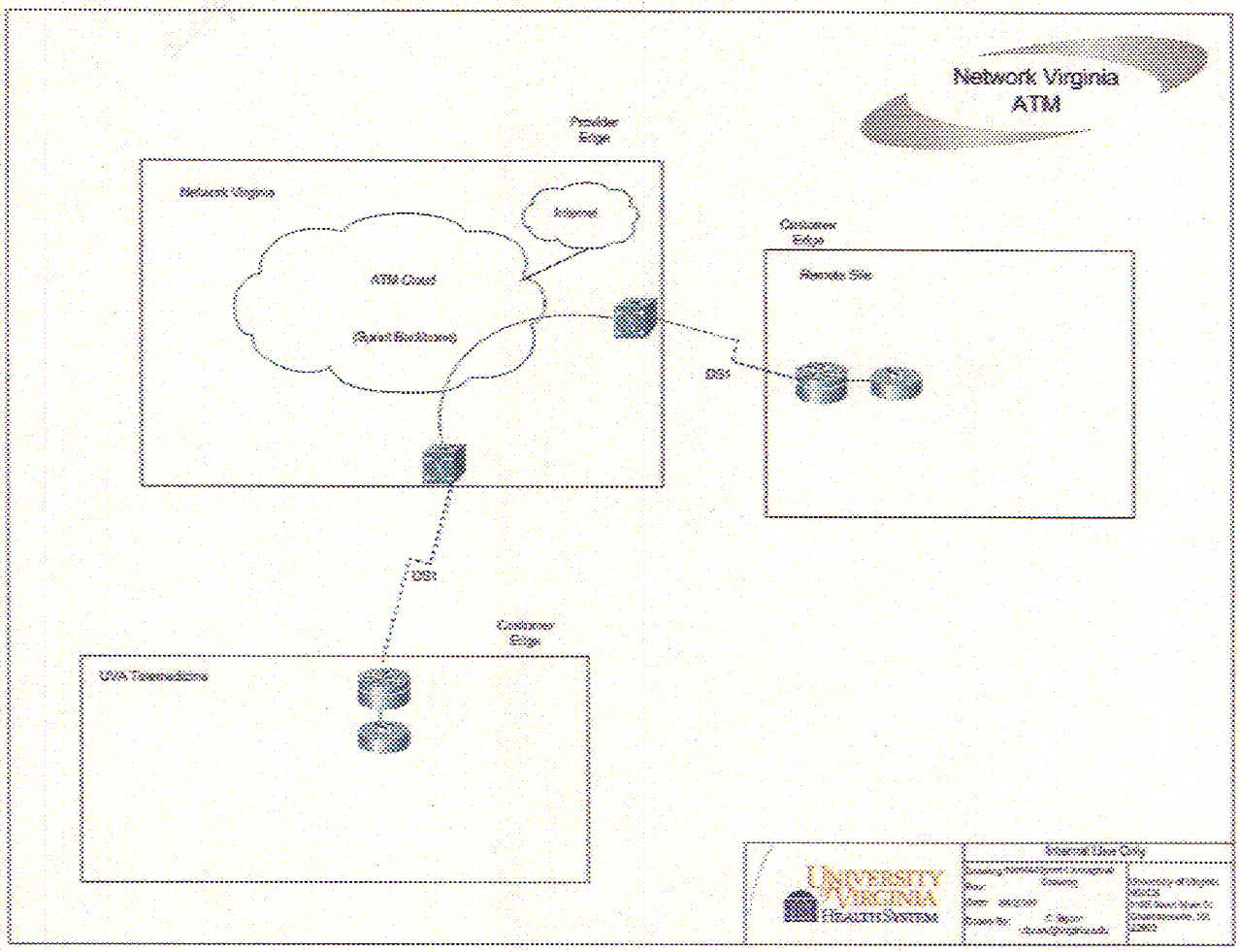

Figure 20 - Current NetworkVirginia ATM Configuration

A complete discussion of each "step" in the network deployment follows below:

<u>**Stage 1, Part A**</u>

MPLS Migration using Northrop Grumman/Commonwealth Infrastructure; Northrop Grumman provides support and maintenance. Northrop Grumman will provide a Managed Router service utilizing a Multi-Protocol Label Switching (MPLS) network to five (5) telehealth sites (Shore Memorial, 3 Community Health Center sites on the Eastern Shore and Johnston Memorial Hospital).

This will be the start of the Northrop Grumman MPLS telehealth network that is being deployed by the Commonwealth. This MPLS service is called Private Internet Protocol (PIP) service and is a network based Virtual Private network (VPN) service enabling any to any communications over a secure network. The Managed Ethernet Port services starts at the backplane of the customer edge router and provides the local area network all the way to the Telemedicine appliances (See Figure 20). The PIP core network

utilizes service provider routers from leading MPLS router manufacturers. These PE (Provider Edge) routers enable the network to provide low levels of latency for a QOS (Quality of Service) enabled services. The PE routers are designed and configured to provide a robust of availability as required for services such as rural healthcare. The core network consists of OC48 backbone connections between Richmond and Relay MD POP locations with all the other edge nodes utilizing dual OC12 backbone connections. **In** support of a rural healthcare network, dedicated access circuits from the customer premise will be terminated to the PIP's PE routers to connect to the MPLS network. **As** a managed network, the circuits are supplied as part of the total network environment and will terminate the dedicated access circuits to its PE routers. The PIP network supports a range of port speeds from DSO to OCn speeds.

Management and awareness of the environment is provided through the Centralized Management Operations Center (CMOC) which improves collaboration and leverages synergies among platforms. The CMOC also includes the NOC that monitors the health of the network. All network devices are managed for operational effectiveness and operational status. The network management goes beyond elementary root-cause analysis to determine the problem state and then link it into the diagnostic process. Both the operational state of the network and virtual services surviving a failure are key factors to prioritize and aid in the timely resolution of complex problems.

The MPLS managed network includes an internet secure gateway **(ISG)** design that provides a consolidated, security-focused Internet presence. The purpose of the **ISG** is to ensure a secure environment for supporting healthcare programs and applications, by providing a multi-layer defense-in-depth security posture by providing virtualized firewalls, intrusion prevention, gateway antivirus, content filtering, and content caching for network constituents.

First and foremost, the **ISG** provides firewall protection for the healthcare network, permitting traffic that specifically conforms to state information security policy. Techniques implemented at this layer include stateful-inspection firewalling, packet filtering and access control lists. The purpose of this system is to detect and prevent inappropriate material or material that otherwise violates network usage policies. Preventing viruses, spyware and malware at the gateway is an integral part of any enterprise security solution. As part of the MPLS managed network, the **ISG** solution includes a hardware accelerated anti-virus solution that is capable of scanning thousands of packets per second to determine which of those messages or packets contains or contributes to an active virus, spyware or malware. Lastly, the **ISG**

solution provides robust intrusion prevention services to the network, providing a proactive means to thwart and report intrusion attempts.

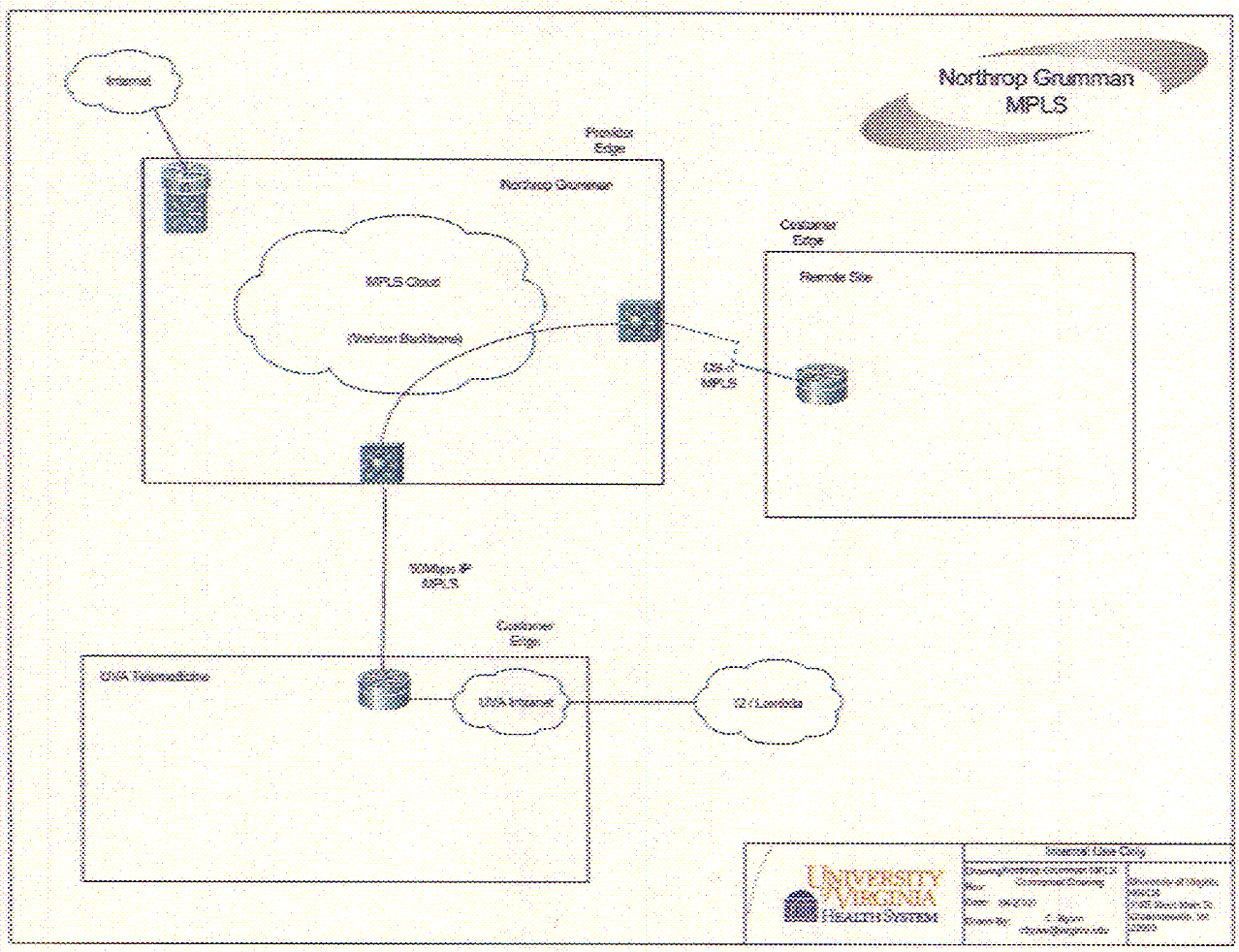

Figure 21 - Proposed Northrop Grumman MPLS Configuration

Stage 1, Part B

MPLS Migration using NetworkVirginia Infrastructure; UVA Office of Telemedicine provides support and maintenance. University of Virginia and NetworkVirginia (Verizon/Virginia Tech) will convert four (4) DS1 ATM sites to MPLS (Bath County, Carilion Giles, Buchanan General, and UVA). Network monitoring and support will remain with UVA. (See Figure 21). Currently UVA works with NetworkVirginia and their telecommunications providers Verizon and Sprint to provide broadband service to our participating sites. The network is managed by Virginia Tech in Blacksburg and the Office of Telemedicine at the University of Virginia monitors the network and maintains the routers, switches and firewalls at the remote rural healthcare sites. The UVA Office of Telemedicine will provide 24/7 network monitoring and support, allowing us to proactively identify, diagnose, and correct any network

problems. This approach will provide a single point of contact for our participating sites and service providers to address issues pertaining to the network.

Stage 2

Upgrade of existing infrastructure to higher bandwidth options. University of Virginia and NetworkVirginia will upgrade four (4) DS1 locations to multiple DS1 circuits for greater throughput. One of the upgraded sites will be the Office of Telemedicine. Using multiple DS1 circuits will allow us to comparatively analyze both network performance and cost effectiveness of our existing infrastructure and the proposed MPLS network solution. As in Stage 1-B, the UVA Office of Telemedicine will continue to provide 24/7 network monitoring and support, allowing for the proactive identification, diagnosis, and correction of any network problems.

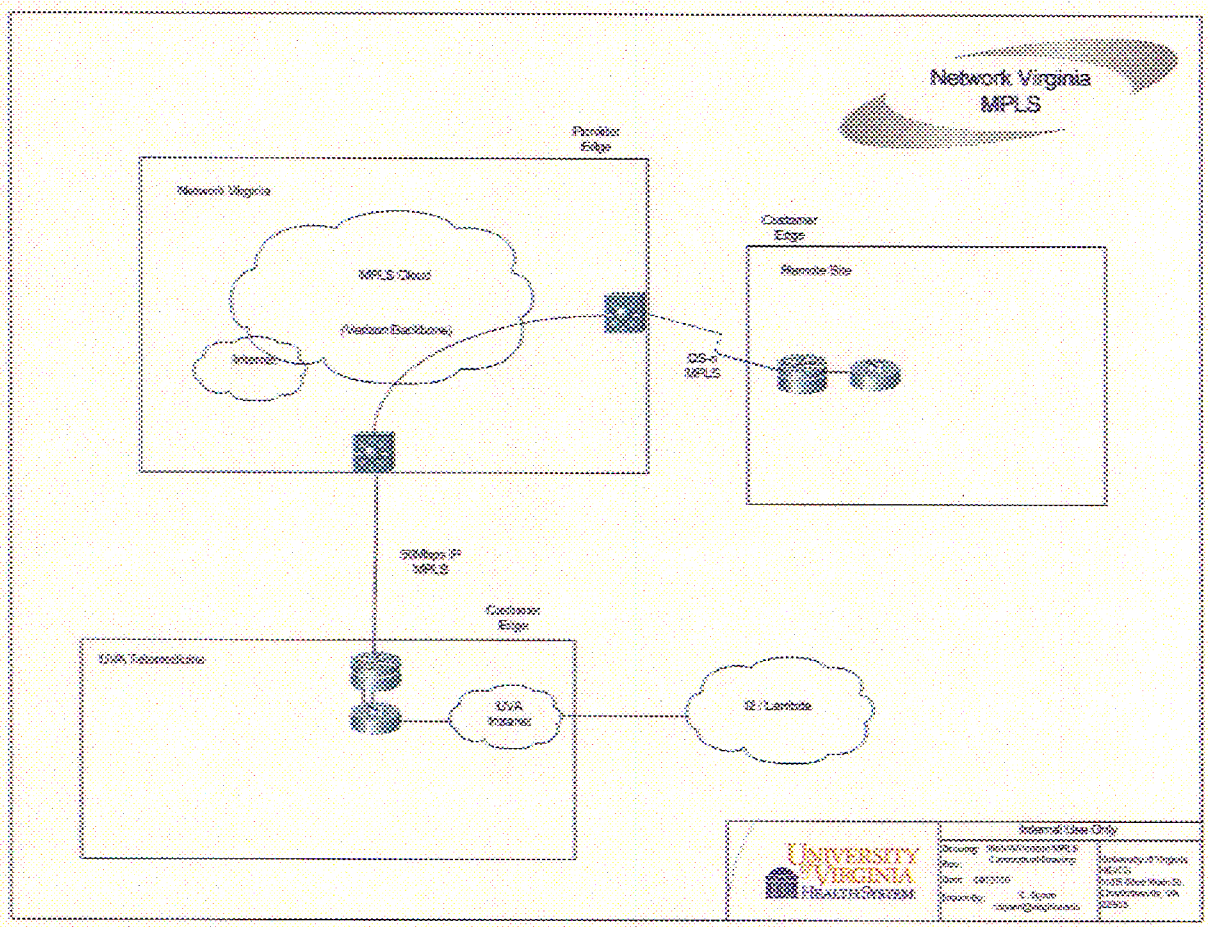

Figure 22 - Proposed UVA/NetworkVirginia MPLS Configuration

During both Stages 1-B, and Stage 2 the UVA Telemedicine NOC will maintain a primary monitoring service for 24/7 monitoring of the network. Should a problem arise, an instantaneous alert will be sent via email and page to designated engineers and managers. The alert will also be audible at the primary server

location. This type of monitoring will provide for a proactive response for any network or telehealth related issues. In addition, the support and engineering teams will schedule and maintain software upgrades to the most current versions. Test drills will he scheduled and performed periodically to ensure compliance and functionality. In the pilot phase, we will be working and monitoring with Northrop Grumman and Network Virginia as service providers. Verizon provides the backbone and transport for both providers which will allow for a side by side comparison of QoS and reliability. NG will provide connectivity up to the LAN side of the CPE at the remote site. UVA Office of Telemedicine will work/monitor with NG and the remote site to insure 24/7 availability. UVA will also manage telehealth equipment at the remote sites. Network Virginia will provide connectivity up to the remote site demarc. UVA Office of Telemedicine will manage the CPE and telehealth equipment at the remote sites.

Stage 3 – Status Quo

Those sites falling into Stage **3** will continue to be served by their existing DS1 service. These sites, deemed critical to the clinical care process of stroke, will be integrated into the VAST network but will not receive additional broadband capacity during the pilot.

Additional Activities

In addition to the MPLS migration, we propose an implementation to eight (8) Emergency Medical Service (EMS) providers throughout Virginia (See Section ***5)***. Each provider will have DS1 service installed along with the necessary network equipment (router, switch, and firewall). The connections will be used to offer educational programs to the EMS providers, primarily through the use of two-way, interactive videoconferencing. As the technology matures, participating EMS providers could potentially serve as a point of presence to the larger community, thereby expanding and supporting the VAST network and improving the delivery of care to rural areas of Virginia.

Partnerships

The VAST partnership and associated network infrastructure plan is a testament to the unwavering spirit of cooperation and coordination between organizations across the Commonwealth. The planning, design, and deployment of the proposed advanced telehealth network is (and will continue to be) the product of partnerships that transcend industry, geographic, and technological boundaries. Driven by a common desire to provide quality health care and health education to those Virginians who live in underserved areas, providers and organizations have volunteered countless resources to bring an advanced, yet inclusive, network architecture into being. This same dedicated team will continue to work hand-in-glove

with local telehealth sites to insure that they have the skills and equipment necessary to maximize usage and sustainahility

Current project partners that have committed to long-term support of the network include:

- Virginia Polytechnic Institute and State University (Virginia Tech)
- Verizon, Mid-Atlantic Broadband
- Bristol Virginia Utilities
- Sprint
- Ntelos
- Northrop Grumman
- Virginia Department of Health
- Virginia Department of Housing and Community Development
- Virginia Telehealth Network
- Virginia Tobacco and Community Revitalization Commission
- University of Virginia Health System
- Center for Innovative Technology
- Secretaries of Technology and Health and Human Resources

Conclusion

The Commonwealth has a long and rich history of creativity and leadership. By adopting a forward-thinking design for the VAST network, defining high quality health related services to traverse the network, and assembling a cross-functional team to operate and manage the network long-term; the Commonwealth is not only deploying an advanced telehealth network, hut also developing a unique "best practices" model with demonstrable and quantifiable results that can be replicated by other states.

Key to the short and long term success of this overall business model is the plans by which UVA and its partners intend to drive network utilization. Simply connecting healthcare provider sites in hopes the network will one day be utilized and grow, is not a viable approach to developing a sustainable statewide telehealth network, and ensuring that FCC investments are well spent. Therefore, we have made a significant effort to focus on utilization and sustainment strategies that will be implemented and tested, as part of this pilot.

5.0 Utilization Strategy

5.0 UTILIZATION STRATEGY

Virginia will lay the foundation for future rulemaking by testing innovative business strategies for managing network services and driving network utilization to enhance access to advanced services for public and non-profit health care providers.

After years of experience operating and managing a large regional telehealth network, the Office of Telemedicine understands the issues and challenges surrounding healthcare provider adoption, utilization and sustainment of telehealth/telemedicine networks. In this section, we discuss our approach for aggregating and driving utilization of the VAST network, and offer the FCC options for testing new business strategies as part of the Rural Health Care Pilot Program.

Specifically, we will propose to study different approaches to telehealth network management, and present three use cases -- for FCC consideration — that would further aggregate healthcare provider needs for the VAST network.

Dedicated Telehealth Network Operations Center -vs- Outsourced Managed Service

Positive user experience is critical to maintaining and growing the utilization rate of telehealth services. Accessing and using telecommunications networks and information technologies is a significant part of that experience. As a result, while technology is perhaps the greatest enabler of telehealth services, if it is not being utilized correctly or it's not working properly, it can also be the biggest reason behind declining utilization – or even discontinuance of telehealth services altogether.

Many healthcare sites are at risk for the technology being a source of a negative user experience. Some rural sites do not have the resources to staff technical support positions or have the ability to provide the appropriate on-going equipment training for clinical staff. Under these conditions, it becomes inevitable that at some point problems arise, which in turn raises doubts in the minds of health care providers, who by their very nature, are leery of using tools that they perceive to be unreliable. Rather than users becoming more and more competent – over time – utilization may decline, because staff are unwilling to make attempts to re-familiarize themselves with the technology after problems arise, leading to more problems and errors when and if they attempt to use it again.

In Virginia, the void in technical support is currently being filled by the Commonwealth's telehealth service providers. Each is individually attempting to shoulder the burden and bear the costs of providing rural sites with training, technical support and related services. Often the ongoing level of support needed

by remote sites exceeds the capacity of a service provider's limited resources. Moreover, working independently, the over-taxed providers are each having to invest time and money to individually learn the same lessons on supporting telehealth sites. They are not able to benefit from each other's 'lessons learned" or leverage a common system of "best practices."

Not only does this constraint affect rural telehealth sites, but may limit existing telehealth service providers from investing resources towards reaching more underserved communities or providing more telehealth services. Additionally, it represents a major barrier for new telehealth service providers to enter the market, as they perceive the level of effort to support these sites as being too great.

Without a better solution for technical support and related training, Virginia's utilization of telecommunications in supporting rural healthcare will stagnate and ultimately decline, leaving underserved communities with poor access to adequate health care. This deficiency in technical support is being addressed in a number of different ways throughout the country. In some cases, states have set-up dedicated stand alone organizations for the sole purpose of building, operating and managing dedicated telehealth networks. Within these statewide organizations there are offices which have the sole responsibility of managing and providing for the technical and related administrative support needs of all telehealth sites throughout the state. Having a dedicated technical resource that understands and supports its health care users appears to have achieved certain levels of success. Virginia wants to further investigate what has already been implemented elsewhere and test other alternative management solutions as part of its business strategy for the FCC Rural Health Care Pilot.

Virginia knows that to properly advance the utilization of telehealth statewide, "business as usual" relative to how its technical support is organized and managed today, cannot be sustained. The Rural Health Care Pilot Program will test potentially better and more cost effective solutions for providing technical and related administrative support.

As described in Section 4, Virginia will use two different entities for deploying MPLS (Network Virginia/ Verizon and Northrop Grumman) in order to explore two different centralized technical support models as part of the FCC Rural Health Care Pilot Program. Under the Network Virginia/Verizon installation, the University of Virginia Telemedicine Network Operations Center (NOC) will continue to maintain and monitor the routers, switches, firewalls and end-user telemedicine devices at the remote sites. The Northrop Grumman deployed MPLS will have the routers and the network monitored and maintained by Northrop Grumman at their NOC. Northrop Grumman will provide limited access to UVA Telemedicine

to a switch at each remote site so that UVA can monitor the end-user telemedicine devices. The University of Virginia's Telehealth NOC will be tested against the Northrop Grumman NG NOC for level of responsiveness, ability to resolve issues and most important, levels of customer satisfaction. The processes, procedures, time and cost associated with implementing both models will be documented so that if one should prove to he more effective, it can not only be implemented by telehealth sites throughout Virginia, but shared as a successful model with other telehealth programs across the country.

The network managed service model deployed by Northrop Grumman has proven effective in the support of small state agencies that do not the traditional capacity or funding to effectively support 24/7 operations. By leveraging support across large and small agencies, identical technical environments and operations support is available and economical regardless of agency size. Several of the smallest Virginia agencies, including the State Board of Elections and the Virginia Museum of Fine Arts are benefiting from new technologies and a low cost solution for complete network and technology management.

Virginia believes its long-term success is directly tied to its overall business management approach which includes technical support, education and training, and strategies, to drive utilization.

Utilization Strategies

While acute stroke is the starting point for the design and implementation of Virginia's statewide telehealth network, as mentioned in Section **3,** the entire stroke continuum of care will be used as the framework for designing a wide variety of telehealth applications and driving utilization over time.

In efforts to learn more about creative ways to further aggregate needs and drive utilization, UVA requests the opportunity to take on three specific sub-studies as part of the overall pilot effort. Use Case #1 will demonstrate how expansion of FCC "eligible" providers/sites might help support cohesive and integrated systems of healthcare. Under current FCC rules, this part of the stroke care continuum is not supported. The inability to connect this user group to the network represents a gap in stroke education and prevention and critical healthcare communications. In Use Case #2, we hope to demonstrate the value of connecting rural hospitals to their community-based physician practices in support of data sharing. And, in Use Case **3,** we consider the missions of regional health information organizations **(RHIOS),** in this case, CARESPARK, and the importance of studying how the state-wide telehealth network might support their needs.

Use Case # 1: Emergency Medical Services (EMS) Provider Training

EMS is a critical component of the stroke care continuum (see Figure *6* in section *2)*. This includes the training of EMS providers on recognizing the signs and symptoms (detection) of stroke. With broadband access that is robust, we can provide this training on a continuing basis to providers in rural areas. One of the great disparities between rural and urban EMS care is the time it takes to access definitive care at the receiving hospital. Reducing the time from 911 activation, to arrival at an appropriate healthcare facility can reduce morbidity and mortality for stroke patients. It is a given that total out of hospital times will be longer for rural EMS transports due to their distance from hospitals. However, one variable that contributes to out of hospital time is time spent on the scene by the EMS crew. Some factors that contribute to prolonged scene times are training and competence. Previous studies have shown differences between rural and urban EMS systems in areas of advanced versus basic life support levels of care, as well as provision of advanced life support procedures. Because of the infrequency of providing advanced life support procedures in rural EMS, there is the potential for lack of familiarity with equipment and skill erosion if training is not provided on an ongoing and regular basis.

There are over 800 EMS facilities in Virginia if all fire stations and rescue squads are included. All EMS providers are required to take courses for certification and continuing education (CE) courses for recertification. The required CE courses are currently offered by the Virginia Department of Health (VDH) Office of Emergency Medical Services (OEMS) in four ways:

- Satellite - Emergency Medical Services Satellite Training (EMSAT) is a monthly, one-hour interactive training and information program for Virginia EMS and Fire personnel. Certified Virginia EMS providers may receive category I CE credit by viewing an EMSAT broadcast at one of the approximately 60 designated state sites.
- On-site – OEMS approves classes that are taught by approved instructors at various site locations around the state and will occasionally offer a course at a VDH site location.
- Internet - with the proper equipment, viewers at designated EMSAT sites in Virginia are able to receive Category 1 and 2 CE credits via the internet while at an OEMS Designated EMSAT Site. This is done through web streaming of live EMSAT programs during the same time as the regular C-band satellite broadcasts
- DVDs – these are provided at cost and mailed to providers along with the quiz/exam

Approximately 6,000 individuals take part in CE credits each year out of the 35,000 person workforce. VDH OEMS presently pays a satellite uplink fee of $2,400 per month to provide the EMSAT capability. This year, VDH **OEMS** started videostreaming their satellite course at their EMSAT facilities as an interim step toward on-demand web-based continuing education. However, they have discovered that receiving videostreamed broadcasts requires a considerable amount of bandwidth, and facilities who have broadband sometimes still have difficulty. VDH OEMS is planning on doing away with DVDs and satellite at some point in the near future, with plans to go to all online videostreaming, making it available 24/7. VDH OEMS is presently building a learning management system infrastructure which should be fully implemented in the next several months. VDH OEMS feels that if all facilities had robust broadband access, it would triple the amount of people receiving CE credits each year. This would significantly enhance the EMS infrastructure, particularly in rural areas.

Given that some of the sites and health care provider types described on the stroke care continuum are currently ineligible under the FCC rules for the Rural Healthcare Program and Pilot, Virginia proposes to demonstrate to the FCC, the value of these participants in driving network utilization, and most importantly, ensuring comprehensive systems of health care. Ideally, although not considered an eligible healthcare provider under section 254 (25) **B** of the Act, we believe the Commission has the authority to include Emergency Medical Services Providers under section 254 (7) c 1 A of the Act. These sections address principles appropriate for the protection of the public interest and are essential to education, public health and public safety.

(7)ADDITIONAL PRINCIPLES- Such other principles as the Joint Board and the Commission determine are necessary and appropriate for the protection of the public interest, convenience, and necessity and are consistent with this Act.

'(c)DEFINITION-

(1)IN GENERAL- Universal service is an evolving level of telecommunications services that the Commission shall establish periodically under this section, taking into account advances in telecommunications and information technologies and services. The Joint Board in recommending, and the Commission in establishing, the definition of the services that are supported by Federal universal service support mechanisms shall consider the extent to which such telecommunications services--

(A)are essential to education, public health, or public safety;

We request consideration of the inclusion of **8** EMS facility sites within this acute stroke intervention network as these providers are a critical first access point into the rural health care system. Alternatively, should the Commission deny this request we seek funding for all other elements of the proposal.

Use Case #2: Connectivity Between Hospitals and Physician's Offices

Johnston Memorial Hospital (JMH) located in Abingdon, Virginia is a modem medical center equipped with state-of-the-art technology and more than **700** employees and 120 medical staff members. Non-invasive cardiology services, an emergency room expansion, an open MRI, and a central energy plant are just a few of the hospital's most recent additions. The facilities have expanded, equipment has been added, and technology has been upgraded, but the tradition of caring has always been present. It is the continued commitment of the employees, medical staff, and volunteers to providing high quality, compassionate care that has sustained JMH throughout the last century and will lead JMH into the future.

The commitment to quality care in a rural setting is challenging, even for a facility such as JMH. Attracting and retaining specialty care physicians is difficult and costly – often prohibitively so. Therefore, it is imperative that JMH seek out creative opportunities to maximize the availability of specialty care and leverage scarce capital resources. The application being presented to the FCC by the Commonwealth of Virginia through the University of Virginia is exactly the type of partnership opportunity JMH needs to expand and enhance the level of stroke care available in Southwest Virginia. Absent of timely "physical" access to primary stroke care centers located in central and eastern Virginia (more than three hours away), the proposed Commonwealth "stroke" network offers new and unparalleled intervention and treatment opportunities.

Recognizing that a single condition is not going to present itself often enough to sustain the high-level of telecommunication capabilities needed to support the stroke network and its associated diagnostic equipment, JMH has partnered with Bristol Virginia Utilities to investigate and experiment with layering additional data intensive applications onto the network to augment the usage of the enhanced telecommunications capabilities and subsequently sustain the system long term.

As previously mentioned, medical diagnostic equipment has consistently become more sophisticated and more digitally oriented. The medical images and results (files) from the equipment continue to grow in size. Increasingly, **JMH** depends on these files to provide the basis for a high quality of care to the patients of Southwest Virginia. In order for a high quality level to be maintained, not only do patients need access to the diagnostic equipment, physicians must also have 24/7 access to test results in order to

provide timely diagnosis and treatment. Physicians using the JMH facility must be able to access the results of these tests if there is ever going to he quality parity between rural and urban healthcare markets. Currently, many of the physicians and clinics do not have the bandwidth necessary to view the results and images and consequently cannot offer the desired level of care.

While the clinical benefits of a high capacity data network are undeniable, it is imperative that JMH (and other partner providers) be able to support and sustain the network long-term. While a majority of the UVA proposal will concentrate on the deployment of the stroke network, JMH will be working with Bristol Virginia Utilities to design and evaluate "sustainability" models, including the ability to aggregate bandwidth and share it in accordance with USAC/FCC guidelines across clinics and doctors' offices who are currently "under"/"un"-connected.

The sustainability model to be tested is to develop an aggregation model for the deployment of a local high-speed data network that will not only "hook" into the UVA pilot network but also allow the JMH medical community (39 independent care providers) to be connected to the network to view diagnostic test results and electronic medical records. If successful, the result will be a replicable, sustainable business case based network capable of providing physicians with a higher level of communication which will allow for a higher level of care.

To this end, JMH and BVU have developed the concept of a "local medical community broadband network" that we believe can be used as a model to provide RHC-funded local broadband infrastructure connecting RHC-qualified hospitals to the medical community they service. This model attempts to deal with the most significant harrier we see in getting ubiquitous broadband access to a local medical community and that is this: most for-profit healthcare providers (ie. physicians) will not purchase broadband access for anything other than their personal practice use (ie. Internet), and even then it tends to he best-effort asymmetric service that is not conducive to high-bandwidth interactive medical applications such as imaging and video. These applications require symmetric bandwidths much greater than the typical consumer-oriented Internet service. Aside from future legislative or regulatory changes, there does not appear to be any other catalyst to remove this barrier. This model is generic, but uses JMH as the specific case for the grant. Essentially, JMH would act as a "broadband aggregator" for their local medical community as follows:

JMH would connect to the VAST network via a high speed broadband connection constructed by the RHC grant. JMH, again. with RHC funding, would construct broadband connections to members of their

medical community to provide ubiquitous broadband access for caregivers to clinical and diagnostic data including that required for stroke management. JMH, in cooperation with BVU, would serve as a "local medical network hub", providing gateway access for the medical community to the regional (ie. CareSpark), state (ie. VAST), and national healthcare networks that develop over time. (See Appendix G for BVU Network Diagrams).

Network sustainahility would he realized through the purchase of network services by the local health care providers. All health care providers could purchase private services (ie. Internet, phone, etc.) if desired directly from BVU, and local clinical applications could be turned up by JMH as required. BVU would provide maintenance of the network as part of their normal operations. JMH would use e-health monies from the USAC RHCP to help pay for the recurring cost of the state network connection. For-profit providers would he responsible for full payment of their private services.

The local medical community served by JMH in Ahingdon VA consists of 63 healthcare providers, of which **48** are serviceable by BVU. Of that 48, 9 are currently connected to the BVU fiber-based broadband network and **39** are not. Based on 2006 FCC broadband data, we estimate roughly 60% of Virginia's businesses utilize broadband services. Based on this pilot site sample, it is clear physician adoption is far below the statewide business average. We estimate it would require $110,000 to extend the fiber network to these 39 facilities such that broadband medical services can be delivered ubiquitously. We have provided a few relevant points using the RHC pilot program FAQ showing how our "local medical community" broadband network model complies with the program guidelines:

Who is eligible to receive funding under this program?

Public and not-for-profit health care providers are eligible to receive jimding.

JMH would he the qualified not-for-profit provider receiving funding to build infrastructure required by them to connect to the state telestroke network and to connect their local medical community as part of the larger regional network.

1. What is the Rural Health Care pilot program?

The pilot program is an enhanced funding initiative intended to help public and non-profit health care providers construct state- and region-wide broadband networks to provide telehealth and telemedicine services throughout the nation.

It usually takes a physician to provide a telehealth/medicine service. We do not believe it is practical or reasonable to expect that physician to always he at the JMH facility to provide the service. Therefore,

JMH would use RHC funds to connect that physician facility through the JMH medical community hub to perform the service. This would make the physician a telecommuting telemedic.

2. What information must be filed with the FCC to apply for the program? Describe how for-profit network participants will pay their fair share of the network costs

For-profit entities would pay 100% of the cost for any services they order that are delivered over the fiber connection (ie. Internet).

3. Will for-profit health care providers be allowed to connect to the network? Yes. Applicants may include for-profit health care providers in their proposals as network participants. However,, for-profit health care providers will be required to pay for their own costs of connecting to the network.

In this case, there are no for-profit providers applying for funding of any type (construction or recurring), and the for-profit providers will be paying their own costs to use the network if/when they require it.

This use case will continue to expand in scope as hospitals, health plans, and the state work to expand the use of administrative and clinical data exchange. **In** addition to the clinical uses outlined in the JMH example, the Hospital and Health Plan associations in partnership with the state (including Medicaid) are actively pursuing a strategy to dramatically increase the volume of HIPAA standard data that is exchanged.

Currently, transactions that take place online range from **42%** to 95% depending on the transaction (Eligibility inquiry, Referral / Authorization, Claims Submission, Claims Status Inquiry, Pay / Remittance) with Virginia's most aggressive adopters. Online transaction rates are significantly lower for providers that are slower to adopt ranging from 5% to 68%. Virginia is pursuing a model of administrative data exchange based on the experience in Massachusetts with the New England Health EDI Network. This network has driven data exchange to nearly 50 million transactions yearly with 100% private market support for the network (no public subsidy). Additionally, as the infrastructure to support data exchange expands as part of this pilot we expect that more and more providers will have the ability to drive transaction volume to the network. A combination of increased penetration rate for HIFAA transactions and an increase in volume will become a major driver of usage for the telebealth networks infrastructure adding to the sustainability of revenue for the network.

Use Case 3: Supporting Regional Health Information organizations (RHIOs)

CareSpark is a regional health information exchange designed to serve 750,000 patients residing in nine rural and medically-underserved counties of far southwest Virginia, in addition to eight counties in northeast Tennessee. Among the approximately 1,200 physicians in the region, the large majority of specialists and tertiary-care facilities are located in Tennessee, including a center of excellence for stroke at Wellmont Health System's Bristol Regional Medical Center and Colleges of Medicine, Nursing, Pharmacy and Public Health at East Tennessee State University. Exchange of clinical data that includes inpatient, emergency department, ambulatory, laboratory and pharmacy information enables coordination of and improvement of patient care and treatment. Through collaboration with state and local departments of health in both Tennessee and Virginia, CareSpark will also enable the collection and analysis of aggregate data for the purpose of public health monitoring and improvement in order to reduce the region's significant health disparities for cardiovascular disease, hypertension and stroke, diabetes, cancers and chronic pulmonary diseases, whose rates for prevalence and premature mortality are among the worst in the nation.

CareSpark's technical infrastructure will be operational in the summer of 2007, initially authenticating and connecting approximately 250 clinicians affiliated with Holston Medical Group (including offices in Abingdon, Duffield and Weber City Virginia, as well as twelve other facilities in Tennessee), Mountain States Health Alliance (including Smyth County Hospital, Dickenson County Hospital and Norton Community Hospital in Virginia, as well as six other facilities in Tennessee), Wellmont Health System (including Lonesome Pine Hospital in Virginia, as well as six other facilities in Tennessee), and Johnston Memorial Hospital in Abingdon, Virginia. 250 additional physicians will be connected in 2008, including twelve federally-qualified health centers in southwest Virginia and thirteen in Tennessee.

While CareSpark's work over the past four years has resulted in strong regional consensus about the types of data to be shared, the appropriate access and use of this data, and the development of an interoperable technical infrastructure that enables sharing of data across disparate electronic health records systems, many primary care physicians in more remote rural areas (over 40% of the health care providers in the region) are not currently using electronic health records within their organizations. While most (95%) have access to the internet at home or in their offices, an estimated 10-15% do not have access to broadband access (either wired or wireless) because of the mountainous topography and /or distance from existing fiber-optic or other networks. Where that access does exist, rates are up to 200% higher than in more urban areas of the state, due to the cost of delivery and support for internet services in these more rural areas of the state. Until more affordable and accessible broadband services are available to these

rural clinicians, use of health information technology by physicians for coordination of patient care, monitoring of health status, continuing medical education and communication with patients will be hindered, resulting in even greater disparities for cost, health outcomes and adoption of clinical best practices. The Virginia Acute Stroke Telehealth **(VAST)** Network and the CareSpark network share a number of rural hospital sites in common. The implementation of the VAST Network would expedite the implementation of the CareSpark RHIO, bringing greater bandwidth and a more robust technical infrastructure to multiple sites.

Sustainability

The University of Virginia has had an active Telemedicine program for eleven years. The Office and a number of remote sites are funded by the UVA Health System. Many of the initial efforts to establish rural healthcare Telemedicine sites were funded with grants from both the federal government and the Commonwealth. All of the grants have expired and the program keeps expanding. The rural healthcare providers have seen the benefit of broadband communications not only for Telemedicine and Teleradiology purposes but also for transmitting patient records and billing and registration purposes. There are a number of sites within the existing and proposed network that are self funded. Those sites that are eligible make full use of the USAC RHCP funds which greatly helps them with support for their communications costs. We envision that increasing the bandwidth to a number of these remote sites will enable them to better utilize the network for a minimal increase in expense.

The University of Virginia will continue to seek out other sources of funding such as through the United States Department of Agriculture, Rural Utilities Service and the Department of Health and Human Services Office for the Advancement of Telehealth to enhance service delivery to the citizens of Virginia. We will also continue to seek ways to enhance reimbursement for telehealth services. We work closely with the Virginia Department of Medical Assistance Services (DMAS). DMAS has supported reimbursement of telehealth facilitated services since 1995 and is committed to exploring opportunities for changes to Medicaid telehealth reimbursement that could lead to better health outcomes for Virginia's Medicaid recipients while enhancing the sustainability of telehealth service providers.

Finally, the lessons learned about the most effective way to manage services and the lessons learned through the proposed "use cases" from this Pilot will inform **us** and the FCC of drivers of utilization beyond that which we know already works. We have already demonstrated over time that telehealth is a sustainable venture in rural Virginia. We foresee this Pilot as being a catalyst for exponential growth of telehealth in the Commonwealth.

6.0 MANAGEMENT PLAN

The University of Virginia Office of Telemedicine, along with its chosen partners, is dedicated to the successful deployment of broadband infrastructure and the development of a statewide telehealth network A qualified Management Team has been chosen and a management plan and quality controls are already in place.

The Office of Telemedicine at the University of Virginia (UVA) Health System is proud to serve **as** the Applicant for Virginia's FCC Rural Healthcare Pilot Program. As the lead agent for the Commonwealth, fiscal and legal executor of the Pilot Program, and operator of the proposed UVA Telehealth Network Operations Center for VAST, we have significant responsibilities for administrative, programmatic and network oversight. Given the scale and scope of this effort, we have taken great care to develop the appropriate management plan and governance process for the pilot program.

This section lays out our objectives and philosophies for managing the Rural Health Care Pilot Program, identifies all those that support our approach, introduces key personnel and sets our initial project plan and schedule.

Objectives

The following describes how the program will be managed to achieve the following objectives,

Central Program Objectives:

- Deploy a broadband network infrastructure to eligible healthcare providers that adheres to cost, schedule and performance
- Monitor and evaluate the network strategy and approach
- Report findings to the FCC

Related Objectives:

- Develop a Tele-stroke Network and other related applications to drive network utilization
- Pilot new strategies for network utilization and sustainment
- Develop an evaluative framework for measuring qualitative and quantitative impacts of telehealth interventions.

Management Overview

Our Key Principles

As the Applicant and leader of the program, the UVA Telemedicine Office will use the following key business management principles to guide the effort.

- Coordinate efforts
- Create needs-based solutions
- Build flexible and scaleable solutions
- Build on existing capabilities
- Leverage existing network infrastructure
- Exploit leading edge technologies
- Evaluate our solutions

The Telemedicine Office has already begun to apply these principles as part of its management approach to developing this proposal

Coordinated Management Approach

UVA strongly endorses the development of a statewide telehealth network as envisioned by the Virginia Telehealth Network (VTN). UVA intends to leverage the partnerships with healthcare organizations and government leaders developed by the VTN, to facilitate joint decision-making and enable thoughtful coordination of the activities associated with the Rural Healthcare Pilot Program on an ongoing basis.

Key state officials and health care providers have been briefed on the proposal and management plan. They are in full support of the approach, and are looking forward to our successes. The Telemedicine Office is proud to list all those that support our efforts, and their letters of support for your review (see Appendix C).

Federal Legislators

- Senator John Warner
- Representative Jo Ann Davis
- Representative Thelma Drake
- Representative Robert Scott
- Representative Virgil Goode

- Representative Bob Goodlatte
- Representative Eric Cantor
- Representative Rick Boucher

Virginia Legislators

- Senator Phillip Puckett
- Senator Charles Hawkins
- Delegate Harvey Morgan
- Delegate Lynwood Lewis
- Delegate Robert J. Wittman
- Delegate R. Edward Houck

State Government

- Marilyn Tavenner, Secretary of Health and Human Resources
- Aneesh Chopra, Secretary of Technology
- Kathy Wihberly, Virginia Department of Health Office of Health Policy and Planning
- Karen Jackson, Director of the Commonwealth's Office of Telework Promotion and Broadband Assistance
- Patrick W. Finnerty, Director, Department of Medical Assistance Services
- Bill Shelton, Virginia Department of Housing and Community Development

Healthcare Providers

- University of Virginia Health System
- Virginia Commonwealth University
- Danville Regional Medical Center
- Johnston Memorial Hospital
- Eastern Shore Rural Health System
- Centra Health
- Clinch River Health Services

Reeional Health Information Organizations

- CareSpark

Organizations

- Center for Rural Virginia
- Medical Society of Virginia
- Virginia Tobacco Commission
- Virginia Hospital and Healthcare Association
- Virginia Primary Care Association
- Virginia Rural Health Association
- Virginia Stroke Systems Task Force

Leadership Roles and Responsibilities

The UVA Telemedicine Office will assign a Rural Health Care Pilot Program Director who will he responsible for the fiscal oversight and management of the pilot. Under the Director, will be a Program Manager responsible for overseeing the deployment and evaluation of the VAST network to 48 sites, and supervising senior network engineer (and other support personnel), in the 24 x 7 operations of the UVA telehealth NOC.

Management Activities will include:

- Government Coordination- All activities associated with FCC coordination and correspondence
- Contracts Administration- All activities related to fiscal management
- Reports- all activities associated with preparation, data collection, development, and distribution of reports and presentations.
- Support- All activities relating to staff support, legal, human resources and administrative support, as needed for the efficient conduct of business.

Financial Tracking and Reporting

The UVA Telemedicine Office will utilize UVA Health Systems institutional financial accounting system to track contract expenditures.

Plans for Monitoring and Evaluation

UVA as developed a plan of approach for monitoring and evaluation to ensure the FCC Pilot produces information that will be helpful to the FCC for future rule-making, and help guide the state in designing the overall statewide telehealth network of the future.

Our evaluation plan will have four primary goals:

1. to assess whether FCC Pilot objectives have been met and evaluate any barriers that were identified in the process
2. to assess the performance and adequacy of the technical infrastructure developed and implemented during the pilot
3. to begin evaluation planning for the clinical applications that will build on the technical infrastructure implemented in the pilot phase
4. to assess the quality of the network support model used in the pilot

Implementation Evaluation

The goal of this component of the evaluation is to continuously monitor and evaluate the extent to which the specific objectives and milestones detailed in the FCC Pilot Project Plan were achieved. In addition, this assessment will enable us to rapidly identify problems that may emerge so that solutions can be developed. The details outlined in this proposal will be used to develop specific evaluation questions, and the evaluation team, independent of technical staff or implementation personnel, will solely determine the answers to these questions. Sample evaluation questions might include:

- Were all sites properly connected/linked together as planned? If not, why not?
- What barriers were identified that delayed or prohibited sites from joining the network?

Assessment of Technical Infrastructure

During the initial year of our project, we will establish the necessary technical infrastructure for establishing connectivity between healthcare provider locations. Another important element of our evaluation will assess the performance of this infrastructure and its ability to meet important requirements for telehealth applications. Evaluation questions for this section might include:

- What was the data transfer speed of transmitting particular types of information, including high resolution CT scans?
- How frequent and severe were any network outages that occurred?
- Was network security sufficient for transmitting confidential patient data?

- What were the type / cost of resources needed by provider sites for connecting to the network?
- Were there any unanticipated consequences?

Assessment of Technical Support Model

Our evaluation will also address the suitability of a Managed Services Provider (MSP) approach for providing technical network support. We will assess the level of responsiveness provided by this model, ability to resolve issues and overall customer satisfaction. We will identify strengths and weaknesses of the MSP approach and work with the planning team to allow comparison of this model with alternatives, including the telehealth NOC.

- What kinds of support were needed by provider institutions?
- What was the mean time to resolution for various types of technical difficulties?
- What was the level of customer satisfaction with the technical support?
- What kinds of technical difficulties were handled well by the MSP? Poorly?

Evaluation Planning

The final part of our evaluation will lay the groundwork for the important next steps in our statewide initiative, development of the telehealth stroke model of care. This next phase will require a comprehensive evaluation that assesses satisfaction with the program from the perspective of multiple stakeholders as well as clinically-oriented process and outcome measures. Our goals for this year will include identifying important measures to assess in subsequent evaluations, and development and testing of pilot instruments for data collection. Measures will be determined on the basis of a literature review and stakeholder interviews. Sample questions might include:

- What measures are important to include from the standpoint of rural clinicians? What about those at larger institutions that are providing the consultative telehealth services? What about the patient perspective?
- What measures have been assessed in other large telemedicine initiatives?
- What instruments are available that have been developed, used, and/or validated for assessing these measures?