Summary of 1999 Activities

Northern Virginia District (NOVA)
Smart Travel Program

Virginia Department of Transportation

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PREFACE

This Summary of 1999 Smart Travel Program Activities being conducted in the Northern Virginia District is the product of the collaboration among the VDOT Northern Virginia District Staff and the VDOT Central Office. It provides a snapshot of the VDOT Northern Virginia District activities currently in progress that promote the successful implementation of Smart Travel.

Virginia's Smart Travel Program was established to enhance awareness of the state's Intelligent Transportation Systems (ITS) program. Smart Travel conveys to Virginia Department of Transportation's (VDOT's) customers how VDOT actively applies technology to transportation operations to improve service delivery. Smart Travel deployments enhance VDOT's capabilities, providing better traffic operations, reducing travel delays, making VDOT's internal operations more efficient, and continuing the safe operations of the Commonwealth's surface transportation network.

The Smart Travel Program is an umbrella for all the transportation technology efforts of Virginia's state and local government agencies, as well as the efforts of the private sector. As the lead agency, the Virginia Department of Transportation has developed a statewide ten-year Smart Travel Business Plan to guide and focus the use of Smart Travel.

The VDOT Northern Virginia District has established its Smart Travel Strategic Plan and Smart Travel Program Plan in 1999, as well as documenting existing Smart Travel activities. These living documents will be revised and updated annually and are used as guidance for the development of VDOT Northern Virginia Smart Travel.

Project Name: Northern Virginia Smart Travel (Intelligent Transportation Systems) Framework
Project Participants: Amy Tang – VDOT
VDOT Contact: Phone (703) 383-2240 Fax (703) 383-2250 Email amytang@vdot.state.va.us

Project Description:

The Northern Virginia Smart Travel Framework provides guidance for the implementation of Smart Travel in VDOT's Northern Virginia District. Smart Travel is VDOT's statewide Intelligent Transportation Systems Program. The Framework documents where Northern Virginia stands today and defines how Smart Travel will affect the Northern Virginia transportation system over the next ten years.

The Framework consists of three major items:

- Update the Northern Virginia District Smart Travel Strategic Plan
- Develop Inventory of Smart Travel Related Systems/Activities
- Develop a Smart Travel Project List and a Program Plan for the Northern Virginia District.

The vision for Smart Travel in Northern Virginia was identified with input from available resources such as the VDOT Northern Virginia ITS Strategic Deployment Plan, the VDOT Smart Travel Business Plan, the National Capital Region Transportation Planning Board Vision Statement, and the Metropolitan Washington Area ITS Showcase Report. Goals and objectives were developed to shape the Smart Travel implementation. The objectives are used to define functions (or activities) to be provided through Smart Travel in Northern Virginia. Functions are specific actions that a Smart Travel system can enable, such as monitor traffic flow. Selected functions were aggregated to create into projects that could be undertaken by the VDOT Northern Virginia District. This hierarchy of action planning connects projects directly to the original Smart Travel vision, thus ensuring the realization of the vision through project deployments.

The following three documents were produced as the result of the Northern Virginia Smart Travel Framework:

- Smart Travel Program in VDOT Northern Virginia – Strategic Plan
- Smart Travel Program in VDOT Northern Virginia – Summary of 1999 Activities
- Smart Travel Program Plan in VDOT Northern Virginia

Project Milestones:

Workshop with VDOT staff	3/19/99
Inventory	4/30/99
Strategic Plan	4/30/99
Program Plan	6/11/99

Project Name: Northern Virginia District Smart Travel Architecture
Project Participants: Amy Tang – VDOT
VDOT Contact: Phone (703) 383-2240 Fax (703) 383-2250 Email amytang@vdot.state.va.us

Project Description:

The Northern Virginia District Smart Travel Architecture is a plan that articulates the District's ITS operations and needs into a system engineering context so that VDOT can deploy Smart Travel systems in an integrated manner. There are two distinct elements of the architecture – functional architecture and physical architecture.

The functional architecture provides detail on the behavior of the computerized systems themselves. The description of the system functional behavior and requirements enables the system developer to specify system software and devices during the design phase. The functional architecture does not dictate a particular design; it provides a description of what the District needs the system(s) to perform.

The physical architecture builds upon the functional architecture by defining the physical components (or subsystems) and other items those enable system functions. It describes the types of interfaces that will exist among subsystems. The interface description includes details on the data that is exchanged, the total amount of data that is exchanged, and the speed at which the data must be exchanged.

Essentially, the Northern Virginia District architecture will provide a description, in technical, systems engineering terms, of the future Northern Virginia Smart Travel. It will describe which systems will exchange data, what data is exchanged, and how that data will enable operations. Because it is based on the future vision, the architecture allows a system to be developed incrementally, without a high risk of making decisions today that would preclude future computerized system implementation. The process of developing the architecture involves extensive agency interaction, interviews, and multi-agency outreach to ensure that future system needs are addressed.

The establishment of the architecture is a step towards a mature systems procurement practice. The architecture allows the Northern Virginia District to create testing procedures and acceptance criteria for designs prepared for the system. To name a few benefits of developing the architecture:

- Interoperability of systems
- Design reliability
- Support to resource sharing initiative
- Reduced development cost
- User acceptance of systems

Project Milestones:

Develop scope	4/19/99
Seek funding	4/30/99

- Greater interaction among District offices
- Greater interaction with other institutions

The District architecture will be consistent with the Statewide Smart Travel Framework, and the Statewide Smart Travel Framework will be consistent with the National ITS Architecture. By being consistent with the Statewide Smart Travel Framework, the District architecture will be consistent with the National ITS Architecture.

Project Name: Wireless Communications Resource Sharing Program
Project Participants: Jimmy Chu & Alan McCormick – VDOT
VDOT Contact: Phone (703) 383-2600 Fax (703) 383-2620 Email Chu_TF@vdot.state.va.us

Project Description:

VDOT entered into public-private partnerships with communications providers and operators to install, operate, and maintain communications within VDOT right-of-way to support an operational communication infrastructure for current and future VDOT Smart Travel. One of the major components of this program is the construction of cellular communications towers on VDOT right-of-way.

Cellular tower companies must negotiate a Master Lease Agreement with the VDOT Central Office. In exchange for access and use of VDOT right-of-way, the private sector partner provides compensation to VDOT. Eight Master Leases have been negotiated and signed by the Central Office since the inception of this process. The VDOT Northern Virginia District follows a comprehensive review process for each site proposed by a cellular tower company. After this review process, the District decides to accept or reject the proposal. If accepted, VDOT receives approximately $70,000 in in-kind Smart Travel program-related hardware and services as compensation for each tower site.

This program has provided benefits to both VDOT and the Cellular Tower Companies. As of April 1999, VDOT has received Smart Travel infrastructure as a result of this effort that includes 14 traffic cameras, 43 cellular call boxes, 2 highway advisory radio (HAR) stations, 12 HAR flashing signs, 1 voting receiver and antenna, 1 VHF base radio station, and 1 variable message sign.

The following table presents a detailed list of cellular tower sites and Smart Travel infrastructure that VDOT received (last updated 4/14/99):

Project Milestones:

VDOT Tower Guidelines published on January 27, 1998

28 Lease Site Addenda have been signed by NOVA District as of April 1999.

Additional lease agreement negotiations are on-going.

Received Smart Travel Hardware through the Wireless Resource Sharing Program

Site ID	Cell Tower Location	Construction Date	Received ITS Hardware
ATT-001	I-495 @ Rt. 738	Oct 97	Camera, 4 Call Boxes
ATT-002	I-495 @ Rt. 50	Sep 97	Camera, 4 Call Boxes
ATT-003	I-495 @ Braddock	Oct 97	Camera, 4 Call Boxes
ATT-004	I-495 @ GW Ramp	Oct 97	Camera, 4 Call Boxes
ATT-005	I-66 @ Rt. 28	Jul 98	Camera, 4 Call Boxes & 4 HAR signs
ATT-006	I-95 @ Lorton Rd.	Jul 98	Voting Receiver
ATT-007	Co-location BAM-001	Jun 99	
BANM-001	DTR @ Hunter Mill	Apr 97	Camera, 2 Call Boxes & 1 HAR
BANM-002	I-66 @ Fair Lakes	Oct 97	Camera, 4 Call Boxes
BANM-003	I-495 @ Timberly	Oct 97	Camera, 1 HAR
BANM-004	I-495 @ Rt. 193	Sep 97	Camera, 4 Call Boxes
BANM-005	I-66 @ River Oaks	Sep 97	Camera, 4 Call Boxes
BANM-006	I-66 @ Merrifield	Mar 98	8 HAR Flashing Signs
BAM-007	Route 110 @ Arlington Cem.	Not started	VMS Sign
BAM-008	I-95 @ Occoquan	Aug 98	
BAM-009	N. Military & Old Glebe Rd.	Not started	
CELL-001	I-66 @ Nutley	Jan 98	9 Call Boxes & Equipment
CELL-002	I-495 @ Van Dorn	Mar 98	Camera
CELL-003	I-66 @ Exit 72	Apr 98	Camera
CELL-004	I-395 @ Rt. 120	Oct 98	
CELL-005	I-66 @ Exit 68	Dec 98	
CELL-006	Co-location w/ATT-004	Mar 99	
CELL-007	I-395 @ Seminary	Jan 99	
CELL-008	I-66 @ Exit 71	Jan 99	
APC-001	Co-location w/ATT-001	Oct 98	
APC-002	Co-location w/ATT-005	Apr 99	
NEX-001	Co-location w/BAM-001	Jun 99	
NEX-002	Co-location w/BAM-004	Apr 99	

Site ID	Cell Tower Location	Construction Date	Received ITS Hardware
ATT-001	I-495 @ Rt. 738	Oct 97	Camera, 4 Call Boxes
ATT-002	I-495 @ Rt. 50	Sep 97	Camera, 4 Call Boxes
ATT-003	I-495 @ Braddock	Oct 97	Camera, 4 Call Boxes
ATT-004	I-495 @ GW Ramp	Oct 97	Camera, 4 Call Boxes
ATT-005	I-66 @ Rt. 28	Jul 98	Camera, 4 Call Boxes & 4 HAR w/signs
ATT-006	I-95 @ Lorton Rd.	Jul 98	Voting Receiver
BANM-001	DTR @ Hunter Mill	Apr 97	Camera, 2 Call Boxes & 1 HAR
BANM-002	I-66 @ Fair Lakes	Oct 97	Camera, 4 Call Boxes
BANM-003	I-495 @ Timberly	Oct 97	Camera, 1 HAR
BANM-004	I-495 @ Rt. 193	Sep 97	Camera, 4 Call Boxes
BANM-005	I-66 @ River Oaks	Sep 97	Camera, 4 Call Boxes
BANM-006	I-66 @ Merrifield	Mar 98	8 HAR Flashing Signs
BAM-007	Route 110 @ Arlington Cem.	Not started	VMS Sign
BAM-008	I-95 @ Occoquan	Aug 98	High Mast Lighting
CELL-001	I-66 @ Nutley	Jan 98	9 Call Boxes & Equipment
CELL-002	I-495 @ Van Dorn	Mar 98	Camera
CELL-003	I-66 @ Exit 72	Apr 98	Camera
CELL-004	I-395 @ Rt. 120	Oct 98	
CELL-005	I-66 @ Exit 68	Dec 98	
CELL-006	Co-location w/ATT-004	Mar 99	
CELL-007	I-395 @ Seminary	Jan 99	
CELL-008	I-66 @ Exit 71	Jan 99	
APC-001	Co-location w/ATT-001	Oct 98	

Project Name: Highway Advisory Radio
Project Participants: Jimmy Chu & Alan McCormick – VDOT
VDOT Contact: Phone (703) 383-2600 Fax (703) 383-2620 Email Chu_TF@vdot.state.va.us

Project Description:

VDOT is currently designing a multi-station Highway Advisory Radio (HAR) system. The purpose of the system is to provide travelers with accurate, real time traffic information that will help them to make better route choice decisions. It is an information interface between VDOT and the traveling public using AM radio, which is available in almost every automobile. The broadcast messages will be keyed to and work in conjunction with wig – wag style static alerting signs, or in coordination with variable message signs to alert motorists to tune their AM radio to a particular frequency for information.

Each HAR station is a miniature low power AM broadcast transmitter and is licensed by the Federal Communications Commission (FCC) for operation on a specific AM radio frequency at a specific location. These HAR stations have an effective broadcast range of only about 2 1/2 miles and as such, transmitter sites have been carefully selected using the following criteria:

- Provide radio coverage of critical highway locations (target areas),
- Provide radio coverage to motorists with timely highway condition reports
- Provide motorists with alternate route information and access.

VDOT was granted licenses in January 1999 by the Federal Communications Commission (FCC) to operate approximately 30 fixed HAR stations throughout the state on an assigned frequency of 1620 kHz. Of these, 15 stations are in Northern Virginia. In addition, the FCC also granted licenses to operate mobile HAR stations (with some restrictions) on assigned frequencies of 1610 & 1620 kHz.

Granting of the HAR licenses is considered a major step in the statewide HAR program, especially in Northern Virginia. In Northern Virginia, the broadcast band is "saturated" with commercial stations; thus frequencies for HAR usage are almost non existent. Licenses for HAR stations that were granted in January 1999 for the other areas of the state have "opened the doors" to others and will make the job of implementing HAR services for motorists much easier.

Project Milestones:

Planning	On-Going
License received	1/99

Project Name: Call Box Program
Project Participants: Jimmy Chu & Alan McCormick – VDOT
VDOT Contact: Phone (703) 383-2600 Fax (703) 383-2620 Email Chu_TF@vdot.state.va.us

Project Description:

Call boxes provide the general public with roadside assistance, enhanced personal security, and timely resolution of traffic incidents on interstate highways. VDOT is in negotiations with cellular carriers to secure a partnership agreement where the carriers would provide free cellular services to VDOT and, in return, the carriers would be allowed to place their sponsorship logos on the call boxes.

VDOT is planning to install approximately 40 motorist assist call boxes on the Dulles Toll Road as a pilot project for the concept. The entire program would include, but not be limited to, approximately 200 call boxes on Northern Virginia interstate highways. One call box will be transportable and used for demonstration purposes.

The boxes have been purchased and will be installed at approximately 1-mile intervals along the Dulles corridor, and will be located primarily in emergency pull off areas along the highway. The boxes are ADA compliant and, where possible, the locations are accessible to the handicapped.

Motorists requiring roadside assistance have only to open the box and push a single button. The call box will then automatically place a call to the VDOT Smart Traffic Center. A traffic controller using a computerized “answer center” answers incoming calls. When a call is answered, the call box identification number and a description of its location will automatically be displayed on the "answer center" screen. The traffic controller can then talk with the person placing the call and take appropriate action to render assistance. If emergency service is requested, the traffic controller can quickly patch the call through to the appropriate 911-dispatch center. The VDOT Smart Traffic Center, which is operational 24 hours a day, seven days a week, will be available to respond to calls from call boxes at anytime.

Project Milestones:

Agreement negotiation with Cellular Phone Carriers is on-going

Project Name: Fiber Optic Resource Sharing
Project Participants: Wayne Haines – VDOT
VDOT Contact: Phone (703) 383-2437 Fax (703) 934-5197 Email Haines_WB@vdot.state.va.us

Project Description:

The major component of this project is to install a fiber optic communications infrastructure to link various Smart Traffic Systems together in a redundant system. The project goals are to:

- Expand upon the fiber optic infrastructure installed as a part of the Smart Traffic Center (STC) and Dulles Toll Road (DTR) Smart Tag Projects.
- Provide network redundancy to existing VDOT fiber optic infrastructure.
- Provide an expanded network for the US Army.

A Resource Sharing Contract has been signed between VDOT and the Army Corps of Engineers with the following basic conditions agreed upon:

- VDOT will provide one fiber optic innerduct along the 17.2 miles I-66 corridor between the Beltway and Route 234.
- VDOT will provide one fiber optic innerduct along the 17.2 miles I-95 corridor between the Beltway and Route 619.
- VDOT will provide one innerduct along the I-395 corridor from the I-495 Beltway to the Smart Traffic Center.
- VDOT will provide 24 Fibers from the 144 Fiber Optic Cable that is part of the Dulles Toll Road Smart Tag System.
- The Army Corps of Engineers (through Lightwave Spectrum International, Inc (LSII)) will construct a new fiber optic cable along the Route 619/234 bypass connecting I-95 with the I-66 Fiber Optic infrastructure.
- LSII will install a fiber optic cable on the DTR Connector (from the DTR Administration Building along the Dulles Access Road to I-66 inside the Beltway) linking the I-66 fiber optic cable with the DTR fiber optic cable.
- LSII will reengineer the fiber optic cable on the DTR by providing new equipment in order to "free" the 24 fibers they need.

Additional fiber optic communications infrastructure may be included in this Resource Sharing Project.

Project Milestones:

Project started	12/98
An engineering study analyzing the DTR fiber reutilization feasibility is underway	

Project Name: Springfield Fiber Optic By-Pass Contract
Project Participants: Wayne Haines – VDOT
VDOT Contact: Phone (703) 383-2437 Fax (703) 934-5197 Email Haines_WB@vdot.state.va.us

Project Description:

Because of the planned construction of the Springfield Interchange, the Smart Traffic Center fiber optic cable trunk line had to be re-routed around the Construction zone. Also requiring relocation through the Springfield Interchange was another fiber optic cable owned by a Federal government agency. VDOT signed a contract in November 1998 for Lightwave Spectrum International, Inc. (LSII) to design and install a by-pass for the fiber optic cables. The re-routed cable runs along Backlick Road from Industrial Road/Electronic Drive in the north to Fullerton Road/Newington Road in the south (a distance of approximately 30,000 feet). Provisions have been made to connect all interim and final Smart Travel devices in the Springfield Construction zone to ensure connectivity to the Springfield Tower and Route 7900. A total of 16 HDPE conduits are constructed in the re-routed trunk line to satisfy both VDOT and Federal Government needs and to provide some future flexibility to VDOT during the eight years of construction of the Interchange.

The civil work for the project is schedule to be completed by LSII in April 1999. A cut-over plan based on many factors, including construction schedule, current system testing and requirements of VDOT, is being prepared. VDOT's Resource Sharing Contractor will maintain the re-routed fiber optic line once construction and cut-over are completed.

Project Milestones:

Contract executed	11/98
Civil work complete	4/99

Project Name: Springfield Interchange Congestion Management Program (CMP)
Project Participants: Ken Wester – VDOT
VDOT Contact: Phone (703) 383-2457 Fax (703) 383-2470 Email Wester_KW@vdot.state.va.us

Project Description:

VDOT recently commenced construction of the Springfield Interchange Improvement Project. The interchange improvements are estimated to cost approximately $350 million and will take about 8 years to complete. Congestion management and maintenance of traffic are vital elements of the project as required under the Intermodal Surface Transportation Efficiency Act (ISTEA) and is the program by which traffic demand and traffic operations will be managed during construction. The goal of the Congestion Management Program (CMP) is to minimize the inconvenience and delays to the traveling public during the construction period.

To this end, the Northern Virginia District has taken the lead in developing, implementing and operating a CMP for the Springfield interchange. Three focus groups have been formed on the following areas to meet the goals of the Congestion Management Program:

- Local Network Operations involves providing intersection spot capacity improvements, traffic signal coordination/optimization, and traffic monitoring/traffic information.
- Traffic Demand Management is aimed at reducing the volume of traffic through the construction zone by encouraging ride sharing, taking the bus, or riding the Virginia Rail Express or Metro Rail.
- Incident Management uses Smart Travel systems to detect and respond to incidents as quickly as possible.

These focus groups consist of representatives from local jurisdictions (traffic and transportation engineers, police, fire & rescue), state agencies (VDOT, VDRPT, State Police), and transit (WMATA, Fairfax Connector, PRTC, and other ridesharing organizations).

Project Milestones:

Construction begin	April 1999

Project Name: Enhanced Use of Video Images for Springfield Interchange
Project Participants: J.R. Robinson – VDOT
VDOT Contact: Phone (804) 786-6677 Fax (804) 786-9748 Email robinson_jr@vdot.state.va.us

Project Description:

The Springfield Interchange is one of the most complex and busiest Interstate interchanges on the East Coast. VDOT is embarking on an 8-year construction project to rebuild the interchange. There are extensive Smart Travel infrastructure components affected by the construction including the traffic signal system, freeway management system, advanced traveler information, incident management, and emergency services. Planning and coordination has been underway for several years and agencies are working together to address important needs.

Extensive Smart Travel infrastructure exists, but there are gaps in the integration of the infrastructure. This project is intended to address one of these gaps; namely, the enhanced use of video images, including the transfer of video between various agencies and organizations. In particular, the main focus of this project is to provide video feeds between the existing VDOT Smart Traffic Center and others, such as the Fairfax County Public Safety Dispatched Center, the Springfield Interchange Office of the State Police, and the Partners in Motion. Video images will also be provided to the VDOT traffic signal system center; thus, will assist in the operation of the signals on the arterial streets in the vicinity of the Springfield Interchange. Depending on the funding, placing video images on existing web sites will be considered and possibly implemented. A smaller but companion to this video sharing is to update the existing VDOT incident management plan, especially as it relates to the Springfield Interchange and the sharing of video images.

This project could enhance the public safety because the dispatchers of the fire and rescue resources can assess the magnitude of the problems and respond to incidents more quickly and effectively. Better response means less congestion and better mobility for the traveling public.

Project Milestones:

Request for funding	4/99

Project Name: Detect Outdated Timing Plans for Springfield Interchange Surrounding Area
Project Participants: Jeris White – VDOT
VDOT Contact: Phone (703) 383-2776 Fax (703) 830-9879 Email White_jj@vdot.state.va.us

Project Description:

The Northern Virginia District has implemented a Management Information System for Transportation (MIST) computerized traffic signal control system throughout Prince William, Loudoun, and Fairfax counties. The 1.5 Generation Control (1.5 GC) system is a software analysis tool that can be integrated and used with the existing system infrastructure. It is a tool that provides the capability to detect outdated timing plans; allows users to re-optimize timing plans with off-line models; implements new timing plans in the field; and stores new plans in the system database. This tool will allow more efficient use of staff by detecting intersections where increasing traffic flows have rendered existing timing plans obsolete.

Throughout the life of the I-95/I-395/I-495 Interchange Project, traffic patterns in the surrounding areas will be altered due to construction. Potentially, the alterations will result in dramatic fluctuations in traffic volumes at intersections within the Local Network Operations (LNO) area. Based upon the demands of the travelling public for optimal flow, the timing plans at these intersections must be monitored and modified on a continual basis. The key to construction project congestion management is to alleviate predictable and unpredictable congestion problems as efficiently and effectively as possible. The 1.5 Generation Control system has the potential to quickly identify and alert VDOT staff to these problems, as well as, provide solutions that can be implemented in an efficient manner. This will allow VDOT to be more proactive in the congestion management of this project.

Project Milestones:

Funding Approved

Project Name: Park and Ride Lot Guidance Information Management
Project Participants: Stephen Read – VDOT
VDOT Contact: Phone (703) 383-2216 Fax (703) 383-2230 Email Read_SW@vdot.state.va.us

Project Description:

Part of the Springfield Interchange Improvement Project Congestion Management Program is to encourage ridesharing and transit usage. VDOT is investigating available technology and potential benefits of a parking management and surveillance system to encourage higher utilization of existing commuter parking where most ridesharing and bus usage is staged. The objective of this project is to advise motorists of the status of commuter parking lots, encourage transit use and alert commuters to road conditions under special circumstances. Additionally, this project could include a security surveillance system to promote the reduction of property and personal crime.

Commuters will be told the availability of parking in advance of their arrival at the parking facility. Motorists can then elect to use another parking lot and/or to connect to another mode to complete their trip. The guidance information may also contain advisories on the roadway conditions that promotes the time savings on the I-95/395 HOV lanes.

If the concept is approved by the Springfield Interchange Congestion Management Steering Committee and all funding stakeholders, the system would continue to be used during the Springfield Interchange construction and after the construction is completed.

Project Milestones:

Search of available technologies	March 1999

Project Name: Woodrow Wilson Bridge (WWB) ITS Design
Project Participants: Amy Tang & Jimmy Chu – VDOT
VDOT Contact: Phone (703) 383-2240 Fax (703) 383-2250 Email amytang@vdot.state.va.us

Project Description:

The ITS Design Subcommittee has been formed to guide the development of a seamless corridor-wide ITS design along the Capital Beltway within the Woodrow Wilson Bridge (WWB) project limits. The ITS design will be integrated into the existing and planned regional MD State Highway Administration and VDOT ITS systems.

The ITS design will be completed by the WWB Project Section Design Consultants. The ITS Design subcommittee will identify the functionality and design requirements of the desired corridor-wide ITS and will document the recommendations.

The ITS Design Subcommittee has met monthly since November 1998. The focus has been on the necessity to maintain existing functionality, to enhance existing functionality during construction, and to identify functionality for the new facility. The subcommittee has identified desired functionality and requirements for surveillance, incident management, traveler information, traffic management, and communications elements. A draft ITS Functionality Report was completed and routed for comments.

Project Milestones:

Draft ITS Functionality Report	3/99

Project Name: Smart Traffic Center
Project Participants: Jimmy Chu – VDOT
VDOT Contact: Phone (703) 383-2600 Fax (703) 383-2620 Email Chu_TF@vdot.state.va.us

Project Description:

The Smart Traffic Center (STC) currently monitors and operates ITS devices on following highways sections:

1. 10-mile stretch of I-66 between the Capital Beltway and the Roosevelt Bridge
2. 11.5-mile segment of the Shirley Highway (I-395) between the Capital Beltway and the 14th Street Bridge
3. 10 miles of the Capital Beltway (I-495/95) in the area of the Woodrow Wilson Bridge.
4. The high-occupancy vehicle (HOV) facilities of I-66, I-95, and I-395.

Ultimately, the geographic coverage of the freeway management system in the Northern Virginia region will include the Dulles Toll Road, I-495 within Virginia, I-66 from DC to I-81, and I-395/I-95 from DC to Fredricksburg.

The Smart Traffic Center is currently performing a variety of functions such as traffic monitoring and management, equipment maintenance, device control, incident detection and verification, incident response and clearance, communication to the motoring public, and traffic information dissemination.

The STC utilizes a computerized Advanced Traffic Management System (ATMS) to monitor and control the Northern Virginia highway network composed of the following subsystems:

- Incident Detection System (IDS) – loop detectors are installed throughout the system at a 1/2-mile spacing to monitor traffic flow and detect incidents.
- Closed Circuit Television (CCTV) cameras are utilized to verify detected incidents and aid in incident management.
- Ramp Metering System (RMS) devices are located at 26 ramps to regulate traffic flow entering the interstate during peak periods.
- Variable Message Signs (VMS**)** are used to provide travelers with information concerning network conditions such as incidents, HOV restrictions and gate opening/closings etc.
- The Gate Control System (GCS**)** of the reversible lanes is utilized to open and close gates.
- The Lane Control System (LCS**)** is used during rush hours to inform motorists whether they can use the shoulder as a regular travel lane.

The existing STC became operational in 1985. The system is now being expanded 17.2 miles to the West on I-66 and 17.2 miles to the South on I-95, which coincides with the extension of the HOV facilities on these two roadways. Additional Smart Travel components will be added when the expansion work is completed.

Project Milestones:

Operational	1985
System expansion along I-66 and I-95	6/99
* includes new devices and completion of SONET communication network	
Acceptance of System Expansion	10/99
Extension of I-66 HOV lane (5.3 miles)	under design
Communication upgrade to Fiber Optic Cable inside Beltway	under design
Upgraded STC computer system	2000
Annual software integration and enhancement project completed.	2005

In addition to geographic coverage expansion, the STC is developing an operating and management software application for the central control system. The many software enhancements included in the new system will provide VDOT a state-of-the-art Smart Traffic Center. Along with the software improvement, additional computer system hardware in the Center is included as part of the new system. The original Perkin-Elmer 3220 will be replaced by two (2) DEC Alpha 2100 work stations that are primary and redundant computer database servers with 256 MB RAM and 40 GB of storage shared between the 2 servers. Many other hardware changes are included in the design and operation of the control room. Three (3) DEC Alpha 600 user workstations, equipped with monitors, will be placed in the new Control Center. It will enable operators to access and track all system functions without having to move from one location to another. In addition, CCTV viewing will be enhanced with the installation of 3 improved video walls to allow for maximized surveillance capabilities. The new Vehicle Classification System (VCS) will assist VDOT in understanding the composition of traffic traveling on interstate highways in Northern Virginia.

There have been other items added to the maintenance function for the Smart Traffic Center staff as a result of this expansion project. The Smart Traffic Center staff will maintain the following new additions to the STC system:

- 324 Electrical and Communications Cabinets
- 201 High Mast and Standard Light Poles
- 1000 Junction Boxes
- 250 Electrical Manholes

Field devices for the future 5.3 mile extension of I-66 currently under design will be added to the system when the HOV lane extension is extended past the Route 29 Interchange. This new construction will add the following sixty-three field devices to the system:

- 23 Incident Detection System (IDS)
- 15 Closed Circuit Television Cameras (CCTV)
- 19 Variable Message Signs (VMS)
- 6 Vehicle Classification System (VCS)

The following chart displays the field device inventory of the freeway management system after the completion of the Expansion Project and the future 5.3 mile extension of I-66 that is currently under design.

STC Devices - Current, Expansion and Planned

STC Subsystems	I-395 & I-95		I-66			I-495	Overall			
	Existing	Expansion	Existing	Expansion	Planned	Existing	Existing	Expansion	Planned	Total
Incident Detection System (IDS)	31	59	12	63	23	0	43	122	23	188
Closed Circuit Television Cameras (CCTV)	26	22	13	32	15	9	48	54	15	117
Ramp Metering System (RMS)	19	0	7	0	0	0	26	0	0	26
Variable Message Signs (VMS)	35	57	55	41	19	20	110	98	19	227
Gate Control System (GCS)	8	15	0	1	0	0	8	16	0	24
Lane Control System (LCS)	0	0	11	0	0	0	11	0	0	11
Vehicle Classification System (VCS)	0	15	0	8	6	0	0	23	6	29
TOTAL	119	168	98	145	63	29	246	313	63	622

For field communications, the existing system uses coaxial cable as the primary communications backbone. The new expanded system uses Single-Mode Fiber Optic with Synchronous Optical Network (SONET) technology to achieve an OC-12 (622Mbps) data rate. The field communication network connects the field devices with the central control system housed in the Smart Traffic Center in Arlington.

There have been approximately 387,000 feet of 48 fiber optic cable installed along the trunk line and over 298,000 feet of 24 fiber optic cable installed between the cabinets. The major fiber optic backbone is in place along I-66 from I-495 for 17 miles west to Route 234 and 17 miles south along I-95 from I-495 to Route 234. This Backbone runs down I-395 and I-66 to the Smart Traffic Center.

The STC receives live traffic video images from the Fairfax County Police Department's Air-Borne Video System in support of its traffic monitoring function.

Project Name: Smart Traffic Center Software Upgrade
Project Participants: Jimmy Chu – VDOT
VDOT Contact: Phone (703) 383-2600 Fax (703) 383-2620 Email Chu_TF@vdot.state.va.us

Project Description:

VDOT has invested a significant amount of funds and effort into a major upgrade and expansion of the Northern Virginia Smart Traffic Center (STC). When complete, the STC will be one of the largest and most sophisticated freeway management systems in the United States. That project focused on extending surveillance coverage to meet operations needs, and was scoped as such even though the STC staff knew of several system software enhancements that would be very useful if implemented. In addition, the size and scope of that project would not allow adding system software enhancements without resulting in extensive schedule delays and budget overruns. Therefore, this project was developed to allow the software changes to be made.

Technology, and even applications, change very rapidly in the ITS arena. In order to gain the most use from the STC, VDOT began investigating ways to upgrade the STC system. These upgrades include:

- "fixes" of minor problems that exist today
- Development of new system functionality
- Introduction of new technology
- Enhanced maintenance of the system.

Specifically, this project will focus on the following key areas:

To provide system administration and maintenance support for the STC.

Due to the complexity of the STC's software system, it requires constant administration and maintenance support. Basic administration services such as the establishment of user accounts, system back-ups, and database administration is necessary. In addition, it is certain that minor system bugs will be discovered over time that will require repair.

To support VDOT in enhancing current functionality of the STC.

A number of important enhancements to the STC have been identified through the course of the system development period. These necessary enhancements will be developed in this effort.

To integrate with the Virginia Smart Travel Laboratory.

The Smart Travel Laboratory (STL) has been developed by the University of Virginia and the Virginia Transportation

Project Milestones:

Request For Proposal (RFP) development	5/99

Research Council to provide an Smart Travel research and development facility for VDOT. In this effort, the STC will be integrated with the lab, establishing a "satellite" workstation in the lab in Charlottesville, Virginia.

The Smart Travel Laboratory, located on the grounds of the University of Virginia, provides the ideal resource to support the development of enhancements for the STC. If warranted, concepts considered for the STC can be prototyped and evaluated in the lab. The purpose of integrating with the Smart Travel Laboratory is to identify needed upgrades to the STC and to develop a functional design that best provides the upgrades. This will be accomplished by a thorough transportation and systems engineering review of the STC, and through the application of research results obtained in the Smart Travel Laboratory.

To integrate with Partners in Motion.

The Washington Metropolitan region's traveler information effort, Partners in Motion (PiM), is integrating information from a number of public and private sources in the area. In this effort, data from the STC has been provided to Partners in Motion via fax, phone, and a dial-up connection to the agency data server. This integration is intended to replace manual data exchange with an automated data delivery process. As a result, selected data from the STC will be provided automatically to the PiM, and information from the PiM will be integrated into the STC system.

Project Name: Virginia Beltway Detection System
Project Participants: Jimmy Chu – VDOT
VDOT Contact: Phone (703) 383-2600 Fax (703) 383-2620 Email Chu_TF@vdot.state.va.us

Project Description:

At this time, no vehicle detection or traffic monitoring systems exists on the Capital Beltway in Virginia, from the American Legion Bridge to the Woodrow Wilson Bridge. The deployment of Smart Travel field equipment along the Capital Beltway has been limited to CCTV cameras at thirteen locations.

The purpose of this project is to deploy traffic monitoring detector stations along the Beltway within Virginia. The objectives of this project are to:

- Monitor traffic speed, volume, lane occupancy, estimated link travel time, and to provide vehicle classification information at selected stations.
- Tie into the existing Smart Traffic Center (STC) central software and system (under a yet to be advertised RFP of System Integration and Technical Support to the STC).
- Install detector stations at existing structures on the Beltway where appropriate and possible.
- Implement an "open" architecture and comply with existing standards (i.e. NTCIP, IEEE software standards, etc.).

At the end of the project an evaluation will be conducted. Initially, the traffic monitoring system will be operated on a stand-alone basis at the STC until complete integration is achieved with the STC's central software by a third party system integrator. VDOT, under a separate procurement, will select the system integrator.

The deployment plan is under development and includes the following items:

Task 1 – Develop a Detector Location Plan
The detector location plan will identify the location, quantity and functional type of detector/traffic monitoring stations needed along the Capital Beltway from the Woodrow Wilson Bridge to the American Legion Bridge. Traffic monitoring within the limits of the Springfield Interchange Project will not be included in the detector location plan. This plan will detail the specific location of the detector stations, and therefore provide an accurate inventory of the number, functional type and location of each traffic monitoring station.

Project Milestones:

Work Plan was approved by VDOT and FHWA on March 15, 1999

Scope of Work 5/99

Task 2 – Technology Evaluation
A technology evaluation of traffic monitoring systems will be conducted addressing:

- Detector functionality and overall performance.
- Communications requirements.
- Integration requirements and compatibility with the database and interface specification of the existing STC central software.

The consultant, working with VDOT, will prepare evaluation criteria for assessing the competing traffic monitoring systems. The detector technologies will be arrayed against the traffic monitoring station locations produced in the previous task to determine the most effective traffic monitoring program approach. The findings and conclusions regarding the preferred technology will be documented in a working paper/technical memorandum and submitted to VDOT for review and comment.

Task 3 – Develop System Architecture
Based on the results of the previous tasks, the consultant will prepare a system architecture and preliminary system design addressing the overall system requirements and phased or staged deployment. The design will determine the total equipment requirements and configuration for each traffic monitoring station without restricting the system vendor's technical potential solution.

Communication requirements will be developed examining both wireline and wireless service. Utilization of the fiber optic communications infrastructure currently in operation along I-95 and I-66 will be examined for use to back haul the information from the traffic monitoring stations to the STC. The system architecture will address interface requirements with the STC software for subsequent development of integration requirements for the third party system integrator.

Task 4 – Develop Procurement Approach
The purpose of this investigation is to develop the procurement methodology that produces a contract vehicle for purchasing and installing traffic monitoring stations by multiple entities. The entities will include VDOT and wireless resource sharing partners. At this time the consultant envisions the procurement approach to resemble a force account methodology where a minimum number of traffic monitoring systems, by type, will be procured over a one year period with options for additional stations. Alternative approaches will be examined.

Task 5 – Prepare Procurement Documents
The consultant will prepare the IFB document, statement of traffic monitoring system, integration requirements, and a final cost estimate for the systems, its phases, and for individual traffic monitoring stations.

Project Name: Automatic Truck Rollover Warning System
Project Participants: Jimmy Chu – VDOT
VDOT Contact: Phone (703) 383-2600 Fax (703) 383-2620 Email Chu_TF@vdot.state.va.us

Project Description:

Currently the Smart Traffic Center operates and maintains two (2) Truck rollover devices that were installed in 1994. These devices provide warning to trucks that are traveling too fast on the ramps in order to avoid accidental rollovers. These two devices are located on I-495 at the I-95 Southbound Ramp and on Northbound I-495 at the Northbound Route 123 Ramp.

The interchange located at Rt. 236 on the Washington DC Beltway (I-495) has been the site of several truck rollover accidents over the last twenty years. A gasoline tank farm is located nearby, and Rt. 236 is used by many gasoline trucks to access the Beltway. VDOT is developing a truck rollover warning system for installation at this interchange to warn trucks when they risk a roll over from excessive speed. The system incorporates non-intrusive vehicle sensors with a video camera system and a dynamic message sign to detect and warn vehicles that are travelling too fast within the interchange.

VDOT will complete the final design and engage a contract to install a new truck rollover warning system at the interchange of Route 236 and the I-495 Beltway. A feasibility study was completed in April 1998. An effort to update that study to include analysis for a non-intrusive detection system will be part of this project scope. The project shall use the Resource Sharing Initiative for deploying the truck rollover system. Resource Sharing partners shall procure and deploy the truck rollover system according to a specification provided by VDOT.

Project Milestones:

Two truck rollover devices installed	1994
Feasibility study	4/98
Document Requirements and Operational Concept	4/99
Design system	6/99
Installation	8/99
System Test	8/99
Independent Evaluation	2/00

Project Name: Northern Virginia Smart Traffic Signal System
Project Participants: Jeris White – VDOT
VDOT Contact: Phone (703) 383-2776 Fax (703) 830-9879 Email White_jj@vdot.state.va.us

Project Description:

The Smart Traffic Signal System, which has been implemented in Northern Virginia District, is a complete computer-based traffic signal management system. The complete system contains field equipment and central system software. Model 170 controllers have been installed at 748 intersections to replace all old controllers.

The central system software is PB Farradyne's Management Information Systems for Traffic (MIST) system, which is capable of interfacing with the Bi-Tran Systems' "170E Controller" software to collect traffic data. The operating system permits the operators to execute other system software tasks while operating the traffic control software and providing direct communications with all intersections in the project area. The MIST system provides the capability for information management, data analysis and reporting, inventory control maintenance logging and real-time graphics display of intersection operations.

In addition, the system provides access to location designs, cabinet wiring diagrams, maps, and other graphics via the image databases. The system has the ability to upload and download all timing plans and operational parameters, including status information and review of conflict monitor, from the central location as well as at a remote access point. The system central control equipment includes eight (8) workstations. All eight operator interface workstations are equipped with hard drives containing 2.0 GB of memory along with CD-ROM capability. Three of the workstations are equipped with 32 bit EISA Capable Ethernet Cards for local use, and the remaining five are provided with 19.6 band modems. The central operating system consists of a database server, MIST Server, Remote Server and Device Driver Server that provides both continuous and dial-up access to designated locations. This system currently operates from the Signal Operations Center in the NOVA District.

The Smart Traffic Signal Operations Center is currently performing a variety of functions including traffic surveillance, traffic flow information dissemination, equipment malfunction management, device control, traffic management, incident detection and verification, and incident response.

The Northern Virginia traffic signal system currently operates almost 800 signals with expansion capabilities to 2,000 signals. This state-of-the-art system allows for signal adjustments necessitated by traffic conditions and for a central monitoring location to alter timing plans. Preliminary studies of the signal system suggest that it will reduce total delay between 14 and 27 percent, total stops between 21 and 23 percent, and total travel time between 8 and 13 percent. Furthermore, the system design provides flexibility, allowing the system to incorporate advanced traffic control algorithms

Project Milestones:

Installation Completed	4/98
RFP for developing signal optimization timing plans was issued	2/99

Note:
The VDOT Northern Virginia Monthly Signal Status Report provides a comprehensive listing of Northern Virginia signal work that has been completed or is planned.

in the future.

The Smart Travel Laboratory located at the University of Virginia provides evaluation of the signal system operations. This laboratory is developing a roadway congestion mapping system using the detection that supports the signal system.

The Northern Virginia Signal System project will be augmented by the project titled, “Traffic Signal Timing Optimization and General Signal System Operation.” Its purpose is to improve and sustain traffic mobility through the optimization of coordinated signal systems and isolated intersections.

Project Name: Traffic Signal Timing Optimization & General Signal System Operation
Project Participants: Jeris White – VDOT
VDOT Contact: Phone (703) 383-2776 Fax (703) 830-9879 Email White_jj@vdot.state.va.us

Project Description:

The Northern Virginia District Smart Traffic Signal System has been developed to control the traffic signals throughout Fairfax, Loudoun, and Prince William counties. Approximately 800 signalized intersections are controlled and monitored from a central control room. It is anticipated that the System will improve and sustain surface traffic mobility through the optimization of coordinated signal systems and isolated intersections. This optimization program is enabled by VDOT's computerized traffic signal system called Management Information System for Transportation (MIST); traffic optimization software called SYNCHRO; and traffic simulation software called CORSIM. This project will be developed utilizing VDOT's policies and procedures and FHWA guidelines.

A Request for Proposal (RFP) was issued to perform the following functions:

- Determine the priority of locations for developing traffic signal optimization based on levels of saturation.
- Update and construct intersection graphics and requisite database tables.
- Collect data.
- Set up and code network.
- Develop and optimize signal timing plans, including the evaluation of the results using traffic analysis and simulation software.
- Implement and document the timing plans.
- Submit signal plans for review.
- Operate the signal system, including responding to internal and external signal system inquires, monitoring system failure log, incident management, event management, and troubleshooting telecommunications.

Project Milestones:

RFP Issued	2/99

Project Name: Real-Time Traffic Adaptive Control System (RT-TRACS)
Project Participants: Jeris White – VDOT; FHWA
VDOT Contact: Phone (703) 383-2776 Fax (703) 830-9879 Email White_jj@vdot.state.va.us

Project Description:

This project is sponsored by FHWA to develop, implement and evaluate a Real-Time Traffic Adaptive Control System (RT-TRACS) for traffic signals. The purpose of this project is to provide a framework for the implementation of a variety of control strategies. Another purpose is to design a system architecture that can select the most appropriate control strategy to monitor its performance in order to handle present day traffic requirements. The first phase of implementation of RT-TRACS, completed in April 1998, included 16 intersections on the Reston Parkway. The second phase of the project will evaluate the current system.

Project Milestones:

Phase I Completed	4/98
Phase II Started	4/99

Project Name: Regional Signal Priority Treatment Study
Project Participants: Jeris White – VDOT; John Collura – The Virginia Tech Center for Transportation Research and George Mason University; MWCOG Signal Operation Committee
VDOT Contact: Phone (703) 383-2776 Fax (703) 830-9879 Email White_jj@vdot.state.va.us

Project Description:
The Metropolitan Washington Council of Government (COG) ITS Task Force - Signal Operation Committee, chaired by Jeris White, recommended that the Task Force request funding to conduct a detailed study of signal preemption/priority treatment and state of the practice for transit, enforcement, fire and EMS.

The goal of this study is to assist the region in considering the use of advanced technologies to implement signal preemption and other vehicle priority strategies along signalized arterials in the Washington D.C. Region. The scope of work includes five major tasks:

- Task 1: Identify and review institutional issues and concerns, stakeholders and available vehicle priority technologies.
- Task 2: Assess available technologies currently used to provide vehicle priority treatments at signalized intersections.
- Task 3: Conduct an extensive simulation analysis evaluation of alternative vehicle priority strategies and treatments at signalized intersections on selected arterial(s) in the Region.
- Task 4: Conduct an extensive operational field test to evaluate alternative priority strategies and levels.
- Task 5: Develop broad policy guidelines to assist the ITS Task Force in the formulation of a proposed policy on vehicle priority strategies and treatments along signalized arterials in the Region.

Arlington County, which maintains and operates signals in Arlington, is working closely with VDOT, the Washington Metropolitan Area Transit Authority (WMATA) and the Task Force to implement signal priority treatment technology.

Project Milestones:

Request for funding	4/99

Project Name: Tysons ITS Support
Project Participants: Jeris White – VDOT
VDOT Contact: Phone (703) 383-2776 Fax (703) 830-9879 Email White_jj@vdot.state.va.us

Project Description:

The Tysons Corner area suffers from one of the highest levels of traffic congestion in the Northern Virginia region. Efforts to mitigate the effects of traffic congestion, including expanding the transit system in the area, are underway. An express bus service is provided by the Washington Metropolitan Area Transit Authority (WMATA) to serve riders between Tysons and Bethesda, MD. To support this effort, VDOT will design and install a Closed Circuit Television (CCTV) system to monitor traffic congestion and provide support for the Tysons-Bethesda transit service in the Tysons Corner area.

The system will provide video feeds to the Smart Signal Operation Center and the Smart Traffic Center. The scope of the project includes all tasks required to design and implement the system. The design phase will include developing functional requirements, researching equipment to meet the functional requirements, and determining the most suitable locations for the placement of the cameras. The implementation phase will include equipment installation and integration testing.

Project Milestones:

Project Management Plan version 1.1 completed	2/99
Develop Functional Requirements	
Final System Document	
Installation Plan	
Project Test Plan	
System Implementation	
Training Plan	
Project Evaluation	

Project Name: Collision Counter Measures System for Unsignalized Intersections
Project Participants: William Harrell – VDOT
VDOT Contact: Phone (703) 383-2391 Fax (703) 383-2410 Email harrell_wp@vdot.state.va.us

Project Description:

This project incorporates traffic detectors and controllers in order to trigger active signs to warn of approaching vehicles near the intersection. Signs at the intersection will warn stopped vehicles of approaching traffic, while signs on the major road will warn approaching vehicles of traffic in the intersection.

The purpose of this system is to make drivers more aware of the situation at an unsignalized intersection by providing timely and appropriate warnings to vehicles in order to prevent collisions. Specifically, this system addresses the intersection of a major road with a stop sign controlled cross street.

A site has been selected in Prince William County, Virginia at the intersection of Aden Road and Fleetwood Drive. This unsignalized intersection was selected primarily due to high accident rate and limited sight distance at the intersection.

Project Milestones:

Operational	3/98
Evaluation and Summary	7/98

Project Name: Smart Tag – Dulles Toll Road
Project Participants: Bill Costis & John Jusevich – VDOT
VDOT Contact: Phone (703) 383-2700 Fax (703)876-6970 Email Costis_WW@vdot.state.va.us

Project Description:

Smart Tag is a toll collection system that uses automatic vehicle identification (AVI) to collect tolls electronically. The objectives of the Smart Tag System are to:

- Increase throughput
- Provide good audit control
- Achieve a high level of voluntary participation
- Achieve a reliable performance level
- Enhance safety

VDOT awarded a contract for installation of FASTOLL in March 1994. The system was fully operational on April 15, 1996. VDOT changed the name of the system to Smart Tag in January 1998 to coincide with the development of several information and management systems now under the overall Smart Travel umbrella. The Dulles Toll Road currently has a contract in place to provide maintenance for both the software and hardware of the system.

On the Dulles Toll Road, this Smart Tag system is integrated with lanes for automatic coin machines, and lanes with attendants for cash paying customers. There are a total of 56 toll lanes that include dedicated Smart Tag Only lanes and a mix of Exact Change lanes and Attended lanes. Attended lanes process 525 vehicles/hour; exact change lanes process 650 vehicles/hour; and Smart Tag only lanes process 1,400 vehicles/hour.

The AVI system consists of three functional elements: a vehicle mounted transponder (or tag), a reader unit located above the travel lanes, and a computer system for data processing. Smart Tag allows drivers to pay by deducting their tolls from prepaid accounts as their tags are read. AVI-equipped vehicles do not need to stop as their tags are read, thereby increasing the efficiency of the toll collection process. As a result, a Smart Tag only lane can process 2 ½ to 3 times the number of vehicles per hour as an attended lane.

In the Richmond area, the Powhite Parkway, operated by the Richmond Metropolitan Authority, and the Powhite Extension, owned and operated by VDOT, are expected to join the VDOT Smart Tag system in mid 1999. All Smart Tag systems in Virginia use a compatible electronic toll collection system (Mark IV reader) that provides the customer seamless service on all systems in Virginia. In addition, VDOT owns and operates a single Customer Service Center with two satellite locations for managing all Smart Tag accounts on the Virginia road system.

Project Milestones:

Fully operational	April 1996
Changed name from "Fastoll" to "Smart Tag"	Jan. 1998
Powhite Parkway and Powhite Extension join Smart Tag System	Mid-1999

The following enhancement projects were proposed to the 1999-2000 Six Year Plan:

- Install electronic toll collection equipment at the new ramp connecting to the Herndon/Monroe commuter parking lot.
- Install variable message signs on Dulles Toll Road.
- Install additional toll collection capacity on the ramp from Spring Hill Road to Westbound Dulles Toll Road.
- Update and restore security system at the Dulles Toll Road Administration building to safeguard Commonwealth cash resources and VDOT personnel.
- Study the feasibility of having video enforcement for toll violations.

Project Name: Smart Tag Store
Project Participants: Greg Whirley – VDOT
VDOT Contact: Phone (804) 786-2759 Fax (804) 786-3449 Email whirley_ga@vdot.state.va.us

Project Description:

The Smart Tag store collects all revenues from the patron's use of the Smart Tag and distributes to each of the separate facilities that use the Automated Vehicle Identification transponders in Virginia. The Smart Tag store in Northern Virginia is operated under a contract awarded in early 1996 by the VDOT Central Office. Greg Whirley is the VDOT Smart Tag Store Project Manager. This store is a necessary and integral component of the Smart Tag System.

The facilities that currently use the Smart Tag are:

- Dulles Toll Road
- Dulles Greenway
- Coleman Bridge – currently uses Video Enforcement for toll violations
- MWAA Gate 14 Access

The Coleman Smart Tag Store has been operational in Suffolk District. A new Customer service store was opened in April 1999 to serve the Powhite Parkway and Powhite Extension facilities in the Richmond District.

Smart Tag customers can log in to the web site www.smart-tag.com for information and on-line application.

Project Milestones:

Fully operational	1996
New Tag Store in Richmond	4/99

Project Name: Regional Effort on Electronic Payment
Project Participants: Heather Wallenstorm – Northern Virginia Transportation Commission; Washington Metropolitan ITS Task Force; Volpe Center; J.R. Robinson – VDOT
VDOT Contact: Phone (804) 786-6677 Fax (804) 786-9748 Email robinson_jr@vdot.state.va.us

Project Description:

The Washington Metropolitan ITS Task Force has established several work groups, and one of these groups is focusing on regional seamless electronic payment services. That work group has developed a scope for a Regional Electronic Payment Services Implementation Plan. This plan will be used to educate and advise regional decision-makers on the steps required and issues involved in implementing such a system, and on the benefits of the system. The ITS Task Force has endorsed this study, which has received funding from a FY98 earmark (matched by VDOT). This project is co-managed by Ms. Heather Wallenstorm, the chair of the regional electronic payment services work group, and by Mr. J.R. Robinson of VDOT, and is performed by the Volpe Center.

The development of a seamless payment mechanism would enable a single electronic payment device to be used for tolls, transit fares, parking fees, convenience purchases and other related applications. These transactions would be conducted in a delay-free, convenient and secure environment. The same device could also be used as identification or to provide security clearance for individual user groups, and may be expanded to provide other services as well. Without a coordinated regional approach, stand-alone systems may have limited success; one payment platform would ensure greater market penetration.
This project will result in a regional electronic payment systems plan and be used to update and advise regional decision makers of the issues involved in implementing a regional, multimodal electronic payment system and the benefits to participating jurisdictions. The scope of this study shall include:

- Inventory of Existing Conditions for prospective participants.
- Needs Assessment - Identify the advantages and disadvantages of implementing a regional electronic payment system in the Washington Metropolitan area.
- Market Profiles of prospective participants.
- Proposed Operational Electronic Payment System – Based on the inventory, needs and market information, propose an electronic payment system. This task shall include both a conceptual vision and a performance specification.
- Technical and Institutional Barriers – Identify technical and policy issues and determine feasibility.
- Implementation – Estimate implementation costs for participating agencies, by sector, and for region-wide deployment. Provide an implementation timeline identifying specific milestones in the implementation process.

The work group is proposing to study the feasibility to set up a regional clearinghouse. This has been endorsed by the ITS Task Force which is seeking funding from the FY00 earmark.

Project Milestones:

Study underway

Project Name: Partners in Motion (Washington Metropolitan Traveler Information System)
Project Participants: J.R. Robinson – VDOT; 25 other public agencies; 13 private companies; USDOT
VDOT Contact: Phone (804) 786-6677 Fax (804) 786-9748 Email robinson_jr@vdot.state.va.us

Project Description:

A public-private partnership, known as Partners in Motion, was formed to implement a traveler information service for the Washington, D.C. metropolitan region. A coalition of 26 public transportation agencies and 38 planning agencies selected a team of 13 private companies led by the Battelle Memorial Institute to develop the traveler information service. This multi-modal information system enables travelers throughout the metropolitan area to have easy access to information on current travel conditions and other transportation data.

The system that Battelle put in place collects traffic and transit data from public agencies and combines the data with additional information from private sources. From a traveler information center, the combined data is made available in a variety of forms, tailored in different ways for dissemination to the traveler.

The six-year program is being executed as a partnership between the public and the private sector. Beyond year three, the objective of the project is to operate all systems as a profit making business in which no public funding is required for continued operation. The public agencies will benefit from revenue sharing after the third year. This revenue is expected to be used for further system enhancements.

The overall project is managed by J.R. Robinson (representing public partners) and Carol Zimmerman (representing private partners).

Project Milestones:

Opening of the Traveler Information Center	7/1/97
Launch SmarTraveler TV	2/9/98
Launch Agency Data Server	3/9/98
Receive ITS America Award	5/5/98
Turn off Agency Data Server and Develop Internet-based Linkage among Partners	4/99
Seek Funding for Developing an Automated Data Feeding System with Major Partners	4/99
Seek Funding for Developing a "Push Alert" Feature with Large Employers	4/99

Project Status

- 1997
  VDOT serves as the public contracting agency for the project. The agreement was signed in December 1996. On July 1, 1997, a media event was held to celebrate the opening of the Traveler Information Center (TIC), interactive telephone services, and web page services (www.smartraveler.com).

- 1998
  On February 9, 1998, SmarTraveler TV was launched in partnership with a local cable company. On March 9, 1998, the Agency Data Server was launched, enabling agencies to transmit their data electronically to the TIC and to share information among the participating agencies. On May 5, 1998, at ITS America's Annual Meeting in Detroit, ITS

America honored Partners In Motion for excellence in providing travelers in the Washington DC area with real-time traveler information. Mr. David Gehr of VDOT and Carol Zimmerman of Battelle accepted the 1998 Outstanding Achievement in ITS Applications/Traveler Information award on behalf of the partnership.

In September 1998, Washington Metropolitan Area Transit Authority (WMATA) placed Partners in Motion public service announcements on the outside of Metrobuses with routes throughout the metropolitan area. The announcements appeared on dioramas at various Metrorail stations in October and inside Metrobuses in November. Similar announcements could also be seen on MARC trains, Fairfax County buses, VRE trains and platforms.

Beginning in November 1998, Partners in Motion ran a 90-day demonstration that transmitted traveler information over a FM subcarrier signal. Cue, a paging company, supplied free airtime and receiver units to show that the FM subcarrier is a cost-effective means for customers to obtain real-time traveler information.

In late 1998, Partners In Motion debuted AutoTraffic (www.autotraffic.com), a web site that provides real-time traffic information on major roadways throughout Maryland, Northern Virginia, and the District of Columbia.

- 1999

  In early March 1999, Vice President Al Gore announced that a 3-digit number will be available for receiving travel related information. This will open up greater opportunities for Partners in Motion in disseminating information to travelers.

  Jones Communications network will broadcast SmarTraveler TV to their cable subscribers in Maryland and Virginia in the summer of 1999.

  Additional features and services will continue to be introduced throughout the life of the project.

Current Effort for Improvement

The public partners use the dial-up connection to the Agency Data Server for inputting and receiving data from the Smart Traveler system. The Agency Data Server has proven to be the least effective part of an otherwise highly successful project. An analysis of the situation, and the continuing rapid development and the use of the Internet, indicate that it would be advantageous to modify the existing system architecture to replace the Agency Data Server with Internet linking among the project partners. Also, agencies that supply a significant amount of data to the system indicated that an automatic data transmission system would be useful.

The Northern Virginia Smart Traffic Center Software Upgrade project would enable automated data feeding from the Smart

Traffic Center to the Partners in Motion (see the Smart Traffic Center Software Upgrade project description). In addition, a plan is underway to include automated data feeding from Montgomery County to the Partners in Motion. This project will also include a "Push Alert" feature that will warn employees of large organizations about highway incidents, so that their staff can plan their commute before leaving work. Battelle is developing an additional scope of work to request FY 99 federal earmark funding to include the Internet link among project partners, Push Alert feature and the automated data feeding from Montgomery County to the Partners in Motion database.

Project Name: Live Traffic Video Images on Internet
Project Participants: Jimmy Chu – VDOT
VDOT Contact: Phone (703) 383-2600 Fax (703) 383-2620 Email Chu_TF@vdot.state.va.us

Project Description:

In the spirit of VDOT's mission to become an effective customer- oriented public agency, VDOT, Northern Virginia District is planning to enter into a public- private partnership with Eyecast to disseminate real- time traffic video images to the public via the Internet.

VDOT would supply Eyecast, without charge, access to the images generated by closed- circuit television cameras (CCTV). In turn, Eyecast agrees to provide the video images free of charge to the public on a web site.

Project Milestones:

Partnership Complete	6/99
Launch the web site	Fall'99

Project Name: Smart Plow Demonstration
Project Participants: Renee Hamilton – VDOT
VDOT Contact: Phone (703) 383-2434 Fax (703) 383-2330 Email hamilton_rn@vdot.state.us

Project Description:

VDOT's Northern Virginia District is testing an Automatic Vehicle Location (AVL) technology, called Smart Plow, which allows real-time tracking of snowplow operations. VDOT managers use a computer-based, color-coded map to determine where plows are located, which roads have been plowed, and which ones are still in need of clearing. Two-way cellular messaging lets the manager give instructions to plow drivers and allows the drivers to communicate when there is a problem or emergency. Currently, 80 vehicles in Northern Virginia are being tracked using Smart Plow.

The primary purpose of this pilot is to assess the benefits of AVL technologies in the logistics and management of snow removal and other traffic operations. Three control stations are used to test how the AVL technology enhances snow removal operations at various levels in the organization. The AVL technology is also being tested in non-snow applications, such as safety service patrols, fleet and resource management, etc. (see the AVL System for Safety Service Patrol project description).

This pilot serves as a beta test for future deployment of AVL technology; if found to be beneficial to VDOT's goals and objectives it may be used on a fleet of 800 vehicles. This pilot program was initiated for the winter season of 1997-1998, however the mild winter did not allow a full evaluation of the technology, and measurable results were limited. Therefore, the pilot has been extended through the 1998-1999 winter season. The Research Council is in the process of analyzing the data gained from two storm events and will be developing an evaluation report by July 1999.

Project Milestones:

Evaluation Report	7/99

Project Name: Automated Vehicle Location (AVL) System for Safety Service Patrol
Project Participants: Cindy Ward – VDOT
VDOT Contact: Phone (804) 692-0390 Fax (804) 692-0810 Email ward_cl@vdot.state.va.us

Project Description:

The Automated Vehicle Location (AVL) system for Safety Service Patrol (SSP) operation is similar to the pilot Smart Plow system that tracks snowplow operations. SSP operations, however, require some modifications to the snowplow system to accommodate different SSP functions.

Originally, the SSP AVL system was designed for use by the Northern Virginia District. However, other areas in the Commonwealth also see the potential benefit of using the AVL technology for their Safety Service Patrol. In order to incorporate consistent technologies, however, it was decided to consider a statewide application to ensure some degree of standardization. To determine the level of effort and estimate the cost to install AVL equipment in VDOT SSP vehicles, there needs to be a survey of existing SSP operations to establish the requirements for AVL tracking of the vehicles.

VDOT will look at the operations of currently separated statewide SSP functions to determine areas where standardization of procedures and equipment may be required in view of the new AVL application. When the contractor establishes AVL requirements for the SSP, VDOT will receive a specification for the procurement of new hardware, software and other AVL system components and databases. VDOT will then need support to oversee the procurement, installation, test and acceptance of the SSP AVL system, set up training programs for personnel, and document the initial use of the system to determine its benefits. In detail, the following specific tasks will be performed by the contractor:

- Perform Requirements Analysis and prepare a Preliminary Design Specification for AVL in SSP vehicles
- Design Specification and Implementation support for installation of an AVL tracking system in SSP vehicles
- Perform Test and Evaluation and Cost Benefits Analysis on SSP AVL Implementation.

Project Milestones:

Preliminary Design Specification	5/99
Design Specification	7/99
Test and Evaluation	10/99

Project Name: Bridge Deck Anti-icing System – Bridge from Route 7 EBL to I-66 EBL
Project Participants: Dan Roosevelt – VDOT; Virginia Transportation Research Council
VDOT Contact: Phone (804) 293-1924 Fax (804) 293-1990 Email Roosevelt_DS@vdot.state.va.us

Project Description:

In the interest of providing motorists with the safest driving conditions possible on its highways and bridges during icy weather, VDOT is evaluating the effectiveness and practicality of automated bridge deck anti-icing spray technology. The State of Virginia experiences numerous freeze-thaw weather cycles during a winter season. Humidity levels in the state are usually high, which results in moisture forming on surfaces as temperatures drop. The temperature of bridge decks usually tracks the air temperature more closely than the adjacent roadway pavements because the bridge decks are exposed to the air. These circumstances can lead to frozen moisture and reduced friction on bridge decks while the adjacent roadway is unaffected. To combat this problem, maintenance crews often treat bridge decks with chemicals and abrasives when no action is needed on the adjacent roadway. An automated system would apply treatment to bridge decks only when necessary, and relieve a maintenance burden.

The objectives of the project are to: 1) Evaluate the durability and effectiveness of the system, 2) Become familiar with the maintenance and construction problems involved with such a system and 3) Develop a prototype performance specification for the installation of such systems in Virginia.

The need for this project is driven by VDOT's plans to widen a number of bridges along I-95 through the Richmond District, and the construction of the I-95-Springfield Interchange in the Northern Virginia District (with a number of new structures) both to commence in the year 2000. VDOT wants to investigate new technologies available for keeping frost from developing on these structures.

The initial phase of this effort involved selecting an anti-icing spray system that is most appropriate for the bridge site. Time constraints due to the design schedule for the I-95 and Springfield Bypass bridges dictated that the pilot test system be designed and installed during 1998. For this reason a bridge scheduled for deck surface replacement was chosen for the pilot test installation. The bridge is on the ramp from Route 7 Eastbound Lane (EBL) to the I-66 Eastbound Lane (EBL) in Fairfax County, Virginia. This bridge site is located in an urban area where frost conditions during winter can be quite prevalent.

The anti-icing system is designed and manufactured by Odin Systems International, Inc. of St. Simons Island, Georgia. The system is composed of a reservoir, a pump and a network of spray nozzles capable of applying a liquid anti-icing agent on the travel lanes of a bridge deck. The liquid anti-icing agent is magnesium chloride. Three nozzle-mounting schemes will be tested: parapet mounted; in deck lane mounted; and, in deck centerline mounted.

Project Milestones:

Construction Began	10/98
Project Operational	3/99

This spray system is automatically activated by a computerized control system developed at the Virginia Transportation Research Council. When activated, the system will spray a liquid chemical across the deck to neutralize patches of ice and other agents that cause slipping. The spray system is activated through the following combination of input sensors:

- Air Temperature
- Relative Humidity
- Precipitation
- Moisture on deck surface
- Deck surface temperature
- Chemical presence on deck surface

Construction for the Anti-icing System began in October 1998 as a part of the normal maintenance replacement of the bridge deck surface. The system was accepted by VDOT on March 4, 1999 and had its first opportunity to operate during the snow event of mid-March 1999. Further evaluation will be conducted by the Virginia Transportation Research Council.

Project Name: Transportation Communications Center (TCC) (formerly Transportation Operations Center [TOC])
Project Participants: Robin Allen – VDOT
VDOT Contact: Phone (703) 383-2001 Fax (703) 383-2040 Email Allen_RM@vdot.state.va.us

Project Description:

The current responsibilities of the Northern Virginia Transportation Communication Center (TCC) include taking and responding to citizen calls, providing customer service in the NOVA District, and maintaining contact with the media during emergencies. Future plans call for the Center to coordinate all road construction, maintenance, and permit work, adjusting the District Signal System during emergencies, and coordinating reports and status of the roads during snow events. Future tasks will become possible as individual management systems become integrated.

The following functions that were performed by the former Transportation Operations Center (TOC) were consolidated with the Smart Traffic Center in October 1998:

- All dispatching and two-way radio capability
- Highway Advisory Radio Program
- Call Box Program
- Smart Traffic Center Data Entry
- Responding to all VDOT telephone calls after 5 P.M. and until 8 A.M.

The Following functions remain at the original TOC, now called the Transportation Communications Center (TCC):

- Customer service information clearing house
- Call services for VDOT from 8 A.M. to 5 P.M.
- One stop shopping for all inquires
- During snow events the TCC reverts back to a 24-hour a day operations center and maintains information on:
  Road reports
  Equipment reports
  Materials reports
  Conference calls with the Council of Governments
  Coordination with the Fairfax County School transportation

A fiber-optic link between the STC and TCC has been established. Presently, the link allows TCC to view STC CCTV images and to select the cameras.

Project Milestones:

Operational	7/94
TOC Consolidates at STC	10/98

Project Name: District-Wide Telecommunications System
Project Participants: Robin Allen – VDOT
VDOT Contact: Phone (703) 383-2001 Fax (703) 383-2040 Email Allen_RM@vdot.state.va.us

Project Description:

VDOT purchased a new 100% digital telecommunications system from Siemens, which is installed at the Northern Virginia District office and at several Area Headquarters. The system is capable of voice, data, and video transmission and has a multi-media server which can link documents, voice mail and e-mail.

The telecommunications system allows VDOT staff to move, add and change files internally and in real-time fashion. The system provides call accounting, records and billing information, prevents long distance abuse and provides voice mail for all VDOT district employees. Functions can be added to connect the Northern Virginia District to other areas of the state, and by leasing a telephone line long distance calls can be eliminated within a 500-mile distance of the main switch.

The system will enhance VDOT's one-number service center that was established in 1994 and provide better customer service. Customers can reach the service center by dialing a local telephone number or dialing an 888 exchange and the same number. The telephones are linked to desktop computers for a variety of applications and, in the future, will provide caller information associated with previous customer calls, or correspondence.

Additional VDOT Northern Virginia facilities will be connected during the 1998-99 fiscal year. Presently, voice and video conferencing are provided with the system. All users are connected via a 5-digit dialing mode. This eliminates external call costs to other VDOT facilities.

Project Milestones:

Project Name: Advanced Law Enforcement and Response Technology (ALERT)

Project Participants: J.R. Robinson – VDOT; Virginia State Police; FHWA; Maryland State Highway Administration; Maryland State Police; Prince George County Police Department; Fairfax County Police; DC Metro Police; Alexandria Police; US Park Police; US Secret Service

VDOT Contact: Phone (804) 786-6677 Fax (804) 786-9748 Email robinson_jr@vdot.state.va.us

Project Description:

ALERT is an integrated in-vehicle platform for enforcement, emergency management services and other specialty vehicles to provide enhanced public safety and improve incident response and management. The City of Alexandria Police Department, US Secret Service, and US Park Police are currently using the ALERT vehicles. These vehicles, though operated by different jurisdictions, are able to communicate with each other.

This project consists of expansion, operational testing, and assessment of the ALERT technologies for incident management. The operational test would be a multi-year and multi-phase effort and would provide a forum to demonstrate and evaluate advanced technologies and to assess their impact on incident management. The focus of the project will be the I-95 portion of the Capital Beltway including the Springfield Interchange and the Woodrow Wilson Bridge. Future phases will expand the vehicles involved with fire, medical, and safety service patrol in the same geographic area, and then to the entire Beltway and ultimately to the entire Washington Metropolitan region.

This FHWA managed project would be composed of three primary phases. Phase I would establish the initial ALERT law enforcement demonstration capabilities. Phase 2 would integrate the other first responder/incident management units including motorist's assistance, fire and emergency management services. The third phase would focus on full operational activities by all participants while the system is being evaluated.

Project Milestones:

Develop scope by FHWA	4/99
Seek Funding	4/99

Project Name: Demonstration of Anonymous Mobile Call Sampling Leveraging Location Fingerprinting
Project Participants: Maryland State Highway Administration (Lead Agency); VDOT; Federal Highway Administration; US Wireless Corp.; Bell Atlantic Mobile; University of Maryland
VDOT Contact: Phone (804) 786-6677 Fax (804) 786-9748 Email robinson_jr@vdot.state.va.us

Project Description:

This project will demonstrate the costs and benefits of using anonymous mobile telephone call sampling to determine travel flow conditions throughout the Washington region. The demonstration will take place along the Capital Beltway, between the Springfield Interchange and the Maryland Route 5 Interchange. While private industry has developed a solution to the challenge of locating and tracking mobile phone calls to serve the E911 market, a variety of additional applications for this technology can be used for Smart Travel. This demonstration project would utilize this technology to assist in:

- Providing accurate traveler information to commuters
- Managing congestion around planned construction and maintenance projects
- Anticipating and planning for congestion impacts of construction projects
- Enabling coordinated incident management during emergency response
- Maximizing the efficiency of state highway capital assets
- Minimizing operational costs in generating accurate traffic data

This demonstration will verify its cost effectiveness as a traffic data collection mechanism.

Project Milestones:

Define scope and seek funding	4/99

Project Name: Dulles Corridor Technology Task Group

Project Participants: Tom Farley and Amy Tang – VDOT; Corey Hill – Virginia Department of Rail and Public Transportation (VDRPT); Northern Virginia Transportation Commission; Washington Airports Task Force; Metropolitan Washington Airports Authority; Dulles Area Transportation Association; Fairfax County; Washington Metropolitan Area Transit Authority; Loudoun County

VDOT Contact: Phone (703) 383-2240 Fax (703) 383-2250 Email amytang@vdot.state.va.us

Project Description:

The Dulles Corridor project is a four-phase project leading to the ultimate implementation of rail transit service in the Corridor. The first two phases involve express bus improvements in the Corridor. Phase three will implement a Bus Rapid Transit (BRT) system to provide high quality bus service as an interim step to rail. Phase four will implement a rail service from the West Falls Church Metrorail Station to the vicinity of Route 772 in Loudoun County. Ten stations are planned along the rail line with service directly to Dulles International Airport and Tysons Corner.

The Dulles Corridor Task Force is appointed by Secretary of Transportation Shirley Ybarra to undertake the implementation; J. Kenneth Klinge chairs the Task Force.

The Dulles Corridor Technology Task Group was formed by the Task Force to (1) provide a link between innovative technology and funding resources, (2) assist the Service Delivery Task Group in determining the best uses for new technologies in the Dulles Corridor area, and (3) advocate technological changes and provide guidance with regard to procurement.

The Technology Task Group has developed a technology application policy and screened preliminary candidate technologies. A consultant team will assist the Technology Task Group to refine a detailed list of viable technology alternatives for high quality transit services along the Dulles Corridor.

Project Milestones:

Technology Task Group Formed	2/99
Screen Preliminary Candidate Technology	3/99
Select Consultant	3/99
Technology Application Policy	4/99