CLEMSON

COMPUTING AND
INFORMATION TECHNOLOGY

2014-15
ANNUAL REPORT

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CCIT spans nearly 400 employees over five counties.

2014-15 CCIT ANNUAL REPORT

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FROM JIM BOTTUM

We have reached the end of a remarkable year for our organization, both in terms of individual accomplishments and those of the organization as a whole. I am proud of the progress we have made on many critical projects and initiatives undertaken this year, and am confident in our organization's ability to meet the challenges of supporting the 21st century University's information technology needs.

FY15 saw us continue our work as a model next-generation campus, continuing our work on the forefront of high performance computing and innovation. Clemson's continued ability to lead and collaborate worldwide on HPC research and education both raised our profile as a University and contributed to those fields in meaningful ways.

"We continued our work as a model next-gen campus."

We have reached numerous accomplishments over the last year, serving all members of the Clemson community. From enhancing the Banner system and my.Clemson app while upgrading business services software, we continued to emphasize efficiency and customer service for our stakeholders. Our commitment to Clemson saw record numbers helped in Support Center and the addition of support channels to promote accessibility. Our partnerships with industry leaders paid dividends to both parties, including a $1.23 million gift of networking technology from Big Switch Networks. Clemson took the next step in its mutually beneficial partnership with Adobe, constructing the Adobe Digital Studio in Cooper Library. The Studio represents our vision to merge creativity and technology in all aspects of the educational model and marks a physical touchstone for our work with the company.

Our research portfolio continued its strength in FY15 as CCIT researchers were either leaders or collaborators on approximately $3.6 million in new research awards to Clemson University. From identity and access management to high performance computing and cyberinfrastructure, our dedication to cutting-edge research will bear fruit for many years to come. We also invested in our own resources, creating the first-ever CCIT Emerging Leaders contingent and continuing work with the MOR Associates national IT leadership program.

We have not gone without challenges, but we have made significant progress in advancing service delivery to campus, facilitating access to the latest technologies for research and education, and forming strategic partnerships both inside the University and with industry partners. Much work is yet to be done, but we have built a solid foundation upon which to build and support resources that will enable advances in research, teaching, and collaboration.

I want to thank each and every CCIT staff member for your hard work and dedication throughout the past year. The accomplishments this year would not have been possible without your perseverance, knowledge, and commitment to serve Clemson University.

Sincerely,

James R. Bottum

James R. "Jim" Bottum
Vice Provost for Information Technology & Chief Information Officer

BY THE NUMBERS

Palmetto ranks as the
4th-fastest
supercomputer at a
US public university campus

21,921
customers walked into the
CCIT Support Center for help

131 million
CPU hours used on Palmetto,
Clemson's high performance
computing cluster

$3.6 Million
in new research
awards for CCIT-
partnered projects

9 CCIT staff
participated in the
nationally recognized MOR
Associates Leadership Program

31,892
calls to the CCIT
support center

Personnel in
46 out of 58
Clemson departments have
received training on the
use of Palmetto

$1.4 million
in service level
agreements for FY15

99 service level
agreements for campus
IT service & system support

63 student interns
in the CCIT organization
during spring semester 2015

100 Gb/s Network
connectivity over the Clemson
wide-area network for research
and education

33,935
my.Clemson app
downloads since launch

EXECUTIVE SUMMARY

Fiscal year 2015 represented a year of successes and challenges for Clemson Computing and Information Technology. A number of initiatives and projects have been undertaken this past year by CCIT focused around five core areas: Infrastructure, Research, Collaboration, Shared Services, and Teaching and Learning – all of which relate back to the five strategic IT goals.

In the development of these strategic goals, CCIT has focused on five core tenets: Build and maintain a robust infrastructure, maintain and support mission-critical systems, provide appropriate learning technologies to support academics, provide the adequate customer support needed for the university and state, and leverage existing and develop new core competencies to drive future innovation.

Within infrastructure, Clemson's high performance computing cluster (Palmetto) continued to stack up in the worldwide rankings for most powerful systems, checking in at No. 108 and ranking within the top five of all public institutions nationwide. Further, Clemson and Internet2 entered the second full year of its partnership, hosting workshops and making headlines for its use of the 100Gb/s research connection. Clemson's networking group also continued its high-speed upgrades as the university worked to become a model next-generation campus.

FY15 was also a product research year for CCIT. Through our research staff, and through faculty partnerships, CCIT researchers were either leaders or collaborators on approximately $3.6 million in new research awards to Clemson University. Projects range from research on identity and access management, high performance computing, security through social media data, cyberinfrastructure in education and next-generation data analysis. A leader in next-generation computing, this year saw Clemson collaborate on the groundbreaking CloudLab cloud architecture project and taking a prominent role at the first SPAN workshop in Atlanta.

CCIT's reputation for collaboration came well-earned in 2014-15. The department's work with the IT Student Advisory Board resulted in continued funding for several projects for all students, including Livescribe Echo SmartPens for increased academic accessibility. The school's partnership with Big Switch Network saw the company gift $1.23 million in networking technology to the university in 2015 and CCIT also worked with the Academic Technology Council on its fruitful Adobe partnership. In the summer of 2015 CCIT sent nine leaders to the MOR Associates national IT leadership program and chose 20 members to make up the first-ever CCIT Emerging Leaders contingent as the department continued to invest in itself and collaborate with the brightest off campus.

CCIT's shared service initiatives saw Enterprise Systems and Applications (ESA) enhance and upgrade the Banner implementation project in the summer of 2014 while continuing to improve support for the TigerOne ID card system. The Mobile Innovation Team added a slew of new upgrades to the my.Clemson mobile application as ESA and Clemson University Business Services successfully launched PeopleSoft Financials 9.2 to improve transaction efficiency. Students, staff and faculty also continued to take advantage of CCIT's Support Center, receiving help by way of nearly 32,000 calls and 22,000 visits.

Lastly, CCIT has partnered with faculty and staff around the university to support teaching and learning, including upgrading equipment in 60 classrooms and four auditoriums. The department revamped the CCIT Research and Development Laboratory in Barre Hall as an interdisciplinary shared space while offering 50 training courses, educating more than 1,000 students, staff and faculty.

CLEMSON
COMPUTING AND
INFORMATION TECHNOLOGY

STRATEGIC GOALS

INFRASTRUCTURE

Build and maintain a robust technology infrastructure for Clemson University to support education, research, and public service

MISSION-CRITICAL SYSTEMS

Maintain and support information technology systems critical to Clemson University's mission.

LEARNING TECHNOLOGIES

Provide appropriate technologies to support and enhance the academic experience for faculty and students

CUSTOMER SUPPORT

Provide support for University stakeholders in information technology use on campus and throughout the State of South Carolina.

GROWTH AND INNOVATION

Provide support for University stakeholders in information technology use on campus and throughout the State of South Carolina.

In support of these goals, CCIT seeks to contribute to the overall university mission and vision. In doing so, CCIT contributes to the following President's Report Card metrics:

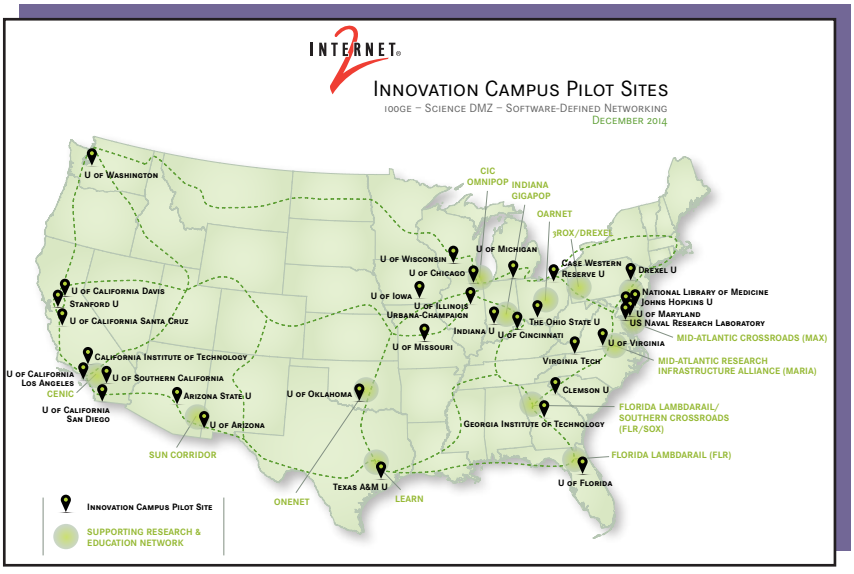
- Measure the effect of high performance computing on productivity.
- Leverage enhanced infrastructure for partnerships and shared cloud services.
- Increase the number and quality of technology-enhanced classrooms.
- Increase government, university, and industry partnerships.
- Increase research expenditures by 50 percent.
- Continue to support economic development through job growth and capital investment in South Carolina through innovation and research.
- Increase the number of undergraduate and graduate students presenting papers/posters at national meetings.
- Increase the number of external internships & co-ops.
- Increase the number of internal (campus) internships to engage 500 students annually.
- Deploy new student and research information systems successfully.
- Enhance business system capabilities to decrease transaction costs.

PALMETTO CLUSTER

The Palmetto Cluster is Clemson's high performance and research computing cluster designed to support faculty and student research and education needs and to increase the competitiveness of the university in advanced computing. This resource, developed and funded collaboratively through IT contributions, faculty contributions, and sponsored research, provides a shared 'condominium' platform that optimizes compute resources for all users. The Palmetto Cluster made its customary appearance on the Top500 list–a biannual ranking of the world's fastest supercomputers–by checking in at No. 108 worldwide and ranking in the top five fastest supercomputers on a public university campus in the United States. In achieving this, the system benchmarked at 630 teraflops – or 630 trillion mathematical operations per second.

"Envision. Collaborate. Innovate."

INTERNET2

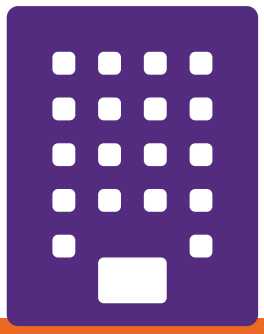


During 2013, Clemson University joined other leading research universities from around the nation in deploying the groundbreaking Internet2 Innovation Platform – the next generation network initiative to bring a 100Gb/s research and education connection to campuses. In FY15, Clemson garnered publicity for its usage of Internet2 to work with NCBI, the largest public genomic dataset repository. Clemson also hosted the Advancing Research Computing on Campuses: Best Practices Workshop in partnership with ACI-REF and the National Center for Supercomputing Applications in March.

INFRASTRUCTURE

CLEMSON NEXTNET

In 2012, the National Science Foundation awarded Clemson University, under the direction of Dr. Kuang-Ching Wang from Electrical & Computer Engineering, a $1 million award to model an evolutionary next-generation campus network to provide advanced network connectivity for research and education. By October 2014, the project has completed upgrading 20 on-campus buildings with 40Gb/s connectivity to laboratories and 10Gb/s connectivity to designated faculty offices for use with other advanced computing and data-intensive computing resources. Between project launch in 2012 and present, the project has funded nine CCIT engineers and staff members to develop persistent support expertise for Clemson NextNet as a next-generation production-grade research network. The project also supported development and testing of high performance data transport solutions between Clemson and partners, notably NCBI/NIH and University of Utah. As a broader impact, the project instilled sufficient knowledge and confidence in software defined networking and technology to begin adoption of SDN-based solutions in other parts of the Clemson production network beyond Clemson NextNet.

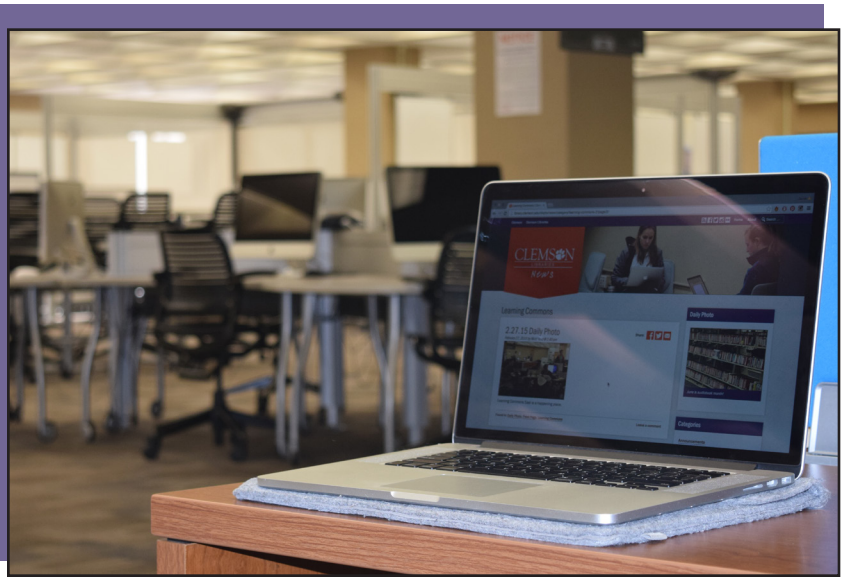


20 BUILDINGS WITH 40 Gb/s LAB CONNECTIVITY

& 10 Gb/s CONNECTIVITY TO FACULTY OFFICES

LIFE CYCLE REPLACEMENT PLANNING

Over the course of the year and beyond, senior management in CCIT has focused on a long-term life cycle replacement (LCR) strategy for systems and infrastructure sustainability. During fiscal year 2015, CCIT, with support from the Chief Financial Officer, Vice President for Research, and the Provost, invested an estimated $3.6 million in life cycle replacement funding – $1 million to classrooms and laboratories, $1 million to the Palmetto Cluster, $1 million to cloud and data center infrastructure, and $0.6 million in network wireless and building rewiring. Priorities for FY16 include upgrading the campus network core routers as well as continuing upgrades for classrooms, laboratories, and ongoing critical infrastructure replacement.



CCIT RESEARCH PRODUCTIVITY

During the last several years, CCIT researchers have successfully submitted numerous research proposals to federal, state, and corporate sponsors in the areas of high performance computing, advanced networking, training, outreach, and educational activities. During fiscal year 2015, CCIT researchers were either leaders or collaborators on approximately $3.6 million in new research awards to Clemson University. Projects range from research on identity and access management, high performance computing, security through social media data, cyberinfrastructure in education and next-generation data analysis. This achievement is a testament to the growing number of faculty partners collaborating with CCIT on research projects, and also to the growing national reputation of Clemson's IT staff as thought leaders in advancing information technology infrastructure and programs.

CLEMSON UNIVERSITY CLOUD

CCIT, over the course of the last year, has developed and executed plans for the development and construction of a number of "Compute Pods." These pods, constructed by a significant number of compute nodes tied to large powerful storage arrays from NetApp with high performance networking services provided by Big Switch's controllers and software, provide robust, resilient and powerful computing power and support for various mission critical university services including the Clemson cloud. This is one of many infrastructure initiatives underway that advance Clemson's commitment to emerging technologies that better service our faculty, staff and students.

IDENTITY AND ACCESS MANAGEMENT

Clemson Identity and Access Management (IAM) provides technological solutions to grant, control and validate the identity of users and their memberships in groups. IAM allows data stewards to manage access to their data and/or resources. This service provides user provisioning (user, role and context based access), password management, directory services and access requests. In FY15, Jill Gemmill, Billy Cook and Nick Watts held a kickoff meeting in February 2015 for FeduShare, an environment for researchers to provision and manage collaborations. Partners in the endeavor include Clemson, the University of Utah, BBN, and the University of Illinois. A key focus of the NSF-funded project squares on informing campus identity and access managers about federated, collaborative project needs and identifying a set of tools to address those needs, leveraging campus IAM. The project team also presented a demonstration at the October 2015 Internet2 Tech Exchange.

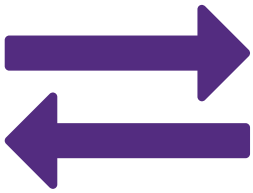
RESEARCH

CLOUDLAB

This year saw Clemson collaborate on the groundbreaking National Science Foundation-funded CloudLab project, aimed at developing a flexible scientific cloud architecture that will support the national research community. Clemson became part of a consortium of universities that received $10 million to fund the project, designed to be a large-scale, distributed facility that can support hundreds of different experimental cloud environments for researchers simultaneously. The deeply programmable CloudLab is designed to serve as a testing ground for researchers whose experimental research will ultimately develop the next generation of cloud architectures. Clemson's high-memory cluster, partnered with Dell and overseen by Dr. Kuang-Ching Wang, features 5,000 cores with 16 GB RAM per core and 16 cores per node with the latest virtualization hardware. The project, free for research and educational use among academics and educators in the United States, launched in October 2014 and Clemson's location went online in the spring of 2015. The project's collaborating institutions are led by the University of Utah and include Clemson, the University of Massachusetts-Amherst, the University of Wisconsin, Raytheon BBN Technologies and the US Ignite project. The NSF Future Cloud will enable the research community to go beyond the use of existing commercial cloud offerings, allowing researchers to influence such offerings in the future.

NSF-SPONSORED SOUTHERN PARTNERSHIP IN ADVANCED NETWORKING

In April, Clemson held the first of a series of NSF funded workshops in Atlanta to help colleges and universities across the southeast in developing campus cyberinfrastructure plans with an emphasis on advance networking capabilities. The project, CC*IIE Region: Southern Partnership in Advanced Networking (SPAN), is focused on developing relationships with colleges and universities across the Southeast to support the increasingly critical role that access to distributed data/computer-intensive infrastructure, both technical and human, is playing in research and education endeavors across a wide range of disciplines. SPAN is a partnership between Clemson University, South Carolina State University, Georgia State University and the University of Georgia that is building a regional community of practitioners across the South that supports next-generation networking. A foremost goal is to leverage Clemson's expertise and experience to help schools think through how to deploy and support cyberinfrastructure and also to explore potential for regional and national cyberinfrastructure partnerships.

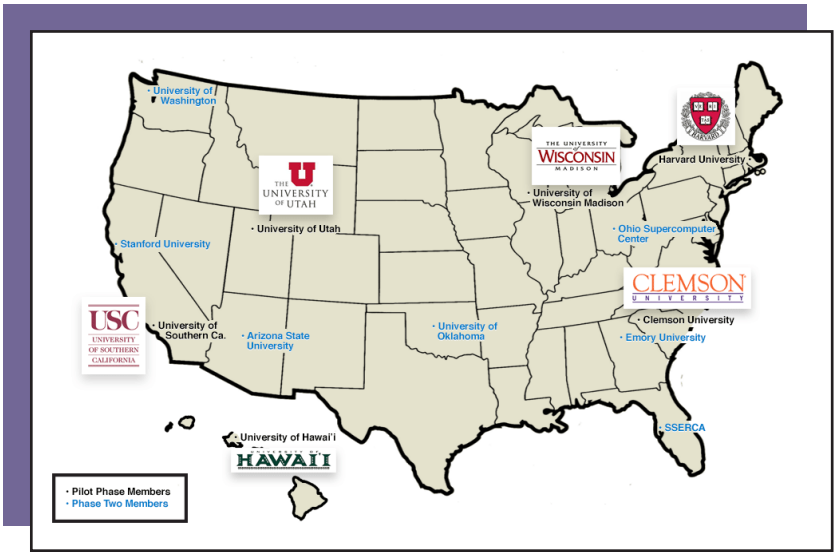


A FOREMOST GOAL IS TO LEVERAGE CLEMSON'S EXPERIENCE & EXPERTISE TO HELP SCHOOLS

The project, which collaborates with the Southern Crossroads initiative, Internet2 and ESnet, offers a program of site visits, best practices documentation and workshops. The first workshop in April featured presentations from Clemson's Dr. Barr von Oehsen (the PI on the project), Chris Konger and CIO Jim Bottum. The project plans to hold its second workshop in November at the University of Alabama in Huntsville.

ACI-REF PROJECT

In 2014, the National Science Foundation awarded Clemson, under the direction of CIO Jim Bottum, a $5.3 million award to enable a national network of Advanced Cyberinfrastructure Research and Education Facilitators (ACI-REFs) to broaden the impact of advanced computing resources on Clemson's campus and across the nation. Built on the successful facilitation structure and organization within CCIT – the Cyberinfrastructure Technology Integration group – the consortium of institutions is committed to the vision of advancing scientific discovery and maximizing investments made by campuses in research computing. In the first year of the program, Clemson held an ACI-REF-partnered Advanced Research Computing on Campuses workshop in April 2015 and Jim Bottum has been a crucial leader as the ACI-REF Principal Investigator.



RESEARCH EXPERIENCES FOR UNDERGRADUATES

In March of 2014, Dr. Vetria Byrd of the Cyberinfrastructure Technology Integration (CITI) group in CCIT was awarded a Research Experiences for Undergraduates (REU) Site award from the National Science Foundation focused on collaborative data visualization applications. In the second year of the three-year award, Clemson fielded over 200 applications nationwide for 12 available spots. During the summer of 2015, students 10 institutions and a wide range of backgrounds (mathematics, chemistry, engineering, biology and psychology) worked with faculty members to gain insight into the complex relationships that exist within data and to further their understanding of tools and methods within the practice of data visualization. The project explores a novel approach to broadening participation in visualization science, as well as explores the significant role data visualization plays in an ever-growing number of disciplines to allow researchers to gain insight into complex relationships that exist within data sets.

COLLABORATION

IT STUDENT ADVISORY BOARD

The ITSAB helped purchase Livescribe Echo Smartpens for students with disabilites, which captures lecture audio to sync with notes taken in class

The IT Student Advisory Board (ITSAB) is a group of students representing all five colleges as well as graduate and undergraduate student senates that advises CCIT on all strategic, student-facing IT issues.

Additionally, the ITSAB, along with CCIT, collaboratively manages the Student Technology Fee and posts a yearly call for proposals which request funding for strategic student-facing IT projects. In 2014-15, the ITSAB chose to help fund the construction of the on-campus Adobe Studio to be housed in Cooper Library, continue development of the my.Clemson app (including a metered parking availability feature), extend the printing pilot project in student housing and help purchase Livescribe Echo SmartPens to assist disabled students with notes and lectures. The board also elected a new chair, Industrial Engineering student Patrick Gorospe.

ACADEMIC TECHNOLOGY COUNCIL

Clemson's Academic Technology Council (ATC), formed by the Faculty Senate to advise CCIT on faculty-related IT issues and policies, has representatives from each of the five colleges, the graduate school, libraries, athletics and CCIT. The ATC added a representative from athletics during FY15 and led an effort to design a tool that would allow faculty to select the information they want to receive, maximizing efficiency with a University-wide committee to address this new direction in campus communication. Through the ATC members, the Council kept academics informed on the progress of the Adobe partnership, the adoption of learning management system Canvas, iRoar, Emeriti College members' access to technology and academic concerns. Chaired by Dr. Jan Holmevik, Associate Professor of English, the ATC and Holmevik worked closely with CCIT throughout the year.

CENTER OF EXCELLENCE

FY15 saw the planning and inception of the Center of Excellence for Next Generation Computing and Creativity. Through digital creativity, geospatial technologies and next generating computing, the Center aims to push the boundaries of discovery and innovation, transforming research, education and creative communication. The Center for Next Generation Computing and Creativity provides an evolving hub for faculty, students, and IT staff to work in partnership, and will drive Clemson University towards its 2020Forward goal of offering an exceptional educational experience and raising up the leaders and innovators of tomorrow.

CLEMSON & ADOBE

CCIT, along with partners from the Department of English, the Libraries, Undergraduate Studies and Creative Inquiry, and Development, continued its first-of-its-kind flagship partnership with Adobe Systems, Inc. This year saw the successful launch of Adobe's world-class Creative Cloud and Digital Publishing Suite for all Clemson faculty, staff, and students, currently the only American university to offer those services. Construction began on the state-of-the-art Adobe Digital Studio in Cooper Library, set for a soft launch in August with a grand opening in October. The joint collaboration, presentation, and training environment will leverage Adobe tools to transform educational and training activities in all disciplines. CCIT hired seven interns to help staff the Adobe Digital Studio upon launch in the fall Clemson faculty and staff presented at the SC14 conference in New Orleans as well as the New Media Consortium Summer Conference in 2015.

CLEMSON & INTERNET2

The 2014-2015 year marked CIO Jim Bottum's third year of his Presidential Fellowship with Internet2, an member-driven organization committed to accelerating research discovery, advancing national and global education, and improving the delivery of public services through innovative applications of technology. In this role, Bottum has also been named to Co-Chair the Internet2 High Performance and Research Computing Program Advisory Group along with Dave Lifka at Cornell University. The group will provide strategic guidance to Internet2 to more closely align the networking and high performance computing communities, and includes CIOs, high performance computing directors, computational scientists, and industry representatives.

INTERN PROGRAM

CCIT has also developed a highly successful student intern program focused on training the next generation of IT practitioners in 21st century cyberinfrastructure through hands-on operational and strategic projects within the organization. CCIT hosted 63 interns in Spring 2015 through the University Professional Internship/Co-Op Program (UPIC) in all areas of IT – including software development, high performance computing, business operations, cybersecurity, mobile innovation, geospatial data, GIS, visualization and storage architecture. The interns are given real-world responsibilities commensurate with their experience and coursework on a wide variety of projects. CCIT interns have gone on to receive job offers from a number of Fortune500 companies including Dell, Google, and Oracle, and many have received offers from highly competitive start ups. Further, in conjunction with CCIT's strategic partnerships with a number of leading technology companies, interns are frequently offered priority review for highly competitive internships at these organizations.

Google DELL ORACLE

COLLABORATION

MOR ASSOCIATES STAFF DEVELOPMENT PROGRAM

During 2015, nine CCIT leaders participated in a national IT leadership program through MOR Associates to advance their professional development and further their leadership skills. This year's Clemson participants include Dustin Atkins, Jamie Brown, Vetria Byrd, Mike Cannon, Katherine Dobrenen, Nathan Long, Lori Tanner, Thomas Taylor, and Dallas Thornton. These nine staff are engaging with their peers from Boston College, the University of Texas-Austin, the University of California-Berkley, Washington University in St. Louis, and New York University. Participation in this program is indicative of CCIT's ongoing commitment to staff professional development, and complements ongoing internal professional development opportunities for the next generations of IT leaders at Clemson.

MOR

This year, CCIT chose twenty members to make up the first-ever CCIT Emerging Leaders contingent. This diverse group of leaders were nominated then chosen by MOR, management, and senior leadership for their great potential in working effectively together on IT related issues. This year's participants include Randy Apon, Jim Baxter, Thomas Black, David Buckley, Andrew Carson, Bobby Clark, Steve Fullerton, Matt Garrett, Nancy Griffis, Tracey Hare, Sam Hoover, Barry Johnson, Studie Johnson, Tim Moon, Linda Nelms, Oyewole (Wole) Oyekoya, Amanda Powell, Bindu Rangaraju, Jacob Richardson, and Michelle Wood. Participation in this program helps them to foster the concept of leading at every level, anticipating needs, proposing solutions, and focusing on results.

CLEMSON & BIG SWITCH NETWORKS

This year saw the continuing fruition of a partnership between Clemson and Big Switch Networks, including a $1.23 million gift of networking technology to the university. The gift of a new networking model will create another programmable part of Clemson's high-bandwidth computing infrastructure, enabling engineers to easily automate and adjust network traffic to meet changing demands. The deployment, which spans hundreds of switches, will help to position Clemson for its transition to the next-generation of technology infrastructure while maintaining educational and research opportunities. Big Switch Networks, of Santa Clara, Calif., is a leader in developing software-defined networking technology, with roots in the original Stanford research team that invented Software Defined Networking (SDN). The company is widely considered to be one of the original pioneers of SDN. The gift will serve as a significant piece of Clemson's next-generation network architecture.

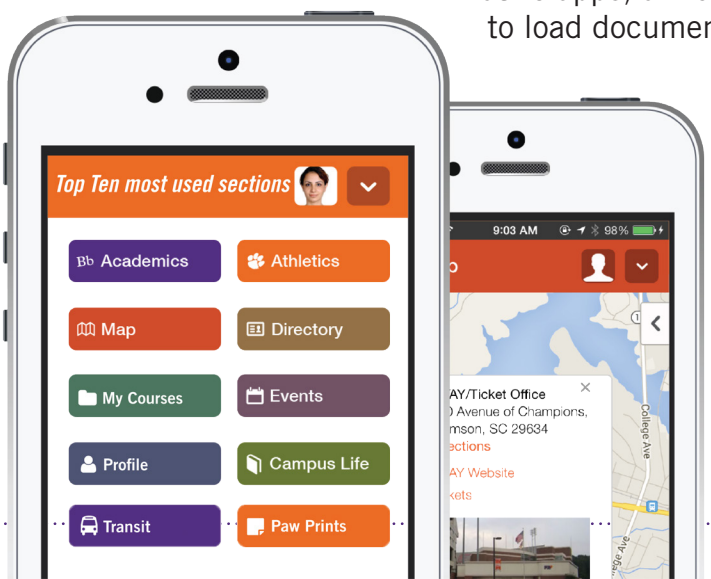
CLEMSON UNIVERSITY | big switch networks

BANNER (IROAR) IMPLEMENTATION

In 2011, Clemson embarked on a major project to replace its student information system (SIS) with Banner, the leading enterprise resource planning (ERP) student system in higher education. Through this multi-year project that involved countless staff from around the university as well as faculty and students, the team enabled significant improvement in many areas. These include creating streamlined online processes to replace many paper forms, improved reporting capabilities related to courses and students, new graduation planning processes to assist in advising students, implementing a single portal for viewing all student information, and providing enhanced degree audit capabilities. The Banner implementation project was completed successfully in Summer 2014, and a series of enhancements and upgrades have already been implemented by the CCIT Enterprise Systems and Applications team with minimal difficulties. Additional enhancements scheduled for the 2015-2016 year include: implementation of an upgraded portal; improvements related to student advising reports and features; streamlined student registration features; implementation of a university "chosen name" policy; and assistance with the 2016 College Reorganization.

MY.CLEMSON MOBILE APPLICATION

CCIT's Mobile Innovation Team is responsible for developing, maintaining, and supporting the my.Clemson mobile application for iPhone and Android devices. This year, the Mobile Team implemented a host of new features for the app, including parking availability for metered spaces and Student Commuter lots, bus tracking with "next bus" arrival time and occupancy, Fike availability for Campus Recreation to show Fike usage by area in real time, completely new and improved Map with vending, printers, handicap-accessible options with location proximity, gameday parking and gameday restrooms for football season, cloud desktop integration with OpenStack for classroom VDI, native login on iOS with ability to save credentials, check TigerOne balance, social media links opening native apps, a more robust directory, updating Blackboard integration to load documents faster and improved analytics and automated monthly reporting for partners and customers.



my.Clemson downloads and usage analytics continued to show that the Clemson community, and students in particular, use iOS far more heavily than they use Android. Current usage shows 83% iOS, 16% Android, 0.6% Windows Phone, < 0.5% everything else. Since the launch of the my.Clemson app on May 19, 2014, users have downloaded the app for iOS 26,205 times and 7,730 times for Android.

SHARED SERVICES

INFORMATION SECURITY

Providing a secure digital environment for the University is of paramount importance to daily activities, and CCIT's Office of Information Security and Privacy (OISP) team have completed several successful security audits of critical systems during fiscal year 2015. The PCI Compliance, Banner Security/ Financial and Card Access systems systems have all undergone stringent security testing procedures to ensure they are safeguarded from any potential malicious activities. Further, the team began seven other audits that include: Information Security Operations, IT Vendor Management, Cloud Computing, Data Security, Data Center Operations, CCIT Policies and Procedures, and Business Continuity – Disaster Recovery. All audits include working across several departments across campus as well as internal and external auditors and features an external penetration test by a third-party penetration team.

In FY15, OISP also completed all of its obligations to complete the necessary System Security Plans (SSPs) for the Department of Health and Human Services environment and successfully responded to audits there as well.

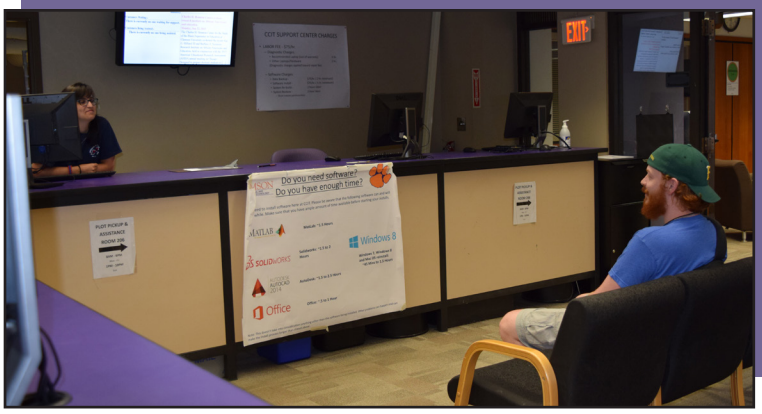
The department added new tools such as Tenable's Passive Vulnerability Scanner (PVS) to provide a greater visibility into our systems and renewed its Trend Micro antivirus solution to include data loss prevention and encryption to provide better end device security. The team began to engage and provide training to internal developers and quality assurance teams on secure code development as well as training developers how to test their code for security vulnerabilities. Information Security and Privacy also leveraged high-performance resources like Hadoop as a creative way to cut time from months to hours while responding to incidents and determining any security events.

OISP also mentored the Clemson Cyber Defense Club, a student organization which participated in the National Collegiate Cyber Defense Competition and the South Carolina Palmetto Challenge in the spring of 2015. Further, Clemson's Chief Information Security Officer, Kevin McKenzie, was appointed to the International Consortium of Minority Cybersecurity Professionals' (ICMCP) Strategic Advisory Board.

TIGERONE CARD SERVICES SUPPORT

Clemson's TigerOne Card Services office, led by the Division of Student Affairs, is one of the major application areas that CCIT supports to provide services to campus. During fiscal year 2015, CCIT teams rolled out a new online card office that enhanced customer experience when managing their TigerOne card, managing their TigerStripe and Paw Points accounts with the ability to review their TigerStripe and Paw Points balances. CCIT also extended a series of enhancements that allowed new students to submit photos online for TigerOne cards, promoting accessiblity and efficiency.

CCIT SUPPORT CENTER



The CCIT Support Center, located on the second floor of Cooper Library, offers the Clemson community a bevy of free support solutions to technological issues. This year, the Support Center helped by way of 31,892 phone calls, 21,921 walk-in customers (up 5.6 percent from FY14) and resolved problems with 14,215. The Support Center also implemented new live chat and remote support channels accessible through the CCIT web site.

CLEMSON UNIVERSITY BUSINESS SERVICES

Clemson University Business Services provides implementation and maintenance support for strategic administrative applications at Clemson and customers include the University's Business Offices, including the Registrar's Office, Controller's Office, Human Resources, Payroll, Office of Sponsored Programs and Students Affairs.

FINANCIALS

In December 2014, CUBS kicked-off a successful launch of PeopleSoft Financials 9.2. The project featured performance gains and optimizations that improved availability while reducing system processing time and related activities for transaction processing. The project was completed on-time, within budget and testing by external vendor CherryRoad showed "exceptional response times and system behavior throughout the execution." Quality assurance executed 180 test cases resulting in a reduction for defects and verification of product before go-live. CUBS also successfully completed yearly budget loads and fiscal year-end processing.

HUMAN RESOURCES

CUBS Human Resources rolled out an Affordable Care Act compliance reporting module to meet required federal reporting while completing a database upgrade to Oracle 11g for the current Human Resources 9.0 system. CUBS HR also worked toward the kick-off of the PeopleSoft HR 9.2 upgrade project.

"EXCEPTIONAL RESPONSE TIMES AND SYSTEM BEHAVIOR THROUGHOUT THE EXECUTION" - CHERRYROAD

SHARED SERVICES

ESA DATA WAREHOUSE

Clemson's Enterprise Services and Applications (ESA) implements and maintains University applications and manages institutional data in support of business processes and decision making for the university's strategic initiatives. After preparing during FYI, on July 1 the Banner Student Operational Data Store (ODS) baseline and Cognos reporting tools were implemented and rolled out to the core student functional users. The Enterprise Data Warehouse team planned for the first rollout before working to extend the ODS, add additional reporting views and add standard reports before rolling out to the campus departments. The ESA Data Warehouse also kicked off its Business Objects Data Integrator (ETL) upgrade, bringing the software to a supported version and included additional software for more user-friendly self-service reporting, mobile, dashboards and analytic reporting.

ACADEMIC SERVICES

In 2011, Clemson embarked on a major project to replace its student information system (SIS) with Banner, the leading enterprise resource planning (ERP) student system in higher education. Through this multi-year project that involved countless staff from around the university as well as faculty and students, the team enabled significant improvement in many areas. These include creating streamlined online processes to replace many paper forms, improved reporting capabilities related to courses and students, new graduation planning processes to assist in advising students, implementing a single portal for viewing all student information, and providing enhanced degree audit capabilities. The Banner implementation project was completed successfully in Summer 2014, and a series of enhancements and upgrades have already been implemented by the CCIT Enterprise Systems and Applications team with minimal difficulties. Additional enhancements scheduled for the 2015-2016 year include: implementation of an upgraded portal; improvements related to student advising reports and features; streamlined student registration features; implementation of a university "chosen name" policy; and assistance with the 2016 College Reorganization.

This year saw CCIT ESA roll out upgrades to Banner with minimal difficulties.

CCIT RESEARCH AND DEVELOPMENT LABORATORY

In the summer of 2015, CCIT unveiled the CCIT Research and Development Laboratory in Barre Hall, room 2004. An interdisciplinary shared space, the laboratory features cutting-edge technology aimed at enabling a broader variety of student projects with real-world applications, ranging from software-defined networking to 3D interactive data visualization.

Student-driven CITI projects such as high-performance computing cluster administrations training and software development take place next to data visualization interns working on funded, collaborative projects with campus faculty. The Environmental Informatics division has used the space to support access to geo-spatial analytics resources, including GIS software, IDE software environments for cartographic design of online mapping applications and to support design of Open Source mapping technologies.

The laboratory featured the installation of HTCondor to increase geo-spatial analytical performance of GIS activities. FY15 saw advanced visualization become a major thrust for the development efforts of the lab, which now features an array of visualization-specific equipment such as specialized software, two Dell Precision T3610 Workstations and a Platform 46 Multitouch Table. The room will also serve as a central point for showcasing cutting edge visualization demos. As part of the CC*NIE campus integration grant, the lab can access Clemson-NextNet, a friction-free, OpenFlow based connection to the campus datacenter and the Internet2 Innovation Platform to provide students with a 10Gb/s per connection and 40Gb/s for the entire lab.

CLASSROOM FACILITY UPGRADES

CCIT supports the technology found in many classrooms around campus, and this support is critical to the learning environments in which faculty interact with students in their courses. In FY15, CCIT upgraded equipment in 60 classrooms and four auditoriums, including one in Freeman Hall. At the end of the fiscal year, CCIT achieved 100 percent technological enhancement of the classrooms it maintains for a total of 370. Further advanced technology upgrades included adding digital HDMI connections, wireless projection capabilities, and installing higher resolution projectors. Upgrades included focused enhancements at Earle, Edwards, Godfrey, Holtzendorff, Jordan, Lee, Tillman, Riggs, and Lehotsky Halls. CCIT also worked with capital projects staff to standardize installations in new buildings including Douthit Hills, Campus Core, Zucker Center and other locations throughout the state.

TEACHING & LEARNING

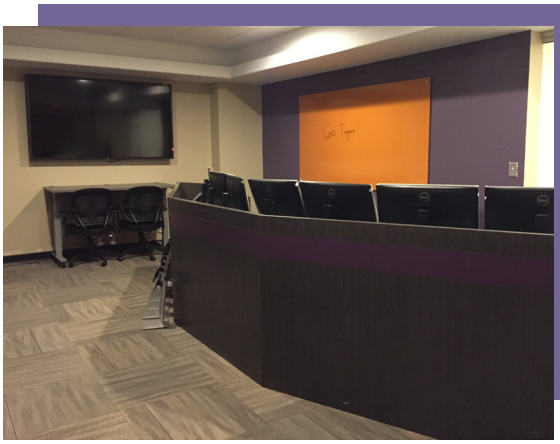
TRAINING OPPORTUNITIES & FACILITIES

CCIT offers a multitude of training and professional development opportunities for Clemson faculty, staff, and students who want to advance their skills in technology applications–ranging from basic training courses to advanced programs in software applications, high performance computing, and visualization. In FY15, Clemson's CITI group (including industry professionals) offered 50 training courses, educating more than 1,000 students, staff and faculty.

The Learning Technologies area increased the number of faculty, staff and student participants for high-performance computing IT-related training 113 percent and increased participants in non-HPC IT-related training by 15.7 percent. CCIT also streamlined the efficiency of training sessions and reorganized training activity for academic instructional technologies to maximize CCIT resources.

CYBERSECURITY OPERATIONS CENTER

Dr. Kevin McKenzie, who oversees Customer Relations and Information Privacy and Security, helped develop a brand-new Cybersecurity Operations Center to open in Barre Hall in November 2015. The Center features a wall of inter-connected monitors, specialized software and four dual-monitor workstations designed for students of all majors and disciplines to explore the world of cybersecurity. In a rapidly growing field that calls for the brightest minds from varied backgrounds, Clemson has positioned itself to educate and inspire budding cybersecurity professionals with its unique, cutting-edge center.



CYBERINFRASTRUCTURE EXPO 2014

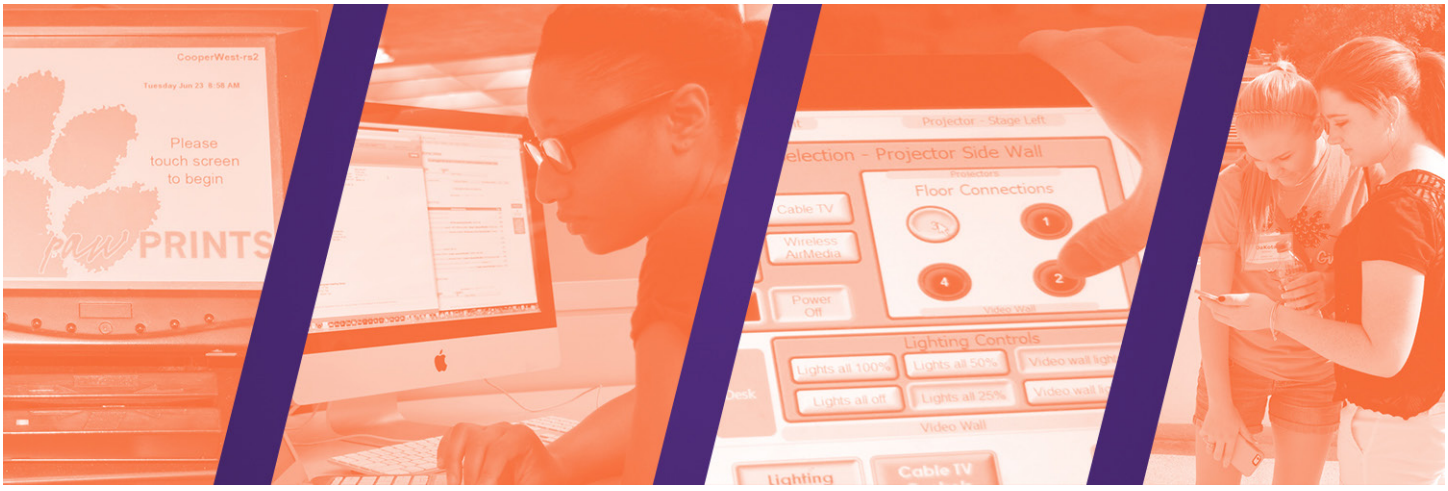
CCIT held its second CyberInfrastructure Expo in September, an event bringing together faculty, students, and staff to showcase innovative use of cyberinfrastructure in their teaching and learning, research, and service. The two-day Expo featured more than 30 speakers who shared how high performance computing and Geographic Information Systems helped made their research possible, as well as offering students and participants the chance to demonstrate their own research and learn about Clemson's state-of-the-art research labs, facilities and products.

SUPPLEMENTARY READING & INFORMATION

The following articles were referenced and can be used as supplementary reading materials on those topics found in the report:

- http://newsstand.clemson.edu/mediarelations/clemson-receives-1-23-million-technology-gift-from-big-switch-networks/
- http://newsstand.clemson.edu/student-program-to-enhance-understanding-of-big-data-visualization/
- http://newsstand.clemson.edu/mediarelations/clemson-part-of-10m-project-to-advance-cloud-computing-technologies/
- http://newsstand.clemson.edu/mediarelations/four-clemson-presenters-will-be-featured-at-internet2-summit/

For more information about Clemson Computing and Information Technology, please visit: Clemson.edu/CCIT



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