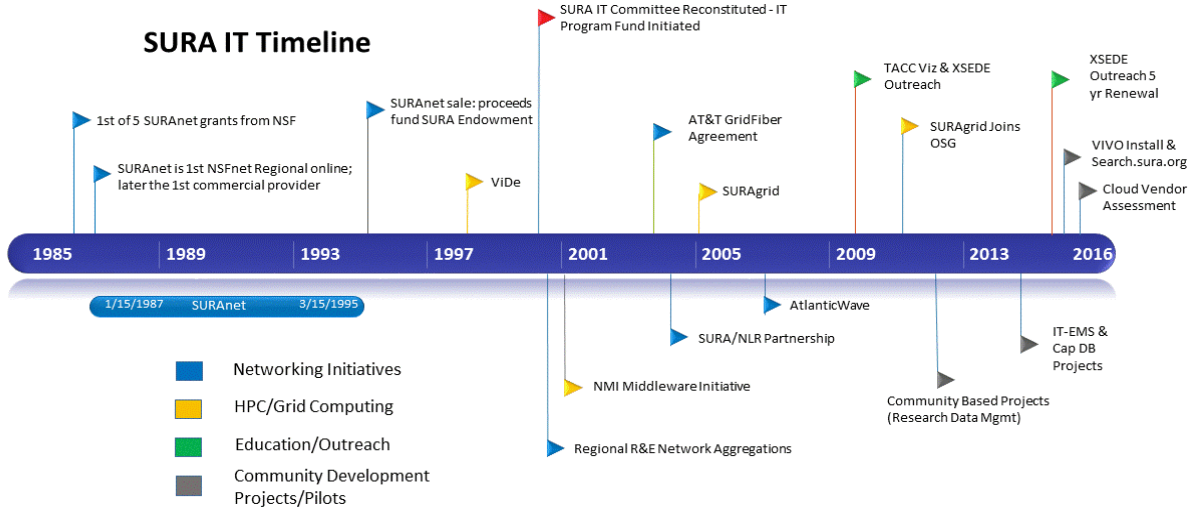# SURA IT - 30 Years of Collaborative Innovation

For three decades, the development, deployment and improvement of information technologies that enable scientific discovery in the southeast have been an integral part of SURA's mission. Over the years, SURA's information technology initiatives have shaped the way information technology is used in support of research and education within the SURA community, nationally, and globally.

SURA IT Timeline

- SURA IT Committee Reconstituted - IT Program Fund Initiated
- 1st of 5 SURAnet grants from NSF
- SURAnet is 1st NSFnet Regional online; later the 1st commercial provider
- SURAnet sale: proceeds fund SURA Endowment
- ViDe
- AT&T GridFiber Agreement
- SURAgrid
- TACC Viz & XSEDE Outreach
- SURAgrid Joins OSG
- XSEDE Outreach 5 yr Renewal
- VIVO Install & Search.sura.org
- Cloud Vendor Assessment

Timeline: 1985 — 1989 — 1993 — 1997 — 2001 — 2005 — 2009 — 2013 — 2016

1/15/1987   SURAnet   3/15/1995

- AtlanticWave
- SURA/NLR Partnership
- NMI Middleware Initiative
- Regional R&E Network Aggregations
- Community Based Projects (Research Data Mgmt)
- IT-EMS & Cap DB Projects

Legend:
- Networking Initiatives
- HPC/Grid Computing
- Education/Outreach
- Community Development Projects/Pilots

1987 – 1995: SURAnet - A Ground-Breaking Regional Network Initiative

By the mid-1980s it was clear that access to high-capacity computer resources was necessary to facilitate breakthrough scientific collaboration among SURA member institutions. A high-performance network to provide this access was essential, but no single institution could afford to develop such a system. A group of founding leaders and researchers from SURA member institutions saw the power of the early internet for science. Under the leadership of Glenn Ricart, a computer scientist from the University of Maryland and 2013 inductee to the Internet Hall of Fame, SURA combined a rapidly expanding set of Institutional computer networks to create a regional research and education network across the Southeast. Launched in 1988 with support from the NSF, SURAnet connected researchers across the Southeast to each other and to existing Federal and international networks. SURAnet grew rapidly and became a competitor with private sector providers. Rather than choosing to spawn a for-profit subsidiary, SURA chose to sell SURAnet on the open market. In 1995 SURA consummated the sale of SURAnet to a private

company for $16 million. Proceeds from the sale of SURAnet were used to create an investment fund that continues to underwrite many of SURA's program activities.

April 2000 – SURA BoT formally Reconstitutes SURA IT Committee

In the late 1990s, under the direction of the SURA Council of Presidents and the Board of Trustees, SURA decided to increase its efforts to advantage its members through the development of collaborative IT projects guided by the following strategic goals:

- Serve the SURA mission
- Sponsorship of collaborative initiatives
- Support for the development of "middleware" and applications that enable science
- Regional information technology infrastructure development
- Influence national IT and networking agenda

To accomplish these goals SURA reconstituted a standing Information Technology program committee, chaired by Gordon Wishon, then CIO at Georgia Institute of Technology. The SURA IT Committee, comprised of Chief Information Officers and technology leaders and innovators from SURA member institutions, took on the challenge of developing a set of SURA IT programs to meet the Board's goals. The SURA IT Committee is led by the SURA IT Steering Group (ITSG) which is comprised of six members and a Chair. The ITSG is selected by the IT Committee and approved by the SURA Board of Trustees. The IT Committee Chair and three of the six ITSG members must be SURA Trustees. ITSG members serve three year terms. Past Chairs include:

Chair	Institution	Years
Gordon Wishon	Georgia Institute of Technology	1998 - 2000
Jed Diem	Tulane University	2001 - 2003
David Lambert	Georgetown University	2004 - 2009
Richard Newman	Florida Institute of Technology	2010 - 2011
Marc Hoit	North Carolina State University	2012 - present

2000 – Present: SURA's Networking Infrastructure Programs:

SURA Regional Infrastructure Initiative
The intent of the Regional Infrastructure Initiative (RII), started in 2000, was to provide a competitive advantage to the region in the pursuit of existing and new research opportunities. Engaging the SURA membership, SURA led an investigation into the feasibility of establishing corporate partnerships and joint ventures to improve the overall availability and reduce the cost of advanced network connectivity for SURA member institutions. The Project activities focused on working with a select set of potential partners to:

- Improve our understanding of the fiber optic infrastructure deployed in the SURA region.
- Explore and develop public/private joint ventures and partnerships to bring new and highly cost effective advanced network services to the SURA region.
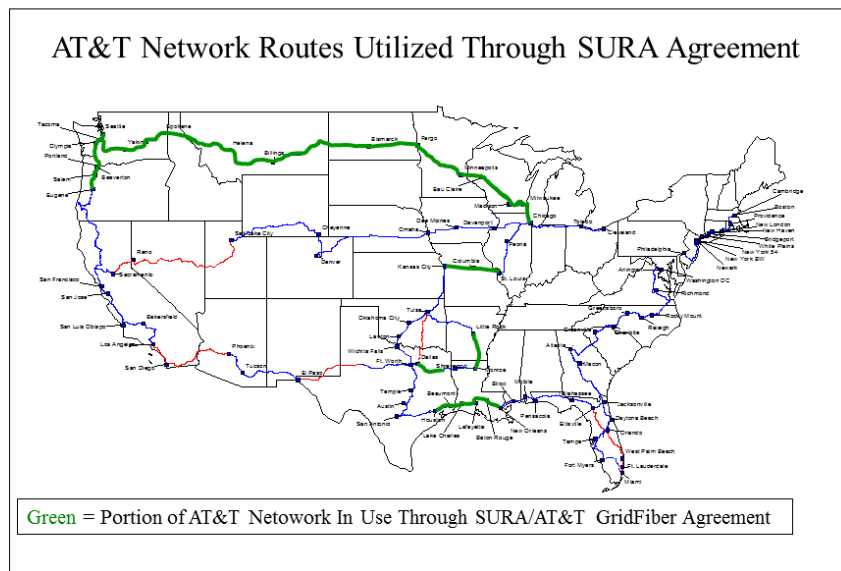
- Create a regional networking infrastructure based on a cost based pricing model that could significantly disrupt the then existing market based pricing models for network infrastructure.
- Develop a SURA community focused on improving the advanced academic networking infrastructure of the SURA region.
- Engage and influence national initiatives, such as Internet2, National LambdaRail and TheQuilt, to bring direct benefits to the SURA region.

By late 2000 SURA had engaged Geographic Network Affiliates International (GEO), a telecommunications consulting firm, in a multi-phase project to help the SURA community better understand the opportunities for identifying and acquiring fiber optic infrastructure in the SURA region. GEO consultants provided key industry knowledge of the existing and developing optical fiber infrastructure in the SURA region and assisted in developing conceptual SURA regional network plans that explored the feasibility of gaining ownership of an optical networking infrastructure for the SURA region.

Oct 2003 – Oct 2008: AT&T GridFiber Agreement
The principal outcome of the SURA Regional Infrastructure Initiative was a partnership with AT&T that gave SURA access to AT&T's national fiber optic infrastructure. This partnership was formalized in the SURA-AT&T GridFiber Collaboration Agreement executed in October of 2003. SURA structured the agreement so regional research and education networking organizations across the country could execute 20 year leases, at no cost, on individual segments of unlit (dark) optical fibers on AT&T's national footprint. The agreement also provided for access to AT&T's co-location facilities and other services that allowed these regional R&E network providers to expand their networks using AT&Ts fiber and facilities.

AT&T Network Routes Utilized Through SURA Agreement

Green = Portion of AT&T Netowork In Use Through SURA/AT&T GridFiber Agreement

Ending in 2008, the partnership with AT&T resulted in the execution of no cost 20 year Indefeasible Right of Use (IRU) agreements for a total of 3,697 miles of AT&T owned dark fiber. This included deployment of AT&T dark fiber in Louisiana, Texas, Missouri, Oregon and a crucial link between Chicago and Seattle serving the northern tier of the US, with advanced network services that would not have been

possible otherwise. These network assets continue to be operated as part of the nation's research and education network backbone.

April 2004 - Present: Reshaping the National R&E Network Landscape

SURA's access to AT&T fiber infrastructure through the AT&T GridFiber Collaboration Agreement coupled with the SURA Board's commitment to invest in the early development of the National LambdaRail (NLR), a high-speed national computer network owned and operated by the U.S. research and education community, allowed SURA to play a key role in expanding the footprint of the NLR national backbone that was very advantageous to the SURA region and to the nation as a whole. In April 2004, SURA's Board of Trustees committed to a partnership with the National LambdaRail that would ensure the inclusion of the southern tier of the US (I-10 route) in their initial deployment of the NLR national backbone. This

Originally Planned NLR National Footprint

commitment, coupled with the no cost dark fiber available through the SURA – AT&T GridFiber Agreement, resulted in the re-conceptualization of the NLR national backbone illustrated here.

Revised National LambdaRail Architecture

For more information regarding NLR see http://www.nlr.net or contact info@nlr.net

SURA's commitment also served as an incentive for other SURA regional R&E network organizations to join NLR, driving their decision to revise their initial national network build to include nodes through the Gulf Coast states.

This revision of the NLR backbone provided a much greater depth of connectivity options for the SURA region, particularly for Florida, Louisiana, Texas and Oklahoma. SURA's efforts literally resulted in putting the

southeast on the national R&E network map, ensuring that our member institutions along the Gulf Coast had access to cutting edge network services at the lowest possible cost.

2006 – Present: AtlanticWave

SURA's participation in NLR and access to NLR services from Florida to NYC facilitated the development of AtlanticWave, a distributed R&E network exchange and peering fabric along the Atlantic coast of North and South America. AtlanticWave, or AWave, facilitates exchange and peering services for national and international R&E networks. AtlanticWave interconnects at international exchange and peering points in NYC, Washington DC, Atlanta, GA, Miami, FL and Sao Paulo, Brazil. AtlanticWave is managed as a partnership between SURA, Florida International University, GeorgiaTech, the University of Maryland and Internet2.

AtlanticWave is an important part of the global R&E network infrastructure providing 10 gigabit/sec interconnection and peering service between North and South America. AtlanticWave supports research and education (R&E) collaborations between U.S. and Latin American such as the international ALMA project (Atacama Large Millimeter/sub-millimeter Array), an astronomical interferometer of radio telescopes in the Atacama Desert of northern Chile.

Middleware, Grid and High Performance Computing

1998 – 2004: SURA ViDe Digital Video Initiative

The Video Development Initiative emerged from a SURA applications workshop in March 1998 when a group convened to discuss the video activities being demonstrated in the workshop. Funded by SURA and led by four SURA institutions, Georgia Institute of Technology, the University of North Carolina at Chapel Hill, the University of Tennessee, Knoxville and North Carolina State University, the Video Development Initiative (ViDe), was created in partnership with the New York State Educational and Research Network (NYSERNet). For the next six years ViDe grew into a national community of pioneers and developers of IP video conferencing technology, services and training. ViDe created the ViDe Videoconferencing Cookbook which saw 4 revisions and was translated into several languages. A white paper on the state of the art of Video-On-Demand technology was also developed which provided a practical approach to evaluating the offerings of video equipment vendors. Both documents became significant

reference works for institutions seeking information about using and supporting digital video within higher education.

During this period SURA supported an annual ViDe Digital Video Workshop, attracting a national audience and providing a forum for training in the deployment and use of digital video technologies and interaction with digital video vendors. As digital video moved from hardware based solutions to imbedded software in common applications, the need for ViDe's activities diminished and the group dissolved in early 2005.

2001-2005: SURA-NSF Middleware Initiative (NMI) Integration Testbed
"Middleware" is the software that makes many forms of collaborative computing, including grid computing, possible. Middleware enables applications access to distributed resources and provides a robust set of advanced network services that allow scientists and researchers to collaborate with their colleagues; effectively share instruments, computing resources, laboratories and data in a networked environment.

In September 2002, SURA and seven other leading research institutions and organizations were awarded a total of $12 million over a three year period to participate in complementary NSF Cooperative Agreements spearheading the NSF Middleware Initiative (NMI). SURA managed the NSF Middleware Initiative (NMI) Integration Testbed program comprised of eight institutions, deploying early releases of middleware products that provided feedback that informed the design and evolution of NMI middleware. Through the NMI, SURA members and collaborators contributed to the immediate advancement of scientific applications and the establishment of a sustainable cyberinfrastructure.

As part of the management of the NMI Integration Testbed program, SURA formalized an inter-institutional grid effort called the NMI Testbed Grid. Testbed sites explored grid computing capabilities with researchers and faculty at their institutions, investigated cross-campus authentication issues and expanded their evaluation and usage of NMI components including integrating grid authentication into the campus enterprise infrastructure. By the time the NMI Integration Testbed funding expired in 2005, the NMI Testbed Grid evolved into the SURAgrid collaboration.

2005 – 2011: SURAgrid

With continuing support from SURA, SURAgrid grew substantially between 2005 and 2010 into a significant regional initiative focused on the development of grid technologies as a mechanism to share access to institutional high performance computing systems. During this period SURAgrid provided users with access to a significant shared HPC resource pool, assisted with research application development and documentation, implemented an institutional cross-certification service through the SURAgrid Bridge CA, developed and maintained a SURAgrid portal, and contributed to regional and national grid technology conferences and events.

In 2006, SURA established a partnership with IBM that enabled SURA to broker the purchase of cutting edge high performance computing systems from the nation's leading commercial vendor at extremely aggressive prices. These systems provided a way for SURAgrid members to expand their campus research computing facilities while contributing to the growing research and education high performance and grid computing infrastructure in the southeastern U.S. Partnerships with Dell and Microsoft followed the IBM model and also contributed to the capacity and functionality of our member's research computing capabilities.

At its peak, SURAgrid membership included 35 institutions, sharing HPC resources, grid service development, peer support and best practices related to integrating campus HPC resources into a shared pool. In March 2011, SURAgrid transitioned from an independent regional HPC resource pool to the shared national HPC environment when SURAgrid became a Virtual Organization within the Open Science Grid (OSG) community. Today, SURAgrid continues to provide a forum for peer technical support for campus research computing operators.

2010 – Present: SURA IT Support for IOOS Coastal Ocean Modeling Testbed (COMT)
From its inception in 2010, SURA provided support for the cyber-infrastructure needs of the IOOS Coastal Ocean Modeling Testbed (COMT) (http://testbed.sura.org/). Over the life of the project, SURA IT assisted COMT researchers in acquiring access to large scale computational resources through the development and submission of successful competitive proposals to the Louisiana Optical Network Initiative (LONI), TeraGrid, and the Extreme Science and Engineering Discovery Environment (XSEDE). Access to these systems was deemed essential to the significant progress achieved by the Inundation Team and enabled the project team to assess the ability of selected models to accurately predict the impact of storm related flooding and wave action. Use of these systems enabled the Inundation Team to run simulations using larger grid sizes, move from 2-D to 3-D models, and explore model coupling such as coupled wind and wave models. Resources acquired included time on the Queen Bee system (through LONI), the Ranger system (through TeraGrid and XSEDE) and Stampede (through XSEDE). SURA IT continues to assist the COMT researchers with their evolving use of national HPC resources.

Education and Outreach

1998 – 2003: SURA-PACS Conferences and Workshops
In 1997, the National Science Foundation revised the original Supercomputer Centers program to create the Partnerships for Advanced Computational Infrastructure (PACI). The program

consisted of the National Computational Science Alliance (the Alliance), led by the University of Illinois at Urbana-Champaign, and the National Partnership for Advanced Computational Infrastructure (NPACI), led by the San Diego Supercomputer Center. SURA was invited to participate in this program as a member of the National Computational Science Alliance's (NCSA) Partnership for Advanced Computational Services (PACS).

SURA's participation evolved into developing and hosting a series of workshops and meetings which formed an important link to member research communities for the dissemination of information and deployment of technologies and encouraged collaborations and specific advanced network applications development inside and outside the SURA footprint. This tradition of community engagement continued well past the life of the PACI program and led to an evolving series of SURA sponsored workshops and community engagement activities that continue to explore the use of high performance computing and networking technologies by new and diverse communities of researchers and educators.

2008 – Present: Great Lakes Consortium for Petascale Computation (GLCPC):

SURA is a founding member of the Great Lakes Consortium for Petascale Computation (GLCPC), a group, comprised of the 28 leading research institutions from around the US. Through the GLCPC SURA participated as an outreach partner in the NSF proposal that resulted in the award of the NSF OCI Track 1 award to the National Center for Supercomputer Applications (NCSA) to build the Blue Waters supercomputer system. The collaboration among the member institutions is greatly expanding the number of faculty and students directly engaged with the development of petascale computing. This cadre of faculty, researchers and students have a broad range of interests, enhancing the potential for advancing scientific discovery, the state of the art in engineering, and science and engineering education. The Great Lakes Consortium allocates a portion of the Blue Waters supercomputer. Through SURAs membership in the GLCPC, SURA institutions can participate in GLCPC workshops and gain access to Blue Waters via the GLCPC allocations process. For more information about the GLCPC see: http://www.greatlakesconsortium.org/.

2009 - Present: XSEDE Partnership

As an outreach partner for the Texas Advanced Computing Center's "*Enabling Transformational Science and Engineering through Integrated Collaborative Visualization and Data Analysis for the National User Community"*, SURA coordinated advanced data analysis and visualization training at Minority Serving Institutions and SURA member institutions in regions with significant populations of Under-Represented Minority (URM) Researchers. This award was one of two Extreme Digital (XD) NSF-funded remote data analysis and visualization investments: Longhorn at TACC and the National Institute for Computational Sciences (NICS) managed Nautilus. Over the course of the four year grant, eleven workshops were offered at ten locations and reached over 183 participants. Outcomes included increased awareness and understanding of the role of visualization in scientific research, requests for time on Longhorn, and the launch of a

visualization lab at Clark Atlanta University. The success of this effort led to the selection of SURA as an outreach partner in the National Center for Supercomputing Applications (NCSA) led and NSF-funded XSEDE program; a five year program awarded in July 2011.

Driven by community needs, XSEDE substantially enhances the productivity of a growing community of scholars, researchers, and engineers through access to advanced digital services that support open research. XSEDE's integrated, comprehensive suite of advanced digital services federates with other high-end facilities and with campus-based resources, serving as the foundation for a national e-science infrastructure with tremendous potential for enabling new advancements in research and education. Extending the use of the advanced digital research services ecosystem to communities who are not traditional users of this ecosystem is a strategic goal of the XSEDE project.

SURA leads the XSEDE Broadening Participation program whose mission is to engage faculty and students from underrepresented groups as XSEDE users and contributors to the advanced digital research services ecosystem. The tight integration of XSEDE Education and Outreach programs with User Support has led to increased participation by non-traditional users. In the first five years, the population of active XSEDE community members has become more diverse compared with that of TeraGrid, as well as compared to the general population of US faculty with federal grant support. Participation as users of XSEDE services and contributors among Under-Represented Minorities (URMs), Minority Serving Institutions (MSIs), and women is increasing and becoming more sustained, with training and consulting as important enablers. During the first five years of XSEDE, over 1,100 new under-represented minority and female PIs were awarded their first allocations of time on XSEDE managed resources.

As a supplement to the XSEDE education and outreach programs, NSF funded SURA to develop a two day workshop for MSIs committed to curricular reforms. Computational modeling and data analytics are crucial to the competitiveness of U.S. business and industry as a way of reducing product design, testing, production, and marketing costs in the face of international market competition. Although some strides have been made in integrating the competencies required in this field into the university curriculum, the pace of change has been slow resulting in a critical shortage of sufficiently qualified students at both the baccalaureate and graduate levels. The problems of integrating computational science into the curriculum are particularly acute on the campuses of minority serving institutions (MSIs). The workshop enabled the participants to

develop strategies for reforms at their institutions and prepare plans ready for their review approval processes. Ten of the twelve participants, have updated courses and created new course offerings while several have submitted certificate proposals for approval.

Collaborative Exploration and Pilot Projects

March 2012: Research Data Management and the DVN Pilot

In the spring of 2012, SURA teamed with the Association of Southeastern Research Libraries (ASERL) to launch a Research Data Management (RDM) project. This project brought together CIOs and library professionals from SURA member institutions to explore collaborations for improving their ability to manage the rapidly growing volume of research data on their campuses. The effort was driven by new requirements from funding agencies and the research communities' needs to effectively manage the ever-increasing size of its research data sets.

The group developed a "Step-By-Step Guide to Data Management" (available on the SURA/ASERL RDM WiKi: http://www.lib.ua.edu/wiki/sura/), which was used to identify gaps in existing RDM processes and guide future efforts of the group. The group also built a discipline specific metadata scheme directory to assist researchers in finding existing metadata models for their research data. Subsequently, SURA facilitated a multi-institutional pilot implementation of the Dataverse Network (http://thedata.org/). The Dataverse Network is an open source application that facilitates the ability to publish, share, reference, extract and analyze research data. The SURA pilot explored the use of Dataverse Network as a tool to address data management and data sharing needs across multiple research domains. The University of North Carolina's Odum Institute hosted the DVN software; allowing participating institutions the ability to test the functionality of the DVN software without installing software locally. The pilot project provided valuable feedback to the DVN Project development team which is documented in a report, "SURA DVN Pilot Project Report of Findings", available at http://www.sura.org/news/docs/DVNPilot.pdf.

Fall 2013: IT-EM Collaboration

The dependence of Emergency Management (EM) professionals on information technology systems has increased as expectations on higher education institutions to be responsive to emergency situations have matured, however the role of information technology, its use, and its importance in institutional protection, prevention, preparedness, response, and recovery strategies has not been fully explored or defined. The purpose of this project is to produce a road map and examples of best practices related to information technology/emergency management strategies to assist IT and EM professionals in higher education institutions with the development of a robust and comprehensive approach for responding to and recovering from emergency situations. The product of this project is a template that can be applied to institutions of higher education, regardless of size, complexity, or classification (i.e., public, private, or community college). This resource, "SURA Technology Services Incident Response Plan Template", is intended to illuminate information technology's role in all phases of emergency management and its importance in routine or unforeseen disruptions to institutional operations. The Template has been downloaded over 300 times and is available from the SURA website at: http://www6.sura.org/download/4830/

Spring 2014: Research Capabilities Database Project
In the spring of 2014, the SURA IT and Development & Relations Committees began a joint project to explore the development of an online SURA member research capabilities aggregation service. A joint IT/Development & Relations Committee project team was formed with the goals of: (1) empowering our member institutions and SURA with knowledge of strengths within our membership for new collaborative, development opportunities; (2) providing an economic development and research tool to support a similar interest with the Southern Governors' Association; and (3) assisting scientists among SURA member schools to access cross-institutional partners on research projects.

The project team determined that ViVo (http://vivoweb.org/), an existing, open-source platform could serve as the tool to aggregate and share this information across multiple institutions that are using a variety of commercial and homegrown tools. The team developed a pilot project to test ViVo's ability to interface with a local institution's existing system to make their local data available to support regional search and analysis functions. The pilot project results documented next steps in terms of direction, technical gaps and needed enhancements that could lead to a deployable research capabilities aggregation service for the SURA membership. The SURA VIVO Pilot Project final report is available at: http://tinyurl.com/he25v7f

Fall 2016: Cloud Vender Assessment
The Fall 2016 IT Committee meeting focused on identifying best practices in selecting and qualifying cloud service providers. As a result of this discussion a small working group of Chief Information Security Officers (CISOs) was formed to explore a shared process for qualifying cloud service providers with a focus on data security. This group, comprised of members from UMBC, Auburn, NC State and GWU are working with the developers of the Educause Higher Education Cloud Vendor Assessment Tool (HECVAT). The group is seeking participation in a SURA HECVAT Pilot Test group to provide structured feedback and recommended improvements to the HECVAT tool.