Annual Report Engineering Computing Center (From July 2010 – June 2011)

(Commonly referred to as the "Mosaic" Computer System)

Contents

Executive Summary

Key accomplishments for this period are:

1. Increase desktop computer seats in the Mosaic labs from 323 to 351. This was accomplished by promoting the use of iMac All in One (AIO) systems that allowed us to better use our desk space for the desktop systems. We have deployed these AIO systems in Smith 225, Smith 229, Duke 323, Woodward 208 and Woodward 237. We also increased the number of lab seats by 9 in Duke 242 for ME and now have 20 systems in CARC 213 for SEEM.
2. We purchased 80 Dell Optiplex 980 high end desk top systems as part of the refresh cycle for faculty desktop systems.
3. We purchased 25 Mosaic Anywhere servers (replace 18 old ones and add 7 to the pool) - we are now at 85 servers. An additional purchase of 15 Mosaic Anywhere servers was completed to support the EPIC initiative.
4. We participated in the campus Web Advisory Committee to represent the college.
5. We completed the migration of the entire college web sites and pages to the new mandatory campus template.
6. We have rolled out the Wordpress technology to let faculty and staff manage their own web sites using a consistent look and feel. We have about a 30% adoption so far.
7. We migrated our web hosting from our single aging Sun Solaris system to a load balanced set of Linux web server systems.
8. We completed the migration of our AFS file infrastructure from being hosted on Sun Solaris to Linux.

9. We developed and successfully released the eAdvising III web application for the college.
10. We continued the build out of the student laptop and study work space in the college by creatively using space in the college buildings. This includes space in the Smith 3rd floor corridor, nook area. Space has been allocated in Smith 249, Smith 229, Duke 242
11. We continued to support the students with disabilities by replacing tables in our labs with ones that are ADA compliant and providing accessibility to these students.
12. Funded the increased wireless signal coverage in Duke 2nd floor in response to an audit that showed student and faculty had legitimate issues with wireless in these areas.
13. Continue to promote the delivery a sustainable model for Mosaic. This includes:
    a. A new process to manage the approval of software applications installation on Mosaic. This model puts tokens and funding with department to use for installation requests.
    b. Windows and Linux product updates, including the transition to a new antivirus product for Windows;
    c. Completed the efforts to end of life on Unix as a desktop platform;
    d. Emphasize Linux as an alternative and attractive solution;
    e. Promote the Mosaic XP virtual image as an alternative model to offering the delivery of application software – this alternative way to deliver Windows applications at low overhead for the Mosaic staff and on a quick turn has been a tremendous success.
    f. Promote the dual mode systems that can run concurrent Mosaic Windows and Mosaic Linux;
    g. Promote the Virtual Ubuntu Linux as a way to let the faculty create customized Linux images that can be run from anywhere where Virtual Box is installed (Virtual Box is installed on Mosaic Windows and Mosaic Linux).
14. Continue to work with the Computing Facilities Advisory Committee
15. Develop the Memo of Understanding that governs the transition from ITS to PCS the laptop support for student in the Levin Scholars program.
16. Promoted initiatives for the college faculty and researchers (Alfresco server for Dr. Patterson; FOM server for Dr. Terry Xu; Web server for Dr. Shenen Chen; Web cam install in Duke ME labs; Cameron 213 renovation)
17. Work with new faculty to help them with the transition to computing in the college and on campus. Created a "College of Engineering New Faculty Computing Guide".
18. Participation in the Higher Ed conference at HP in San Jose California.
19. Collaborate with Central Piedmont Community College ITS
20. Participate in SOAR, CSW, ABET; Promote involvement in UNC Charlotte Explore, Discover Engineering, Commencement activities.
21. Continue to look for improvements in the way we deliver our services in Mosaic and PCS, including the use of competency assessments for our TA staff, use of software source control to manage our development process.

The following represent the goals for the Mosaic and PCS organization over the next 12 months:

a. Fill open positions in Mosaic and continue to groom new students as technical specialists.
b. Manage the application software installation and updates on our systems. This includes using virtual technology when appropriate.
c. Complete the transition of our back end infrastructure from Unix to Linux – including the printing and data backup support.
d. Migrate all Mosaic Windows from Office 2007 to Office 2010.
e. Infrastructure support for the EPIC building coming on line and EPIC research efforts.
f. Infrastructure support for the Motorsports building coming on line.
g. Continue to enhance and maintain the web services, contents and technology.

h. Selectively take on development or porting of web based applications.
i. Increase services and offering on the Linux platform – including migrating to Red Hat 6.x; introducing a batch control system to manage long running computational jobs.
j. Assess, research and pilot the technology to enable us to migrate to Windows 7. A Windows 7 pilot will be rolled out in the summer of 2012.

The group consists of 8 professional, highly skilled, technically-oriented full time individuals. The group also maintains 5 student technical specialists who work on many software projects to support the needs of the COE.

Mosaic Computing continues to be the most stable, secured and application rich environment on this campus. We continue to be viewed as IT technology innovators by many other IT groups on campus. We have an outstanding staff that is focused and agile; we are well funded by the Dean's office; most importantly, we continue to receive accolades from our customers. Periodically, we will get called by members of others colleges on campus to help with issues because they have heard so much about our abilities to solve problems.

This year presented the following challenges as well as opportunities:

- Adequate staffing to handle the work load in Mosaic and PCS. Chad Dewitt left in Dec 2010 and we have been unable to find qualified applicants for the position.
- Key student technical specialists who play a role in our plans have left us due to graduation or they have found better opportunities.
- Managing the requests from the faculty for software products to be installed on Mosaic.
- Managing the growth and scope of the Personal Computer Support Group.
- Finding sufficient time to research appropriate technology to enhance our offerings to the COE.

The following provides more details of key accomplishments for the past year by the Mosaic and PCS team:

Mosaic Computing

The College of Engineering maintains a dedicated computing infrastructure to serve the needs of its faculty, staff and students. This system, known as the Mosaic Computing Environment or just Mosaic, is operated by a staff employed within the college. This system is architected to primarily support Windows XP workstations configured to take advantage of a robust network-based infrastructure. The desktop systems are configured to be centrally managed. That means that users cannot corrupt or modify the systems they use. This locked down mode ensures that each time someone logs in to a Mosaic managed system they are assured that they get a pristine system. Linux workstations are also supported. Remote access to Linux x-servers is also available. All college members have remote access to the same Windows desktop through a service called Mosaic Anywhere. Additionally, all college of engineering faculty and staff can remotely access their primary Mosaic Windows desktop systems from anywhere. The Personal Computing Support group (PCS) handles all service and support of unmanaged systems that the college owns or those that are personally owned by engineering students, faculty or staff.

Mosaic is highly dependent on a reliable and fast network. The ITS central organization provides the network infrastructure to the entire campus. The college also depends on key campus wide applications such as email, course management system, Banner, and several others. Mosaic is actively engaged with ITS to ensure that all services used by the college through ITS are delivered and supported to members of the college of engineering.

Software

The Mosaic Computing Environment provides students and faculty access to a wide range of general purpose and discipline specific software. There are currently over 250 unique applications installed on the two primary platforms including many industry standard engineering packages. Software on the campus Citrix server is also used. For Example:

Computer Aided Design

Ansys – Finite Element Analysis
AutoCAD – Computer Aided Drafting and Design
Fluent – Numerical Analysis
ProEngineer – Computer Aided Design and Simulation

Electronics – VLSI *design*

Cadence/PSpice – Circuit Design
Synopsis – VHDL Design
Mentor Graphics – Electronic Design Automation

Mathematics/Analysis

Maple – Symbolic Algebra/Calculus
MatLab – Linear/Non-Linear Systems Analysis
MathCAD – Numerical and Symbolic Calculation and Visualization

Project Management *and Simulation*

Microsoft Project – General Project Management
Primavera SureTrack - Construction Oriented Project Management
ProModel – Process Optimization Suite

Measurement and Automation

National Instruments Labview

Civil Engineering

Geotechnical – Driven, FB Pier, Pl-Aid, Spile
Highway Capacity/Traffic – McTrans HCS, SimTraffic, Synchro
Geographic Information Systems – ArcGIS
Autocad Civil 3D
Haestad Method
SAP2000

Programming

Languages – C, C++, Fortran, Java
Environments – Visual Studio, Rational Suite, Sun Forte

Office Productivity

MS Office – Word, Excel, PowerPoint, FrontPage, Access
Graphics – Adobe Photoshop/ImageReady, Gimp
Email –Outlook

The above list is not intended to be complete. It is merely a representative sample of the software packages that are available for use by both faculty and students.

We recently participated in a campus license arrangement for **Matlab**; We also participated in making available to all students numerous engineering software applications from **Bentley**.

Computer Infrastructure

The Mosaic environment is built around the principle that users should never be tied to a particular machine, but instead should be able to move to any system of any supported type and access the same personal file storage, printers, web space, and software. To support this concept the college has developed a common network file system and authentication infrastructure based on the Andrew File System (AFS) and the Kerberos authentication standard. A user can log into any Mosaic workstation in any location (faculty office, classroom, student lab …) using a single username and password. All user files are stored on one of sixteen AFS file servers which are housed at various locations throughout the campus, and users do not need to know where their files are physically located in order to access them. Each user's files, desktop, and customizations are automatically available at login regardless of where they are working, and they access the same file space on both the Windows and Linux systems.

Users can also create their own shared folders by adding individual users or custom groups to their AFS access control lists. This allows faculty to create folders for class related materials that are accessible by students in their classes, or students to create shared folders for use by their peers on a team project. Every Mosaic user can also create their personal web pages. All user files are backed up to tape on a daily basis and the most recent backup is always available online so that users can recover lost files without administrator intervention.

Undergraduate student accounts are generated automatically based on course enrollment data, and each student gets 2 GB of personal network storage space (additional quota is available on request as needed for academic purposes) as well as access to email, and a personal web site. Printing resources are granted to students at 250 pages per semester. Additional printing resources can be purchased by the students.

Faculty, staff and graduate students receive 4 GB of personal storage space and 1000 pages of printing quota (additional disk quota is available on request as needed for academic purposes).

The desktop systems that are part of the Mosaic computing environment are architected for remote software installation and maintenance so that software updates and software releases can be distributed monthly without requiring staff to physically visit each machine. This locally developed capability also allows for software packages to be installed in the network file space or on the local hard disks which allows for quick resolution of most software related problems.

The infrastructure of the Mosaic environment is transitioning to Linux based servers that deliver AFS and Kerberos. License management is provided through Windows based license servers housed in server rooms.

Every Mosaic system is monitored for usage and this information is available in real time to the Mosaic Help Desk or for product usage evaluation during software product renewal.

AFS File Server Summary	
Number of file servers	16
Total disk space available/in use	68 Terabytes /8.2 Terabytes
Average size of backup	7.1 terabytes /week

Computer Accounts	Total number of users in Users table	86513
	Number of Mosaic User Accounts (active and inactive)	6162
	Number of active Mosaic accounts	3682
	Number of Mosaic student active accounts	3031
	Number of active accounts for faculty and staff	430
	Internal Mosaic infrastructure Accounts	16
	Number of active Guest Accounts	205

The Mosaic server rooms are distributed in secured computer room facilities in college buildings. A single server room outage can only impact a limited number of users. The server rooms operate in a lights out mode. The server rooms are equipped with UPS systems to ensure proper power and conditioning for the key infrastructure components that deliver the Mosaic Computing environment. Additionally, the Duke and Woodward server rooms have power generators to provide coverage in the event of a catastrophic power outage. Remote access to the servers in the server rooms is available through use of a managed KVM interface. Equipment can be powered off and back on from a remote console interfacing to a managed power strip.

Key environmental factors in the server rooms that can impact the Mosaic computing services (high temperature) are monitored and alarms are triggered when a threshold is exceeded. Alarms are typically generated in the form of an email.

Specialized Servers are housed in Mosaic server rooms to accommodate special requirements for the faculty:

- COEDesign for Steve Patterson
- FOM for Terry Xu
- ISRV for Shenen Chen
- Telehealth for Claude Hargrove
- Linux compute server for Howie Fang

The Mosaic Computing infrastructure is based on the AFS file system and the Kerberos authentication system. Both of these software products are available as Open Source software. The college maintains a yearly consulting contract with one of the developers of these products. To deliver this infrastructure, the college maintains its own file servers, disks, tape backup and associated hardware.

Application software license servers are maintained by the college to handle the various licensing technologies that come with applications software installed on Mosaic. The dominant licensing technology is based on FlexLM. The licensing servers ensure that the college is in compliance with the terms and conditions of the vendor installed application software.

An administrative data base has been developed and is maintained by the college to handle many aspects of running of the college in an efficient and expedient fashion. This data base system has transitioned to be supported by ITS for the entire campus.

A device data base has been developed and is maintained by Mosaic to handle the management of the Mosaic hardware (desktop systems and servers). This data base is also used for many of the automation processes that Mosaic uses.

A Mosaic account management data base system has been developed and is maintained by Mosaic to handle the management of all user accounts on the system.

A fixed assets data base system has been developed and is maintained by Mosaic to handle the tracking of fixed assets in the college.

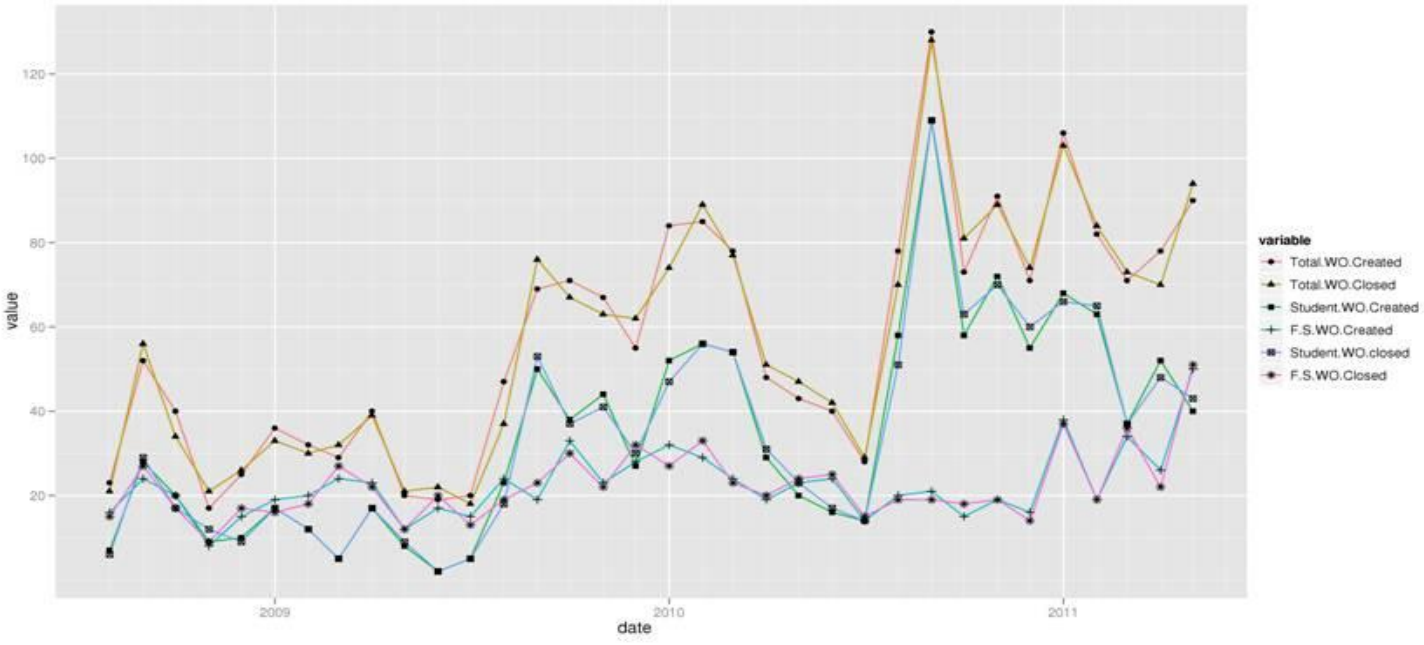
Mosaic Infrastructure	Smith Server Room 253	Woodward Server Room 242A	DUKE Server Room 340
AFS File servers	Resident	Resident	Resident
AFS DB servers	Resident	Resident	Resident
AFS Data Backup servers	Resident	Resident	Resident
Kerberos Servers	Resident	Resident	Resident
License servers	Resident		Resident
Linux X-Server	Resident		Resident
Admin servers	Resident		Resident
Oracle & MySQL DB servers	Resident		Resident
Web Servers			Resident
Windows 2003 AD Servers	Resident	Resident	Resident
Compute Server			Resident
Build-PC	Resident	Resident	Resident
Probe Server			Resident
J-Drive Support	Resident		Resident
Mosaic Anywhere servers	Resident	Resident	Resident
General/Test	Resident		

Personal Computer Support

The Personal Computer Support group delivers a plethora of services and support to the faculty, staff and to the students. This organization continues to do a remarkable job handling the opening of 940 work order requests and closing 936 work orders. The majority of the work orders are for students as shown by the following table:

July 1/10 – June 20/11	Engineering Faculty/Staff	Engineering Students	Total
Open Work Orders	296	644	940
Closed Work Orders	243	643	936

Personal Computer Support Work Orders Statistics:



PCS held various laptop promotions throughout the year with the support of Dell, Apple and HP. The PCS office has relocated to the newly renovated Smith 226 to be more centrally located to support the laptop users. The PCS group has undertaken many special projects for the college. Here are a few key ones:

- **a.** Conduct full testing of eAdvising III
- **b.** Conduct full testing of our web sites that migrated to the new campus template and are now hosted on our Linux servers.
- **c.** Support the Apple iPad mobile device and applications
- **d.** Build Linux systems for faculty researchers.
- **e.** Develop a Student Laptop Purchase Guide
- **f.** Develop a Good Laptop Use practices
- **g.** Assess and document applications as well as technology for the college.

All projects in PCS are tracked on a Google doc spreadsheet.

- **Student Laptop Initiative.** Laptops are now required for all newly entering freshmen in the college of engineering. To support this initiative, PCS continues to provide the following:
  - Software applications for student laptops - the PCS group has negotiated with many vendors to provide software applications to the students at no cost or at extremely low cost. This includes Microsoft Office 2010 Professional at a cost of about $80. Students have access to a variety of software application as shown in the following link: http://coe.uncc.edu/pcs/student-support/software-for-your-pc.html
  - Vendor support (Dell, Apple and HP) – the PCS group has successfully negotiated an arrangement with Dell, Apple and HP where the recommended laptop configurations are made available at very attractive pricing; demo units of these laptops are on display for students to test drive in the PCS Center in the Smith building. All the vendors have also donated laptops to PCS and these are made available as loaners to our faculty and staff as well as to students.
  - Laptop work areas – areas have been sectioned off in the college buildings to accommodate student need for laptop work areas. Wireless access has been added to all these areas to enable access to the campus network from laptops. Here is a summary of these areas:

Laptop Work areas

Location with wireless access, tables	Available thin client
Cameron Hall 1st floor Lobby	yes
Duke Centennial Hall 3rd floor library	
Duke Centennial Hall 242	yes - also on the 1st floor
Smith Building 2nd floor lobby	yes
Smith Building 249	
Smith Building 3rd floor corridor	yes
Smith Building 3rd floor nook	
Woodward Hall 2nd floor lobby	yes
Woodward Hall 1st floor lobby	

- We are actively participating in **SOAR** for engineering freshmen and transfer students. We interact with parents and to students at these sessions. We also display our recommended laptops in the Smith lobby, in the Woodward lobby, in the Duke lobby and in the Cameron lobby.
- We are active in the **Computing Skills Workshops** for our students, which has been a tremendous success. Sessions were held in the early part of the fall 2010 semester and in the early part of the spring 2011 semester. For the first time we also held CSW in the summer session. The attendance in CSW is increasing from year to year. A comparison of the 2009 Fall CSW to the 2010 Fall CSW is illustrated in this table:

Computing Skills Workshops	Fall 2009	Fall 2010
Number registered	366	512
Number attend	270	389
% attended	73%	76%

Attendance for the last 3 Spring CSW sessions is illustrated in this table:

	Spring 2009	Spring 2010	Spring 2011
Attendance	29	102	82

We were complimented on numerous occasions about what a great resource the CSW was for the students. Students who attend CSW and are in 1201 or 1202 receive some type of course extra credit or an incentive from the instructor.

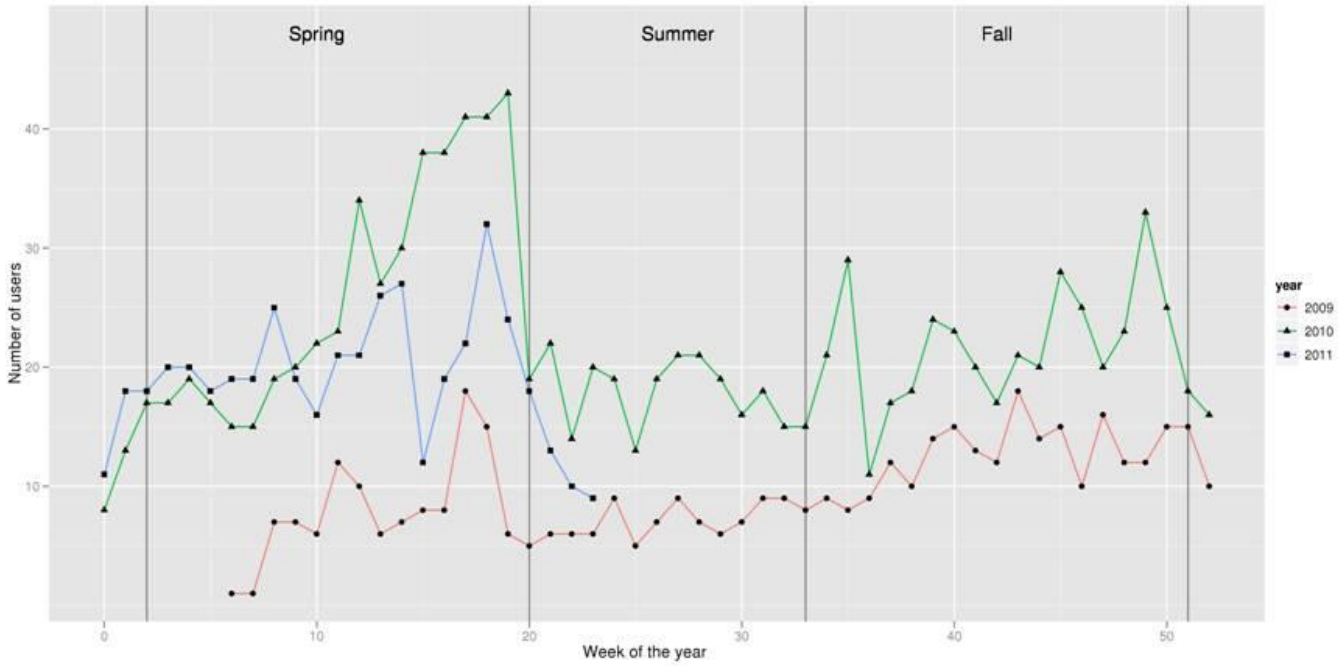
Web Strategy

- Mosaic continues to provide web support and services to all college departments. We have completed the **COE web strategy** to have a unified look and feel and a content management system that is usable based on Joomla. We also completed a conversion effort of our template to the new University approved template. We have provided Joomla training to all members of the college who are involved in managing the web contents. We monitor our web for broken links and orphaned links and correct these. We also offer web templates and consulting to COE student organizations. We have been able to save money by removing unneeded SSL certificates.
- **Web based applications**. We have enhanced and developed new web applications for the college. One of the key web applications that have been developed for the college is eAdvising III. This product was developed with Mosaic resources. The application enables a student to create an academic plan, select courses for the next semester, electronically submit the proposed academic plan to the advisor, and schedule an appointment with the advisor to review the course selection – all possible through this web application. We also developed a mobile college web application to run on any mobile device. We are in the home stretch on the following web based application:
    a. Management tool for printers and plotters;
    b. Management tool for the senior design administration;
    c. Management tool for COEConnect II
    d. Rework of the ticket system

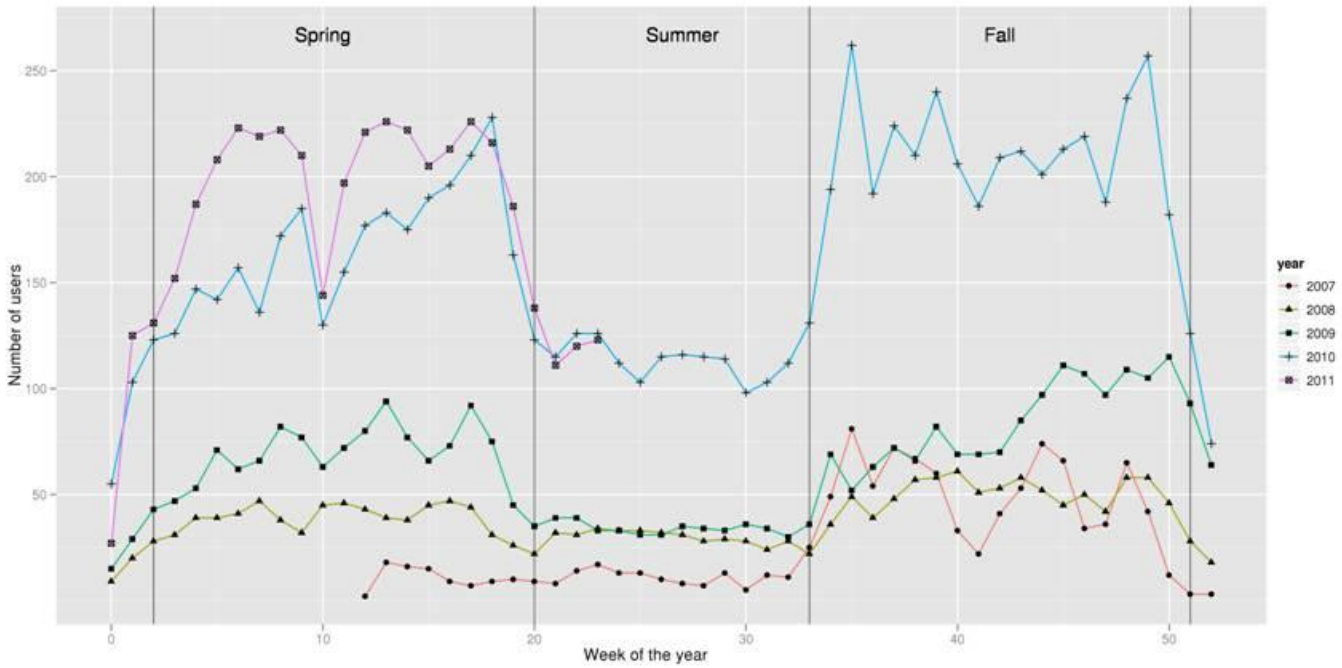
Linux Strategy

- **Linux** Operating System. Our Linux usage continues to increase and our customers love the Linux X-Servers that we offer. We have made a concerted effort to get all the Linux applications up to date and to add new ones. We have started to offer Linux training (first one was to the Mosaic and PCS TA- more will be in the fall of 2011). We have revamped the Linux documentation on our Mosaic web site. The efforts on Linux have produced positive results. Usage of our Linux Compute Server keeps growing. We have a total of 5 Linux X-servers. We updated all of our Linux X-servers to have more powerful processors and extra memory. When a new or an update to a software application is available on Windows and Linux we will install it on Linux.
- Usage of our Linux services is increasing as depicted by the following graph:

Linux Compute server usage (LXS-ME1):



Linux X-Server usage LXS-SM1; LXS-SM2; LXS-SM3; LXS-ME2; LXS-ME3 (without the Compute Server):



Window Strategy

- **Monthly software updates** continue with new applications or updates to applications with faculty sponsors (the list is long). To see a complete list of the plethora of applications on Mosaic Windows and Linux, see the following link: http://coe.uncc.edu/mosaic/available-on-mosaic.html
- **Virtual Mosaic Windows XP.** This is our safety valve for handling software applications on a rush basis or for a small number of users. This technology was developed by Mosaic and is based on the Bittorrent protocol which lets seeders populate peers with the image on an efficient basis.
- **Migration to Windows 7.** We are moving off Windows XP as this platform is not our future. Windows 7 or the follow on to Windows 7 will be where the industry converges.
- **Migration to Office 2010.** We are planning to move forward with migrating to Office 2010 in the summer of 2011.
- **Mosaic Health Monitor.** This is an application that will monitor the logged in users Mosaic resources and trigger alerts when thresholds are reached.
- **Mosaic Any where Monitor.** This is a software application that was developed in Mosaic and lets our Help Desk manage the Mosaic Anywhere servers in a more efficient manner.

Administrative

- We participate in various UNC Charlotte **Campus Computing Committee** meetings and representing COE interests and needs. These meeting include ITS Management Team, College IT Strategic team, Local IT Admin Group, User Services and the IT Infrastructure Committee. We meet with various representatives on campus to discuss mutually beneficial topics.
- Renovation of the **Cameron 213 Mosaic classroom/lab** with 20 workstations. This lab is available for public use and for SEEM teaching. This project was completed at a substantial savings for the college.
- We continue monitoring our budget allocation versus our expenditures.
- We identified a list, with justification, of Mosaic projects that need funded using one-time funds.
- We work with the Dean and the department chairs at AIM meetings throughout the year.
- We work with OSDS to assist and support with technical matters in the FLC.
- We are continuing to handle the surplus management of equipment that no longer has any value to us or the COE.
- We continued to re-evaluate what we do and what we offer, and determined if it makes sense to continue sustaining these activities or to offer our expertise to other departments in the college.
- We continue to publish a newsletter twice a year – covering Mosaic and PCS news as well as technical tips.

Recent expenditures on computing equipment in the COE is summarized in the following.

Recent Computing Laboratory Equipment Funding

Academic Year	Student Technology Fees	College Operating Funds	College One-Time Funds	University One-Time Funds	Total Funds
2005-2006	$485,267		$300,000		**$785,267**
2006-2007	$277,198	$115,000	$102,903		**$495,101**
2007-2008	$347,500	$100,000	$120,051	$65,000	**$632,551**
2008-2009	$407,500		$90,000		**$497,500**
2009-2010	$407,500		$82,000		**$489,500**

Computer hardware repairs are provided by a combination of in-house repair, maintenance spares, depot maintenance, and traditional vendor maintenance contracts; however, the trend over the last few years has been toward equipment with multiyear warranties that allow most repairs to be achieved through cross-shipped replacement of the defective parts.

The Mosaic equipment and software budget is primarily provided through a student computing fee of $100 per semester (for full-time students) paid by all students with majors in the Colleges of Engineering. In addition, all students at the university pay a separate education and technology fee which primarily funds the general purpose labs provided throughout the campus. While the Mosaic computing fees cover most of the equipment and software costs, the support staff costs are funded through the college's operating budget.

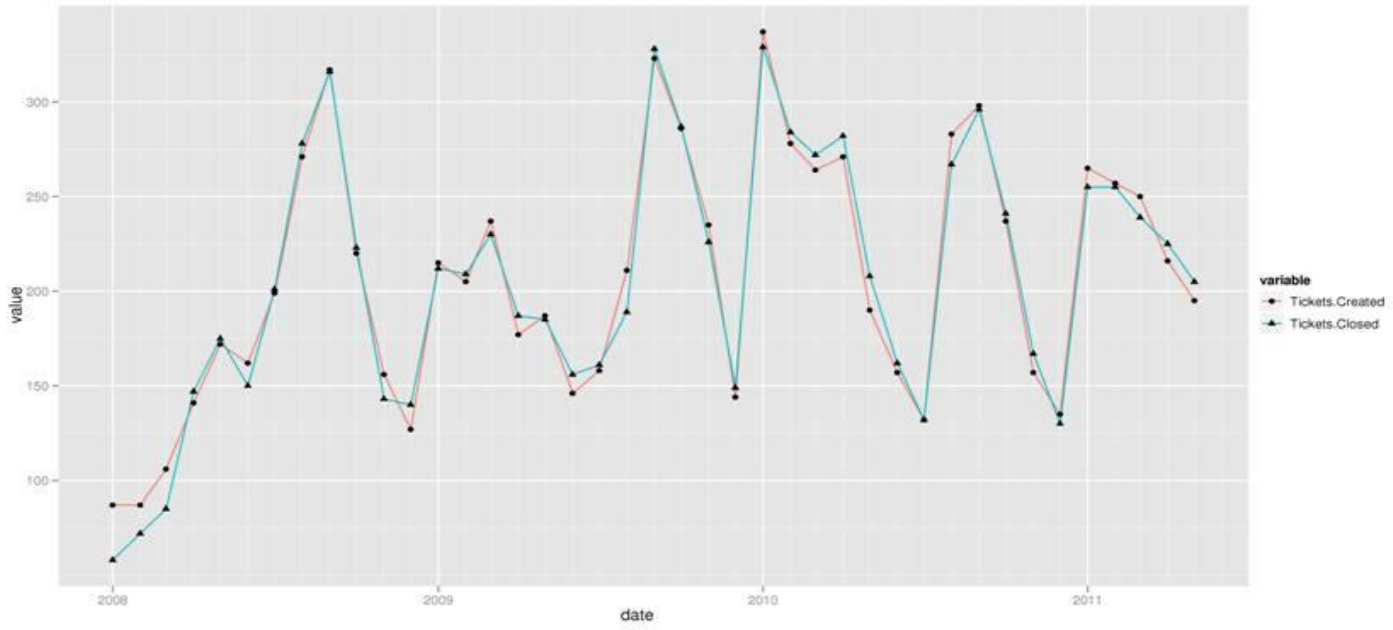
Funding for new labs, equipment, and other facilities is included in the regular Mosaic budget and planning processes, but in recent years many new projects have also been funded through special grants from the Provost's office. These supplemental funds have allowed for accelerated development of a number of new facilities including multi-media enabled classrooms and the CAD/drafting lab.

Customer Support

The **Mosaic Help Desk** monitors the Mosaic labs and Mosaic classroom/labs using a variety of methods. The Help Desk uses Labmap, a web based software that was developed by Mosaic, to monitor who is using any particular workstation. All Mosaic labs are under surveillance using IP based web cams. The Mosaic Help Desk is able to monitor all labs in real-time using a single display that shows 32 camera views. The web cam's video is archived and reviewed daily for any issues. The archive is held for 3 weeks. The Help Desk also roams each Mosaic lab on a scheduled basis. This roaming process handles any issues with printers, plotters or workstations. Every roaming session generates a report summarizing the lab conditions. Any issues are addressed immediately through a published escalation process. The issues are also rolled up into a twice per week update. The table below depicts the number of tickets opened and the number of tickets closed for the period of July 1,2010 thru June 20,2011:

Number of tickets created	2554
Number of tickets closed	2542

Customer Support data ticket statistics:



The Mosaic TA group continues helping us with documentation by handling the product help file creation for all our products and scrubbing all our Mosaic platforms to make sure our help files match the product installed. See the following for a list for the help files:
http://coe.uncc.edu/mosaic/available-on-mosaic.html

Customers have several avenues to seek assistance on computer related issues. Besides the traditional mode of calling the Mosaic help desk or walking up to the Mosaic Help Desk, there are the following additional avenues for customers to seek technical assistance:

- Live Help – this is a web based chat tool that is integrated into the Mosaic Web, and it enables the customer to hold an on-line conversation for technical help. The conversation generates a log which is then entered into a ticket.
- Ticket System – this enables a customer to fill in a web form and submit it to be entered into the ticket system.
- Email to MLC@uncc.edu – an email to this address is automatically forwarded to the Help Desk coordinator, the PC Technician, and the assistant Dean. The email is also auto forwarded to the mosaic-support1 mail box that is monitored by the Mosaic Help Desk. Every email generates a ticket.
- Wimba for remote access and control – customer problems can be resolved by using Wimba, the campus sponsored web based software tool that allows the help desk to connect to the remote workstation and diagnose problems.
- Nagios for Mosaic lab and service monitoring – the Mosaic help desk uses a web based application that is configured to monitor all key components of the Mosaic services. This includes monitoring of lab workstation, printers, plotters, web servers, Mosaic Anywhere servers, license servers, and file servers.
- Knowledge Base – the Mosaic Help Desk uses a knowledge base web application as an extension to the ticket system to submit articles about issues and how to resolve them. The knowledge base provides a way to get everyone in the Help Desk up to speed on common issues and their resolution.
- Competency assessment – Every individual who joins the Mosaic Help Desk receives rigorous training, which includes hands-on problem solving and a procedure manual. An on-line competency assessment is given to all new individuals who are employed by the Help Desk. A yearly competency assessment refresher is conducted with all Mosaic Help desk personnel. The competency assessment is reviewed by the Help Desk coordinator and areas are identified where further training is required.

- We work closely with many of the **engineering faculty** to better understand and deliver on their computing needs. We present the computing environment to all new faculty during the new employee orientation. Many times, we are involved with helping the faculty with initiatives that involve equipment configuration for research, support of software install in research labs. We worked with Dr. Terry Xu on setting up a Service Level Agreement (SLA) for the Facilities Online Management system that she is piloting in the college to track and mange equipment use in Duke. We worked with Dr. Steve Patterson to set up and manage a server for the Alfresco software that he is piloting. We worked with Dr. Shenen Chen to set up and manage web servers for his research efforts. We worked with Dr. Scott Smith to set up web cams for monitoring the ME labs.
- We continued to work on **various research projects** that we believe will pan out for the benefit of the college. We have released the dual mode system that lets us deliver Linux and Windows on the same workstation. We are released the Mosaic Virtual XP image that lets us install and release product quickly and to all Mosaic Windows system.
- We work closely with the **Computing Facilities Advisory Committee** to get their feedback on various initiatives we were pursuing and to hear back from them as department representatives. The committee is made up of Dr. Ron Sass, Dr. Ron Smelser, Dr. Howie Fang, Dr. James Amburgey, Chris McDaniel, Dr. Ahmad Sleiti, and Dr. Churlzu Lim. We met with the advisory group on October 15, 2010 and April 8,2011.

Customer Satisfaction

User satisfaction with the computing environment is also measured on an annual basis as part of the college's continuous improvement process. Comparison of the SPART survey of engineering students and faculty reveals a continued level of satisfaction with the services provided by Mosaic and PCS:

	2011 SPART Surveys Faculty (N= 110)	2011 SPART Surveys Students (N=676)	2010 SPART Surveys Faculty (n=98)	2010 SPART Surveys Students (n=698)
	%≥ agree	%≥ agree		
The College's MOSAIC computing system meets my needs.	81.8%	85.9%	85.3%	86.4%
The services provided by the Mosaic Personal Computing Support (PCS) group meet my needs.	85.2%	83.2%	90.1%	79.8%
The wireless connectivity in the College of Engineering buildings meets my needs.	61.6%	67.9%	67.0%	67.1%
The College of Engineering provides adequate space for students to work on laptops.	55.8%	61.9%	54.8%	61.9%

Mosaic Labs/Classrooms and Workstations

- We manage, support and maintain the following number of **Mosaic workstations** in labs/classrooms (please note this does not account for Mosaic workstations used by faculty and staff) – as of June 15,2011:

MOSAIC Lab Locations, Contents & Hours

Cameron Hall 109 (CAD Classroom/Public)	38 Windows XP Workstations 8AM-8:30PM, Monday through Thursday 8AM-5PM, Friday Equipped with printer and color plotter Available for general use when not in use for a class
Cameron Hall 113 (Public)	19 Windows XP Workstations 24 Hour by 7 Day Access Equipped with printer, scanner and color plotter

Cameron Hall 213 (Classroom/Public)	20 Windows XP Workstations 24 Hour by 7 Day Access Equipped with printer Available for general use when not in use for a class
Duke Centennial Hall 242 (Public)	53 Windows XP Workstations 24 Hour by 7 Day Access Equipped with printer, scanner and color plotter Laptop work area and a thin client
Duke Centennial Hall 323 (Public)	25 Windows XP Workstations 24 Hour by 7 Day Access Equipped with two printers, scanner and color plotter
Smith 225 (Classroom/Public)	43 Windows XP Workstations 8AM - 8:30PM, Monday through Thursday 8AM - 5PM, Friday Equipped with printer Available for general use when not in use for a class
Smith 229 (Classroom/Public)	30 XP Workstations 8AM - 8:30PM, Monday through Thursday 8AM - 5PM, Friday Equipped with printer Available for general use when not in use for a class
Smith 249 (Public)	44 XP Workstations 24 Hour by 7 Day Access Equipped with printer, two scanners and color plotter Laptop work area
Smith 260 XP Drafting/CAD Lab (Classroom)	33 XP Workstations in desks with a drafting surface 8AM – 8:30PM, Monday through Thursday 8AM - 5PM, Friday Equipped with printer and color plotter Available for general use when not in use for a class
Woodward Hall 140 (Classroom)	26 XP Workstations Set up for distance education
Woodward Hall 208 (Public)	12 XP Workstations 24 hour by 7 day access Equipped with printer and scanner
Woodward Hall 237 (Classroom/Public)	17 Dual mode Linux/XP Workstations 24 Hour by 7 Day Access Equipped with printer Set up for lecture capture and distance education Available for general use when not in use for a class
Woodward Hall 243 (Public)	17 XP Workstations 8AM - 8:30PM, Monday through Thursday 8AM - 5PM, Friday Equipped with printer; scanner Color plotter

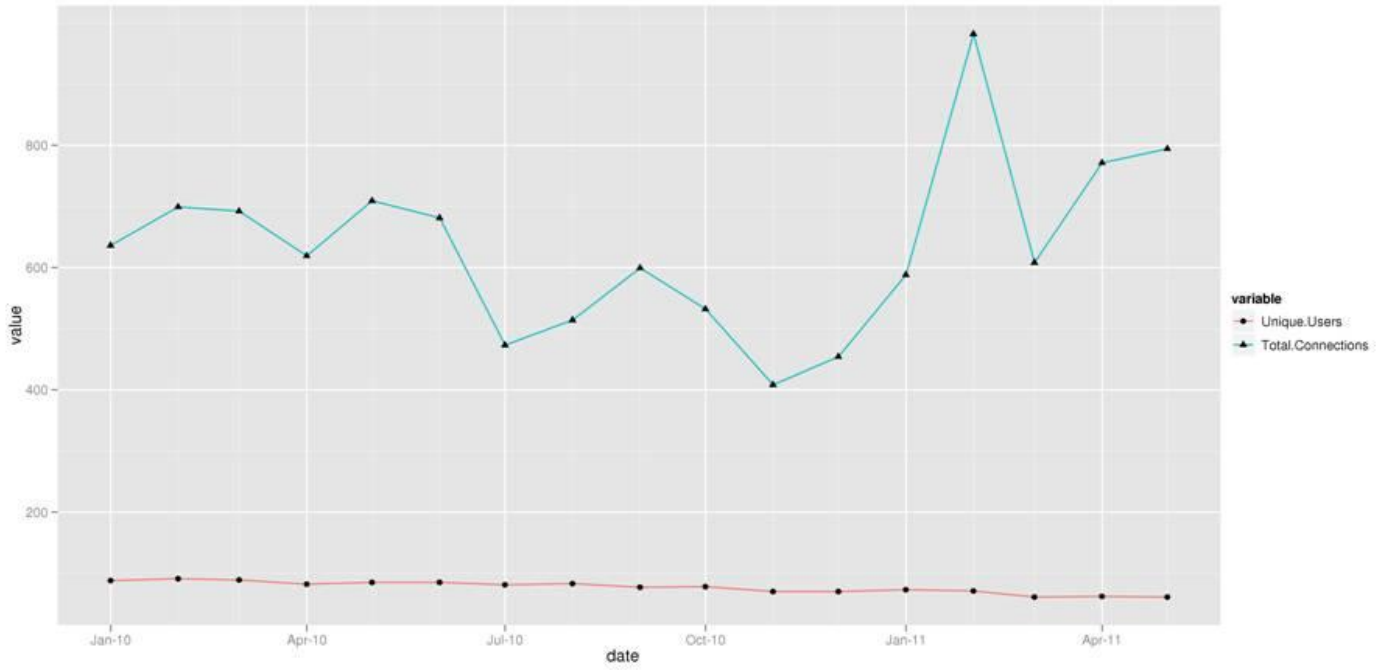
Totals:	**5 Labs; 7 Classroom/Labs**	**351**

The college **classrooms** are equipped with an instructor podium which has a Mosaic Windows system. Some of the classrooms (in Smith and in Woodward) are equipped with lecture capture technology.

Faculty and staff desktop systems are refreshed based on a 3 year cycle. All retired systems are either rolled out as secondary systems or are sent to surplus for disposal. Our strategy (due to budget constraints) is to refresh the faculty desktop systems on a 3 year cycle and the staff on a 4 or 5 year cycle. All our efforts, when we purchase the new desktops systems, is to make sure we have the proper systems for deployment of Windows 7 64 bit.

Our success with the Apple iMac running Mosaic Windows and Mosaic Linux on the **All in One** desk top system is the catalyst for us to evaluate other desktop systems that are available as an All in One.

Remote Access. Mosaic computing provides several avenues for accessing the college's computing resources. Mosaic Anywhere is a service developed by the Mosaic group that allows any valid Mosaic user to access one of the 85 rack mounted servers that run the same Windows desktop as in the labs. Access to these servers is available from anywhere including Linux, Windows and MacOS. **COEConnect** is a Windows based application package that was developed by the Mosaic group to support faculty and staff gaining secured remote access to their primary Mosaic Windows desktop system. This product has been very valuable to the faculty and staff and has enabled us to curtail the growth of the Mosaic Anywhere server pool. A newer version, COEConnect II has been released and deployed for faculty and staff who are running the 64 bit versions of the Windows OS, as well as for Mac OS users. The following graph depicts the COEConnect usage:



Faculty and Staff Resources

There are currently over 700 Mosaic Windows machines located in faculty and staff offices and faculty research labs. All faculty members are provided with an appropriate computing system and may choose either Windows or Linux, although some faculty members have both. In addition many faculty members also have Mosaic systems in their research labs or graduate student offices and many also have stand-alone PC systems that do not fully participate in the shared computing environment. Laptops are becoming increasing popular with faculty although to date all laptop purchases have been funded from either departmental funds or faculty research grants. Faculty and staff Mosaic systems have access to the same software suite that is available to students and in the classroom computer labs, and faculty members can easily prepare lecture materials or software demonstrations in their offices and then present those in a classroom lab.

The following resources are also available to the faculty and staff:

- **Network access** to the Mosaic computing environment is through the campus high speed Ethernet based network that supports 100Mbps.
- **Wireless access** to Mosaic Anywhere throughout the Cameron, Duke, Smith and Woodward buildings.
- **Classroom Electronic Presentation** systems are installed in most of the engineering rooms in the Smith, Woodward, Duke and Cameron. These consist of podiums equipped with the multimedia enabled equipment, including support for projectors, projector screen, document camera, smart board digital displays.
- **Disk storage** service is available to all researchers in the college who need 100GB to terabytes of disk storage that is backed up. This offering is available on a fee-based plan.
- **Digital signage** is available in all engineering buildings. These devices are managed by the Mosaic group and contents for these are created by the college public relations coordinator.
- **Loaner** laptops, digital camera and LCD projectors are available from PCS
- **Pan-Opto:** This lecture capture system in available in specially equipped classrooms. Six in the Smith Building for ET and SEEM; 1 in the Woodward building for ECE; 1 in the Cameron building for SEEM. Instructors may record lectures and supplemental material using traditional classroom techniques as well as numerous multimedia techniques. Lectures may be delivered synchronously where remote students may interact during the lecture, or recorded and played back asynchronously. Once recorded, lectures may be edited to optimize playback. The Pan-Opto capabilities are also used to record student presentations for personal reflection and review in addition to inclusion in the course material archive.
- **WebHW:** A restricted access, user authenticated, web-based electronic homework submission and return tool that was originally developed to support the Freshman Engineering program. It allows instructors a simple way to set up online submission, grading and return of electronic homework materials. WebHW both facilitates the submission and return of coursework and provides the mechanism for the creation of e-portfolios.
- **WebPE:** A restricted access, user authenticated, web-based peer evaluation tool that was originally developed to support team projects in the Freshman Engineering program. It allows the instructor to create teams of students who will provide peer evaluations of each other's participation in a common project. Students receive anonymous feedback and cumulative ratings, while the instructor is automatically provided with a detailed analysis of all evaluations.
- **Computational Resources**. The college maintains a 64 bit Red Hat Linux X-Server that is referred to as a compute server. This system has 8 processor cores and 64 GB of memory as well as very fast internal disks. This system is typically upgraded or enhanced on a three year cycle. Faculty members can also request access to the supercomputing systems at the University Research Center and high-end visualization facilities provided by the North Carolina Supercomputer Center (NCSC).

Staff

The Mosaic and PCS services are supported by ten highly skilled individuals. This staff includes:

Assistant Dean for Engineering Computing, who manages the support staff and budget, develops strategic and tactical plans, directs infrastructure development, plans hardware and software acquisitions, assists faculty and staff with special purchases, and provides general technical consulting to the faculty.

User Services Coordinator, who supervises 15-20 lab TAs, maintains the computer labs and other shared facilities, operates the computer help desk / help line, monitors system resources, and provides general troubleshooting and other assistance to faculty, staff and students

Personal Computing technician, handling the efforts to support student owned laptops, faculty and staff laptops.

Computer Network Coordinator, who performs system administration, manages network file system including backups, provides general hardware support, performs routine system maintenance, and carries out initial set up of all Mosaic systems.

Applications Programmers (3), who install, update and maintain all software applications for both Mosaic Windows and Sun systems, manages software acquisition and licensing, and contributes to Mosaic Windows system design.

System Programmers (2), who develop custom installation and maintenance procedures for the Mosaic Sun, Linux and Windows systems that allow automated configuration, software installation, updates, and repair.

Database Administrator/Multimedia/Web Developer, who installs, maintains and programs the Mosaic support databases and the college's administrative database systems, and administers the college and departmental web sites.

The full time staff is aided by 23 student technical assistants who handle the help desk, roaming functions, laptop support, and software development. Certain additional services (e.g. maintenance of the campus network infrastructure and Internet connection) are provided by external staff members housed in the campus' Information and Technology Services division.