

# Information Technology

ANNUAL REPORT 2004-2005





## **Information Technology 2004-2005 Annual Report**

Information Technology encompasses the centrally provided communications and computing environment for Virginia Tech, including computing and networking infrastructure that supports the missions of Virginia Tech.

The Information Technology organization is made up of several major areas reporting to the Vice President for Information Technology. They include Network Infrastructure and Services; Learning Technologies; Enterprise Systems; IT Security; Secure Enterprise Technology Initiatives; Research Computing; eCorridors; and Administration and Planning.

This report for the period ending June 30, 2005, is organized into four sections. First, new directions are highlighted in “Featured Topics and New Directions,” projects that engage Information Technology staff members across several organizational units. Second, traditional themes of engagement in and support for instruction, research, and outreach comprise “Core Missions.” Third is the 2005 fiscal year financial summary. Finally, this report includes the annual report of each unit within Information Technology.

Management of Information Technology at Virginia Tech may be contacted by:

Telephone: 540/231-4227  
E-mail: [infotech@vt.edu](mailto:infotech@vt.edu)  
Web: [www.it.vt.edu](http://www.it.vt.edu)  
Mail: 1700 Kraft Drive, Suite 2000  
Virginia Tech  
Blacksburg, VA 24061

## Table of Contents

<b>I. Featured Topics and New Directions</b> .....	<b>5</b>
Scholar .....	5
Mobile Computing .....	7
Security .....	9
<b>II. Traditional Core Missions</b> .....	<b>11</b>
Instruction.....	11
Research .....	13
Outreach .....	15
<b>III. Financial Summary</b> .....	<b>17</b>
<b>IV. Unit Reports</b> .....	<b>19</b>
eCorridors .....	21
Enterprise Systems .....	27
Information Technology Acquisitions.....	41
Institute for Advanced Learning and Research.....	51
Learning Technologies .....	73
Network Infrastructure and Services.....	113
Research Computing .....	195
Secure Enterprise Technology Initiatives .....	209
University Information Technology Security Office .....	219

## Scholar

Scholar is a Virginia Tech implementation of the Sakai Project, a community source software development effort that began in 2004. The project works to design, build, and deploy a new Collaboration and Learning Environment for higher education. The course management goals of the project include environments and tools that support research collaboration as well. Founding institutions of the project are the University of Michigan and Indiana University. Both universities independently began open source efforts to replicate and enhance the functionality of their existing course management systems. Soon after, MIT and Stanford joined. With contributions of the Open Knowledge Initiative, the uPortal consortium, and a grant from the Mellon Foundation, the Sakai Project was formed.

Virginia Tech participates in the Sakai Project through the efforts of several Information Technology units. Currently, Sakai's course management system is operating in a pilot mode. The system consolidates the functions of a course management system like Blackboard, adding research and collaboration features and an enhanced ePortfolio. Initially, Scholar will be configured to provide non-course project sites, such as dissertation committee worksites, research project collaboration, and file-sharing sites. Starting in spring semester 2006, Scholar will expand

to include a small number of pilot courses.

Learning Technologies has been an active participant in national initiatives on open source software development. Non-proprietary open-source applications help insure that faculty and student needs are addressed. Staff involvement in Sakai included testing the software, quality assurance analysis, deployment exercises, hardware purchases, and support planning.

The Collaborative Technologies Unit of Secure Enterprise Technology Initiatives was also engaged in the research and develop the Sakai framework at Virginia Tech.

The development of a course evaluation system component of Sakai is the component for which Virginia Tech has taken leadership in this open source consortium. Learning Technologies' Application Development group collaborated with Columbia University and MIT to modify and extend the course evaluation system.

Maintaining the underlying database management system and application administration for Scholar is undertaken by the Database Management Systems team. System administration for the infrastructure, including the infrastructure for the development test bed, is work of the Systems Support group of Network Infrastructure and Systems.

Online Course Management Systems supports these systems, including testing usability and functionality.

*Presentation:* Mitra, A., Cartolano, R., Plymale, W., Zeckoski, A. “An on-line course evaluation system in the Sakai framework.” Presentation at the Sakai Educational Partners Summer Conference, Baltimore, MD, June 2005.

## Mobile Computing

Wireless access to the high-performance networks of Virginia Tech underpins truly mobile computing in support of the research, teaching, and outreach missions of the university, as well as critical support for administration. Wireless technology was extended to approximately 85 percent of administrative and academic space on the Blacksburg campus and the Northern Virginia Center. Wireless implementation included installation in new and remodeled buildings as well. The security of wireless networking was enhanced with the establishing of the Virtual Private Network service.

Information Technology staff work with faculty to ensure that wireless access enhances student learning through pedagogical innovations in the classroom, as well as informal access in study spaces. The wireless campus resulted from the work of several groups within Network Infrastructure and Services. The Research and Development group provided design support; Business Administration and Operations manages registration; and the Virginia Tech Operations Center staff provides technical support to network users on availability, registration, and set-up and troubleshooting.

Teaching and learning are supported by the New Media Center (Learning Technologies) that loans tablet computers for use in the experimental classrooms in

Torgersen Hall. New Media Center staff and the Computer-Integrated Classroom Support staff engage in studying the ways in which the portability, connectivity, and handwriting support of tablet PCs work with the wireless network to facilitate teaching and learning. A track within the Faculty Development Institute focused on the use of tablet computers in teaching. Learning Technologies and Network Infrastructure and Services work together to continue to study the wireless network requirements of tablet computing. Collaboration extends to other university communities through *EDUCAUSE Net@EDU Wireless Networking Group*, including the University of Chicago, New York University, Pennsylvania State University, and the University of North Carolina at Charlotte.

Research work in mobile computing includes the response of Communications Network Services to the Virginia Tech Transportation Institute for help in planning for wireless collection of video and data from sensor controllers at traffic light locations in the Blacksburg area. The “Instrumented City” project provides a research test facility to monitor traffic flow, traffic safety, noise, and air pollution.

Outreach to Virginia communities assists in establishing and expanding wireless service. The Blacksburg Electronic Village (NI&S) staff and the eCorridors Project have

provided expertise and assistance to Virginia communities. In Bedford, the municipality seeks to connect emergency vehicles with municipal buildings in order to improve response time. Nelson County anticipates using wireless as part of their comprehensive broadband strategy to build on network access as an economic development strategy. eCorridors is working to propose recommendations to improve a wireless hot spot in Chatham, Virginia.

Finally, support for routine communications, including administration, was enhanced by wireless projects. The Virginia Tech Operations Center provided support for the March and June 2005

meetings of the Board of Visitors to ensure uninterrupted wireless availability. The migration to Palm OS Pocket PCs in the Virginia Tech Mobile Messaging project is the result of multiple project teams working to establish a new wireless service for mobile access to data. The converged telephony and computing environment provides continuous wireless synchronization of e-mail and data for university executives.

*Presentation:* Hach, Richard. "Integrated Technology for Emergency Systems/Disaster Recovery," Wireless and ICS Working Groups of Net@EDU, Tempe, Arizona, February 2005.



## Security

A major initiative was the establishment of the Information Technology Security Task Force. The Task Force brought IT staff together from across the organization to begin the process of evaluating future needs for security in a variety of areas. Areas being addressed include policy, education, communication, the network environment, the desktop environment, the server environment, networked storage and backup systems, physical security, and identity management.

One university-wide change to better secure identity information is the transition away from Social Security numbers as university ID numbers. Administrative Information Systems (Enterprise Systems) assisted in the ongoing process of converting from using Social Security numbers as identifiers for students, faculty, and staff, to a unique, Virginia Tech-created number. The change extends the state mandate that Social Security numbers no longer be printed on ID cards.

Establishing a public key infrastructure for services and individuals continues, with implementation of the Class 1 Server certificate and continued work on personal, public key infrastructure digital signatures by various Information Technology units, including eProvisioning (SETI), the Information Security Office, and System Support (NI&S). The university benefited from assistance from Microsoft in its

provision of a formal risk assessment process of the Active Directory and Exchange environments.

Information Security Office staff and other IT units provided more in-person security awareness training sessions to faculty, staff, and students through orientation sessions for new faculty, new employees, the Faculty Development Institute, and new student orientation.

Technical training in information technology security was offered through the national leading institution the SANS (SysAdmin, Audit, Network, Security) Institute.

The Virginia Alliance for Secure Computing and Networking (VA SCAN) was recognized by EDUCAUSE for its work. This collaboration among James Madison, George Mason, the University of Virginia, and Virginia Tech exists 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.

Other measures undertaken to improve the integrity, availability, and confidentiality of university systems and data include:

- PID and Hokies password rules were strengthened to

- deter malicious guessing of passwords;
- A weak Windows authentication mechanism, LAN Manager, was disabled;
  - SafetyNet, a web-based vulnerability scanning tool, was created for the university community;
  - An advanced and data-rich portion of the Enterprise Directory, ED-ID, was made available to providers of university web services so that appropriate

- authorization for those services can be accomplished; and
- Ivy, a server hotfix manager, was developed to assist in keeping servers securely patched.

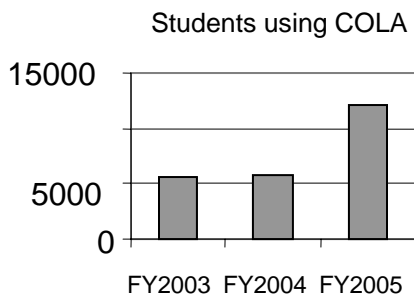
*Publication:* Mary Dunker, "Something You Are," *EDUCAUSE Review*, vol. 39, no. 4 (July/August 2004): 64–65.

# Instruction

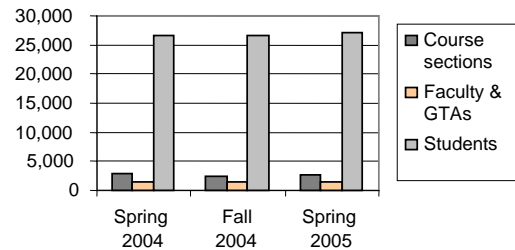
One set of Information Technology's most important functions is support for teaching and learning. Information Technology also provided direct support of instruction through teaching and through engaging students in program-related employment. Finally, Information Technology supports student life in ways that facilitate and enrich their studies at Virginia Tech.

## Supporting instruction

With the expansion of the wireless network to cover most academic space, students use laptop and tablet platforms in class and in informal study environments. The growth in wireless registration (COLA) demonstrates the expansion.

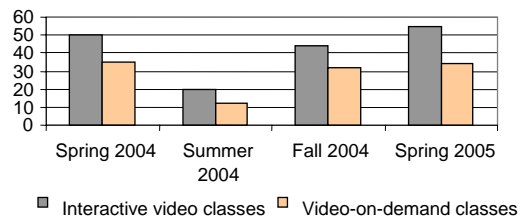


Blackboard is the enterprise course management system. Both residential and distance learning courses use the system. As can be seen in the graph, most courses, most students, and most instructors use the system so that the numbers are increasing but relatively stable over recent semesters.



Additional changes to course management systems during the period included adding more options to Blackboard. New contracts with additional vendors were established, not only for Virginia Tech, but for educational institutions state-wide under the leadership of Information Technology Acquisition. The Sakai project—Scholar—also provides an additional option for future development in course management systems.

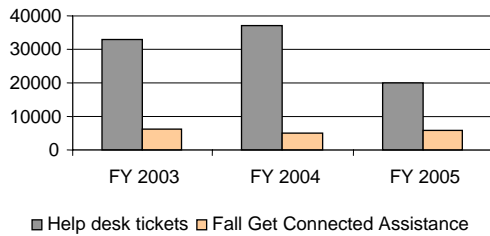
Interactive conferencing and video-on-demand classes are supported by Video Broadcast Services. Usage trends continue to show increases.



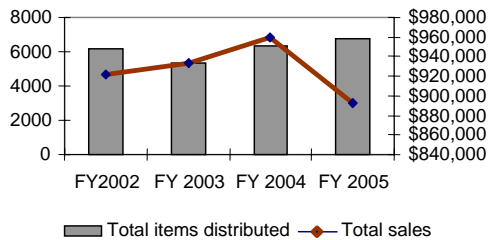
In other work, Administrative Information Systems' Student Team worked to enhance the course registration system to better serve students with double majors.

## Support for students

The Virginia Tech Operations Center and University Computing Support help students in their use of communications and computing technology. Decreased demand for these services reflects increasing technology literacy, improving stability of systems and software, lack of major programmatic or vendor changes, and the results of proactive efforts like the VTnet CD that help prevent problems.



Student Software Distribution provided more products to more students at decreased costs to students.



In other work, telecommunication system in residence halls was upgraded to meet newer safety codes, and students are now able to

access more information about their financial aid through the self-service Web application Hokie SPA.

## Students supported

Graduate students were supported through assistantships and projects in eCorridors, the Security Lab, and the Data Warehouse.

Undergraduate students were supported through employment as help desk consultants, Resident Computer Consultants, New Student Orientation workers, Get Connected staff, and Tech Connect workers.

	Students	Wages paid
Student wages	172	\$572,921
Graduate assistantships	9	\$144,464

## Courses taught

Erv Blythe and Brenda van Gelder taught “Advanced Topics in Information Technology Policy: Information Technology Infrastructure and Regional Competitiveness,” SPIA 5454, Spring Semester 2004.

Randy Marchany teaches “Computer & Network Security Fundamentals,” ECE 4560 every Spring Semester.

Anne Moore taught “IT Society and Public Policy,” UAP 5564, Fall 2004.

Shelli Fowler taught five sections of the GEDI course, GRAD 5114.

## Research

Research support by Information Technology includes administering the research computing environments, establishing and maintaining high-performance networking, software support, and also sponsoring professional development opportunities that help faculty and graduate students become more effective and successful in their research and scholarship. Information Technology personnel also engage in research and mentor student research projects.

### Research computing

The initiative in Computational Science and Engineering received funding to support a lecture series that brought high profile researchers to the university, supported two post-doctoral positions and two graduate research assistantships, and facilitated upgrading the shared memory computing environment.

Appropriate lecture series visitors were among those researchers assisted in transporting their application code to be used on System X, the centerpiece of the university's research computing. System X remains the fastest university supercomputer. Other research computing machines are available to researchers who require other types of environments.

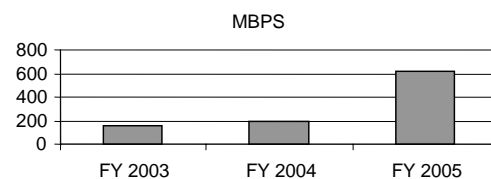
### High-performance networking

A leader in high-performance networking, Virginia Tech is engaged in several consortia to continue improvements. One project is the National LambdaRail (NLR) project. This national project connects major research hubs across the United States.



The system provides researchers with opportunities to experiment with cross-country networks that operate like campus networks and rely on Ethernet protocols familiar to most network engineers. An explicit goal is to bring researchers closer together to solve complex architectural and end-to-end network scaling challenges.

NLR, combined with other networks, contributed to sharp increases in networking capabilities.



## Research support

**Software.** With support from University Libraries, the Office of the Vice President for Research, and the Graduate School, Information Technology Acquisition supports a new license for the bibliographic management software EndNote, and makes it available to faculty, staff, and graduate students. Past work of Information Technology Acquisition was recognized this year by ESRI, a major vendor of major geographic information system software, for ITA's role in making the software more readily available for teaching and for research across Virginia.

**Proposals and grants.** The Sponsored Research Proposals and Grants data marts were implemented in the Spring of 2005 by Information Warehouse and Access. The Director of Sponsored Research expressed his appreciation:

Having the ability to extract this data in a quick and understandable format will have ramifications beyond description. If we are truly to achieve a top research status as an institution, we must manage aggressively and make decisions that allow us to exploit our research successes. The Warehouse data will provide the basis for this management.

**Preservation of research materials.** Digital Imaging provides direct support for and participation in faculty efforts related to making research materials available, providing digital archiving of existing research materials, and the development of high-resolution

computer generated images suitable for use in research visualization projects requiring a high degree of image fidelity. In cooperation with the University Libraries, Digital Imaging began the process of scanning the printed dissertations owned by the university. Approximately 500 dissertations, representing over 86,000 pages of research information, have already been processed.

## Research by IT personnel

With nearly \$2 million in sponsored grants and contracts in fiscal year 2005, Information Technology personnel are actively pursuing relevant research on developing and evaluating information technology.

### *Grants awarded to Information Technology personnel in Fiscal Year 2005*

John Moore, Kevin Oliver (Learning Technologies), "Creating optimum learning environments," Subcontract through Florida Community College at Jacksonville, \$19,849.

Hud Croasdale (Information Technology), Hassan Aref, and Sedki Riad (College of Engineering), "Resident Information and Communication Technologies and graduate program in Egypt and the Mena region: Faculty skills development," Association Liaison Office for University Cooperation in Development, \$99,986.

Hud Croasdale (Information Technology), "IT2—Quilt," Internet2, \$130,084.

## Outreach

Significant responsibility for outreach projects lies with the eCorridors Project, the Institute for Advanced Learning and Research, and the Blacksburg Electronic Village (NI&S).

The eCorridors Project assisted the communities of the City of Bedford and Nelson County in planning for connectivity for economic development and public safety. The project also worked with Chatham, Virginia, on a “last mile” prototype. The New River Valley Planning District Commission approached eCorridors, requesting assistance in planning telecommunications infrastructure in the four-county region.

The eCorridors staff members author a blog for the group FirstMile.US on network access in rural communities.

In recognition of its work in improving the quality of life in the Southside Virginia communities it serves, the Institute for Advanced Learning and Research received the Innovator’s Award from the Southern Growth Policies Board in June 2005. The Institute’s work included programs for both educators and their students, as well as for small business operators and community leaders.

Since its inception in 1991, Blacksburg Electronic Village (BEV) has performed an important outreach effort by

encouraging the community to come together using technology. Entirely based on the Internet and focused on technology and community, BEV’s goal is to increase the community’s capacity to adapt to rapid changes in society and to use technology to solve increasingly complex community challenges.

Working with One Care of Southwest Virginia, a collaborative effort to provide basic coordination of health and human services throughout Virginia’s Ninth Congressional district, BEV has begun to explore how best to make the software more broadly available.

Under a Technology Opportunities Program (TOP) grant from the U.S. Department of Commerce called “Getting Rural Virginia Connected: A Vision for the Future,” BEV has partnered with the Virginia Cooperative Extension Service and established electronic villages in a number of disadvantaged rural counties in Virginia. TOP was designed to demonstrate practical applications of new telecommunications and information technologies to serve the public interest. A major area of attention is affordable, universal, broadband access. Broadband is generally considered essential for economic development and for the creation of jobs in the “new economy” of electronic business and commerce. See <http://top.bev.net>.

BEV successfully established a relationship with the Woodrow Wilson Rehabilitation Center in Fishersville, Virginia. Residents of the center became BEV interns, and were paired with small businesses that had requested assistance with their e-Village web pages.

In a Learning Technologies program, the Summer Academy for Rising Students engages high school students in instruction in genetics, neuroscience, hydrology, and materials science. The program provides an inquiry-based summer residency and after-school component targeted to high school students in public school divisions within the Southside region.



## Financial Summary

During fiscal 2005, the organizational units of Information Technology provided E&G and auxiliary resources totaling \$49,315,481 in support of university academic, research, administrative, and outreach goals.

Information Technology (IT) provided academic and administrative support activities totaling \$27,933,793 and research/overhead support totaling \$1,929,536. The organization's two auxiliary units, Communication Network Services and Student Software Sales, provided \$16,001,444 support toward the university's goals.

Services totaling \$1,219,300 were provided by IT in support of the Advanced Technology Learning Center and classroom connectivity for distance learning.

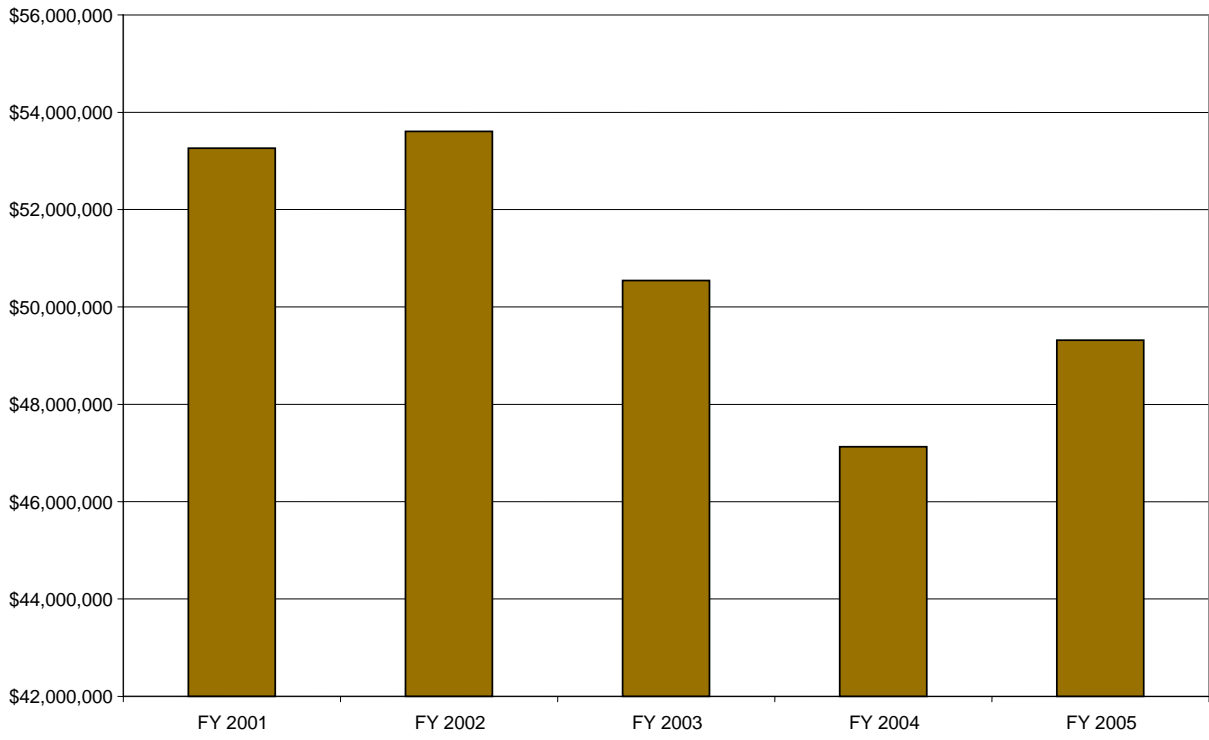
IT also operated several self supporting units to provide specialized services. The major unit (Printing Services) provided volume printing to university departments. University support provided by these units totaled approximately \$5,975,000.

Funding to support the activities of IT was provided by:

E&G	\$23,346,542
Equipment Trust Fund	1,969,166
Auxiliary Operations	16,001,444
Self Supporting Operations	5,975,708
Sponsored Grants	1,500,310
Continuing Education	93,085
Overhead	<u>429,226</u>
Total	\$49,315,481

The IT organization is an active participant in the sponsored research arena. Balances in the IT Sponsored Programs were approximately \$1,500,000 at fiscal year end. Project sponsors include The Department of Education, Future of the Piedmont, Blacksburg Electronic Village, US Department of Commerce, and Internet 2 Inc.

### IT Total Funding



## Unit Reports



## eCorridors

eCorridors serves to create competitive advantage by facilitating the deployment of advanced network infrastructure and applications, leveraging inter-regional connectivity for communities.

### Projects

#### **City of Bedford**

The City of Bedford, Virginia, engaged eCorridors to assist them in writing, soliciting and evaluating Requests for Proposals (RFP) for a wireless system to connect emergency vehicles, municipal buildings, and eventual public access. They are interested in this because wireless connectivity of public safety and emergency vehicles is expected to significantly improve personnel safety, coordination, response, and reaction to events. The City also anticipates saving significant amounts on telephone and internet connections by connecting its municipal facilities to the wireless network. Eventually, it is hoped the City can also provide affordable high-speed access to business and residence.

Accomplishments to date:

- Assisted the City of Bedford in writing the RFP
- Assisted the City of Bedford in determining who to solicit with the RFP
- Completed on-site meetings with prospective bidders
- Concluded the first stage of the project

#### **Nelson County**

The Nelson County Economic Development Authority has engaged the eCorridors group to produce 'a study' to help them form a comprehensive broadband strategy. There are several private sector initiatives to deliver 'broadband' services (DSL, cable, and wireless) currently underway in some areas of the county. These efforts are naturally concentrated in small residential clusters of higher population and the Wintergreen Resort, leaving much of the county un-served. The authority would like

the county to be able to provide free wireless Internet access areas not currently being provided for. As part of that initiative, the Authority would like to promote a ‘Welcome to the Nelson County Wireless Corridor’ along Route 29(?) initiative, advertising to visitors that free wireless is available, (generally and in restaurants etc.) The Authority feels a free wireless corridor would encourage visitors to stop and could boost economic activity.

Accomplishments to date:

- Identified private sector service providers and opportunities to coordinate with private sector service providers.
- Identified the opportunities to coordinate with the school system existing strategies and resources.
- Developing the parameters for a study of county topography

### **Wireless “Last Mile” prototype project**

eCorridors is working to propose recommendations to improve a wireless hot spot in Chatham, Virginia with potential for expanded private sector wireless services for residents and businesses. To date, the group has researched potential vendors and technologies.

### **New River Valley Planning District Commission**

The New River Valley Planning District Commission approached eCorridors and requested our assistance in planning for the enhancement of telecommunications infrastructure to the four counties of Montgomery, Floyd, Giles, and Pulaski. This was an exciting opportunity to effect change in our own backyard that could very well benefit the university community in the process. The planning district put together a needs assessment/ survey and distributed it to educational institutions and businesses in the area. Major employers who responded to the survey indicated they were less than satisfied with the telecommunications capacities (bandwidth and services) available in the NRV. Many cited the desired services were either unaffordable or unavailable from commercial service providers.

NRVPDC sought and obtained funding from ARC to begin planning for the design and deployment of a public regional fiber optic network consisting of inter-county, intra-county, and local access points. Access to affordable advanced telecommunication infrastructure and services throughout the region is expected to create an economic engine for the New River Valley. The goal of this project is to attract and retain employers and employees, grow higher educational opportunities, support entrepreneurial spirit, foster community connectivity, improve emergency response and generally enhance the quality of life in the New River Valley region.

The eCorridors program is actively participating as a project partner and consultant. Various members of the eCorridors team have engaged in the following educational, research and outreach activities with the NRVPDC.

Accomplishments to date include:

- Participated in the development of the initial community needs survey/assessment.
- Provided partial analysis of survey responses via VT survey tool.
- Proposed initial fiber routes and recommended fiber specifications.
- Provided online, interactive GIS maps to the NRVPCD.
- Facilitated initial contact of technology vendors (CNS, Cisco, Corning and others).
- Provided education related to project rationale, technology, and strategy to various community groups.
- Provided technical consulting for preliminary engineering and cost estimates of the proposed network.
- Assisted in the development of the organizational structure required for operation and management of proposed network.
- Helped with grant writing and provided letters of support for grant proposals.
- Participated regularly in planning sessions.
- Prepared copies of NRVPCD telecommunication project video and DVD for distribution.
- Maintain news and updates for NRVPCD telecommunication project on the eCorridors website.

## **FirstMile.US blog**

eCorridors was approached by the new organization, “FirstMile.US” to author a blog on the topic of grassroots efforts in Virginia to bring network access to rural communities. The blog (<http://www.firstmile.us/blogs/va/>) has been up and running since early June 2005 and has new entries on a bi-monthly basis. While eCorridors staff and graduate students will be the primary authors of blog entries, it is hoped that we will be able to engage local and state leaders and companies to provide guest entries for the blog in the coming months.

## **Prototype enterprise GIS**

The purpose of this project is to create and maintain a centralized repository of geographic information (an “enterprise GIS”) relevant to university outreach efforts, research projects, and internal operations, which will be accessible to desktop and server-based Geographic Information Systems (GIS) across university departments. Initially, a prototype system will be developed with the primary purpose of serving the internal mapping needs of the Information Technology organization – chiefly, CNS and eCorridors. However, due to significant interest in and support of the project from a number of organizational units of the university outside of IT, such as the Center for Geospatial Information Technology, the Office of the University Architect, and Site and Infrastructure Design, it is anticipated that the system may eventually scale up to serve a broader user base. The system will benefit the Information Technology organization by enabling the sharing of geospatial information between departments, which is anticipated to result in reduced duplication of effort, reduced data redundancy, improved data currency, and reduced need for storage of common, but

often large, “base map” data on client workstations. It may also serve as a catalyst for the development of a larger-scale enterprise GIS for the university community as a whole, by generating interest in the concept of centralized sharing of geospatial data.

## **Telecommunications legislative bills tracking**

The eCorridors program monitors and tracks telecommunications-related legislation using the online Virginia Legislative Information System, available at: <http://leg1.state.va.us/> and [GovTrack.us](http://GovTrack.us). The information is posted on the eCorridors website, which archives an ongoing collection of state and federal bills and resolutions related to telecommunications.

This database serves communities that may be considering issues associated with incorporating telecommunications into their economic development efforts. Common queries from communities engaged in or considering public telecommunication projects revolve around the legality of their proposed plans. This project began out of an in-house, need-to-know the regulatory environment for our day-to-day activities. The project is intended to provide a unique source of consolidated state and federal statutory information from which communities and decision makers can learn about, anticipate, and plan telecommunication related activities accordingly.

## **Professional Activities**

### **Jean Plymale**

- Attended the Freedom to Connect Conference, March 30-31, 2005
- Invited and gave a presentation entitled, “Advancing Rural eCommerce,” at the Institute for Advanced Learning and Research, April 18, 2005
- Presented, “Placemaking In Virginia; Planning for Rural Telecommunications,” at the Virginia Chapter of the American Planning Association
- Attended the Law Seminar Municipal Broadband Conference, Nashville, TN, July 2005

### **Brenda van Gelder**

- Presented at Educause Mid-Atlantic Regional Conference January 13, 2005, in Baltimore, Maryland, "Creating a "Producer Network Advantage," for presentation at the 2005 EDUCAUSE Mid-Atlantic Regional Conference in Baltimore.
- Presented at the Institute for Advanced Learning and Research in Danville, June 18, 2005, *Impacting Rural Communities through New Age Technologies*. My presentation was part of the conference’s feature panel discussion, *Public vs. Private- The Battle Over Internet Service Provision*.
- Obtained VITA Project Management Certification at the \$100,000 level.
- Participated as a member of the Educause BPG Steering committee (contributed to discussions of USF idea for funding municipal broadband, broadband index/ definition)
- Served on the Program Committee for EDUCAUSE Policy Conference 2005



- Served on the Steering Committee for IALR's IRCNAT conference, held June 2005.
- Submitted paper abstract to 9<sup>th</sup> Annual Rural Telecommunications Congress, to be held Oct. 10-12, 2005, it was accepted.
- Attended Educause Policy Conference 2005, April 5-7.
- Attended the Law Seminars International Municipal Broadband Conference, Jim Baller and Co., July 11-12, 2005.
- Attended Virginia Tech personnel-department sponsored manager's training "*Changing Leadership in Changing Times*," March 4 and 23, 2005.

### **Teaching and research**

- During spring semester, 2004, the Director of eCorridors, Brenda van Gelder, co-taught a graduate level course in the Urban Affairs and Planning Dept. with the Vice President for Information Technology, Erv Blythe. The course was SPIA 5454, "Advanced Topics in Information Technology Policy: Information Technology Infrastructure and Regional Competitiveness."
- This past year, eCorridors staff gave four research presentations at conferences; submitted one abstract (that was accepted for presentation at a conference next year); and attended 10 professional development conferences, seminars or workshops. The staff has also begun writing weekly blog articles for FirstMile.US ([www.firstmile.us](http://www.firstmile.us)).
- eCorridors provided support for one graduate student and one undergraduate student. Three members of eCorridors' full-time staff also enrolled and completed courses for credit throughout this reporting period.
- The eCorridors group is focused on outreach initiatives with Virginia communities and regions first, but also works with communities outside of Virginia when appropriate opportunities present themselves. The group does not actively seek out communities to engage; rather, it responds to requests and inquiries initiated by the communities directly to our staff or to the VP's office. During the period of January 1, 2004 and June 30, 2005, eCorridors has been engaged with four communities on an ongoing basis and several on a one-time or occasional basis. In most cases, eCorridors' work with communities involves applied research from the Advanced Network Services and Electronic Villages areas of Information Technology, as well as the wireless research from within IT and the university research centers.



# Enterprise Systems

Enterprise Systems consists of two areas: Administrative Information Systems and General Enterprise Systems. These two areas are responsible for much of the transactional and analytic data systems for university operations.

## Administrative Information Systems

Administrative Information Systems (AIS) provides the university community with information technology and support to complement its 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.

The focus of Administrative Information Systems (AIS) over the last 18 months has been Banner maintenance and upgrades, the Social Security number transition, and eCommerce.

**Banner maintenance and upgrades.** To maintain appropriate functionality for the systems, applying upgraded Banner software releases is a normal activity. Banner 6.X was implemented March 6 and 7, 2004. Currently, work is progressing for a Banner 7.X upgrade for November 12 and 13, 2005. Also, work was completed to have a finer-grained suppression or confidentiality for addresses and phones according to individual preference.

**Social Security number transition.** AIS works closely with the Department of Human Resources (Personnel Services), the University Registrar's Office and the Hokie Passport Office to change university numeric identifiers from the Social Security number (SSN) to an assigned number. AIS has converted over 600,000 system identifiers from the SSN to a generated ID number. In addition, we have worked with the Hokie Passport Office to streamline the SSN conversion for active faculty and staff.

All faculty and staff will be converted by end of February 2006. All students will be converted by end of May 2006.

**eCommerce.** AIS led an effort to provide an eCommerce solution for accepting credit cards for transcripts in 2003. Since then, it became apparent that further development and maintenance of a university-wide eCommerce solution would be expensive and time-consuming. AIS began working with the Bursar's Office and other staff from the financial area to purchase an eCommerce solution. The solution was purchased using a contract from James Madison University and implemented in June. Not only is the solution serving the transcript area, but the university is now taking credit cards (via a third-party vendor) and ACH payments for tuition (automated debits). This solution will now be available for other areas of the university such as Hokie Passport, Dining Dollars, Squires, and others.

### **Alumni/Development Team**

- Implemented a new Moves Management system that allows fundraisers to identify their top 50 prospects and to create solicitation plans for those prospects including all "moves" associated with the solicitation. The system includes several management reports and audit reports.
- Worked with AIS colleagues on the conversion from social security numbers to generated ID numbers as the identifier for Banner records.
- Participated in AIS project to add confidentiality indicators on addresses and phone numbers to our system and processes.
- Created multiple reports in support of the comprehensive campaign including reports showing progress towards goal for all priorities and sub-priorities for the campaign and a report of million dollar donors.
- Overhauled the entire Student Calling Center infrastructure including a database upgrade to SQL 2000, applied a major upgrade to Smartcall (including all client machines) to version 9.2,. Over 30 workstations and the server were upgraded or replaced.
- Upgraded software and security on every machine supported by the Desktop Support team in the user's own work area to reduce user downtime. During this process, Internet Native Banner (INB) clients were installed, the equipment was logged into or verified in our fixed asset inventory, Office 2000 and Windows 2000 Patches were checked and installed if needed, anti-spyware was implemented and firewall clients were installed.

### **Enterprise Systems Support**

Enterprise Systems Support's primary role involves support of the ITA purchasing, software sales and software distribution systems.

- Deployed a new Java-based point of sale and management system for ITA Student Software. The new system remains integrated with the Banner student billing and the fall check-in web ordering software system. Provided hands-on training classes and user's guide to ITA staff on the new student software application.
- Deployed a new Java-based department software application for tracking software orders and licenses for university departments. The new system is integrated with

the university financial systems for department fund transfers. Provided hands-on training and user's guide on the department software application for ITA staff.

- Developed a JavaScript-based document browser for purchasing records and document images. This application was used for approximately one year before being replaced by a Java-based browser described below.
- Wrote a Java PurchBrowser client application to provide a faster searching of purchase order information and document retrieval. The new browser provides a single location to access many purchasing documents and applications, a new contract document type, and a simple reporting tool.
- Migrated the purchasing bid creation and distribution application from the NeXT to the Web.
- Moved the listing sheet editor formerly on the NeXT machine to the web. Listing sheet source documents remain in the same tagged format familiar to the purchasing staff.
- Integrated the UNIX-based ITA department fax server with Macintosh OS/X desktop applications. A CUPS print driver for OS/X was configured to handle fax jobs submitted from the Mac desktop to the department fax server.
- Wrote a web-based fax queue-monitoring tool to allow fax users to view outgoing fax progress.
- Successfully migrated all ITA applications off the UNIX NeXT environment. Details are covered in ten items listed above.
- Installed Crystal reports on ITA administrative machines. Setup Oracle views for student and department software administrative reporting. Developed a users guide for ITA staff on these Oracle views and Crystal Reports.
- Setup a development and production website document repository for ITA staff to manage web documents (currently not used by ITA).
- Wrote a label-printing tool for printing software inventory barcode labels using Excel and Excel macros.
- Developed a web-based contract management system for universities within the state of Virginia to obtain copies of contracts managed by Virginia Tech.
- Ported our five key WebObjects Applications from Web Objects 5.0 to Web Objects 5.2. Application code and Framework code changes were necessary for this change.
- Set up a *subversion* repository in which to store ESS source code. All web application and cron script code is stored in the repository. Scripts developed to do a full backup of the repository on a daily basis and an incremental backup of every commit to the repository.
- Set up a system using NaturalDocs to create technical documentation for our applications and systems. Made a good start at writing technical documentation for our systems and code.
- Made progress in setting up our development web server so we can test and develop all apps there before deployment. Rebuilt PERL in a cleaner way on the test server and production server to facilitate gradual cleanup of a PERL setup on our production web server.
- Upgraded ITA's main web server to apache2. The WebObjects adaptor was also built to support this upgrade.
- Fulfilled various requests from ITA management for special reports, minor manual database updates, and web page maintenance, an estimated average of three per week.

- Maintenance of the Network Software server. Significant work involved copying discs, creating ISO images of all CDs on the server, developing procedures to keep three servers synchronized, creating new samba shares for additional software titles, and manually maintaining the database list of shares and access rules.
- Added direct web download capability to the software server. Overhauled the web front end to provide more aesthetic web pages. Altered to support an Ed-Lite directory schema change.
- Annual web server certificate renewed and PERL and WebObject applications updated to trust the new Ed-Auth certificate authority.
- Authportal support upgraded and improved. Our main WebObjects authentication/authorization framework was improved to separate out authportal functionality so as not to affect our other non-authportal applications.
- Purchasing office PO Printing application was modified to seamlessly support purchasing blanket orders.
- Developed a document scanning input system for ITA records and documentation. Wrote a PERL daemon email-client back-end to manage scans from Student and Departmental software offices. Front-end management pages added to the Student and Departmental WebObjects programs.
- Wrote a web tool to view network share statistics and user access for the network software system.
- Wrote a tool to analyze statistics on network software access in order to display suspicious access of network software by single users from multiple machines.
- Participated in Centralized Student Software check-in for Student Software Distribution and provided technical and application support for ITA during 2004 and 2005 fall student check-in.

## **Finance Team**

- Implemented Banner 6.x including comprehensive testing of the entire system and re-applying all local Virginia Tech modifications.
- Configured and installed new server hardware and software to support Banner document printing such as Purchase Orders, Accounts Receivable Bills and government forms such as 1099 and 1098T forms. This work involved upgrading workgroup server hardware, upgrading the software to Adobe Central Output Server software, and upgrading to Windows 2003 Server. The Finance Team also extended the functionality of the system by adding automated PDF creation to the processes. One benefit to this effort was to significantly reduce the print time for on demand Student Statements. This change reduces student wait times at the Bursar's Office.
- Student Bills were redesigned to be easier to understand. The bills were further modified to meet the requirements of a new bank processing center.
- The Finance Team received new workstations this year and the team created a common configuration for these machines significantly reducing deployment time for other teams who also received new hardware. In conjunction with the Banner 7.x deployment, the old workstations were reconfigured to allow development work in the old environment (Banner 6.x) allowing the new hardware to be used for development work in Banner 7.x.
- The Finance Team was heavily involved in the testing, configuration, training, and deployment of Internet Native Banner.

- The Finance Team has been leading the effort to implement an electronic commerce system to Virginia Tech. We participated along with the Internet Applications Development team to develop eCommerce (specifically ePayment) software. This effort allowed us to begin accepting Credit Card payments for student transcripts. The experience in developing that software was key in helping us to select, procure, and deploy an eCommerce solution to the campus this year (InfiNet's Quikpay solution).
- Assisted in the effort to for identifying VCOM students in Banner processes required to provide student services to them.
- Began development on a fully automated Unclaimed Property system.
- Created automated processes for batch invoicing into the Accounts Payable system.
- Created automated processes for loading of re-componentized assets into the Fixed Assets system, allowing for the loading of anywhere from 5000-30000 assets at one time.
- Assisted in development of the Proposals Data Warehouse.
- A significant amount of our time this year has been spent working to integrate Virginia Tech's procurement systems with the State mandated eVA e-procurement system.
- Continue the training effort of Banner Accounts Receivable during the year training 25 new users.
- Assisted in the training of 20 users on the Finance and Accounts Receivable Data.
- Trained 85 users (new and refresher training) on the Tuition Remission system.

## **HRIS Team**

- Modified, tested, and installed Banner HR 6.0 and HR 6.1. Moved from client/server to Internet Native Banner (INB). 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.
- Implemented a new salary encumbrance process to provide better data to the departments on their sponsored commitments along with their general fund encumbrances. This included new programs and tables on the Banner side and the data warehouse.
- Rewrote the HRIS web reports to run from the web job submission system allowing reports to run against Banner or the warehouse based on the data required.
- Modified programs and forms to implement the new confidentiality indicators on addresses and phones.
- Implemented a new electronic personnel action form to process terminations for salaried employees online thus no longer requiring a paper form. This includes the appropriate approval for the termination.
- Implemented a number of employee self-service enhancements including adding taxable earning information to the electronic pay stub and displaying leave balances.
- Modified the performance evaluation system to include position number for the supervisor and reviewer and changed forms and programs to capture/report this information.

- Wrote conversion programs for SOC code changes and for account code changes for special research faculty; new programs for recognition leave and for updating HR with new VT degrees each semester.
- Developed numerous reports to provide information to the state, the executive vice president, and the Personnel Services annual report.
- Involved in the normal yearly processing for the HR system: performance reviews, position roll, salary increases, benefit premium updates, tax updates, CVC, tax shelter limits, leave roll, etc.
- Continual changes to the system to improve data quality, system performance and customer satisfaction.

## **General Team**

- Implemented Banner 6.X upgrade for general forms and programs.
- Implemented a new process to disallow entry of a SSN as an ID number within the Banner system.
- Implemented a new process to keep track of what the Social Security Administration considers a valid SSN based on the first five characters of social security number.
- Implemented a process to convert all of the Banner ID numbers that are considered to be an SSN to a generated ID number. This process converted over 600,000 IDs.
- Implemented granular confidentiality for student and employees.
- Changed the budget tuition system to print their documents on departmental printers instead of using the failing Docuprint printer.
- General maintenance and enhancements for the Banner general system.
- General maintenance and enhancements for the budget tuition system.

## **Student/Financial Aid Team**

### Corrections and Maintenance

- Ongoing daily support of student/financial aid processes as required.
- As move was made to Internet Native Banner (INB) appropriate clean-up of in-house developed forms was done.
- Participated in the testing and verification for implementation of release 6.x of Banner in March 2004.
- Participated in the preliminary testing and form conversion of release 7.x of Banner.
- Continued the enhancements of the routines used to create the files associated with census processing, in particular, modifying to use new primary major and concentration tables.
- Ran the processes to clear PIDMs 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

- Enhanced registration scheduling to check for secondary majors when major restrictions are associated with a section.
- Enhanced transcript request via the Web by changing the interface from an internally developed payment gateway to use the new eCommerce InfiNet system.
- Enhanced process to establish graduate rate codes on students having assistantships.
- Developed processes for the transfer of data from University systems to NCAA-developed Compliance Assistance and Academic Performance Program systems; performed required updates to data as required by Registrar's Office.
- Implemented a web-based Graduate Admission Analysis system to provide more efficient and timely processing of applications by departments.
- Developed conceptual model of a web-based advisor comment tracking system
- Continued participation in the migration to generated ID numbers for the primary access point of Banner.
- Enhanced programs to process the new confidentiality indicators associated with addresses and telephones.
- Assisted in establishing the processes required to support graduate certificate programs.
- Performed the necessary updates required of the system in support of the University restructuring.
- Developed functionality for the Undergraduate Admissions and Office of Scholarship and Financial Aid to allow applicants to view the information about their application, or award, via the Web.
- Assisted the Graduate School in improving data flow and processes within their office.
- Corrected and enhanced the reasonable academic report process for Financial Aid.
- Continued to enhance the Web for Student and Faculty/Advisors capabilities – for areas such as the National Student Clearinghouse and University Orientation program.
- Continued work on the Undergraduate Admissions and Graduate Admissions data marts.
- Initiated work on a General Student data mart.

## Team education

- Conducted 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 Systems

The mission of General Enterprise Applications 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.

Responsibilities include:

- Maintaining the underlying database management system and application administration for the Enterprise systems, including Banner, Blackboard, SAKAI, 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 IT 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), 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 General Enterprise Applications (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 two Graduate Research Assistants this past year. One was a beginning direct Ph.D. student whose work experience led to a summer internship with Goldman Sacs and a strong interest in application security issues.

The other was a Ph.D. student in human factors who defended and graduated during the summer. His dissertation was focused on providing a Web Development tool that allowed a non-developer to create dynamic web sites. Individuals in GEA participated in surveys and in Human Factors testing. The resulting product, CLICK, is maintained on our servers and is being production tested.

The Sponsored Research Proposals and Grants data marts were implemented in the Spring of 2005. IWA developed Dashboards and is providing training to key users in colleges and departments. We received the following comment from the Director of Sponsored Research.

Having the ability to extract this data in a quick and understandable format will have ramifications beyond description. If we are truly to achieve a top research status as an institution, we must manage aggressively and make decisions that allow us to exploit our research successes. The Warehouse data will provide the basis for this management.

We also experienced similar success with the Undergraduate Admissions Data marts and Dashboards that we developed.

The implementation and support of Internet Native Banner that eliminated the use of client-server technology for Banner transactions. By moving them to the Web we created a much more secure environment for sensitive university data by ensuring that all transactions were encrypted.

Web hosting as of May this past year now supports over 1,000 web sites for colleges, departments, centers, Virginia Tech Organizations and registered VT Student Organizations. We provide the database, and web server support for these sites eliminating the need for individual web server administrators, ensuring a stable and secure environment.

The Knowledgebase area continues to update and create new articles that information and instructions. This resource is used continuously by University Computing Support to provide assistance to users. It is also available as a self-help resource.

Not only have these areas reached out to support our user community, but they also have collaborated with, and supported other areas within IT to enhance the services that our organization provides.

## **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 very stable and auditable production environment for our critical enterprise IT services.

DBMS developed and implemented software that allows users to schedule updates to production and pre-production databases. This software significantly reduced DBMS time and resources, which are being used on other efforts. The DBMS group also developed a new monitoring system that provides them with “early warning” conditions that need “next-day” attention and pages them when problems occur. Every member of DBMS carries a beeper. They provide 24X7 monitoring and response to problems.

The Banner system was upgraded to new releases of Banner 6.x. Other numerous Banner and Banner upgrades were installed. This involved 260 installations across all instances. This does not include the numerous patches that were applied at the request of the AIS Banner technical leads. A Banner 7 test environment was also set up to allow the developers to conduct an impact analysis for the implementation of Banner 7. In addition to upgrading and patching Banner, Oracle was migrated to a new release.

The DBMS team migrated production databases to 24 X 7 availability by moving to “hot” backups. They also moved the databases to the Storage Area Network. This move set the stage to move from the E10K to a new hardware environment. The E10K hardware platform was replaced with a bank of new, more efficient machines. Maintenance cost savings were significant. The Banner self-service environment was moved to a Linux environment using Oracle 10gAS, web cache, and CNS load balancing.

During the Blackboard upgrade over the Christmas break, DBMS provided performance analysis, and advice, which helped address serious production problems that occurred at the beginning of the Spring 2005 semester. This collaboration resulted in a request for DBMS to provide the production database support for Blackboard. This was followed by a request for data base support for Sakai. DBMS

also provided the software, and some technical support in load testing the Sakai product. The results were shared with the schools working on Sakai.

This past year DBMS also began providing production support for the Enterprise Directory. This involves database and application administration support. In June, DBMS also took over the database support for the Enterprise Data Warehouse, and application administration and technical support for Web Hosting and Filebox services.

The DBMS team provides the necessary controls, oversight, performance monitoring, and 24 X 7 on call response to ensure a very stable and auditable production environment for our critical enterprise IT services.

## **Web Hosting and Filebox**

The Web Hosting service provides significant support to academic and administrative areas who 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 web site potentially represents a web server that does not have to be maintained by faculty, graduate students, or staff.

As an enterprise service, this achieves tremendous efficiencies for the university, and ensures a more secure environment.

Highlights over the past year include the hosting of the beta version of Click, an open-source application that allows end users to develop dynamic web sites. Several applications were developed to increase the ease and efficiency of setting up new web hosts, and to provide 24 X 7 monitoring. The Hosting group also contributed four open source applications to SourceForge:

Calendar, VTSurvey, Fileman, and a beta version of Click.

Filebox provides individual web sites for over 25,000 faculty, staff, and students. It is also used by faculty for class projects. This past year, it was upgraded to more powerful machines, repurposing the older machines to set up a much-needed development environment. Early next fiscal year load balancing will be implemented.

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

The Knowledgebase (KB) and *computing.vt.edu* websites provide information about using IT resources. The Knowledgebase 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 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. Knowledgebase work is summarized in the table.

Time Period	New Articles	Average Time to Publication	Updated Articles
Jan 04 – Jun 04	93	.9 days	306
Jul 04 – July 05	186	2.1 days	768

The webpage *computing.vt.edu* contains over 500 pages of content that are updated upon request. Although statistics were not kept this past time period, over 1/3 of the pages were updated. Some of the key updates, and new pages were changes to the features associated with the Enterprise Directory, and implementation of Internet native Banner.

Time Period	Site	Average Visitors per Month	Average Visits per Month	Average Web Pages Visited per Month
FY05	Computing	27,732	51,832	128,723
FY05	Answers	40,520	52,621	157,086

Feedback on Knowledgebase articles included:

- very pleased with these directions, I have found the knowledge base to be invaluable...keep it up, please. (Faculty)
- 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.

Each night transactional data from the previous business day is extracted from the Banner transactional processing system and added to the Data Warehouse. The data is restructured in the Warehouse so it is easy to understand and use. The Data Warehouse contains data current as of the previous business day, and also accumulates historical data that can be used for trend analysis. The data marts in production at the time of this report are Accounts Receivable, Alumni Development, Employee, Finance, Foundation, Graduate Admissions, Payroll, Position Control, Undergraduate Admissions, Undergraduate Admissions Recruiting and Sponsored Programs (proposals and grants) data mart. IWA works cooperatively with the Data

Stewards in the various business operational areas to provide data and tool training for the users of each data mart. IWA recently began working on a series of data marts for Current Student Information, including Enrollment.

IWA supports a compliment of Web enabled tools for accessing data. Brio is supported for interactive ad hoc queries over the web. Additionally, a number of in-house written applications are maintained and supported by IWA including: Report Job Submission for submitting parameter driven batch query jobs; Report Distribution for disseminating output from batch query jobs via a web URL in an e-mail notification; Metadata Viewer for authorized Data Warehouse users to view data models and the data definitions for each data mart; Service Request which provides a web interface for submitting service requests and a data base for tracking man-hours; Problem Tracking which tracks man-hours by problem occurrence and serves as a reference of fixes for problems.

**Data Warehouse Development and Maintenance.** During the reporting period, IWA continued to be involved in developing new data marts while at the same time sustaining the existing data marts. For data marts under development, project meetings are held weekly to plan and coordinate effort. For established data marts, monthly meetings are held with each business area to coordinate necessary warehouse changes due to evolving business processes, software upgrades, or data correction. Between July 1, 2004 and June 30, 2005 such warehouse changes were reflected in the completion of 102 service requests for a total of 563 staff hours. Additionally, during that same period, 195 problems were reported and 291 staff hours spent resolving them. A list of the most notable development and maintenance work during the reporting period follows:

- Implementation of Undergraduate Admissions Recruiting data mart that includes demographic data of recruits, and contact history by contact type. Easily linked with Admissions applicant data for analysis.
- Implementation of Sponsored Research data mart and enhancement of Grant (Awards) information. Provides detail of proposals, their budget and status history. Includes an agency hierarchy for reporting and detailed proposal investigator information with percent credit. Easily linked with grant (award) data to obtain budget and expenditure information and includes grant investigator information.
- Enhancements made to Finance and Payroll data marts to include budget projection transactions and new salary encumbrance data.
- Special indicators added to demographic data for easy recognition of confidential addresses and telephone numbers, and for total confidentiality.
- New budget attributes were added to the Position Control data mart and the Finance fund code information for Budget Office reporting. The new attributes divide and subdivide fund areas for budget performance reports.
- Made numerous enhancements to the database structure to enhance query performance, and numerous performance enhancements to the ETL processes to increase the efficiency of the nightly load.

**Data Warehouse User Support.** The Data Warehouse is accessed and used by over 2890 users across the university. An estimated 200 – 250 of these users are power

users who use a variety of tools to access the warehouse. The majority of these users submit monthly status and reconciliation reports that run against the Finance data mart. Support for these users is primarily through maintenance and upgrades of the Report Job Submission and Report Distribution web applications. Additionally, there are 200 licensed users who have been trained to use the Brio query tool to report from the Warehouse. Approximately 50 of these users are considered “power users” who develop and run ad hoc queries on nearly a daily basis. During the reporting period, IWA offered the following user support:

- Provided training classes on using the various data marts. Nearly 100 people were trained during the reporting period. Training evaluations consistently noted excellent instruction, preparation, and benefit to the students.
- Provided individual assistance in query development or answers to questions pertaining to the Warehouse on more than 143 occasions. Many of these involved going to the requestor's office to work directly with them at their computers.
- IWA also developed and now maintains 15 dashboards for the areas of Undergraduate Admissions, Graduate Admissions, and Sponsored Research. They are used by the core offices, and also colleges and departments. Over the past fiscal year there were 4,034 sessions using these dashboards.

**Reports on the Web.** The Web Job Submission Utility that provides job submission from the web and delivers the reports via the web was enhanced to support SAS in addition to SQR, and Banner job submission. It was also modified to support interactive reports that run and return to the users screen. The Web Distribution Utility, which can be used separately, is used by the Registrar for most of the reports produced for departments. It is also used by Banner job submission and the new version of DR Web.

Web Job Submission Statistics

Web Job	Total Executions	Warehouse Executions	Banner Executions	Logins
FY05	80,743	80,529	214	43,480
FY04	71,262	71,259	9	41240

Web Distribution Statistics

	Web Dist	Total Reports	Web Sessions
FY05		188,553	290,808
FY04		163,372	246,834

The Web Job submission utility provides uses an easy way to run reports when they need them. They can also use it to return data. The Web Distribution utility replaced the printing, bursting, addressing, and mailing of centrally generated reports. It has saved thousands of dollars in resources over the years.





## Information Technology Acquisitions

Information Technology Acquisitions department (ITA) acquires technology goods and services for the university using best value concepts, researching alternatives, identifying sources, evaluating the most appropriate procurement methods, and negotiation for the most advantageous terms. ITA also acquires and distributes software to the university community at the best possible terms through Departmental Software Distribution and Student Software Distribution.

Highlights of the eighteen months of the reporting period include:

Managing four major RFP processes where we had had none for the proceeding several years. These RFPs resulted in:

- Two statewide contracts for Learning Management Systems available to all state and private non-profit educational institutions from K-12 through higher education as well as any other public entity in the state.
- A new Library Management System that promises to bring significantly more capabilities to the University Libraries in supporting the varied academic missions of the university, and that permitted them to implement on time and within budget.
- An imaging and workflow system that is in the process of being implemented in the Graduate School and holds promise for implementation in many other administrative units
- An e-commerce system to take on-line payments of tuition and fees and eventually replace paper billing.

ITA received a “Special Achievement in GIS” award from ESRI for the innovative contract that we negotiated and continue to manage. The contract covers all state higher education institutions in Virginia.

Staff worked closely with the Enterprise Systems Support group of AIS, completely replacing all of our purchasing, inventory and software sales systems.

Inventory and billing processes for Student Software and inventory, sales and billing processes for Departmental Software were redesigned, resulting in significantly faster billing and better records of software distributed.

New or renewed major software contracts resulted in significantly better pricing for the university. These included:

- Adobe CLP
- Adobe CLP student addendum
- Macromedia including a student addendum
- Microsoft Campus Agreement
- Zone Labs Integrity products
- EndNote site license for faculty/staff and Graduate Students

Working closely with the Enterprise Systems Support Group of AIS, ITA developed and deployed a new methodology for network-based software distribution that significantly increased the number and variety of software distributed via network connectivity and improving the security over these resources.

A new student software bundle for the School of Architecture and Design was established that will help them in standardizing on a software product set for teaching purposes

ITA is committed to providing excellent customer service to faculty, staff, students, and parents. Software Distribution is in many ways the ‘front door’ to Virginia Tech’s Information Technology organization. We serve faculty, staff, and students in a point of sale environment.

Our customer service commitment is exemplified by our student software check-in sales process. The combination of the beautiful venue of Torgersen Bridge, the positive attitudes and commitment of our staff and volunteers, and our application of technology to the sales process has resulted in our providing a unique purchasing experience to incoming students and their parents. During the first five days of the fall semester, August 18<sup>th</sup> through August 29<sup>th</sup>, 2004 we processed approximately 2400 sales. Seldom was the wait longer than 15 minutes and was accomplished without having to stand in line.

Beth Fisher, Associate Director taught an FDI course, “Using the Web for Research” twice. Vicky Moore, Linda Walters and Beth Fisher took the required classes for the Virginia Contracting Officer designation. Vicky and Linda sat for and passed the exams and now have the VCO designation.

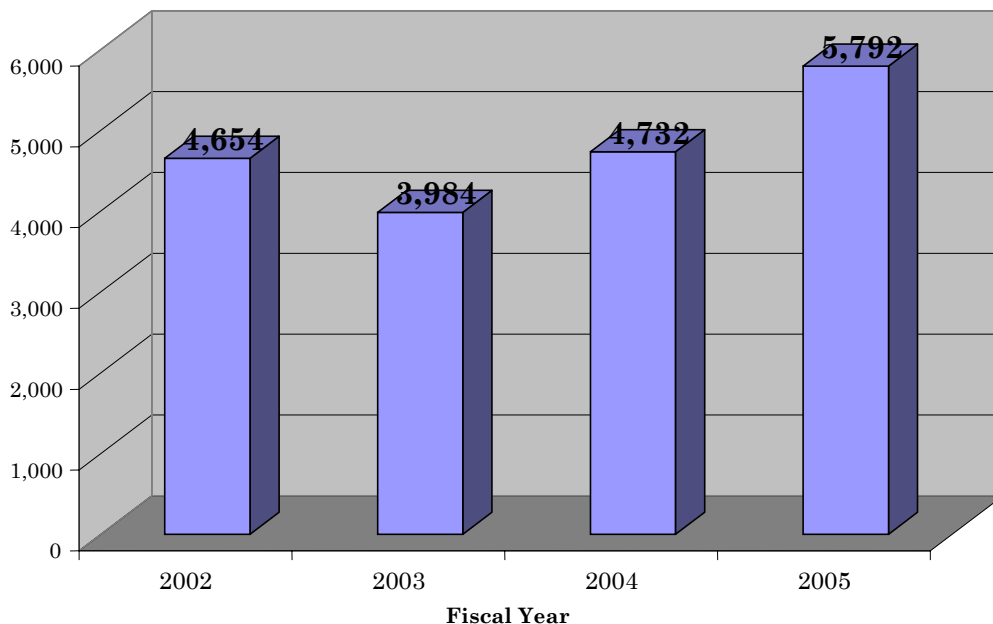
To accomplish ITA’s two-fold mission, the department is organized into three major operational entities: Computer Purchasing; Software Distribution; and Contract Management, Licensing and Billing.

## Departmental Software Distribution

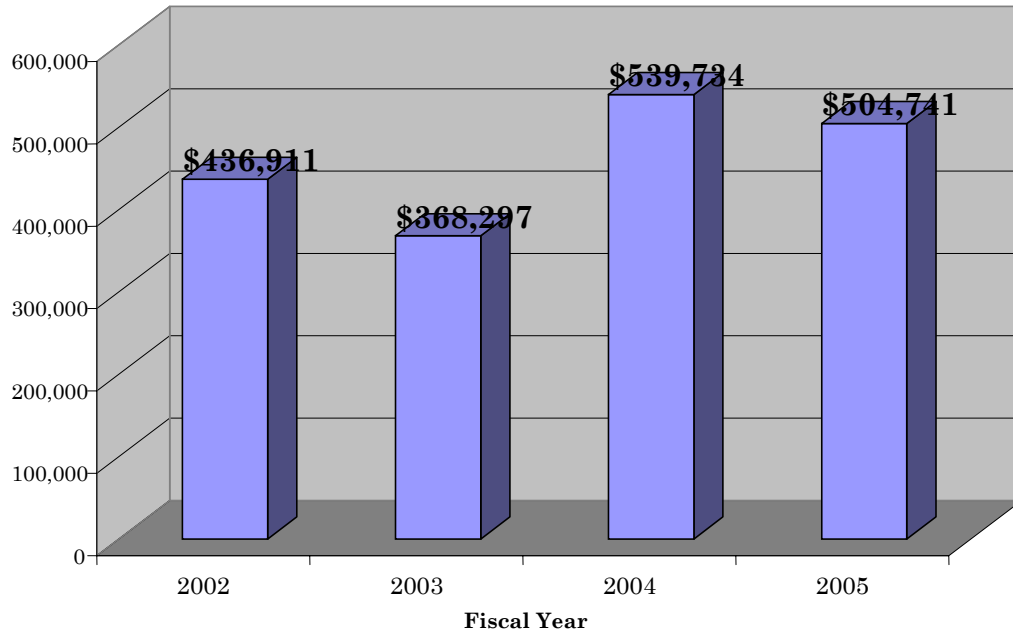
Departmental Software Distribution is a part of the Software Distribution Office and is organized on a partial cost recovery basis. Departmental Software Distribution provides software at discounted prices, and occasionally at no cost to departments, with limited support for faculty and staff of Virginia 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 is payment using an Interdepartmental Service Request (ISR).

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. FY2003 was down due to an IT security initiative to provide Microsoft Window XP and Office products at no charge to reduce the number of vulnerable systems. The sales drop in FY 2005 was due to a change in product mix and a drop in price for Adobe, Macromedia and Mathworks products. Individual products distributed include licenses and additional CD's and DVDs purchased. Distribution numbers do not include numbers related to site licenses distributed through the network software installation service. 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.

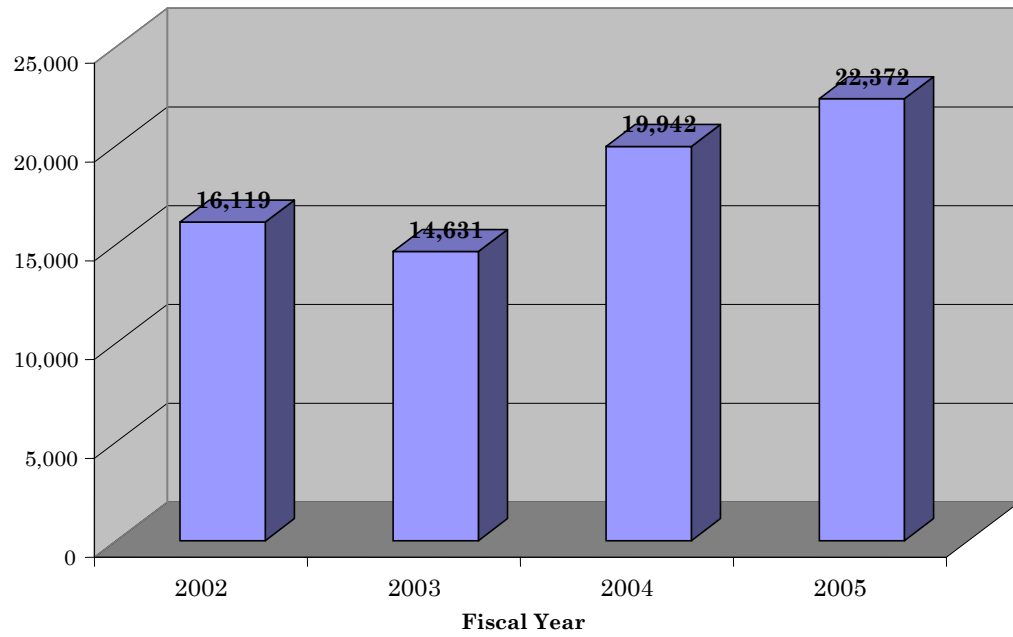
**Departmental Software  
Total Interdepartmental Service Requests Processed**



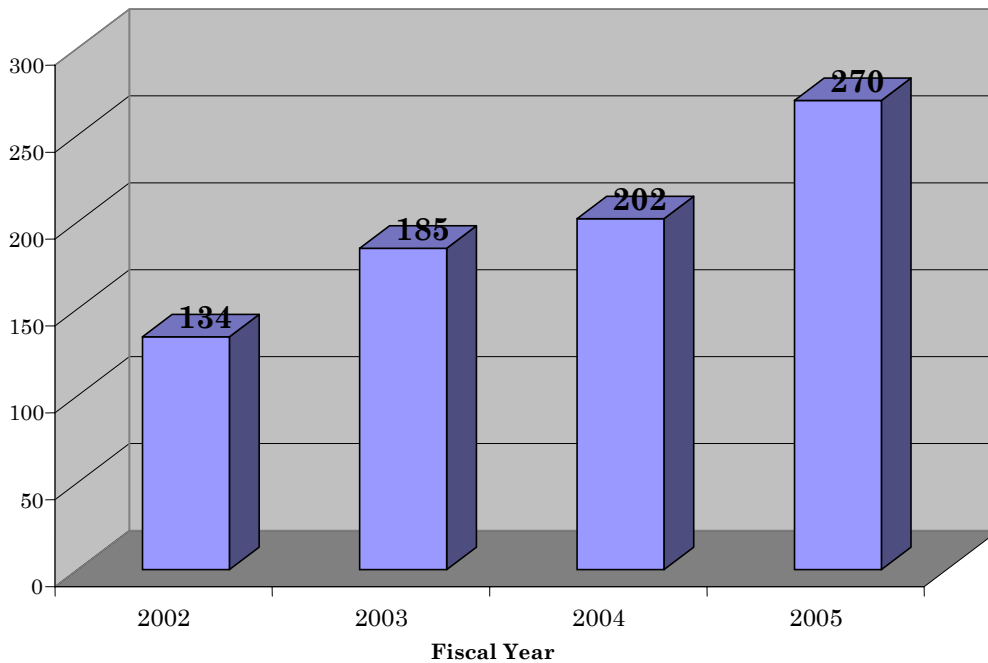
**Departmental Software  
Sales to Departments Summary**



**Departmental Software  
Individual Products Distributed**



### Departmental Software New Products Introduced



### Student Software Distribution

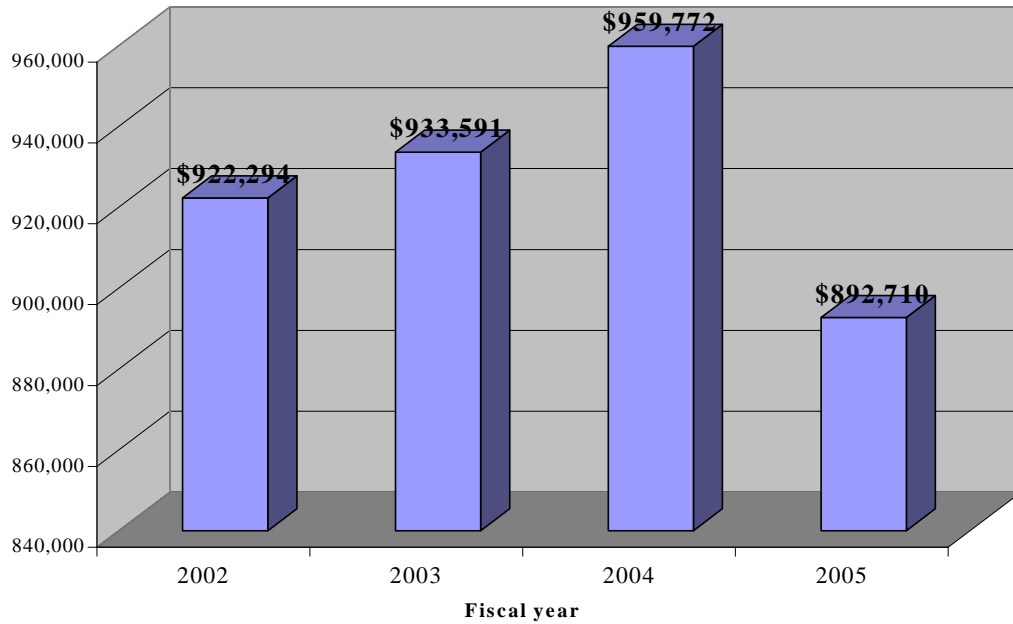
Student Software Distribution is a part of the Software Distribution Office and is organized as an auxiliary. Student Software Distribution was primarily organized to provide software for the Engineering Freshman Software Bundle. It also distributes software to other students, primarily Microsoft Office. 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 added three new major software publishers to the product mix. Macromedia and Adobe products were added as a student option addendum to our university contracts. Adobe Creative Suites was requested by the School of Architecture + Design as part of their new Freshman Software Bundle. The third publisher added is ESRI who are providing free student copies of their ArcGIS/View software. Working closely with the Enterprise Systems Support Group of AIS, ITA developed and deployed a new methodology for network based software distribution primarily for student software that significantly increased the number and variety of software we distribute via network connectivity while improving the security over these resources. See <http://network.software.vt.edu>.

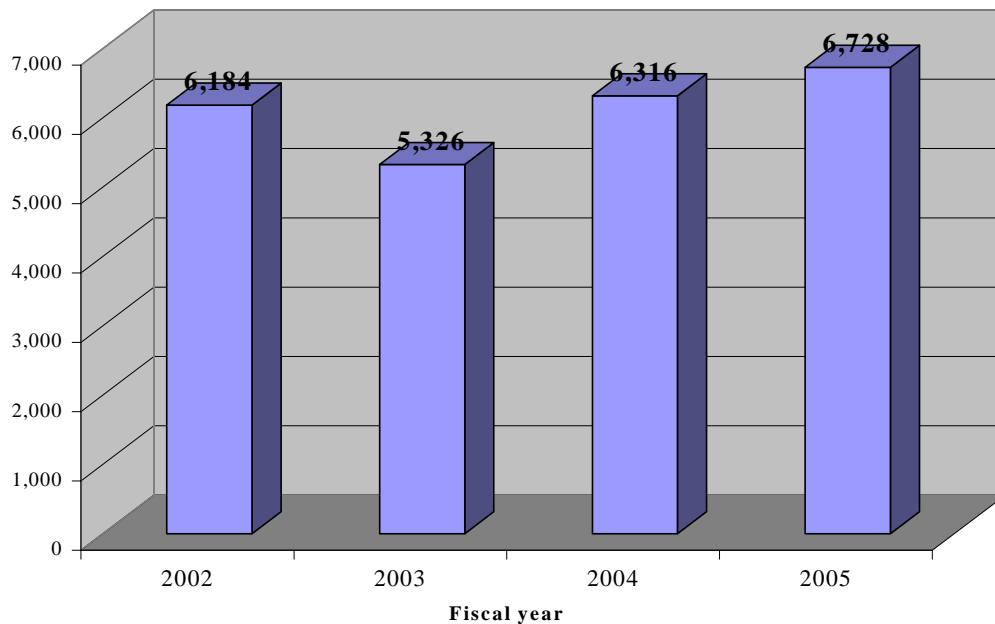
The two graphs below show total sales by fiscal year and total products distributed through those sales. The sales drop in 2005 was due primarily to the decrease in price of the Engineering Freshman Software Bundle. Since fiscal year 2002, the price

of the bundle has dropped from close to \$500 to \$403 in fiscal year 2005. This was accomplished through better pricing obtained on the components of the bundle. Total units distributed has continued to rise the last two years primarily due to an increase in unit sales of the Freshman Engineering Bundle, with the addition of Computer Science to the College of Engineering, an increase in sales of Microsoft Office and an increase in the number of free upgrade trade-ins processed.

**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 VASCUPP contracts for ESRI software (GIS software), Blackboard and Angel (Learning Management Systems). They handle billing for both Student Software and Departmental Software. This section also manages the most of the technical aspects related to software distribution with regards to:

- Developing new distribution CD's (e.g., reducing the SAS distribution from 23 CD's 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)

During fiscal year 2005, this section completely revised ITA's billing and reconciliation procedures that has resulted in quicker and more accurate billing of departments and students.

### Computer Purchasing

As the following graphs show, the Computer Purchasing office issued 1336 and 1342 purchase orders and processed \$20.8 million and \$18.0 million in FY2004 and FY

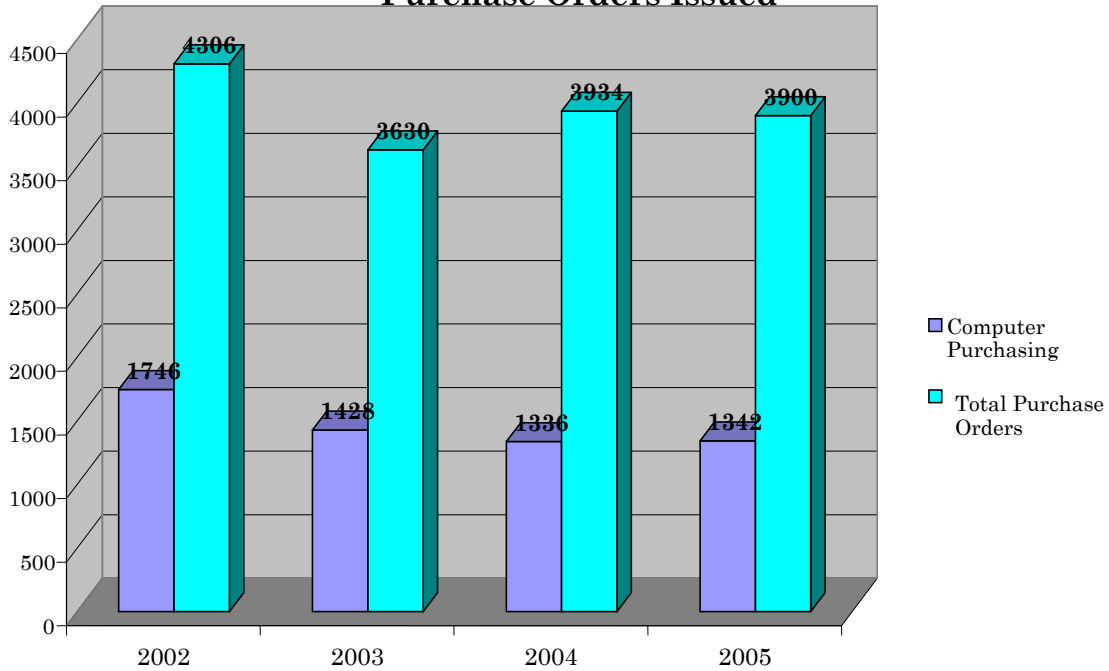
2005 respectively. This accounted for 35% and 35% of the total number of purchase orders issued by the University and 35% and 26% of the total value of those orders during FY2004 and FY2005. These numbers were down from 1746 purchase orders and \$22.5 million in FY2002. These reductions are the result of the continued drop in prices for desktops and laptops, (departments have authority up to \$2,000) and the reduced percentage of Equipment Trust Funds being spent on computing equipment.

Fifty-one requests for bids were issued in FY2004 to 1406 vendors giving an average bid participation of 28 vendors per bid. Of the bids issued in FY2004, 78% were delivered through the ITA-developed *Bids on the Web* or *BOW* application. ITA's automated bid faxing system account for 21% and the remaining 0.3% were printed and mailed. In addition, all bids were posted on the state's central bid website. Forty-five requests for bids were issued in FY2005 to 894 vendors giving an average bid participation of 20 vendors per bid. Of the bids issued in FY2005, 63% were delivered through the ITA-developed *Bids on the Web* or *BOW* application. The remaining 37% were faxed using ITA's automated bid faxing system. In addition, all bids were posted on the state's central bid website. ITA's web-based *ReqStat* utility, which provides online computer purchasing information, was heavily used by the university community during the year. Major system changes were made during FY2004 to incorporate Computer Purchasing's orders into orders placed through the Commonwealth's eVa system. It may help the state consolidate purchasing information but has extended one day the average processing time for Computer Purchasing's purchase orders. In addition, the requirement to try to force non-registered vendors into the state's system has added significant overhead to the purchasing process.

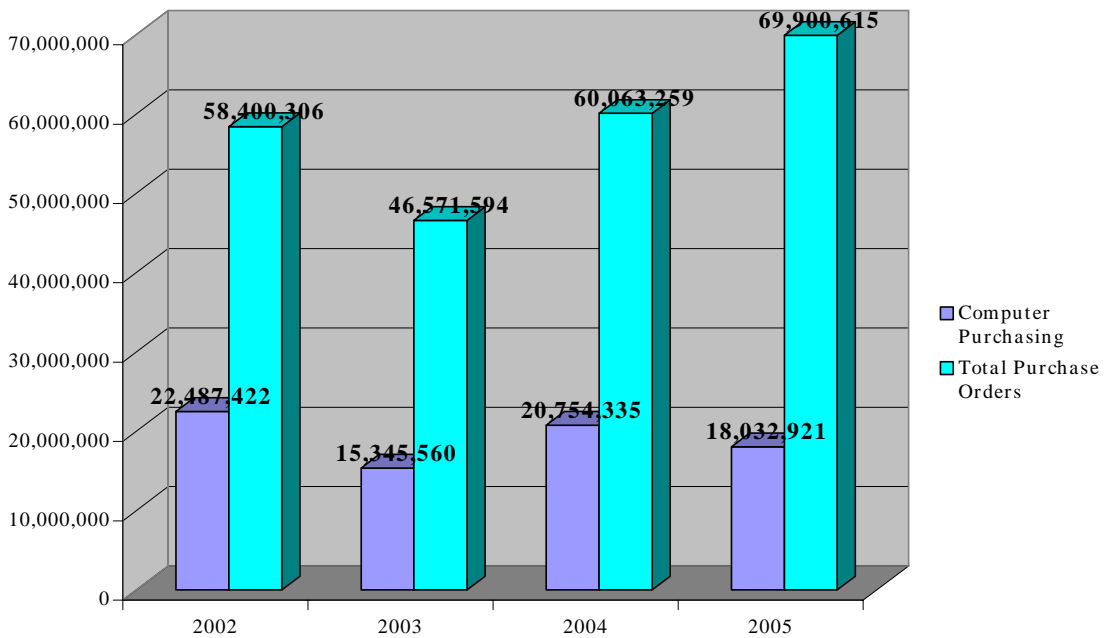
During fiscal year 2004 and 2005, two buyers from the Computer Purchasing Office took the required classes for the Virginia Contracting Officer (VCO) designation. They took the exam during fiscal year 2005 and passed. Both now have the VCO designation.



### Computer Purchasing Purchase Orders Issued



### Computer Purchasing Total Purchase Order \$ Value



During the last 18 months, ITA has also processed four major RFP procurements. RFP# 646441 was a procurement process for Learning Management Systems that was

managed by ITA but was a cooperative procurement initiated by the Electronic Campus of Virginia. This RFP resulted in contracts to Blackboard and Angel that are available to all state and private non-profit educational institutions from K-12 through higher education as well as any other public entity in the state. RFP#646386 was a procurement for a new Library Management System for Virginia Tech. This procurement resulted in a contract with Innovative Interfaces Inc. and is available as a VASCUPP additional user contract. 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 available as a VASCUPP additional user contract. RFP#646436 was for an e-commerce solution for the university Bursar's Office. This RFP was cancelled and the university purchased an e-commerce solution as an additional user from James Madison University's VASCUPP contract with Ininet.

## Institute for Advanced Learning and Research

The work of Information Technology includes the university-led economic revitalization of a six-county, two-city footprint in Southside Virginia under the umbrella of the Institute for Advanced Learning and Research (IALR) in Danville. The IALR was constituted as a sub-division of state government in 2002 and has a 15-member appointed Board of Directors who are drawn from the geographic region the IALR serves. The IALR serves Southside Virginia as a regional research, technology, and education center, with the development and management of the organization's mission led by Virginia Tech. The programmatic focus is on advanced learning, outreach, and advanced networking and technology. The Information Technology activities include marketing and community relations, and assessment and institutional research, as well as information technology operations.

The mission of the Institute for Advanced Learning and Research (IALR) is to develop and attract technology and talent critical to Southside Virginia's economic transformation through advanced learning, strategic research, outreach programs, advanced networking and technology, and commercial opportunity development. The IALR leverages the resources of Virginia Tech in partnership with Danville Community College and Averett University and public and private bodies and organizations of the region as a means to that end.

The IALR has four primary purposes:

1. To cultivate an innovation economy environment through research, commercialization, and related services.
2. To create opportunities through education—both formal and informal—for the development of human capital.
3. To facilitate the utilization of leading edge infrastructure by serving as a regional accelerator for technology adoption.
4. To have a tangible impact on Southside's transformation by increasing the research and development funds flowing into the region; by increasing the number of baccalaureate-educated people who live, work, and visit the region; and by increasing the broadband penetration among organizations and households in the region.

## *Overview*

The January 2004 through June 2005 period has been incredibly busy and full of many significant accomplishments. This period literally saw the birth of a new institution in Southside Virginia, an institution intricately linked to Virginia Tech, yet not Virginia Tech, and not quite like anything else. So, the maps for this university-community engagement have had to be charted as the journey has unfolded. Of course, the progress to date has only been possible with the support of many, which has meant the need to rally people around a vision and line up enough financial resources to deliver results.

We have, since January 2004, opened a beautiful new high-tech building, which has subsequently won an international award for its creative and effective integration of technology into the facility's design. The many disparate technologies in the building have been effectively used in over 400 different kinds of events. We have developed partnering relationships with numerous vendors that extend the opportunity to educate organizations throughout Southside about leading edge technologies that can be leveraged locally to create competitive advantage. The IALR has increasingly assumed a leadership role in the region for providing a focus on information technology issues and opportunities.

An essential element of regional economic transformation is the development and attraction of human capital. To this end, activities during the reporting period have focused on the continued ramp-up of outreach programs and the development of a development and delivery strategy for academic offerings. More than \$2 million in sponsored funds have been awarded and directed to outreach programs, impacting hundreds of teachers, children, business people, non-profit staff, and citizens of Southside. The primary focus of these outreach programs has been to create the community conditions in which an innovation economy can thrive, particularly building competencies in math, science, and technology. In the academic arena, work during the past year has focused on developing a plan to offer degree programs that are targeted at re-creating the primary economy workforce (in disciplines that map to the IALR's research thrusts), and meeting latent needs in the secondary economy workforce (healthcare, education, government, social services, etc.).

One of the greatest challenges the IALR has faced has been the need to communicate effectively with an exponentially growing number of stakeholders and public constituencies. During the reporting period, the IALR was the subject of over 200 articles in the local media and received several mentions by publications outside the region. Dozens of presentations to state, federal, and local groups were given; hundreds of people were provided tours, and thousands received hard copy and electronic information about IALR programs and activities. A new web site was launched, glossy print materials were developed, a bi-monthly newsletter was created, three videos were produced, and numerous program-specific brochures were designed. Of particular significance was the development of a communications plan for adoption in the upcoming fiscal year.

Funding commitments for the IALR and its programs exceeded \$58 million by the end of the reporting period. Staffing doubled from roughly 25 to 50 between January 2004

and June 2005. Tremendously talented, educated, accomplished, and diverse people have joined the IALR staff, providing the region with a nexus of intellectual capital to anchor a new, innovation-based economy. The IALR has been fortunate to garner several honors, including the Southern Growth Policies Board Innovator's Award, winner of an Archi-Tech Audio-Visual Award, and finalist in the Small Business Administration/Kauffman Foundation Best Practices in Entrepreneurship and Economic Development competition.

The Institute for Advanced Learning and Research has a strategic plan that guides its activities. The strategic plan is updated annually to reflect needs to adjust to a dynamic environment. It consists of six program goals and six operational goals that represent the long-range vision for the IALR to impact Southside Virginia. Each year, IALR staff members prepare a Plan of Work, which consists of the activities of focus for the fiscal year that will move the IALR toward its long-range goals.

The period included in this Virginia Tech Information Technology Annual Report encompasses many of the activities that were planned during the 2003-04 and 2004-05 fiscal years. Below is a summary of the achievements associated with the roughly half of the IALR which is under the operating leadership of Virginia Tech's Southside Regional Director of Information Technology. In each section, the goal from the IALR Strategic Plan associated with the program or operations area is stated. This goal statement is followed by the accomplishments associated with the 2003/4 and 2004/5 Plans of Work.

## **Advanced Learning**

Goal: Position the region to develop a workforce for the future by promoting the development of seamless pathways between associate's, bachelor's and graduate programs associated with strategic research investments and by enhancing access to advanced learning opportunities.

### 2004-05 Accomplishments:

(Items A-G below relate accomplishments to objectives set forth in the 2004-05 IALR Plan of Work. Items H-N relate to accomplishments beyond the objectives set forth last year.)

- A. Work with the IALR academic partners to develop a core academic program plan, focused on building a new economy workforce, with estimated timetables for program availability and announcement of specific '05-'06 academic year offerings.

With academic partner involvement and Academic Council approval, have developed a list of Strategic Academic Programs to target for availability in Southside. These programs align with the research centers and information technology priorities of the IALR. They are targeted to serve resident graduate students associated with the research centers as well as to attract and develop a workforce for the future centered in these fields. A slate of fall '05 programs has been developed and will be announced prior to the end of the fiscal year.

- B. Work with the IALR academic partners and third party providers as needed to plan market-driven programs to serve current Southside employer needs.

Have compiled and shared with Academic Council a list of Market-Driven programs, consisting of requests received from the community for higher education programs. Some are slated for delivery beginning fall '05; others are being sized and negotiated with educational providers.

- C. Establish the foundation to create expanded access to higher education in the region, drawing upon established higher education center models.

Three significant activities were accomplished this year that contributed to developing a model for expanding access to higher education in the region. The IALR, in partnership with SCALE-UP and Danville Community College, hosted a Super Saturday event to educate high school students and parents about financial aid and college admission processes. Secondly, a fee structure has been developed for academic uses of the building. Thirdly, arrangements have been made to begin offering a wide range of Virginia Tech courses and programs in Southside through VTOnline.

- D. Promote public awareness of Institute for Advanced Learning and Research programs via open houses, advertisements, literature, website information, etc.

The IALR hosted an open house in late fall and plans to initiate a “virtual open house” in conjunction with the announcement of Fall '05 programs and courses. Information has been written for the IALR website as well as for numerous hard copy publications about the academic program plans. Electronic distribution lists have been utilized to notify interested publics about particular academic program offerings. A marketing campaign is being developed for fall, to include general public awareness as well as targeted markets on a program basis.

- E. Create and implement a student services function at the Institute for Advanced Learning and Research that interfaces with the partner institutions on admission, registration, financial aid, advising, library services, and bookstore services.

Plans are to hire a student services coordinator this summer who will take the lead in developing the student services function. This coordinator will be housed in the CyberLibrary, to be readily accessible to the public as well as to the primary academic spaces in the building.

- F. Develop an academic space utilization policy and plan which includes a financial modeling component.

An academic space utilization policy was developed and approved by Academic Council and by the IALR Board in February 2005. Subsequently, an academic space fee structure was developed and approved by the Academic Council and by the IALR Board in May 2005.

- G. Facilitate the development of dual admission processes and program matriculation requirements with associated tracking systems for AS/BS and BS/MA combinations across institutions.

The timing for this activity did not lend itself to addressing this year. Academic partnerships between institutions have not developed to the stage where dual admission processes and program matriculation requirement tracking are ready to be discussed.

- H. Defined staffing needs for the Advanced Learning area. One staff member is on board; two remain to be hired.
- I. Worked with Virginia Tech faculty and administrators to define a process for serving the academic needs of resident graduate students in Southside.
- J. Worked with Virginia Tech Institute for Distance and Distributed Learning to develop a memorandum of understanding to frame the responsibilities and expectations of VT and IALR with respect to videoconference-delivered courses.
- K. Awarded a federal earmark through the Department of Labor to develop, with Danville Community College, a Fast-Track Information Technology Associate Degree Program.
- L. Submitted a \$1.5M federal request for FY06 to fund the creation of a Center for Graduate Science and Engineering Distributed Program Development at the IALR.
- M. Evolved Academic Council to include IALR Board representation and to play a more active role in program development.

## Outreach

Goal: Seek sponsored funding and engage research university resources to develop programs that will assist in creating conditions—community-related, economic, educational, technology-related, and social—in which an innovative, high tech, network-based economy can prosper in Southside.

### 2004-05 Accomplishments:

#### Plan of Work Activities Completed

<i>Work Plan Item</i>	<i>Status (4/30/05)</i>	<i>Statistics</i>
Conclude FY01 Department of Education Future of the Piedmont grant implementation (K-12 faculty development, VT STARS	<ul style="list-style-type: none"> <li>• Program activities completed.</li> <li>• Evaluation underway (due late spring)</li> <li>• Dissemination efforts, including publication, video,</li> </ul>	Faculty development: <ul style="list-style-type: none"> <li>• DPS: 178 teachers trained</li> <li>• PCS: approximately 150 teachers &amp; administrators trained</li> <li>• 42% report that more than</li> </ul>

<p>contribution, Adult Computer Literacy Program, Computer Refurbishing Program contribution, Institute for Advanced Learning and Research technology purchases)</p>	<p>and public recognition event, due June 2005</p>	<p>60% of their students now use technology in learning process</p> <p>Computer Refurbishing Program:</p> <ul style="list-style-type: none"> <li>• 16 clients trained</li> <li>• 150+ computers refurbished and sold</li> </ul> <p>Adult Computer Literacy Program:</p> <ul style="list-style-type: none"> <li>• 44 adults served through Church-Based Tutorial partnership</li> </ul>
<p>Implement FY03 Department of Education Institute for Advanced Learning and Research grant (technology for IALR building, Learning Liftoff math literacy program, The Cutting Edge science and math K-18 faculty development program)</p>	<p>Learning Liftoff:</p> <ul style="list-style-type: none"> <li>• More than 400 participants registered</li> <li>• growing strong interest in program from parents, adult education programs, etc.</li> </ul> <p>Cutting Edge:</p> <ul style="list-style-type: none"> <li>• three programs delivered (bioinformatics, biotechnology, robotics).</li> <li>• 4<sup>th</sup> program (nanotechnology) rescheduled for fall 2005 because of competing demands on teachers (SOLs, APs, etc.)</li> </ul>	<p>Learning Liftoff</p> <ul style="list-style-type: none"> <li>• 39 “groups” (schools, church groups, etc.) registered</li> <li>• 463 participants registered, with approximately 250 active users</li> <li>• 20% adult learners, 80% K-12</li> </ul> <p>Cutting Edge</p> <ul style="list-style-type: none"> <li>• 90 educators attending 3 sessions</li> <li>• Approx. 80% indicate the session met or exceeded their expectations</li> <li>• More than 70% interested in learning more about topics</li> </ul>
<p>Implement FY03 Department of Labor Institute for Advanced Learning and Research grant (technology for</p>	<p>Program completed:</p> <ul style="list-style-type: none"> <li>• 25 small businesses recruited in partnership with</li> </ul>	<p>E-Commerce for Small Business:</p> <ul style="list-style-type: none"> <li>• 69% of participants report a good understanding of e-commerce concepts after</li> </ul>



<p>multimedia development lab and computer classroom, eCommerce for Small Business program)</p>	<p>Chamber of Commerce.</p> <ul style="list-style-type: none"> <li>• Participants offered seven full-day training modules with additional technical assistance from Virginia Tech graduate students.</li> <li>• Internal evaluation and confidential phone interviews completed.</li> <li>• Evaluation results now under study for potential “round two.”</li> </ul>	<p>program</p> <ul style="list-style-type: none"> <li>• 58% report understanding what e-commerce means for their specific business</li> <li>• 85% have revised their business plan to incorporate e-commerce or plan to do so within six months</li> <li>• 75% have bought new hardware since the program or plan to do so within six months</li> <li>• 92% have revised their website themselves since the program or plan to do so within the next six months</li> </ul>
<p>Advocate FY05 Federal Requests for Summer Academies continuation and Fast-Track IT Workforce Prep Program</p>	<p>Fast Track IT Workforce Prep Program funded (\$100,000).</p>	<p>n/a</p>
<p>Partner with Virginia Tech, on submitting a proposal to develop web-based, modular education units to disseminate research opportunities associated with IALR research centers</p>	<p>Not pursued, given competing demands.</p>	<p>n/a</p>
<p>Partner with SCALE-UP to plan, fund and implement activities that actively involve local community with IALR (additionally, secure funding for administrative support for SCALE-UP to advance this objective).</p>	<ul style="list-style-type: none"> <li>• SCALE-UP planning retreat held October 2004.</li> <li>• Incorporation completed December 2004.</li> <li>• New board elected April 2005.</li> <li>• 501c3 paperwork to be submitted May 2005, which will enable funding efforts for administrative support.</li> <li>• Marketing materials (brochure, new logo)</li> </ul>	<p>Super Saturday:</p> <ul style="list-style-type: none"> <li>• Largest turnout in the state (10 are held statewide), with approximately 150 attendees, despite inclement weather.</li> <li>• 88% of attendees rated the program good or excellent.</li> </ul>

	<p>developed.</p> <ul style="list-style-type: none"> <li>• Three public events increased SCALE-UP's community visibility: <ul style="list-style-type: none"> <li>○ co-sponsorship of Super Saturday,</li> <li>○ keynote presentations at the Pittsylvania County branch of the NAACP</li> <li>○ presence at Danville "Festival in the Park."</li> </ul> </li> </ul>	
Work with VT-STARS, helping to coordinate local activities for new cohort of participants	After extensive discussions with VT-STARS staff, agreement to remain supportive of program but not devote staff resources to assistance with new cohort.	n/a
Explore adoption of Project Discovery; implement if appropriate.	Presence of Danville City Council member on IALR board created a conflict-of-interest situation that disqualified our participation with the CDBG-funded project. SCALE-UP has expressed interest in adopting project at later date and has structured board membership to accommodate such an initiative.	n/a

Plan of Work Activities in Progress

<i>Workplan Item</i>	<i>Status (4/30/05)</i>
Develop proposal and begin implementing FY04 Department of Education Institute for Advanced Learning and Research grant (science, math, and technology K-18 Faculty	<p>Southside Summer Adventure:</p> <ul style="list-style-type: none"> <li>• 20 camps for students grades 3-12 scheduled in 7 locations. Total of 480 participants expected.</li> </ul>

<p>Development Summer Academy; science, math, and technology summer camps for K-12 children)</p>	<ul style="list-style-type: none"> <li>• 23 outstanding local college students recruited as interns.</li> <li>• Very strong interest from parents.</li> </ul> <p>Summer Educator’s Development Institute:</p> <ul style="list-style-type: none"> <li>• Final scheduling underway, pending final agreement with Danville Public Schools re: collaborative training effort.</li> <li>• Tentative plan for 21 days of training for approx. 450 educators on full range of science, math, technology topics.</li> </ul>
<p>Submit competitive proposal to continue and expand the Institute for Advanced Learning and Research partnership with the Church-based Tutorial Program - to provide technology and math literacy learning opportunities via a wireless network connecting churches to the Institute for Advanced Learning and Research</p>	<ul style="list-style-type: none"> <li>• Pilot phase funding secured from Verizon Foundation, Gamewood Inc. and Outreach department reallocation.</li> <li>• RFP issued to Church-Based Tutorial Program sites; six sites selected.</li> <li>• Installation and training currently underway (installation May 2005, training complete June 2005).</li> </ul>
<p>Develop and implement community planning process around technology opportunities, to culminate in submission of a competitive proposal to appropriate funding source(s)</p>	<ul style="list-style-type: none"> <li>• Two communities selected for planning process (Gretna, North Main).</li> <li>• Seed funding secured from Virginia Center for Innovative Technology for needs assessment/ community planning sessions, to be held late May/early June 2005.</li> <li>• Actively seeking implementation funding for pilot sites, in partnership with CIT.</li> </ul>

Activities and Accomplishments Outside of the Plan of Work

- Developed Informal Science Education program in partnership with Danville Science Center, Church-Based Tutorial Program, and nationally recognized researcher. Submitted proposal (\$2.5 million over 3 years) to NSF. Awaiting decision.
- Launched “Summer Learning Expo” highlighting opportunities for all ages throughout region. Developed companion catalog.
- Founding Partner in “Community Capacity Coalition” to strengthen local nonprofit organizations. Sponsored two-day workshop attended by 34 organizations. The coalition is currently making plans for ongoing programs.
- Began development of telemedicine project to link local physician office with e-Dan. Currently seeking funding.

- Implemented partnership with Southern Piedmont Technology Council, providing administrative support for council's programs.
- Partnering with Danville Public Schools and Pittsylvania County Schools to present joint Career Day for career and technical education students.

#### Awards/Accolades/Designations

- Accepted into membership of New Media Consortium
- Employer of the Year from Danville Area Disability Employers' Network
- Selected for presentations at Virginia Tech University Partnership conference (July 2005) and National Outreach Scholarship Conference (October 2005)

#### Comments from program participants

“(Now) I am not afraid to use technology in the classroom. I am willing to accept new ideas from students. Students are beginning to feel as though they are a part of their learning and are not just doing what the teachers expect.” (teacher in faculty development project)

“She (the instructor) was a great motivator. I loved the hands-on applications. I am entering a new field after teaching for 30 years and now, after this workshop, I feel more comfortable in the business world.” (student in community workshop)

“The interns were knowledgeable and eager to assist. I especially liked the fact that they approached the meetings without a ‘salesperson’ mentality and sought to objectively identify the pros and cons and feasibility of ecommerce for our specific application.” (E-commerce program participant)

“There is so much to be done to impact our communities, and there are numerous resources to do a great job. This experience was an inspiration to me in continuing my mission and encouraging others to do likewise.” (participant at nonprofit planning workshop)

“(Super Saturday) was a great program. The information presented was invaluable.” (parent)

#### *Conference and Training Program Development*

#### **DARPA SBIR Programs (January 13-14, April 27-28)**

Under a grant from the Department of Defense administered by Virginia's Center for Innovative Technology, conducted outreach program in Southside on the Small Business Innovation Research grant program. Hosted four events, including a seminar for economic development professionals on the SBIR program, two day-long seminars for technology entrepreneurs, and an outreach reception for technology entrepreneurs. Total attendance: 130

### **Southern Growth Policies Board Community & Leadership Forums (January 7)**

Hosted a set of focus groups with members of the community and members of the local leadership in conjunction with the Southern Growth Policies Board. Results to be included in the 2005 Report on the Rural South, to be released at SGPB's annual conference in Point Clear, Alabama in June.

### **Open-House (March 11)**

Hosted an open house on the Institute, its research and outreach programs and economic development objectives for 100 individuals in March.

### **LEAD Virginia (May 19-21)**

Helped plan curriculum for this Virginia Chamber of Commerce program for the Southside leg of the program in May. Forty-five business leaders from around the state converge for three days to learn about this part of the state and the special challenges we face in our economic development efforts.

### **Tobacco Buyout program (May 28)**

Planning to host a day-long seminar for 300 tobacco growers and quota holders on how to get the most out of the tobacco quota buyout. In conjunction with the Virginia & North Carolina Cooperative Extensions and corporate sponsors.

### **Advanced Networking and Technology**

Goal: Provide regional leadership in implementing, showcasing, and educating the community about advanced networking and leading edge information technologies.

#### 2004-05 Accomplishments:

(Items A-J below relate accomplishments to objectives set forth in the 2004-05 IALR Plan of Work. Item K relates to accomplishments beyond the objectives set forth last year.)

- A. In partnership with the Future of the Piedmont, develop wireless hotspots in the downtowns of Danville, Chatham, and Gretna.

Wireless hotspots were developed for these three downtowns and publicly announced November 2004.

- B. Host a technology symposium at the IALR focused on impacting rural regions with information technology, particularly highlighting the technologies in the IALR and advanced network infrastructure in the region.

Hosted **Impacting Rural Communities Through New Age Technologies** conference on technology and rural prosperity for 170 registrants April 18-19.

Topics ranged from broadband connectivity issues to education and workforce development. Potential to become an annual conference.

- C. Launch a “Technology Tuesdays” program targeted at bringing together technically minded information technology professionals in the region, particularly from the schools and governments.

The Technology Tuesdays program was launched in spring 2005 and included an IBM Education Briefing and a Protecting Network Security program by DSI, Cisco, and CryptoCard.

- D. Initiate a series of multimedia workshops in the Multimedia Development Center at the IALR for the community at large, but particularly targeting local teachers.
- E. Offer a set of office productivity software training classes for the community at large.

34 community computer workshops, two hours in duration, were offered through the IALR on topics ranging from MS Office Suite product introductions to Navigating the Web to Using Digital Cameras and Scanners to Selling on eBay. Over 400 registrations were served; many workshops had waiting lists.

- F. Work with the Institute Conference Center to identify and contract for information technology certification programs to offer at the IALR.

Contracted with Pearson VUE to establish the IALR as a testing center for numerous information technology certifications.

- G. Partner with the Growing Digital Network Program and the Information Technology Institute at Danville Community College to integrate their capabilities into appropriate needs and opportunities at the IALR.

GDN and the DCC IT Institute worked with us to webcast and archive several programs ranging from outreach to announcements to special events. They also collaborated with us to offer workshops as part of the community computer workshop series, including Setting Up a Home Wireless Network.

- H. Work with communities and organizations interested in linking to the eDan infrastructure.

Interest was very moderate, but did include City of Danville and Danville City Schools, Pittsylvania County and Pittsylvania County Schools, Mecklenburg Communications, a Chatham medical establishment, and Ross Laboratories.

- I. House and manage the administrative responsibility for the Southern Piedmont Technology Council.

The IALR entered into a memorandum of understanding in July 2004 to hire, house, and supervise a part-time SPTC staff person.

- J. In conjunction with the Southern Piedmont Technology Council, work with the region to provide educational forums, information sharing opportunities, IT consultation, etc. to support the development of eDan, nDanville, the Regional Backbone Initiative, and other related infrastructure projects.

The major SPTC activities of the year included hosting the annual awards banquet and restructuring the SPTC board. Numerous SPTC/IALR program activities are planned for 05-06.

- K. An Educators' Recognition Event was hosted May 2005 to highlight the accomplishments of local schools in integrating technology into teaching and learning. The event served as a culmination to the Virginia Tech led K-12 faculty development program that was sponsored by the U.S. Department of Education. A video showcasing the use of technology in local schools was produced and premiered at the event.

#### Awards/Accolades/Designations

The IALR received the Chairman's Award from the Southern Piedmont Technology Council, in recognition of its visionary leadership to promote technology in Southside Virginia.

#### **Information Technology Operations**

Goal: Develop and maintain a leading-edge information technology operation that relies on best practices to support its constituents, evolve the infrastructure, develop IT staff capabilities, and be a high-tech symbol for the region.

- Hire staff
- Secure funding for planned information technology
- Procure and install planned information technology
- Develop information technology policies
- Launch information technology operations
- Define research informatics platform

#### 2004-05 Accomplishments:

- A. Develop and implement IT policies regarding acceptable use of IALR equipment and networks.

An acceptable use policy was developed and adopted by the IALR Board in 2004.

- B. Thoroughly document networks, infrastructure, addressing, and equipment inventory.

Documentation of networks, infrastructure, and cabling for the new IALR facility was accomplished. In addition, an asset management system was implemented and all equipment was tagged and entered into the system.

- C. Thoroughly document and develop a system for maintaining licenses and contracts.

A system for documenting and maintaining software licenses has been developed.

- D. Thoroughly document current network setup and settings.

This documentation has been completed and is being maintained.

- E. Develop and implement a disaster recovery plan.

A disaster recovery plan has been developed.

- F. Implement and develop offsite back-up procedures and policy.

Extensive conversations with the City of Danville have resulted in the connection of the IALR to the City's nDanville network. The City and the IALR are entering into a collaborative agreement with EMC to host each other's data in a hot back-up mode.

- G. Develop and implement a help-desk system with easy accessible software and tutorials.

Several tutorials have been developed and placed on the IALR internal network. Work is underway to establish a more formal help-desk function.

- H. Continue to work with staff on current network infrastructure and office productivity and continue to conduct staff development as needed and also as newer technologies are installed.

Continuous development of the IALR's network and office technologies has occurred as more and more staff members have joined the organization. Several staff development sessions have occurred, with more planned in the upcoming year.

- I. Develop a fee structure around specific technology not common to the region. (i.e., Conference Bridge)

Research is occurring on this topic. No fee schedule has yet been established.

- J. Develop fee structure with and without IT support for Institute Conference Center activities.

At this stage, the ICC has chosen to bundle its pricing, so there is no separate, incremental pricing for IT services associated with ICC events.

- K. Install Virtual Private Networking capabilities.

Virtual Private Networking has been installed and is in use by staff members.



- L. Begin planning for expansion of network capabilities.

The network has already been extended to link the IALR to nDanville. Plans are underway to link the IALR via fiber optic cable to the IALR Research Addition, due to be completed in 2006. Other discussions have occurred regarding linking to the Regional Backbone, to the National Lambda Rail, and to MATP.

- M. Begin planning for technology refresh.

A schedule has been developed with associated pricing for input to the equipment replacement funding process.

- N. Begin to plan for research technology operations.

Several conversations have occurred with the IALR research leaders and faculty to begin planning for technology infrastructure for their operations. Since the labs did not become fully operational until late into the 04-05 fiscal year and most faculty members did not arrive until August 05, it is anticipated that much of this initial activity will occur in the upcoming fiscal year.

- O. Continue to keep IT staff trained on the latest technologies on a regular basis.

IT staff have attended numerous training sessions, workshops, and conferences in order to stay current with the latest technologies.

- P. Conduct Board Seminars on the Technology Assets of the building.

A seminar on IALR technologies and programs was planned for (and subsequently conducted) at the August 2005 IALR Board meeting.

- Q. Begin to plan for Cell Tower hosting project.

The economics of this project did not support proceeding with it at this time.

- R. Implement wireless networks.

A wireless network was planned and installed throughout the IALR facility.

- S. Implement Unified Communications.

The Unified Communications System (integrating email and voicemail) was implemented and training for staff was conducted.

- T. Begin to plan for IT consulting for Community Service Boards.

The Community Service Boards did not indicate an interest in pursuing this.

U. Design of Research technology/Grid Computing/Virtual Labs

This work is still ahead of us.

- V. In the spring of 2004, the IT staff was responsible for bringing up the major elements of the entire IT infrastructure of the new facility, including audio-visual and videoconferencing systems, computers and desktop devices, a voice over IP system, and data network.
- W. Other IT systems installed during the reporting period include: A call accounting system, an ialr.org web server, Plato Learning System, Fundware accounting system, CC Breeze scheduling system, VUE Testing Center, IRCNAT web site, and help desk web site.
- X. Other network support addressed during the reporting period included: Websense installation, Plate lab network configuration, research lab configuration, Governor's School lab configuration, new cable management installation, expanding the cabling plant, and network security.
- Y. Other audio-visual supports installed during the reporting period included: upgraded audio in Great Hall, installed wireless touch panels in meeting rooms, installed Room View, installed a C and KU band satellite, supported over 400 events with audio-visual services.
- Z. Initiated and managed a student intern program, which has employed seven interns to date from Virginia Tech, Averett University, Danville Community College, and National Business College. Internships included a rich set of hands-on experiences, followed by coaching on resume writing and interviewing. Interns have been successfully employed by several Southside businesses and organizations.

Awards/Accolades/Designations

The IALR facility was a winner at the 2005 International Communications Industries Association/Archi-Tech Audio Video Awards for an outstanding example of creative and effective integration of technology into a facility.

**Marketing and Community Relations**

Goal: Maintain effective communication channels with key stakeholders throughout the Southside region and work to inform the general public about IALR plans and accomplishments.

A. Plan and host special events and announcements as needed

Numerous special events were hosted during the reporting period and included the following events of special note:

IALR Inauguration and Ribbon-Cutting (June 2004)

IALR Open House (March 2005)  
IALR State of the Institute (April 2005)  
IALR Research Wing Dedication (June 2005)

In addition, many announcements were staged and hosted, including:

March 22, 2004	AAPPI \$400,000 from HUD and RTI study
March 26, 2004	JOUSTER \$2.2 million and demonstration at VIR
April 8, 2004	DOE \$596K for Outreach
November 3, 2004	Southside Wireless Hotzones
June 29, 2005	UVA-VCU nursing announcement

- B. Continue to make presentations throughout region, and expand this capacity by cultivating Future of the Piedmont Associates and SCALE-UP.

An extensive number of presentations have been made throughout the region, principally by IALR staff members. An overview presentation was developed and provided to the Future of the Piedmont Associates and SCALE-UP in 2004, though has not been used widely by those groups.

- C. Continue to cultivate local media relationships to communicate with public at large.

Visits with several local media/publishers throughout the IALR's service region were scheduled during 2004-05 to develop stronger links between their audiences and our activities. Subsequently, more articles about the IALR have appeared in regional newspapers and magazines. Members of the media were also specially invited to the March 2005 Open House and offered a breakout opportunity to address their communication interests. Finally, we have periodically hosted luncheons with local media to continue to cultivate relationships and provide background information on developing situations and activities.

- D. Continue to develop SCALE-UP partnership.

The relationship with SCALE-UP has continued to develop, with significant progress in 2004-05 regarding 501c3 filing, formal appointment of board members, and adoption of a strategic plan.

- E. Develop community relations through events, tours, and programs, including the IALR Ambassadors program where applicable.

Hundreds of people have been hosted through facility tours, events, and programs. A regular tour schedule has been implemented and many people have visited the facility and learned about the IALR through its outreach programs.

- F. Continue development on IALR print materials programs, facilities, and mission through New City Media; print materials in-house as needed.

Development of glossy IALR print materials continued, with current availability of pocket portfolio style covers and several critical inserts. In addition, numerous program-specific flyers and other print materials have been developed and distributed in conjunction with program marketing activities.

- G. Develop a new web site that is synergistic with print materials in design and image creation.

A new IALR web site was created and launched January 2005. This web site extends the imaging and themes of the professionally produced print materials.

- H. Publish IALR newsletter, The Lighthouse, on a regular basis.

The Lighthouse newsletter was launched in the summer of 2004 and continues to be published and distributed to several hundred stakeholders every 2-3 months.

- I. Advertise programs and events as needed; investigate additional sponsorship opportunities in addition to current commitments (NOVA and WVTF).

Advertising has become mostly program-driven as opposed to institutionally driven. This advertising approach maximizes the value of the relatively scarce dollars available for this purpose.

- J. Maintain presence in EVINCE magazine.

A monthly column authored by IALR staff has continued to inform the greater Danville community about various programs, activities, and events associated with the IALR.

- K. Sponsor and support worthwhile events that the IALR should be associated with.

The IALR has sponsored several community events, particularly in conjunction with the Chamber of Commerce and United Way. IALR staff have also partnered with the Chamber to initiate a Young Professionals network and program series.

- L. Join chambers of commerce within Southside service region in order to expand IALR presence and influence; place IALR staff on chamber committees where appropriate.

The IALR has become a member of all Southside Chambers of Commerce as well as the state of Virginia Chamber. Staff members have participated in selected events hosted by the regional Chamber organizations.

- M. Pitch and develop story ideas for selected national publications.

Stories in non-local publications featuring the IALR or one of its programs have appeared in Virginia Business magazine (4/05), Bacon's Rebellion (11/04), The Richmond Times-Dispatch (3/04, 6/04, 11/04, 5/05), Roanoke Times (11/04),

Nano Investor News (4/05). Work continues to develop story ideas for regional and national publications.

- N. Develop communication/usage plan for the plasma wall in the Atrium; look into possible advertising plan.

A usage plan has been devised to maximize the value and impact of the plasma wall in the Atrium.

- O. Work to develop a comprehensive communication plan for the IALR was initiated during 2004-05. This effort began with conversations and advice from Virginia Tech's office of University Relations and culminated in a document that was presented to the IALR Board during the summer of 2005.

### **Assessment and Institutional Research**

Goal: Utilize quantitative metrics and qualitative mechanisms to measure and report the impact of the IALR's programs on Southside and the Institute's overall contribution to creating a robust economy in the region.

#### 2004-05 Accomplishments:

##### Plan of Work Activities Completed

- Determine metrics and qualitative mechanisms for the IALR overall  
Status (4/30/05)—Completed December 2004

##### Plan of Work Activities in Progress

- Establish benchmarks and provide initial report comparing progress at end of 2003-2004 year to benchmarks

Status (4/30/-05)—In progress. Virginia Tech report due May/15/05; phone survey to be conducted June 2005; senior survey to be conducted May 2005.

- Determine metrics for each program

Status (4/30/05) – In progress. Stakeholder Report (12/04) provided data for initial metrics. A comprehensive assessment process has been initiated for each program area.

- Identify qualitative mechanisms for each program area

Status (4/30/05)—In progress for some programs; others to be established as programs become operational.

- Provide an annual report of progress against goals in spring 2005

Status (4/30/05)—Report will be available September 2005

### Other Institutional Awards/Accolades/Designations

The IALR was honored with a regional Innovator's Award by the Southern Growth Policies Board in June 2005. The award, presented by Alabama Governor Bob Riley, host of the SGPB's "Rising Together: Summit on the Rural South" conference, recognized the IALR for improving the quality of life in the South.

The IALR was recognized as a finalist in the March 2005 "Putting it Together: the Role of Entrepreneurship in Economic Development" national conference hosted by the Small Business Administration's Office of Advocacy, the Council of State Governments, the Ewing Marion Kauffman Foundation, and the National Lieutenant Governors Association.

### Grants Awarded

Community Technology Capacity Building Initiative	\$5,000	The Community Foundation of the Dan River Region
Community Technology Capacity Building Initiative	\$9,000	Verizon
Southside AmeriCorps	\$75,461	Corporation for National and Community Service
Making the Net Work	\$10,000	Virginia's Center for Innovative Technology
Fast Track Information Technology Workforce Preparation Program	\$100,000	U.S. Department of Labor
Learning Liftoff Math Literacy and Cutting Edge K-16 Faculty Development	\$500,000	U.S. Department of Education
eCommerce for Small Businesses	\$100,000	U.S. Department of Labor
Southside Summer Adventure and Southside Educators Development Institute	\$600,000	U.S. Department of Education
IALR Information Technology	\$180,000	U.S. Housing and Urban Development

### Selected Presentations

Virginia House and Senate Finance Committee (1/5/04)  
Virginia Economic Development Partnership (1/22/04)  
Virginia House Appropriations Higher Education Subcommittee (1/26/04)  
Southside Public Education Superintendents (5/26/04)  
Community Services Board IT Professionals Conference Keynote (8/25/04)  
Virginia's Center for Innovative Technology (8/31/04)  
Sorenson Institute (10/13/04)  
Virginia Economic Development Partnership (11/4/04)  
Leadership Southside (11/9/04)

Virginia Research Technology Advisory Committee (11/16/04)  
Virginia Senate Finance Education Sub-Committee (12/9/04)  
Virginia Tobacco Commission Staff (3/1/05)  
National Association of State Universities and Land-Grant Colleges Council on  
Extension, Continuing Education, and Public Service Conference (6/9/05)





## Learning Technologies

Learning Technologies is a multi-faceted organization dedicated to supporting the tripartite mission of the university: instruction, research, and outreach.

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 faculty and 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 has had a significant impact on the instructional mission of the university by providing the coordination and leadership for several major 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 have been 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 Management Systems supports Blackboard and Sakai systems 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. Consulting services are provided to faculty regarding the integration of technology in teaching through the

New Media Center. The Research Task Force continues to explore the potential of new technologies on enhancing student learning. Assistive Technologies ensures that all students and faculty have the appropriate technology to meet their needs. 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. 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. Consulting is also provided on planning for the integration of technology in all new and renovated facilities on campus. In addition, the operational units provide services that are vital to modern learning environments including computer-integrated classrooms that support specialized software systems critical to faculty and student instructional needs.

## 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 continued with additional workshops through August 2005. During these twelve years, more than 300 customized workshops have been conducted along with several hundred additional short courses and seminars. During the spring and summer of 2005, approximately 465 faculty participated in short courses and workshops in the fourth year of the third cycle (2002-05) bringing the total of all participants to more than 4500 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 faculty have the opportunity to provide the most efficient and effective learning environment for our students.

The FDI program saw a large increase in participation in short courses and workshops during the academic year, as faculty and graduate assistants took advantage of new content additions. Our overall aim was to strengthen the FDI program's relevance and value to faculty 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, new partnerships were forged with other university departments, such as Sponsored Programs, that had important content for faculty -- in this case related to grant preparation and research collaboration—and would benefit from linking with our established training program. 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 faculty, such as Tablet PCs, Silicon Chalk, and electronic portfolios. Greater detail on these advances is provided in the impact section of this written report.

Growth in the number of participants is reflected in these statistics:

#### Growth in FDI Workshops and Short course Sessions and Attendance

Semester	Activity	Sessions	Participants
Spring 2004	Blitz Week	16	168
	Short Courses	92	938
	Spring Tracks	5	101
Summer 2004	3-day Tracks	22	320
Fall 2004	Blitz Week	16	106
	Short Courses	94	730
Spring 2005	Blitz Week	10	194
	Short Courses	146	1,866
	Spring Tracks	9	140
Summer 2005	3-day Tracks	21	324

### Online Course Systems

As part of Educational Technologies, Online Course Systems (OCS) provides a range of important enterprise-level academic services, such as Blackboard, 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

Growth in the OCS services is reflected in these statistics.

**Blackboard.** The Blackboard learning system has evolved into an enterprise level system that has become a mission-critical application for instructors and researchers and students. The recent upgrade to version 6.2.3 provided many new and improved features. Today over 75% of undergraduate courses are using the Blackboard learning management system. To improve performance and stability of the system, several steps were taken, including locating the servers for all production services in Andrews, utilizing support services from other Information Technology units. Another step taken by OCS was to foster a closer relationship with Blackboard Inc. OCS works closely with Virginia Tech's assigned technical support manager in while solving all technical and performance issues. Key OCS staff members also met with the

Blackboard account manager and the director of support during the 2005 Blackboard Users Conference.

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

**Blackboard Statistics—Active Classes, Instructors, and Students**

	<b>Spring 2004</b>	<b>Fall 2004</b>	<b>Spring 2005</b>
<b>Course sections</b>	2,848	2,516	2,570
<b>Faculty &amp; GTAs</b>	1,485	1,540	1,555
<b>Students</b>	26,706	26,710	27,072

**Open Source Portfolio.** Open Source Portfolio (OSP) is actively used by targeted audiences to document learning and 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 nine potential release candidates of OSP 2.0 and participated in a load test for the final release candidate of 2.0. OCS has reported more than 60 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 Statistics—Accounts, Active Shares, Instructors, Students**

	<b>Spring 2004</b>	<b>Fall 2004</b>	<b>Spring 2005</b>
<b>Accounts</b>			
<b>Shared Portfolios</b>	580	606	768
<b>Instructors</b>	57	57	80
<b>Students</b>	580	606	768

**OCS Helpdesk.** The primary method for providing individualized user support is through the OCS Helpdesk. User questions are sent via email to [ocs@vt.edu](mailto:ocs@vt.edu) and 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 General Statistics – Questions Answered by Submitter Type

	Spring 2004	Fall 2004	Spring 2005
<b>Questions answered</b>	2,327	2,630	2,406
<i>Submitted by:</i>			
<b>Instructors</b>	614	555	532
<b>Undergraduates</b>	89	375	174
<b>Graduates</b>	36	35	39
<b>GTAs</b>	120	110	96
<b>Other</b>	134	179	160

**OCS Training.** OCS staff played an active supporting role in the FDI workshops. Throughout the past 18 months, OCS provided training workshops to hundreds of faculty on using Blackboard. At the beginning of each semester, we offered “Blitz Week” which included two Blackboard training sessions each day and, when needed, one in the evening. Before fall 2004 semester, OCS staff gave workshops to graduate students (who were teaching with Blackboard) and to new faculty through the FDI. 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 the 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 to 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 January 2004-June 2005.

<b>Full Summary</b>						
	<b>TOTAL</b>	<b>Faculty</b>	<b>Staff</b>	<b>Undergrad</b>	<b>Graduate</b>	<b>Public</b>
<b>3-D</b>	<b>69</b>	0	5	56	5	3
<b>Audio</b>	<b>318</b>	39	56	156	52	15
<b>Authoring</b>	<b>204</b>	9	117	31	35	12
<b>Blackboard</b>	<b>25</b>	15	6	0	4	0
<b>CD/DVD Burn</b>	<b>256</b>	36	37	98	53	32
<b>Desktop Publishing</b>	<b>1,155</b>	72	121	659	226	77
<b>ElementK</b>	<b>58</b>	3	8	32	5	10
<b>Equip Loan—Mavica</b>	<b>657</b>	37	66	377	169	8
<b>Equip Loan— TRV/others</b>	<b>309</b>	33	65	116	90	5
<b>ETD</b>	<b>92</b>	2	6	3	79	2
<b>Flatbed Scanning</b>	<b>2,032</b>	153	139	1,012	675	53
<b>Graphics</b>	<b>949</b>	54	81	575	190	49
<b>PowerPoint</b>	<b>68</b>	19	5	24	17	3
<b>QTVR</b>	<b>7</b>	1	3	2	0	1
<b>Slide Scanning</b>	<b>314</b>	78	41	109	68	18
<b>Video</b>	<b>4,229</b>	193	341	2,603	909	183
<b>Web Development</b>	<b>865</b>	113	66	415	250	21
<b>TOTAL</b>	<b>11,607</b>	857	1,163	6,268	2,827	492

## Projects

### Open source applications projects

To enlarge the scope of applications and services available to faculty and students, and to gain better control over operating costs, Educational Technologies became involved in the Sakai and Open Source Portfolio 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. Staff involvement in Sakai conferences, followed by tests of the software and involvement in creating a Sakai-compatible tool (see below) started during the report period. Preliminary testing, QA analysis, deployment exercises, hardware purchases, and documentation/support planning were done leading up to a pilot test of the Sakai Learning and Collaboration software planned for fall 2005, running parallel to Blackboard.

The Application Development group collaborated with Columbia University to modify and extend a course evaluation system. The intent is to continue Virginia Tech's leadership on this project and make it a Sakai-compatible tool by summer 2006. Interest in helping develop this application has also been offered by Rice and Cambridge University.

The Virginia Tech Electronic Portfolio continued to gain adopters as Engineering Education committed to have all freshman engineers create portfolios. A series of faculty meetings was held to build understanding of new functionality and how to

integrate the curriculum better. OCS conducted extensive testing of version 2.0 of the software.

### **FDI tracking system expansion**

The FDI tracking system is used to manage program participant activity, workshop registration, web pages, and computer selection, delivery and inventory. During the reporting period, a series of refinements, modifications, bug fixes, and expansions were accomplished.

### **Blackboard software upgrade**

The Blackboard course management system was updated from version 5.5.1 to version 6.1.2. Despite extensive planning and a long series of tests, migration to the new software version encountered significant technical problems that affected classes, faculty, and students. Issues were resolved with assistance from the DBMS group and the vendor. Based in part on this experience, a decision was made to shift the underlying technical staff support for all Educational Technologies production services to Systems Support, Database Management Systems (DBMS), and Distributed Storage.

### **Server/infrastructure conversion**

The current production systems (Blackboard, ePortfolio, Sakai) were changed from having departmental staff install, operate, and maintain servers, storage and database services to a more efficient model that uses the services of System Support, DBMS, and Distributed Storage in the Andrews Information Systems Building. Our staff will continue to manage and administer the applications, provide user training, and define current and future functionality and procedures in collaboration with faculty users. Distributing the tasks and responsibilities across several groups should maximize the expertise available for these applications and permit our staff to focus more on the applications and less supporting infrastructure.

### **CREOLE**

The CREOLE online faculty development module project, funded by the U.S. Department of Education (FIPSE) through Florida Community College Jacksonville, was successfully completed in June 2005. This 42-month project produced four learning modules consisting of 19 chapters, 591 final screen pages, and numerous video and animation segments produced with over a dozen content writers nationally. It generated \$123,321 in grant funding.

### **KAU continuing education project**

The FDI program became involved as one of several content providers for a faculty training program held in the summer of 2005, operated through the university's continuing education division. This activity was part of an agreement between Virginia Tech and King AbulAziz University in Saudi Arabia. During the reporting

period, negotiations were conducted on an acceptable project budget model for a three-week custom FDI program, including the negotiation of workshop content, in collaboration with Dr Sedki Riad, Director of International Programs for College of Engineering. Fifty KAU faculty members participated during July-August 2005 in extended workshops.

## **New Media Center projects**

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

**NMC Website.** The manager of the NMC has continued her work on the Accessible Web Development Committee. The New Media Center's website was used to explore the issues in accessible web development and experiment with different ways to make our websites a useful resource for as many people in the Virginia Tech community as possible.

Several other issues came up while redesigning the site. We discussed blogs, wikis, and content management systems at this past Learning Technologies retreat. The NMC has experimented with all of these this past year. All of these experiments are still ongoing.

The Center has also added a spotlight piece to the front page to showcase work being done by faculty and students at Virginia Tech. We have run several features so far. Carol Burch-Brown was our very first faculty feature. Other features have included articles on lab upgrades, the Progeny Film festival, and the work of Rudy Picardo (a graduate student).

**Content Management Systems.** The NMC has been experimenting with a content management system (CMS) named Plone. We are seeing a rise in support requests from department personnel who have "inherited" their department's web site. Many of these staff members do not have the necessary skill set to redesign, build, and maintain a website; and support for some is made more difficult by the scarce time given, if any, to learn about web development. CMS looks like a promising solution that we will continue to explore in the upcoming year.

**Faculty/Department Projects.** We work with faculty and staff all year long on various instructional, research, and departmental projects each year. Some highlights from this year are listed below:

- *Carol Burch-Brown*—Professor Burch-Brown is a frequent flyer at the NMC. Her students use the lab all year to complete various projects.
- *Simone Paterson*—Professor Paterson has used our classroom, had her students take NMC tours, and hosted part of her students' exhibition of works in the NMC this past year. We also assisted them when they were redesigning their own facilities in Henderson.
- *Crandall Shifflett*—Professor Shifflett's students recorded a series of interviews in the Tidewater area for a video on the Native American population in that area. Shannon Phillips met with Professor Shifflett and his entire class on several



occasions to go over aspects of project management as well as the technical issues surrounding video projects. The center provided the hardware and software needed to complete their editing as well as a place to store their work files. We also supplied a place to store their shared work drive at our front desk.

- *Yonsenia White* – We work closely with Professor White and her students to create videos of their performance projects.
- *Torgersen Hall Display* – The NMC designed the new posters on display in the third floor Torgersen display cases.
- *Search Committee* – The NMC worked with Art Department’s hiring committee this past year to help select a candidate for the new cyberarts position.

**Outreach Programs.** The NMC has run training sessions for several summer programs on campus. 4H, Upward Bound, and Women in Computing organizations have all used NMC facilities and/or staff during their programs.

**NMC Hiring Database.** The New Media Center has put together a web interface for all employee applications. These applications are entered into a database where applicants can choose to make their application available to any other units on campus seeking to hire a student employee with multimedia experience. When another campus department/unit contacts us, we now do a search through our database and email them the records of applicants who have the skill set they are looking for.

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

**Blackboard.** The NMC, in cooperation with Online Course Support, now offers walk-in help to faculty using Blackboard to post course materials online.

## **Applications Development projects**

Application Development contributed code to open source projects as listed below:

- Open Source Portfolio: Set of administrative and statistical tools for use in the Open Source Portfolio Initiative.
- Evaluation System: This project started as a project to develop an online student rating system for use at Virginia Tech using code obtained from Columbia University. This system has been through initial pilots and is in the final stages of development.

Application Development extended existing projects and systems as listed below:

- Blackboard Faculty Tools—The faculty tools allow faculty to create development courses, copy courses, merge course sections, and remove development courses.
- Blackboard Gradebook Import Tool—Allows instructors to import grades into blackboard from various Test Scoring Services (TSS) formats, configurable CSV formats, and the Blackboard formats. This tool was developed to allow instructors to maintain grades in a spreadsheet offline and upload them into Blackboard for secure and confidential display to students. It also provides a FERPA-compliant grade display method through blackboard.
- Blackboard Admin Tools—The admin tools allow Virginia Tech Blackboard systems administrators to create external accounts, view current user sessions, view user sessions graphs, and view logs for faculty tools.
- Blackboard External Tools—The external tools allow OCS to view student information system data, correct minor data issues, and view log data.
- Blackboard SIS loader—Loads users, courses, and enrollments into Blackboard based on a data feed from banner, registry, and the Institute for Distance and Distributed Learning. This process is automatic and occurs several times a day.
- Helpdesk—Added additional mail filtering features, and updated code for contacting faculty and viewing statistics.
- FDI system—Redesigned the existing system to allow enhanced tracking of faculty and computers throughout the FDI process. System supports tracking training of faculty and graduate students in the uses of various software and systems.

Application Development is currently working on the following projects:

- Sakai—The Sakai project is a research and collaboration system framework that is highly extendable. Application Development is working directly with universities including Stanford, Berkeley, MIT, and Columbia University to enable use of the system at Virginia Tech and develop needed tools.
- Evaluation System—The evaluation system that was developed is being redesigned to work as a tool within Sakai and to be more flexible and feature rich. This project is collaborative between Columbia University, MIT, and Virginia Tech.
- FDI System—The FDI system continues to be extended and will include features that allow faculty to self-register for workshops, choose computers, and view events among others.

## **Systems integration projects**

The quality of service provided by Educational Technologies continues to improve as we draw on skilled resources from across the university and expand our own expertise.

## Graduate Assistants, Training and Staff Development

### **Graduate assistant programmers in Application Development**

Two graduate students worked in Application Development on Graduate Assistantships during the fall 2004 and spring 2005 semesters. They were trained to do programming in Cold Fusion and Perl and learned to write SQL queries against an Oracle database. Both students were involved in a collaborative open source project with Columbia University.

### **Student workers in FDI**

During the academic year over the past 18 months, FDI has employed one graduate assistant (GA) to provide support for its programming. The nature of this support matches FDI's needs; however, an effort is made to provide the GA with professional experiences that will further his/her personal career goals. For instance, FDI's GA 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 web pages. This work provided professional listings on his resume that will further his career after Virginia Tech. Our GA during the 2004-05 AY possessed a different skill set. While he too provided web support for FDI, he was also 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.

In addition to this AY GA commitment, FDI also hires a number of graduate students to support its extensive summer programming. During the summer of 2004 and 2005, 18 student lab assistants were hired. Many FDI tracks cover highly specialized topics, such as SAS, geographic information systems, parallel programming, etc., 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 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, which is 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.

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 Pacific, Kim Gausepohl, Shannon Phillips, James Dustin, Tony Atkins, Aaron Zeckoski, and Brian Maloney.

Conferences and seminars attended were: Educause, Sakai Educational Partners Conference, Open Source Portfolio Initiative, JASIG, Blackboard Users Conference, New Media Center conference, UbiComp, VT/Microsoft Executive Briefing, Society for Information Technology and Teacher Education, South Atlantic Modern Language Association, International Society for Exploring Teaching and Learning, and Learning Technology Consortium.

## Impact on University Functions

### **FDI's 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 IT. 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 faculty are invited to enroll), the demand for seats in our spring and fall workshops has increased dramatically. Between spring 2004 and spring 2005, the number of workshops seats filled more than doubled. This indicates that there is 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. 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. During the fall 2004 semester, we met with representatives from all of the dean's offices across campus. The focus of these meetings was to engage in a conversation regarding the needs of faculty from an administrative perspective. What we learned in those meetings greatly informed the offerings we provided during the spring. During the spring and summer of 2005, as part of each workshop's evaluation process, participants were asked to provide suggestions for future FDI workshops. The information gathered from those participants, over 2,000 since the beginning of the spring 2005 semester, has enabled us to ensure that our offerings continue to stay relevant and timely this fall and beyond. 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**

Faculty and students have chosen Blackboard as the statistics indicate, and 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. OSP has provided a needed tool to document learning and provided students with a repository for their professional and personal materials that we expect to be widely adopted in the future. As we provide quality assurance (QA) and roll out Sakai, we expect this new learning environment to provide 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 QA activities contributing to the design and stability of our learning tools. The QA 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**

### **Faculty Development Institute**

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 faculty, 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 of 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 from across the university. Further, when needed skills cannot be found on campus, we have also forged complementary relationships with vendors, such as Apple Computer, Microsoft, National Instruments, and MathWorks. 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 2005 was over twice as many as spring 2003.

In addition to adjustments in staffing approaches, we have also 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 unenroll 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.

## Graduate Education Development Institute

The Graduate Education Development Institute (GEDI) aligns directly with the university’s mission in instruction. In particular, GEDI represents a collaboration between Learning Technologies and the Graduate School. GEDI is a central component of the Transformative Graduate Education (TGE) initiative that focuses on increasing graduate students’ opportunities for professional development. Other components of TGE are “Preparing the Future Professoriate/Professional,” which gives graduate students a broader understanding of 21<sup>st</sup>-century universities and the Citizen Scholar Experience that encourages graduate students to make connections between their scholarly work and communities beyond academe. The Graduate Education Development Institute continues to have a positive impact on the professional development of our university’s current graduate students and future faculty.

The mission of GEDI is to increase our graduate students’ abilities to integrate the use of technology into their current and future teaching, and to develop pedagogical practices that focus on student-centered, problem- and inquiry-based learning in all disciplines. The Graduate Education Development Institute prepares our future faculty to actively engage a new generation of tech-savvy 21<sup>st</sup>-century learners.

Brief video narratives that indicate the impact GEDI has had on its participants are available at [http://www.gedi.vt.edu/GEDI\\_vids.htm](http://www.gedi.vt.edu/GEDI_vids.htm)

## Project status

During this reporting period, approximately 82 graduate students completed the GEDI course—GRAD 5114, “Pedagogical Practices in Contemporary Contexts,” a semester-long, for-credit graduate seminar. Eighty-two participants over three semesters is a significant number since nearly all of the graduate students currently take this course on “overload” (above and beyond their departmental course requirements). Their interest in becoming skilled and confident teachers drives their commitment to GEDI, and GEDI has thus far successfully tapped into their desire to be effective in their classrooms and labs.

During the Fall 2004 and Spring 2005 courses, the director was able to increase the variety and depth of the hands-on technology tools workshops because of a GTA Fellowship (funded by the Graduate School) that increased our GEDI staff to two (the Director and one GTA GEDI Fellow). In the statistics included below, the students’ awareness and understanding of a range of teaching and learning technology tools has increased (see Fall 04 and Spring 05 assessment data below). Likewise, the qualitative data also suggests that participants are eager to integrate the technology tools they explore in GEDI into their teaching. (See below.)

## Assessment data

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

<i>Response</i>	<i>Fall 03 Exit (n=48)</i>	<i>Spring 04 Exit (n=13)</i>	<i>Fall 04 Exit (n=50)</i>	<i>Spring 05 Exit (n=19)</i>	<i>Total Exit (130)</i>
Extensively	44% (21)	46% (6)	58% (29)	68% (13)	53% (69)
Moderately	52% (25)	54% (7)	38% (19)	26% (5)	43% (56)
Minimally	4% (2)	0% (0)	4% (2)	5% (1)	4% (5)
Not at all	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)
<i>No answer</i>	-	-	-	-	-

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

Response	Spring 04 Entry (n=13)	Spring 04 Exit (n=13)	Fall 04 Entry (n=58)	Fall 04 Exit (n=50)	Spring 05 Entry (n=21)	Spring 05 Exit (n=19)	Total Entry (n=92)	Total Exit (n=82)
Very unsure of my skills	8% (1)	8% (1)	5% (3)	0% (0)	5% (1)	0% (0)	5% (5)	1% (1)
Unsure of my skills	23% (3)	0% (0)	26% (15)	14% (7)	29% (6)	5% (1)	26% (24)	10% (8)
Average skills	46% (6)	31% (4)	43% (25)	40% (20)	52% (11)	37% (7)	46% (42)	38% (31)
Above average skills	23% (3)	54% (7)	24% (14)	46% (23)	14% (3)	53% (10)	22% (20)	49% (40)
Superior skills	0% (0)	8% (1)	0% (0)	0% (0)	0% (0)	5% (1)	0% (0)	2% (2)
No answer	-	-	2% (1)	-	-	-	1% (1)	-

**Question:** I think cultural diversity is a relevant issue in my course design and teaching.

Response	Fall 03 Entry (52)	Fall 03 Exit (48)	Spring 04 Entry (13)	Spring 04 Exit (13)	Fall 04 Entry (58)	Fall 04 Exit (50)	Spring 05 Entry (21)	Spring 05 Exit (19)	Total Entry (144)	Total Exit (130)
Strongly agree	38% (20)	52% (25)	38% (5)	54% (7)	50% (29)	54% (27)	43% (9)	58% (11)	44% (63)	54% (70)
Agree	35% (18)	27% (13)	31% (4)	46% (6)	29% (17)	28% (14)	29% (6)	32% (6)	31% (45)	30% (39)
Neither agree nor disagree	21% (11)	12% (6)	31% (4)	0% (0)	17% (10)	8% (4)	14% (3)	0% (0)	19% (28)	8% (10)
Disagree	6% (3)	8% (4)	0% (0)	0% (0)	0% (0)	6% (3)	14% (3)	11% (2)	4% (6)	7% (9)
Strongly disagree	0% (0)	0% (0)	0% (0)	0% (0)	2% (1)	4% (2)	0% (0)	0% (0)	1% (1)	2% (2)
No answer	-	-	-	-	2% (1)	-	-	-	1% (1)	-

**Sample Qualitative Responses:**

**What technologies are you likely to employ?** “I will continue to use Blackboard, but I will also try some of the Collaboration Tools next year. I will also use case



studies, problem based learning (PBL), authentic assessment techniques, formative evaluation, and varying types of class dialogue and small group discussion. I am thinking about requiring our rising sophomore students to use ePortfolio. . . .”

“I will definitely apply change-ups in lecture, and try and find the best way to connect with students. I will also use Blackboard and ePortfolio to stay connected to students for projects outside of the class. If I teach any distance learning classes, then I will definitely utilize software such as CentraOne.”

**What technologies did you explore that were new to you?** “Most of the technology that we went over (with the exception of IM and website construction) was new to me. I have been using Blackboard since I was an undergraduate, but this was the first time I was given the opportunity to be on the instructor’s side of the program. This experience was particularly helpful since my department requires me to use the program in my course. The introduction to the other technologies—such as the chats and online class—were also helpful because it gave me experience with other options I could potentially use in place of regular classes. . . .”

“ePortfolio—the idea that colleagues can share information within a closed system was new to me and I think that it will be useful in the near future. Dreamweaver—definitely a plus to learn that making a website is quite easy with this program. Blackboard—although I have been a GTA here for a few semesters, I never spent the time to learn how to use Blackboard. I will definitely consider using it for future classes now. CentraOne—I thought it was also cool that you could actually conduct a class via headphones and the Internet.”

**Briefly describe how this course has affected your knowledge and understanding of pedagogical practices.** “I learned that it is critical for teachers to connect with students on numerous levels. Coming into this class, I just assumed that the traditional top-down lecture was standard procedure and the only way to teach a subject. Now I know of the importance of delivering information in group sessions, even if the subject is more rigid like science, or assigning group projects to make sure that students learn how to interact as well as becoming independent thinkers.”

“This course forced me to think about aspects of myself and of teaching that I had never considered before. It forced me to think about my teaching self and how it will affect my teaching. It has also taught me that I don’t need to be a dictator in the classroom to maintain order and gain respect.”

## Research Task Force

The continuing mission of Learning Technologies’ Research Task Force is to advance and support research of existing and emerging technologies within Learning Technologies, Information Technologies, and the university. The task force accomplishes this by scanning the environment, forming partnerships with research faculty 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 mobile computing and pervasive computing.

## **Mobile computing in the classroom**

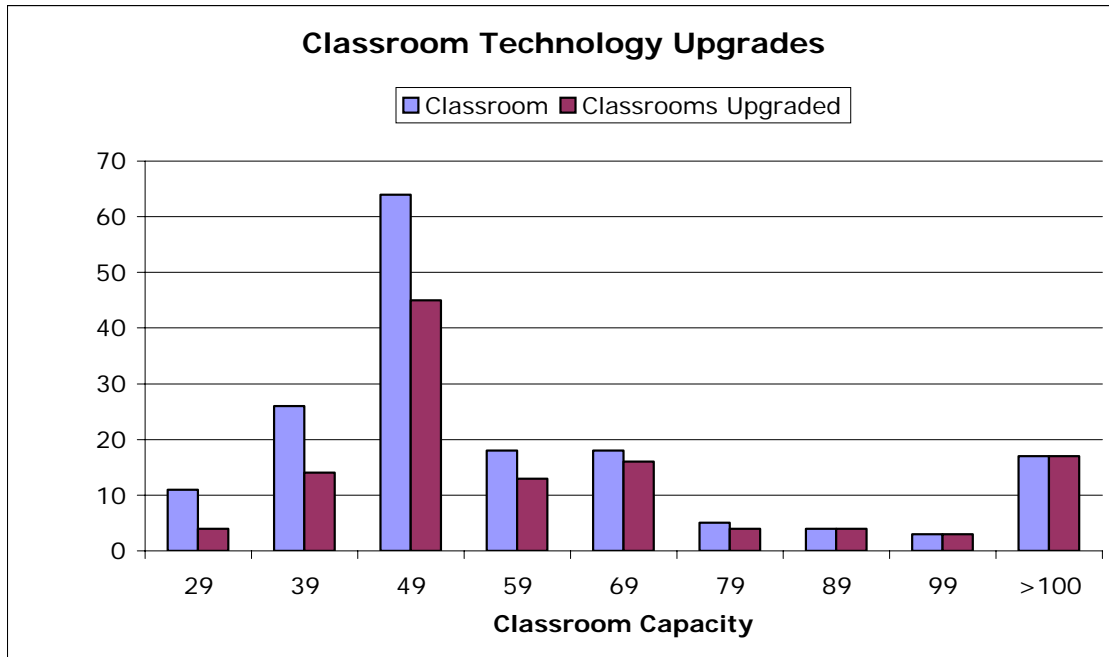
Members of the New Media Center are studying ways in which the portability, connectivity, and handwriting support of the tablet PC facilitate the teaching and learning experiences of instructors and students. A FDI track on the use of tablet PCs in the classroom has been developed and presented. Instructional applications including the University of Washington's Classroom Presenter and Microsoft's OneNote are also being evaluated. The NMC is assisting the College of Engineering in development of an electronic lab notebook based on OneNote. Learning Technologies has partnered with NI&S in a working group to study wireless network requirements of tablet PCs.

## **Pervasive computing**

Presentations on pervasive computing concepts were given to IT management and staff in an effort to raise awareness of potential pervasive computing research initiatives. Network Infrastructure and Services is considering the investigation of an enterprise-wide event notification system similar to Wake Forest's DeaconAlert System. Assistive Technologies provided project suggestions for an Electrical and Computer Engineering class on wearable and ubiquitous computing. Based on AT's recommendations, graduate students completed projects on a "smart" pill bottle to assist a person in managing their medications, and a campus navigation system that in real-time identified accessibility areas in Virginia Tech campus buildings. Members of the research task force participated in Computer Science's Large Displays project – a project investigating student collaboration and socialization support afforded by large interactive displays situated in public places. 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.

## **Classroom Upgrades and Computer-Integrated Classrooms**

More than 120 classrooms have been upgraded with technology systems designed to assist faculty and students in teaching and learning. These facilities provide faculty and students 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 are in great demand by 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. The Commonwealth Graduate Engineering Program, the MBA distance-learning program, and numerous other courses are taught using a two-way interactive video system on NetworkVirginia. NetworkVirginia is the state's broadband network that currently provides voice, video and data access for over 700 institutions 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 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.

### 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 faculty to transform teaching and learning at the university.

The CICS unit provides support for all computer-integrated classrooms on campus. This includes 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 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 checkout by students, faculty, or staff 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 as shown in the table below.

Computer-Integrated Classrooms	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
Henderson 23A	30	
Major Williams 502	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
	674	344

### Pay-for-print service

Effective July 1, 2004, CICS assumed responsibility for the pay-for-print system serving 29 printers around campus including several that are not in CICS facilities. In doing so, we eliminated the cost of outsourcing this service, which was approximately \$60,000 per year, and improved service without adding personnel. The service now pays for itself and we have received requests to add additional printers before fall 2005. The printers serviced from July 1, 2004 through June 30, 2005 and their respective volumes are shown below.

Printer	Jobs	Pages	Sheets	Amount Charged
Ambler-Johnston 4102	3,518	12807	12756	\$1,275.10
Architecture Annex 1	495	1900	1900	\$186.30
Architecture Annex 111	22	52	52	\$5.20
Burruss 122 HP8150	804	1841	1841	\$184.10
Burruss 122 HP8550	145	246	246	\$123.00
Cheatham 217	744	3982	3982	\$398.20
Cheatham 220	1,351	3793	3793	\$370.20
Chemistry-Physics 306	834	2779	2778	\$277.80
Derring 2069	12	14	14	\$0.80
Durham 152	573	1738	1655	\$155.70
Durham 187	245	1323	1323	\$71.60
Litton-Reaves 1370	2,316	9052	9052	\$895.30
Major Williams 502	65	111	111	\$0.00
Math Emporium #1	14,090	52202	52024	\$5,004.50
Math Emporium #2	10,941	41371	41291	\$3,845.00
McBryde 116	688	2486	2486	\$248.60
Pamplin 2010	6,383	21749	20684	\$2,026.10
Patton 316 HP4000	3,103	6063	6034	\$596.00
Patton 316 HP5100	528	587	587	\$114.00
Patton 319	2,365	5212	5147	\$507.50
Randolph 114E	1,778	5587	5587	\$558.70
Saunders 101	30	62	62	\$6.20
Shanks 160	413	892	892	\$89.00
Shanks 180	166	287	287	\$28.30
Shanks 360	139	192	192	\$18.00
Torgersen 1010	2,143	6566	6536	\$651.70
Torgersen 1080	2,795	8215	8215	\$776.20
Torgersen 3250	4,162	13603	13596	\$1,359.60
Vet Med Library 101T	326	1161	1161	\$116.00
	61,174	205873	204284	\$19,888.70

### **PACE/PDM collaborative course support**

Our group is also providing an essential support and development role for Dr. Jan Helge Bøhn in 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, and ITESM-Monterrey Mexico. 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.

### **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.

## Digital Imaging Center

The mission of Virginia Tech's Digital Imaging Center 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 class materials through the online E-Reserve.

With the start of the new fiscal year (2003-04), Digital Imaging assumed a new operating structure. This structure facilitated direct support for and participation in faculty efforts related to making research materials available, providing digital archiving of existing research materials, and the development of high-resolution computer generated images suitable for use in research visualization projects requiring a high degree of image fidelity.

In conjunction with this new operating structure, cost constraints associated with accessing our support for these types of projects were also restructured and removed in an effort to extend these types of services to all areas of the University involved with image related material. Services that we traditionally supported that were available through other campus support units or local vendors were dropped or discontinued. Along with these changes, a proposal process was implemented in order to provide departments and faculty a means of presenting their projects for consideration and review. This proposal process is used to screen requests for appropriateness in terms of research value and to direct those projects requiring output only to other available service centers.

The results of this shift in operating structure have been well received as evidenced by the selected projects listed below. Through the end of the past fiscal year, 25 projects representing 21,770 individual images have been completed. These projects were proposed by departments and faculty representing seven of the eight academic colleges and the University Library.

### *Completed Projects: 2003-2005*

1	Graduate Research	3	3D images	Heart Models
2	Library Archives	288	manuscript pages	Rare Book
3	Engineering	104	slide images	Antenna Design
4	Bio-Engineering	24	3D images	Spinal Vertebrae
5	Library Archives	3,207	transcript pages	WDBJ 7 News
6	Library Archives	601	manuscript pages	YSS Ledger
7	Graduate Research	6	3D images	Food Products
8	Horticulture	4,120	slide images	Plant Samples
9	Agriculture	400	slide images	Pesticide Safety
10	Library Archives	485	glass transparencies	Lantern Slides I

11	Library Archives	307	glass transparencies	Lantern Slides II
12	Library Archives	298	manuscript pages	Church Ledger
13	Library Archives	232	manuscript pages	CW Cook Book
14	Library Archives	27	cover pages	Music Cover Art
15	Engineering	3,038	slide images	Transportation
16	Engineering	1	3D image	Helmet
17	History	5,845	microfilm images	MT Newspaper
18	Library Archives	2,074	photographs	Goodsell Collection
19	Library Archives	4,222	film negatives	Goodsell Collection
20	Library Archives	20	manuscript pages	WWII Ration Book
21	Horticulture	1,599	slide images	Plant Therapy
22	Veterinary Medicine	41	3D images	Canine Skeleton
23	Forestry	1	3D image	Tree Section
24	Library Archives	372	manuscript pages	WSS Ledger
25	Foreign Languages	376	microfilm images	L'Endehors Journal

In addition to these completed projects, we are working on numerous collections of images representing myriad formats ranging from photographic imagery on paper and all types of standard translucent films and negatives. To date and including the completed projects, Digital Imaging has prepared well over 80,000 scans in support of numerous efforts around campus to archive research materials and historic documentation. In addition, we have scanned over 1,100 articles for the library in support of the E-Reserve, making it possible for students to retrieve these class assigned materials without the need to visit the library to pick up a printed copy. And, in cooperation with the University Library, we recently began the process of scanning the printed dissertations owned by the university so that those research documents can be added to the existing Electronic Thesis and Dissertations. To date we have scanned approximately 500 dissertations, representing over 86,000 pages of research information.

Digital Imaging is well positioned and professionally staffed to collaborate with departments and faculty on grant proposals requiring digital archival of important records in both visual and document formats. Current efforts include support for the University Library in submitting two grants involving large-scale visualization projects related to the International Archive of Women Architects. Additional support is offered through our participation in a consulting role to the Virginia Heritage Project, a statewide consortium of manuscript and archival institutions formed by the Virtual Library of Virginia (VIVA). These preservation and digitization initiatives provide an opportunity to establish standards and best practices for similar projects throughout the state of Virginia. The following list of projects represents only the beginning of what we plan in terms of research support as we continue to integrate new types of scanners that add to our capacity for digital image processing.

### **Selected Specific Projects**

**Project:** Visual Design Archive

**Principle Faculty:** 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:** 12,520 images have been scanned

**Project:** Electronic Thesis & Dissertations

**Principle Faculty:** 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 faculty in those areas.

**Project Status:** 500 dissertations have been scanned

**Project:** Civil War Newspapers: Historical Archive

**Principle Faculty:** William C. Davis

**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. Funding for this project is provided through a grant from the Watson-Brown Foundation of Atlanta, Georgia.

**Project Status:** The newspaper pages have been scanned (from microfilm).



16,894 column images have been created for the web pages.

**Project:** IAWA: Women in Architecture Archives  
**Principle Faculty:** **Gail McMillan**  
**Department:** Digital Library Archives, University Library  
**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. For Digital Library Archives these information resources are historically significant documents that are unique and rare.

Within Goal 1 of the Strategic Plan to acquire, develop, and provide timely access to research-level information resources in support of research and scholarship at the university, we have particularly targeted resources unique to Virginia Tech for digitizing and online access. Because of the nature of these works, it is important that these materials are not exposed to weather and/or other abrupt changes in temperature or humidity. This collection will be ongoing.

**Project Status:** 119 images have been scanned

**Project:** University Archives  
**Principle Faculty:** **Gail McMillan**  
**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. 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:** 9000 images have been scanned

**Project:** Architecture History  
**Principle Faculty:** **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 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 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:** 2880 images have been scanned

**Project:** Forest Ecosystems and Forest Management

**Principle Faculty:** **Thomas R. Fox**

**Department:** Forestry

**Proposal:** This collection representing approximately 1000 slides represents a record of the last twenty years of forest ecosystems and forestry operations throughout the United States, Canada, South America, Australia, and New Zealand. Many of the slides represent documentation of past and ongoing research trials and are used to archive changes in the growth of the forests and the conditions of the forests over the past twenty years. This visual record of these changes in the forest is valuable and should be preserved.

**Project Status:** 360 images have been scanned

**Project:** Historic Maps of Virginia and the United States

**Principle Faculty:** **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:** Scheduled to begin in August 2005

At the conclusion of the reporting period represented by this document, Digital Imaging had processed 195,145 individual items of existing analog material into digital formats suitable for research and instructional uses. All indications point toward an increase in the demand for our services and the unique role we play within Learning Technologies.

## Test Scoring Services

Test Scoring Services supports the collection of data by Virginia Tech faculty and staff by processing optical 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. Statistics for the 2004-2005 academic year show the following:

Number of different clients served	800
Jobs processed	6,300
Exams	5,000
Final exams	1,100
Course evaluations	500
Research data capture jobs	400
Total sheets processed	780,000

Test Scoring continues to process about the same number of jobs each year. More than 30% of faculty use opscans for exams, and during the critical final exam period, well over 200,000 forms were processed in the five days before fall and spring graduation.

While opscans continue to be the preferred information gathering method for many applications, Test Scoring worked with other units in Learning Technologies to evaluate and promote online strategies for course evaluations and testing. Pilot versions are under way.

Test Scoring also supports Element K by answering questions and creating usernames, handling 800 problem reports from 7/1/04-6/31/05 and 400 from 1/1/04-6/30/04.

## 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:

- Providing technical expertise, leadership, and coordination for disability accommodations based on assistive technologies (AT). This leadership includes coordination of AT on computers for teaching and learning in classrooms, computer labs, academic departments, the university libraries, and in administrative offices.
- Promoting multidisciplinary research and instructional activities that may create or find better uses of AT for people with disabilities and for all individuals.

- Participating in and/or hosting public outreach events that communicate to the university and the commonwealth the benefits of assistive technologies for all individuals.

Assistive Technologies, a unit of Learning Technologies, is comprised of the Assistive Technologies Lab and Special Services.

## **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 technologies useful for all individuals.

Research, instruction, and outreach opportunities for assistive technologies involve:

- Collaborating within the university and research community,
- Participating in outside college and university consortiums,
- Obtaining grants and sponsored programs from government or industry,
- Working with statewide disability service agencies like the Woodrow Wilson Rehabilitation Center (WWRC) or the Virginia Assistive Technology System (VATS).

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 for all individuals.

## **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, faculty, staff, and public patrons by a referral from either the Office of Services for Students with Disabilities or the Office of the ADA Coordinator. In addition to being an accessible computer facility, Special Services demonstrations of AT software, equipment, and consulting services are open to the university community, departments, and the general public by appointment with Assistive Technologies.

## **Consulting services**

Assistive Technologies offers consulting services to the university community on a variety of AT software and devices used for disability accommodations. 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, instruction by Assistive Technologies may also be available.

## Accessibility initiative

The Assistive Technologies department is currently participating in and/or providing leadership to initiatives on web accessibility standards, university-wide accessibility training, and related software and hardware procurements for evaluating, repairing, and monitoring university web accessibility compliance. The accessibility initiative is also being coordinated with other university initiatives to include branding and marketing by University Relations and with Information Technology initiatives exploring web content management systems and web development training.

## Other resources

Working with Learning Technologies partners such as Computer-Integrated Classroom Services and Educational Technologies, Assistive Technologies helps support approximately 50 accessible computer workstations in at least 25 locations on 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 or administrative facilities.

Working in conjunction with Southwest Virginia Assistive Technology System (SW VATS), the Training and Technical Assistance Center (T/TAC), and State disability service agencies, the Assistive Technologies department helps educate customers as to other AT equipment and training resources available from within the commonwealth.

## Research, sponsored programs, and grants

**Wearable Computers/E-Textiles and ECE Student Design Projects.** The AT Lab continues to provide consulting to faculty members in the Bradley Department of Electrical and Computer Engineering (ECE) on the potential uses of wearable computers (e-textiles) involving people with and without disabilities. E-textiles are fabrics that have electronics and interconnections woven into them. Tom Martin, Ph.D., principal investigator on existing federally funded e-textile project(s), continues to collaborate with the AT Lab on a regular basis. The focus remains on meaningful design experiences for engineering students, by having individual students and student project teams produce "custom designed" devices and software that will directly aid individuals with a disability.

**Navigation for Mobility and Accessibility Project (NavMAP).** The Center for Geospatial Information Technology (CGIT) and AT Lab are collaborating on a proposal to utilize cutting edge geospatial information technology tools from Geographic Information Systems (GIS) and Global Positioning Systems (GPS) applications to produce NavMAP. NavMAP is an application to produce an electronic mapping system for accessible and efficient routing between locations in environments such as a university campus or building complexes. The goal of this prototyping project is to provide users of wheelchairs, walkers, or persons with mobility issues accurate and real time routing information. NavMAP should provide routing information free of stairs and/or excessive slopes with additional information on accessible building entrances and relevant building features.

**Project TRAIN IT.** Project TRAIN IT is an information technology (IT) employment initiative funded by the U.S. Department of Labor through regional workforce investment boards. Project TRAIN IT is managed by Woodrow Wilson Rehabilitation Center and provides both IT training and rehabilitative services to participants at home to re-enter the workforce. The AT Lab has been funded to assist eligible trainees who may be temporarily hired at Virginia Tech and elsewhere in western Virginia to obtain IT work experience. The AT Lab will use graduate and undergraduate student interns funded by this project to assist the TRAIN IT employees with technical issues and on the job-related disability accommodations.

**Notification system for students with cognitive disabilities.** The AT Lab served as a client/evaluator on a graduate research project for the Grado Department of Industrial System Engineering (ISE5604 Human Information Processing class) researching cognitive prosthetics. The project team instructed by Dr. Tonya Smith-Jackson researched memory, perception, and conceptual disabilities issues. The final product was a low-fidelity notification system for students with cognitive disabilities. Due to the AT Lab's interest in improving cognitive prosthetics, it is hoped that another graduate research team will continue this project in the upcoming school year.

**Virginia AgrAbility.** This grant is a USDA program obtained from a proposal originated by Robert Grisso, Ph.D. of Biological Systems Engineering at Virginia Tech. Dr. Grisso contacted the Assistive Technologies early during the proposal due to our knowledge of disability service agencies in the state and community organizations that could partner on the grant. The AT Lab serves in an advisory role (monthly) to the grant which delivers services such as public education, rehabilitative therapies, assistive technologies, in-home health care, peer counseling, farm equipment modification, independent life skills training, and prevention of accidental disabilities for the agricultural community.

**Cellular phone user interfaces.** Collaboration continues with the Grado Department of Industrial and Systems Engineering, human factors/ergonomic laboratories (ISE-HF) in seeking corporate funded research on cellular phone user interfaces. This research identifies user requirements and challenges related to user interface designs of existing cellular phones among persons with and without disabilities. The AT Lab served only as an advisor for the Phase IV funding proposal that addresses software needs of persons without disabilities using cellular phones.

**Other research notes—signing avatar research.** A multi-year, phase II funding proposal, was rejected by the Department of Education to further develop and evaluate a sign language multimedia authoring system that synchronizes signing avatar animations to digital media for web sites. The AT Lab had proposed to conduct formative and summative evaluations of the web authoring tool interface with multimedia authors and sign language interpreters and oversee production of signing avatar materials that would have evaluated end-user features of the application. Should other funding resources become available, the AT Lab may consider revising the project based on updated information and technological advances in avatar research.

## Summer Training Academy for Rising Students

The past eighteen months were a transitional period for the Summer Training Academy for Rising Students (VT STARS) program. The 2004 calendar year began with uncertainty regarding the program's future.

A major effort was made to identify potential resources and seek program funding. Full proposals were submitted to the National Science Foundation, the Carillon Foundation, the US Department of Education, the Jessie Ball duPont Fund and Verizon Foundation.

A concurrent effort was also expended in redefining the program, on the basis of recent reports on the achievement gap and post-secondary degree attainment for impoverished high school students. 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 also included an expansion of the participating school divisions to broaden the program's regional impact.

Planning for the final summer academy of the initial pilot with Danville and Pittsylvania high schools was maintained, in conjunction with relationship building at the Institute for Advanced Learning and Research. In June 2004, a comprehensive three-week summer program was provided for sixteen students from the 2002 cohort. This marked the end of the five-year demonstration effort. Evaluation of the pilot is pending.

In 2005, forty-eight students comprised the first cohort of a newly funded second phase of VT STARS. A brief descriptive summary of the 2005 summer residency is included.

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

Preliminary discussions for institutionalization have begun with the Provost's office, as part of the university's increased focus on diversity, pipeline programs, and innovative ways to contribute to economic development in targeted southwestern regions.

On-campus partnerships are being used to leverage current funding for sustainability.

Implementation of e-mentoring is underway, in conjunction with the Graduate School.

The VT STARS 2005 summer residency consisted of a three-week residential learning experience from June 25 through July 16 at Virginia Tech's main campus in Blacksburg, Virginia. There were 48 participants from eleven high schools in six Southwest Virginia school divisions (Danville, Martinsville, Franklin County, Henry County, Patrick, and Pittsylvania Counties). Five high school instructors were residence hall counselors and program chaperones. Our residential themes were 'Seeing How Others See You' and 'Habits of Effective Teens.'

During the three-week summer residency, participants received constructivist instruction in Life Science (Genetics, Neuroscience, Organisms, and the Environment), Earth and Environmental Science (Watersheds, Hydrology) and Materials Science (Metals, Ceramics, Semiconductors, Polymers, Composites, Biomaterials, Exotic, and Strange Materials). Small groups of four-to-six participants formed thematic presentation teams to demonstrate their understanding of the significance and importance of self-selected questions within topics from each area of the science modules. These presentations were given to an audience of parents, siblings, and family on the last day of the program. In preparing their presentations, participants received critical feedback to guide them through the process of scientific inquiry, research methods and peer persuasion. In addition, each science module used a specific set of criteria for 'evidence of learning' to assist students in reflection and self-analysis of their progress and presentation quality. Participants were highly motivated to give presentations that their parents and families would understand and respect.

Participants were introduced to the concepts of graph theory, matrices, global positioning (GPS), and geographic information systems (GIS). These topics were used to establish a foundation for place-based education projects that will occur during an after-school science and technology club at each participating high school during the 2005-2006 school year. The graph theory and matrices concepts were deemed non-stigmatizing topics for review of algebraic problem solving. A diagnostic algebra assessment was performed prior to the math module to assist in benchmarking future participants. Analysis of the diagnostic assessment scores is pending receipt of each participant's school records, transcript grades, and standardized test scores. Additional assessments included a National High School Survey of Student Engagement, a National Science Foundation funded Survey of Career Decision-Making and the Nelson Denny Reading Comprehension self-scoring assessment. An Achievement Motivation Profile self-report inventory will be administered as part of the after-school science/technology clubs.

Nearly all the students embraced the rigorous and intense daily pace and schedule as an enjoyable challenge, appropriate for their official designation as 'visiting junior scholars.' A simple, yet comprehensive dress and conduct code was adhered to with a very minor exception.

There was strong parental support and involvement with the program. Several parents visited weekly and were very interested in sustaining their child's participation and affiliation. Attendance at the family cookout and at the program's closing ceremonies was excellent.

Only one participant's parents failed to attend the student presentations. Most parents expressed their satisfaction and pride regarding their child's participation and small group presentation. In a telephone conversation, two weeks after the closing ceremonies, a young mother wanted me to know that she had carefully practiced the pronunciation of 'Arabidopsis Thaliana' before talking with her daughter. Clearly, the program's framework for immersive non-formal learning has potential to increase parental expectation, and student motivation for greater academic achievement. Mr. Joseph O. Reed, Jr. a retired Army Lt. Colonel gave touching, motivational remarks as the luncheon speaker after the student team presentations. His emotional personal



statements provided an excellent counter-point to the theatrical comedy “Kimberly Akimbo” that students attended as the first event of our summer program.

While the 2005 summer residency was a success, it is clear that various changes are required to achieve fully the desired outcomes and overall positive community impact. The daily instructional schedule for the 2006 summer residency has been modified to incorporate changes in both the residence hall and academic schedules to reduce daily stress factors, and to provide participants more time and options during the daily lunch and dinner break. These changes include a mandatory study hall from 7-9pm, Monday through Friday, and better-defined roles for the graduate e-mentors and residence counselors.

Below is a summary of key positive and negative findings of the 2005 summer residency at Virginia Tech:

Positive Findings (Pros)	Negative Findings (Cons)
<ul style="list-style-type: none"> <li>• The three science modules were adequate</li> <li>• Virginia Tech’s main campus facilities (i.e., computer labs, residence hall space, food, etc) were sufficient and appropriate</li> <li>• Most participants appreciated access to the available resources and sought to achieve assigned tasks and designated goals</li> <li>• Computer labs in the dorm were very effective for social and academic uses.</li> <li>• The field trips and program outings were positive and engaging events</li> <li>• Collaboration with university partners exceeded the defined expectations</li> <li>• The graduate student e-mentors made exceptional and unique contributions throughout the summer residency, and especially in the math module</li> </ul>	<ul style="list-style-type: none"> <li>• The math module needs tighter linkage with the science instruction</li> <li>• Participants need more time for self-expression and more optional activities</li> <li>• Additional female adult chaperones are needed to sustain a higher quality of counseling within the residential module</li> <li>• The role of graduate student e-mentors and their citizen-scholar experiences was not clearly defined and explained</li> <li>• Three of the participants did not relish an intense “pre-college experience” and choose to withdraw from the program</li> <li>• A few participants were not emotionally mature enough to handle the intensity</li> <li>• Alternative eating options are needed to increase the holistic experience</li> </ul>

The above findings of the 2005 summer residency inform the planning for summer 2006. It is now time to implement the after-school science/technology club component of the program as an integral continuation of the summer residency. This component of the program will launch the e-mentoring aspect of the program, by focusing on four topics from the math module. Several science learning events and activities will be planned, along with local meetings for participants and their parents.

Additional planning will occur to strengthen the collaborative partnerships within Virginia Tech. An effort will be made to extend each science module into after-school

science/technology clubs and to identify related activities for continued exploration on an individual basis. It would be useful to offer participants the choice to deepen or broaden their knowledge by extending or expanding their current presentations into science projects.

This summary concludes with an expression of appreciation to the program's dedicated staff, generous supporters, institutional advocates, district partners, and parents for continued success of *VT STARS*.

## Teaching, Publications, Presentations, Outreach, Grants

### **Associate Vice President, Learning Technologies**

**Anne H. Moore**

#### **University Service:**

- Search Committee – Department of Music, Computer Music/Composer, CyberArts Cluster Hire; Assisted With Strategic Planning For Cluster Hire Proposal, Spring 2005.
- University Coordinator – WCET/Observatory on Borderless Education International Benchmarking of E-Learning at Virginia Tech, Spring 2005.
- University Director – Center for Innovation in Learning; Provide grants for e-learning development with funds when available; Coordinates annual XCaliber Award.

#### **Teaching**

- UAP 5564-95668 – IT, Society and Public Policy. Fall 2004

#### **Publications**

- “Community Development for a New Economy: Lessons Learned from the Dan River Regional Effort.” Virginia Issues and Answers. Spring 2005.
- “Faculty Development for the Net Generation.” In Jim Oblinger and Diana Oblinger (eds.) Educating the Net Generation. Educause E-book, February 2005. With John F. Moore and Shelli B. Fowler.
- “Technology, Learning, and Change: Community Development Revisited.” Educause Quarterly. Vol. 7, No. 2, 2004.
- “Great Expectations and Challenges for Learning Objects.” Essays on Teaching Excellence. Vol. 15, No. 4. The Professional & Organizational Development Network in Higher Education, 2003-2004.

#### **Presentations**

- “Classrooms of the Future: the State of the Art in Education Communications Technology.” April 2005. Conference on Improving Rural Communities Through New Age Technologies. The Institute for Advanced Learning and Research. With Sharon Pitt, Rachel Fowlkes, Jeffrey Seifert, Thomas Hammond. Danville, VA.
- “Education and Rural Prosperity: Raising the Bar.” April 2005. Conference on Improving Rural Communities Through New Age Technologies. The Institute for Advanced Learning and Research. With Carol Inge, Kala Somerville, Jerry Hughes. Danville, VA.
- “New Models of Delivering Education, K-12 through Postsecondary.” March 2005. The Institute for Advanced Learning and Research. Danville, VA.
- “A Case for Change.” November 2004. WCET Annual Conference. With Patricia Cuocco, Gerard Hanley, Lee Alley. San Antonio, TX.

- “Community Leaders in a New Economy.” November 2004. Sorensen Institute for Political Leadership. Blacksburg, VA.
- “Faculty Development, Support and Training.” October 2004. Educause Annual Conference, Current Issues Roundtable Discussion, Moderator. Denver. CO.

### **Outreach Activities**

- Program Development Advisory Group and Activity Coordination – Institute for Advanced Learning and Research, Southside Implementation Team.
- Southern Growth Policy Board Focus Group on Rural Development – Institute for Advanced Learning and Research, Spring 2005.
- Conference Program Chair and Political Liaison—Electronic Campus of Virginia, Fall/Spring 2005.
- Task Force on Strategic Planning—Learning Technology Advisory Council, State Council of Higher Education.
- 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.

### **Educational Technologies**

#### **Teaching**

Staff members who have taught courses or done guest lectures are listed below. This does not include the many FDI workshops normally offered.

- John Moore: a guest lecture in Barbara Lockee’s graduate education course
- Jeshua Pacifici: several sections of English Composition, using Blackboard and the beta version of the Course Evaluation tool
- Eddie Watson: taught a section of GRAD 5984 – Critically-engaged Teaching with Advanced Technologies (Spring semester, 2004)

#### **Publications**

Moore, A.M., Moore, J.F., Fowler, S. 2005. *Faculty Development for the Net Generation*. Chapter 11 in *Educating the Net Generation*. An EDUCAUSE eBook.  
<http://www.educause.edu/EducatingtheNetGeneration/5989>.

Plymale, W. (2005). *Pervasive Computing Goes To School*. EDUCAUSE Review 40(1): 60-61.

#### **Presentations**

Aaron Zeckoski and Bill Plymale: Mitra, A., Cartolano, R., Plymale, W., Zeckoski, A. (2005, June). An on-line course evaluation system in the Sakai framework. Presentation at the Sakai Educational Partners Summer Conference, Baltimore, MD.

Kim Gausepohl: As part of her masters degree course work Kim Gausepohl presented an interface mock-up of a notification system for students with memory and attentional deficits to the Assistive Technologies unit.

John Moore: Laudato, N., Watson, C.E., Moore, J. (2004, June). *Faculty instructional labs: Now that you've built them, are they coming?* Presented at the New Media Center annual conference, Vancouver, BC.

Laudato, N., Moore, J., Watson, C.E. (2004, October). *Faculty instructional labs: Now that you've built them, are they coming?* Presented at Educause 2004 conference, Denver, CO.

Moore, J.F., Morrone, A.S., Murphy, C. M. (2004, October). Staff Development Potpourri. Panel presentation at Educause 2004 conference, Denver, CO.

Cambridge, D., Cambridge, B., and Moore, J.F. (2005, January). E-Portfolios.

Pre-conference seminar presented at the Educause 2005 Mid-Atlantic Regional Conference, Baltimore, MD.

Bill Plymale: Thompson, M., Plymale, W., Hager, C., Henderson, K., Midkiff, S., DaSilva, L., Davis, N., Park, J. Ad Hoc Networking Support for Pervasive Collaboration. (2004, September). Poster presented at UbiComp 2004, Nottingham, England. <http://ubicomp.org/ubicomp2004/adjunct/posters/thompson.pdf>

Eddie Watson: Ewing, T., Lehr, J., Nelson, A., Watson, C.E., Hicks, D., (2005, March). How can educational technology improve content knowledge and classroom pedagogy? Teaching history and preparing teachers with the Digital History Reader. Paper presented at the annual international conference of the Society for Information Technology and Teacher Education, Phoenix, AZ.

Watson, C.E., Schwartz, E.E. (2004, November). Blended instruction: Taking the best of both worlds. Paper presented at the annual conference of the South Atlantic Modern Language Association, Roanoke, VA.

Depauw, K., Fowler, S., Watson, C.E. (2004, November). Changing the academy: Faculty and graduate student development at Virginia Tech. Paper presented at the annual conference of the South Atlantic Modern Language Association, Roanoke, VA.

Laudato, N., Moore, J., Watson, C.E. (2004, October). *Faculty instructional labs: Now that you've built them, are they coming?* Paper presented at Educause 2004, Denver, CO.

Ewing, T., Watson, C.E., Stephens, R., Hicks, D., (2004, October). The digital history reader: Enhancing learning and understanding in world and US history. Paper presented at the annual conference of the International Society for Exploring Teaching and Learning, Baltimore, MD.

Laudato, N., Watson, C.E., Moore, J. (2004, June). *Faculty instructional labs: Now that you've built them, are they coming?* Paper presented at the New Media Center Summer Conference, Vancouver, BC.

Graduate Education Development Institute  
Shelli B. Fowler

### Teaching

- Five sections of the GEDI course, GRAD 5114
- Guest lectured/taught two classes in the VT STARS/CSE preparatory course.

### Publications

“Faculty Development for the Net Generation,” co-authored with Anne Moore and John Moore in Education the Net Generation, Diana G. Oblinger and James L. Oblinger, Eds. Available at [www.educause.edu/educatingthenetgen/](http://www.educause.edu/educatingthenetgen/)

### University Service

Interim Director of Composition, Department of English, 2004 – 2005

### Assistive Technologies

Bill Holbach

Hal Brackett

### Lectures and Presentations

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 5314: 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 the unique AT application and the built-in accessibility in standard software packages.

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.

EDCT 5604: Career & Technical Education “Foundations of Vocational & Technical Education” focuses on the learning environment for all students, regardless of age or disabilities. The class was most interested in learning about technologies that were found to be effective with individuals with learning disabilities.

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.

EDSP 566: (Radford University) "Teaching Students with Individualized Adapted Curriculum" Study of curriculum, methods, techniques, and materials used in the education of students who have disabilities that require individualized planning to design curriculum goals appropriate to their needs. Typically, these students have intermittent, limited, or extensive support needs. Educational planning and program content for primary, intermediate, and secondary levels is addressed.

Miscellaneous Lectures and Presentations: During the reporting period, Assistive Technologies has presented on a range of topics involving AT and accessibility issues within the university community. Included were presentations for the Faculty Development Institute (FDI), for Information Technology at Departmental Computer Support Symposiums (DCSS), and for a variety of university departments to include Personnel Services (computing services and the Office of the ADA Coordinator).

## Outreach

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: 190 students, and 115 parents, teachers, or consumers.

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. Estimated attendance: 50 students and 60 parents in one lecture and six workshops.

Youth Leadership Forum (YLF-VA) "Empowering Young Leaders for the 21st Century": The YLF-VA program seeks to empower young people with disabilities to further 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: 80 students in one panel discussion and five workshops.

C-Tech2 Computers and Technology at Virginia Tech: A College of Engineering program open to rising junior and senior women 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. Estimated attendance: 60 students in four workshops.

Imagination “Imagine yourself an engineer at Virginia Tech”: A College of Engineering program in partnership with Roanoke City Schools that is open to eighth and ninth grade students from Roanoke and Montgomery County. The focus of the program is to allow minorities to have access to information and technology that would help them prepare for college and careers in technology, science, and engineering. Estimated attendance: 60 students in four workshops.

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: 30 students in two workshops.

#### Other Miscellaneous Activities

AT Coordinator serves as a resource for the ADA Executive Committee which meets monthly to address university compliance with the Americans with Disability Act (ADA). ADA Executive members are comprised of ADA related support personnel from throughout the university, as well as consumers of ADA and AT related services.

#### VT STARS

Ed McPherson

#### Grants

- US Department of Education—\$397,640
- Jessie Ball DuPont—\$117,361
- Verizon—\$9,000





## Network Infrastructure and Services

Network Infrastructure and Services exists to enable Virginia Tech to succeed in its overall mission by providing and managing the 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 and the research and outreach missions of the university, while embracing our role as a corporate citizen within the local, state, regional and international communities, and
- Remaining sufficiently flexible to pursue aggressive development and expansion of new services.

### Introduction

Network Infrastructure and Services (NI&S) creates and manages technological solutions to enable Virginia Tech to accomplish its mission of instruction, research, and outreach. Our goals are to identify and adopt those solutions meeting current needs as well as future demands and those providing the best combination of price, performance, and productivity enhancements.

Virginia Tech's campus network has grown from an initial small network giving mainframe access to a select group of on-campus researchers and administrators in the 1970's to a large and sophisticated resource playing an integral part in the daily lives of all members of the university community.

In early 1984, the university announced the formation of Communications Network Services (CNS) as a new organizational entity established to consolidate voice, data, local area networking, wide area networking, satellite, microwave, and video communications responsibilities. This organization grew out of the Networking group in the Virginia Tech Computing Center. One of the main goals for CNS was to install a voice and data PBX along with cable TV systems to serve faculty, staff, administrators, and students.

In 1988, CNS deployed a state-of-the-art ROLM CBX voice/data system, which became the largest deployment of its type. The easy access to ROLM data lines facilitated a dramatic increase in network users. Foresight on the part of the CBX switch planners resulted in a telecommunications infrastructure reaching almost every corner of campus and allowed additional levels of connectivity to the desktop user as the need for increased bandwidth and more sophisticated technologies continued to grow. The original infrastructure, continuously enhanced, expanded, and updated, is the foundation for our network today.

Through the years, Communications Network Services has also provided the leadership for ground-breaking projects such as the Blacksburg Electronic Village and NetworkVirginia. Now, CNS is just one part of the much larger and more comprehensive NI&S organization. Over the past five years, Mr. Erv Blythe, Vice President for Information Technology, aligned technology infrastructure units under the Associate Vice President for Network Infrastructure and Services, Ms. Judy Lilly. NI&S currently includes Systems Support, University Computing Support (UCS), and the Virginia Tech Operations Center (VTOC), which provide support for 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. The Network Infrastructure and Services organization creates a strategic advantage by leveraging internal systems development to create management systems allowing the integration of all of its information needs and to adapt quickly to new requirements and a changing environment.

Virginia Tech's campus-wide network and the entire Network Infrastructure and Services organization are a reflection of the ongoing commitment and dedication to thoughtful planning and management practices. 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, media 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 video conferencing, 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 directly participates in and supports the development of regional, national, and world-wide high-performance research computing and communications networks.

Reporting to the Vice President for Information Technology, 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—faculty members, researchers, students, administrators and staff. NI&S is increasingly becoming directly involved in research activities and is expanding its partnerships and collaboration with faculty members to help the university achieve its goal to be ranked among the “Top 30” institutions in research and scholarship.

In all of its operations, NI&S emphasizes sound fiscal management. Its highly skilled workforce of approximately 210 professionals, as well as almost 100 students employed in various wage positions, is distributed among Communications Network Services, Systems Support, University Computing Support, Video/Broadcast Services (VBS), the Virginia Tech Operations Center (VTOC), University Printing and Digital Imaging Services, and University Mail Services.

**Network Infrastructure and Services Staffing**

<b>Units</b>	<b>Personnel</b>
Communications Network Services	110
Systems Support and University Computing Support	
<i>Help Desk / 4 HELP</i>	21
<i>Server Administration</i>	12
<i>E-Commerce Clients</i>	8
Video/Broadcast Services	14
University Printing and Digital Imaging Services	26
University Mail Services	19

Maintaining and enhancing an advanced communications infrastructure and remaining at the forefront of technology services require an up-to-date and evolving funding model. Organizational units within Network Infrastructure and Services are supported from a combination of auxiliary, education and general (E&G), 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 continually upgrade the network. NI&S also participates in funded sponsored projects and research.

Virginia Tech relies on Network Infrastructure and Services 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 <http://www.cns.vt.edu/> and Judy Lilly, the Associate Vice President, Network Infrastructure and Services, may be reached at (540) 231-2599.

## Network Engineering and Operations

Network Engineering and Operations includes Research and Development and Project Management, led by Carl Harris, Director for Network and Systems Engineering; Network Engineering, led by Brian Jones; the Virginia Tech Operations Center, led by Joyce Landreth, Switch Engineering, led by Barry Linkous; and Systems Support and University Computing Support, led by Joyce Landreth.

### Research and Development

Members of Network Infrastructure and Services' Research and Development group contribute to the innovative implementation of networking technologies throughout the university and beyond our campus at local, regional, and national levels.

The advice of these individuals 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. 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.

Led by Carl Harris, Director, Network and Systems Engineering, the Research and Development group provides planning and design support for implementing new and upgraded network services. The following wide-ranging projects will enable future enhancements in areas such as distributed computing, wireless networking, regional and national networking infrastructure, and network security.

*Campus Wireless Deployment.* Designed and deployed an 802.11B/G wireless network covering approximately 85 percent of administrative and academic space on the Blacksburg campus and the Northern Virginia Center.

*Network Access Security.* Designed and implemented authentication systems allowing only authorized users access to the Virginia Tech network from public portals and the wireless network. Provided test applications to allow temporary access to campus visitors and guests such as reporters and recruiters.

*Access Grid Node.* The Access Grid® is an ensemble of resources including multimedia large-format displays, presentation and interactive environments, and

interfaces to Grid middleware and to visualization environments.<sup>1</sup> Virginia Tech's first room-based Access Grid Node, with multiple projectors, cameras, computers, and other multimedia components, was completed in Research Building XIV. The Node has provided production services ranging from a thesis defense to multiple meetings of the Multi-Sector Crisis Management Consortium as well as allowing campus participation in conferences associated with the National Science Foundation and supercomputing. This facility also serves as a research platform for multi-site, high-bandwidth, multicast visual, aural, and presentation distribution.

*Virtual Private Network (VPN) Services.* Developed, tested, and deployed multiple Virtual Private Network solutions providing secure access to campus resources from insecure public networks including remote Virginia Tech campuses and offices, private homes, and the Internet in general.

*Videoconferencing.* Virginia Tech's Asynchronous Transfer Mode (ATM) videoconferencing infrastructure is aging. Internet Protocol-based videoconferencing has become more reliable since we deployed the legacy ATM system some years ago. Research into and development of H.323-based systems will allow the deployment of key core equipment enabling this new technology to work with our existing systems as we continue the transition.

*Telecommunications Infrastructure Upgrade Planning.* As the need for bandwidth increases, NI&S is planning for deployment of our next-generation communications infrastructure. The initiative, with the first deployment planned for October 2005, will put gigabit Ethernet services at every portal on campus and upgrade the current telecommunications infrastructure to allow another ten years of service.

*Internet Protocol—Version 6 (IPv6).* Designed and implemented an IPv6 overlay network across campus allowing testing and research of this next-generation technology.

*Video Network Operations Center (VNOC) Upgrade.* The VNOC provides connection and monitoring services for Virginia Tech's video distribution, transmission, and conferencing facilities. Over the past year, the VNOC has undergone extensive redesign and upgrades to increase operational flexibility, enhance levels of monitoring and quality control, and to integrate the cable television playback operation into the Center. Research and Development provided overall design direction throughout the process.

*Project Management.* Appropriate implementation of new services increases utility while decreasing potential interruptions of existing services. Development of a project management infrastructure has increased our ability to coordinate tasks and resources across areas, enabled tracking of progress, and increased on-time completion of tasks. Continuing efforts in this area include the development of an integrated and centralized project management server to allow easier sharing of information and status.

---

<sup>1</sup> Access Grid Homepage. <http://www.accessgrid.org>.

Load Balancing. Designed and implemented a centralized, managed, load-balancing solution providing increased availability and reliability for important university applications including Banner, web portals, and streaming video services.

TACACS/Radius. Upgraded the centralized authentication and authorization servers.

Dynamic Host Configuration Protocol Service (DHCP) Upgrade. Migrated the campus DHCP services to new hardware and software providing increased performance and lower operating costs through the use of more reliable and manageable open source platforms.

Modem Pool Enhancements. Upgraded the Virginia Tech modem pool service and equipment to provide increased capabilities and security.

Network Time Protocol Servers. Network Time Protocol provides a network-based approach to synchronize time across the network. NI&S's final design and deployment of a distributed, triple redundant cluster of servers provides the accurate time standard by which Virginia Tech operates.

Fiber-optic Infrastructure Specifications. Proposed and adopted new standards for fiber-optic installation on campus using single-mode fiber in most locations and angle polished connectors to allow higher bandwidth usage.

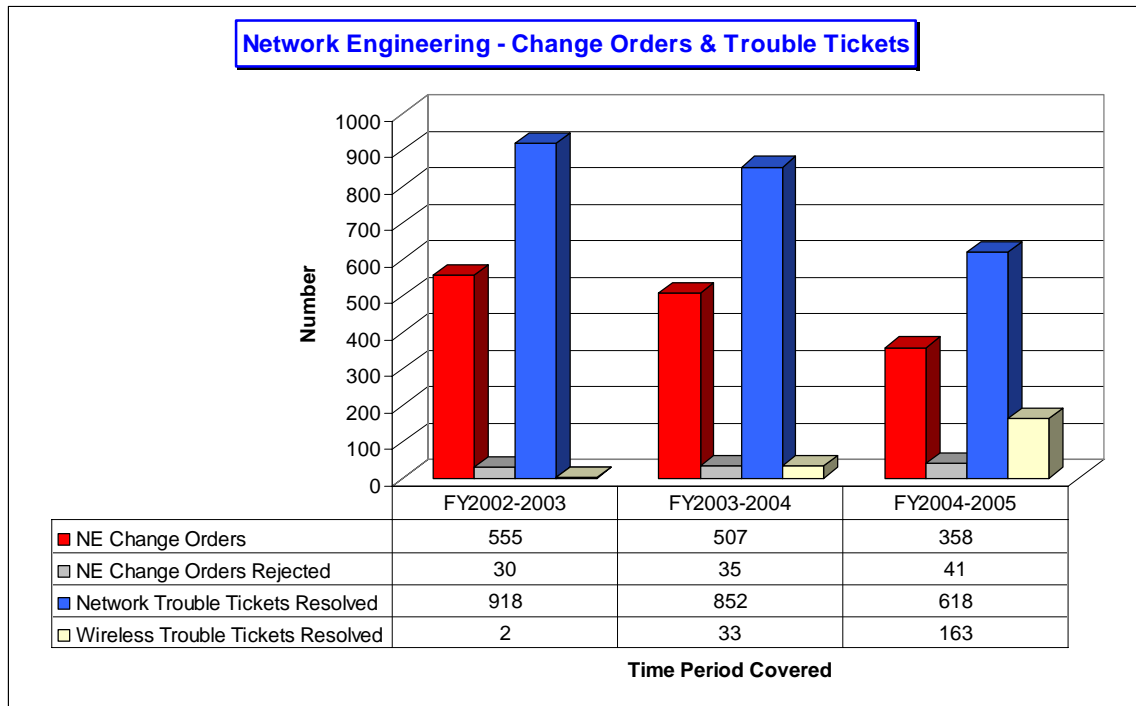
Conference Room. Designed and installed multimedia upgrades to conference rooms and classrooms in Research Building XIV. Enhancements include projectors, dedicated computers, telephone conferencing systems, and sound reinforcement.

## **Network Engineering**

The university's sophisticated core network serves the most challenging needs of university researchers as well as a myriad of administrative and learning applications. The network supports advanced grid-based computation, network-based collaboration environments, and other research efforts in key areas such as biotechnology, computer science, engineering, and mathematics. Our systems are designed to support the most advanced telecommunications services currently available as well as newly evolving technologies.

Supporting this network is a Network Engineering team of highly skilled information technology specialists with 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 also conducts research of network protocols 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 change management, authentication and authorization services, and performance measurement and analysis.

During the fiscal year of July 1, 2004, through June 30, 2005, 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” daily basis.



### *Network Service Upgrades*

*Bioinformatics.* Installed advanced network capabilities in the new Bioinformatics facility to support the unique needs of this Institute. Capabilities provided include 100 Mbps Ethernet to every user workstation, 1000 Mbps Ethernet for server applications, and wireless LAN (local area network) service throughout the facility. Advanced security measures required by the Bioinformatics Institute, to protect sensitive and valuable research data and applications, are also provided.

*Veterinary Medicine.* Upgraded network to 100 Mbps Ethernet for all user workstations and installed wireless access points throughout the facility.

*Dairy Science Complex.* Installed network services in the new Dairy Science Complex, providing Ethernet services using fiber-optic technology. This agricultural research complex is the first on campus to be served using these advanced capabilities and technologies.

*Virginia Tech Transportation Institute.* Upgraded network to 100 Mbps Ethernet for all user workstations. Routing equipment was upgraded to enhance performance and security.

Cooperative Extension. Assisted the Virginia Cooperative Extension agency in the design and implementation of a major upgrade of their statewide communications capabilities. The new network provides higher-speed connectivity using a combination of vendor-provided Internet access services and a secure virtual private network overlay.

Major Williams Hall. Installed switched 100 Mbps Ethernet backbone, eliminating a legacy shared 10 Mbps backbone and providing improved network speeds to user workstations.

Computer Science. Upgraded Computer Science network connections in McBryde Hall, providing 100 Mbps Ethernet to every user workstation.

Donaldson Brown Hotel and Conference Center. Improved wireless LAN coverage within this older structure by analyzing radio frequency propagation characteristics and strategically placing additional wireless access points.

IT Administrative Systems. Developed and deployed a high-performance server load-balancing solution to support the Internet Native Banner initiative, as well as to provide load-balancing service for the Enterprise Directory, Filebox application, and web-hosting services.

East Eggleston Hall. Installed fiber-optic gigabit Ethernet backbone, eliminating a legacy shared 10 Mbps backbone and providing improved network speeds to user workstations.

Residence Halls. Improved security of network connections used by Residential Programs for administrative purposes by isolating these connections from those used by resident students.

Kent Square. Extended campus fiber-optic cable plant to this off-campus office, providing reliable and affordable communications capabilities to offices of the Executive Vice President located there.

201 Church Street. Extended campus fiber-optic cable plant to this off-campus office space used by University Development and Investments and Debt Management increasing network speeds and eliminating monthly costs for network access provided by an outside vendor.

3101 Commerce Street. Provided an inexpensive ISDN-based solution to support Mechanical Engineering department users at this site in the town's Industrial Park.

Teske House. Consolidated switching equipment to downstairs location of the Women's Center improving maintenance access and reducing customer interruptions.

Special Broadband Installations. Using an inexpensive DSL-based solution, provided network access to many locations on- and off-campus where fiber-optic cable plant is currently unavailable.



## *Security Improvements*

TACACS+ and RADIUS Upgrades. Developed and deployed additional software capabilities for the server supporting the TACACS+ and RADIUS authentication and authorization protocols. The new capabilities provide the basis for the wireless LAN authentication system, as well as providing the underlying functionality to support strong encryption on the Virtual Private Network service. Additional improvements include better diagnostics and monitoring capabilities for the server software and more informative logging of security-related events on the server.

Management Systems Access Encrypted. Management access to network equipment was migrated to the Secure Shell (SSH) protocol on all systems supporting this protocol. SSH provides transport layer encryption of management communications and significantly improves the security and integrity of the network management environment.

VPN Access Security Improved. Developed and deployed software to allow users of the Virtual Private Network service to use a password other than the one associated with their Virginia Tech PID. This enhancement improves security by providing the means for the user to avoid saving the PID password in the VPN connection profile on his/her computer.

Encryption Keys Strengthened. Developed and deployed software to strengthen the encryption keys used for authentication/authorization protocol exchanges between our network equipment and network management systems.

Vendor Security Advisories Management. Multiple security advisories were issued by our network equipment vendors during the reporting period. For each advisory, we evaluated the applicability of the advisory to our environment. Where applicable, we thoroughly evaluated the suitability and efficacy of vendor's proposed workarounds and tested updated software versions where appropriate. Software updates or other workarounds were deployed into the production network in a timely manner and were carefully coordinated using our Engineering Change Order (ECO) management system.

## *Network Management Improvements*

Systems Migrated for Efficiency. Migrated several critical network management systems from Sun Solaris platform to Linux platform. The Linux platform provides significant initial and ongoing equipment and maintenance cost benefits and has proven to be less complex and less costly to manage. Systems migrated from Sun Solaris to Linux include:

- Campus Domain Name Service (DNS) and Dynamic Host Configuration Protocol servers.
- Operations Center Problem Resolution System server (Remedy).
- Fault Management server (Smarts InCharge).

Performance Management System (Concord eHealth). Upgraded from version 4.7 to version 5.0.2. New benefits include improved data gathering and reporting components.

Fault Management system (Smarts InCharge). Upgraded from version 4.6 to version 6.2. New benefits include substantially improved “root cause analysis” for detecting the source of network faults, better integration with our other management systems, and improvements in software configuration management.

#### Other Network Engineering & Operations Accomplishments

- Resolved 781 second-level diagnostic trouble tickets escalated by the Virginia Tech Operations Center.
- Processed over 3000 move, add, or change network orders and repair requests.
- Researched and purchased new edge-switching hardware platforms for testing improved network functionality.
- Participated in determining the new CNS fiber standard for using angle polish single mode fiber to allow for future bandwidth expansion in support of university networking needs.
- Participated in planning discussions concerning new network topologies to provide support for research computing and network needs.
- Participated in Gig2Desk planning sessions for providing the university academic community with Gigabit Ethernet capabilities at the desktop.

Network Maintenance Contracts. Reviewed maintenance quotes and contracts to ensure accuracy for fault and performance management software, trend analysis and capacity planning software, network testing hardware, as well as servers and systems hardware. Determined license requirements for fault and performance management systems. Developed budget requests for needed licensing and maintenance requirements for software and hardware.

#### Television and Satellite Uplink Operations

- Provided daily satellite uplink service for 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 Athletics Department.
- Provided rapid response to reported television service outages to maintain a high level of service availability.
- Extended campus television service network to the new Bioinformatics facility.
- Completed the planning and selection process for replacement of the High Power Amplifier to extend the useful life of the satellite uplink facility.
- Worked in conjunction with local cable providers to resolve public access programming quality and presence issues.

- Completed integration of media playback and instructional video operations functions to the Virginia Tech Operations Center.
- Trained Virginia Tech Operations Center personnel to provide support and backup for satellite uplink operations.
- Updated and refined satellite uplink operations manuals and procedures during training efforts.
- Acted as consultant to Student Programs on a project to offer new and premium cable television entertainment services.
- Provided satellite uplink to commercial television networks for media events involving University Relations, the Athletics Department, and the Graduate School.

## **Virginia Tech Operations Center**

The Virginia Tech Operations Center (VTOC) provides a single point of contact for support of the university's central Information Technology services. The Center, which serves the campus as well as locations around the Commonwealth, 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 twenty-four hours a day, seven days a week for telecommunications, central IT services, constituents' computing platforms, cable television, 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.

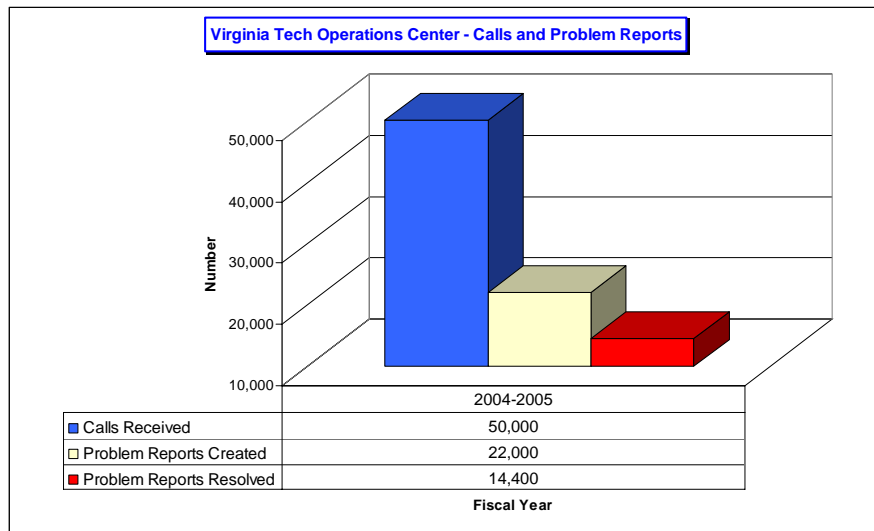
The Operations Center supports the unique needs of the university computing and network environment by receiving initial trouble calls or web-submitted inquiries from faculty, staff, alumni, retirees, parents, and students. Problem tickets are opened to track the diagnosis, escalation (if required),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

VTOC support, communications and operations efforts during the period beginning July 1, 2004 and ending June 30, 2005 included:

### General Support

- Received approximately 50,000 calls, answering the majority directly
- Created approximately 22,000 problem reports that required more investigation
- Resolved approximately 14,400 problem reports, after excluding the spam in the initial reports
- Monitored the network continuously for service faults and degradation and escalated alarms to engineers as required
- Coordinated the replacement of 4Help@vt.edu e-mail function with a web-based submission form for problem reporting. This change makes problem reporting easier for users and saves staff time previously needed to separate spam from genuine requests for assistance.
- Increased staff mobility and productivity through the use of wireless headsets

- Strongly encouraged use of MyVT and VTnet 2004 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 and VTOC for various internal and external groups



“Calls received” are total calls, with the majority of calls that were handled immediately and required no problem report. “Problem Reports Created” included “spam” received when accepting e-mail requests for assistance, prior to transitioning to a web-only trouble-ticket system. “Problem Report Resolved” indicates the number of help requests received and subsequently resolved that required investigation and/or referral to resolve.

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 2004 “Fall Rush” period was another successful support endeavor. Planning for this effort involved the training and scheduling of 53 volunteers for 400 hours of extended support time. The volunteer training packet was completely redesigned and four training sessions were held to provide hands-on experience for volunteers. During this slightly greater than two-week period, the VTOC received over 7300 calls. During this time, Operations Center personnel also assisted with the deployment of the computer authentication project for residence hall students.

Wireless Network. In connection with the campus-wide wireless deployment, the VTOC staff provided technical and ‘frequently asked questions’ support for the user community. Questions included those about the wireless network deployment schedule, wireless availability, registration, rates, and coverage, as well as set-up and troubleshooting. The VTOC staff also provided support for March and June 2005 meetings of the Board of Visitors to ensure uninterrupted wireless availability.

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

*Uplink Operations Support.* Support calls for classroom video playback are now received in the Operations Center. Diagnosticians are able to initiate and terminate Teleport uplinks and downlinks and are receiving on-going training on Teleport operations which will allow them to provide support for that area whenever needed.

*Video Network Operations Center (VNOC).* The reorganized Video Network Operations Center is now an integral part of the Virginia Tech Operations Center. The VNOC works with the local cable company to make sure programming from the campus television station, VTTV, is provided on a nightly basis. VNOC personnel also provide support for videoconferencing used for distance learning, employment interviews, and meetings. A new call flow pattern was designed to improve response time and allow technical support staff and management immediate access to the call center staff whenever needed.

*Communications.* When troubleshooting problems and advising the campus community about network outages, accurate and timely communications are critical. Communications between the CNS website, the trouble call distribution flow, computing.vt.edu, MyVT website, 4Help, and the VTOC have been significantly improved. The campus community benefits from access to multiple locations where clear, consistent outage information can be found.

The VTOC also serves as a communications hub for campus computer professionals through e-mail, website, and in-person visits. Online contact lists and procedures have been developed allowing immediate access to other Information Technology groups including middleware, Microsoft Implementation Group (MIG), Content and Knowledge Management (CKM), and Online Course Support (OCS). A Call Center “hotline” provides immediate access to the VTOC by technical support staff and management. Listservs are used for faster dissemination of important information as well.

*Operating Policies, Procedures and Documentation.* The following policies, procedures, and documentation were developed or updated:

- Online on-call procedures to provide contact information for support and management personnel
- Teleport uplinks/downlink operational procedures
- Detailed call flow procedures and documentation for support of the Edward Via Virginia College of Osteopathic Medicine
- Manager-on-Call group procedures including executive support staff training
- Redesigned VTOC operational policy for confidential data
- Wireless user support and technical documentation updated and moved to the Knowledge Base

- Enhanced the Customer Support Center (CSC) Dashboard. The Dashboard is a web page and portal with information and links to online support tools, the Knowledge Base, contact lists, and the on-call schedules.
- Key-handling training and procedures

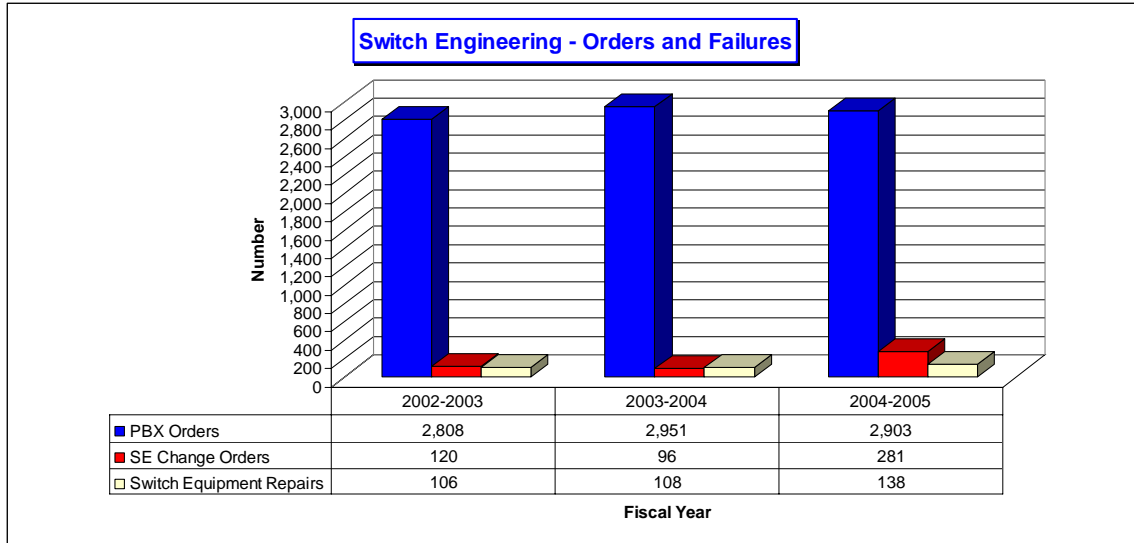
*Restructuring, Staff Development and Training.* Major changes were implemented throughout the VTOC areas to improve productivity, enhance customer support, and provide opportunities for staff to develop new skills. VTOC call center staff now use the same Consultant on Desk (COD) form in Remedy as the Torgersen personnel. This transition provided staff opportunities for training as COD backup, in quality assurance, and for other diverse duties. Personnel working in different locations were provided face-to-face interaction opportunities to increase familiarity, teamwork, and understanding of each unit's successes and potential for improvement.

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. All staff members have completed several Element K online tutorials covering a wide range of software. Industry certifications for technologies we support are also encouraged. 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.

## **Switch Engineering**

Switch Engineering (SE) is responsible for the configuration and maintenance of the university telephony systems on campus and at various other Virginia Tech locations. These systems, which support over 14,000 extensions, including both digital and analog devices, are comprised of a 14-node Siemens 9751 Model 70 CBX, Siemens 9751 Models 10 and 50, one HiCom Model 30e, and the 11-node PhoneMail system servicing the Blacksburg campus and the Northern Virginia Center.

The main goal of the Switch Engineering group is to offer the expected "five nines" of reliability (99.999 percent) for delivering telephony services to the university.



Following is a list of key projects undertaken or completed during the period:

*New Voice System Implementation and Evaluation.* Next-generation voice systems from Avaya, Alcatel, and Nortel were deployed and evaluations of these systems were completed. These evaluations will provide the information needed to support the decision-making process for obtaining a new, state-of-the-art telephony system for the university. The evaluations incorporated the following:

- Integration with existing telephony applications such as Call Detail Recording (CDR) and E911.
- Shared trunking facilities between Siemens, Nortel, Avaya, and Alcatel using the AdTran Atlas 830 Enterprise Intergraded Access Device.
- Extension to cellular – pushing campus extension calls to cellular phones with the on-campus switch controlling the call process.
- IP Softphones.
- Voicemail applications and clients.
- Necessity for providing interoperability and security in a converged network.
- Training classes on the operation and functioning of telephone instruments and all associated applications.

*Enhanced E911 Services.* Working with the university’s vendor, OSSI, and the Virginia Tech Police, developed and completed the integration of the vendor’s E911 software application with the university’s telephony systems to provide enhanced emergency response. This new service replaced the legacy 911 system with an E911 service including the location information for all calls from the campus and a special “call enunciator service” for the Inn at Virginia Tech and Skelton Conference Center.

Provided the Virginia Tech Police Department with the ability to call and also establish conference calling with the local Blacksburg E911 and Emergencies Services from their on-campus E911 system.

*Veterinary Medicine IVR Application.* Switch Engineering personnel developed a working prototype of an Interactive Voice Response (IVR) application for Vet Medicine. This system offers college and hospital administrators the flexibility to handle after-hours emergencies with notification of on-call personnel via cellular and paging services.

*Increased CBX Operating Efficiencies and Routing Optimization.* Switch Engineering is constantly working to increase the operating efficiencies of existing CBX hardware and to optimize trunking facilities and dialing patterns to insure the lowest possible costs to the university.

During the period from January 1, 2004 through June 30, 2005, the following CBX optimization projects were completed:

*CBX Alarms.* Developed and implemented scripting applications for notification, identification, and acknowledgement of CBX alarms and special conditions to the responsible Switch Engineering personnel.

*CBX Dialing Patterns.* Standardized dialing patterns for all campus CBX switches and applications.

*Processing of Toll Charges.* Eliminated toll charges incurred when users dialed numbers local to Blacksburg by using a long distance (1 + area code + number) dialing pattern.

*PhoneMail Networking.* Networked the main campus and Northern Virginia Center (NVC) PhoneMail systems to allow the transfer and sharing of voicemail messages between the two systems.

*Traffic Analyses.* Completed voice traffic analyses/optimized trunk resources resulting in the disconnection of certain facilities and significant cost savings to the university.

*Consolidation of CBX Switches.* Continued consolidation of CBX nodes resulting in the removal of underutilized nodes, reduction in power consumption, and reduction in occupied switchroom floor space.

*Efficient Use of Extensions.* Renumbered NVC internal extensions to better utilize internal and DID extension resources.

*Electric Service Switch.* Extended voice services to the new Virginia Tech Electric Service facility by installing and networking an additional CBX to main campus.

*Emergency "Blue Light" Phones.* In cooperation with the Virginia Tech Police Department, Switch Engineering provided oversight for the installation of 15 additional emergency phones throughout campus.

*University Relations Emergency Closing Application.* Expanded the functionality of the Emergency Closing application to provide additional capacity and more efficient call



distribution during periods of extremely high call volume to the Virginia Tech Weather Line.

*Inn at Virginia Tech and the Skelton Conference Center.* The Inn at Virginia Tech and the Skelton Conference Center features 147 guest rooms and over 20,000 square feet of technologically advanced and flexible meeting space including a ballroom with a seating capacity of over 700, a dedicated auditorium, and individual conference rooms. The SE team researched, designed, procured, and installed all of the voice equipment and the associated systems (Voicemail, Call Accounting, and E911 Enunciator) for the facility, which is the largest hotel and conference center in Virginia west of Roanoke. SE was also responsible for integrating the telephony systems with the hotel's property management system. Providing complete functionality and all required features, the telephony services at the Inn and Conference Center are directly connected to the Virginia Tech CBX via two T1 circuits. To ensure the most rapid response possible in the event of an emergency, the new E911 Enunciator provides both visual and audible alerts to the front desk at The Inn at Virginia Tech and to the Virginia Tech Police Department when a 911 call is received from any of the hotel's telephone numbers.

*"Self maintainer" for University Telephony Systems.* Provided telephony services at 99.999 percent reliability. As a self maintainer, CNS is able to call the Siemens Technical Assistance Center (TAC) directly for consultation and technical assistance in the resolution of major problems with Siemens equipment (on-site Siemens technical support is available at time and materials rates, if needed).

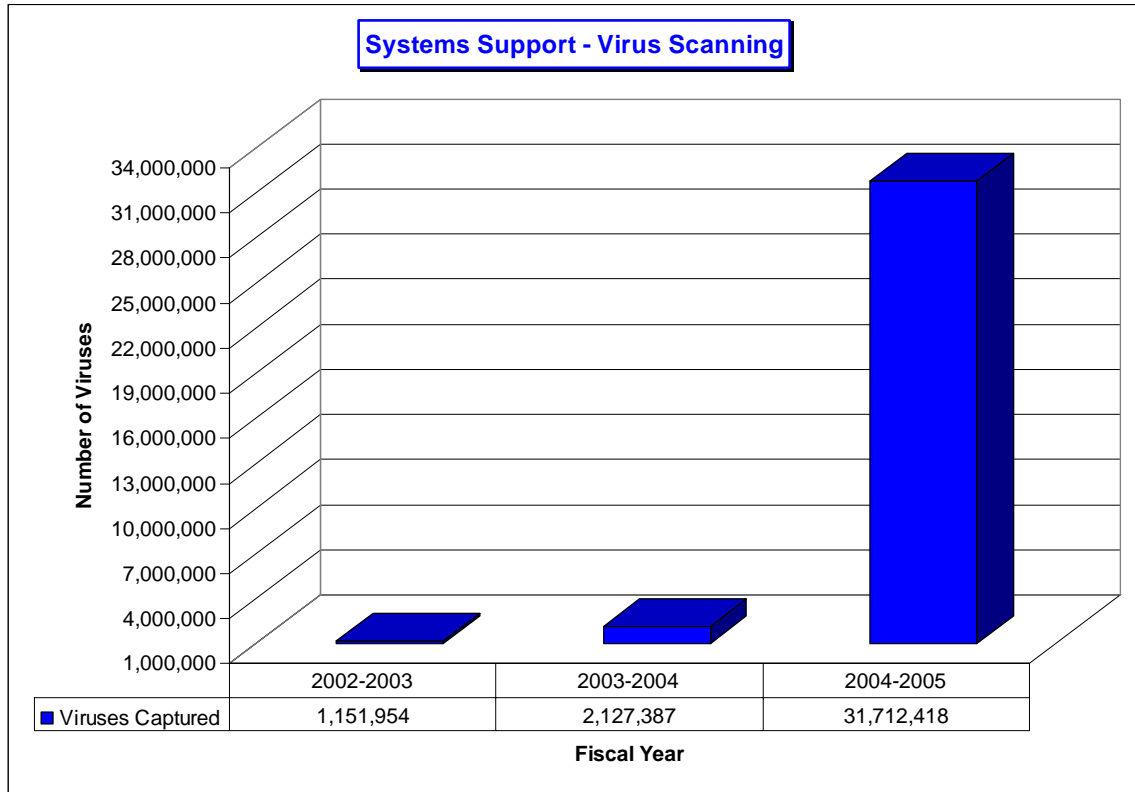
## **Systems Support**

Systems Support administers the campus e-mail services and is responsible for the server hardware and operating system software on which the university's enterprise applications operate. Using "best practices" for systems administration, the group supports the university community by providing a robust technical computing infrastructure with secure, reliable, centralized services.

Following is a brief summary of Systems Support's accomplishments during the period July 1, 2004 through June 30, 2005, with comparative data for the prior two fiscal years.

### **E-Communications Services/Windows Administration Services**

*Upgraded virus scanning and spam filtering capabilities.* Blocked over nine million viruses from delivery on campus during the period. Also began studying possible approaches to improving spam-handling capabilities.



Upgraded main campus e-mail service:

- Installed new computer hardware (Sun Fire 4800).
- Migrated to new e-mail software and transferred users and mail boxes to new disk storage.
- Assisted with the deployment of the new Enterprise Directory while supporting authentication for users of the old central directory.
- Increased storage available to the main campus e-mail server in preparation for offering new services.
- Upgraded the main campus outbound mail relay to provide higher throughput for transferring outbound mail.

Increased storage capacity for Microsoft Exchange server. Supported increased demand from service users. Also began preparations and testing for migration to the next version of the software, MS Exchange 2003.

Mobile Messaging. Prepared pilot infrastructure to accommodate use of GoodLink service for “smart phone” devices (will replace central support of the BlackBerry devices).

Virginia College of Osteopathic Medicine. Continued support of the Edward Via Virginia College of Osteopathic Medicine for e-mail (MS Exchange) and directory (MS Active Directory) services.

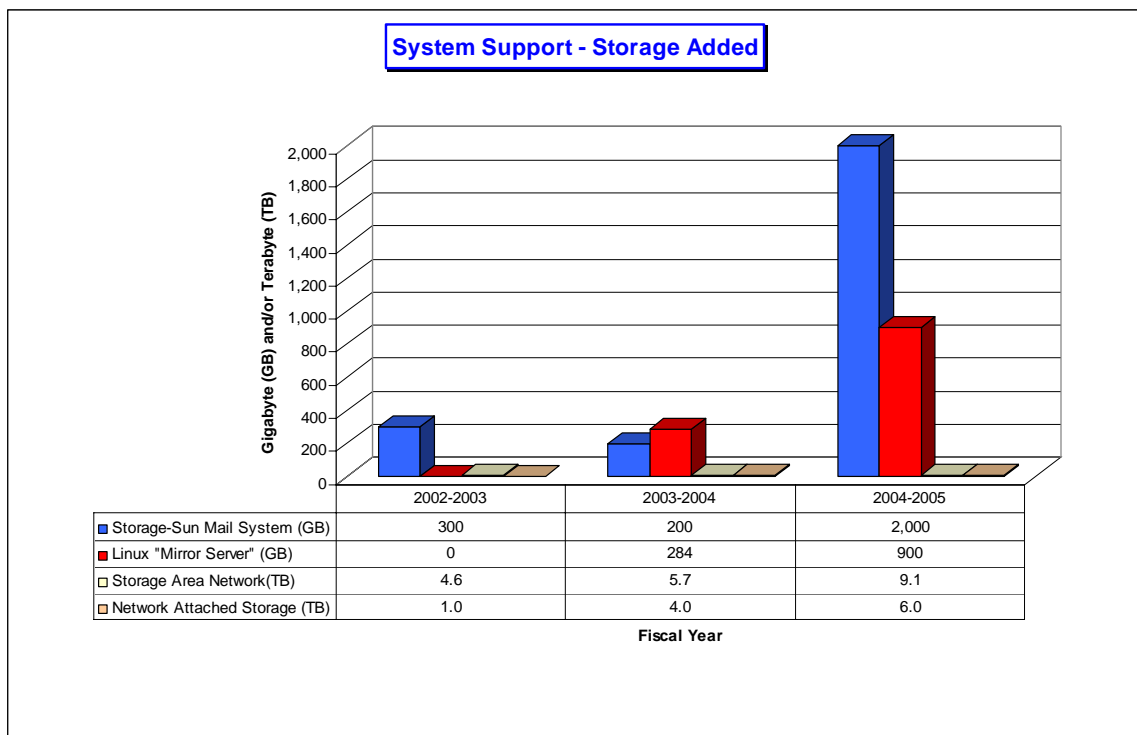
End User Security Scanning. Provided systems engineering support to a university security initiative for an end user security scanning service to allow all users on the Virginia Tech network to ensure their computers have the latest security patches installed.

Listserv service. 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 been essentially steady, delivering 250,000 messages to 1,000 active mailing lists per day during the fall and spring semesters.

### Storage Management Team

Network Attached Storage (NAS). Increased storage capacity by two terabytes (two trillion bytes) in order to support continued growth of departmental file sharing, the Virginia Tech Filebox service, and departmental web hosting applications. Eighty percent of all storage is used for academic and research purposes.

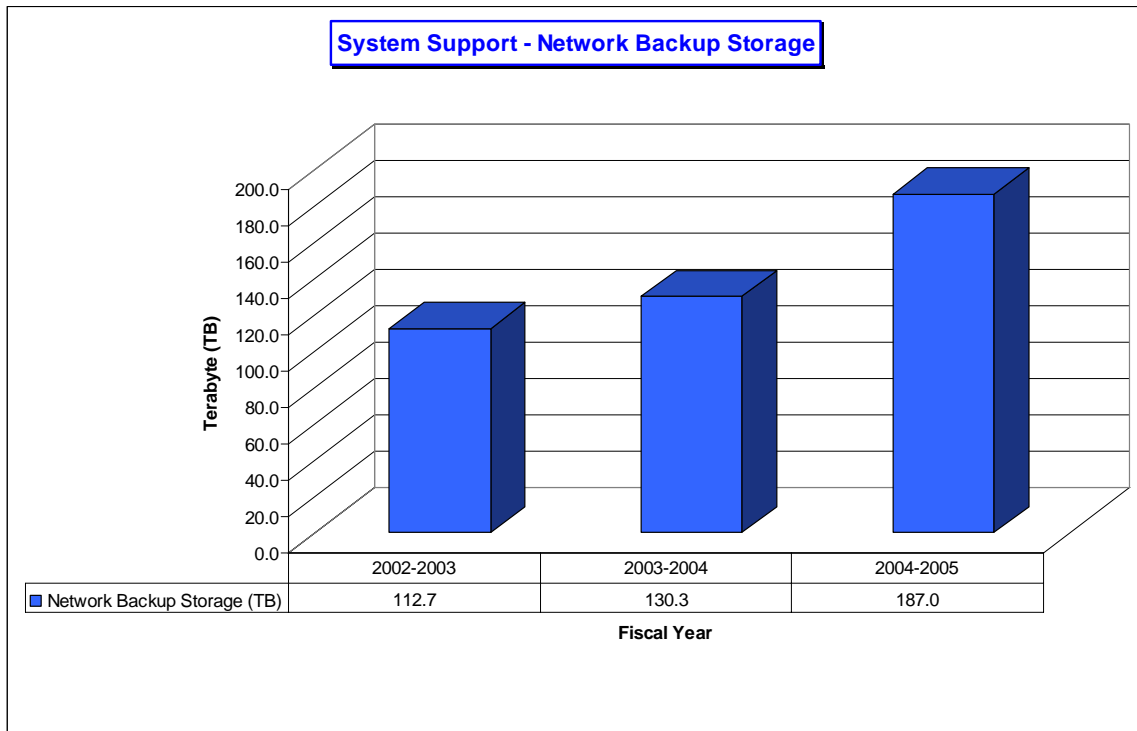
IBM Enterprise Storage Service (or Storage Area Network/SAN). Increased storage capacity by more than two terabytes in order to support continued consolidation of enterprise application (e.g. Banner) storage needs. System capacity was increased, providing sufficient resources to accommodate thirty additional server connections to the storage area network.



Network Backup Service. 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).

Over 900 clients store nearly eighty terabytes per month from the various desktop and server systems. For desktop systems, almost one terabyte per day is stored (925GB) for over 600 clients, representing a seventy percent increase in storage and a forty-five percent increase in clients over the past 24 months. For server systems, over one terabyte per day is stored (1.3TB) for over 290 clients, representing a 23 percent increase in storage over the last 24 months.



Support for Information Technology Security Lab

- Provided system administration support for the Engineering Security class and Security Lab machines, including the creation of test cases for students.
- Assisted with the performance of benchmark tests on various software and hardware products using software provided by the Center for Internet Security (CIS).
- Contributed case studies to the “SANS Institute/FBI Top 10 Internet Security Issues.” (SANS is the SysAdmin, Audit, & Network Security Institute)

Network Storage and Backup Technologies. Evaluated technical options for disk-to-disk backup, as well as other ways to improve reliability and performance of backup services.

Banner Performance Data. 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.

Research and Cluster Computing. Provided systems administration to the Research and Cluster Computing team and end user support to the university research community.

High-Volume Printing. Provided alternate printing solutions for the university's high-volume printing applications (such as W2 and 1048 forms, transcripts, form letters and student bills) when the current printer solution is unavailable.

Software Product Support. Provided support to the Information Technology Acquisitions' Software Distribution unit for software products including SAS, IMSL, Mathematica, and Matlab.

## **UNIX Administration Services**

Upgraded Banner Server Hardware. Virginia Tech's enterprise resource planning application, known as *Banner*, was updated. This effort included:

- Installing new hardware (a variety of Sun servers).
- Migrating Banner disk storage into the Storage Area Network (SAN) providing a higher level of data integrity and protection.
- System configuration changes to improve the manageability of the systems.
- Preparing and testing the infrastructure to support the deployment of the *Internet Native Banner* product module.

Sakai Test Bed. Prepared the infrastructure for the Sakai project test bed. Virginia Tech is an educational partner with the Sakai project, which is developing an open source Collaboration and Learning Environment solution.

Distance Learning Equipment Upgrades. Prepared the infrastructure and supported the Learning Technologies group during the Blackboard Course Management System upgrade, including the creation of temporary Blackboard application servers to resolve start-of-term system load and performance problems.

Web Hosting Moved to Linux Platform. Prepared the infrastructure and supported the migration of the Virginia Tech Web Hosting service to Linux-based systems.

Equipment Upgrade for Software Sales. Expanded the server hardware and disk storage providing Information Technology Acquisition's (ITA) software download service.

Information Warehouse Equipment Enhancement. Expanded disk storage supporting the Information Warehousing Report Management system.

## 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:

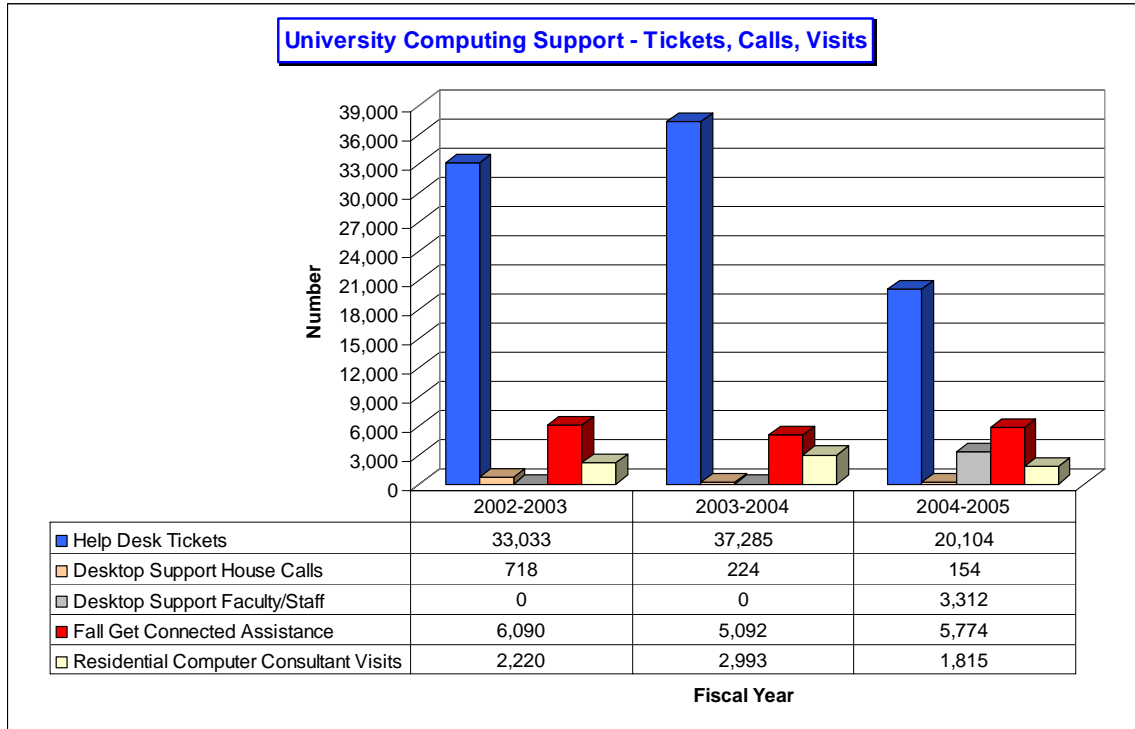
- VT Mail
- Exchange Mail
- Connections to the network or modem pool
- Blackboard
- Hokie SPA and Banner
- Network Attached Storage (NAS)
- Backup services

UCS also provides assistance with general computer issues including:

- Computer security
- Virus and Spyware removal
- Microsoft Office products
- General Windows and Macintosh computer issues
- Computer requirement questions

Requests about Virginia Tech Information Technology services may be received from faculty, staff, students, alumni, retirees, or prospective students, and are handled by staff at the "4Help" phone line. Regardless of affiliation, a person may report a problem at any time by calling the Virginia Tech Operations Center (VTOC). Any problem the VTOC staff cannot handle is submitted as a problem ticket for UCS. In addition, people may report problems using the UCS web form at <http://4help.vt.edu>.

UCS statistics for the period of July 1, 2004 through June 30, 2005, with comparative data for the prior two fiscal years:



*Faculty/Staff Support.* A team of three or four UCS staff members, with one on “active duty,” is responsible for the faculty/staff support desk. Most problems are handled by telephone within a half hour. More complex problems may require research by UCS staff, coordination with other groups within Information Technology, or a “house call” before they can be resolved. Primary areas of support include Banner, the Exchange service, Virginia Tech e-mail, and storage-related services such as Filebox, Hosting, and MyStore.

In addition to their help desk responsibilities, the Faculty/Staff Support group will visit departments, at their request, and assist with computer security recommendations. This group also 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. Over three hundred machines are deployed each year in connection with this program.

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 also 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.

The team is also involved with exploring and supporting new technologies of interest to faculty and staff. The year’s most significant project was the move from BlackBerry® equipment to “smartphones”. This transition established a system that supports

multiple e-mail capable cellular phones, handheld devices, and prevalent operating systems. Additional benefits of the new system are secure, real-time, reliable wireless information access on a variety of palmOne® and Microsoft® Windows Mobile®. Mobile devices are growing increasingly mission-critical as people come to expect Internet access anywhere and everywhere. A great deal of staff time was spent investigating and becoming familiar with the various offerings as well as supporting early adopters. Support needs and the number of different devices in use are expected to increase.

*Student Support.* Three classified staff members oversee the student programs, including seasonal activities such as participation in “O” (Orientation) Team meetings, Computer Requirement meetings, and New Student Orientation. The Student Support group is also responsible for providing much of the computing-related information for the Hokie Handbook

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.

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. 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.

Six of our Help Desk students graduated at the end of Spring Semester. Of those, five graduated cum laude or better and several had double majors. UCS was extremely fortunate to have had their services and honored the students with a luncheon and certificates of appreciation in May.

Between twenty and twenty-four student Resident Computer Consultants (RCCs) live and work in the residence halls, each spending about ten hours per week providing computer support to their fellow students. RCCs begin their official duty on the first day of classes for the Fall Semester, providing support for problems not resolved by Help Desk staff and responding to direct requests for assistance. RCCs are also charged with preparing and presenting educational sessions for residents.

Students working at New Student Orientation (NSO) prepare and present an informational session for incoming students and their parents. For the most recent NSO, they prepared a totally new presentation, including a video program with an emphasis on computer security. The group distributed the VTnet CD during orientation for the first time last summer, enabling incoming freshmen to arrive on campus with computer virus-protection preinstalled. In preparation for the meeting each incoming student has with their academic advisor, 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.

*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) and [lockitdown.cc.vt.edu](http://lockitdown.cc.vt.edu), researches and tests software offerings, writes and updates Knowledge Base articles—constantly looking for ways to make the Virginia Tech computing experience better and safer.

This year, UCS created a customized installer for Symantec AntiVirus to enhance the default protection level of the product. UCS also worked with the university's Public Key Infrastructure (PKI) group on certificate distribution and the pilot eToken project. Virginia Tech versions of WinsockFix and IEFix were developed by UCS personnel to solve Internet and Internet Explorer problems.

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 also used by the support professionals for discussions of computer issues of general interest. Discussions are underway to enhance the communications channels with this group.

UCS works closely with the Information Technology Knowledge Base team. New articles are written and existing articles updated or purged as necessary to keep the Knowledge Base information as comprehensive and current as possible.

Within the past year, UCS has taken advantage of secure, centralized hosting services instead of running their own web servers and, through the experience gained, is now better able to support others in their use of these services. UCS created a Blackboard course to learn more about it both from a student and instructor perspective. A departmental file server in the Help Desk area was recently upgraded to the Windows 2003 Server operating system. The experience working with this process provides a better understanding of the campus Microsoft environment, further enhancing the quality of support provided.

University Computing Support is in the process of improving integration of its support functions with the Virginia Tech Operations Center. To that end, both formal and informal training has been provided on a variety of computing topics. One UCS staff member is always present in the VTOC during normal business hours for escalation of more complex issues.

A web-based, central repository of important, up-to-the-minute information pertaining to the operation of the university's network was developed and named "Dashboard". The Dashboard consolidates links to support tools and consulting information in addition to providing status announcements. Faculty/staff support material has been moved from the Consultant's Homepage to this special website. Student consulting material will soon be moved to its own customized version of "Dashboard" as well.

UCS staff members have worked on a scheduling/calendaring system for the Student Help Desk, a "job-jar application", where student consultants can work on tasks when

there are no pending problem tickets. To improve the trouble ticket workflow, UCS personnel have also submitted many requests for Remedy updates and changes that have resulted in more efficient operations.

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 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 also assures all computers auctioned by the Surplus Property Office have had all data wiped from their hard drives or, where that is not possible, seeing that the hard drive is destroyed. The machine then has a legal operating system installed. In addition to guaranteeing sensitive data is destroyed, Surplus Property is able to command a better price by auctioning a working machine. Over 1,800 machines were “cleaned” during the past year.

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.

## **Project Management Team**

Many of the projects Network Infrastructure and Services undertakes are both lengthy and complex, involving significant investment of financial and personnel resources. Managing a project on such a scale presents a special challenge. The Project Management team exists to meet this challenge.

Project Management is the application of a variety of sophisticated tools and techniques to help ensure a project will be completed successfully. The Project Management group applies software tools to maximize resources, prioritize tasks, and ensure every project team member can focus their time and expertise on successfully executing their individual tasks. The NI&S Project Management team employs project plans to assist in keeping projects on schedule and within budget.

Each project plan plots a projection of necessary tasks for the duration of the project. The Project Management team works with each project manager to identify tasks, determine begin and end dates, recognize dependencies between tasks, estimate the amount of time needed to complete a task, and decide who should be responsible for implementation.

For consistency, NI&S project plans are developed using a standard template. Plans are distributed in Portable Document Format (PDF) and HyperText Markup Language (HTML) format so team members do not need specialized software to view the plans and track their progress. Very complex projects may require tiered project plans.

Periodic project status meetings are held to review the project timeline and deliverables. Team members communicate completed tasks, outstanding issues, and other details pertinent to the project with the project manager. Continuous monitoring and tracking of project 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 a final project status report and highlights lessons learned so future projects can benefit from the experience of past projects.

### Project Plans Developed

- Ongoing Remedy development
- Xerox Docuprint printer replacement
- GoodLink® mobile messaging
  
- Network Infrastructure and Services Annual Report
  
- Transition to IP H.323 interactive videoconferencing
- Network Infrastructure and Services Strategic Plan update
- The Inn at Virginia Tech and Skelton Conference Center--networking, telephony, and hotel entertainment systems
- Wireless Local Area Network deployment including the installation of network switches, deployment of network access points, and the development of associated business policies and procedures
- Gigabit to the Desktop campus recabling project

University Machine Room. The Project Management team administered electric power service additions to the Andrews Information Systems Building Machine Room to accommodate equipment installations. A Visio drawing of the power distribution and a spreadsheet of all power panel breaker layouts were developed. Specifications were developed in cooperation with Virginia Tech Electric Service to obtain price quotes. Hardware maintenance contracts were negotiated with vendors to incorporate required updates.

Remedy. Project Management provided support for Remedy system administration by distributing weekly reports and developing special reports. A “Remedy Training Session” was developed and provided to the University Computing Support (UCS) group.

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 estimates.

Access Grid Node. Served as the primary contact for event scheduling in the NI&S Access Grid facility.

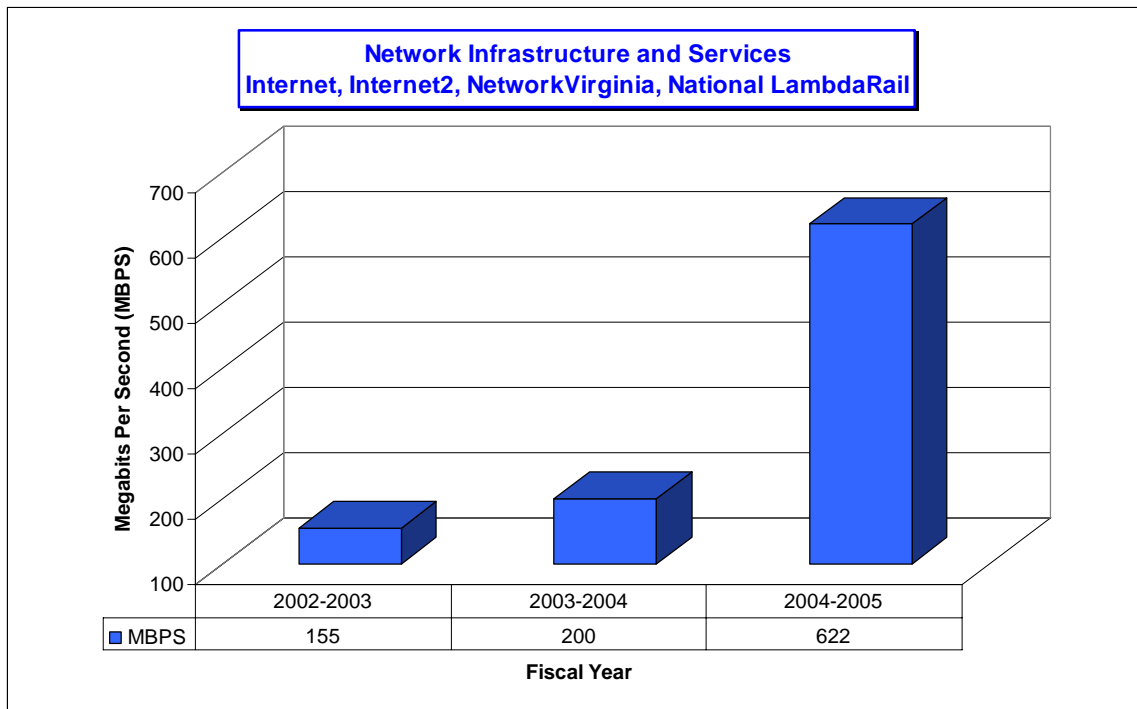
NI&S Strategic Plan. Coordinated the development of the NI&S Strategic Plan including the planning for a two-day retreat, numerous meetings in preparation for

writing the environmental forecast, and assisting individual areas with the development of their goals and objectives.

Organizational Changes. Coordinated the transition of the Systems Support and University Computing Support groups to NI&S.

## Regional and National Initiatives

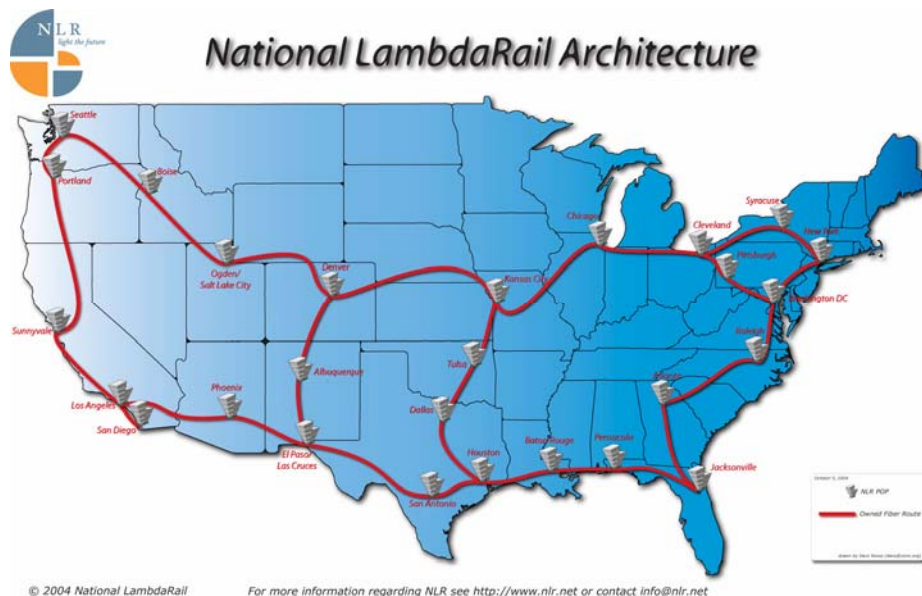
Virginia Tech has assumed a key role in the development of the latest advanced network infrastructure initiatives at national and regional levels. Through direct, aggressive support for such initiatives as National LambdaRail, the Mid-Atlantic Terascale Partnership (MATP), and the Virginia Optical Research Technology Exchange (VORTEX), Network Infrastructure and Services plays a crucial role supporting the research competitiveness of Virginia Tech and the Commonwealth of Virginia.



National LambdaRail (NLR). National LambdaRail is a major initiative of United States research universities and private sector technology companies. The goal is to build and operate a national optical network infrastructure for research and experimentation in networking technologies and “big science” applications. NLR puts control of incredible bandwidth and new network technology directly into the hands of scientists and engineers and provides the capability to reach strategic computing and networking resources wherever they are located. The network will provide opportunities for breakthroughs in research while helping colleges and universities control their networking costs. A key goal of NLR is to stimulate and support innovative network research that will surpass the current incremental evolution of the Internet. The network will be owned and controlled by members of the National LambdaRail consortium.

Working with the Virginia Tech Foundation (VTF), NI&S personnel provided regional leadership to ensure an NLR node would be located in the commonwealth. The node is now operational in McLean, Virginia. The Foundation made a significant financial investment in NLR and is a Class A Member of NLR, Incorporated with explicit responsibility to facilitate access in Virginia, Maryland, and Washington, D.C. Erv Blythe, Vice President for Information Technology at Virginia Tech, is an NLR Board member serving a three-year appointment on the NLR Executive Committee. Jeff Crowder, Director of Strategic Initiatives, is the NLR Administrative Coordinator for Virginia, Maryland, and the District of Columbia. John Lawson serves as the Technical Coordinator for the NLR mid-Atlantic region.

By leveraging these NLR leadership roles and with NI&S employees participating in all facets of NLR design, engineering, and operations, it will be possible for Virginia Tech to develop cost-effective, high-performance access to virtually any relevant federal laboratory, research university, or national or international network exchange point. Our university's researchers and students will be able to take full advantage of the capabilities of NLR as they develop.



**Implementation.** The National LambdaRail organization is creating a web of fiber-optic information superhighways across the nation. On November 18, 2003, NLR announced it had successfully lighted the first path on the national footprint between Chicago's StarLight facility and Pittsburgh's Supercomputing Center--a joint project of the University of Pittsburgh and Carnegie-Mellon University. On January 23, 2004, the path between Seattle and Portland was completed. Implementation continued on schedule with the path from Pittsburgh to Washington, D.C. being completed February 26, 2004, the Washington, D.C. to Raleigh to Atlanta route lighted on April 14, 2004, and the Seattle to Sunnyvale, CA segment finished on May 1, 2004. In addition, the NLR wavelengths (lambdas) from Sunnyvale to Los Angeles and Los Angeles to San Diego became available during May 2004.

NLR Phase One implementation was completed by the end of 2004. Phase Two implementation will extend the NLR infrastructure across the country to Louisiana, Texas, Oklahoma, New Mexico, Arizona, Utah, and New York to support growing membership and provide additional east-west and north-south routes for a more robust and flexible infrastructure. Phase Two implementation is already underway and is scheduled to be completed during summer 2005.

The NLR system will not be routinely connected to the Internet. Rather, a participating institution will be able to use a lambda to set up a custom-made, private, high-speed data connection between two locations. The connection would be insulated from hacking and other problems affecting the Internet.

Institutional members of the National LambdaRail organization will have unlimited use of three of the lambdas. The fourth is reserved for the Internet2 advanced-networking consortium, which is contributing a total of ten million dollars to the NLR project over five years. Internet2 will use the lambda for research on technologies that eventually could be used in a successor to the Abilene high-speed network.

Dense Wavelength Division Multiplexing (DWDM) Technology Enables Multiple Dedicated Test Beds. National LambdaRail lit the first fiber pair with an optical Dense Wavelength Division Multiplexing (DWDM) network capable of transmitting 32 or 40 simultaneous light wavelengths ('lambdas' or 'waves'). Each of these wavelengths is capable of transmitting 10 gigabits per second. The capacity available is four times that of the Abilene network. The unprecedented richness and flexibility of this infrastructure, combined with robust technical support services, will allow multiple, concurrent, large-scale experiments to be conducted. Network researchers will be able to gain exclusive access to their own dedicated test beds with full visibility and access to the underlying switching and transmission fabric. Researchers will also be better positioned to collaborate with other scholars around the globe.

First transcontinental Ethernet network. National LambdaRail is the first national-scale network to deploy transcontinental 'circuits' based on end-to-end Ethernet technology, which is widely used in enterprise, institutional, and even home networks. NLR is also deploying a routed IP network over the optical DWDM network. The combination of these networks enables the allocation of independent, dedicated, ultra-high performance services to applications, groups, networked scientific apparatus and instruments, and research projects. The system will give researchers an opportunity to experiment with cross-country networks that operate like campus networks and rely on Ethernet protocols familiar to most network engineers. An explicit goal of NLR is to bring various researchers closer together to solve complex architectural and end-to-end network scaling challenges.

Generational cost decrease. Use of Ethernet 'LAN PHY' standards-based facilities in NLR represents a generational shift in the nature, usability, and cost of technologies in backbone networks. Together with other efficiencies in its design and operation, NLR is expected to achieve major decreases in the cost of ultra high-speed network services required to enable high-performance cyberinfrastructure for science and research.

Additional dark fiber pairs available. National LambdaRail optical waves enable the building of networking research test beds at switching and routing layers with the ability to redirect real user traffic over them for testing purposes. For optical layer research test beds, additional dark fiber pairs are also available on the national footprint.

Additional information about the NLR may be found at <http://www.nlr.net>.

Mid-Atlantic Terascale Partnership. The Mid-Atlantic Terascale Partnership (MATP) is a consortium of research institutions in Virginia, Maryland, and Washington, D.C. created to provide access to the National LambdaRail and to facilitate collaboration for development of high-performance computing and networking resources. The goal of MATP is to promote regional research competitiveness through access to advanced infrastructure.

Virginia Tech worked closely with the University of Virginia to establish the MATP. The consortium is open to any public or private research entity in Virginia, Maryland, and Washington, D.C. Through unprecedented cooperation and aggressive innovation, the MATP members have worked together to ensure early access to NLR for our region. The five million dollar initial investment required to ensure location of an NLR node in the area was made by the Virginia Tech Foundation (VTF), a nonprofit corporation. VTF is the NLR member of record on behalf of the region. VTF, in turn, licenses NLR network access rights to the MATP. By joining the MATP, each participating institution gains a share of the NLR rights and responsibilities afforded Network Infrastructure and Services through the use agreement with the Virginia Tech Foundation. Each MATP member will contribute a cost share amount of \$500,000 spread over five years (\$100,000 per year) toward the five million dollar NLR investment. The cost share contributions may be adjusted to reflect member participation levels.

The MATP system will benefit the broader regional research community as well as institutions of higher education. NASA, the Department of Energy's Jefferson Laboratory, and the Southeastern Universities Research Association (SURA) are early MATP participants and each has made substantial contributions.

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.

The MATP organizational structure is an informal consortium. Contracts with the Virginia Tech Foundation for licensed access to NLR, and with NetworkVirginia service providers for development of Virginia Optical Research Technology Exchange (VORTEX), are held by Virginia Tech on behalf of the consortium. (See "NetworkVirginia and NetworkVirginia (ng)" section for more information.)

Current MATP Members:

- The College of William and Mary
- George Mason University



- NASA
- Oak Ridge Associated Universities
- Old Dominion University
- The Southeastern Universities Research Association / Jefferson Laboratory
- University of Virginia
- Virginia Commonwealth University
- Virginia Tech

Additional information about the MATP may be found at <http://www.midatlantic-teryscale.org/>.

*Virginia Optical Research Technology Exchange.* As in most parts of the country, including virtually all rural areas, the kind of network needed to connect to the National LambdaRail did not exist in Virginia. A new network with extraordinary capacity and one capable of supporting the most advanced network technology needed to be built. Virginia Optical Research Technology Exchange (VORTEX) is a new, optical, wide-area network program led by Virginia Tech to build an advanced research network throughout Virginia, which will connect our research universities to each other and to the NLR. We are pursuing a multi-faceted approach featuring a strategic alliance with key telecommunications providers for development of new statewide fiber infrastructure in addition to customer-owned last-mile fiber and dark fiber leasing.

In 2004, Virginia's Governor Mark Warner and Secretary of Technology Eugene Huang supported successful legislation making it possible for the state's research institutions to aggressively negotiate an innovative collaborative agreement with Verizon and other providers to establish the VORTEX project. Rather than building a single purpose, state-owned, fiber-optic network solely for research, Virginia is leveraging the existing NetworkVirginia to collaborate with Verizon and other providers in building a new statewide Dense Wave Division Multiplexing-based (DWDM) system to support both research and economic development interests. (DWDM is the fiber technology used by National LambdaRail.)

Virginia Tech negotiated an agreement with Verizon Virginia to make VORTEX a reality. Working closely with research network design engineers at the university, Verizon is now constructing a statewide, high-capacity, optical backbone system with initial nodes in Norfolk, Richmond, McLean, Charlottesville, Roanoke, and Blacksburg. MATP members will independently construct or separately purchase the "last-mile" fiber-optic links needed to connect to the VORTEX backbone. The new network will provide "lambda level" access to 10 Gbps channels mirroring the capability of the NLR national backbone.

When the system is complete this summer, Virginia Tech and other MATP members will use VORTEX to connect to NLR at a cost significantly less than the cost of building a private, government-owned network for their use alone. MATP members will be able to purchase 10 Gbps channels essentially at Verizon's cost to provide them. That cost is lower than the comparable cost to operate a private DWDM network since Verizon will use spare network capacity to offer new IP-based and Ethernet services to other NetworkVirginia customers including schools, universities, public service providers, and businesses. Gigabit level connectivity can be provided to



practically any researcher in the state, including those located at smaller institutions which may not initially have lambda-level access. The service can also be used to extend connectivity broadly to build, for example, a high-performance sensor network.

This approach leverages the state investment in research infrastructure to provide early access to advanced network technology in rural areas years before it might otherwise be realized. VORTEX not only provides the lowest possible access cost for member research institutions, but also creates a competitive economic advantage for the entire commonwealth.

Costs for VORTEX are divided among 1) participating institutions, 2) a contribution from state government, and 3) private investment. Virginia MATP member institutions will invest an estimated six million dollars over five years. Virginia's state government provided a one-time contribution of \$2.4 million. Verizon and other providers are making a significant, multi-million dollar investment in excess of the amounts contributed by MATP members and the state for construction and operation of the network. VORTEX represents a public/private investment of at least ten million dollars over the first five years of operation. The effort to secure a LambdaRail node for Virginia and to develop the VORTEX network to connect to it has truly been a cooperative effort with significant contributions from each participating entity. The effort will provide early access across the commonwealth to the most advanced network services available anywhere.

VORTEX is currently under construction and will reach Virginia Tech's main campus with an initial 10 Gbps wave in July 2005. VORTEX is expected to reach all of the initial nodes including Norfolk, Richmond, McLean, Charlottesville, and Roanoke during the summer of 2005 as well.

*NetworkVirginia and NetworkVirginia (ng)*—NetworkVirginia, an ongoing project led by Network Infrastructure and Services, continues to play an important role providing low-cost network infrastructure throughout the commonwealth to support distance learning programs and Internet access for approximately 1.4 million people. Sites connected include four-year colleges and universities, the Virginia Community College System, private schools, and K-12 school systems. State agencies such as the Department of Health, the Virginia Employment Commission, and the State Police, as well as municipalities and private businesses also participate. NetworkVirginia supports access to Internet2's Abilene network as well as other regional and national research and education networks. The enhanced capabilities of NetworkVirginia (ng), a next-generation core network system designed, specified, and implemented several years ago by NI&S Research and Development personnel, also offer the capacity and support for new Internet-based applications like IP videoconferencing, high definition video, and greatly improved reliability and performance for Internet access. A single connection to NetworkVirginia can be used to support different types of multimedia connections simultaneously. The bandwidth can be flexibly allocated and reallocated as needed.

In 2004, the General Assembly passed legislation authorizing Virginia Tech to negotiate an extension in the term of the agreements comprising NetworkVirginia beyond 2006. Major contract revisions were executed with both Verizon and Sprint to

refresh the technology used in the network. The contract improvements and term extensions will ensure continued availability of low-cost broadband access to the latest Internet technology for citizens statewide. These resources position NetworkVirginia (ng) to take advantage of extremely cost-effective scalability and flexibility over the next several years. Through careful management and aggressive negotiation, NetworkVirginia (ng) continues to move ahead of the technology curve and to provide the most cost-effective Internet2 access in the country to all Virginia institutions.

Recent notable improvements to NetworkVirginia agreements include:

- Reduction in prices for many services.
- Addition of new packet-based access services.
- QoS enabled Multiprotocol Label Switching (MPLS) interlata transport services to support new IP applications.
- New low-cost access services including DSL and satellite.
- New high-end services including Gigabit Ethernet, SONET, and custom data services.
- New rate for commercial OC3 (155 Mb) service.

NI&S manages the NetworkVirginia contracts with Sprint and Verizon and provides technical support for network management, vendor coordination, and order processing. The Virginia Tech Operations Center (VTOC) in Blacksburg provides 24x7 monitoring and fault resolution for the aggregate network to ensure problems are resolved across multiple provider boundaries.

During the period from 1/1/04 through 6/30/05, the NetworkVirginia Support Group accomplished the following:

- Processed 146 service requests from colleges, state agencies, K-12 schools, and commercial customers across the state requesting new connections, changes, or termination of services.
- Upgraded the Internet2 connection supporting all NetworkVirginia customers, resulting in a forty percent increase in bandwidth from 600 Mb to 1000Mb for Internet2 access.
- Added native IPv6 support for NetworkVirginia customers utilizing Internet2.
- Performed software upgrades on all NetworkVirginia backbone routers resulting in more reliable and secure service.
- Migrated NetworkVirginia connections terminated on obsolete backbone network equipment to next-generation equipment resulting in faster, more reliable service.
- Decommissioned all remaining obsolete backbone equipment, reducing operating costs for the network.
- Participated in a major initiative to resolve Sprint billing problems affecting 575 NetworkVirginia locations.

Completed NetworkVirginia Order and Design system enhancements included the following:

- Upgraded NetworkVirginia Order and Design system resulting in more reliable, secure service.
- Interfaced a customer connection graphing tool with the NetworkVirginia Order and Design system to allow for on-demand monitoring of bandwidth utilized on customer connections.
- Upgraded NetworkVirginia Order and Design system for IPv6 support.

*Internet2 gigaPOP.* Virginia Tech continues to provide effective management of the NetworkVirginia Internet2 gigaPOP. The gigaPOP allows access to Internet2 and other national research networks for Virginia universities and K-20 schools. This connectivity is absolutely critical to the research competitiveness of Virginia Tech and the other research institutions in Virginia. The gigaPOP facilities, located in the Washington, D.C. metropolitan area, are managed and operated by the Virginia Tech Operations Center (VTOC) and the NetworkVirginia Operations Management team. All costs for operation of the NetworkVirginia (ng) gigaPOP are recovered through cost shares distributed among the participating universities and other entities.

In 2004, Virginia Tech negotiated a highly favorable contract extension with Sprint to implement a one Gbps link via Mid-Atlantic Crossroads (MAX) facilities representing a fifty percent increase in capacity at no additional cost to participants.

Virginia Tech plays a leadership role in national Internet2 activities with active participation in multiple Internet2 programs including the K-20 Initiative, the Quilt (<http://www.thequilt.net/>), the Technical and Policy Advisory Committees, Fiberco (<http://www.fiberco.org>), Joint Techs, and other I2 initiatives.

*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 and Network Infrastructure and Services to develop a proposed system design for a regional Fiber to the Premises (FTTP) network. The region includes Floyd, Montgomery, Pulaski, and Giles counties. 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 the greatest barrier to the future economic well-being of the New River Valley. The solution proposed is to deliver Gigabit Ethernet access to approximately 120 sites initially, including local governments, education, healthcare, industrial parks, and major industry.

John Nichols, of NI&S, 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 solution. Seth Peery used GIS tools to plan fiber-optic routes and to estimate costs for materials and labor.

The plan is available at the following website address:  
<http://www.nrvpdc.org/NRVTelecomPlan/NRVTelecomPlan.html>.

## Technology Initiatives

*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>2</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>3</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>4</sup>

Several Network Infrastructure and Services staff members serve in leadership positions in the Net@EDU Wireless Networking Group. The Wireless Networking Group explores “the application of wireless 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>5</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.

Over the last year, the Wireless Group accomplished the following<sup>6</sup>:

- 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 regulatory developments and supplied information to EDUCAUSE and the FCC.
- Developed vendor relationships to keep abreast of technology.

---

<sup>2</sup> EDUCAUSE membership, <http://www.educause.edu/Membership/5>

<sup>3</sup> Mission of Net @ EDU, <http://www.educause.edu/OrganizationandPolicies/3041>

<sup>4</sup> Net @ EDU working groups, <http://www.educause.edu/WorkingGroupsandCollaborations/412>

<sup>5</sup> Net @ EDU Wireless Networking Group, <http://www.educause.edu/WirelessNetworking/933>

<sup>6</sup> Summary of Wireless Working Group activities reported at the Net @ EDU Annual Conference, Feb. 7, 2005.

- Provided information on standards and the implementation of emerging technologies to members via the group website and listserv.
- Tracked developments for outdoor and community wireless networks.

*Campus Telecommunications Infrastructure Upgrades--Virginia Tech's Gigabit to the Desk Project.* The University's network infrastructure is critical to the secure, reliable, and highly responsive services needed to advance network-assisted teaching, research, and outreach. Virginia Tech's telecommunications infrastructure must continually adapt to changing technology and needs so the university can fully participate in regional, national, and global markets in the broadband-connected world of the future and take advantage of network technology to achieve its goals.

Technology has evolved to the point where, in order to serve the most demanding needs of our researchers as well as countless administrative and educational applications, Virginia Tech needs to upgrade the campus cabling infrastructure to provide gigabit speeds to the desktop. The new network will support converged voice, data, and video applications. Faculty and administrators will use the network to create technology-based educational opportunities and deliver new services to Virginia communities trying to solve increasingly complex challenges. University researchers will utilize the advanced information technology infrastructure as they support the university's goal to be ranked among the "Top 30" institutions in research and scholarship.

For simplicity, this large and complex infrastructure upgrade project has been termed the "Gigabit to the Desktop Project." The project focus is to provide high performance and leading-edge capabilities on a cost-effective and reliable basis.

Much of the existing campus cable infrastructure was installed over 15 years ago. As the need for bandwidth continues to increase, telecommunications infrastructure in many of our academic and administrative buildings must be upgraded to the new standard required to provide gigabit Ethernet at communications outlets. Outside fiber-optic cables and pathways to telecom rooms in each building, equipment/telecom rooms themselves, twisted-pair cabling and pathways from telecom rooms to communications outlets in work areas, Ethernet switches, power systems, and environmental controls will also be upgraded. In a few buildings, wireless LAN access points are also needed.

Many of the existing telecommunications room spaces need to be relocated and expanded to support the planned facilities and to meet state building and safety codes. In addition, new single-mode fiber-optic cables will be installed underground to connect each building to main campus switch centers. The fiber-optic backbone cables installed on campus beginning in the late 1980s consisted of multi-mode fibers and a small number of single-mode fibers. Today, the multi-mode fibers cannot support the data transmission speeds needed to support future applications. This project will provide for the deployment of higher strand count single-mode fiber cables over redundant, diverse routes ensuring more than sufficient capacity and minimizing the likelihood of service outages.

Always striving to enhance Virginia Tech's teaching and learning environment through continuous investment in and development of the network infrastructure, NI&S intends to install this next-generation infrastructure and associated systems to enable our university community to develop converged applications and maximize productivity. Network attached storage, cluster computing, and access to multiple file servers regardless of their location are just some of the enhanced capabilities that will be routinely available.

An engineering design team has been focused on developing a plan for several pilot buildings. A significant amount of work has already been completed in the Food Science and Technology Lab, and we have learned a great deal from that process. Seitz Hall is the site for the next pilot implementation.

Major project considerations being investigated and carefully considered include:

- Converged voice, data, and video applications and solutions
- Codes and standards
- Health and safety
- Disaster avoidance and recovery
- Copper twisted-pair cable technology
- Fiber-optic cable technology
- Wireless technologies
- Telephone switch technologies
- GIS and CAD technologies
- New networking and telephony equipment

Customer support staff members have joined in project planning meetings so they may better assist customers and departmental personnel as work on the project moves forward. NI&S will work closely with each department having service in the pilot buildings to reduce disruptions and maximize the final results. For example, Computer Aided Design (CAD) drawings will be provided to show all existing service locations so requests for communications outlet moves and additions can be completed in association with the upgrade.

*eCorridors*. The eCorridors mission is "To create competitive advantage by facilitating the deployment of advanced network infrastructure and applications leveraging inter-regional connectivity for communities."<sup>7</sup> The eCorridors Program is an economic development and outreach program of Virginia Tech focused on a long-term vision of facilitating the development of next-generation network infrastructure and services in collaboration with interested communities in Virginia. "eCorridors" are electronic Internet routes that will provide network connectivity into and out of every community in the commonwealth.<sup>8</sup>

NI&S personnel are frequently involved in assisting Virginia communities in economic development initiatives. The eCorridors Program is one way Virginia Tech is helping communities to develop competitive advantage. The eCorridors team acts as a

---

<sup>7</sup> eCorridors website at <http://www.ecorridors.vt.edu/about/mission/>

<sup>8</sup> eCorridors website at <http://www.ecorridors.vt.edu/about/mission/faqs.php>

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.

Network Infrastructure and Services engineers provide support for eCorridors initiatives throughout the state. Assistance over the last year included technical research and planning support for:

- New River Valley community fiber-optic network.
- Pulaski County community wireless network.
- City of Bedford municipal wireless Request for Proposal released on June 1, 2005.
- Leading-edge, last-mile access solutions for Southside and other Virginia regions.
- Nelson County Economic Development Authority in forming a comprehensive broadband strategy.

*The “Instrumented City”* - In January 2004, the Virginia Tech Transportation Institute (VTTI) asked Communications Network Services for help in planning for wireless transport to allow the collection of video and data from sensor controllers at traffic light locations in the Blacksburg area. The “Instrumented City” project began in September 2001—the first project of its kind in North America. The project provides a real-life research test facility to monitor traffic flow, traffic safety, noise, air pollution, and other factors. Early deployment of remote monitors 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 data transport. CNS assisted VTTI and the Town with planning, analysis of alternatives, and technical support. The Town issued a Request for Proposal on July 23, 2004, for wireless telecommunication services to meet the needs of homes, businesses, educational institutions, local governments, and other public organizations. The Blacksburg Transit Authority also plans to use the service to monitor the location of busses and to provide wireless access to passengers. Most Blacksburg streets and the Blacksburg Industrial Park will have coverage for fixed, portable, and mobile applications. Similar services are desired for others areas of Montgomery County and the New River Valley region. Vendor awards are expected in the summer of 2005 with deployments beginning later in the year.

*Graduate School RFP for Imaging System.* During the summer of 2004, individuals from various areas within Information Technology (IT) and from the Graduate School collaborated to identify and define specifications for the purchase of an imaging system. An imaging system allows documents to be scanned when received and subsequently accessed from a central repository. The documents can then be routed to individuals for action and/or review based on predefined workflow rules. The Graduate School wanted to implement a system to reduce the amount of paperwork Graduate Admissions exchanges with more than seventy academic departments

across campus. Guided by Pat Rodgers, Project Leader for the Imaging System RFP Process,

Information Technology personnel discussed and documented the infrastructure components needed to support such a system. Infrastructure components included hardware (services, scanners, etc.), human resources, databases, middleware, storage requirements, and security needed for the initial implementation of the system and for on-going support. These criteria were included in the Graduate School's Request for Proposal.

In the early fall of 2004, an RFP evaluation committee, led by Information Technology, was formed. The committee was composed of three individuals from the Graduate School and three from IT. The committee expanded the specifications/requirements in the RFP to ensure any purchased system not only met the needs of Graduate Admissions, but could also be used by other university departments. Therefore, if the initial implementation in Graduate Admissions is deemed successful, the potential exists for this system to be used university-wide.

The RFP was issued in October, 2004. Eight vendors responded. The RFP evaluation committee spent approximately four months reviewing the proposals, eliminating those vendors not meeting the requirements, reviewing the remaining proposals, organizing vendor site visits for product demonstrations, asking questions, comparing products, and checking references. Negotiations resulted in the signing of a contract with Nolij Corporation in June 2005. As a result of the need for rapid deployment, installation of the software also began in June 2005.

The imaging system will store images of scanned documents, as well as perform optical character recognition (OCR) and intelligent character recognition (ICR) of the scanned data. OCR provides the ability to translate characters from a scanned document into a machine-readable format. ICR does the same for hand-printed numbers and characters. Workflow processes are then defined for the routing of the scanned images. While the selected system can serve solely as a repository of the images and interface with any database, emphasis has been placed on a tight integration with Banner, the university's administrative information system.

The Graduate School plans to implement the project in phases. The first phase will concentrate on imaging the applications sent to the Graduate School and initial document collection for all applicants. Subsequent phases will address the additional administrative functions needed to track graduate students as they progress towards their degrees.

IT is working closely with the Graduate School during this initial implementation to help define a technical infrastructure for storage and access of documents. After initial deployment, the product and process will be evaluated. Successful implementation in the Graduate School will lead to the purchase of a site license allowing use of the system by other business units in the university. IT will continue to manage this project as it is adopted by other university business units.



*Agriculture Human Natural Resources Information Technology Project.* In March 2004, staff from Business Administration and Operations, in cooperation with other units from Communications Network Services and from Agriculture Human Natural Resources Information Technology (AHNRIT), began planning for an important project. The goals of the project were to enhance the available bandwidth and upgrade security features of the existing data network—frame relay for most locations—at more than one hundred Cooperative Extension offices throughout Virginia. Coordination took place with multiple service and equipment vendors to facilitate the provisioning of high-speed data service in a variety of ways depending on the Extension office location.

The Ordering and Provisioning Manager, Debbie Smith, led this project for CNS and was the primary point of contact for interactions with the Associate Dean for Information Technology and other information technology personnel in the College of Agriculture and Life Sciences. The Manager of Ordering and Provisioning and the Senior Communications Account Manager facilitated communications among all parties. They also scheduled, organized, and led all meetings, including those between both departments, as well as those with outside vendors. Critical to the successful outcome of this project, the Senior Communications Account Manager played a significant role as a consultant with College of Agriculture and Life Sciences information technology personnel. This work involved extensive coordination with College staff to write and process the many orders required for the necessary service and equipment.

Business Administration and Operations' approach to the project incorporated extensive support from CNS engineers who worked proactively with College of Agriculture and Life Sciences information technology personnel. The coordinated effort involved the testing and evaluation of various service options and equipment types to ensure the diverse networking needs of individual offices throughout the state were met in a timely manner and within their budget constraints.

Personnel from both CNS and Virginia Cooperative Extension communicated and collaborated over many months to identify and resolve the various technical and administrative issues associated with the multifaceted endeavor. As a result of this undertaking, it is expected every Extension office will have access to enhanced network services and equipment by the end of fiscal year 2006.

Some of the successful outcomes already in place as a result of this project include:

- 34 Extension sites upgraded to DSL service.
- 15 Extension sites upgraded to cable modem service.
- Equipment was purchased and the groundwork completed for 62 sites to upgrade to DS1 service. These upgrades should be completed during the next fiscal year.
- A NetworkVirginia contract modification was developed, approved, and implemented for a new satellite broadband service. Although AHNRIT has decided to pursue other options, this new service may now be ordered by any NetworkVirginia customer.

- Improved communications and a spirit of cooperation between AHNRRIT and CNS personnel have resulted in an enhanced working relationship between the two groups.
- As a result of numerous communiqués between AHNRRIT personnel, the CNS Telco Vendor Billing group, Business Administration and Operations' team, the Verizon Enterprise Solutions group, and the Verizon DSL staff, improvements were made to the way Verizon bills Extension for DSL services. A Verizon DSL statement is now received by Cooperative Extension administrative offices in a consolidated form making reconciliation and payment much simpler.

*Residence Hall Telecommunications Room Fire Code Resolution Project.* In October 2004, Communications Network Services was notified by the state Fire Marshall's Office that some of the electrical equipment installed in the Virginia Tech residence hall telecommunications rooms during the 1980s did not meet current safety codes.

A project team was immediately formed to address the problem and develop a plan for resolution including a timeline, budget, and a determination of other campus groups who would be impacted by the required work. Site surveys needed for this undertaking also provided the opportunity to gather information needed for future projects.

The project team determined the best solution for the thirty-two telecommunications rooms in twenty-four residence halls was to replace the old electrical apparatus with new surge suppressors equipped with circuit breakers and on/off switches. CNS determined new electrical work by Physical Plant would be required in five of the telecommunications rooms.

By coordinating with the Environmental Health and Safety Office, Student Programs, and Physical Plant, CNS was able to complete some of the required work in the telecommunications rooms where only a minimum amount of recabling was needed during the 2004 Thanksgiving break. The final round of work associated with this project was scheduled for the 2004 Christmas break period. All network equipment was successfully switched over to the new surge suppressors by early January 2005.

*Information Technology "Security Task Force".* Several NI&S staff members were appointed to the Vice President of Information Technology's Security Task Force, chaired by Mary Dunker. The group's goal is to "Build Virginia Tech's secure environment so that by the year 2008, VT has earned the reputation of having a robust, highly functional and adaptable network and computing infrastructure, with an environment that is among the most secure in terms of privacy of its users and the integrity and availability of its computational and network infrastructure resources."

Laurie Zirkle served as a member of the Education subcommittee which was charged with identifying existing training programs and proposing new ones where needed. As Co-chair of the Communications committee, Jeff Kidd assisted with the development of a white paper addressing resources and outlets, existing and proposed, for disseminating Information Technology communications throughout the university community. Clark Gaylord chaired the Network Committee which also included Judy Lilly, Carl Harris, and Phil Benchoff. This group identified the current methods of

securing the Virginia Tech network infrastructure along with its existing vulnerabilities and proposed practical solutions for those vulnerabilities. Dave Martin, Kevin Davis, and Judy Watson participated as members of the Desktop Environment committee. They worked closely with the Server Environment Group, which was chaired by William Dougherty and included Tim Rhodes, Dave Martin and Laurie Zirkle. Both of these subcommittees identified vulnerabilities in operating systems and imbedded applications, add-on applications and databases, and authentication and authorization, and they developed possible solutions to those problems. Dan Cook worked with other IT Personnel on the Backups and Network Storage subcommittee. Maynard Hoover chaired the team charged with evaluating the security of physical IT assets, offices, and buildings as well as identifying potential security improvements related to those assets. Marshall Fisher also participated on that team.

## Video/Broadcast Services

Video/Broadcast Services (VBS), led by Mark Harden, Manager, produces broadcast-quality instructional video and advanced multimedia instructional materials. The group also operates and maintains network-based systems to deliver live and prerecorded class materials both on-campus and to distance-learning students. VBS utilizes these capabilities to support the Continuing Education activities of the university.

For more than twenty years, VBS has provided the university and the commonwealth with avenues for distance learning. These services began with microwave transmission which then matured to satellite broadcast. About a decade ago, Virginia Tech saw the need to expand distance-learning opportunities as a response to the higher costs involved with 'brick and mortar' campuses. The effort, largely a Virginia Tech design, became the current interactive ATM network and now reaches all corners of Virginia. The network has delivered coursework for thousands of Virginians and continues to be managed by Virginia Tech.

VBS maintains and operates electronic classrooms throughout the state for the Interactive Video Conferencing (IVC) network, providing full-service connectivity, monitoring, instructor training, technical assistance, and diagnostic support for approximately fifty to fifty-five graduate classes per semester. Problem resolution for the network is available through the newly consolidated one-call trouble reporting Customer Service Center (CSC) in the Virginia Tech Operations Center (VTOC). VBS offers live and on-demand streaming media servers to support classes, projects, and special events.

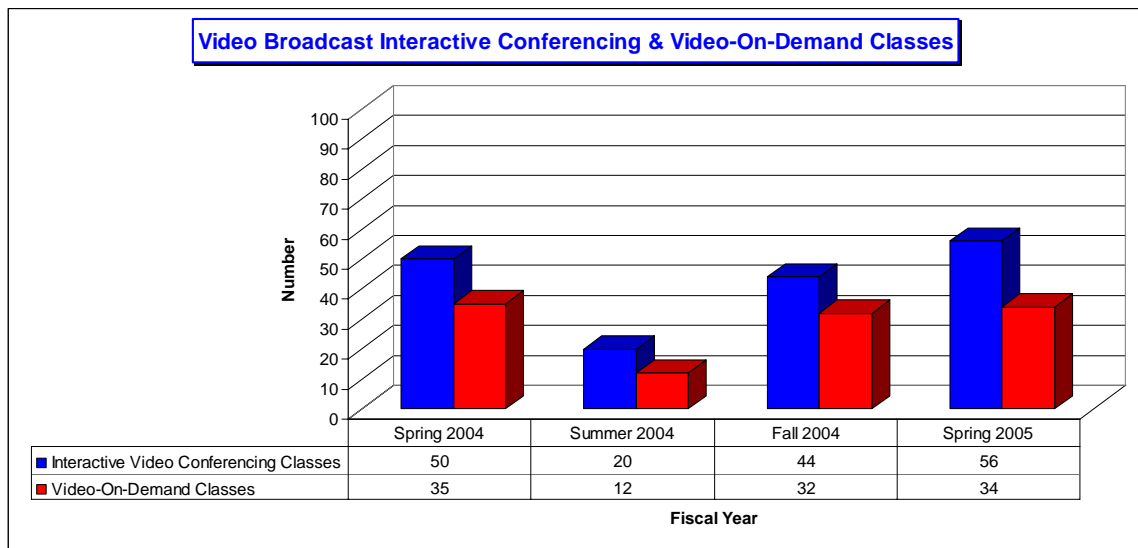
Interactive video conferencing and class support are the means by which the university maintains its commitment to distance education. VBS coordinates the scheduling of on- and off-campus interactive video conference and video bridging services to Virginia Tech distance-learning classroom facilities as well as to non-Virginia Tech facilities, e.g. other universities and the Community College system. VBS also schedules support staff for video conference room setup, room operation, and opening/closing facilities each day, as well as for setup of network and presentation equipment and operational testing.

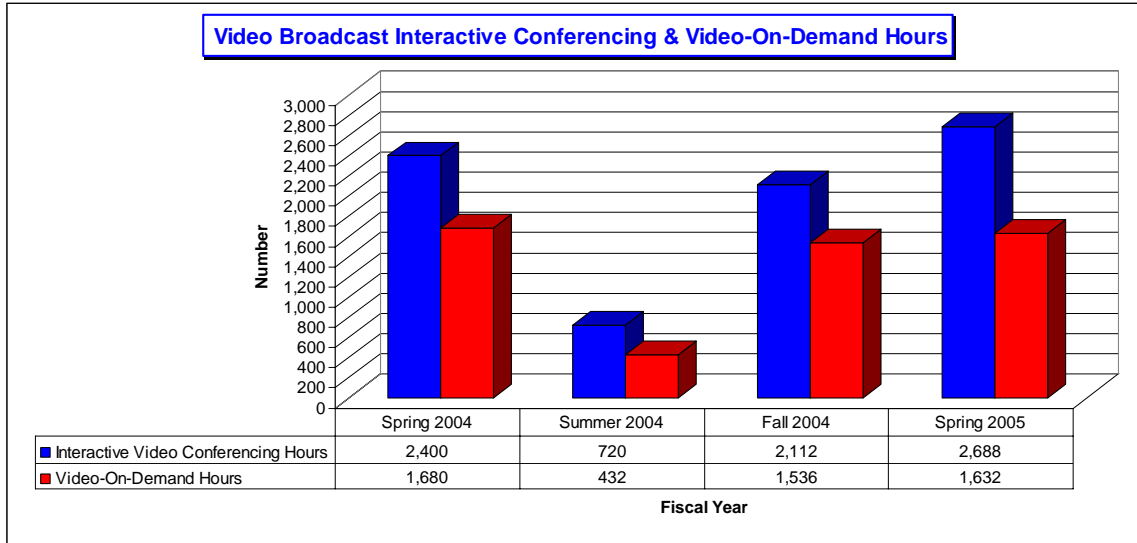
As video conferencing transfers to an Internet Protocol (IP) delivery method, even wider distribution of Virginia Tech class material will be facilitated and more university departments will expand their offerings to include greater distance-learning opportunities.

In preparation for the move to IP delivery, VBS completed a redesign of the Video Network Operations Center located in Research Building XIV. This effort included the upgrade of VNOC operators' monitoring capabilities and an extensive renovation of the Virginia Tech Instructional Campus Cable Television System.

The ongoing work involved to reconfigure the VNOC has been largely performed by VBS staff members David Mattox, Sam Tressel, and Doug Whorley. In addition to the design work itself, their efforts have included the specification, purchase, and installation of all necessary equipment. The work required several hundred person hours during the summer of 2004 and a partial implementation of the IP-delivery system will debut in the fall of 2005.

Over 280 classes received "live-class support" for Interactive Video Conferences (IVC) and Video-on-Demand over the recent year:





Beyond distributing classes, video conferencing also provides a path for Virginia Tech experts to reach out with research and applications which can be critical to the citizens of Virginia, and 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 video conferencing needs of Virginia Tech's outreach and research initiatives.

*Certification of Water Treatment Plant Operators* - Jack Lilly, Associate Director of Continuing and Professional Education, secured funding from the Virginia Department of Health for the instruction and certification of water treatment plant operators. Produced by VBS Department Head Mark Harden, who also provided the planning and coordination of the program delivery to the receive-sites, the water treatment training sessions are an example of efforts to maximize the use of the Interactive Video Conference (IVC) system. Comprising two series of monthly classes, these workshops cover a variety of topics aimed at helping water treatment plant operators maintain their state-mandated professional certifications. VBS-provided services include videotapes and DVDs of the individual lectures, which are made available to students in the event of a missed class. The classes are offered to owners, managers, and operators of all water utilities in Virginia-- from the very smallest to the largest--and are broadcast simultaneously to fourteen 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. The use of IVC technology affords these professionals convenient access to real-time, high-quality instruction and minimizes disruptions to their work schedules.

*Training for Social Services Professionals*. In response to an initiative of the Virginia Legislature, Video/Broadcast Services is also participating in a pilot program for the Virginia Department of Social Services which will offer important training to the state's Social Services professionals. The program currently meets on Saturdays and serves four distant locations, but expansion is expected.

Conference Proceedings Produced on DVD. Similar services will also be offered at the new Inn at Virginia Tech and Skelton Conference Center. The services available will include recording and webcasting live conferences as well as producing videotape and DVD packages for sale. (An indication of the potential for this market was first seen in late 2002 with the production of DVDs for sale at a conference of electrical engineers. The conference took place in San Diego, California, but the producing organization asked a Virginia Tech professor, who was the chief presenter, to record his lectures for interested parties who could not attend. Pre-conference sales of the DVD package were priced similarly to the conference registration, minus travel and housing costs. The sponsoring organization realized enough on the DVD sales to cover the cost of production and, in fact, make the conference a financial success.)

Video and Multimedia Production - In addition to Interactive Classroom Support, VBS offers production services for both conventional audio/video and emerging multimedia. These productions require a blend of skills bridging both traditional and cutting-edge video and networking technologies to allow for dissemination through tape, multimedia, Internet, video conference networks, and direct satellite broadcast. Productions range from relatively simple interviews to those involving complex issues of lighting and photography of visually-demanding subject matter. There are also technological and logistical challenges involved in transferring live video to the Web. Varied content includes instructional, promotional, and grant-related material as well as a number of efforts which involve the broadcast of crucial university governance meetings to an audience beyond the campus. To assure the highest production quality, VBS also offers script development, instructional design, and set/lighting design services.

A new live interview studio established in Whittemore Hall, with a fiber feed to the Satellite Uplink, is an effective way to allow Virginia Tech professionals and their ideas to reach the wider world. Previously, the process of getting a signal from the VBS main studio to a satellite required five people: one at the teleport uplink facility and four at VBS. With the new Whittemore Hall system installed and designed so it can be operated by two people, VBS can now offer single-camera interview uplinks during expanded hours.

## **Key projects**

Engineering Cultures. The Engineering Cultures project began in 2001 at the request of Dr. Gary Downey who was then teaching using the traditional, in-class, lecture format. The class seeks to explore the impact engineering arts have had on various societies and cultures. When student demand approached 300 students per semester, Dr. Downey asked VBS to help design an interactive delivery package to serve the students and allow him more time to conduct research and develop new materials. The instructional design was developed by Dr. Downey, Mark Harden, and VBS senior producer, Jeff Dalton. The production, supervised by Dalton, included thirty hours of recorded lectures and the collection of prodigious amounts of supporting material including maps, photographs, and historic references. These materials are presented in an attractive and informative, interactive, CD-delivery format. VBS also provided editing-for-content to Dr. Downey as there are significant differences between academic writing and broadcast writing styles.

In 2003, the project won a Virginia Tech Excalibur Award, given for the outstanding use of technology in instruction. During Fall Semester 2004, VBS began reauthoring the thirty hours of class material for online delivery. The transfer of material, performed by VBS staff members Joe Schottman and Andrew Tweedt, resulted in a beta version of the online edition in Spring 2005. It was received with positive, promising results.

The Engineering Cultures project will continue to increase in scale for the foreseeable future. The course now has official visibility from the National Academy of Engineering (NAE). Gary Downey has recently been named one of the Academy's first Boeing Engineering Education Senior Fellows, and continued expansion of the Engineering Cultures multimedia project is part of the Fellowship plan. Local student demand for the streamed multimedia modules is expected to continue at the rate of 200-300 per year, and these modules also serve the university's outreach mission by reaching alumni and working engineers. With a stable streaming model and the commitment to produce additional modules, Engineering Cultures can become a highly visible component of the university's instructional technology and distance-education program.

*Partnership for Research and Education in Plants (Phases One and Two)*. This program is coordinated by the Fralin Biotechnology Center. Scientists have sequenced the Arabidopsis genome in an effort to better understand plant biology. Arabidopsis, sometimes called the "lab rat" of botany, is easily grown and provides an almost ideal test subject. The focus of the exercise is to provide seeds and instruction materials to thousands of high school classrooms across the nation so students can learn genetic research procedures, share findings regarding genetic functions in plant physiology, and make solid contributions to the body of knowledge. Web-based resources developed for students and teachers will include video clips, graphics, and digital images in a searchable database of experimental protocols. The program, produced by Kevin Cook, went online in April 2005 and received very positive feedback from the sponsoring professor.

*Virtual Jamestown*. Dr. Crandall Shifflett, Professor of History and Project Director of Virtual Jamestown, taught a class for graduating history majors in the Spring 2005 semester using the Virtual Jamestown digital archive as a basis for a multimedia production. VBS participation in the project, produced by Jeff Dalton and Kevin Cook, included videography, script writing, and video editing. WETA, the Washington, D.C. Public Broadcast Station (PBS) and Intelligent TV, a production company, are exploring the possibility of a major production from Virtual Jamestown in 2007 to coincide with the commemoration of the 400<sup>th</sup> anniversary of the Jamestown landing. The current project is an initial step toward the goal and will include interviews with descendants of the native Algonquins including representatives of all eight surviving Virginia tribes. The project has been described by the current chief of the Nansemond Indian Nation as the first attempt to explain the impact of the Jamestown landing from the Native American perspective.

*Mountain Lake Workshops*. The Mountain Lake Symposia and Workshops were originated by Virginia Tech Professor Emeritus of Art, Ray Kass. The workshops began in the early 1980s and were part of Mountain Lake programs including artists'

conferences, lectures, exhibitions, and collaborative workshops conducted by guest artists. Well-known artists and critics participated in the programs. The workshops invited internationally known artists to collaborate with students, artists, and interested residents of Southwest Virginia to expand upon the ideas of the visiting artists. In conjunction with the Virginia Tech Art Department, VBS has mastered the following Mountain Lake Workshop documentaries into DVD format. The DVDs provide a supplement to museum exhibits and are also used in Virginia Tech art classes.

- “John Cage”
- Methanogenesis

Choices and Challenges. The *Choices and Challenges* forums brought eminent philosophers, scientists, historians, sociologists, and policy analysts to the Virginia Tech campus to participate in forums designed to examine the social and ethical aspects of advances in science and technology.

The following projects involved multi-camera location recordings of live public panel discussions. The programs will be postproduced and edited for later broadcast on the Public Broadcasting Service (PBS) Adult Learning Channel. Excerpts are also used in Virginia Tech classes.

- Big Brother Technologies
- On the Eve of Human Cloning

Building Construction Class. Video/Broadcast Services 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 Spring 2005 Building Construction course.

Chartered University Town Hall Meetings. At town hall meetings, President Charles W. Steger and Executive Vice President Minnis Ridenour provided an overview of the Chartered University initiative and its impact on the Virginia Tech community. These events were live webcast and/or processed for video-on-demand.

Other Projects. In coordination with University Relations, Video/Broadcast Services provided live satellite broadcast interviews with Virginia Tech faculty to TV networks and stations.

VBS also digitized or encoded various administrative seminars and workshops for distribution as video-on-demand.

## Blacksburg Electronic Village

Since its inception in 1991, Blacksburg Electronic Village (BEV) has performed an important outreach effort by encouraging the community to come together through the use of technology. Entirely based on the Internet and focused on technology and community, BEV’s goal 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.

Guided by its current director, Bill Sanders, the Blacksburg Electronic Village emphasizes four pillars of fostering community in the age of technology:

People. People comprise the community. How people's social and economic needs are met affect both the individual's quality of life and the viability of the community as a whole. (A primary focus on "people"—as opposed to technology—has been one of BEV's hallmarks from the beginning.)

Content. People create information and knowledge. A community remains both cohesive and meaningfully connected to the world around it by sharing and receiving information and knowledge, locally and globally.

Services. Technology-based services and transactions are more efficient, more widely accessible, increasingly the social norm, and a key to economic growth.

Infrastructure. The "stuff" people think of as cables, wires, circuits, and network electronics are the waterways, railways, and highways of the information age. Access to infrastructure equals increased opportunity.

## Highlights of 2004-2005

Blacksburg Electronic Village as a Prototype and Field Laboratory. BEV (<http://www.bev.net>) remains one of the longest running and best known community networks in the world. BEV's early focus on building a data infrastructure is no longer necessary as the private sector is now fully capable of meeting the demand for Internet service. Nevertheless, BEV remains central to ongoing community information technology efforts. The BEV Director, Dr. Bill Sanders, serves ex officio in support of the town's Telecommunications Advisory Committee and is frequently involved in discussions about community technology issues. BEV still serves 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.

Blacksburg Electronic Village Programs and Services. Built entirely on stable, secure open source LAMP systems (Linux, Apache, MySQL, PHP) software and tools, BEV offers a 'starter kit' approach to community networking for communities lacking adequate infrastructure, staff, or resources of their own. Programs and services include:

Web Hosting and Domain Name Service. BEV offers web hosting and domain name services for nonprofit community (civic, social, and volunteer) organizations.

BEV-in-a-Box. Replication, rapid deployment, and hosting of BEV’s own application infrastructure for modification and use by any community wishing to develop and deploy its own online electronic village.

Virtual Business Incubator. Tools and functions suitable for use by home and micro-business entrepreneurs allowing them to gain an initial economic foothold on the Internet and to begin to understand e-commerce and global marketing.

Community Connections. Tools and functions suitable for civic, social, and other nonprofit organizations wanting to improve communications among their constituents and take advantage of network technology to advance their goals.

Leadership and Organization. After working for several months in tandem with Mathew Mathai, Bill Sanders assumed the directorship of the Blacksburg Electronic Village full-time on July 1, 2004. Other adjustments in organization and personnel were made during the year to help increase efficiencies and access to technical resources.

The BEV technical staff joined the Systems Development and Administration group of Network Infrastructure and Services. This change allows for cross-training and access to additional technical resources, if needed, to back up the BEV staff. This structure has already proven helpful given that one member of the BEV technical staff was called to active duty in Iraq leaving only two members of the technical team available.

## **Programs and Activities**

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 Providers and e-mail providers, demand for those services from BEV has declined. “Community Connections” (noncommercial) accounts comprise the largest portion of the customer base. A summary of core function activity appears in the table below.

### **Blacksburg Electronic Village Services**

<b>Service</b>	<b>Measure</b>
Domain Name Service	227 Domains Supported
Websites	Full Service: 63 Community Connections: 125
E-mail boxes	503
E-mail lists	128
E-mail volume	> 17,000 valid messages delivered per week (net of SPAM, nondeliverables, etc.)

Health and Human Services. For several years, BEV has collaborated with various health and human service agencies in Southwest Virginia to develop and deploy

Internet-based client intake and referral software. Participating agencies avoid duplicate records and multiple intake processes by having the first agency servicing a patron fill out the master online record of that patron's need and qualification for service.

Working with One Care of Southwest Virginia, a collaborative effort to provide basic coordination of health and human services throughout Virginia's Ninth Congressional district, BEV has begun to explore how best to make the software more broadly available to support this effort.

Infrastructure-related Initiatives. The local planning district commission is developing a public/private partnership approach to create a broadband infrastructure in our region. Information Technology's eCorridors project is providing staff support and consulting for the effort, with the participation of the BEV Director. In addition, the Town of Blacksburg has recently initiated a contract with a wireless service provider. Wireless service should be available in Blacksburg during July 2005. BEV will continue working with both of these entities with an eye on local implications and the possibility a wireless infrastructure deployment and support model might emerge that would be replicable in other areas of the state.

Department of Commerce "Technology Opportunities Program". A Program Model - Beginning in 2001, under a Technology Opportunities Program (TOP) grant from the U.S. Department of Commerce called "Getting Rural Virginia Connected: A Vision for the Future," BEV has partnered with the Virginia Cooperative Extension Service (VCE) and established electronic villages in a number of disadvantaged rural counties in Virginia.

TOP was designed to demonstrate practical applications of new telecommunications and information technologies to serve the public interest. A major area of attention is affordable, universal, broadband access. Broadband is generally considered essential to economic development and to support the creation of jobs in the "new economy" of electronic business and commerce.

BEV, VCE, and local leaders in each participating county worked together to develop an online presence (an e-Village) for each community and to plan telecommunications infrastructure. The e-Villages are being hosted at BEV in Blacksburg so high-speed Internet access is available to them. The counties covered under the grant lacked both the infrastructure and expertise to do this work on their own.

The TOP grant allowed a significant number of individuals and organizations in rural areas to register, have a presence, and engage in community-based activities via the Internet in a way they would not have otherwise (see table below). In addition, the grant paid for the development of a Technology Master Plan for each participating county. The development of these plans involved site visits and in-depth analysis of community technology needs and opportunities by senior Virginia Tech networking and communications experts.

<b>TOP - Registered "villagers" and "organizations"</b>		
<b>County</b>	<b>Villagers</b>	<b>Organizations</b>

Craig	48	16
Cumberland	194	34
Dickenson	55	1
King and Queen	239	10
Louisa	62	6
<b>Total</b>	<b>598</b>	<b>67</b>

Note: Accomack and Northampton e-Villages are hosted commercially

The Technology Assessment and Master Plan reports addressed three deliverables for the TOP grant. The first was to identify at least four social and/or economic needs in each county. These became goals for the technology plans. The second was to develop strategic technology plans to address the goals. The last was to identify and plan for regional technology corridors to link communities.

The approach used for the technology planning was the “Take Charge Process.” In this process, leaders in each community formed a Technology Leadership Team (TLT) to determine where their county was (assessment), where their county wanted to be (goals), and how to get there (technology plan). During the project, collaboration was encouraged among local governments, education, healthcare groups, planning district commissions, Virginia’s Center for Innovative Technology, the Mid-Atlantic Broadband Cooperative, area ISPs/service providers, utilities, and others. In developing the plans, concepts from the Computer System Policy Project (CSPP) Readiness Guide were used to assess the network readiness of service providers, county government, public schools, healthcare organizations, businesses, and homes. The CSPP is a public policy group advocating network readiness. It is comprised of leaders from America’s foremost information technology companies.

For the development of the technology plans, needs and goals were identified, alternative technology solutions were explained, and applicable solutions were recommended. The technology alternatives evaluated included digital subscriber lines (DSL), cable modem, wireless technologies, broadband over power lines (BPL), satellite, and fiber-optics. The recommended technology plans included a vision statement, mission, consolidated goals and objectives, and applicable technology solutions.

The TOP grant officially closed September 30, 2004. The final report to the Department of Commerce, the final county reports, and the technology master plans are all available to the public at <http://top.bev.net>.

Extending the e-Village Program Model. Lessons learned from the Technology Opportunities Program (TOP) grant and the significant positive results in some counties led BEV and VCE to continue their collaboration. Together, they are looking for ways to expand, extend, and sustain this program. Discussions are underway with existing TOP counties wishing to retain their TOP-funded e-Villages and with other communities that seem interested and willing to make the commitments required to begin e-Villages of their own.

In addition, VCE has revived its Community Initiatives program. VCE is in the process of renaming, refocusing, and staffing the program with the goal of offering an

e-Village/community network opportunity program through local extension agents, along with the more traditional agriculture, 4-H, or Family and Consumer Science programs.

Expanding Academic Collaborations - This year, BEV began to identify university academic programs having clinical or practicum-based components suitable for online delivery. For example, any professional program providing site-based clinical or internship experiences for its students might be able to provide those same services to communities through an e-Village.

Preliminary discussions regarding two college programs have been well received, and efforts are actively underway to envision how online clinical experiences might be implemented. BEV will continue to pursue these and other similar possibilities.

Economic and Workforce Development. Blacksburg Electronic Village has been engaged this past year in several activities related to economic and workforce development.

*e-Villages*. The Technology Opportunities Program (TOP) grant, mentioned above, underscored the potential of an e-Village to contribute to community economic growth. The final report to the Department of Commerce contains numerous stories and anecdotes about small and micro-businesses that, after putting up their first web page, experienced business activity they would not have had otherwise. While these transactions may seem trivial to long-time Internet and e-commerce users, they were powerful learning experiences in these rural communities and are contributing to expanded activity and increased grassroots demand for access and infrastructure.

BEV's nascent e-Villages program is an integral part of Information Technology's eCorridors outreach program that has been so active in Southside Virginia. In fact, several communities in Southside are among those engaged in discussions about the possibility of establishing their own e-Villages through the Blacksburg Electronic Village/Cooperative Extension partnership.

*The Woodrow Wilson Rehabilitation Center*. In an effort to provide technical support to the rural communities participating in the TOP program, BEV successfully established a relationship with the Woodrow Wilson Rehabilitation Center (WWRC) in Fishersville, VA. Residents of WWRC became BEV interns. BEV then paired the interns with small and micro-businesses in the TOP counties, who were requesting assistance with the development of their initial e-Village web pages. These "virtual" interns worked from Woodrow Wilson, but future plans will also allow participation by disabled interns, who will work from their homes under WWRC's Project Train-IT.

This program, designed to train a virtual workforce and match its members with work opportunities via the Internet, is attracting considerable interest in key human resource and workforce development organizations. The project, with its potential to create online economic activity between businesses and workers, may attract funding from a variety of sources including businesses themselves, in terms of paid internships, if not jobs, and economic development interests such as workforce investment boards.

## Business Administration and Operations

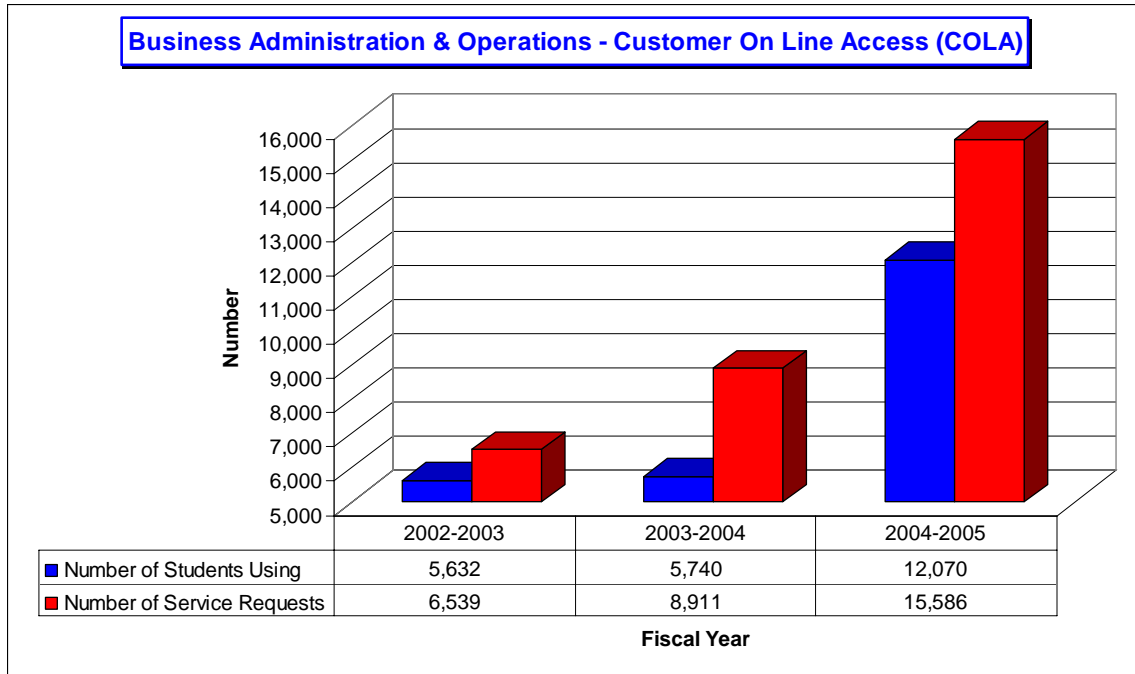
The Business Administration and Operations groups include Systems Development and Administration, led by Morgan Allen, Director; Network Administration, led by Richard Hach, Assistant Director; and Field Engineering, led by John Pollard, Director for Engineering Operations. Also included are Ordering and Provisioning, Business Services, and Public Relations, led by Pat Rodgers, Director for Business Technologies and Services. These groups support the daily enterprise business activities and operations of all units within Network Infrastructure and Services.

### **Systems Development and Administration**

The Systems Development and Administration group (SDA) is responsible for developing and maintaining much of the organization's administrative telecommunications management systems and the computer infrastructure supporting those systems, as well as the development and systems administration for Blacksburg Electronic Village (BEV) systems and services.

ATLAS is the principal enterprise telecommunications management system. It was developed and is maintained by the Systems Development team. ATLAS provides many of the department's administrative management functions including billing, accounts receivable, accounts payable, purchase order, budget management, work order, service management, voice call detail record and equipment management, and materials and cable plant inventory. Customer Online Access (COLA) is the web-based customer interface for ATLAS and provides electronic bill delivery, account information, and service provisioning.

The Systems Administration team supports in excess of 65 servers and more than 250 desktop systems. The team provides server support for database servers, network management systems, Printing Services printing management systems, BEV servers, domain name servers, voice call detail record polling systems, general file and application servers, and various web and middleware server systems.



*Upgrades, Migrations and Security.* The most significant accomplishment of the Systems Development and Administration group this year was the highly successful migration of ATLAS systems to Oracle 9i and new Solaris servers. Performance for most applications improved dramatically with many batch applications running 10-15 times faster after migration.

Other notable system upgrades included the migration of web services to a much faster and more robust Solaris infrastructure followed by a move and consolidation of web and middleware services to a Linux infrastructure. These changes have provided a standard infrastructure and allow for systems administration economies between the traditional Communications Network Services systems administration team and BEV systems administration team. Another improvement was the migration of ATLAS test and development instances to a new, much faster, and more robust server. Additionally, BEV completed a very successful migration of eight RedHat Linux systems from RedHat 7.3 to Enterprise Linux version 3.

In addition to infrastructure upgrades, the Systems Administration team continued to provide rigorous and continuously evolving security administration to protect the organization's information technology infrastructure, general systems administration, and end user support. The group is actively involved in security initiatives and organizations such as the SysAdmin, Audit, and Network Security Institute (SANS) with many of the team's members attending SANS security classes. Further, several team members have earned valuable certifications this year.

Additional significant accomplishments in the area of Desktop Administration included the implementation of client firewalls and the migration to centrally managed roaming profiles.

*Continuous Improvement, Adapting to Change.* Leading the long list of software development accomplishments this year was the introduction of the Service User Model to the ATLAS service management system. This new model provided a standard approach for managing the “person to telecommunications service” relationship based on Enterprise Directory Unique Identifier (UID) and replaced several different legacy models and applications. This functionality yielded the ability to support bundled services as well as the management of primary user designation for long distance and Ethernet services.

Other significant accomplishments having a positive impact on business operations included: development of a document management system to allow the indexing and management of CNS business documents; and development of support for split funding of telecommunications accounts.

Significant ongoing development activity is required to support voice Call Detail Record (CDR) management. This year, call record load applications were re-engineered to run faster and more reliably. Prior to the re-engineering, the data load process took 15 to 20 minutes. Now, the typical load process runs in *under two minutes*. Because the CDR load process runs every hour, this change has dramatically reduced overhead burden on the production ATLAS system during the day allowing online transaction processing (OLTP) applications to run much more efficiently. Additionally, the re-engineering streamlined the associated code by a factor of five. Leaner code serves to improve efficiency and effectiveness of ongoing maintenance. The team also continued to develop call detail management systems to integrate with new and evolving voice systems in support of departmental research into those next-generation systems.

Development also improved business efficiency with respect to vendor billing. The development team improved vendor billing integration with ATLAS by automating the loading and billing of Virginia Information Technology Agency (VITA) one-time charges. The new interface eliminated the need for manual entry of hundreds of transactions each month. Improvements were also made in vendor-to-ATLAS reconciliation processes.

Systems Development added functionality to both ATLAS and COLA this year to support management of a new short-term wireless network access service offering for sponsored users who do not have a university Personal Identifier (PID). Examples of customers in this category include media covering athletic events, prospective employers at job fairs, and systems administrators from all over the world attending a SANS security conference on campus.

There were many major improvements to the COLA system this year. In addition to infrastructure improvements mentioned earlier, much of the underlying Java code was either re-engineered to be more efficient and robust or was migrated to a new development model that moves more of the business rules and Structured Query Language (SQL) code into Procedural Processing Language (PL/SQL) packages. Although Java is important and necessary, PL/SQL expertise is more prevalent—both in the group and across campus. By moving more of the Java code to PL/SQL, COLA is more easily maintained by the available staff, and development response time is improved. Furthermore, in a continuing effort to reduce systems use of private



information, the second-level (PID/password is the first level) authentication challenge for COLA secure-service provisioning was changed from the full University ID to the last four digits of the University ID.

The migration of the CNS internal site to ED-AUTH authentication was another enhancement to web systems completed this year.

Ongoing improvement of applications developed and maintained by the Systems Development team continued this year. ATLAS/COLA applications are constantly analyzed and reviewed for functional and performance improvements, including almost *one thousand code modifications* this year. Examples of efforts greatly improving organizational efficiencies include the following:

- Streamlined service account changes.
- Work order changes to support the campus wireless implementation.
- Support for new network cabling standards.
- Continued improvements in inventory management and Banner fixed asset reconciliation.
- Improvements in billing processes and work order management.
- Reporting support for the campus recabling project.

Additionally, many ATLAS applications were redesigned to adapt to Oracle 9i standards and/or take advantage of new Oracle 9i functionality, including the increasing use of Java Stored procedures. Improvements were also made in database backup processes by migrating to warm backups.

*Network Infrastructure and Services Integration.* Another area seeing significant effort by the entire Systems Development and Administration team was application development to support the integration of various Network Infrastructure and Services groups. Accomplishments in this area included:

- Integration of Systems Support (SS) and University Computing Support (UCS) organizations into ATLAS inventory, budget management, and purchase order systems.
- Development of an ATLAS Interdepartmental Printing Request (IPR) management application for Printing Services.
- Integration of a new Mail Services postage system into ATLAS billing.
- Development of an ATLAS Video/Broadcast Services (VBS) project management application to schedule, document, and bill for Video Production projects.
- Integration of ATLAS VBS teleconference management system with the Institute for Distance and Distributed Learning (IDDL) scheduling system, allowing for a bulk load of each semester's classes saving significant data entry time.

## Network Administration

The Network Administration Group—including Vendor Billing and Fiscal Operations as well as 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 Administration and Operations groups within CNS. Network Administration consults with peer institutions throughout the country on telecommunications administration, and within CNS, develops, implements, and maintains many of the department's methods and procedures.

The Network Administration group oversees telecommunications administration and successful operation of switched and dedicated facilities. This work includes an emphasis on CDR management and security, vendor billing, 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.

The Call Detail Records Operations and Security staff acts as a primary resource to protect the university from fraudulent use of its telecommunications network. They also provide high-level technical and administrative support in systems operation, design, maintenance, and financial management of the university telecommunications system as well as research, evaluate, and develop detailed and accurate communications design cost estimates.

Vendor Billing and Fiscal Operations personnel work extensively with the many vendors providing communications products and services to ensure the best possible service for the department and its customers. Regular meetings are conducted with Verizon, Sprint, Virginia Information Technology Agency (VITA), and other vendors in order to maintain open lines of communication and to ensure the most rapid and efficient resolution possible of contractual disputes, service, and billing problems. The Vendor Billing area is responsible for the management of more than sixty accounts and approximately two million dollars annually.

As indicated above, Network Administration accomplishes much of its work through the cooperation of, and collaboration with, many groups across Network Infrastructure and Services including the organization of teleconferences on issues of interest/concern, participation in projects meetings, and joint work on system enhancements.

### Major Initiatives

NetworkVirginia Billing Project - Network Administration successfully managed a billing and invoicing project with Sprint which affected 575 agency and education locations on NetworkVirginia by conducting regular meetings with the vendor to resolve multiple chronic billing problems. As a result, the accuracy of vendor records improved, vendor billing processes became more effective, customer satisfaction improved, and significant costs were avoided for the Commonwealth of Virginia.

Verizon ExpressTrak Conversion - Verizon Communications Inc. has recently implemented a new billing system, ExpressTrak, which resulted in significant changes to the thirty different accounts CNS maintains with them. During the past 18 months,

Network Administration has worked with Verizon to manage the complex conversion and resolve numerous rating and administrative problems resulting from the conversion process.

Virginia Tech Mobile Messaging - BlackBerry Migration to Palm OS, Pocket PCs - Richard Hach, Assistant Director, Network Administration, led multiple project teams tasked with the establishment of a new CNS wireless service offering for mobile access to data. In a pilot project, we are already providing integration of converged telephony and computing devices with the Exchange server and providing continuous wireless synchronization of e-mail and data for university executives. CNS plans to expand this service offering in the near future.

Consulting Services - The Network Administration Group provides 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 the following:

- Radford University
- University of Maryland
- George Mason University
- Loyola of Maryland
- Indiana University
- Creighton University
- James Madison University
- Case Western Reserve
- Webster University
- East Stroudsburg State College
- Northern Michigan University
- Sewanee
- Washington College
- University of Virginia
- The College of New Jersey
- University of Saskatchewan
- Plymouth State University
- University of Georgia
- Pennsylvania State University

The Network Administration group also participates in professional organizations with peer institutions and represents Virginia Tech at ACUTA conferences and seminars, EDUCAUSE conferences and seminars, and Net@EDU annual member meetings and steering committees.

State and Federal Regulations. Network Administration is also responsible for making sure Network Infrastructure and Services is aware of state and federal regulations governing telecommunications and ensuring compliance with those regulations. They function 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:

- Recording Industry Association of America (RIAA)/Motion Picture Association of America (MPAA) activity on college campuses
- Communications Assistance for Law Enforcement Act (CALEA)
- Streaming Video Patents
- Do Not Call List
- Do Not Fax Rules
- CAN-SPAM Legislation
- Gramm-Leach-Bliley Act
- Changes to Universal Service Fund (USF) Methodology
- Slamming and Cramming
- E911
- Number Portability
- Municipal Networks
- PATRIOT Act

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.
- Analysis of extended local calling service to Roanoke.
- Wireless communications system facility and other wireless technology initiatives.

Relationship Management. Network Administration continues to emphasize relationship management with both the university community and the community at large. During the report period, Network Administration continued its work with the Virginia Tech Police Department in a second phase of improvements to the Blue Light Emergency Phone System, revisions to 911 emergency systems and procedures, changes to cellular telephone service, alarm systems, and the replacement of the university police radio repeater. Network Administration also worked extensively with Agricultural Extension to upgrade the AHNRRIT data communications network. In addition, Network Administration personnel worked with many university departments to implement mobile messaging and continued to support 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. The Network Administration group, in partnership with others across CNS, continued to implement changes to improve the price performance of network services and optimize the network. Changes implemented include:

- Network optimization and removal of trunks no longer needed.
- Vendor changes resulting in economies on toll charges.
- Disconnection of polling and Diagnostics lines no longer being used.

- Replacement of individual circuits with T1 facilities

## **Field Engineering**

Field Engineering (FE), managed by Doug Jones, designs, installs, and maintains state-of-the-art telecommunications cabling distribution systems to support the complex voice, data, and video needs of Virginia Tech. Working closely with leading industry vendors to develop new products required to meet the university's demanding requirements, FE deploys the most advanced and highest quality systems available. The installed systems are designed to be flexible enough to meet the university's changing needs over a ten- to fifteen-year period.

The Field Engineering design team works closely with project architects and engineers as well as 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 (VoIP), the designs for new facilities include required environmental controls, physical security, and backup power systems.

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. These efforts include rigorous testing, evaluation of products, and refinement of installation practices resulting in maximum utilization of the installed systems. Currently, the Field Engineering and the Research and Development teams are developing horizontal raceway systems that provide physical security of station cable, ease of installation, and are aesthetically acceptable. Once a prototype is fabricated, manufacturers will be contacted and the feasibility of product development will be discussed. To date, Field Engineering has developed a multimedia outlet box and a lightning protection module that are now standard product offerings by two manufacturers.

Two major projects were completed this year to directly support the university's outreach and research missions. These projects were the Virginia Bioinformatics Institute (Phase I and Phase II) and the Danville Institute for Advanced Learning and Research (IALR).

Field Engineering is involved with capital projects from the earliest planning stages through project completion. The 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. The outside plant infrastructure is designed and sized to provide adequate capacity to serve the facility being built as well as future construction in the area. The university's ten-year Master Plan is a good reference for our outside plant design efforts. The FE project designers are very responsive to the changing and demanding needs of the university community. The rigorous planning efforts and quality workmanship ensure the communications infrastructure in university buildings will provide the highest network performance and the longest service life possible.

## *Completed Projects*

*Virginia Tech Electric Service Building (VTES)* - This project involved the installation of 125 jacks, 23,100 feet of Category 6 station cable, and 48 fusion splices of optical fiber. The communications installation for this project required 374 person hours and was completed in January 2004. A Siemens Model 10 switch was installed in this building which allows Communications Network Services to provision additional voice services to facilities in the Southgate and Tech Center Drive area. The new Electric Service facility houses the business office, engineering and construction crews, and the warehouse as well as offices for the Virginia Tech Electric Service (VTES) management team. The Mechanical Utilities workgroup also operates from this facility. VTES serves the Virginia Tech campus as well as 5,800 customers in the Town of Blacksburg.

*Virginia Bioinformatics Institute (VBI)* - Completed in January 2004, Virginia Bioinformatics Institute (VBI) Phase I houses several high-tech laboratories, as well as research and computing facilities. VBI is a flagship bioinformatics research institute combining cutting-edge biological research with state-of-the-art computer science. Faculty and staff who work at this facility require sophisticated information technology systems in order to complete research into the understanding of molecular, cellular, and environmental interactions affecting human health, agricultural systems, and the environment. Rapid growth of the Institute requires a robust, yet flexible, networking infrastructure to support their unique research and to train the next generation of diverse, internationally competitive bioinformatics scientists. VBI Phase I involved the installation of 1,540 jacks, 165,900 feet of Category 6 station cable, and 672 fusion splices of optical fiber. The project required 2,875 person hours and was completed in January 2004. VBI Phase II was completed in December 2004, more than doubling the size of the facility. Requiring 4,227 person hours to complete, the Phase II project involved the installation of 1,826 jacks, 248,000 feet of Category 6 station cable, and 616 fusion splices of optical fiber.

*Institute for Advanced Learning and Research (IALR)* - Located in Danville, Virginia, this facility supports an economic development project designed to teach advanced technologies and offer research facilities to Southside Virginia. The City of Danville and Pittsylvania County partnered with Virginia Tech to develop and operate this facility. The Institute for Advanced Learning and Research (IALR) is a partnership between the region's educational, governmental, and private leadership institutions. As an incubator to foster economic development, education, research, and technology-access, this initiative will enable the Dan River Region to compete more vigorously in the global marketplace and enhances quality-of-life in the region. The services of the Institute will act as a major catalyst to replace jobs lost in the tobacco and textile industries.

Communications Network Services designed and installed the advanced cabling systems to support the network within this facility. CNS hired workers from the Danville area to perform the installation work under the supervision of two experienced field technicians and a supervisor from Virginia Tech. This project provided an excellent opportunity for the workers to learn valuable telecommunications installation skills. One of the new employees was subsequently

hired by the Institute and works there today. The project involved the installation of 1,738 jacks, 336,000 feet of Category 6 station cable, and 288 fusion splices of optical fiber. The communications installation for this project required 4,089 person hours and was completed in February 2004.

Recreation Fields Building - It was especially challenging to bring network services to this building, due to its isolated location. Completed in June 2004 after 326 person hours of work, this project involved the installation of 12 jacks, 340 feet of Category 6 station cable, and eight fusion splices of optical fiber. Most of the CNS work involved construction of an outside plant ductbank and outside cable placement. This facility is used for the storage of equipment used in intramural sports as well as housing an office for the intramural sports coordinators.

Career Services Building - This building, which includes a Career Resource Center and a computer lab, houses staff who assist graduate and undergraduate students with self-assessment, research of careers and majors, job search tools, and graduate school information. The facility has several meeting rooms where employers can conduct interviews with students. Several computer workstations are also available where students can research various employers and perform job searches in their related fields. The project involved the installation of 270 jacks, 42,300 feet of Category 6 station cable, and 96 fusion splices of optical fiber. The communications installation for this project required 807 person hours and was completed in July 2004.

New Dairy Barn - This facility uses new technology and environmental controls to increase milk production and a floor plan layout to maximize process efficiency. Some of its features include exterior walls that retract by thermostatic control and ceiling misting systems to keep the dairy cows cool when temperatures are high. A new wing, housing a classroom and several faculty offices, will be added in the near future. The facility has 12 jacks, 560 feet of Category 6 station cable, and 48 fusion splices of optical fiber. The communications work for this project required 64 person hours and was completed in August 2004.

Livestock Arena - Completed in September 2004, the Livestock Arena is used for various kinds of cattle, livestock, and equine instruction as well as a venue for judging livestock competitions. The facility has 25 jacks and 2,200 feet of Category 6 station cable. The communications installation for this project required 85 person hours.

Wireless LAN (Local Area Network) - This project, involving the installation of more than 700 wireless access points in classrooms and public areas throughout campus during the summer of 2004, has significantly improved access to mobile computing by students and faculty in their meetings and classroom activities. Students now have the ability to work on their assignments and communicate with faculty by using wireless devices from over 85 percent of campus administrative and academic 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 greater numbers of regional, national, and international conferences. The facility serves alumni, visitors, and friends and provides the university and the community with a

modern conference center and world-class hotel. The center 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 provides many advanced technologies and capabilities. These include advanced gigabit Ethernet technology, the latest in wireless LAN 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 video conferencing, and support for next-generation Internet protocols. This facility has 1680 jacks, 260,000 feet of Category 6 station cable and 480 fusion splices of optical fiber.

### *Campus Infrastructure Upgrades*

*Emergency Phones Phase Two* - Fifteen additional emergency phones were installed at strategic locations throughout campus in a project completed in October 2004 bringing the total to 32 emergency phones installed campus-wide. A third phase of this project, adding another eight emergency phones, is scheduled to be completed within the next twelve months.

*Plantation Road Ductbank* - The Plantation Road research area is located more than 6,000 feet from the main campus. Voice service was provided through Off Premise Service (OPS). Data had been provisioned over an unreliable direct buried optical fiber that had been donated to the university several years ago.

Field Engineering partnered with Virginia Tech Electric Service to build a ductbank connecting Plantation Road to the main campus ductbank system, allowing us to upgrade service to this research-intensive area. This February 2005 project provides enhanced communications services over single-mode fiber to these research buildings. The facilities located in the Plantation Road area include Rotor Dynamics, Geotech Lab, Structures Lab, Architecture Test Model, Fiber-Optics Lab, and Aquaculture. The voice and data services there now have the same functionality as on-campus locations. The new concrete-encased ductbank provides a secure cable pathway from the Hillcrest cable center to a new communications structure at Plantation Road.

*Fiber Meet Point at Thomas Conner House* - This "meet point" provides a convenient facility for service providers to connect to the university network and satisfies the university's strategic objective for the interchange of services between vendors and the university. This large, optical fiber-patching cabinet is strategically located so service providers can interface with Virginia Tech network facilities without easement issues. The project was completed in April 2004.

*Fiber Meet Point at CRC Research Building 12* - This project was completed in June 2004 and provides a convenient facility for service providers to connect to the university's network at the Virginia Tech Corporate Research Center. Having "meet points" at both the Corporate Research Center and the Thomas Conner House provides physical diversity, improving the durability of our interconnections with outside service providers. The "meet points" also allow geographically convenient options for connection to the campus network to providers located near downtown Blacksburg and/or in the Corporate Research Center area.



Ductbank Construction to the Verizon Central Office and Kent Square - This work, in downtown Blacksburg, was completed in November 2004 and will provide additional interconnection facilities to accommodate growth at Virginia Tech. The new ductbank facilitates cable pathways to various Virginia Tech leased properties in town as well as to the Verizon Central Office. The National LambdaRail optical fiber circuit will be placed in this ductbank and extended aurally via Verizon and American Electric Power poles.

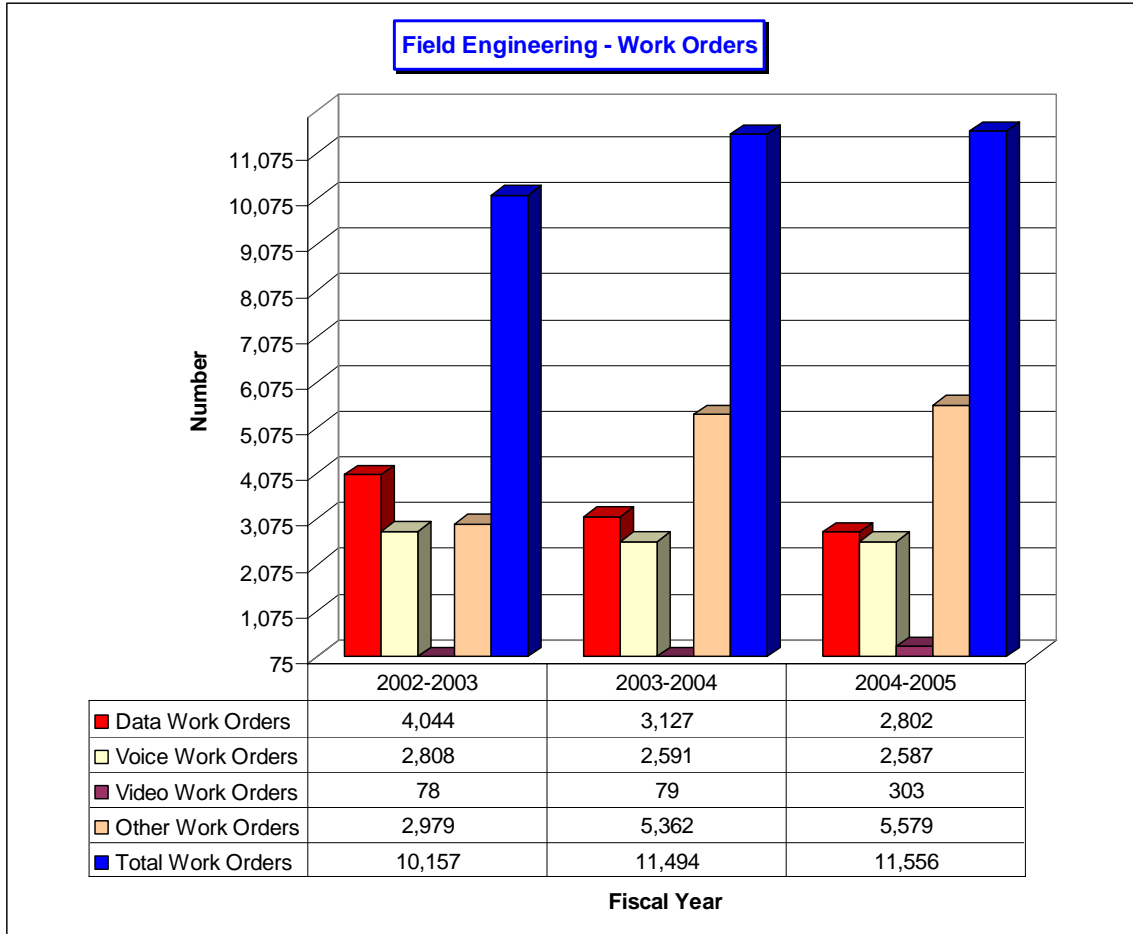
#### *Capital Project in Progress*

West Side Lane Stadium Expansion - This project, scheduled for completion in time for the Fall 2005 football season, involves the installation of extensive telecommunications facilities to luxury boxes, a new press box, two new elevators, new offices, classrooms, a computer lab, and tutoring facilities for Virginia Tech athletes. Field Engineering has worked closely with Athletics to design this state-of-the-art facility. As a result of the construction schedule, Field Engineering continues to find creative ways to install and/or stage communications infrastructure in the completed sections of the expanded facility working around the fact that many of the telecommunications equipment rooms have yet to be built. We will continue to coordinate closely with Athletics, Capital Design and Construction, and the general contractor as the opening day deadline approaches to insure all essential telecommunications services are in place as required. Given the construction schedule, we anticipate a significant amount of work in a very compressed timeframe will be necessary to bring the facility online. When completed, this facility will have 1450 jacks, 334,000 feet of Category 6 station cable, and 576 fusion splices of optical fiber.

#### *Miscellaneous Projects*

New Optical Fiber Standards. A new contract for the purchase of optical fiber was awarded in July 2004. CNS has adopted a new fiber standard including the installation of a 48 single-mode fiber (SMF-28e, low water peak fiber) as a building feed. The low water peak fiber allows more useable bandwidth which adds significant traffic capacity to the fiber circuit. A composite cable with 24 multi-mode and 24 single-mode fibers is used as a standard building riser. The multi-mode component is 50um and is rated at 10 gigabit/300 meters. The single-mode component is SMF-28e, low water peak fiber. CNS purchases fiber coupler plates with three meter pigtailed; the pigtailed are machine polished with SC connectors for multi-mode and SC-APC connectors for single-mode. The fiber pigtailed are fusion-spliced to our outside and riser fiber and have glass identical to the glass to which they are spliced. The resulting optical fiber circuits consistently have very low insertion loss and very high performance.

2004 Virginia Tech Cabling Standards. Our cabling standards document was updated to reflect current installation practices, materials, and infrastructure physical requirements. This document is a very useful reference for architects and engineers when designing new buildings for the university. Information Technology personnel from other universities sometimes request this information as well.



### Capital Projects – January 2004 – June 2005

Projects	Measure
Total RJ-45 jacks installed	5,548 each
Total Cat 6 station cable installed	818,400 feet
Personnel hours used for installation work	12,847 hours
Total optical fiber fusion splices completed	1,776 splices

## Ordering and Provisioning

Ordering and Provisioning processes departmental orders and ensures the timely provisioning of services and equipment, including phones, cellular phones and service, and integrated voice and data equipment and service.

The Ordering and Provisioning group serves as the primary point of contact between CNS and the university community. Customers' telecommunications needs are addressed by the implementation of appropriate, cost-effective services. The team assists in strategic telecommunications planning efforts for new buildings, as well as

tactical planning for routine voice, data, and video requests. Telecommunications needs have been accommodated for more than 230 Virginia Tech departments, as well as numerous vendors and outside agencies, during the reporting period. Over 11,500 work orders and more than 280 cellular orders were initiated during the period of July 1, 2004 through June 30, 2005.

Ordering and Provisioning plans and coordinates the development and submission of letters of estimate, receives and processes Interdepartmental Communications Requests (ICRs), initiates work orders, and follows up with customers after the completion of the work. With the fundamental goal of ensuring customer satisfaction, extensive support was provided for all major telecommunications projects.

Ordering and Provisioning personnel participated on several departmental teams to review, update, and enhance internal procedures and operating guidelines in order to improve workflow, communications, and team building, while providing for continuous process improvement.

*Key Business Administration and Operations Projects* – Numerous key projects were moved into production during the period by the Business Administration and Operations units.

*Cellular Orders and Billing.* During fiscal 2004, Business Administration and Operations' Ordering and Provisioning group took on the role as the main point of contact for university employees' cellular service inquiries. The group coordinates customer orders with the Virginia Information Technology Agency (VITA) and the various cellular service vendors. They also collaborate with other Communications Network Services units to establish more effective and efficient ordering, provisioning, and billing of cellular service. Issues addressed and resolved include:

- Improvements to the process for placing an order for cellular service, equipment, and/or accessories.
- Enhancements to the Interdepartmental Communications Request (ICR).
- Improvements to the internal work flow process.
- Improved working relationships with cellular vendors.
- Directory listings.
- Transition of Verizon Wireless customers to U.S. Cellular.
- Responding to specific customer service issues.
- Identifying trouble reporting procedures.
- Updating customer cellular service information on the CNS public website.

*Wireless Local Area Network.* Business Administration and Operations staff supported the implementation of the campus-wide Wireless Local Area Network (Wireless LAN) service by defining internal processes and procedures for offering the service. Issues addressed and resolved include:

- Identifying the process for ordering Wireless LAN service.
- Interdepartmental Communication Requests (ICR) requirements.
- Internal work flow.

- Customer expectations.
- Transitioning existing Wireless LAN ‘pilot’ customers to the Wireless LAN ‘production’ service.
- Billing and account management.
- Responding to specific customer service issues.

Improvement to the Wireless Local Area Network ordering and billing process will continue as we endeavor to meet customer expectations, resolve internal and external issues, and implement website updates to provide the most complete, accurate, and up-to-date information to our customers.

*The Inn at Virginia Tech, Skelton Conference Center, and Holtzman Alumni Center.*

Business Administration and Operations’ Director participated on the internal project team charged with the planning, design, procurement, and implementation of all the telecommunications systems for The Inn at Virginia Tech and Skelton Conference Center and Holtzman Alumni Center. Project support included:

- Input to the overall implementation plan and communications requirements.
- Responsibility for cost-rate analysis and proposals.
- Acting as the primary liaison with the Purchasing Department to address, investigate, and resolve procurement issues.
- Coordinating the development of the Hotel Entertainment System Request for Proposal and evaluating contractors’ responses.

*Virginia Tech Mobile Messaging.* Business Administration and Operations staff members participated on a CNS team charged with establishing support procedures for the provision of a new wireless service offering, Virginia Tech Mobile Messaging. The service provides for the integration of converged telephony and computing devices with the Exchange server as well as continuous wireless synchronization of e-mail and other data. Staff members also worked on a subcommittee to develop a rate for the Virginia Tech Mobile Messaging service. Business Administration and Operations will answer user inquiries about the service and will manage the associated publicity, ensuring the most complete and accurate information about the new service is available to end users.

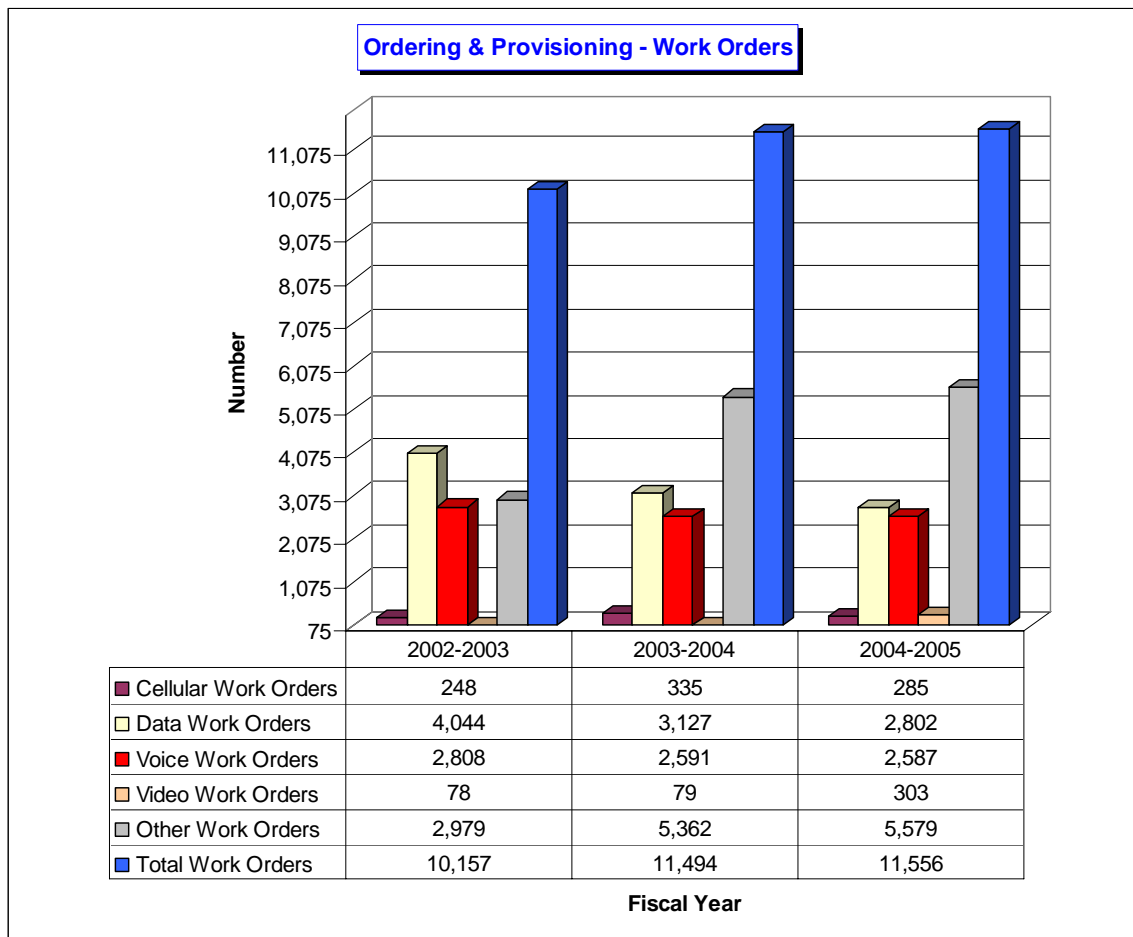
*Process Improvement.* The Financial Services Manager worked with the Systems Development and Administration team to develop and implement forty-six Business Administration and Operations software modification requests (SMRs) to the ATLAS enterprise information system. These enhancements included:

- Addition of an estimated prorated charge/credit to service management.
- Addition of a control to verify Personal IDentifiers (PIDs) are active when scheduling PID-related services.
- Display of the Interdepartmental Communications Request (ICR) number in the reference field on the Controller’s Office transfer file.
- Addition of bursar and bank detail totals to cash receipts transfer file log.
- Ability to search Banner document number or Banner date on purchase order screen.

- Addition of an application to track and monitor all Interdepartmental Printing Requests received by Printing Services.
- Removal of Social Security numbers from all ATLAS screens.
- Completion of project to write off balances of less than \$1.00.
- Addition of an “Abuse Block” which allows identification of customers whose network access has been turned off because they are causing network problems. This block prevents scheduling of other services for a customer who is causing such problems.

Business Administration and Operations worked on other areas of process improvement including the following:

- Identified the primary user of each phone extension and eliminated “No Name Listed” and “Multiple Users” descriptions on monthly statements, as required by Internal Audit.
- Reviewed and documented the customer work order process to allow better tracking.
- Implemented the Controller’s Office procedures for the verification of ‘authorizing signatures’ on Interdepartmental Communications



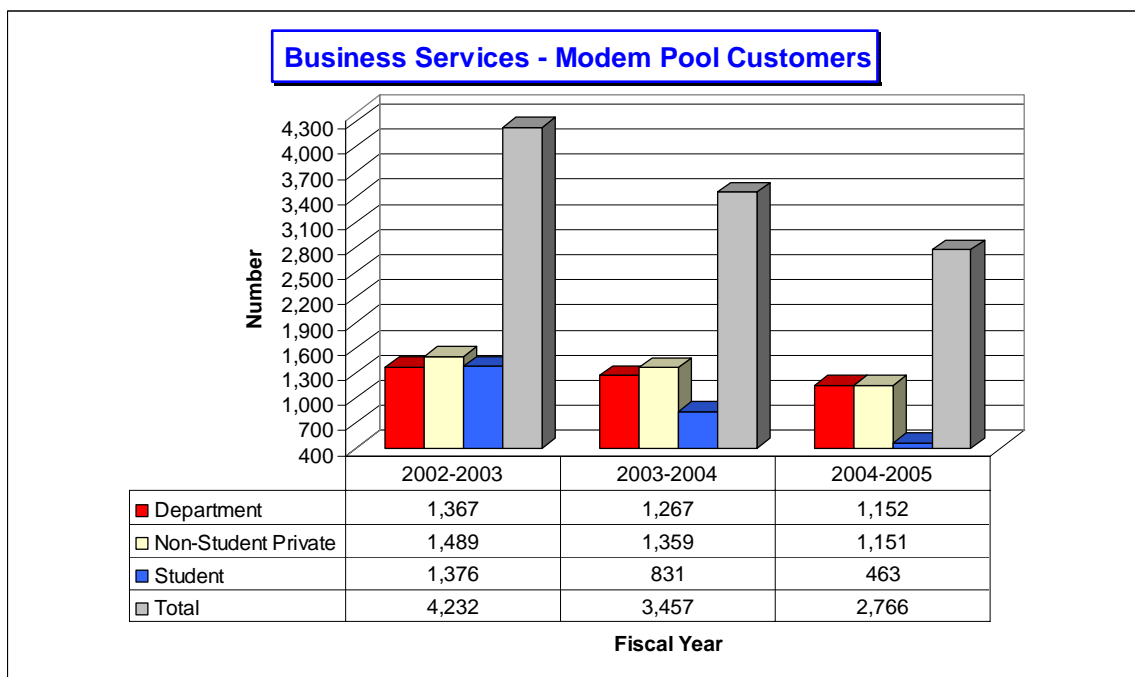
## Business Services

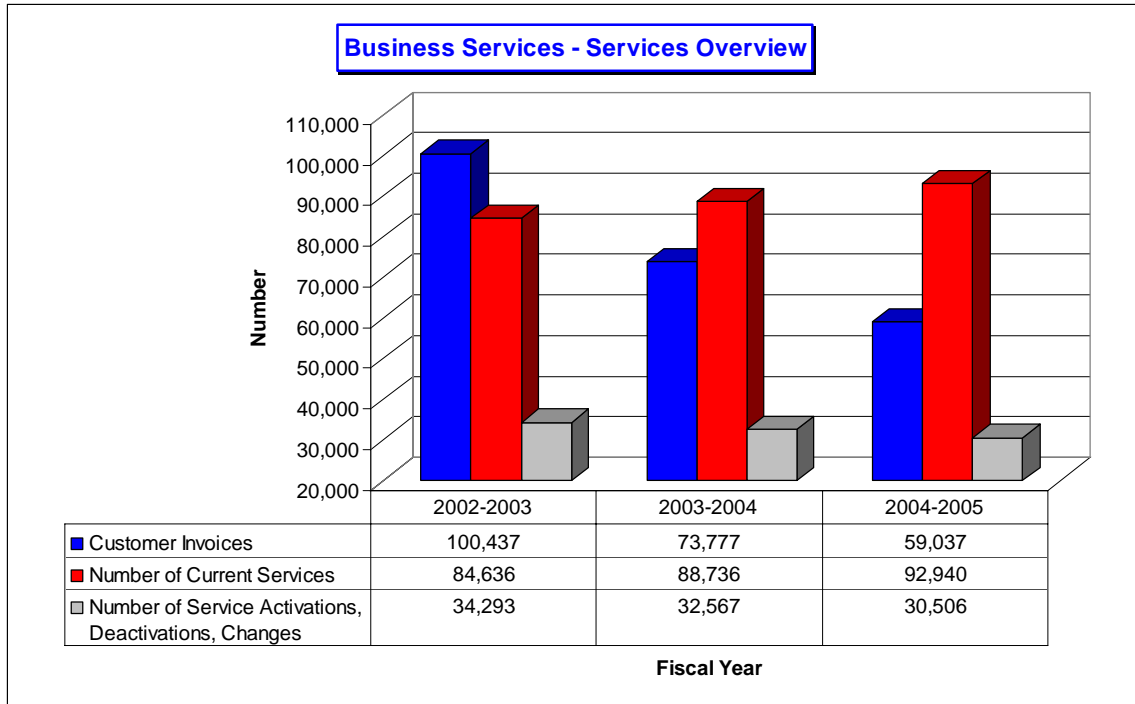
As a result of the growth experienced by NI&S and to better support business and administrative needs, Business Services was recently reorganized into two separate and distinct functional areas. These groups-- Accounts Receivable and Accounts Payable-- manage these functions for Communications Network Services, the Blacksburg Electronic Village, Video/Broadcast Services, Systems Support, University Computing Support, University Mail Services, University Printing Services, and the Virginia Tech Operations Center. Business Services is charged with ensuring these functions are carried out in accordance with university policies and procedures and with industry best practices.

In addition, Business Services manages customer telecommunications, VBS, BEV, and Printing Services accounts for university departments, university administration, on-campus and off-campus students, as well as outside agency customers of the university-owned telecommunications system. A branch office, Student Telecommunications, is the primary point of contact between students and Network Infrastructure and Services for telecommunications service and billing.

During the past year, accounting functions, including revenue and expenditure support, "time clock," and payroll for Systems Support and University Computing Support were transitioned into Business Administration and Operations, as these units became part of NI&S.

Business Services also participates in the development of, and provides guidance in, the business aspects of a variety of major projects some of which are listed below.





**Key Facts** - For the period of July 1, 2004 through June 30, 2005:

- Applied university and state accounting principles to ensure consistency and audit compliance across Network Infrastructure and Services' budget.
- Processed 7,181 invoices totaling approximately \$13,636,977.
- Processed 3,410 Network Infrastructure and Services purchase orders.
- Processed 30,506 telecommunication users' services changes (activations, deactivations, and fund changes).
- Generated 59,037 customer invoices.
- Processed 516 Electronic Funds Transfer customer requests resulting in reduced day-to-day operating costs.
- Closed 11,556 work orders.
- Consistently met or exceeded the state and university prompt-pay expectations for Communications Network Services, University Mail Services, the Blacksburg Electronic Village, Video/Broadcast Services, the Virginia Tech Operations Center, Systems Support, and University Computing Support.

## Public Relations

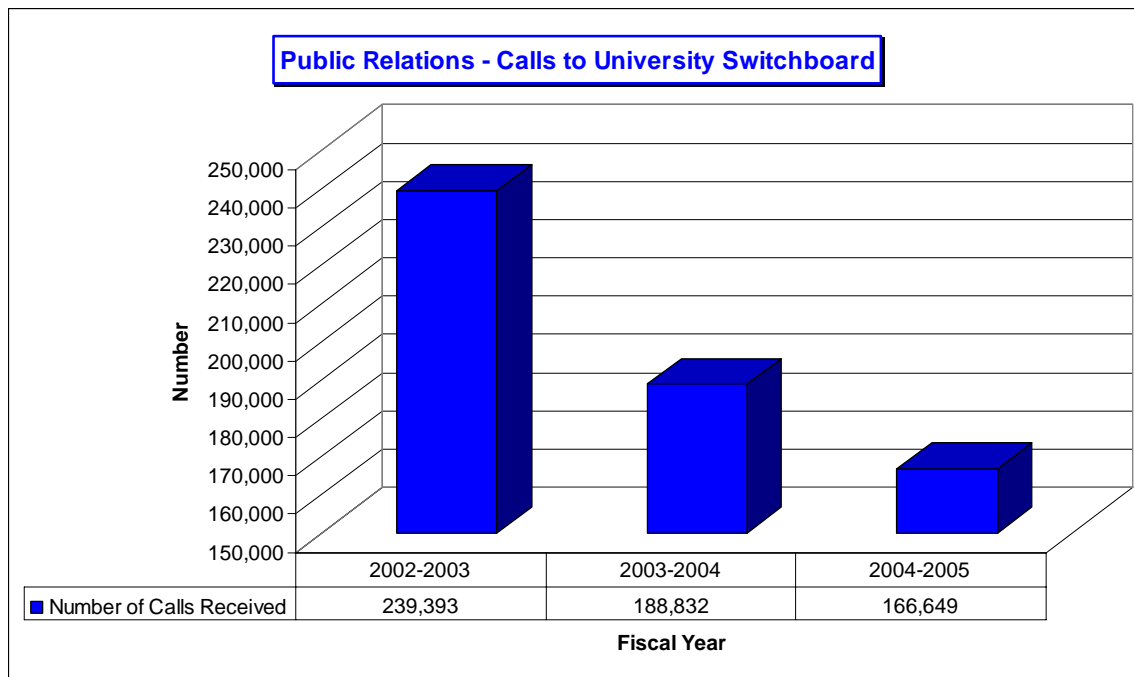
The Public Relations group includes the communications staff providing web development, maintenance and outreach services for CNS and NI&S, the CNS Reception team, and the University Switchboard staff.

Web development staff members provide accurate and timely information about NI&S activities and services to customers. They serve as the liaison between Network Infrastructure and Services and other university departments, groups, and offices by maintaining the CNS public and internal websites and, by coordinating development

and distribution of memos or letters to the appropriate customer base to inform them of developments concerning telecommunications. Editorial and website technical support for updating the “2004-2005 On-Campus Telecommunications Handbook” was also provided. Public Relations works with University Relations to provide information about NI&S for the university website, university publications, and to the outside media. They coordinate internal activities in support of NI&S, including writing and editing the Network Infrastructure and Services Annual Report for 2003-2004, updating the CNS Emergency Response Plan and coordinating the merging of this plan into the university’s plan, and participating on ATLAS project teams.

Public Relations Reception staff members provide information and assistance to students, parents, faculty, employees, vendors and visitors who contact Network Infrastructure and Services employees via the main telephone line, e-mail, postal mail or in person at our Corporate Research Center offices.

Another valuable Public Relations support service is assisting individuals who contact the university at its main telephone number. Virginia Tech’s Directory Assistance staff, or Switchboard Operators, provide telephone listings for on-campus students, faculty, staff and departments of Virginia Tech. Directory information is also available for affiliated entities such as the Cooperative Extension Offices, the Northern Virginia Center, and companies affiliated with Virginia Tech. Switchboard Operators also assist callers by explaining proper dialing procedures for campus as well as rates for local, long distance and international calls.



Premium Sports Programming for Student Programs - Extensive support was provided to Student Programs, the university department administering on-campus residential life, to identify premium video programming and develop a proposal for providing the cable television programming to a public residence hall viewing space. The pilot



implementation in a single residence hall was completed in March 2005. A parallel proposal for premium sports programming has been developed and submitted. The long-term objective is to distribute this programming to multiple residence halls, if students' interest in the offering is confirmed via a Student Programs survey.

*Student Programs Summer Telecommunications Service* – An agreement provides telephones and local calling capability to Student Programs summer conference guests, and eliminates the need to remove and remotely store residence hall phone sets during the summer. It was recently expanded to also provide access to the Internet for the summer conference guests. As a result, CNS has generated significant operational savings for the university.

*“While You’re Away” Sponsored by the Vice President for Student Affairs* - The Public Relations Manager coordinated with the Systems Support Manager to present a one-hour class entitled, “Effective and Acceptable Use of the Internet.” The presentation, given to Dr. Neal King’s class on “Theories of Pop Culture” in August 2004, explores policy issues, practical actions, and potential consequences of using the campus network and the Internet.

*Internet Copyright Infringement* - Public Relations gave presentations, as requested, on the topic of Internet copyright infringement, including a briefing for the university’s incoming Judicial Affairs staff prior to the beginning of the Fall semester. During the school year, hundreds of Internet copyright infringement complaints are processed involving coordination with students, with the university’s Judicial Affairs office, and with departmental system administrators to address and resolve cases and assure compliance with the Digital Millennium Copyright Act (DMCA)

*Outreach and Special Support* - The Public Relations Manager serves as an ex officio representative to the Board of Directors of the Educational Media Company at Virginia Tech. He is also a member of the university’s Americans with Disabilities Act Executive Committee.

Other Outreach and Special Support activities included participating on the Student Computer Requirement Team, which annually updates recommended computer specification for incoming students, and speaking to the Student Programs Advisory Group.

## University Printing Services

Printing Services continues to offer high-quality products and services to meet the varied needs and ever-increasing demands of the university community. During 2004, Printing Services staff developed new skills as they continued to transition from an analog to a completely digital environment. Digital work flow efficiencies are now being fully realized, particularly in the area of full-color printing, for which there is high demand within the university.

Printing Services uses hardware and software to enable faculty, students, and staff, regardless of their physical location, to submit jobs with customizable options through the Printing Services website.

## **Printing Plant**

The Printing Plant continues to support the mission of the university by producing a high- quality printed product in a timely manner. The digital computer-to-plate system has increased efficiencies, effectively improving turnaround time and allowing more time for content development. The new system has also increased the overall product quality level, especially in the proofing and plate-making area. Demand for four-color products continues to increase, forcing greater demands on the existing two-color equipment and other resources.

## **Copier Management Program**

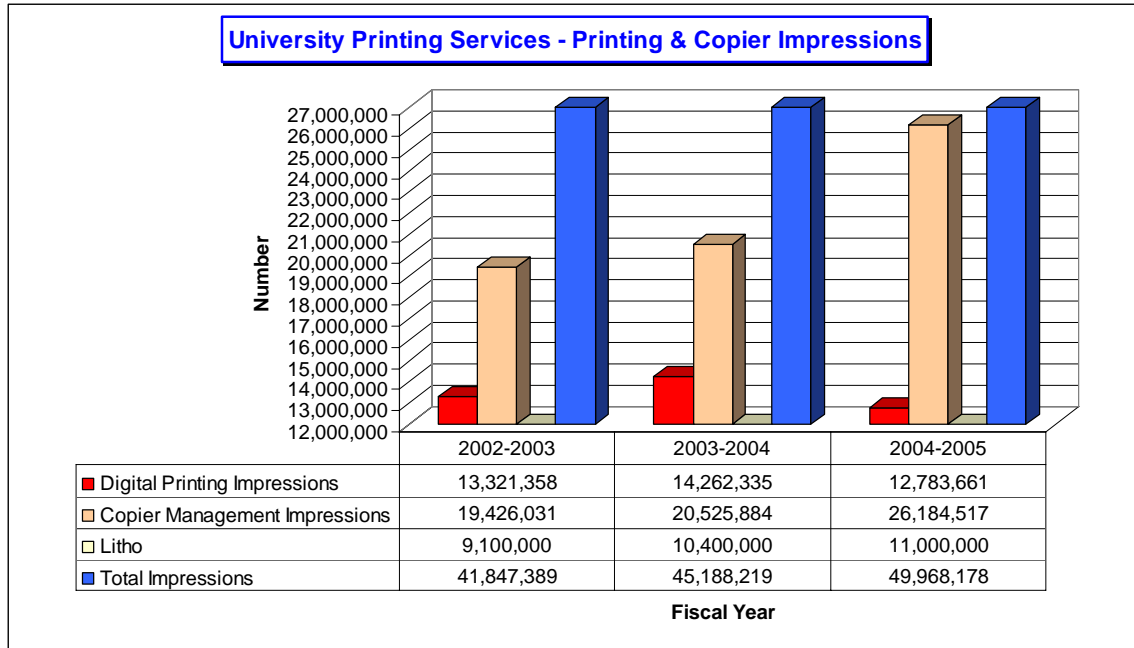
The Copier Management Program (CMP) grew significantly over the past year--its first full year of operation. The CMP has three main objectives: management of agreements with the copier vendor; serving as liaison between the copier vendor and university departments; and providing cost savings to the university. Our vendors are obligated and motivated to deliver service in an appropriate and timely manner providing an excellent level of service to our customers.

Approximately four hundred multi-function copier/printer/fax/scanners are currently administered under the CMP, and the number is expected to grow as older contracts expire. 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 cost per copy. A combination color copier/printer/scanner was recently introduced into the program to allow departments to laser-print full color at a very reasonable cost.

Online tools allow departments to submit requests for service calls and supplies directly from the Printing Services website. These enhancements have allowed off-campus Extension offices and research facilities to take advantage of the program. Current projections indicate five hundred machines will be in service by the end of 2005, with an average university usage of three million copies per month.

## **Digital Print Centers**

The Digital Print Centers, formerly called Copy Centers, are now *entirely* digital with no analog devices. In addition, our print management system allows one device to drive all the printers in each center, including four-color devices. Each center prints approximately 1.8 million copies per month plus 8,000 per month on each color printer. Both Digital Print Centers are capable of receiving web-submitted files. Following the retirement of a ten-year-old device, the university's Information Technology printing will be produced on new equipment capable of processing 105 pages per minute.



## Centralized Mail

Centralized Mail continues to handle over two million pieces of outgoing mail per year in addition to all mail sent to Deans, Director, and Department Heads. The group handles labeling and presort bar-coding to achieve the lowest possible cost for the university.

## University Mail Services

Mail Services is composed of two functional entities--University Mail Services (UMS), which processes mail for university departments, and Residential Mail Services (RMS), which processes mail for all students living in the campus residence halls. Mail Services handles approximately 100,000 mail items every month.

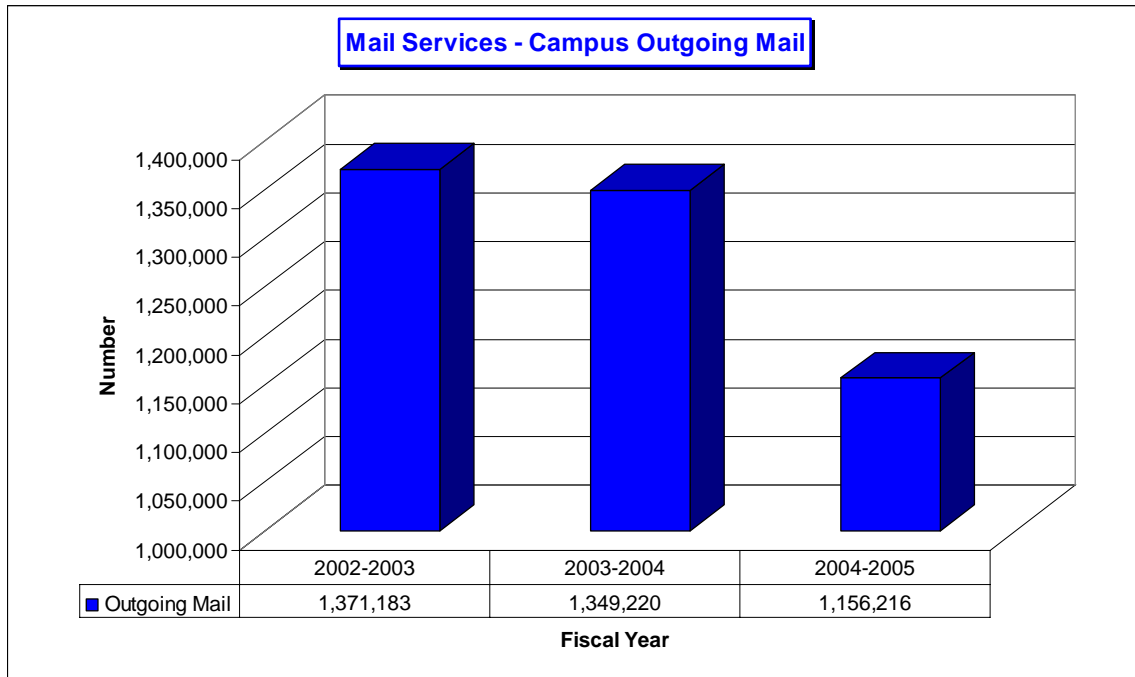
UMS delivers mail and picks up mail and packages for more than 300 university departments each day including satellite centers such as the College of Veterinary Medicine, the Math Emporium, and the Virginia Tech Corporate Research Center.

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. Residential Mail is also increasing its reliance on technology to ensure students receive important mail even if incorrectly addressed. The speed at which mail is now processed, even at increased volumes, has been improved by using automated systems.

Mail Services is served by vendors such as DHL, UPS, and the United States Postal Service (USPS). Network connectivity has allowed more efficient use of Mail Services resources including the establishment of an online departmental billing process

leveraging the capabilities of the ATLAS enterprise management system. The online billing system has automated transactions between university departments and University Mail Services, saving paper and printing costs as well as increasing transaction accuracy.

More information about Mail Services can be found at its website, [www.mailservices.vt.edu](http://www.mailservices.vt.edu).



## Professional Activities

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, places, and other information may not be reflected on this list.

### Seminars and academic course support

*Crowder, Jeff*, February and March 2005, served as a panelist for Faculty Development Institute's "Panel Discussion: Research, Scholarship, and Discovery at Virginia Tech"

*Dougherty, William*:

- October 2004, spoke to a Deans, Department Heads, and University Center Directors seminar group on "E-mail Service Feature Comparison," outlining

differences in potential use between the Sun ONE/POP server, the Exchange system, and Listserv functions.

- November 2004, gave a presentation to a meeting of Biological and Systems Engineering Department graduate students and faculty on “E-concerns.” This presentation addressed privacy, application and enforcement of the acceptable use policy, copyright of electronic/digital media, and other computer security issues.

Sanders, Bill, April 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.

## **Boards and committees**

Crowder, Jeff:

- CNS representative, VTIA (Virginia Telecommunications Industry Association, <http://www.vtia.org/>).
- National LambdaRail Administrative Coordinator for the Mid-Atlantic Region including Virginia, Maryland, and Washington, D.C.

Hach, Richard, ongoing participation on steering committees to plan presentations and agendas for Net@EDU Wireless Working Group, Joint Meetings of Net@EDU Integrated Communications Services Working Group and Wireless Working Group, for both annual member meetings and EDUCAUSE annual meeting.

Lilly, Judy:

- Net@Edu Advisory Committee
- Net@Edu Wireless Working Group
- “One Care of Southwest Virginia” Board Member (not-for-profit serving the Ninth Congressional District)
- Information Technology (IT) Security Task Force
- Information Technology Enterprise Directory Advisory Committee
- University Emergency Response Team – IT Lead for Virginia Tech
- University Computer Privacy Committee - Represented IT on the committee that successfully developed and obtained Board of Visitors’ approval for the new Computer Privacy Policy
- Blacksburg Electronic Village Board (advisory member)
- University Imaging RFP Advisory and Review Committees
- Advisory Committee to the Town of Blacksburg for their Wireless RFP. Include extensive review and editing of the RFP.
- Provost’s Council
- NetworkVirginia Contract Administrator for Verizon and Sprint
- Blacksburg Intermediate Woman’s Club, Member of Education Committee, Past President

Nichols, John:

- Co-chair for the EDUCAUSE Net@EDU Wireless Networking Group.
- Member, New River Valley Planning District Commission (NRVPDC) Telecommunications Committee. Led a design team to develop a proposal for a community Fiber to the Premises (FTTP) network to deliver Gigabit Ethernet access.
- Advisor for the Blacksburg Telecommunications Advisory Committee.
- Advisor to the Pulaski Telecommunications Committee for community fiber and wireless projects.
- Advisor for the Blacksburg Community Wireless Project and served as a member of the town's RFP Evaluation Committee.

Sanders, Bill:

- Member, Community Foundation of the New River Valley: Community Advisor Development Committee.
- Member, Mental Health Association of the New River Valley: Board of Directors, Finance Committee.
- Ex officio member, Blacksburg Telecommunications Advisory Committee.
- 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.

Smith, Roy, February 2004 and April 2005, participated in the interview process for the University Bursar's position.

Stock, Doris:

- Member, Legislative and Regulatory Committee, Association for Communications Technology Professionals in Higher Education (ACUTA).
- Member of University committee tasked with review and implementation of the Gramm-Leach-Bliley Act.

## **Degrees awarded and certifications achieved**

Anderson, Patrick Cragin, May 2005, graduated from Virginia Tech, Cum Laude.

Brown, Eric, May 2005, Master of Science, Electrical Engineering, Virginia Tech

Chinaka, Daniel Tsuneo, May 2005, graduated from Virginia Tech, Magna Cum Laude.

Cook, Dan, March 2004, Security Administrator Certification from *Sun*.

Hewett, Russell Joseph, May 2005, graduated from Virginia Tech, Magna Cum Laude, and "Degree in Honors"

McFerrin, Lisa Gail, May 2005, graduated from Virginia Tech, Cum Laude, and Commonwealth Scholar.

Mulligan, Gavin Horton, May 2005, graduated from Virginia Tech, Cum Laude.

Sprague, Robert, July 2004, Cisco Certified Network Professional Recertification.

Zirkle, Laurie:

- January 2004, SANS GIAC Certified UNIX Security Administrator Certification.
- March 2004, SANS GIAC Security Essentials Recertification with Honors.

## **Military service**

Keller, Ron, served with his Army Reserve unit in Kuwait and Iraq in Operation Iraqi Freedom II and has returned to his position with Communications Network Services

Roberts, Robert, currently serving with his Army Reserve unit in Kuwait and Iraq in Operation Iraqi Freedom III.

## **Active grants**

Dougherty, William, March 2005, as member of the [ABUSE@vt.edu](mailto: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". University Computing Support also participated in this project.

Mathai, Mathew, and Sanders, Bill, September 2004, completed the final reports and closed out the Blacksburg Electronic Village's \$378,000 grant from the U.S. Department of Commerce under the Technology Opportunities Program (TOP).

## **Presentations, papers, and publications**

Crowder, Jeff:

- January 20, 2005, "Mid Atlantic Terascale Partnership: Economic and Structural Models" paper provided to Commonwealth of Virginia's Secretary of Technology Huang and submitted to the Southern Governor's Association. <https://rdweb.cns.vt.edu/~crowder/pubs-papers/20050120-SGA-MATP-Final.doc>
- May 26, 2005, Presented "Developments in National and Regional Networks for Research" for the Virginia Tech High-Performance Computing Conference in Blacksburg.
- Numerous presentations given regarding National LambdaRail and Mid-Atlantic Terascale Partnership to multiple groups including IEEE, SAIC, NASA, Quilt, and Virginia Tech Foundation Board.

Hach, Richard, and Nichols, John, Summer 2004, presentation on wireless technologies to a meeting of US Cellular regional operations personnel in Roanoke

Hach, Richard, February 2005, presentation on community network wireless plans and technology for wireless data infrastructure as part of a panel discussion on “Integrated Technology for Emergency Systems/Disaster Recovery” for the Wireless and ICS Working Groups of Net@EDU in Tempe, Arizona

Kidd, Jeff, and Dougherty, William, April 2004, spoke to seminar for representatives of the Student Life support groups on “E-Concerns.” This presentation addressed issues concerning copyright of electronic/digital media, acceptable use policies, how to analyze and read e-mail header information, how to report “cyber-abuse,” and other computer security issues.

Nichols, John:

- June 2004, Presentation about community networks at a Wireless Communications Association conference in Washington, D.C.
- Consulted with New River Valley Community College on their wireless deployments.
- Major contributor, Request for Proposal for Wireless Services for the Town of Blacksburg.

Sanders, Bill:

- 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.
- Poster session on the Blacksburg Electronic Village at the 2004 Service Learning Conference in Blacksburg.
- April 2005, Gave a presentation and participated in a panel discussion on the TOP grant and e-Village activity for the “Advancing Rural e-Commerce Conference” at the Institute for Advanced Learning and Research in Danville, Virginia.

Sheppard, Anne, April 2004, “Student Computing Programs at Virginia Tech,” Association of Collegiate Computing Services (ACCS) of Virginia conference.

Stock, Doris, October 2004, “Streaming Video Patent Issue and Higher Ed,” ACUTA News.

Watson, Judy, April 2004, panel member, “Help Desk Issues,” Association of Collegiate Computing Services (ACCS) of Virginia conference.

## **Conferences and training**

Allen, Morgan, and Stell, Ray, June 2004, attended Southeastern Oracle Users Conference 2004 in Charlotte, NC.



Blevins, Bill, and Grubb, Terry, January 13, 2004, attended a Virginia Information Technology Agency (VITA) “Telecommunications” seminar in Richmond, VA.

Cohen, Marc, and Christian, Jason, May 2005, attended Microsoft Security Training.

Cook, Dan, and Rodgers, Pat, Oct. 2004, attended “Meeting IT Challenges: National Strategies and Local Solutions” conference jointly hosted by the Association of Collegiate Computing Services (ACCS) and the Virginia Alliance for Secure Computing and Networking (VA SCAN).

Christian, Jason; Cohen, Marc; Cook, Dan; Kellison, LaRhonda; Stell, Ray; Sumner, Marc; Ward, Luke; and Zirkle, Laurie, March 2004, participated in a SANS Internet Security Seminar.

Christian, Jason; Cook, Dan; Fischer, Eric; Stell, Ray; Ward, Luke; and Zirkle, Laurie, March 2005, participated in SANS seminar on Intrusion Detection.

Inman, Kevin, May 2005, attended the “Tiger Client Management” seminar in Charlottesville, VA.

Kidd, Jeff, July 2005, attended the “Institute for Computer Policy and Law” tenth annual seminar at Cornell University, Ithaca, NY

Lilly, Judy:

- April 2005, Attended the annual EDUCAUSE Policy Conference in Washington, D.C.
- May 2005, Attended the annual Internet2 Member Meeting in Arlington, VA

Martin, Barbara, April 2005, represented Communications Network Services at the Verizon Billing Symposium and participated in the Billing User Group, in Nashville, TN

Nichols, John, March 2005, attended the Virginia Telecommunications Industry Association (VTIA <http://www.vtia.org/>) conference at the Hotel Roanoke Conference Center

Sheppard, Anne, June 2004, participated in the ResNet 2004 Symposium in Princeton, New Jersey

Smith, Roy, January 2004, attended the ACUTA Winter Seminar on “Student Telecom Services” in New Orleans, LA

Stock, Doris, and Whitlock, Diane, August 2004, attended the ACUTA Annual Conference in Chicago IL

Watson, Judy, July 2004, participated in the Virginia Desktop Support Manager Conference

Whitlock, Diane, May 2005, represented Network Administration during a site visit to East Carolina University to review their implementation of VoIP technology.

## Research Computing

Virginia Tech has received recognition over the past two years because of its investment in research computing. Highlighted in the area of research computing are the 16p (Spring 2004) and 64p (Spring 2005) SGI systems, System X and Initiative in Computational Science and Engineering (Summer 2005) funded by the Governor's research panel.

## System X

System X was ranked Number 3 in the Top500 List published in November 2003. At that time, System X consisted of standard desktop machines—1,100 Power Mac G5s. In January 2004, System X was upgraded to 1,100 Xserve servers. The Xserve servers were custom-built by Apple Computer for the Virginia Tech project. Each Xserve has two G5 processors running at 2.3 GHz. Combined with the system's super-fast InfiniBand communications backbone, the upgraded system was benched at 12.25 trillion operations a second (12.25 teraflops). The Xserve servers are about 15 percent faster than the desktop machines they replaced, but overall, the new System X operates about 20 percent faster, almost adding 2 teraflops. System X was listed as Number 7 on the November 2004 Top500 List.

For the period 1 January 2005 through 1 July 2005, Virginia Tech researchers were encouraged to run applications on System X. These researchers were referred to as "hero users"—users who were running at their own risk. Below is a list of units and users during this period.

Aerospace and Ocean  
Engineering  
Biochemistry  
Biology  
Chemical Engineering  
Chemistry  
Civil and Environmental  
Engineering  
Computer Science

Joseph Wang

David Bevan

John Tyson

David Cox, Amadeu Sum

Daniel Crawford, Diego Troya

Elisa Sotelino

Adrian Sandu, Alexey Onufriev, Sean

Corcoran, Liqing Zhang, Cal Ribbens, Layne

Engineering Science and Mechanics	Watson, Srinidhi Varadarajan Ishwear Puri
Geosciences	Matthias Imhof
Material Science and Engineering	Diana Farkas, Yu Wang, Levon Asryan
Mathematics	Jeff Borggaard, Terry Herdman
Mechanical Engineering	Danesh Tafti, Ken Bell, Michael von Spakovsky, Mark Paul
Physics	Uwe Tauber, Beate Schmittmann

In addition to Virginia Tech researchers, several high profile external users have run applications on System X. These external users include:

Dr. David Keyes, Fu Foundation Professor of Applied Mathematics, Department of Applied Physics and Applied Mathematics, Columbia University. Dr. Keyes is the author or co-author of over 100 publications in computational science and engineering, numerical analysis, and computer science. He has co-edited 8 conference proceedings concerned with parallel algorithms and has delivered over 200 invited presentations at universities, laboratories, and industrial research centers in over 20 countries and 35 states of the U.S. With backgrounds in engineering, applied mathematics, and computer science, and consulting experience with industry and national laboratories, Keyes works at the algorithmic interface between parallel computing and the numerical analysis of partial differential equations, across a spectrum of aerodynamic, geophysical, and chemically reacting flows. Newton-Krylov-Schwarz parallel implicit methods, introduced in a 1993 paper he co-authored at ICASE, are now widely used throughout engineering and computational physics, and have been scaled to thousands of processors on the ASCI platforms. Dr Keyes and two of his Ph.D. students worked with the IT staff to transport and run his application code to System X. At the time, this report was prepared Dr. Keyes and his students have used System X successfully on PETSc-based applications. Dr. Keyes in a note to Dr. Terry Herdman stated, "Because of this generosity and implicit partnership, I consider myself at your disposal for purposes of activities that support System X and computational science at Tech."

Robert J. Harrison, Computational Science, Oak Ridge National Laboratory (ORNL), and Chemistry, University of Tennessee, Knoxville. Robert J. Harrison holds a joint appointment between Oak Ridge National Laboratory (ORNL) and the University of Tennessee, Knoxville. At the university, he is a professor in the chemistry department. At ORNL, he is a corporate fellow and leader of the Computational Chemical Sciences Group in the Computer Science and Mathematics Division. He has many publications in the areas of theoretical and computational chemistry, and high-performance computing. His undergraduate (1981) and post-graduate (1984) degrees were obtained at Cambridge University, England. Subsequently, he worked as a postdoctoral research fellow at the Quantum Theory Project, Univ. Florida, and the Daresebury Laboratory, England, before joining the staff of the theoretical chemistry group at Argonne National Laboratory in 1988. In 1992, he moved to the Environmental Molecular Sciences Laboratory of Pacific Northwest National Laboratory, conducting research in theoretical chemistry and leading the development of NWChem, a computational chemistry code for massively parallel computers. In

August 2002, he started the joint faculty appointment with UT/ORNL. In addition to his DOE Scientific Discovery through Advanced Computing (SciDAC) research into efficient and accurate calculations on large systems, he has been pursuing applications in molecular electronics and chemistry at the nanoscale. In 1999, the NWChem team received an R&D Magazine R&D100 award, and, in 2002, he received the IEEE Computer Society Sydney Fernbach award.

Several Virginia Tech researchers have a need to use NWChem. We are working with Dr. Harrison to include this software on System X.

Dr. Michael Schafer, Department of Numerical Methods in Engineering, Darmstadt University of Technology. Dr. Schafer is well known for the development of a flow solver code for large eddy simulation of incompressible turbulent flows. The code provides a finite volume multigrid solver (in FORTRAN770; the parallelization is based on grid partitioning via MPI. Dr. Cal Ribbens and his student, Rajesh Sudarsan, worked with Dr Schafer and were successful in transporting and running his flow solver, FASTEST, on System X. We have offered Dr. Schafer the opportunity to run some larger problems in the near future. Dr Schafer has offered his code to Virginia Tech researchers who are interested in using the code. Once Dr. Schafer returned home he wrote stating, "I am well back home and would like to thank you again for all your efforts around the visit which I enjoyed very much. The System X work has been very successful. With the excellent help of the VT experts, we got the code running quickly and could perform a variety of test calculations. I hope very much that the visit can be followed by an intensive cooperation in which I am very much interested. In particular, with the group of Danesh Tafti there appears to be a variety of overlapping interests."

Dr. Gabriel Wittum Interdisciplinary Center for Scientific Computing, University of Heidelberg is recognized as one of the leading experts in scalable simulation on adaptive unstructured meshes. Dr. Wittum conducted a scalability study on System X. The study was based on the simulation system UG, which has been developed by Dr. Wittum. UG supports unstructured grids in two and three space dimensions, local adaptive grid refinement on massively parallel computers and fast multi-grid solvers. The study concluded that up to 512 processors the software scales well. We hope to be able to extend the scalability to 2048 processors during Dr. Wittum's next visit to Virginia Tech.

## Initiative in Computational Science and Engineering

The initiative in Computational Science and Engineering (CS&E) was one of the four proposals that Virginia Tech submitted to the Governor's Research Review Panel. Terry Herdman, Director of Research Computing and Director of ICAM, was listed as the PI/coordinator for this initiative. Virginia Tech received \$2M (Summer 2004) to support the four proposals. Brad Fenwick, VP for Research, with input from the four PIs decided on the level of funding for the four proposals. The Initiative in CS&E received \$251K. The CS&E funds supported the following initiatives.

1. Upgrade the shared memory computing environment at Virginia Tech.

2. CS&E Lecture Series: Invited high Profile CS&E researchers to Virginia Tech for a four to five day visit. For each Visitor that has application code that could use the architecture of System X, time on System X and assistance in transporting their code was offered to the researcher. One component of this lecture series was a conference on HPC held on the campus of Virginia Tech, May 2005.
3. CS&E Post Doc Fellows CSE Special Lecture Series: Two Post Doctoral positions were created to assist on particular Virginia Tech CS&E projects.
4. Two GRAs positions were funded to assist AC&E faculty in transporting their application code to Systems X.

## Upgrade for shared memory computational environment

During the spring 2004 semester the Research Division and IT purchased a 16p SGI Altrix to enhance our shared memory platforms and complement System X. The SGI was running at capacity almost immediately when it came on line. Requests for this system exceeded capacity by a factor of four. Some of the funds from the Initiative in CS&E were used to supplement funds from the Research Division, College of Science, Department of Mathematics and IT to purchase a 64p SGI Altrix 3400. Included in this purchase was an introductory visualization, Viz, system. This visualization system will be used to provide visualization data to the desktop of the researcher and thus introduce the researcher to the capabilities of state of the art visualization. The SGI 64p is on line and running at capacity.

## CS&E lecture series

2-6 March:

Eric de Sturler, Thomas M. Siebel Professor, Computer Science, University of Illinois, Urbana-Champaign

Dr. Siebel is an expert in scientific computing and large scale iterative methods for solving systems of equations that arise in physical modeling. Eric consulted with faculty members having common research interest including Peter Sapporo, Jeff Borggaard, Traian Iliescu, Ekkehard Sachs, Serkan Gugercin, Christopher Beattie, Mathematics; Calvin Ribbens and Layne Watson, Computer Science; Daniel Crawford, Chemistry and Danesh Tafti, Mechanical Engineering. He presented the research lecture *Fast Solvers for Long Sequences of Linear Systems* on 2 March 2005.

14-18 March and 2-3 May:

David Keyes, Fu Foundation Professor of Applied Mathematics, Department of Applied Physics and Applied Mathematics, Columbia University. Dr. Keyes is the author or co-author of over 100 publications in computational science and engineering, numerical analysis, and computer science. He has co-edited eight conference proceedings concerned with parallel algorithms and has delivered over 200 invited presentations at universities, laboratories, and industrial research centers in over 20 countries and 35 states of the U.S. With backgrounds in engineering, applied mathematics, and computer science, and consulting experience with industry and national laboratories,

Keyes works at the algorithmic interface between parallel computing and the numerical analysis of partial differential equations, across a spectrum of aerodynamic, geophysical, and chemically reacting flows. Newton-Krylov-Schwarz parallel implicit methods, introduced in a 1993 paper he co-authored at ICASE, are now widely used throughout engineering and computational physics, and have been scaled to thousands of processors on the ASCI platforms.

David Keyes presented a research lecture on scientific discovery through advanced computing to the Virginia Tech Computational Science and Engineering faculty and graduate students. He prepared and presented a workshop on Domain Decomposition to interested faculty and graduate students. Dr. Keys gave a presentation and provided advice to the mathematics undergraduate and graduate students on careers in mathematics. He consulted with faculty and students having common research interest. Also, Dr Keys discussed and provide advice for the Virginia Tech effort in proposing a graduate Computational Science and Engineering program. During the 14-18 March visit, he met with the directors of the TCF and completed the first steps necessary to transport his application code to system X. On his return visit to Virginia Tech Dr. David Keyes presented a research lecture on the scalable solvers and an overview of PETSC to the Virginia Tech Computational Science and Engineering faculty and graduate students. He consulted with faculty and students having common research interest. Dr. Keys met with the ICAM faculty and discussed initiatives in Computational Science and Multiscale analysis. He worked with the staff of the TCF and ran his application code to System X.

4-8 April:

Satya Atluri, Samueli/von Karman Chair in Aerospace Engineering, and the Director of the Center for Aerospace education & Research, University of California, Irvine. Dr. Satya Atluri, Samueli/von Karman Chair in Aerospace Engineering, and the Director of the Center for Aerospace education & Research, University of California, Irvine visited Virginia Tech 4-8 April 2005. He gave the research lecture, *My current Research on the Meshless Local Petrov-Galerkin (MLPG) Method*, 4 April, 4:00pm. More than 90 faculty and students attended this lecture. Dr. Satya Atluri presented a workshop on Issues in *Multi-scale Modeling*, with sessions on 5 April and 7 April. Dr Atluri consulted with several faculty members on common research interest and joint research projects.

11-15 April:

Linda Petzold, Department of Computer Science, University of California at Santa Barbara. Dr. Linda Petzold's research areas include numerical ODEs, DAEs, and PDEs, parameter estimation and optimal control for PDEs, scientific computing, and mathematical modeling. Her research concentrates on computational science and engineering, and in particular simulation, sensitivity analysis, design optimization, optimal control and problem solving environments for systems described by differential-algebraic equations and partial differential equations. Current projects focus on several important engineering applications: development of a computational infrastructure for microfluidic systems with applications to biotechnology, development and analysis of multiscale simulation methods for biochemical networks.

The computational issues addressed range from development and analysis of numerical methods for problems at scales from stochastic to deterministic, to analysis of errors due to the use of reduced order models, to the design of software environments to make scientific computation more easily accessible.

Dr Linda Petzold participated in the workshop on Multi-scale Modeling of Cell Cycle Regulation organized by Dr. John Tyson, Biology. Eight Virginia Tech faculty members and one graduate student attended this workshop that ran for 6 1/2 hours. Dr. Petzold gave the research lecture *Bridging the Scales in Biochemical Simulation*, Monday 11 April, 4 pm. More than 40 Virginia Tech faculty and graduate students attended this presentation. Dr Petzold gave a presentation to the faculty, graduate students and undergraduate students, *The Coming of Age of Computational Science*, Tuesday 12 April, 4pm. Dr. Petzold consulted with several faculty on the development of computational science and engineering (CSE) education programs. She chaired the SIAM working group that prepared SIAM's document on graduate CSE programs that was the foundation for the Virginia Tech Task Force report on graduate CSE programs. During her visit, she interacted with numerous Virginia Tech faculty identifying joint research projects.

11-15 April:

Yang Cao, Division of Biology, University of California at Santa Barbara. Dr Cao's research areas include Sensitivity and uncertainty analysis for large-scale differential algebraic systems, numerical methods for DAE systems and stochastic simulation of biochemical systems. He has held a post doc position at UCSB for the past two years working with Dr. Linda Petzold. He presented the lecture, *Multiscale Stochastic Simulation of Biochemical Systems*. He consulted with John Tyson, Biology, and Layne Watson, CS, and participated in the workshop on Multi-scale Modeling of Cell Cycle Regulation organized by John Tyson. Dr. Cao will join our CS department in January 2006.

18-22 April:

Carla D. Moravitz Martin, PhD. Student, Cornell University. Carla is working with Charles Van Loan. She is recognized as one of the most promising researchers in the area of numerical linear algebra. She gave the lecture, *Higher-Order Tensor Decompositions*, and held detailed research discussions with Drs. C. Beattie, J. Borggaard, T. Illiescu, and T. Herdman. Carla completed the Ph.D. degree, Summer 2005. She will stay at Cornell for the 2005-2006 AY as an assistant professor. She plans to apply for a CS&E position at Virginia Tech for the 2006-2007 AY.

25-29 April

Pavel Bochev, Sandia National Laboratories, Computational Math & Algorithms, visited Virginia Tech 24-28 April 2005. Dr. Bochev together with Max Gunzburger and John Burkardt presented a four-lecture workshop on *Compatible and Alternative Spatial Discretizations for PDE's*. More than 20 Virginia Tech faculty and graduate students attended this workshop. In addition, he met with the System X staff and discussed terascale computing hardware, software, and application codes. Dr. Bochev



consulted with several faculty and graduate students on computational science and engineering graduate programs and research computing. He discussed possible joint research projects with the faculty of the Interdisciplinary Center for Applied Mathematics. He also discussed careers at national laboratories with several graduate students.

John Burkhardt, School for Computational Sciences, Florida State University

Dr. Burkhardt presented the lecture, The Water Pump and the Spitting Fish, Tuesday 26 April at the Math Club/SIAM Student Chapter meeting. He met with several undergraduate and graduate students discussing applied mathematics and computational science and engineering programs and careers. Together with Pavel Bochev and Max Gunzburger. Dr. Burkhardt participated in the four-lecture workshop on Compatible and Alternative Spatial Discretizations for PDE's. He met with the System X staff and discussed professional code development for terascale computing and issues relative to building large node computing systems. Dr. Burkhardt consulted with several faculty and graduate students on computational science and engineering graduate programs and research computing.

Max Gunzburger, Frances Eppes Distinguished Professor, School of Computational Science and Department of Mathematics, Florida State University. Dr. Gunzburger presented the lecture, Color printers, mailboxes, fish, and Homer Simpson - or - Centroidal Voronoi tessellations; algorithms and applications, Monday 25 April. Together with Pavel Bochev and John Burkhardt. Dr. Gunzburger presented a four-lecture workshop on Compatible and Alternative Spatial Discretizations for PDE's. More than 20 Virginia Tech faculty and graduate students attended this workshop. In addition, he met with the System X staff and discussed terascale computing hardware, software, and application codes. Dr. Gunzburger consulted with several faculty and graduate students on computational science and engineering graduate programs and research computing.

8-10 June:

Robert J. Harrison, Computational Science, Oak Ridge National Laboratory (ORNL), and Chemistry, University of Tennessee, Knoxville. Robert J. Harrison holds a joint appointment between Oak Ridge National Laboratory (ORNL) and the University of Tennessee, Knoxville. At the university, he is a professor in the chemistry department. At ORNL, he is a corporate fellow and leader of the Computational Chemical Sciences Group in the Computer Science and Mathematics Division. He has many publications in the areas of theoretical and computational chemistry, and high-performance computing. His undergraduate (1981) and post-graduate (1984) degrees were obtained at Cambridge University, England. Subsequently, he worked as a postdoctoral research fellow at the Quantum Theory Project, Univ. Florida, and the Daresebury Laboratory, England, before joining the staff of the theoretical chemistry group at Argonne National Laboratory in 1988. In 1992, he moved to the Environmental Molecular Sciences Laboratory of Pacific Northwest National Laboratory, conducting research in theoretical chemistry and leading the development of NWChem, a computational chemistry code for massively parallel computers. In August 2002, he started the joint faculty appointment with UT/ORNL. In addition to

his DOE Scientific Discovery through Advanced Computing (SciDAC) research into efficient and accurate calculations on large systems, he has been pursuing applications in molecular electronics and chemistry at the nanoscale. In 1999, the NWChem team received an R&D Magazine R&D100 award, and, in 2002, he received the IEEE Computer Society Sydney Fernbach award.

13-17 June

Matthias Heinkenschloss, Department of Computational and Applied Mathematics, Rice University. Dr. Heinkenschloss is an expert in domain decomposition preconditioners for PDE constrained optimization problems. Systems governed by partial differential equations (PDEs) arise in many science and engineering applications, e.g., in the form of optimal control, optimal design and parameter identification problems.

20-24 June

Gabriel Wittum

*Symposium on HPC for CSE, Donaldson Brown Conference Center*

Key Note Speaker:

Eng Lim Goh, Ph.D.

Senior Vice President and Chief Technology Officer, SGI

Dr. Eng Lim Goh has been with SGI for 14 years, becoming one of the chief scientists in 1998 and chief technology officer in 2001. His tenure included work in computer graphics algorithms and high performance computing (HPC) architectures.

In HPC, Dr. Goh oversees Project Ultraviolet, the goal of which is to design and build the company's next generation science-driven computer architecture.

A strong opponent of designing next generation computer systems specifically for applications performance, Dr. Goh advocates computational density and a balanced multi-paradigm approach, across globally addressable memory, to architectural design that maps to the profile of customer applications.

In computer graphics, Dr. Goh's current research interest is in the relationships between human visual perception and visual computing. He has been awarded a U.S. patent in this field. Dr. Goh is also leading a small research effort to investigate application-transparent, massively parallel advanced rendering.

Before joining SGI, Dr. Goh worked for Intergraph Systems, Schlumberger Wireline Netherlands, and Shell Research U.K. A Shell Cambridge University Scholar, he completed his Ph.D. research and dissertation on parallel architectures and computer graphics.

Steve Modica

Principal Engineer, SGI

Reconfigurable Application Specific Computing (RASC) with FPGAs

(Field Programmable GATG Arrays)  
David Barkai  
HPC Computational Architect, Intel  
Bio

David Barkai is an HPC computational architect for Intel Corporation. He has also been a member of the Distributed Solutions Lab of Intel's Corporate Technology Group, a content architect for the Intel Developer Forum Conference and a software scientist in the Microcomputer Software Lab.

Before joining Intel in 1996, David worked for over 25 years in the field of scientific and engineering supercomputing for Control Data Corporation, Cray Research, Inc., Supercomputer Systems, Inc., and NASA Ames Research Center.

David holds a Ph.D. in theoretical physics and has more than 20 publications as papers, conference proceedings, and textbook contributions on the subjects of physics, numerical methods, and computer applications and architectures. Most recently, he authored the book "Peer-Peer Computing: Technologies for Sharing and Collaborating on the Net", 2001.

Alex Grossman  
Senior Director of Hardware Storage, World Wide Product Marketing  
Apple Computers, Inc.

Bio  
Alex Grossman is director of hardware storage in Apple's Worldwide Product Marketing group. He and his team are responsible for driving the development, marketing and management of Apple's server and storage products. Prior to joining Apple, Grossman was Vice President of Sales, Marketing, and New Product Development at MicroNet Technology, Inc., a developer and manufacturer of hardware storage solutions for creative professionals and IT managers.

Grossman has contributed to several patents associated with storage technology and led the team that developed the first FireWire-based Storage Area Network.

Rob Pennington  
Chief Technology Officer, NCSA

Bio  
Rob Pennington leads NCSA's Integrated Cyberservices Directorate, driving the center's efforts to develop the world's largest academic-based Linux cluster computing systems and providing strategic direction to NCSA's software development, computing operations, and data and information management efforts. Previously, Pennington served as NCSA's interim director.

Currently he also acts as NCSA's TeraGrid site lead and the TeraGrid cluster lead. Pennington is a member of the Open Source Cluster group and the IEEE Task Force for Cluster Computing. In addition, he was recognized for his service to society by inclusion in the Computerworld Honors Collection, a library of cutting-edge

information technology projects that is distributed to museums, libraries, and institutions around the world.

Pennington earned his B.S. in Chemical Physics from East Tennessee State University and his Ph.D. in Astronomy from Rice University in 1985. Pennington joined NCSA in 1997.

Eric P. Kronstadt  
Director, Exploratory Server Systems, IBM  
Session Topic TBA

#### Bio

Dr. Kronstadt was graduated from Brown University in 1967, and received his Ph.D. in mathematics from Harvard University in 1973. He joined the Computer Science department of the IBM T. J. Watson Research Center in 1978. From 1978 to 1983 he helped develop software and architectural extensions for the Yorktown Simulation Engine (YSE).

In 1983, he joined the VLSI Systems group, and became manager of that group in June 1983. In that capacity he was involved in the design and specification of a number of high performance experimental RISC microprocessors, as well as the development of a standard cell design system. He became manager of the RISC Systems Department in January, 1990. Subsequently he was named Director of Advanced RISC Systems and later Director of Personal Systems Solutions. Responsibilities in these positions included, PowerPC based architecture, microprocessor design, compilers and operating systems, the IBM Anti-virus product, development of advanced handwriting recognition techniques and prototypes, development of MPEG encoding and decoding hardware and software, and the development of wireless and mobile computing environments.

Since 2004, he has been Director of Exploratory Server Systems and the Director of the Deep Computing Institute, with responsibility for advanced operating systems research, highly performance computing architectures including BlueGene, and emerging high performance applications including computational biology.

Dave Strenski  
Application Analyst, Cray, Inc.  
Reconfigurable Computing and FPGA Integration

Dave Strenski is an application analyst for Cray Inc., working on Reconfigurable Computing and FPGA integration. He also works closely with Cray's CAE and Bioinformatics customers.

Prior to Cray Inc., Dave held a variety of technical positions at Silicon Graphics (SGI), Cray Research, Supercomputer Systems (SSI) and Science Application International Corp.(SAIC).

Dave holds a B.S. in Land Surveying, a B.S. in Civil Engineering, and a M.S. in Mechanical Engineering. His publications include work in the areas of

parallel computing and numerical consistency of parallel results. He has also published work relative to searching genomic data using the special bit functions on Cray's vector hardware, and has a patent pending on a meshing algorithm for threaded fasteners.

Alanna Dwyer  
High Performance Computing, Hewlett Packard  
Designing Production Clusters for HPC

#### Bio

Alanna Dwyer manages Linux Marketing for HP's High Performance Computing Division. Alanna has been working in the area of Linux and clusters for six years, and recently managed the launch of HP's Unified Cluster Portfolio for HPC. In this role, she works across a spectrum of technologies (servers, interconnects, cluster managers) and partnerships. Prior to this, Alanna held positions in product management and strategic planning within the IT industry. Alanna has a BA from Boston College in Math and Economics, and an MBA from the Wharton School at the University of Pennsylvania

#### **CS&E GRAs**

The CS&E initiative students provided general assistance to users of Anantham (the Linux/Myrinet cluster in Torgersen), Ojibwa (an SGI Altix in Torgersen), and System X. They each held 10 office hours per week in the LASCA lab, so that they would be available for walk-in help most afternoons. In addition, they provided more in depth assistance to a number of faculty and visitors (listed below). This assistance included installing and testing math software libraries for users, and helping to parallelize, port, debug, and tune applications for System X.

The following projects received assistance from these GRAs in 2004-05 (the list is incomplete, but it gives a good sense of the scope of their work):

Daniel Crawford (Chemistry). Quantum chemistry  
Danesh Tafti (ME). Fluid dynamics.  
Randy Wynne (Forestry). Remote sensing.  
Diego Troya (Chemistry). Quantum chemistry.  
Diana Farkas (MSE). Molecular dynamics.  
David Cox (ChemE). Ab initio (quantum mechanical) molecular dynamics  
Adrian Sandu (CS). Atmospheric modeling.  
David Keyes (CSE visitor). Fluid dynamics, optimization.  
Elisa Sotelino (CEE). Structural mechanics.  
Matthias Imhof (Geosciences). Computational seismology.  
Amadeu Sum (ChemE). Molecular modeling.

Highlights include:

1. The massively parallel Navier-Stokes Solver GenIDLEST was ported to System-X.
2. Assisted System-X staff in identify and reporting problems encountered by users.
3. Initiated computations to simulate the turbulent flow and heat transfer in a leading edge film cooling geometry. These calculations push the state-of-the-art in simulating complex turbulent flow and heat transfer using Large-Eddy Simulations (LES).

## Outcomes

1. Based on initial computations on System-X, a proposal was submitted to AFOSR “Turbulent Characteristics of Leading Edge Film Cooling”, \$375,000. It is still pending.
2. Initial results will be presented at the SIAM Annual Meeting July 11-15, 2005 in New Orleans in a Symposium “Computational Science on the 2200 Processor System X” highlighting System-X usage for leading edge science and engineering.
3. A conference paper titled “Large Eddy Simulation of Turbine Blade Leading Edge Film Cooling” is being prepared for presentation at the International Heat Transfer Conference to be held in Sydney, Australia, August 13-18, 2006.

## Post Docs

Post Doc: B. M. Love

Project: Computational Design of Optimum Material Microstructure through Multiscale and Multiphysics Analyses and Bridging Length Scales

Professor, R. C. Batra, Department of Engineering Science and Mechanics

Overview of project: A challenging problem in mechanics of materials is to design material’s microstructure so that under a given loading it deforms in a prespecified way and at a specific instant of time. An example is to design a tungsten heavy alloy kinetic energy rod that upon striking a rolled homogeneous steel target makes a hole of a given depth and diameter. It involves not only selecting the constituents but also their volume fractions, particulate shapes and sizes, and their distribution in the matrix. Recalling that the analysis of transient thermomechanical deformations of a microporous heat conducting isotropic and homogeneous viscoplastic body is computationally expensive, it is absolutely necessary to develop techniques that determine effective thermomechanical properties of a particulate composite. The effective thermophysical properties are likely to depend upon the particulate sizes, shapes and arrangements. Thus probabilistic methods are needed to establish confidence levels on the performance of a given structure. Furthermore, techniques of bridging length scales between the meso- and the continuum- levels are needed to facilitate the analysis and the design of materials. It should be noted that micromechanics techniques to determine effective properties of a particulate composite made of viscoplastic constituents are nonexistent.

We have complete some work in this area. For example, we have analyzed ductile failure of particulate composites comprised of tungsten particulates immersed in nickel-iron matrix and subjected to high strain rate loading. The performance metric

for such materials is that their shear banding characteristics (i.e. time of initiation of a shear band, the number of shear bands, frequency of shear banding, direction of shear bands, and the spacing between adjacent shear bands) match those of depleted uranium. The stiffness of partial differential equations governing strongly coupled thermal and mechanical (multi-physics) large deformations changes during the deformation process and deformations become highly heterogeneous upon the initiation of a shear band which is usually 10  $\mu\text{m}$  wide. Energy dissipation rate due to plastic deformations within a shear band is about 70 kW/mm<sup>3</sup>, and the time elapsed between the initiation and the full development of a shear band is typically 10  $\mu\text{s}$ .

These results will help us prepare a competitive proposal to be submitted to the Department of Defense.

#### Publications:

1. R. C. Batra and B. M. Love, Crack Propagation due to Brittle and Ductile Failures in Microporous Thermoelastoviscoplastic Functionally Graded Materials, *Engineering Fracture Mechanics*, **72**, 1954-1979, 2005.
2. R. C. Batra and B. M. Love, Mesoscale Analysis of Shear Bands in High Strain Rate Deformations of Tungsten/Nickel-Iron Composites, *J. of Thermal Stresses*, **28**, 747-782, 2005.
3. R. C. Batra and B. M. Love, Multiscale Analysis of Adiabatic Shear Bands in Tungsten Heavy Alloy Particulate Composites, *Int'l. J. Multiscale Computational Eng'g*, (accepted).
4. B. M. Love and R. C. Batra, Determination of Effective Thermomechanical Parameters of a Mixture of Two Elastothermoviscoplastic Constituents, *Int. J. of Plasticity* (accepted).

Post Doc: Micah Abrams

Project: Computational Design of Optimum Material Microstructure through Multiscale and Multiphysics Analyses and Bridging Length Scales

Professor, D. Crawford, Chemistry

Overview of project Develop new quantum chemical software for computing vibrational circular dichroism spectra of chiral molecules using Hartree-Fock and second-order perturbation theory. Lead an investigation focusing on electronically excited states of water clusters.





## Secure Enterprise Technology Initiatives

Secure Enterprise Technology Initiatives (SETI) was formed to focus on developing secure applications, middleware, and interfaces to support the university's computing and network services. The department works in conjunction with the IT Security Office to enforce auditable security standards that address privacy issues while providing a balance between system usability and system security. SETI research and development initiatives will exploit leading edge, innovative technologies to enhance the ability of Virginia Tech affiliates to interact securely with new and existing computing and networking services.

### **Security**

SETI was formed around the theme of securing the infrastructure. To that end, the security of the Enterprise was improved by the following projects and activities.

The Virginia Tech IT Security Task Force is chaired by the director of SETI, and much of the participation in Task Force activities comes from SETI staff.

The SETI Test and Deployment Group was formed to ensure the security, usability and interoperability of SETI services and applications.

SETI management promoted the creation of a position in the General Enterprise Systems group to support the production Enterprise Directory environment.

The Middleware and MIG groups worked together to strengthen PID and Hokies passwords and to provide more consistency between PID and Hokies password rules.

In efforts to sunset older, unsupported Windows operating systems, MIG successfully coordinated the elimination of LAN Manager authentication, a weak Windows authentication mechanism.

MIG created SafetyNet, a web-based vulnerability-scanning tool that is now available to the open source community.

The Virginia Tech Exchange and Active Directory environments underwent a formal Risk Assessment by Microsoft.

eProvisioning developed and supports the PKI infrastructure that issues SSL certificates for production web servers and for middleware services. The Virginia Tech Certificate Authority Root certificates were distributed to users via the VTNet CD and in the Windows browser software distributed with Dell computers under the Academic Computing initiative.

MIG revised the Active Directory (AD) Usage Guidelines, which provide operational policy for participating in the Hokies Active Directory forest. The new Guidelines were accepted by heads of 14 departments having member domains in the Hokies AD forest.

The Test and Deployment group tested the NG Scoring Tool for the Center for Internet Security. This testing contributed to the nationally recognized benchmarks for scoring computer security.

ED-Id became available for use by the Virginia Tech community. This directory requires certificate-based authentication. The principle of least privilege is applied to grant services fine-grained access to directory attributes.

## **Open source**

SETI is strongly committed to using and developing open source software. My VT is based on uPortal, the Enterprise Directories utilize Open LDAP, and the Virginia Tech Certificate Authority was developed using OpenCA software. SETI software contributions to the open source community are described at <http://www.opensource.isc.vt.edu> and <http://opensource.w2k.vt.edu>.

## **Collaborative Technologies Unit**

The Collaborative Technologies Unit (CTU) dedicated winter 2004 to developing the next version of My VT—My VT 3.0. Based on the open source uPortal framework, My VT 3.0 offered improvements such as aggregated user layouts and group management that enables one to assign permissions to content and to restrict access. This release also marked the second iteration of a Virginia Tech portal based on the uPortal framework. The upgraded code base proved to be a big improvement and has provided a portal that is more stable and robust. My VT 3.0 went into production in August 2004. Over 30,000 users have accessed My VT over the last year and daily traffic averages a few thousand logins.

In 2004, VT Search received its first significant update in two years. The new look of VT Search brings the site in line with other university web sites. In addition to the new look, the underlying code base was streamlined for better performance and reliability. Additional functionality was added to offer combined searching of the web and the user directory in one query.

CTU began working with the Hokie Passport Office in 2003 on a portal channel that would display Hokie Passport balances online for account holders. The project was shelved for a long period of time due to security concerns with the Hokie Passport Office's outdated server. A number of months, and a new server later, the project was back in development. The Hokie Passport channel went into production in January 2005. It was an immediate hit with students and accounted for an additional 5,000 new portal users in a number of days.

CTU began investigating Yale University's Central Authentication Service (CAS) as a possible replacement for the exiting Authportal single sign-on service during summer 2004. A comparison of available products was performed in fall 2004 that resulted in a recommendation document in favor of CAS. Development of CAS began in winter 2005 and the service is scheduled to go into production in fall 2005. CAS has a large user and support base that will result in long-term saving by requiring less development effort and increased service integration.

The Office of the Executive Vice President approached CTU in 2003 about developing a portal to be used by the Board of Visitors Finance and Audit Committee. The portal was initially developed based on the open source uPortal framework. The site proved to be too complicated for the BOV's needs so the decision to migrate the site over to Virginia Tech's open source Fileman code base was made. This has proven to be more manageable and maintainable. The BOV portal is used quarterly by members of the board to review electronic versions of documents found in the BOV notebook.

Concern for conducting Virginia Tech business over insecure commercial instant messaging systems such as AOL Instant Messenger, combined with CTU's desire to offer a mechanism for presence awareness and instant communication in My VT, led to the creation of the IM project. CTU's IM project is based on the open source Jabber messaging platform. The service is currently in a beta pilot.

CTU began researching collaborative work environments for use in My VT in early 2004. Around this time, a number of universities began pooling resources to combine their various course management systems: the result, the Sakai Project. Sakai has now grown to become a rather large open source project for higher education. The Sakai project is being dubbed as a Collaborative Learning Environment (CLE). IT's Education Technology shared an interest in this project as well. This has resulted in a joint project between CTU and ED Tech whereby both groups are participating in the development of the Sakai framework and associated tools.

The Portal Group was renamed Collaborative Technologies Unit in early 2005. This move was made to more accurately describe the mission of the group and to break out of the portal stereotype.

## eProvisioning

The eProvisioning group created the VT Middleware Certification Authority, a subordinate CA within the Virginia Tech PKI infrastructure, to issue SSL digital certificates for client applications needing strong authentication and encryption of network transactions when accessing university enterprise directory services.

The VTCA website [www.pki.vt.edu](http://www.pki.vt.edu) was created to provide the campus community with a web-based subscription service for requesting certificates from the VT Certification Authority. The website also serves as the primary source for disseminating information about ongoing PKI initiatives at the university.

A research pilot is in progress to investigate the use of smart USB tokens (eToken) for implementing strong two-factor authentication and as a secure portable device for consolidation and storage of multiple user identity credentials. Smartcards or tokens provide a solution for addressing the security problems associated with traditional authentication methods based solely on id and password.

A project has been initiated within the office of Budget and Financial Planning to implement digitally signed leave reports for their staff. It is envisioned that this project will provide the foundation for future expansion to eventually implement university wide digital signature capabilities.

A project has been initiated to establish a subordinate VT User Certification Authority within the Virginia Tech PKI infrastructure to issue personal digital certificates. Personal digital certificates will allow the university to take full advantage of the benefits of public key technology by offering strong user authentication, enhanced encryption, secure email, and digital signature support.

## Microsoft Implementation Group

The Microsoft Implementation Group is responsible for maintaining the health and security of the Hokies Active Directory (AD) environment, which includes applying security updates, antivirus protection and monitoring system events for both production and non-production domain controllers, Web servers and database servers. The MIG maintains a test/pilot environment for pre-production evaluation of hot fixes and service packs, and supports Daisy and Ivy products that aid in patch application. During the reporting period, system administration has been enhanced by upgrades to hardware and software; locating a redundant domain controller outside the ISB to provide DNS service should an outage occur in the ISB and providing real-time antivirus protection on production systems. The MIG built a 64-bit system for Virtual Server test environment, extended production schema for the Exchange 2003 migration, enabled LDAPS on production domain controllers, began using Virginia Tech CA SSL certificates and migrated the MIG network storage to a new networked terabyte system.

The MIG implemented security enhancements to the Windows environment that eliminated LanManager (LM) authentication, synchronized password rule sets between the Enterprise and Active Directories, created a “Dead man switch” for executive administrative access override of the AD, and forced expiration of crackable passwords for users with Hokies accounts. The MIG also participated in the Microsoft Risk Assessment workshop, assisted with the Microsoft Exchange health check, and secured signed agreements for the updated Active Directory Usage Guidelines. The group began a project to restrict access to production domain controllers to those addresses within the Virginia Tech IP space. As chair of the Virginia Tech IT Security

Task Force's Desktop Committee, Marc DeBonis enlisted support from MIG to evaluate and make recommendations for securing the desktop environment at Virginia Tech.

MIG documented best practices, recorded research results and made and written recommendations relative to Windows 2003 PKI Interoperability, XP Professional Security Guidelines, backup guidelines for AD root and child domains. These papers may be accessed via <http://vtmig.w2k.vt.edu/publications.htm>. "Best practices" articles documented antivirus deployment on domain controllers and can be found in the Virginia Tech Knowledge base at <http://www.answers.vt.edu>.

Additional documentation was developed for AD service provisioning, SafetyNet, Migo evaluation, response to the Microsoft Risk Assessment, a post mortem for the LM security changes, ID management on Windows platforms and the draft Desktop Committee report to the VT IT Security Task Force. MIG created a wiki to facilitate communication for the Desktop Committee of the Virginia Tech IT Security Task Force.

MIG created the following software tools and solutions that strengthened the security of the Windows environment, facilitated Windows system administration, and better integrated our Windows and non-Windows environments.

- SafetyNet (SN) self-service security assessment tool
- Ivy server side hotfix manager
- Web service to synchronize Enterprise Directory and Active Directory data, including adding contacts for pre-hire employees.
- Medium Facilities Management (MFM) OU in University Services to allow users to request centralized management of desktop patches and security policies.
- BorderGuard to determine the number of password hack attempts against domain controllers.
- Neighborhood Watch intrusion detection system.
- Portinator application to monitor network port status on production servers.
- Namearby Active Directory name arbitration interface to the Enterprise Directory to facilitate namespace testing for PID generation.
- Clog web-based change-log management system.
- Alert\_NL to alert network liaisons of misconfigured DNS clients.
- Sigma slipstream "increased security install" for Windows XP Professional with Service Pack 2.
- MIG conducted the following research and technology evaluations.
- Rainbow Tables relative to LM security concerns
- Smoothwall open source software
- Microsoft Windows 2003 Service Pack 1 beta test
- Mac Office 2004 (specifically Entourage 2004)
- Tested interoperability between Mac OS OD and Windows AD
- Beta tested Microsoft WUS (now WSUS)
- Beta tested Microsoft MOM 2005 beta
- Evaluated VMWARE ESX and Microsoft Virtual Server beta
- Beta tested Mac OS 10.4 (Tiger)

- Tested bittorrent p2p as mechanism for secure distributed file transfer
- Beta tested Microsoft Windows XP service pack 2
- Evaluated Microsoft Virtual PC for new testing environment
- Beta tested CNS VPN solution (PPTP and L2TP) (Mac and PC)
- Beta tested Microsoft Baseline Security Analyzer 2.1
- Evaluated sitedigger and wikito google hacking tools (sent SSN discoveries to abuse list)
- Evaluated Microsoft ISA 2004
- Evaluated eProvisioning smartcard technology on Windows platform
- Participated in evaluating CNS Avaya VOIP solution
- Participated in DSpace pilot
- Evaluated FTP servers for Daisy server side file transfer mechanism
- Evaluated MS risk assessment prerequisites
- Evaluated Windows Firewall, BlackIce and ZoneAlarm firewalls for NeWa project
- Beta tested Microsoft Virtual Server 2004 service pack 1
- Evaluated Eeye Blink and IIS Secure security software for CNS
- Evaluated Snortsam open source software
- Evaluated eProvisioning eToken pilot

## Middleware

The Middleware team developed and supports authentication, authorization and white page lookup services via three LDAP-based Enterprise Directories that are now in production. ED-Lite exposes publicly accessible white pages. ED-Auth is an encrypted authentication and authorization service. ED-ID offers authentication in addition to an extensive collection of directory attributes that are accessible only to authorized services connecting with a pre-approved digital certificate. During the reporting period, a unified Enterprise Directory was developed and tested. All directory schemas were synchronized to conform to the ED-ID schema, and data views were investigated.

All synchronous replication processes were replaced with message-based asynchronous Java services. A new version of the ED-to-Active Directory synchronization software was developed as a .NET web service that accepts SPML.

Hard coded entity beans were replaced with Java beans that are dynamically generated from the database schema. Reflection based wrapper classes were written for all beans to ease development and JNDI lookups. All session beans and web applications were updated to use the new wrapper classes. Permanently reserved character strings were added to the name arbiter, and session bean methods were exposed as web services to allow for portal integration.

The Middleware web site was converted to a wiki format, and old documentation was converted and published on the wiki.

Code development and deployment was improved by developing a subversion based install process for all applications that were needed to bring up a J2EE environment.

## Testing and Deployment

In 2004, the SETI Testing and Deployment (TAD) group began to take form to support the developers in Middleware, MIG, eProvisioning, and the Collaborative Technologies Unit. The group developed formal testing procedures, documentation and auditable testing methods. TAD installed and utilizes an issue tracking system, and provides written reports to the developers, to project sponsors and to management upon request.

Testing and Deployment has created a test environment consisting of office workstations, a small testbed of MacOS and Fedora machines and four Dell Poweredge servers running Debian Linux. The Poweredge servers host Jira, the issue tracking system and tools for testing LDAP and client and server certification. There is also a crash-and-burn system. They are developing a Windows testbed and will be accessing the Security Lab for additional testing options.

TAD updates the IT Critical Dates calendar to document major SETI system changes, deployments and downtime.

Key activities were deployment support for the NT End-of-Life project, the webmail.vt.edu reskinning and launch of the VTCA Root Certificate. They also tested the NS Scoring Tool for the Center for Internet Security. Other testing was conducted on the following applications and services.

- NeighborhoodWatchPOC
- SafetyNet
- My VT3.0
- PeopleSearch
- AuthPortal
- PKI web site and RA/CA process
- Hokies password synchronization
- Data Acquisition Tool (DAT)
- VCOM import tool
- Enterprise Directory (ED) password rules
- eToken pilot
- Jabber pilot
- PIDgen

## Professional Activities

The following individuals made presentations, earned certifications, and contributed publications to professional journals.

Representing the Educause/Internet2 Computer and Network Security Task Force, Mary Dunker presented “Effective Cybersecurity Practices for Higher Education” at the Educause Mid Atlantic Regional and Southeast Regional conferences. Mary earned the SANS GIAC Security Essentials Certification and contributed her research paper,

“Don’t Blink: Iris Recognition for Biometric Identification” to the SANS Reading Room. Mary chairs the Virginia Tech IT Security Task Force.

Marc DeBonis hosts the monthly Virginia Tech Windows User Group and assists in facilitating the monthly Microsoft Account Review. He represents Virginia Tech on Microsoft’s Macintosh Business Unit Customer Council. Marc chairs the Desktop Committee of the Virginia Tech IT Security Task Force. Marc also manages the Microsoft PSS support contract.

Bahaa Al-amood spoke at the Educause Dartmouth PKI Deployment Summit, sharing Virginia Tech’s experience in using an open source solution to build a PKI infrastructure. For many universities, the question today is no longer if PKI should be implemented but rather “how” and “when” the technology can be made available.

Collier Jones presented “uPortal Extreme Makeover: My VT 3.0” at the JA-SIG uPortal Conference.

SETI staff members completed the SANS GIAC Intrusion Detection or Firewall Analyst courses.

Ken McCrery, Marc DeBonis, Frank Galligan, James Powell and Chad LaJoie made presentations at DCSS.

The Microsoft Implementation Group served as sponsor for the Microsoft SEP class, Microsoft DID class and the Microsoft Windows debugging course for the university community.

Marc DeBonis and Mary Dunker attended the Microsoft Executive Briefing in Redmond, Washington.

Marc DeBonis participated in Microsoft Tech Ed 2005.

## Research

Mary Dunker, “Something You Are,” *EDUCAUSE Review*, vol. 39, no. 4 (July/August 2004): 64–65.

James Powell produced a paper, “RFID: Introduction to the Internet of Things” and presented it to the Virginia Tech IT Security task Force.

The Microsoft Implementation Group performed research in the areas of desktop security, Windows 2003 PKI interoperability, the Migo device, and Rainbow Tables. Documents may be found at <http://vtmig.w2k.vt.edu/publications.htm>



## Statistics and Metrics

MIG's open source software downloads from <http://opensource.w2k.vt.edu>:

- AuthAD - 108
- Daisy (v. 2.2) - 1801
- DictionaryFilter - 220
- Faith - 312
- Ivy - 122
- NeWa (POC) - 36
- OUAdmin - 94
- Portinator - 137
- SafetyNet - 434
- SelfService - 187

Hokies Self-Service utilization (<http://selfservice.w2k.vt.edu>).

- Unique logons: 8450 (6749 full users and 1701 contacts)
- Converted to full user accounts: 1261
- Exchange Mailboxes created: 971 (828 full and 143 calendar only)
- Successfully changed passwords: 1034
- NAS folders created: 601
- Roaming profiles set: 85
- Home drives set: 191
- Computers as members of NFM and SFM: 27 in SFM and 159 in NFM

SafetyNet utilization (<http://safetynet.w2k.vt.edu>):

- Number of successful logins = 1087
- Total # of scans = 665
- # of individual systems scans = 552
- # of zone scans = 114
- # of machines that have failed one or more scans = > 1134
- # of machines scanned (within zones) = at least 1575
- # of delegates created to scan zones = 3
- Average time of a scan -> 650 seconds (~ 10 minutes)



## University Information Technology Security Office

The mission of the Information Technology (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.

### **Goals and objectives:**

1. Work with university security personnel to ensure educational and promotional programs are made available to the entire university community.
  - a. Design, develop and implement training materials and classes (in-person and online) for the general user community.
  - b. Assist in providing technical training with the IT Security Lab.
2. 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.
3. 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.
4. Maintain a central web site that can be used as an information tool and provide university users with access to security-based tools for use at the departmental level.
5. Work with other university security personnel to evaluate current policy and recommend updates and appropriate policy as necessary.
6. Coordinate and manage the VT Computer Incident Response Team (VT-CIRT). Also, coordinate and maintain the VA Higher Education CIRT mailing list (VA-CIRT).
7. Function as the Root Certificate Authority for Virginia Tech.
8. 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.

9. Provide the SETI group with goals and guidance in ensuring that computer and network security is designed and integrated into the development and implementation of IT applications.
10. Work with Virginia Tech departments on and off-campus to increase their security awareness and environment.

## **Major accomplishments and ongoing activities**

### Education and awareness:

- Continued to provide security presentations as invited to groups and departments.
- Participated in all Faculty Development Institute sessions during the spring and summer of 2005, and 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, and had the opportunity to speak to new faculty during their orientation.
- Started a new presentation as part of classified employee orientation on a weekly basis.
- Enhanced the security web site with new links and access to security tools for all users.
- Assisted in hosting professional security-related programs on campus for both technical and non-technical personnel; for example, hosted a week-long SANS security class.
- Used publications, both locally and on the national level, to promote security issues within higher education.
- Hosted visitors from other higher educational institutions on our campus to view what is being done for security, and also participated in programs where visitors were hosted by other Tech departments.
- Have continued to improve the security web site and looked at new tools to make available to the user community.
- Worked with Get Connected personnel on type of materials to be presented during freshman orientation.

### State and Federal interactions:

- Have continued active participation in VA SCAN (Virginia Alliance for Secure Computing and Networking). Web site can be viewed at <http://www.vascan.org/>.
- Have worked with the SANS Institute on educational opportunities for high education, and with the Center for Internet Security on tools and possible training programs.
- Remain active in the EDUCAUSE organization, particularly with the various security initiatives.

- Have worked with State agencies through VA SCAN to provide security presentations at various agency locations around the Commonwealth.
- Attended federal government workshop in Washington, DC, where higher education had the opportunity to interact with industry specialists.

#### Business Impact Analysis/Risk Assessment (BIA/RA):

- Oversaw the process for the Information Technology organizations – four (4) separate BIA/RA reflect the organizational structure in IT.
- Required all departments to submit updated risk assessments in 2005 to the IT Security Office.
- Made some minor modifications to the risk analysis forms and updated to the security web site.
- Started preparing for next risk analysis period (2007-2008) by discussing how the process might be done online using a secure web site.

#### Disaster Recovery Plan

- Have kept the disaster recovery plan updated to reflect changes in personnel and equipment.
- Have worked with the VT Safety Office to ensure our plan is in compliance with federal and state guidelines.
- Working with other IT offices to ensure each recovery plan interacts in the proper manner.
- Planning to conduct a “mock” disaster in the fall of 2005.

#### Enterprise Directory (ED) Initiative

- Have provided leadership for the ED Advisory Group.
- Attend meetings to plan for implementation schedules and future efforts by the team.
- Ensure that IRM has the necessary resources to assume production responsibilities.

#### Virginia Alliance for Secure Computing and Networking (VA SCAN)

The Alliance is a collaboration among four Virginia universities - James Madison, George Mason, the University of Virginia, and Virginia Tech. Incorporating such resources as JMU's Commonwealth Information Security Center, GMU's Center for Secure Information Systems, and the joint GMU/JMU Critical Infrastructure Protection Project (CIPP). The Alliance combines the varied strengths of our member institutions' security programs for the benefit of the Commonwealth and its colleges and universities.

- Organization has received a governor's award and will be recognized in 2005 at the EDUCAUSE national conference.

- 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" email 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 Laboratory's mission is to test computer hardware and software for security vulnerabilities under the direction of the Information Technology Security Office. It will actively design, develop and implement computer and network security training materials, classes (in-person and online) to University technical and general users. It will act as a testing facility for cooperative research project between the Information Technology Security office and academic researchers. It will also provide testing services to external entities according to a fee schedule.

### **Goals and Objectives:**

1. Technical Education
  - a. Develop and provide computer security guidelines for VA Tech system and network administrators.
  - b. Develop and provide Information Technology Acceptable Use training for general users (faculty, staff and student) with the cooperation of the University Information Technology Security Office.
  - c. Develop and conduct system administration, computer and network security training classes (in-house and online) for system and network administrators within and outside of the University. This includes professional organizations, conferences, and state and federal government agencies.

- d. Coordinate computer and network security training classes and material with distance learning initiatives at the academic and continuing education levels.
- e. Develop marketing strategies to “sell” computer and network security to the general user community.
2. Computer Incident Response Team and Security Initiatives
  - a. Coordinate and manage all security initiatives with Information Systems & Computing in coordination with the University Information Technology Security Office. Define guidelines and procedures for the six phases of Computer Incident Response: preparation, detection, containment, eradication, recovery and follow-up.
    - i. Coordinate response to system and network attacks
    - ii. Coordinate with external CIRTs.
    - iii. Maintain and manage VA-CIRT.
3. Academic Instruction
  - a. Assist the Electrical and Computer Engineering (ECE) Department develop system administrator intern program.
  - b. Assist the ECE Department in teaching graduate level Computer & Network Security Fundamentals course.
  - c. Provide online materials for computer and network security distance learning classes.
  - d. Provide guest speakers for undergraduate and graduate level classes offered by University colleges on computer and network security topics.
4. Security Testing and Certification Laboratory
  - a. Serve in partnership with the Center for Internet Security (CIS). The laboratory is the testing site for certification of compliance of vendor security software with CIS benchmarks.
  - b. Develop methodology for testing security of network capable devices such as printers, data acquisition devices, modems, environment control systems, and medical equipment.
    - i. Create security guidelines for these devices
  - c. Develop methodology for testing security of Unix, Linux, Windows 2000, Windows XP, and Macintosh systems.
  - d. Develop and implement forensic kits for Unix and Windows systems.
  - e. Develop and update computer and network minimum-security benchmarks for Unix, Windows, Apple, and network devices.
  - f. Work on security initiatives with the SANS Institute, FBI, Center for Internet Security, NSA, Federal and State agencies.
5. Professional Society, training conferences
  - a. Provide speaker to local, state, regional, national and international conferences on computer security issues.
  - b. Host regional and national security conferences and seminars for peer organizations.

## Major accomplishments and ongoing activities

### Academic Support

- Lab provides full classroom support for ECE 4560 – Computer & Network Security Fundamentals

- Taught every Spring semester
- 180 students have taken the class since 1999
- Graduate and senior level ECE/CS students
  - Class taught at NOVA and main campus via TV
  - Class taught statewide via College of Engineering CGEP
- Hands-on exercises
  - Learning how to use attack/defense tools
  - Analyzing attacks in real-time
  - Team based

### Teaching Hospital

- Lab is being configured to allow students to observe, “treat” and immunize systems in a real world setting
- Services can be outsourced to companies and agencies
- Designed to allow cybersecurity experiments to be run in a controlled environment
- Lab currently does vendor product evaluation
  - Bindview, Symantec, NetIQ, Tippingpoint, CounterPoint
- Student “Pipeline”
  - Undergraduate student hired to provide lab support
    - Helped with Center for Internet Security Benchmark testing of new CIS benchmarks for Windows and Linux
    - Helped with CIS test of external vendor product
    - Helped configure lab systems for NSA CAE support

### Research Support

- Facilities available for Masters and PhD research in cybersecurity
- Completed PhD degrees that used the lab:
  - “Taxonomy of Computer Attacks,” 1999, ECE
  - “Battery Based Intrusion Detection,” 2005, ECE
    - Patent pending – G. Jacoby, R. Marchany
- Completed Masters degrees that used the lab:
  - “Using Plant Epidemiological Methods to Track Computer Network Worms,” 2004, CS
  - “pTCP: A Client Puzzle Protocol for Defending Against Resource-Exhaustion Denial-of-Service Attacks,” 2005, ECE
  - “E-Commerce Security,” 2003, MIT/Business
- Current Research:
  - “Thwarting Network Stealth Worms Through Biological Epidemiology and Natural Immune Systems,” 2006, ECE
    - “Wireless Sensor Networks,” 2006, ECE
    - “Visualization Tool for Determining Network Attacks,” 2006, ECE
    - “Network Based Visualization,” 2007, ECE
    - “Taxonomy of Vulnerabilities,” 2006, CS
  - Lab provides work space and systems for graduate student research
  - Student “pipeline” has been established with ECE and CS
  - Lab Director serves as a member of graduate student’s committee



- Research papers have been submitted for publication
- The current research by graduate students also is a “pipeline” for undergraduate students. One PhD student is currently using 5 undergraduates to help with his research
- NSA Center for Academic Excellence in Cybersecurity Research
  - Virginia Tech named an NSA CAE in Fall of 2004
  - This designation allows Virginia Tech to apply for cybersecurity research grants
    - Multidisciplinary curriculum: ECE, CS, Bus, MIT
  - IT Security Lab will be the Teaching Hospital for the CAE
    - <http://research.cs.vt.edu/infosec>
- Lab Director Projects
  - Training
    - Coordinated 2005 SANS-EDU program at Virginia Tech
      - 251 attendees from US, Canada, New Zealand
    - SANS has adopted this initiative and is offering to other EDU institutions
  - Presentations
    - Guest lectures: IS Audit class; Ecommerce class; College of Engineering Freshman orientation; IT class at Salem HS; VT Entomology department; FDI classes; KAU guests
    - Conference talks:
      - NY State Cybersecurity Symposium, Albany, NY
      - IALR Cybersecurity Panel, Danville, VA
      - NERCOMP presentation, Amherst, MA
      - ACUA presentation, Portland, OR
      - Council of Independent Colleges of VA, Charlottesville, VA
      - VA Society of CPA’s, Richmond, VA
      - VA SCAN Conference, Charlottesville, VA
      - VA SCAN K-12 Outreach, Harrisonburg, VA
      - EDUCAUSE Security Conference, Washington, DC
      - Institute of Internal Auditors, Orlando, FL
      - SANS Institute (week course), Tokyo, Japan
    - Local presentations:
      - FDI, lunch seminars
      - Administrative Staff Professional Network
      - DCSS
      - VT Institutional Research
      - VT Graduate School: International students, GTAs, and general graduate students
      - Get Connected
      - Commission on Classified Student Affairs
      - Users groups
- Lab projects:
  - Vulnerability Scanning
    - Checknet style scan engines
    - Fast scan tools

- York University Zobot
- PKI Review
- CIS Testing
- Investigation into IPS/IDS for implementation at VT
  - Have been allocated funding

## 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.

### Goals:

- Provide a support structure for administering authorization, authentication and security access controls to information technology resources to the university community.
- Facilitate the review of security and access processes to improve the effectiveness and efficiency of services provided to the university community.
- Make authorization rules and access information accessible for review to appropriate levels of management within the university community for decision making and strategic planning.
- Continually research and provide information technology solutions and standards for administrative operations.
- Identify management issues to address for future implementation.
- Establish a long-term strategic plan for investigating emerging-technologies that will affect security and access control issues related to information systems and computing.
- Inform the university community of security procedures through open communication

### Major accomplishments and ongoing activities

- Is recognized as a production office responsible for user identifications at Virginia Tech – it oversees all aspects of the production environment.
- Added a new position to assist in the maintenance of IRM applications and provide backup for IRM's production functions.
- The office continues to have the goals listed above and will be involved in defining access and enforcing rules for Virginia Tech resources

### Public Key Infrastructure (PKI)

- The IT Security Office and associated entities (including IRM) is very involved in the production environment for the Certificate Authority (CA) service that provides digital certificates to securely sign documents, 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 has recently accepted the responsibility of staff member serving as both RA Administrators and CA Administrators for the Class 1 Server CA and the Middleware CA.

#### Enterprise Directory (ED) Project

- IRM is very involved in all aspects of this project. It replaces many systems that have been in place for years and has been (and will be) major changes for the user community. IRM will continue to be involved in defining needs and testing systems prior to production. IRM leads a technical group that continues to meet weekly during implementations.
- Have created nine production services that use ED-ID for authentication and authorization.

#### Consultation

- One of the important responsibilities for IRM is to provide consultation to other groups (within IT and beyond) on user access issues. IRM has done this during the past with Banner and other administrative applications, as well as with those defined above.

In addition to the major areas described above, the IRM staff has also been active in the following areas:

- Worked closely with application areas to define requirements for any applications dealing with identity and access
- Major activity is to maintain and provide access capability for Virginia Tech systems:
  - PIDGEN (includes over 95,000 PIDs)
  - Manual creation of PIDs (basically anything not in Banner)
    - UNIX and other special systems
    - Banner/Oracle access
    - 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 2004 there were 4350 trouble tickets and thus far in 2005 (through July) have responded to 2513 tickets
- Enhanced the Banner Access Request system
- Went through a cleanup of departmental PIDs and deleted approximately 1000 unused accounts
- Provides consultation and troubleshoots issues dealing with access
- Currently maintains and enforces most of the access policies/procedures

## **Professional Activities**

Some IRM staff members attended the following professional meetings: EDUCAUSE 2004, Banner Summit 2005, Security Professionals Conference 2005

The IRM Director lead the Enterprise Directory Policy and Technical Issues meeting each week, the Enterprise Directory Project Planning meeting each week and chairs the Identity Management Committee of the Security Task Force. The Identity Management Committee also meets weekly and will be presenting a draft report and recommendations to the Security Task Force within the next couple of months.