

University of the Virgin Islands:
Information & Technologies Services Infrastructure Assessment

Final Report
(Revision 2.0)

December 17, 2008



1170 Hamilton Court
Menlo Park, California 94025
www.cgnet.com

Contents

- 1. Executive Summary and Recommendations 4
 - 1.1. The Local Area Network..... 5
 - 1.2. Communication between Campuses 5
 - 1.3. The PBX System..... 5
 - 1.4. Wireless..... 5
 - 1.5. Internet Access..... 5
 - 1.6. Internet2 Access..... 6
 - 1.7. Email..... 6
 - 1.8. Banner 6
 - 1.9. Blackboard Academic Suite..... 6
 - 1.10. Video and Audio Conferencing 6
 - 1.11. Enterprise Anti-Virus System 7
 - 1.12. Computer Labs and Workstations..... 7
 - 1.13. Help Desk and Customer Service 7
 - 1.14. User Relations 8
 - 1.15. Staff Development 8
 - 1.16. Enterprise Network Services..... 8
- 2. The Study and Its Goals..... 9
- 3. Background and Methodology..... 11
 - 3.1. Methodology..... 11
- 4. The Network 12
 - 4.1. Local Area Network..... 12
 - 4.2. Communication between Campuses 13
 - 4.3. The PBX System..... 13
 - 4.4. Wireless..... 14
- 5. Internet Access and Internet2 15
 - 5.1. Internet Access..... 15
 - 5.1.1. Internet Security 15
 - 5.1.2. Performance Issues..... 15
 - 5.2. Internet2 Access..... 16

6.	Applications.....	18
6.1.	Email.....	18
6.1.1.	Email Anti-spam and Anti-virus.....	18
6.1.2.	Email User Perceptions	18
6.1.3.	Microsoft Exchange Administration.....	18
6.2.	Banner	19
6.3.	Blackboard Academic Suite.....	20
6.4.	Video and Audio Conferencing	21
6.5.	College Level Examination Program CLEP.....	21
7.	IT Infrastructure	22
7.1.	Active Directory.....	22
7.2.	Backup.....	22
7.3.	Enterprise Anti-virus System.....	22
7.4.	Computer Labs and Workstations.....	22
8.	Service, Support and Staffing.....	24
8.1.	Help Desk and Customer Service	24
8.2.	User Relations	25
8.3.	Staff Development	26
8.4.	Enterprise Network Services.....	26
9.	Appendix	28
9.1.	Illustrative Coments	28
9.2.	Example week of Help Desk Requests	33

University of the Virgin Islands: Information and Technologies Services Infrastructure Assessment

1. Executive Summary and Recommendations

The University of the Virgin Islands (UVI) and the Virgin Islands Experimental Program to Stimulate Competitive Research (VI-EPSCoR) engaged CGNET Services International to review the University's existing and planned cyber-infrastructure. CGNET is an internationally recognized consulting firm with an exemplary record of undertaking studies like the one described here for the last 25 years.

The goals of the study were to determine the extent to which the present infrastructure - including the University's network, the devices attached to it, and its connections to the Internet – is stable and has the best design, maintenance, security and redundant elements to support existing functions. The study also assessed UVI's readiness for future development, including wireless systems, increased Internet and Internet2 capacity with failover capabilities from use of multiple ISPs, and expanded data storage and management capabilities.

It is our belief that the Information technology infrastructure investments made in the past years have resulted in a stable system, with upgraded local area network speeds and upgraded servers. These efforts have built an excellent foundation to support current services and future expansion. Further work needs to be done in some areas, however, particularly Internet access, communications between the University's campuses, and wireless connectivity.

We also believe that investments in more personnel will be required to improve user support and support for the research needs of the university. Information & Technology Services (ITS) has made use of consultants to help bring the systems up to date and educate the staff. We believe this is an effective way to supplement the current staff.

Finally, we recommend several ways that ITS could improve its customer service and relations with the user community in general. Our recommendations, and their rationales, are distributed throughout the report, but we summarize them here. In the following section recommendations are listed by functional area, and details for each are found in subsequent sections.

1.1. The Local Area Network

Recommendation 1: Continue to upgrade the entire campus to 1-gbps fiber connectivity.

Recommendation 2: Ensure that key data and applications have redundant connectivity to the LAN.

Recommendation 3: Maintain access to LAN consultant for another year to assist with these activities.

1.2. Communication between Campuses

Recommendation 4: Monitor the bandwidth usage of the microwave system.

Recommendation 5: Maintain the health of the microwave system.

1.3. The PBX System

Recommendation 6: Schedule annual maintenance of the PBX system to keep the software updated.

1.4. Wireless

Recommendation 7: Begin the campus-wide wireless connectivity project as soon as possible.

Recommendation 8: Communicate the current state of wireless on campus and the plans for its improvement to users.

1.5. Internet Access

Recommendation 9: Clearly separate the Internet traffic from the students' dormitories from the rest of the University's Internet use, and control Internet access to the dormitories.

Recommendation 10: Move the Ironport anti-spam appliance to a location between the University network and the Internet.

Recommendation 11: Work out acceptable interim and permanent policies for proper Internet usage and enforce them through control of specific protocols and sites.

Recommendation 12: Fine-tune the WAN optimization appliances (Blue Coat) as soon as possible and intensively test them before deploying them full time.

Recommendation 13: Use a program like MRTG or Cacti to monitor bandwidth usage, and go the extra step to post the usage in an internal site.

Recommendation 14: Clearly communicate to students why fees are going to be charged for Internet access from the dormitories.

1.6. Internet2 Access

Recommendation 15: Hire a consultant to connect the available INTERNET2 line in St. Croix to that campus.

Recommendation 16: Develop a concrete plan for microwave connection between the campuses at Internet2 speeds and execute it as soon as possible.

1.7. Email

Recommendation 17: Do a new public debut of the anti-spam system.

Recommendation 18: Publicize the success of the anti-spam system.

Recommendation 19: Test the restore of email from backup once a quarter to make sure the system is working.

Recommendation 20: Document the procedures for restoring email from backup.

Recommendation 21: Establish mailbox quotas for everyone in the system, with no exceptions.

Recommendation 22: Implement a mail archiving system.

Recommendation 23: Reconfigure the list server system.

Recommendation 24: Publish a policy for email backup and restore.

Recommendation 25: Create a document with procedures for disaster recovery of the Exchange system and follow them.

1.8. Banner

Recommendation 26: Review efforts to maintain productive contact with Banner module owners and users to identify why current procedures appear not to be working and to modify the procedures if necessary.

1.9. Blackboard Academic Suite

Recommendation 27: Implement F5 load balancing on the Blackboard servers between semesters, so they can be tested adequately during a time of reduced usage.

1.10. Video and Audio Conferencing

Recommendation 28: Hire student video conferencing aides for each department that uses video conferencing.

Recommendation 29: Encourage faculty members to regard the video conferencing system as a teaching tool and to get certified on its use.

1.11. Enterprise Anti-Virus System

Recommendation 30: Manage the Antivirus administration system to make sure that all the university desktops, laptops and servers have their Antivirus signatures up to date.

1.12. Computer Labs and Workstations

Recommendation 31: Consider changing the current software that manages the lab computers to one that has a different approach to resetting the configuration after it is used.

1.13. Help Desk and Customer Service

Recommendation 32: Reduce the amount of time ITS staff spends on video conferencing support.

Recommendation 33: If it is not possible to decrease the amount of time ITS spends on video conferencing support, consider hiring more staff in this area.

Recommendation 34: Give help desk staff direct access to a manager with substantial technical expertise, who can give them ideas on how to solve problems quicker.

Recommendation 35: Find ways to encourage IT staff to solve user problems quicker and in a friendlier manner, such as incentives, bonuses or training.

Recommendation 36: Update the ticketing system so different priorities can be assigned to different classes of problems.

Recommendation 37: Invest in software that will allow users to reset and unblock the Active Directory passwords and accounts. Many of the calls helpdesk gets are related to password problems.

Recommendation 38: Create a document repository website for ITS documentation.

1.14. User Relations

Recommendation 39: Target the information you send to each group of users

Recommendation 40: Communicate clearly.

Recommendation 41: Send messages to large groups of users only when necessary.

Recommendation 42: Continue the newsletter.

Recommendation 43: Create a public FAQ website about ITS and its services.

Recommendation 44: Be realistic about the time to bring new services and features and adjust expectations accordingly.

Recommendation 45: Clarify backup and restore procedures with users and publish related policies.

1.15. Staff Development

Recommendation 46: Begin an exchange IT sabbatical program.

1.16. Enterprise Network Services

Recommendation 47: Increase the focus of their support in systems administration for their current services like exchange, Active Domain, backup system and antivirus system.

Recommendation 48: Monitor the health of the data centers.

Recommendation 49: Have the network documentation available at each data center.

Recommendation 50: Continue the practice of hiring network consultants to help with the overall health of the system.

2. The Study and Its Goals

The University of the Virgin Islands (UVI) and the Virgin Islands Experimental Program to Stimulate Competitive Research (VI-EPSCoR) engaged CGNET Services International to perform a review of the University's existing and planned cyber-infrastructure. The goals of the study are to determine:

- The extent to which the present infrastructure - including the University's network, the devices attached to it, and its connections to the Internet – is stable and has the best design, maintenance, security and redundant elements to support existing functions, and
- UVI's readiness for future development, including wireless systems, increased Internet and Internet2 capacity with failover capabilities from use of multiple ISPs, and expanded data storage and management capabilities.

UVI and VI-EPSCoR have requested that this report include the following elements:

- An overall report of findings and methodologies used and strengths and weaknesses within the existing UVI infrastructure and approaches to expansion.
- A determination of the ability of the present infrastructure design and implementation to provide stable, uninterrupted service, and documentation of any necessary steps to achieve that stability.
- Documentation of readiness for future expansion in the areas cited above.
- Any other specific recommendations to remediate any outstanding concerns or achieve possible improvements.

The report will address these goals and elements.

It is important to stress, however, that while it is possible in theory to separate the University's IT and network infrastructure from the services it provides, in practice the elements are highly interdependent. Slow Internet access, for example, can affect the performance of the University's online services, such as the Banner and Blackboard applications discussed below. Conversely, the services accessed over the network, such as Facebook pages reached from the University's dormitories, can affect the performance of the network because of the amount of bandwidth they require. Furthermore, staff members' duties are not defined by either services or infrastructure. Time spent configuring a video conferencing setup in a classroom can take time away from addressing other requests at the help desk or any of several other activities.

As a result, this report will address the adequacy of UVI's cyber-infrastructure in terms of the following categories of facilities and services:

- The local area network, including the microwave connection between the two campuses
- Internet access, including future access to Internet2
- The information technology infrastructure, including computer labs, servers, backup, anti-virus and directory services
- Applications, such as email, audio and video conferencing, Blackboard and Banner
- Service, support and staff

By examining these key areas, we expect to address the matters listed above in the clearest and most effective fashion.

3. Background and Methodology

The University of the Virgin Islands was chartered in 1962. It has two campuses, on the islands of St. Thomas and St. Croix in the U. S Virgin Islands, which are approximately 35 miles apart, with most of that distance over water. The University's total user population is about 2100, with about 300 of these being faculty and staff.

In 2004, the University's library and technology resources were combined in one administrative component, Information & Technology Services (ITS) which manages the University's computer and network needs. The group manages the University's local and wide area networks, its Internet access and its telephone system. The group manages instructional services infrastructure including video conferencing, smart classrooms and online instruction. It also manages the desktop and laptop computers on the network, as well as the organizational applications that faculty, staff and students use.

In prior years, the network was managed on a less formal basis without major planning and with minimal budgets. The network devices were bought from different sources and not properly specified for the university environment. They were managed primarily when problems occurred. There was no integrated email system, and although the University is a Microsoft Windows environment, the active directory system was not properly managed and maintained.

In the past two years, the University has undertaken significant planning efforts and made a major investment to upgrade the basic network infrastructure. More importantly, it has invested in putting together a team and training it to manage and support this infrastructure. This report will provide information about the current status of the ITS group and the facilities it manages. It will also present the results of interviews with its stakeholders: faculty, students, staff and administrators. After reviewing the strengths and weaknesses of the University's network services, we will also suggest ways to continue to improve the network and to make it more reliable, providing better support for faculty, staff and students and making it possible to support future educational initiatives.

3.1. Methodology

In collecting information for this report, we interviewed the different units within ITS, in particular the Enterprise Network Services Unit. We reviewed documentation provided about the network and the systems ITS manages. We also had the opportunity to visit the St. Croix campus, talk to ITS staff there and meet with David Zumwalt, the executive director of the UVI Research & Technology Park. The Research & Technology (RT) Park, located on St. Croix, is an affiliate of the University. It is a technology center with a mandate to attract high technology businesses to the U. S. Virgin Islands.

Based on this research, we formed the following view of the UVI network's current status.

4. The Network

4.1. Local Area Network

Most buildings on the campuses are connected via multimode optical fiber with bandwidth of one gigabit per second (1 gbps). The remaining buildings are scheduled for fiber connectivity, but currently are connected to the network via copper wiring (RJ45 at a speed of 100 megabits per second).

The network devices are based on HP Procurve equipment. There is currently some network redundancy among the buildings that host the data centers and among some of the other buildings.

We reviewed the current LAN documentation and found it to be current and easy to understand. According to this documentation, the network is properly configured with VLANs to minimize problems from broadcasting storms.

We believe that the network is capable of supporting the current and future loads as long as the proper investment in equipment maintenance, upgrades and service agreements continue. Currently ITS has personnel that understand the current network and it has access to a network consultant that helps them manage the network.

Some users are concerned that the current LAN setup may not be adequate to handle INTERNET2 and that it is not properly managed. Some also believed that the Internet problems are caused by the LAN. The bandwidth of the LAN is more than adequate to handle connectivity to Internet2, and, as we discuss below, there are much better explanations for Internet access difficulties than anything having to do with the LAN. This issue therefore becomes one of perception and user relations, which we also discuss below.

We believe that the effort to bring the LAN up to a standard of optical fiber connectivity at 1 gbps is advisable, because the bandwidth will be uniform across the campus, which should aid in its ongoing administration. We also believe that redundant connectivity, which allows for uninterrupted service during a single connectivity failure, is most important in and out of the data center, on which everybody depends. Further plans for redundant connections should be prioritized on the basis of how long campus locations can tolerate being without service.

Recommendation 1: Continue to upgrade the entire campus to 1-gbps fiber connectivity.

Recommendation 2: Ensure that key data and applications have redundant connectivity to the LAN.

Recommendation 3: ITS should maintain access to its LAN consultant for another year to assist with these activities.

4.2. Communication between Campuses

The two campuses are connected by a microwave link with 16 T1 cards. Two of the cards have never been operational. Different T1 cards have been assigned to different functions, including video conferencing, voice communications, and general data communications between the LANs. This means the effective bandwidth for data communications is significantly less than the bandwidth of the LANs on each end of the connection. The microwave system was tuned up before the current semester started and later as part of the response after Hurricane Omar knocked the antennas out of alignment.

ITS has invested in Blue Coat appliances to optimize the Internet traffic in St. Thomas, as well as the traffic between the campuses. The devices were enabled at the beginning of the semester, but unfortunately the implementation resulted in many problems for the network. For example, access from St. Croix to the Banner and Blackboard application sites on St. Thomas was very slow and almost unusable. Access to legitimate sites from St. Thomas was also blocked, which was very frustrating to faculty and staff. Currently, the devices' content filtering and antivirus functionality has been disabled, and more tests will be performed between semesters to tune the system with the help of the vendor. The devices continue to accelerate http requests between campuses.

At present, it is difficult to determine whether this microwave link represents a bottleneck on LAN traffic between the campuses, either for data communications or for video conferencing. Therefore, we recommend:

Recommendation 4: Monitor the bandwidth usage of the microwave system. This will allow the network staff to have a better view of the health of the system and to identify potential problems with the inter-island communication and video conferencing. By gathering this data ITS will also be in a better position to make a more optimal allocation of the T1 cards among the different services that use the microwave system. It will also facilitate the configuration of future upgrades of the microwave system.

Recommendation 5: Maintain the health of the microwave system. Check on the health of the microwave system daily. Have one staff look at the equipment and make sure there are no alarms. Write a procedure on how to deal with equipment alarms and post it near the microwave equipment at both sides.

Ultimately, the best solution to limited bandwidth on the inter-island microwave link is to increase its bandwidth for data communications. We discuss this in terms of Internet2 access, below.

4.3. The PBX System

The University uses AT&T /Avaya telephone private branch exchanges (PBXs). The one in St. Thomas is hosted in Penha House, with a redundant controller in the ACC datacenter. A similar system is in St. Croix. The two are interconnected by the microwave system, which allows a university-wide phone system with dialing between campuses without any special prefixes. If there is a problem with the microwave system, the campuses can communicate over the public phone system. There is currently no

maintenance program for the PBX system, because of lack of funds. ITS also has chosen to self-insure the system.

We believe that the current PBX system and its connectivity between the islands are adequate for the foreseeable future.

Recommendation 6: Schedule an annual maintenance of the PBX system to keep the software updated.

4.4. Wireless

No campus-wide wireless system exists today. The libraries have wireless available inside, and a couple of buildings also have wireless devices installed by faculty but not managed by ITS. In St. Croix, the RT Park installed wireless outside the buildings as a test, but it was removed because the authentication system was not working, and it was letting everyone connect without entering any credentials. During the 2008/2009 budget year, ITS is planning to begin a campus-wide wireless project. Currently, the idea is to implement wireless in the student dorms as well as throughout the libraries. The project is seeking funding for further expansion.

One of the common themes during the interviews was that everyone was interested in being able to connect to a wireless network across the campuses. There is conflicting information about where wireless connectivity is available and where it isn't. Very few people are aware of the current wireless project. They wanted to know about the wireless system in St. Croix. We believe that this concern should abate if the current situation is clearly explained to users and if the plans for expansion are executed in a timely manner.

Recommendation 7: Begin the campus-wide wireless connectivity project as soon as possible. One of ITS' major concerns is the possible oversaturation of the Internet access link by the students who will use the wireless system. We share those concerns, but it might be possible, for the time being, to deploy the system with access to university resources only. -

Completing the campus-wide deployment within a year is a big project that may tax the current staff, so bringing in a 3rd party for the design and implementation of the wireless system may be necessary.

Recommendation 8: Communicate the current state of wireless on campus and the plans for its improvement to users. We discuss user relations more broadly below.

5. Internet Access and Internet2

5.1. Internet Access

The St. Thomas campus is connected to the Internet in two ways: via an 8.5-Mbps wireless service and by a T1 line supplied by AT&T. The St. Croix campus is connected via a 22.5-Mb microwave line. The connection to the Internet in St. Thomas is usually saturated. ITS does not have a clear picture of what generates this traffic, and it is hiring a consultant to look at this situation. There is no BGP routing which will help the university route traffic to an alternative Internet service provider. The current provider, Choice, should be able to help set this up.

5.1.1. Internet Security

The University is protected by redundant Cisco adaptive security appliances that act as a firewall between the Internet and the local area network, protecting the local network from malicious intruders. Both campuses are protected.

5.1.2. Performance Issues

Currently, Internet access is slow throughout the University. Everyone is affected, from students not being able to access Blackboard applications from home, to the staff not being able to access BanWeb from outside the University, to researchers and the GIS group not being able to post their data to collaborate with their peers, to staff not being able to do their job because the site they are trying to reach is very slow.

This problem is more severe on St. Thomas, however, where almost all day long the Internet connection is saturated. We recommend the following:

Recommendation 9: Clearly separate the Internet traffic from the students' dormitories from the rest of the University's Internet use, and control Internet access to the dormitories. This will improve the security of the University network as well as allowing the University to manage the dormitories as an Internet service,. In the short term, this will also help control the amount of traffic that the students generate from their dorms.

Recommendation 10: Move the Ironport anti-spam appliance to a location between the University network and the Internet. Between 75 and 90 percent of all mail messages are spam. Almost all of the spam is probably caught by the Ironport. Moving the Ironport to a collocation site outside the University LAN - for example, moving it to the RT Park collocation site and having incoming mail go there, would keep the spam off the University's network and free up bandwidth for other uses, such as Internet access.

Recommendation 11: Work out acceptable interim and permanent policies for proper Internet usage and enforce them through control of specific protocols and sites. Some of these policies would apply for the main university network and a different set to the dormitories and open access wireless points.

At this time there is no policy to block access to certain Internet sites. While universities usually do not block sites to their faculty, staff and students, the particular situation at UVI is different, however, because of the difficulties in getting adequate access. It is important to establish a policy that will clearly indicate acceptable and unacceptable Internet usage. If necessary, the Network Services team can consider controlling certain protocols, such as P2P, that allow people to download music and movies illegally. The University can create different policies for students and policies than for faculty and staff. The Network Services team would need “political” support to control bandwidth in this way, however. Policies can be updated once there is access to more Internet bandwidth.

Recommendation 12: Fine-tune the WAN optimization appliances (Blue Coat) as soon as possible and intensively test them before deploying them full time. Use the weekly maintenance schedule to do these tests. Optimize WAN for now, but do not use the blocking feature yet.

Recommendation 13: Use a program like MRTG or Cacti to monitor bandwidth usage, and go the extra step to post the usage in an internal site, near the FAQ for example, so people that are interested can see it and adjust expectations about the Internet.

Recommendation 14: Clearly communicate to students why fees are going to be charged for Internet access from the dormitories. Currently, students do not understand why these fees are to be assessed or why they should pay them.

5.2. Internet2 Access

The University has the ability to upgrade its microwave link to the Internet in St. Croix from its current 22.5 mbps to access to an STM-1 line to Internet2, which has a bandwidth of 155 Mbps. This line can carry not only university-related traffic but also commercial traffic. ITS is in the process of hiring a consultant with expertise in university connections to Internet2. Hopefully, the St. Croix campus can have the upgraded access by the end of December 2008

The biggest problem is how to bring Internet2 connectivity from St. Croix to St. Thomas. The island’s main Internet service provider does not seem to have the inclination or capability to do this, and because it is a monopoly no one else can provide inter-island communications. Theoretically, the University could use the current inter-campus microwave link, but the current system cannot support Internet2 speeds. The link would have to be significantly upgraded.

Professor Lynn Rosenthal has suggested that UVI could contract for the construction and management of a microwave on an alternative path instead of or in addition to the current path, e.g. a link from the Global Crossing landing on St. Croix to a mountain on St. Thomas and another link from that point to campus. He suggests that there might be a possibility to bypass the monopoly, as a link between islands legally can be provided if it is a final leg to connectivity beyond the territory. The inter-island communication problem persists, however, because other providers are unwilling to bypass the monopoly. Nevertheless, there is the intention to upgrade the microwave system serving St. Thomas.

The RT Park, EPSCoR and the University are working together to find the funds for this upgrade and hope they will be available in the first half of 2009.

Some students, faculty and staff interviewed felt that since the University has announced that Internet2 will be available in St. Croix that their Internet access problems will be solved, but this will not be the case for the St. Thomas campus until its connectivity to the Internet is improved, as discussed above.

UVI is fortunate that the RT Park is helping to get the funds to update the microwave equipment that will allow Internet2 to reach St. Thomas, but in the immediate term ITS should:

Recommendation 15: Hire a consultant to connect the available Internet2 line in St. Croix to that campus. There is some necessary planning, but we believe that it should not take more than three or four weeks to do. The consultant will have to present a plan with tasks that he will follow to get St. Croix connected. Also, the consultant should prepare the St. Thomas campus for the future or at least present a plan and major steps.

Recommendation 16: Develop a concrete plan for microwave connection between the campuses at Internet2 speeds and execute it as soon as possible. Not only will this improve Internet access, but also it will improve LAN communications between the campuses including video conference quality.

6. Applications

6.1. Email

The University has chosen to implement Microsoft Exchange as the email system for faculty and staff and Google email for students, as a multitude of universities in the US and around the world have done. From the available documentation for the email system, it appears to have been properly configured. The documentation was very clear on what steps were followed when it was installed, and it shows how to create new users. The University is using a Linux server to smart host the Exchange server, which is the best practice for an organization of this size. Mail can also be accessed using Outlook Web Access (webmail) and by using direct push/active sync for smart phones and PDAs.

6.1.1. Email Anti-spam and Anti-virus

The University has invested in an anti-spam and antivirus system for email, the IronPort appliance from Cisco. This appliance is used by major companies and universities, and it is well known as an effective device to control spam and viruses via email. Each user has access to the IronPort quarantine and configuration area via a Web browser.

6.1.2. Email User Perceptions

Many people still do not trust the Exchange mail system. Many think that there are problems receiving messages, and a few think that their messages are not reaching their destinations. People are unaware of the anti-spam system, yet people do recognize that there is less spam. The email system for faculty and staff seems to be properly configured, however, and with the addition of the anti-spam appliance many of the problems that the system had in the past are no longer occurring. The current system will probably prove itself to users over time, but here are some suggestions for the near term:

Recommendation 17: Do a new public debut of the anti-spam system. The ITS newsletter has pointed out the implementation of the new anti-spam system, but when we asked users, they did not know it existed. Many thought we were talking about the Outlook spam folder. Re-launch the system. Give it a name such as spam.uvi.com or quarantine.uvi.com. Do not use an IP address to access it, as no one will remember it. Write a one- or at most a two- page manual on what the anti-spam system is and how to access it. Email the manual to users and post it on the FAQ page.

Recommendation 18: Publicize the success of the anti-spam system. In future ITS newsletters, post the email statistics and compare them to the previous months. Post a simple diagram of how an email message gets in an out of the email system.

6.1.3. Microsoft Exchange Administration

Recommendation 19: Test the restore of email from backup once a quarter to make sure the system is working.

Recommendation 20: Document the procedures for restoring email from backup.

Recommendation 21: Establish mailbox quotas for everyone in the system, with no exceptions.

Managing large mailboxes is very time consuming and mail storage is at a premium. It is not infinite. This will also make people manage their mailboxes better.

Recommendation 22: Implement a mail archiving system. This will help people delete items, knowing that they can always retrieve them from the archival system if necessary. It will help in keeping the email storage manageable.

Recommendation 23: Reconfigure the list server system. The email system is also used as a list server system, but Exchange does not do a good job in this area because it does not allow list owners to manage it easily. We suggest returning this functionality to a robust linux-based system that can be managed through a Web interface. Have the owner of each list manage it, offloading this duty from the Exchange managers. Only internal lists should be managed by Exchange.

Recommendation 24: Publish a policy for email backup and restore.

Recommendation 25: Create a document with procedures for disaster recovery of the Exchange system and follow them. An alternative would be to purchase software that would deal with Exchange disaster recovery automatically. Such software is available from Computer Associates , PlateSpin and SunGard, for example. As part of any disaster recovery plan the recovery time objective which is the maximum time the email system can be down after a failure and the recovery point objective which is the maximum amount of data (email)that the organization can tolerate to lose, needs to be defined to decide what kind of DR solution would be appropriate. Of course this is a process that will generate discussions and it takes time. But as a first step, ITS should know the steps to restore their exchange server from the latest backups and rehearse it and create a document describing the process .

6.2. Banner

Banner is a Web-based suite of applications providing access to the University's records for registration and admissions. It also provides a range of information about courses, classes, financial aid, etc. Part of Banner's information is also made available through a Website, BanWeb.

ITS is currently in the final stages of upgrading the Banner system's Oracle database to the latest version. It has asked its users to test the upgraded system prior to applying changes to the production environment. Banner data is backed up every day, and there is also a replica system for continuity and testing.

It is important to point out that although the Banner computer resources are managed by ITS, each module is configured and managed jointly with the module's owner. For example, Human Resources is in charge of implementing the HR module according to its procedures. The same is true for the accounting department and the registrar.

The Banner system generated a relatively large number of complaints during our interviews with students, faculty and staff. The lack of a good reporting tool and, for some, lack of access to reporting, were cited as causes for making users' jobs difficult. Compiling data for reports is very time consuming and can only be done by a few people. Banner seems to slow down during student registration, making other modules unbearably slow. There were complaints about a lack of communication with the Banner ITS group and a belief that ITS makes changes without consulting users. Some users have the feeling that they are not getting the full use of Banner and that there are modules that have not been implemented. Although users seem to know that training for the Banner modules exists, some of them do not understand them, and they do not have the time to go over them. Others do not trust the Banner team because the Banner team appears not to know all the features in Banner.

ITS has assigned representatives to visit the department using each module at least one day each week, and they are also on call by telephone. It is also true that ITS is impeded in making changes by the need to consult with the departments using the modules. The Data and Users Services group has attempted to organize a functioning Banner Users Group, but it has so far found it difficult to generate attendance. Thus, it appears that the basis of these complaints may stem at least as much from inadequate communications among the involved parties as from ITS itself. ITS call center statistics show significant responsiveness from the ITS Banner group, for example.

The Banner system touches everyone's working life at UVI, however, and it is important to continue improving its availability. Most important, the communications with the Banner stakeholders, especially in the administration, must be improved.

ITS is currently hiring a system administrator for the Banner and Blackboard applications, which we encourage doing as soon as possible. This will increase the reliability of the system and will free other staff to work more closely with users.

Recommendation 26: Review efforts to maintain productive contact with Banner module owners and users to identify why current procedures appear not to be working and to modify the procedures if necessary.

6.3. Blackboard Academic Suite

The Blackboard Academic Suite is a Web-based family of applications used by the University to provide distant learning and by the faculty to supplement their classes with online materials.

During our interviews, we heard comments that the faculty is finding that Blackboard is not helping them with their classes. Students complain that they cannot access it from outside campus, and access from St. Croix is slow. Some do not trust Blackboard's reliability although they welcome the help that ITS is providing them to work with Blackboard.

The Blackboard system recently has been improved, however, by adding two front-end servers and two back-end servers. This has added redundancy to the system. Also, the software has been upgraded to the latest version. The Blackboard Web servers will be configured through the University's F5 load

balancers to provide faster access from off campus, within the constraints of the bandwidth problems. This project should be completed during the 2009 fiscal year.

We believe that the hiring of the new system administrator mentioned above and the improvements that continue to be made to the system should reduce the intensity of complaints over time. The situation can also be improved by improving access to Blackboard over the Internet, as we have discussed.

Recommendation 27: Implement F5 load balancing on the Blackboard servers between semesters, so they can be tested adequately during a time of reduced usage.

6.4. Video and Audio Conferencing

A common theme among the faculty was the difficulty with using the video conferencing system. Some rooms have different hardware, and they have difficulty with the different kinds of remote controls. Picture quality could be better, and at times they lose the video or audio in the middle of the class. There is usually an ITS video conference specialist available at the start of each class to help.

At present, ITS staff report that a significant amount of their time is spent assisting with video conferencing, yet complaints persist. New approaches should be implemented to address this problem. Here are two:

Recommendation 28: Hire student video conferencing aides for each department that uses video conferencing. These aides would be trained and certified by ITS on the video conferencing system and would make sure that the system was working at the beginning of each class.

Recommendation 29: Encourage faculty members to regard the video conferencing system as a teaching tool and to get certified on its use. Faculty members often use the video conferencing a few times a week. By now, they should be familiar with how to use it and how to fix minor problems, however the interface does take some time to learn. Perhaps going to a one- or two-hour course should be required before a faculty member is permitted to teach a class that requires video conferencing.

6.5. College Level Examination Program CLEP

During interviews with students one preoccupation they have at the moment is with access to CLEP as is not currently working and students are not able to validate course credits before they graduate. We believe this is more of a problem with in the registrar's office. ITS did not know about this problem, but it is ready to help if it is within their capabilities.

7. IT Infrastructure

We define IT infrastructure as enabling technologies to provide and maintain the delivery of services over the University's network.

7.1. Active Directory

To allow user authentication, ITS installed Microsoft Active Directory, this also enables the email system to work. From the documentation, we can see that there are enough domain controllers across the network. Active Directory should replace the old LDAP system based on Linux which was used to authenticate users on old systems.

7.2. Backup

ITS has recently chosen IBM's Tivoli as its enterprise backup system. It is an enterprise-class backup system, and we found it to be properly deployed. People do not trust the current file shares because they think they are not backed up. They are unaware of backup/restore procedures, particularly the new ones using Tivoli. Communicating these improvements is a user-relations issue, not a technical one.

7.3. Enterprise Anti-virus System

ITS uses F-Secure as its enterprise antivirus system. The general feeling from ITS is that although the software is performing adequately, they would like to upgrade to better software, such as Symantec's, that will allow them to manage the push of antivirus signatures more easily. The current system is not actively managed, most likely because the enterprise network services personnel do not have time available.

Recommendation 30: Manage the Antivirus administration system to make sure that all the university desktops, laptops and servers have their Antivirus signatures up to date and prevent future mass infections that would cripple the university IT infrastructure.

7.4. Computer Labs and Workstations

Some users feel restricted by the lack of rights to install software on their servers. In the computer labs they suggest having a lab monitor at all times to make sure all computers are working, without having to wait for the helpdesk to fix them. This is a proper configuration of workstations that are in the network; it prevents the download of malware that can infect other systems.

Lab workstations reset to the original image with each reboot. This makes logging onto the machines take longer because it has to create a user profile and for some classes it makes them reinstall updates taking time away from class.

Recommendation 31: Consider changing the current software that manages the lab computers to one that has a different approach to resetting the configuration after it is used without the need to reinstall all software again.

8. Service, Support and Staffing

8.1. Help Desk and Customer Service

Information & Technology Services has an integrated help desk system. Telephone calls about the network, email, servers, desktops, Banner, etc., are routed to the help desk phone number or users can be attended to in person at the libraries' main desks. The front-line support is usually done via phone or by the library staff who also have the duty to help library users.

Although many issues are resolved immediately, many calls are escalated to information technology specialists who also are responsible for helping with the video conference rooms. As a result, resolving problems can often take longer than necessary. ITS has a customer service charter that sets support expectations for their staff and users. Among its provisions is the expectation that most problems will be fixed within three days.

For the week of November 3 to 9, 378 users asked questions or reported problems at the main library help desks, while 281 users contacted to the help desk by phone. The tables in the appendix show the timing of these calls in more detail.

Support in St. Croix is also routed to the primary help desk call center, but users can also go to the library for support when needed. The staff is very motivated, and they are also under a lot of pressure to get all issues resolved. Since there are about 175 hours of classes using video conferencing each week, however, the information technology specialists have to spend a lot of their time facilitating the video conferencing instead of helping the users with their support problems.

There is a ticketing system to track help desk requests and the escalation of problems. Problems can also be escalated to the Banner, Blackboard and network services areas. The system does not seem to have sufficiently detailed problem priority classifications. Priority 1 incidents are those that affect the university as a whole (no email or Internet). Priority 2 is everything else.

The staff was fairly positive about the support they had been getting from the help desk area, and they like the follow-up calls. Still, some of the complaints in this area have to do with how long it takes for a problem to get solved, and some users were vocal about issues with the prioritizing of support requests. Some would like to see a 24x7 helpdesk area.

Access to users' websites has decreased, and people no longer have access to modify data. Also, there is no general support for Mac and Windows Vista operating systems.

There are difficulties in adding money to the virtual wallet for printing as students can only pay in certain places.

Although the overall feelings about the helpdesk area are mixed, people have noticed an improvement in the service. Staff really appreciate that there is a ticketing system and that there is follow-up after a problem is thought to be resolved. Still, the time to get problems fixed is too long, and this affects the performance of staff and faculty. Some suggestions for improving this area:

Recommendation 32: Reduce the amount of time ITS staff spends on video conferencing support.

Video Conferencing troubleshooting takes a lot of time away from other level-two support. Suggestions for improving video conferencing support are recommended in the section on video conferencing, above.

Recommendation 33: If it is not possible to decrease the amount of time ITS spends on video conferencing support, consider hiring more staff in this area.

Recommendation 34: Give help desk staff direct access to a manager with substantial technical expertise, who can give them ideas on how to solve problems quicker.

Recommendation 35: Find ways to encourage IT staff to solve user problems quicker and in a friendlier manner, such as incentives, bonuses or training. One of the concerns heard from users is that there is no empathy from IT to the problems users are having.

Recommendation 36: Update the ticketing system so different priorities can be assigned to different classes of problems. For example, a problem that affects a department may deserve higher priority than a problem affecting one user. Or a user on deadline may require higher priority than someone who can afford to wait.

Recommendation 37: Invest in software that will allow users to reset and unblock the Active Directory passwords and accounts. Many of the calls helpdesk gets are related to password problems.

Recommendation 38: Create a document repository website for ITS documentation. This could be within SharePoint or with a content management system like Joomla or Drupal and hosted in a collocation site with proper security.

8.2. User Relations

Many of the concerns raised by users were caused by their having incorrect information, partial information or no information at all from ITS. ITS has made efforts to reach out to their community to inform them of changes and updates to the system, but definitely “something is lost in translation” and the information is not really reaching the users. We suggest, therefore:

Recommendation 39: Target the information you send to each group of users. Instead of sending to everybody, just try to send each group the specific information it needs.

Recommendation 40: Communicate clearly. Whenever possible, messages should be short and to the point. Also, remove any techie speak, like “Upgrading Exchange server.” Use “Upgrading the email system,” instead.

Recommendation 41: Send messages to large groups of users only when necessary, when it affects a large number of users.

Recommendation 42: Continue the newsletter. The newsletter is an effective way to let users know what ITS is doing. You may consider having sections in the newsletter, however, such as Library, New People, Banner, Blackboard, Network, etc.

Recommendation 43: Create a public FAQ website about ITS and its services that does not involve authenticating users to look at the information. Have sections for different services. Have ITS personnel promote the site. Consider giving staff the tools to update the information in the FAQ, perhaps through a content management system.

Recommendation 44: Be realistic about the time to bring new services and features and adjust expectations accordingly.

Recommendation 45: Clarify backup and restore procedures with users and publish related policies.

8.3. Staff Development

Recommendation 46: Begin an exchange IT sabbatical program. We have heard of the difficulties in recruiting seasoned IT staff. We believe the University could involve its partner universities on the mainland, perhaps by offering short-term work to interested IT staff who may want to spend part of a sabbatical or an extended vacation in such a beautiful environment. We believe that the local staff will greatly benefit from interacting with such people who work in similar environments.

Similarly, local staff will benefit by going to user group meetings in their areas of work.

8.4. Enterprise Network Services

This group manages the network backbone and the basic application services such as email and Active Directory for user authentication. It also supports the servers, backups, patches and antivirus. For the past couple of years, this group has been busy installing new network equipment, upgrading the email and domain name service system and providing new hardware to both campuses. The group also provides specialized support to at least a couple of units that in return pay for part of some of the staff salaries. This group is also the third level of support in the help desk system. Their focus has been primarily on network issues, although they also perform computer system administration. ITS also has been investing significantly in training to upgrade its staff's skills which we recommend to continuing.

This group should start preparing for future expansion of its responsibilities as the University starts attracting research grants that will have a heavy IT component. The Marine Sciences Unit and the GIS unit have heavy requirements for information storage for example. Enterprise Network Services should accommodate these groups by offering their services. For example, they need access to system administrators, data centers to host the servers that store their data and access to the Internet. In return the grants could help pay for these services, since in the future staff may increase in this area to properly support upcoming projects.

Recommendation 47: Increase the focus of their support in systems administration for their current services like exchange, Active Domain, backup system and antivirus system.

Recommendation 48: Monitor the health of the data centers. If there is a power outage or a problem with air conditioning, the monitoring system should advise them. Similarly for major services like Internet and email, if the email system is failing the monitoring system should send a page to the person on duty.

Recommendation 49: Have the network documentation available at each data center. This will help staff to troubleshoot quicker.

Recommendation 50: Continue the practice of hiring network consultants to help with the overall health of the system. This would not be a full-time consultancy but one for a couple of days a month. Much of the work can be done remotely. The Network Services staff would benefit from having a third party with whom they can freely address questions and concerns and who can give them a hand with larger projects when needed.

This group should work behind the scenes to make sure infrastructure is working adequately and supporting the second level support team when appropriate, but hopefully end-user support duties should be kept to a minimum so they can concentrate on their primary job.

9. Appendix

9.1. Illustrative Coments

Prior to, and during the course of the study, the investigators had many opportunities for input from students, faculty, and staff. These included conference calls, face-to-face meetings, and a video conference. Setting included group meetings and private discussions with individuals. The following are included for illustrative purposes and are intended to give a flavor of the types of questions and comments that were made. These are raw data from our notes, and should be taken as such. No conclusions should be made from the types or questions, the number of questions, or the content of these questions. The authors' conclusions are contained within the body of the report.

1. Internet access is too slow in STT. Access from outside campus to Banner and Blackboard is very slow.
2. Not enough bandwidth for researches to post information, like maps and data.
3. The video conference equipment does not always work well, it works different from room to room and most times they need a VC person at the beginning of each class to make sure everything works seamless.
4. Why is there no wireless system on Campus? What happened to the wireless system on STX?
5. Computers in the labs do not always work, most labs are not,attended, and the machine resets to the original image with each reboot. This makes logging to the machines take longer because it has to create a user profile and for some classes it makes them reinstall updates taking time away from class.
6. There are very few data repositories, so data is everywhere.
7. Researches cannot find places to get their data to collaborators via file sharing/ftp.
8. The data is not backed up, leading to lost data in the past. People therefore do not trust the system, and now use external USB drives.
9. Exchange mail system is not trusted, especially incoming mail. People are not aware of the anti-spam system. People would like to get all their mail including spam.
10. Faculty has no faith on the reliability of the blackboard system.
11. Help Desk is taking a long time to solve problems, but most staff are happy with the improved ticketing system and the follow-up from helpdesk after a problem has been resolved.

12. There exists no web site support.
13. There is no support for MAC and Windows Vista.
14. Problems exist with Proxy servers.
15. The web filtering was not working, blocking many sites including access to banner and blackboard.
16. Access to Internet2 is not working yet.
17. Banner varies from day to day; there are good days and days when you cannot get in. This sometimes gets difficult and makes the job harder.
18. Mails are read through Web access at times.
19. Speed is a major problem – agreed by all.
20. Communication has been upgraded; newsletters are now circulated ever so often.
21. Mail pick up is slow and the cause is unsure.
22. Slow building is also another issue at hand.
23. Ban Web is very slow when dealing with Share Point.
24. Staff feels like user support is improving.
25. Help Desk has been good thus far and service has improved (estimated from around summer). When a problem is reported they now call back and follow up on that report.
26. There is somewhat of a lack in trust with having access to and someone dealing with your Personal Computer. So there is different environment in terms of trust with PC's.
27. There is also improvement regarding spam. It is now a lot less in comparison to previous months.
28. After the new firewall was put in place there was difficulty seeing that individuals were changing their name/address hence the new firewall was not recognizing the domain.
29. Email procedure is good going out but not so reliable coming in.
30. The backup system is not reliable. Staff member lost four months of work and it took three months to retrieve the work lost. Server space is no longer secured. Staff have expectations that backup system should work. There needs to be a way of keeping track of everything.
31. Statistics show only two people have been on the informational site in Blackboard. (Ricardo Uribe)

32. Getting the necessary reports needed poses a challenge with regards to the Accounting department.
33. Users of the Grant Module claim to face a challenge with this module. (Mr. Uribe did point out that the Grant Module may not be an IT problem but can very well be the persons for the module.)
34. More technology is required, however staff realize it takes time and funds.
35. Students have difficulty adding money to their account for printing purposes.
36. There is an issue getting microwave replaced at this point although bandwidth is already coming to St. Croix campus.
37. When or how St. Croix campus is supposed to, or know how to, switch to the proxy server?
38. When power goes out what is the alternate path?
39. What is the plan in terms of dealing with the backup system issue?
40. Would it be a difference if the backup plan was done locally? (Ricardo Uribe)
41. Does accessing the system from home work? (Ricardo Uribe)
42. Are we safe now with the use of Blackboard? (Comment: It has been working well thus far for the semester.)
43. Help Desk not being available 24 hours, especially within the crucial times. Should the system go down and messages are left at the Help Desk, the messages left are not picked up.
44. IT department should be smooth in operations. No one should know that they are visible.
45. Existing problems are not monitored. For example, computers in the various labs that are down or are missing software remain there for a period of time before anything is or can be done to fix the problem.
46. IT department should examine each computer in the labs at the beginning of the semester before classes get underway.
47. Each computer lab should have IT personnel available who are able to assist with any issue that may occur. In the past, students were the ones to provide assistance but seeing that this haven't worked out something else should be chosen or another way of going about it.
48. Training sessions post challenges due to internet speed and availability.
49. Rebooting system occurs every time a new person logs on. Therefore if person A uses a computer and logs out then person B logs in it goes through the process once again of rebooting. So every time the system boots, it reinstalls.

50. In terms of Power Protection there are times when there is a large number of power failures. No report given to faculty on what has been done.
51. The loss of files when it's not backed up on the server. Having one server and backup dies poses a challenge if you do not have a CD or flash drive to come into effect to prevent files from being lost. Money was put in to have a backup plan from outside sources but UVI Faculty never saw a report plan.
52. The issue of training was brought up in terms of individuals who receive training find better jobs and therefore IT has to find replacements to train again. The new staff coming in would or might not know the mechanism in place.
53. Lack of professionalism. Example given; UVI refused to pay \$50,000 to IT professional and he was told that he would not be paid that kind of money. That individual got something in two weeks for more money.
54. The Video Conferencing system is not up to par and has difficulty at times with the audio and virtual image. Example given; Faculty member was late for a video conferencing class and although late, nothing had been set up yet.
55. IT needs more time and money to be able to rationalize and have someone check the rooms before all sessions start.
56. One way faculty works around some of the challenges is by using Web Conferencing Online. This enables the use of emailing and doesn't require video conferencing. Also available is Dial-up Audio Conferencing and although accessible, many are unsure of its usage and how to go about benefiting from this service.
57. Within the Business Division, they would like to go to Hybrid but cannot get the support they are seeking because of the lack of faith in the Technology System which is not dependable, internet, blackboard etc.
58. Faculty find their own way in terms of having things stored simply because anything can get lost at anytime.
59. The availability of wireless access on the St. Croix campus was available in public areas but has since been reduced to coverage around the Library area. Reason being, it was a security threat. Faculty feels that information should be passed on to both Faculty and Students when certain decisions are made.
60. There is not much access outside of the University with the exception of emailing.

61. Web servers are not available.
62. In terms of software being installed, it is not feasible unless you have administrative rights. Therefore, students (mainly Computer Science/Information Systems majors) do not learn how install software on their PCs.
63. The availability of Blackboard is a major concern as is Banner.
64. University should get users more involved.
65. Students using Library Research have very limited online database access and it is almost impossible to research off campus.
66. Faculty find other means of obtaining articles online for their students.

9.2. Example week of Help Desk Requests

The table contains the number of requests for each hour going forward to the next hour. For example, the number "4" under walk-up on 8 AM on 3 November means 4 requests between 8 AM and 9 AM.

ITS Service Desk Daily Stats - Number of Walk-ups by time of day															
Time / Date	AM				PM										Totals
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
3-Nov-08	4	10	15	4	3	3	4	7	3	5	8	2	1	0	69
4-Nov-08	4	8	6	6	3	1	3	8	12	1	1	0	0	0	53
5-Nov-08	1	6	5	2	5	2	7	15	5	16	11	0	0	0	75
6-Nov-08	2	7	4	6	1	13	9	10	3	14	6	2	2	0	79
7-Nov-08	10	4	8	7	10	12	4	0	4	8	1	3	0	0	71
8-Nov-08	x	2	6	2	7	0	0	1	9	x	x	x	x	x	27
9-Nov-08	x	x	x	x	x	1	0	0	1	2	0	0	x	x	4
Week total	21	37	44	27	29	32	27	41	37	46	27	7	3	0	378

ITS Service Desk Daily Stats - Number of Phone requests by time of day															
Time	AM				PM										Totals
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
3-Nov-08	3	9	7	4	6	2	12	7	5	5	3	0	1	2	66
4-Nov-08	5	8	5	7	5	1	2	2	6	0	0	0	0	0	41
5-Nov-08	4	5	7	2	3	1	7	7	5	1	0	0	0	0	42
6-Nov-08	4	3	6	7	2	9	9	8	1	1	1	2	0	0	53
7-Nov-08	8	9	8	3	9	10	3	2	4	4	2	5	0	0	67
8-Nov-08	x	0	5	0	1	0	0	1	2	x	x	x	x	x	9
9-Nov-08	x	x	x	x	x	0	0	0	0	2	1	0	x	x	3
Week total	24	34	38	23	26	23	33	27	23	13	7	7	1	2	281