

# Information Technology 2005-2006 Annual Report



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## Featured topics

## Focus on security

Information technology security remains a vital and moving target. This fiscal year has seen repeated news accounts of government agencies, other institutions of higher education, and corporations who have exposed the personal information of their patrons or customers. The personal information of Virginia Tech's faculty, staff, students, and other partners is critical to safeguard, and the various efforts to improve information technology security help the campus community to be able to use the information needed to complete their responsibilities while maintaining appropriate levels of control and confidentiality.

Security reviews began this fiscal year to increase security assurance and to identify and ameliorate vulnerabilities. Working closely with the Controller's Office, the IT Security Office identified the first offices for security reviews to be those dealing with credit card information, and began the first fifteen reviews.

Among the measures instituted this year is the ability for faculty, staff, and students to control more finely the public display of their contact information. In consultation with Personnel Services, the Vice Provost for Academic Affairs, and the University Registrar, several Information Technology workgroups established means for individuals to set their own display. Supporting this transition are Information Resource Management, Middleware Services, Administrative Information Systems, and the Collaborative Technologies Unit.

This fiscal year also saw the first regular orientation in information technology security for newly hired staff employees. IT Security Office staff members participate in the weekly new employee orientation. [In addition, they continue to be active in the Faculty Development Institute sessions and in new faculty orientation.](#)

The Virginia Tech Central Authentication Services (CAS) went into production in August 2005. In addition to the added convenience of single-sign on, CAS adds security to online applications by reducing the number of times credentials travel over the network.

Tools developed to improve desktop security include the initial deployment of Medium Facilities Management (MFM) for Windows machines. The Microsoft Implementation Group (MIG) developed MFM to automate windows patching, virus scanning, and a firewall for those selecting this service. Another new tool, Sunflower, is a component of Some Facilities Management that scans machines with Microsoft's Baseline Security Analyzer 2.0.

## Networking for distance learning

Virginia Tech's distance learning programs provide opportunities for learners throughout Virginia and beyond. From early satellite communications to two-way interactive videoconferencing, the network provided the underpinnings of communications between university sites. Throughout the 1990s and into the twenty-first century, the foundation for connectivity has been NetworkVirginia as the foundation for the Asynchronous Transfer Mode (ATM) network. Since 1998, the university has offered between 50 and 70 courses each fall and spring with total student enrollments of 1000 to 1500 each semester.

While the ATM technology has been stable and reliable, the videoconferencing equipment nears the end of its useful life and newer protocols and improved technologies for instruction are available. The upgrade underway constitutes a major conversion project that will enhance the university's position in this competitive market. With increased bandwidth and high quality, reliable videoconferencing over the Internet, faculty members and students will benefit from high-resolution graphical displays and other instructional enhancements.

H.323 is the standard for interactive videoconferencing utilizing the IP protocol and H.329 is the standard for adding high-resolution graphics. Information Technology has embarked on a conversion plan to H.323 systems that support H.239 standards.

Video/Broadcast Services is leading the project. Key university partners are the Commonwealth Graduate Engineering Program, the M.B.A. Distance Learning Program, the Institute for Distance and Distributed Learning, Learning Technologies, and Outreach and International Affairs. Communications network Services' Research and Development groups identify and address infrastructure and quality of service issues. Learning Technologies supported classroom equipment upgrades, and the Network Operations Center provides round-the-clock support.

The first phase of the conversion ran through March 2006. During the 2005-2006 academic year, nearly twenty courses were supported in the new technology, including five courses to the Wake Forest Medical Center and three to the Arab Academy in Cairo, Egypt. Phase Two of the project beginning in April 2006 will include the installation of two gateways to connect ISDN and IP videoconferencing systems. This phase will involve the deployment of twenty-two origination systems and ten small-group receiving systems at twelve different sites. Completion is scheduled in time to support fall semester courses.

In addition to the major upgrades to the videoconferencing bridging and classroom equipment, the project includes solutions for personal computers and improvements in video streaming. The personal computer videoconferencing solution will allow faculty members to teach when they are traveling, and will expand the benefits for students in sites other than those with enhanced classroom systems.

## Student computer requirement

Since 1998, Virginia Tech has required computer ownership of incoming undergraduates. This year, the requirement has been for mobile computing—a laptop or tablet computer. In addition to serving on the requirements committees, staff members in Information Technology support the student computer requirement, and through the provision of infrastructure, have made the mobile computing requirement possible.

The provision of wireless access in classroom space has been substantially in place for two years, with additional capacity added as more faculty use in-class learning experiences with laptop and tablet computers. Today, over 85% of the academic space in on central campus has wireless available.

The help desk, 4Help, directly supports students using laptops and tablets with telephone, online, and walk-in support. Vendors supply hardware support as a part of the computer requirement. For short-term checkout of back-up computers, however, laptops are available from TechConnect Lab, a unit of Learning Technologies, located on Torgersen Bridge. Additional computers, often with specialized software, are available in the computer-integrated classrooms and computer labs supported by units within Learning Technologies. Software is available to students at much better educational contracts than would be available at retail prices, through the contracts and distribution by Information Technology Acquisition.

Support for technology in the classroom has long been a staple of the Faculty Development Institute (FDI) and Educational Technologies. With tablet computers, the paradigms for learning with technology have changed. FDI helps faculty work with the new possibilities for visualization and conceptualization possible with tablet computers. Summer 2005 FDI tracks included teaching with tablet computers. Graduate students participating in the Graduate Education Development Initiative also learn to work with tablet computers to facilitate classroom instruction.

Similarly, research on using tablet computers for instruction is part of the efforts of the Computer Integrated Classrooms group within Learning Technologies. This group provided support for a project conducted in partnership with Microsoft that studies the effect of evolving hardware and software systems on teaching and learning.

## Office of the Vice President for Information Technology

The mission of Information Technology is to serve the university community and the citizens of the Commonwealth of Virginia by applying and integrating information resources to:

- Enhance and support instruction, teaching and learning;
- Participate in, support, and enhance research;
- Foster outreach, develop partnerships with communities, and promote the capabilities of advanced networking and communications;
- Provide, secure, and maintain systems allowing the university to accomplish its missions.



# Restructuring

During the past year, the board of visitors passed a resolution adopting the Virginia Tech's management agreement as an element of the Restructured Higher Education Financial and Administrative Operations Act. The management agreement negotiated with the secretaries of finance, administration, education, and technology took effect July 1, 2006. The agreement is significant for Information Technology, allowing the university to manage many of its aspects independent of the Virginia Information Technology Agency's approval and oversight.

The following is an extract from the management agreement:

This Policy shall govern the University's information technology strategic planning, expenditure reporting, budgeting, project management, infrastructure, architecture, ongoing operations, security, and audits conducted within, by, or on behalf of the University. Upon the effective date of a Management Agreement between the Commonwealth and the University, as authorized by subsection D of § 23-38.88 and § 23-38.111, therefore, the University shall be exempt from those provisions of the Code of Virginia, including those provisions of Chapter 20.1 (§ 2.2-2005 et seq.) (Virginia Information Technologies Agency) and of Article 20 (§ 2.2-2457 et seq.) (Information Technology Investment Board) of Chapter 24 of Title 2.2 of the Code of Virginia, that otherwise would govern the University's information technology strategic planning, expenditure reporting, budgeting, project management, infrastructure, architecture, ongoing operations, security, and audits conducted within, by, or on behalf of the University; provided, however, that the University still shall be subject to those provisions of Chapter 20.1 (§ 2.2-2005 et seq.) (Virginia Information Technologies Agency) and of Article 20 (§ 2.2-2457 et seq.) (Information Technology Investment Board) of Chapter 24 of Title 2.2 of the Code of Virginia that are applicable to public institutions of higher education of the Commonwealth and that do not govern information technology strategic planning, expenditure reporting, budgeting, project management, infrastructure, architecture, ongoing operations, security, and audits within, by, or on behalf of the University.

The procurement of information technology and telecommunications goods and services, including automated data processing hardware and software, shall be governed by the Policy Governing the Procurement of Goods, Services, Insurance, and Construction, and the Disposition of Surplus Materials approved by the Board, and the Rules Governing Procurement of Goods, Services, Insurance, and Construction that are incorporated in and attached to that Policy.

The university's board has approved several high level policies that support the areas of security; project management; accessibility; and infrastructure, architecture and ongoing operations. These policies can be found at <http://www.policies.vt.edu/index.php> in the 7000 Information Technology policies section. Additional standards and guidelines are under development.

## Nolij project

On June 17, 2005, a contract was signed with Nolij Corporation for an online imaging system resulting from a request for proposals (RFP) [#646435](#) for a graduate admissions imaging system. The purpose of the RFP was to secure an imaging system used initially by the Graduate School with the option to expand use later to other functions of the university. Demand remains strong for an enterprise wide, online imaging system at Virginia Tech. Departmental inquiries regarding the status of the Nolij implementation are steady.

A kick-off meeting for Virginia Tech's Nolij project was held June 28, 2005. The Virginia Tech Nolij implementation team consists of fourteen, mostly technical, Information Technology staff members from various units and two Graduate School information technology representatives. Shortly after receiving and installing the Nolij software system, some security problems were revealed which prevented deployment. Negotiations began immediately (mid-July 2005) with Nolij Corporation to rectify our security concerns. Weekly conference calls between the Virginia Tech implementation team and the Nolij Corporation project manager and company president (also the lead developer) continued through October 2005.

These negotiations resulted in a decision in early November 2005 by Nolij Corporation to rewrite their Web thick client in the recommended Java language. Meanwhile the university implementation team devised an interim secure solution to make the existing Nolij system available to graduate admissions staff. This solution involves the use of a private Citrix server and private networks to secure client-server communications and transactions. The "Citrix solution" is not scalable to an enterprise level and remains in use by the Graduate School only. The intent was to give some imaging capabilities to the Graduate School while Nolij Corporation works on the Java rewrite.

Since November 2005, the university Nolij implementation team has freely shared advice, expertise, and code examples with Nolij Corporation via conference calls and e-mail. In May 2006, Nolij Corporation shared their source code for the Java servlet piece of the system with the university and continues to implement our recommended changes to the design and code. As of August 2006, the university is preparing to install a limited (beta) client to test the design and secure network communications and transactions. This test is expected to be followed shortly by release of the full Nolij Web client/server implementation (version 5.0).

# Financial Summary

During fiscal year 2006, organizational units of Information Technology provided resources totaling \$49,836,000 in support of the university's academic, research, administrative, and outreach goals.

Information Technology provided direct academic, research, and administrative support activities totaling \$19,992,000. Telecommunications, video, data, and networking services support was \$22,466,000. An additional \$760,000 was expended in support of sponsored projects.

Additional support services included:

|                            |              |
|----------------------------|--------------|
| Mail Services              | \$ 1,480,000 |
| Printing Services          | 4,220,000    |
| Software sales to students | 909,000      |

Funding to support the activities of Information Technology was provided by:

|                       |               |
|-----------------------|---------------|
| Education and general | \$ 26,432,840 |
| Equipment Trust Funds | 1,663,911     |
| Auxiliary operations  | 16,741,164    |
| Self supporting units | 4,132,067     |
| Sponsored programs    | 1,300,574     |
| Overhead              | 525,263       |
| Continuing education  | 93,247        |
| Total                 | \$ 50,889,066 |

## Area reports

## eCorridors

The eCorridors group is comprised of three full-time staff members, one graduate student, and two undergraduate students. The director of eCorridors, Brenda van Gelder, reports to Vice President for Information Technology, Erv Blythe. Expertise for eCorridors' activities is drawn from within many areas of Information Technology, and results in symmetry of purpose and economies of effort among the communications networking, broadband wireless, and the Blacksburg Electronic Village groups. eCorridors staff also collaborates with university faculty and administration including the director of economic development, the director of government relations, University Relations, and a number of faculty researchers.

The mission of eCorridors is to create competitive advantage by facilitating the deployment of advanced technology infrastructure and applications leveraging inter-regional connectivity for, and collaboration among, communities. This mission involves activities that fit within the overall Information Technology strategic plan.

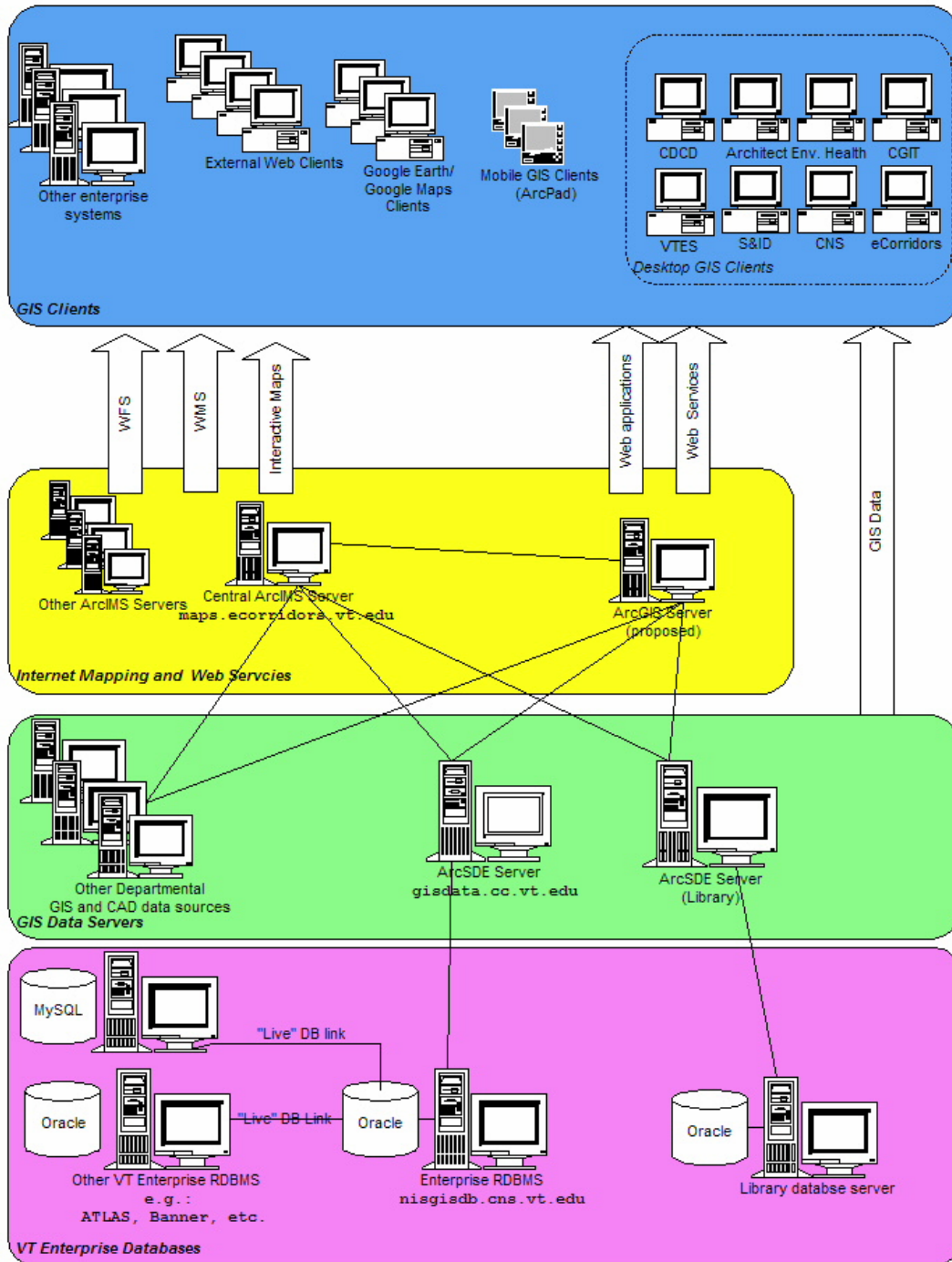
## Research

Part of the Information Technology mission statement is to “participate in, support and enhance research.” eCorridors is comprised of personnel who have developed competencies and credentials as a result of engaging in new research and supporting ongoing university research efforts. Staff expertise includes broad understanding of the technical, social, and political implications underpinning access to advanced technologies. The depth of knowledge obtained enables members of eCorridors to contribute to the national, state, and local information technology policy analysis and development in areas such as network security, ecommerce, network infrastructure deployment and quality of service, and the rights of individuals and municipalities. Research specialties pursued as part of eCorridors' activities include spatial analysis, strategic alliances, collaboration, and partnerships with public and private sector entities, economic development best practices, and spatial application development. Some specific eCorridors activities supporting research during the year follow.

**Cisco and City of Danville regional voice interoperability project.** This project involved the City of Danville emergency services and police, the Virginia State Police, North Carolina State Police, representatives from Cisco Systems and from the National Institute of Justice, and Virginia Tech. The purpose of the project is to improve the overall emergency communication effectiveness between public safety agencies and to break down barriers that cause interoperability issues. eCorridors personnel were engaged as part of the overall technical evaluation process to evaluate such things as the viability of pilot technology with existing networks; technical security; delayed transmissions; bandwidth performance issues; and the cost of implementation. Research advancements that resulted from this project include obtaining data that can be used to assess the advantages and disadvantages of using Voice Over IP (VOIP) in rural areas; the inner workings and issues involved with multi-state voice communications policies and procedures; acceptance of a new technology by public safety officials;; cost-efficiency of VOIP as related to radio improvements; viability and reliability of critical communication over the Internet, and operational effectiveness in cross-agency communication.

**Enterprise geographic information system.** In collaboration with Communications Network Services, eCorridors has contributed to the development of a prototype enterprise geographic information system (GIS) consisting of server-based applications and servers. GIS systems are bandwidth and computationally intensive and require large storage capacities. This proof-of-concept system provides new tools that enable researchers and other users to share and store geospatial resources in a centrally accessible database. The reason these capabilities are needed are that (1) departments frequently need data that are maintained by other departments; (2) some datasets are simply too large to be stored cost-effectively at the level of the individual user, or even the individual department; and (3) a centrally-administered system would be reliable, more secure, and more structured than current informal data sharing mechanisms. The system is intended to serve a diverse academic community such as the University Libraries, the Center for Geospatial Information Technology, and Site and Infrastructure Development, as well as be utilized for outreach and economic development projects. Outreach and economic development projects are increasingly dependent on GIS resources. The GIS prototype also has potential for open sourcing of new and modified software. Beyond the machines directly administered by Information Technology, there are other initiatives across campus that can be knit together by an enterprise GIS infrastructure. It is anticipated that the systems owned by University Libraries and other GIS-related areas of the university can be structured to be able to interoperate and share data (eCorridors Figure 1). As the small group of GIS professionals based in Information Technology builds an enterprise GIS system, and as the other, complementary systems come online across the university, it is important to note that there will be a need for central coordination and management of the entity as a complete system. The group within Information Technology that conceived of the idea of enterprise GIS and demonstrated the very first proof-of-concept implementation on campus are prepared to provide the leadership to make this effort successful and self-sustaining as an enterprise system on par with the likes of Banner, Exchange, and other centralized services that have come to be recognized as an established component of the university's vital information technology infrastructure.

A Unified Concept Model  
for a Spatial Data Infrastructure at Virginia Tech



Concept Diagram by Seth Peery, Virginia Tech eCorridors Program  
Last Modified: 2006-06-21

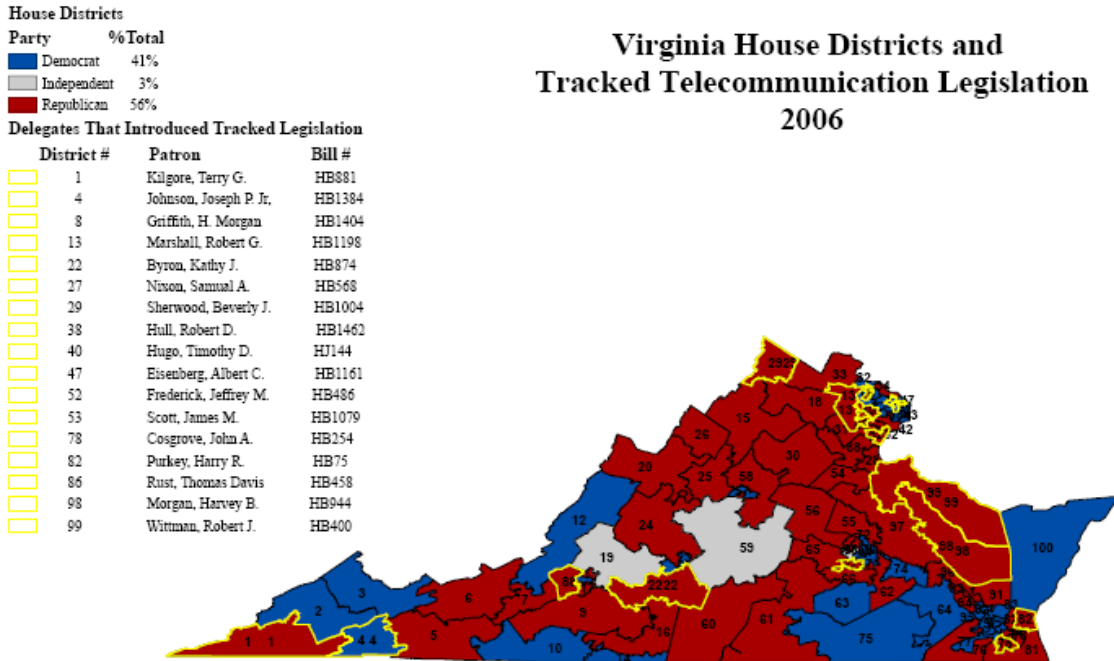
eCorridors Figure 1

## Outreach

Also included in the Information Technology strategic plan is to “foster outreach, develop partnerships with communities and promote the capabilities of advanced networking and communications.” eCorridors has developed a reputation among communities statewide and nationally as a reliable source of guidance in the development, planning, and optimal utilization of advanced telecommunications systems. eCorridors has collaborated with many communities throughout Virginia to expand advanced network and communication infrastructure and services. Similarly, the many private sector participants recognize that Virginia Tech is a respected player in rural and community networks. Our emphasis on public-private partnerships has resulted in a number of entrepreneurs and small businesses, as well as national companies, approaching us for information, insight, and advice before approaching rural communities to introduce new products and services. Some of the communities and organizations that approached eCorridors for assistance include: the New River Valley Planning District Commission for assistance in planning and implementing regional infrastructure; Nelson County for assistance in starting a dialog about the need for broadband; Bedford City for assistance in reviewing responses to a wireless services RFP; Virginia Tech’s Office of Economic Development for assistance in putting together a promotional package about Blacksburg as a potential distributed data storage location; and the Newva Technology Council for assistance in creating an IT-focused constituent group and for facilitating access for individuals in local industry to interact with Virginia Tech faculty researchers on issues of interest. Other outreach-focused efforts by eCorridors are described below.

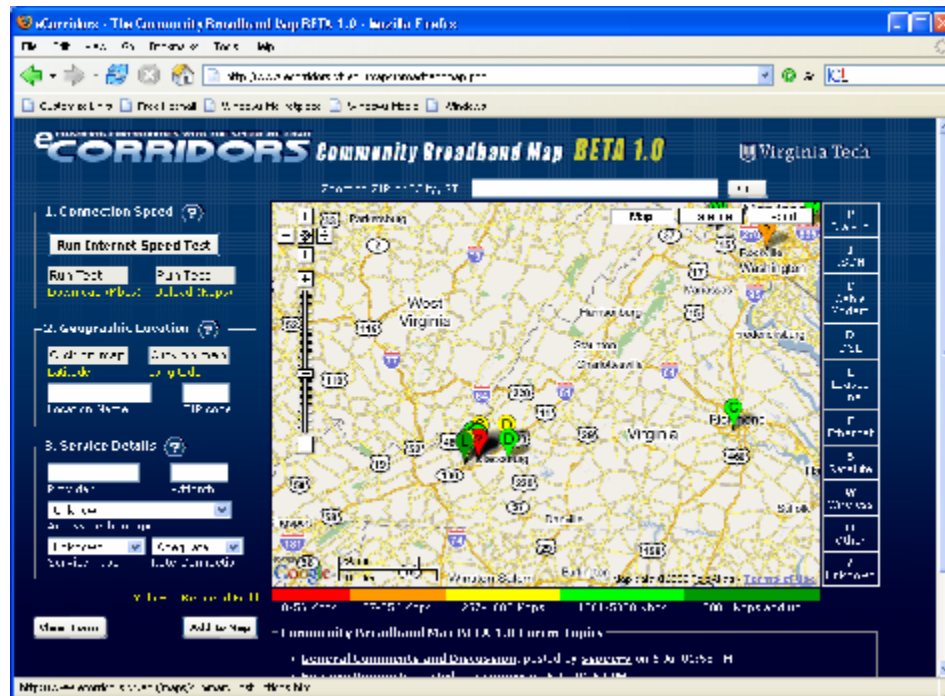
**Legislative policies map.** Many of the inquiries to eCorridors from communities engaged in or considering public telecommunication projects revolve around the legality of their proposed plans. The legislative policies project began out of an in-house need to know the regulatory environment for our day-to-day activities. We developed a means of tracking state policy legislation that is related to telecommunications on a GIS interface so that we could have a visual interpretation of the legislative activity from the House, and on a separate map, the Senate. The purpose of the bill-tracking project is to provide regulatory information to those interested in telecommunication related legislation. Using the online Virginia Legislative Information System, available at: <http://leg1.state.va.us/> and GovTrack.us, an ongoing collection of state and federal bills and resolutions related to telecommunications were compiled and then made publicly available on the eCorridors website. (See eCorridors Figure 2). This project benefits communities considering incorporating telecommunications into their economic development efforts as well as others interested legislative intelligence surrounding strategic planning for telecommunications infrastructure and services, and regulatory issues affecting ecommerce, software, and network devices.





eCorridors Figure 2—Telecommunications Legislative Policy Map

**Broadband community map.** One of the challenges in assessing the availability, cost, and speeds of bandwidth in different areas of the state is the lack of a central collection of this type of data. While telecommunications providers often advertise bandwidth in bundled packages of varying speed rates, subscribers to those packages do not always get the bandwidth they pay for due to a large number of factors that affect capacity at any given time. The eCorridors group developed a beta version of a “Community Broadband Map” which allows broadband consumers to measure their service’s speed, mark their business or residence location, add optional descriptive information about the adequacy of their connection, and add a marker corresponding to these descriptors on the map. This represents a "bottom-up" approach to broadband mapping, insofar as it is driven by the voluntary contribution of connectivity information by users. There are numerous potential uses of this map as it becomes populated with a sufficient amount of data. For example, in areas where the map reveals an abundance of high-speed connectivity, communities could use the map to illustrate this fact, as a means to attract technology workers and their employers. In areas where the map reveals a lack of high-speed connectivity, communities could use the map as a means to attract new ISPs, or as justification for developing their own infrastructure, where permitted by law. Individuals could use the map as an input to personal location decisions. The site consists of a speed testing application, the open-source "NDT" tool developed for Internet2, and a Google Map, tied together by a form through which users can input their data. Discussion forums are also provided as a means of discussing bandwidth trends, needs, and availability, as well as a forum for posting problems with the mapping application. The map is available online at <http://www.ecorridors.vt.edu/maps/broadbandmap.php> (eCorridors Figure 3).



eCorridors Figure 3—eCorridors Community Broadband Map

## Education

The Information Technology strategic plan has an objective to “increase the number of ... student employees.” The eCorridors program has always had student employees, both graduate and undergraduate. During 2005-2006, we employed two undergraduate English department interns and one Urban Studies and Planning graduate student. It is expected that an increasing number of students will be working with us in the coming years.

## Publications, presentations, and interviews

Some of the research conducted by Jean Plymale of the eCorridors group was published in a chapter of the book, *“Pittsburgh and the Appalachians, cultural and natural resources in a postindustrial age,”* edited by Joseph L. Scarpaci and Kevin J. Patrick, 2006.

The director of eCorridors was involved in a number of presentations and media coverage during the 2005-2006 year aimed at increasing awareness of telecom policy issues affecting communities and higher education. These include:

March 24, 2006, interviewed for an article in Blue Ridge Business Journal, authored by Keith Farrell, "Is Our Region Prepared for eCommerce?"

Lead author for the Virginia blog on First Mile U.S., a national organization that promotes grassroots efforts to provide broadband in rural communities

Authored an article for *Virginia Issues and Answers* magazine, May-June 2006 issue, entitled, "Policy Insecurity"

Met with Bill Leighty of Warner and Kaine's staffs and the Office of Commonwealth Preparedness, to discuss emergency communications funding and issues, November 21, 2005

Met with Congressman Rick Boucher and with Hughes Bates of Congressman John Warner's staff to discuss net neutrality and other, more local issues, June 8, 2006

Briefed Atlantic Coast Conference chief information officers on the Communications Assistance to Law Enforcement Act during their meeting at Virginia Tech on November 11, 2005

Interviewed by Drew Clark of TechDaily on the topic of net neutrality and Senator's Steven's draft bill, June 19, 2006

# Enterprise Systems

Enterprise Systems provides the university community with information technology and support to complement its teaching, learning, research, and outreach as well as to serve administrative operations. Enterprise Systems supports

- Banner and other university-wide central administrative systems;
- Core administrative information and services through database support and through operational software implementation, development and maintenance;
- Web hosting projects, Filebox, content and knowledge management; and
- Data analysis and decision-making through data warehousing and decision support tools.

Enterprise System has two major components—Administrative Information Systems that supports the university’s transactional enterprise system, and General Enterprise Applications that supports database management, the information warehouse, user documentation, and hosting solutions for departments and individuals.

## Administrative Information Systems

Administrative Information Systems (AIS) has focused work during the year in the following areas:

- Banner maintenance and upgrades  
These are normal activities for AIS in order to keep current with Banner releases. The upgrade from Banner 6.X to Banner 7.1 was implemented November 12 and 13, 2005.
- Work continued on the Social Security number (SSN) transition and was completed in June. During this effort, AIS converted over 600,000 system identifiers from a SSN to a generated ID number. A monitoring process is in place to ensure that SSNs remain secured. Access to SSNs is based on business need.

- e-Procurement  
Virginia Tech contracted with SciQuest Inc. for a hosted system to allow campus users to shop on-line, and procure and pay for goods and services. This system required the implementation of software from Sungard HE called Luminis Data Integration. This software brokers messages between the Banner financial modules and the SciQuest software. In addition, there was significant effort to integrate these systems with eVA, work that continues.
- Technology support for the university's comprehensive campaign
- Created a moves management module for Development to track prospects and solicitations
- Major enhancements to the network software delivery system to support software sales and distribution
- Implemented changes to support the university's restructuring effort including modifications for a new type of employee (university staff)
- Implemented NOLIJ Transfer in the Graduate School to facilitate tape loads and other application loads such as CollegeNet
- Implemented NOLIJ Web to support imaging Graduate School applications and supporting documentation

Administrative Information Systems provides the university community with information technology and support to complement teaching, learning, research, and outreach. AIS serves as the central resource responsible for supporting administrative information systems including acquisition, development, and maintenance of the university's core business systems. The organization is dedicated to the continual improvement of the services we provide to students, faculty, staff, and the public through effective implementation and management of information technology products, services, and support.

### Alumni/Development Team

The Alumni/Development Team completed 2595 service requests, including 1331 production control (65 reports scheduled to run automatically), 526 programming requests which included mail files, Banner form fixes, report modifications, new ad-hoc and Banner reports, batch updates, report corrections, 74 duplicate corporate record clean-ups, 62 person record clean-ups, report analyses, validation table updates, and new tables. The desktop service team also completed 602 service requests.

Activities during the year include:

- Implemented version 7.0 and 7.1 of Banner Advancement software
- Worked with the technical staff supporting the Executive Vice President and Chief Operating Officer to create a database to store photographs and biographical information on key volunteers and alumni
- Analyzed and re-designed the pledge reminder process in a project with the staff in Gift Accounting, Donor Relations. and Annual Giving

- Created multiple reports in support of the comprehensive campaign including reports for funds raised to support endowed accounts and a gift chart showing the number of gifts needed at various levels with the number of donors/prospects needed to secure those gifts
- Created algorithms to compute total years of giving, continuous years of giving, and most recent year of giving for donors, and provided new columns in a Banner table to store this information so it is available for reporting and ad-hoc queries
- Developed a comprehensive report for the vice president to provide a quick overview of comparative metrics for our fundraising program including information about largest outright gifts from persons and non-persons, number of new donors, number of new gift society members, percentage of growth for each gift society, number of prospect visits, average gift size, average pledge size, number of participating matching gift companies, gifts received from matching gift companies, number of repeat donors, number of gifts and pledges of one million dollars or more
- Created electronic acknowledgement reports for colleges and constituent areas, the Office of the Vice President and the associate vice president for development
- Created an automated process to batch add exclusion codes from donor input to the student callers
- Wrote a new report to count rated prospects by zip code, alumni chapter and state to support the regional fundraising efforts for the campaign
- Worked with the United States Postal Service (USPS), the Alumni Association, and Development's data integrity coordinator to develop an automated process to batch update alumni and donor addresses using files provided by USPS
- Provided a large data file of annual giving data to DonorCentrics for comparative analysis with peer institutions
- Developed a weekly process to update the status of all faculty and staff members based on data files provided by the human resources system
- Created a new Banner table to accommodate salutations that exceed 50 characters, modified Banner forms and reports to use the new table.
- The AZRG280 report, which provides the output files to assist gift accounting in producing monthly and year-end numbers, was modified extensively to reduce the need for intensive manual updating of excel spreadsheets that had occurred.
- Enhanced the online java reporting tool (DRWeb) to provide more reporting options, added new capabilities in population selection management and creation, and improved the user interface
- Created new Banner tables and modified Banner forms to accommodate a request to have a "moves" team for prospect in solicitation tracking/moves management
- Pulled a file of all constituents without an active mailing address  
Updated 6078 mailing addresses and 11,896 phone numbers using files from Alumni Finder and HEP
- Upgraded both the server software and the tape backup hardware for improved performance  
We also added network capability between the fileserver FILE and the backup server so a backup that used to take 2 days now takes about an hour and 45 minutes.

- Completed the implementation of the Integrity firewall  
Using the additional logging capability it provides, we have been able to identify network traffic anomalies on clients that otherwise may have gone undetected. These findings were presented to the Virginia Tech Windows Users Group.
- Installed a Windows Update Server and configured all of our desktops to take their updates automatically on a nightly basis, reducing the time between patch release and application to our PCs
- Deployed 18 new Treo 700 PDA/Phones to senior leadership, and developed support and training procedures for the devices  
Deployments included helping get the service contracts approved and signed, working directly with Verizon to get the devices activated and existing phone numbers transferred, establishing and activating the Goodlink accounts, and then demonstrating and providing basic training on the use of the devices. Performed several resets of the devices as well as Goodlink account resets  
Began developing the groundwork for the redeployment of the Treo 600 devices freed up by senior management
- Deployed over 35 laptops this last year as upgrades or new machine installations
- Implemented process to archive every system in an effort to improve our document retention process  
This process involves making a full system copy to DVD and storing it in a newly installed fire media safe in the server room each time a custodian change occurs (new hire, separation, or machine update).
- Successfully completed our compliance audit and a university inventory audit
- Upgraded SmartCall system in the Student Calling Center that was a full version level upgrade, requiring a complete change over of the database to a new one instead of a step upgrade  
The clients and other components also required complete replacement.
- Upgraded the presenter laptop to provide wireless access to improve support for presentations
- Developed a web-based self-scheduling tool for the Business Office to use for this year's mandatory diversity training  
The tool provided enrollment reporting and adaptive schedule options based on class availability. In addition, we made many manual updates to the database as required to accommodate the complex and mercurial scheduling desires of training attendees.
- Peter Franchi attended SANS security training.
- Siegfried Hill and Michael Ringenbach attended SDEXPO conference.
- Siegfried Hill earned SANS GCFW certified Firewall Analyst certificate and renewed his SANS certifications and was invited to become a member of the SANS Advisory Board.

## Enterprise Systems Support

In the past year, Enterprise Systems Support (ESS) provided operational support to Information Technology Acquisition's (ITA) purchasing, software sales, and software distribution functions.

Prior to FY2006, ESS was devoted to migrating ITA's core operations to platform-independent, web-based applications. With this move completed, ESS was able to focus on enhancements, additions, and on-going support of systems that support ITA efforts. Some of the accomplishments of the past year were visible to users, such as user interface and business process changes requested by ITA. Other work, such as server upgrades and documentation development, was done behind the scenes as an investment in the future of ITA computer systems and applications.

The network software delivery system—*network.software.vt.edu*—received several major upgrades during the past year. Apache web servers were added to each server and direct software downloads were added as an option for software delivery. Single downloads of one gigabyte are now supported. Sixty-six software titles are currently available via network download or install. Other enhancements to the network software delivery were the integration of ED-ID into the logic to determine a student's academic level and major and an employee's affiliation and department in real-time. A Banner view created by the AIS Student Systems' group was also incorporated into the server access logic to provide details such as a student's degree and college.

Diagnostic tools were developed to provide much better feedback regarding the access rules for students and employees. ESS staff can now determine the specific server access rule that is preventing access by a user to specific software. Usability of the software server access rule set was enhanced in the past year through a web-based display of the server access rules. This web application was made available to information technology managers responsible for their departments' licensing and software access.

Two additional software servers were added in the past year, bringing the total number of software servers for the campus to five. All servers are interconnected through a private, internal Ethernet network. This private, secure network also includes the ITA production Web server that provides the software server user interface.

Several enhancements and additions were made to the Departmental Software application in the past year.

- Department copies of the proof of purchase document that were previously printed and sent through campus mail are now emailed to the department by the Department Software application.
- ESS worked with ITA and the Faculty Development Institute (FDI) staff this year to streamline and automate software delivery to FDI participants. FDI administrators are able to view the status of software agreement and licensing by users to schedule computer deliveries. Applications were created to merge FDI participants and details related to their computer and software into the department software data.
- FDI participants are provided a login to the Department Software system to electronically accept and sign software license agreements. The license agreements presented to the faculty member were specifically tailored to the software owned by the participant.
- A new document image type for journal entries was added to the list of document image types.



- The interface to process new product titles and details was improved to speed up the process of adding new products.
- We developed a 'holding pen' for new products to prevent their accidental sale before it should be released to the campus.
- ESS put an electronic version of the Department Software manual on a collaborative TWiki platform for review and updates by ITA and ESS staff.

Enhancements to the Student Software system are noted below:

- Extensive changes were made to the Student Software application and database tables to capture Autodesk license codes and associate these codes with a student sale. Logic to track the code through subsequent product returns and resale was also incorporated. Processes at the point of sale for Autodesk products were changed to automatically fill in an Autodesk license agreement with the student's information and the product license number obtained from the product inventory barcode.
- Reporting capabilities were added to the application to provide reports mandated by Autodesk.
- Document imaging capabilities were added to the student system in the past year. The four document types of adjustments, documentation, licenses, and returns were setup for ITA staff.
- ED-ID was integrated into the student software system for more accurate, real-time checking of student status. Student extracts of Banner information are no longer used to verify a student's enrollment or academic level.

Authentication for the ITA Departmental Software Web pages was moved from Authportal to the Central Authentication Service (CAS) system. CAS provides users the convenience of a single login for all CAS-supported services at Virginia Tech.

ESS staff provided hands-on help-desk support and assistance for the computers and staff of the Computer Purchasing Office. Changes were made in the PurchBrowser document imaging system in the past year to incorporate HokieMart information. On-going development is in progress to incorporate all HokieMart purchases into the Computer Purchasing system so buyers can quickly locate and view HokieMart purchases made when departments call for assistance.

A hardware change in ITA's production web and file server was the catalyst for an extensive review and cleanup of many ESS applications. Applications and much of the code for needed apps was reviewed as they were moved to new production servers. Documentation was also written applications as they were migrated.

Four new servers were introduced in the past year, a pre-prod machine for application testing, a dedicated NFS file server for file storage, and two new production software servers. A list of the servers, changes in the past year, and their function is provided below.

- ITA500 (hardware upgrade) – Production web and application server
- ITA200 (hardware upgrade) – Development server
- CCPFAX (hardware upgrade) – FAX server

- ITA300 (new server) – Pre prod server for application testing
- ITA400 (new server) – Dedicated NFS file server, 1.5 Tbyte capacity
- MAHAL (new server) – Production software server
- FEET1 (dual-CPU and drive upgrades) – Moved from a test to production software server
- HWALA1 (dual-CPU and memory upgrades) – Production software server
- HWALA2 (dual-CPU and memory upgrades) – Production software server
- FEET2 (dual-CPU and memory upgrades) – Production software server

A utility was developed in the past year to securely store and manage passwords used by applications. Applications that required an Oracle login, for example, now obtain the password through this utility rather than through password storage in code or a file. Tools were also developed to streamline the loading and replication of software onto the five production software servers. IP-based web access to numerous web pages and applications was removed in the past year and replaced with LDAP-based, username-password authentication.

ESS provided numerous ad-hoc reports to ITA staff when requested and Crystal Reports training sessions for ITA. ESS staff also provided point-of-sale and systems support during fall check-in in August 2005. DVD images were created for SAS installation, software from approximately 200 CDs was loaded onto the network software servers, and software access rules were changed throughout to the year as directed by ITA.

### Finance Team

The Finance Team continues to support all the central systems that serve the financial administrative offices at Virginia Tech. We find ourselves involved in many projects that integrate new and existing systems with Banner. Increased reporting demands for the university's Higher Education Restructuring effort created a high demand for resources from our team this year.

The Finance Team's major project this year was the procurement, installation, and integration of a new e-procurement system for Virginia Tech. Virginia Tech contracted with SciQuest Inc. for a hosted system to allow campus users to shop on-line, and procure and pay for goods and services. Virginia Tech's implementation, called HokieMart, is integrated with Banner Finance to allow maximum efficiency for departmental users. Many integration points had to be developed by the Finance Team to complement the integration provided by SciQuest and Sungard SCT.

Other major projects and accomplishments were quite diverse and included:

- Modification, enhancement, installation, and testing of Banner 7.1
- Processed approximately 250 service requests
- Implementing new processes and procedures to allow departments to create and maintain customized financial 'activity codes' in Banner

- These personalized activity codes allow departments to classify their transactions in Banner in such a way as to allow them to do custom reporting on their activity.
- Modifying and testing central processes and assisting departments in enhancing the data transfers to and from Banner to a more secure methodology
  - Developed a new unclaimed property reporting system to assist the Bursar's office in collecting information about unclaimed property, producing and tracking the process to contact owners of the property and reporting the unclaimed properties to the state
  - Assisted in the continued deployment of the InfiNet on-line payment system to additional units within the university
  - Analyzed, created specifications and began development on a new general accounts receivable system to centralize AR billing and collections in the Bursar's office

### Human Resources Information Systems

Major activities of the Human Resources Information Systems team (HRIS) this fiscal year included:

- Completed approximately 180 service requests
- Modified, tested, and installed Banner HR 7.0 and HR 7.1  
Completed conversion of VT developed forms into the Banner 7 format and re-modified Banner HR 7.x programs
- Modified, tested, and installed the year-end tax and W2 release  
Made additional changes to the W2 and 1042 programs and reports
- Provided information (data) requested by the Office of Human Resources (HR) and the state used as part of the restructuring initiative
- Implemented a new subsystem to assign groupings to various HR codes for more generic code in all our reports  
The first code moved to the HR encyclopedia was the ECLS (employee class) code. This was required because of the new university staff ECLS codes added July 1, 2006 due to the restructuring effort. Over 200 reports and a number of forms were changed to remove hard-coded ECLS codes and make program decisions based on values in the encyclopedia system.
- Completed the rewrite of the HRIS web reports to run from the web job submission system allowing for reports to run against Banner or the data warehouse based on the data required  
The new reports went into production in December 2005.
- Worked with the Hokie Passport Office to define the specifications for a new electronic interface between HR and their ID card system
- Supplied data and reports used in the conversion of the Banner id number from the SSN to a generated ID number for employees.
- Developed numerous reports to provide information to the state, the executive vice president, and the Human Resources' annual report
- Involved in the normal yearly processing for the HR system—performance reviews, position roll, salary increases, benefit premium updates, tax updates, Charitable

- Virginia Campaign (CVC), tax shelter limits, leave roll, etc.  
Included this year was an additional increase for classified employees based on the numbers of years' service to the state.
- Continual changes to the system to improve data quality, system performance, and customer satisfaction

### General Team

The General Team's activities this year included:

- Participated in the testing and verification for implementation of release 7.1 of Banner in November 2005
- Converted the Budget Tuition system to use Oracle 10g instead of Oracle 9i in the VaTECH database
- Converted the Banner in-house written forms from Oracle 9i to Oracle 10g
- Converted the Budget Tuition system to use secure copy (scp) when transferring files to enhance data security
- Completed the processes, scripts and programs for the Banner ID number conversion from SSN
- Continual monitoring of the Banner system to improve data quality and integrity
- Supported the creation of new affiliations and confidentiality/suppression in the Enterprise Directory by installing triggers on tables and testing
- General maintenance on Oracle forms, SQL scripts, and SQR programs to fix errors and make improvements as requested

### Student/Financial Aid Team

During the past year, the Student/Financial Aid Team continued the support of, and enhancements to, modules associated with the Banner Student and Banner Financial Aid. Throughout the year, corrections have been made to those production processes that are not performing as the functional area requires. Approximately 190 service requests for modifications/enhancements were submitted during this period.

Activities were both for corrections and maintenance and for enhancement and expansions.

#### Corrections and maintenance

- Ongoing daily support of student/financial aid processes as required
- As the move was made to Internet Native Banner (INB), appropriate clean up of in-house developed forms was continued.
- Participated in the testing and verification for implementation of release 7.1 of Banner in November 2005

- Assisted in the implementation of several point releases for the Financial Aid module
- Continued to run processes to clear PIDMs (records no longer needed) associated with recruit records no longer needed, thus reducing the size of several General tables
- Expanded the distribution of self-service data extracts from the Student Data Warehouse

### **Enhancements and expansions**

- Implemented Studio Abroad to track and report on students enrolled in study abroad programs
- Developed data views from Banner for Information Technology Acquisitions (ITA) to properly identify currently enrolled students as well as future enrolled students
- Worked with Information Resource Management to identify and implement additional student affiliations to more accurately reflect an individual's relationship to the university
- Initiated work on a governance approval system for the Registrar's Office
- Assisted in the development of processes/programs in support of the Electronic Loan Management (ELM) implementation in Financial Aid
- Initiated work to support the SACS accreditation process; developed preliminary web-based information pages associated with course and instructor information based upon data in Banner
- Developed and implemented web-based new student orientation registration system along with orientation check-in process
- Worked on the upgrade to DARS and Darwin 3.5
- Developed new processes/forms to allow graduate students to withdraw from courses
- Continued the enhancement of process to establish graduate rate codes on students having assistantships
- Enhanced the processes for the transfer of data from university systems to NCAA-developed compliance assistance and academic performance program systems; created programs to audit data across the NCAA-developed Compliance Assistance and Banner
- Developed reports for athletic advising to send to ACC offices
- Created the provision of extract data for the Institute for Distance & Distributed Learning
- Developed views from Banner in support of the SAKAI project, providing course, section, and enrollment data
- Implemented NOLIJ Transfer in the Graduate School to load applications from CollegeNet and to process other tape loads
- Implemented NOLIJ Web imaging/workflow system in the International Office of the Graduate School; enhanced a generic image viewer to present images to the graduate admissions analysis system
- Developed a Web-based advisor comment tracking system, implementation has been delayed to accommodate request by the assistant deans to control access to comments
- Continued participation in the migration to generated ID numbers for the primary access point of Banner

- Continued to enhance the Web for Student and Faculty/Advisors capabilities for areas such as the National Student Clearinghouse and university orientation program
- Continued necessary enhancements to the Undergraduate Admissions data mart
- Continued work on a General Student data mart, performing extensive data verification and helping to establish quality control checks

**Team education.** As needed, continued student module and financial aid module information sessions for team staff members and functional users to help develop a better understanding of all the student processes

## General Enterprise Applications

The mission of General Enterprise Applications (GEA) is to enable and support data management, application administration, and the development of information delivery technologies in order to promote efficient and effective access to the Virginia Tech information resources.

Services include:

- Maintaining the underlying database management system and application administration for the enterprise systems, including Banner, Blackboard, SAKAI, the data warehouse and the production Enterprise Directory
- Designing and building an enterprise data warehouse to support the management information needs of research, outreach, and instruction
- Editing, publishing, and maintaining technical knowledge for the Virginia Tech information technology community through a group of Web resources including [www.computing.vt.edu](http://www.computing.vt.edu), [www.it.vt.edu](http://www.it.vt.edu), [www.pki.vt.edu](http://www.pki.vt.edu), and [www.answers.vt.edu](http://www.answers.vt.edu)
- Supporting Web hosting services for colleges, departments, and service units and Fileboxes for faculty, staff, and students

Although the specific units that comprise GEA require different sets of expertise and represent a diverse group of activities, their underlying focus is that of working to provide a stable, efficient and effective information technology infrastructure for the various activities of the university.

GEA provided relevant and challenging projects for three graduate students this past year and the Knowledgebase area employed two students from English, one as a graduate assistant and the other on student wage. They both learned skills relevant to their area of study, and gained skills and work experience that will serve them in the future.

The other was a doctoral student in Computer Engineering. He had the opportunity to attend the SANS training during spring break and gained experience that enabled him to gain an internship in northern Virginia with a private company working on security for mobile devices.

This year, much of the Information Warehousing and Access (IWA) staff was involved in the development of the student registration data mart. It will be implemented in production next fiscal year. Several Web Job reports are being developed to provide users with self-service applications so they can get the data they need with they need it. As a result of this development, there has been a significant clean-up of student data. The checks run as part of the nightly extraction, transformation, and loading process will help provide continuing clean-up of the data as problems are identified.

The sponsored research proposals and grants data marts and dashboards continue to provide critical data to the Office of Sponsored Programs (OSP). IWA developed a prototype of the “Current and Pending” report which will provide significant time savings as soon as it is available to users. The Banner Finance team is re-writing the report and will be responsible for continuing maintenance.

Jim Blair, Associate Vice-President for Research and Interdisciplinary Studies, said, “those who have received training on the OSP dashboard are raving about it.”

The Web Hosting area has worked on several applications to improve monitoring, and security. They were also heavily involved in the implementation of the new Virginia Tech Web site.

Web statistics from *computing.vt.edu* and *answers.vt.edu* show a significant increase in user access.

## Database Management Systems

The Database Management Systems (DBMS) team provides the necessary controls, oversight, performance monitoring, and 24 x 7 on-call response to ensure a stable and auditable production environment for our critical enterprise information technology services.

**New application software.** DBMS implemented new software in support of E-procurement and of imaging. The DBMS team installed and now supports the Luminous Data Integration software that enables an externally hosted software, SciQuest, to communicate with our Banner finance system. They also worked to implement the Nolij system for the Graduate School in a way that minimized security exposures.

### Application software upgrades

- The Banner system was upgraded to new releases of Banner 7.0/7.1 during the year. More than 112 Banner and Banner Web upgrades and patches were installed to the Banner databases during the past year. The upgrades were applied to six Banner

databases and four Virginia Tech Foundation databases to support the Banner environment.

- Monitoring software was enhanced for databases, servers, and application supporting IWA, Educational Technologies, Web Hosting, and Filebox.
- Tracking and scheduling of production updates was enhanced to include updates to non-Banner databases. As we extend support to include non-Banner areas, these enhancements allow developers of those applications a means to migrate source code and database updates to production.

### **System software migrations**

- More than 24 Oracle database were migrated to release 9.2.0.6 during the year. These databases support a host of administrative system throughout the university.
- Software—Harvest—providing means for developers to manage and track changes to production source code was upgraded to release 5 and release 7.

**Database changes.** All database supporting Blackboard, Sakai, and e-Portfolio databases were migrated to SAN storage to provide a more stable environment.

### **Hardware upgrades**

- Banner Self-Service and Internet Native Banner environments were moved to a Linux-based environment with Oracle 10gAS, Apache/SSL and load balancing.
- Hosting/Filebox hardware replaced
- Replaced hardware hosting databases supporting Blackboard, Sakai, and ePortfolio
- Replaced hardware hosting the Banner Xtender Solution Imaging System
- Replaced hardware hosting databases for the IWA

### **Other**

- Phased out Touchnet with the implementation of Infinet
- Assumed Additional Oracle support for Educational Technologies
- Currently developing procedures to provide support for:
  - Extension Services
  - Collaborative Technologies Unit
  - The Office for International Research, Education & Development

### **Education and training**

- two staff members attended the SANS institute desktop security session.
- two staff members attended Apache administration session.
- one staff member attended Oracle tuning session.
- one staff member attend Oracle 10g administration session.



## Web Hosting and Filebox

The Web Hosting service provides significant support to academic and administrative areas that take advantage of the services. They maintain a secure and stable infrastructure that supports over 1000 web sites including the [www.vt.edu](http://www.vt.edu), and support for many registered student organizations. Each website potentially represents a Web server that does not have to be maintained by faculty members, graduate students, or staff members. As an enterprise service, this service achieves efficiencies for the university and ensures a more secure environment.

Highlights over the past year include the implementation of utilities that helped allow some non-technical resources. For example, the director of General Enterprise Applications set up sites and responded to hosting e-mail. The implementation of a wiki for hosting documentation and applications also helped significantly with support. Both of these helped compensate for the lack of resources in this area.

Filebox provides individual web sites for over 25,000 faculty and staff members and students. It is also used by the faculty for class projects. This past year, it was upgraded to more powerful machines, and load balancing was implemented.

## The Knowledgebase, *computing.vt.edu*, and other websites

The Knowledgebase and *computing.vt.edu* provide information about using information technology resources to users. The Knowledgebase (KB) contains specific “how-to” instructions. Each online access potentially saves a help-desk call. The Knowledgebase is also used by the help desk in responding to user questions. The *computing.vt.edu* pages provide more general information about services. The basic content for KB articles is provided by the technical area of expertise. The KB staff then edits the article to ensure end user comprehension, tests it when appropriate for technical correctness, and applies a style to it that ensures the readability of the article.

*computing.vt.edu* contains over 500 pages of content that is updated upon request. Although statistics were not kept this past time period, over 1/3 of the pages were updated. Some of the new initiatives included public key infrastructure and support of digital certificates.

### Feedback on Knowledgebase articles

“very pleased with these directions, I have found the knowledge base to be invaluable...keep it up, please. (faculty member)”

“I like this method. In the spirit of “teach a man to fish” – you gave me information to help myself now and in the future (alumnus)”

“Explicit and detailed information. Easy steps to follow (student)”

## Information Warehousing and Access

The mission of Information Warehousing and Access (IWA) is to design, develop, and implement an enterprise data warehouse that allows easy access to management information for analysis and reporting.

IWA works together with the central administrative offices and the data users to develop the data warehouse. The warehouse is being built in iterations by subject area. Each subject area of data is called a data mart. The various data marts are linked together to form an integrated warehouse using the Ralph Kimball (<http://www.rkimball.com/>) design methodology. The resulting enterprise data warehouse is used to report across the spectrum of university data to support both day-to-day administrative functions and management decision making.

### Accomplishments

- Provided training on the data warehouse, the Brio Insight software (or Hyperion Intelligence Client), query building and dashboard navigation and data exploration to 124 staff members  
Training was conducted in a classroom setting, small groups or one-on-one sessions
- More than 500 requests for assistance received in the year  
In most cases, answers were provided immediately in response to the questions asked.
- Provided seven data warehouse, Brio Insight software (or Hyperion Intelligence Client) and dashboard demonstrations
- Brio users have increased by nearly a third this fiscal year. We had 146 users at the end of FY 2005—at year end 2006, we have 192.
- Web Job Submission and Web Distribution have shown similar increases in usage. Total executions of Web Job in FY 2006 were 97,551, compared to 80,743 in FY 2005. Web Distribution for the same periods show 206, 382 reports distributed in FY 2006 versus 188553 in FY 2005. More remarkable is the continued reduction in the number of reports printed. Although there were nearly 18,000 more reports distributed in FY 2006 (compared to the previous fiscal year), the number of reports sent to local printers dropped from 835 in FY 2005 to 709 in FY 2006. This change represents savings in printing and paper costs and reflects an increased acceptance of viewing reports electronically.
- The Office of Undergraduate Admissions continues to be our greatest success story. We have nine dashboards to support them and their users (Central Office, Departmental, Provost's, Corps of Cadets, Corps Commandant's, Arts Major, Music Major, Athletics, and Orientation). We work closely with office staff in the development of ad hoc queries, resolving data issues and providing information to her office and that of the departments.
- Office of Sponsored Programs (OSP) is another success story. We've developed a dashboard that provides up-to-date information on proposals, awards and expenditures, which can be viewed by the submitting, home or credit organizations. This OSP dashboard accounts for the majority of training done this year.
- We have designed special dashboards and reports for key users of the data mart. Users have expressed their appreciation.

- The “Current and Pending Report” we developed at a user’s request has been a time-saver for the employees who have been able to use it. We hope that the Finance Team will follow through to get this reporting capability into production for use across the university.
- The Graduate School is returning attention to the data warehouse. We have a dashboard in production and will be working on other reporting tools for use in the central office and for departments.
- The College of Agriculture and Life Sciences is a big user of the data warehouse. We continue to provide assistance to key data warehouse users as they develop ad hoc queries. They have an interest in dashboards for their reporting and management needs. One college administrator said, “The data warehouse is our source for all of our reporting and is invaluable to us.”
- Office of Human Resources has a number of Brio queries that they use regularly in the management of personnel.
- Dining Programs Administration—we have created custom reports that assist in financial management. The monthly reports automatically divide the data into portions that her sub-managers require.

### Operational statistics

#### Web Job Submission

| Report Submission |            |     |                  |                      |                   |             |        |               |                   |                |                    |               |
|-------------------|------------|-----|------------------|----------------------|-------------------|-------------|--------|---------------|-------------------|----------------|--------------------|---------------|
| Type              | Start Date | Day | Total Executions | Warehouse Executions | Banner Executions | Interactive | Logins | Total Submits | Scheduled Submits | Folder Submits | Definition Submits | Saved Submits |
| Year              | Jul 1, 06  |     | 4123             | 3912                 | 211               | 565         | 1943   | 4083          | 885               | 300            | 2442               | 1641          |
| Year              | Jul 1, 05  |     | 97551            | 93882                | 3665              | 9246        | 55669  | 97473         | 11096             | 6412           | 68717              | 28755         |
| Year              | Jul 1, 04  |     | 80743            | 80529                | 214               | 14          | 43480  | 80750         | 6143              | 5171           | 60294              | 20455         |
| Year              | Jul 1, 03  |     | 71262            | 71259                | 9                 | 0           | 41240  | 72557         | 1041              | 7750           | 55260              | 17297         |

#### Web Distribution

| Report Distribution |            |     |         |          |        |        |           |                 |          |            |      |           |        |               |            |         |
|---------------------|------------|-----|---------|----------|--------|--------|-----------|-----------------|----------|------------|------|-----------|--------|---------------|------------|---------|
| Type                | Start Date | Day | Reports | Sessions | Logins | Views  | View Text | View Postscript | View PDF | View EXCEL | Zip  | Docuprint | Labels | Local Printer | Distribute | Release |
| Year                | Jul 1, 06  |     | 7608    | 12532    | 1838   | 12848  | 6784      | 958             | 4528     | 276        | 114  | 0         | 16     | 26            | 189        | 46      |
| Year                | Jul 1, 05  |     | 206382  | 334146   | 40441  | 334841 | 187005    | 21417           | 112885   | 8090       | 3335 | 35        | 289    | 709           | 5429       | 2244    |
| Year                | Jul 1, 04  |     | 188553  | 290808   | 35888  | 291260 | 170680    | 11499           | 98134    | 6832       | 2459 | 429       | 348    | 835           | 5205       | 595     |
| Year                | Jul 1, 03  |     | 163372  | 246834   | 19232  | 247710 | 143204    | 5039            | 88568    | 6393       | 2315 | 664       | 327    | 1598          | 3991       | 264     |

Warehouse data consumers:

- Hyperion Intelligence (formerly called Brio Insight) users increased by nearly a third this fiscal year. We had 146 users at the end of FY 2005—at yearend 2006, we have 192.
- Scoop, a locally developed Excel plug-in application, is used frequently by 35 users with 80 known installations of the software.
- Users of other applications—probably number less than 100  
SAS is the predominant application, used by Institutional Research and other individuals across the university.
- Overall, there are 2175 unique user IDs with access to the data warehouse. The data warehouse has 130 gigabytes of data—adding 8.6 gigabytes in the past fiscal year. The total number of records in the data warehouse is now at 239,374,084. Our largest fact table (Finance\_Transactions) now has in excess of 50 million records.

| Data Mart Name                    | Rows 2005  | Rows 2006  | Increase  | Percent Increase |
|-----------------------------------|------------|------------|-----------|------------------|
| Accounts Receivable Fact Table    | 21,917,480 | 28,868,040 | 6,950,560 | 31.7%            |
| Undergrad Applications Fact Table | 297,996    | 385,280    | 87,284    | 29.3%            |
| Finance Transactions Fact Table   | 43,623,584 | 49,821,860 | 6,198,276 | 14.2%            |
| Payroll Earnings Fact Table       | 4,154,702  | 4,670,640  | 515,938   | 12.4%            |
| Job Dimension                     | 536,092    | 599,140    | 63,048    | 11.8%            |
| Giving Fact Table                 | 1,647,501  | 1,766,220  | 118,719   | 7.2%             |

## Training and staff development

### Professional development of salaried and wage personnel

- Georgiy Kolomiyets  
Attended the SANS Security Training: Hacker Techniques, Exploits & Incident Handling (March 5-10, 2006). Certified as CIAC Certified Incident Handler  
Microsoft and VT IT Security Workshop (May 24-25, 2006)  
Attended the Mid-Atlantic Brio Users Group meeting in December, held at the Australian Embassy in Washington, D.C.
- Vicky Shaffer  
Participated in Higher Education Data Warehousing Forum Conference April 2006—a two-day conference hosted by the University of Illinois. Participated as a panel member in a session during the conference  
Served as a member of the planning committee for the Higher Education Data Warehousing Forum—involved in all aspects of the conference planning

- Alan Moeller  
Participated in the Hyperion Solutions 2006 Conference in Las Vegas, NV April 2006. Presented (with Marti): Three Elements for Success at Virginia Tech  
Attended the Mid-Atlantic Brio Users Group meeting in December, held at the Australian Embassy in Washington, D.C.  
Participated in two Supervisor Training Sessions offered by HR—Tools for Effective Supervision and Performance Planning (March 2006).
- Marti Graham  
Participated in the Hyperion Solutions 2006 Conference in Las Vegas, NV April 2006. Presented (with Alan): Three Elements for Success at Virginia Tech  
Participated as a panel member in the pre-conference Hyperion Higher Education User's Group panel discussion to highlight the way we are using Hyperion with our data warehouse
- Becky Brim  
Participated in the Virginia Association for Management Analysis and Planning (VAMAP—a professional organization for institutional researchers, planners and budget officers at public and private colleges in Virginia) conference in Charlottesville, VA, May 2006

### Impacts

Brio Dashboards continue to increase in importance as a tool for providing information to data consumers across the university. The Office of Undergraduate Admissions has more dashboards available for use, both internally to their organization and externally to the departments, than any other organization. These dashboards are a convenient way to get the latest information, refreshed every night, to those users who need to manage admissions information. The Office of Undergraduate Admissions reports that phone calls from departments have diminished with the implementation of these dashboards.

The Office of Sponsored Programs has also embraced the dashboard as a great tool for providing accurate information in a format that can provide the details needed for management without creating a large paper document. Much of the training done this year has been for users of the sponsored research dashboard, with favorable feedback from users.

# Information Technology Acquisitions

Information Technology Acquisitions (ITA) has a twofold mission. First, ITA seeks to acquire technology goods and services for the university using best value concepts. Second, ITA makes every effort to acquire and distribute relevant software to the university community at the best possible terms. To accomplish this mission, the department is organized into three major operational entities: Computer Purchasing, Software Distribution (Departmental and Student), and Contract Management, Licensing and Billing.

ITA carries out this mission by reviewing and researching technology alternatives with the faculty and departments, and by developing multiple sources for technology goods and services. We follow good practices for public sector procurement and use the most appropriate method of acquisition, whether requests for proposals, invitations for bids, or sole source procurements. We negotiate with vendors for the most advantageous terms available for the university and, when appropriate, for the Virginia higher education community.

In securing and distributing software, ITA's Departmental Software Distribution unit identifies and responds to situations where volume purchases can provide the university with better terms than individual software purchases, and the Student Software Distribution unit acquires and distributes software to students to support academic program requirements.

In developing processes and supporting systems for all of the services of Information Technology, we seek to establish excellent customer service as well as adherence to best practices in public procurement. This year, several developmental changes improved both service and accountability.

**Faculty Development Institute software tracking.** The Faculty Development Institute (FDI) refreshes hardware and software for teaching and research faculty participants. In years past, software licenses distributed with the machines had not been transferred to the appropriate department. Not only did this failure to transfer create inaccurate records, it also led to overcharging FDI, since our Microsoft Campus Agreement already covered some faculty members. The new tracking system notifies participants or their designees that they have software licenses to view. They must review the license and agree to the terms of the licenses. Their click-through agreement transfers the licenses to the appropriate department in the ITA system, and generates the appropriate charge (or appropriate zero charge) to FDI. The system supports FDI's scheduling for the delivery of hardware and software to the faculty member.

**Autodesk serial number tracking.** For student check in during August 2005, ITA established a more robust system to track Autodesk serial numbers. As part of our agreement with Autodesk, we have to report serial numbers assigned to specific students. Previously, we manually assigned numbers to students at point of sale, an imprecise method that has led to inaccuracies. With the new system, serial numbers are assigned in advance to Engineering and Architecture bundles. The process created only a slightly longer processing time at point of sale, but improved accuracy and saved significant time in compilation and reporting.

**New student software bundles.** During the year, work proceeded to create several new student software bundles for Fall 2006. More students were moved to the Microsoft Campus Agreement. New bundles are for:

|   |   |
|---|---|
| Pamplin College of Business freshmen                        | Landscape Architecture undergraduates               |
| Pamplin upperclassmen                                       | Landscape Architecture graduate students            |
| First-year M.B.A students                                   | School of Architecture and Design graduate students |
| Second-year M.B.A. students                                 | Agricultural Technology students                    |
| First-semester students in the College of Natural Resources |   |

**ESRI contract.** ITA worked with the Virginia Department of Education (DOE) and the university's Office of Outreach and International Affairs to extend the ESRI Higher Education contract to include all Virginia middle and high schools. ESRI is a major vendor for geographic information systems (GIS) software. DOE is adding Standards of Learning for middle and high schools relating to GIS understanding, and plans to use the ESRI software available through this contract.

**Major procurements.** Three major requests for proposals were underway this fiscal year. The Graduate Admissions Imaging System contract (UCP-VTGAIS-05), was wrapped up. Project status is summarized in the Noli project section of this annual report. In negotiations at the end of the year were two: RFP 501757 for Cyber Infrastructure Support for Virginia BioInformatics Institute and RFP 648689 for the procurement of a Network Intrusion Protection and Detection system.

**Software distribution enhancements.** Working closely with the Enterprise Systems Support (ESS), ITA significantly expanded the capabilities of our network based software distribution system. The number and variety of software we distribute via network connectivity were increased and the security over these resources was improved. Usage increased from 7,506 mounts in FY 2004 to 27,010 mounts and downloads in FY 2006.

**HokieMart.** In conjunction with the university's new e-procurement system, HokieMart, ITA implemented four punch-out catalogs.

**New Student Orientation.** We worked with the Provost Office to provide space and publicity for hardware vendors in Squires during New Student Orientation. ITA worked to ensure that the process was open, and that vendors systems meet minimum university specs.

## Software Distribution

Software Distribution is comprised of Departmental Software Distribution and Student Software Distribution.

### Departmental Software Distribution

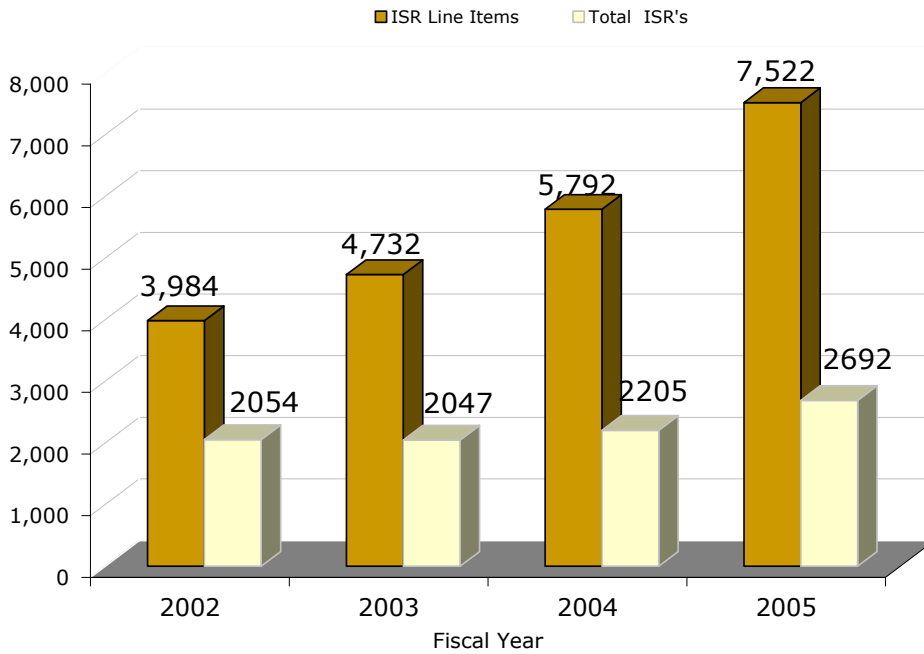
Departmental Software Distribution is a part of the Software Distribution Office and is organized on a partial cost recovery basis. Departmental Software Distribution provides software at discounted prices, and occasionally at no cost to departments, with limited support for faculty and staff members of Virginia Tech. Software distributed by Departmental Software Distribution includes software purchased through major contracts or site licenses (e.g., Microsoft Select and Campus Agreement contracts) and any software that can be obtained at quantity discounts for which there is a demand by departments. Departmental Software Distribution also offers a limited number of laptops for short-term lease to departments. The only form of payment Departmental Software Distribution accepts internal to the university is payment using an Interdepartmental Service Request (ISR). Total recoveries include billings to other universities for their share of the ESRI state education license that we manage.

The following graphs show totals per fiscal year of ISRs processed, sales, total items distributed, and new products added. Sales billings to departments vary each year based on the mix of products that are purchased by departments. Sales for fiscal year 2003 were down due to an Information Technology security initiative to provide Microsoft Window XP and Office products at no charge in order to reduce the number of vulnerable systems. The sales drop in fiscal 2005 was due to a change in product mix and a drop in price for Adobe, Macromedia, and Mathworks products. The increases in the current year, fiscal year 2006, were due to volume increases and the addition of the Department of Education to the ESRI state education license. Sales include all ISRs processed for departments. Total recoveries are higher due to ESRI billings to other colleges and universities in the state. Individual products distributed include licenses, departmental licenses, and additional CDs and DVDs purchased. Distribution numbers do not include numbers related to site licenses distributed through the network software installation service. Network software installation service numbers shown in the graph include distributions to departments. We have continued to diversify our product set based on demand from academic program areas as evidenced by the increase in new products introduced each year.

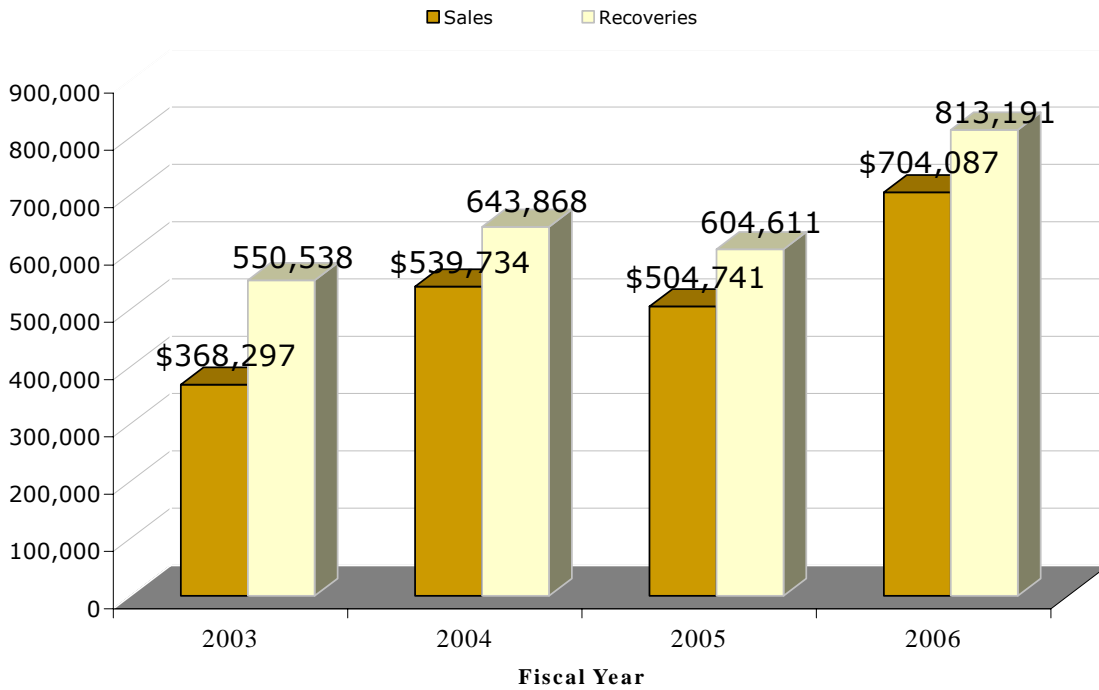


# Information Technology Acquisitions

## Department Software Total Interdepartmental Service Requests Processed

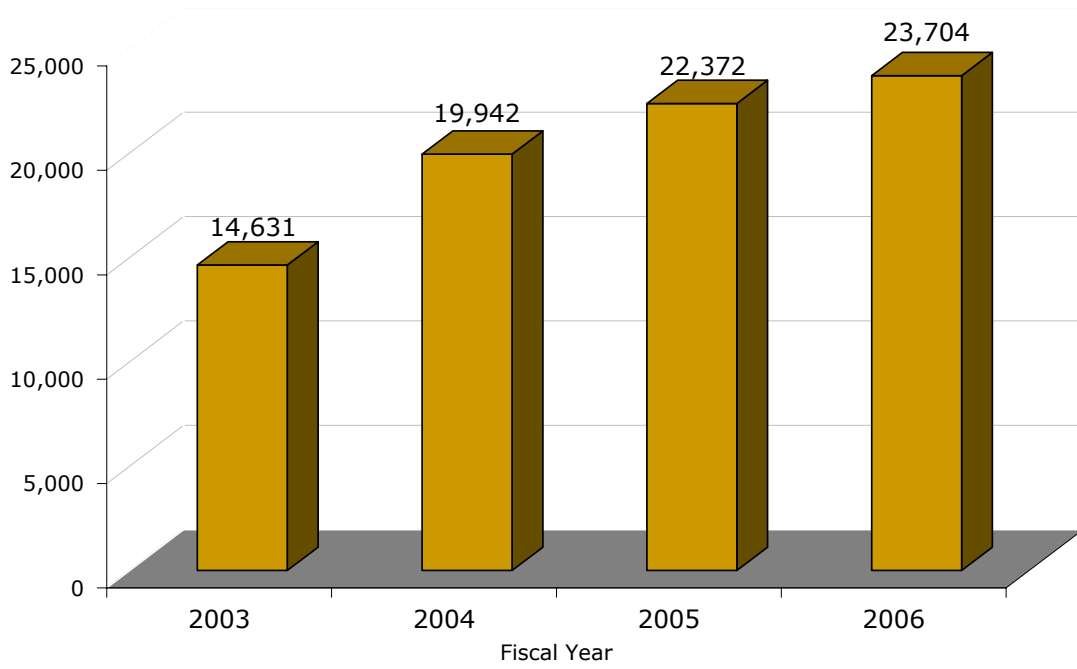


## Department Software Sales Summary

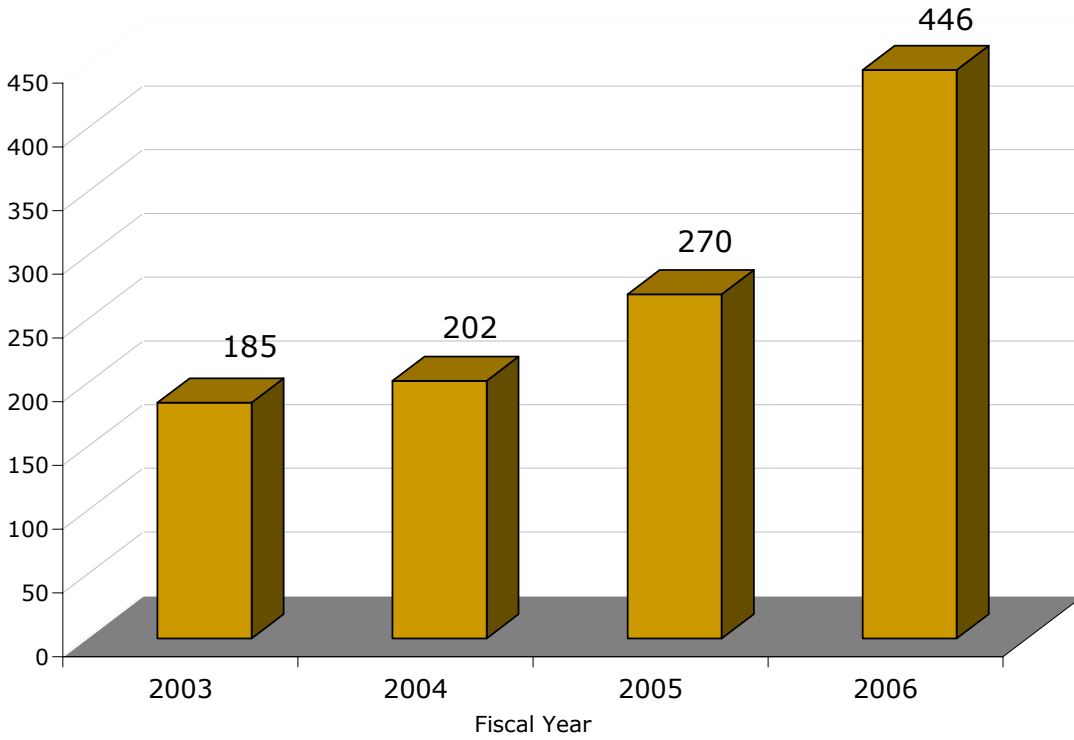


# Information Technology Acquisitions

## Department Software Individual Products Distributed



## Department Software New Products Introduced



## Student Software Distribution

Student Software Distribution is a part of the Software Distribution Office and is organized as an auxiliary. Student Software Distribution was primarily organized to provide software for the Engineering Freshman Software Bundle. It also distributes software to other students, primarily Microsoft Office. It only handles software that is specifically requested to support an academic program, such as the Freshman Engineering Bundle, or is only available as an add-on to a current university contract and the software is available to students at a price that is significantly lower than otherwise available.

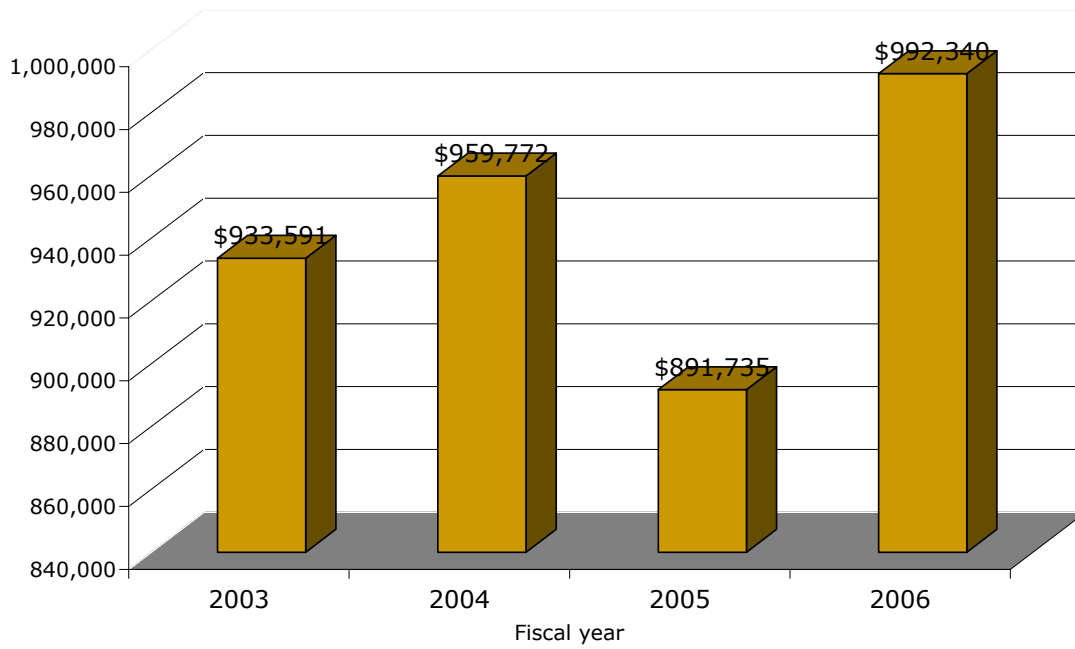
This year we have developed several new student software bundles for Fall 2006. These included Pamplin College of Business bundles for freshmen, upperclassmen, M.B.A. first-year students and M.B.A. second year students; the College of Natural Resources first semester bundle; the Landscape Architecture Department software bundle for undergraduates and graduate students; and a graduate student bundle for the School of Architecture and Design. The development of these new bundles was driven primarily due to the desire to extend the Microsoft Campus Agreement license to the affected colleges' and departments' students. Working closely with the Enterprise Systems Support Group of Administrative Information Services, ITA continued to enhance the capabilities of the network software server and added more products to this distribution method. See <http://network.software.vt.edu>

The two graphs below show total sales by fiscal year and total products distributed through those sales. The sales drop in FY 2005 was due primarily to the decrease in price of the engineering freshman software bundle. Since fiscal year 2002, the price of the bundle has dropped from close to \$500 to \$398 in fiscal year 2006. This reduction was accomplished through better pricing obtained on the components of the bundle. The sales increase in FY 2006 was due primarily to an increase in the number of engineering bundles, the new architecture bundle, and brisk sales of Adobe Creative Suites. Total units distributed have continued to rise the last three years primarily due to the factors noted above and to an increase in the number of free upgrade trade ins processed.

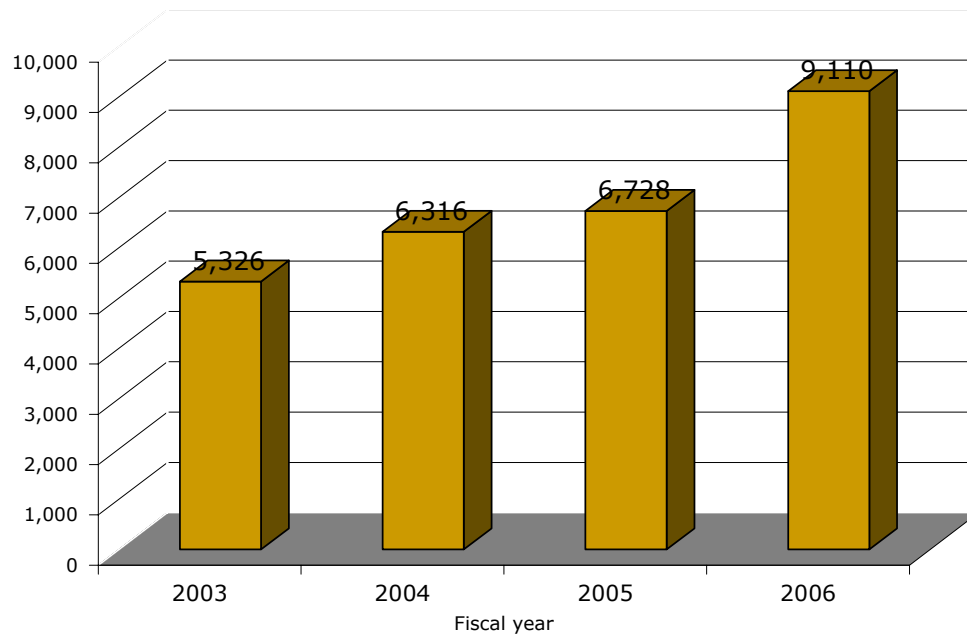
The third graph below, "Network Software Usage," shows the explosive growth we have had in distributing software to students and departments via downloads or virtual mounts. We now offer 66 software titles from the network software server. We continue to invest in new hardware and software to stay ahead of this demand.

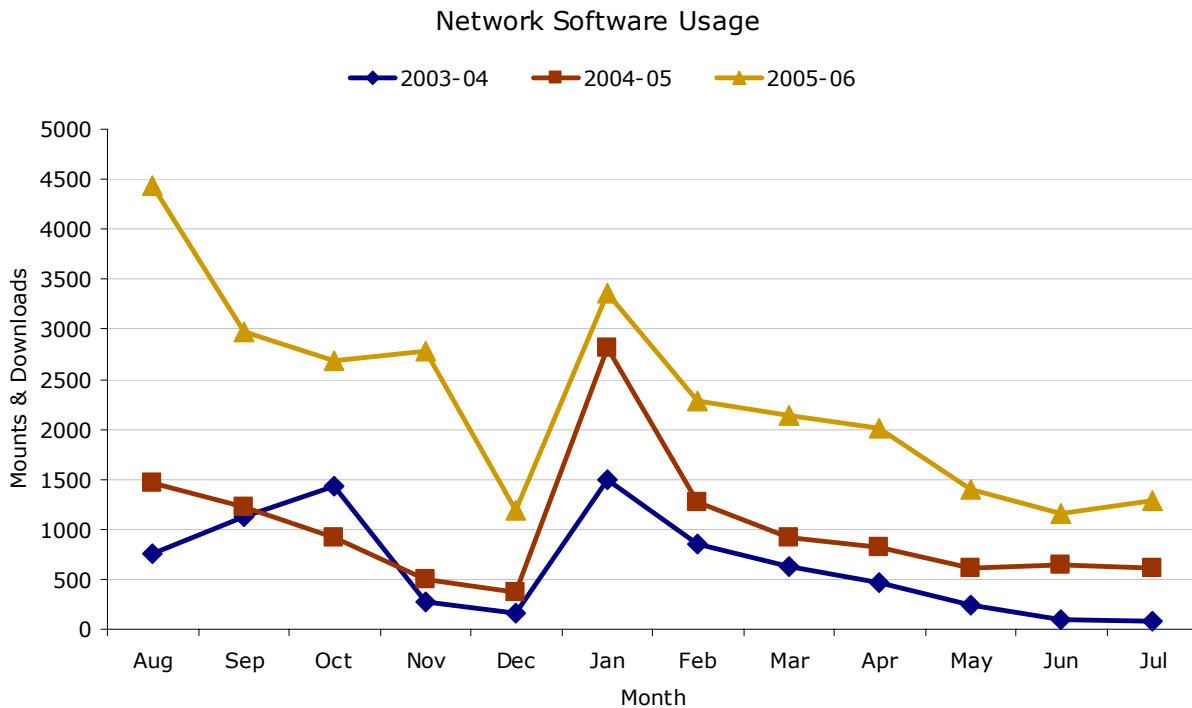
# Information Technology Acquisitions

## Student Software Total Sales



## Student Software Total Items Distributed





## Contract Management, Licensing, and Billing

The Contract Management, Licensing, and Billing section of ITA has responsibility for managing the various contracts and licenses that are used for distributing software to the university and the state of Virginia. Virginia Tech holds the Virginia Association of State Colleges and University Purchasing Professionals (VASCUPP) contracts for the geographic information systems and mapping software from ESRI, contracts that now include all middle and high schools in the commonwealth; along with learning management systems Blackboard and Angel. They handle billing for both Student Software and Departmental Software. This section also manages most of the technical aspects related to software distribution with regards to:

- Developing new distribution CDs (e.g., reducing the SAS distribution from 23 CDs that are sent from SAS to one DVD for distribution to departments and students);
- Creating and managing license codes (e.g., creating the yearly Matlab key that terminates on a date certain that helps us manage our licenses).

## Computer Purchasing

As the following graphs show, the Computer Purchasing office issued 1342 and 1481 purchase orders and processed \$18.0 million and \$19.5 million in FY2005 and FY 2006 respectively. This activity accounted for 35% of the total number of purchase orders issued by the university and 26% of the total value of those orders during FY2005 and FY2006. Numbers of orders and dollars were up due to increases in base funding. The number of purchase orders issued in FY2006 does not include orders issued from the HokieMart. The lower percentage of total dollars procured through Computer Purchasing the last two fiscal years has been primarily due to an increase in construction expenditures.

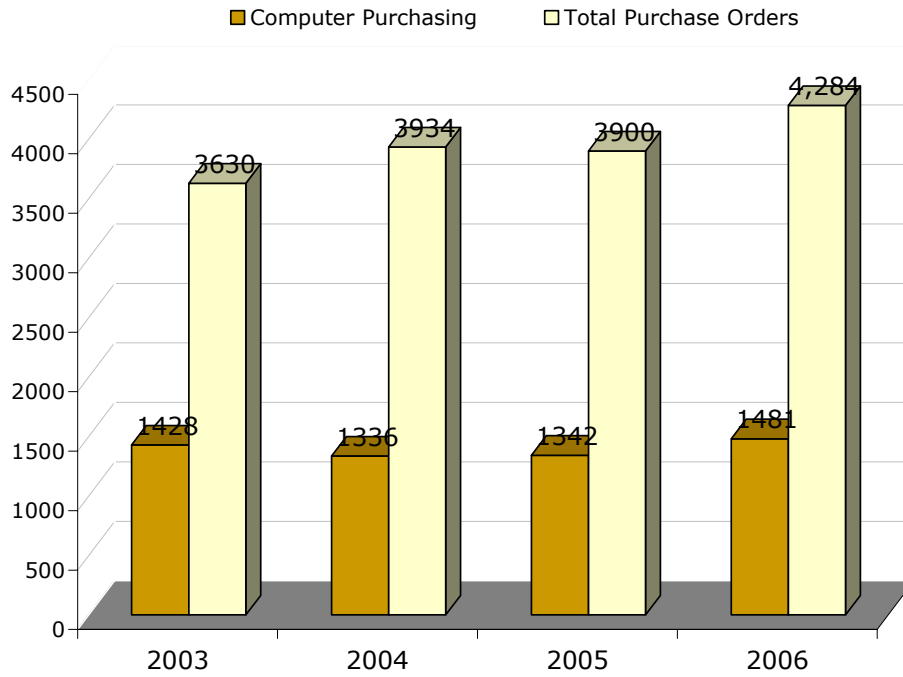
During FY 2006, Computer Purchasing participated in the pilot implementation of the HokieMart (SciQuest Higher Markets) e-procurement system. This system, HokieMart, will allow Virginia Tech

- To secure better pricing of commonly-used products;
- To provide one-stop shopping;
- To reduce time and effort in the purchasing process;
- To select goods from online suppliers;
- To produce cost savings through the use of HokieMart contract suppliers;
- To improve business practices with the introduction of initial purchase approval;
- To increase efficiency with the use of central invoicing and electronic receiving;
- To produce, in conjunction with Banner, accurate and more timely financial information;
- To increase the flow of purchase orders to eVA.

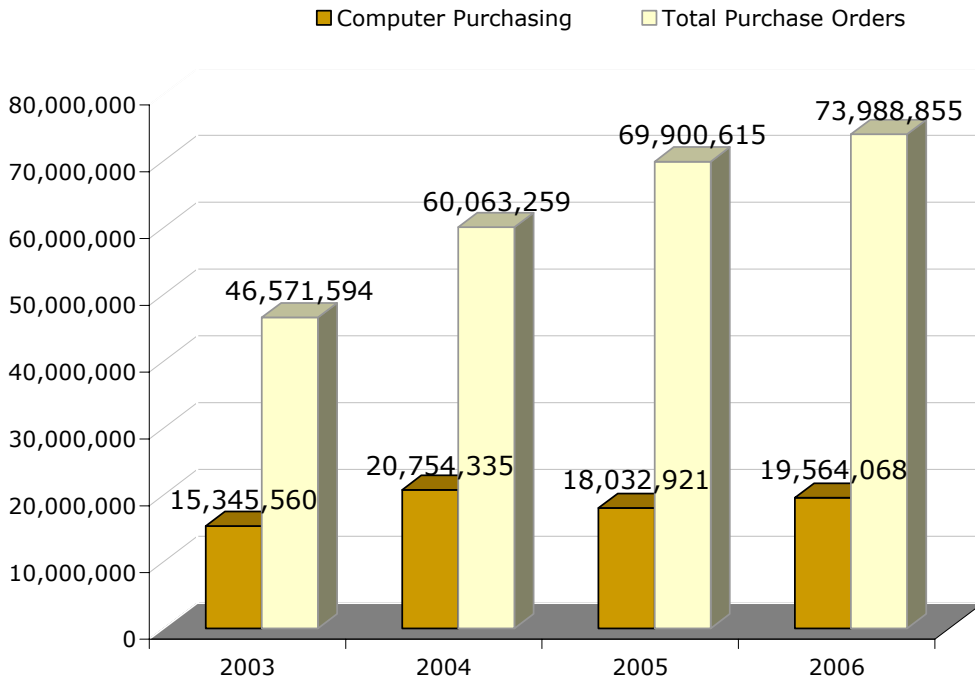
HokieMart will introduce fundamental changes in the current university purchase-to-payment process. With the introduction of an e-procurement system, it will serve as a tool to enhance significantly the purchase of goods and services for the entire university. ITA coordinated and tested the inclusion of four information technology vendor punch-out catalogs into the HokieMart initial implementation (Dell, Gateway, Apple, and Daly, a peripherals provider).

# Information Technology Acquisitions

## Computer Purchasing Purchase Orders Issued



## Computer Purchasing Total Purchase Order \$ Value



## Information Technology Acquisitions

During the last year, ITA has also processed three major RFP procurements. RFP#646435 was for an imaging and workflow system, initially to be implemented in the Graduate School but designed to be rolled out across the institution as an enterprise-wide system. This RFP resulted in a contract with Noli, Inc. and is also available as a VASCUPP additional user contract. RFP#648689 is for a Network Intrusion Protection and Detection system and is in the final negotiating stages. RFP#501757 is for CyberInfrastructure Support and is currently in negotiations.



# Information Technology Security Office

The mission of the Information Technology Security Office (IT Security Office) is to provide technology tools, education, awareness, and guidance necessary for Virginia Tech to work towards a safe and secure information technology environment for teaching and learning, research, outreach, and the conduct of university business. The office is also responsible for the Information Resource Management (IRM) office and the IT Security Lab.

The goals and objectives of the office are to

1. Work with university security personnel to ensure educational and promotional programs are made available to the entire university community.
2. Design, develop and implement training materials and classes (in-person and online) for the general user community.
3. Assist in providing technical training with the IT Security Lab.
4. Ensure all departments under the vice president for Information Technology are covered annually by a detail risk assessment, and that appropriate recovery plans are in place.
5. Coordinate the information technology risk assessment reports from university offices and departments every three years, and ensure they have necessary information to complete the assessment and a recovery plan.
6. Maintain a central website that can be used as an information tool and provide university users with access to security-based tools for use at the departmental level.
7. Work with other university security personnel to evaluate current policy and recommend updates and appropriate policy as necessary.
8. Coordinate and manage the Virginia Tech computer incident response team (VT-CIRT). Also, coordinate and maintain the Virginia higher education CIRT mailing list (VA-CIRT).
9. Function as the Root Certificate Authority for Virginia Tech.
10. Provide Information Technology departments with goals and guidance in ensuring that computer and network security is designed and integrated into the development and implementation of information technology applications.
11. Work with Virginia Tech departments on and off campus to increase their security awareness and environment, and ensure that purchased software meets minimum security goals.

12. Provide a security review service to all departments on campus to ensure that sensitive data is secure and that machines within a department are secure from outside sources.
13. Provide leadership and direction for the IRM and the IT Security Lab. Secure appropriate funds and assist them in planning efforts and obtaining their goals.

Major accomplishments and ongoing activities during the year range through several areas of work.

### **Education and awareness**

- Continued to provide security presentations as invited to groups and departments In 2006, this activity included invitations to specific classes that are utilizing and/or studying technology
- Participated in all Faculty Development Institute sessions during the spring and summer of 2006, and also participated in certain selected groups during the past months
- Assisted orientation leaders in developing appropriate presentation for the new student orientation held during the summer
- Presented security session at several student orientations; for example, foreign students, new graduate teaching assistants, graduate student orientation fair, College of Engineering freshman orientation, Business Information Technology classes, and had the opportunity to speak to new faculty members during their orientation
- Participated as part of classified employee orientation on a weekly basis
- Maintained the security website to provide users with easy access to security tools and references for the latest security news
- Assisted in hosting professional security-related programs on campus for both technical and non-technical personnel; for example, hosted a weeklong SANS security class during Spring break.
- Used publications, both locally and on the national level, to promote security issues within higher education
- Participated in programs where visitors were hosted by other university departments by sharing our technology security programs.

### **State and federal interactions**

- Continued active participation in the Virginia Alliance for Secure Computing and Networking (VA SCAN—<http://www.vascan.org/>)
- Assisted in planning the VA SCAN annual conference and participated on a panel to discuss security initiatives at higher education institutions
- Worked with the SANS Institute on educational opportunities for high education, and with the Center for Internet Security on tools and possible training programs
- Remained active in the EDUCAUSE organization, particularly with the various security initiatives
- Worked with State agencies through VA SCAN to provide security presentations at various agency locations around the commonwealth

- Attended a major security conference for higher education in Denver, Colorado, and participated in committee work to improve offerings to institutions

### **Business impact analysis/risk assessment**

- Oversaw the process for the Information Technology organizations and combined four previous assessments into two for the organization
- Worked with Internal Audit to ensure departments on campus have updated assessments (done every 3 years)
- Made minor modifications to the risk analysis forms and updated to the security website
- Directed planning for next risk analysis period (2007-2008) by discussing how the process might be done online using a secure website

### **Disaster recovery plan**

- Kept the Information Technology disaster recovery plan updated to reflect changes in personnel and equipment
- Worked with the university safety office to ensure our plan is in compliance with federal and state guidelines
- Worked with other Information Technology offices to ensure each recovery plan interacts in the proper manner

### **Security review program**

- Defined a security review program to be implemented university wide, and secured funding for software and personnel
- Worked closely with the Controller's Office and Internal Audit to identify the first offices for review

### **Enterprise Directory initiative**

- Provided leadership for the Enterprise Directory Advisory Group
- Attended meetings to plan for implementation schedules and future efforts by the team
- Ensured that IRM has the necessary resources to assume production responsibilities

**Virginia Alliance for Secure Computing and Networking.** The Virginia Alliance for Secure Computing and Networking (VA SCAN) exists for the purpose of strengthening information technology security programs within the Commonwealth of Virginia. The alliance was formed in response to Governor Mark Warner's charge to Virginia higher education to help the state meet cybersecurity goals outlined in his 2002 Commonwealth of Virginia Information Technology Strategic Plan. The initial focus of the alliance is security programs within Virginia higher education; extending outreach to K-12 education and to state and local governments is under consideration.

The Alliance brings together Virginia higher education security practitioners, who developed and maintain security programs widely emulated by other institutions, and researchers responsible for creating cybersecurity instruction and research programs nationally recognized for excellence. VA SCAN is made up of security professionals from George Mason University, James Madison University, the University of Virginia, Virginia Tech, and the Virginia Commonwealth University, as well as researchers and staff members from the Center for Security Information Systems at George Mason University, the Institute for Infrastructure and Information Assurance at James Madison University, and the joint George Mason/James Madison Critical Infrastructure Protection Project.

The purpose of VA SCAN is to:

- Strengthen security programs across Virginia higher education institutions with the integration and availability of field proven tools, best practices, and personnel resources from VA SCAN partners.
- Link existing models and knowledgebase with security research, instruction, and federal/state government initiatives.

The services provided by VA SCAN include:

- Security instructional materials and on-site training
- Consulting in the forms of an "ask the expert" e-mail service and on-site consulting engagements on a variety of security topics
- A Web-based toolkit of security tools and best practices
- A self-assessment checklist for Commonwealth of Virginia security standards

The benefits of the program include:

- Reduces security training costs
- Information available by VA SCAN will reduce the likelihood of breaches and the consequences if they do occur
- Takes advantage of economies of scale
- The exchange of new concepts, practices and tools

This development will support the strategic goal domain of outreach.

- Progress will be measured as VA SCAN becomes a more broadly used resource by the commonwealth and its agencies.

## IT Security Lab

The IT Security Lab's mission is to test computer hardware and software for security vulnerabilities. The lab's staff will actively design, develop and implement computer and network security training materials for in-person and online classes of university technical and general users. The lab will conduct security reviews for Virginia Tech departments and assist in correcting vulnerabilities. The laboratory will function as a testing facility for cooperative research project between the Information Technology Security Office and academic researchers, and will also provide testing services to external entities according to a fee schedule.

Goals and objectives of the lab are:

1. Develop and conduct technical training classes (in-house and online) for system and network administrators within and outside of the university, as well as for professional organizations, conferences, state and federal government agencies
  - a. Determine appropriate classes that might be secured from outside resources and coordinate for presentation at Virginia Tech
  - b. Investigate and recommend new techniques for delivering technical training for all users
2. Assist as needed in providing security awareness classes to Virginia Tech users and to outside constituents
3. Oversee the security review function within the IT Security Office, utilizing tools that can determine vulnerabilities and recommending methods to secure hardware and sensitive data
4. Coordinate and manage the six phases for the Computer Incident Response Team (CIRTS) at Virginia Tech: preparation, detection, containment, eradication, recovery and follow up
  - a. Coordinate with external CIRTS around the country and worldwide
  - b. Maintain and manage the Virginia CIRT (VA-CIRT) for communication among state locations
5. Utilize the IT Security Lab as a security testing site for certification of compliance for vendor software and network capable devices, creating methodologies and guidelines for future use
6. Work on security initiatives with the outside constituents including the SANS Institute, Federal Bureau of Investigation (FBI), Center for Internet Security (CIS), National Security Agency (NSA), and other federal and state agencies
7. Assist university academic departments in developing programs related to technology security instruction and research, including teaching a graduate level computer & network security fundamentals course
8. Determine and obtain appropriate professional development programs for Virginia Tech, as well as for state, regional, national and international conferences on computer security issues  
Host regional and national security conferences and seminars for peer organizations

Major accomplishments and ongoing activities for the fiscal year include the following:

### **Security reviews**

- Hired a system analyst and worked together to secure hardware and software to perform security reviews
- Completed, or in progress, security reviews for 15 departments/areas that deal with credit card transactions
- Planned program in place to begin security reviews for departments/areas that deal with secure information

### **Testing hardware and software**

- Served in partnership with the Center for Internet Security (CIS) as a testing site for certification of vendor security software with CIS benchmarks
- Developed methodology for testing security of network capable devices, and created security guidelines
- Developed and implemented forensic kits for Unix and Windows systems
- Updated computer and network minimum security benchmarks for Unix, Windows, Apple and network devices

### **Secure security tools for improving overall university security**

- Wrote a request for proposal for an intrusion protection system and led efforts to evaluate proposals and select a vendor
- Worked with others in the Information Technology organization to integrate into operations center
- Secured Core Impact software to use with the security review program to test vulnerabilities
- Secured hardware and software to use in forensics efforts when investigating incidents and assisting law enforcement

### **Develop and maintain cooperative programs for academic programs**

- Assisted the Department of Electrical and Computer Engineering (ECE) in developing systems administrator intern program
- Taught a graduate level computer and network security fundamentals course for the college
- Provided online materials for computer and network security distance learning classes
- Provided guest speakers for undergraduate and graduate level classes offered by colleges on computer and network security topics
- Continued effort with SANS and NSA to create a higher education version of the “service academics’ cybersecurity competition”
- Goal is to create a contest that judges student teams’ ability to defend a computer system from attack

## Research support

- IT Security Lab used throughout year to support Masters and PhD research in cybersecurity efforts
- Research by IT Security Lab graduate student generates US patent application for a battery-based intrusion detection system – student and IT Security Lab director co-holders of the patent application
- Lab graduate research associate position filled for 2006-2007 academic year
- Completed PhD degrees
  - “Taxonomy of Vulnerabilities”, 2006, Computer Science
  - “Thwarting Network Stealth Worm Through Biological Epidemiology and Natural Immune Systems,” 2006, ECE
  - “Visualization Tool for Determining Network Attacks,” 2006, Electrical and Computer Engineering
  - “Energy Efficient Wireless Sensor Network MAC Protocol,” 2006, Electrical and Computer Engineering
- Current Research
  - “Battery Sensing Intrusion Protection System,” PhD Electrical and Computer Engineering 2007
    - 3 undergraduate students working on research projects for this PhD student
  - Continued PhD research for Electrical and Computer Engineering
  - Master’s research beginning Fall 2006

## Lab director’s projects

- Training
  - Coordinated 2006 SANS-EDU program at Virginia Tech in March 2006
  - 262 attendees from US and Canada.
  - Approximately 75 Virginia Tech staff members participated and 70% will be taking certification exams.
- Presentations
  - Guest Lectures: College of Business information systems audit class; College of Engineering Freshman Orientation; Get Connected, Faculty Development Institute, Virginia Tech Graduate Student orientation, DCSS
  - Conference Talks
    - SANS Institute week courses (LA, Tokyo, Toronto)
    - Electrical and Computer Engineering graduate seminar on cybersecurity
  - ACC CIO meeting, Wake Forest University
  - Virginia Tech Engineering Expo
  - Montgomery County Board of Supervisors
  - Educause Security Conference, Denver, CO
  - VT Industrial Systems Engineering Faculty Retreat
  - CUAV, Charlottesville, VA
    - Institute of Internal Auditors, New York City

- FBI Cybersecurity Conference, Knoxville, TN
- VA SCAN, George Mason University
- ISACA, New Jersey Chapter
- Publications
  - “Using Battery Constraints within Mobile Hosts to Improve Network Security,” Jacoby, Marchany, Davis, IEEE Security & Privacy Journal, fall 2006
  - “Ubiquitous Security: Privacy vs. Protection,” Buennemeyer, Marchany, Tront, Proceedings of 2006 Conference on Pervasive Systems and Computing, 2006
  - “Battery-Sensing Intrusion Protection System,” Buennemeyer, Chiang, Marchany, Tront, Proceedings of 7<sup>th</sup> Annual IEEE Systems, Man & Cybernetics Information Assurance Workshop
  - “Identifying, Characterizing and Controlling Network Stealth Worms in Wireless Networks Through Biological Epidemiology,” ACM Wireless, 2006
  - “A Divide-and-Conquer Strategy for Thwarting Distributed Denial-of-Service Attacks,” Chen, Park, Marchany, IEEE Transactions on Parallel and Distributed Systems, Fall, 2006
  - “Battery Exhaustion Attack Detection with Small Handheld Mobile Computers,” Buennemeyer, Marchany, Tront, 2006

## Information Resource Management

Under the direction of the IT Security Office, Information Resource Management (IRM) provides the university community with policies, procedures, and support for secure access to information resources to complement its teaching, learning, research, and outreach as well as to support administrative operations.

The goals and objectives of IRM are to:

1. Provide a support structure for administering authorization, authentication, and security access controls to information technology resources to the university community.
2. Facilitate the review of security and access processes to improve the effectiveness and efficiency of services provided to the university community.
3. Make authorization rules and access information accessible for review to appropriate levels of management within the university community for decision making and strategic planning.
4. Continually research and provide information technology solutions and standards for administrative operations.
5. Identify management issues to address for future implementation.



6. Establish a long-term strategic plan for investigating emerging technologies that will affect security and access control issues related to information systems and computing.
7. Inform the university community of security procedures through open communication

Major accomplishments and ongoing activities for the year include the following:

**IRM organization.** Recognized as a production office responsible for electronic user identities at Virginia Tech, IRM oversees all aspects of the production environment. This year, we continued to have the goals listed above and will be involved in defining access and enforcing rules for Virginia Tech resources.

**Public key infrastructure.** The IT Security Office and associated entities including IRM are involved in the production environment for the Certificate Authority (CA) service that provides digital certificates to sign documents securely, secure transactions, and protect identities. The service is the main component of the university's public key infrastructure (PKI), a system of digital keys assigned to computer users to verify identity. As PKI is deployed, it will increase security and make it possible to use digital signatures in situations where a written signature is required today.

- IRM staff members served as both RA Administrators and CA Administrators for the Class 1 Server CA and the Middleware CA. IRM will serve as the role manager for the VT User CA when it becomes a production service in late 2006.
- IRM is developing a workflow process to support digital signing of leave reports.
- The IRM director chaired the PKI Policy Committee that produced the certificate practices statements for the Class 1 Server, Middleware, Root, and User CAs.

**Enterprise Directory project.** IRM sponsored the Enterprise Directory (ED) project and continues to define requirements for implementations. IRM also provided database programming support for the project.

- The IRM director led a weekly meeting of an ED technical group and also a weekly meeting of an ED policy group.
- IRM has created 13 production services that use ED-ID for authentication and authorization.

**Virginia College of Osteopathic Medicine.** IRM developed a batch load process to allow quicker and more efficient loading of incoming classes of students. This load process was used for the Fall 2006 class.

**Consultation.** One of the important responsibilities for IRM is to provide consultation to other university groups on user access issues. IRM has done this during the past with Banner and other administrative applications, as well as with those defined above.

### **Daily support and production work**

## Information Technology Security Office

- Worked closely with application areas to define requirements for any applications dealing with identity and access
- Maintain and provide access capability for Virginia Tech systems
  - PIDs (includes over 108,000 PIDs)
  - UNIX
  - Banner/Oracle access (approximately 3000 production accounts)
  - Virginia Information Technologies Agencies (VITA) access
  - Distance learning access
  - Active Directory (Hokies domain)
  - Other special needs
- Responded to Remedy trouble tickets for basically any “access” issues  
In 2005, there were 3604 trouble tickets. Through mid-August 2006, we have responded to 2160 tickets.
- Continued process of cleaning up 3000 former employee accounts
- Instrumental in defining and producing two new student affiliations to aid the Library and Graduate School in identifying categories of students
- Worked with Middleware to provide a means for authorizing temporary groups
- Setup temporary access for numerous summer groups – worked closely with Hokie Passport Office and Math Emporium
- Worked with email team to provide departments with a more secure type of shared email account (continued activity)
- Currently maintain and enforce most of the access policies/procedures

### **Professional development and contributions**

- IRM staff members attended EDUCAUSE 2005 and Banner Summit 2006.
- The IRM director leads the Enterprise Directory Policy and Technical Issues meeting each week and the Enterprise Directory Project Planning meeting each week.
- The IRM director is a member of both the Educause and Sungard SCT Identity Management groups.
- The IRM director is a member of the ED Advisory Board, ED Liaison Group, and the Data Security Committee of the Security Task Force.
- The IRM director presented at the VT Technology Conference in May 2005.

# Information Technology for Southside Virginia and the Institute for Advanced Learning and Research

Information Technology for Southside Virginia and the Institute for Advanced Learning and Research engaged in programs to support regional programs and the institute. Highlights during the year include development of a distributed education model that links curricula in K-12 through community college, baccalaureate degree completion, and graduate study in targeted fields associated with strategic Virginia Tech research activity in Southside. This model utilizes information technology extensively to permit baccalaureate and graduate program access at learning sites across the region.

An extensive set of community program offerings, focused primarily on technology, science, and math, have attracted 4336 participants during the 2005-2006 fiscal year. Another 1100 citizens visited and utilized our public computer facilities.

We have been selected by Microsoft as one of 90 national small to mid-sized organizations for beta testing of the new Vista operating system.

## Advanced networking and information technology

Goals for this area are to develop and maintain a leading-edge information technology operation that relies on best practices to support its constituents, evolve the infrastructure, develop information technology staff capabilities, and be a high tech symbol for the region. Also, we provide regional leadership in implementing, showcasing, and educating the community about advanced networking and leading edge information technologies.

During the year, we partnered with the Southern Piedmont Technology Council to offer 15 programs, attracting 410 participants throughout the year, including an audio-visual, day-long

event highlighted by the president of Technical Innovation, and technology awards banquet keynoted by Virginia's Secretary of Technology. Programs included:

October 18, 2005

Luncheon Program: The Regional Backbone & You  
Riverstone Technology Park, Halifax, VA

November 9, 2005

Tech Tuesday: AV Day at the Institute  
Institute for Advanced Learning and Research,  
Danville, VA

November 15, 2005

Tech Bunch Lunch-Informal Professional Gathering at the Cyber Café  
Institute for Advanced Learning and Research,  
Danville, VA

December 20, 2005

Luncheon Program: Nanotechnology and Robotics-Southside's Industries of the Future\*  
Institute for Advanced Learning and Research,  
Danville, VA

January 17, 2006

Tech Bunch Lunch-Informal Professional Gathering at the Cyber Café  
Institute for Advanced Learning and Research,  
Danville, VA

February 21, 2006

Luncheon Program: Terrorism, Natural Catastrophes & Technology: Redundancy & Disaster Recovery in Southside  
West Piedmont Business Development Center,  
Martinsville, VA

February 28, 2006

IBM Traveling Solution Center  
Institute for Advanced Learning and Research,  
Danville, VA

March 21, 2006

Tech Bunch Lunch-Informal Professional Gathering at the Cyber Café  
Institute for Advanced Learning and Research,  
Danville, VA

April 20, 2006

SPTC partner program: Broadband 101  
Institute for Advanced Learning and Research,  
Danville, VA

May 23, 2006

Luncheon Program: Advancing E-Commerce in Southside: Lessons from Local Companies  
Institute for Advanced Learning and Research,  
Danville, VA

June 12, 2006

SPTC Annual Technology Awards Dinner  
Institute for Advanced Learning and Research,  
Danville, VA

June 27, 2006

Tech Bunch Lunch-Informal Professional Gathering at the Cyber Café  
Institute for Advanced Learning and Research,  
Danville, VA

Other accomplishments for the year include:

- Implemented a help desk application and function
- Implemented MediaSite for streaming and archiving videoconferenced courses between Blacksburg and Danville, resulting in an award nomination at InfoCom
- Developed and offered bi-monthly information technology training sessions for IALR staff
  - January Avaya phone system and use of networked drives
  - March Overview of Microsoft Outlook and Microsoft Web access
  - April VPN overview, Unified Communications, Avaya IP softphone
  - May Review of the previous topics
- Selected as beta site for Microsoft's new operating system, Vista. The IALR was selected as one of 90 small to mid-sized organization nationally to test the upcoming

release of Microsoft's new desktop operating system. Currently, we have 2 labs with Vista installed and we are planning to extend controlled implement later this calendar year.

- We had only one unscheduled outage this past year due to hardware failure. Recovery time was 1 hour.
- Implemented a network reporting and analysis tool called MARS. Also, installed an Intrusion Detection system.
- Installed the hardware solution for disaster recovery solutions in which we are partnering with the city of Danville for "hot offsite storage."
- Employed one intern, who created intranet website structure, helpdesk system, and database, and completed images for the different model of machines we currently have.

**Training and staff development.** For the year, staff members

- Attended COVITS, Infocomm conferences, and IBM Global briefings;
- Attended Microsoft and Cisco Certified training sessions;
- Maurice Ferrell, Director of Advanced Networking and Information Technology, completed coursework associated with a master's degree.

## Advanced learning

Our staff supports and extends the goal of positioning the region to develop a workforce for the future by:

- promoting the development of seamless pathways between K-12, associate, bachelor, and graduate programs associated with strategic economic sectors;
- creating an academic and social support system for research center-affiliated graduate students;
- enhancing citizen access to advanced learning opportunities.

This year, activities in support of this goal included the following:

- Developed conceptual structure for seamless high school through graduate degree pathways utilizing a mix of face-to-face and technology-mediated instruction, identified and enlisted several academic partners for the pathways, and developed funding proposals to secure seed funding for pathways
- Offered engineering and math courses at the IALR in Fall 2005 and Spring 2006 Offered access to Web-based programs of study, through Virginia Tech, the University of Virginia, and the Southern Regional Education Board

- Designed and hosted a very successful Academic Open House in Spring 2006 that attracted 60 individuals  
There were 19 educational programs represented; 5 were associated with Virginia Tech.
- Secured Virginia Tech agreement to videoconference numerous courses needed by the five resident Virginia Tech graduate students working in IALR laboratories
- Established a full set of support services for graduate students, to include Virginia Tech registration assistance, comprehensive fee waiver completion, housing, IALR orientation program, and course requests
- Initiated Southside Higher Education Coalition with the Southern Virginia Higher Education Center in South Boston and the New College Institute in Martinsville, with two collaborative projects: a shared course catalog for Fall 2006 and an entrepreneurship program grant proposal
- Submitted \$15 million grant proposal to U.S. Department of Labor (WIRED grant) for funding to develop academic pathways and related outreach programs for a region encompassing south central Virginia and North central North Carolina, utilizing high speed information technology infrastructure  
Even though this proposal had the support of two governors and Congressional representatives from both states, it was not funded. Alternative funding mechanisms are currently being pursued in partnership with North Carolina.
- Offered Virginia Commonwealth University bachelor's in nursing program at IALR
- Initiated conversation with the University of Virginia to offer their Commonwealth Graduate Engineering Program courses and programs at IALR  
Program delivery will begin Fall 2006.
- Offered scholarships to area seniors through a competitive application process  
Nine \$500 scholarships were offered to students who planned to major in areas associated with the IALR-VT research centers.

### **Training and staff development**

- Julie Brown, Manager of Advanced Learning, attended the VASPA conference in November 2005
- Julie Brown attended the Sloan-C conference on Blended Learning in May 2006
- Julie Brown completed graduate coursework associate with a doctoral program

## **Outreach**

Our outreach goals are to provide a nucleus of leadership, based in social science scholarship, for partnering across organizations to:

- provide targeted, accessible, affordable programs that enable Southside citizens to build their competencies in mathematics, science, technology, and engineering;
- to promote the value of postsecondary education.

During the year, accomplishments spanned several areas.

#### K-12 Faculty Development

- 116 attendees at four “Cutting Edge” sessions
- 210 attendees at 17 Summer Educators’ Development Institute 2005



#### K-12 Student STEM Learning Opportunities

- 300 students served through Southside Summer Adventure sessions (20 sessions in six locations). Approximately 600 K-12 registrations for Learning Liftoff distance math education lab.



- Field trips have welcomed more than 550 students to the IALR facility (tracking began 11/05).



- Prepared NSF submission for ITEST funding (IT Education for Students and Teachers).

### Adult STEM Learning Opportunities

- Approximately 200 adult registrations for Learning Liftoff distance math education lab.
- Community computer workshops continue to be very successful, with 52 workshops attended by 909 participants (previous year: 418 participants in 30 workshops). As part of this initiative, five area church-based tutorial sites are receiving refurbished computers, broadband access, and “Train the Trainer” sessions.
- Expanded (evening) staffing of public computer labs has been made possible through placement of Averett University work-study students. There have been on average 115 visits to the public computer labs per month, with over 1,100 visits logged between August 2005 (when records began) and mid-May 2006.
- More than 75 small business owners and employees participated in eight workshops sessions on e-commerce principles and techniques.



### Other

- Four AmeriCorps members are working with the Book Buddies program, Learning Liftoff, and Danville Church-Based Tutorial Program sites. 2 additional members are working with the Dan River Center for Voluntarism. A proposal for 2nd year funding has been submitted.



- Super Saturday, a financial aid “fair,” was held February 4, with approximately 225 people in attendance. More than 100 students and parents attended four workshops on the college admissions process.



- Launched Outreach Advisory Council, with three sub-committees working to identify areas of priority for outreach efforts.
- Implemented advanced e-messaging capabilities to publicize outreach opportunities, through Get Active interface. Number of community residents registered to receive regular updates on workshop opportunities over 1,000.

### **Training and staff development**

Elizabeth Nilsen (Director of Outreach & New Economy Program Development): OVERSpace (noncredit workshop); Outreach Scholarship Conference: Transformation through Engagement; Virginia Association of Science Teachers 2005 Conference; Aspen Institute’s Sector Skills Academy (2006/7: year-long program)

TiJuana Harris (Coordinator of K-12 Programs): Supervision for the First-Time Supervisor (noncredit workshop); Virginia Association of Science Teachers 2005 Conference

Kate Poirier (Coordinator of Summer Educators’ Development Institute): IT Tools & Methods: Intro to IT – CRN12089; IT Tools & Methods: Intro to Computers – CRN12095; IT Tools & Methods: Education and the Web – CRN12094 (total 3 VT credits); Virginia Department of Education Educational Technology 2005 Conference

Southside Summer Adventure Interns (local college students majoring in STEM area or education): 21 total, working with K-12 students

Two work-study employees, welcoming guests to public computer labs and providing limited technical assistance

## New economy programs

Goals in this arena include organizing conferences and seminars that bring together scholars, industry experts, and like-minded individuals around topics that relate to the development of an innovation economy in sectors associated with IALR strategic science and technology initiatives, as well as around economic and social development themes.

Accomplishments include:

- Hosted programs attracting 436 participants to the Institute Conference Center
- Hosted a High Tech Manufacturing Roundtable October 2005 to discuss the joint marketing possibilities among Southside high-tech manufacturers  
Fourteen representatives from area manufacturing companies were present at the meeting held at IALR.
- Hosted scientists and economic developers from the University of Virginia, the University of North Carolina, Virginia Tech, IALR, and area companies for a day at IALR in November 2005 to educate each other about the research activities and competencies of their institutions in the area of nanotechnology; to explore possible areas of collaboration; and to decide if the creation of a formal inter-institutional nanotechnology research collaboration should be pursued
- Partnered with VA Tech and Virginia Cooperative Extension to host two workshops on the topics of “Alternative Uses for Tobacco Transplant Greenhouses” and Hydroponic Vegetable Production”  
A hundred area farmers received detailed descriptions from national experts on marketing and budgeting, and greenhouse design.
- Partnered with the UVA Public Service Office and the UVA Institute on Aging to offer the Southside community a free lecture from a series entitled Engaging the Mind  
The topic of the lecture held at IALR was “Aging Well in the 21<sup>st</sup> Century” by Dr. Richard Lindsay, Professor Emeritus of Internal Medicine. This free lecture was heard by 88 persons from the community.
- Hosted a Southern Growth Policies Board (SGPB) Community Forum entitled “Innovation and Technology: Making Choices for your Community”  
Eighteen persons from the community discussed what the community can do to make the most of the economic potential of technology and innovation. Participating in the forum meant that our results were heard by many Southern leaders through a report and a presentation at the SGPB 2006 Conference on the Future of the South in Louisiana. The IALR community forum was the only one held in the state of Virginia.

- Hosted a workshop in April 2006 entitled “Co-firing Switchgrass to Produce Electricity” in partnership with Virginia Tech’s Conservation Management Institute (CMI) for 75 participants from various regions of the east coast  
CMI recognized Southside as an ideal location to evaluate and promote the use of switchgrass, a native warm season grass, as a source of biomass for co-firing with coal and producing electricity. This workshop addressed the issue of reluctant farmers to growing switchgrass without enough demand, and power companies co-firing operations without enough supply. The workshop studied two feasibility research projects in Alabama and Iowa and their experience with co-firing switchgrass.
- The IALR along with DARPA and CIT hosted a session on “STTR/SBIR Strategies & University/Small Business Collaboration”  
This session hosted 27 interested researchers and area persons interested in partnering together.
- The IALR became an institutional member of the University Continuing Education Association that includes both public and private accredited colleges and universities, as well as nonprofit organizations with a commitment to professional education

## Community engagement

Community engagement goals are to develop programs that educate the citizens of the IALR service region about competing in a global economy and the unique role of the IALR as a catalyst in helping to position Southside effectively; and to partner with community organizations to engage them actively in embracing, supporting, and owning the IALR mission and facility.

This year, accomplishments include:

- Completed plans to develop and implement community and international programs to the IALR region to enhance community awareness of the value of the IALR and to promote understanding of cultural diversity
- Partnered with the City of Danville to develop an International Festival Committee  
This committee contains over 30 volunteers from the community and plans to execute its first event May 2007.
- Hosted monthly Lunch and Learn programs for over 200 senior citizens on topics ranging from Nanotechnology to the Science of Hurricanes.



- Hosted an International Women's Day program in conjunction with Women's History Month  
Over 80 women attended to hear success stories of women in the community.
- Established a videoconferencing service at the IALR in collaboration with the Freedom Calls Foundation for families to contact loved ones in Iraq.



- Created Russian for Beginners 8 week program. 35 people are registered
- Partnered with the Halifax County Public Schools and was awarded a Fulbright grant to host a delegation of Brazilian school principals  
The delegation of principals visited the IALR in December 2005.
- Developed an International Classroom Journey program for K-12 students in Southside, Virginia
- Received certification as a Person VUE test administration July 2005

## Institute Conference Center Programs and client services

Goals: Attract organizations beyond Southside to experience the region by hosting their events at the IALR; offer state-of-the-art meeting space to local business clients and for-profit organizations; provide expansive venues for social and revenue-based events. Serve the program mission of the IALR and clients who choose to use the IALR facility through service excellence and facility distinctiveness.

This year, we

- Served as a venue for ECPI College of Technology for a two-day training seminar that attracted participants from Virginia, North Carolina, and South Carolina, who consumed a total of 98 local hotel nights



- Hosted food show with a Danville based food distributor with over 60 exhibitors and 800 guest attendees.
- Maintained and renewed IACC (International Association of Conference Centers) membership, which confirms that the ICC operates at the highest standards of a conference center
- Recognized as a preferred partner of EMC Venues, a full service meetings and hospitality solution company
- Obtained a 36.5% increase in number of event bookings as compared to LY, resulting in a 17.5% increase in the number of client IALR visitors compared to LY
- Achieved a 15% increase in net revenue as compared to LY, attributed to an increase in government and university business
- Served more than 17,000 attendees of clients who chose to use the IALR building and services for a wide range of events.

### **Training and staff development**

- Participated in a three day sales and hospitality workshop conducted by EMC Venues

## **Communications and public relations**

To maintain effective communication channels with key stakeholders throughout the Southside region and work to inform the general public about IALR plans and accomplishments are goals in this area. This year, accomplishments include:

- Delivered the 2005 annual report to the community  
This was the first annual report produced by the IALR and encapsulated achievements, programs, special events, and progress.
- Partnered with the Danville Science Center and local schools to host science and technology field trips  
Over 500 middle and high school students visited the IALR and spent the day with IALR horticulture scientists and the IALR information technology director. Students learned about the exciting research initiatives underway in Southside, as well as career options available in science and technology.



- Held grand opening for the Institute for Sustainable and Renewable Resources June 2006  
Congressman Virgil Goode announced over \$700,000 in funding for ISRR this year.
- Held groundbreaking event for the Virginia Institute for Performance Engineering Research (VIPER) facility at Virginia International Raceway November 2005
- Hosted IALR First Partners Showcase Event February 2006 for local government and educational institutions to highlight accomplishments of the partnerships
- Hosted State of the Institute Event for the region in April 2006 to provide a report to the community of the IALR's 2005 accomplishments and to distribute the annual report



## Planning and assessment

Our goal is to support the continued development of the IALR and its mission focus through strategic and annual planning, assessing the impact of the IALR and its programs on Southside, and developing management information systems and processes that serve strategic and operational needs. To support this goal, we

- Conducted a quality of life phone survey of the IALR service region to obtain baseline information and data;
- Completed submission of State Agency Strategic Plan and Service Area Plan documents. Subsequently, we revised the service area plan at the request of the Kaine administration;
- Developed departmental assessment plans and systems for data collection;
- Conducted a survey dubbed "GradPoll" for graduating high school seniors to understand educational and occupational plans and aspirations;
- Developed a comprehensive, institution-wide plan of work for the 2005-2006 fiscal year.

# Learning Technologies

Learning Technologies is a comprehensive, learner-centered organization dedicated to supporting the tripartite mission of the university: teaching and learning, research and discovery, and outreach and engagement. This report covers these efforts over the past twelve months from July 2005 through June 2006.

The mission of Learning Technologies is to provide a teaching and learning infrastructure that meets modern needs for integrating technology across content areas. We seek to create and support robust environments for teaching, learning, and discovery for the faculty and for students that are grounded in sound principles of learning, and in a thorough knowledge of integrating technology for effectiveness and efficiency of effort. We seek these aims in several ways:

- Through comprehensive development programs and training activities in the appropriate use of emerging technologies;
- Through systematic application of appropriate resources to designing, developing, implementing, and evaluating technology-assisted instruction; and
- By providing highly responsive services that advance and support network-assisted teaching, research, and outreach.

Learning Technologies at Virginia Tech received national recognition when the **Award for Systemic Progress in Teaching and Learning** was received from EDUCAUSE in October 2005 at its annual conference. The following is a quote from the awards committee:

Overall, this exemplary set of activities at Virginia Tech has expanded the university's leadership role in the effective integration of instructional technology with pedagogy and enabled the university to serve as a model and a resource for other institutions across the state and the nation.

Building on its exemplary track record, Learning Technologies continues to have a significant impact on the instructional mission of the university by providing the coordination and leadership for several ongoing initiatives including the Instructional Development Initiative and its Faculty Development Institute (FDI). FDI is designed to have a long-term effect on the climate for the acceptance of instructional technology as a critical, enabling component of the University's mission. We are active participants in national initiatives on open source software development such as the Sakai collaborative learning environment, ePortfolio, and software

supporting online student ratings of instruction. Online Course Systems supports Blackboard and Sakai that are used by all students on campus and in the distance-learning environment.

The Graduate Education Development Institute (GEDI) is a collaborative effort between Learning Technologies and the Graduate School, and is a central component of the Transformative Graduate Education initiative that focuses on increasing graduate students' opportunities for professional development. Assessment data for GEDI continue to suggest that the program is fulfilling a need in helping graduate students explore technology-enriched pedagogy and broaden their professional development as current teachers and future faculty members.

The New Media Center provides consulting services to the faculty regarding the integration of technology in teaching. The center is also available to students who are using multimedia while working on class projects.

The Research Task Force continues to explore the potential of new technologies on enhancing student learning. Ongoing projects include work on collaborative learning spaces, pervasive computing, and context-aware notification systems.

Assistive Technologies ensures that all students and faculty members have the appropriate technology to meet their needs. The unit provides technical expertise, leadership, and coordination for disability accommodations.

The Digital Imaging Center has been transformed into a unit that provides high quality scanning services for Newman Library initiatives and faculty projects such as the Civil War Center. Work continues on the digitizing of all paper-based dissertations produced at the university. The production of electronic reserve materials directly supports the instructional mission.

The Summer Academy for Rising Students (VT STARS) provides the opportunity for high school students from economically depressed regions of the commonwealth to reach their potential for success in higher education. The program has been redesigned and re-positioned as an immersive academic enrichment program with an inquiry-based summer residency and after-school component targeted to 'high school students in the academic middle' in public school divisions within the Southside region.

Learning Technologies provides consulting on the integration of technology in all new and renovated facilities on campus. These facilities include the major renovation of nine classrooms during the summer of 2006 as part of the university master plan for classroom improvements. In addition, the computer-integrated classroom unit provides support services to the Math Emporium and other spaces that are vital to a modern teaching-learning environment including specialized software systems critical to the instructional needs of the faculty and of students.



## Educational Technologies Instructional Development Initiative

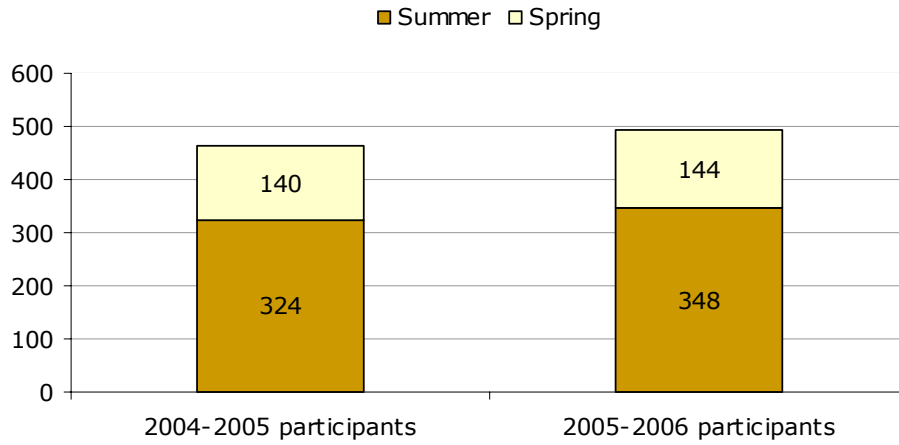
### Faculty Development Institute

The Faculty Development Institute (FDI) began with three pilot faculty workshops during the summer of 1993 and continues with additional workshops through August 2006. Over these thirteen years, more than 330 customized workshops have been conducted along with hundreds of additional short courses and seminars. During the spring and summer of 2006, 492 faculty participated in short courses and workshops in the first year of the fourth cycle (2006-2009), bringing the total of all participants to more than 4900 since 1993. FDI provides the knowledge, skills, and tools needed by faculty teaching in the 21<sup>st</sup>-century university. This nationally recognized program has had a transformative impact on the university's instructional program by ensuring that the faculty has the opportunity to provide the most efficient and effective learning environment for our students.

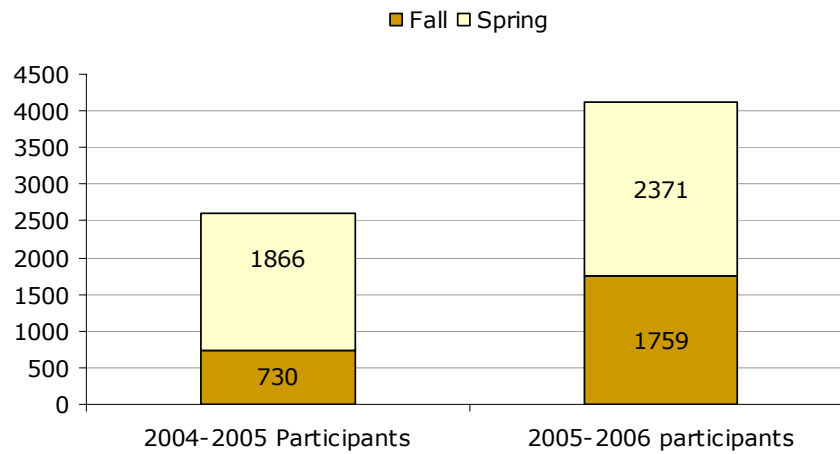
The FDI program saw a high level of participation in short courses and workshops during the academic year as faculty members and graduate assistants took advantage of new content additions. Our overall aim was to strengthen the FDI program's relevance and value to faculty members by providing a wider range of content, all with an underlying technology connection, that appeals to an increasingly diverse range of faculty interest. This increase in programming was facilitated by several innovative arrangements with content providers. First, additional partnerships were forged with other university departments. Second, arrangements were made with software vendors to provide training on specialized software newly available from Software Distribution. Third, new FDI short courses were internally developed to create awareness and readiness for several important new educational technologies being introduced to the faculty, such as Tablet PCs, Scholar (VT's version of Sakai), and electronic portfolios. Greater detail on these advances is provided in the impact section of this written report.

The graphs represent the growth in the number of offerings and participants.

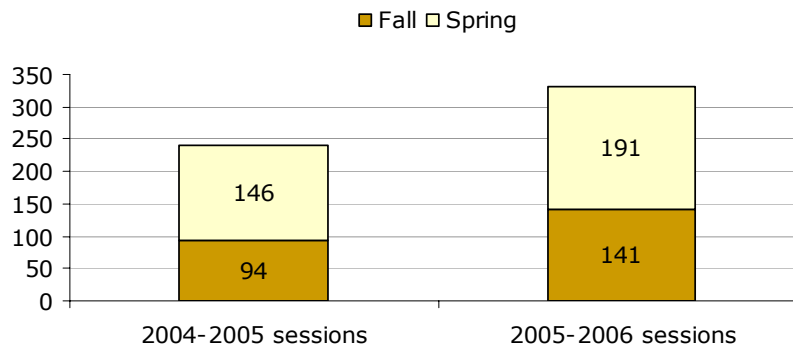
Participation in 3-Day FDI Tracks



Short Course Participants



Number of Short Course Sessions



## Online Course Systems

As part of Educational Technologies, Online Course Systems (OCS) provides important enterprise-level academic services, such as Blackboard and Scholar that are used by virtually all students both in residence and in distance learning settings. Other online services include the electronic portfolio (based on the Open Source Portfolio), Courseware, and WhizQuiz. In addition to being the department’s public face for online services, OCS performs other important tasks including:

- Learning systems user support: Support Desk, help pages, Web support, application documentation
- Learning systems training: user training (FDI), handout materials, tutorials, resource development
- Product evaluation and quality assurance: usability and functionality testing, quality analysis and documentation, product design contribution for forthcoming services such as Sakai, Online Course Evaluation, and an enhanced version of ePortfolio.
- Faculty collaboration and participation: advisory committee role, outreach, research and instructional needs assessment, and user involvement

**Blackboard.** The Blackboard learning system has evolved into an enterprise level system that has become a mission critical application for instructors, researchers, and students. Today, over 75% of undergraduate courses are using the Blackboard learning management system. OCS works closely with the vendor’s assigned technical support manager while addressing technical and performance issues. To improve the security of Blackboard, the application was re-configured this year to use Secure Sockets Layer (SSL) site-wide. Previously, SSL was only used for the initial login. This change will help prevent session cookie hijacking and other types of attacks.

The statistics below depict the growth and adoption of this application over the past 18 months.

Blackboard active classes, instructors, and students

|                  | Spring 2005 | Fall 2005 | Spring 2006 |
|------------------|-------------|-----------|-------------|
| Course sections  | 2,570       | 2,561     | 2,313       |
| Faculty and GTAs | 1,555       | 1,536     | 1,671       |
| Students         | 27,072      | 25,924    | 24,593      |

**Open Source Portfolio.** Open Source Portfolio (OSP) is actively used by targeted audiences to document learning and to share professional and personal materials to advance career opportunities. OCS has been providing software testing and quality assurance to refine and further the development of this product. OCS worked with the staff of the commercial support vendor to test numerous potential release candidates of OSP 2.1 and 2.2. OCS has reported bugs and improvements to the OSP workgroup through the JIRA bug reporting system. The statistics below depict the growth and adoption of this application since it was introduced:

ePortfolio active shares, instructors, and students

|                   | Spring 2005 | Fall 2005 | Spring 2006 |
|-------------------|-------------|-----------|-------------|
| Accounts          |             |           |             |
| Shared Portfolios | 768         | 2487      | 1694        |
| Instructors       | 80          | 59        | 82          |
| Students          | 768         | 2487      | 1176        |

**OCS help desk.** The primary method for providing individualized user support is through the OCS help desk. Users send questions via email to [ocs@vt.edu](mailto:ocs@vt.edu) or through the “Contact Us” Web form (<http://www.edtech.vt.edu:8080/ocs/contact.shtml>). These questions are automatically added to the helpdesk database where OCS staff members answer them through the helpdesk application. Questions can be easily grouped by sender or by subject and quickly searched or mailed to multiple addresses. Questions are easily categorized and tagged for use in our knowledge base. The statistics below depict the number of questions received in the helpdesk over the last 18 months:

OCS Helpdesk questions answered by submitter type

|                    | Spring 2005 | Fall 2005 | Spring 2006 |
|--------------------|-------------|-----------|-------------|
| Questions answered | 2,406       | 2,819     | 2,664       |
| Submitted by:      |             |           |             |
| Instructors        | 532         | 521       | 524         |
| Undergraduates     | 174         | 464       | 102         |
| Graduates          | 39          | 44        | 61          |
| GTAs               | 96          | 114       | 103         |
| Other              | 160         | 177       | 178         |

**OCS training.** OCS staff played an active supporting role in the FDI workshops, reaching hundreds of faculty members using Blackboard. Before the fall 2005 semester, OCS staff gave workshops to graduate students who were teaching with Blackboard and to new faculty members through the FDI. In addition, throughout the semester OCS conducted several roundtable discussions for both Blackboard and Scholar at which faculty participants were encouraged to report their experiences using the products in their classes. At some of these sessions, faculty exemplars enhanced the discussion with a brief presentation of their use of the software.

OCS is also responsible for developing user documentation, training handouts, and tutorials. OCS has developed a comprehensive help website. We have also provided training workshops for Open Source Portfolio and several smaller products.

**New Media Center**

The New Media Center (NMC) provides a central campus facility that supports the integration of technology in teaching, and provides the opportunity for students to use technology in support of learning. The table below displays total New Media Center use for a variety of services, broken

out by type of users (faculty, staff, undergraduate, graduate, and general public). The time period covered is July 2005-June 2006.

2005-2006 summary

|                    | Total       | Faculty    | Staff      | Graduate    | Under-graduate | Public     |
|--------------------|-------------|------------|------------|-------------|----------------|------------|
| 3D                 | 16          | 0          | 3          | 1           | 12             | 0          |
| Audio              | 222         | 32         | 28         | 26          | 134            | 2          |
| Authoring          | 110         | 2          | 92         | 5           | 11             | 0          |
| Blackboard         | 61          | 21         | 24         | 6           | 10             | 0          |
| CD/DVD burn        | 105         | 14         | 3          | 32          | 40             | 16         |
| Desktop publishing | 611         | 52         | 45         | 90          | 402            | 22         |
| ElementK           | 22          | 1          | 0          | 1           | 20             | 0          |
| Equipment loan     | 676         | 71         | 95         | 135         | 374            | 1          |
| ETD                | 22          | 0          | 4          | 15          | 3              | 0          |
| Flatbed scanning   | 1012        | 84         | 45         | 345         | 495            | 43         |
| Graphics           | 754         | 50         | 37         | 87          | 542            | 38         |
| PowerPoint         | 76          | 6          | 1          | 21          | 48             | 0          |
| QTVR               | 0           | 0          | 0          | 0           | 0              | 0          |
| Slide scanning     | 234         | 48         | 13         | 52          | 105            | 16         |
| Video              | 1960        | 129        | 84         | 260         | 1428           | 59         |
| Web development    | 367         | 28         | 28         | 37          | 266            | 8          |
| <b>Total</b>       | <b>6248</b> | <b>538</b> | <b>502</b> | <b>1113</b> | <b>3890</b>    | <b>205</b> |

**Application Development projects**

Application Development (<https://content.cc.vt.edu/confluence/display/DEV/Home>) continues to design and develop enterprise-level software tools and systems to support teaching, learning, and research at Virginia Tech. To enlarge the scope of applications and services available to faculty members and students and to gain better control over operating costs, Educational Technologies has become involved in open source application projects. The non-proprietary open-source applications help insure that faculty/student unique needs can be better addressed and current license costs eventually be redirected.

For more information about Application Development projects, contact: Aaron Zeckoski, Manager of Application Development ([aaronz@vt.edu](mailto:aaronz@vt.edu), 540/231-8053).

**Scholar (Sakai) collaboration and learning environment development.** Scholar (<https://scholar.vt.edu/>) is the Virginia Tech version of Sakai, a community source software development effort to design, build, and deploy a new collaboration and learning environment

(CLE) for higher education and research. Application Development is working directly with other universities, including the University of Cambridge, the University of Texas at Austin, the University of Michigan, and many others, to enable use of the system at Virginia Tech and to develop needed tools.

The manager of Application Development assisted the Sakai Foundation in development of tools and design of the foundation website (<http://www.sakaiproject.org/>). He also assisted with conference planning by sitting on the conference committee and developing Web-based tools to assist with the planning processes.

The manager of Application Development worked to plan a 4-part full day boot camp workshop (<http://bugs.sakaiproject.org/confluence/display/BOOT/Home>) and present a 2-hour workshop on using Hibernate in Sakai at the Sakai conference in Vancouver. Work continues on this effort to create a series of tutorials to assist programmers in creating new tools and extending the Sakai framework. Future boot camps are being planned for December 2006 and June 2007.

The manager of Application Development presented demonstrations of code that is being developed at Virginia Tech at the Sakai Vancouver conference. Assistance for the demonstrations was provided by the lead systems integrator. Virginia Tech was noted for this effort in an article in the July 2006 issue of *Campus Technology* ([www.campus-technology.com/article.asp?id=18793](http://www.campus-technology.com/article.asp?id=18793)).

The manager of Application Development and the lead systems integrator were given access to the private forum in which security issues related to Sakai are documented and possible solutions discussed.

Staff involvement in Sakai conferences, tests of the software, and involvement in creation of Sakai-compatible tools continued during the report period. Preliminary testing, quality assurance analysis, deployment exercises, hardware purchases, and documentation/support planning were done, leading to a pilot test of the Sakai Learning and Collaboration software planned for fall 2006, running parallel to Blackboard.

More information about the development efforts related to Scholar is available at <https://content.cc.vt.edu/confluence/display/DEV/Scholar>.

**ePortfolio (Open Source Portfolio) development.** The Virginia Tech Electronic Portfolio continued to expand and improve during the reporting period. Development efforts provided users with secure Virginia Tech PID-based access to the system and resulted in a large amount of customization of the software in the form of features and local fixes for software and usage issues. Systems integration provided custom templates for the upcoming version of the system that will be deployed in fall 2006 and continues to work on providing custom templates for departments as they adopt the electronic portfolio. OCS provided quality assurance testing of the upcoming version for the national effort.

The Open Source Portfolio is being integrated into Sakai as part of the framework and the two projects will be fully merged shortly. Development efforts have focused on Sakai as a result

during the reporting period but will work to extend and improve the code for portfolio over the upcoming year.

More information about the development efforts related to ePortfolio is available at <https://content.cc.vt.edu/confluence/display/DEV/ePortfolio>.

**Evaluation system (Course Evaluations) development.** The Application Development group collaborated with Columbia University to modify and extend a course evaluation system in 2004. The system that was developed out of that effort is currently being piloted at Virginia Tech. The current system is integrated with the paper evaluation system so that all results from either system end up in a secure database. Pilot testing has been done with individual faculty members and in groups, and is now being done with entire departments. Results of pilots to date have been excellent and users have commented that the system is easy to learn and use.

Application Development continues to lead the project to make it an open-source Sakai-compatible application by summer 2007. Comments from the faculty, research in the field of evaluation, and guidance from the Center for Excellence in Undergraduate Teaching are being used to design the new system. Cutting-edge technologies will be used to ensure that the system is easy to use and fully accessible. Stockholm University (Sweden) is currently providing development assistance with the project. Previous assistance has been provided by the University of California-Davis.

More information about the development efforts related to evaluation is available at <https://content.cc.vt.edu/confluence/display/DEV/Evaluation+System>.

**FDI tracking system development.** The FDI tracking system is used to manage program participant activity, workshop registration, webpages, and computer selection, delivery and inventory. During the reporting period, a series of refinements, modifications, bug fixes, and expansions were accomplished. The FDI system continues to be extended and will include features that allow faculty members to self-register for workshops, choose computers, and view events. The system has been improved to allow a larger number of courses and events to be managed by the same number of staff and other efficiency improvements are planned for the coming year.

More information about the development efforts related to FDI is available at <https://content.cc.vt.edu/confluence/display/DEV/FDI+Tracking+System>.

**Software Skills Gateway development.** The Software Skills Gateway (<https://gateway.edtech.vt.edu/>) provides a way to link to ElementK using a Virginia Tech PID and password without having to know a custom username and password. It also provides tracking information and management capabilities. The gateway was completely rewritten using advanced Java technologies such as Web services, Hibernate, Spring, and Java Server Faces. The business logic was revamped to support greater flexibility, better service to users, and lower maintenance. The current gateway manages a limited number of licenses in a fully automated manner and requires no user intervention to create, manage, and expire licensed access to ElementK.

More information about the development efforts related to the Software Skills Gateway is available at <https://content.cc.vt.edu/confluence/display/DEV/Software+Skills+Gateway>.

**Internal project development.** The Application Development and Systems Integration areas work together to improve or extend internal Web-based services. Work with groups in Learning Technologies on programming or Web hosting projects is also done as requested. Highlights from the reporting period include:

- Set up an enterprise level wiki (<https://content.cc.vt.edu/>) for use by Learning Technologies and other Information Technologies groups. Users include Database Management Systems, Secure Enterprise Technology Initiatives, UAS, VBI, IVY+ Desktop Management Group, and others. For more information, see <https://content.cc.vt.edu/confluence/display/DEV/Confluence>.
- Set up an enterprise-level issue tracking system (<https://bugs.cc.vt.edu/>) for use by Learning Technologies and other Information Technology groups. Users include CTU and SETI Testing. For more information, see <https://content.cc.vt.edu/confluence/display/DEV/JIRA>.
- Set up an enterprise source code repository (<https://content.cc.vt.edu/confluence/display/DEV/Subversion>). External users include Sakai collaborative partners and Columbia University.
- Built interest for and located a trainer to provide Tomcat administration training. Five Learning Technologies staff and twenty staff from other groups on campus attended the training, which was well received. Based on this training, our staff has already been able to improve the quality of our services that rely on Tomcat (such as Scholar, ePortfolio, Confluence, JIRA, and the Learning Gateway). This activity is a prototype for the type of activity that will eventually be part of the Professional Development Institute.
- The Virginia Tech Java Users Group was initially formed by the Systems Integration and Application Development managers during this reporting period. The group consists of Java developers and application support personnel from many Information Technology areas including DBMS, SETI, and NIS. The group meets monthly to discuss issues related to Java on campus. Presentations on Java technologies and programming techniques take place during the meeting in an effort to improve skills across the enterprise.

**Faculty/departmental project development.** Application Development and Systems Integration work with faculty members and departments on programming or Web hosting projects as time allows. Highlights from the reporting period are:

- Worked with Terry Wildman and the Center for Excellence in Undergraduate Teaching to migrate four websites (including <http://www.ceut.vt.edu/>) from a departmental server to the campus hosting solution
- Worked with the Web hosting team to update and improve the Fileman code used to power Courseware



- Presented on PHP advanced concepts such as authentication/authorization, security, and email during FDI and continue to assist faculty members with PHP programming questions
- Worked with Drs. Perez and Edwards (Computer Science) to assist with a senior-level Software Engineering Computer Science course which will include Sakai programming projects and be offered in Fall 2006

**External Project Development.** The Application Development and Systems Integration areas work with groups involved in the Sakai community and open source projects on programming or Web hosting projects as time allows. Highlights from the reporting period are:

- Worked with staff at the University of Michigan to transfer the Sakai collaboration server (<https://collab.sakaiproject.org/portal>) from the University of Michigan to Virginia Tech  
The server hosts the Sakai project mailing lists and collaborative tools and is used by about 2000 people from all over the world involved in the project. Hosting this project raises our profile in the Sakai community and gives us a natural means to interact with and learn from key Sakai technical personnel.
- Set up an LDAP server at Virginia Tech to support Sakai services  
The LDAP server is used to store users and institutions involved in the project and to provide authentication and authorization for Web-based applications like the conference registration and tracking system.
- Developed a series of Web-based applications for conference registration, planning, and tracking (<http://bugs.sakaiproject.org/confluence/display/SFS/Home>)  
Also helped migrate and setup a code repository for all Web-based application code used on the Sakai foundation website.
- Designed and developed a Web-based voting and tracking application for Sakai requirements (<https://sakaiproject.org/requirements/>)
- Designed and developed a Web-based application for submitting skin (the series of style sheets that control the look and feel of the application without code changes) contest entries, voting, and results viewing (<https://sakaiproject.org/skin/>)

### Systems Integration projects

The Systems Integration team provides day-to-day support for all production and preproduction services provided by Educational Technologies. The quality of service provided by Educational Technologies continues to improve as we draw on skilled resources from across the university and the country to expand our own expertise.

For more information about Systems Integration Projects, contact: Anthony Atkins, Lead Systems Integrator ([anthony.atkins@vt.edu](mailto:anthony.atkins@vt.edu), 540/231-3957).

**Continued transition of core services.** Our staff has continued transitioning production systems (Blackboard, ePortfolio, Sakai) to rely on Information Technology support resources for core

services (operating system support, database administration, file storage, backups). This year, we transferred all database and file system content to the storage solutions offered by the Distributed Storage group. Our goal for the upcoming year is to transition the last two legacy services to the new centrally managed model, and to transition from locally supported load balancing to the load-balancing solution provided by Network Infrastructure and Services.

In the past year, we have continued to build a working relationship with the Unix administration services, database management systems and distributed storage groups, and have incorporated a number of best practices from those and other groups. As an example, this year we expanded all production services to include a preproduction instance to assist with testing, troubleshooting, and change management.

**Change management.** Tools such as JIRA, Confluence, and Subversion have allowed us to consolidate our practices and implement a robust change management policy. Good change management practices allow us to be flexible to the changing needs of the community while maintaining the quality and reliability of our services.

More information about our change management practices is available at <https://content.cc.vt.edu/confluence/display/PUBLIC/Change+Management>.

### New Media Center projects

The New Media Center (NMC) was involved in several key projects during the reporting period.

**NMC website.** The center has now incorporated the use of two different wiki engines into its Web presence. One site is available to the public and includes the use of blogs. The other site is available to a small work group.

### University-wide projects

- **Content management systems**  
The manager of the New Media Center is now participating in a university committee charged with evaluating several enterprise-level content management systems. This system would be available to Web developers across campus. The NMC manager's role on the committee is to evaluate support and training materials from each system.
- **Digital assets/collections**  
The manager of the New Media Center in cooperation with the Art and Architecture librarian have brought together a group of service units to agree on and work through a shared process for digital collections development.
- **Virginia Tech website redesign**  
The manager of the New Media Center has participated in group meetings and consulted with University Relations on the redesign of the Virginia Tech website in regard to training and supporting university Web developers as they adopt the new look and feel. Classrooms managed by New Media Center staff have been used by the various redesign committees for presentation and testing purposes.

- **MyVT redesign**  
The manager of the New Media Center has attended initial feedback meetings on redesigning the MyVT website.
- **Accessible Web Development Committee**  
The manager of the New Media Center continues to chair the training sub-committee. The university has purchased a training package of online tutorials for campus Web developers in anticipation of this critical training need. Accessibility awareness sessions have also been developed and placed into the FDI curriculum. The center is also scheduling one-on-one consultations on accessible Web design with departmental Web developers across campus. The Office of the Americans with Disabilities Act Coordinator and Services for Students with Disabilities has recently recognized the manager of the NMC as a member of the “ADA Access Honor Roll” for her work with the Accessible Web Development Committee.

**Faculty/department projects.** The New Media Center has an ongoing commitment to work with faculty and staff members throughout the year on various instructional, research, and departmental projects. Some highlights from this year are listed below.

- Professor Burch-Brown is a frequent flyer at the NMC. Her students use the lab all year to complete various projects.
- Professor Simone Paterson has frequently used the NMC classroom and required her students to take a tour of the NMC. The NMC also hosted part of her students’ exhibition of works this past year.
- The NMC worked closely with Professor Yonsenia White and her students to create videos of their performance projects. Professor White also worked with the New Media Center to create a DVD for her tenure application this year.
- **Wireless projection**  
The operations coordinator outfitted all three of the FDI classrooms (managed by the NMC) with wireless projection systems.

**Outreach programs.** The NMC ran training sessions for several summer programs on campus this year. Upward Bound, Women in Computing, and the Fisheries Department summer program all used NMC facilities and/or staff during their programs.

**NMC hiring database.** The New Media Center continues to work with units and departments across the university looking to hire students with experience in multimedia. Several of our own former student employees now hold 1500-hour and full time position across campus. Employers from several units across campus have also received applications from our system that match the skills sets they are looking for.

**Tablet PCs.** The NMC manages a cart of tablet computers, which are used by the faculty and by students in experimental classrooms in Torgersen Hall.

**Blackboard and Scholar.** In cooperation with Online Course Support, the NMC now offers walk-in help to faculty members using Blackboard and/or Scholar to post course materials online.

## Scholar—Sakai

At the end of last year (April 29, 2005), we held a conference call with Beth Van Gordon at Indiana University and gained access to their instance of Sakai, Oncourse. After exploring their site, we met with Sakai representatives from Indiana University and other institutions in June 2005 at the SEPP conference in Baltimore. Throughout this year, we have continued to work closely with the Sakai community especially at Indiana University and the University of Michigan where they have production environments of Sakai.

We regularly attend the bi-annual Sakai conferences and work closely with our colleagues and peers at universities around the world exploring Sakai and open source learning tool development. We delivered presentations at the January 2006 Mid-Atlantic Educause and May 2006 Sakai conferences on balancing considerations for open source and vendor solutions for learning environments. We coordinated the user support discussion group for the Sakai community and organized meetings and set agendas for the bi-annual meetings. We set requirements from the user support group and submitted them to the development team. We participated in the Sakai community voting to rank requirements for the most recent Sakai release (2.2).

The Online Course Systems (OCS) staff and other Educational Technologies staff have been involved in building a support structure for Scholar. Working closely with other institutions, we hope to leverage the collaborative fruits from other universities in building product documentation, data gathering tools, and training/support strategies. OCS has played a major role in the open-source community quality assurance workgroup, contributing to its comprehensive testing of the new Sakai release version 2.2.

We have held numerous meetings (roundtables and workshops) with Virginia Tech faculty members (typically, early adopters with Blackboard and OSP) and graduate students. These meetings have provided information and a demonstration of Scholar; they have identified needs and concerns, and opened a dialogue between our support/development staff and our users. We held two meetings targeting researchers and were successful in presenting Scholar as a complementary tool for research. From these research meetings we had two Computer Science faculty members volunteer to assist in code development by assigning their graduate course to work on Sakai code.

In the spring, we initiated the Scholar Fellow Program with the objective to create a community around Scholar, inviting faculty members to contribute to the product development and local customization, and to take an advocacy role with their colleagues and students. In the past, Learning Technologies has relied on a vendor product, Blackboard, where neither our support/development staff nor our users had meaningful input into its design. We have organized a "Scholar community" to provide input into the development of Scholar and to advocate for Scholar within the broader university community.

- We are conducting ongoing informal roundtable discussions with Scholar participants to better understand the needs of this user community and establish pro-active support.

- We have a Scholar fellow discussion list to exchange ideas and information.
- We have a survey tool to foster input from Scholar users and identify what features are most helpful and what type of functionality is needed.

User information is weighed and forwarded to our development team to set requirements for enhancements and tool design. These requirements are shared with the primary Sakai development team and other development efforts from within the Sakai Educational Partners Program (SEPP) community. OCS also reports on our Scholar user data to the open-source community to benefit other institutions working with the software. We hope to leverage the role that we are playing in the development of SAKAI to allow our users direct input into the design and customization of Scholar and we look forward to playing a lead role in shaping Scholar.

We have 18 faculty members participating as Scholar fellows. Usage statistics since January 2006 follow:

- 349 VT users and 105 guests have logged into Scholar.
- 15 course sites and 143 project sites were created or updated.
- 402 users were enrolled as an instructor/maintainer in at least one current site.
- 226 users were enrolled as a student/member in at least one current site.
- The average session length for all users was just under 11 minutes.
- The maximum session length was four hours and 30 minutes.

In summary, advocacy activities around Scholar increased significantly after January 1, 2006. Virginia Tech is in the position of involving its faculty and graduate students in the development and customization of our Sakai instance—Scholar. We are working closely in collaboration with institutions around the nation and around the world both benefiting from this collaboration and contributing to all the participants. We feel that we are shaping Sakai into the optimum learning system for Virginia Tech users.

### Graduate assistants, training and staff development

**Graduate assistant programmers in Application Development.** Two graduate students worked in the Application Development area on graduate assistantships during Fall 2005 and Spring 2006. Both students continued to work during the summer of 2006 as wage employees. They were trained to do programming in Java and PHP and learned to write advanced SQL queries against an Oracle database. The graduate students are also learning cutting-edge technologies like Spring, Hibernate, Java Server Face, and the Sakai Framework. Both students are involved in the national open source Sakai project and are working on internal projects such as the FDI tracking system and open source projects such as the evaluation system.

**Student workers in FDI.** During the past academic year, FDI has employed two graduate assistants to provide support for its programming. The nature of this support matches FDI's needs; however, an effort is made to provide the graduate assistant with professional experiences that will further his/her personal career goals. For instance, FDI's graduate student during the

spring semester 2004 was pursuing a degree in graphic design. While he provided essential program support such as Web maintenance, he was also charged with redesigning all of Educational Technologies webpages. This work provided professional listings on his resume that will further his career. Our graduate assistant during the 2004-2005 academic year possessed a different skill set. While he too provided Web support for FDI, he was charged with developing and teaching a number of FDI workshops. His previous teaching experience in higher education enabled him to be exceptionally effective. His career goals center upon instructional technology in a faculty development setting, and his time with FDI have provided him with professional experiences that will make him attractive to prospective institutions. The graduate assistants over the past 12 months have similarly been provided with professional experiences that will enhance their education in their field of study.

In addition to this academic year assistantship commitment, FDI also hires a number of graduate students to support its extensive summer programming and augment the spring and fall short courses. In the 2005-2006 year, 13 student lab assistants and interns were hired. Many FDI tracks cover highly specialized topics such as SAS, GIS, or parallel programming, and students were hired directly from those programs to provide support for the instructors during those sessions. Not only did this employment provide unique career-related experience, it also enabled these students to gain experience-grounded knowledge of software and related development or use issues that will be critical in their chosen profession. For our less specialized tracks, students that showed exceptional poise and skill were often provided with opportunities to lead sessions in addition to their role as assistants. Several lab assistants were provided with opportunities to lead breakout sessions or teach regular sessions within tracks. These experiences provided public speaking, leadership, and teaching experiences that are needed for success on many career paths.

**Professional development of staff and wage personnel.** The importance of on-going participation in professional development is frequently stressed to staff. These activities may include credit courses as well as conferences and training seminars. Such activities are important to the long-term success of the department by strengthening staff knowledge of leading edge technologies and best practices and by providing professional networking opportunities that foster peer-to-peer communication and support, important in learning about best practices and in securing the department's participation and understanding of open-source development initiatives.

Several staff members are enrolled in credit courses being taken to obtain masters and doctoral degrees. Those involved during the reporting period were Kim Gausepohl, Bill Plymale, Ed Schwartz, and Eddie Watson. Tony Atkins completed an MS degree in Industrial and Systems Engineering, May 2005.

Educational Technologies staff are encouraged and given opportunities to participate in at least one professional development event a year, such as regional and national conferences and training seminars. Several staff made conference presentations and are listed elsewhere in the publication/presentation section. Attending conferences and training seminars during the reporting period were John Moore, Bill Plymale, Ed Schwartz, Eddie Watson, Jeshua Pacifici, Kim Gausepohl, Shannon Phillips, James Dustin, Tony Atkins, and Aaron Zeckoski. Shannon

Phillips completed the Virginia Tech Women's Leadership and Mentoring program. James Dustin trained and received certification to perform Dell computer warranty repairs.

Conferences and seminars attended were Educause 2005, Mid-Atlantic Educause 2006, Sakai Educational Partners Conference 2005 and 2006, Open Source Portfolio Initiative, New Media Center conference, SITE-Society for Information Technology and Teacher Education, ISETL-International Society for Exploring Teaching and Learning, Learning Technology Consortium, HFEW 2005 Human Factors and Ergonomics Society, CHI 2006 Computer-Human Interaction, UPA 2006 Usability Professional's Association, AECT, and EduComm.

### Impact on university functions

**FDI contributions.** FDI seeks to improve the quality of teaching and research at Virginia Tech by offering comprehensive programming grounded in sound principles of learning. Our core mission demands that we add value to the university beyond Information Technology. One of FDI's most critical contributions within the university continues to be its function as conduit between expertise in IT and the university community at large. As new initiatives emerge and new technologies become available, we provide an avenue for diffusion of these new ideas as well as opportunities for the modeling of best practices and ongoing discussion regarding meaningful applications. We strive to act as educator, mentor, innovator, and change agent for the university community.

There are a number of key indicators that provide evidence of our contributions to our university community. One is our growing enrollment. While summer enrollment stays approximately the same from year to year because of the four-year cycle (25% of the faculty is invited to enroll), the demand for seats in our spring and fall workshops has increased dramatically. Between Spring 2005 and Spring 2006, the number of workshops seats filled grew from 1,866 to 2,371. This growth indicates that there continues to be a clear demand across campus for our training and development offerings and the growing enrollment suggests that adopting sound principles of learning as part of our curricular objectives resonates with the university community (and, we trust, results in corresponding good practice).

Another indicator of success is the number and diversity of our offerings. FDI programming evolves from semester to semester. The number of workshops in Spring 2004 was 92 while the number in Spring 2005 was 146 and 191 in Spring 2006. Many of the new offerings were heavily attended and included emerging instructional technologies as well as topics that are consistent with the university's renewed emphasis on research. The FDI staff meets regularly with the faculty from all colleges, and these meetings provide direction for the offerings we provide. Additionally, as part of each workshop's evaluation process, participants are asked to provide suggestions for future FDI workshops. The information gathered from those participants has enabled us to ensure that our offerings continue to stay relevant and timely. These evaluations have also showed that FDI is currently on target with faculty needs (evidenced by evaluation scores and faculty comments). By staying current and continuing to learn from the faculty regarding their needs, we continue to contribute to the diversification and growth of Virginia Tech's applications of technology in research and instruction.

**OCS' impact on the university.** Faculty members and students have chosen Blackboard and, as the statistics indicate, it is a mission-critical enterprise system at Virginia Tech. OCS training efforts have contributed significantly to the successful adoption of this learning management tool, and with the release of more tools, we are playing a critical role in expanding the learning environment at the university. The ePortfolio system, OSP, has provided a needed tool to document learning and provided students with a repository for their professional and personal materials which we expect to be widely adopted in the near future with the latest release 2.2 which integrates with the Sakai learning management system. As we provide quality assurance and roll out Sakai + OSP, we expect this new learning environment to provide the faculty and administrators with collaborative tools to manage their learning, research, and administrative activities. A growing and an important part of OCS will be to continue to perform essential quality assurance activities contributing to the design and stability of our learning tools. OCS also plans to work closely with faculty members, researchers, and students to gather user requirements for the further development of both OSP and Sakai. In addition, the quality assurance efforts on the course evaluation tool will enhance tool development and lead to an easier and more secure course evaluation process that will be widely used. OCS will continue to develop and provide training and resource materials to assist new users with emerging products; and we will continue to maintain a comprehensive support structure for our products.

### Changed processes

**Changed processes relative to FDI.** As FDI programming has evolved, so too have its processes for providing that programming. As the result of needs assessments and other indicators, we have discovered a gradual shift in faculty attitude toward technology. Further, it is clear that the skill levels of the faculty, the staff, and the student body continue to grow and diversify. While we continue to develop skills within our group to share with the university community, FDI's approach has expanded to meet the diversification of our university population by developing and fostering partnerships across the university. The main goal of these highly successful partnerships is to enable the availability of a broader range of workshop topics.

As a result of this strategy, FDI now has partnerships with the Research Division, the Office of Sponsored Programs, University Libraries, the College of Engineering, the College of Agriculture and Life Sciences, the Center for Geospatial Information Technology, the Institute of Distance and Distributed Learning, the Statistical Consulting Center, as well as other groups within Learning Technologies. In addition to these recursive partnerships, FDI has also developed relationships with individual faculty and staff members from across the university. Further, when needed skills cannot be found on campus, we have continued to nurture complementary relationships with vendors, including Apple Computer, Microsoft, National Instruments, MathWorks, SAS. All of these partnerships and relationships have resulted in more diverse training offerings for our university community, enabling us to meet the growing needs of our faculty. As a result, the number of workshops we delivered in Spring 2006 was over 30% greater than Spring 2005.

In addition to adjustments in staffing approaches, we have changed the way in which we manage the registration process. The feature set of our "homegrown" database system continues to grow.



Participants can now enroll and un-enroll themselves in workshops. Presenters can access their role sheets anytime they wish. The system sends reminders to participants a few days before the date of a workshop. These features and others not only make it easier for us to manage the enrollment process, but it also enables participants to control their selections 24 hours a day. Additionally, new reporting features allow our current staff to manage more classes. This allows us to add more seats and provides a scalable solution for future growth. Significant new features are planned that should be available for use in spring 2007.

**Contact information:** John Moore *jmoore1@vt.edu* 540/231-8991

### Research Task Force

The continuing mission of the Research Task Force is to advance and support research of existing and emerging technologies within Learning Technologies, Information Technology, and the university. The task force accomplishes this mission by scanning the environment, forming partnerships with research faculty members and their departments, and proposing points of focus and action by means of white papers, prototype development, and proof-of-concept activities. Currently, areas of study include the following pervasive computing topics.

**Collaborative learning spaces.** Learning Technologies is studying collaborative learning spaces based on Stanford University's interactive workspaces research. This project offers a student work space with a large shared screen display and collaborative software in Torgersen Hall. This space provides state-of-the-art groupware for students working on team projects to facilitate more efficient interactive group activities. This system supports simultaneous authoring of computer documents and presentations, seamless sharing of these documents, and a record of meeting activities.

**Context-aware notification systems.** Learning Technologies is assisting the University of Missouri with their research on a Sakai-based event notification system. The Context-aware Activity Notification System (CANS) is a notification system for online communities designed around the importance of a user's social context and personal notification preferences. CANS was built with a focus on why, when, and where users receive awareness information and how that information can be used to derive meaning from the activity occurring in the collaborative community.

**Thin client technologies.** Learning Technologies, in conjunction with Network Infrastructure and Services, is investigating the use of thin client desktop computing. Benefits to the university community include better security, lower costs, and more efficient management and support of applications. Applications under investigation include a testing lab model made up of thin clients. This environment potentially offers greater control over the administration of distributed tests and quizzes.

**Wireless sensor networks.** Learning Technologies is exploring applications of wireless sensor networks and associated middleware to teaching, learning, and assistive technologies. (Example: mote prototyping involving distributed Tuplespaces and the Agilla framework).

**Pervasive computing services.** Learning Technologies is working with research faculty members and graduate students to identify a set of pervasive computing services that can be applied to teaching and learning. Such services include the pervasive computing concepts of context awareness, event notification, adaptive user interfaces, ambient information, and resource discovery. Collaborative and instructional systems incorporating pervasive computing services would improve the conveyance, understanding, and retention of knowledge by teachers, students, and researchers.

Learning Technologies acknowledges the significance of pervasive computing research activities by formally defining a pervasive computing research group with associated budget and staffing over the next five years.

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### Graduate Education Development Institute

During the 2005–2006 academic year, approximately 72 students completed the Graduate Education Development Institute (GEDI) course—GRAD 5114 “Pedagogical Practices in Contemporary Contexts.” The course is now required of all entering graduate students in the English Department (M.A. and M.F.A.). Other departments are giving students credit for the course in their cognate areas, so an increasing number of graduate students will be able to apply the GEDI course to their programs of study. Most students continue to take the course above and beyond their departmental course requirements.

For the fall 2005 semester, Dr. Erin Dolan and Dr. Jim Dubinsky co-taught the GEDI course. In addition, the program garnered funding for another GTA position from the Graduate School, resulting in two graduate student GEDI fellows for 2005-2006. During Spring 2006, Jeshua Pacifici joined the GEDI program part-time, and spent the spring learning the GEDI curriculum in order to facilitate the revising of the technology workshops in the course. This spring the GEDI fellows completed a flash animation for the GEDI webpage <http://www.gedi.vt.edu>

**Assessment data.** Assessment data for GEDI continue to suggest that the program is fulfilling a need in helping graduate students explore technology-enriched pedagogy and broaden their professional development as current teachers and future faculty members.

Question: Compared to when I started this class, I now feel more confident with using technology in my teaching.

| Response                   | Fall 05<br>Mid TT (44) | Spring 06<br>Mid TT (22) | Total<br>Exit (66) |
|----------------------------|------------------------|--------------------------|--------------------|
| Strongly agree             | 18% (8)                | 23% (5)                  | 20% (13)           |
| Agree                      | 73% (32)               | 45% (10)                 | 64% (42)           |
| Neither agree nor disagree | 9% (4)                 | 27% (6)                  | 15% (10)           |
| Disagree                   | 0% (0)                 | 0% (0)                   | 0% (0)             |
| Strongly disagree          | 0% (0)                 | 0% (0)                   | 0% (0)             |
| No answer                  | -                      | 5% (1)                   | 1.5% (1)           |

Question: To what extent did this course improve your awareness of the teaching and technology resources available to you?

| Response    | Fall 05<br>Exit (n=46) | Spring 06<br>Exit (n=22) |
|-------------|------------------------|--------------------------|
| Extensively | 72% (33)               | 64% (14)                 |
| Moderately  | 26% (12)               | 36% (8)                  |
| Minimally   | 2% (1)                 | 0% (0)                   |
| Not at all  | 0% (0)                 | 0% (0)                   |
| no answer   |                        |                          |

Question: My own best evaluation of my teaching skills at this point in time would be:

Response

- 1 = Very unsure of my skills
- 2 = Unsure of my skills
- 3 = Average skills
- 4 = Above average skills
- 5 = Superior skills
- no answer

| Fall 05<br>Entry (n=52) | Fall 05<br>Exit (n=46) | Spring 06<br>Entry (n=20) | Spring 06<br>Exit (n=22) |
|-------------------------|------------------------|---------------------------|--------------------------|
| 8% (4)                  | 0% (0)                 | 0% (0)                    | 0% (0)                   |
| 25% (13)                | 9% (4)                 | 30% (6)                   | 5% (1)                   |
| 50% (26)                | 46% (21)               | 45% (9)                   | 45% (10)                 |
| 13% (7)                 | 43% (20)               | 20% (4)                   | 50% (11)                 |
| 4% (2)                  | 2% (1)                 | 5% (1)                    | 0% (0)                   |

### Sample Qualitative Responses

What technologies are you likely to employ in your teaching?

I have already recommended to my department that we start using ePortfolio as part of our assessment plans throughout our courses which will help students and the department. I definitely think that having students participate in discussion boards and create wikis in conjunction with some problem-based learning activities will be helpful.

I really like the discussion boards and chats, things that are a little simpler to use and navigate. In that way the students get a chance to voice their opinions and thoughts outside of the class room. . . . These very same ideas can then be brought back into the classroom to stimulate discussion, b/c every one will have had a chance to participate. I also like the chats or IM office hours b/c it is convenient for both the professor and the students.

I like the idea of using tablet PC, where I can 'write' on board while moving around the class.

I like the idea of using tablet PC, where I can 'write' on board while moving around the class.

In engineering, there is typically not a lot of 'room' for discussion. However, I think that project aspects and team-based problems would work well with the technologies. Perhaps sharing of group project materials in ePortfolio or using discussion board for examining the projects after students read/see the presentation.

I'm curious to use wikis so that the students can construct a knowledge-base, based on the continually growing content in the class. In a sense, the process of building the wiki should be one in which dialogue and debate occur, thus achieving some level of critical thinking.

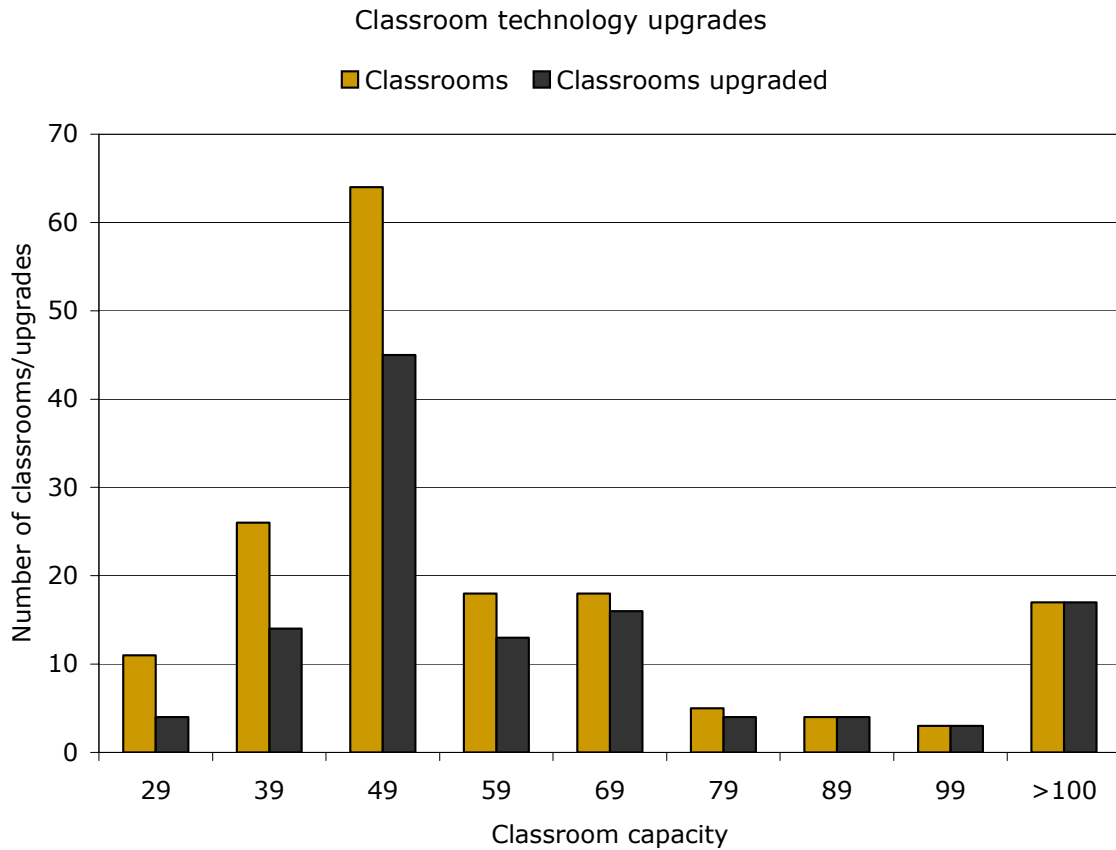
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### Classroom upgrades and computer-integrated classrooms

A university-wide classroom improvement project is currently underway. This initial project is the first phase of classroom master plan. During the summer of 2006, nine centrally scheduled classrooms will receive extensive renovations with plans for eight additional classrooms next summer. These renovations include new infrastructure, acoustical and lighting improvements, and the installation of the latest technology for the enhancement of teaching and learning. Several other classrooms received technology upgrades over the past year including Military Science, and the New Research Center in Natural Resources. The Graduate Life Center opened in August 2005 with assistance from Learning Technologies in equipping the center with interactive video conferencing capabilities, two presentation classrooms, and a computer lab for graduate student use. Consulting services were provided to the New College Institute in Martinsville to assist that institution in the design of instructional technology systems for two classrooms and a conference room at the newly renovated site.

An ongoing technology refresh program systematically replaces existing technology in the classroom. A concerted effort is made to ensure that high capacity auditoriums are kept up to date. As an example, all of the classrooms in Torgersen Hall received new projection systems because of obsolescence and the need to enhance the capability of distance learning classrooms.

Over the past several years, more than 120 classrooms have been upgraded with presentation technology systems designed to assist faculty members and students in teaching and learning. These facilities provide the capability for displaying a wide array of computer-generated presentations including scientific visualization, and other complex graphic displays. All of the stations have a network connection, which provides access to the Internet for downloading information during class sessions. These classrooms continue to be in high demand by the faculty across all colleges and departments in the university.



Ten centrally scheduled distance-learning classrooms have been put online to support classes being delivered to students off campus. These classrooms and classrooms across the state are being upgraded this summer to IP-based interactive video conferencing. This upgrade will provide greatly enhanced capabilities to meet the needs of faculty members and students. The Commonwealth Graduate Engineering Program, the M.B.A. distance-learning program, and numerous other courses are taught using this two-way interactive video system on NetworkVirginia, the state’s broadband network that provides voice, video, and data access for over 700 locations in the commonwealth.

Computer-integrated classrooms have been installed in eleven locations on campus providing more than 1000 computing stations for accessing the Internet and specialized software. These spaces provide a setting for faculty members and students to use this specialized software in solving advanced problems in their discipline. The most prominent example is the Math Emporium, which provides over 500 computing systems in a unique learning environment for students.

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## Computer-Integrated Classroom Support

The mission of the Computer-Integrated Classroom Support (CICS) unit is to provide the highest quality and most reliable computer-integrated classroom environment to enable the faculty to transform teaching and learning at the university.

The CICS unit provides support for all computer-integrated classrooms on campus, including approximately 1000 computing stations throughout the campus.

CICS services include the following:

- Provide software/hardware installation, maintenance and troubleshooting for computer-integrated classrooms (CICs) and labs
- Train faculty and staff members on the use of computer teaching stations and A/V equipment in CICs
- Provide consultation and support as requested to other departments
- Provide laptops for check out by faculty or staff members or by students from the TechConnect Lab (Torgersen 3250)
- TimeClock System administration and training
- Support the president's conference room—Burruss 325
- Manage and maintain the following computer-integrated classrooms

| Computer-integrated classroom             | Macintosh  | Windows    |
|---|------------|------------|
| AIS Classroom                             |            | 16         |
| Ambler-Johnston 4102                      |            | 45         |
| Architecture Annex 1                      |            | 25         |
| Art & Design Learning Center 112          | 16         |            |
| Chemistry/Physics 305                     |            | 25         |
| Derring 2069                              |            | 22         |
| Graduate Life Center                      |            | 18         |
| Henderson 23A                             | 30         |            |
| Major Williams 502 (Closed December 2005) | 20         |            |
| Math Emporium                             | 520        |            |
| Price 301A                                | 15         |            |
| Randolph 114E                             |            | 36         |
| Saunders 101                              |            | 25         |
| Shanks 160                                | 30         |            |
| Shanks 180                                |            | 25         |
| Shanks 360                                | 25         |            |
| Southgate Classroom                       |            | 36         |
| Torgersen 1010                            |            | 33         |
| Torgersen 1080                            |            | 35         |
| Torgersen 3250                            | 18         | 18         |
| Ware 103                                  |            | 3          |
| <b>Total</b>                              | <b>674</b> | <b>362</b> |

**Partners for the Advancement of Collaborative Engineering Education-Product Data Management (PACE/PDM) Collaborative Course Support.** Our group is also providing an essential support and development role for Dr. Jan Helge Bøhn in the Department of Mechanical Engineering. Dr. Bøhn has been the driving force behind the creation of several collaborative product data management courses involving other PACE Institutions including Technische Universität Darmstadt Germany, Howard University, Brigham Young University, ITESM-Monterrey Mexico, ITESM-Toluca Mexico, Monash University, Hongik University South Korea, University of British Columbia, University of Toronto, University of Waterloo, and University College Trollhättan as well as General Motors. CICS is providing the administration of the Teamcenter Engineering application and database servers, Teamcenter Community Web and database servers, as well as consultation with the other institutions on installation and setup of their clients to interface with our systems.

**Pay-for-print service.** This year we began providing color printing services for \$0.40 per sheet, which significantly increased our revenue. We also added printers in Donaldson-Brown 40, and Torgersen 1140.

| Printer                | Jobs          | Pages          | Sheets         | Amount charged     |
|------------------------|---------------|----------------|----------------|--------------------|
| Ambler-Johnston 4102   | 1,911         | 6,599          | 12,756         | \$1,198.10         |
| Architecture Annex 1   | 752           | 2,553          | 2,255          | \$335.30           |
| Architecture Annex 111 | 0             | 0              | 0              | \$0.00             |
| Burruss 122 HP8150     | 809           | 2,022          | 2,022          | \$202.20           |
| Burruss 122 HP8550     | 182           | 428            | 428            | \$115.70           |
| Cheatham 217           | 359           | 1,913          | 1,913          | \$191.30           |
| Cheatham 220           | 782           | 2,432          | 2,432          | \$243.20           |
| Chem-Phys 306          | 1,863         | 5,691          | 5,429          | \$542.90           |
| Derring 2069           | 4             | 4              | 4              | \$0.40             |
| Donaldson-Brown 40     | 1,782         | 7,948          | 7,696          | \$1,228.30         |
| Durham 152             | 237           | 882            | 789            | \$78.00            |
| Durham 187             | 6             | 42             | 42             | \$4.20             |
| Litton-Reaves 1370     | 2,344         | 7,530          | 7,530          | \$753.00           |
| Major Williams 502     | 145           | 206            | 206            | \$20.60            |
| Math Emporium #1       | 13,450        | 52,906         | 51,279         | \$5,127.90         |
| Math Emporium #2       | 17,919        | 68,309         | 66,361         | \$6,636.10         |
| McBryde 116            | 573           | 1,671          | 1,671          | \$167.10           |
| Pamplin 2010           | 4,617         | 15,205         | 15,112         | \$1,602.70         |
| Patton 316 HP4000      | 2,378         | 4,908          | 4,685          | \$468.50           |
| Patton 316 HP5100      | 840           | 912            | 912            | \$182.40           |
| Patton 319             | 1,651         | 4,247          | 4,015          | \$401.50           |
| Randolph 114E          | 1,997         | 5,840          | 5,840          | \$584.00           |
| Randolph 114E Color    | 598           | 1,795          | 1,793          | \$440.90           |
| Saunders 101           | 24            | 52             | 52             | \$5.20             |
| Shanks 160             | 370           | 594            | 594            | \$59.40            |
| Shanks 180             | 129           | 217            | 217            | \$35.50            |
| Shanks 360             | 80            | 142            | 142            | \$14.20            |
| Torgersen 1010         | 1,685         | 5,299          | 5,297          | \$498.50           |
| Torgersen 1080         | 1,452         | 4,423          | 4,406          | \$676.70           |
| Torgersen 1140         | 423           | 1,074          | 1,061          | \$260.60           |
| Torgersen 3250         | 4,306         | 13,999         | 13,700         | \$2,645.00         |
| VetMed Library 101T    | 547           | 2,326          | 2,326          | \$232.60           |
| <b>Total</b>           | <b>64,217</b> | <b>222,173</b> | <b>216,807</b> | <b>\$24,952.50</b> |
| % Change from FY04-05  | +5%           | +8%            | +6%            | +26%               |

**Tablet PC initiative.** Our group is providing support for a project conducted in partnership with Microsoft that is providing the opportunity to study the effect of evolving hardware and software systems on teaching and learning. This project is studying the impact of specialized, collaborative software and tablet computers on learning.

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## Digital Imaging

The mission of Learning Technologies' Digital Imaging is to support the research and instructional activities of the university by providing:

- a comprehensive range of scanning services in support of image archiving, research, and course development projects;
- assistance for the University Library's Image Database Initiative; and
- support for preparation of instructional materials through the online E-Reserve

With the start of the 2003-2004 fiscal year, Digital Imaging service has been provided to individuals or departments at Virginia Tech based upon criteria related to image archiving and the preparation of high-resolution files suitable for use in research visualization projects that require a high degree of image scanning precision and network accessibility. Projects are considered based on the merits of proposals submitted by faculty members and graduate students interested in converting collections of original materials to digital formats suitable for research or instruction. Accepted proposals are scheduled to meet the expectations of the project and the established imaging standards for creating digital archives.

Through the end of the fiscal year represented in this report, Digital Imaging has scanned a total of 330,847 individual items associated with 66 distinct projects. A representation of this effort includes:

|                      |         |  |
|----------------------|---------|--|
| E-Reserve            | 15,314  | journal pages from 1,179 documents     |
| Reserve annex        | 4,225   | journal pages from 299 documents       |
| Thesis/dissertations | 178,488 | manuscript pages from 1,108 documents  |
| Collections          | 115,414 | assorted images, and                   |
|                      | 17,406  | page images from manuscripts and books |

In addition to the support for numerous scanning projects, we have also produced over 40,000 surrogate images for the Center for Civil War Studies as part of a project to prepare Civil War newspapers for online delivery. This project is scheduled for completion by early fall 2006. As the completion date nears, we are now preparing to expand support for this project to assist in making it a model for image repository projects at Virginia Tech. One outcome projected as a result of this effort will prepare us to undertake additional projects as well as offer consultation to other agencies across the commonwealth interested in similar projects.

During the past fiscal year, a total of 15 separate collections were completed. These collections represent 20,480 individual images represented by slides, negative films, photography, and newsprint. A description of those collections is provided below.

COMPLETED PROJECTS: 2005-2006

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|                   |       |                 |                          |
|-------------------|-------|-----------------|--------------------------|
| Architecture      | 6,079 | 35mm slides     | Building images          |
| Humanities        | 58    | photographs     | Ital: 1105               |
| Art & Art History | 320   | 35mm slides     | Art: 4384                |
| Humanities        | 335   | 35mm slides     | Hum: 1114                |
| Library Archives  | 392   | photographs     | George Marvin            |
| Architecture      | 486   | 35mm slides     | Arch: 3115               |
| Geography         | 1,281 | 35mm slides     | Cityscape images         |
| Forestry          | 1,166 | 35mm slides     | Forest ecosystems        |
| Architecture      | 3,719 | 35mm slides     | Arch: 3116               |
| Library Archives  | 3,970 | newspaper pages | Spectrum archive         |
| Library Archives  | 1,317 | film negatives  | Railroad history         |
| Library Archives  | 481   | photographs     | Railroad history         |
| PPWS              | 76    | 35mm slides     | Entomology               |
| PPWS              | 640   | 35mm slides     | Plant diseases           |
| Geography         | 160   | Slides          | South America cityscapes |

Five completed projects were directly related to the preparation of class materials used for instruction. Many of these images were also made available to the students in those classes as supplemental course materials.

|                   |       |             |            |
|-------------------|-------|-------------|------------|
| Humanities        | 58    | photographs | ITAL: 1105 |
| Art & Art History | 320   | 35mm slides | ART: 4384  |
| Humanities        | 335   | 35mm slides | HUM: 1114  |
| Architecture      | 486   | 35mm slides | ARCH: 3115 |
| Architecture      | 3,719 | 35mm slides | ARCH: 3116 |

Additional course material was created through support provided to the Electronic Reserve hosted by the University Library.

|               |       |               |     |           |
|---------------|-------|---------------|-----|-----------|
| E-reserve     | 3,408 | journal pages | 268 | documents |
| Reserve annex | 2,231 | journal pages | 166 | documents |

The 5,639 pages scanned represent a total of 434 individual supplemental readings available to students online through links established in Blackboard and on the University Library website.

In addition to the completed projects mentioned above, Digital Imaging continues to provide scanning support for numerous projects originating from the University Library's Special Collections and Digital Library and Archives. A selection of current projects is represented below.

SELECTED SPECIFIC PROJECTS

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|                           |  |
|---------------------------|--|
| Project:                  | Visual Design Archive  |
| Principal Faculty Member: | A. Jack Davis  |
| Department:               | Architecture   |
| Proposal:                 | This collection represents 20,000 existing slides taken during trips |

and onsite visits to view examples of noted architectural designs around the world. This collection will be used in two ways, one as a resource for instruction in the College of Architecture and Urban Studies, and as an archive available to researchers through the University Library.

Project Status: 15,675 images have been scanned.

Project: Electronic Thesis & Dissertations

Principal Faculty Member: Gail McMillan

Department: University Library

Proposal: Current requirements for submission of electronic thesis and dissertations make access to these types of research materials a valuable resource to both on campus and off campus researchers. Dissertations housed in the University Library that were submitted prior to this requirement are also available to researchers in printed form and as a result require the user to visit the library or submit a request for use of that material. By converting selected dissertations to digital format, the library can provide remote access to these materials and enhance the magnitude of online research material available to both on campus and off campus research. These materials will be selected by discipline with the assistance and recommendation of the faculty in those areas.

Project Status: 178,488 Manuscript Pages Scanned; 1,108 Completed Documents

Project: Civil War Newspapers: Historical Archive  
Principal Faculty: William C. Davis  
Member:  
Department: Virginia Center for Civil War Studies  
Proposal: As stated in the University Libraries Strategic Plan, our mission is to provide and promote access to information resources in direct support for the achievement of Virginia Tech's objectives in teaching, learning, research, creativity, and community service.

These newspapers represent an important information resource for historically significant documents that are unique to this period. Virginia Tech has committed itself to becoming a leading center for study of the American Civil War. A searchable record for the newspapers published during this period represents just the beginning of an overall effort to create such a center for Civil War Studies. This project represents the first steps toward making the newspapers published during that time available online and searchable in terms of the text and major events.

Project Status: The newspaper pages have been scanned (from microfilm). 40,042 surrogate images have been created for the Web display.

Project: University Archives  
Principal Faculty: Gail McMillan  
Member:  
Department: Digital Library Archives, University Library  
Proposal: Creating a digital archive for the historical images and documents related to the University benefits the preservation effort for these materials as well as increasing the accessibility to the documents and photos. This project includes over 100,000 items currently housed in the Athletic Department alone that are not protected from environmental damage due to heat and humidity. It also represents over 9,000 photographs (slides) that were previously housed in the University Relations Department along with the Bugle Collection (Virginia Tech yearbooks). Providing accessibility to the images and documents recorded throughout the existence of Virginia Tech is considered a primary resource for research on the history of the University. Upon completion, the University Archives will be available electronically with an option for requesting printed copies of selected items. This archive should provide the capability to reproduce each item matching the condition of the original in terms of both size and coloration.

Project Status: 53,912 images have been scanned.

Project: Architecture History  
 Principal Faculty Member: Brian Shelburne  
 Department: Art & Architecture Library  
 Proposal: Creating a digital archive for the 20<sup>th</sup> century architecture of Europe and the United States so that the images are available to faculty members and researchers for study and as instructional materials in teaching. This archive should provide the capability to reproduce each item matching the condition of the original in terms of both size and coloration. These images represent the historical record of numerous faculty members as well as specific records of individual collections. The initial request is for 3500 slides associated with Europe and the United States. The entire collection is estimated to be 70,000 images.  
 Project Status: 6079 images have been scanned.

Project: Historic Maps of Virginia and the United States  
 Principal Faculty Member: Gail McMillan  
 Department: Special Collections  
 Proposal: This collection representing approximately 568 historic maps of Virginia is a vital resource to understanding the settlement and expansion of the United States. As stated in the University Libraries Strategic Plan, our mission is to provide and promote access to information resources in direct support for the achievement of Virginia Tech's objectives in teaching, learning, research, creativity, and community service. For Digital Library Archives these information resources are historically significant documents that are unique and rare.  
 Project Status: 103 large format maps have been scanned.

**McCormick Farm project.** In February of this year, we were contacted by David Fiske to provide assistance with redesigning the McCormick Farm Museum. Mr. Fiske oversees the McCormick Farm and Shenandoah Valley Agricultural Research and Extension Center located in Steeles Tavern, Virginia. This historic site includes machinery, photographs, models, and tools related to the Cyrus McCormick family as well as the farm buildings and home where Cyrus McCormick grew up. The McCormick Farm is the place where the McCormick reaper, considered to be one of the five great inventions of the industrial age, was invented.

Digital Imaging is involved with preparing digital archives of the original photographic images displayed at the museum. We are also assisting in the creation of reproductions for the photographs so that the original source material can be preserved in a secure location. In addition, plans also include the design of an electronic display to provide supplemental information about the reaper and the life of Cyrus McCormick.

Project Status: 47 large format photographs have been scanned  
15 photo quality inkjet prints have been printed and mounted for framing  
Planning is underway for the presentation materials including signage for the  
blacksmith shop and gristmill.

**Virginia Heritage project.** The Virginia Heritage Database is a consolidated database of finding aids to manuscript and archival collections in Virginia. As a participating member of the Virtual Library of Virginia (VIVA), Virginia Tech contributes finding aids to the database for the collections housed in our Special Collections.

Over the past year our efforts have included investigation of standards for metadata, especially the technical metadata associated with the creation of archival images. As a result of this investigation, we have implemented a standard for the archival scans we produce and identified a process that could be adopted by other members of the Virtual Library of Virginia.

These efforts were coordinated along with the Digital Library and Archives at Virginia Tech and include representation on a statewide committee looking at grant-funded opportunities to enhance the work developed through the Virginia Heritage Project.

This project in combination with our efforts to improve support for scanning at Virginia Tech are working together to create a leading edge center for digital archiving capable of meeting the needs of an information technology driven university.

## 2005-2006 technology improvements

Specialized equipment purchases allowed Digital Imaging to enhance and expand its services in several important areas during the 2005-2006 fiscal year.

Increased speed and productivity in digitizing Virginia Tech theses and dissertations became available early in the fiscal year with an upgrade to this service achieved with the addition of a production-level, large-capacity Fujitsu document scanner.

Additional space and increased data protection for rapidly accumulating scanned files was provided during this time by the acquisition of an Apple Xserve RAID system with seven terabytes of storage capacity.

The process of scanning large format artwork was greatly improved with the investment made in a commercial quality copy system manufactured by Tarsia Technical Industries that has the capability of capturing flat materials up to 40 x 60 inches using a heavy-duty copy stand table, special reflective lighting units, a medium format camera, and a high resolution digital scan back.

The end of the fiscal year literally turned the page on new scanning capabilities with the procurement of an innovative new book scanning system created by Kirtas Technologies that provides a safe and efficient method of digitizing bound documents by incorporating a unique

and automated page-turning technology, a high resolution digital camera, and post-scan batch processing software.

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## Test Scoring Services

Test Scoring Services supports the collection of data by Virginia Tech faculty and staff members by processing optical mark reader forms, providing analysis of the data, and promoting and supporting innovative technologies that improve data handling efficiency.

Primary uses of opscan forms at Virginia Tech are exams, course evaluations, and collection of research data. Use varies from year to year, and shows no consistent direction of change. Last year the number of jobs declined somewhat, but there was an increase in the total number of forms processed. Statistics for the 2005-2006 academic year show the following:

- Number of different clients served: 826
- Jobs processed: 6,000
- Exams: 5,000
- Final exams: 950
- Course evaluations: 500
- Research data capture jobs: 500
- Total sheets processed: 800,000

While opscans continue to be the preferred information gathering method for many applications, Test Scoring worked with other units in Learning Technologies to archive data, which will be available in a new online course evaluation system.

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## Assistive Technologies

“Empowering people for a lifetime of learning, teaching, working, recreation, and independence by advancing assistive technologies through research, instruction, and outreach.”

The mission of Assistive Technologies reflects the university’s commitment to ensuring that all

qualified individuals are provided equal access opportunities to the educational and employment programs and services of Virginia Tech. The Assistive Technologies department mission-critical objectives include:

- Technical expertise, leadership, and coordination for disability accommodations based on assistive technologies (AT). This leadership includes coordination of university AT on computers for teaching and learning in classrooms, computer labs, academic departments, the university libraries, and in administrative offices;
- Multidisciplinary research and instructional activities that may create or find better uses of AT for people with disabilities and for all individuals;
- Instruction and outreach at the university or across the commonwealth that communicates the benefits of assistive technologies to all individuals.

Assistive Technologies, a unit of Learning Technologies, is comprised of the Assistive Technologies Lab, Special Services, and other AT service and support functions.

### **Assistive Technologies Lab**

The Assistive Technologies Lab (AT Lab) located in Torgersen Hall is a multidisciplinary research lab, training, and outreach facility that creates or improves assistive technologies for persons with disabilities and works to advance emerging technologies useful to all individuals.

Research, instruction, and outreach opportunities for the AT Lab involve:

- Collaborating on AT projects within the university and the research community;
- Participating in college and university consortiums on AT services and public outreach events, such as College Bound;
- Obtaining grants or sponsored funding from government, industry, and the private sector for AT related research;
- Working with disability service agencies like the Virginia Assistive Technology System (VATS), Woodrow Wilson Rehabilitation Center (WWRC), or the Virginia Board for People with Disabilities (VBPD) on AT services, sponsored programs, and outreach.

Through instruction on assistive technologies in the classroom, conducting research, and participating in public outreach forums, the AT Lab attempts to raise awareness about disability issues, publicize AT research and results, and demonstrate the benefits of assistive technologies to all individuals both regionally and statewide.

### **Special Services**

The Special Services facility, located in Newman Library, supports a wide variety of disability accommodations and services based on AT, including specialized computer software, adaptive



equipment, and individualized training. Special Services is open to all students, to members of the faculty and the staff, and to public patrons by a referral from either the Office of Services for Students with Disabilities or the Office of the ADA Coordinator in Human Resources. In addition to being an accessible computer facility, Special Services demonstrations of AT software, equipment, and services are open to the university community, departments, and to the general public by appointment with Assistive Technologies. Special Services, at the request of the VP for Multicultural Affairs, also helps serve a regional on-campus transition program (OCTP). OCTP provides high school students with disabilities work experience and the opportunity to attend college classes. The students and their aides periodically use computers in Special Services to research topics and write their daily activities logs. Assistive Technologies provides training to the students and the staff as requested.

**Consulting services.** AT consulting services are available to any university entity providing a disability accommodation or wanting to utilize assistive technologies for any academic, research, or administrative purpose. For departments wanting to develop a better understanding of assistive technologies and accessibility issues for persons with or without disabilities, formal instruction by Assistive Technologies may also be available.

**Information technology accessibility initiatives.** The Assistive Technologies department has taken a leadership role on initiatives for university information technology accessibility policy and standards. This includes related software procurements for developing, evaluating, repairing, and monitoring Web accessibility compliance at Virginia Tech. The accessibility initiative is being coordinated with other university entities, such as University Relations for homepage website redesign, Information Technology investigating Web content management systems, Purchasing and Information Technology Acquisitions on accessible procurements, and initiatives within Learning Technologies and Human Resources for accessibility training.

**Assistive technology support services.** Working with partners in Learning Technologies such as Computer-Integrated Classroom Support, Assistive Technologies helps support accessible computer workstations and AT software in at least 25 locations across campus. Most of these workstations are located in university computer labs (VT Labs) with certain additional workstations being maintained or housed in departmental computer labs, administrative facilities, and satellite locations. An effort to provide networked AT support for all university computers continue and is moving beyond the formative stage.

**Sponsored programs and activities.** Assistive Technologies works with a variety of sponsored programs.

- Virginia Assistive Technology System, Southwest Region (SWVATS). In partnership with consumers, employers, educators, public and private agencies, organizations and others, VATS works to bring about changes in practices, policies, and laws to improve access to assistive technology. Assistive Technologies partners with SWVATS to provide AT information to high school students, their parents, educators, and consumers at the Real World Day event in the fall, to middle school students, parents, and educators at the Real World Day-Middle School event in the spring, and high school students planning to attend college, their parents, and

- educators during the College Bound program.
- The Training and Technical Assistance Center (T/TAC)  
The T/TAC, funded through a grant by the Virginia Department of Education, provides services to teachers, administrators, and others requesting assistance for their students in special education. Assistive Technologies partners with the T/TAC to provide college transition preparedness for high school students, their parents, and educators.
- AgrAbility Virginia helps individuals with disabilities overcome barriers to continue in their chosen profession in agriculture. The program collaborates with community professionals to modify farm and ranch operations, adapt equipment, increase farmstead accessibility, provide financial counseling, identify funding sources, and coordinate community services. Assistive Technologies provide technical assistance by participating in monthly meeting and annual events.
- Project TRAIN IT is a program funded by the U.S. Department of Labor to train and employ persons with disabilities in information technology related jobs. The AT Lab provides information technology interns with disability related accommodations and support systems to help them be employed in southwestern Virginia.
- E-text provisioning  
Working with other major universities in Virginia, Assistive Technologies is jointly exploring the possibilities of developing a statewide e-text provisioning system to provided electronic alternatives to printed materials for persons with print disabilities.

### Research activities

Collaboration continues on cellular phone user interfaces with the Human Factors Engineering Ergonomics laboratory in the Grado Department of Industrial and Systems Engineering (ISE-HFEE). Research included a cross-cultural study that compared cell phone user requirements titled “Needs Analysis and Requirements Acquisition for Inclusive Design of Cell Phones: UK and Germany.” The research targeted three user groups that included persons who are blind, legally blind, or with upper-extremity physical limitations. Graduate students from ISE-HFEE and Assistive Technologies (AT Lab) presented design recommendations to the corporate sponsor in Japan. The AT Lab graduate assistant did additional cross-cultural comparative research. The research was titled “A Cross-Cultural Comparison of Cell Phone User Interface Design Preferences from the Perspective of Nationality and Disability.” The research mapped user requirements to design preferences by targeting two user groups, persons with legal blindness (partially sighted) and persons without apparent disabilities from India and the United States. Dissemination of these results will be published and results from five years of cell phone research presented at the Human Factors and Ergonomics Society annual meeting.

The AT Lab continues consulting with graduate/undergraduate students and faculty members in the Bradley Department of Electrical and Computer Engineering (ECE) and the Department of Computer Science and Center for HCI (CS). Research consulting activities include the potential uses of Assistive Technologies for people with and without disabilities. The focus is on meaningful design experiences for engineering students, by having student project teams research and produce "custom designed" devices and software that will directly aid individuals

with a disability. Examples of projects this year included a location awareness navigation system and a location-based feedback notification system. The first of these systems used wireless networks to assist navigation for individuals with disabilities. The results of this work, “Location Awareness at VT Using Place Lab” was presented at the 20<sup>th</sup> Annual Conference on Technology and Persons with Disabilities hosted by the Center on Disabilities at California State University, Northridge. The second project, a location-based notification system, had a paper accepted at the 44<sup>th</sup> ACM Southeast Conference hosted by the Florida Institute of Technology. The paper “VTAssist—A location-based feedback notification system for the disabled” was also presented in the CS department’s annual VTURCS Research Symposium where it won the Industry Choice award and placed second for Peoples choice award.

### University lectures and presentations

Assistive Technologies participates in a wide range of university presentations and classroom lectures. This instruction includes AT demonstrations and lectures designed to raise accessibility design issues and disability awareness for computer science, education, and many other university disciplines:

CS 3604: Computer Science “Professionalism in Computing” is classroom instruction that promotes concepts of universal access design, assistive technologies, and disability accommodations for information technologies and computing. Students’ follow-up assignment consists of volunteering to work 10 hours with the Assistive Technologies Lab on a variety of AT related projects.

EDCI 3114: Teaching & Learning “Educational Applications of Microcomputers” is a basic familiarization course for in-service teachers and other school personnel. The students were given an opportunity to learn about unique AT applications and built-in accessibility features in standard software applications and operating systems (Windows / Mac OS X).

EDCI 5554: Special Education “Educating Exceptional Learners across the Lifespan” is classroom instruction on assistive technologies, with lecture and hands-on demonstration of assistive technologies, for graduate students who will become secondary education teachers.

EDCI 5474: “Adapting Curriculum Instruction for Students with Disabilities” focuses on designing educational programs for students with disabilities including informal assessment, curriculum modification, instructional alternatives, assistive technology, and specialized materials. Assistive Technologies demonstrated the range of AT available and gave the students hands-on experience with selected devices and programs.

Cook Counseling Center, Virginia Tech: The Cook Counseling Center, an entity within Student Affairs, requested disability awareness and assistive technologies training for their counseling staff. The presentation included an overview of assistive technologies and an opportunity for hands-on experience with various assistive technology devices.

## Outreach activities

**College Bound "Preparing students with disabilities for a collegiate experience."** The College Bound program is a two and 1/2 day conference at Virginia Tech, with a consortium of sponsors that prepares high school seniors and juniors with disabilities and their parents for the realities of attending college. Students and parents attend different workshops on various aspects of preparing for college, including a lecture and hands-on workshops involving assistive technologies and computing. Added this year was a pilot tract for educators. Educators from around the state attended and learned how to better prepare their students for college. In attendance: 30 students, 25 parents, and 23 educators.

**AHEAD Virginia state conference.** Assistive Technologies provided the Association on Higher Education and Disability (AHEAD) state conference participants with a hands-on experience of AT services being supported for disability accommodations at Virginia Tech. Attendees were mostly ADA Coordinators or Services for Students with Disabilities counselors from public and private colleges and universities throughout the Commonwealth.

**Real World Day.** A consortium outreach project of Virginia Tech, Radford University, New River Community College, and Virginia Assistive Technology System. For Southwest Virginia, Real World Day (RWD) gives students, parents, consumers, and teachers an opportunity to learn about and try out a variety of assistive technologies. Disability service agencies are on hand to discuss their services. Throughout the day, there are a variety of presentations on funding, how to be successful in college, self-advocacy, and transition from high school. Besides presenting, Assistive Technologies is responsible for recruiting presenters displaying assistive technologies at the "AT Buffet" portion of RWD. Estimated attendance: 180 students, and 120 parents, educators, or consumers.

**Real World Day-Middle School.** Through a program to deliver transition information to middle school students, parents, and educators, Read World Day-Middle School provided 50 students, their teachers, and one parent an opportunity to learn about and try out a variety of assistive technologies. Like the program targeting high school students and adult consumers, disability service agencies are on hand to discuss their services, a speaker on self-advocacy, how to be successful in college, self-advocacy, and transition to high school.

**High School/High Tech.** High School/High Tech students from the Montgomery County Public Schools attend transition, AT awareness, and AT hand-on workshops at Virginia Tech. High School/High Tech is a national initiative of the President's Committee on Employment of People with Disabilities, which focuses on students with disabilities at the secondary level and encourages them to take the necessary academic preparation and skill training to pursue high tech careers. Estimated attendance: 20 students in two workshops.

This year Assistive Technologies also employed two HS/HT students for the summer to provide them with work experiences in a technology field.

**Youth Leadership Forum (YLF-VA) "Empowering Young Leaders for the 21st Century."** The YLF-VA program seeks to empower young people with disabilities to develop their

leadership skills. Students, serving as delegates from communities throughout Virginia, participate in a wide range of activities and learning experiences during a four-day conference set on a university campus. The Virginia Board for People with Disabilities (VBPD) funds the conference. Estimated attendance: 35 students in one panel discussion and five workshops.

**C-Tech<sup>2</sup> “Computers and Technology at Virginia Tech.”** A College of Engineering program open to rising junior and senior girls currently enrolled in Virginia high schools. The focus of the program is to allow young women to have access to both information and technology that would help them prepare for college and careers in engineering, math, or science. The AT lab hosted an overview of several technologies used by all people including individuals with disabilities. There were 28 participants this year.

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## Summer Training Academy for Rising Students

The past year is best described as an implementation period for the Summer Training Academy for Rising Students (VT STARS). The 2005 fiscal year began with the successful first summer residency of the US Department of Education (DOE) grant funded phase (2005-2007) of the program. This phase includes a major shift of the program to a year-round focus.

A major effort was made to leverage available grant resources by establishing ongoing partnerships with several university partners: Fralin Biotechnology Institute, the College of Science and the Department of Geosciences; and the Materials Science Department. This effort was reflected in the program’s content delivery of instructional activities in the areas of life, earth/environmental and materials sciences. Significant time was devoted to seeking additional program funding via research grant activity with these and other university partners. This search consisted of writing letters of support, and planned participation in proposals to the National Science Foundation and the National Institutes of Health.

Additionally, the program was promoted to select members of the Virginia Assembly as a potential regional model for pipeline approach to minority under-representation in science and technology sectors of the emerging knowledge economy. This effort was coordinated with the university’s government affairs officer, and is ongoing.

VT STARS was redesigned and re-positioned as an immersive academic enrichment program with an inquiry-based summer residency and after-school component targeted to “high school students in the academic middle” in public school divisions within the Southside region. The repositioning of the program included an expansion of the participating school divisions to broaden the program’s regional impact, in conjunction with relationship building at the Institute for Advanced Learning and Research (IALR).

In spring 2006, a series of workshops and information sessions were held at IALR to promote the program and recruit highly motivated ninth grade participants. IALR, the Center for Academic Enrichment and Excellence, the Office of Undergraduate Admissions, and the Provost's Office supported this week of workshops.

In summer 2006, thirty-seven new students comprised the second cohort of the Department of Education-funded second phase of VT STARS. Additionally, thirty-three of the forty-one eligible students returned for a second summer residency of ten days. In accord with the initial proposal, the graduate student e-mentoring component was broadened this summer, with eight doctoral students directly involved in the summer's instructional activities. The instructional activities for summer 2006 utilized a constructivist approach and theme of "Infectious Diseases, Epidemics, and Materials and Environmental Issue" in a quest format.

The constructivist and thematic approach allowed full integration of the instructional topics, and non-formal hands-on activities within a learner-centered project focus. It also provided participants and residence counselors a concrete organizational emphasis for this summer's mandatory evening study hall. The overall effectiveness of the newly mandated evening study hall was greatly enhanced by the direct involvement of several graduate students, who were assigned specific support roles as project resources. The instructional activities for math were nicely embedded in this approach via the introduction of a grade appropriate simulation model developed by National Institutes of Health.

An effort will be made to identify similar government funded cyber-resources for 2007.

Formative evaluation of the first year of the second phase continues, along with due diligence reporting to each funding source, and the various VT STARS stakeholders.

Discussions for institutionalization continue with the Provost's office, as part of the effort to link VT STARS to the university's increased focus on diversity, pipeline programs, and innovative ways to contribute to economic development in targeted southwestern regions. A priority goal for these discussions is the creation of a base operating budget for the 2007 fiscal year. A base operating budget is viewed as a critical success factor.

Strategies have been identified for use of research grant proposals to leverage on-campus partnerships for explicit program funding support in the near-term future.

Another significant achievement was the completion of the program's transition to the Apple computer platform. This change culminated with program-wide deployment of Studywiz, an Apple client-server course management system, and participation in Apple's Educational Leadership Institute in May 2006. The Studywiz software provides a flexible and robust standards-based network infrastructure to support the program's summer residency, e-mentoring, and envisioned year-round focus. Studywiz will enable reuse of all instructional content and online collaboration among participants between high schools. This connection may prove significant for the creation of after-school science and technology clubs at participating high schools. Studywiz also has native support for parental involvement and creation of learning

resources by teachers. These features will be further deployed to broaden and deepen the program's instructional capabilities.

As a follow-up activity, VT STARS is co-sponsoring an Apple "Podcasting for Administrators" event at IALR on July 27, 2006. In addition, plans are underway to deploy podcasting as a standard instructional strategy to make all summer instructional activities available to participants as part of the program's shift to a year-round focus.

Planning for activities to launch the year-round component is underway in conjunction with continued development of Studywiz and creation of learning resources for a different instructional theme for the 2007 summer residency. A likely theme is "Energy Resources, Scarcity, and our Changing World," based on participation in outreach workshops at the Oak Ridge Center for Advanced Studies.

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## Professional activities

### **Courses taught:**

EDP 6006. Learning, Teaching and The Role of Higher Education in a Democratic Society, Spring 2006, 11 graduate students. (Moore, A.H.)

GRAD 5114, two sections; enrollment = 50, Fall 2005 (Fowler, S.B.)

GRAD 5974, Independent Study (Integrating Technology into Teaching) for the FP graduate certificate (2 and 3 credits); enrollment = 2, Fall 2005 (Fowler, S.B.)

GRAD 5114, one section; enrollment = 22, Spring 2006 (Fowler, S.B.)

### **Awards:**

EDUCAUSE Award for Systemic Change in Teaching and Learning, October 2005.

Zeckoski, A. Scholar Fellow 2006-2008. Sakai Foundation, June 2006, Vancouver BC.

### **Publications:**

Fowler, S.B. "Multimodal Literacy and Cultural Identities: 21<sup>st</sup>-century Technologies and Issues of "Self-Authorship" and "Voice" in U.S. Institutions of Higher Education," co-authored with Dr. Sheila Carter-Tod in the *International Journal of the Humanities*, Vol., 3, 2005/2006 <http://www.Humanities-Journal.com>, ISSN 1447-9508 (print), 1447-9559 (online)

Moore, A.H. "The Math Emporium: A Case Study." In Diana Oblinger (ed.) Spaces That Enable Learning. Educause E-book. In Press. With Barbara Robinson.

Moore, A.H. "Torgersen Hall: A Case Study." Moore, A.H. In Diana Oblinger (ed.) Spaces That Enable Learning. Educause E-book. In Press. With J. Thomas Head.

Schwartz, E. "Understanding Dreamweaver: Skill-based training in a pedagogical context." January 2006, *Campus Technology*.

Watson, C.E. "ePortfolio in higher education: Student assessment and beyond," Proceedings of the International Society for Exploring Teaching and Learning Annual Conference (October 2006). In press.

**Presentations:**

Clark, C.G., Watson, C.E., & de Vry, J. "How course management systems can improve learning: Three case studies," presented at Association for Educational Communications and Technology, October 2005, Orlando, FL.

Fowler, S.B., & Carter-Tod, S. "Multimodal Literacy and 21<sup>st</sup>-century Technologies," paper presented at the Commonground—International Humanities Conference, Cambridge, England, August 2005.

Fowler, S.B., Bekken, B., Marie, J., Olsen, D. & Wildman, T. "Integrating GTAs and Technology-enriched Teaching and Learning into the General Education Curriculum," paper presented on a panel at the Integrations: Liberal Learning in a Diverse World 2005 AGLS and AIS Joint National Conference, Fairfax, Virginia, October, 2005. (Association for General & Liberal Studies and the Association for Integrative Studies.)

Gausepohl, K. & Pacifici, J. "Shaking the Vending Machine: Management & Pedagogical Implications of Open Source Software," presentation at the Fifth Sakai Conference, May 2006, Vancouver, BC.

Gausepohl, K.A. "Sakai QA Panel," Sakai Conference, June 2006, Vancouver, BC.

Gausepohl, K.A. "User Support Panel," Sakai Conference, June 2006, Vancouver, BC.

Hancock, M., Knoop, P., Zeckoski, A. "Sakai Requirements," Round table presentation and discussion. Sakai Conference, June 2006, Vancouver, BC.

Hancock, M., Heyer, O., Zeckoski, A., "Sakai Foundation Requirements Process." December 2005, Sakai Conference, Austin, Texas

Moore, A.H. "Faculty Engagement Strategies: Parallel Universes and the New Economy." April 2006. Adobe Higher Education Leadership Forum. San Jose, CA.



Moore, A.H. "Enhancing Student Learning: High-Benefit Teaching and Learning Strategies." April 2006. Sungard Executive Summit. Orlando, FL. With David G. Brown, Gordon Nixon, Shirley Waterhouse.

Moore, A.H. "FITness: A Net Generation Model for Developing Information Fluency Among Faculty and Students." January 2006. Educause Mid-Atlantic Conference. Baltimore, MD. With James Mazoue.

Moore, A.H. "Contemporary Challenges in Higher Education: Digital Natives and Digital Immigrants." Invited addresses with discussion to the University Academic Advisory Committee, January 2006; the Faculty Senate, March 2006; the Engineering Pedagogy Group, April 2006, with Shelli Fowler and Brent Jesiak. Blacksburg, VA.

Moore, A.H. "Grassroots Leadership Development." November 2005. Sorensen Institute. Blacksburg, Virginia.

Moore, A.H. "Understanding the Dynamics and Meeting the Needs: New Models of Faculty Support For Online Learning." August 2005. Distance Learning Conference 2005. University of Wisconsin, Madison. Co-Sponsored by the Alfred P. Sloan Foundation, Sloan-C Asynchronous Learning Networks. With Kathy Christoph, Susan Metros, Les Howles, Melody Thompson.

Moore, A.H., Moore, J.F., & Fowler, S.B. "Faculty Development for the Net Generation." August 2005. Webinar for Pacific Rim Colleges and Universities, Adelaide University coordinating.

Moore, A.H., Moore, J.F., & Fowler, S.B. "Net Generation Learners," Interactive Webinar presentation, August 2005.

Moore, A.H., Moore, J.F., & Fowler, S.B. "By Design: Grassroots Development for Strategic Gains," conference award presentation at EDUCAUSE, Orlando, October 2005.

Moore, J.F. "Faculty Development Support Models: A Systemic Approach," invited presentation at Faculty Development in Blended and Online Learning Conference, March 2006, Houston.

Ogle D., Zeckoski A., "Taking the Sakai Style Guide to the next level." Presentation on the state of the Sakai Style Guide. December 2005, Sakai Conference, Austin, Texas

Pacifici, J. & Gausepohl, K. "Haute Software: Juggling Open-Source and Vendor Software," presentation at Mid-Atlantic Educause Conference, January 2006, Baltimore.

Treviranus U., Zeckoski A., et al. "We all don't have to agree-Flexible UI design." Panel presentation on using tag libraries to enforce good design patterns. December 2005, Sakai Conference, Austin, Texas.

Treviranus U., Zeckoski A., et al. "User Interface Panel," Sakai Conference, June 2006, Vancouver, BC.

Watson, C.E. "Faculty Development at Virginia Tech: A case study," EduComm, June 2006, Orlando.

Watson, C.E. & Moore, J. "Keeping Faculty Development Relevant: Leading and Responding to Institutional Change," presented at Educause October 2005, Orlando.

Zeckoski A., "Sakai Providers BOF," Leader of a "Birds Of a Feather" discussion about the use of providers in Sakai and demonstration of Virginia Tech use of providers in Scholar. Sakai Conference, June 2006, Vancouver, BC.

Zeckoski A., "Programmers Cafe-Data persistence using Hibernate." Presented a 2-hour programming workshop and organized full-day bootcamp. Sakai Conference, June 2006, Vancouver, BC.

### **Outreach Activities:**

Moore, A.H. Advisory Committee for the Coalition for the Revitalization of Southside Virginia, 2006—

Moore, A.H. Invitational Regional Workshop, Charting the Course: The Role of Higher Education and Research in the Economic Revitalization of Rural Virginia, Berry Hill Plantation, Halifax, Virginia, December 1-3, 2005.

Moore, A.H. Invitational Statewide Conference, What's Next for Virginia's E-Learning Environment? Conference Chair. Richmond, Virginia, November 2005.

Moore, A.H. Outreach Advisory Council, Institute for Advanced Learning and Research, 2006—

Moore, A.H. Development Team. Leadership Development Through the Arts, Urban Affairs and Planning, Theatre Arts, UVA's Cooper Center for Public Administration, Proposal for Private Funding Pending, 2003—

Moore, A.H. Strategic planning and fundraising, VTStars Program, ongoing.

### **University Service:**

Atkins, A. "ElementK and Safari Books Resources." Microsoft/VT IT Security Summit, May 2006, Blacksburg. Focused on security-related online training and reference resources for information technology staff.

Fowler, S.B. Pedagogy consultant, Earth Sustainability—Living in the 21<sup>st</sup> century, Core Curriculum Learning Community Pilot Project, bi-weekly meetings, Fall 2005-Spring 2006.

Fowler, S.B. GTA Orientation presentation on GEDI; creation of GTA Orientation panel consisting of former GEDI participants for recruitment of new GTAs into GEDI; establishment and scheduling of Bb and Technology Tools workshops for GRAD 5004 (1-credit GTA

Orientation course)—taught by GEDI Fellows throughout the Fall semester—for hands-on training for GTAs and “gateway” recruitment tool for GEDI, Fall 2005.

Fowler, S.B. Invited lecture, “Engineering in the 21<sup>st</sup> century: What’s Diversity Got to Do with It?” for 250 Galileo and Hypatia students, Fall 2005.

Fowler, S.B. Invited lecture, “21<sup>st</sup>-century Diversity,” for the Citizen-Scholar Engagement Seminar, Fall 2005.

Fowler, S.B. Invited presentation with Brent Jesiek on GEDI at VT, for the Learning Technologies Consortium, Spring 2006.

Fowler, S.B. Invited lecture, “Social Justice & Scholarship,” for the Citizen-Scholar Engagement Seminar, Spring 2006.

Fowler, S.B. Invited presentation, with Susanna Rinehart, “LGBT Issues in Academe,” for Educational Leadership graduate seminar, Spring 2006.

Fowler, S.B. Invited Group discussion leader, “Virginia Tech Symposium on Representations of Race and the African-American Community,” Spring 2006.

Fowler, S.B. Invited dialogue with the Engineering Pedagogy group, on contemporary students and technology issues, including pedagogical strategies for addressing MySpace.com, et al, with Anne H. Moore and Brent Jesiek, Spring 2006.

Fowler, S.B. Pedagogy evaluations for one faculty member and two GEDI graduate students (includes one week of class visits, discussion of syllabus and course materials, and letter of recommendation for each).

Fowler, S.B. Mentoring Committee Member for two junior faculty members, Dr. Sheila Carter-Tod and Dr. Gena Chandler, Department of English.

Fowler, S.B. Invited panelist, “Contemporary Technology for Engaging 21<sup>st</sup>-century Learners,” Earth Sustainability course, Fall 2005.

Fowler, S.B. Diversity Resources Database revisioning committee, focusing on STEM as a DRD redevelopment priority, Office of the Vice President of Multicultural Affairs, Spring 2006.

Fowler, S.B. Dissertation committees (in EDP, STS, MFT, and T&L); two pre-lims and one dissertation defense in 2005-2006.

Fowler, S.B. Ongoing advising (open door policy) for numerous GEDI students who are teaching or about to teach here at VT.

Fowler, S.B. Served on the Coordinator of Outreach & Alumni Relations Search Committee (failed search in Fall 2005; successful hire in Spring 2006).

Head, J.T. Dissertation committee in Teaching and Learning in 2005-2006.

Head, J.T. & Zeckoski A., "Course evaluation system," Presented information about the Course Evaluation System Pilot, April 2006, DCSS, Virginia Tech.

Moore, A.H. University Director, Center for Innovation in Learning; Coordinates annual XCaliber Award; Provides grants for e-learning development when funds are available. 1998—

Moore, A.H. Advisory Committee, Institute for Governance and Accountabilities, 2005—

Moore, A.H. Quality Enhancement Planning Team, Southern Association of Colleges and Schools, Commission on Colleges, accreditation reaffirmation process, 2006—

Moore, A.H. University Strategic Planning, Advanced Technologies and Information Systems section draft, 2005-2006.

Moore, A.H. University Featured Speaker/Professional Staff Development Series, sponsored invited speaker, December 2005.

Moore, J.F. University Classroom Master Planning Committee.

Moore, J.F. Search committee for University Director of Assessment.

Moore, J.F. Member, Teaching-Learning Grant and Summer Faculty Fellows Award Committee.

Moore, J.F. Member, University computing requirement committee.

Moore, J.F. Member, Commission on Graduate Studies and Policy.

Schwartz, E. Search committee for Director of Leadership and Employee Development.

Watson, C.E. Editorial review board, International Journal of Teaching and Learning in Higher Education.

**Professional Service:**

Head, J.T. EDUCAUSE Regional Conference 2006, Chair of the Teaching Learning Track.

Head, J.T. Learning Technologies Consortium Semi-Annual Meeting Spring 2006, Chair of Local Arrangements.

Moore, A.H. Adobe Higher Education Leadership Advisory Board, 2006—

Moore, A.H. Research Channel Advisory Board, 2006—

Moore, A.H. WCET, the Cooperative advancing the effective use of technology in higher education, Elected to Executive Council, 2005—, Executive Director Search Committee, May 2006—

Moore, A.H. Commons Solutions Group, 2005—

Moore, A.H. Sorensen Institute for Political Leadership, Regional Advisory Board, 2005—

Moore, A.H. EDUCAUSE Center for Applied Research, Institutional Representative to ECAR, 2003—

Moore, A.H. Blue Ridge Public Television, Higher Education Council. 2002—

Moore, A.H. National Learning Infrastructure Initiative. Re-Named Educause Learning Initiative in 2004, Planning Committee. 2001-2006.

Moore, A.H. IMS Project, Institutional Liaison to IMS Advisory Board, 1999-2005.

Moore, A.H. Electronic Campus of Virginia. Founding Chair. Virginia Tech Liaison to Steering Committee and Treasurer, 1999—

Moore, J.F. Open Source Portfolio Initiative Board.

Moore, J.F. Member, Educause Advisory Committee on Teaching and Learning, 2005-2008.

### **Recognition:**

Fowler, S.B. Instructional Technology Leadership Program, EDUCAUSE Institute, Penn State, July 2005.

Fowler, S.B. Contributing unit (GEDI) to the Learning Technologies 2005 EDUCAUSE Award for Systemic Progress in Teaching and Learning, October 2005.

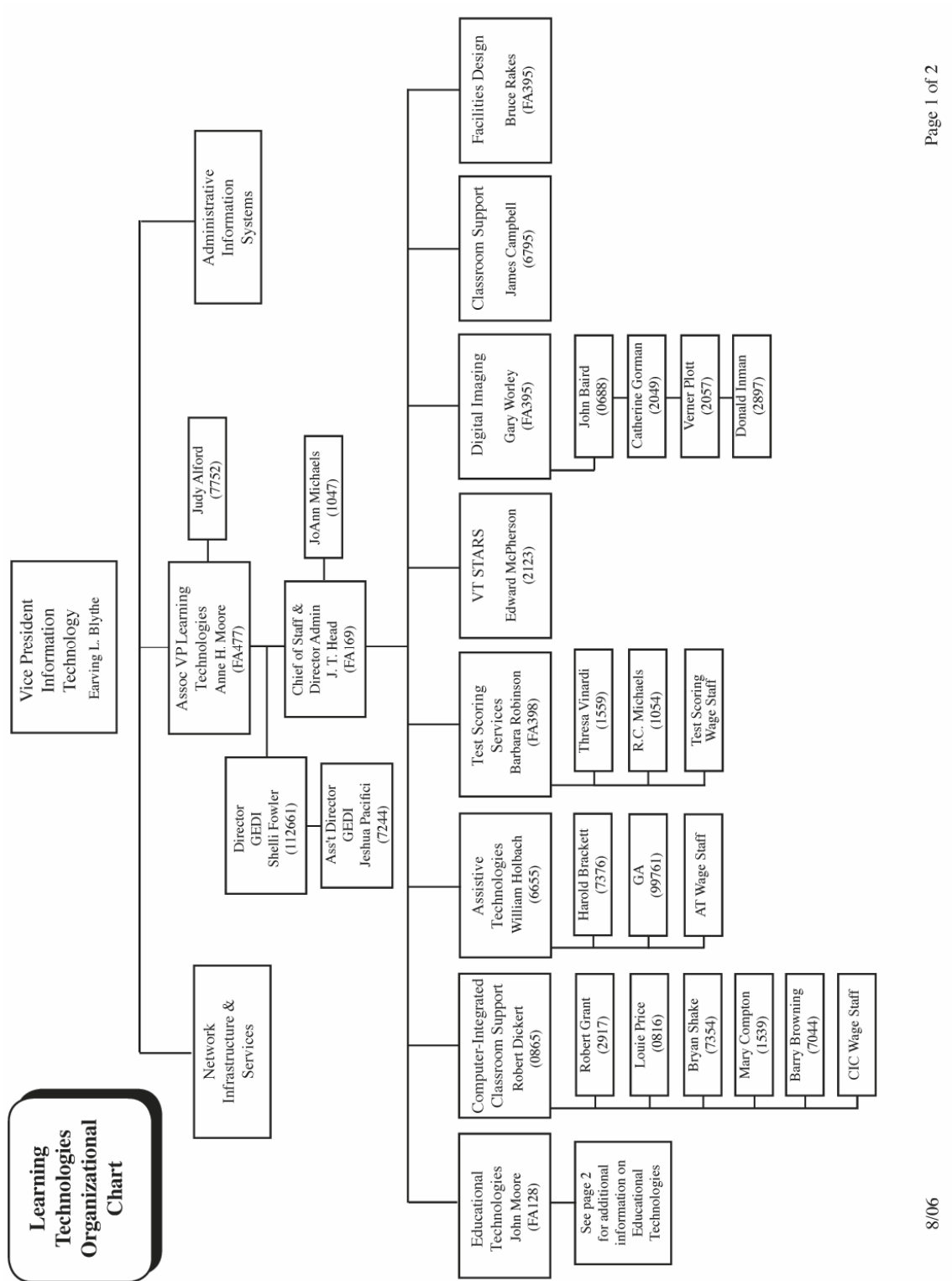
Fowler, S.B. Selected as a Virginia Tech Multicultural Fellow, Office of the Vice President for Multicultural Affairs, November 2005.

Fowler, S.B. Finalist, 2006 Exemplary Program Award for Innovative approaches to Graduate or Undergraduate Education, Office of the Provost, April 2006. GEDI and TGE were nominated by graduate student participants from the program.

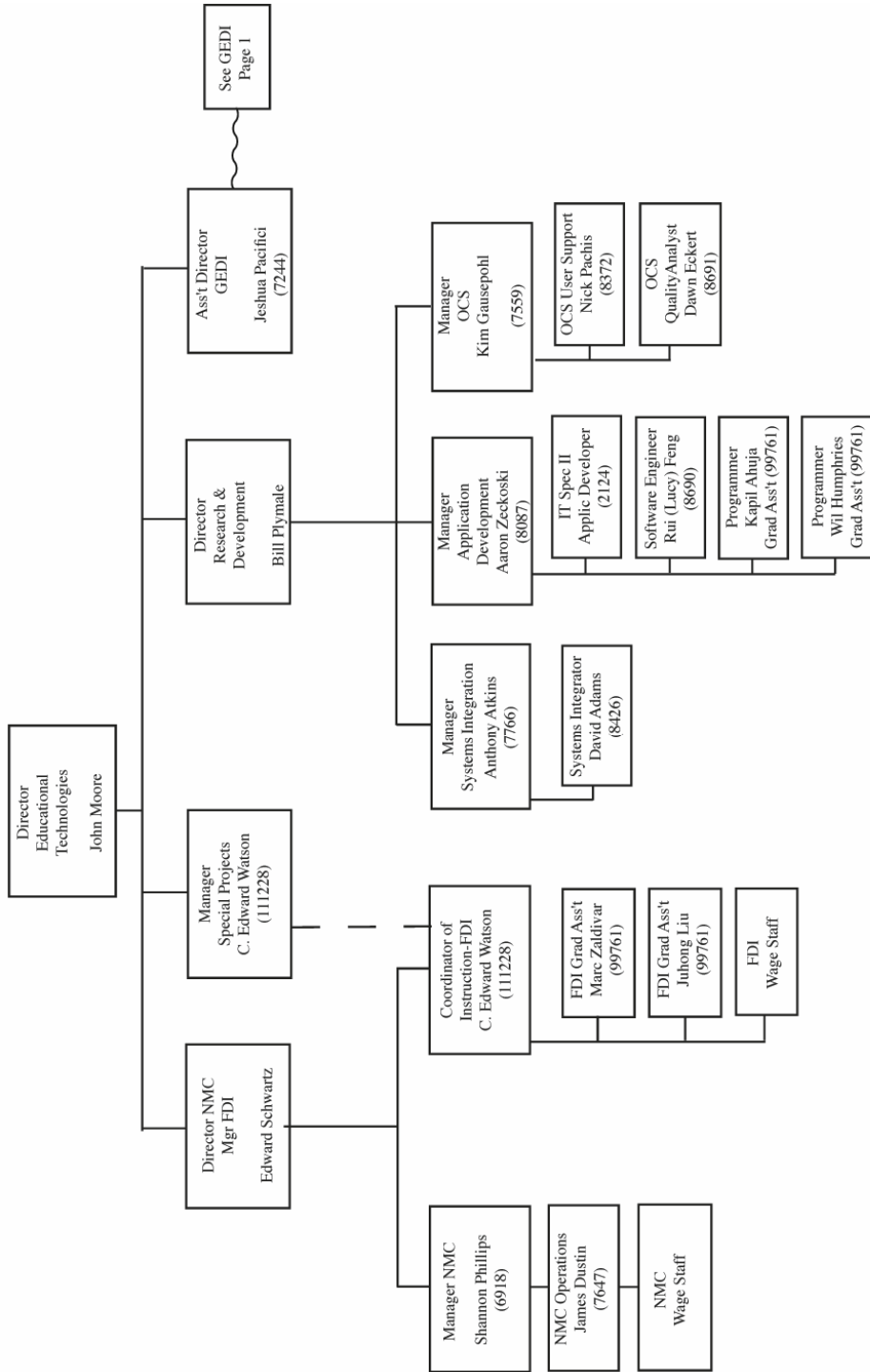
### **Active Grants:**

Moore, A.H. U.S. Department of Education. Grant Consultant/University Coordinator. VTSTARS Second Phase programming. (Ed McPherson, Principal Investigator)

Appendix: Organizational Charts



Educational Technologies Organizational Chart



# Network Infrastructure and Services

Network Infrastructure and Services exists to enable Virginia Tech to succeed in its overall mission by providing and managing the university's information technology infrastructure and services. We accomplish this by:

- Identifying and incorporating solutions through the dynamic implementation and management of emerging technologies,
- Promoting sound fiscal management,
- Endeavoring to advance the capabilities of our existing information technology infrastructure and services,
- Broadly disseminating information regarding new technological developments,
- Providing network, system, and services management, maintenance, and support with emphasis on a high level of security, availability, and reliability,
- Supporting the teaching and learning, research, and outreach missions of the university, while embracing our role as a corporate citizen within the local, state, regional, and international communities,
- Remaining sufficiently flexible to pursue aggressive development and expansion of new services.

## Vision statement

Network Infrastructure and Services (NI&S) believes technological innovation and improvements will support and enhance Virginia Tech's position in an increasingly global and competitive digital environment. We strive to anticipate the technological needs of the university community and provide the leadership to create innovative and cost-effective solutions.

We believe the university will continue to rely heavily on NI&S's ability to successfully identify leading-edge technological advances and make them available now and in the future as Virginia Tech pursues national recognition as a top research university.



We believe NI&S can make extraordinary contributions to the university's outreach efforts. We will endeavor to influence the development of the information economy to improve the quality of life for the university community and the citizens of the commonwealth.

NI&S Strategic Plan, 2006

### Introduction

Network Infrastructure and Services creates and manages technological solutions to enable Virginia Tech to accomplish its mission of instruction, research, and outreach. Our realistic, but visionary, goals include the identification and adoption of those solutions meeting current needs as well as future demands and those providing the best combination of price, performance, stability, availability, and reliability. Emphasis is placed on promoting secure and integrated information technology strategies to advance the university's excellence and to maximize the university's competitive advantage in the digital economy.

Today, Virginia Tech's campus network is a large and sophisticated resource, playing an integral part in the daily lives of all members of the university community. The telecommunications infrastructure, originally installed in 1988 by Communications Network Services (CNS) and continually enhanced, expanded, and updated since that time, reaches almost every corner of campus. It provides a pervasive, leading-edge, technology infrastructure to support the vision and mission of the university.

CNS, the telecommunications auxiliary, is one part of the much larger and more comprehensive NI&S organization. Erv Blythe, Vice President for Information Technology, has aligned the technology infrastructure units under Associate Vice President Judy Lilly. NI&S now includes Systems Support and Information Technology Support, which supports the university's centralized information technology services; Video/Broadcast Services (VBS) producing broadcast-quality instructional video and advanced multimedia instructional materials; and Printing and Mail Services which support the university through efficient and timely distribution and dissemination of information. An internal systems development team creates management tools allowing the integration of NI&S information needs, quick adaptation to new requirements in a changing environment, improved internal controls, and the use of better planning methods to maximize efficiency.

Network Infrastructure and Services provides leadership for the Blacksburg Electronic Village and NetworkVirginia to help improve the quality of life for citizens throughout the Commonwealth of Virginia. Taking advantage of an optical and wireless infrastructure providing ubiquitous, high-performance network access and direct connections to national and international research networks, NI&S directly participates in and supports the deployment of regional, national, and world-wide high-performance computing and communications networks.

Virginia Tech's campus-wide network and the Network Infrastructure and Services organization are a reflection of the ongoing commitment and dedication to thoughtful planning and management practices in a dynamic technological field that continues to evolve at an ever-

## Network Infrastructure and Services

increasing pace. The university community relies heavily on near-instantaneous and continuous access to information from anywhere, at any time, on any available medium. As a leader in higher education network development, Virginia Tech makes use of gigabit Ethernet, wireless local area network access, wired and wireless voice communications, video and related services, broadcast-quality teleconferencing services, and a cable television system for teaching, learning, research, administration, and community service. New Internet-based applications like IP videoconferencing and high-definition video, and greatly improved reliability and performance for Internet access and distance learning programs are readily available. Support services, enhanced network security, and help desk functions are integral to daily operations.

In addition, NI&S collaborates with Research Computing, Learning Technologies, Enterprise Systems, and the Information Technology Security Office to provide network management, support, and centralized services emphasizing security and reliability to all segments of the university community. NI&S, seeking to sustain and enhance the university's reputation in advanced network initiatives and learning environments, is increasingly involved in research activities. The organization is expanding its partnerships and collaboration with faculty members to help advance the university's reputation as a highly-rated research university and to integrate technology in teaching, research, and outreach programs.

NI&S seeks to attract, develop, and retain quality employees in order to enhance the organization's effectiveness and contributions to the university. The highly skilled and talented NI&S workforce of approximately 210 professionals, as well as almost 100 students employed in various wage positions, is committed to achieving excellence. Staff members within NI&S take advantage of opportunities to work together to improve the organization's flexibility and agility in the delivery of services and the deployment of new technologies.

### Network Infrastructure and Services staffing by unit

| Unit  | Fiscal Year<br>2004-2005 | Fiscal Year<br>2005-2006 |
|---|--------------------------|--------------------------|
| Communications Network Services               | 110                      | 113                      |
| System Support Services—Help Desk/4 HELP      | 21                       | 21                       |
| System Support Services—Server Administration | 12                       | 11                       |
| System Support Services—E-Commerce Clients    | 8                        | 8                        |
| Video Broadcast Services                      | 14                       | 14.5                     |
| University Printing & Digital Imaging         | 26                       | 26                       |
| University Mail Services                      | 19                       | 18                       |
| <b>Total Staffing (Faculty &amp; staff)</b>   | <b>210</b>               | <b>212</b>               |

Virginia Tech is adapting to new financial and administrative responsibilities and opportunities as the Restructured Higher Education Financial and Administrative Operations Act of 2005 is implemented. NI&S has always emphasized sound financial integrity and stability in all of its operations and administers a balanced budget to ensure financial resources are available to invest in new technologies. Business processes and systems are constantly improved to maximize organizational effectiveness. Maintaining and enhancing an advanced communications infrastructure and remaining at the forefront of technology services require an up-to-date and

evolving funding model. Planning and resources must be linked. Organizational units within Network Infrastructure and Services are supported from a combination of auxiliary, education and general, and cost center funds. NI&S makes use of all these funding mechanisms to provide access to cutting-edge technology and services. As an auxiliary, CNS is permitted to assume some debt for capital expenditures related to infrastructure development. However, the majority of NI&S funding results from revenues associated with the resale of services from auxiliary operations. The auxiliary portion of NI&S is required to recover all operational costs as well as all costs necessary to maintain and upgrade the network. NI&S participates in funded sponsored projects and research.

Rapid changes in technology, mobility, flexibility, and the nature of broadband infrastructure are changing the way the university community works. The expectations of and demand for the benefits of that technology continue to grow. Virginia Tech relies on Network Infrastructure and Services to understand and forecast user needs and to identify leading-edge technological advances and make them available to the university community. Access to next-generation network technologies, protocols, services, and applications is critical as the university pursues top-tier research status; strives to create a modern, technology-enriched, advanced learning environment; and fulfills its outreach mission to improve the quality of life for all of the commonwealth's citizens.

The department's main offices are located in Research Building XIV at the Virginia Tech Corporate Research Center. Our address is 1770 Forecast Drive (0506), Blacksburg, VA, 24061. The departmental website is [www.cns.vt.edu/](http://www.cns.vt.edu/) and Associate Vice President Judy Lilly may be reached at 540/231-2599.

### Core competencies

Network Infrastructure and Services operates an enterprise for the benefit of students, faculty, and staff to improve teaching, learning, and research at Virginia Tech. Through continuous improvement, quality service, and a culture of employee dedication, an environment is promoted to support the university community and help all campus groups meet their strategic objectives.

Building upon diversified information technology experience, management expertise, close relationships with our customers and vendors, and longevity of employment, NI&S professionals bring capabilities yielding long-term advantages to the university critical to its growth and success. From the time the university formed Communications Network Services in 1984 to the present, difficult-to-imitate expertise has been nurtured and developed to add value to the department and to substantially benefit its customers.

Individual capabilities, examined as years of professional experience, skills, education, and knowledge, tell part of the story. The majority of NI&S managers, networking and telephony engineers, computer security specialists, customer service personnel, systems administrators, and field engineers can measure their years of experience in double digits. Their skills include financial management and analysis, contract negotiation and procurement, network engineering and operations, applied telecommunications research, billing management, consulting, technical

support, system design, equipment testing and evaluation, outside plant management, facility design and engineering, systems development, distance learning operations, software engineering, videoconferencing, and high-performance computing, just to name a few.

NI&S employees possess in-depth knowledge of university policies, procedures, and organizational structure. They have institutional knowledge regarding network and telephony equipment, switchrooms, equipment locations, resource assignments, and the overall cable infrastructure. They possess broad industry knowledge from time spent in broadcast communications, service with various branches of the United States military, and employment with local exchange telecommunications companies, inter-exchange carriers, and cellular providers.

### About Core Competencies

*C.K. Prahalad and Gary Hamel* introduced the core competency concept in a *Harvard Business Review* (1990) article, when they wrote that a core competency is "an area of specialized expertise that is the result of harmonizing complex streams of technology and work activity." Core competencies help successful organizations meet objectives and create a strategic differentiation. Gallon, Stillman, and Coates (1995) clearly describe core competencies as more than the traits of individuals when they define them as "aggregates of capabilities, where synergy is created that has sustainable value and broad applicability."

To be able to *install* a system is not necessarily a core competency. To design a cable raceway system that improves security and ease of installation or to develop an outlet box and a lightning protection module better than what is generally available in the industry are core competencies. During the recent upgrade to the network infrastructure in the Data Center, CNS Field Engineering employees fabricated unique floor boxes to accelerate the system conversion and minimize network downtime. Those are some of the strengths and work-related experiences differentiating NI&S from other organizations. NI&S management continually invests in these employee strengths and experiences, integrates and coordinates the various groups, and develops strategies to unify the entire organization.

NI&S employees sustain the organization, and the combination of complementary skills and embedded knowledge they possess brings benefits to the customer and provides the organization with a competitive advantage. NI&S managers are well-educated, possessing 53 associate's and bachelor's degrees in various fields of study including electronics, computer science, computer engineering, mathematics, electrical engineering, marketing, and management. They hold nine advanced degrees in business administration, computer science, human resource development, communications, education, and instructional systems. Thirty-six individuals hold licenses and possess industry certifications in computer security, radio and telecommunications, industrial equipment, systems engineering, systems management, database administration, and project management.

For some in NI&S, core competency refers to their ability to design, install, and maintain complex telecommunication systems. For others, it is how they plan and coordinate, improve workflow processes, and contribute to a perceived customer benefit of doing business with

NI&S. The effective utilization of these competencies allows them to be widely leveraged. The organization's collective skills—combined, coordinated, and integrated—create deep proficiencies enabling NI&S to deliver unique value to the university.

### Strategic planning

A major strategic planning initiative, begun in January 2005, was completed during the past year. The previous strategic plan had been published in 1994, so we revised it to reflect our current organization, including groups that have become a part of Network Infrastructure and Services since the last plan was developed. The update provided an opportunity to assess our progress over the last decade, to identify priorities, and to develop goals that will have future relevance and significance in spite of the constantly changing technological environment.

The plan identifies strategic goals and directions that require immediate commitment. It carefully considers the university mission of teaching, learning, research and outreach and reaffirms our objective to remain on the cutting edge of technology. New and emerging information technology trends were identified, administrative and budgetary issues were evaluated and network security was assigned a high priority. The plan highlights the key role NI&S employees play in successful departmental operations as we strive to reach our goals. The strategic plan will be reviewed annually and updated as appropriate in order to remain current and useful.

Perhaps more important than the resulting document, was the strategic planning process itself. With the assistance of a consultant and with the support of the Associate Vice President, Network Infrastructure and Services, the Strategic Planning Project Team led this effort. The endeavor brought together everyone's best efforts in building a consensus about where the organization is going. NI&S people provided ideas and viewpoints during retreats held to develop a mission statement as well as goals and objectives for each specific departmental area. Individuals throughout the Information Technology organization were interviewed to develop the environmental forecast. During two half-day sessions, the team developed the vision statement, mission statement, and goals and objectives for the entire NI&S organization.

The integrated plan was approved by Vice President Erv Blythe.

### Project management

Many Network Infrastructure and Services projects to advance campus communications services and infrastructure are lengthy and complex, involving significant investment of financial and personnel resources. Managing projects on such scale presents special challenges. The Project Management Team exists to meet these challenges.

Project management involves the application of sophisticated tools and techniques to increase organizational efficiency and help ensure a project will be completed successfully. The project management group uses software tools to maximize resources, prioritize tasks, and ensure every project team member can successfully execute their individual tasks. The Project Management Team employs project plans to assist in keeping projects on schedule and within budget.

For consistency, NI&S project plans are developed using a standard template, and each plan plots the necessary tasks for the duration of the project. Plans are distributed in portable document format (PDF) and hypertext markup language (HTML) format so team members can track progress. Complex projects may require tiered project plans.

Periodic project status meetings are held to review the project timeline and deliverables and allow team members to communicate completed tasks, outstanding issues, and other details pertinent to the project. Monitoring and tracking of progress help the Project Management Team anticipate, identify, and resolve problems that could impede successful completion of the project.

When each project is completed, the project team works together to prepare a closing report. The closing report provides final project status information and highlights lessons learned so future projects can benefit from the experience of past projects.

### **Project plans developed during 2005-2006**

- Virginia Tech Mobile Messaging (Goodlink)  
To implement the mobile messaging service, “Goodlink,” from Good Technology Inc. and migrate university Blackberry users to the newer service
- Aerospace and Ocean Engineering SGI install  
To install a Silicon Graphics, Inc. (SGI) high-performance computer in the Data Center
- Gigabit to the desktop  
To plan for the campus-wide deployment of new and improved network capabilities to the desktop
- DocuPrint replacement  
To phase out the Xerox DocuPrint service and replace it with a more efficient and cost-effective solution
- System X administration  
To move administrative support for System X and high-performance computing to the NI&S Systems Support group from the Research and Cluster Computing group
- The Inn at Virginia Tech  
To provide networking, telephony, and hotel entertainment services for the Inn and Conference Center
- Backups and data storage systems  
To upgrade production backup and data storage processes
- Next-generation network equipment evaluation  
To develop selection criteria and to evaluate next-generation network equipment

- Improving cellular reception at the Inn  
To investigate and select a third-party vendor to establish improved cellular service for the Inn at Virginia Tech
- VTOC Software  
To transition the administration of certain network management software (Network Health) from Network Engineering personnel to the Virginia Tech Operations Center (VTOC)
- H.323 Conversion  
To transition from an asynchronous transfer mode (ATM)-based to an IP-based H.323 interactive videoconferencing system
- Educational Technologies storage migration  
To move the Educational Technologies storage to centrally-managed storage on the storage area network (SAN) and network attached storage (NAS)
- NI&S annual report  
To create the NI&S annual report
- Board of Visitors meeting in Northern Virginia  
To ensure all networking requirements were available for the board meeting held in Northern Virginia
- Andrews Information Systems Building Data Center network upgrade  
To upgrade the network in the Data Center to the latest technology

### **Other activities during 2005-2006**

- Microsoft Project Server 2003 evaluation  
Conducted extensive evaluation of Project Server 2003 to determine the suitability of this tool for improving project management practices throughout the NI&S organization
- Maintenance contracts  
Updated and renewed the contracts for the IBM, Sun, and DEC equipment located in the Andrews Information Systems Building Data Center
- VITA project management  
Coordinated the scheduling of an on-site VITA—Virginia Information Technology Agency—project management class for NI&S personnel as well as a class to prepare NI&S personnel for taking the Core and Facilitating tests  
The following NI&S personnel have completed the VITA Project Management Core and Facilitating qualification tests: Morgan Allen, William Dougherty, Marshall Fisher, Henry Floyd, Christine Morrison and John Pollard.
- AISB Data Center electrical needs  
Oversaw the processing of 20 requests for new electrical equipment installations in the Data Center
- High-performance computing  
Worked on the power and HVAC requirements for equipment rooms associated with the high-performance equipment proposal
- Environmental forecast  
Authored the environmental forecast (the future information technology environment for the Virginia Tech community) for the NI&S strategic plan

- Strategic plan  
Coordinated the development of the NI&S strategic plan including retreat-planning, assisting individual areas with the development of goals and objectives, and working with Printing Services to get the document printed
- Virginia College of Osteopathic Medicine  
Coordinated Information Technology services for the Edward Via Virginia College of Osteopathic Medicine
- Cost estimates  
Assisted with deployment of new services by providing cost estimate information
- Access Grid Node  
Served as event-scheduling contact for the NI&S Access Grid Facility
- Athletic Department  
Coordinated the development of revised cost estimates and service level objectives to the Athletic Department for the placement of a rack in the Data Center
- Change Management Task Force  
Provided administrative support for the Change Management Task Force established by the vice president
- Telephony planning  
Provided administrative support for meetings to discuss vendor solutions for next-generation telephone system technologies
- Workflow  
Provided administrative support for meetings to explore improvements in workflow efficiency in order to shorten the time interval needed to complete work orders
- Documentation  
Provided administrative support for the documentation architecture meetings to investigate ways to improve the structure and quality of departmental documentation
- Continuity of operations  
Coordination of the NI&S continuity of operations (COOP) planning process which is part of the university-wide COOP planning

### H.323 conversion

The university has a long and successful history providing distance learning programs and related services to students away from the main campus. These distance learning programs connect with the Commonwealth Campus Centers in Northern Virginia, Tidewater, Roanoke, Southwest Virginia, and Richmond, as well as numerous other partner sites regionally, nationally, and internationally.

In 1998, Virginia Tech, in collaboration with the University of Virginia, Old Dominion University, and Virginia Commonwealth University, converted the delivery of the Commonwealth Graduate Engineering Program from satellite to two-way interactive



videoconferencing (IVC). At the same time, Virginia Tech converted the master of business administration program from satellite delivery to two-way interactive videoconferencing and extended new course offerings in other academic areas to the centers and partner sites. The foundation for this transition was the establishment of NetworkVirginia ([www.networkvirginia.net/](http://www.networkvirginia.net/)) as an asynchronous transfer mode network. Virginia Tech deployed approximately 40 videoconferencing systems to about 20 sites, including multiple systems on the Blacksburg and Northern Virginia campuses as well as at the Commonwealth Campus Centers. Additionally, Virginia Tech installed two videoconferencing multi-point control units (MCUs) and established the Video Network Operations Center (VNOC) in Blacksburg to provide bridging for all the sites. Since 1998, the university has offered between 50 and 70 courses each fall and spring with total student enrollments of 1000 to 1500 each semester.

The ATM technology has proven to be stable and reliable. However, after eight years, the videoconferencing equipment is at end-of-life, and newer protocols and improved technologies for instruction are available. Therefore, we are upgrading our systems and mode of delivery in a major conversion project that will have significant impact on our distance learning community and enhance Virginia Tech's position in this increasingly competitive market. We now have increased bandwidth and the capability to provide high-quality and reliable videoconferencing over the Internet. Functional improvements and instructional enhancements requested by our faculty and students, such as high-resolution graphical displays, will be deployed. We will provide an improved infrastructure and superior video bridging capabilities with support for multiple protocols, in order to provide for the future deployment of advanced distance learning and content-distribution technologies.

H.323, the standard for interactive videoconferencing utilizing the IP protocol, is now fully supported and is being implemented by educational institutions, government facilities, and corporations. H.239, the standard for adding high-resolution graphics to H.323 videoconferences, is mature, but is not as widely deployed as basic H.323 systems. All Virginia Tech sites upgraded as part of this project will support H.239 and will receive enhanced displays capable of displaying the high-resolution graphics.

After conducting extensive research and evaluating new videoconferencing technologies, we have developed a conversion plan we believe will result in the most timely and cost-effective acquisition and implementation path. The conversion to H.323 systems that support H.239 will provide enhanced instructional delivery by adding a data channel allowing the presentation of high-resolution computer screen displays, while simultaneously viewing the instructor. Additionally, students at the receive sites will soon be able to make computer-based presentations during the classes. Improved integration of the systems will provide simpler and more uniform controls for the faculty as well as the incorporation of the latest technologies, including improvements in camera control and audio input.

Video/Broadcast Services (VBS) is leading the H.323 conversion project focusing on the Virginia Tech statewide videoconferencing network used for academic and instructional purposes. During the past year, VBS has worked closely with key stakeholders such as the Commonwealth Graduate Engineering Program, the MBA Distance Learning Program, the Institute for Distance and Distributed Learning, Learning Technologies, Outreach and

International Affairs, and selected faculty members in other areas to identify instructional enhancements and additional features and functions needed in the new system. VBS is working collaboratively with the Communications Network Services Research and Development group to identify and address infrastructure and quality of service issues. Technical requirements are being established and tested so a smooth transition of the ATM-based IVC classrooms to IP H.323 can be made. Training and technical documentation will be provided for our employees so they are able to provide quality support to faculty members and students taking advantage of the new H.323 environment. Orientation sessions will be provided to prepare the faculty to better understand the pedagogical considerations in teaching on the enhanced, interactive videoconference delivery systems. Key faculty members will be consulted frequently to provide input on continuous improvement of the design layout and usability of the touch panel control system.

Phase One of the H.323 conversion project (January 2005 to March 2006) saw a number of major events and accomplishments. These include the following:

- Key stakeholders and faculty members met to identify desired videoconferencing enhancements and improvements.
- Vendor presentations on H.323 videoconferencing solutions to CNS/VBS staff and key stakeholders
- Collaboration with Commonwealth Graduate Engineering Program university partners (UVA, ODU, VCU) on H.323 solutions, upgrade issues, and timeline
- Identification and implementation of gatekeepers for security and address resolution by CNS Research & Development
- Evaluation and selection of IP-based, multi-point conferencing units (MCUs) and IP-VCRs installed by CNS Research and Development
- Video Network Operations Center (VNOC) implementation of new H.323 Codian MCUs and setup of translation systems to support multiple protocols (ATM, ISDN, IP)
- VBS and VNOC production-level support of approximately 20 IP-bridged videoconferencing courses during Fall 2005 and Spring 2006 semesters, including five courses to Wake Forest Medical Center in Winston-Salem, N.C. and three courses to the Arab Academy in Cairo, Egypt
- Project manager hired to focus on completion of the H.323 conversion by the beginning of Fall 2006
- Project plan completed with key tasks and timeline identified
- Analysis of videoconferencing sites, systems, and enrollments completed
- Creation and approval of H.323 budget
- Configuration of instructor-origination videoconferencing system prototype using Aethra CODEC, high-resolution displays in conjunction with H.239 protocol, and customized Crestron touch panel and controls
- Demonstration of proposed H.323 videoconferencing systems with instructional enhancements and capabilities to selected stakeholders resulting in approval to proceed with statewide implementation
- Completion of meetings with representatives of all partner sites to discuss issues related to H.323 conversion plans and timeline

## Network Infrastructure and Services

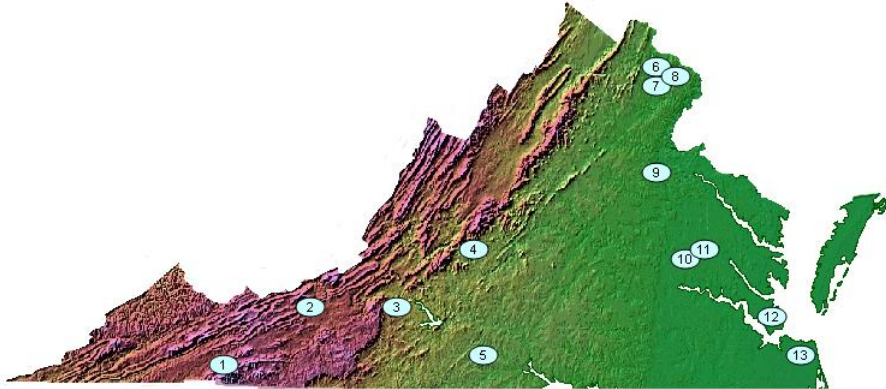
- Completion of all orders for videoconferencing equipment upgrades as detailed below
- Completion of faculty representatives' review of design, layout, and functionality of the touch panel control system



Associate Vice President Judy Lilly welcomes representatives from university departments and videoconferencing network site partners to the H.323 conversion project stakeholders presentation and demonstration in April 2006.

Phase Two of the project (April 2006 through August 2006) will include the installation of two gateways to connect ISDN and IP videoconferencing systems. This support is especially important for military and corporate sites. This phase will involve the deployment of 22 origination systems and 10 small-group receive systems at 12 different sites with completion in time to support fall semester courses.

## Virginia Tech Videoconferencing Sites



1. Southwest Virginia Center, Abingdon
2. Virginia Tech, Blacksburg
3. Roanoke Center
4. Center for Advanced Engineering, CVCC Lynchburg
5. Southern Virginia Higher Ed Center, South Boston, VA
6. Northern Virginia Center, Falls Church
7. Washington – Alexandria Architecture Center
8. Advanced Research Institute, Arlington
9. University of Mary Washington, Fredericksburg
10. Virginia Tech Outreach Office, Richmond
11. Richmond Center
12. ODU Peninsula Center
13. Hampton Roads Center, Virginia Beach

Both the origination and receive systems will reuse existing components as well as integrate new components and enhancements.

Origination system replacement and additional components:

- Replacement of the ATM CODEC with H.323 Aethra 8400 CODEC
- Replacement of the AMX touch pad control with Crestron controller and touch pad with videoconference display
- Upgrade of instructor computer
- Provide for integration of instructor's tablet PC
- Replacement of document camera with digital document camera
- Addition of enhanced display
- Addition of VCR/DVD combo player
- Improved audio control of individual components

Origination system components retained

- Tracking cameras
- Tracking microphones
- Audio mixers
- Monitors and consoles

- Special lighting and acoustical paneling
- Videotape recorders

### Receive system replacement and additional components

- Replacement of ATM CODEC with H.323 Aethra X5 CODEC
- Addition of enhanced display
- Addition of VCR/DVD combo player

### Receive system components retained

- Monitor(s)
- Microphones
- Videotape recorders
- Console/cart(s)



A typical receive system with set-top Aethra X5 CODEC, video monitor, and LCD for high-resolution computer displays.

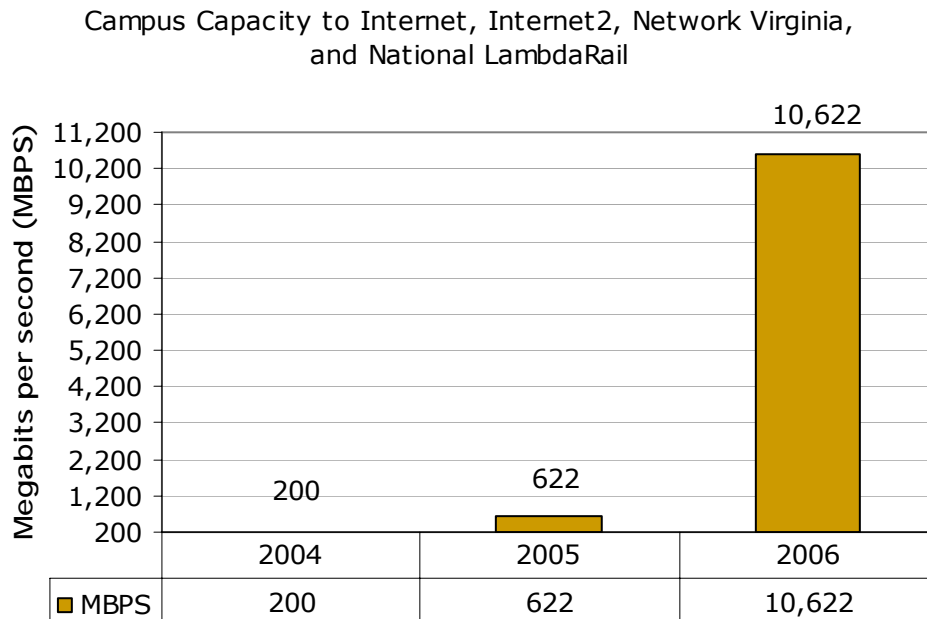
As noted above, in both the origination and receive upgrades, an enhanced display will be added. The Aethra H.323 systems and the new Codian multi-point conference units support the latest H.239 protocol for improved computer displays at a resolution of 1024 by 768. The upgrade includes the addition of a projector and screen or a large LCD to each of the videoconferencing origination rooms so students can read detailed data on the enhanced computer displays with ease. The output from the new digital document camera replacements will be sent through the H.239 channel and viewed on the enhanced display.

In addition to the major upgrades to the videoconferencing bridging and classroom equipment, the project includes solutions for personal computers and improvements in video streaming. The personal computer videoconferencing solution allows faculty members to teach their courses when they are traveling and is beneficial for students at sites not having the enhanced classroom systems. The video streaming improvements include the ability to view a live class session with the high-resolution computer images. With faculty consent, each class will be archived for later viewing with the possibility of downloading the audio with related presentation.

The H.323 conversion is much more than the upgrade of equipment and the switch to a new protocol for videoconferencing. The project has always been viewed as an opportunity to provide improvements to benefit instruction and learning. The initial reaction of the faculty has been especially positive.

### Regional and national initiatives

Virginia Tech plays a key role in the development of the latest advanced network infrastructure initiatives at regional and national levels. Through direct, aggressive support for initiatives such as National LambdaRail (NLR), the Mid-Atlantic Terascale Partnership, and the Virginia Optical Research Technology Exchange, Network Infrastructure and Services plays a crucial role in support of the research competitiveness of Virginia Tech and in the development of new initiatives to meet the emerging needs of Virginia communities, citizens, and government. The graph below depicts the increase in network capacity.

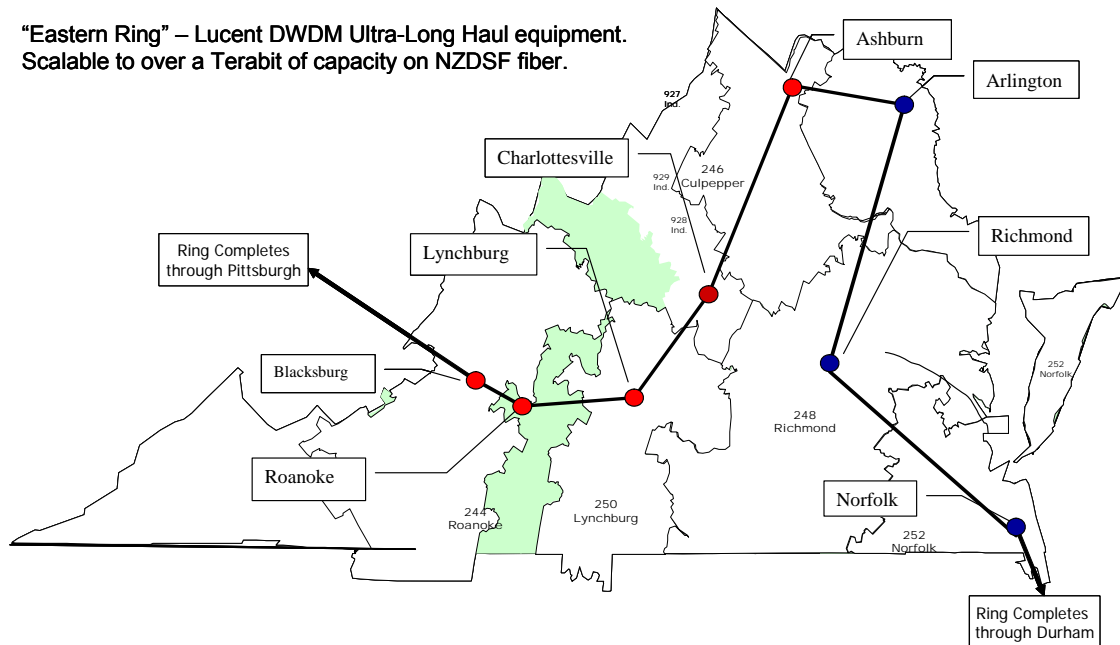


**Virginia Optical Research Technology Exchange.** The Virginia Optical Research Technology Exchange (VORTEX) is a new, statewide optical network project led by Virginia Tech. The network has extraordinary capacity and is capable of supporting the most advanced network technology. It recently became operational as Virginia Tech personnel oversaw the successful, on-time construction and completion of the VORTEX program, connecting our research universities to each other and to the National LambdaRail.

VORTEX delivers 10 Gbps connectivity to the National LambdaRail node in Washington, D.C., which serves research universities statewide including Virginia Tech, the University of Virginia, Virginia Commonwealth University, and a group of institutions in Hampton Roads including Old Dominion University, the College of William and Mary, Jefferson Lab, and others. Our staff resolved various construction obstacles in multiple localities to keep the project on schedule. In Blacksburg, a side benefit of the project resulted in access to multiple strands of dark fiber valued in excess of \$700,000, for both the town and the university. The total of the initial VORTEX investment statewide is estimated at \$10 million.

### VORTEX – a MATP Project in Virginia

- “Western Ring” – Fujitsu DWDM equipment - 32 initial lambdas, scalable to 64 10G Lambdas on standard single mode fiber
- “Eastern Ring” – Lucent DWDM Ultra-Long Haul equipment. Scalable to over a Terabit of capacity on NZDSF fiber.



**Mid-Atlantic Terascale Partnership.** NI&S directed operations for the Mid-Atlantic Terascale Partnership (MATP) facilitating access to National LambdaRail and collaboration for terascale computing and networking among research entities throughout Virginia, Maryland, and the District of Columbia. NI&S serves as the operational agent for MATP, providing technical and

management services in support of the organization and acting as the “pivot point” between MATP and NLR.

In the fall of 2005, we successfully completed design and construction of a new MATP NLR aggregation facility located in McLean, Virginia. This facility provides access to all of NLR’s PacketNet and FrameNet services. Virginia Tech management and control of this facility expands the university’s regional and national leadership role and provides a significant competitive advantage for university research programs.

The MATP NLR aggregation facility will generate a projected revenue stream in excess of \$1.85 million over five years through port fees and service charges assessed to participants.

Additional information about the MATP may be found at [www.midatlantic-terascale.org/](http://www.midatlantic-terascale.org/)

**Mid-Atlantic Broadband Cooperative Partnership.** NI&S provided support to the Mid-Atlantic Broadband Cooperative (MBC) for connecting their regional fiber infrastructure to tier-one markets in Washington, D.C., Raleigh, N.C., and Atlanta, Ga.

MBC is building a project called “Virginia's Regional Backbone Initiative (RBI).” This program, initially the brainchild of Virginia Tech’s eCorridors program, is applying optical network technology to generate long-term economic revitalization. The objective is to promote economic development opportunities, attract technology-based industries, and create new jobs. The RBI will provide an advanced telecommunications infrastructure that will span over 700 miles, connect four cities, 20 counties, and 56 industrial parks, while providing high-speed Internet access to nearly 700,000 citizens and over 19,000 businesses. The initiative stems from a unique collaboration between the Virginia Tobacco Indemnification and Community Revitalization Commission, the U.S. Department of Commerce–Economic Development Administration, and a non-profit organization.

Critical to the success of RBI will be connection of the regional network to major national and international network hubs located in tier one areas. Virginia Tech provided direct support to MBC for negotiation and acquisition of long-term leases for dark fiber stretching from Washington, D.C., to Atlanta. The fiber intersects MBC’s RBI network creating an access path with major nodes on both ends and one in Raleigh, N.C. Virginia Tech provided input to enable MBC to procure a dense wavelength division multiplexing (DWDM) system to light the long haul fiber with multiple 10 Gbps channels. The DWDM system will provide sufficient capacity to connect the region for several years. MBC plans to make the long haul system operational during the third quarter of 2006.

MBC provided a letter of intent to Virginia Tech to allocate approximately 2,800 fiber-miles to the university from within the RBI and to provide access to the long haul system at marginal cost. Virginia Tech intends to use this infrastructure to engage in research and education activities to benefit the Southside region served by MBC and other areas of the commonwealth. Virginia Tech expects to use these facilities to significantly improve access for the university to network hub facilities and university programs in the National Capital Region as well as North Carolina, Georgia, and nationwide.



Additional information about MBC can be found at [www.mbc-va.com/aboutus.asp](http://www.mbc-va.com/aboutus.asp)

**Network Virginia and the Network Virginia (ng) gigaPOP.** As part of the organization's contribution to the university's outreach mission, Network Infrastructure and Services manages the Network Virginia contracts with Sprint and Verizon and provides technical support for network management, vendor coordination, and order processing. With an emphasis on a high level of security, availability, and reliability, the unit provides network design and provisioning services for Network Virginia customers, and, in conjunction with the Virginia Tech Operations Center (VTOC), provides 24x7 monitoring and fault resolution to ensure any network problems are resolved across multiple service provider boundaries. Our extensive work with Network Virginia has allowed us to influence the commonwealth's information economy and has led to an improvement in the quality of life for citizens in every corner of the state.

NI&S operates the Network Virginia (ng or "next generation") Internet2 gigaPOP which provides access to the Abilene network (<http://abilene.internet2.edu/>) for all Virginia Internet2 participants, including universities and K-20 schools. In 2005-2006, we altered the gigaPOP physical infrastructure in Washington, D.C., completing a move to the MATP co-location facility in McLean.

In addition, NI&S negotiated an extension and final agreement with Sprint for Network Virginia network management services.

During the reporting period, the Network Virginia operations unit was responsible for several projects to improve and enhance services, in addition to providing outstanding network maintenance and operational support services.

- Upgraded processors on Cisco gigabit switch routers in Washington, Richmond, and Roanoke
- Upgraded IOS on Cisco gigabit switch routers in Washington, Richmond, and Roanoke
- Added new OC12 SprintLink Internet connections in Roanoke and Richmond
- Added new gigabit Ethernet SprintLink Internet connection in Washington, D.C.
- Added new access carrier extension capacity in the following locations:
  - Two OC3s in former Bell Atlantic LATA 248
  - One OC3 in former Bell Atlantic LATA 252
  - One OC3 in former Bell Atlantic LATA 246
  - One OC3 in former Bell Atlantic LATA 236
  - One OC3 in former Bell Atlantic LATA 250
  - One OC3 in former GTE LATA 236
  - Two DS3s and one OC3 LATA in Sprint 928
  - One DS3 in Sprint 956
- Processed 220 service requests from colleges, state agencies, K-12 schools, and commercial customers across the state resulting in a change of status to active or disconnected

## Network Infrastructure and Services

- Successful deployment of Mid-Atlantic Terascale Partnership service switch in McLean, Virginia
- Established 10 gigabit/second access to National Lambda Rail and Internet2/Abilene for Virginia Tech, the University of Virginia, and Virginia Commonwealth University
- Established gigabit/second access from MATP node in McLean, Virginia, to NetworkVirginia
- Established gigabit/second access from MATP node in McLean, Virginia, to Mid-Atlantic Crossroads
- Established 10 gigabit/second access from MATP node in McLean, Virginia, to NLR layer 3 network
- Established gigabit/second access from MATP node in McLean, Virginia, to NLR layer 2 network
- Established 10 gigabit/second access from MATP node in McLean, Virginia, to the Energy Sciences network

**National LambdaRail and Internet2 Access for K-12, Museums, and Libraries—A Virginia First!** Virginia's K-12 schools, museums, and libraries will be among the first in the nation to connect to both the National LambdaRail and Internet2, providing better access to educational and research resources worldwide.

Through a new cooperative program led by NI&S and the Institute for Connecting Science Research to the Classroom, schools, museums, and libraries connected to NetworkVirginia will be able to access NLR, Internet2, or both at no additional cost. This project was co-sponsored by a group of Virginia research universities and the Virginia Community College System.

Virginia universities are the first in the nation to combine the tremendous capacity of NLR and Internet2 for K-12 and continuing education. The National LambdaRail is the new national network for research and education that goes beyond internet technology. It provides enormous capacity to support scientific research for the nation's top research universities, supercomputing centers, and federal research laboratories. The Abilene network, operated by Internet2, is a special purpose Internet for education and research. Linking more than half the nation's colleges and universities and some 46,000 total institutions of research and education nationwide, it supports DVD-quality videoconferencing and provides access to tools such as remotely controlled electron microscopes.

Working with NI&S and the Institute, Thomas Jefferson High School for Science and Technology (TJ) in Fairfax County is the first Virginia K-12 school to connect. Students at TJ are already completing coursework in supercomputing and advanced network protocols directly relevant to NLR and Internet2. Faculty members at TJ and Virginia Tech are developing ideas to augment these programs and expand access to opportunities ranging from distributed performing arts education to instruction in distributed supercomputing for high school students statewide. Virginia students will now have access to technology and hands-on educational opportunities previously available only to advanced students at elite universities.

While National LambdaRail provides access to the nation's most powerful research network and computing resources, Internet2 brings a successful K-20 program with a wealth of educational

technology program support and collaboration opportunities. Combined access to both gives Virginia researchers and learners an immense advantage. Internet2 programs targeted at K-20 education will be available to schools across Virginia. These programs include Megaconference Jr., a project using advanced videoconferencing technology to bring together thousands of students in elementary and secondary schools around the world for an all-day learning conference. Students can receive live undersea exploration demonstrations from remote locations with famed oceanographer Bob Ballard, take master music classes from world-renowned instructors, or use remote-controlled instruments to dissect a biology specimen from 1,000 miles away.

NI&S strives to build coalitions with other higher education institutions and with vendors to provide enhanced services for the citizens of Virginia. In this case, Virginia Tech brought together several other universities, the Virginia Community College System, the Virginia Department of Education, and vendor partners Sprint and Verizon to co-sponsor this initiative. University participants include the College of William and Mary, George Mason University, Old Dominion University, the University of Virginia, Virginia Commonwealth University, and Virginia Tech. These institutions are members of the NLR-related Mid-Atlantic Terascale Partnership together with NASA and the Southeastern Universities Research Association who also are sponsors. The Virginia Department of Education is working with Virginia universities to help advance Virginia's K-20 National LambdaRail and Internet2 program.

Sprint and Verizon provide the advanced network services that comprise NetworkVirginia which offers low-cost broadband network access statewide. For this project, Sprint contributed a high-speed link that ties NetworkVirginia to an on-ramp to NLR and Internet2 operated by the Mid-Atlantic Terascale Partnership. The advanced network hub node providing the on-ramp is located in McLean and is operated by Virginia Tech on behalf of NLR, MATP, and the NetworkVirginia Internet2 gigaPOP.

**Supercomputing 2005: System X and National LambdaRail Applied.** NI&S personnel participated in a Supercomputing 2005 demonstration project linking Virginia Tech's System X with clusters in Utah, Los Alamos, and Seattle over the National LambdaRail. The project, entitled "mpiBLAST on the GreenGene Distributed Supercomputer: Sequencing the NT Database against the NT Database (An NT-Complete Problem)" was conceived and led by Professor Wu Feng, who was then at Los Alamos National Laboratory and now serves on the faculty at Virginia Tech.

The Basic Local Alignment Search Tool (BLAST) allows bioinformaticists to characterize an unknown sequence by comparing it against a database of known sequences. The similarity between sequences enables biologists to detect evolutionary relationships and infer biological properties of the unknown sequence.

Open-source parallel BLAST—mpiBLAST—decreases the search time of a 300kB query from 24 hours to four minutes on a 128-processor cluster. It allows larger query files to be compared, something which is not feasible with the current BLAST. The team attempted to compare the largest query available, the entire NT database, against the largest database available, the entire NT database.

### Network Engineering and Operations

#### Research and Development

Members of the Research and Development (R&D) group contribute to the innovative implementation of networking technologies throughout the university and beyond our campus at local, regional, and national levels. R&D leads the strategic development of the university's communications services and infrastructure and provides technical leadership to the university community.

Network Infrastructure and Services encourages employee involvement in research and outreach efforts. The advice of the R&D engineers is continually sought in matters of advanced network services, system security and design, database systems and applications design and development, and scientific and quantitative analysis methods. The wide-ranging educational backgrounds and real-world experiences of the group bring diversity to problem-solving and a broad insight not found in more specialized areas. NI&S seeks to attract and retain the best engineering staff and to promote creativity, interaction, and team-building within the R&D group. The varied team experience provides a foundation for them to develop solutions that are not just technically successful but also those efficient in terms of total cost of ownership through effective implementation and maintenance processes.

The Research and Development group of Network Infrastructure and Services provides the planning and design support for the implementation of almost all new or upgraded network services for Virginia Tech including those addressing the current demand for converged technologies and those anticipating future requirements. Wide-ranging projects undertaken by the group will enable future enhancements in areas such as distributed computing, wireless networking, regional and national networking infrastructure, increased redundancy and reliability, pervasive computing, and network security.

The department's updated strategic plan defines network security as "the sum of the security measures taken with individual network components and is accomplished by maintaining appropriate code and patches on network switches and devices, by providing network integrity, and by proactively monitoring for and isolating potential violators." The forward-looking work of the R&D engineering staff has helped Virginia Tech earn a reputation of having a robust, highly functional, and adaptable network and computing infrastructure, creating a secure environment providing privacy for network users as well as integrity and availability of computational and network infrastructure resources. Those resources will be critical to the support of university researchers as their environment becomes increasingly competitive. NI&S must continue to support maturing technologies as well as provide campus research groups with

robust, secure, high-performance networks that have convenient and flexible access to national and international high-speed networks.

The prime areas of concentration of the research engineers over the last year involve the following areas.

**H.323 network core equipment.** Distance learning is an important component of academic outreach and will continue to play a significant role in fulfilling the university's mission. The Virginia Tech instructional videoconferencing systems throughout the state deliver distance learning classes to undergraduate, graduate, and outreach classes. The systems are being upgraded to replace an aging asynchronous transfer mode infrastructure in order to accommodate the increased demand for bandwidth and flexibility needed by interactive, multimedia classrooms. Substantial progress toward full implementation of Internet protocol-based distance learning courses has been made in a project that is on schedule and within budget,

In its first known implementation, the R&D group created a redundant, gatekeeper model using open source software (Free BSD, GnuGK, freevrrpd). Providing leadership in open source development will position NI&S to contribute to the university, the surrounding community, and others in the higher education environment as well as enhance the university's national visibility. R&D engineers researched and installed redundant gateways providing the ability for IP-based videoconferencing systems to call ISDN-connected systems and vice versa. They led the adoption of the hierarchical gatekeeper model, provided by VIDE (see [www.vide.net](http://www.vide.net)), among major institutions in Virginia. This model allows for resolution of permanent place independent names to the currently associated network address therefore providing an address that works wherever a user roams. This system allows changes in network topology without changing a classroom's known identifier. Network Infrastructure and Services engineers have developed models allowing time-critical traffic such as videoconferencing and voice over IP to have priority on the ATM infrastructure.

**Campus infrastructure upgrade project.** Research and Development has the primary planning responsibilities for the infrastructure upgrade project that will eventually provide increased connection speeds for most university users as a result of re-engineering, the upgrade of the majority of network equipment, and the rebuilding of approximately half the in-building wiring. Appropriate physical facilities and an up-to-date cable plant will enable new technologies to develop and allow quicker adaptation of current and emerging technologies. Some of the project-related efforts over the last year include:

- Substantially completed a comprehensive evaluation of the vendor hardware currently available to support both the campus core and connections directly attached to users
- Selection of a replacement server load-balancing solution providing increased capacity, performance, and functionality for server clusters supporting important university applications including Banner, Web portals, and streaming video services
- Developed a new Horizontal Link ID standard for Virginia Tech's inside cable plant This new model has already reduced the time needed for wiring a building by allowing more of the work to be planned earlier in the design/construction process.
- Development of infrastructure documentation procedures to provide consistent and comprehensive availability of information as new copper and fiber resources are

deployed. These new procedures are intended to be efficient and dynamic in their ability to capture and disseminate information.

### Other projects

- Successful deployment of the Mid-Atlantic Terascale Partnership service switch in McLean, Virginia, and its connection to the National LambdaRail
- Prepared an RFP for wireless/cellular telephone service improvements at the Inn and Conference Center to allow wall-to-wall coverage for various wireless carriers
- Development and implementation of a county-wide, broadband wireless network in Pulaski, Virginia, creating the Community Broadband Alliance model, a cooperative implementation model for municipal broadband networks
- Provided support and analysis in response to security and other incidents affecting the university network and constituents' computing equipment
- Developed the Routed Subnet Model to pursue strategies to deliver network service at the subnet level while overcoming the security and reliability constraints of traditional switching
- Increased coverage of the 802.11B/G wireless network to 90 percent of administrative and academic space on the Blacksburg campus and the Northern Virginia Center
- Substantial work on 802.1x authentication and authorization services for the wireless LAN access using Active Directory  
Once this service is put into production, users will be able to log into the wireless LAN and the Hokies domain with a single process simplifying access to shared services throughout campus.

**Additional research and planning topics.** NI&S personnel are engaged in telecom infrastructure research and planning on the following topics:

- Unshielded twisted-pair (UTP) cabling systems
- Fiber-optic cabling systems
- CAD-GIS tools and GIS system deployment for the department
- PBX and Softswitch vendor solutions
- IP multimedia subsystem
- Unified messaging
- Wireless access and backhaul solutions
- Codes and standards
- Health and safety
- Pervasive computing applications

### Software and systems development activities

- Upgraded from Remedy 6.0 to 6.3, enabling Web-based Remedy forms
- Developed a Web application to manage X.509 certificates used by various services for authentication and encryption

## Network Infrastructure and Services

- Deployed a Confluence wiki for sharing of operational and planning information
- Development activities related to Central Authentication Service (CAS) single sign-on
  - Developed a plug-in module for the Confluence wiki software
  - Made significant contributions/revisions to plug-in module for Apache Web server software to enable single sign-on via the Virginia Tech CAS. This Apache software is used by most websites at Virginia Tech, so this module development could become significant.
  - Converted Web servers that provide applications or documentation for the Virginia Tech Operations Center to single sign-on (CAS) authentication, improving worker efficiency and increasing security
- Conducted successful evaluation and implementation of the Oracle Advanced Security option for encrypting data streams between network management applications and Oracle database servers
- Improved processes and testing for Oracle patch kits to reduce the time required to fully test new patches and deploy them on production database servers
- Deployed an additional Oracle server instance to improve the responsiveness and availability of the database supporting the Remedy help desk application
- In order to address the challenges associated with the development and implementation of effective information storage and management, R&D conducted an evaluation of the potential benefits and risks associated with moving from directly-attached storage to a Storage Area Network (SAN) for database servers.
- Upgraded Domain Controllers used to provide authorization services for most desktop workstations in CNS and the Virginia Tech Operations Center
- Reduced server count by phasing out the file server used for the VTOC, R&D, Switch Engineering, and Network Engineering. File sharing services are now provided by the Information Technology-managed network-attached storage (NAS) service
- Instituted a cross-training program to allow senior VTOC technicians to become responsible for administration of all VTOC desktop workstations
- Phased out aging computer terminals in major campus switching centers; replaced them with Windows-based workstations utilizing remote administration capabilities
- Deployed six additional Linux servers to support new application requirements; e.g. H.323 video gatekeeper systems
- Replaced four obsolete Sun Solaris servers with Linux servers as part of normal life-cycle replacement

## Network Engineering

The university's core network must serve the challenging needs of university researchers as well as a myriad of administrative and learning applications. Advanced grid-based computation, network-based collaboration environments, and other research efforts in key areas such as biotechnology, computer science, engineering, and mathematics depend on a secure and reliable network as well as one that is able to take advantage of the latest technologies. A key part of the NI&S mission is to advance the capabilities of and provide daily support for our existing

## Network Infrastructure and Services

information technology infrastructure and services while simultaneously planning for increased capabilities to empower Virginia Tech's faculty, staff, and students as newly evolving technologies become available.

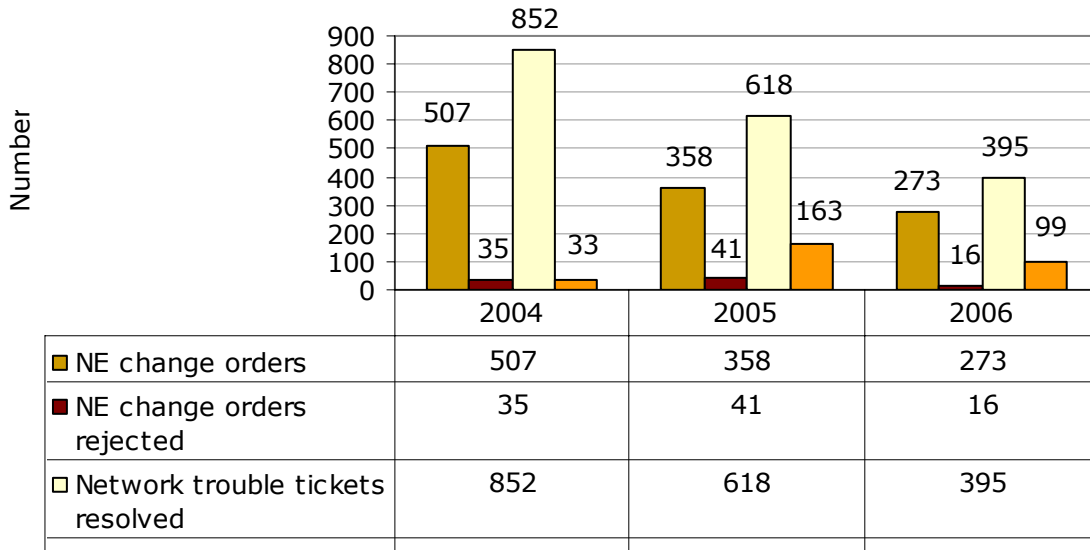
Supporting the Virginia Tech network is a Network Engineering team of highly-skilled and extremely resourceful information technology specialists who design, implement, and manage a reliable, scalable, adaptable, and secure telecommunications infrastructure. The group has extensive experience and strong credentials in statistics, mathematics, computer science, network engineering, software development, and systems analysis. Their responsibilities include network architecture and engineering, network operations and maintenance, security assessment and implementation, and network performance measurement and analysis. The team conducts network protocols research and pilot-testing of new products and technologies in cooperation with hardware and software vendors. Software development is another major activity with continuous work on applications supporting fault management and problem reporting, configuration management, authentication and authorization services, and performance measurement and analysis. Software tools with open, consistent, and extensible interfaces are used.

A campus-wide infrastructure upgrade is being considered. If completed as intended, it will allow the university community to take advantage of the convergence of various telecommunications technologies. The upgrade would provide leading-edge networking equipment and level the wiring standard throughout all campus buildings. New network equipment would allow the university community to utilize applications which are increasingly bandwidth-intensive as Web development and IP-delivery of distance learning continue to evolve. Wireless network access is now available in most administrative and classroom buildings and will continue to be extended across campus. Another challenge will be the provisioning of the network capability needed to support the emerging "pervasive computing" field. Network security remains an important concern and responsibility of the Network Engineering group.

During the reporting period, Network Engineering completed many projects to upgrade service and improve security, in addition to providing outstanding network maintenance and operational services on a 24 x 7 basis.



Network Engineering - Change Orders & Trouble Tickets



**Network service installations and upgrades**

- The Inn and Conference Center  
Installed advanced network capabilities in the new Inn and Conference Center to support the unique needs of this location. Capabilities provided include 1 Gbps Ethernet to every guest room and wireless LAN (local area network) service throughout the facilities. Advanced security controls and hospitality features are incorporated into the new network. Hotel and conference guests can utilize the network with no prior configuration of their computers, a feature known as “zero-touch.”
- Agriculture and Forestry Building  
Installed Ethernet network service in this newly-constructed building
- Virginia Tech Transportation Institute  
Installed Ethernet network service in a new building at the Institute and upgraded the network at the existing location  
All network users in the new building now have 1 Gbps network service; the upgrade to the existing building is still underway.
- West Side Lane Stadium  
Installed Ethernet network service in the new addition to the stadium.
- Knowledge Works II  
Installed 1 Gbps Ethernet network service in this Corporate Research Center building which is being used to temporarily house the Department of Computer Science
- Graduate Life Center (GLC)  
Installed Ethernet network service in a newly-renovated building which provides space and venues to meet the unique needs of graduate and professional students

The GLC is intended to be the hub of graduate student life. Programs and services provided here will encourage and facilitate active participation in the Virginia Tech graduate community.

- Gigabit Ethernet backbone upgrades  
Several academic buildings on campus received backbone upgrades providing the capabilities needed to deliver 100 Mbps Ethernet service to network users.
  - Seitz Hall. The upgraded network provides wireless LAN service in this building.
  - Robeson Hall
  - Hutcheson Hall
  - Smyth Hall
  - McComas Hall
- Plantation Road  
As a result of fiber-optic upgrades to the outside plant serving the Plantation Road area, two laboratories—the Rotor Dynamics Laboratory and the Structures Laboratory—were upgraded from DSL to gigabit Ethernet. The new backbone connections are more than 500 times faster and provide the capabilities needed for 100 Mbps Ethernet user connections and wireless LAN.
- Other DSL-to-Ethernet upgrades  
Tennis Pavilion and recreational sports facilities on Tech Center Drive were upgraded from DSL to high-speed Ethernet service.
- Northern Virginia Center  
Upgraded the network to support gigabit Ethernet connections for various servers
- Teske House  
Installed wireless LAN service
- Virginia Cooperative Extension  
Continued work for Virginia Cooperative Extension on the implementation of an upgrade to their statewide communications capabilities including a secure virtual private network (VPN) overlay

### **Other network operations activities**

- Implemented an authentication and authorization service for Virginia Bioinformatics Institute (VBI) users  
The new service provides a more scalable and manageable virtual private network (VPN) service for VBI.
- Upgraded software on 1100 wireless access points and campus core routers to address a significant security vulnerability
- Successfully ended support for AppleTalk and IPX routing protocols and performed associated network reconfiguration  
Discontinuation of support for these obsolete protocols will substantially reduce software costs for the next-generation network backbone.
- Improved speed and reliability of DSL services (for buildings not on the campus fiber-optic plant) by replacing aging ADSL equipment
- Participated in a successful NI&S Business Technologies project to locate and account for missing fixed assets

## Network Infrastructure and Services

- Provided information, expert consulting advice, and network configuration to the Information Technology Security Office in the evaluation of network intrusion detection/intrusion prevention security devices. (RFP #648689)
- Evaluating and planning for implementation of network management platforms and software for the Data Center upgrade project  
IronView and Inmon are the two packages we are preparing to use.
- Planning for the Data Center network upgrade to provide high-speed network access to university applications, improved backup capabilities, and more efficient load balancing services that are easier to deploy and manage
- Endured the tragic loss of a long-time coworker and friend, Robert Nicholson

### **Television and satellite uplink operations**

- Provided daily satellite uplink service for the Virginia Satellite Educational Network throughout the public school year
- Provided satellite broadcast and fiber-optic support of sporting events for Jefferson Pilot Sports in conjunction with the Virginia Tech Athletic Department
- Provided rapid response to reported television service outages to maintain a high level of service availability
- Extended the campus television service network to the new hotel and conference center and installed the necessary equipment to provide HBO service to the facility
- Worked with CNS Public Relations, Student Programs, and our service providers to amend contracts and determine all necessary arrangements and equipment needed to provide a “pilot” program of premium sports and movie service to various residence hall lounges  
Acquired appropriate filtering equipment and completed installation
- Completed the planning and selection process for replacement of the High Power Amplifier (HPA) to extend the useful life of the satellite uplink facility  
Researched and ordered a new High Power Amplifier to replace a failed unit  
Ordered new upconverter and video modulator to replace 20 year-old equipment associated with the failed HPA
- Provided satellite uplink services to commercial television networks for media events involving University Relations, the Athletic Department, and the Graduate School
- Repaired CATV distribution skeleton wiring, conduits, splitters, and outlets at Cochrane Hall  
The work included the addition of outlets in the common areas to preempt vandalism of equipment to gain CATV access to these areas by undesirable methods.
- Relocated campus two-way radio repeaters, fiber-optic cables, coax, microwave heliast, and all other equipment from the shack on Slusher Tower due to roof renovations
- Worked with our service providers to replace several faulty satellite receivers that were losing their programming on a daily basis

## Switch Engineering

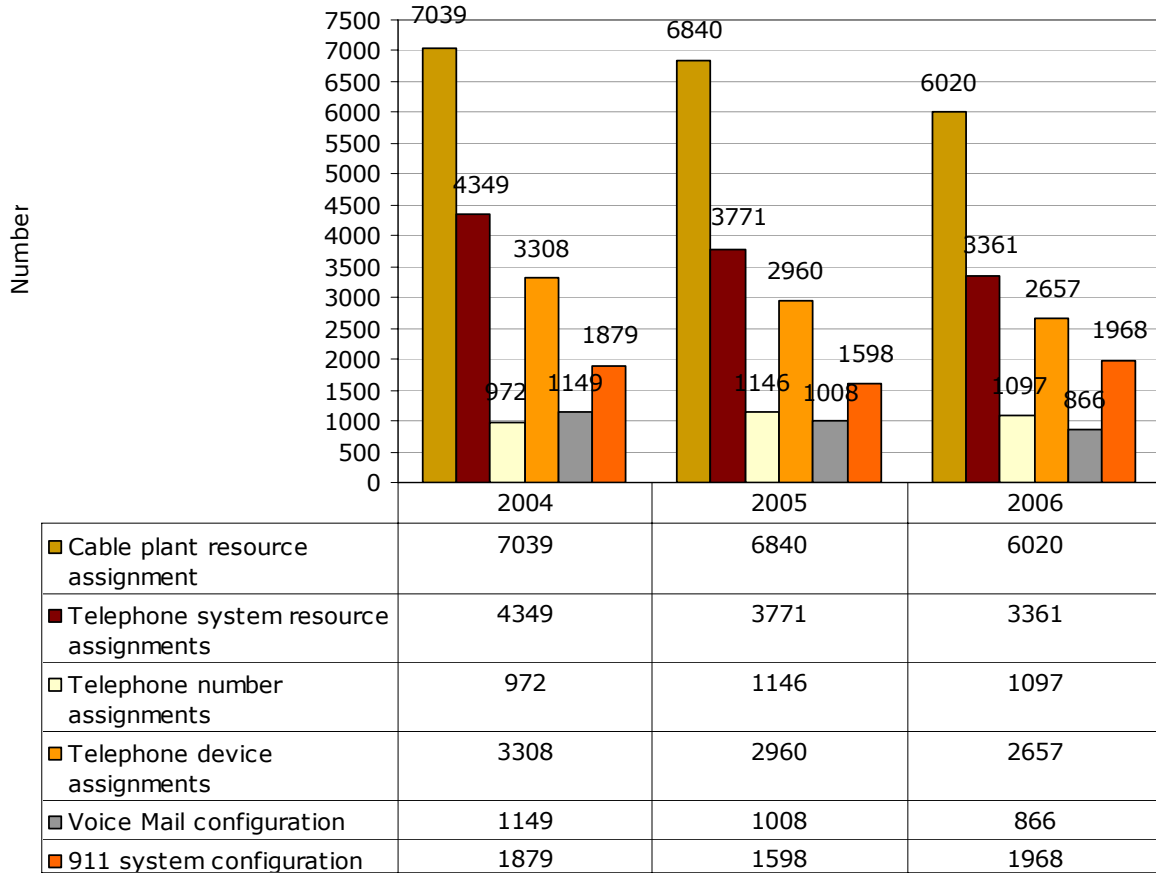
Switch Engineering (SE) is primarily tasked with the planning, design, implementation, operation, and optimization of the systems and equipment utilized to provide telephone and voice messaging services to the university community, on campus and at other Virginia Tech locations throughout the state. Even as the university’s technology systems continue to develop, grow, and adapt to changing requirements, the main goal of the Switch Engineering group remains the achievement of the expected “five nines” of reliability (99.999 percent) in the delivery of telephony services. SE will manage the end-of-life and decommissioning of legacy voice technologies in a way that will be as transparent as possible to the university community.

### Telephone system operation and maintenance

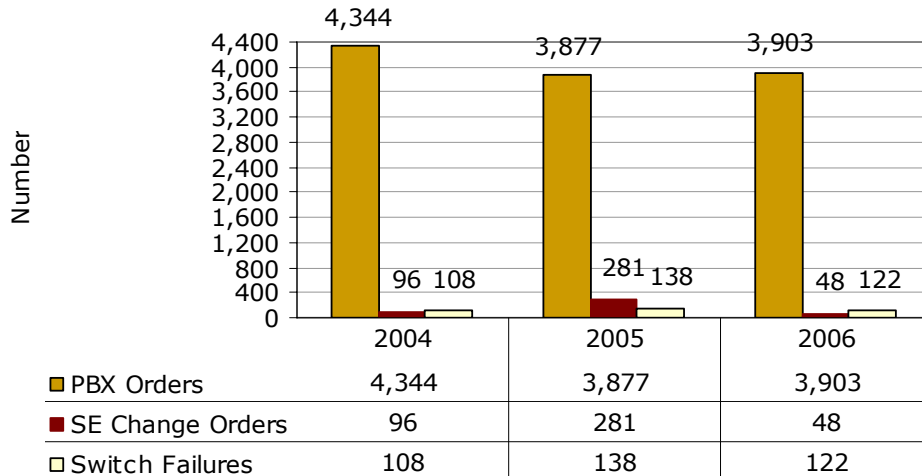
|  | FY 2005-2006 |
|--|--------------|
| System availability                            | 99.999%      |
| System hardware failures resolved              | 0            |
| Operating system & application patches applied | 0            |
| User reported failures resolved                | 756          |
| Hardware architecture modification projects    | 2            |
| Software architecture modification projects    | 46           |

# Network Infrastructure and Services

## Switch Engineering-Work Order Processing



## Switch Engineering-Orders and Failures



Following is a list of key projects undertaken or completed during 2005-2006. These projects take advantage of a practical combination of standards-based solutions and in-house development to meet the unique needs and support the special applications of the university.

**The Inn at Virginia Tech and Skelton Conference Center**

- Relocated the telephone, voicemail, wake-up call, and call accounting systems from the Donaldson Brown Hotel to the new Inn with minimal service interruption to the hotel’s staff
- Specified, procured, and deployed a custom, “call enunciator” software package to provide on-site emergency call (911) alerts to hotel staff members allowing for rapid response to emergency events
- Redesigned the existing, inbound call-handling applications to improve the staff’s ability to respond to the significant increase in call volume to the hotel’s reservation group

**PhoneMail architectural modification**

- Redistributed existing hardware resources in response to a sustained reduction in demand for voice messaging services by the student community resulting in additional storage resources and access ports for faculty/staff voice messaging
- Implemented inter-system networking between Blacksburg and Northern Virginia to facilitate message sharing between users of the two systems

PhoneMail™ System operation and maintenance, FY06

|  |         |
|--|---------|
| System availability                            | 99.982% |
| System hardware failures resolved              | 3       |
| Operating system & application patches applied | 0       |
| Hardware architecture modification projects    | 1       |
| Software architecture modification projects    | 1       |

**Alternate routing application development.** We developed an interactive voice response (IVR) application to empower individual departments to control the routing of their main telephone numbers to predefined, alternate routes in response to changes in the university’s normal operating schedule.

**University Relations emergency closing application**

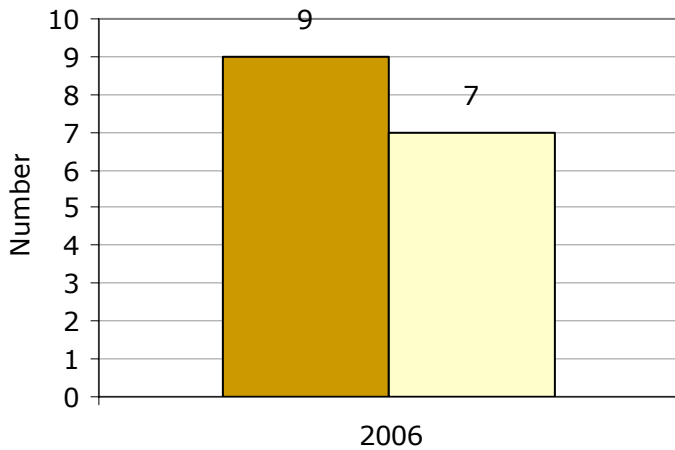
- Redesigned the Automatic Call Distribution (ACD) application handling the thousands of inbound telephone calls to the university during inclement weather and other emergency situations
- Improved the utilization of the media resources providing operational status and schedule modification announcements significantly reducing caller wait time and the number of busy call attempts

**CBX node consolidation.** We redesigned and consolidated the CBX nodes in the Burruss switch center reducing floor space requirements and power consumption.

**Emergency blue light phones for campus.** In cooperation with the Virginia Tech Police and other campus departments, CNS provided oversight for the installation of additional emergency phones throughout campus as well as cost estimate information for future installations. The “blue light phones” provide a more secure environment for students, faculty, staff, and campus visitors. E911 calls placed from these phones are delivered to the Virginia Tech Police with specific location information allowing the police to respond quickly even to remote campus locations.

Switch Engineering-Public Safety and Regulatory Compliance

■ Annoying & harassing call investigations □ Emergency telephones installed



**Evaluation of next-generation technology.** In an effort to enhance Virginia Tech’s competitive advantage and implement a new voice system utilizing a converged network, the Switch Engineering unit has been conducting an ongoing evaluation of next-generation technologies to determine the key technologies and system vendors that will be important to the university’s overall telecommunications strategy. The goals are to develop new, high-quality services and enhance existing services to accommodate identified technological needs and anticipate future demands of Virginia Tech students, faculty members, and researchers. The future of campus telecommunications will include the deployment, maintenance, and improvement of leading-edge, high quality systems that are reliable and secure. One new delivery method, IP telephony, utilizes the data network to provide the model for the next generation of telephony and voice messaging services. The planned initiative to upgrade the campus infrastructure will provide the opportunity to integrate a new campus telephone system and positions the university to accommodate technologies not yet fully developed as the lines between “voice, video, and data” continue to disappear.

The following is a list of key initiatives in this area during the reporting period.

- Collaborated with industry-leading vendors to provide IP telephony, video telephony, enhanced voice messaging, and collaboration services to a focus group of staff members in the Information Technology organization
- Enhanced existing provisioning, billing, and documentation processes to support IP telephony
- Constructed a multi-vendor IP telephony and unified messaging lab to facilitate additional research and compatibility testing as well as promote a supportive environment for the professional development and education of our staff in these areas
- Conducted extensive research focused on analyzing the capabilities and limitations of the IP telephony solutions from Avaya, Cisco, and Nortel Networks
- Studied interoperability issues and security needs required in a converged network
- Began development work on the integration of existing call detail record (CDR) and E911 applications with next-generation systems

### **Facilities management**

- Capital Projects facilities planning for the equipment and telecommunications rooms in the Surge Space building, the Building Construction Lab, ICTAS building, and the VTTI II building
- Capital Projects facilities planning for the equipment and telecommunications rooms for the Burruss Hall, Graduate Student Life Center, and Cowgill Hall renovation projects
- Completed installation of new, state-of-the-art HVAC units in Cassell and Burruss switchrooms
- Completed Seitz renovations planning and began implementation using the on-demand bid system
- Began planning process for converting the Andrews Information Systems Building machine room into a full-scale Data Service Center as part of the proposed National Science Foundation grant

### **Systems Support**

Systems Support provides reliable and secure, mission-critical, electronic communications, central computing resources, and stewardship of university information assets in support of the university's mission of teaching and learning, research, and outreach. Group goals include the provision of a secure, 24 x 7, high-availability, computing resource environment with standards-based, centrally managed, hardware and software configurations. Systems Support strives to provide a stable and reliable computing environment by performing in-depth service monitoring, trend analysis, and predictive capacity planning and through the use of standard systems configurations and access controls.



## Network Infrastructure and Services

The Systems Support department administers a wide variety of centrally-provided, computing infrastructure services including campus e-mail services (the Microsoft Exchange service as well as the Sun ONE POP/IMAP service) as well as central storage and backup facilities and services (the IBM Storage Area Network or SAN and the Network Appliance Network Attached Storage or NAS). Systems Support is responsible for the server hardware and operating system software on which the university's enterprise applications (such as Banner, Web Hosting/Filebox, ITA, IWA, Middleware, Portal, and eProvisioning), instructional applications (including Blackboard, Sakai, and ePortfolio), and research applications (including those using "System X") operate. Using best practices for systems administration, the department supports the university community by providing a robust technical computing infrastructure with secure, reliable, centralized services.

During the past year, Systems Support took on the overall responsibility for production-level computing services in the high-performance computing arena including 24 x 7 support for hardware and operating systems. The goal is to leverage System X and other high-performance components for use by all campus researchers and departments.

In cooperation with the Department of Computer Science and the Research Division, several Systems Support staff members participated in the National Science Foundation (NSF) grant proposal creation for the "Petascale Computer Project." The information provided for the grant included an analysis of various alternatives and potential operating costs. If the proposal is funded, it would allow Virginia Tech to build a large-scale (up to 100Teraflops) cluster computer on-site, which would be available for use by anyone to whom the NSF provides access.

Projects during this fiscal year include the following:

**Virginia Tech Mobile Messaging.** In conjunction with the increased use of mobile messaging, Systems Support has begun an initiative to document the security measures associated with the service. The devices used are essentially handheld computers with wireless and cellular access to data including e-mail messages and webpages. Many of the security concepts used for other computing devices are applicable, but the size and mobility of these instruments can potentially cause new problems.

**Data Center.** Another new Systems Support initiative concerns the future of the Data Center. Ongoing discussions among various Network Infrastructure and Services groups—Communications Network Services, Facilities, the Research Application Support group, and Systems Support—are focusing on how to best utilize existing space; what improvements would be required for increasing server numbers; and necessary security measures.

**Imaging software.** Systems Support provides continuing assistance to the Graduate School as they implement the NoliJ imaging software. In addition to operating system and hardware support, a security assessment of the software and database design has been conducted. Regular meetings with the vendor, other stakeholders, and support groups are attended by the Systems Support department manager and members of all three technical teams. Once security issues are resolved, it is hoped this product will be able to be used by all university departments who wish to do imaging.

Dell roadmap sessions. As part of an ongoing effort to encourage peer-to-peer training, local seminars and other learning opportunities for support staff and the entire university community, sales, marketing, and technical staff from Dell visited the Blacksburg campus and made multiple presentations about their company's future plans during February and March 2006. Systems Support hosted these sessions and arranged for computer support professionals throughout campus to participate.

**E-Communications Services and Windows Administration Services Team.** The E-Communications Services and Windows Administration Services (ECS-WAS) Team provides primary operating systems (OS), hardware, and application support for all centralized messaging systems (e-mail, Listserv, mobile messaging, USENET news), and OS and hardware administration support for all non-UNIX based centralized services (CITRIX; Enterprise Systems and Central Services Domains; Microsoft Exchange). Other miscellaneous responsibilities of this group include the maintenance of the Virginia Tech UNIX/Linux mirror site, responding to internet abuse complaints (through *abuse@vt.edu*), and participation in the Computer Incident Response Team (CIRT).

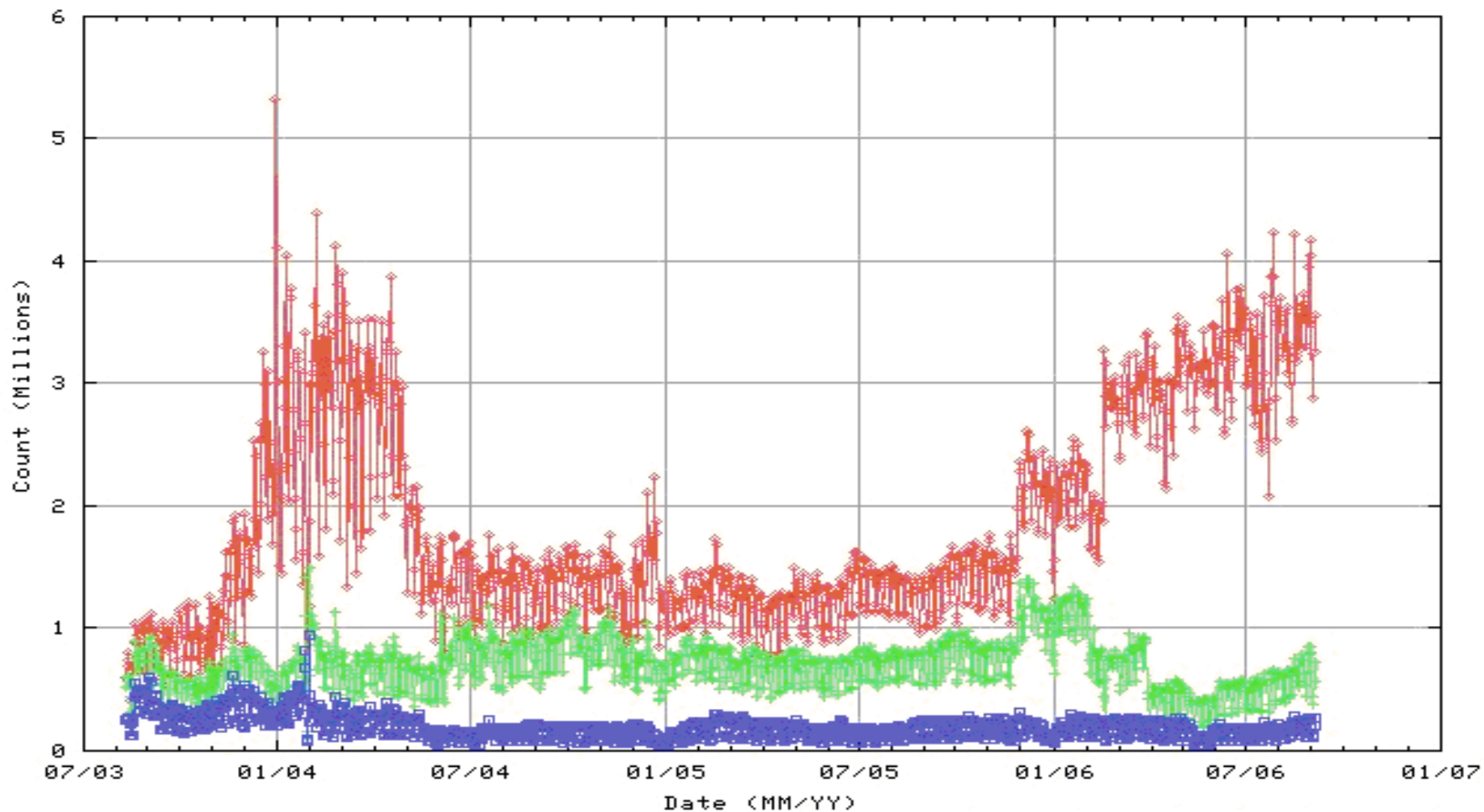
During the year, the team

- Deployed new hardware and software to support the WebMail facility providing system expansion, redundancy, and improved performance in addition to enhanced spam-filtering and other folder management improvements;
- Conducted research of second-generation anti-spam products, including development of a product test bed consisting of a test e-mail environment and other peripheral equipment required to evaluate various vendor offerings; initial testing of future anti-spam solutions began in April 2006;
- Relocated equipment supporting the Center for Geospatial Information Technology (CGIT) research computing services to the Andrews Information Systems Building Data Center and assumed systems management and some applications management duties; This change will allow CGIT faculty members to concentrate on their research;
- Deployed new hardware and software to support mobile messaging services utilizing the Goodlink suite of products from Good Technology; existing mobile users utilizing Blackberry devices were migrated to this new service;
- Following an e-mail outage in December 2005, investigated Sun Microsystems recommendations and conducted extensive research into the redesign of the existing e-mail system architecture; prepared an implementation plan including the ordering of equipment and its installation; spreading mailbox files over the existing disk storage has improved performance;
- Equipment used to support the Virginia College of Osteopathic Medicine (VCOM) was upgraded to Windows Server 2003; this upgrade provides the latest operating system features to ensure continued reliability of VCOM's messaging facilities;
- Supported Listserv; Listserv is a distributed, subscription-based, e-mail communications tool; it allows Virginia Tech students, faculty, and staff to post information on specific topics (such as class work or assigned projects) to a wide audience with a single message; Listserv usage has increased slightly over the

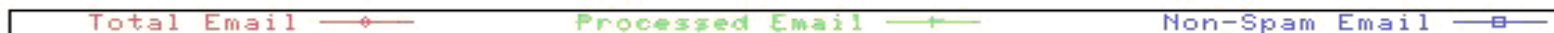
## Network Infrastructure and Services

- previous fiscal year, delivering 300,000 messages to 1,500 active mailing lists per day during the fall and spring semesters;
- Utilized the Microsoft Risk Assessment Service to perform a thorough risk analysis and assessment of the Exchange environment and implemented recommended security and system configuration change; the analysis was performed by Microsoft personnel who conducted interviews with administrators, managers, and users; a detailed report, which included best practices analysis and recommendations for our specific environment, was provided;
  - Upgraded to Exchange 2003; this upgrade will allow a broader implementation of mobile and unified messaging options and was recommended by Microsoft as a result of the risk analysis assessment described immediately above.

Email Flow at Virginia Tech



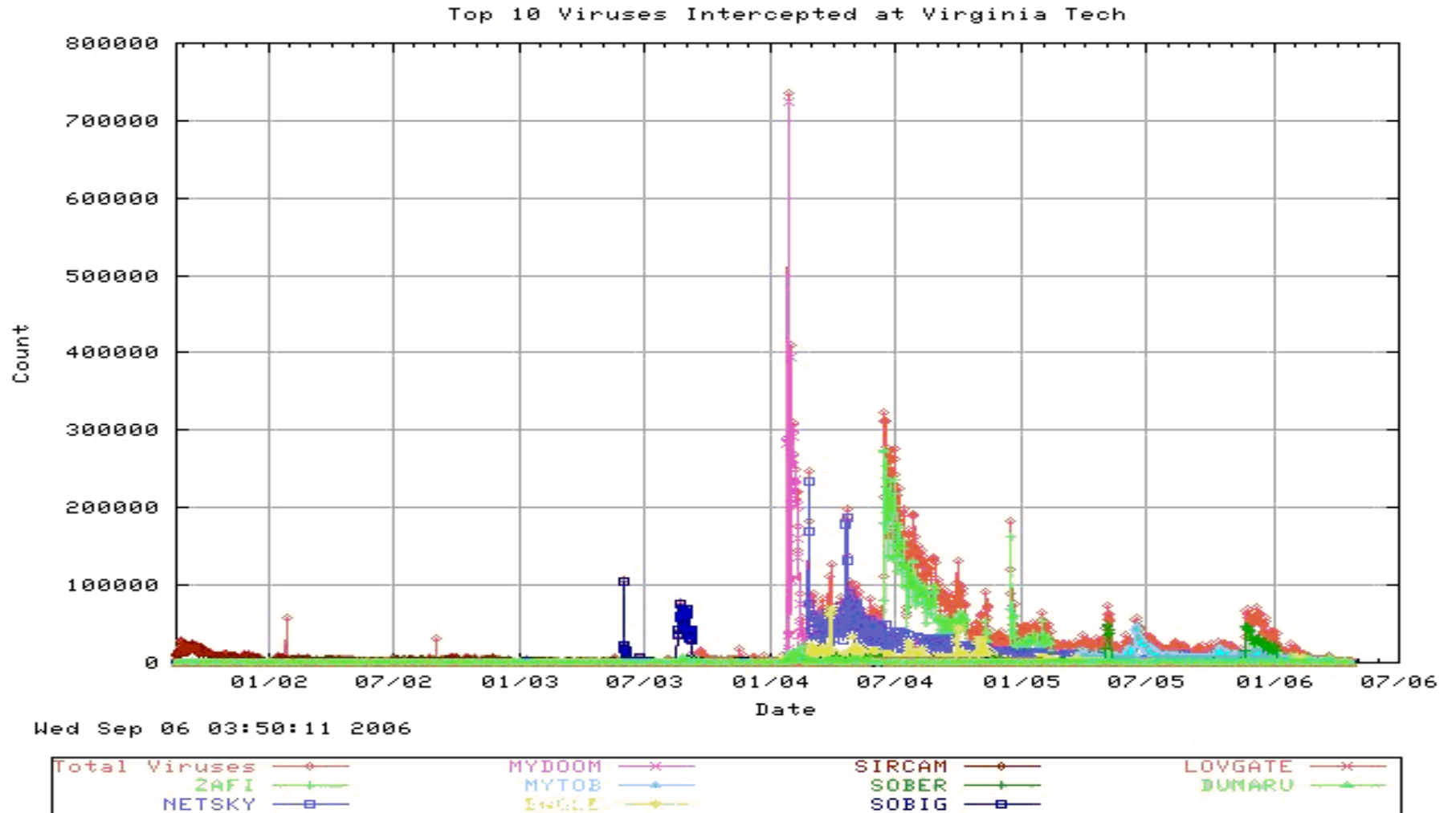
Wed Sep 06 03:50:10 2006



The graph displays e-mail traffic sent to the vt.edu central domain between August 10, 2003 and June 2, 2006.

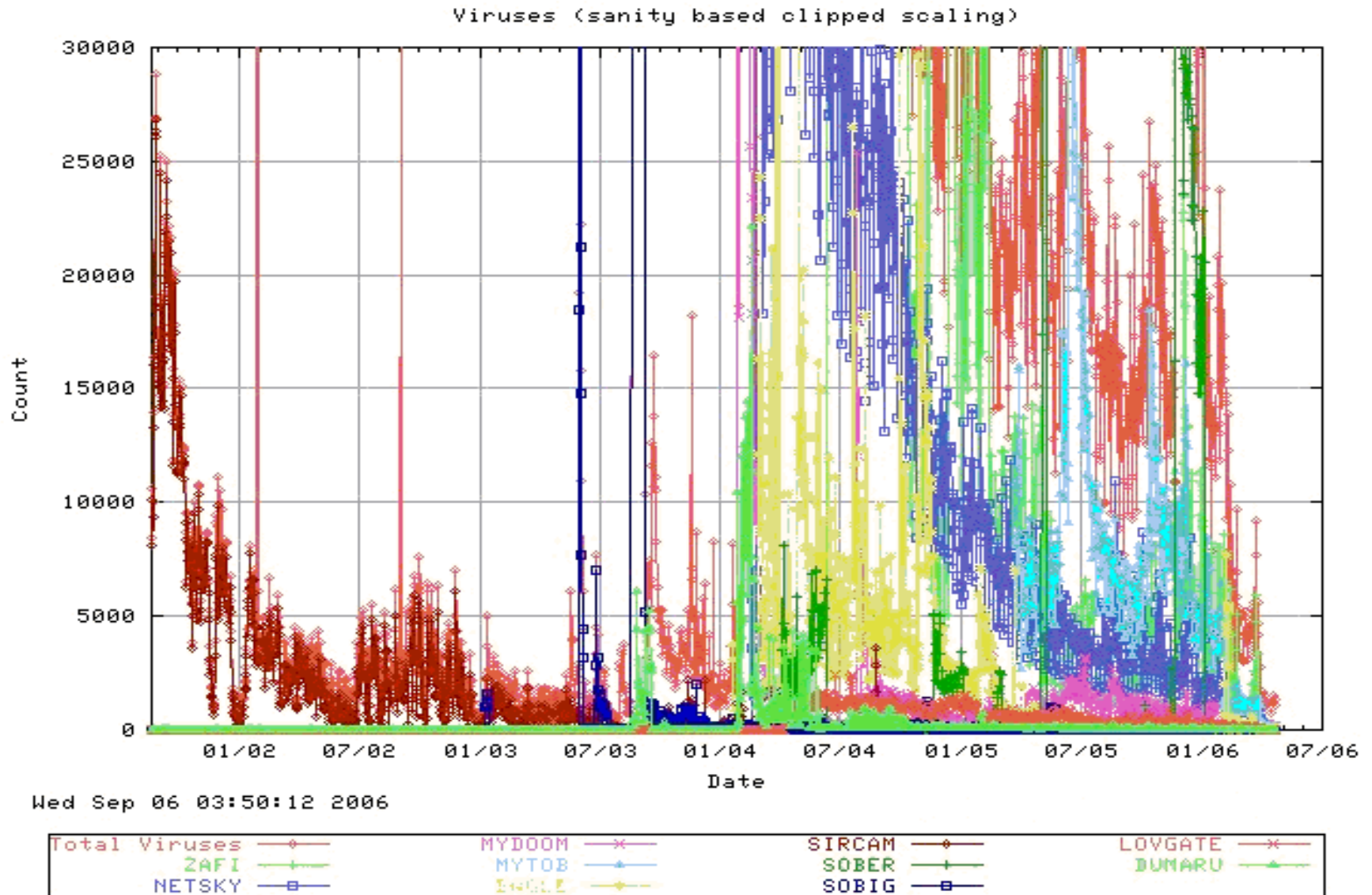
- The top line (red/labeled “Total E-mail”) represents all messages sent from remote sites.
- The middle line (green/labeled “Processed E-mail”) represents messages processed by the server, i.e. not blocked at the gateway. Messages could be blocked at the gateway because they contained viruses, because they were sent by sites on our block list, or because they were sent by sites appearing on one of the “Real-time Black Lists” (RBLs) to which we subscribe.
- The bottom line (blue/labeled “Non-Spam E-mail”) represents all messages that were delivered and did not receive the spam tag, which is added by the gateway devices as they filter all incoming messages.

Note: While the blue line—“Non-spam e-mail”—remains fairly stable, averaging between 200,000 and 300,000 daily, the other two lines vary constantly. Unfortunately the red line—“Total E-mail”—is showing an incline, meaning the amount of unsolicited or unwanted e-mail messages is continuing to increase.

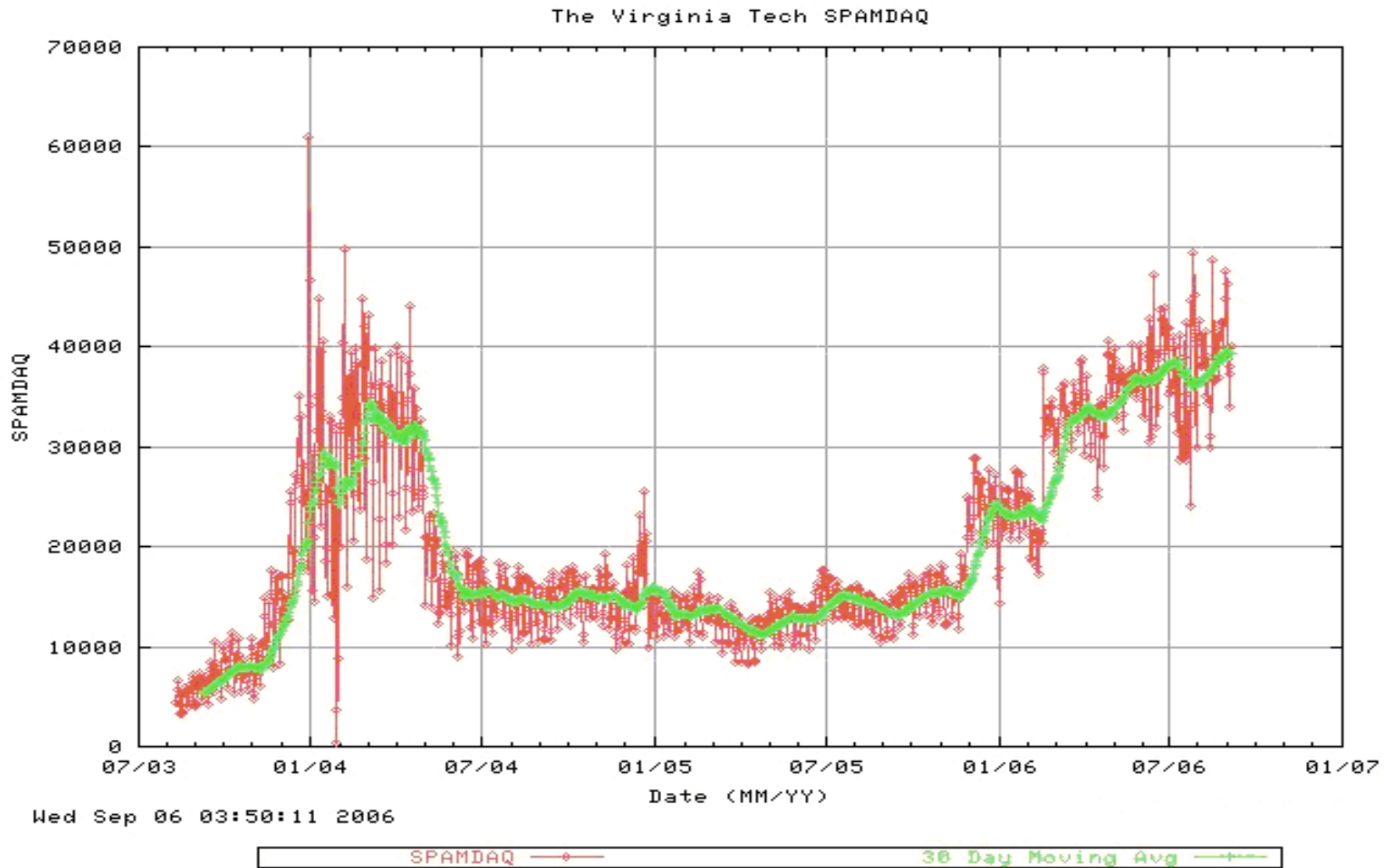


This graph displays virus counts for the top ten viruses received at Virginia Tech. On any given day, Virginia Tech's central e-mail service intercepts between 20 and 50 individual virus types, some of which are received at a rate of thousands while others are received in single digit-sized batches. The MYDOOM outbreak that occurred in early January 2004 remains the virus event with the largest impact since the antivirus devices were deployed (August 2001), as is clearly illustrated above.

The graph on the following page shows the same period and data in more detail.



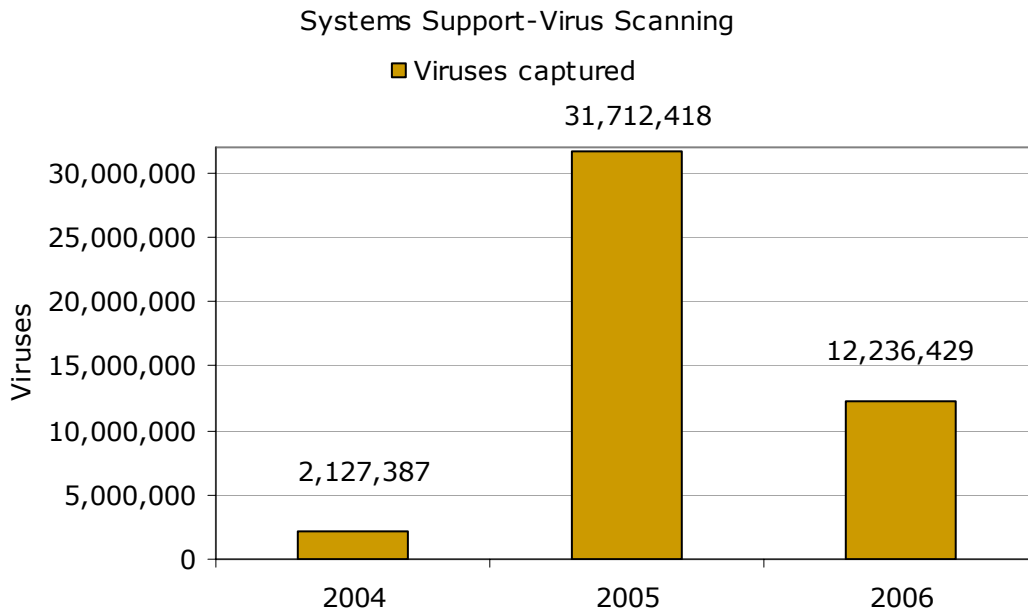




The previous graph illustrates the Virginia Tech SPAMDAQ. This is an index reflecting the severity of incoming spam. Much like a stock index, it shows the long term ebb and flow of unsolicited/unwanted e-mail received by Virginia Tech’s central e-mail servers.

The SPAMDAQ is computed by comparing a single day’s intake of spam as detected by the university’s spam and virus filters against the average spam received over Fall Semester 2003 (August 25-December 18, 2003). The number “10,000” is set as the index value for the median spam amount. (A score of 5,000 means half the index amount was received; a score of 20,000 means twice the index amount was received.)

Note the tremendous surge right before the CAN-SPAM Act went into effect at the end of 2003. Although this legislation seems to have curtailed spam through 2004 and much of 2005, the number of unsolicited/unwanted e-mail messages is again increasing.



Viruses Captured for FY 05-06→ 12,236,429\*  
 Savings (based on \$8.00 per hour/average call length 3.75 hours to the Help Desk)  
 If 1 of 100 viruses captured spawned a call: \$3,670,928.00  
 If 1 of 10 viruses captured spawned a call: \$36,709,280.00  
 \*Fewer viruses were captured in this fiscal year than the previous one. This reduction is due to improved user awareness, and a major outbreak that occurred last year (MYDOOM) that did not recur this year.

**Storage Management Team.** One of the greatest information technology challenges facing the university is to develop and implement strategies for effective information storage and management as research at Virginia Tech, and its associated data generation, continues to flourish and expand. Instructional programs, including ePortfolio, and administrative projects, such as imaging, will require significant increases in data storage. This explosion of information

places huge demands on available resources and constantly requires the addition of new hardware and the implementation of new management strategies.

The Storage Management Team (SMT) is primarily engaged in providing centralized, state-of-the-art, self-managed storage environment and backup facilities for all university affiliates. Such services mitigate the risk of information loss caused by catastrophic hardware failure of storage media. SMT services include the administration of the IBM storage area network (SAN) for large, database-intensive applications, as well as the network-attached storage (NAS) devices that provide file-level storage for desktop/laptop users or department-level file sharing. Eighty percent of all storage is used for academic and research purposes. Backup services are provided for desktop users as well as enterprise and departmental-level servers.

Service is provided to academic departments, research institutes (such as Virginia Bioinformatics Institute), administrative units, central Information Technology groups (including the e-mail servers), and Virginia Tech affiliates (such as the Edward Via Virginia College of Osteopathic Medicine). Backup and restore services are provided through IBM's Tivoli and EMC's Network Storage and Recovery (NSR) products. SMT provides systems administration support for Printing Services as well as testing support to the Information Technology Security Office.

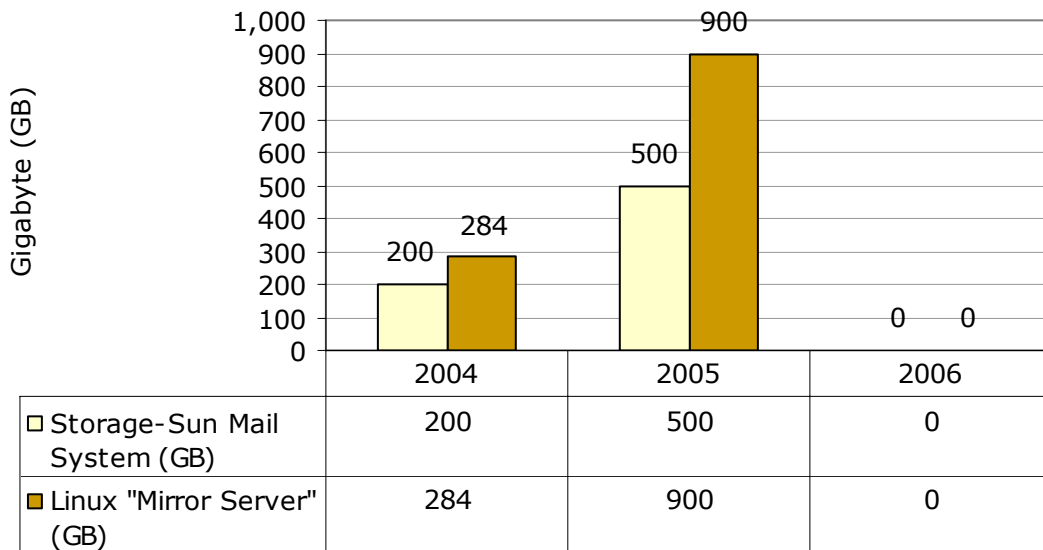
During the year, the team

- Developed and implemented a tape inventory system to monitor use and availability of tapes and began automating manual operational procedures; these changes will decrease the need for operator intervention and improve reliability of data;
- Increased the capacity of centrally-managed storage systems by 8TB, and upgraded the NetApp NAS to model 3050C providing additional system failover capability and increased storage capacity; SMT installed an expansion unit to the IBM ESS (SAN) to increase storage capacity and the number of host computer systems able to be connected;
- Decommissioned the following systems and services:
  1. Tape legacy system which was used to read older tape formats--applications using this system began using CDs
  2. IBM (AIX-based operating system) research system, moving active users to the other research systems  
User data was archived on the Network Backup service.
  3. Information Resource Management's (IRM) Kerberos systems  
Kerberos is no longer used for authentication services at Virginia Tech.
  4. Silicon Graphics Inc. (SGI), software update servers  
The campus SGI licensing model has changed making this server unnecessary.
- Print Services activities
  1. Docuprint printer replacement  
Purchased software to manage print jobs submitted by UNIX-based systems to the new Minolta Model 1050 printer
  2. Provided alternate print options for users of the "Docuprint" printer while the function is being replaced

## Network Infrastructure and Services

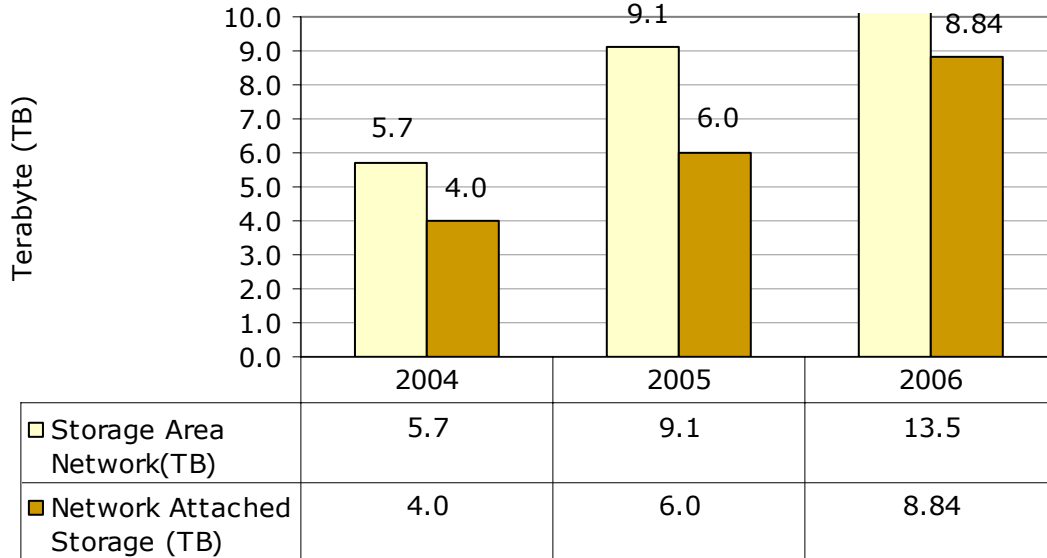
- Migrated research computing application support to the new research application support group;
- Researched and developed a proposal for managed network storage infrastructure to meet growing storage demands; the proposal includes backup-to-disk for the network backup service which will allow for faster and more reliable restoration of data. Disaster recovery sites for storage are addressed;
- Collected performance data for Banner systems, e-mail systems, as well as on other storage systems (NAS and SAN) for use with capacity planning software to determine when equipment upgrades might be necessary.

Systems Support-Storage Added (Gigabyte)



## Network Infrastructure and Services

Systems Support-Storage Added (Terabyte)

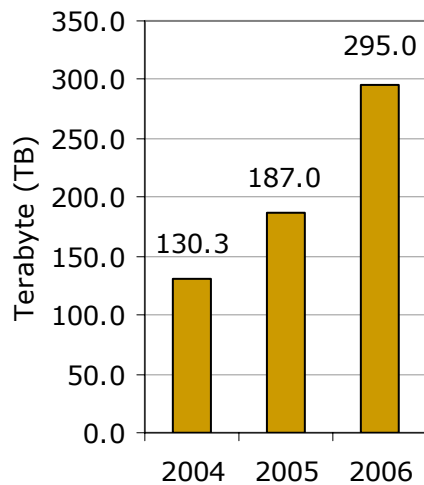


For FY 06→

Sun Mail System=0GB added  
 Linux Mirror Server=0GB added  
 Storage Area Network (SAN) =13.5TB added  
 Network Attached Storage (NAS) =8.84TB added

System Support-Network Back-up  
Storage

■ Network backup storage (TB)



For FY '05-'06→ 295TB stored

This is basically the amount of data that was transferred from disk to tape during the 12-month period.

**UNIX Administration Services.** The UNIX Administration Services (UAS) Team provides hardware and operating system support for all UNIX/Linux-based services offered to the university community. These services include administrative application services (such as Banner and the Information Warehouse), instructional application services (such as Blackboard), and research applications services (such as those running on System X, Silicon Graphics Inc. [SGI], and Sun-based hosts). By utilizing consistent standards across all platforms and concentrating on the hardware and operating systems, a relatively small number of staff can accommodate a large and growing set of servers.

During the year, the team undertook the following activities:

- Managed 155 non-research systems, providing systems administration support to 11 separate groups within the Virginia Tech Information Technology division  
Managed 1,040 research systems including Apple MAC OS X-based System X, Sun Microsystems' Solaris-based systems, and Silicon Graphics Incorporated IRIX and Linux-based research systems
- Expanded load balancing management for systems serving Banner Webaccess, the Enterprise Directory authentication and authorization services, MyVT portal services, and Filebox-Web Hosting facilities  
Load balancing management improves reliability and performance for these services.
- Deployed IPSec (Internet Protocol Security) policies to provide end-to-end encryption for Banner database links  
This deployment will better secure the service and the data transmitted between the users' workstations and the database servers.
- Migrated Learning Technologies' Blackboard and Sakai databases into the storage area network (SAN) improving management of the service and reliability
- Installed additional servers for Learning Technologies' Blackboard and Sakai services to enhance reliability and performance
- Migrated to new, more powerful hardware to support the data warehouse  
The previous equipment was running older, less secure versions of the operating system and other utilities, but could not be upgraded until vendor software was capable of supporting newer versions.

## Network Infrastructure and Services

| UAS Managed Systems                                  | Availability | Number of Hosts |
|--|--------------|-----------------|
| Middleware - Production Servers                      | 100.000%     | 12              |
| Test/Development/Preproduction Servers               | 99.990%      | 12              |
| Portal Systems - Production Servers                  | 99.999%      | 11              |
| Test/Development/Preproduction Servers               | 100.000%     | 7               |
| DBMS Systems - Production Servers                    | 99.995%      | 14              |
| Test/Development/Preproduction Servers               | 99.997%      | 7               |
| Big Brother Systems - Production Servers             | 100.000%     | 2               |
| Information Warehousing Systems - Production Servers | 99.993%      | 3               |
| Test/Development/Preproduction Servers               | 99.980%      | 1               |
| Learning Technologies Systems - Production Servers   | 99.984%      | 12              |
| Test/Development/Preproduction Servers               | 99.994%      | 11              |
| eProvisioning Systems - Production Servers           | 100.000%     | 3               |
| Test/Development/Preproduction Servers               | 99.996%      | 3               |
| SETI Systems - Production Servers                    | 99.990%      | 1               |
| Test/Development/Preproduction Servers               | 99.993%      | 3               |
| Hosting Systems - Production Servers                 | 99.995%      | 4               |
| Test/Development/Preproduction Servers               | 99.997%      | 4               |
| ITA Systems - Production Servers                     | 100.000%     | 8               |
| Test/Development/Preproduction Servers               | 100.000%     | 2               |
| Knowledge Base Systems - Production Servers          | 100.000%     | 1               |
| Test/Development/Preproduction Servers               | 100.000%     | 1               |
| UAS Systems - Production Servers                     | 100.000%     | 1               |
| Test/Development/Preproduction Servers               | 100.000%     | 4               |
| Imaging Systems - Production Servers                 | 100.000%     | 1               |
| Test/Development/Preproduction Servers               | 99.995%      | 2               |
| Research Computing - Production Servers              | 99.766%      | 3               |
| <b>Total Servers</b>                                 |              | <b>133</b>      |

\* Totals less than 100 percent represent unscheduled downtime

- Installed servers for the public key infrastructure/identity management user certificate project  
This project is scheduled to begin a pilot phase early in fiscal year 2007.
- Installed servers for the Graduate School imaging project and participated in the testing and deployment  
This system began production activities for the Graduate School in May 2006.
- Implemented Banner/SciQuest ePurchasing-related hardware and load balancing services  
The new purchasing system will allow all university affiliates to interact directly with approved vendors through a Web portal.
- Installed an additional Information Technology Acquisitions software distribution server, and upgraded the existing systems in preparation for expanded network distribution of student software

**Information Technology Support.** Information Technology Support (IT Support) is comprised of two units: the Virginia Tech Operations Center (VTOC) and University Computing Support

(UCS). IT Support furthers the university's missions of teaching and learning, research, and outreach by providing a 24x7, centralized, single point of contact for computing and telecommunications services support to all Virginia Tech affiliates through:

- Support and consultation on computer desktops/laptops
- Support for use of central computing, telecommunications, and multimedia services
- Development of software tools and utilities, such as the VTnet CD, to facilitate support of end users
- Reclamation of surplus computers to insure compliance with requirements set forth by Virginia Tech standards and guidelines
- Advocacy for the university community by presenting computing-related concerns and suggestions for ways to make computing offerings more user friendly

During the past year, Network Infrastructure and Services hired an assistant director who has been charged with creating and implementing a plan to more tightly integrate UCS with the VTOC as well as enhancing the level of service and support provided to the university community. Goals include improving the ability to address the university's technology concerns in a timely and professional manner, developing business processes to deliver the "right answer, right now," and implementing a methodology for assessing the university community's satisfaction with IT Support services.

The ongoing effort has included weekly staff meetings to facilitate the integration of the VTOC Call Center staff, which is tasked with taking initial calls to the 4Help phone number, with the second-level support provided by University Computing Support staff located in Torgersen Hall. The intent is to eventually replace the existing "call-back" model now used to provide UCS services.

Another initiative to move the integration of the two support centers forward is the use of an online, instant messaging "chat room" to post questions quickly to a larger group of technical experts. This "virtual office" concept allows members from both groups to quickly communicate problems, post questions, and collaborate on solutions.

Requests for information about or assistance with Virginia Tech Information Technology services may be received from faculty, staff, students, alumni, retirees, or prospective students. Regardless of affiliation, a person may report a problem at any time by calling the Virginia Tech Operations Center. In addition, people may report problems using the UCS Web form at <http://4help.vt.edu>. The VTOC provides first-level support for all phone calls and handles initial support for Web tickets during non-business hours. Calls and tickets may be escalated to other groups, including UCS, as necessary.

During the past year, IT Support has coordinated with the Microsoft Implementation Group in sponsoring the Windows Software Update Service (WSUS) program. The purpose of the project is to develop and deploy an infrastructure to service faculty and staff Windows systems and core Microsoft applications allowing for the timely testing, deployment, and automated installation of necessary patches and updates to reduce the number of vulnerable and exploited systems. Customers who utilize the service will have core Microsoft applications and operating systems



patched in a timely and secure manner resulting in fewer help desk calls, reduced exploitation of customer systems, and increased robustness of the entire Virginia Tech network. See <https://hokiespw.ais.vt.edu/wsuswiki/> for more detailed information about this important project.

The Virginia Tech Operations Center (VTOC) provides support of the services provided by Information Technology. The Center, located in the Corporate Research Center, serves the campus as well as other Virginia Tech locations around the commonwealth. It merges traditional call center and computing help desk functions with network operations, video operations, and systems support in an integrated operations center. The VTOC provides support 24 hours a day, seven days a week for telecommunications, Information Technology services, constituents' computing platforms, cable television, uplink operations, Video Broadcast Services, and NetworkVirginia problem-reporting. Tape backup services including loading/unloading of tapes, off-site rotation, location documentation, tape inventory monitoring, and data restores are available as well.



Virginia Tech Operations Center

The VTOC supports the unique needs of the university computing and network environment by receiving initial trouble calls or Web-submitted inquiries from faculty, staff, alumni, retirees, parents, and students. Problem tickets are opened to track the diagnosis, escalation (if required), and resolution of each reported problem. The VTOC provides proactive monitoring of faults and service degradation for Information Technology services, network hardware, and network connectivity components.

VTOC support, communications, and operations efforts during the period beginning July 1, 2005 and ending June 30, 2006 included:

- Received approximately 47,000 calls, the majority of which were resolved immediately.

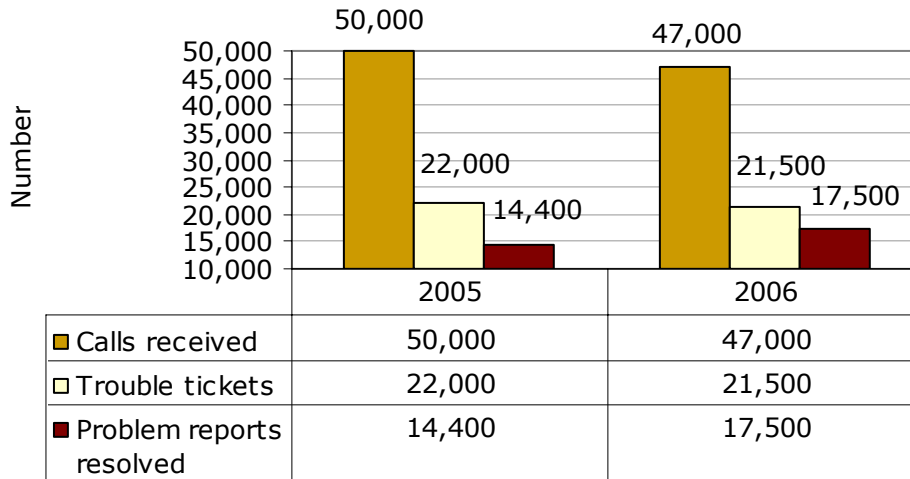
## Network Infrastructure and Services

- Created approximately 21,500 problem reports requiring additional investigation.
- Resolved approximately 17,500 problem reports
- Monitored the network and central servers continuously for service faults and degradation and escalated alarms to engineers as required
- Strongly encouraged use of MyVT, the 4answer Knowledge Base, *computing.vt.edu*, and VTnet 2005 CD for Virginia Tech network users, especially incoming staff and students

These services reduce the need for problem-report submission by allowing users to find information and complete system configurations more easily.

- Provided "24x7" call center services for faculty, staff, and students of the Edward Via Virginia College of Osteopathic Medicine
- Coordinated tours of the switchroom, Access Grid, and VTOC for various internal and external groups

Virginia Tech Operations Center-Total Calls and Problem Reports

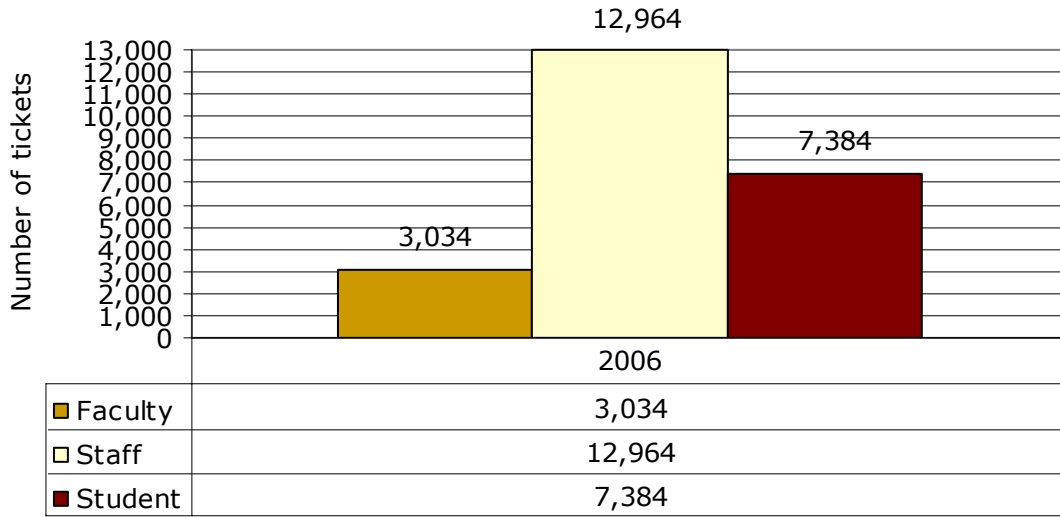


"Calls received" are total calls--the majority are handled immediately and do not require the creation of a problem report.

"Number of Trouble Tickets" includes "spam" received when accepting e-mail requests for assistance, prior to the transition to a Web-only trouble-ticket system.

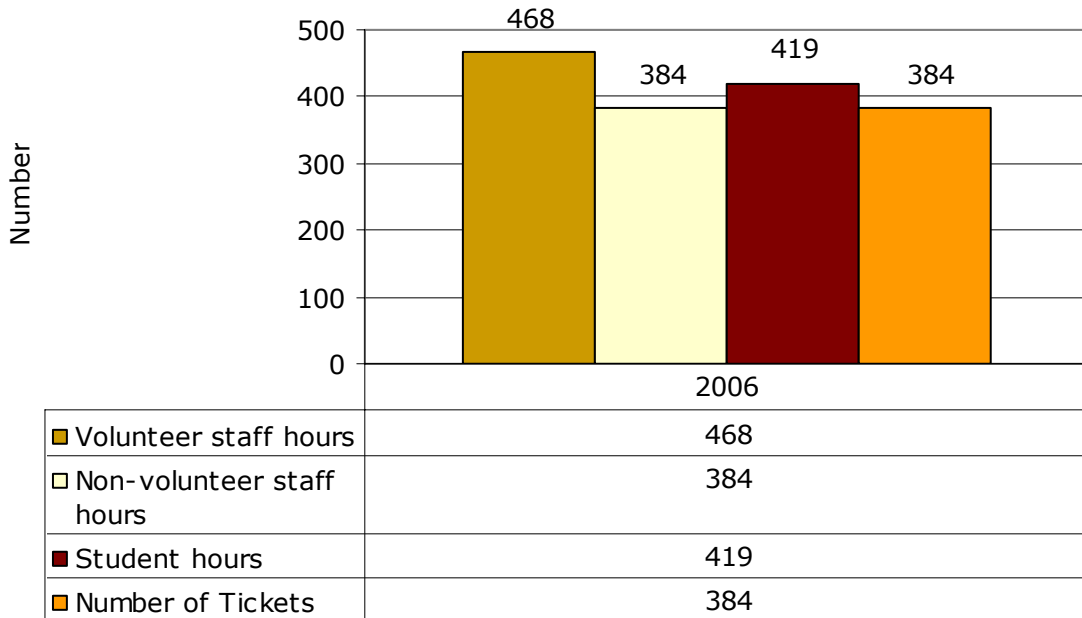
"Problem Reports Resolved" indicates the number of help requests received and subsequently resolved that required investigation and/or referral.

Virginia Tech Operations Center-Tickets by Affiliation



Fall Semester support. Supporting the information technology needs of new and returning students, faculty, and staff at the beginning of the Fall Semester is a critical function of the VTOC. The 2005 "Fall Rush" period was another successful support endeavor. Planning for this effort involved the training and scheduling of approximately 50 volunteers for 468 hours of extended support time. Training sessions were held to provide hands-on experience for volunteers. During this slightly greater than two-week period, the VTOC received over 4790 calls.

Virginia Tech Operations Center-Get Connected Tickets and Work Hours



Infrastructure monitoring. The VTOC has assumed responsibility for eHealth monitoring software operations and maintenance and works with other NI&S groups to define necessary escalation procedures. Additional, large display units, used to project the software, were purchased increasing the VTOC’s ability to monitor the status of critical systems, services, and infrastructure. VTOC equipment and workstation layouts were redesigned to provide better access to the enhanced infrastructure monitoring system.

Problem report flow. Incoming call distribution methods and problem-report flow methods were redesigned to improve efficiency in the handling of user inquiries. PCs used by the staff have been reconfigured to provide improved troubleshooting tools for multiple operating systems.

Uplink operations support. Support calls for classroom video playback are received in the Operations Center. Diagnosticians are able to initiate and terminate Teleport uplinks and downlinks and are available to provide support for that area whenever needed.

VT Employee Connect. Worked with University Leadership Development on implementation of VT Employee Connect program

This program is designed to provide computer access to Virginia Tech employees who do not use computers in the performance of their daily job responsibilities. Computer access allows these employees to:

- receive university communications and VT News
- check email

- check the Internet and VT home page for university policy information and announcements
- change personal information such as address and emergency contact information
- review other personal information such as benefits, pay stubs, etc.

Please see the following website for more detailed information about VT Employee Connect:  
[www.uld.vt.edu/mainfiles/programs/vtec.htm](http://www.uld.vt.edu/mainfiles/programs/vtec.htm)

Premium sports programming. Provided support for a pilot project broadcasting premium sports programming to various residence hall lounges.

Wireless network. Via Web tools, the VTOC helps departmental administrators to implement and support the sponsored wireless initiative. The group supports the wireless implementation in residence hall common areas.

Ombuds function. Participated on the Ombuds committee established by the Vice President for Information Technology for the purpose of responding to and resolving matters brought to management's attention by end users.

Social Security number to Virginia Tech ID number transition. Provided front-end support for the transition from Social Security to Virginia Tech ID Numbers as identifiers. This transition was especially challenging for alumni.

eToken. eTokens containing digital certificates were issued to staff members who provided feedback to the project developers on their advantages and ease of use.

Blacklisting. Another concern for many users—faculty, staff, students, and retirees—is the blacklisting of certain e-mail domains and addresses. A new procedure for understanding and addressing blacklisting concerns was developed to provide assistance to the campus community in this area.

Communications. When reporting or troubleshooting problems and advising the campus community regarding network or central application outages, accurate and timely communications are critical. Communications between the staff providing these services at 4Help and the VTOC have been improved. The campus community benefits from access to multiple locations where clear, consistent outage information can be found. The VTOC has been involved in testing and pilot phases for an Information Technology wiki and instant messaging to provide better communication among Information Technology staff and allow for a quicker response.

In an effort to provide access to IT Support knowledge resources to the university community, the VTOC serves as a communications hub for campus computer professionals through e-mail, website, and in-person visits. Online contact lists and procedures are continually developed and improved allowing immediate access to other Information Technology groups including middleware, Microsoft Implementation Group, Content and Knowledge Management, and Online Course Support. A Call Center "hotline" provides immediate access to the VTOC by

technical support staff and management. A dashboard website and listservs are used for faster dissemination of important information as well.

Operating policies, procedures, and documentation. During the period from July 2005 through June 2006, the VTOC made significant efforts to enhance documentation and update procedures to provide improved customer support services including:

- Online, on-call procedures to provide contact information for support and management personnel to ensure Information Technology system events requiring immediate attention are proactively escalated and resolved to minimize the impact to the university community. Paper copies are kept to protect operations if automated systems become inoperable.
- Redesigned VTOC operational policy for confidential data.
- Enhanced the internal Customer Support Center (CSC) Dashboard. The Dashboard is a webpage and portal with information and links to online support tools, the Knowledge Base, contact lists, and the on-call schedules.
- Enhanced tape mount requests for mail recovery using an automated notification system.
- Developed procedure for the Inn at Virginia Tech to enhance support for guest and conference wireless users. This process facilitates increased coordination between the support units at the Inn, the VTOC, and the wireless engineers at CNS.
- Added capabilities and procedures for more comprehensive VPN, wireless, and modem pool support after normal business hours.
- New, more automated tape procedures were implemented with the addition of a scanner to document tape transitions reducing errors and the time required for backup duties.
- Designed improved tracking and notification documentation for tickets requiring escalation.
- Worked with Mail team to support the Blacklist initiative.
- Assumed responsibility for administration of VTOC PCs and Macs.
- Documented cabling infrastructure with the VTOC.

Restructuring, staff development, and training. Major changes were implemented throughout the VTOC area to improve productivity, enhance customer support, and provide opportunities for staff to develop new skills and ensure they have access to all the applications the VTOC supports and are aware of new software acquisitions.

A new, formal training program includes weekly discussions on new procedures and refresher sessions for existing processes. The training sessions provide hands-on, interactive training, and a training coordinator position was created to facilitate the new program. Online training materials and tutorials are now available. Online guides and flowcharts have been developed to assist Call Center staff in quickly resolving common problems such as wireless connectivity and blacklisting issues.

Student workers from Torgersen were provided face-to-face interaction opportunities to increase familiarity, teamwork, and understanding of the VTOC's successes and potential for

improvement. VTOC staff visited James Madison University and hosted North Carolina State employees for ideas and experience-sharing to provide better support. Staff moved to a new physical location within the VTOC to improve job functionality.

The VTOC is anxious to attract and retain qualified employees and to promote the professional development critical to the effective delivery of Information Technology support and to meet the unique requirements associated with a 24x7 environment. Significant formal and on-the-job training in areas of customer support and infrastructure monitoring, configuration, and management has been completed for new staff members as well as for experienced personnel with a resulting decrease in the number of calls requiring escalation. Staff members are encouraged to take advantage of the free online and classroom training available at Virginia Tech to develop job-related skills. A program of cross-training for operators, diagnosticians, and Torgersen 4Help staff has been developed so personnel have a basic understanding of the support activities in all areas.

University Computing Support. University Computing Support (UCS) provides end user technical support for many of the information technology services offered to students, faculty, staff, and other Virginia Tech affiliates. These services include, but are not limited to:

- VT Mail
- Exchange Mail including mobile messaging
- Ethernet, wireless, and modem network connections
- Blackboard
- Hokie SPA and Banner
- Network-attached storage (NAS)
- Backup services

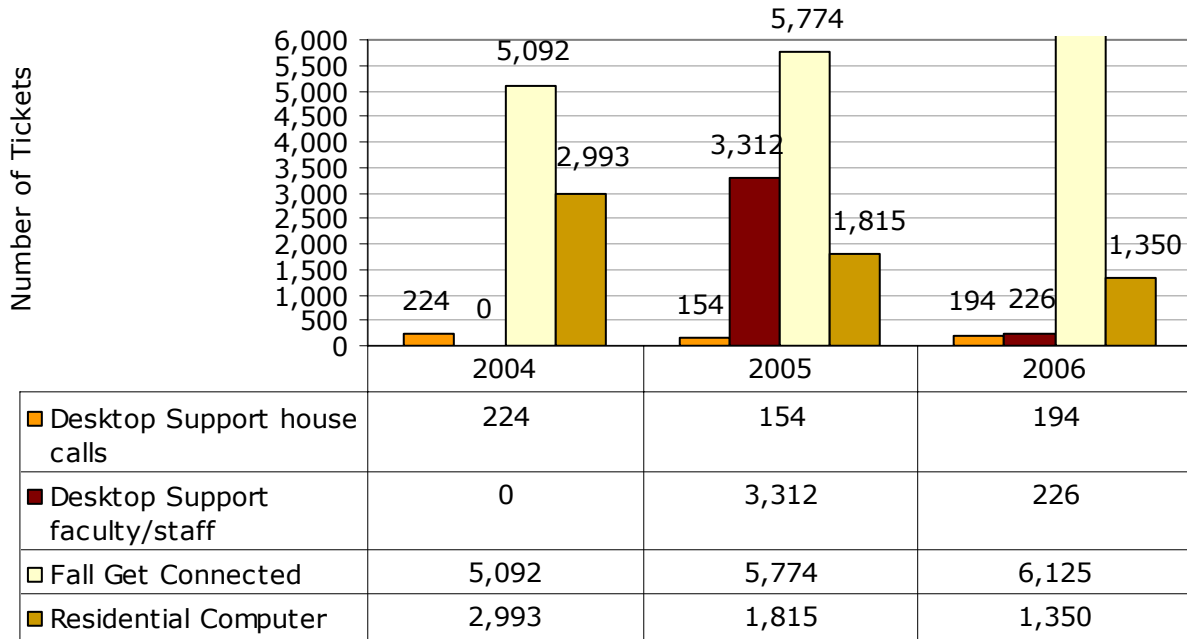
UCS provides assistance with general computing issues including:

- Computer security
- Virus and spyware removal
- Microsoft Office products
- General Windows and Macintosh computer issues
- Computer requirement questions

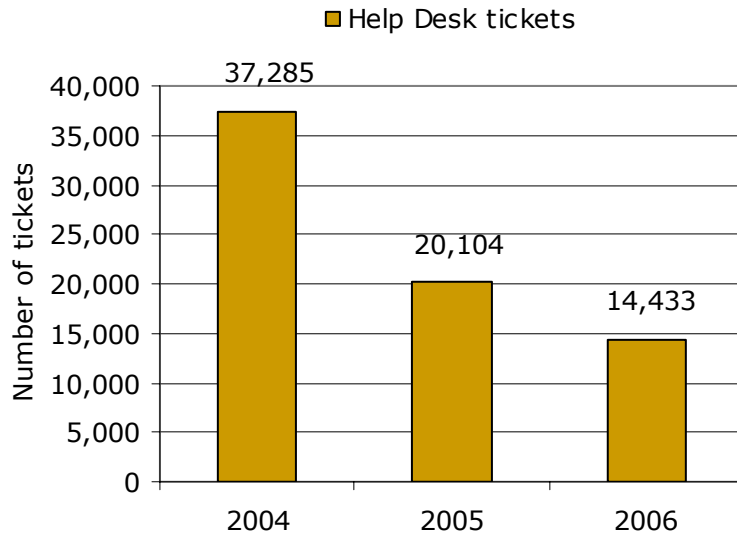
UCS statistics for the period of July 1, 2005, through June 30, 2006, with comparative data for the prior two fiscal years:

## Network Infrastructure and Services

University Computing Support-Support Tickets, Calls, and Visits



University Computing Support-Help Desk Tickets



As shown in the above graphs, the total number of tickets handled by UCS has continued to decline. In part, this decline results from our users being more familiar with Information Technology offerings and better able to support themselves. In addition, Information Technology is handling more virus and network attacks before they affect the end user.

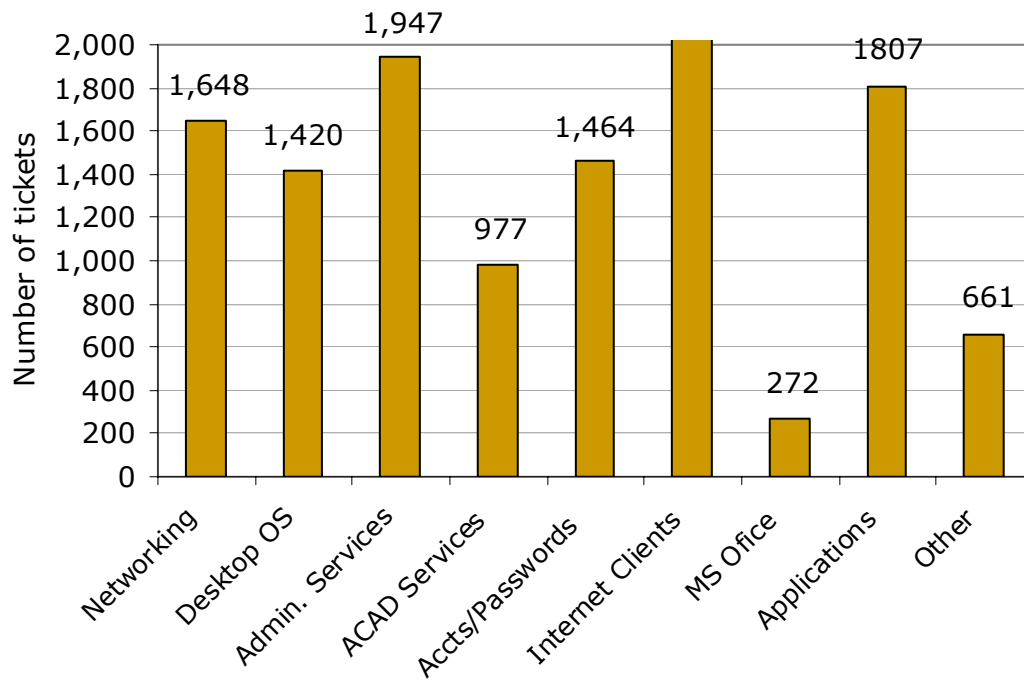


## Network Infrastructure and Services

UCS made more “house calls” to faculty/staff offices during FY 06 than in the previous year. There are now two people devoted to this area allowing us to provide direct computing assistance to more people. At the same time, more faculty/staff calls were handled by the general 4Help service as opposed to dedicated full-time staff since most of our student consultants have been with us long enough now to be familiar with all aspects of the Virginia Tech computing experience. Moving Banner to the Web made its support less complicated.

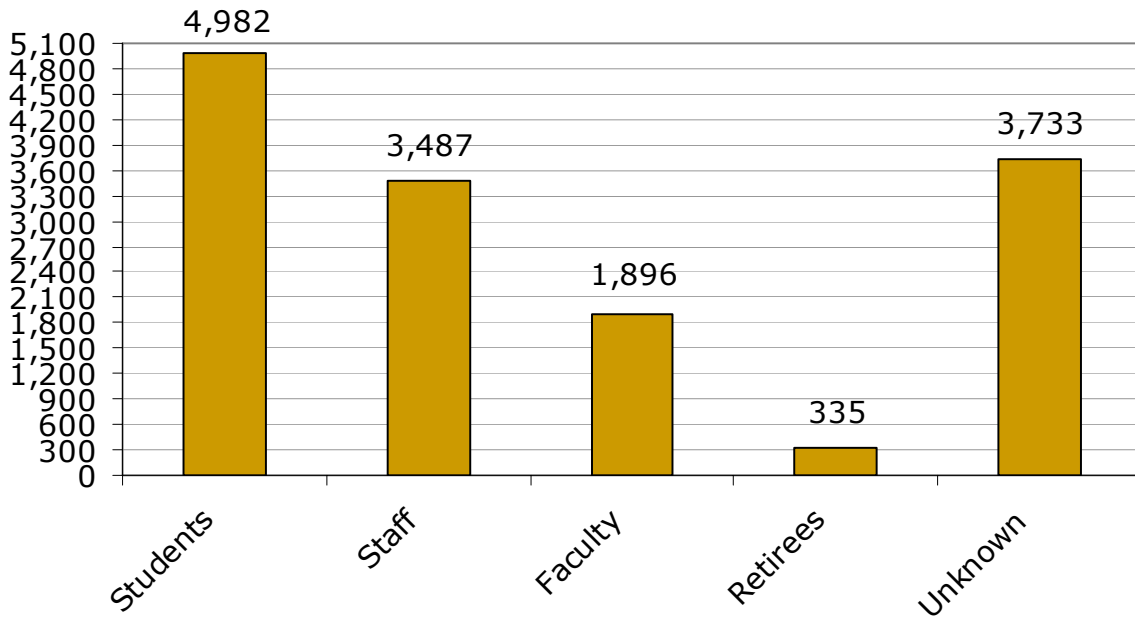
While the number of residence hall rooms visited by the Get Connected staff was up during the past Fall, the actual number of residence hall occupants requiring assistance was down. The number of residential computer consultant (RCC) visits was down from its all-time high in 2003-2004 when the Blaster Worm and several viruses spread through e-mail kept the RCCs busy.

University Computing Support-Tickets by Cause of Problem



Breakdown of Tickets by Cause of Problem. Internet clients, mainly Internet Explorer and e-mail clients, accounted for the largest number of problem tickets. Information Technology-provided applications and services such as Banner, e-mail, Filebox, hosting, network-attached storage, and Hokies domain issues also generate a large number of requests for help. Symantec AntiVirus questions dominate within “Applications.” “Acad Services” include Hokie SPA, LISTSERV, and Blackboard.

University Computing Support-Tickets by Affiliation



Breakdown of Tickets by Affiliation - Keeping in mind that many people have multiple Virginia Tech affiliations, we record, where possible, the affiliation of those seeking computing assistance. Students continued to ask for the most assistance but the quantity declined in relation to calls from faculty and staff. The number of questions from retirees continued to increase as did the questions from those without an active Virginia Tech affiliation such as alumni, prospective or admitted students, parents, etc. We expect that trend to continue.

Faculty/Staff Support. All faculty/staff problem tickets sent to 4Help are handled by student employees under the direct supervision of a full-time staff member. The student employees are familiar with, and able to provide support for, most VT Information Technology offerings. Any problems beyond the student's scope of knowledge are first escalated to a full-time UCS staff member who will research the problem, coordinate problem-solving with other groups within Information Technology, or decide if a "house call" is necessary to resolve the problem.

Two UCS staff members, both hired this year, and one backup employee work with faculty and staff to clear up any problems that cannot be otherwise solved. Primary areas of support include Banner, the Exchange service including PDA and SmartPhone services, Virginia Tech e-mail, Hokies Domain issues, and storage-related services such as Filebox, Hosting, and MyStore. In addition, the faculty/staff support group will visit departments, at their request, and assist with computer security recommendations.

Selected offices on campus are offered proactive and expedited support. UCS faculty/staff support personnel visit these offices twice each month to see if any problems exist and to apply security-related software updates. A support team member is paged "24x7" if someone from one of these offices submits a request for assistance. Special attention is provided during meetings of the Board of Visitors and sessions of the state legislature to assure any computer-related

problems are anticipated and handled in a timely fashion. These functions are increasingly being taken over by support organizations within the administrative units.

This group oversees the distribution of Academic Client Computers to the university community including the management of the list of those eligible to receive a computer, ordering the equipment, and master machine configuration. This year, 242 machines were deployed.

Student support. UCS provides support for student computing in several ways including:

- The New Student Orientation Computer security presentation
- VTnet distribution
- Fall semester move-in "Get Connected" program
- Residential Computer Consultant (RCC) program
- 4Help computing consulting service
- Walk-in support for selected problems like wireless setup.

These programs are supervised by full-time staff members, but most of the services are provided by student employees. In addition, UCS hosts the computing requirement webpage ([www.compreq.vt.edu](http://www.compreq.vt.edu)) which was redesigned this year and provides computing-related information for publication in the Hokie Handbook.

UCS staff members are vitally involved in "O" (Orientation) Team meetings, computer requirement meetings, and New Student Orientation. Student employees working at New Student Orientation (NSO) prepare and present an informational session for all incoming students and their parents which includes a video program emphasizing computer security. Incoming students pick up the VTnet CD during orientation so their machines are protected from viruses before being connected to the Virginia Tech network. As we say, "Get VTnet, Get Secure, Get Connected." In preparation for the meeting, each incoming student has with their academic advisor during NSO, UCS works with students one-on-one, if necessary, to ensure they have created a Personal Identifier (PID), know its password, and are authorized to register for courses online.

At the beginning of the fall semester, the Get Connected program helps students living in the residence halls connect their computers to the Virginia Tech network. Get Connected staff help ensure basic Internet applications, including e-mail and Web browsers, are working correctly by the first day of classes. Once the move-in period is over, students are supported by residential computer consultants (RCCs) in the residence halls and by the Student Help Desk.

Between 20 and 24 RCCs live and work in the residence halls, each one spending about 10 hours per week providing computer support to their fellow students. RCCs begin their official duties on the first day of Fall classes. They provide support for problems not able to be resolved by Help Desk staff and respond to direct requests for assistance. RCCs are charged with preparing and presenting educational sessions for student residents.

The Student Help Desk, staffed by undergraduate students under the supervision of a UCS staff member, handles telephone requests for assistance. Because the student workers are familiar with the student computer experience at Virginia Tech, they are ideally suited to provide this support.

## Network Infrastructure and Services

Most calls are resolved by phone although wireless network users are invited to bring their machines in for troubleshooting. Primary areas of student support include virus and spyware removal, Blackboard, VT Mail, wireless network, and Personal Identifier (PID) creation. In the past year, we have experimented with an appointment-based, walk-in service to provide a more formalized procedure and to offer assistance to those who live off-campus and need hands-on computing help. We hope to expand this service in the coming year.



University Computing Support—4Help at work

Other activities. In addition to direct support of end users, UCS manages the computers in the student consulting area, creates the VTnet CD, maintains websites such as [antivirus.vt.edu](http://antivirus.vt.edu)<sup>24</sup> and [lockitdown.cc.vt.edu](http://lockitdown.cc.vt.edu)<sup>25</sup>, researches and tests software offerings, and writes and updates KnowledgeBase articles. In other words, the staff is constantly looking for ways to make the Virginia Tech computing experience better and safer and to facilitate the creation and dissemination of information technology support knowledge to the university community.

UCS continues to refine our customized installer for Symantec AntiVirus in an effort to enhance the default protection level of the product. Most antivirus vendors, including Microsoft, are now offering products that provide protection from spyware and malware. UCS is investigating these products to find one providing maximum protection to our users' computers. A new version of Microsoft Windows is due out at the end of 2006. UCS is experimenting with the beta version of this software so we will be able to provide better support when the product is released. In addition, we are learning more about various PDA platforms as they relate to the Virginia Tech computing environment, and we are exploring the Tablet PC, required by the College of Engineering for the first time this year. Now that the Macintosh is Intel-based, we are learning about Windows on the Mac. UCS is getting ready for the leave report digital-signing pilot.

UCS hosts the TechSupport listserv where Information Technology announces new services and provides information on system outages to campus computer support professionals. The listserv is used by the support professionals for discussions of computer issues of general interest. Discussions continue on ways to enhance the communications channels with this group.

UCS works closely with the Information Technology KnowledgeBase team. New articles are written and existing articles updated or purged as necessary to keep the KnowledgeBase information as comprehensive and current as possible.

During the past year, UCS completed the move of its internal computing support pages—a central repository of important, up-to-the-minute information pertaining to the operation of the university’s network and known as Dashboard—to Web Hosting. The Dashboard consolidates links to support tools and consulting information in addition to providing status announcements. UCS is now experimenting with using a wiki for these pages. A wiki allows everyone to be responsible for and able to update content as needed. In addition, we are working with our VTOC colleagues on the pilot phase of a private, persistent chat room to create a virtual office since we do not all share the same physical space.

Training sessions are held three times per semester for the RCCs and Student Help Desk staff. Get Connected and Student Help Desk Boot Camps are held for several days before the start of the fall semester. Additionally, the RCC and Student Help Desk trouble tickets are reviewed by a full-time staff member who checks the responses for accuracy.

University Computing Support assures all computers auctioned by the Surplus Property Office, over 2,500 this year, have had all data wiped from their hard drives or, where that is not possible, making sure the hard drive is destroyed. A legal operating system is then installed on the machine. In addition to guaranteeing sensitive data are destroyed, Surplus Property is able to command a better price by auctioning a working machine.

UCS worked with others within the Information Technology organization to come up with procedures to improve our ability to support the increasing number of Virginia Tech retirees who need computing help. This assistance includes making sure retirees and their families understand the implications of depending upon PID-based services when the PID holder passes away.

UCS is a participant in the Women's Center *Violence against Women Act* grant and makes sure all staff members know how to refer someone seeking assistance.

**Network Registry services.** The Network Registry group provides support related to IP and IPv6 address management and registration and plays an important role in providing and managing the university’s information technology services to ensure their security, reliability, and availability. Network Registry services include the following:

- **IP Address Assignment.** Every host in the Internet has an IP address. This unit manages and tracks all addresses assigned to Virginia Tech.
- **IP Domain Name Service (DNS).** DNS provides a mapping between the host names and the IP addresses of the hosts. Almost every network transaction begins with a DNS lookup.
- **Dynamic Host Configuration Protocol (DHCP) Service.** Hosts registered to use DHCP obtain their network configuration information from the DHCP servers. This process allows registered hosts to be moved from one network to another without requiring the system administrator to reconfigure them. It simplifies the task of renumbering networks.

## Network Infrastructure and Services

- Design and development. The Network Registry unit develops new systems and tools to enable efficient and effective management of address management and registration services.

These services are used by every host attached to Virginia Tech's network and every host outside the network that interacts with hosts on the network. The supporting tools are part of the mechanism Virginia Tech uses to operate a reasonably open network while still being able to hold individuals accountable for their network activity. Network Registry Services:

- Provided support for the relocations and configuration of new networks required for the opening of the Inn and Conference Center,
- Re-configured central domain name servers to isolate the servers providing information about Virginia Tech to the outside world from the ones used by internal hosts to resolve both local and remote names.

Staff in this unit provided consulting and engineering assistance in the areas of networking, security, and system administration in support of special applications used by other groups within the university.

- Phil Benchoff chaired Virginia Tech Personal Certificate Authority/Hardware Selection Committee
- Phil Benchoff and William Dougherty served on the Virginia Tech public key infrastructure (PKI) Policy Management Authority. This group approves all policies related to certificate authorities at Virginia Tech. These documents will be used if we wish to get our root certificate recognized by a root authority, included among the trusted certificate authorities. The certificate will be installed in Web browsers, providing a means for users to sign documents electronically. As a result, recipients will have higher assurance of the sender's or signer's identity than just the sender's address or than PID/password authentication.
- Participated in the security evaluation of Noli software for the Graduate School Imaging project. Reported on the security aspects to upper-level Information Technology management and produced the materials used to educate the vendor on the architecture changes required for a reasonably secure system.
- As part of the NI&S mission to pursue aggressive development and expansion of new services, the unit provided the primary engineering for augmented IPv6 services on Virginia Tech's network.

## Technology outreach

### Blacksburg Electronic Village

The Blacksburg Electronic Village (BEV) exists to increase the availability and encourage the use of information technology to enhance social capital and broaden economic opportunity in Virginia communities.

Since its inception, the Blacksburg Electronic Village (BEV) has performed an important outreach effort by encouraging the community to come together through the use of technology. Focused on technology and community, BEV's aim is to increase, through outreach and education, the community's capacity to adapt to rapid changes in society and to use technology to solve increasingly complex community challenges.

BEV ([www.bev.net](http://www.bev.net)) remains one of the longest running and best known community networks in the world. Its early focus on building a data infrastructure has expanded as the private sector has increased its ability to meet demand for Internet service. Nevertheless, BEV remains central to ongoing community information technology efforts and continues to serve as the prototype community network infrastructure model through which Virginia Tech Information Technology and its partners work with communities. In addition, BEV remains the Web-hosting service provider of choice for many local civic and social organizations, including the Town of Blacksburg.

During the past year as a part of the Network Infrastructure and Services' strategic planning process, BEV developed specific goals and objectives for the implementation of its mission. This year's activities and achievements are listed below.

**Deployment of state-of-the-art infrastructure.** The Blacksburg Electronic Village endeavors to accelerate evaluation, testing, and deployment of state-of-the-art telecommunications infrastructure. BEV's director serves as a liaison to the Town of Blacksburg helping to reinvigorate the relationship between the university and the community. This collaboration allows the town to serve as a "field laboratory" and a national model for community technology issues. In support of this relationship during the past year:

- The director served as an *ex officio* member of the Blacksburg Telecommunications Advisory Committee, which meets monthly.
- The director served on the task force that revised the Blacksburg's comprehensive plan with particular emphasis as a facilitator and primary editor of the chapter

- pertaining to information technology.  
*www.blacksburg.va.us/comp\_plan/plan.php?url=master\_tocs/index.html*
- The director served on the committee that reviewed proposals for the redesign and revision of the town's website. *www.blacksburg.va.us/*

As a result of these efforts, BEV and its staff have significantly increased the level of communication between the town and the university. These discussions have laid the groundwork for increased collaboration, particularly on information technology infrastructure-related issues that need to be addressed in the years ahead.

BEV continues to provide assistance for civic and community organizations and to support valuable community-based information technology applications, services, and programs in town. For example, BEV's director frequently works with the BEV-Seniors group, and this year he facilitated a special Eagle Scout project for them with Boy Scout Troop 705. BEV loaned computers and consulting support to the scouts who developed training materials and taught classes for seniors to help them become more proficient with e-mail and the sharing and storage of photographs and pictures among loved ones. The Scout/BEV-Seniors program, covered in the local press, was well-received.

BEV's director attends the meetings of the telecommunications subcommittee of the local Planning District Commission (PDC). In an effort to encourage the development of a commercially viable and competitive environment for a converged telecommunications infrastructure, the PDC is pursuing the build-out of a regional fiber-optic network in collaboration with several nearby localities.

**Outreach.** BEV's outreach efforts focus on providing the broadest possible access for communities worldwide to BEV ideas, programs, infrastructure, and services. The Blacksburg Electronic Village continues to provide support—through the BEV-in-a-Box application—for the rapid and low-cost development of “e-Villages.” E-Villages have been established throughout the state under a Department of Commerce “Technology Opportunities Program” (TOP) grant for economically disadvantaged communities. BEV e-Village services include:

- Hosting e-Villages on BEV servers
- Communicating with and providing support for the Technology Leadership Teams
- Serving as an “honest broker” for those communities in search of consulting support, technical assistance, and funding and investment opportunities as they develop civic and commercial Internet-based activity



## Network Infrastructure and Services

### TOP: Registered "villagers" and "organizations" 2005-2006

| County         | Villagers | Organizations |
|----------------|-----------|---------------|
| Craig          | 62        | 16            |
| Cumberland     | 212       | 41            |
| Dickenson      | 60        | 2             |
| King and Queen | 349       | 16            |
| Louisa         | 72        | 6             |
| Total          | 755       | 81            |

Note: Accomack & Northampton e-Villages are hosted commercially

BEV continues to support the POWER (POWER Offers Web Economic Resources) intern program, begun under the TOP grant, which matches students (most from New River Community College in Dublin, Virginia, and the Woodrow Wilson Rehabilitation Center in Fishersville, Virginia) with businesses and civic organizations in the TOP counties needing "starter" websites. (See <http://power.bev.net/power.php> for more information.) These websites, furnished at no cost to the communities and offering learning opportunities to the interns, generally provide an initial static website as an "electronic business card" or "a billboard on the information superhighway."

The services are provided in conjunction with BEV's Community Connections and Virtual Business Incubator programs and are designed to give rural micro-businesses and civic organizations an initial Web presence. As those organizations have greater needs (for example, online shopping carts or donations), they are expected to find commercial hosting services that provide those functions in the marketplace.

In May 2006, BEV and its director received an "ADA Honor Roll" award from the university's Human Resources Department. The award recognized BEV for its role in establishing a relationship with the Woodrow Wilson Rehabilitation Center. The program has provided internships through Virginia Tech to individuals with disabilities enrolled in the various information technology training programs at the center. The interns have worked both on-site and virtually over NetworkVirginia.

BEV staff participated in direct support of several communities out in the field in the following ways:

- Provided technical support for a website development and maintenance class held at the Institute for Advanced Learning and Research for the Cumberland County Technology Leadership Team and e-Village participants.
- BEV's director assisted the Virginia Cooperative Extension Service's Community Viability Program and the local King and Queen County Extension agent in work with the Rappahannock Tribe of Native Americans. As a result, the tribe is in the process of pursuing several entrepreneurial enterprises with the potential to be marketed through the county's e-Village. In addition, BEV promoted a cooperative relationship between VT KnowledgeWorks, a technology business accelerator located

at the university's Corporate Research Center, and the Rappahannocks. VT KnowledgeWorks has agreed to work with tribal leadership on selected business-related issues and needs. These efforts remain proprietary at this time pending resolution of intellectual property issues.

- BEV's director consulted with the Planning Commission of King and Queen County and made a presentation on the significance of the Technology Assistance and Master Plan (TAMP) prepared for the county by Network Infrastructure and Services under the TOP grant.
- Louisa County has requested assistance in understanding and implementing their TAMP. BEV's director and appropriate NI&S staff are preparing to respond.
- BEV's director spoke by invitation at the national meeting of NSF EPSCoR (Experimental Program to Stimulate Competitive Research) directors on the topic of building demand for cyber infrastructure.

**Establish relationships to enable sharing of academic resources.** BEV works with various university colleges, departments, and programs to enhance course offerings through the use of technology and to increase direct involvement with outreach efforts suitable for Virginia communities. This year, BEV worked with the following academic areas:

College of Agriculture and Life Sciences. BEV continues to collaborate with Virginia Cooperative Extension, through its Community Viability program, to offer technology planning and e-Village opportunities in disadvantaged communities.

College of Science. The college is in the process of implementing a new program with the *T.C. Williams School of Law* at the *University of Richmond*. The program will prepare attorneys who have the scientific background to deal with the complexities of emerging and dynamic intellectual property (IP) law—the fastest growing field of law in today's technology-driven society. The key aspect of this unique program is the convergence of technology, society, and law. These attorneys will be particularly important in fields like bioinformatics and information technology where the number of IP issues is on the rise.

Students participating in the program need a clinical experience. BEV has been a partner in discussions to facilitate the establishment of a “virtual law clinic.” This clinic, initially offered through existing e-Villages, would expand the opportunity for students in the law program to provide support and assistance under the supervision of a clinical attorney. The parties involved are developing operational requirements for the virtual clinic and seeking funding in concert with the ongoing development of the program.

Edward Via Virginia College of Osteopathic Medicine. BEV initiated discussions with college leadership about the possibility of improving online access to osteopathic medical resources, particularly in Southwest Virginia. These efforts would offer an alternative service paradigm to the University of Virginia's “high end” telemedicine program.

Pamplin College of Business. Each year the BEV director, along with a representative of the IT Security Office, gives a presentation to classes on the subject of information technology audit. This year, Bill Sanders and Randy Marchany have initiated discussions with Professor Sam

Hicks about the possibility of creating a risk analysis and information technology security simulation that could be used to provide actual practical experience. The idea has been discussed with a representative of a Big Four accounting firm for possible sponsorship, and the initial reaction was quite positive. BEV will continue to pursue this idea in the year ahead.

College of Architecture and Urban Studies. In the context of developing its website support operation, BEV approached the Department of Art and Art History with its award-winning Visual Design Studio ([www.vds4.net](http://www.vds4.net)) about collaborating on the design and development of websites. BEV can now help its customers arrange graphic design services in conjunction with VDS4. The idea is to provide exposure to a broader range of technologies and skills for staff and student interns in both organizations.

Department of Communication. “Planet Blacksburg”, ([www.planetblacksburg.com](http://www.planetblacksburg.com)) is a student-run media outlet organization that publishes in multimedia format on the World Wide Web. Like the *Collegiate Times*, Planet Blacksburg is staffed primarily by students in the Department of Communication. BEV is in discussions with the department chair and with the sponsor of the student organization to learn how BEV (or Virginia Tech Information Technology) might help provide technical support to the effort, currently hosted commercially at the private expense of the sponsor.

### **Develop resources and partnerships to invest in community networks**

Software and hosting for human services. BEV staff wrote software and provides related services for client intake and referral among social service organizations in two separate projects: one for New River Community Action and the other for People Incorporated of Southwest Virginia, a human services integrator in the Washington County area.

To further support of health and human services in the region, BEV released the software from COSMOS, the Washington County project, as open source software this year. The software supports Congressman Boucher’s initiative to improve availability of and collaboration among health and human services agencies in the Ninth Congressional district. BEV continues to host the applications and support the software for Washington County.

In addition, BEV has provided a quote to One Care of Southwest Virginia (a Ninth District consortium of agencies) to serve as the provider of last resort for COSMOS services should One Care be unable to find a commercial provider or one who can provide these services at an affordable cost.

Rural sourcing. Locating a high-tech business in Southwest Virginia is one thing; staffing it for success is another. BEV has initiated discussions with appropriate partners, including the Virginia Community College System and the Woodrow Wilson Rehabilitation Center, about the feasibility of online human resource development to support “rural sourcing.” The idea is that among various entities, we have programs that could be combined to create a criterion-based learning environment, allowing individuals to test themselves for the skill sets necessary for employment in high-tech sectors. Information about where to acquire these skills could be linked with internship and apprenticeship opportunities and criterion-based tests to allow people to

demonstrate their knowledge, skills, and abilities, as well as build a portfolio. These portfolios could be presented to prospective employers or used to establish their credentials and sell services to high-tech companies anywhere.

Class VI water operator training. As an outreach effort and to assist the Commonwealth of Virginia's Department of Occupational and Professional Regulation (DPOR), BEV undertook, on a cost recovery basis, the scheduling of Class VI water operator testing in selected locations around the state. BEV and other NI&S staff scheduled classroom facilities and hired proctors in keeping with DPOR requirements, communicated with qualified water operator candidates, and registered the candidates for the test sessions. As a result, Virginia Tech and BEV provided a valuable public service. The project engendered goodwill among dozens of individuals who would normally not communicate with or have any connection to the university.

Website support service. BEV completed a successful pilot program for a new service to assist in the design and development of websites. The service—to be available both to university departments and external non-profit organizations—will be managed by a full-time employee and staffed by students using the same model as the student helpdesk. The service is scheduled to be in production by Fall, 2006.

### **Enhance support for BEV efforts in communities**

New Century Technology Consortium CIO Forum. At the request of the Vice President for Information Technology, the BEV director is serving on the steering committee for this organization. The initiative is designed to create a forum in which small-company CIO's and technology employees can exchange ideas among themselves and through which they can collectively arrange for access to training and other resources their organizations could not afford individually.

Mental Health Association of the New River Valley (MHANRV). BEV's director, as part of an effort to participate in selected community groups, is serving on the board of this organization. Its collaborative partnership with the Free Clinic of the New River Valley exposes BEV to the health and human service needs in the region and provides opportunities to create synergies and to leverage technology infrastructure in support of such services. BEV hosts the website for the MHANRV.

The Community Foundation of the New River Valley (CFNRV). The foundation is a philanthropic organization offering donors an opportunity to give locally and see their money used in the community. The CFNRV will award nearly \$50,000 this year alone in grants and awards, most in amounts \$500 or less. BEV's director is serving as a Community Advisor to the CFNRV, serves on the development subcommittee, and is consulting on the redesign of the foundation's website, currently hosted by the BEV. The activity helps significantly in establishing communications with and among community leaders.

**Blacksburg Electronic Village core functions**

Over the years, BEV’s core functions have evolved in response to changing community needs. With the advent of commercial internet service and e-mail providers, demand for those services from BEV has declined. “Community Connections” (noncommercial) accounts now comprise the largest portion of the customer base. A summary of core function activity appears in the table(s) below.

Blacksburg Electronic Village (BEV) Services

| Service                                  | FY 2004-2005 | FY 2005-2006 |
|--|--------------|--------------|
| Domain Name Service                      | 227          | 230          |
| Websites (Full Service)                  | 63           | 66           |
| Websites (Community Connections)         | 125          | 123          |
| E-mail boxes                             | 503          | 504          |
| E-mail lists                             | 128          | 157          |
| E-mail volume per week (valid messages)  | 17,000       | 23,000       |
| E-mail volume per month (valid messages) | 74,000       | 100,000      |
| E-mail volume per year (valid messages)  | 884,000      | 1,196,000    |

**EDUCAUSE Net@EDU wireless networking group**

“EDUCAUSE is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology.”<sup>1</sup> “Net@EDU is a member-driven program of EDUCAUSE whose mission is to promote thought leadership on advanced networking in higher education. Membership comprises information technology leaders from higher education, state networks, and industry. Members work together in advancing the evolution of a global networking environment to best support the transformation of education and research through information technology. The activities of Net@EDU members span the spectrum of academic networking, from administration of campus networks to local, state, regional, national, and international networking projects. Net@EDU provides individual members a forum for discussing issues they deem important to the higher education community and the opportunity to work with colleagues who share those same interests.”<sup>2</sup>

“The working groups of Net@EDU offer members the opportunity to collaborate by pooling their resources, time, and energy to develop winning strategies for networking in higher education. While their goals may differ, the various working groups share the common characteristic of providing a forum for thought leadership on networking issues of pressing interest.”<sup>3</sup>

John Nichols and Richard Hach serve in leadership positions in the Net@EDU Wireless Networking Group. The Wireless Networking Group explores “the application of wireless

<sup>1</sup> EDUCAUSE membership, <http://www.educause.edu/Membership/5>

<sup>2</sup> Mission of Net @ EDU, <http://www.educause.edu/OrganizationandPolicies/3041>

<sup>3</sup> Net @ EDU working groups, <http://www.educause.edu/WorkingGroupsandCollaborations/412>

networking across the full spectrum of wireless technologies, including those for fixed, portable, and mobile applications. Focus areas include tracking technology developments, regulations, applications, security, and deployment issues that may be important to higher education.”<sup>4</sup>

The Wireless Networking Steering Committee meets via bi-weekly conference calls with discussions posted to the team website. Committee member universities currently include Virginia Tech, University of Chicago, New York University, Pennsylvania State University, and University of North Carolina at Charlotte. The Wireless Networking Group teleconferences with members of the Integrated Communications Strategies (ICS) Steering Committee to plan for joint programs at major conferences. ICS members include the University of Virginia, Macon State College, the Chief Technology Officer for the District of Columbia, Colorado State University, and University of Iowa.

Over the last year, the Wireless Group:

- Planned programs for meetings at the annual EDUCAUSE and Net@EDU conferences, including joint programs of mutual interest with the Net@EDU Integrated Communications Strategies Working Group
- Kept abreast of spectrum and regulatory developments
- Developed vendor relationships and arranged for vendor presentations to keep abreast of technology
- Provided information on standards and emerging technologies to members via the group website and listserv
- Tracked developments for outdoor and community wireless networks
- Began development of a radio spectrum report and plans for vendor collaboration on spectrum analysis

### eCorridors

The eCorridors mission is “To create competitive advantage by facilitating the deployment of advanced technology infrastructure and applications leveraging inter-regional connectivity for, and collaboration among, communities.”<sup>5</sup> The eCorridors Program is an economic development and outreach program of Virginia Tech that is focused on a long-term vision of facilitating the development of next- generation network infrastructure and services in collaboration with interested communities in Virginia. As the build-out of the interstate highway system increased economic development for communities along its route, "eCorridors" are electronic Internet routes that, when fully completed, will resemble a grid, or mesh, of network connectivity into and out of every community throughout the Commonwealth. These networks will be specifically designed to enable communities to leapfrog existing technologies and provide next-generation

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<sup>4</sup> Net @ EDU Wireless Networking Group, <http://www.educause.edu/WirelessNetworking/933>

<sup>5</sup> eCorridors website at <http://www.ecorridors.vt.edu/about/mission/>

network access for such purposes as economic development, quality of life, education and workforce training.<sup>6</sup>

Network Infrastructure and Services personnel serve on the eCorridors team to provide engineering support. The eCorridors team acts as a facilitator and catalyst for the development of creative partnerships with municipalities, public utilities, nonprofit entities, and private sector companies to combine resources and expertise for the deployment of advanced, broadband network infrastructure and services.

Over the last year, Network Infrastructure and Services participated in several eCorridors' projects:

- New River Valley Planning District regional fiber-optic network project
- Pulaski County community wireless network
- City of Bedford municipal wireless RFP and analysis of responses
- City of Danville wireless network trial
- Collaboration with broadband service providers to promote broadband deployment: Mid-Atlantic Broadband Cooperative, D-Tel, iTown, Digital Bridge Communications, Technology Management Partners, Pacific Broadband Networks, Conterra Ultra Broadband, Citizens Telephone Cooperative, Verizon
- Consulting for a Southampton County WISP startup
- Provided speakers for eCorridors seminar for the Redwood Technology Consortium meeting
- Served as invited speaker/expert on municipal broadband and the strategic planning of wireless infrastructures for municipalities at MuniWireless 2006 Conference in Atlanta, Georgia

### The VTTI "Instrumented City"

In January 2004, Communications Network Services assisted the Virginia Tech Transportation Institute (VTTI) in planning for wireless transport to allow the collection of video and data from sensor controllers at traffic light locations in the Blacksburg area. Begun in September 2001, the "Instrumented City" project is the first of its kind in North America. It provides a real-life research test facility to monitor traffic flow, traffic safety, noise, air pollution, and other factors. Earlier deployment of traffic count sensors in Blacksburg used a low-speed wireless network for telemetry, but higher speeds are needed for video, data, and Internet access.

VTTI partnered with the Town of Blacksburg for deployment of sensor equipment and video cameras. CNS assisted VTTI and the town with technical specifications and an analysis of wireless alternatives. The town issued a request for proposal on July 23, 2004, for mobile wireless Internet services to meet the needs of VTTI, homes, businesses, educational institutions, local governments, and other public organizations. The Blacksburg Transit Authority planned to

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<sup>6</sup> eCorridors website at <http://www.ecorridors.vt.edu/about/mission/faqs.php>

use the wireless service to monitor the location of busses and to provide Wi-Fi Internet access to passengers.

Citizens Telephone Cooperative responded to the RFP, but subsequently decided to independently deploy an advanced mobile wireless Internet service in the New River Valley region. The service may be used by VTTI and is planned for use by Blacksburg Transit and the Town of Blacksburg. It became available in Christiansburg, Radford, and parts of Blacksburg in early 2006. Full coverage in Blacksburg is planned for August 2006.

The Qualcomm-Flarion wireless technology deployed by Citizens is using the 700 MHz band that provides better penetration through foliage and inside buildings than cellular/PCS phones operating in the 1900 MHz band. The technology supports downstream speeds up to 1 Mbps with low latency and is able to support voice, data, and video over IP.

### **Fiber to the premises network for the New River Valley region**

The New River Valley Planning District Commission (NRVPDC) Telecommunications Committee, which meets monthly, asked Virginia Tech's eCorridors group and Network Infrastructure and Services to develop a system design with estimated costs for a regional fiber-to-the-premises community network. The region includes Floyd, Montgomery, Pulaski, and Giles counties. The scenario proposed was to deliver gigabit Ethernet access to approximately 120 sites initially, including local governments, education, healthcare, industrial parks, and major industries.

The committee envisions forming a nonprofit entity to manage the provision of open access transport to support economic development. While no single project is a total solution for all economic development needs, the lack of a regional fiber-optic network is viewed as a major barrier to the future economic well-being of the New River Valley.

John Nichols, Senior Information Technology Manager, led the design team, which included Seth Peery of eCorridors, NRVPDC staff, and key members of the New River Valley Telecommunications Committee. Cisco Systems and Corning Cable provided information and pricing for the proposed equipment and cable. Seth Peery used GIS tools to plan fiber-optic routes and to estimate costs for materials and labor. The plan is available at [www.nrvpdc.org/NRVTelecomPlan/NRVTelecomPlan.html](http://www.nrvpdc.org/NRVTelecomPlan/NRVTelecomPlan.html).

As of June 2006, plans are being developed to build an initial section of the fiber-optic infrastructure between Pulaski and Dublin.



## Video/Broadcast Services

Video/Broadcast Services (VBS), led by Mark Harden, produces broadcast-quality instructional video and advanced multimedia instructional materials. The group operates and maintains network-based systems to deliver live and prerecorded class materials both on-campus and to distance-learning students. Through the development, production, and distribution of synchronous and asynchronous instructional content, VBS supports the university's missions of teaching and learning, research, and outreach.

VBS has provided the university and the commonwealth with avenues for distance learning for more than 20 years. About a decade ago, Virginia Tech expanded distance-learning opportunities as a response to the higher costs involved with 'brick and mortar' campuses. That effort led to the interactive asynchronous transfer mode network, managed by Virginia Tech, which now reaches all corners of the state and has delivered coursework for thousands of Virginians.

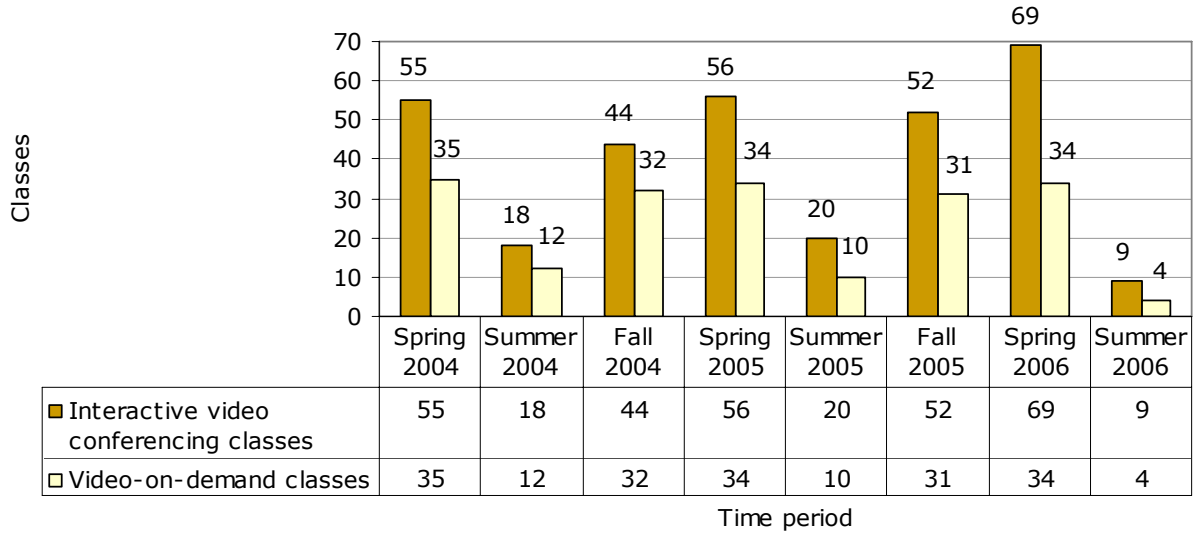
During the past year, VBS has concentrated their efforts in support of the H.323 Conversion Project, which will provide higher quality and more reliable videoconferencing solutions and services using newer protocols and improved instructional technologies. H.323 systems will provide enhanced instructional delivery at the same time VBS continues to furnish servicing of videoconferencing facilities through event management, on-site technical support, and advanced engineering support. As videoconferencing transfers to an Internet protocol (IP) delivery method, even wider distribution of Virginia Tech class material will be facilitated and more university departments will expand their offerings to include greater distance-learning opportunities. In addition, VBS continuously evaluates the infrastructure and proactively plans to respond effectively to the university's technology needs, providing maximum stability, availability, and reliability in production and distribution services.

Interactive videoconferencing is one means by which the university maintains its commitment to distance education. VBS maintains and operates electronic classrooms throughout the state for the interactive video conferencing (IVC) network, providing full-service connectivity, real-time management and monitoring, instructor training, technical assistance, and diagnostic support. VBS coordinates the scheduling of interactive videoconference and video bridging services to the university's distance-learning classroom facilities, as well as to non-Virginia Tech facilities, e.g. other universities and the community college system. VBS offers live and on-demand streaming media servers to support classes, projects, and special events. Problem resolution for the network is available through the Virginia Tech Operations Center.

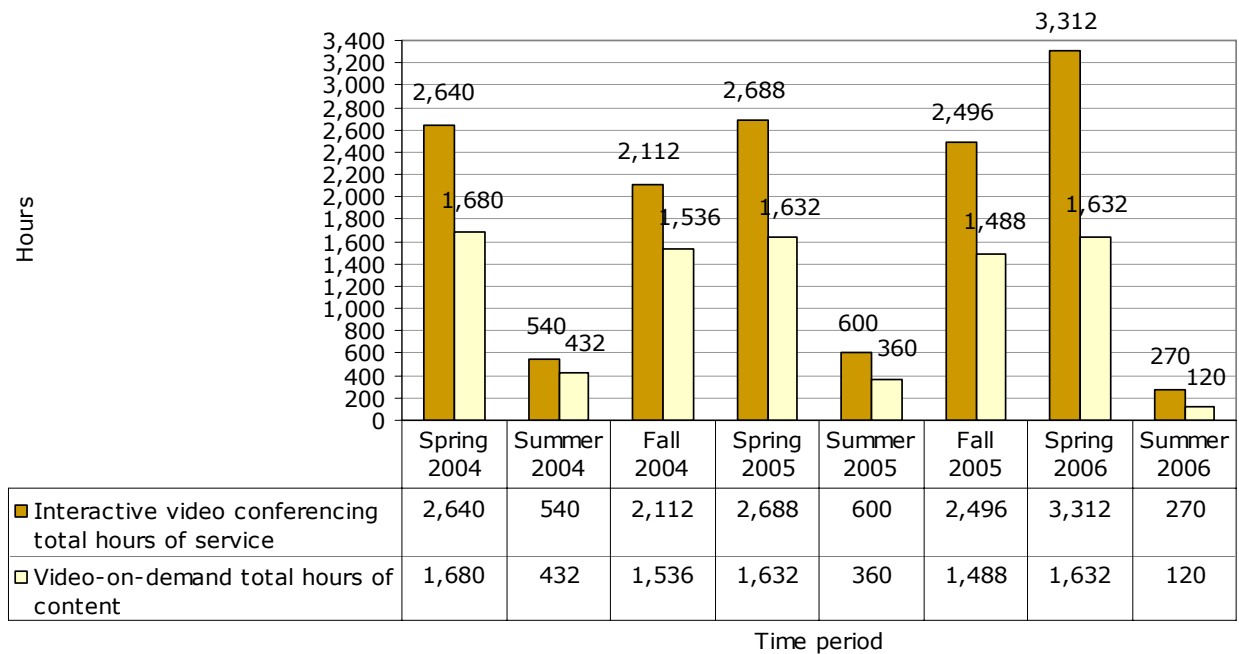
## Network Infrastructure and Services

Over 232 classes received “live-class support” for interactive video conferences (IVC) and video-on-demand over the recent year:

Video/Broadcast Services-Interactive Conferencing & Video-on-Demand Classes



Video/Broadcast Services-Interactive Conferencing & Video on Demand Hours



Beyond distributing classes, videoconferencing provides a path for Virginia Tech experts to reach out with research and applications, which can be critical to the citizens of Virginia. It has become a primary means of fulfilling the university’s outreach mission. Academic use of the system usually occupies the afternoon and evening hours. However, off-peak demand hours

provide significant opportunities to serve the videoconferencing needs of Virginia Tech's outreach and research initiatives.

### H.323 conversion

While the asynchronous transfer mode delivery of Commonwealth Graduate Engineering Program courseware proved reliable and effective for almost a decade, the transfer to an Internet protocol system was necessary for several reasons:

- The asynchronous transfer mode equipment being used was past its expected lifespan, and replacements were difficult to find,
- Current courseware development is moving in the direction of IP,
- Internet protocol delivery will reach a larger audience, potentially worldwide, for Virginia Tech classes,
- IP conversion provides an opportunity to improve instructional capabilities,
- IP network standards allow the establishment of a Quality of Service (QoS) framework,
- As a top-tier research university, Virginia Tech has an obligation to lead the way in the use of new technologies.

The conversion from ATM to H.323 IP-delivery required the replacement/refitting of 40 ATM sites across Virginia, including 10 on the Blacksburg campus. These systems carry approximately 50 classes to an average of 1000 students each semester. As a necessary, cost-saving measure, the conversion was planned to allow for the retention of most basic equipment in both origination and receive-only sites. However, a great deal of new equipment was installed resulting in a much-improved learning environment. The conversion has provided greatly enhanced instructional capabilities including the ability for the instructor to view several class sites at once, and the deployment of a live and archived streaming interface for video and data allowing students to "discuss" the class.

Conversion to IP bridges required a major upgrade to the bridging capabilities of the Video Network Operations Center in Blacksburg. Two new Codian bridges have 20 ports each and are expandable as necessary. The new bridges feed two IP VCRs – basically large hard drives capable of recording video so it can be encoded for streaming and archiving. The system includes two "gatekeepers" which provide greater security and address resolution/certification. Finally, the new bridges can inter-convert ISDN and IP signals, allowing the transmission of Virginia Tech classes to client sites which may not be IP-compatible. See [www.vbs.vt.edu/Vbsguide/vbsroominfo.html](http://www.vbs.vt.edu/Vbsguide/vbsroominfo.html)

### **Redundancy/failover design and increased storage capacity**

Classes supported by the streaming media capabilities of VBS generate approximately 10 gigabytes of content per week which must be stored and streamed on demand. In the summer of 2005, VBS began an upgrade of its distance learning video streaming server.

The servers added to the mix provided a low-cost, immediate upgrade to VBS streaming activities and can be easily scaled as need demands. The addition to the array allows redundant storage of files insuring that a failure of one server would be immediately covered by another.

In addition to a massive upgrade of storage capacity, the new scheme separates file-reading and file-writing functions. An instructor's class goes in one side of the array; a student's request to view the lecture is accommodated from another side. This separated design increases system security and guards against system failure. Further, the separation of server functions allows the performance of system maintenance on one side of the server while the other side shifts immediately to failover mode, ensuring seamless operation of the system.

The next phase of the upgrade, planned for Fall 2006, will establish distributed servers in Virginia Tech locations away from the Blacksburg campus. These servers will reduce the load on the main VBS array by performing server functions specific to an area. For example, if a student in Alexandria requested a file, that file would be immediately moved from storage in Blacksburg to the appropriate server in Northern Virginia. As a result, the student would be able to watch the file from a local server, which will enhance connectivity, image quality, and the overall learning experience.

### **Certification for water treatment plant operators**

By law, water treatment plant operators in Virginia are required to maintain proficiency through certification classes and exams. For several years, Associate Director Jack Lilly, Continuing and Professional Education, has had grants to meet these instruction/certification needs. These workshops cover a variety of topics aimed at helping water treatment plant operators maintain their professional certifications.

The classes are offered to owners, managers, and operators of all water utilities in Virginia, from the smallest to the largest, and are broadcast simultaneously to 14 locations throughout the commonwealth. These sites include all the Virginia Tech/VBS off-campus facilities—Northern Virginia, Richmond, Roanoke, and Hampton Roads—as well as the community college system and several other universities. Since July 2004, 41 classes have drawn a total attendance of more than 2000.

The use of IVC technology affords these professionals convenient access to real-time, high-quality instruction and minimizes disruptions to their work schedules. The programs are produced by VBS department head, Mark Harden, who provides the planning and coordination of the IVC program delivery. VBS-provided services include videotapes and DVDs of the individual lectures, which are made available to students in the event of a missed class.

### Engineering Cultures

“Engineering Cultures” has served as the prototype for the multimedia instruction efforts of VBS and has become a highly visible component of the university’s instructional technology and distance-education programs. The class explores the impact of the engineering arts on societies and cultures. The original editions were on CD-ROM, and the illustrative material was streamed. The instructor, Professor Gary Downey, makes annual revisions to the content and delivery of the program.

The most recent revision is the result of enhanced technology. “Engineering Cultures” has become “Engineering Cultures ONLINE.” Converting the program to an online model eliminates the costly duplication and handling of several hundred sets of CDs which, in turn, allows a price decrease for students.

The transition from disc-delivery to online-interactive distribution required a major retooling of the program structure by VBS producers, and greatly expands the program’s functionality by allowing virtually instant access to any point within the program’s 30 hours of content. The online edition increases the security of the material by requiring a Virginia Tech userid and password for access.

The online edition opens an avenue to off-campus registrations for working professionals, including alumni. Through the auspices of the Department of Continuing and Professional Education (CPE), business and engineering professionals can earn CEU credits or certification as they expand their understanding of other societies.

### Other projects

**Choices and Challenges.** The Choices and Challenges forums bring eminent philosophers, scientists, historians, sociologists, and policy analysts to the Virginia Tech campus to participate in discussions that examine the social and ethical aspects of advances in science and technology. The 2005 forum considered the ethical issues involved in the increasing use of drugs for the treatment of depression and anxiety. The production involved multi-camera location recordings of live, public, panel discussions. The programs were post-produced and edited for use in Virginia Tech classes.

**Building Construction class.** VBS provided on-location recordings of seminar speakers during Spring and Fall 2004 semesters. This series of lectures was encoded for video-on-demand to support a Fall 2005 and a Spring 2006 Building Construction course.

**Satellite uplink projects.** In coordination with University Relations, VBS provided live satellite broadcast interviews with Virginia Tech faculty members and Athletic Department personnel to television networks and stations. One notable example was the announcement of a charity auction to benefit victims of Hurricane Katrina. The auction was co-sponsored by Virginia Tech men’s basketball coach, Seth Greenberg.

**American Association of Collegiate Schools of Business interview.** Dean Richard Sorensen of the Pamplin College of Business recorded an interview about the university's accounting curriculum for the American Association of Collegiate Schools of Business. VBS provided audio and video recording in its television studio and mastered the footage to DVD.

**Computer security.** VBS completed a series of highly-produced spots emphasizing the importance of the security measures individuals should use to protect their own computers, prevent identity theft, and protect the university computer network. The spots are aimed at students and staff and will be used for summer orientation sessions. They are available as streaming video from the VBS website.

**Atlantic Coast Conference international programs.** Facilities and support were provided by VBS for two interactive, videoconference meetings of eleven ACC schools' international programs officers.

**Oral history for Christiansburg Institute.** The Christiansburg Institute, founded in 1866, was the first high school for African-American students in Southwest Virginia and was known for its academic excellence. It served students in the New River Valley for a century before closing in 1966. VBS videotaped a collection of the reminiscences of Mrs. Rosa Holmes about the Christiansburg Institute. Mrs. Holmes is a prominent educator and civil rights pioneer in Montgomery County. The interviews will become part of the Christiansburg Institute archive collections, and copies will be placed in the Newman Library Special Collections.

**Engineering Excellence Presentation.** Sponsored by College of Engineering, VBS produced an on-location recording of a presentation by Elon Musk, the founder of Pay Pal and SpaceX, a private space launch company. VBS converted the presentation to multimedia for online and DVD delivery.

**The Patient Art.** For the Department of Interdisciplinary Studies, VBS digitally re-mastered a DVD of a video documentary about a group of African weavers visiting Virginia.

**Diversity seminar.** VBS managed location coverage and the recording of a two-day seminar concerning educational and societal diversity for Office of Multicultural Affairs.

**Women in Education.** The group handled location coverage of a seminar concerning the opportunities and challenges faced by women faculty members, especially in the sciences. The video will serve as documentation of the seminar and related discussions.

**Accounting presentation.** For the Pamplin College of Business and the Department of Accounting and Information Systems, a studio recording of an award-winning presentation by Virginia Tech accounting students was produced.

**Computer Science tour and mentoring.** Students enrolled in the Department of Electrical and Computer Engineering took a tour of VBS facilities to learn about video production techniques and interactive videoconferencing. VBS assists and mentors those students who want to become

more deeply involved in the merging of computer technology and traditional video/filmmaking techniques such as special effects, lighting, and sound.

**Forest landowner lectures.** VBS will produce and process the video files for video-on-demand for the lecture series, multimedia presentations demonstrating best management practices in conservation, harvesting, income enhancement for landowners and managers of large tracts of mature forest land.

## Business Administration and Operations

Network Infrastructure and Services is supported by four distinct business administration and operations units. The Business Technologies and Services group is led by Pat Rodgers and includes Ordering and Provisioning, Business Services, and Public Relations; Systems Development and Administration is led by Morgan Allen; Network Administration, is led by Richard Hach; and Field Engineering and Safety is led by John Pollard. These groups support the daily enterprise business activities and operations of the organization.

## Business Technology and Services

Business Technology and Services encompasses three major areas: Ordering and Provisioning, Business Services (including: Accounts Payable / Telecommunications (or Telco) Vendor Billing, and Accounts Receivable and the Student Telecommunications office), and Public Relations (including Web Page Content, Graphics Design, and Information Architecture; Customer Support Services; the University Switchboard; and the Communications Network Services' Receptionists). These areas support the day-to-day operational activities and facilitate the business and administrative needs of Communications Network Services, University Printing Services, University Mail Services, Video/Broadcast Services (VBS), the Blacksburg Electronic Village (BEV), Systems Support, University Computing Support (UCS), and the Virginia Tech Operations Center (VTOC). Business Operations facilitates transactions between the various Network Infrastructure and Services departments and their clients, including students, university faculty and staff, vendors, the Commonwealth of Virginia, and other Network Infrastructure and Services partners and constituents. One of the group's major objectives is to respond to all customer inquiries in a professional and timely manner, as we endeavor to improve our processes, refine our business practices, and provide enhanced services. We strive to balance information-gathering with decision-making to support the timely implementation of service offerings to meet identified needs. Business Operations is charged with ensuring these functions are carried out in accordance with university policies and procedures and industry best practices.

In November 2005, Business Services and Network Administration Telco Vendor Billing staffs were restructured and realigned into a new Business Services unit with two distinct areas—

Accounts Payable/Telco Vendor Billing (AP/TVB) and Accounts Receivable (AR)—each with its own manager reporting to the director for business operations.

The new structure created an opportunity to better meet the needs of our customers, both internal and external, and to enhance the ability of NI&S to make timely and cost-effective decisions to support our daily operations and long-term initiatives. As NI&S continues to grow and to provide new services, it is important that the supporting infrastructure be evaluated and modified to better support a changing organization. The realignment allows better utilization of personnel and expertise in these areas, expands the base of knowledge and experience for both staffs, and provides a broader base of cross-training and back-up resources.

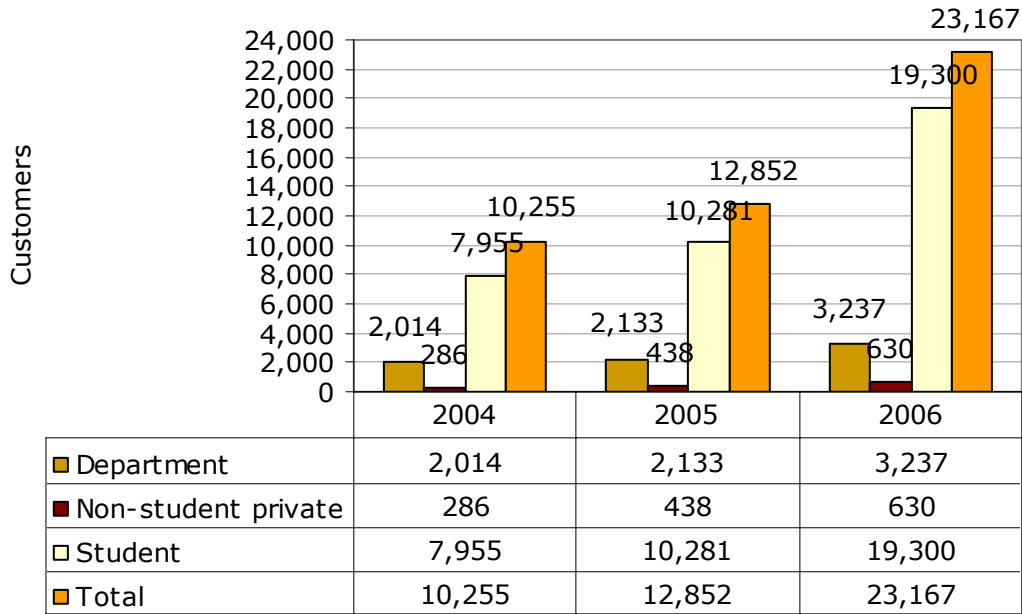
**Wireless local area network guest services.** Virginia Tech has a large volume and wide variety of visitors on campus daily. Many of these guests have a need for quick, ubiquitous access to wireless network services. To address this need, a new administrative service model and rate structure were developed enabling rapid, efficient account activation and deactivation for these customers. All areas of Business Operations participated in the implementation of the pilot wireless local area network guest services application during the second quarter FY 2005-2006.

The wireless local area network guest services application is for short-term guests of the university when the access serves a bona fide university business need. Guests requesting this service must have a departmental sponsor who will approve and be responsible for service requests, appropriate use, and the reconciliation of the resulting charges.

As of January 1, 2006, the wireless local area network guest services pilot application transitioned to a billable production service. Ordering and Provisioning, Public Relations, and Accounts Receivable personnel, working closely with Systems Development and Administration, fulfilled major roles in the successful implementation of this service for university visitors. The business rules and instructions, along with Web-based interfaces for departmental sponsors and their guests, were incorporated into the Customer On-Line Access (COLA) Web application and the CNS public website (*wireless.cns.vt.edu*).



Business Services-Wireless LAN Customers



**Implementation of bundled network services.** As of July 1, 2005, the rate charged for a wired Ethernet connection includes access to the university’s campus-wide wireless network and virtual private network (VPN). This enhanced service bundle allows our customers improved and more secure access to our network from both on- and off-campus locations. It supports one of our major strategic objectives; namely, to restructure our telecommunications services portfolio to provide a variety of bundled packages.

**Virginia Tech Mobile Messaging.** Business Operations worked closely with other areas in Information Technology on the transition from BlackBerry to Virginia Tech Mobile Messaging (Goodlink) service. The new mobile messaging service provides for the integration of converged telephony and the synchronization of e-mail and other data. The rollout and availability of the Virginia Tech Mobile Messaging service began during the first quarter of the fiscal year. The Ordering and Provisioning, Public Relations, Accounts Payable/Telco Vendor Billing, and Accounts Receivable staffs all played significant roles in the successful deployment of this new technology to university faculty and staff members and to administrators.

**Cable TV contract amendment.** Virginia Tech and Campus TeleVideo have a longstanding contract allowing for the provision of cable television educational and entertainment programming on campus. An amendment to this agreement was negotiated this year to provide an enhanced cable television lineup to the Inn at Virginia Tech, as well as pilot presentation of premium sports programming to a residence hall.

**Successful removal of public telephone installations.** Increased usage of cellular telephones and the installation of university-owned and operated emergency “blue light phones” have eliminated the need for public telephones in university buildings and on campus grounds. With the expiration of the university’s contract with Verizon for public telephones at the end of 2005,

a communications campaign was initiated by Public Relations to notify departments about the intention to remove these phones. A significant planning effort involving all areas of Business Operations allowed for well-coordinated action by CNS and Verizon personnel to complete this project.

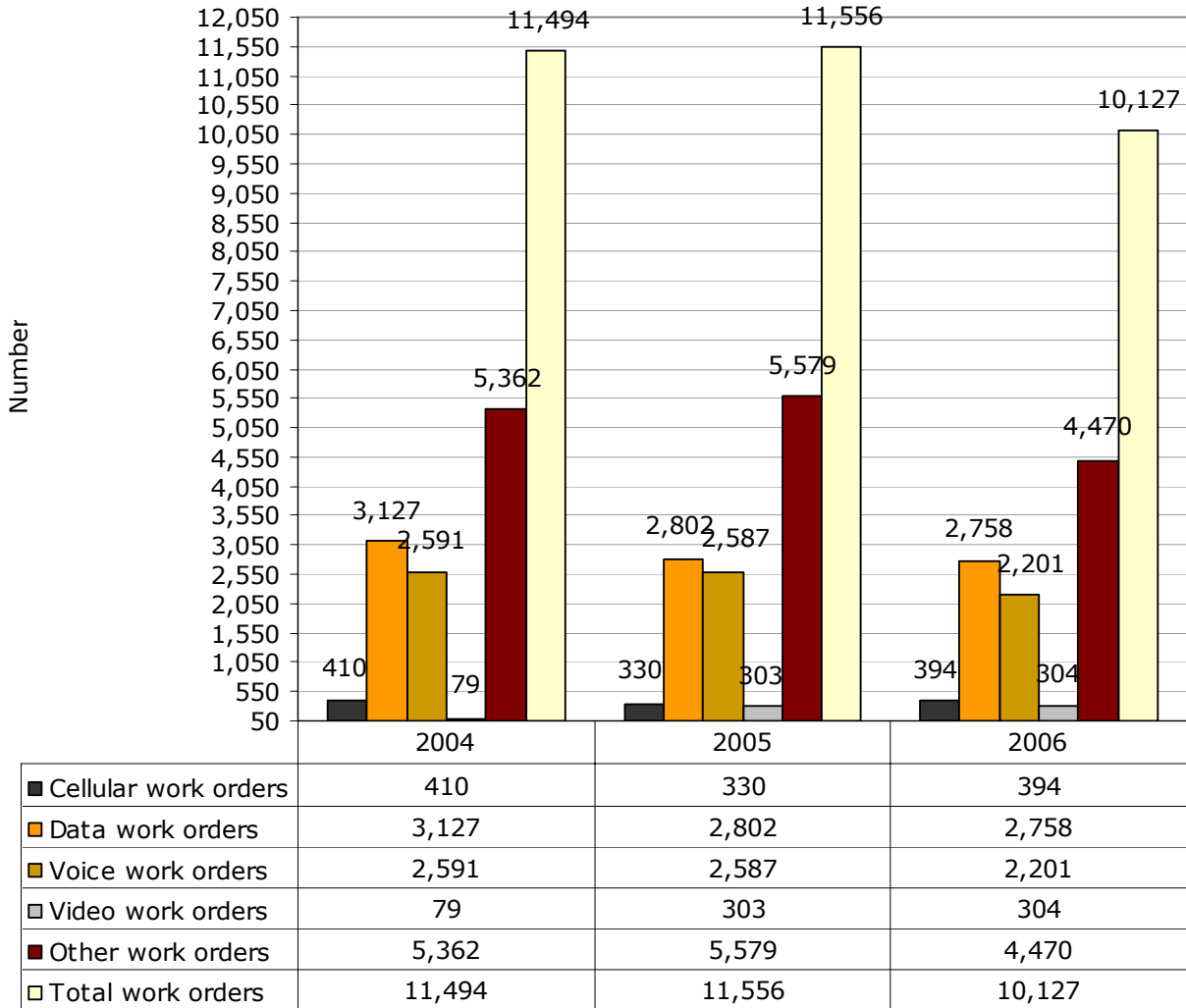
### Ordering and Provisioning

Ordering and Provisioning (O&P) processes departmental telecommunications orders and helps ensure timely provisioning of services and equipment, including phones, cellular phones and service, and integrated voice and data equipment and services. The O&P group serves as the primary point of contact between CNS and the university community and is in an excellent position to evaluate our customers' telecommunications needs. The team assists in strategic telecommunications planning efforts for new buildings, as well as tactical planning for routine voice, data, and video requests.

With a fundamental goal of ensuring customer satisfaction, O&P provides extensive support for all major telecommunications projects. O&P plans and coordinates the development and submission of letters of estimate, meets with departments, receives and processes interdepartmental communications requests (ICRs), initiates work orders, and follows up with customers after the completion of the work. One critical aspect of the O&P involvement in provisioning telecommunications services is facilitating the management and preparation of service requests. This assistance includes an inventory of current active services, advice on the design and reconfiguration of services, and coordination of work when services are moved or installed. O&P arranges meetings with other NI&S groups, particularly with our engineering and technical staff, upon departmental request.

During the period from July 2005 through June 2006, O&P assisted in the fulfillment of telecommunications needs for more than 230 university departments and for many vendors doing business on campus. Over 12,600 discrete work orders were processed including over 400 orders for cellular equipment and service.

Ordering & Provisioning-Work Orders



Total for 2005-2006 year orders shows a slight decrease due to fewer capital projects worked than in prior years.

**Agriculture, Human, and Natural Resources Information Technology project.** Completion of this project significantly enhanced the available bandwidth and upgraded the security features of Cooperative Extension’s network at over 100 offices throughout Virginia. Personnel from Communications Network Services , Agriculture Human Natural Resources Information Technology (AHNR-IT), and multiple service and equipment vendors worked together to facilitate the provisioning of high-speed data service in a variety of ways depending on the Extension office location. Additional benefits were realized including an enhanced working relationship between AHNR-IT and CNS personnel. As a result of input from Ordering and Provisioning, Accounts Payable/Telco Vendor Billing, and AHNR-IT staff, improvements were made in Verizon’s billing process to the university for digital subscriber line (DSL) services. A consolidated Verizon DSL statement is now received by Cooperative Extension’s administrative offices making reconciliation and payment much simpler.

Personnel from both CNS and Virginia Cooperative Extension (VCE) communicated and collaborated over many months to identify and resolve the various technical and administrative issues associated with this multifaceted endeavor.

At the close of FY 05-06, only two VCE sites remain to be converted to the enhanced network services and equipment. You may see a list of all the sites already converted at [www.ag.vt.edu/network/](http://www.ag.vt.edu/network/).

**Cellular orders and billing.** The Ordering and Provisioning group remains the first point of contact for university employees' cellular service inquiries. The communications account managers worked closely with customers, the Virginia Information Technology Agency (VITA), various cellular vendors, and other CNS workgroups to continually provide a high level of customer service and to respond promptly when cellular provisioning and billing issues arose.

O&P supports approximately 110 cellular data customers and nearly 900 cellular customers statewide providing consultation, ordering, order fulfillment, phone activations, cellular telephone number porting, equipment and service troubleshooting, equipment replacement, and accessory ordering and replacement. O&P support is provided to the Accounts Payable/Telco Vendor Billing and Accounts Receivable groups for the resolution of billing issues. O&P monitors the cellular telephone section of the CNS website on a continuous basis and provides updated information as vendors offer new cellular equipment.

**The Inn at Virginia Tech, Skelton Conference Center, and Holtzman Alumni Center.** The O&P staff works with hotel and conference center personnel frequently to provide needed telecommunications services and insure the highest levels of service for hotel guests, staff, and conference participants. Wireless network access is provided for guests.

**Gigabit to the desktop.** The Ordering and Provisioning team plays a significant role in the ongoing planning for this major project to upgrade our campus infrastructure and provide the university academic community with gigabit Ethernet capabilities at the desktop. O&P personnel are working with other NI&S workgroups to process the necessary orders for the upgrade in the Food Science Building and Seitz Hall—both chosen to be a pilot buildings for the project.

O&P personnel have joined in project planning meetings, so they may better assist customers and departmental personnel as work on the project moves forward. They work closely with each department during the upgrade process to reduce disruptions and maximize the final results.

**National Capital Region.** Virginia Tech facilities in the National Capital Region offer opportunities for research and graduate studies.

Virginia Tech research centers in the region are expanding and include many subject areas. They provide opportunities for partnerships and collaborations with private industry, local and federal agencies, and other higher education institutions in the vicinity. As the federal government continues a transition of its research funding model, the shift will influence the university's approach to research in the National Capital Region. Virginia Tech will develop closer ties with decision-makers in the area in order to attract research dollars.

Graduate degree and certificate programs in the National Capital Region are taught by internationally-recognized faculty members at two locations—Old Town Alexandria and the Northern Virginia Center in Falls Church. *Commonwealth Campus* facilities allow local residents to take classes of interest to them without being formally admitted to a degree program.

As Virginia Tech continues to expand its presence and offer additional services in the National Capital Region, O&P responds to their special needs for telecommunications services to support their research, teaching, and outreach initiatives. During the past year, the team worked with the Virginia Bioinformatics Institute to set up telecommunications services for an office in Alexandria and assisted with the orders for a new router at the Washington Alexandria Architecture Center. O&P prepared the orders to provide gigabit Ethernet connections for the Northern Virginia Center server room.

**Kent Square/Town of Blacksburg.** Virginia Tech and the Town of Blacksburg stay connected through several joint communications projects and through their work on regional technology programs. One such project is Kent Square, a new, mixed-use retail, office, and parking facility in downtown Blacksburg. Virginia Tech and the Town of Blacksburg have cooperated to provide reliable and affordable communications capabilities to the location for office and classroom space the university leases there and to provide additional interconnection facilities to accommodate growth. The ductbank NI&S installed in 2004 facilitates cable pathways to various other Virginia Tech leased properties in town as well as to the Verizon Central Office. The National LambdaRail optical fiber circuit has been placed in this ductbank and extended aerially via Verizon and American Electric Power poles.

During the last year, O&P worked with several university tenants moving to Kent Square in order to make sure all of their telecommunications needs were met on a timely basis.

**Additional project support.** Significant support was provided by O&P for the following projects:

- West Side Lane Stadium
- Biology Building
- Latham Hall
- Graduate Life Center at Donaldson Brown
- Athletics broadcast fiber and wireless card readers
- Virginia Bioinformatics Institute
- University Gateway Center
- Virginia Tech Transportation Institute Phase II
- Peggy Lee Hahn Garden Pavilion
- KnowledgeWorks Phase II
- Institute for Critical Technology and Applied Science
- Rotor Dynamics Lab (post-fire renovation)
- Classroom improvement project Phase I
- Library Special Collections renovation

**Process improvement.** Efforts during the year included several designed to improve internal processes.

Workflow and COLA ICR enhancements. O&P constantly reviews the effectiveness of NI&S services in meeting user needs with a focus on quality of service. In an effort to simplify the administrative processes required to support our services, workflow processes and procedures are reviewed and evaluated to find ways to enhance our ability to respond to users' needs in a timely and effective manner. The O&P staff works cooperatively with other NI&S groups, including Field/Network Engineering and Systems Development and Administration personnel, to update and improve the workflow process and to ensure that the needs of NI&S workgroups, as well as our customers, are considered before changes are implemented.

COLA is a Web-based customer portal that provides electronic access to CNS services and applications to students and authorized departmental users. During the past year, a pilot program was launched to provide online access to the currently paper-based interdepartmental communications request (ICR) to improve efficiency and customer care. An ICR is a form that is used by departments to order services from CNS. The pilot application provides a database-driven tool allowing departments to enter and manage requests for network services. Departmentally-entered information is then directly loaded into ATLAS work orders.

The communications account manager and a communications account assistant participated on the COLA ICR Enhancement team providing significant input and feedback to the Systems Development and Administration group for the new Web-based ICR. O&P recruited, trained, and continually worked with several departmental communications liaisons piloting the new ICR to ensure it will better meet the needs of our customers. Another significant improvement to COLA has been the deployment of a tool for departments to authorize guest access to the Virginia Tech wireless network. O&P worked with department liaisons to set up this service and provided user support for the new application.

Training/continuing education. The ordering and provisioning manager, supervisor, and the communications account manager successfully completed the OSHA 10-hour Construction Safety And Health Course. The CNS safety officer meets regularly with O&P to provide updates and the latest safety information allowing the team to improve their safety awareness when on construction sites and in everyday office situations.

### Business Services

Business Services includes Accounts Payable / Telecommunications (or Telco) Vendor Billing, Accounts Receivable, and the Student Telecommunications office. Business Services supports the day-to-day operational activities and facilitates the business and administrative needs of NI&S units.

**Accounts Payable/Telco Vendor Billing.** Accounts Payable/Telecommunications (or Telco) Vendor Billing (AP/TVB) personnel provide essential, administrative support services for Communications Network Services, Video/Broadcast Services, University Printing Services,

University Mail Services, the Virginia Tech Operations Center, University Computing Support, Systems Support, and the Blacksburg Electronic Village. Their work includes support for purchasing, accounts payable, and travel requests and reimbursements.

The AP/TVB staff works extensively with the key vendors providing the university's communications products and services. The goal is to ensure the best possible service for the department and all university customers and to ensure the most rapid and efficient resolution possible of contractual disputes, service issues, and billing problems. The Telco Vendor Billing area is responsible for the management of more than 60 accounts and approximately \$1.9 million dollars annually.

Key projects and accomplishments for the year include the following:

**Integration of cellular data/mobile messaging billing with ATLAS.** Automated billing of Sprint PCS call detail records (CDRs) from electronic data retrieved from the Sprint website was accomplished in February 2006. This process allows for more efficient and effective billing to our customers. Automated pass-thru of Sprint/Nextel CDRs from their Web-based application is scheduled for May 2006. AP/TVB personnel are working with Cingular and Verizon Wireless to obtain electronic billing data.

**Vendor discounts.** Work with Verizon this year has resulted in the automatic application of customer specific pricing (CSP) service and equipment discounts. The automated process will reduce the time and effort previously spent requesting adjustments for these discounts and maintaining the paper trail involved with the manual process. Therefore, it supports one of our strategic objectives—the elimination of paper-based processes, where applicable. A negotiated amendment to the Verizon CSP Agreement provides for the current discount levels to be maintained.

**Accounts Receivable.** Accounts Receivable (AR) provides timely and accurate billing and accounts receivable functions for Communications Network Services, the Blacksburg Electronic Village, Video/Broadcast Services, University Mail Services, University Printing Services, the Virginia Tech Operations Center, Systems Support, and University Computing Support. Monthly billing for various telecommunications services is provided to university academic departments and administrative areas, on- and off-campus students, as well as outside agency customers of the university-owned telecommunications system.

Student Telecommunications (ST), a branch office located on campus in the Student Services Building, is the primary point of contact between students and Network Infrastructure and Services for telecommunications service and billing. To better serve the student community, the Student Telecommunications office extended its hours in FY 2006 to include the noon hour.

**Cellular service.** In July 2005, CNS expanded cellular service offerings to the faculty and staff of the university by adding more options for cellular data service and equipment. As a result of continuous technological advancements, a wider variety of cellular telephones became available. As mobile technology continues to evolve, Accounts Receivable will proceed to work closely

with Systems Development and Administration to update our billing system and workflow processes to accommodate the additional services and equipment for our customers.

**Public Key Infrastructure (PKI) Project, Student Telecommunications.** The PKI project is the vehicle by which Virginia Tech will incorporate individual digital signatures (the public key infrastructure) into the university community. The Student Telecommunications staff will be the registration authority administrator for all user certificate issuances. A Student Telecommunications representative is a member of the team charged with developing the authentication process for Digital Certificates. Phase I of the PKI is scheduled to begin later in 2006, and will require the entire Information Technology staff to use digital certificates to sign leave reports.

**The Waterworks Project, Student Telecommunications.** In a cooperative effort with the Blacksburg Electronic Village and the Association of Boards Certification (ABC), the Student Telecommunications staff successfully carried out administrative functions and activities to provide for the registration and testing of 115 candidates for the Class 6 waterworks exam. Tests were provided every other month from February through November 2005.

Student Telecommunications staff played an important role in the overall success of this project. The office maintained a separate telephone line for the purpose of providing superior service to all individuals associated with the testing process. As designated by the BEV director, multiple satellite locations, complete with trained proctors and computers, were provided to facilitate the examination. Registration for a specific test date was enabled through a “smart,” online registration form designed by BEV personnel. The “smart form” permitted registration for the upcoming test date only. Telephone registration was permitted and extensive contact was made with each registrant, by email, telephone, and by mail. On each test day, ST personnel were available to answer questions as well as investigate and resolve any difficulties in accessing the Web-based tests (logins, passwords, etc.).

### Public Relations

The Public Relations group within Network Infrastructure and Services ensures the smooth flow of information between users of the university's telecommunications services and NI&S. Public Relations personnel in the Reception, Web and Documentation, and University Switchboard groups provide information and assistance to students, parents, faculty, employees, vendors, and visitors. Public Relations is directly involved in developing, piloting, and implementing university network services by disseminating accurate and timely information about NI&S activities and services, and by soliciting feedback for other NI&S support units. Internal and university-wide information campaigns leverage a wide array of information media to ensure “news gets to those who need it.” All inquiries and requests are addressed quickly and accurately.

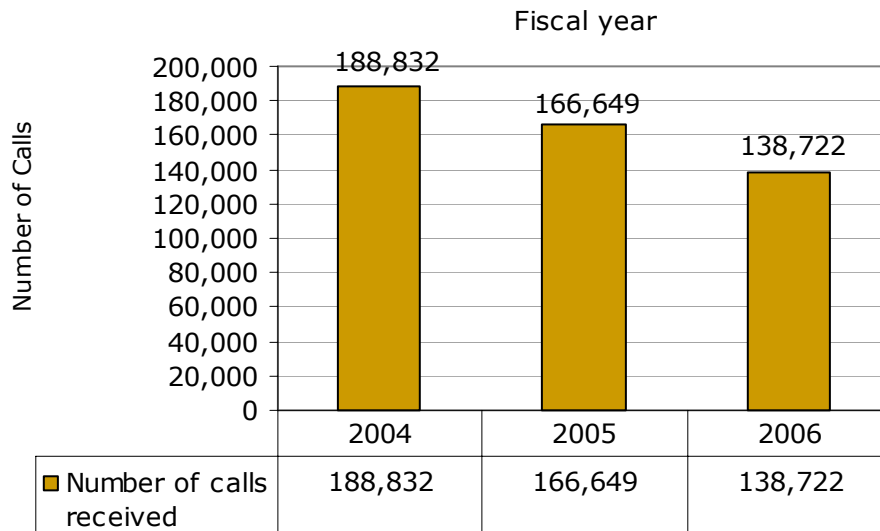
In May 2006, CNS's Public Relations manager received an “ADA Honor Roll” award from the university's Human Resources Department. The award recognized the manager's achievements



in providing an accessible and accommodating environment for students and employees with disabilities.

The University Switchboard (Operators) assists individuals who contact the university at its main telephone number by providing telephone listings for on-campus students, faculty, staff, and departments of Virginia Tech. The Operators assist callers by explaining proper dialing procedures for on-campus, local, long distance, and international calls.

Public Relations - Calls to University Switchboard



Key projects and accomplishments during this fiscal year included:

**Customer communications.** Public Relations coordinated development of both scheduled and ad hoc news releases to inform our customer base of planned or emergent information technology system issues and the impact those issues might have on their operations.

**Website enhancements.** The Web and documentation specialist worked with Systems Development and Administration and with Ordering and Provisioning to design and develop the departmental user interface integrated into the COLA website. The effort supported the initial deployment of the on-line interdepartmental communications request. The first phase of this project addressed the development of Web-based ordering capabilities for data network requests.

In addition, over 250 hours of website development and maintenance support was provided to the Blacksburg Electronic Village.

**Student Programs initiatives.** Service to students and visiting telecommunications customers takes many forms. In addition to providing telephone, network, and cable television services to

individuals, other important services are coordinated with Student Programs (SP). During the year, Public Relations worked extensively with various SP representatives to develop and implement mutually beneficial operating agreements for an array of services.

Telecommunications services for summer guests. The memorandum of understanding for summer telecommunications services in the residence halls was updated and renewed. This agreement provides local telephone service, network access, and cable television services to conference groups housed in university residence halls during the summer months and yields substantial cost-efficiencies to CNS in the twice-a-year residence hall telephone inventory effort.

Premium television channels for residence hall lounges. In support of Student Programs' objective to encourage students to gather and socialize in residence hall lounges, Public Relations coordinated with SP, the university's cable television contractor, Campus Televideo, and with CNS management to provide a pilot cable TV offering. A comprehensive proposal was developed to allow the broadcast of premium sports events to as many as 45 residence hall lounges. If accepted, the new premium television services in the residence hall lounges would be implemented during the 2006-2007 school year.

Wireless network service in residence hall lounges. As a pilot project, wireless local area network service was provided to a lounge in each of five residence halls during the Spring 2006 semester. Public Relations staff drafted, developed, and forwarded publicity materials to Student Programs to notify student residents of the availability of this sought-after service.

### Space Management Committee

There is a critical university need for a comprehensive space management strategy at Virginia Tech. The preferred approach would involve more effective utilization of space and facility data related to university infrastructure, including tracking space and land usage, facilities inventory and condition assessment, and geographic information system (GIS) data. This approach would allow the university to better manage space and land as the campus continues to grow. Computer aided design (CAD), GIS, relational database, and Web access systems are generally components of a space management system.

James Hyatt, Executive Vice President and Chief Operating Officer, established a Space Management Committee on March 6, 2006 to research solutions. The panel is composed of individuals who can provide expertise in the programmatic, financial, and administrative evaluation of space management systems. John Nichols, Senior Information Technology Manager of Network Infrastructure and Services, serves on the committee.

The primary goal of the group is to identify, evaluate, and recommend an appropriate space management system or systems to best meet university needs. The committee has begun researching systems in use at other universities. Upon completion of a thorough review of viable options, the committee is to develop a set of recommendations for consideration by the end of summer 2006.

### Systems Development and Administration

The Systems Development and Administration (SDA) team is responsible for developing, implementing, and maintaining much of the organization's administrative telecommunications management systems and the computer infrastructure supporting those systems. The group handles the development and operational support for Blacksburg Electronic Village initiatives, systems, and services. Work by SDA to develop and maintain secure and reliable Information Technology application solutions supports the vision and mission of NI&S and provides a strategic advantage to the department.

ATLAS, developed and maintained by the Systems Development unit, is the organization's principal telecommunications management system. It supports billing, accounts receivable, accounts payable, purchase order, budget management, work order, service management, and voice call detail record management as well as equipment, materials, and cable plant inventory. Customer On-Line Access is the Web-based customer portal for ATLAS providing electronic bill delivery, account information, and service provisioning and management.

The Systems Administration unit supports more than 75 servers and over 250 desktop systems. The team provides server and middleware support for Oracle database systems, network management systems, printing management systems, BEV systems, voice call detail polling systems, general file and application servers, and Web systems.

**Web development.** The Systems Development and Administration staff researches relevant open source technology to reduce cost, improve integration of systems, and adhere to industry standards. Approximately half of the 14 Web applications used by *cola.cns.vt.edu*, *internal.cns.vt.edu* and *www.cns.vt.edu* were migrated to the Spring MVC (a model-view-controller framework) this year. Spring is an open source application development framework allowing Web designers to work in parallel with Java programmers to develop websites. Java programmers focus on writing the application code; the Web designers concentrate on developing the user interface. Spring was selected because it allows faster and more manageable development and deployment of enterprise-class Java applications than the previous Java servlet model.

Velocity replaced XSLT (Extensible Stylesheet Language Transformations) as the HTML page-generation tool for COLA applications already migrated to the Spring model. Velocity is a Java-based template engine used for Web development. Velocity works well with the Spring framework. Using Velocity, a Web designer can directly access objects provided by Java programmers. It has a simple syntax and, therefore, provides a simpler alternative to JSP (Java Server Pages) or XSLT.

Additional features were added to the COLA guest wireless provisioning application suite as it moved from a pilot to a full production system. Added functionality includes an administrator

configuration manager and an administrative tool allowing the Operations Center to provide support for guest registration.

A production pilot interdepartmental communications request (ICR) application was developed for COLA. The pilot application provides an ATLAS database-driven tool for departments to enter and manage network communications requests. Information entered will be directly loaded into ATLAS work orders, significantly improving efficiency in the Ordering and Provisioning group. This pilot project will position the organization for the development of a comprehensive departmental telecommunications ordering tool planned for next year.

Another accomplishment in the area of Web development was the selection and migration to Subversion as a code management system. Subversion, an open-source industry standard, source code management system, replaced an old, internally-developed system. Additionally, the Web Development team worked with the Systems Administration team to implement improved load-testing tools allowing developers to test an environment involving thousands of concurrent transactions.

**ATLAS.** Approximately 20 percent of the more than 250 Oracle forms and reports applications in ATLAS were migrated to Oracle Forms/Reports10g. The applications are now supported on the Oracle AS servers managed by Information Technology's General Enterprise Applications group, providing economies of scale to the university in terms of Oracle Application Server management. During migration, significant effort was put into application redesign to improve usability and standardization as well as consolidate functionality. These improvements maximize organizational efficiency and empower system users to make rapid and accurate decisions.

Systems Development and Administration strives to maximize security in all NI&S business processes. An internal security review led to improved access control to ATLAS information. Additionally, the interface with Wachovia, where lockbox bill payments are processed, was replaced with a more secure sftp (SSH (secure shell) file transfer protocol) connection, as were interfaces with Banner systems.

Integration with central university information systems was improved by the implementation of an Oracle Advanced Queuing link between the Enterprise Directory Registry database and ATLAS. The message-based link provides data updates in near real-time and reduces reliance on nightly batch exports, thus decreasing the amount of data transferred between systems.

Improvements in call detail record management included support for Cisco Call Manager call collection, the collection of Rolm internal CDRs, and numerous new interfaces with telecommunications vendors such as Sprint and Nextel.

An important improvement in the ATLAS work order system this year was the introduction of environmental health and safety information into the workflow process. Orders for areas known to be hazardous are automatically queued to the NI&S safety coordinator for evaluation before any work is scheduled at the premises.

Inventory system improvements continued with the further development of fixed assets and personal inventory management and reconciliation tools, as well as applications to support the monitoring and reporting of inventory cycle count management. New reports were developed to perform analysis of cable plant information in support of strategic planning.

An important improvement in the ATLAS billing system was the re-engineering of service bill plan management providing easier administration of existing fiscal year bill plans and added support for service anniversary date bill plans.

Changes in the purchase order system included an enhanced, automated, event notification and the addition of draft status orders. These improvements provide system users with relevant business information and effective procurement tools.

In all, over 350 ATLAS code modifications were made during the 2005-2006 fiscal year to support continuous improvement of the system.

**Systems Administration.** Maximizing system availability is an overriding objective, and Systems Administration leverages emerging technologies and best practice methodologies to improve redundancy and reliability in order to meet the requirements of 24 x 7 operations. System performance and response time is constantly monitored, and secure and reliable system backup processes ensure reliable recovery of systems and information.

The Unix Administration team completed several system upgrades this year including both the primary and secondary call detail polling systems. The enhancements included system hardware replacement and a Spectif Event Manager (SEM) software upgrade. The BEV Macintosh Retrospect backup system was upgraded to new hardware and software, and the BEV POP mail server was upgraded from a DEC Alpha system to a new Linux-based system.

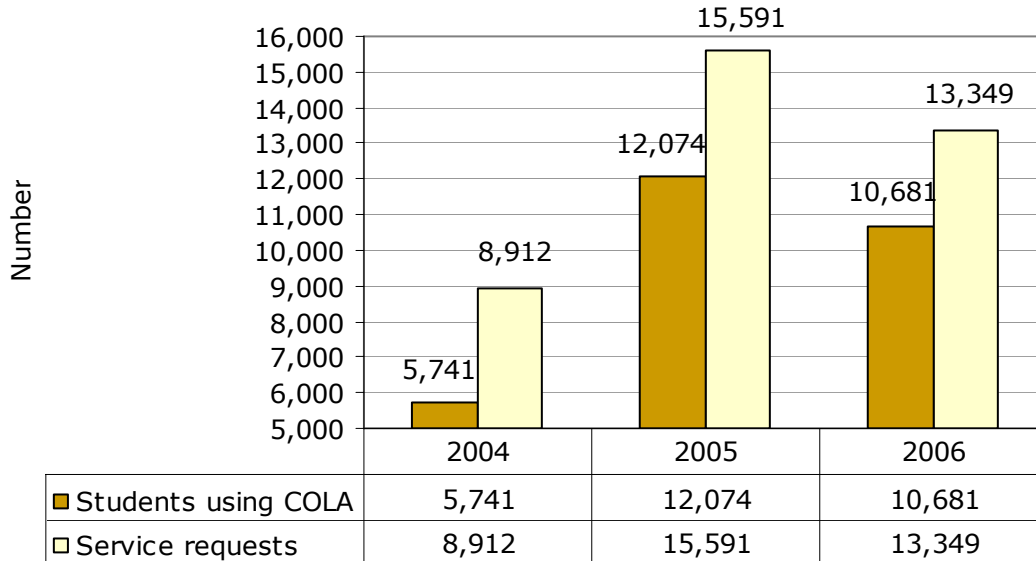
In the area of middleware support, the Unix Administration team performed numerous upgrades to Java, Tomcat, LDAP, and Apache. BEV support personnel installed the Magpie PHP RSS parser providing the CNS public website with the ability to accept and publish news feeds from other sources. Magpie will allow CNS websites to automatically echo trouble announcements, so the university community will be able to check on the current status of NI&S facilities in a timely manner. The Unix Administration team implemented single sign-on support for Apache/Tomcat integration for *internal.cns.vt.edu*.

In the area of desktop administration, the Windows Administration team continued migrating users to a roaming profiles solution with over 90% of target machines completed. Roaming profiles provide a centrally managed, desktop storage system for the organization's desktop computers, allowing users convenient access to their data from other machines within the domain. Additionally, the migration to roaming profiles improves backup and recovery reliability and manageability as well as allowing the organization to retire a more expensive, network-based backup and recovery system. The team successfully installed a Windows Software Update Server (WSUS) to manage Windows updates, implemented a new backup strategy for notebook computers, and began research into improved management and review of

Windows system logs. Additionally, the Windows team procured and deployed over 50 new desktop systems.

Oracle Database Management support was provided for a proof-of-concept GIS project. GIS systems will allow for improved management, planning, and design of telecommunications infrastructure.

Business Administration & Operations-Customer On Line Access



### Network Administration

The Network Administration Group—which included Vendor Billing and Fiscal Operations through the end of 2005, and Call Detail Record (CDR) Operations and Security—coordinates with industry representatives and others within Communications Network Services to accomplish its goals and objectives. The group has developed and continues to maintain critical business relationships with key providers of telecommunications goods and services and works closely with the Switch Engineering and the Business Operations groups within CNS. Network Administration consults with peer institutions throughout the country on issues related to telecommunications administration. Within CNS, Network Administration develops, refines, and maintains many of the department’s methods and operational procedures. The group proposes improvements to business practices to ensure we are operating in accordance with university rules and to increase the department’s ability to respond to the university’s needs in a timely and effective manner.

## Network Infrastructure and Services

On November 3, 2005, Judy Lilly, Associate Vice President, Network Infrastructure and Services, announced the restructuring of the Business Operations and Network Administration groups. This structural and organizational change involved the merging of the Vendor Billing and Fiscal Operations area with Accounts Payable. All Accounts Payable and Accounts Receivable functions are now aligned under Business Technologies and Services to support our customers more effectively. The change has allowed the associate director of Network Administration to become more engaged in the preparation and release of departmental requests for proposals and to increase his emphasis on NI&S special projects and initiatives, as well as staff support.

The Network Administration group oversees telecommunications administration and the successful operation of switched and dedicated facilities. This work includes an emphasis on CDR management and security, the integration of new technologies into existing systems, effective fiscal operations, technical and administrative support for network design, and network adjustments in order to maintain maximum service levels for the university at the lowest possible cost. In addition, Network Administration staff work with internal groups and our vendors to ensure a timely resolution of reported service and vendor billing issues in order to minimize the impact to the university community.

The Call Detail Records Operations and Security staff acts as a primary resource to protect the university from fraudulent use of its telecommunications network by proactively monitoring for misuse and providing requested information to Internal Audit and legal authorities as appropriate. The staff provides high-level technical and administrative support in systems operation, design, maintenance, and financial management of the university telecommunications system as well as in the research, evaluation, and development of detailed and accurate communications design cost estimates.

Network Administration personnel work regularly with vendors providing communications products and services to the university. Regular meetings are conducted with Verizon, Sprint, Virginia Information Technology Agency, and other vendors to maintain open lines of communication and to ensure the rapid and efficient resolution of any contractual issues, service problems, and billing disputes.

As indicated above, Network Administration accomplishes much of its work through the cooperation of, and collaboration with, other support, financial management, and engineering groups across Network Infrastructure and Services. With Network Administration, these groups work together to enhance the ability of NI&S to make timely, accurate, and cost-effective decisions in support of daily operations, the evaluation of new service offerings, special initiatives, and long-term planning. In addition, Network Administration frequently organizes departmental participation in teleconferences on issues of interest or concern, participates in meetings about special projects, and proposes system enhancements to increase efficiency and support the deployment of new services.

Major initiatives for the fiscal year include the following:

**Information Technology metrics.** Network Administration worked with others across the organization to implement improved measurements and data collection efforts, in order to provide appropriate and meaningful information regarding the activity of NI&S operations.

**Virginia Tech Mobile Messaging.** We successfully transitioned an executive trial of wireless smart devices, including PDAs, Pocket PCs, and air cards used by university personnel from a pilot program, which replaced Blackberry devices, to the CNS Mobile Messaging production-level service. Network Administration collaborated with multiple CNS and Information Technology project teams to establish the new CNS wireless service offering for mobile access to data. Mobile Messaging provides integration of converged telephony and computing devices with the Exchange server and allows continuous wireless synchronization of e-mail and data. Over 100 active smartphone devices are currently in service for university faculty members and administrators.

**Agreements with vendors.** Worked closely with the Office of the University General Counsel to develop and negotiate agreements with Cingular Wireless and Citizens Telephone Company for new service offerings and improved price performance of existing service.

**Consulting services.** Network Administration staff provide information to other colleges and universities about the services Virginia Tech provides, policies and procedures CNS has implemented, our rates, the impact of regulatory issues on our campus, multiple vendor services, and billing. Some of the schools assisted this year include:

- Radford University
- Pennsylvania State University
- Kettering University
- University of Kansas Medical Center
- University of Rhode Island
- Simpson College
- Butler University
- University of Toledo
- Florida State University

The Network Administration group participates in professional organizations with peer institutions and represents Virginia Tech at the Association for Communications Technology Professionals in Higher Education conferences and seminars, EDUCAUSE conferences and seminars, and Net@EDU annual member meetings and working group meetings. With these groups, and through involvement with the Sprint Higher Education Advisory Board, Network Administration gives and receives input regarding current and emerging communications technology.

**State and federal regulations.** Network Administration is responsible for making sure NI&S is aware of state and federal regulations governing telecommunications and ensuring compliance with those regulations by confirming required changes are accurately reflected in departmental



systems. The group functions as the university's primary resource in the investigation and interpretation of FCC and SCC regulatory activities that may impact current and future services.

The group prepared operating information on and/or emphasized the following issues during the fiscal year:

- Communications Assistance for Law Enforcement Act
- Changes to Universal Service Fund methodology
- Slamming and cramming
- E911
- Number portability
- Municipal networks
- PATRIOT Act
- CAN-SPAM regulations
- File sharing
- Telecommunications Act of 1996 rewrite
- Voice over Internet Protocol (VoIP) regulatory classification
- Educational Broadband Service (EBS) spectrum issues
- Commonwealth of Virginia communications tax reform
- Commonwealth of Virginia video franchising reform
- Acacia patent claims
- Net neutrality
- Junk fax regulations
- ITFS/EBS
- Federal excise tax

**Special projects and initiatives.** Network Administration participated in the management and operation of special projects and supported strategic initiatives within Network Infrastructure and Services. These projects included:

- VoIP trial/evaluations with multiple vendors.
- Support of new hotel and conference center communications.
- Wireless access for Virginia Tech Transportation Institute Instrumented City Project.
- Support of Wireless@Virginia Tech and the Center for Wireless Telecommunications in meeting DARPA Wireless Adaptable Network Node Program objectives.
- Assumption of several call detail record billing and reconciliation processes formerly accomplished by Systems Development and Administration staff

**Relationship management.** Network Administration continues to emphasize relationship management with both the university community and the community at large. During fiscal year 2005-2006, Network Administration continued its work with the Virginia Tech Police Department in a third phase of improvements to the Blue Light Emergency Phone System, revisions to 911 emergency systems and procedures, changes to cellular telephone service, and alarm systems. In addition, Network Administration personnel continued to work with many university departments to implement mobile messaging and supported all aspects of university-

wide cellular telephone service, including interaction with vendor personnel, requests for contract waivers from VITA, customer care, invoice reconciliation, and customer billing activities.

**Network changes/billing reconciliations.** The Network Administration group, in partnership with others across CNS, continued to improve the price performance of network services as a result of thorough review and reconciliation of vendor bills and ongoing network optimization. Changes implemented include the following:

- Optimization of facilities, including the replacement of individual analog trunks with PRI facilities, and the removal of trunks no longer needed
- Disconnection of polling and diagnostics lines no longer being used
- Ongoing analysis of vendor costs to facilitate network optimization for telecommunications services provided to off-campus locations
- Continuous work related to the evaluation of next-generation technologies including call distribution analysis, proper billing of calls made through systems being evaluated, re-direction of university telephone numbers as needed, and the installation and disconnection of test facilities
- Work with vendors on long-term billing issues related to directory assistance calling and monthly charges for telephone numbers

## Field Engineering and Safety

### Field Engineering

Field Engineering (FE), managed by Doug Jones, supports the university's mission by designing, installing, documenting, and maintaining state-of-the-art telecommunications distribution systems. FE supports a full range of telecommunications services responsive to the specific and complex needs of the university community. Working closely with leading industry vendors to develop new products required to meet the university's demanding and diverse requirements, FE deploys the most reliable, adaptable, and secure systems available. The installed systems are designed to be flexible enough to meet the university's evolving technological needs over a ten- to fifteen-year period and include campus-wide wireless networking and ongoing infrastructure upgrades.

The Field Engineering team strives to maintain positive relationships with and fully support the university community. FE works closely with project architects and engineers, as well as with the university's Capital Design and Construction teams during project development, to ensure communications cable pathways and spaces meet all industry and Virginia Tech standards. As technologies migrate towards Voice over Internet Protocol, the designs for new facilities include

required environmental controls, physical security, and backup power systems. FE coordinates its activities with Physical Plant to minimize disruption of university operations and plans its work schedules to avoid disturbing classes in session.

The Field Engineering group, with assistance from Network Infrastructure and Services' Research and Development team, works closely with manufacturers of station cable, connectivity products, equipment racks, and horizontal cable distribution systems. The goal is to pursue and apply reasonably priced, leading-edge technology in support of the latest advances in high-speed telecommunications applications. These efforts include rigorous testing, thorough evaluation of products, and refinement of installation practices resulting in maximum utilization of the installed systems.

Field Engineering is involved with capital projects from the earliest planning stages through project completion and focuses its processes on the university community's satisfaction with telecommunications services. The group identifies, refines, and documents operational procedures to provide a smoother, timelier workflow process and to increase employee efficiency, safety, and professionalism. Inside Plant design work is incorporated in each of the building design phases and reflects input from the future building tenants as well as project planners, architects, and engineers. Outside Plant infrastructure is designed and sized to provide adequate capacity to serve the facility being built, and provide for the university's master plan expectations for future construction in the area. FE project designers continually strive to improve the data-carrying capacity and capabilities of the telecommunications infrastructure. Thorough planning efforts and quality workmanship ensure the communications infrastructure in university buildings provides the highest network performance and the longest and most reliable service life possible.

Communications Network Services maintains a warehouse facility of 26,400 square feet. Material stock levels are maintained for routine telephone and network installations and repair work, Outside Plant infrastructure, and Inside Plant new construction. A separate, dedicated space at the warehouse is used to store departmental records.

Major accomplishments and completed projects during this fiscal year include:

**West Lane Stadium, facilitate 2005 football season during stadium construction.** The Field Engineering group was responsible for all voice, data, and video cabling for the expansion project on the west side of Lane Stadium. The project was originally scheduled for completion in time for the Fall 2005 football season and involved installation of extensive telecommunications facilities to luxury boxes, a new press box, seven new elevators, new offices, classrooms, a computer lab, and tutoring facilities for Virginia Tech athletes.

Due to the scope of the project and several construction delays, the facility was not finished by the target completion date of September 17, 2005. Field Engineering crews and CNS managers worked closely with Turner Construction, the state fire marshal, the commonwealth's Bureau of Capital Outlay Management, Capital Design and Construction, and several contractors to acquire a temporary certificate of occupancy allowing all home football games to take place. Many

special provisions were made so all communications functions were operational on game days, including:

- Temporary power circuits were installed in 12 communications equipment rooms to power network switches,
- Plywood doors were installed on several communications equipment rooms to secure network hardware,
- CNS field technicians assisted the Blacksburg Fire Department with the fire watch because not all fire alarms were completely installed or tested,
- Some temporary station cables were installed where permanent conduits were not in place,
- A temporary optical fiber cable was installed to facilitate operation of the Sky Cam.

Field Engineering has continued to find creative ways to install or stage communications infrastructure, while stadium construction continued. When completed, this facility will have 1450 communications outlets, 334,000 feet of Category 6 station cable, and 576 fusion splices of optical fiber.

**Seitz Hall Building upgrade pilot.** The Campus Infrastructure Upgrade project is still in the planning stages. The industry is in the process of ratifying a new 10Gbs Unshielded Twisted Pair standard, and Voice over IP is still being evaluated. Seitz Hall was chosen as a pilot building for the overall project because the Biological Systems Engineering Department, located there, has a critical business requirement for additional bandwidth. A comprehensive design was developed and construction has begun on the Seitz infrastructure upgrade. This project involves the installation of horizontal and vertical cable pathways, the construction of a new telecommunications equipment room, the installation of a new optical fiber feed, and recabling of the entire building. Seitz will serve as an installation model for upgrading the telecommunications infrastructure in all university buildings.

**The Inn at Virginia Tech and Skelton Conference Center.** The Inn at Virginia Tech and Skelton Conference Center opened in July 2005, allowing Virginia Tech to host additional regional, national, and international conferences with a greater number of attendees. Serving alumni, visitors, external partners, faculty, staff, and friends, the facility provides the university and the surrounding community with a modern conference center and world-class hotel. The structure supports Virginia Tech's educational agenda by providing high-tech communications services for state-of-the-art meeting rooms and conference facilities. The networking infrastructure installed at the Inn at Virginia Tech uses the latest technology to provide many innovative capabilities. These include advanced gigabit Ethernet technology, the latest in wireless network technology, fiber-optic capability to connect the conference center to national, regional, and local high-performance computing and networking infrastructure, high-performance Internet and Internet2 access, advanced H.323-based videoconferencing, and support for next-generation Internet protocols. This facility has 1680 communications outlets, 260,000 feet of Category 6 station cable, and 480 fusion splices of optical fiber.

**Optical fiber distribution for the Town of Blacksburg.** During the summer and fall of 2005, the Field Engineering Outside Plant group designed and installed optical fiber infrastructure for

several facilities within the Town of Blacksburg. This infrastructure upgrade directly supports the town's networking initiatives and fosters a strong synergistic relationship between the town and the university. Optical fiber installations to the Old Town Hall, the Blacksburg Fire Department, the Recreation Center, the Aquatic Center, the Boatwright House, and the Bennett House have been completed.

**Virginia Tech and manufacturer partnering initiatives.** Field Engineering works closely with several manufacturers of telecommunications products on product evaluation and feature enhancement. Currently, FE is working with manufacturers of cable management racks, cable trays, communication outlets, and raceways. Materials selected as a result of this evaluation process will be used in the campus infrastructure upgrade.

### **Capital projects in progress**

**Knowledge Works.** Located in the Corporate Research Center, this building will be used as office space for Computer Science Department faculty members and graduate students. The two-story facility is cabled with 153,000 feet of Category 6 plenum station cable. There are two communications equipment rooms in the building and approximately 500 communications outlets.

**Virginia Tech Transportation Institute (VTTI), Phase II.** This new facility, adjacent to the Smart Road, will provide office and lab space for researchers and will have a server room. VTTI research initiatives include collaboration with the Virginia Department of Transportation (VDOT) and several automobile manufacturers for development of advanced automobile and roadway safety technologies. The new building is cabled with 80,000 feet of Category 6 plenum station cable. The structure has one communications equipment room and approximately 200 communications outlets. The installation of a dedicated, single-mode optical fiber connecting the VTTI complex directly to the main campus fiber network is currently underway. The fiber will replace two existing T-1 facilities and provide the same bandwidth capacities at this location as are available on the main campus.

**University Mall Center.** This new four-story office building, located next to the University Mall, will provide office space on the upper floors for University Development and the Virginia Tech Foundation. The lower floors will be used for a bank, a restaurant, and other retail space. The Virginia Tech offices will be cabled with 166,500 feet of Category 5E plenum station cable and are served by two communications equipment rooms and approximately 333 communications outlets.

**Life Sciences I.** This 72,000 square foot building, located between Litton-Reaves and the Virginia Bioinformatics Institute, will include vivarium facilities as well as other laboratories, teaching research lab support spaces, offices, and common areas. The building will be cabled with 230,000 feet of Category 6 station cable and will have seven communications equipment rooms and approximately 500 communications outlets.

**Agriculture/Forestry Building.** This 85,000 square foot laboratory facility, recently named Latham Hall, supports plant science teaching and research in the College of Agriculture and Life

## Network Infrastructure and Services

Sciences and in the College of Natural Resources. The building has four communications equipment rooms, approximately 450 communications outlets, and is cabled with 234,000 feet of Category 6 station cable.

The Peggy Lee Hahn Horticulture Garden Pavilion. The Garden Pavilion is located between the Horticulture Garden and English Field. It will provide space for gardening lectures, seminars, and special presentations. The building was funded by a donation from former Virginia Tech President, T. Marshall Hahn, and his wife, Peggy. The facility is cabled with Category 6 station cable. It has one communications equipment room and full networking capabilities.

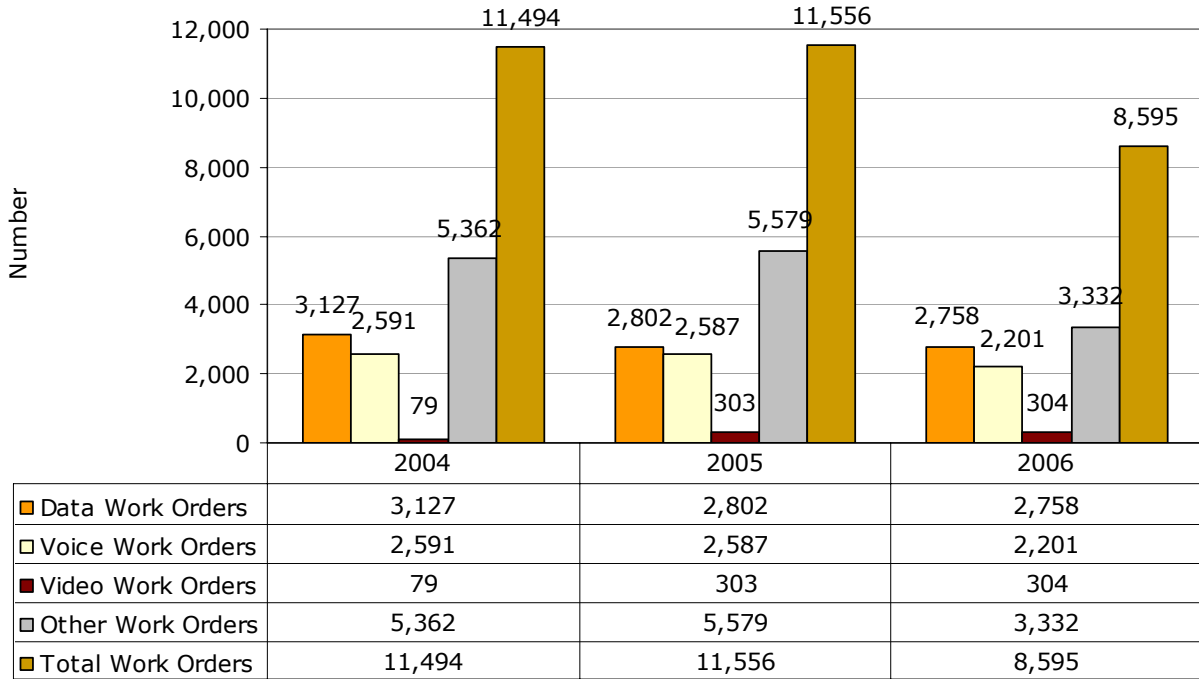
Graduate Studies at Donaldson Brown. The former Alumni Hall section of the Donaldson Brown facility is being renovated to serve as office space for the Graduate School. The renovated area, served by one communications equipment room and approximately 65 communications outlets, will be cabled with 33,000 feet of Category 6 station cable. The hotel section of Donaldson Brown has already been converted to graduate housing. When the current project is completed, graduate students will have access to graduate advisors, computer labs, and seminar rooms all in one facility.

Classroom improvement project. As faculty members develop new and innovative ways of teaching, it is necessary to upgrade their classrooms to accommodate these new methods. The university is initiating a significant renovation project to enhance the learning environment and afford more flexibility in teaching styles in 16 of the most heavily used campus classrooms. The renovations will allow more innovative teaching and learning experiences and support greater use of instructional technology. Work in eight of the classrooms will be completed this upcoming summer and another eight will be finished during the summer of 2007.

Field Engineering personnel worked in six different buildings during the summer of 2006 to enable the completion of this significant project. Our installation work included copper and coaxial cabling, wireless access points, and 89 new communications outlets.

## Network Infrastructure and Services

Field Engineering-Work Orders



NOTE: Work Orders graph. For the 05-06 fiscal year, only work orders with a Field Engineering component are included in this graph. Orders not requiring Field Approximately 1500 work orders fell into "non-field" categories this year. Also, the total of orders for 05-06 year shows a decrease, due to fewer capital projects worked than in prior years. See the Ordering and Provisioning "Work Orders" graph for the *total* work orders handled by the department this year.

Field Engineering Capital Projects

| Projects                                     | FY2004-2005 | FY2005-2006 |
|--|-------------|-------------|
| Total RJ-45 jacks installed (each)           | 5,548       | 4,400       |
| Total Cat 6 station cable installed (feet)   | 818,400     | 1,101,000   |
| Total optical fiber fusion splices (splices) | 1,776       | 1,656       |

### Safety

As Network Infrastructure and Services has grown, it has become more efficient to handle the majority of important safety issues in-house. To facilitate this process, Steve Gordon, safety coordinator, began work at NI&S in July 2005. While our strong partnerships with Facilities and Environmental, Health and Safety Services remain, environmental, safety, and health questions may now be answered more quickly and efficiently. Managers and staff can receive information regarding health issues and Occupational Safety and Health Administration (OSHA) compliance directly from the Safety Coordinator. Training can be customized to specific NI&S workgroups

## Network Infrastructure and Services

and environmental investigations are completed more rapidly. This initiative yields a safer, more supportive, and more efficient work environment for employees at NI&S and throughout the university.

Steve is certified by the National Safety Council in First Aid/CPR and by the Commonwealth of Virginia as a lead-based paint risk assessor and asbestos inspector. He is certified as an instructor of the OSHA 10-Hour Construction Course and as a general industry outreach trainer. At the university, he is authorized as a Confined Space Entrant/Attendant/Supervisor and a Lockout/Tagout Authorized Person. Steve provides environmental reviews for lead and asbestos in Virginia Tech buildings, safety compliance guidance at construction sites, and serves as the department's Personal Protective Equipment (PPE) coordinator.

OSHA training standards have been initiated and the tracking of employee training is being automated so managers can effectively plan employee time and activities for the future in these important areas. Employee training requirements for working at construction sites have been re-evaluated to ensure employees receive adequate instruction as efficiently as possible. Over the winter months, 37 NI&S staff members attended the OSHA 10-hour construction course, which covers a variety of safety topics and serves as a foundation of construction site safety knowledge.

Environmental reviews were previously completed by the university's Facilities Department. Having moved this function in house, the reviews are able to be completed as quickly as needed and just-in-time information is provided when on-site decisions need to be made.

Personal Protective Equipment is now internally coordinated. All NI&S safety equipment is purchased through the Safety Coordinator to ensure access to properly approved equipment at the best possible price. By standardizing the process and providing employees with attractive PPE choices, employee compliance has been enhanced. Centralizing the process has allowed NI&S managers to concentrate on their particular areas of expertise, rather than having to spend time contacting multiple university sources to get questions about safety equipment answered. An established single point of contact has allowed all PPE processes to become much more efficient.

The safety coordinator conducts periodic reviews of construction sites to raise NI&S employee awareness, increase compliance, and proactively prevent injuries and worker's compensation claims. He conducts short safety presentations at staff meetings on a regular basis.

## University Printing Services

Printing Services provides a means to produce and deliver tangible documents to support the university's missions of teaching and learning, research, and outreach. Services include a full-



service print facility, digital copying/printing centers, management of the contract allowing university departments to lease copiers/printers, pre-sort standard (bulk) mailing, and copyright clearance according to federal copyright laws.

Printing Services offers high-quality products and services to meet the varied needs and ever-increasing demands of the university community. Digital work flow efficiencies are now being fully realized, particularly in the area of full-color printing for which there is a significant and constantly increasing demand within the university.

Printing Services uses leading-edge technology infrastructure to enable faculty, students, and staff, regardless of their physical location, to submit jobs with customizable options through the Printing Services website at [www.printing.vt.edu](http://www.printing.vt.edu). The group continually investigates new technology options to provide enhanced services, and attempts to implement methods to provide funding for necessary equipment upgrades. In addition, Printing Services is constantly working to improve business processes and controls to reduce costs while maintaining outstanding service levels.

### Printing Plant

Producing a high-quality product in a timely manner in support of the university's mission is the main goal of the Printing Plant. The university's print requirements mirror national trends: runs have shortened and the demand for color is constantly increasing. A new initiative is underway to make Print Plant staff the "go to" people for quality color work as we implement a strategy to move to quality color, digital presses, and smaller presses.

The installation of new pre-press hardware to aid in color reproduction, as well as advanced training for staff on computer-to-plate technology has kept Printing Services on the cutting edge in this area. New software was acquired to add continuity to workflow and aid in color calibration and reproduction. In addition, new finishing equipment and software were installed to provide a higher degree of quality and greater efficiencies. The well-trained and dedicated work force uses quick set up and versatile finishing equipment to rapidly complete required deliveries.

### Copier Management Program

The Copier Management Program (CMP) is extremely popular, and University Printing Services constantly reviews the process to ensure continuous improvement. The CMP has three main objectives: management of agreements with the copier vendor; serving as liaison between the copier vendor and university departments; and providing cost savings to the university. Our vendors are obligated and motivated to deliver service in an appropriate and timely manner providing an excellent level of service to our customers.

Now in its third year, the CMP has placed over 400 copiers and increased revenues significantly. At the same time, no existing customer has opted out of the program.

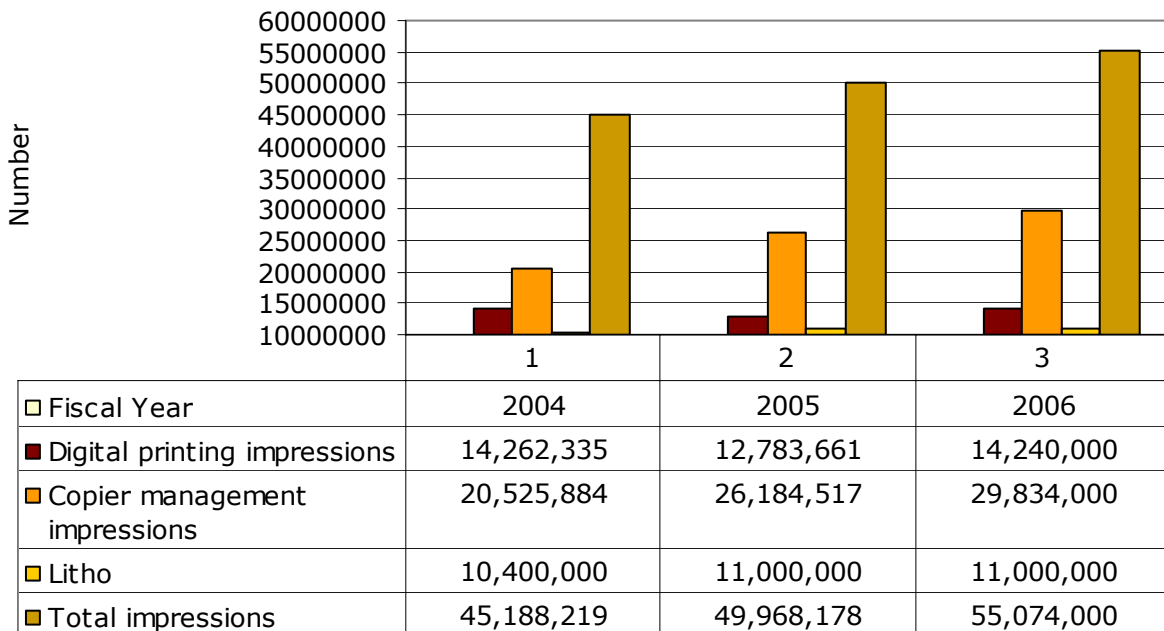
Hardware provided by the program allows a department to copy, print, fax, scan-to-fax, and scan to e-mail—eliminating the need for additional devices and reducing the cost per copy. A combination color copier/printer/scanner, now available through the CMP, allows departments to laser-print full color at a reasonable cost.

Online tools allow departments to submit requests for service calls and supplies directly from the Printing Services website, allowing off-campus Extension offices and research facilities to take advantage of the program. Printing Services is currently negotiating with a vendor for another enhancement to the program—high-capacity machines on contract at a reduced cost.

### Digital Print Centers

Demand for color printing and copying continues to increase. During the past year, the Digital Print Centers have added high-capacity devices, coil binding, and upgraded software. With the addition of the high-capacity devices, greater efficiency is achieved not only as a result of increased speed, but with complete finishing, which has eliminated the need to transport an unfinished product to another location for finishing. Receiving Web-submitted files and having a student-dedicated print and copier area have improved the ability of the Digital Print Centers to serve the needs of the university community and to reduce operating costs.

University Printing Services-Printer & Copier Impressions



### Centralized Mail

Centralized Mail handles approximately two million pieces of outgoing mail per year in addition to all mail sent internally to Deans, Directors, and Department Heads. As the steward of the university's Pre-sort Standard Postal Permit #28, Centralized Mail handles labeling and presort bar-coding to achieve the lowest possible cost and keeps accurate records of all usage.

### Mail Services

Mail Services provides timely, efficient, and cost-effective mail services to faculty, staff, and students. It provides a critical infrastructure support service through convenient delivery to and pickup from the United States Postal Service. Customer feedback is sought in order to analyze needs and provide better and more efficient service.

Mail Services is composed of two functional entities—one processing mail for university departments (University Mail Services or UMS), and one processing mail for students living in on-campus residence halls (Residential Mail Services or RMS). Mail Services handles an average of approximately 100,000 mail items every month.

UMS may be relied on to deliver mail, and to pick up mail and packages, on a regular schedule for more than 300 university departments each day including satellite centers such as the College of Veterinary Medicine, the Math Emporium, and the Virginia Tech Corporate Research Center.

RMS is responsible for delivering mail and distributing notices for packages to approximately 8,900 students living on campus. Residential Mail serves students through the use of five staffed mailrooms on campus and proudly provides high-quality assistance with a personal touch. Residential Mail employees strive to ensure students receive important mail, even if incorrectly addressed, and to provide information on ways to limit unwanted or junk mail.

Residential Mail has implemented procedures emphasizing the protection of students' privacy. For example, the name and address on every piece of incoming mail is cross-referenced with the name of the student(s) living at that address. If there is not a match, every effort is made to find the correct address for the student. If no campus address is found, the mail is returned to the sender. Packages are not given to a student unless the student has a form of photo identification to prove they are the student to whom the package is addressed.

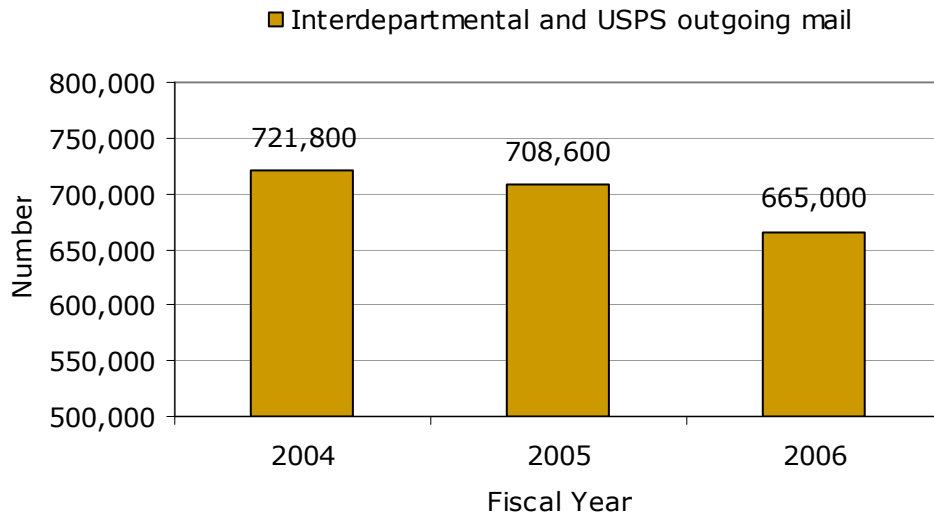
Mail Services works with vendors such as DHL, UPS, and the United States Postal Service. The rate at which mail is processed, even at increased volumes, has been improved by using automated systems. Network connectivity has allowed more efficient use of Mail Services resources including the establishment of an on line departmental billing process that leverages the capabilities of NI&S's ATLAS enterprise management system. The online billing system has

## Network Infrastructure and Services

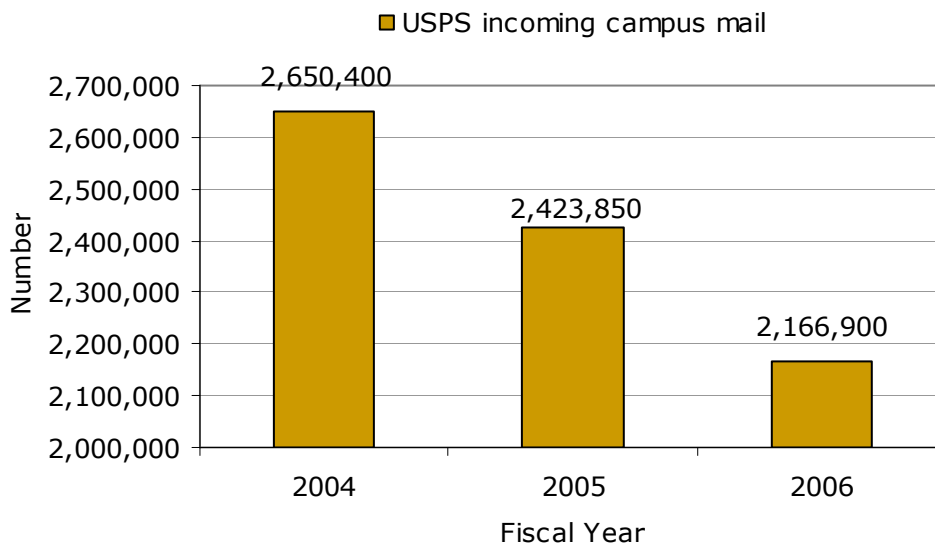
automated transactions between university departments and University Mail Services, saving paper and printing costs, as well as increasing transaction accuracy. Mail Services constantly researches technological advances in mail-handling equipment and mail-related software to insure the most cost-efficient mail and parcel services are provided to the university.

More information about Mail Services can be found at its website, [www.mailservices.vt.edu](http://www.mailservices.vt.edu).

University Mail Services-Interdepartmental and USPS  
Outgoing Mail



University Mail Services-USPS Incoming Campus Mail



## Professional development

In addition to regular job responsibilities, many Network Infrastructure and Services staff members participate in professional activities by serving on university and/or national committees, attending and presenting at university-based and national conferences, and teaching seminars or class sessions. Please note that the information below is based on information submitted for the Annual Report. Some participants/activities as well as dates, place, and other information may not be reflected on this list.

### Seminars and academic course support

Crowder, Jeff. February/March 2006, Member, Virginia Tech's Faculty Development Institute Research Panels

Sanders, Bill

- January 2005, gave a lecture on information technology risk analysis to all sections of the "Information Systems Audit and Control" course taught by the Department of Accounting and Information Systems in the Pamplin College of Business
- May 2005, gave a lecture on "Leadership" to an executive MBA class from Averett University through the Roanoke Higher Education Center
- May 2005, invited presenter and panel member related to technology and rural economic development at the NSF EPSCoR (Experimental Program to Stimulate Competitive Research) Directors Conference in Nashville, Tennessee

### Boards and committees

Benchhoff, Phil. Member, Policy Management Authority for public key infrastructure

Cornish, Carol. Member, Public Key Infrastructure Users Certification Practice Statement Committee

Crowder, Jeff

- Chair, Search Committee, Network Research Manager for Virginia Tech's Information Technology High Performance Computing and Networking Team
- CNS representative, Virginia Telecommunications Industry Association, [www.vtia.org/](http://www.vtia.org/).
- National LambdaRail Administrative Coordinator for the Mid-Atlantic Region including Virginia, Maryland, and Washington, D.C.
- Member, financial and technical committees of the Southeastern Universities Research Association Southern Region Optical Networks group

## Network Infrastructure and Services

- Team member for Supercomputing 2005 demonstration project linking System X with clusters in Utah, Los Alamos, and Seattle
- Managed activities of a consultant, David Sobotta, hired to represent National LambdaRail, the Mid-Atlantic Terascale Partnership, and Virginia Tech to develop relationships with key federal agencies in the Capital Region including FGM, Inc., OBM, and NASA.

Dougherty, William

- Member, Policy Management Authority for public key infrastructure
- Member, OMBUDS Function development group
- Member, Noliq Advisory Board

Hach, Richard

- Member, Net@EDU Wireless Networking Steering Committee and Net@EDU Wireless Networking Working Group
- Member, Association for Communications Technology Professionals in Higher Education
- Represents NI&S on the Sprint Higher Education Advisory Board

Nichols, John

- Co-chair, EDUCAUSE Net@EDU Wireless Networking Group
- Member, Conference Program Steering Committees for Net@EDU Wireless Networking and Integrated Communications Strategies working groups
- Member, University Space Management Committee
- Member, The Quilt, a coalition of advanced regional network organizations
- Member, New River Valley Planning District Commission Telecommunications Committee
- Member and Virginia Tech representative to the Fiber to the Home Council
- Advisor, Blacksburg Telecommunications Advisory Committee
- Advisor, Town of Blacksburg Wireless Project
- Affiliated, Virginia Tech Center for Wireless Telecommunications

Rodgers, Pat. Member, Public Key Infrastructure Users Certification Practice Statement Committee

Sanders, Bill

- Ex officio member, Blacksburg Telecommunications Advisory Committee
- Member, Town of Blacksburg Comprehensive Plan Review Task Force
- Member, Town of Blacksburg Committee to redesign and revise the town's website
- Member, New Century Technology Consortium CIO Forum Steering Committee

## Network Infrastructure and Services

- Vice President, Mental Health Association of the New River Valley: Board of Directors; Member, Finance Committee
- Community Advisor, the Community Foundation of the New River Valley (CFNRV); Member, Development Subcommittee
- Member, Community Impact Program Committee: helping to promote philanthropic giving among companies and residents of the Corporate Research Center
- Liaison from BEV and Virginia Tech Information Technology to Blacksburg Electronic Village, Inc.

Sheppard, Anne

- Member, Accessibility Standards Committee, Virginia Tech
- Board Member, Association of Collegiate Computing Services (ACCS)

Stell, Ray. Member, Data, Database, and Application Security; Networked Storage, Backups Security Committees, Information Technology Security Task Force

Stock, Doris. Member, Association for Communications Technology Professionals in Higher Education; Member, Legislative and Regulatory Committee

Zirkle, Laurie Member, Education and Server Environment Committees, Information Technology Security Task Force

### **Degrees awarded/certifications achieved/continuing education**

Allen, Morgan. February 2006, VITA Project Management certification

Blacksburg Electronic Village and Bill Sanders, Director, May 2006, ADA Honor Roll designation from the Human Resources Department of Virginia Tech for work with the Woodrow Wilson Rehabilitation Center

Davis, Kevin. GCIA (GIAC Certified Intrusion Analyst) Certification

Dougherty, William. February 2006, VITA Project Management certification in Core and Facilitating Processes

Field Engineering—Outside Plant Staff and Inside Plant Staff, 16 hours, Operation and Maintenance Asbestos Certification

Field Engineering—Senior Supervisors and Manager, Asbestos Inspector Certification

Eller, Russ, Holohan, Ed, Keller, Ron, Sparks, Bryant. Adult First Aid certification

## Network Infrastructure and Services

Eller, Russ, Holohan, Ed, Jones, Brian E., Keller, Ron, Sparks, Bryant. 10 hours, Construction Safety & Health, Lockout/Tagout Authorized Persons

Fisher, Marshall. December 2005, VITA Project Management certification

Floyd, Henry. February 2006, VITA Project Management certification

Gordon, Steve

- December 2005, OSHA 10 Hour Construction Course Certification
- November 2005, National Safety Council First Aid/CPR Certification
- June 2005, Commonwealth of Virginia Asbestos Inspector Certification

Harris, Carl. Re-certified as Cisco Certified Internet Engineer (CCIE)

Hoover, Maynard. Completed Lockout/Tagout Authorized Person safety training course

Jarrell, Ron. Certified by Virginia Tech Human resources in “Workplace Mediation,” and will be involved with the Virginia Tech Conflict Resolution and Mediation team

Jones, Brian E.

- Spring 2006, completed Old Dominion University course in project management
- Fall 2005, completed Old Dominion University course in linear electronics

Kidd, Jeff,

- April 2006, accepted as a Radford University graduate student to pursue a Masters of Science in Corporate and Professional Communication
- May 2006, ADA Honor Roll recognition for providing an accessible and accommodating environment for students and employees with disabilities

Morrison, Christine. November 2005, VITA Project Management certification

Network Engineering staff, 16 hours, Operation and Maintenance Asbestos Certification

Network Engineering staff, Adult CPR Certification

Nichols, John. August 2005, Asbestos Inspector Recertification

Ward, Luke. October 2005, SANS GIAC Certified Intrusion Analyst Certification

Warehouse Staff, Powered Industrial Trucks Certification

Wright, Danny. February 2006, CompTIA Network+ Certified Professional



Zirkle, Laurie. October 2005, SANS GIAC Certified Intrusion Analyst Certification

In addition, nine NI&S employees earned degrees this year. Schools attended include Virginia Tech, Old Dominion University, and New River Community College.

### Military service

Keller, Ron. Served with his Army Reserve unit in Kuwait and Iraq in Operation Iraqi Freedom II

Roberts, Robert. Served with his Army Reserve unit in Kuwait and Iraq in Operation Iraqi Freedom III

### Active grants

Dougherty, William. April 2006, as part of the *ABUSE@vt.edu* team, assisted Judicial Affairs and the Virginia Tech Women's Center in renewing grant through the "Violence against Women Act (VAWA)" to provide guidance and assistance to victims of "cyber-stalking."

### Presentations/papers/publications/consultation and outreach

Callahan, Tim

- March 2006, Invited speaker at MuniWireless 2006 conference, "The Community Broadband Alliance Model for Municipal Broadband Networks" in Atlanta, Georgia
- March 2006, panel member, MuniWireless 2006 conference, "Community Wireless & Digital Inclusion" and "Planning County and State-wide Initiatives" in Atlanta, Georgia

Crowder, Jeff

- September 2005, "Mid-Atlantic Crossroads + Mid-Atlantic Terascale Partnership Toward a Converged Model for Multistate Collaboration for High Performance Computing and Networking"
- December 7, 2005, Seminar participant, 2005 Virginia Department of Education's Education Technology Leadership Conference, "Evolution of the Net" and Cyberpals Project with Thomas Jefferson High School for Science and Mathematics
- Spring 2006, "Superior Research Network and Internet Access at Virginia Tech" Spring ITELL Newsletter

## Network Infrastructure and Services

- March 2006, Provided letter of support for a proposal entitled "A Center for Scalable Data Distribution and Real-Time Interaction Technologies" submitted by Virginia Tech for the US Department of Energy Office of Science SciDAC program
- Authored section on external network access and VT leadership in research networks in Virginia Tech HPC proposal: "Accelerating the Time to Discovery through Efficient and Usable Petascale Computing" NSF Program Solicitation 05-625: High Performance Computing System Acquisition: Towards a Petascale Computing Environment for Science and Engineering
- Provided direct support to the Mid-Atlantic Broadband Cooperative and Ben Davenport for the development of "Tier 1" access strategy

Davis, Kevin and Watson, Judy. May 2006, presented information on Symantec AntiVirus software and UCS service at the MS/VT Security Summit

Dougherty, William

- October 2005, presentation on the duties and future directions/goals of Systems Support at the Departmental Computing Support Symposium (DCSS)
- December 2005, presentation on virus scanning and spam filtering as part of an overall information technology security strategy to a group of K-12 educators and administrators in Roanoke, Virginia
- January 2006, presentation to incoming Virginia Tech student-athletes on computer security and abuse including copyright issues, acceptable use policies, and cyber-abuse
- April 2006, presentation on virus scanning and spam filtering as part of an overall information technology security strategy at the EDUCAUSE Security Professionals Conference in Denver, Colorado

Hach, Richard. May 2006, authored section for use with response to Defense Advanced Research Projects Agency (DARPA) Advanced Technology Office (ATO) Request for Proposal for the Wireless Adaptable Network Node (WANN). Addressed NI&S capabilities to support Wireless@Virginia Tech and the Center for Wireless Telecommunications (CWT) in meeting on DARPA WANN program objectives.

Landreth, Joyce. April 2006, presented "The Use of Smartphones in a University Environment." at the Association of Collegiate Computing Services (ACCS) of Virginia conference in Charlottesville, Virginia

Nichols, John

- Provided eCorridors consulting support to the City of Bedford to help prepare their wireless RFP and to evaluate vendor responses
- Supported eCorridors for a City of Danville wireless project and provided related consulting to Virginia Tech individuals
- Provided consulting support for a Southampton County individual interested in starting a wireless Internet service

## Network Infrastructure and Services

- Collaborated with service providers in support of eCorridors and BEV outreach to promote broadband deployment, including with Mid-Atlantic Broadband Cooperative, D-Tel, iTown, Digital Bridge Communications, Technology Management Partners, Conterra Ultra Broadband, Pacific Broadband Networks, Citizens Telephone Cooperative, and Verizon.
- Provided engineering support to the Blacksburg Electronic Village for technology projects in rural counties and for the Town of Blacksburg

### Sanders, Bill

- Provided computer consulting support to Boy Scout Troop 705
- Regular attendance at meetings of the Telecommunications Subcommittee of the Planning District Commission
- Provided consulting support to the Planning Commission of King and Queen County including a presentation on the significance of the Technology Assistance and Master Plan (TAMP)
- Multiple presentations to county Boards of Supervisors, business people, as well as economic development and human resource organizations concerning the economic and social value of community networks and e-Villages.

### Conferences and training

Albert, Judy, Baber, Wanda; Dougherty, William; Homer, John; Jarrell, Ron; Lau, Eliza, Martin, Dave; McNabb, Chris; Ranck, Bill; Rhodes, Tim; Sobczak, Justin; Stell, Ray; Zirkle, Laurie. October 2005, attended Solaris 10 Boot Camp in Blacksburg

Allen, Morgan. April 2006, attended Independent Oracle Users Group Conference in Nashville, Tennessee

Allen, Morgan; Christian, Jason; Cook, Dan; Early, Brian; Harris, Carl; Hutson, Joe; Mathai, Mathew; Phipps, Richard; Roberts, Robert; Ward, Luke. June 2006, attended Administering Apache Tomcat training in Blacksburg

Baber, Wanda; Edmonds, Doug; Jarrell, Ron; Kletneiks, Valdis; Martin, Dave; McNabb, Chris; Ranck, Bill; Rhodes, Tim. March 2006, participated in SANS GIAC (Global Information Assurance Certification) training in pursuit of “Incident Handler” certification—a concerted effort to protect information technology critical information assets

Blevins, Bill. May 2006, Attended Hokie Mart (SciQuest) Training

Blevins, Bill; Grubb, Terry; and Smith, Debbie. February 2006, OSHA Construction Safety and Health Course

## Network Infrastructure and Services

Christian, Jason; Fischer, Eric; Stell, Ray; Wright, Danny. May 2006, attended the VT/MS Security Summit in Blacksburg

Cook, Dan; Fischer, Eric; Kirstein, Dean; Phipps, Richard; Stell, Ray; Thistle, Gene; Ward, Luke; and Zirkle, Laurie. March 2006, participated in a SANS Internet Security Seminar on Hacker Techniques, Exploits, & Incident Handling in Blacksburg

Cornish, Carol

- September 2005, attended “Civility in the Workplace” management workshop by Richard Pimental at the Virginia Bioinformatics Institute Conference Center
- December 2005, attended “Conflict Management and Confrontational Skills,” in Roanoke, Virginia
- January 2006, attended “Training for New Supervisors” at the Inn at Virginia Tech
- February 2006, attended “Excelling as a First Time Manager” in Roanoke, Virginia
- April 2006, attended Conflict Discrimination seminar at Research Bldg 14

Davis, Sandra

- March 2006, attended “Stay Connected at Work-Communicate” conference at Squires Student Center
- April 2006, attended Conflict Discrimination seminar at Research Bldg 14

Dougherty, William

- September 2005, attended the Commons Solutions Group meeting at Carnegie Mellon University in Pittsburgh, Pennsylvania
- October 2005, assisted in bringing a Sun training session, “A Solaris 10 Boot Camp” to the Virginia Tech campus
- November 2005, attended Executive Briefing Center meetings focused on research and high-performance computing, thin-client technology at Sun Microsystems’ campus in Palo Alto, California
- December 2005, attended Executive Briefing Center meetings focused on advanced messaging and integration with Virginia Tech’s existing infrastructure at Microsoft’s office in Reston, Virginia
- February/March 2006, attended Virginia Tech/Radford University meetings on Disaster/Recovery/Business Continuity Planning
- March 2006, attended the IBM Mid-Atlantic Education Summit in White Plains, New York
- April 2006, attended the EDUCAUSE Security Professionals Conference in Denver, Colorado
- May 2006, attended the Commons Solutions Group meeting at the University of Wisconsin-Madison

## Network Infrastructure and Services

Field Engineering—Warehouse Staff, Inside and Outside Plant Staff, Senior Supervisors and Manager, First Aid and CPR Training

Field Engineering— Inside and Outside Plant Staff, Senior Supervisors and Manager, Personal Protective Equipment Training

Field Engineering— Inside and Outside Plant Staff, Fall Protection Training

Field Engineering—Inside Plant Staff

- Ground Fault and Electrical Safety Training
- Proper Use of Ladders and Scaffolds Training

Field Engineering—Outside Plant Staff

- Confined Space Entrant Training
- Excavation Competent Person Training

Fischer, Eric. December 2005, participated in a SANS Internet Security Seminar, “Securing Windows,” in College Park, Maryland

Gillespie, Sean. April 2006, attended Internet2 Network Performance Workshop in Charlottesville, Virginia

Gordon, Steve. February 2006, Virginia Tech Confined Space Entrant, Attendant, Supervisor Training

Hach, Richard

- September 2005, participated as a Delegate to the 7<sup>th</sup> Annual Commonwealth of Virginia Information Technology Symposium (COVITS) 2005 in Richmond, Virginia
- October 2005, attended EDUCAUSE 2005 Annual Conference in Orlando, Florida
- November 2005, attended Luminary Series leadership presentations in Roanoke, Virginia
- February 2006, attended Net@EDU Annual Member Meeting and joint meeting of ICS and Wireless Working Groups in Tempe, Arizona
- March 2006, participated in Sprint Higher Education Advisory Meeting in La Jolla, California
- March 2006, attended EDUCAUSE Learning Initiative Focus Session: Mobility and Mobile Learning in Adelphi, Maryland
- April 2006, attended EDUCAUSE Policy Conference in Washington, D.C.
- May 2006, represented CNS at meeting with Wireless@VT and Science Applications International Corporation (SAIC) regarding Defense Advanced Research Projects Agency Wireless Adaptable Network Node (DARPA WANN) proposal

Hamilton, Patricia. April 2006, attended conflict discrimination seminar at Research Bldg 14

Harris, Carl

- December 2005, attended Executive Briefing Center meetings focused on advanced messaging and integration with Virginia Tech's existing infrastructure at Microsoft's office in Reston, Virginia
- November 2005, attended Executive Briefing Center meetings focused on research and high-performance computing, thin-client technology at Sun Microsystems' campus in Palo Alto, California

Hoover, Maynard. June-September 2005, completed FEMA's Community Emergency Response Team (CERT) Training offered through Virginia Tech's Environmental, Health and Safety Services Department

Hutson, Joe

- March 2006, attended VoiceCon Business IP Telephony conference in Orlando, Florida
- December 2005, attended Executive Briefing Center meetings focused on advanced messaging and integration with Virginia Tech's existing infrastructure at Microsoft's office in Reston, Virginia

Inman, Kevin. February 2006, attended annual "Apple Computer Technology Briefing" in Charlottesville, Virginia

Jarrell, Ron. December 2005, attended Executive Briefing Center meetings focused on advanced messaging and integration with Virginia Tech's existing infrastructure at Microsoft's office in Reston, Virginia

Jones, Brian E. October 2005, attended INSIGHT2005 Concord User Group Conference in Boston, Massachusetts

Kirstein, Dean. May 2006, attended Microsoft Developer Security Workshop

Kidd, Jeff

- July 2005, attended the "Institute for Computer Policy and Law" tenth annual seminar at Cornell University, Ithaca, New York
- June 2006, attended the Virginia Government Communicators Conference in Richmond, Virginia

Landreth, Joyce

- May 2006, attended the James D. McComas Staff Leadership Seminar
- June 2006, attended the Southeast Regional EDUCAUSE Conference, "Balancing Today with Tomorrow through Innovation, Collaboration and Integration"

## Network Infrastructure and Services

Linkous, Barry. April 2006, attended Joint Users of Siemens Technologies – United States (JUST-US) conference in Dallas, Texas

Martin, Barbara

- September 2005, Attended the "Civility in the Workplace" management workshop presented by Richard Pimental at the Virginia Bioinformatics Institute Conference Center
- April 2006, Attended "Rising to the Challenge: Trust – Ethics – Empowerment" seminar sponsored by the New River Valley Chapter of the International Association of Administrative Professionals

Baber, Wanda; Edmonds, Doug; Jarrell, Ron; Kletneiks, Valdis; Martin, Dave; McNabb, Chris; Ranck, Bill; Rhodes, Tim, participated in GIAC (Global Information Assurance Certification) training in pursuit of "Incident Handler" certification—a concerted effort to protect Information Technology critical information assets

Nichols, John

- August 2005, attended Asbestos Inspector recertification training
- October 2005, attended VITA Project Management Training
- October 2005, participated in the eCorridors Redwood Technology Consortium Seminar in Blacksburg
- February 2006, attended EDUCAUSE Net@ EDU Annual Conference and co-chaired the Wireless Networking Group meeting in Tempe, Arizona
- April 2006, attended diversity training for managers
- April 2006, attended "The Excellence Edge: New strategies for Creating Extraordinary Results" in Roanoke, Virginia

Nowlin, Carrie

- September 2005, attended "Civility in the Workplace" management workshop by Richard Pimental at the Virginia Bioinformatics Institute Conference Center
- October 2005, attended "Criticism and Discipline Skills for Managers" by Career Track in Roanoke, Virginia
- October 2005, participated in the Virginia Tech Lockbox Tour in Baltimore, Maryland
- January 2006, attended "Training for New Supervisors" at the Inn at Virginia Tech
- April 2006, attended Conflict Discrimination seminar at Research Bldg 14
- April 2006, attended the "Rising to the Challenge: Trust – Ethics – Empowerment", seminar sponsored by the New River Valley Chapter of the International Association of Administrative Professionals

Rodgers, Pat

## Network Infrastructure and Services

- April 2006, attended EDUCAUSE Policy Conference in Washington, D.C.
- January 2006, attended Common Solutions Group meeting in Durham, North Carolina

Sanders, Bill. November 2005, Attended Luminary Series leadership presentations in Roanoke, Virginia

Sheppard, Anne. June 2006, Attended the ResNet Conference in Bowling Green, Ohio

Smith, Debbie

- October 2005, attended Virginia Tech Choices and Challenges Forum
- May 2006, attended Hokie Mart (SciQuest) Training

Smith, Roy

- April 2006, Attended Harassment and Discrimination Presentation and Complaint Workshop
- May 2006, Attended Hokie Mart (SciQuest) Training

Sprague, Robert

- April 2006, attended Internet2 Network Performance Workshop in Charlottesville, Virginia
- September 2005, Completed the Faculty Development Institute class, "Collecting Survey Data via the Web"
- Completed 12 credits towards Virginia Tech MBA

Stell, Ray, April 2006, attended Independent Oracle Users Group Conference in Nashville, Tennessee

Turner, Margie

- March 2006, attended Annual Conference "Stay Connected at Work-Communicate" at Squires Student Center
- April 2006, attended Conflict Discrimination seminar at Research Bldg 14

Walsh, Danielle

- September 2005, Completed the Faculty Development Institute class, "Collecting Survey Data via the Web"
- September 2005, Completed the Faculty Development Institute class, "Blackboard 6 (Part One): Creating Web-based Courses"

Whitlock, Diane



## Network Infrastructure and Services

- July 2005, attended the Administrative Staff Professional Network (ASPN) Conference Planning workshop presented by University Leadership Development at The Inn at Virginia Tech and Skelton Conference Center
- June-September 2005, completed FEMA's Community Emergency Response Team (CERT) Training offered through Virginia Tech's Environmental, Health and Safety Services Department
- September 2005, attended the "Civility in the Workplace" management workshop presented by Richard Pimental at the Virginia Bioinformatics Institute Conference Center
- November 2005, participated in a group collaboration session with Citizen's Telephone Cooperative in Floyd, Virginia

Worrell, Pat

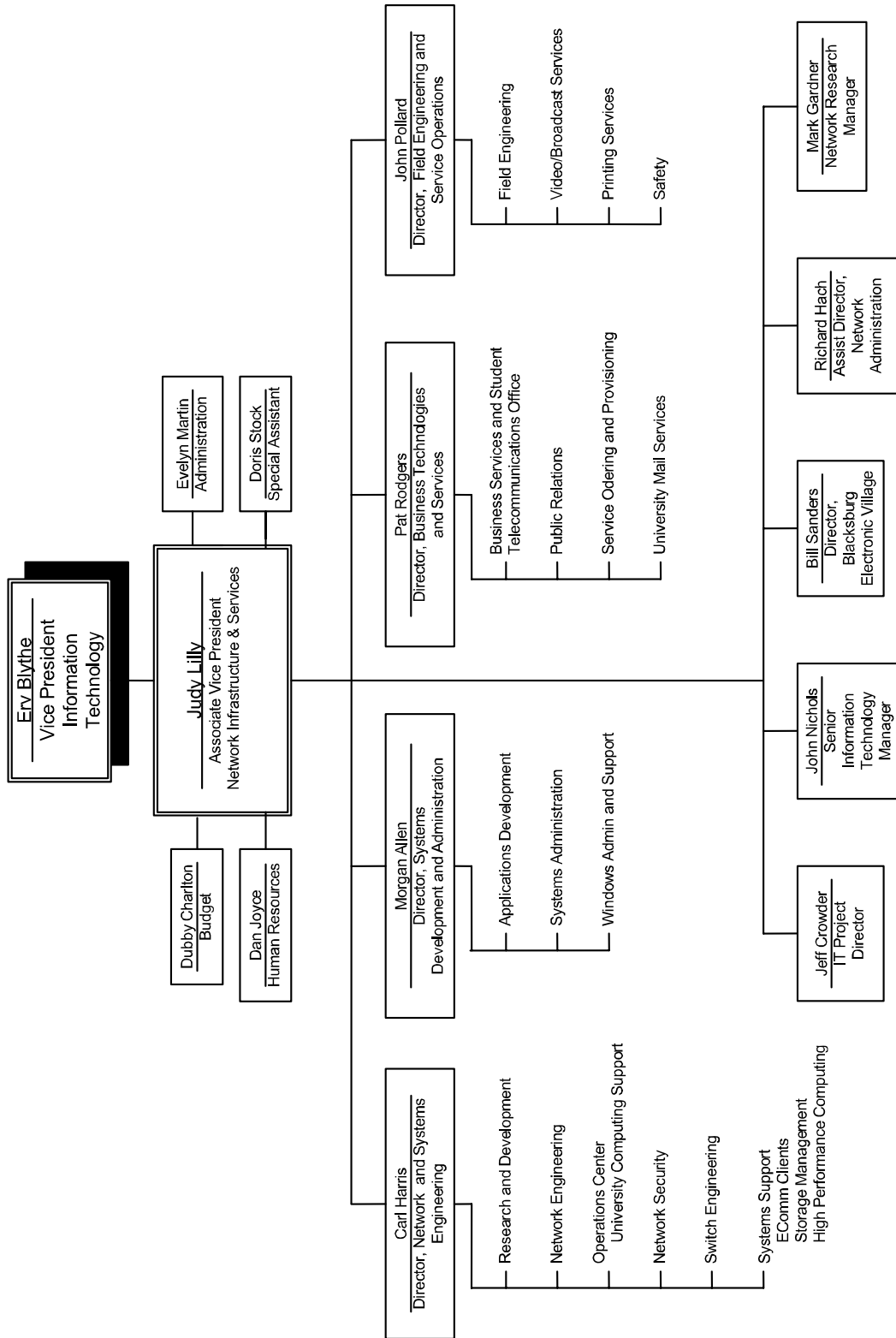
- July 2005, attended "Managing Multiple Priorities," Fred Pryor Seminar in Roanoke, Virginia.
- September 2005, attended "Civility in the Workplace" management workshop by Richard Pimental at the Virginia Bioinformatics Institute Conference Center Tech.
- October 2005, attended the Business Practices Seminar, sponsored by the University Controller's Office
- April 2006, attended the "Rising to the Challenge: Trust – Ethics – Empowerment" seminar sponsored by the New River Valley Chapter of the International Association of Administrative Professionals
- April 2006, attended Conflict Discrimination seminar at Research Bldg 14

Wright, Danny. June 2006, participated in a SANS Internet Security Seminar, "Securing Windows," in Charlottesville, Virginia

Appendix: Network and Infrastructure services organizational  
chart

# Network Infrastructure and Services

June 2006



# Research Computing

This report provides an overview of activities of the Research Computing Team for the period 1 July 2005 through 30 June 2006. Members of the team include:

Terry L. Herdman, Associate Vice  
President for Research  
Computing and Support Services

Kevin Shinpaugh, Director of High  
Performance Computing,  
Research and Cluster Computing

William Sydor, Research  
Applications Support, Research  
and Cluster Computing

Geoffrey Zelanka, Applications  
Developer, Research and Cluster  
Computing

Judy Lilly, Associate Vice President  
Infrastructure Networks and  
Services, Communications  
Networks Services

Jeff Crowder, Project Director,  
Telecommunications Auxiliary,  
Communications Network  
Services

Mark Gardner, Network Research  
Manager, Telecommunications  
Auxiliary, Communications  
Network Services

William Dougherty, Assistant  
Director Systems Support,  
System Engineering and  
Administration

Tim Rhodes, Technical Team  
Manager, System Engineering  
and Administration

Steven Greenfield, Senior Systems  
Engineer, Systems Engineering  
and Administration

Lucas Scharf, Systems Engineer,  
Systems Engineering and  
Administration

Information Technology supports an array of computing and advanced networking facilities for a broad range of research and science applications. During the time period covered by this report, the research computing team undertook the management and operations of Systems X and developed a plan for including all the computational facilities in this structure. The demand for application support has risen during this reporting period, and the research computing team has responded to provide the best possible operational, administrative, and management support through stable, production-oriented computing resources. We also want to provide support services (application support, transporting of code to various systems, MPI support, and visualization support and tools) that advances the research programs of the university's research faculty.

High lights for this past year include the following:

- Visits to high performance computing (HPC) centers to assist in our development of a plan for Virginia Tech advanced research computing
- Virginia Tech Booth at SC 2005 and other HPC conferences allowing our team to interact with hardware and software vendors, researchers and business, industrial and government organizations that have interest in the complex problems that require HPC
- Collaborations with Virginia Tech research groups and external research groups
- Participation in the Level 1 and the level 2 NSF Petascale proposals
- Stabilizing System X as a production system
- New upgrades for Inferno 2 and adding a 64p Altix 4700
- Developing a plan for adding visualization to our HPC support services
- Assistance in the recruitment of Virginia Tech faculty and graduate students

## Visits

The Research Computing Team has been developing a plan for the creation of an advanced research computing facility with user support services. In an effort to learn from successful high performance computing centers in the areas of management, operations, and support services we visited several centers.

### **Computational and Information Sciences Directorate**

Virginia Tech was invited to visit the U.S. Army Research Laboratory's Computational and Information Sciences Directorate (CISD), the principal Army organization for research and development in computational and information sciences. CISD is responsible for and directly oversees leading research initiatives in information science and technology and computational

science, as well as in atmospheric and environmental sciences. CISD manages and executes a Department of Defense Major Shared Resource Center for high performance computing. It also oversees the Army High Performance Computing Research Center for research initiatives in computational sciences, the Army Center of Excellence in Information Sciences, and the Communication and Networks Alliance, part of the Collaborative Technology Alliances program. CISD coordinates technologies within the Army, other services and their laboratories, industry, and academia to leverage basic and applied research opportunities for the benefit of the Army.

Attending on behalf of Virginia Tech were Erv Blythe, Gene Cliff, Jeff Crowder, William Dougherty, Terry Herdman, Tim Rhodes, and Kevin Shinpaugh.

### Pittsburgh Supercomputing Center

The Pittsburgh Supercomputing Center (PSC) is a joint effort of Carnegie Mellon University and the University of Pittsburgh together with Westinghouse Electric Company. Established in 1986, PSC is supported by several federal agencies, the Commonwealth of Pennsylvania, and private industry, and is a leading partner in TeraGrid, the National Science Foundation's cyberinfrastructure program.

The Pittsburgh Supercomputing Center provides university, government, and industrial researchers with access to several of the most powerful systems for high-performance computing, communications, and data handling available to scientists and engineers nationwide for unclassified research. PSC advances the state-of-the-art in high-performance computing, communications and informatics and offers a flexible environment for solving the largest and most challenging problems in computational science. As a leading partner in the TeraGrid, PSC works with other TeraGrid partners to harness the full range of information technologies to enable discovery in U.S. science and engineering.

PSC is a leading edge site in the National Science Foundation's Shared Cyberinfrastructure program, providing U.S. academic researchers with support for and access to leadership-class computing infrastructure and research.

The National Resource for Biomedical Supercomputing, sponsored by the National Institutes of Health, develops new algorithms, performs original research, and conducts training workshops, in addition to fostering collaborative projects and providing access to supercomputing resources to the national biomedical research community.

In partnership with the Department of Energy's National Energy Technology Laboratory, Carnegie Mellon University, the University of Pittsburgh, West Virginia University, the West Virginia Governor's Office of Technology, the Institute for Scientific Research, Duquesne University, the Pennsylvania State University, and Waynesburg College, PSC provides resources to the SuperComputing Science Consortium, a regional partnership to advance energy and environment technologies through the application of high performance computing and communications.

Attending were: Erv Blythe, William Dougherty, Mark Gardner, Terry Herdman, Tim Rhodes, Kevin Shinpaugh, and Bill Sydor.

### SpaWar

Space and Naval Warfare Systems Center San Diego (SSC San Diego) is the U.S. Navy's research, development, test and evaluation, engineering, and fleet support center for command, control, and communication systems and ocean surveillance. SSC San Diego provides information resources to support the joint warfighter in mission execution and force protection.

SSC San Diego was established June 1, 1940, as the Navy's first west coast laboratory. It is headquartered in San Diego, California, with other sites at Pearl Harbor, Hawaii; Barrigada, Guam; Yokosuka, Japan; Philadelphia, Pennsylvania; Stuttgart, Germany; and Bahrain. The center employs 3,400 civilian and military personnel, the majority of them engineers, scientists, and technicians developing technology to meet the Navy's information requirements of the future and providing Fleet support to keep current information systems running.

Attending were Terry Herdman and Kevin Shinpaugh.

## Conferences

### Supercomputing 2005

The Supercomputing Conference 2005 was held November 13-18 in Seattle, Washington. This is the premier conference on high performance computing and related technologies. Information technology provided the majority of the funding and personnel for the Virginia Tech booth. The Research Division provided additional support for the booth and covered the travel expenses for three Virginia Tech researchers. During the conference, Terry Herdman and Kevin Shinpaugh attended an NDA briefing with IBM on the JS21 and the BladeCenterH, which was the key technology in the university's petascale proposal in February.

### Internet2 HPC Forum

A workshop on "Effective Approaches to Campus Research Computing Cyberinfrastructure" was held April 25-27, 2006, at the Crystal Gateway Marriott Hotel, Arlington, Virginia. The

workshop, aimed primarily at major campus chief technology officers and with relevance to chief information officers, began a community process for greater common understanding around the technology options and, to a lesser degree, the political and financial issues for campus research computing cyberinfrastructure. The workshop was centered on coordinated presentations by several universities that are doing leading-edge deployments of research computing capabilities. Campuses will be selected to present an architecturally diverse set of approaches, including campus-wide grids, clusters (e.g. Condor pools or Beowulf clusters), condo's, etc. We intend to deliver a whitepaper detailing the approaches and the comparative analyses that emerge from the workshop discussions.

### HPC User Forum

The HPC Users Forum was held April 10–12 in Richmond, Virginia. The HPC User Forum provides the opportunity to:

- Discuss ideas and issues with other HPC users
- Showcase your requirements and achievements
- Review vendor strategies and products
- Present consolidated positions to vendors & policymakers
- Explore new user opportunities and emerging technologies
- Direct IDC's HPC research efforts

Attending were Erv Blythe, Jeff Crowder, William Dougherty, Tim Rhodes, and Kevin Shinpaugh.

## Collaborations

### VT NSF Petascale(Level 2)

The Research Computing Team worked with the Computer Science Department in the College of Engineering and the Research Division to pursue the National Science Foundation (NSF) program on “High Performance Computing System Acquisition: Towards a Petascale Computing Environment for Science and Engineering.” The NSF accepted proposals from organizations willing to serve as HPC resource providers, and who propose to acquire and deploy a new HPC system or to upgrade an existing system.



Competitive HPC systems will

- Enable researchers to work on a range of computationally-challenging science and engineering applications;
- Incorporate reliable, robust system software essential to optimal sustained performance;
- Provide a high degree of stability and usability.

The Virginia Tech proposal was with IBM to provide the next generation HPC system to provide 100 TF (TeraFlops) of peak performance. If selected, NSF would provide funds of 15 million dollars toward the purchase of the machine. NSF would also provide additional funds to support a service center for five years.

### **LASCA**

The Research Computing Team has continued to work with LASCA. We provided funds to support graduate research assistants (GRAs) who work with LASCA faculty and GRAs to provide resources to help with coding and transportation of existing code for System X users.

### **VBI**

Kevin Shinpaugh provided high level Solaris Unix system support for the Sunfire E15K at VBI. He provided up to 10 hours per week of support. His support was provided to VBI at a cost of \$30,000 per year. VBI had had trouble locating appropriate Solaris expertise within the budget they had. The Research Computing Team also recruited VBI research faculty/staff to use System X and the SGI computers. Chris Barret's group within VBI started porting and scaling of their EpiSims code which is a comprehensive event characterization for biological incidents such as bird flu and other contagious diseases.

### **ORNL NSF petascale proposal (level 1)**

Terry Herdman worked with Thomas Zacharia and Jeffrey Nichols, ORNL, to identify contributions that Virginia Tech could make to the ORNL NSF Petascale proposal. The K-12 information technology program, research descriptions in LES, Traian Iliescu and Jeff Borggaard, in Chemistry, Daniel Crawford, and Climate Modeling, Adrian Sandu, were identified as components that should be included in the proposal as well as Virginia Tech's overall strength in Computational Science and Engineering. We are investigating if some of our efforts in the NLR could be used as a component of this proposal.

### **HSMM**

HSMM, Roanoke, Virginia, proposed a joint effort in rendering large data sets. Kevin Shinpaugh prepared a proposal, with the help of Virginia Tech's Office of Sponsored Programs, to address the needs of HSMM. The proposal was awarded.

### **NCR**

Terry Herdman has worked with Chris Barrett, VBI, to identify researchers and research programs in complex science that would fit within the framework of Center proposed by researchers at the Finland University of Technology.

## New personnel

### Lucas Scharf

Luke Scharf joined the NIS-Support group to provide system administration for the IT centrally provided research computing resources located in the Andrews Information System Building (AISB). Luke came from the Aerospace and Ocean Engineering (AOE) department where he was responsible for all the system support. He has experience with large scale SGI research machine such as Enterprise.aoe.vt.edu, which AOE secured from the Army. He has experience with a cluster in AOE similar to System X, but on a much smaller scale.

### Mark Gardner

Mark Gardner joined the IT department in CNS in June 2006. He was previously with the Radiant Team of the Advanced Computing Lab group at Los Alamos National Laboratory, a Department of Energy facility in New Mexico. Mark has expertise in high performance networking, especially related to high performance computing, real-time systems, compilers, and operating systems. He is already making an impact by helping researchers increase data transmission throughput from System X to NCSA archival storage. Mark has agreed to reviewed the NSF Petascale proposal and will be very valuable to the research computing efforts.

## System X

### Memorandum of understanding

A memorandum of understanding (MOU) addressing the support for and operation of System X was signed in August 2005. This document presents mutual understandings and agreements among the provost, the vice president for Information Technology, the vice president for research, and the dean of the College of Engineering. The MOU addressed the need to transform System X from an experimental, high performance computing development project to a production facility. In particular, the MOU calls for System X to become a stable computing environment available to university and external faculty and researchers that supports a broad range of scientific codes and applications. It was noted that a stable System X can be leveraged

in developing partnerships with major science and research players (for example, federal research laboratories and agencies, other universities, private sector organizations, and more specifically, the Virginia Bioinformatics Institute). In addition, the MOU calls for System X to be transitioned to a production-oriented, professionally administered resource, serving the Virginia Tech research community. Information Technology agreed to (1) place System X under operational control of production computer operations staff, and of production systems administration staff and (2) assume the related operation, administration and management costs to place System X on a full-time (24x7) production schedule. Also, Information Technology agreed that allocation of resources on System X will reflect the following principles:

- The ultimate measure of success will be the research merit of applications maintained and supported in the System X computational environment;
- System X will facilitate limited, scheduled experimental access by computer science researchers developing and testing alternative operating system components, specialized message processing interfaces, communications drivers, applications scheduling and management tools, checkpoint-restart capabilities, and storage management and other software environment functions critical to increasing the efficiency, reliability and cost/performance of massively parallel computing systems.

The vice president for research and the vice president for Information Technology delegated overall responsibility to the associate vice president for research computing and support services for the management of System X as a production computing facility. This high performance computing facility will now be dedicated to research applications. The vice president for research and the vice president for Information Technology will coordinate, or establish a process for, the allocation of university-based research computing and related university sponsored technology resources(see next section).

## Allocation

Research faculty members submit a proposal describing the research project and the number of hours being requested. The allocation committee—Calvin Ribbens (Computer Science), Daniel Crawford (Chemistry) and Danesh Tafti (Mechanical Engineering)—makes recommendations regarding allocations to Associate Vice President Terry Herdman.

Cumulative allocations by PI for System X through April 2006

| Principal investigator | College     | Department | Hours   |
|------------------------|-------------|------------|---------|
| Joe Wang               | Engineering | AOE        | 5000    |
| Bob Walters            | Engineering | AOE        | 100000  |
| Joe Schetz             | Engineering | AOE        | 50000   |
| Elisa Sotelino         | Engineering | CEE        | 384615  |
| David Cox              | Engineering | CHE        | 50000   |
| Amadeu Sum             | Engineering | CHE        | 1184615 |

## Research Computing

|                       |             |           |         |
|-----------------------|-------------|-----------|---------|
| Adrian Sandu          | Engineering | CS        | 305000  |
| Alexey Onufriev       | Engineering | CS        | 255000  |
| Naren Ramakrishnan    | Engineering | CS        | 600000  |
| Kirk Cameron          | Engineering | CS        | 100000  |
| Liqing Zhang          | Engineering | CS        | 15385   |
| Cal Ribbens           | Engineering | CS        | 145000  |
| Srinidhi Varadarajan  | Engineering | CS        | 50000   |
| Wu Feng               | Engineering | CS        | 500000  |
| Layne Watson          | Engineering | CS        | 505000  |
| Ishwar Puri           | Engineering | ESM       | 50000   |
| Ron Kriz              | Engineering | ESM       | 100000  |
| Danesh Tafti          | Engineering | ME        | 1633000 |
| Kenneth Ball          | Engineering | ME        | 410000  |
| Michael von Spakovsky | Engineering | ME        | 20000   |
| Mark Paul             | Engineering | ME        | 384615  |
| Diana Farkas          | Engineering | MSE       | 1545000 |
| Sean Corcoran         | Engineering | MSE       | 212000  |
| Yu Wang               | Engineering | MSE       | 246154  |
| Levon Asryan          | Engineering | MSE       | 246154  |
| David Bevan           | Science     | BIOCHEM   | 104999  |
| John Tyson            | Science     | BIOL      | 10000   |
| T. Daniel Crawford    | Science     | CHEM      | 5000    |
| Diego Troya           | Science     | CHEM      | 100000  |
| Matthias Imhof        | Science     | GEOS      | 105000  |
| Jeff Borggaard        | Science     | MATH      | 370000  |
| Terry Herdman         | Science     | MATH/ICAM | 100000  |
| Uwe Tauber            | Science     | PHYS      | 200000  |
| Kyungwha Park         | Science     | PHYS      | 340000  |
| Beate Schmittmann     | Science     | PHYS      | 320000  |
| Jaroslawn Sobieski    | NIA         | NIA       | 10000   |
| Sarah-Jane Frankland  | NIA         | NIA       | 25000   |
| Craig Mattocks        | UNC         | GEOS      | 5000    |
| Ina Hoeschele         | VBI         | VBI       | 9000    |

Madhav Marathe

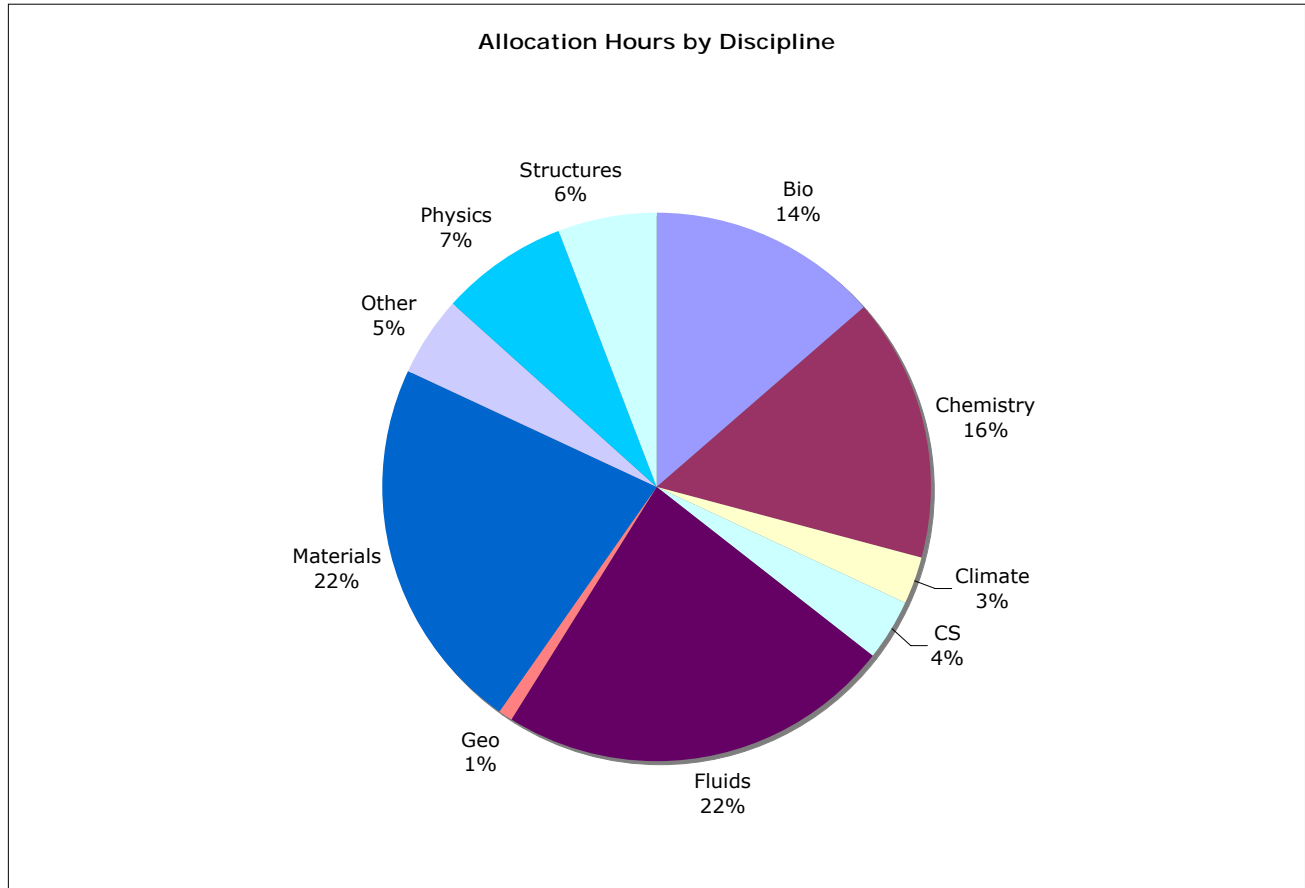
VBI

VBI

100000

Total awarded:

10900537



Allocation by research area for System X.

### IB switch upgrade

In January 2006, the problematic reference design InfiniBand (IB) switches from Mellanox were replaced with new switches from Silver Storm Technologies (SST). A memorandum of understanding had been signed with SST in Fall 2005 to allow SST access to System X for development and testing of IB driver stack for Mac OS X. In exchange, the university has the right to use the software developed and to purchase new switches at a highly discounted rate.

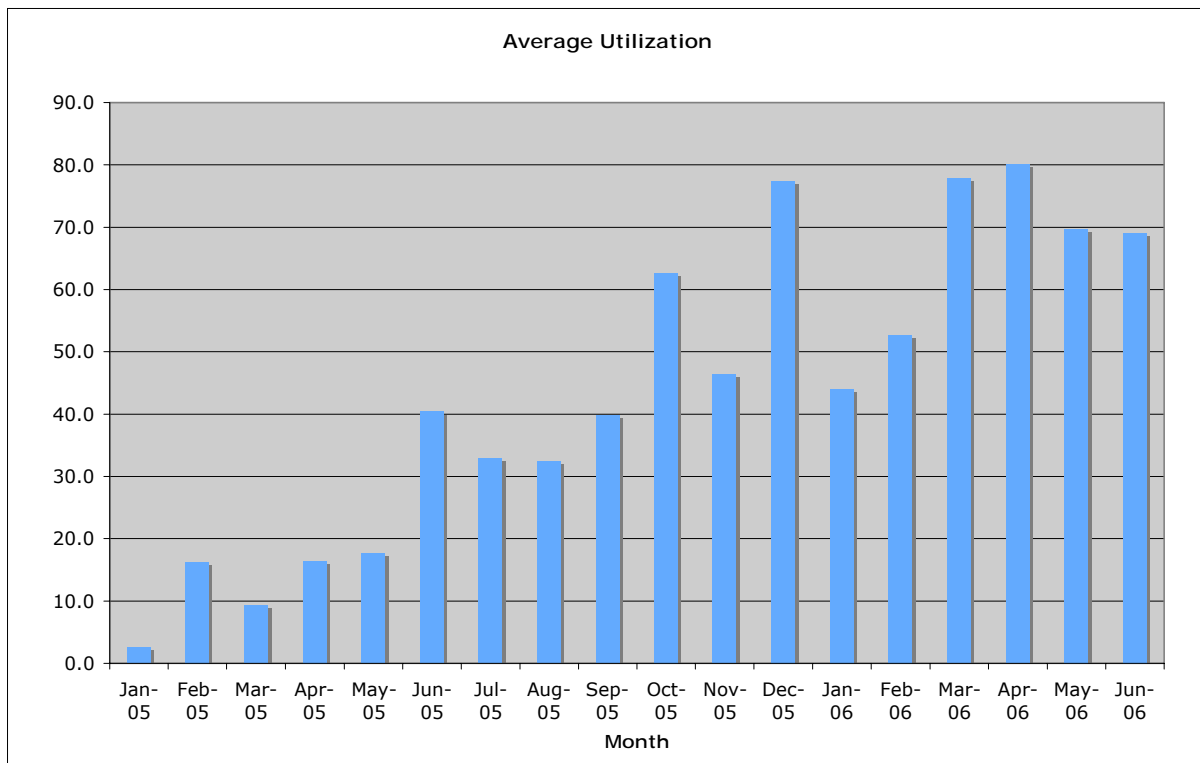
The Mellanox switches had been the source of many outages and job failures. Once the new switches from Silver Storm Technologies were in place, we saw immediate increase in reliability if the system, far fewer failed jobs and no equipment failures. The amount of hours used by successful jobs reached over 99.9% in February 2006.

## User support

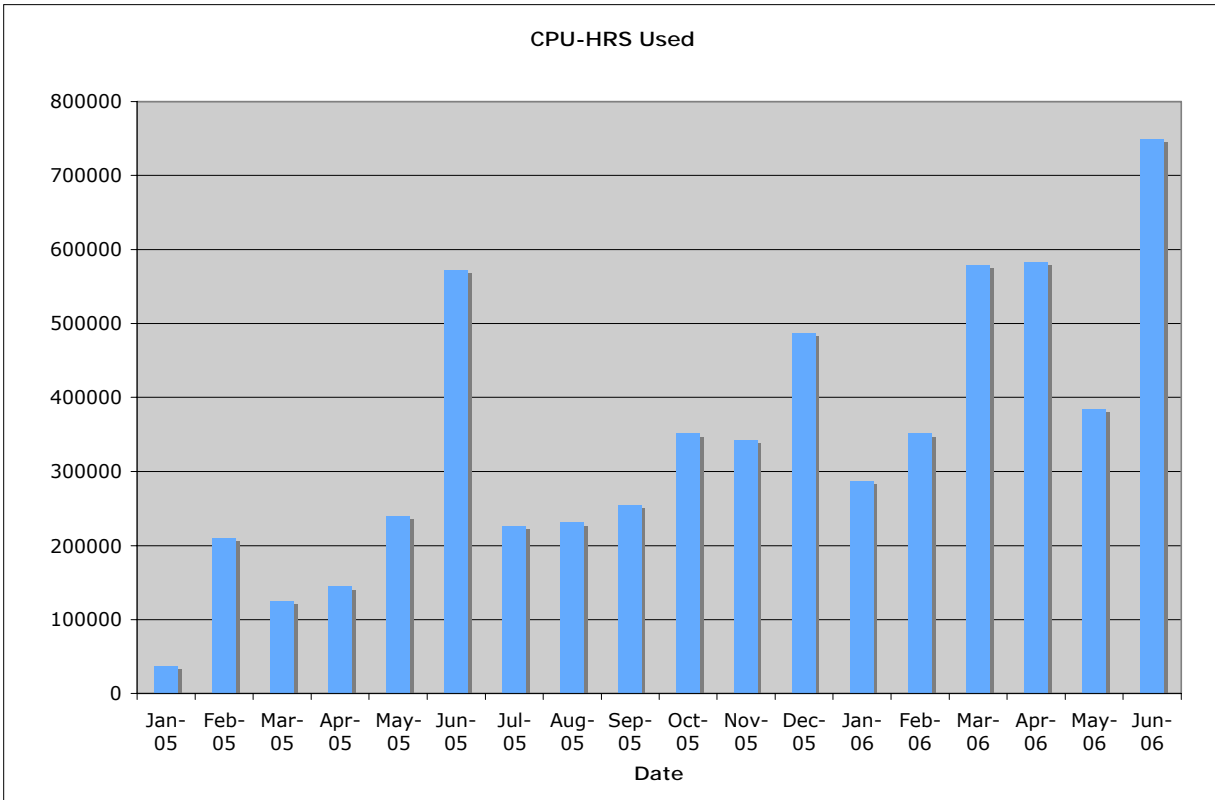
Support services are offered to System X users by Research Computing staff and GRAs under the supervision of Kevin Shinpaugh, Director of HPC. Technical support resources are also offered to System X users in the form of development consultation offered by LASCA. Walk-in and by appointment consultation is offered to any faculty or graduate student working on application code for use on any of the university's research computing resources. A regular schedule of 2:00 PM to 5:00 PM, Monday through Friday was maintained for face-to-face assistance in the LASCA facilities located in 2050 Torgersen Hall.

## System utilization

The following graphs and tables provide levels of utilization and job success rate for System X for the period: January 2005 to June 2006. This shows a significant upward trend in usage and successful jobs. We note that the November 2005 interruption in service to Virginia tech researchers was due to the use of System X during the StorCloud Challenge as part of the 2005 Supercomputing Conference. We also note that the December 2005 and March 2006 time frame was the period of the upgrade of the Infiniband communications network. System X was basically unavailable in March 2006 for Infiniband testing. Thus the successful jobs information for arch is tainted.

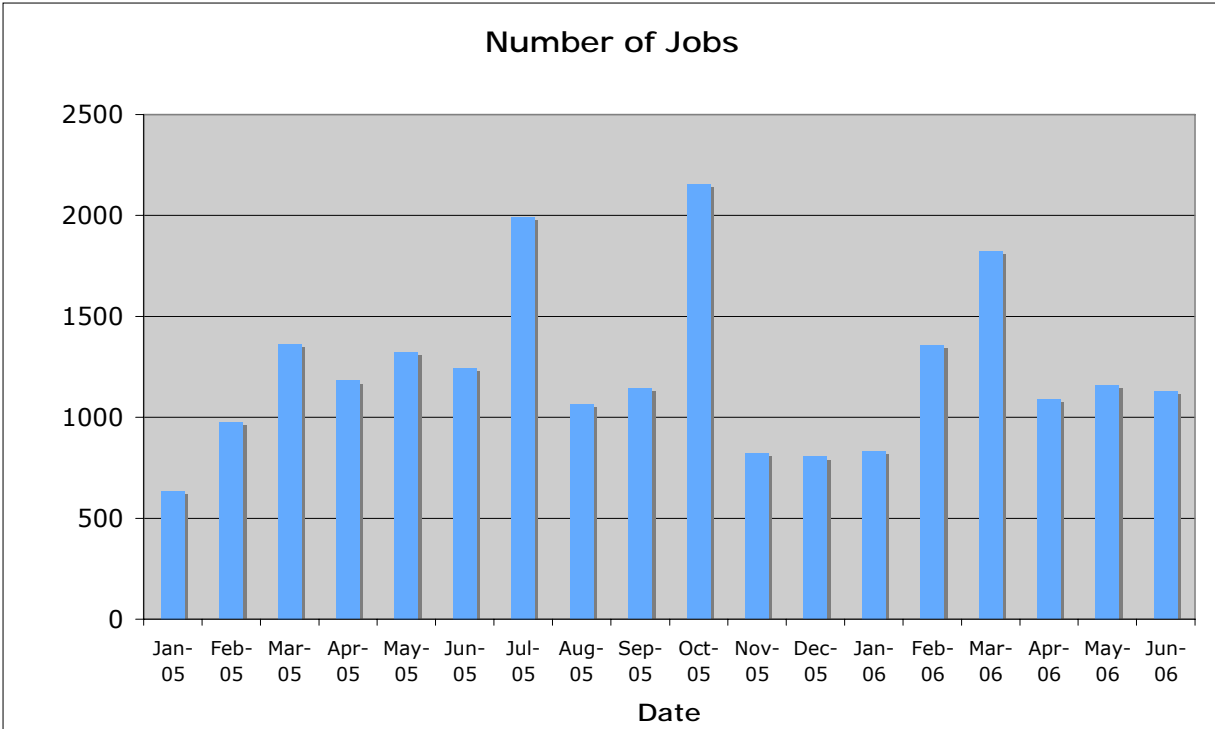


Monthly average utilization by percent of available machine for System X



Monthly CPU-Hrs used on System X

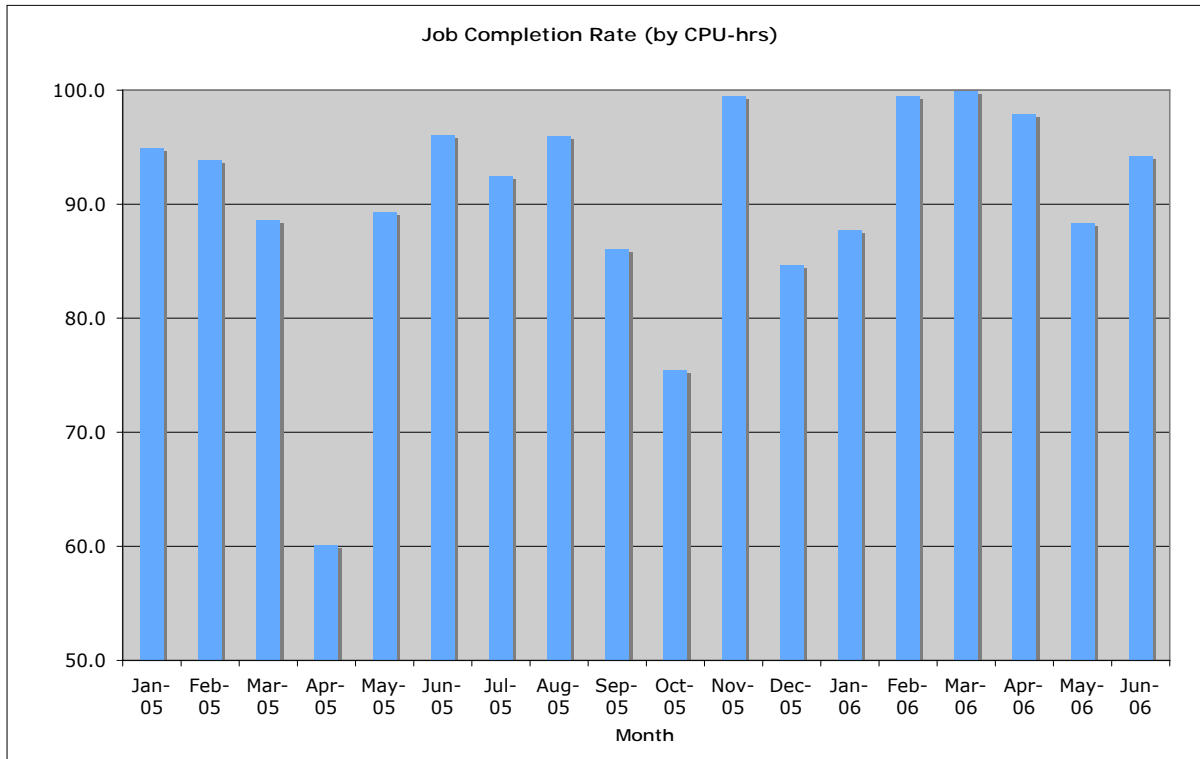




Monthly number of jobs submitted on System X



Job success rate, percentage of jobs that ran to completion without system caused errors.



Percent of CPU-Hrs that resulted in a successful job

### Virginia Tech research using System X

The following first appeared in a report on System X prepared by C. Ribbons, CS, Jason Lockart, College of Engineering, and Kevin Shinpaugh, IT Division.

There are several ways to measure the impact of System X on Virginia Tech research. The most direct measure is grants funded and submitted and publications. A survey of current PIs produced the data in the table below. About half of the current PIs responded, although the most active PIs are represented here. Investigators were asked to list research proposals funded or submitted during the time System X has been in full production (January 2005-March 2006). There are additional research projects funded prior to these dates that have moved their work to System X. Those projects are not represented within this data.

It should also be noted that a \$16 million proposal was submitted to the NSF this year to fund the creation of a NSF Supercomputing Center here at Virginia Tech. This center's resources would be part of the NSF Cyberinfrastructure program and supply computational and applications support to Virginia Tech and peer institutions around the country, further establishing Virginia Tech as a leader in high-performance computing, and computational science and engineering research.

System X is generating significant returns on the cumulative investment for its creation, upgrades, and continued maintenance and support.

System X Principal Investigator Research Grants and Publications

| PI                    | College  | Dept       | 05-06 Funded          | 05-06 Pending          | 05-06 Pubs |
|-----------------------|----------|------------|-----------------------|------------------------|------------|
| Bob Walters           | COE      | AOE        | \$70,000.00           | \$0.00                 | 1          |
| David Cox             | COE      | CHE        | \$435,000.00          | \$0.00                 | 0          |
| Amadeu Sum            | COE      | CHE        | \$0.00                | \$872,194.00           | 5          |
| Alexey Onufriev       | COE      | CS         | \$1,286,940.00        | \$0.00                 | 1          |
| Naren Ramakrishnan    | COE      | CS         | \$0.00                | \$1,973,113.00         | 1          |
| Adrian Sandu          | COE      | CS         | \$0.00                | \$0.00                 | 1          |
| Layne Watson          | COE      | CS         | \$1,718,955.00        | \$0.00                 | 2          |
| Ishwar Puri           | COE      | ESM        | \$0.00                | \$822,000.00           | 0          |
| Danesh Tafti          | COE      | ME         | \$0.00                | \$1,126,672.00         | 5          |
| Michael von Spakovsky | COE      | ME         | \$600,000.00          | \$5,197,362.00         | 2          |
| Diana Farkas          | COE      | MSE        | \$303,412.00          | 0.00                   | 6          |
| David Bevan           | CALS/COS | BIOCHEM    | \$711,000.00          | \$623,372.00           | 3          |
| T. Daniel Crawford    | COS      | CHEM       | \$989,820.00          | \$2,750,000.00         | 0          |
| Diego Troya           | COS      | CHEM       | \$760,000.00          | \$0.00                 | 0          |
| Kyungwha Park         | COS      | PHYS       | \$30,000.00           | \$0.00                 | 0          |
| Beate Schmittmann     | COS      | PHYS       | \$0.00                | \$0.00                 | 1          |
| Uwe Tauber            | COS      | PHYS       | \$0.00                | \$0.00                 | 1          |
| Sarah-Jane Frankland  | NIA      | NIA        | N/A                   | N/A                    | 2          |
|                       |          |            | <b>\$6,905,127.00</b> | <b>\$13,364,713.00</b> | <b>31</b>  |
|                       |          | <b>COE</b> | \$4,414,307.00        | \$9,991,341.00         | 24         |
|                       |          | <b>COS</b> | \$2,490,820.00        | \$3,373,372.00         | 5          |

Recruitment of research faculty and graduate students

A significant benefit of System X and the SGI Shared Memory Systems is the role that these facilities and support services play in the recruitment of new research faculty and graduate students. Over the last two years, several departments have recruited highly qualified researchers

who work in high-performance computing and computational science and engineering. These departments include Chemical Engineering, Chemistry, Civil and Environmental Engineering, Computer Science, Engineering Science & Mechanics, Geosciences, Materials Science and Engineering, Mechanical Engineering, and Physics. During this time period, Geosciences interviewed six candidates. All six attended a tour of our computational facilities. Two of the successful candidates corresponded with Terry Herdman and Kevin Shinpaugh prior to accepting the university's offer concerning our systems and the applications support we could provide. Computer Science has rapidly assembled a world-class research group in high-performance computing systems and cluster computing, due in no small part to the commitment demonstrated by the university in System X.

### Researchers and research projects using System X

Project Summaries by PI for System X.

Hat: engr1001

PI: Adrian Sandu, Computer Science

Allocation History: 5,000 (1/10/05), 300,000 (8/26/05)

Project Title: High Resolution Atmospheric Simulations

Project Description: developing algorithms and codes to model the physical and chemical processes which influence air quality over thousands of square miles.

Hat: engr1002

PI: Diana Farkas, Engineering Science & Mechanics

Allocation History: 5,000 (1/10/05), 240,000 (2/11/05), 500,000 (10/18/05), 800,000 (2/16/06)

Project Title: Mechanical Behavior of Nanocrystalline Materials

Project Description: studying mechanical properties and deformation behavior of metals and alloys using atomistic simulations involving many millions of atoms.

Hat: engr1003

PI: Danesh Tafti, Mechanical Engineering

Allocation History: 5,000 (1/10/05), 20,000 (1/24/05), 608,000 (2/10/05), 500,000 (8/26/05), 500,000 (1/31/06)

Project Title(s): Advanced Cooling of Turbine Blades for Power and Propulsion; Simulation of Complex Turbulent Flow and Heat Transfer

Project Description: developing algorithms and codes, and doing large scale simulations, to study complex air flows and heat transfer in turbomachinery.

Hat: engr1004

PI: Alexey Onufriev, Computer Science

Allocation History: 5,000 (1/10/05), 250,000 (6/7/05)

Project Title: Insights into the Primary Level of DNA Packing from Novel Computational Methods

Project Description: molecular dynamics simulations to study the details of DNA packing within the nucleosome.

Hat: engr1006

PI: David Cox, Chemical Engineering

Allocation History: 50,000 (2/3/05)

Project Title: Electronic Structure Calculations of Inorganic and Organic Systems

Project Description: using first principles (density functional theory) methods to study the atomic arrangements and electronic structure of systems arising in surface chemistry, bulk minerals, and polymer composites.

Hat: engr1007

PI: Sean Corcoran, Materials Science & Engineering

Allocation History: 20,000 (3/8/05), 192,000 (1/30/06)

Project Title: Mechanical Behavior of Bicontinuous Nanoporous Gold

Project Description: studying fracture mechanisms of nanoporous metals using atomistic simulations.

Hat: engr1008

PI: Ken Ball, Mechanical Engineering

Allocation History: 10,000 (3/28/05), 200,000 (6/10/05), 200,000 (10/26/05)

Project Title: Direct Numerical Simulation of Turbulent Pipe Flow Drag Reduction Through Spanwise Wall Oscillation; and Dynamic Eigenfunction Decomposition of Drag Reduced Wall-Oscillated Turbulent Pipe Flow

Project Description: using spectral-element code to study complex flows in pipes.

Hat: engr1009

PI: Michael von Spakovsky, Mechanical Engineering

Allocation History: 20,000 (4/13/05)

Project Title: Nano-/Meso-Scale Analytical/Numerical Modeling with Experimental Validation of Fuel Cell Membranes and Electrode/Catalyst Layers

Project Description: developing new models of the complex interactions between gaseous mixtures and porous electrodes in fuel cells, using molecular dynamics and lattice Boltzmann methods.

Hat: engr1010

PI: Ishwar Puri, Engineering Science & Mechanics

Allocation History: 50,000 (7/14/05)

Project Title: Multiscale Simulations of Complex Fluids Flowing in the Presence of Electric and Magnetic Fields

Project Description: using the lattice Boltzmann method to simulate multiphase multicomponent fluid flow, where the fluid contains solid microscale ferrous particles and where fluid-particle and inter-particle interactions are modeled.

Hat: engr1011

PI: Ron Kriz, Engineering Science & Mechanics

Allocation History: 100,000 (9/6/05), 250,000 (5/24/06)

Project Title(s): Deformation Behavior of Gold Nano-Pyramids; and Deformation Behavior of Nickel

Project Description: using atomistic simulations to study the response of gold and nickel nanoscale structures to compression.

Hat: engr1012

PI: Naren Ramakrishnan, Computer Science

Allocation History: 100,000 (12/24/05), 500,000 (3/7/06)

Project Title: Chemical Space Exploration

Project Description: collaborating with the National Centre for Biological Sciences (NCBS, Bangalore, India) on a project whose aim is to qualitatively and quantitatively characterize the chemical space of biologically plausible reaction systems. The work involves defining a basis set of chemical reactions, combining these reactions into stoichiometrically valid reaction networks, understanding the behavior of these systems by numerical solutions of systems of ODEs as well as enumerating their steady states via homotopy continuation methods, studying the stability properties of these steady states by linear system analysis, and organizing a database of reaction networks and their properties.

Hat: engr1013

PI: Kirk Cameron, Computer Science

Allocation History: 100,000 (1/30/06)

Project Title: Improving High-End System Effectiveness

Project Description: computer science research on power-efficiency of applications and systems, performance measurement and analysis, and performance improvement of large-scale systems and applications.

Hat: engr1014

PI: Gary Brown, Electrical & Computer Engineering

Allocation History: 300,000 (4/20/06)

Project Title: Small Period Rough Surface Scattering

Project Description: simulating electromagnetic scattering caused by rough surfaces such as sea foam.

Hat: engr1015

PI: Christopher Wyatt, Electrical & Computer Engineering

Allocation History: 10,000 (5/24/06)

Project Title: Deformation Based Morphometry of Human and Non-Human Primate Brains

Project Description: developing algorithms and software in the area of computational neuroinformatics, focusing on image registration and segmentation to study variations in functional and structural properties of brains.

Hat: engr1016

PI: Ali Nayfeh, Engineering Science & Mechanics

Allocation History: 100,000 (5/24/06)

Project Title: Development of a Parallel 3-D CFD Code to Analyze Vortex-Induced Vibrations

Project Description: developing codes to simulate fluid flow over a cylinder. The Reynolds-Averaged Navier-Stokes equations are discretized using finite differences. Results are used to develop reduced-order vortex-induced vibration models for offshore structures.

Hat: engr2001

PI: Amadeu Sum, Chemical Engineering

Allocation History: 384,615 (1/10/05), 800,000 (3/28/06)

Project Title(s): Probing the Interactions, Structure, and Dynamics of Phospholipid Bilayers for Drug Design and Biological Preservation; and Molecular Modeling of Biomolecular Systems and Complex Fluids

Project Description: developing and applying molecular modeling methods to study the structure and dynamics of cell membranes and clathrate hydrates.

Hat: engr2002

PI: Yu Wang, Materials Science & Engineering

Allocation History: 246,154 (1/10/05)

Project Title: Computational Studies of Microstructure Evolution

Project Description: Meso-scale and nano-scale simulations of piezoelectric materials.

Hat: engr2003

PI: Mark Paul, Mechanical Engineering

Allocation History: 384,615 (1/10/05)

Project Title: Spatiotemporal Chaos and Nonlinear Dynamics of Fluids

Project Description: using partial differential equations and spectral solution methods to model the complex spatiotemporal dynamics of fluids at macroscopic and microscopic scales.

Hat: engr2005

PI: Levon Asryan, Materials Science & Engineering

Allocation History: 246,154 (1/10/05)

Project Title: Computational Materials Science

Project Description: first principles simulations of semiconductor materials and devices. Nano- and microelectronics, optoelectronics and photonics.

Hat: engr2006

PI: Elisa Sotelino, Civil & Environmental Engineering

Allocation History: 384,615 (1/10/05)

Project Title: Computational Structural Dynamics

Project Description: nonlinear finite element analysis of structural properties of steel/concrete systems.

Hat: icts1001

PI: Layne Watson, Computer Science

Allocation History: 5,000 (1/10/05), 200,000 (4/12/05), 300,000 (6/10/05)

Project Title(s): Global/Local Algorithms for Composite Material Structural Design; and Eukaryotic Cell Cycle Modeling

Project Description: developing algorithms and software, and doing large-scale simulations, in support of two applications: structural analysis and design of aircraft wings made from composite materials, and differential equation based modeling of the cell cycle of budding yeast.

Hat: icts1002

PI: Cal Ribbens, Computer Science

Allocation History: 5,000 (1/10/05), 100,000 (5/13/05)

Project Title: Tools and Algorithms for Improving Performance and Utilization on Terascale Clusters

Project Description: developing algorithms and software to improve performance of individual codes, and the utilization of entire clusters, by exploiting common characteristics of large-scale simulations.



Hat: rdiv1001

PI: David Bevan, Biochemistry

Allocation History: 5,000 (1/10/05), 99,999 (3/23/05)

Project Title: Computational Studies of Protein Structure and Function

<http://128.173.49.4/tcfalloc/downloadfile.php?resID=12>

Project Description: molecular dynamics simulations to allow atomic-level analysis of protein structural features.

Hat: rdiv1003

PI: John Tyson, Biology

Allocation History: 10,000 (6/10/05)

Project Title: Benchmarking of Electrostatic Interactions in Biomolecular Systems

Project Description: testing the performance of molecular dynamics codes used to simulate the properties of cellular membranes.

Hat: rdiv1004

PI: Uwe Tauber, Physics

Allocation History: 200,000 (6/10/05)

Project Title: Vortex Motion in Anisotropic Type II Superconductors

Project Description: using nonequilibrium Monte Carlo Metropolis simulations to study properties of superconductors containing defects.

Hat: rdiv1005

PI: Kyungwha Park, Physics

Allocation History: 340,000 (9/22/05)

Project Title: Computational Study of Magnetic and Transport Properties of Molecular Nanomagnets and Related Systems

Project Description: studying magnetic and electronic structure properties of nanomagnets using density functional theory (DFT) quantum mechanics. Potential applications include ultra-high density storage devices and single-molecule electronic devices.

Hat: rdiv1006

PI: Ina Hoeschele, Virginia Bioinformatics Institute

Allocation History: 9,000 (2/23/06)

Project Title: Evaluation of the statistical properties of multivariate estimation of genetic parameters for categorical, continuous and molecular genetic data with application to radiographic findings in the limbs of horses

Project Description: using multivariate linear-threshold models and Gibbs sampling to study multivariate estimation procedures used to guide genetic evaluation and selection schemes for the horse industry.

Hat: vpit1001

PI: Matthias Imhof, Geosciences

Allocation History: 5,000 (1/10/05), 100,000 (11/3/05)

Project Title: Preparing the Next Generation Synthetic Seismic Research Dataset

Project Description: developing models and codes as part of a consortium (led by the Society of Exploration Geophysicists) to do full 3-dimensional seismic simulations, with applications in oil and gas recovery.

Hat: vpit1003

PI: Diego Troya, Chemistry

Allocation History: 100,000 (4/5/05)

Project Title: Benchmark Electronic-Structure Calculations for Accurate Molecular Dynamics Studies

Project Description: doing highly accurate quantum mechanical simulations of chemical reactions, to help develop and validate molecular dynamics approximations to these processes, with applications in atmospheric chemistry and combustion.

Hat: vpit1004

PI: Beate Schmittmann, Physics

Allocation History: 250,000 (4/18/05)

Project Title: Transport in Quasi One-Dimensional Models

Project Description: studying fundamental questions in non-equilibrium statistical mechanics using one-dimensional transport models. Applications include molecular motor processing and vehicular or pedestrian traffic.

Hat: vpit1005

PI: Beate Schmittmann, Physics

Allocation History: 70,000 (5/6/05)

Project Title: Phase Transitions in Two-Species Model

Project Description: using Monte-Carlo techniques to study problems in non-equilibrium thermo-dynamics and driven diffusive systems.

Hat: vpit1006

PI: Robert Walters, Aerospace & Ocean Engineering

Allocation History: 100,000 (8/26/05)

Project Title: Stochastic CFD Simulations of Complex Aerodynamic Flows

Project Description: using computational fluid dynamics simulations to model realistic, complex aerodynamics problems. Stochastic approach requires many runs to study the sensitivity of the models to problem parameters.

Hat: vpit1007

PI: Madhav Marathe, VBI

Allocation History: 100,000 (10/17/05)

Project Title: Epidemiological Modeling

Project Description: developing models and software to simulate information diffusion in large populations, with current application to modeling the spread of infectious diseases.

Hat: vpit1008

PI: Joseph Schetz, Aerospace & Ocean Engineering

Allocation History: 50,000 (12/6/05)

Project Title: Detached Eddy Simulations of Scramjet Engines

Project Description: using computational fluid dynamics simulations to study the highly unsteady and turbulent flow inside the combustion chamber of Scramjet engines.

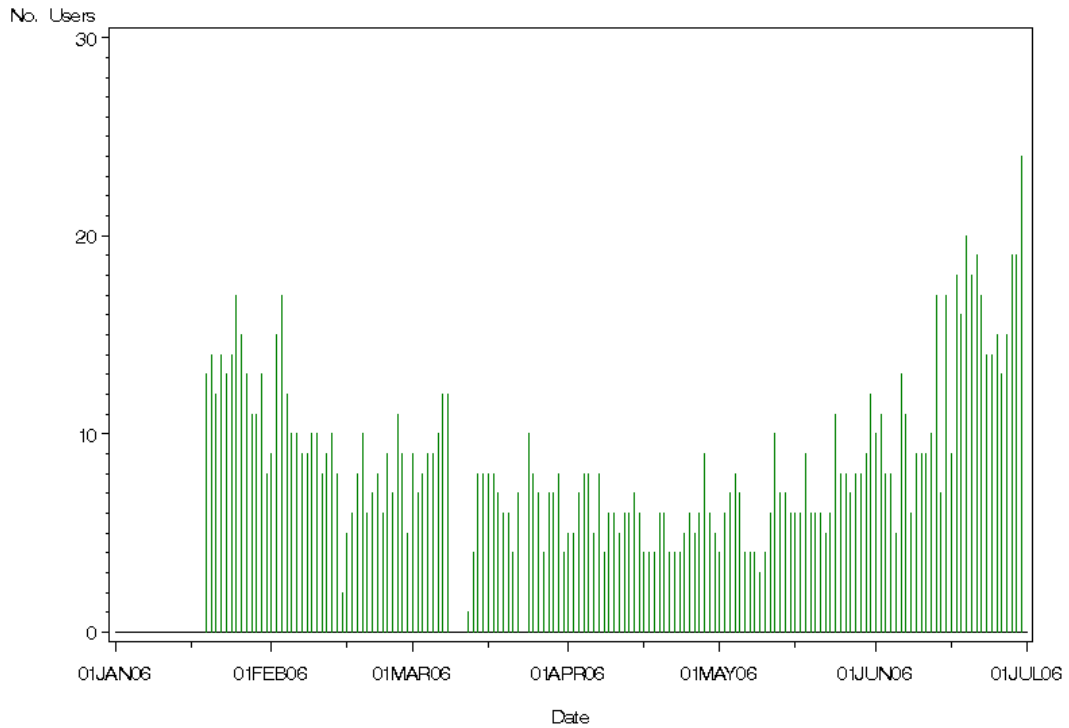
## SGI machines (Shared Memory)

Several members of the research computing faculty are most comfortable using the SGI shared memory platforms. Those choosing to use off-the-shelf, third party, software find these systems friendly to the user. We have made a sincere effort to provide the hardware and software

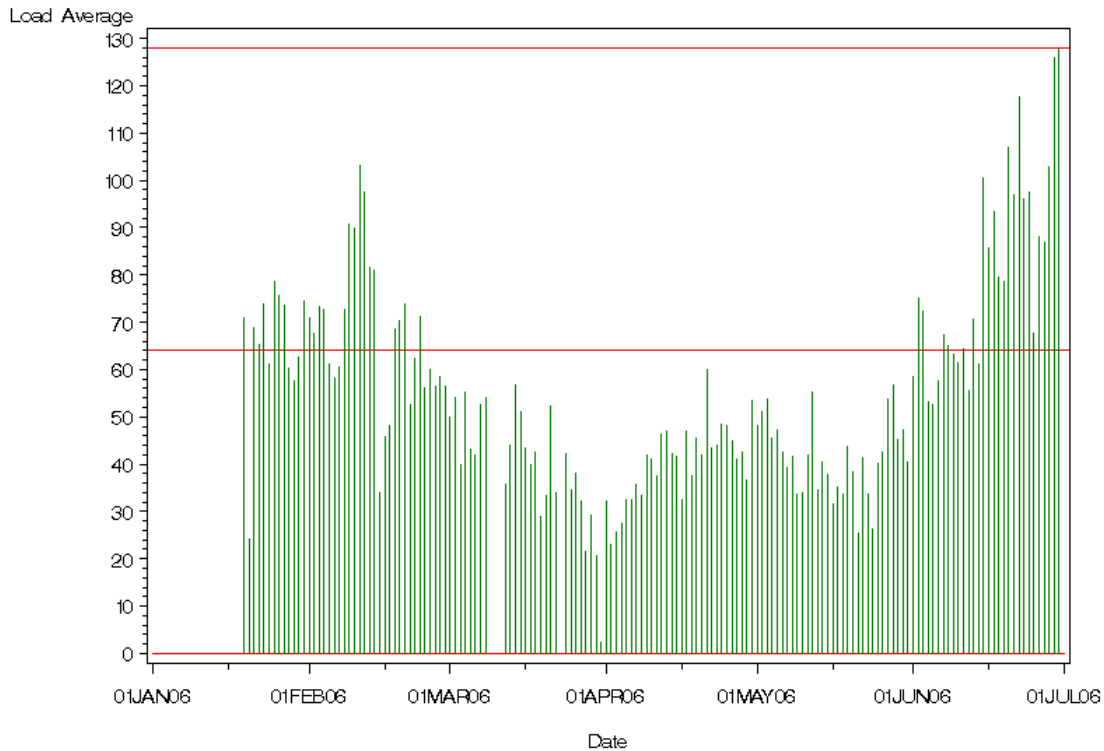
requested from this user community. Faculty members and graduate students from the College of Science have been big users of the SGI systems.

### Use of SGI platforms

The graphs display the number of users for Inferno 2 for January through June 2006, and daily use.



Number of user on Inferno2



Inferno 2 daily load average

### Inferno2 expansion

In June 2006, an additional frame of 64 processors was added to the SGI 3700 Altix computer known as Inferno2. This brings the system up to 128 processors. Terry Herdman took the lead in securing funds to purchase this additional 64p for Inferno2. Contributions came from Information Technology, Research Division, College of Science, Department of Mathematics, Department of Chemistry, and Department of Geological Sciences. This upgrade and the new Altix 4700 was a package with a total cost of \$425K.

### New SGI Altix 4700

A new SGI Altix 4700 with 64 processors was purchased in Spring 2006 and delivered in July 2006. This system uses blades instead of bricks as the machine architecture. The system also has a faster internal interconnect for processors-to-processor communication. As noted above this system was purchased with contributions from Information Technology, Research Division, College of Science, Department of Mathematics, Department of Chemistry, and Department of Geological Sciences.

## Researchers and research projects for Inferno 2

### Selected project summaries

Name: David Bevan

Department: Biochemistry

Research Abstract: Projects in my lab apply computational methods to simulate the structure and dynamics of proteins and nucleic acids. Much of our current work involves studies of beta-glucosidases. In particular, we are trying to understand the determinants of substrate specificity in these enzymes using homology modeling, molecular dynamics, and molecular docking. These methods also are being applied to investigate the mechanism of inhibition of Eg5, a human kinesin motor protein involved in mitosis. Of particular interest is identifying potent inhibitors that might be potential drug candidates as anti-cancer agents.

Name: David F. Cox

Department: Chemical Engineering

Research Abstract: Electronic Structure Calculations of Inorganic Clusters, Surfaces and Defects Density functional theory is used to investigate the electronic structure of large-scale (> 150 atom) inorganic systems. The bonding in inorganic systems, and the electronic structure associated sites of potential electrophilic and nucleophilic attack are detailed by examining the spatial characteristics of the valence electron charge density, and the Electron Localization Function (ELF). We are investigating the electronic and chemical differences between the bonding of protons around bulk and surface point defects, and the electronic structure of semiconducting nanoparticles. The investigation of point defect properties requires large-scale systems to isolate the defect in our periodic DFT calculations.

Name: Vijay Singal

Department: Finance

Research Abstract: Continuing research work with large financial databases. My research spans three areas: Anomalies related to market efficiency, International finance (currencies, emerging markets, ADRs, and investments), and resolving finance-related issues using data from one industry but from both financial and product markets.

Name: David Notter

Department: Animal and Poultry Sciences

Research Abstract: Research is being conducted on genetic evaluation of livestock using data from the U.S. National Sheep Improvement Program. The objectives of the research are to develop methodology for simultaneous genetic evaluation of large numbers of breeding animals on many farms across the U.S. and to provide U.S. sheep breeders with estimates of the genetic merit of their animals for economically important traits.

Name: Gertraude Freyer

Department: Dairy Science

Research Abstract: Further Investigations on Inbreeding in Dairy Cattle The negative

consequences of inbreeding on fitness and related traits is known. Many investigations led to and increased understanding in detail. In animal breeding, the use of reproductive technologies and statistical approaches made a directed selection efficient. Recent studies (e.g. Cassel, Adamec and Pearson, 2003 in JDS 2967-2983) focused on maternal and fetal inbreeding depression for fertility and calving traits in Holsteins and Jersey, and on the effect of incomplete pedigrees on estimates of inbreeding and inbreeding depression on milk traits. This was a population analysis. A next step will be testing and adapting a new method including genetic markers to make inferences about inbreeding and their effects on complexes of traits.

Name: Quinton Nottingham

Department: Business Information Technology

Research Abstract: Managers of all types of business processes are interested in both monitoring and controlling the behavior of those processes. One typical reason for closely monitoring the behavior of a process is to determine the expected quality of the finished product, based upon the measured values of intermediate process variables. This research presents a framework for a data driven nonparametric process classification tool that allows managers to predict the classification of a finished product as "acceptable", "unacceptable", or "inconclusive", based on operating conditions of the process at different phases.

Name: Christine Blinn

Department: Forestry

Research Abstract: Increasing the Precision of Forest Area Estimates through Improved Sampling for Nearest Neighbor Satellite Image Classification The impact of changes in training data sample size and sampling method on the overall classification accuracy and precision of forest area estimates obtained from forest/non-forest satellite image classifications will be explored. Simulation techniques will be used to create distributions of classification accuracy, forest area estimates and precision of forest area estimates from one hundred image classifications created with training data sample sizes ranging from 25 to 500 pixels. A simple minimum distance to means classification with single pixel training will be used to create forest/non-forest classifications of three mosaicked Landsat ETM+ images covering a majority of Virginia.

Name: Greg Hensley

Department: Civil Engineering

Research Abstract: The purpose of this research is to examine the dynamic behavior of guyed towers utilizing synthetic ropes. It is part of a National Science Foundation Grant designed to investigate the potential use of synthetic ropes to dissipate energy in structures. These synthetic ropes as the guy wires in guyed towers. The main focus is to examine the theoretical behavior under seismic load, and the research primarily consists of computer modeling with the finite element program, ABAQUS.

Name: Florian Bleibinhaus

Department: Geosciences

Research Abstract: A seismic 2D survey across the San Andreas Fault (SAF) near Parkfield

provides a characterization of the subsurface structure at the location of the San Andreas Fault Observatory at Depth (SAFOD). 4 GB of acoustic wavefield recordings are inverted for a 2D model of the complex acoustic velocity/damping structure using a method after Pratt (1999). The most expensive part of the non-linear iterative inversion procedure is the FD forward modelling of the wavefield in the frequency-space domain. The optimization of parameters controlling the inversion requires that this process be repeated several times.

Name: Landon Segó

Department: Statistics

Research Abstract: Continuously monitoring a small incidence rate. A number of methods have been proposed to detect an increasing shift in the incidence rate of a rare health event, such as a congenital malformation. We compare the performance of the Sets technique and its modifications to the Bernoulli CUSUM chart under a variety of circumstances.

Name: Uros Tasic

Department: Chemistry

Research Abstract: Polymer films acting as thermal blankets of spacecrafts operating in low-Earth orbit (200-700 km altitude) erode under the action of highly oxidizing environment of that region of space. Our research is aimed at providing molecular insight into degradation mechanisms of polymers coating satellites and spacecrafts through high-energy collisions with the gaseous species of the natural low-Earth orbit atmosphere.

## Visualization and research computing

During May and June 2006, Erv Blythe, Terry Herdman, and Nicholas Polys (Computer Science Ph.D. candidate) had several discussions on the role of visualization in advancing the research programs of the Virginia Tech research faculty. The following provides a vision for a visualization component for the research mission for Virginia Tech. As we develop our plan for facilities and application support for research computing we must have a visualization component. This section provides a start: we will continue to discuss the role of visualization. The material for this section comes from a document produced by Nicholas Polys with revisions by Terry Herdman.

### Opportunities for research visualization

The twenty-first century has opened up a new paradigm for science and research. With the increase in affordable technology, the computational sciences are contributing more



and more to our understanding of the world around us. Virginia Tech is consistently a leader in innovation and nationally ranked as a research institution; but there is always room for improvement. This document outlines a proposal to unify our fragmented resources and position Virginia Tech at the forefront of the modern research enterprise.

Virginia Tech has demonstrated competencies in research areas such as applied and computational mathematics, engineering, architecture, bioinformatics, human-computer interaction, and geospatial information systems. All of these areas could benefit from the application of modern computational and graphics tools. However, many researchers in these areas do not have the tools or knowledge needed to take advantage of such methods. In order to leverage the expertise and resources of the university, a coherent approach to high-performance computing and visualization is needed.

A top concern for computational scientists and one recognized by the NIH, NSF, and DHS is managing the data explosion through the development of better visualization tools. Across domains, researchers, engineers, and designers are faced with large volumes of data that are heterogeneous in nature. While computers can provide excellent memory and computational prostheses for solving complex problems, they are unable to match the human's abilities for pattern-recognition, creative reasoning, and insight. It is imperative that next-generation interfaces leverage the strengths of the human operator to create useful and economical tools for analysis and decision-making.

The trend towards visualization investments can be seen in a number of prominent national labs and research universities that have made significant commitments in visualization infrastructure and support. These investments include visualization facilities, equipment, and operational costs including maintenance and administration of the technology. For example, Purdue's Envision Center (<http://www.envision.purdue.edu/>) is the result of a modest initial investment (\$2 mil) but sustained support. Iowa State's Virtual Reality Applications Center (<http://www.vrac.iastate.edu/>) (\$10 mil+), the University of Louisiana's Immersive Technology Enterprise (<http://www.lite3d.com>) (\$27 mil), and the UNC Charlotte Visualization Center (<http://www.viscenter.uncc.edu>) are other examples where institutional commitment has resulted in attracting and retaining the best scientists, faculty, and students.

Many of the National Labs and Research Centers such as Los Alamos, Oak Ridge, and NIST also operate cutting-edge visualization facilities with a staff of visualization technology experts who support the domain experts in building tools for their research. These visualization experts essentially facilitate the process of discovery through the development of digital tools. They learn the scientists' language, the details of their problem, and devise useful solutions. These experts are crucial to the success of next-generation research applications.

## A vision for Virginia Tech

Visualization technologies are widely recognized as a crucial tool for insight, education, and communication. Here at Virginia Tech, we are well positioned to take advantage of the convergence of high-performance computing (HPC) and visual analysis tools. From the System X to the VT-CAVE and the gigapixel displays, the facilities and expertise are here for cutting-

edge research of international stature. By adding more support for application development and applied research to the university infrastructure, more scientists and researchers will benefit from these powerful technologies.

Our vision for Virginia Tech includes the establishment of visualization and development facilities to complement HPC resources such as System X. This vision includes a dedicated research staff of visualization and computational experts that support scientists in the development of simulation and visual analysis tools. Enabling domain experts with cutting-edge technology is the primary mission of this group. This outcome will be achieved through the design and development of visual analysis tools for researchers; these are the tools that will drive scientific discovery in this century.

The team and facility should serve faculty and scientists all across campus, for example in the Colleges of Engineering, Science, Natural Resources, Architecture and Urban Studies, the School of Biomedical Engineering and Sciences, Bioinformatics, Geography, and Geology. Virginia Tech research in GigaPixel displays should be leveraged toward new, applied problems. This vision includes equipment and administration of cluster rendering with commodity Linux systems such as the university's DADS architecture and Web services for visualization.

### **Support for visualization**

In order to realize this vision, commitment, and support for visualization infrastructure and services is required at the University level. Currently visualization initiatives are piecemeal and support is fragmented across a number of departments and grants. By subsidizing facilities, hardware, and operational costs such as maintenance and administration, university researchers will have reliable, centralized access to cutting-edge facilities, which makes them more productive scientists and more competitive for additional grants and other state and national funding.

Well-run facilities are only part of the equation however. To lower the barrier of entry in to high-end computation and visualization research, support services are required, specifically technical expertise for application development services (domain experts and GRAs cannot do this). By establishing a focused venue for visualization development, VT can produce industry-grade tools that address the most challenging research problems. In addition, connections to local medical researchers (e.g. osteopathy, veterinary) may also be expanded.

Our focus on research computing distinguishes this proposal from those seeking to expand the educational reach of visualization technologies for on-campus and distance learning (also an important goal worthy of support). What we propose rather is the establishment of research team that will expand the existing federally and university-funded infrastructures.

The research team will be led by a director of high-performance visualization / senior research scientist who will be responsible for outreach to and advocacy of Virginia Tech's research community as well as consulting and management of projects and staff. A technical staff will be established including programmers and system administrators who will provide the systems and

tools required for applied research and development. Post-doctoral positions will be appropriated for individual research problems and projects.

## Secure Enterprise Technology Initiatives

Identity management and securing the university's distributed computing environment have characterized much of the work done by groups within Secure Enterprise Technology Initiatives (SETI) during the 2005-2006 reporting period. Both themes further the Information Technology strategic goal of securing the enterprise.

**Identity management.** SETI took the lead in initiating multiple projects to secure the electronic identities of Virginia Tech faculty, staff, and students. SETI teams developed, tested, and deployed infrastructure components that raise the level of trust in the identities of individuals who are authorized to access certain electronic information.

Development of the Virginia Tech User Certification Authority (UCA) is now well under way. The VT UCA issues personal digital certificates on tokens or smart card devices. The smart devices allow identities to be managed using multi-factor authentication, which provides a high level of assurance that a person is who they say they are by using "something you have and something you know." Personal digital certificates can be used to authenticate to Virginia Tech services and to digitally sign electronic documents.

The Enterprise Directory was enhanced to include additional affiliations that allow services utilizing ED-Auth to make access decisions based on a student's enrollment status. Other enhancements allow Information Resource Management (IRM) to create groups and to create entries for non-Virginia Tech affiliates who need PIDs to access a service for a limited time. Privacy for students and employees was enhanced with new suppression rules that were added for PIDs and e-mail addresses, allowing users more granular choices in what is displayed by VT People Search.

The Central Authentication Service (CAS) provides an easy way for a Web service to use PID credentials for authentication without giving the service access to the PID password. The password is transmitted securely from the user's session to the CAS server where the credentials are validated against the Enterprise Directory. CAS may also be used to create a single sign-on environment for multiple services that use PID/password-based authentication.

SETI staff members served on the Identity Management Committee of the Information Technology Security Task Force (STF). The committee contributed to a section on identity

management in the document, *Security in a Distributed Information Technology Environment* (authorized access required).

**Securing the distributed computing environment.** Information Technology has committed to helping the university's departmental computing users and administrators secure their computing and network resources. To further this effort, Virginia Tech's Windows Software Update Service, Medium Facilities Management, and Sunflower were made available for alpha or beta testing during this period. These services make it easier for the end user and administrator to apply and track patches for Windows machines.

The Microsoft/Virginia Tech IT Security Summit was hosted by SETI and the Microsoft Implementation Group. Computing support staff from all departments on campus were invited to learn about services offered by Microsoft and Information Technology that would help them secure their technology resources.

The draft documents produced by the Virginia Tech Information Technology Security Task Force were used as input to *Security in a Distributed Information Technology Environment*, a document that outlines effective standards and practices for securing the broad spectrum of information technology resources at Virginia Tech. Several SETI staff members reviewed and made valuable contributions to that document.

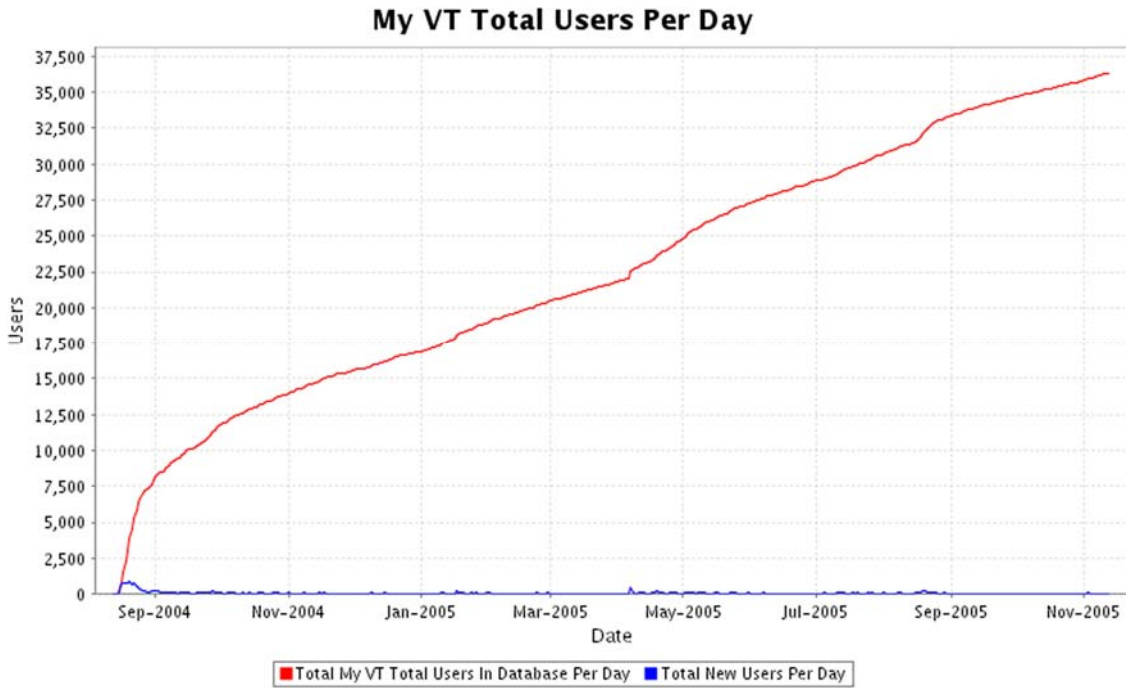
## Collaborative Technologies Unit

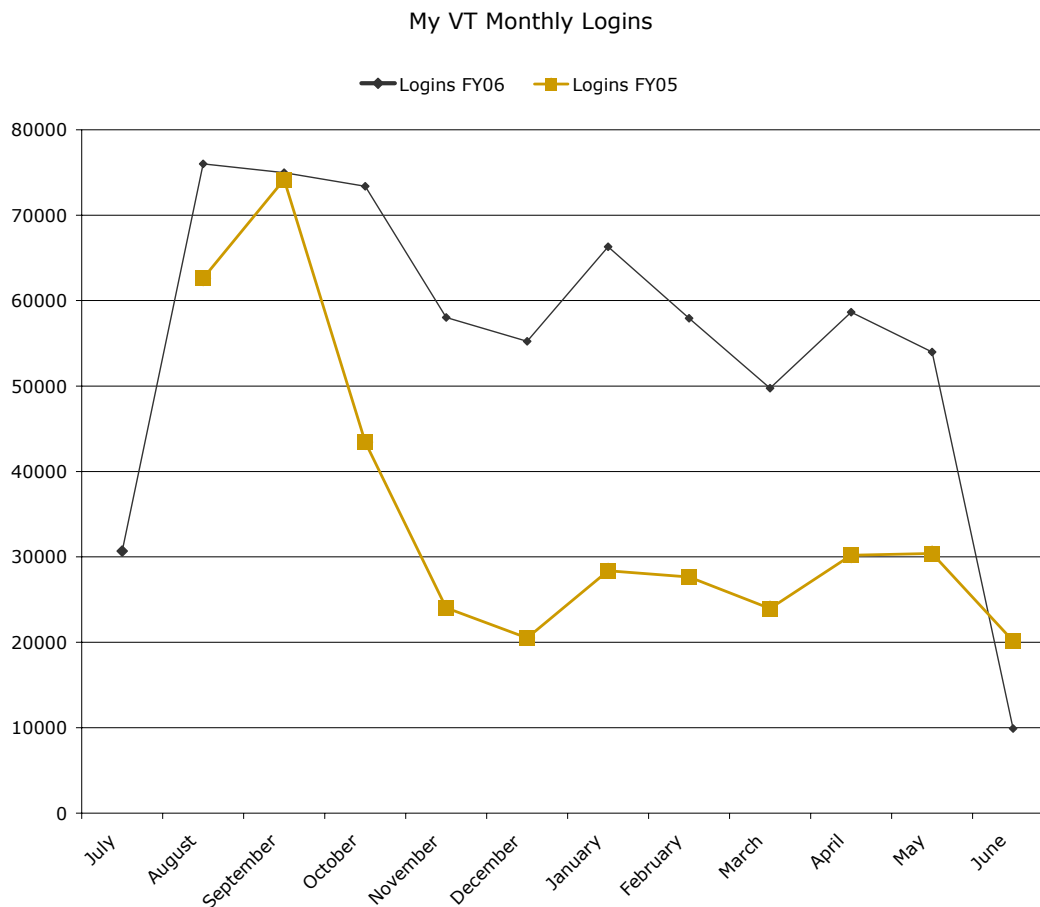
The Collaborative Technologies Unit (CTU) specializes in open source application development to enhance the ability of Virginia Tech affiliates to interact securely with new and existing computing and networking services. The following information outlines major projects undertaken by the group in 2005/2006.

**My VT Web portal.** CTU received extensive recognition in the higher education portal community this year for the work done on My VT. My VT is based on the open source *JA-SIG uPortal* software. Customizations made to the uPortal user interface for My VT 3.0 were considered revolutionary. As a result, members of the CTU team were invited to give presentations on My VT at various user conferences and developer seminars. CTU was also asked to participate in the development of the next generation of uPortal. Demand for the customizations made by CTU to uPortal was great and resulted in a "My VT uPortal Quick Start" release of the uPortal source code. The My VT look and feel is now starting to appear on portals all around the world. My VT was also cited as one of the best examples of a uPortal implementation in JA-SIG's annual report to the Andrew W. Mellon Foundation.

My VT's usage continues to grow. The average number of logins per day has doubled from 2004/2005 and usage remains consistent. Near the midpoint of the fiscal year (November 15,

2005), there were 36,364 user accounts for My VT, an increase of 21,588 or 146% since the previous November.





**Virginia Tech Central Authentication Services.** Virginia Tech Central Authentication Services (VT CAS or CAS) went into production in August 2005. VT CAS is based on the open source [JA-SIG Central Authentication Service](#) that was originally developed by Yale University. CAS is a single sign-on service, which allows a user to provide his or her credentials once in order to access multiple applications. This service provides both convenience and added security by greatly reducing the number of times Virginia Tech credentials must travel over the network. The benefits of CAS stretch across the entire university as well as to our commercial partners. The service is easy to implement and is quickly growing in popularity. Virginia Tech services currently using CAS include:

- Business & Management Systems website
- CNS R&D Web
- Departmental Software
- Equipment Trust Fund Tracker
- Filebox
- Geosciences website
- Hokie SPA
- Institutional Research IRINFO website
- My VT

- NI&S Confluence Wiki
- Psychology Department Web Content Management System

In addition, other services are developing use of CAS:

- HokieMart (SciQuest)
- Learning Technologies Confluence Wiki
- Remedy AR System
- Sakai
- VT Wireless LAN (BlueSocket)

**Virginia Tech Web redesign.** CTU has played a supportive role this year in the Virginia Tech Web redesign. CTU assisted University Relations in the RFP process for acquiring Web design and consulting services and with the interviewing and hiring of staff to establish their Web Communications group. Members of CTU are actively participating on the VT Redesign Steering Committee, VT Redesign Advisory Committee, Academic Sites Task Force, Departmental Sites Task Force, and the VT Enterprise Content Management System Committee.

**VT Search/VT People Search.** Providing access to public information while protecting private data proved to be a hot topic this year. The redesign of the Virginia Tech Web brought about many issues related to our public Web search. CTU dedicated time to improving our current free Web search provided by Google and researched other solutions such as different search engines and commercial search appliances by Google. A number of improvements were made to VT People Search. New information such as personal webpage addresses and instant messaging IDs were added to the site. New user affiliations were added to the Enterprise Directory so that students who were not enrolled during summer sessions would still be displayed in the VT People Search if they were enrolled in the previous or upcoming semester.

**Instant messaging (IM) pilot.** CTU's IM project continues to operate as a pilot. The purpose behind this pilot is to provide presence awareness and a mechanism for secure real-time collaboration. The IM service is based on the open source XMPP protocols. A variety of different XMPP servers and clients were tested in 2005/2006. CTU is currently using Jive Software's Wildfire Server. Wildfire is a Java-based server with a Web-based administrative interface. The product is fairly robust and has performed very well. The current pilot has nearly 300 registered users and supports messaging, chat, and file transfers.

**Board of Visitors' portal.** CTU continued to maintain the Board of Visitors (BOV) portal for the Finance & Audit Committee. The portal is based on the open source VT Fileman code. The content is updated quarterly prior to the scheduled BOV meetings. Usage has been very limited. Members of the Executive Vice President and Chief Operating Office staff have shown an interest in the project. They are currently evaluating possible uses and areas to expand upon.



## eProvisioning

The main body of work for the eProvisioning unit during this fiscal year is in support of the personal digital signature project. This work included several aspects, from the creating of the certification authority, to researching devices, to creating an administrative interface.

**User CA project.** A project was initiated in August 2005 to expand the university's public key infrastructure (PKI) at Virginia Tech by creating a Certification Authority (CA) for issuing personal digital certificates to members of the university community. Digital certificates based on public key cryptography have been increasingly accepted as the technology solution needed to address the inherent security issues associated with traditional ID/password systems. The new VT User CA will complement the current production VTCA SSL (Secure Socket Layer) server certificate services by eventually making personal digital certificates available to all faculty and staff members and students at the university.

The new CA will expand the number of certificates beyond current usage. As of August 2006, 180 certificates had been issued by the VTCA.

| Certificate authority |      |        |            |
|-----------------------|------|--------|------------|
| Year                  | User | Server | Middleware |
| 2005                  | 15   | 135    | 30         |

If these certificates had been purchased from Thawte at today's prices, they would cost the university over \$23,000 each year.

|                         | Cost each per year | Total       |
|-------------------------|--------------------|-------------|
| User certificates       | \$19.95/year       | \$ 299.25   |
| Server certificates     | \$140/year         | \$18,900.00 |
| Middleware certificates | \$140/year         | \$ 4,200.00 |
| Total                   |                    | \$23,399.25 |

**Smart devices research and development.** After extensive research and evaluation of different smart device products, Aladdin's USB Pro token was selected as the smart device to be used for initial deployment of digital certificates at the university. Authentication methods that use smart cards or tokens are emerging as the way best suited for implementing strong user multi-factor authentication. Smart cards or tokens provide a convenient way to consolidate and store multiple identity credentials onto a single portable device that can be used to manage the authentication process more securely.

**Token Administration System.** Development of the Token Administration System (TAS) was started in August 2005 to provide an administrative interface for managing personal digital certificates on smart cards/tokens. The TAS application is a comprehensive system that will provide full lifecycle management including token assignment, deployment and certificate

issuance. The implementation of TAS will provide the framework for supporting a university-wide deployment of digital certificates onto smart devices.

**Digital signature pilot.** A pilot was started in November 2005 in conjunction with the Office of the Executive Vice President and Chief Operating Officer to investigate how digital certificates could be used to implement digitally signed Adobe leave report documents. The eProvisioning group provided the technical assistance and PKI infrastructure services to support the issuance of digital certificates onto Aladdin USB 16K Pro tokens for participants in the pilot.

**PKI integration.** In order to realize fully the benefits of PKI, it is important to provide application developers with the proper tools to enable the integration of digital certificates into university business processes. The eProvisioning group has developed an application programming interface (API) using Web services to help facilitate the use of public key technology. The Web services API provides a high-level intuitive interface that helps hide the low-level cryptographic operations needed by making them transparent to the application developer. The API is currently being used to integrate digital signature capability into the university Web-based leave reporting system.

**Certificate policy and certification practice statement.** The eProvisioning group has participated in several meetings with the Virginia Tech Public Key Infrastructure Policy Management Authority to provide technical support for the development of Certificate Policy and Certification Practice Statement documents that describe the framework for operating digital certificate services at Virginia Tech.

## Microsoft Implementation Group

The Microsoft Implementation Group (MIG) is responsible for maintaining the health and security of the Hokies Active Directory (AD) environment, including the application of security updates, maintaining antivirus protection, and monitoring system events for both production and non-production domain controllers, Web servers and database servers.

Operational activities include downloads from MIG's open source software (<http://opensource.w2k.vt.edu>).

| Software         | Number |
|------------------|--------|
| AuthAD           | 137    |
| Daisy (v. 2.2)   | 2684   |
| DictionaryFilter | 431    |
| Faith            | 412    |
| Ivy              | 188    |
| OAdmin           | 118    |

|             |     |
|-------------|-----|
| Portinator  | 156 |
| SafetyNet   | 564 |
| SelfService | 268 |

Utilization of the Hokies Self-Service facility (<http://selfservice.w2k.vt.edu>) was:

|   |       |
|---|-------|
| Unique logons                               | 23471 |
| Full users                                  | 18841 |
| Contacts                                    | 4630  |
| Converted to full user accounts             | 3397  |
| Exchange Mailboxes created                  | 3004  |
| Full user                                   | 2420  |
| Calendar-only                               | 584   |
| Successfully changed passwords              | 2014  |
| NAS folders created                         | 1260  |
| Roaming profiles set                        | 210   |
| Home drives set                             | 354   |
| Computers as members of University Services | 213   |
| NFM-  | 172   |
| SFM   | 33    |
| MFM   | 8     |

SafetyNet utilization (<http://safetynet.w2k.vt.edu>):

|  |                                 |
|--|---------------------------------|
| Number of successful logins                      | 1400                            |
| Total # of scans                                 | 782                             |
| # of individual systems scans                    | 663                             |
| # of zone scans                                  | 119                             |
| # of machines that have failed one or more scans | 1152                            |
| # of machines scanned (within zones)             | at least 1671                   |
| # of delegates created to scan zones             | 4                               |
| Average time of a scan                           | > 790 seconds<br>(~ 13 minutes) |

Projects for the year fall into several areas.

**Windows server and desktop management.** The Microsoft Implementation Group (MIG) played a significant role in easing the burden of securing Windows machines by developing Medium Facilities Management (MFM), Virginia Tech's Windows Software Update Service (WSUS), and My Services 2.

**MFM.** Planned as a new component of Hokies Self Service, the beta deployment of MFM provides basic services and policies to secure desktop computers. The main services provided are automatic windows patching, virus scanning, and a firewall. In addition, many policies are set to reduce a system's vulnerability footprint. The MFM policies try to follow the principle of least privilege so users only have the rights that they need and no more.

**WSUS.** The Virginia Tech WSUS project will result in an infrastructure that will provide faculty and staff with updates to Windows systems and core Microsoft applications. This infrastructure will allow for the timely testing, deployment, and installation of necessary patches and updates to our customer base. Such automated installation will reduce the number of vulnerable and exploited systems, thus lowering the total cost of ownership for the lifecycle of these systems. The project was sponsored by 4Help, and includes Web reporting tools that show users, departmental information technology administrators and help desk consultants the patch history of enrolled machines. If desired, Virginia Tech's WSUS service can be offered to students in the future. Alpha testing of VT WSUS was in progress at the end of the reporting period.

**My Services 2.** A public beta version of My Services 2 was released to users. My Services 2 is a complete rewrite of the My Services tab within Hokies Self-Service. My Services 2 provides a comprehensive wizard like workflow that allows users to answer basic questions in order to step through the enrollment process. Flash-based video tutorials are provided along with custom server side applications that detect possible issues and help correct them early on in the process. A user can also temporarily postpone the process and return later as well as give detailed feedback into how the interface is working for them.

**Security applications.** Sunflower and Neighborhood Watch were completed during this reporting cycle. Sunflower was developed as a component of University Services Some Facilities Management (SFM) that scans machines with Microsoft Baseline Security Analyzer 2.0. Scan results are available to the machine owners via the VTmig secure Sunflower website and contain information about what was scanned, the results, and recommendations for what to do to fix a deficient situation. Neighborhood Watch is a research project designed as a distributed client/server architecture for detecting, alerting, and blocking unsolicited network requests.

**Infrastructure security enhancements.** Improvements were made to upgrade the production servers to the level of Windows 2000 Service Pack 4 + rollup. The Active Directory servers were migrated to Windows 2003. Subsequently, MIG managed and responded to a Health Check for the Active Directory environment, identifying and acting upon several areas for improvement. The developer WSUS servers were upgraded to Windows 2003 Service Pack 1. IPsec rules were applied to prevent users outside the Virginia Tech-managed networks from trying to authenticate to the Hokies Active Directory. A de-militarized zone was created for the production Windows domain name servers (DNS) to avoid DNS hijacking and harvesting.

Active Directory usage requirements were updated with an addendum that clarified some of the requirements. Impact statements were produced where administrative practices for a service in a child domain might create a security risk for the service or Active Directory forest. A best practice document was developed for migrating VT Active Directory child domains to Windows 2003.

**Pilot projects.** The MIG team created a project description to install, integrate, and test a pilot Microsoft Live Communications Server (LCS) 2005 server with the university's pilot Active Directory (w2k-pilot). This pilot will enable the investigation of LCS's features and functionality by the Business and Management Systems group. LCS will be evaluated based on the current needs of the Office of Executive Vice President and Chief Operating Officer. LCS should allow

the pilot group to conference with people while on the road and away from conference rooms setup with that ability.

MIG worked with Communication Network Services (CNS) to build a project description for 802.1x that would allow Windows-based systems to authenticate seamlessly to the CNS wireless network, obviating the need to manually open a Web browser and type in credentials to access the Internet.

**Communication and end-user support.** In addition to continuing to host the Virginia Tech Windows Users Group, MIG staff members were instrumental in initiating other programs designed to communicate with and educate the information technology community. MIG created the ITKnowHow Wiki for central and departmental information technology administrators. This resource is used to document common tips, tricks, links, scripts and source code for solutions to common (and uncommon) information technology issues. MIG made the Microsoft TechEd presentations available through the ITKnowHow Wiki.

MIG conceived of and planned the first Microsoft/Virginia Tech IT Security Summit. The two-day event provided security-related guidance and support options to both central and distributed information technology support personnel. The summit was attended by over 100 employees and was an excellent way to communicate about Information Technology services and Microsoft solutions.

Other programs hosted by MIG included a Microsoft Developer Security Class, a working group on future Anti-Virus software procurement direction, a Thawte key signing party and a discussion among staff with the Information Technology organization about open source software.

**Testing new technologies.** A virtual server environment was built for development and testing, thereby reducing the need for new physical hardware and software licenses. Client-side testing was done for Vista and for Microsoft Office beta for the Mac, including Entourage. MIG members actively participated in testing the Aladdin eTokens being evaluated for the PKI personal digital certificate project.

## Middleware Services

The Middleware Services group has focused on enhancing the Enterprise Directory (ED) during this reporting period. Changes to ED infrastructure and interfaces were deployed that enhance the security, manageability, and functionality of the Enterprise Directory.

**Infrastructure.** The ED-Lite, ED-Auth and ED-ID LDAP directories were consolidated into ED-Unified. The unified structure simplifies the maintenance of the directories, which exist in

multiple copies for redundancy. The ED-Unified implementation required testing, deployment coordination, and the development of several OpenLDAP overlays. The new ED-Unified directory responds to queries based upon how the user binds to the directory service.

The infrastructure was expanded with the addition of a messaging-specific server to the server farm. An ED-ID proxy service was added for ED-ID services that are unable to support SASL-EXTERNAL. Permanent name reservations were added to the Name Arbiter and the Registry.

**Management and monitoring enhancements.** The Enterprise Directory Registry database now stores statistics on PID authentication. Using the Directory Access Tool (DAT), staff in Information Resource Management (IRM) and the Virginia Tech Operations Center (VTOC) can see when a password was last changed, the IP address of the last authentication attempt, and the date and time of the last successful and failed authentication attempts.

**E-mail-related enhancements.** IRM was given the ability to add a “display e-mail” alias using the DAT. The display e-mail was created at the request of the Dean of the College of Engineering and allows any RFC 822-compliant address to be displayed in VT People Search as the preferred e-mail address for a given PID. A dynamic number of standard e-mail aliases is now supported, and IRM has the ability to set that number via the DAT. With the addition of group and administrative types of accounts, a person can now have multiple e-mail accounts associated with their directory entry.

**Attributes and affiliations.** In order to allow services to make better authorization decisions based on the status of past and future students, the vt-student-future and vt-student-recent affiliations were added to ED. New directory attributes of labeledURI, instantmessagingID, and fax, mobile, and pager numbers increase the amount of contact information available for an individual. The labeledURI and instantmessagingID may be displayed or suppressed from public viewing at the user’s discretion. Fax, mobile, and pager numbers are only available to authorized services using ED-ID.

**Privacy and security.** Virginia Tech students now have the ability to suppress their PIDs and e-mail addresses, and employees may suppress their PIDs to prevent them from displaying in ED-Lite and People Search. The security of the password reset process was improved by requiring that the user change the password within 24 hours of the time the password was reset for them. After 24 hours, the temporary password will expire and become unusable.

**Provisioning.** “Revocable” people were added to the Enterprise Directory’s business logic. A revocable person entry might be created for someone who is not strongly affiliated with the university but who needs a PID in order to access a service. The entry might expire, or it could be converted to a permanent entry if the person becomes affiliated with Virginia Tech.

Groups were added to the Enterprise Directory to allow services to make authorization decisions based upon group membership instead of or in conjunction with ED-Auth affiliations or attributes available in ED-ID. Thus, a service provider could grant access to any collection of PIDs that are in an ED group. During this first phase, IRM has the ability to create a group, set ownership characteristics, and add and remove PIDs from the group.

Groups, ED-ID services, and e-mail accounts now have full life cycle support in the Enterprise Directory. An expiration date is associated with the each entity that allows it to be de-provisioned. In all cases where something is de-provisioned, an e-mail notice is sent to the owner of the related PID, group, or service.

**On-going operations.** Enterprise Directory usage has grown since its implementation. During a representative week in November 2005, authentications numbered over 80,000 per day.

|                         |         |
|-------------------------|---------|
| Authentications         | 80,596  |
| Unique users            | 23,210  |
| Unique host connections | 432     |
| ED-Lite searches.       | 247,742 |

## Test and Deployment

Testing is a critical component in any software development cycle. With the ability to put another set of eyes on a product before it goes into production, fewer problems emerge with production services developed and maintained by SETI. This year, formal testing checklists and verification templates were improved upon, and the Test and Deployment (TAD) group assisted with coordinating several deployments. TAD continues to help with communications by submitting updates to Knowledge Base articles, by sending out notifications of SETI changes and maintaining the Information Technology Critical Dates calendar at <http://purl.vt.edu/iscriticaldates>.

**Service enhancements.** Systems running Fedora Core 5, Debian 3.1, WinXP pro and server2003, SuSE 10.0, and Mac OS 10.4.7 were added to the test bed. LDAP search tools were improved to aid in testing the Enterprise Directory functions.

TAD provided testing and verification for the four SETI development groups:

### eProvisioning

- Tested OpenCA 0.9.2.4
- Helped test User RA/CA process
- Tested digital signing on email clients
- Tested digital signing on browsers with eTokens
- Assisted with documentation on obtaining VTCA SSL server certificates

### MIG

- WSUS alpha and beta

- Neighborhood Watch final report
- IPsec of domain controllers

### Middleware

- New affiliations
- Email expiration process
- ED-ID schema changes
- De-support of LDAP v.2 binds and SSL v.2
- Enhanced DAT functionality for IRM and Call Center: creation of “revocable users” (persons with no Banner data); improved person searching and suppressed display of SSN; 24 hour PID password expiration; authentication statistics; scheduler services, including expiring email; change number of allowed email aliases; manage departmental PIDs
- VCOM import, update and removal tools (via XML), and VCOM PIDgen
- Replaced Banner to Registry data loading with single queue process
- Applied for middleware certificates and ED-ID services for Debian, SuSE, and Mac OSX systems

### CTU

- CAS single sign-on for Filebox, Hokie SPA, and Departmental Software
- People Search and Advanced People Search: display/suppress PID, email address, URI, IM address, cell, fax and pager phones; verify proper suppression/display of new affiliations vt-student-future and vt-student-recent; perform searches based on various department names and department numbers
- Alumni Directory authentication page
- Test PID password rules; develop and maintain contact list for PID-based services
- Web Hosting move to load-balanced environment
- MyID (MyVT Personal Profile channel)

**Meetings and working group participation.** The Test and Deployment group participated in project meetings and working groups for the User CA, Secure Token Working Group, Mobile Messaging Security Group, Data Quality committee, Security Task Force, ED Planning group, PKI implementation group, and Tech team. Since testing and verification need to be performed for every SETI project, involvement of the TAD group early in the planning cycle proved to be very important.



## Professional development and student education

**Experience and learning gained by student workers.** SETI employs fulltime and part-time employees who continue to learn through formal education programs at Virginia Tech. Two SETI employees earned degrees this year, one baccalaureate and one graduate degree. A new graduate research assistant joined the Test and Deployment group.

**SANS certifications.** Several staff members earned certification through SANS:

- Marc DeBonis—GCIH (GIAC Certified Incident Handler)
- Zeb Bowden—GCIH
- Matt Hart—GCIH
- Frank Galligan—GCFW (GIAC Certified Firewall Analyst)
- Ismael Medaghri Alaoui—GCIH
- Randall Price—GCIH
- Steve Warrick—GCIH
- J.R. Fleeman—GCIH
- Bahaa Al-amood—GCIH

**Additional training.** Tomcat training hosted by Learning Technologies was taken by:

- Cathy Winfrey
- Brian Long
- Jeff Brewster
- Ken McCrery

In addition, the following individuals participated in security and operational training experiences:

- Frank Galligan—SCT Banner HRIS Enterer
- Ismael Alaoui—Microsoft Developer Security Workshop
- Bahaa Al-amood—Microsoft Developer Security Workshop
- Marc DeBonis—Microsoft Developer Security Workshop
- Zeb Bowden—Microsoft Developer Security Workshop
- Steve Warrick—Microsoft Developer Security Workshop
- Matt Hart—Microsoft Developer Security Workshop
- Doug Atwater—Confluence training hosted by NI&S

**Organizational participation.** SETI staff gave of their time and expertise in varied Information Technology and university cross-organizational efforts. These include:

Information Technology Ombudsperson Committee representatives

- Marc DeBonis
- Ken McCrery

Information Technology Security Task Force (STF) participation

- Mary Dunker, STF Chair; member Identity Management and Policy Committees
- Marc DeBonis, Chair, Desktop Committee; member, Identity Management Committee; reviewer for *Security in a Distributed Information Technology Environment*
- Ken McCrery, member Identity Management, Education, Communication Committees
- Frank Galligan, Bahaa Alamood, presentations
- Kimberley Homer, member, Education and Training Committee and Server Committee
- Zeb Bowden, member, Server Committee
- Steve Warrick, member, Network Committee

**Conference participation.** SETI was well represented by staff members at professional conferences.

- Bahaa Al-amood presented Virginia Tech's PKI implementation at the 7<sup>th</sup> annual Educause PKI Summit.
- Marc DeBonis presented SafetyNet at Educause Security Professionals Conference. Marc also attended Mac World where he represented Virginia Tech at the Mac Business Unit council meeting.
- Ken McCrery, Jeff Brewster, Kevin Inman served on panel to discuss portals at ACCS conference and attended the JA-SIG uPortal conference. Ken also attended the Sakai conference.
- Daniel Fisher attended Educause Shibboleth CAMP.
- Mary Dunker attended Educause, the Cisco Executive Briefing and the VA SCAN conference.

**Publications.** Two papers were accepted as contributions to the Educause Effective Security Practices database. Marc DeBonis created an effective practice on the open source SafetyNet Security Scanner developed by MIG. Mary Dunker described the Certification Authority for PKI that was developed by SETI's eProvisioning group. Both papers can be located by searching the resource database at [www.educause.edu](http://www.educause.edu)

## Changed processes

Reorganization of SETI resulted in a new organizational structure, with all five unit leaders reporting to the SETI director. The Test and Deployment (TAD) team was expanded to include a full-time position and a graduate assistant. Resources were reallocated among MIG and Middleware groups that eliminated split duties for one employee and allowed MIG to fill a fulltime position.

TAD improved their deployment checklists and verification templates. The team leader documented dependencies upon the Enterprise Directory, providing a way to notify the owners of those dependent services of changes to ED.

Moving to a Unified Enterprise Directory reduced the effort required for the Middleware team to maintain the ED-ID, ED-Auth and ED-Lite LDAP services.

MIG changed its development process to one that begins with a local copy on the developer's system, uses a virtual machine test environment, and allows the team manager to upload the software "bundle" into the beta hardware environment and update the running code. This process speeds up the development, forces developers to check in their code, and uses a deployment engineering process to segment permissions between development and testing environments.

Wikis gained popularity as an excellent means for communicating, documenting discussions and collaborating on projects. MIG and CTU created new wikis, while Middleware continued to update theirs.