The QUILT CIRCLE
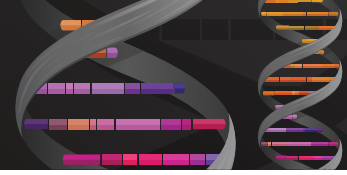
National Regional Networks Consortium

...Advanced regional networking in support of research and education

2015 Edition

This year's edition of *The Quilt Circle* is bursting with projects and programs enabled by the regional research and education networks that comprise our Quilt membership. Naturally, The Quilt is proud of the positive impact our member networks and organizations have on the communities they serve. Our annual publication gives us the opportunity to showcase the work of our members and highlight the collective impact each have on the institutions they serve and support across the nation.

Given the depth and breadth of our members' work, it can be challenging to select a single image that effectively captures and communicates its impact. This year's cover, the image of DNA strands, is truly a fitting one to represent the work of our regional research and education network community. For those of you already familiar with the work of the regional research and education (R&E) network in your area and for those who are just learning about them for the first time in *The Quilt Circle*, you will quickly learn that our R&E networking DNA is indeed unique.

It is in our R&E networking DNA to ensure our community of connected institutions are able to access advanced networking capabilities, tools and services when and how they need it, with the best possible performance so that the network is not an impediment to scientific progress. It is in our DNA for our networking organizations to be driven by the interests of our user communities to enable these institutions to fulfill their promise and mission. It is in our DNA to collaborate at the highest levels to ensure our country's scientific community and academic pursuits have access to the most advanced technology capabilities available. Our Quilt members are the ultimate collaborators; bridging the human network with physical networks at the community, state, national, and international levels.

Just as our collective R&E networking DNA is unique, so are our individual members. The 2015 edition of *The Quilt Circle* showcases this uniqueness with articles on health and science research projects. This edition also showcases how other member communities benefit from the advanced capacity, tools, access and support that research and education networks provide. And finally, you will enjoy learning about a number of our member organizations that are celebrating organizational anniversaries this year, including The Quilt!

We are pleased to have added two new member organizations to The Quilt community in the last year – Networkmaine in Maine and the Illinois Century Network in Illinois. With the addition of these organizations, we enrich our collaborations through their contributions of expertise, perspectives, and staff talents. In welcoming our new members, The Quilt continues to grow as a vibrant community where leaders from our regional networking organization members come to engage with one another.

The collaborative spirit that is the foundation for each of our member networks and the creation of The Quilt 15 years ago is also the same driving force behind the success of the organization today in accomplishing our program objectives. Our work together this year is a valuable reminder of the roles we all play in the success of one another's organizations and in building the national fabric of regional networks into a Quilt community.

Jen Leasure

Jen Leasure
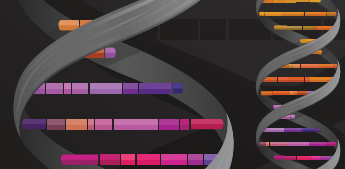President and CEO

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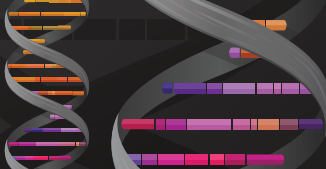www.wvnet.edu

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Geisinger Health System (GHS) has become the first health care organization in the state to connect with PennREN, the Pennsylvania Research and Education Network.

As a non-profit coalition of Pennsylvania's education, research, health care, economic development, libraries and public media institutions, the Keystone Initiative for Network Based Education and Research (KINBER) constructed PennREN as a public network intended to provide broadband connectivity, foster collaboration and promote the innovative use of digital technologies.

In 2013 KINBER completed construction and manages the Pennsylvania Research and Education Network (PennREN), which provides advanced data networking to organizations across Pennsylvania, enhanced access to regional, national and international Research and Education (R&E) networks and enables value-added services such as data sharing and on-net cloud services with "built-in" opportunities for collaboration between members.

"Geisinger is a PennREN pioneer in the health care arena, and its connection to our high performance network will enable opportunities for innovation, such as transmission of big data for genomic research, telemedicine, video consultation, remote patient monitoring, and access to specialist care," said KINBER Executive Director Wendy Huntoon. "Health care providers can also use KINBER services to benefit from health information exchange or gain access to other services like disaster recovery and data centers, resulting in a more efficient and effective delivery of services," she said.

Last December, researchers at the University of Pittsburgh tested the connection with Geisinger over KINBER's Member Exchange (KMEX) and were able to send a 175GB file of de-identified genomic research data. KINBER anticipates data transfer times will improve as the KINBER and Geisinger technical staffs perform end-to-end performance tuning on the link.

Using KMEX saved researchers the time and expense of having the data burned to a hard drive and then shipped to Geisinger, said Raghu Metpally, PhD, a bioinformatics scientist at Geisinger's Sigfried and Janet Weis Center for Research. "The whole process went very smoothly without any data loss or damage," he said.

"With GHS massively using Genomics in its research and clinics, a dedicated high speed data transfer system like KINBER makes very large data intensive collaborations easier, either in receiving the data from the service centers or sharing the data across collaborators who are spread to institutions like Penn State University and the University of Pittsburgh," Dr. Metpally said.

Vice President of Information Technology and Associate Chief Information Officer for Geisinger Health System, John Kravitz, said he feels that KINBER offers "uniquely reliable" internet connectivity. Geisinger had wanted better connectivity for their researcher collaborators within Pennsylvania, Kravitz said.

"With the flexibility of the KINBER network we have the capability to establish redundancy with virtual internet connections via a single physical connection," Kravitz said, noting that the network allows Geisinger to connect to Philadelphia and Pittsburgh for research initiatives; if one connection fails Geisinger can failover to the other connection.

"In the past we would have been connected solely through an Internet point of presence in New York City with limited redundancy," Kravitz said.

He added that Geisinger is happy with the work accomplished so far and looks forward to more opportunities to leverage the KMEX (KINBER) Network in the future.

About KINBER

As a not-for-profit membership organization, the Keystone Initiative for Network Based Education and Research (KINBER) provides broadband connectivity, fosters collaboration, and promotes the innovative use of digital technologies for the benefit of Pennsylvania. Visit www.kinber.org for more information.

Public Health Grand Rounds is a collaborative program produced by the Rhode Island Department of Health and the Office of Continuing Medical Education (CME) at the Warren Alpert Medical School of Brown University. The program enables medical professionals to further their education and training, as well as maintain or achieve important certifications essential to career development, with presentations that focus on a critical issue of importance in the rapidly changing health care system. OSHEAN enables far-reaching engagement within the medical community by live-streaming Public Health Grand Rounds sessions via the OSHEAN Video Commons Service, allowing interested practitioners to participate even if they cannot attend in person.

When evaluating solutions to drive enrollment in the programs offered by Brown University's CME Program and partnering organizations like the Rhode Island Department of Public Health, Brown's Director of the Office of Continuing Medical Education, Maria Sullivan, enlisted the support of OSHEAN to enable live streaming of the Public Health Grand Rounds sessions. By utilizing OSHEAN's Video Commons services and the capabilities of the high-bandwidth Beacon 2.0 network – one of the most powerful fiber optic networks in the country – Brown is able to connect with an audience that goes far beyond Rhode Island's borders while also collaborating with sponsoring institutions like Women & Infants Hospital, an organization that hosted a recent Public Health Grand Rounds event. OSHEAN members who subscribe to the Video Commons Service are provided with video conferencing equipment and assistance with both setup and management of streaming events, making it seamless for users to quickly and easily create live or on-demand webcasts.

Sullivan had been working with OSHEAN's video services specialist Jim Carr on recording lectures for re-broadcasting to members of the continuing medical education community. With the creation of the Public Health Grand Rounds and the support of the Rhode Island Department of Health, Sullivan realized the potential of utilizing the OSHEAN network to attract a larger audience to each session while also providing valuable educational resources to busy medical professionals, many of whom could not regularly attend seminars and other events due to schedule complications. OSHEAN now makes it possible to watch these sessions live or on-demand, providing maximum flexibility and seamless online streaming.

"OSHEAN's video services are a great resource (for the CME Program)," said Sullivan. "They are able to turn around the finished product very quickly, ensuring that the edited video is online within 24 hours of the live session. In addition to helping attendees secure necessary accreditations, live streaming the sessions and having them available on-demand afterwards provides great exposure for the Office of Continuing Medical Education and the University."

OSHEAN is motivated by its commitment to members to deliver premium, affordable, broadband telecommunications, IP networking, and Above-the-Net services. It is the mission of OSHEAN to seek out innovative technology solutions that best align with its members' objectives.

About OSHEAN

OSHEAN Inc., is a 501(c)(3) non-profit consortium of member organizations that was formed to foster the development of a communications infrastructure for Rhode Island's research, educational, health care, and public service community. OSHEAN is committed to developing network expertise among its member organizations and to creating an environment that encourages collaboration through shared resources, information and expertise. Visit www.oshean.org for more information.

The information technology landscape continues to rapidly evolve. As in the past, major advances are being driven by techniques that provide for higher levels of abstraction in architecture and functionality than those that currently exist. At the same time that these techniques are transforming information technology to enable new capabilities, fundamental components are being transformed to substantially enhance available resources. For example, capacity increases in networking have made 100 Gbps networks commonplace. To meet the needs of its data-intensive science communities, Metropolitan Research and Education Network (MREN) is taking advantage of these trends to design and implement new types of services, leveraging significantly enhanced capacity combined with enhanced network programmability, enabling a migration from static network foundation resources to dynamic provisioning capabilities.

> MREN works closely with multiple science domain communities to define their requirements and to provide services that address those requirements. MREN also provides access to specialized remote instrumentation, such as research facilities at national research labs and also at international sites through its partnership with the StarLight International/National Communications Exchange Facility.

To provide support for large-scale capacity, MREN, in partnership with the StarLight community, designed, developed, and implemented the StarWave 100 Gbps Exchange Facility. This exchange provides additional support for the 30 separate 100 Gbps paths at the StarLight Facility, including capabilities for both Layer1 and Layer2 100 Gbps switching. During the Supercomputing 2014 conference in New Orleans, the 26th annual supercomputing conference for High-Performing Computing, Networking, Storage, and Analysis, the StarLight consortium and its research partners, including International Center for Advanced Internet Research, Northwestern University, designed and staged a series of demonstrations to showcase capabilities of SDXs, including capabilities for provisioning and dynamically controlling individual high-capacity streams transported nationally and internationally over wide-area networks to, from, and around the conference showfloor. At SC14, with significant support from ESnet, MREN supported 14 sets of 100 Gbps demonstrations – almost all provisioned over national and international WANs.

Highly complementary to such capacity is network programmability, which enables such capacity to be optimally utilized. MREN began supporting programmable networking over 15 years ago with its participation in multiple Grid networking projects. These projects extended Grid middleware to networks to enable them to be "first class" resources in Grid environments vs external non-controllable resources. Over six years ago, MREN began experimenting with Software Defined Networking (SDN) based on OpenFlow, an activity that complemented its support for the National Science Foundation's Global Environment for Network Innovations (GENI) initiative. MREN has provided support for multiple GENI initiatives, including the national InstaGENI deployment, the GENI Experimental Engine, and the International GENI, the world's first and most extensive international SDN/OpenFlow testbed. More recently, MREN has supported a GENI project that implemented a Software Defined Networking Exchange (SDX) at the StarLight facility.

MREN International OpenFlow Testbed

About MREN

The Metropolitan Research and Education Network (MREN) is advanced, high performance regional network supporting organizations in seven states in the upper mid-west. MREN's primary focus is on providing advanced digital communications for leading-edge research and educational applications, primarily communication services for data intensive science. Visit www.mren.org for more information.

Staying on the Cutting Edge in California: CENIC's Advances in Network Technology in Support of Data-Intensive Research
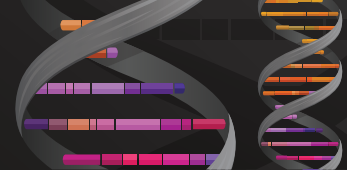
Since becoming an established foundation for modern research and education, advanced networks have been subjected to intense pressure to remain on the cutting edge by the very innovations that they enabled. Both creating and responding to these pressures on the US West Coast is the mission of the Corporation for Education Network Initiatives in California (CENIC) and its California Research & Education Network (CalREN) – a 3,800-mile fiber-optic network lacing together all of the Golden State's research and education communities into a resilient fabric of innovation and economic power.

Part of this response consists of bandwidth upgrades to ensure that CalREN contains the headroom needed to maintain its communities in a state of growth, and in November 2014, CENIC announced the completion of a 100-Gigabits-per-second (Gbps) upgrade for the CalREN core backbone.

> Nearly 10,000 sites are connected to CalREN, and with this upgrade, the eleven million Californians who use CalREN every day will be able to create and engage in even more advanced and innovative teaching and learning methods as well as cutting-edge global research in a large and ever-increasing variety of network-dependent disciplines.

"As with many advanced networks, CalREN backbone traffic is in a constant state of accelerating growth, and we're always heartened by this since it means that the network is doing the job it was designed to do: encourage innovation of all kinds," says CENIC President and CEO Louis Fox. "This makes ongoing network upgrades like this absolutely critical to the continued health of California's spirit of innovation."

CENIC Board Chair and Associate Vice President of IT at Stanford University Bill Clebsch states, "With the CENIC backbone upgrade, we now have an end-to-end high-speed path from our researchers to their partners elsewhere in California and beyond. CENIC's new capabilities are absolutely necessary to enabling and accelerating the pace of discovery and innovation." Larry Smarr, founding Director of the California Institute for Telecommunications and Information Technology agrees, saying, "CENIC's backbone upgrade to 100 Gbps is coming just in time to keep California in a leadership position."

In addition to facilitating 100-Gbps connectivity within California, CENIC also helped to facilitate a trans-Pacific, 100-Gbps demonstration which recently took place during the REANNZ-hosted GLIF meeting in Queenstown, New Zealand. In a unique and groundbreaking display of network-enabled telemedicine, three OptIPortals – in Queenstown, at the Qualcomm Institute on the campus of UC San Diego, and at the University of Illinois at Chicago's Electronic Visualization Lab – were linked together to permit the diagnosis of a patient in San Diego by a doctor in Chicago as the New Zealand audience watched. The 64-Megapixel and 74-Megapixel displays at UC San Diego and the University of Chicago's Electronic Visualization Lab were connected by a 100-Gigabit path between California and Chicago via CalREN.
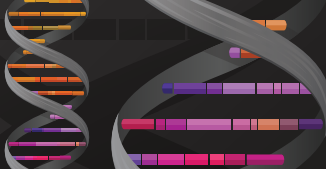
The trans-Pacific, 100-Gigabit connectivity to the 33-Megapixel display in New Zealand was made possible by REANNZ, Southern Cross, and Ciena Corporation – a particularly significant achievement given that it was supported by technology that had been put into place on the ocean floor before 100-Gigabit transoceanic networking was a possibility. As a consequence, this demonstration has opened up new realms of possibility for worldwide ultra-high-performance networking and collaboration without expensive and highly challenging upgrades to existing submarine fiber equipment.

Qualcomm Institute visualization director Thomas DeFanti takes a virtual tour inside the StarCAVE virtual reality environment. The collaborative potential of such facilities will be greatly enhanced by the 100-Gbps backbone upgrade. (Photo credit: Calit2's Qualcomm Institute.]

About CENIC

CENIC, a 501(c)(3) organization, connects California to the world—advancing education and research statewide by providing the world-class network essential for innovation, collaboration, and economic growth. CENIC operates the California Research and Education Network (CalREN), a high-capacity network designed to meet the unique requirements of over 20 million users, including the vast majority of K-20 students together with educators, researchers, and other vital public-serving institutions. Visit www.cenic.org for more information.

In the fall of 2014, Mid-Atlantic Crossroads (MAX) announced a strategic partnership with BYTEGRID Holdings LLC, a provider of multi-tenant data centers, to leverage the resources of both organizations to provide an advanced cyberinfrastructure platform serving the research and education (R&E) community across the mid-Atlantic region.

Through this partnership, MAX established a terabit-capable point of presence (TeraPoP) in BYTEGRID's 214,000-square-foot data center located within the White Oak Science Gateway and Life Sciences Village in Silver Spring, MD. Launching a TeraPoP at this location puts the data center within MAX's high-performance network footprint, which has an aggregated capacity of 8.8 terabits per second. In addition, the MAX regional network provides extremely high-speed access to the larger national and global R&E network infrastructure, including multiple 100-Gbps connections to the Internet2 network and other high-performance wide area network infrastructures.

As a result, MAX's partnership with BYTEGRID provides a much-needed resource to members of the local life sciences research community by helping them integrate massive storage archives (typically involving petabytes of data) with high-performance compute and network requirements.

The expansion of MAX's 100-Gbps advanced networking infrastructure within BYTEGRID's Federal Information Security Management Act (FISMA)-compliant facility enables both organizations to offer highly secure colocation solutions to participants within the government community. Other available services will include direct connection into Amazon Web Services, as well as an "Innovation Sandbox" focused on the development of ultra-high-throughput IT infrastructure solutions.

> In their continuing support of research, MAX announced last year, they had successfully transmitted data at rates of 400 Gbps and 800 Gbps over their optical network during a field trial. The week-long trial positions MAX to be able to provide a 400 Gbps-capable networking infrastructure to the surrounding research and education community when the technology is made available industry-wide.

The MAX-BYTEGRID partnership also enables the continued integration and unification of advanced cyberservices for the R&E community. MAX successfully achieved a networking infrastructure based on 400-Gbps technology in recent field trials, and plans even higher speeds (up to 800 Gbps) for the future. This robust, yet flexible, infrastructure complements BYTEGRID's flagship data center campus in Silver Spring, which consists of two data center facilities encompassing 91,000 square feet of computer room floor and nine megawatts of uninterruptible power supply

(UPS) capacity. The maintainable and fault-tolerant design of BYTEGRID's facility offers an ideal location for future projects and expansion opportunities for both organizations, especially to serve the burgeoning R&E community and federal government entities that are expanding their presence in the D.C. metro area.

"MAX is pleased to be a key technology partner and establish the TeraPoP in BYTEGRID's FISMA-compliant facility in the heart of the Life Sciences Village in Silver Spring," said Tripti Sinha, Executive Director of MAX. "We are committed to providing the advanced networking infrastructure required by our participants, who include some of the world's most important research, education, and scientific organizations."

BYTEGRID's Maryland Data Center

About (MAX)

Mid-Atlantic Crossroads (MAX) is a multi-state regional network led by the University of Maryland. MAX owns and operates an all-optical, Layer 1 core network that is the foundation for a high-performance infrastructure providing state-of-the-art, 100-Gbps network technology and services. MAX participants include universities, federal research labs, and other research-focused organizations in the Washington and Baltimore metropolitan areas. MAX serves as a connector and traffic aggregator to the Internet2 national backbone and peers with other major networks. Visit www.maxgigapop.net for more information.

Everything we do these days generates data; lots and lots of data. Clinical studies run by universities and biomedical research institutions create masses of valuable data. Weather forecasts leave behind waves of data. Even an annual checkup at the doctor's office creates data. What if all of this information from many multiple sources could be synthesized and analyzed for overarching themes, trends, or anomalies? What could we do next if researchers had a better way to look at the massive amounts of data just lying around – the big data?

Big data is an all-encompassing term. It allows for transference, storage, and mining of data that enables more informed strategic decision-making at the highest levels.

High-performance computing and big data capabilities serve as the backbone of all of Louisiana State University's (LSU) research strengths. It is necessary to study coastal processes and develop more and better-integrated methods of hurricane protection. It is a driving force behind the search to find safer, more efficient ways to extract energy from the Earth and the development of new alternatives to fossil fuels. And it is vital to identifying better methods to treat disease and illnesses and to determine patterns of healthcare outcomes in our citizenry.

The cyberinfrastructure required to meet the needs of researchers and every important industry that generates massive amounts of data is a challenge that faces Louisiana and every other state. An advanced research and education network like the Louisiana Optical Network Initiative (LONI) is needed not only to support the growing needs of industry research, but also to explore data sharing in fields that could benefit from cross-referencing information. For example, LSU Health Sciences Centers in Shreveport and New Orleans generate large amounts of bioinformatics data, which is stored at their individual locations. Meanwhile, the LSU School of Veterinary Medicine and the Pennington Biomedical Research Center likewise produce enormous amounts of biomedical data. With the proper connections and support, researchers across LSU's campuses could combine their data and expertise using LONI, which is the fiber optics network connecting Louisiana research universities to one another, as well as to Internet2, to look at healthcare outcomes, for instance, in an entirely new way.

> LONI offers its participants a world-class network and high performance computing environment with the strategic integration of highly available and scalable bandwidth, computational, storage and personnel resources.

One such example is genome sequencing, which involves determining the exact sequence of an organism's DNA and has many applications in biological and medical research. However, it requires expansive amounts of data processing. The human genome contains three billion molecular units. Assembling and analyzing this amount of data, or even assembling and analyzing many much shorter genome sequences like those of the West Nile or AIDS viruses or pathogenic bacteria that cause acute human disease, will require massive computational power and data storage capabilities, such as those produced through big data networks like LONI.

Researchers at LSU are already investigating a cyberinfrastructure to satisfy these big data demands through a $1 million grant from the National Science Foundation. Seung-Jong Park, associate professor of computer science with a joint appointment in the Center for Computation & Technology (CCT), along with co-investigators Joel Tohline, Sean Robbins, Lonnie Leger, Gus Kousoulas, and other senior LSU faculty are involved in a campus-wide project aimed at bringing big data computational capabilities to various university research groups.

While Park's group focuses on the logistics and technical sides of such connectivity, work in specific fields—such as biomedical, environmental and coastal sciences, materials and manufacturing, physics and astronomy—is already making use of the existing capacity and capabilities offered from LONI.

About LONI
LONI is a state-of-the-art, fiber optics network that runs throughout Louisiana, and connects Louisiana research universities to one another as well as Internet2. The resources provided by LONI enables greater collaboration on research that produces results faster and with greater accuracy. Visit www.loni.org for more information.

The Texas Education Telecommunications Network (TETN) uses the LEARN network to connect K-12 students across Texas to improve student performance and to increase the efficiency of public school educational programs via an integrated statewide network. TETN is a consortium of 21 entities; the Texas Education Agency (TEA) and all 20 Texas Education Service Centers (ESCs).

As a result of ESC 11's Connect2Texas initiative, students were able to interact with the Bob Bullock History Museum, Perot Museum of Nature and Science, Amon Carter Museum of American Art, the National Cowgirl Museum and Hall of Fame, and the Fort Worth Zoo to name just a few of the 25 content providers that are available to enhance and engage students in their learning. Students are enlightened by these topics, as well as many others: "ABC's of Chemistry", "Paleontology 101", "Icy Science", "Geometric Trans- formations", "John F. Kennedy and the Dallas Civil Rights Movement", "Habitats of the Gulf of Mexico", "ASI: Animal Skull Investigation!" and "Cowgirl Science".

> LEARN enables the diverse community they serve to bring a world of opportunity and valuable educational experiences to over 823,000 Texas higher education students and over 1,034,000 Texas public school children.

The LEARN and TETN collaboration is also used to support over 10,000 K-12 students in Texas who are dual-enrolled in courses delivered by different schools. Leveraging the bandwidth and connectivity of the LEARN network enables students to participate in high school courses that are not offered in their own districts, to receive credit toward their diploma. Additionally, dual credit classes are available between K-12 schools and institutions of higher education that provide students the opportunity to gain higher education credit hours while attending high school.

Ho! Ho! Ho! Over 18,000 students were "edutained" by Santa

and Mrs. Claus through a program presented by ESC 3 over the network enabled by TETN and LEARN. Mrs. Claus read a book and answered hundreds of questions from students in kindergarten through second grade. Programs like this provide young students the opportunity to experience interactive videoconferencing technology and exercise their communication skills.

Additionally, in collaboration with ESC 6, students throughout
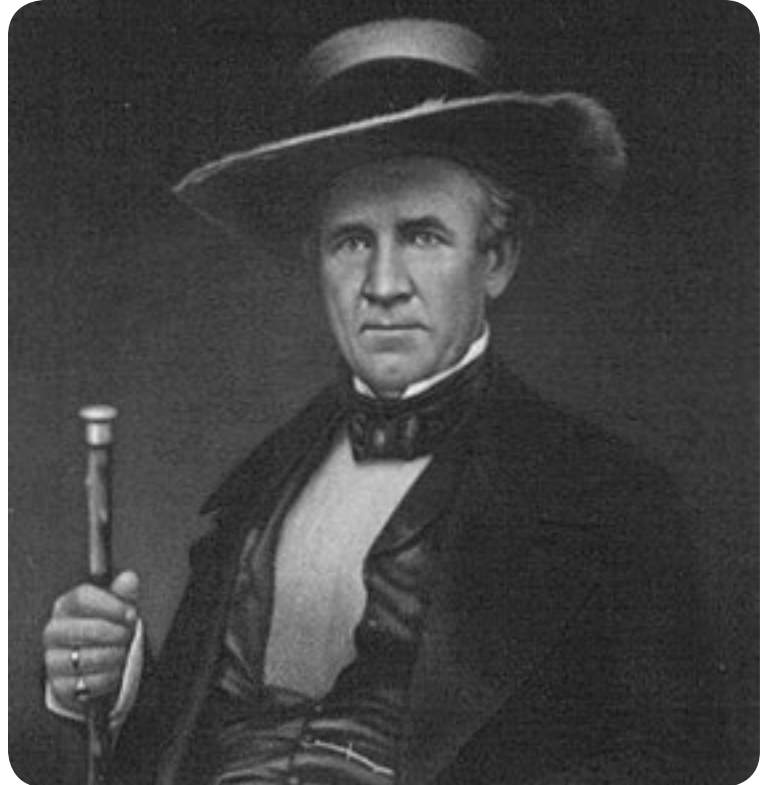
Texas have access to a series of programs on one of the greatest Texans in our history, General Sam Houston. Students in fourth and seventh grade learn about General Sam Houston from the General himself, as the curator of the Sam Houston Memorial Museum impersonates him and shares the General's experiences. Texas history comes alive for these students as they engage in conversation and questions with General Sam Houston.

About LEARN

LEARN is a 501(c)(3) consortium of 39 organizations throughout Texas that includes public and private institutions of higher education, community colleges, the National Weather Service, and K-12 public schools. The consortium connects these organizations, and over 640 affiliated organizations, together with high performance optical network services to support their research, education, healthcare, and public service missions. Visit www.tx-learn.org for more information.
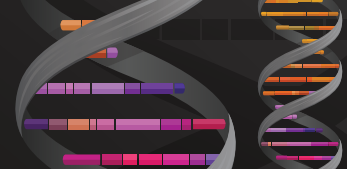
With the steady rise of streaming content, interactive web services, and online testing, increased Internet bandwidth is in high demand. Unfortunately, for southeast Missouri, an area known to be unserved and underserved by existing broadband infrastructure, cost-effective Ethernet solutions have been limited. But a public-private partnership between MOREnet and Sho-Me Technologies, a telecommunications provider based in Marshfield, Missouri, is addressing the problem.

MOREnet has acquired 2,500 miles of fiber to expand the infrastructure for high-capacity, low-cost Internet access in the southeastern area of Missouri to provide cost-effective gigabit and beyond Internet access for nearly 200 member locations in the area.

> Bringing robust and reliable Internet access to SE Missouri will also benefit health care providers in these local communities by enabling greater access to connectivity to improve their patient outcomes through more advanced applications and information sharing, while also broadening remote educational opportunities for health care providers and clinicians wishing to learn and collaborate via technology.

This investment allows community anchor institutions (CAIs) including K-12 schools, public libraries, higher education and health care providers within more than thirty counties across the southeast region of the state to connect directly to the MOREnet backbone, thereby stabilizing connectivity costs while increasing bandwidth to a gigabit and beyond.

The project has been well-received by MOREnet member organizations. Jim Thomas, Director of Media Services, at Poplar Bluff R-1 School District stated, "This project ensures that Poplar Bluff Schools and other school districts in southeast Missouri will be prepared for expansion and growth without concerns about connectivity issues because of costs. The staff at MOREnet has once again provided leadership and planning needed for future growth. This allows school districts to focus on the mission of serving needs of students and not worrying about whether we will have enough bandwidth for adding or expanding programs."

Through the partnership, MOREnet will light the fiber and provide wave services to Sho-Me, creating benefits for both organizations. The benefits to Missouri are clear:

- Increased bandwidth allows schools to meet the objectives of the Federal ConnectED initiative goals for the next five years and into the future. ConnectED was designed to empower teachers with the best technology and the training to use it effectively and empowers K-12 students through individualized learning and rich, digital content.
- Increased bandwidth at public libraries can assist unemployed workers to get back on their feet and excel in a modern workplace. Local citizens who utilize public libraries for services such as genealogical research, adult literacy skills, or career enhancement will also benefit from the upgraded infrastructure.
- Infrastructure lays the foundation for schools to deploy innovative classroom technologies such as bring your own device (BYOD), virtual field trips, cloud resources, and 1:1 initiatives.
- The public-private partnership enables affordable connectivity to the region supporting economic development growth, including CAI sites served by the MOREnet consortium and local commercial and residential sites served by Sho-Me Technologies.
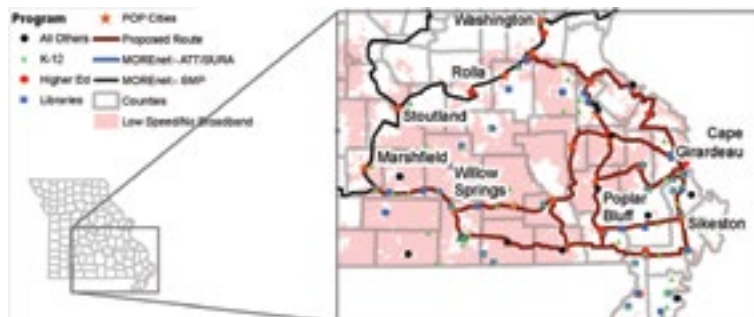
2,500 miles of new fiber effectively triples the network that MOREnet manages while improving broadband connectivity for CAIs in an un- and underserved area of Missouri.

About MOREnet

Established in 1991, the Missouri Research and Education Network (MOREnet) is a member-driven consortium providing Internet connectivity, access to Internet2, technical services, resources and support, as well as technical training to Missouri's public sector entities, including K-12 schools, colleges and universities, public libraries, health care, government and other affiliated organizations. MOREnet serves more than 700 members across Missouri. Visit www.more.net for more information.

Earlham College and Wabash College in Indiana are connecting their students with researchers around the world thanks to the $700,000 in Campus Cyberinfrastructure - Infrastructure, Innovation and Engineering (CC*IIE) grants I-Light helped them win.

From a fund of nearly $20m, the National Science Foundation (NSF) awards between 20-35 CC*IIE grants annually. This money aids cyberinfrastructure re-engineering and network integration activities to improve network performance, reliability, and predictability levels for science applications and research distribution.

> In addition to giving small colleges and universities a seat at the table with the large research institutions, I-Light helps members obtain funding to upgrade campus networks. I-Light procures support letters, provides money to attend NSF workshops like the Broadening the Reach conference in Kansas, and facilitates general planning to members seeking grants.

Increasingly, the NSF grants such as the CC*IIE require demonstrated access to research and education networks. Fortunately, Earlham and Wabash share the distinction of being connected to state, national, and international research and education communities through I-Light, Indiana's high-speed fiber optic network.

Earlham College has a long tradition of undergraduate research participation, both independently and in collaboration with faculty. The CC*IIE grant augments Earlham's undergraduate science education by bolstering computational resources both on and off campus and provide students access to scientific resources and applications through I-Light's research & education (R&E) networks.

"Winning this grant means our labs will be better connected and our scientific data will be transmitted faster and more efficiently throughout the region," says Tom Steffes, Earlham College CIO, and principal investigator for the Earlham CC*IIE project.

Earlham received $347,228 for their proposal, "CC*IIE Campus Design: Network Infrastructure for Improved Science Discovery and Education." The grant will upgrade Earlham's cyberinfrastructure to 10Gbps, which includes a dedicated network for science research traffic, and, through I-Light, vital access to Internet2.

"Leveraging the networking expertise within I-Light through this partnership allows us to provide a much higher level of service to our researchers than we could on our own," said Brad Weaver, Wabash

College director of IT services and principal investigator for the Wabash CC*IIE project. "Because of I-Light, we can improve our network and open new research and scholarship opportunities for our students, enabling the College to build on this success."

Wabash College won $347,107 for their proposal, "CC*IIE Campus Design: Network Upgrade and Science DMZ to Enable High-Performance Data Transfer." The grant will increase Wabash's R&E connection via I-Light to 10Gbps, raising the speed and providing redundant paths from the network core to Wabash science buildings. The grant will also enable unimpeded 10Gbps high-performance data transfer for researchers across regional and national research networks.

The grant will also meet immediate research needs, including work at the National Superconducting Cyclotron Laboratory (NSCL), and with the Midwest Undergraduate Computational Chemistry Consortium (MU3C).
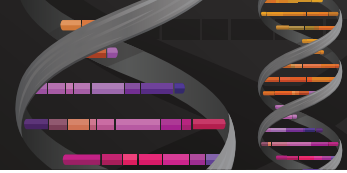
"The I-Light team was thrilled when two of our members were awarded the CC*IIE grants," said Marianne Chitwood, Director of I-Light. "These grants will provide Earlham College and Wabash College both the opportunity to fully realize the rich benefits of being connected to the I-Light network by providing much needed capacity increases from these campuses to the backbone network."

*The CC*IIE grant augments Earlham's undergraduate science education.*

About I-Light

I-Light, a unique collaboration among Indiana colleges and universities, state government, and private sector broadband providers, is a high-speed fiber optic network that connects Indiana member sites to state, national, and international research and education communities. Visit www.ilight.net for more information.

Access to on-line resources is a challenge facing schools in rural areas around the U.S. Many of these schools have limited low-bandwidth access to the Internet, and it is not practical or in some cases possible, for students to download large files and media as part of their daily learning routine. This process can be slow for one student, and almost impossible for hundreds of concurrent users. In order to address this challenge, WVNET recently partnered with URCast Network to provide caching services to K-12 schools in West Virginia.


URCast creates an environment where minimal Internet access is required to deploy lessons to students. Teachers use a "Message Builder" application to combine materials such as documents, videos, pictures, web pages and even entire web sites into a message that is published to a caching server. The caching server can be any computer with enough capacity to hold all of the school's content. Students run a "Message Center" application on their computers or devices, and they receive an alert when a new message is available. The new message is copied from the caching server to the student's device, so they never access the Internet to obtain the content.

WVNET Director Dan O'Hanlon worked with URCast to find a test school for a proof-of-concept URCast deployment. They selected Mount Vernon Elementary School in Barbour County WV, where most students are living at or below the poverty level. The school has very low bandwidth Internet access to serve kindergarten through 4th grade classes. Teachers at Mount Vernon want to use modern blended delivery learning methods that combine many resources including some from the Internet.

WVNET set up a URCast network at Mount Vernon Elementary and there was an immediate positive impact. Students were able to quickly access videos and documents that normally took up to 20 minutes to load. This jump in accessibility reduced access time and increased learning time. It also made it possible for teachers to rely more on digital resources instead of costly textbooks, workbooks and copies, and there was no need for increased Internet bandwidth. The school provided tablet computers to students in some grades and these students were able to take cached content home where they could use it without the need for an Internet connection.

Schools wanting to build a URCast caching system need to invest in the software, a caching server, technical support, and training. The recent FCC ruling accepting caching services as a category two E-rate-eligible service across the United States means that any public and most non-profit schools, and most libraries in the United States can have caching services subsidized by federal government funding. Clearly, this makes an already inexpensive service even more affordable.

WVNET was created in 1975 to provide central computing facilities and wide-area network communications linking its "central site" computing resources in Morgantown with the campus computing systems at most of the colleges and universities throughout the state.

WVNET is now working to implement URCast networks at more rural schools throughout West Virginia to bring them more in line with the more urban communities, providing equal opportunity of access to information and bridging the digital divide by eliminating the low- bandwidth barrier to greater opportunities.

About WVNET

WVNET is a dynamic service organization providing telecommunications and computing services within West Virginia. WVNET offers services to Higher Education, K-12, public libraries, and government agencies. Visit www.wvnet.edu for more information.
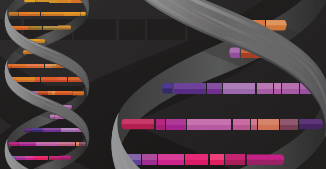
Florida LambdaRail Marks 10-Year Anniversary With 100 Gbps Network Upgrade

Florida LamdaRail (FLR) is investing $3.5 million to expand its network from the current 20 gigabits per second (Gbps) to an internationally recognized state-of-the art 100 Gbps by the summer of 2015. With this upgrade, FLR joins a select few research & education networks nationally who have performed a complete system upgrade of this magnitude. The expanded capacity – capable of 16 Tb, or 40x(4x100Gb) waves - will enable Florida's researchers, educators, and students to connect to each other and to the world via a network built for the data and telecommunications needs of the 21st Century.

> Since its inception 10 years ago, FLR has worked to provide exceptional service and enduring value for its members, saving its university partners more than $24 million along the way by delivering cost-effective data transport between and among network members.

The expansion by FLR to 100 Gbps supports the growth of a number of exciting ventures within Florida including:

Science DMZ – FLR is working to configure 10x100Gbps waves of its new 16 Tb capacity for the creation of a Science DMZ to support Florida's research community. A specially configured sub-network built to handle the unique data-related security, speed and volume needs of researchers, the Science DMZ within the FLR network will, among the many benefits to the research community, allow FLR members and affiliates to fully exploit the benefits of the three Global Environment Network Innovations (GENI) racks in service at FLR member institutions (The University of Florida, Florida International University and the newest rack at the University of North Florida.) Experimentation within the GENI environment is today leading to the development of advanced applications. Moving to a 100 Gbps environment will unleash even more creative advances.

SSERCA - the Sunshine State Education & Research Computing Alliance (SSERCA) is a coalition of Florida LambdaRail member public and private universities committed to unlocking the potential for massive transformative change through collaborative high performance computing, data transfer and storage, and big data analysis. SSERCA members and affiliates rely upon FLR and the forthcoming Science DMZ to provide the research environment and backbone that ultimately make their activities possible.

AMPATH/AMLIGHT - Americas Pathways and Americas Lightpaths are two National Science Foundation supported initiatives housed at Florida International University that provide the vital network links between North and South America. AMPATH serves as the premiere interconnection point for network-enabled U.S.- Latin America and Caribbean science research and education through its exchange point facilities in Miami, Florida. In addition to FLR, AMLIGHT interconnects research and education networks from across the hemisphere, including those of CLARA (Cooperation of Latin American Research networks encompassing Latin American countries), RNP (the Brazilian NREN), ANSP (the State of Sao Paulo network) and ESnet, Internet2, and other regional research and education networks serving the United States.

As the FLR infrastructure grows, it allows members to continue furthering research, advancing education and supporting 21st century economy initiatives.

FLR Network Infrastructure

About FLR

The Florida LambdaRail, LLC (FLR) is an independent research and education network owned and operated on behalf of the FLR partner institutions and affiliates. Created to facilitate advanced research, education, and 21st century economy initiatives in the State of Florida, utilizing next generation network technologies, protocols, and services, FLR provides opportunities for Florida university faculty members, researchers, and students to collaborate with colleagues in-state, across the country, and around the world. Visit www.flrnet.org for more information.

The Connecticut Education Network (CEN), in cooperation with the University of Connecticut (UConn) and with backing from the State of Connecticut, is now providing 100G connections to its backbone and 100G Internet2 connectivity to UConn researchers. This Internet2 link capability benefits UConn's research community by facilitating high-performance, data-intensive research collaboration with peers nationally. This Innovation Platform was built with support from a National Science Foundation Campus Cyberinfrastructure Network Infrastructure and Engineering grant.

CEN's Internet2 link enables researchers within specific university departments' access to advanced cyber-infrastructure to conduct their research:

- The Computer Science & Engineering (CSE) Department is able to perform wide area network performance research.
- The Geography Department has continuous access high-resolution satellite images stored at external servers.
- Molecular & Cell Biology (MCB) is able to transfer huge genome sequence reads produced by next-generation sequencers and process outputs within campus and with external sites.
- The Physics Department can participate in the Open Science Grid, a global community of scientists, researchers and experts in high-throughput computing, and regularly transfer terabytes of jobs to and from the grid within a day
- The Statistics Department can conduct research on high dimensional statistical modeling and inference using large data sets.

UConn Health is able to conduct research on quantitative cell biology and simulation, as well as computational genomics that require terabytes of data transfer on a daily basis.

CEN IP Backbone

These projects are part of a wider success story that the CEN has achieved over the past fifteen years, with strategic investments in network infrastructure, management and operations upgrades for the benefit of its user community. Examples include:

- Multiple 10G connections with Jackson Labs in Farmington, CT.
- 100G backbone between Connecticut and Cambridge, MA.
- Access to premier R&E network operations support 24x7 from GlobalNOC.
- Providing a highly redundant meshed fiber backbone with 20 optical nodes (see photo).
- Providing bandwidth capacity to support member bandwidth utilization of over 40Gbps.
- Creating partnerships with content distribution networks (CDN) such as Akamai, for on-net cache servers providing increased performance, reduced cost and faster access to content for our members.
- Providing capacity for 400Gbps of peering connectivity providing cost-effective network management for member institutions.

The future for CEN looks very bright with exciting opportunities to extend our optical backbone into New York City with a 100Gbps connection to enable CEN members to directly connect to multiple Internet exchanges and strategic peers like Quilt member, NYSERNet, while providing better connectivity to CDN and large content sources. CEN is planning to directly connect to cloud providers and services directly such as AWS, Google, or others via secure Layer2 circuits. CEN is also pleased to be part of the CTGig Project to facilitate broadband coverage in CT.

One of CEN success stories is their annual member conference. Readers are invited to attend the next conference on May 15, 2015. Keynote speakers are Matt Watts, Director of Technology and Strategy, from NetApp and Dr Jeff Borden, Chief Innovation Officer of Saint Leo University, Florida.

About CEN
Connecticut Education Network (CEN), the nation's first all-optical research and education network, delivers reliable, high-speed Internet access, data transport, and value added services to its members throughout Connecticut. Visit www.cen.ct.gov/cen for more information.

The Great Plains Network: ENhancing Cyberinfrastructure by Training and Education (ENCITE)

Advanced research and education network services are, by and large, driven by the needs of campuses with very high levels of research activity within a state. Network personnel on other campuses may be more concerned with maintaining and upgrading the campus wired and wireless infrastructure, with little time and incentive to learn about, much less implement, developments that might enhance research efforts on campus. Moreover, when the need to implement a new technology does arise, personnel at less research-intensive campuses may have difficulty accessing information and gaining assistance with implementation because they are isolated from the broader networking research community.

To address this gap, the National Science Foundation recently awarded the Great Plains Network (GPN) a grant to build a long-term, scalable and enduring partnership among small, medium and large institutions of higher education and state and regional networks in Kansas, Missouri, Nebraska, Oklahoma and South Dakota that will serve to improve campus network knowledge, expertise and research cyberinfrastructure through a program of outreach, training and engagement. This project promises to directly benefit scientists in the fields of physics, bioinformatics, climate modeling, and weather forecasting.

> GPN was the first research and education network to have staff dedicated to support for researchers. The ENCITE project was made possible by this long history of research support and the relationships between GPN and the community it serves.

Partnering with advanced networking experts, GPN has already begun a series of webinars and workshops to improve knowledge, expertise and research cyberinfrastructure knowledge at higher education campuses in Arkansas, Kansas, Missouri, Nebraska, Oklahoma, and South Dakota. Webinars and workshops this year have encompassed the following topics: bridging the technical divide between researchers and networkers, OpenFlow-based load balancing, deploying Science DMZ, an overview of NSF's recently announced Cyberinfrastructure: Data, Networking, and Innovation (CC-DNI) program, proposal preparation for the CC-DNI program, and determining network requirements for modern network design. Over 200+ individuals across the national research and education community have attended these session and archived sessions have been viewed close to 50 times.

This project is an extension of GPN's long history of supporting research through collaboration, education and training and builds upon the existing relationships between GPN, six research and education networks that connect to GPN, and the colleges and universities that connect to those networks. The project also takes advantage of long-term relationships among GPN, the research and education networks, and national leaders in research and education cyberinfrastructure.

For this project, GPN is partnering with ARE-ON, KanREN, MOREnet, OneNet, South Dakota's Reed Network, Network Nebraska, Internet2, ESnet, University of Chicago and University of Oklahoma.

About GPN

The Great Plains Network is a consortium founded by researchers and for researchers to advance regional capabilities with respect to advanced networking and access to national cyberinfrastructure. Visit www.greatplains.net for more information.

MCNC's Client Network Engineering, or CNE team, provides network consulting in technical areas including network and security design, configuration, and operations throughout North Carolina. Formed in 2008 to provide two of the four critical services within the North Carolina School Connectivity Initiative for public K-12 education – connectivity and network consulting – the CNE team is currently comprised of eight network engineers with certifications from Cisco, Microsoft, Red Hat, and (ISC)2. The team, through the N.C. Department of Public Instruction and the N.C. Community College System, provide services at no cost to school districts, charter schools, and community colleges.

The CNE team conducts network and security assessments and assists in resolving complex network problems. Network assessments provide measurements, analysis, and documentation of the functionality, performance and security of the NCREN community member's network. To date, the CNE team has completed engagements with more than 100 school districts and charter schools and conducted more than 75 network assessments. "The CNE team provides a unique service for our education community; collaborating with our state education agencies and public schools to ensure our school networks can support the transition to digital learning and effectively leverage NCREN broadband services." said Dave Furiness, Senior Director of Client Network Engineering.

The transition to digital learning in North Carolina is contingent upon the availability of reliable, enterprise-class network infrastructure in schools. Wireless network assessments help NCREN constituents determine if their wireless LAN infrastructure is sufficient to support emerging digital learning initiatives.

Coordinating high-quality, cost-effective network administrator training is a priority for the CNE team. Network administrator training culminates with the Summer Institute, where industry experts conduct intensive sessions on topics of interest to the community. Past Summer Institute sessions have included Wireshark network analysis and WLAN analysis and troubleshooting. Less intensive fall and spring training sessions also are conducted.

> NCREN currently serves as the fundamental broadband infrastructure for more than 500 institutions. NCREN is one of the nation's premier middle-mile backbone networks with expanded capabilities now allowing MCNC to customize services and applications for users more than ever before, further enabling private-sector providers to leverage high-speed fiber to bring cost-efficient connectivity to rural and underserved areas of North Carolina.

As MCNC has evolved into the lead provider of network technologies to North Carolina community anchor institutions, the NCREN community has requested to make the CNE team available to individual constituents on an as-needed basis. Although the majority of the CNE work is with K-12 and community colleges, CNE services also are available to other NCREN users on a fee-for-service basis as CNE resources allow.
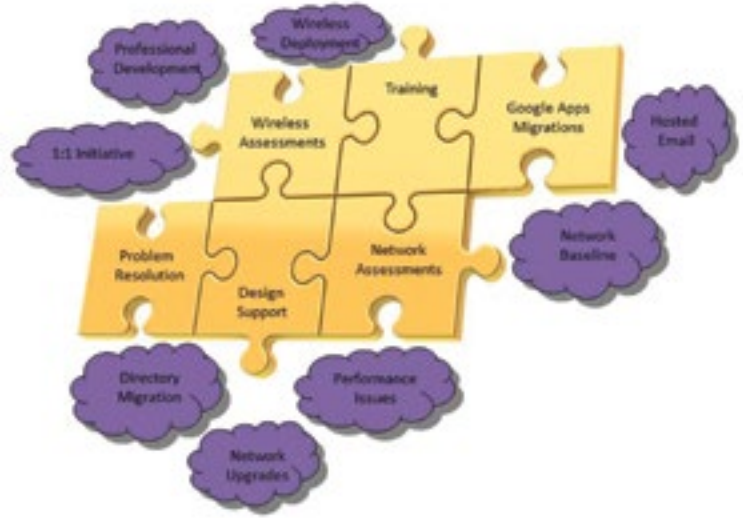
About MCNC

MCNC is a technology nonprofit that builds, owns, and operates the North Carolina Research and Education Network (NCREN) serving a growing number of research, education, K-12, non-profit health care and other community institutions in the state for more than 30 years. Visit www.mcnc.org for more information.

While the athletic rivalry known as the "Bedlam Series" pits Sooners against Cowboys each fall, Oklahoma's two largest universities have put rivalry aside and successfully come together to create a shared technology initiative that creates cost efficiencies and value for both institutions. OneNet has been at the center of this collaboration and is now acting as a catalyst to extend shared service programs to institutions across the state.

Oklahoma's shared services initiative began in 2012 with the University of Oklahoma (OU) and Oklahoma State University (OSU) working together to share information technology resources. Early successes included jointly negotiated vendor contracts, federated accounts, a common service catalog, and shared training programs.

A critical goal of the initiative is to enhance network connectivity among the universities' campuses, and the partnership with OneNet makes those linkages possible. OU and OSU systems are now connected through new private lambdas, which OneNet helped implement and now manages for the universities.

In addition to improving network connectivity, OneNet has built capacity to support research initiatives at both institutions by deploying a 100Gbps ring around the state. The ring connects OU's campus in Norman and OSU's campuses in Stillwater and Tulsa to OneNet and its upstream connection to Internet2. This new network provides the infrastructure necessary to support the production, analysis, and transfer of big data among the institutions and outside the state.

Photo courtesy of the University of Oklahoma

These successes have set the stage for a shared services model that can be duplicated across the state, and OneNet is working with IT leaders from institutions statewide to seek out opportunities for collaboration.

"The initiatives with OU and OSU are just the beginning," said Von Royal, OneNet Executive Director and CIO for the Oklahoma State Regents for Higher Education. "We've created efficiencies and cost savings for our two largest institutions, but our state's smaller institutions, which often have more limited resources, can benefit even more from these types of collaborations."

> OneNet enhances economic growth by meeting the mission-critical needs of the state's education, research, health care, and public service communities. OneNet reaches out beyond their customers to spur economic development by facilitating public-private partnerships to deliver technology throughout communities and create opportunities that otherwise would not be available.

Royal is working with the State Regents' Council on Information Technology (CoIT) to identify needs that can be met through shared solutions. CoIT members include the highest level IT leader at each of the state's institutions. This group has made shared services a key objective in their strategic plan.
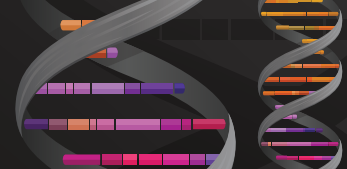
To facilitate communication about shared services and promote participation, a shared services marketplace website is available at www.okhighered.org/cio. The marketplace is designed as a clearinghouse for shared technology contracts, resources and services for all of Oklahoma's higher education institutions. The site features service offerings and contract options for campus technology teams and highlights successful collaborations.

"As technology continues to advance and the need for cost efficiencies grows, IT collaborations will be vital to the success of our state's institutions and students," said Royal. "OneNet is committed to championing initiatives across our higher education system to ensure Oklahoma's students have access to the IT resources needed to succeed in their educational pursuits."

About OneNet

OneNet, a division of the Oklahoma State Regents for Higher Education, has a mission to advance technology across Oklahoma. OneNet serves local and state governments, tribal organizations, research centers and laboratories, colleges, universities, public and private schools, libraries, hospitals and clinics, military bases and nonprofit organizations. Visit www.onenet.net for more information.

In 1986, the National Science Foundation (NSF), with great foresight, initiated an effort called the NSFnet to build a national Research and Education (R&E) Network to enable advanced scientific research and education and connect the NSF-funded supercomputing centers using the latest Internet technology. As part of this effort, NSF encouraged regions to join forces and construct regional networks to connect to the new NSFnet. The NSFnet initially operated at 56 Kbps, was upgraded to T-1 (1.544 Mbps) in 1986, and was running at T-3 (45 Mbps) speeds when it ceased operation in 1995.

The initial efforts to create Westnet began in 1985. In 1987, Westnet became operational as a regional network including connectivity for the states of Arizona, Colorado, New Mexico, Utah, and Wyoming. Southern Idaho was added as a member in 1989. The network was managed and operated by Colorado State University (CSU) and The University of Colorado at Boulder (CU-B). Westnet transitioned to Sprint as its backbone provider when NSFnet was decommissioned in 1993, and ceased to operate as a regional network in 1996 when funding from NSF was discontinued. At that time, Westnet made an effort to transition its operation to state networks.

> For more information on the pivotal role NSFnet played in the development of networking technology to benefit research and education, please visit: http://en.wikipedia.org/wiki/National_Science_Foundation_Network and https://www.nsf.gov/about/history/nsf0050/internet/launch.htm.

Nearly every region had a regional network. Examples include: CERFNET (California Education and Research Federation Network, CICnet, Merit/MichNet, MIDnet, NEARNET (the New England Academic and Research Network), NorthWestNet, NYSERNet (New York State Education and Research Network), SESQUINET, and SURAnet (the Southeastern Universities Research Association network).

When Internet2 formed, many from the Westnet region re-formed regional networks to aggregate and connect to Internet2. In the Westnet region, the Front Range GigaPoP (FRGP), Idaho Regional Optical Network (IRON), and the Utah Education Network formed independent physical networks with Westnet continuing to function as an overarching affinity group across the region.

Over the years, these ties have grown strong across the Westnet region. One reason for these resilient ties is the shared geographic challenges among the group members serving large states with low population. Another reason is the outstanding leaders the region which include Pat Burns, Ken Klingenstein, Julian Kateley, David Wood, Ed Sharp, Kelly McDonald, and others. To take advantage of these cultural affinities, the group has continued to meet twice a year in-person since 1986.

At the January 2015 meeting of Westnet, the group recounted its history and how NSF's vision led to long, successful, and enduring relationships and partnerships. When asked about her participation in the group in the early days, Marla Meehl, Manager of the Front Range GigaPoP responded, "I participated in the group since its inception and am proud to be part of something so broad and impactful. " Kelly McDonald, who is also a founding member, and recently retired from BYU after 40 years, remarked: "One of the highlights of my career has been the interaction with right-minded Westnet colleagues. After all these years, I no longer remember the problems we discussed; I only remember that we collaborated in a very fulfilling way. "

In 2016, Westnet will celebrate 30 years of leadership and collaboration in networking. The networks that evolved from Westnet continue to fulfill NSF's vision by providing advanced technology in support of research and education.

Physical Initial NSFNET Topology

About FRGP

The FRGP is a consortium of Universities, non-profit corporations, government agencies, and secondary members (such as the UCAR Point of Presence) behind primary FRGP members who cooperate as part of a Regional Optical Network (RON) in Colorado and Wyoming in order to share wide area networking services including the commodity Internet, Internet2, and peering connectivity. Visit www.frgp.net for more information.

NJEDge.Net builds community through collaboration, bits by terabytes. NJEDge is committed to creating and maintaining the New "Jersey Strong" education community with robust infrastructure, support and technical excellence; and, equally, with professional learning opportunities.

The NJEDge.Net strategic plan contains guiding principles that steer the consortium to build community, foster collaboration, and develop academic technology partnerships. These principles point to the importance of fostering professional development by creating programs that anticipate and respond to member priorities through a diverse array of programs for the technology and academic audiences. These facilitated events bring together like-minded professionals who share and learn from one another. Sheri Prupis, Vice President of Academic and Community engagement at NJEDge.Net, holds a simple motto: "We are defined by our work. Its effectiveness is measured by the connection to individuals and community. NJEDge owes its members thoughtful solutions and collaborative outlets."

> Since its inception, NJEDge.Net's physical network has been the enabling infrastructure to create and foster a strong professional network through community building between and among college and university members, and through its affinity groups' programs and professional development events.

Annual events such as the faculty showcase, virtualization and cloud seminar, summer luncheon, and annual conference are premier venues to showcase best practices. Their consistent delivery attracts larger participation each year. Derek Weber from Raritan Valley Community College has presented many times at the annual conference. He says that the reward in sharing his work and collecting feedback has been immeasurable, "One of the most helpful experiences in my journey was the opportunity to present my work in collaboration with NJEDge."

To meet a growing need of member organizations' "first responders" such as help desk personnel, desktop support technicians, media assistants, IT specialists, and consultants, NJEDge created a User Services Symposium. The turnout was larger than expected as more than 70 "first responders" came together to explore strategies for better serving our students, faculty, and staff. Presentations included topics on prospecting and retaining student talent, developing a Helpdesk ticket tracking database, time management, inventory tracking, and PC management.

For many participants, this was their first opportunity to meet their counterparts from other schools and to establish dialogue and relationships that will form a new User Services affinity group. In all, NJEDge has eight affinity groups that are topic-centric and formed voluntarily through requests from CIOs, faculty, and professional staff. They are member run with NJEDge support.

As part of their mission to build a strong partnership in teaching and technology, NJEDge.Net proactively serves members by recommending newer ways to update and maintain their network. In 2014, NJEDge.Net provided Passaic Valley Community College with virtualization and advanced networking technologies that enabled the institution to acquire essential modernization through NJEDge's consortium-buying program and professional learning opportunities.

The K-12 community has different priorities and practices than that of other members. Last year NJEDge.Net launched an aggressive campaign to offer virtualization and video conferencing to district schools to handle the BOYD reality. Michael Sweeder, Educational Media Technology Director for Egg Harbor Township is happy with the video portal NJEDge installed because it allowed, "… the school district [to] participate in home and global community projects." Having a safe a social network for communicating with other classes and students around the world is one of the main core objectives in establishing global communities for future work place readiness.
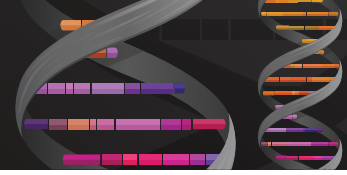

2014 User Services Symposium Participants

About NJEDge.Net
Established in 2000, NJEDge.Net is a non-profit consortium created to support New Jersey's institutions of higher education in their pursuit of excellence in teaching, learning, and research. Visit www.njedge.net more information.

SAINTCON: Leading the Way for Computer & Network Security Education

The talk is about technology and network security, and the attire is t-shirts and jeans.

This is the 2014 SAINTCON, an annual computer and network security conference, developed by the Utah Security Advisory and Incident Network Team (UtahSAINT) and hosted this year by Weber State University in Ogden, Utah. In 2001, Troy Jessup, a network security manager with Utah Education Network (UEN), founded the UtahSAINT organization in response to the state of security on the networks of UEN customers.

> UEN's Network Security detects attacks on the network, identifies miscreant tools and trends, and mitigates infrastructure vulnerabilities. UEN provides in-depth leadership in security training and works in partnership with national and global security organizations to avert large threats and incidents.

"Back then it was normal to not see any security mechanisms in place for many of our customers." said Jessup. The "Security Summit" that followed later that year drew 35 people. The event has evolved and grown over the years. Today the conference is known simply as SAINTcon and attendance has grown to more than 400 participants. Attendees come from Utah, Idaho, Nevada, and Colorado but this year participants came from as far away as Washington D.C.

Jessup remarks about the new career opportunities network security offers and the increase in gender diversity at the conference. "With the growth of the organization and the conference, we are seeing a lot more women participate," he said. "Some of the brightest minds in security are women."

Among the attendees were 12 Socialgeeks students of Twin Falls High School (Idaho). For many of the high school students, this was their second year attending the conference. Jason Torgrimson, a teacher from Twin Falls (Idaho) High School said, "Women bring a different perspective to the table. It is much needed."

Conference goers had an extensive list of topics to choose from. Choices ranged from "Security, We Are Doing It Wrong" to "Hacking Like A 3-Year Old." A new track this year was security training for executives, which offered seminars such as, Security Communication Planning and Legal Responsibilities.

UEN CEO Ray Timothy was impressed. "They put together an executive track for those of us who don't deal with security on a regular basis; that helped us to better understand security issues at the executive level." he said.

In an era of unprecedented security breaches, SAINTCON organizers say the expanded scope of the conference is warranted. "We will continue to make every effort to choose topics and presenters that address the very latest threats, attacks and defenses, both in terms of tools and practices," said UEN technical services director Jim Stewart.

"A conference participant building a micro-controlled computer from a circuit board badge and parts given to them at the conference. The goal was to build and then program them to interact with other badges around the conference"

About UEN

Utah Education Network connects Utah school districts, schools and higher education institutions to a robust network and quality educational resources. UEN is one of the nation's premier education networks. Visit www.uen.org for more information.

Merit Network Collaborates with Quilt Members to Provide Professional Development Courses

As an important part of meeting its mission of providing value for its Members, Merit offers a robust schedule of professional development opportunities. Merit Professional Learning has a full calendar of information technology and cybersecurity courses, offered at a significant savings.

Merit has formed partnerships with several Quilt members to extend these Professional Learning programs to their Members organizations. Merit has learning partnerships with Quilt Members CEN, Great Plains Network, KINBER, MCNC-NCREN, NJEDge.Net, NYSERNet, and WiscNet.

"The partnership affords each organization the opportunity to provide a broader spectrum of training opportunities to its members than either could alone. NYSERNet's members truly value the skills and knowledge that Merit's staff and partners share via Merit's extensive catalog of offerings," said Stephen Kankus, chief operating officer at NYSERNet.

Like Merit, these research and education networks have a mission of providing network connectivity to the non-profit community, fostering collaboration between their Members and promoting innovation in information technology.

Participants at Merit's CISSO Cybersecurity Certification Course

"This is a great example of how Quilt Members can partner to benefit their members. By leveraging each organizations strengths and resources, we can build a stronger community," said Don Welch, Merit's president and CEO.

> Merit is the Quilt's oldest member. Started in 1966, Merit has continued to innovate by providing high-performance networking, IT services, and professional training to its Membership in Michigan and to other Quilt member organizations.

When developing its Professional Learning calendar, Merit takes into account the needs of Member organizations, considering relevant trends and upcoming technologies to enhance the skills of modern professionals. Merit provides a full schedule of in-person and live online courses, aimed at developing critical skills, such as networking, virtualization, web applications, software development and more.

In recent years, cybersecurity has become an increasing concern. Merit offers cybersecurity certifications utilizing the infrastructure of the Michigan Cyber Range. Powered by Merit, the Michigan Cyber Range is a virtual environment used to teach and test system security in the safety of an isolated world. Cybersecurity certifications offered include penetration testing, information security, incident handling, and digital forensics. A portal was created for members of partnering organizations to access the Professional Learning calendar and easily register at the discounted pricing.

In addition to providing technology and security education, the Merit Professional Learning program serves to bring together organizations with common needs and interests. Partnering with other Quilt members to offer Merit's Professional Learning calendar furthers the common mission of providing valuable resources to our collective member organizations. Learn more at www.merit.edu/RONlearning.

About Merit Network

Merit Network is a nonprofit corporation owned and governed by Michigan's public universities. Merit provides high-performance networking and IT solutions to Michigan's public universities, colleges, K-12 organizations, libraries, state government, healthcare, and other non-profit organizations. Visit www.merit.edu for more information.
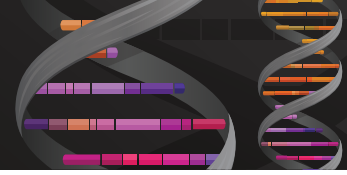
From business pundits to research competitions, Columbus, Ohio, and its citizens continue to impress.

Consider this sampling of accolades from 2014: Forbes Magazine ranked the city as the No. 1 place to make your mark, and the Library Journal again named the Columbus Metropolitan Library as a 5 Star Library, its highest rating. Meanwhile, students at The Ohio State University won the national EcoCar Challenge, while middle school students from the Columbus suburb of Gahanna won the U.S. Army's national eCYBERMISSION contest.

Behind the scenes, quietly enabling these organizations is the Ohio Academic Resources Network (OARnet), Ohio's research and education network. With more than 2,240 miles of high-speed backbone fiber, OARnet connects higher education, K-12 schools, state and local governments, libraries and other community anchor institutions throughout the state.

"We take great pride in providing the network infrastructure that delivers critical communication channels to these and many other award-winning projects and organizations," said Pankaj Shah, executive director for OARnet and the Ohio Supercomputer Center. "Our goal is to empower our communities to accomplish the many great things they are doing."

For the City of Columbus, that included a strategic plan launched in 2007 by Mayor Michael B. Coleman that aimed to make Central Ohio the best-connected region in the state. This plan led the way for advancements in public-owned fiber optic networks, digital inclusion, safety, economic development, service delivery, education, healthcare, and all other factors that impact quality of life in the region.

For its efforts, Columbus was named as one of the world's "smartest" cities by the Intelligent Community Forum (ICF), an economic and social development think tank, for the third year in a row.

"The ICF's annual Top7 Intelligent Communities award recognizes cities that use smart strategies in innovation, workforce development, digital inclusion and broadband penetration to advance their economies and the quality of life for their residents," said Moez Chaabouni, deputy director, technology, City of Columbus. ""With this award, Columbus joins an elite group of cities who have embraced what the ICF calls the Broadband Economy.

> At 100 Gbps, you could transfer 80 million file cabinets of data daily, simultaneously download e-books for Ohio's 1.8 million school children in two minutes, or transmit 8.5 million electronic medical records in 60 seconds. Smartphone data on OARnet can be sent 50,000 times faster than average mobile data.

"This great achievement was awarded to Columbus in part by leveraging OARnet's 100 Gigabit per second statewide network," Chaabouni said. "The backbone connects the City of Columbus to the world and delivers fast and reliable city services throughout."

These storied partnerships with Columbus organizations – and others around the state – have a legacy of spurring innovation and discovery. OARnet connected Columbus' Nationwide Children's Hospital with a rural medical center in southern Ohio to better diagnose newborns. Meanwhile, researchers at The Ohio State University and other institutions leverage OARnet connections to the Ohio Supercomputer Center. And, OARnet connects engineering design firms, such as Columbus' Emc2, to powerful modeling and simulation resources.

"OARnet is proud to be an active partner with all of our communities," said Shah. "Together, we are making a name for Ohio as the 'Broadband State'."

About OARnet
The Ohio Academic Resources Network (OARnet) is a member of the Ohio Board of Regents' Ohio Technology Consortium. Since 1987, OARnet has identified and deployed shared services that reduce costs, deliver quality programs, increase productivity, and improve customer service. Ultimately, OARnet promotes community and economic development by expanding access to affordable technology. Visit www.oar.net for more information.

It was 15 years ago that a small group of regional research and education network leaders gathered in Kansas City, Missouri to create a forum where leaders throughout the regional networking community could build on the intellectual capital and best practices of research and education network service providers worldwide. The group subsequently took the name, The Quilt, based on the musings of one the organization's founders that they crafting a quilt of networks.

> "In a sense, we are engaged in crafting a quilt. Each patch reflects the diversity and the particulars of the institutions and regions we serve. Yet all the regional patches must be sewn together seamlessly, coherently, and interoperably to serve a larger purpose and community. The quilt should reflect our diversity, but avoid arbitrary and unnecessary complexity. The whole cloth should be substantially more useful and valuable than the sum of the parts." – Michael Krugman, Boston University

From that small group of visionaries, The Quilt, Inc. has grown to be a vibrant community and the trusted forum where 36 members and 10 affiliates collaborate and engage with one another. The Quilt community extends beyond its membership as its members connect and serve more than 250 higher education institutions, thousands of K-12 schools, and thousands of other organizations such as libraries, healthcare, and public safety.

Through Quilt member meetings, workshops, and virtual working groups, the membership exchanges ideas and collaborates on projects vital to the success of the research and education networking community. Our biannual meetings provide an opportunity for the membership to interact and exchange ideas as well as get information about timely topics. In addition to its member meetings, The Quilt has a successful history of hosting community workshops which provide an in-depth focus on a wide range of topics from building and managing optical networks and services to best practices in member outreach and communication to professional and leadership development.

As a community, we continue to build strong relationships at the national level with industry partners, policy-makers, and governmental agencies so that we can provide a unified voice for the U.S. regional research and education networking community. Our partnerships with national and international organizations with similar research and education mission and interests also continue to thrive.

The Quilt and its members are focused on providing value-added services that utilize our member networks to deliver new services in a cost-efficient and effective manner for each institution. The Quilt continues its long tradition of seeking opportunities for consortium buying agreements for the benefit of its members and their institutions as well as facilitating collaboration among our members to provide these services. There is no greater compliment to The Quilt than to be asked by a member or strategic partner to explore new ideas for services and collaborations within The Quilt community.

The work of The Quilt is a reflection of our members' priorities, opportunities, challenges, and successes. The support and cooperative spirit among our membership is remarkable. By working together through our national Quilt community, we collectively advance the mission of research and education.

Quilt 2015 Winter Member Meeting
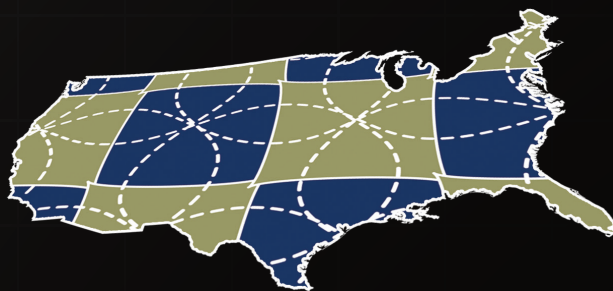
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