently share accurate and timely travel condition, roadway closure, routing and other information with the public during emergencies.
- Effectively manage evacuating traffic during emergencies using contra flow, suspension of tolls, etc.

## Goal 2: Enhance Mobility

### 2.A - Operate the Transportation System Effectively and Efficiently

- Improve communication and coordination within NOVA and with other agencies.
- Fully utilize system capacity.
- Maintain traffic flow using a traffic signal approach that is time, event, and conditions-sensitive.
- Proactively monitor and assess road conditions in real-time.
- Integrate traffic engineering and ITS to deliver near-term results.
- Enhance outcome-based project planning and implementation.
- Improve snow operations.
- Target traffic hot spots for improvement.

### 2.B - Enhance Operations and Maximize the Effectiveness and Efficiency of Personnel, Equipment and Resources

- Improve intra-agency cooperation by implementing the NOVA Operations Business Process Model.
- Support and participate in the mechanisms through which regional agencies share information.
- More efficiently track resources.
- Utilize performance-oriented standards for system and field device operations wherever feasible.
- Implement ITS projects on time and on budget.

### 2.C - Expand ITS Infrastructure to Enable Corridor Management

- Implement coordinated, corridor-level traffic management on key freeway and adjacent arterial roadway segments.
- Utilize a robust, results-based inspection and maintenance program focused on condition assessment and operability of a variety of ITS systems and devices.
- Expand the geographic coverage of ITS infrastructure on the NOVA arterial and freeway transportation system.

# Goal 3: Make the Transportation System User Friendly

## 3.A - Enhance and Simplify VDOT NOVA Interactions with Travelers

- Ensure that NOVA customers receive the services they request promptly and to their satisfaction and strive to decrease the amount of time it takes to respond to questions from the public.
- Improve the convenience of paying transportation fees like tolls and transit fares by supporting a common, multi-modal payment system.

## 3.B - Support Traveler Information Services

- Improve dissemination of a variety of useful traveler information.
- Provide information to travelers to facilitate their selection of the best mode, route and time of departure.
- Support comprehensive traveler information services by coordinating with other agencies in disseminating parking, tourism, and transit information.
- In cooperation with other agencies, increase the speed with which incidents are identified and communicated to travelers.

## Goal 4: Enable Cross-Cutting Activities to Support Goals 1-3

### 4.A - Enhance Mobility Using Technology

- Reduce travel time and improve schedule reliability for buses and HOV carpool and vanpool users.
- Reduce demand on the roadway network, primarily during peak hours, by promoting alternative modes and spreading demand.
- Improve pedestrian and special needs accessibility along major arterials by retrofitting pedestrian facilities in rapidly urbanizing areas.

### 4.B - Create a 21st Century Foundation for Operations

- Facilitate integrated and systems engineering-based ITS so as to minimize “after thought” ITS investments.
- Bridge knowledge and skill gaps and leverage investment from the academic and private sectors.
- Identify projects that contribute to safe and efficient traffic flow. Determine work plan and funding requirements and sources.
- Ensure that ITS projects are considered as part of regular planning processes and incorporated appropriately into traditional construction and maintenance projects.

### 4.C - Conduct a Strategic Research and Development Program

- Continue to track USDOT ITS program direction, including the nine ITS initiatives, and reflect in the NOVA ITS program as appropriate.
- Coordinate with local research universities and research institutions to develop new, beneficial technologies and technology applications.
- Strategize research priorities and initiatives based on VDOT NOVA local needs as well as VDOT statewide and industry direction.

# Regional Operating Concept

An operating concept is a high-level description of an ITS system that emphasizes the roles and relationships of key stakeholders. It summarizes the "big picture", showing major system elements and their general relationships in the long-term (10-year) view. The NOVA ITS Operating Concept consists of three tiers. Tier I includes the three "Program Areas" shown at right. Tier II consists of the following 11 "Activity Areas", which, in various combinations, carry out the wide-ranging activities of each Program Area:

- Archived Data Management
- Electronic Toll Collection
- Emergency Management
- Corridor Management
- Incident Management
- Maintenance and Construction Management
- Parking Management
- Surface Street Management
- Transit Coordination
- Traveler Information
- Snow and Weather Related Operations

The Regional Operating Concept will evolve along with VDOT NOVA's ITS program, VDOT's statewide ITS program, and in response to ITS activities undertaken by other public and private organizations. One such example is the operation of High Occupancy Toll (HOT) lanes in the NOVA Region by a private entity under the Public-Private Transportation Act, expected for 2006. The HOT Lane operators will need to develop a Concept of Operations, in coordination with VDOT NOVA and other key regional transportation organizations whose activities will impact and be impacted by the HOT Lanes. They will need to integrate the HOT activities into the broader, coordinated, regional ITS system described in the VDOT NOVA Regional Operating Concept. The VDOT regionalization initiative, which will organize activities into various regions

**Systems Operations**
*Encompassing day-to-day management activities, including freeway corridor management, surface street control, etc.*

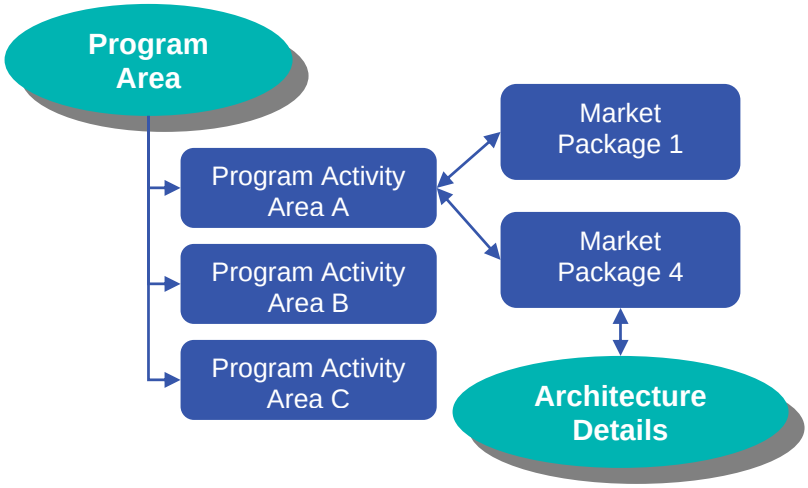
**Regional Emergency Management**
*Encompassing activities related to large-scale emergencies, such as evacuations.*

**Traveler Information**
*Encompassing traveler information services, such as variable message signs and highway advisory radio.*

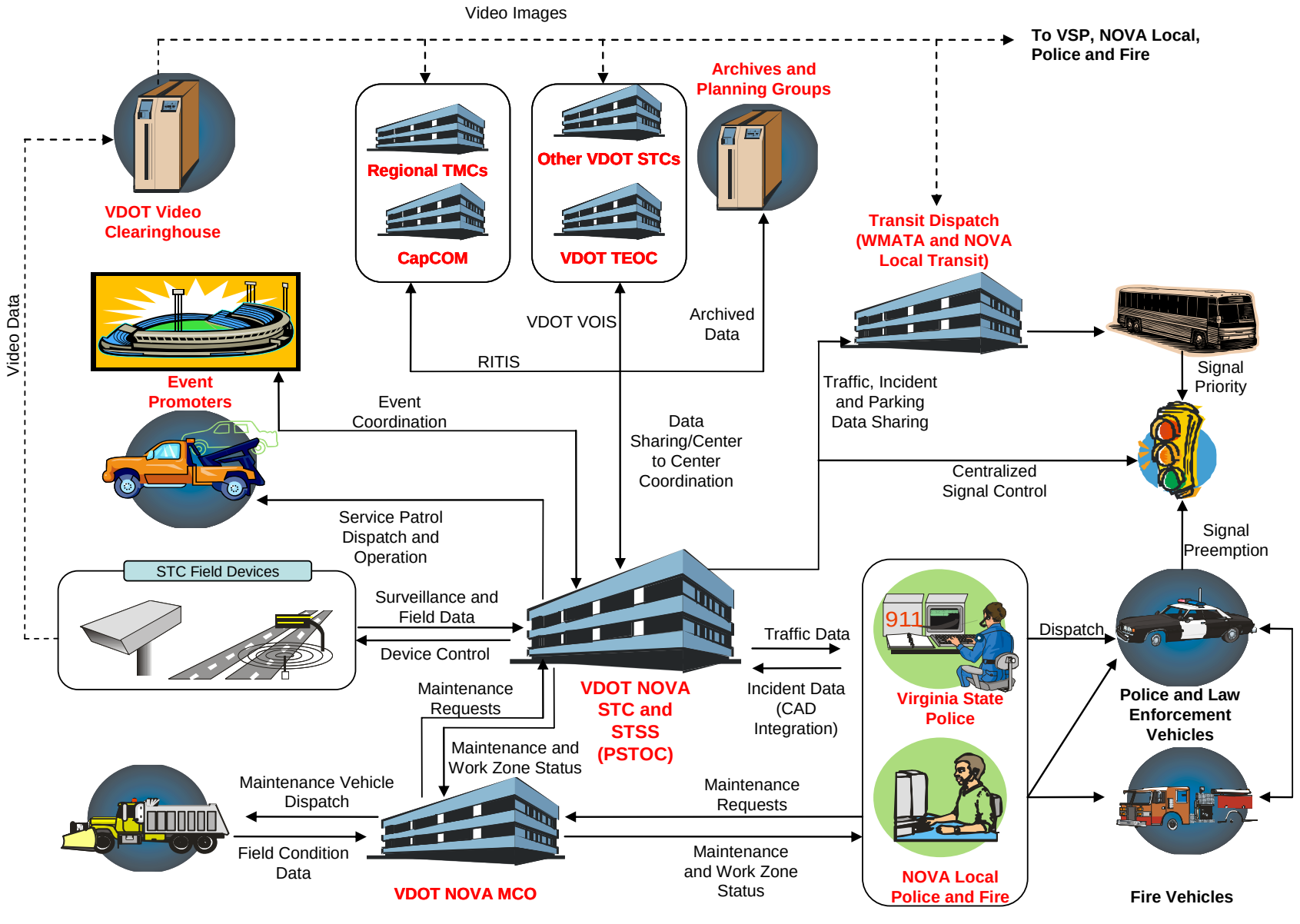
throughout the state, is a good example of VDOT statewide activities that must be incorporated into the VDOT NOVA Regional Operating Concept, and the Program Plan, over time.

Tier III of the Regional Operating Concept consists of "Market Packages", which are concepts from the NOVA ITS System Architecture. Market Packages are the critical concepts that directly link the Program Plan with the System Architecture. Any ITS activity included in the Regional Operating Concept, which is an all-encompassing view of NOVA ITS operations, can be traced, via the Activity Areas, to collections of Market Packages. In turn, Market Packages are the central concept in the NOVA ITS System Architecture. The System Architecture provides rich detail on ITS stakeholders, the ITS elements they are associated with, information exchanges, and standards. In this manner, the bigger picture that is the Program Plan is fully consistent with, and directly tied to, the more detailed and technical view provided by the System Architecture.

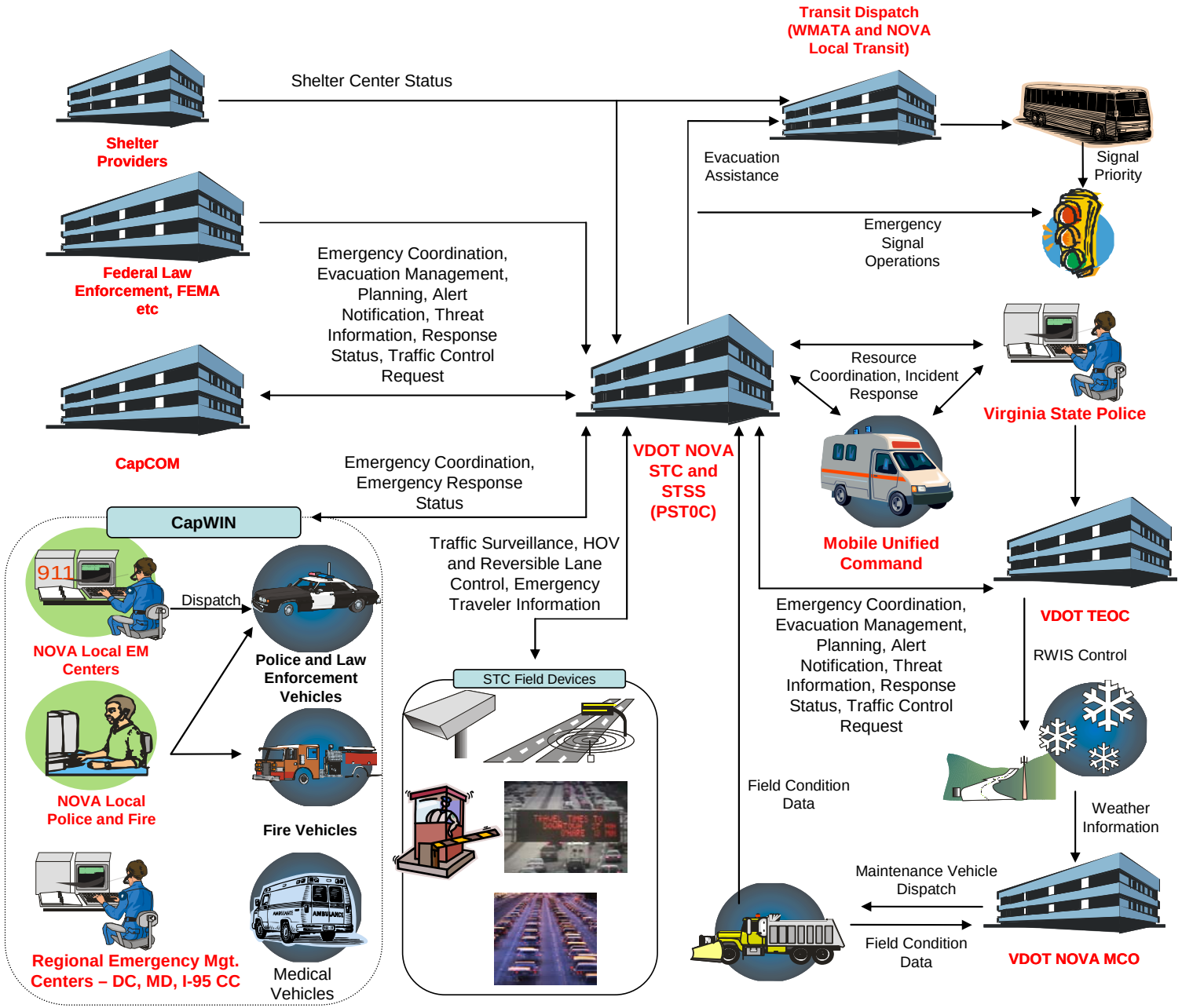
*Workshop participants brainstormed the interactions between agencies.*



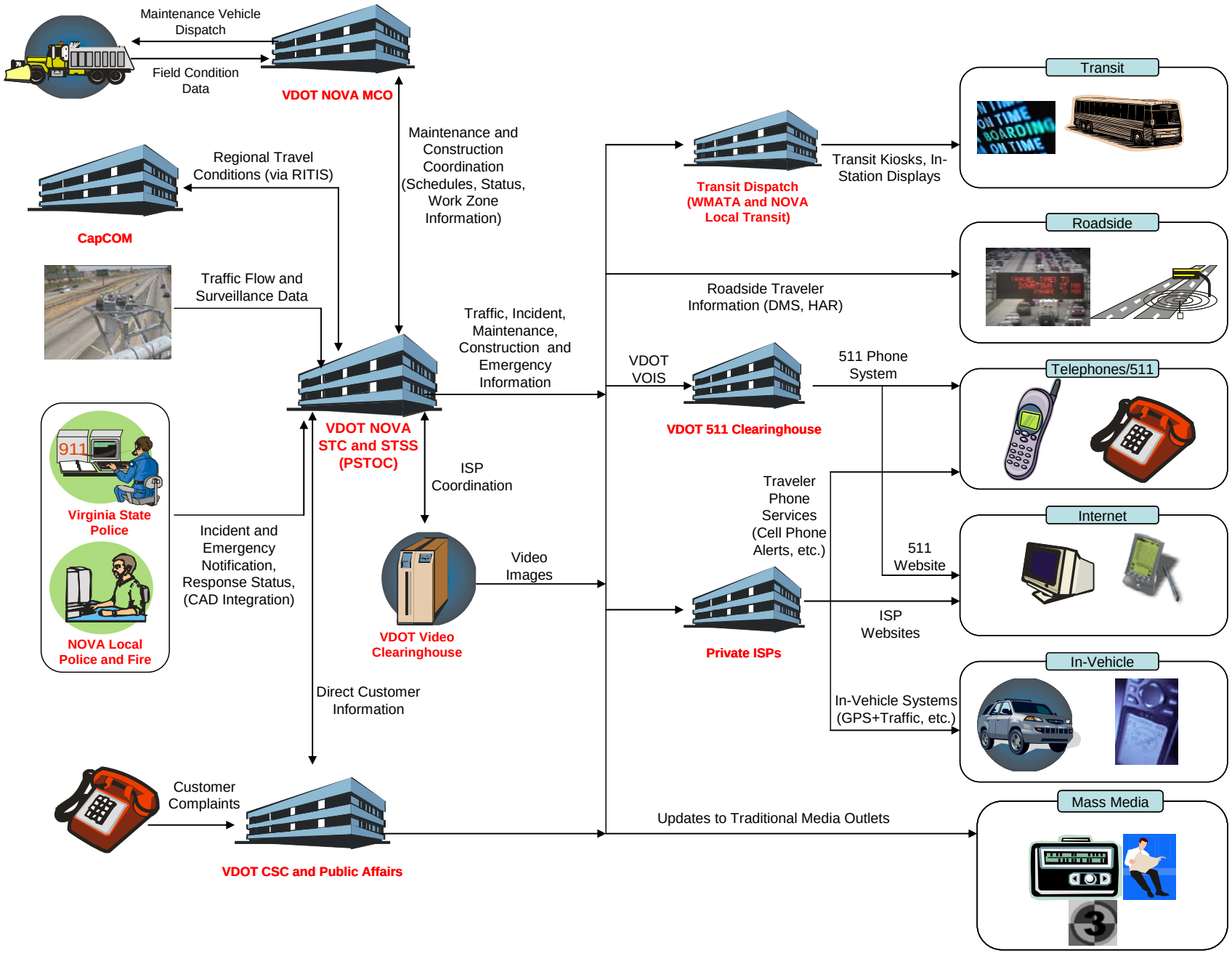

The full Program Plan document provides detailed information on all three tiers of the Operating Concept, including real-world scenarios illustrating activities within each of the three Program Areas. On the following pages are the high-level diagrams for each Program Area.




***Operating Concept Diagram: System Operations***




***Operating Concept Diagram: Regional Emergency Management***




***Operating Concept Diagram: Traveler Information Services***

# ITS Projects

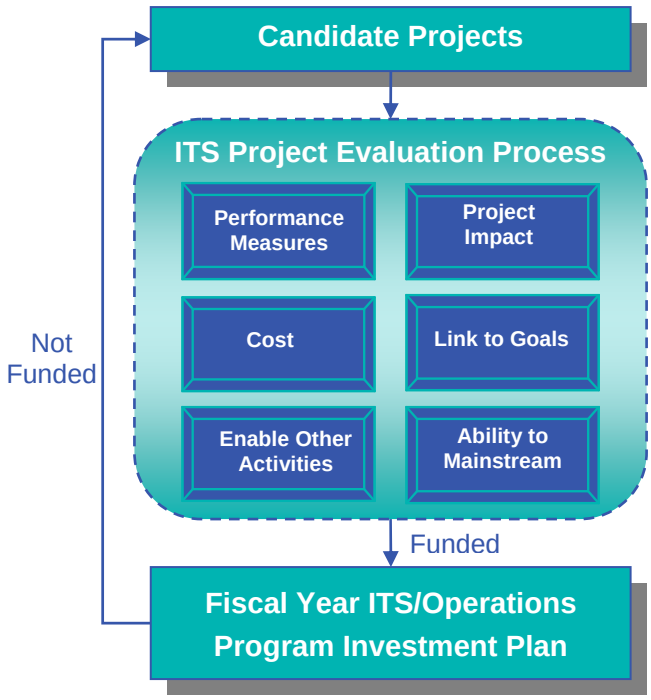
The Program Plan provides tools for developing projects consistent with Smart Travel program objectives. Four classes of projects are envisioned and ITS project developers will be asked to associate their project with one or more of them. Reinforcement projects provide minor upgrades to existing equipment, such as software patches. Replacement projects replace existing equipment with new and improved systems, such as replacing a surveillance camera with a newer, more effective unit. Expansion projects increase ITS coverage, such as by adding new variable message signs on roadways previously lacking them. Integration projects either integrate ITS into non-ITS projects—like installing permanent cameras or signs as part of a roadway construction project—or integrate various ITS elements with one another, such as linking VDOT and emergency responder computer-aided dispatch systems.

**Reinforcement Projects**

**Replacement Projects**

**Expansion Projects**

**Integration Projects**




Direction in developing effective and appropriate ITS projects is critical. However, because resources for technology investments are finite and tough decisions must be made about the priority and phasing of ITS investments, a sound process for determining which candidate ITS projects will be funded in any given year is equally vital. The innovative, quantitative process developed by VDOT NOVA is objective, can be applied consistently, and incorporates these critical considerations: benefit provided to the public (the extent to which the project improves transportation system performance), cost, project consistency with ITS and other VDOT NOVA goals, the ability of the project to enable other high priority investments, and the ability to incorporate the ITS project into funded traditional roadway projects.

The ITS project evaluation process resides at the center of the larger process to develop the annual VDOT NOVA ITS/Operations Program Investment Plan. Proposed ITS projects are assembled from a variety of sources encompassing a wide range of NOVA staff, including formal work plans, projects not funded in prior years, and projects now underway seeking continuing funding. The most beneficial and cost-effective ITS projects, as determined through the ITS project evaluation process, are incorporated into the fiscal year ITS/Operations Program Investment Plan. Unfunded projects are retained for consideration in the next fiscal year.


A form and step-by-step process has been developed to help VDOT NOVA managers of non-ITS roadway projects work with NOVA ITS personnel to consider whether and how ITS elements may be appropriate for their project. The process includes an assessment of the need to replace, upgrade or expand any existing ITS elements included in the project area and consideration of whether current plans call for adding ITS elements in the project area.

Incorporating ITS into traditional roadway construction and maintenance projects, rather than installing them separately, is an efficient and cost-effective way to deploy technology. Installation costs and impacts to travelers are minimized by consolidating into a single project what would otherwise occur through separate projects. Such "mainstreaming" of ITS can also accelerate the rate of technology deployment, bringing the benefits to travelers sooner.

## Clear Direction for Moving Forward

The VDOT NOVA Smart Travel Program Plan is the core and compass for the innovative transportation technology planning and implementation that will continue to occur in the NOVA region. The plan clearly establishes the objectives driving technology investment, outlines the range of activities and regional interactions that will be pursued, provides a framework for developing specific projects that will advance overall objectives, and establishes an objective method for making challenging ITS funding decisions that emphasizes benefits to the public. With the clear direction provided by the Program Plan, VDOT NOVA is well-positioned to leverage the tremendous promise of advanced technologies and to move forward decisively and in a coordinated fashion.

# List of Acronyms

| | |
|---|---|
| ADMS | Archived Data Management System |
| AHQ | Area Headquarters |
| AVL | Automated Vehicle Locator |
| CAD | Computer-aided Dispatch |
| CapCOM | Capital Region Communications and Coordination |
| CapWIN | Capital Wireless Integrated Network |
| CATT | Center for Advanced Transportation Technology |
| CCTV | Closed-circuit Television |
| CHART | Coordinated Highway Action Response Team |
| CMAQ | Congestion Mitigation and Air Quality |
| CMS | Condition Monitoring System |
| COG | Council of Governments |
| CSC | Customer Service Center |
| CVISN | Commercial Vehicle Information System Network |
| DMV | Department of Motor Vehicles |
| DOT | Department of Transportation |
| DTR | Dulles Toll Road |
| FBI | Federal Bureau of Investigation |
| FEMA | Federal Emergency Management Agency |
| FHWA | Federal Highway Administration |
| FMCSA | Federal Motor Carrier Safety Administration |
| FY | Fiscal Year |
| GCS | Gate Control System |
| GIS | Geographical Information System |
| GW | George Washington |
| HAR | Highway Advisory Radio |
| Hazmat | Hazardous Materials |
| HOV | High Occupancy Vehicle |
| IDS | Incident Detection System |
| IEN | Information Exchange Network |
| IMC | Inspection, Maintenance, and Construction |
| ISP | Information Service Provider |
| ITS | Intelligent Transportation Systems |
| ITSPPA | Intelligent Transportation Systems Planning and Programming Administration |

| | |
|---|---|
| IVR | Integrated Voice Response |
| LCS | Lane Control System |
| LED | Light Emitting Diode |
| MCO | Maintenance and Construction Operations |
| MDSHA | Maryland State Highway Administration |
| M&O/ITS | Management and Operations/ITS |
| MWAA | Metropolitan Washington Airport Authority |
| MWCOG | Metropolitan Washington Council of Governments |
| NCRIP | National Capitol Region Interoperability Program |
| NHS | National Highway System |
| NOVA | Virginia Department of Transportation Northern Virginia District |
| NPS | National Park Service |
| NTOC | National Transportation Operations Coalition |
| NVSTC | Northern Virginia Smart Traffic Center |
| PGB | P.B. Farradyne |
| PSTOC | Public Safety and Transportation Operations Center |
| RECPSM | Regional Emergency Coordination Plan |
| RITIS | Regional Integrated Transportation Information System |
| RMS | Ramp Metering System |
| RWIS | Road Weather Information System |
| SOC | Statewide Operations Center |
| SSP | Safety Service Patrol |
| STC | Smart Traffic Center |
| STL | Smart Traffic Lab |
| STP | Surface Transportation Program |
| STSS | Smart Traffic Signal System |
| TEOC | Transportation Emergency Operations Center |
| TMC | Traffic Management Center |
| TOC | Traffic Operations Center |
| TPB | Transportation Planning Board |
| USDOT | United States Department of Transportation |
| UVA | University of Virginia |
| VCS | Vehicle Classification System |
| VDOT | Virginia Department of Transportation |
| VII | Vehicle Infrastructure Integration |
| VMS | Variable Message Sign |
| VOIS | Virginia Operations Information System |

| | |
|---|---|
| VRE | Virginia Railway Express |
| VRRP | Virtual Router Redundancy Protocol |
| VSP | Virginia State Police |
| VTTI | Virginia Tech Transportation Institute |
| WMATA | Washington Metropolitan Area Transit Authority |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YEARS OF
TRANSPORTATION EXCELLENCE
1906 - 2006