PROJECT REPORT

SMARTRIP REGIONAL ROLLOUT

February 6, 2007

PROJECT REPORT: REGIONAL SMARTRIP ROLLOUT

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PURPOSE

This Special Project Report addresses the SmarTrip Regional Farebox Procurement project from the perspective of the Northern Virginia Transportation Commission (NVTC). NVTC is the agency managing the farebox purchases for the six participating transit systems in Northern Virginia: Alexandria DASH, Arlington Transit, City of Fairfax CUE Bus, Fairfax Connector, Loudoun County Transit, and PRTC. The Northern Virginia farebox purchases are covered by a $6 million contract, with funding coming from a variety of state, local and federal sources. The technical consulting services contract that supports the farebox purchase contract is also funded by state and federal grants, including FTA VA-26-7009.

This report is intended to provide a brief history of the project, and a discussion of lessons learned in the process of bringing together a regionally integrated fare collection system that includes multiple transit agencies and jurisdictions of all shapes and sizes.

EXECUTIVE SUMMARY

As one might expect with cutting-edge technology projects that involve multiple jurisdictions, achieving regional integration of Smartcard fare collection has proven to be a very difficult and elusive task for the Northern Virginia Transportation Commission. The rollout of a regionally integrated smartcard fare payment system has experienced delays for several reasons, including contractual issues with the vendor, regional fractionalization, disputes between vendors, equipment that initially did not work properly, and a project schedule that was overly ambitious. Significant progress has been made, however, and while there are still many challenges facing NVTC and the region, a successful conclusion is in sight.

NVTC and its regional partners have profited from the lessons learned by transit systems in other locations that have purchased new fare collection technologies. In addition, NVTC's lessons learned should be especially helpful to transit systems seeking to install cutting-edge technology in a regional setting with a large transit provider operating a heritage system, while its smaller neighbors are seeking the latest improvements that will still be fully compatible.

For the regional participants in NVTC's project, there are three major lessons to date. The first is to recognize that **smaller transit systems may not have the resources to operate a full-fledged smartcard-based fare collection system**. The second is to understand that with multiple transit systems in the same region, **total independence is impossible**. Every agency's fare collection system must maintain consistency and compatibility with every other agencies' fare collection systems. Finally, a major lesson is to **take advantage of the strengths of each transit system, especially those of large, regional transit system partners**. Smaller agencies should take advantage of the strengths of the larger agencies, in terms of staff size, resources, and technical sophistication. At the same time, small agencies must

understand and accept the fact that larger agencies have a much larger investment, and have much more at stake, and accordingly, they should have more control over the governance, architecture, and configuration of a regional system. In a regionally integrated system that includes very large metropolitan transit systems and very small suburban transit systems, not every participant is an equal partner, and efforts to assign equal financial responsibility and decision-making authority to each participant are counter-productive.

The table in Appendix A shows the relative size of this region's bus systems and the map in Appendix B shows a schematic depiction of the integrated rail and bus route structures.

HISTORY

NVTC and the Regional Partners

NVTC began its efforts to achieve an integrated regional fare collection system using smartcards over a decade ago. Originally, the plan was to implement a pilot program of smartcard payment on transit systems in Northern Virginia, using the WMATA SmarTrip card format. The two major projected benefits of the regional fare integration project, stated in a 1997 SSTP Grant Application, were:

> ➢ increased ridership resulting from more convenient payment options and more flexible pass products and renewals
> ➢ reduced expenses for cash handling and the maintenance of fare-collection equipment.

Within a year, the planned pilot implementation had grown into a region-wide, system-wide implementation of SmarTrip fareboxes and fare payment systems for Northern Virginia transit agencies.

By 1997, NVTC had obtained $1,200,000 in federal funds to initiate a regionally integrated fare collection system among WMATA, VRE, and local bus systems in Northern Virginia. This included a $200,000 FTA Headquarters Grant, VA-26-7009. This grant was originally intended for demonstration of smartcard technology in the region, but was later re-assigned (with the permission of FTA) to fund the technical services and consulting contract for the SmarTrip Regional Farebox Rollout in Northern Virginia.

In 1999, the Washington Metropolitan Area Transit Authority ("WMATA") issued an RFP to procure smartcard-enabled fareboxes for its bus system.

WMATA had already successfully implemented a smartcard payment system for its Metrorail system (known as SmarTrip) and it wished to expand that system to cover its bus fleet. In addition, the State of Maryland and the Northern Virginia Transportation Commission had wished to join WMATA in the purchase of SmarTrip-enabled fare collection equipment, with the intent of developing a fully integrated regional fare collection system. In January of 2001, WMATA awarded its farebox contract to Cubic Transportation Systems, Inc.

In August of 2001, NVTC exercised an option in WMATA's contract with Cubic Transportation Systems to purchase SmarTrip-enabled bus fareboxes for five transit systems in Northern Virginia (Loudoun County Transit was added to the contract in April of 2002). In the same year, NVTC contracted with the IBI group to provide technical expertise and assistance with the farebox and garage computer system installations in Northern Virginia, using some of the federal grant funds originally provided to NVTC in 1996. In 2003, NVTC secured an additional state grant for point-of-sale devices in Loudoun County to provide further opportunities to use the regional SmarTrip network.

The Regional SmarTrip Rollout project included seventeen participating systems at its inception, known as the Regional Partners. They included:

The Washington Metropolitan Area Transit Authority (WMATA)
Maryland Transit Administration (MTA)
Montgomery County Ride-On
Prince Georges County "The Bus"
Frederick County Transit
Ocean City Transit
Harford County Transit
Annapolis Transit
Howard Area Transit
Laurel Transit

The Virginia Railway Express

Fairfax Connector

Alexandria DASH

City of Fairfax CUE Bus

Agencies covered by the NVTC contract

PRTC OmniLink

PRTC OmniRide

Arlington Transit

Loudoun County Transit

Since the project began in 2001, the Regional Partners have met each month at WMATA to discuss the progress of the regional SmarTrip rollout, and exchange information. Regional cooperation is critical to the success of this project.

Testing at WMATA

Early stages of the project (development of the work plan, agreement on initial specifications, First Article Testing) experienced delays, as WMATA staff and Cubic staff attempted to work out persistent problems with the software and fareboxes. There were no liquidated damages provisions in WMATA's contract although delay in achieving project milestones meant that Cubic did not earn the payments associated with those milestones.

By the time the WMATA In Service Qualification Testing (ISQT) finally began in November of 2002, the project was already nine months behind schedule. The ISQT was scheduled to run for 90 days, but because of extensive problems with the fareboxes (e.g., jamming coin slots, malfunctioning bill-validators) and with the system software (e.g., end-of-day processing malfunctions, daily cash reconciliation) the ISQT ran for seventeen months.

By the time the ISQT was completed in April of 2004, WMATA was using the 23rd version of the Cubic garage computer software, and the system was still showing minor errors with end-of-day processing. WMATA proceeded with installing equipment in the remaining bus garages, and completed its entire fleet installation in June of 2004. At that time, the project was two years behind schedule, and Cubic had not yet begun to work on the NVTC implementation.

Metro has been generally pleased with the performance of its SmarTrip fareboxes since then and SmarTrip cards are heavily used by customers on many Metrobus routes.

Governance Issues and the RAC

During the same time that WMATA was conducting their ISQT, the regional partners were working to develop a governance structure for the regionally integrated fare collection system. The Regional Administrative Committee (RAC) would include representation from each of the agencies participating in the regional SmarTrip system, and set policies for the initial structure and ongoing operations of the regional SmarTrip system. This included policies such as the time for settlement adjustments, refunds, probing requirements, revenue sharing, and every other rule that would govern the operations of those participating in the regional SmarTrip system. Approximately two years into this effort, WMATA staff informed the Regional Partners that the Regional Administrative Committee would no longer be a topic of discussion at the regional meetings.

The regional partners learned that the WMATA Board of Directors was adamant that the governance of the regional SmarTrip system must ultimately fall under the control of the WMATA Board of Directors, and not under the domain of the Regional Administrative Committee. The WMATA Board was not going to

allow an informally selected panel of representatives from various transit systems in the region to dictate or define WMATA policy, whether it be operational issues or fare collection issues.

While this was not a popular decision at the time, it ultimately became clear to the regional partners that this was the correct decision. WMATA had committed over $100 million to the regional SmarTrip project, an investment several times larger than that of MTA, and 20 times larger than all of the Northern Virginia agencies combined. WMATA provided over one million daily passenger trips to the region, again significantly larger than MTA, and over 20 times more than all of the Northern Virginia agencies combined. WMATA also had a very successful and effective smartcard system already in place in the region, unlike all other regional participants.

WMATA had invested far more in the regional SmarTrip system than all other regional participants, and had a much larger stake in the success of the regional system, not to mention the success of their current system.

In the aftermath of the RAC dissolution, WMATA and the regional partners agreed to re-structure the governance of the regional SmarTrip fare collection system. The regional partners would still be asked to advise and discuss regional SmarTrip policies, but the WMATA Board of Directors would have the final say on all issues.

All Eyes on Baltimore

Once the WMATA bus installation had been completed, the focus of the regional SmarTrip rollout shifted to Baltimore. Cubic had introduced its next generation of farebox and garage computer software, known as Nextfare4, in the summer of 2003. The Maryland Transit Administration (MTA) accepted a

proposal from Cubic to install Nextfare4 software on their bus and rail systems. This decision by MTA had major consequences for the other Regional Partners: if the integrated regional fare collection system were to ever become a reality, every participating system would eventually have to purchase and use the same software that MTA had purchased. In the interim, the Nextfare4 software would have to be compatible with the existing Cubic software on the WMATA bus and rail systems (known as Nextfare 3).

In September of 2003, Cubic informed NVTC that the commission would be receiving the Nextfare4 software on its fareboxes and garage computers. This was of concern to NVTC, as it had always been the intention of NVTC to use the same equipment as WMATA, and switching to Nextfare4 meant that WMATA and NVTC agencies would be using different software. However, there were several compelling reasons for which NVTC approved the switch. Nextfare4 provided several advanced features that, according to Cubic, would not be available using WMATA's legacy system. These features included Autoload (the process of designating a specified amount to be automatically loaded on to your smartcard once its remaining stored value has dropped below a specified level); Smart Benefits (a directed Autoload of pre-tax transit benefits); and the ability for a card to store up to five pass products. In addition, WMATA staff indicated that it was only a matter of time before WMATA upgraded to the Nextfare4 software, and that it would be wise for NVTC to take advantage of the upgrade being provided free of charge.

The MTA bus system in Baltimore would be one of the first transit systems in the nation to install and test Nextfare4 (the others being Los Angeles, Atlanta, Minneapolis and Houston). The MTA In Service Qualification Testing was scheduled to begin in August of 2004, but it was not until November of 2004 that the ISQT actually started. The five months of delay were caused by repeated failures of the Nextfare4 software during the Factory Acceptance Testing and First Article Testing. First article testing and approval involves evaluating a

contractor's initial, preproduction, or sample model or lot to ensure the contractor can furnish a product conforming to all contract requirements.

Back to NVTC

The successful completion of the above-mentioned In Service Qualification Testing (ISQT) that was taking place at MTA in Baltimore was critical to the progress of the installations in Northern Virginia. MTA was testing the Cubic Nextfare4 software that would be installed on the fareboxes and garage computers of the transit systems in Northern Virginia. The testing at MTA was intended to serve as the formal testing of the Northern Virginia fare collection system. However, discussions with MTA staff in the spring of 2005 raised concerns among NVTC staff about the testing taking place in Baltimore. For NVTC, the most important aspect of the MTA testing was the functionality of the smartcards (how well they performed), and the interaction with the WMATA smartcard format and devices. In April of 2005, NVTC and consultant staff made a site visit to Baltimore to observe the MTA ISQT firsthand, and to discuss the results. NVTC discovered that the testing, which had taken place in Baltimore, was of little use to NVTC, as there was no formal testing of the integration with the WMATA card format.

Based on those discoveries, NVTC immediately went to the vendor (Cubic Transportation Systems) and expressed NVTC's urgent need for separate testing of the NVTC garage computer systems, and for integration testing with the WMATA card format and devices. NVTC could not allow the installation of untested software, devices or computers on its transit systems, and NVTC needed to be certain that its devices and cards would not adversely impact the devices and cards used by WMATA.

Lengthy discussions and negotiations between NVTC and Cubic eventually led to the adoption of the current testing plan. The testing plan called for formal, observed testing of the Northern Virginia garage computers and software at the Cubic facilities in San Diego and Chantilly. The testing plan also included formal, observed testing of the integration between WMATA's card format and equipment and the card format and equipment to be installed in Northern Virginia, according to an extensive test plan that was approved by WMATA, NVTC, and MTA). Additionally, the plan called for a 30-day "dry run" pilot installation of five buses and a garage computer system at the Alexandria DASH facility. The full installation of the fareboxes and garage computers in Northern Virginia would not take place until this testing has been completed to the satisfaction of NVTC.

The formal observed testing in San Diego and Chantilly was completed in July of 2006. The integration testing of WMATA's existing card format and the new Nextfare4 card format was completed in August of 2006. The System Integration Testing of the NVTC software and configurations was also completed in August of 2006, with only minor problems. The 5-bus pilot installation on Alexandria's DASH was completed in October of 2006, and the 30-day testing period began in mid-November, once some minor software issues were addressed. If there are no major issues or problems uncovered by DASH over the next 30 days, the fleet wide installation of fareboxes identical to the one pictured below will occur at DASH in January of 2007. The remainder of the Northern Virginia transit systems would follow in the next month. Initial testing, for example, has occurred during November, 2006 for the Fairfax Connector.

Smaller Agencies Need Help

In January of 2006, WMATA approved a resolution known as the Single Platform Solution, which will migrate the WMATA legacy smartcard system to the previously discussed Nextfare4 software. This is very important to the region, as NVTC and the other participating systems in the region will be using Nextfare4, and it is critical that they maintain full interoperability and consistency with WMATA.

The good news of WMATA's migration to Nextfare4 was offset somewhat by events in Maryland. In the early part of 2005, NVTC staff received confirmation that six of the Regional Partner systems, all smaller transit systems in Maryland, were no longer participating in the regional SmarTrip rollout. Details

were scarce, but NVTC staff learned that concerns over ongoing operational costs led to the departure of the smaller systems. This was of great concern to NVTC, as these ongoing costs were also an issue for smaller systems operating in Northern Virginia. NVTC had been negotiating ongoing maintenance contracts with Cubic for over a year, and the cost for farebox maintenance, software maintenance, software licensing, bug fixes, and technical support, was expected to be over $70,000 per agency. Some of NVTC's smaller agencies have annual farebox revenues of approximately $100,000 per year, and these agencies could not possibly justify spending over $70,000 to maintain their fare collection system. Something had to be done to protect the viability of these smaller agencies, or the number of regional participants would shrink further.

In an effort to protect and ensure the participation of smaller systems in the Regional SmarTrip Rollout, NVTC staff worked closely with WMATA to develop a Regional Software Maintenance Agreement (RSMA) as a component of the WMATA Single Platform Solution contract. The RSMA covers WMATA and the "friends of WMATA" (NVTC systems and Montgomery Ride-On), and provide all participating agencies with advantageous pricing for software support, bug fixes, updates, and technical support. This provides significant cost savings for each of the participating NVTC systems in terms of ongoing support and operations. Instead of having to spend $70,000 per year to maintain their fare collection systems, smaller agencies will spend approximately $30,000 per year for the first two years, and then approximately $23,000 per year for subsequent years.

In addition, discussions surrounding the RSMA led to a very advantageous change in the regional architecture. In the original configuration, each of the NVTC systems (DASH, ART, CUE, etc.) would have a garage/central computer, and that computer would be running some very expensive and complex software packages (full enterprise version of Oracle DB, WebLogic, Hummingbird). Each of those computers would be capable of serving as a

central computer for a system as large as Los Angeles County MTA. Each of those computers would also require a regimen of daily, weekly, and monthly maintenance tasks, and each system operator would need a significant amount of training to operate these very complex software packages.

The new arrangement under the RSMA places this very complex software on the WMATA central computer, with WMATA assuming the daily, weekly, and monthly maintenance tasks in a centralized management role. WMATA will also assume the complicated tasks of programming and maintaining fare tables, business rules, and fare products for the participating NVTC agencies (although the agencies will still have full control of what is being programmed).

The new arrangement provides major cost savings and improved operational support for participating NVTC agencies, while at the same time removing the major burdens of managing and maintaining their system software and configurations. For WMATA, the main benefits are greater control and quality assurance. As with the governance issues discussed previously, WMATA bears far greater risk in the regionally integrated fare collection system. An improperly configured fare table can corrupt the regional fare collection system, leading to a system-wide failure. In the event of a system-wide failure, WMATA would lose approximately $1 million per day, which is several times more than all of the NVTC agencies combined would stand to lose. It makes sense that WMATA should have more control over what touches their fare collection system. NVTC systems will still have full control over the rules for their fare collection system and their fare tables and fare products, but WMATA will have quality assurance control over how those fare tables and products are programmed.

It should also be noted that MTA (who has been running a Nextfare4 system for the past 18 months) recently informed the Regional Partners that MTA would be contracting with Cubic to handle configuration and fare table

management, at a significant cost. Thanks to the RSMA, NVTC agencies will not have to bear those costs.

NVTC agencies provided formal letters of participation to WMATA in August of 2006, stating their intention to participate in the cost-sharing agreements of the RSMA. The cost-sharing provisions commenced with the first WMATA-hosted regional installation of fareboxes and Nextfare4 software, which occurred in October 2006 at the Alexandria DASH facility.

The Regional Customer Service Center

In parallel with the region's efforts to develop and test fareboxes, garage computers, and fare collection software, there was the equally important task of implementing the Regional Customer Service Center. The Regional Customer Service Center ("RCSC") provides customer service and financial clearing for all SmarTrip transactions in the Baltimore-Washington regional area. The RCSC is located in Reston, Virginia, and is operated by a contractor, ERG/Northrop-Grumman, who was selected by representatives from WMATA and the Regional Partners through a competitive bidding process.

Each of the agencies participating in the regional SmarTrip system has formally agreed to the Operations Funding Agreement, which obligates their participation in the cost-sharing arrangement for the RCSC. This agreement, developed over several months of meetings with the Regional Partners and formally approved by the WMATA Board of Directors, allocates the monthly operating costs of RCSC among the Regional Partner agencies. After months of discussions, it was decided that the costs would be shared proportionally, based on the number of smartcard transactions that each agency sends to the RCSC for processing.

The initial planning of the regional system had WMATA acting as the lead agency, and providing a central bank account for the purposes of collecting revenue and financial settlement and clearing. WMATA's upper management quickly rejected that idea, as they did not wish to assume the responsibility and liability for handling the funds of all participating agencies. It was decided that the clearing and settlement arrangements would not include a central bank, or ongoing repository of funds. Each agency would hold the cash or credit card funds it collected for SmarTrip value loads (adding money to the card at a farebox or ticket vending machine) and at the end of each month, each agency would make a claim to the region for the SmarTrip fare payments accepted on their system. The settlement formulas employed by the RCSC would then decide how much to deduct from or credit to each agency's held funds, based on the number of value loads versus the number of smartcard fare payments accepted by that agency. The monthly exchange of funds would be handled automatically via Automated Clearing House (ACH) electronic bank fund transfers.

There have been (and continue to be) extensive discussions among the Regional Partners surrounding the details of the RCSC clearing and settlement operations. At issue are the rules surrounding the resolution of settlement disputes, ACH transaction processing, and the processing of claims and manual adjustments. Each of the participating agencies, and in some cases the jurisdictions in which these agencies operate, have their own set of rules and regulations regarding the handling of cash revenue, disbursement of payments, ACH generation, and customer refunds. It was (and still remains) a major challenge for the Regional Partners to integrate these various rules and regulations into a coherent operational structure.

In addition, these transit agencies take great pride in their handling of customer service issues and complaints. Under the regional SmarTrip system, customer inquiries relating to SmarTrip transactions will be directed to the RCSC

for handling. This is necessary because the RCSC (and not the individual agencies) will be able to access, check, and verify the transactions for an individual card via computer. For the customer service representatives at the participating transit agencies, this represents a loss of control in a very important area, and thus there have been extensive procedures put in place to ensure that customer service remains at a high level.

As this is one of the first regionally integrated electronic fare payment clearinghouses of its kind anywhere in the United States, there continue to be numerous unforeseen issues affecting regional operations that require additional discussion among the Regional Partners. For example, the smartcard hotlist (a list of stolen or lost cards that should not be accepted) will be sent electronically to each agency on a daily basis. It is then up to each agency to upload this hotlist to their fareboxes when they probe and empty their cashboxes. However, if an agency does not probe their buses on a daily basis, (many small transit agencies do not probe every day or on weekends) then it is possible to have buses in service that are accepting invalid transactions from cards that have been "hot listed". The projected amounts of these invalid transactions are miniscule when compared with the projected total regional farebox revenues, but any discrepancies can cause a delay with end-of-the-month settlement and clearing, and that made this a major issue. When this project began, no one could have envisioned that the basic operational procedures of smaller agencies would become an issue for discussion and dispute among the Regional Partners, but it took several months before a simple set of rules, responsibilities and procedures could be developed and agreed upon for that particular situation.

The SmarTrip transactions from Northern Virginia and other regional agencies will be transmitted from their fareboxes to their garage computers, from their garage computers to the WMATA central computer (known as the Data Network Concentrator or "DNC"), which will then send those transactions to the computers at the RCSC. The link between the WMATA DNC and the RCSC

operates under a communications protocol known as the SmarTrip Integrated Regional Specification or "SIRS". The SIRS protocol has been in development for two years (originally scheduled for three months), with WMATA, Cubic and ERG/Northrop Grumman (the operator of the RCSC and provider of communications lines for the region) working jointly on the specifications. Getting the two contractors to agree on the specifications and communications protocols associated with SIRS was a very difficult task. Each contractor had its own system of proprietary protocols and software functions, which it would not share, yet all had to work together and develop software that could communicate with all other systems. The first round of testing of the SIRS protocol began in July of 2005, and was completed in August of 2006, several months behind schedule. The final round of SIRS operational testing is now scheduled for completion in January of 2007. NVTC will be reluctant to proceed with its full system installations until the RCSC testing has been fully completed.

The Current Situation

NVTC is currently working with WMATA and Cubic to complete the initial installation of WMATA-hosted software under the provisions of the Regional Software Maintenance Agreement, while at the same time evaluating Alexandria DASH's pilot installation of five fareboxes. If there are no further problems uncovered during the 30-day test period of the five DASH fareboxes, NVTC will proceed with the installation of the remaining 50 DASH fareboxes. At that time, NVTC and Cubic will also proceed with the configuration testing and farebox installations for the remaining NVTC agencies.

In parallel with the activities surrounding the various testing scenarios described above, NVTC staff has been working with Cubic to develop an acceptable training plan for the regional operators. It is very difficult to schedule training when one is not absolutely certain of a date for installation. On the one hand, you do not want to train operators and maintenance personnel too far in

advance of the installation date, because they will forget their training if they do not use it. On the other hand, the training for this system includes instruction on farebox maintenance, farebox operation, garage computer operation, and several different software packages. Cubic needs to have substantial lead time in assembling the multitude of instructors, setting up venues, and preparing materials.

It should be mentioned that the technical consulting services provided by the IBI group via FTA grant VA-26-7009 have been extremely important, especially over the last 18 months of this project. IBI's expertise with the technical issues surrounding the testing negotiations for NVTC, the SIRS testing, the dual card format integration testing, and the training scheduling, has been indispensable to NVTC. Without the technical advice of IBI consultants, NVTC and its local transit agencies would be at a great disadvantage in negotiations with the vendor, Cubic, and with other Regional Partners (WMATA, MTA) in discussions that relate to the regional architecture, testing scenarios, and especially in the extensive design review discussions. Cubic, WMATA and MTA each employ a multitude of engineers and technical personnel who are well versed in the complexities of fare-collection systems and bus data management. NVTC and its local agencies do not have that sort of in-house expertise.

The total budget for the entire regional fare collection project is now over $150 million. Significant investments of both local and federal funds have been made by WMATA and the Regional Partners in the development of this regional fare collection system. NVTC will continue to work diligently to ensure that the Northern Virginia farebox and garage computer installations are completed, and the completed system functions properly to achieve the anticipated benefits.

CONCLUSION

Lessons Learned

In terms of bringing together a regionally integrated, smartcard-based fare collection system that includes jurisdictions and transit systems of all shapes and sizes, the lessons gained from this project so far can be broken into three major areas:

Smaller Systems May Lack the Resources to Succeed On Their Own with a Smartcard System

NVTC's experience with this project has made it clear that smartcard systems, as they currently exist, may be too complicated and expensive to design, test, install and operate for smaller transit agencies, such as a 15-bus suburban transit system. A transit system with annual farebox revenues in the $100,000 to $200,000 range simply cannot justify spending $70,000 to $100,000 annually to operate and maintain a fare collection system. For that reason, smaller transit systems need to look for project partners. NVTC staff believes, based on its experiences in managing this project, that if the transit industry were to accomplish nationwide Smartcard fare collection standards allowing interoperability, the resulting competition among vendors would ultimately prove useful in bringing down the costs, especially for smaller transit systems.

With Multiple Transit Systems in the Same Region, Total Independence is Impossible

The original idea of independent transit agencies operating autonomously in a regionally integrated fare collection system was found to be impossible. In a regionally integrated fare collection system, a given smartcard can "touch" every agency, and whatever fare products or configurations a given agency put on a smartcard can "touch" the devices at every other agency. What happens if two

agencies chose conflicting designations for their new monthly passes? What happens if an agency introduced a weekly pass that conflicted with the business rules established by several other agencies? What if an agency started issuing cards with a rider classification that was not recognized by the card readers at other agencies?

The solution to these potential disaster scenarios adopted here is to require that each agency test any new fare products or configurations on the systems of every other participating agency. This is to be accomplished at a Regional Lab, which is now operated and staffed by WMATA under the payment structure and operating rules of the RSMA.

In terms of smartcard operations in a regionally integrated fare collection system, there is no such thing as independent or autonomous operation. Every agency's fare collection system must maintain consistency and compatibility with the other agencies' fare collection systems.

Take Advantage of the Strengths of Each Transit System, Especially Those of Large Regional System Partners

In a regional integration that involves one very large metropolitan transit system and many small transit systems, there is no reason to expect all participants to be equal. In this case, WMATA faced a far greater financial and operational risk than any other participant did, and they rightfully expected a larger say on issues of regulation and governance.

Smaller systems can also benefit from the in-house expertise and resources of larger systems such as WMATA. As mentioned previously, smaller systems participating in the regional SmarTrip project were having difficulty with ongoing operation and maintenance costs. In developing the Regional Software Maintenance Agreement, WMATA and NVTC staff re-organized the regional

system architecture to relieve smaller agencies of burdensome tasks and costs. This was accomplished by centralizing administration, support, operations, and maintenance, and in the process, providing for a more reliable and robust system. The region was able to take advantage of WMATA's resources and expertise to the great benefit of all parties.

Exhibit A Estimated Regional SmarTrip® Operating Budget
Estimated RCSC Operating Cost Allocation (Years 2-5)
Plus transitional costs for ACS Customer Service for Year 1 and fist half of Year 2 (if necessary)

Operating Costs ($Millions) *includes 15% Burden (10% Operating, 5% Project Management)	Annual Ridership (000s)	Regional Share of Ridership	Quarterly Cost (Year 1) (ACS Service)	Year 1 Total ($ million)	1st Full Year RCSC Operations (+ ACS Transition) Quarterly Cost	Year 2 Total ($ million)	2nd Full Year RCSC Operations Quarterly Cost	Year 3 Total ($ million)	3rd Full Year RCSC Operations Quarterly Cost	Year 4 Total ($ million)	4th Full Year RCSC Operations Quarterly Cost	Year 5 Total ($ million)	Total Operating Cost Yrs 1 through 5 ($ million)	Agency Share of Cost (Years 1 through 5)
ART	110	0.02%	$43	0.000	$115	0.000	$141	0.001	$141	0.001	$141	0.001	$0.002	0.01%
Harford County (HATS)	200	0.04%	$77	0.000	$209	0.001	$257	0.001	$256	0.001	$256	0.001	$0.004	0.02%
Loudoun County Transit	238	0.05%	$91	0.000	$247	0.001	$303	0.001	$302	0.001	$302	0.001	$0.005	0.03%
Howard Transit	292	0.06%	$113	0.000	$306	0.001	$375	0.001	$374	0.001	$374	0.001	$0.006	0.04%
Transit Services of Frederick Co.	311	0.06%	$120	0.000	$325	0.001	$399	0.002	$398	0.002	$398	0.002	$0.007	0.04%
CTC	587	0.12%	$227	0.001	$614	0.002	$753	0.003	$752	0.003	$752	0.003	$0.012	0.07%
PRTC	956	0.20%	$370	0.001	$1,000	0.004	$1,227	0.005	$1,225	0.005	$1,225	0.005	$0.020	0.12%
CUE	981	0.20%	$380	0.002	$1,026	0.004	$1,259	0.005	$1,256	0.005	$1,256	0.005	$0.021	0.12%
Annapolis	1,300	0.27%	$504	0.002	$1,361	0.005	$1,669	0.007	$1,665	0.007	$1,665	0.007	$0.027	0.16%
The Bus	1,340	0.28%	$519	0.002	$1,403	0.006	$1,720	0.007	$1,717	0.007	$1,717	0.007	$0.028	0.16%
VRE	2,014	0.42%	$780	0.003	$2,108	0.008	$2,586	0.010	$2,580	0.010	$2,580	0.010	$0.043	0.25%
DASH	2,522	0.52%	$977	0.004	$2,640	0.011	$3,238	0.013	$3,231	0.013	$3,231	0.013	$0.053	0.31%
Ocean City Transit	3,315	0.68%	$1,284	0.005	$3,469	0.014	$4,255	0.017	$4,246	0.017	$4,246	0.017	$0.070	0.40%
Fairfax Connector	5,595	1.15%	$2,167	0.009	$5,855	0.023	$7,182	0.029	$7,167	0.029	$7,167	0.029	$0.118	0.68%
Ride-On	19,963	4.11%	$7,734	0.031	$20,892	0.084	$25,626	0.103	$25,573	0.102	$25,573	0.102	$0.422	2.43%
MTA	108,526	22.36%	$42,043	0.168	$179,798	0.719	$205,791	0.823	$216,954	0.868	$216,954	0.868	$3.446	19.9%
WMATA	337,100	69.5%	$287,301	1.149	$845,067	3.380	$702,402	2.810	$712,597	2.850	$712,597	2.850	$13.040	75.3%
Regional Total	485,347	100%	$ 344,732	1.38	$ 1,066,435	4.27	$ 959,183	3.84	$ 980,435	3.92	$ 980,435	3.92	$ 17.325	100.0%

Assumptions:

1. The following comprise RCSC operating costs:

RCSC (ERG) Operating Costs (Total)	$12,101,294
Overhead (10%)	$1,210,129
Project Management (5%)	$605,065
Annual Audit of the RCSC System (Total)	$400,000
IT Support for the DNC (Total)	$340,000
ACS Customer Service Transition	$2,068,389
Total	$17.325

2. All amounts reflect estimates, based on smart card market penetration assumptions. Actual operating costs may vary.
3. Assumes the use of ACS for Customer Service in 1st Qtr/FY04.
4. Operators begin to enable their SmarTrip systems beginning July 2003. Year 1 costs will not be incurred if the SmarTrip system is not activated in 2003.
5. Annual figures for ridership obtained from: National Transit Database, Web Site verification, and telephone requests.

Appendix B: Map of Participating Jurisdictions and Transit Systems in Northern Virginia