annual report 2021

LEARN
LONESTAR EDUCATION AND RESEARCH NETWORK

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LEARN
LONESTAR EDUCATION AND RESEARCH NETWORK

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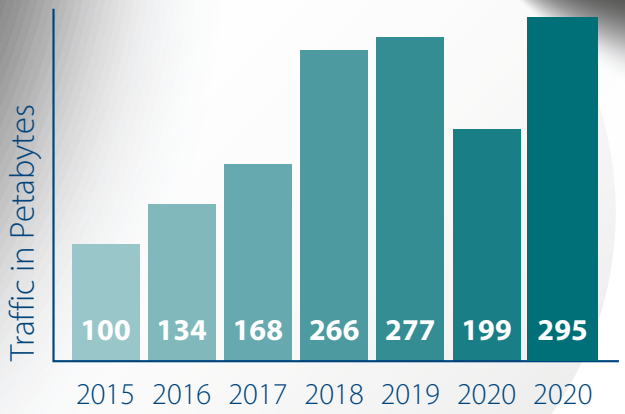
LEARN'S TOPOLOGY



LEARN's Vision

LEARN will be the most efficient and effective enabler of research, education, healthcare, and public service communities in Texas using technology and shared services.

2021 EXECUTIVE COMMITTEE

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MICHAEL HITES

Southern Methodist University
smu.edu

Chair Elect:

JIM BRADLEY

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shsu.edu

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angelo.edu

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baylor.edu

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ED EVANS

Texas A&M University Corpus Christi
tamucc.edu

President & CEO:

AKBAR KARA

LEARN
tx-learn.net

Letter from the Chair

MICHAEL HITES

Southern Methodist University

The LEARN Annual Report is always filled with stories about the remarkable work of the LEARN membership, and this 2021 edition is no exception. In addition to the highlights in this year's report, I would like to recognize some of the achievements of our LEARN Board of Directors in 2021.

Over the course of the year, the Governance and Participation (G&P) Committee tackled two major projects. The first was a review of new Board Member onboarding processes. Through this effort, new Board Members now get a thorough review of the benefits of their organization's LEARN membership and will find out how to engage and collaborate with their LEARN community partners. A second project examined a refresh of terminology across all official LEARN documents. The committee did a comprehensive analysis of LEARN documents and are working on a new Bylaws section that will define commonly used terms, setting a standard that will be used for years to come.

This year, the Operations and Services (O&S) Committee reviewed Session Initiation Protocol (SIP) as a Service and NOC as a Service. Our members requested both these services so LEARN began to pilot SIP as a Service and several members were eager to participate. The O&S Committee is still exploring NOC as a Service and hope to pilot it in 2022.

The accomplishments of LEARN staff in 2021 deserve to be highlighted as well. LEARN staff focused on strategic work throughout the year, including making deliberate hires and personnel changes, looking for ways to be more efficient by automating and tracking operational processes, assisting national organizations, partnering with corporations, implementing a federal grant, and reducing expenses where possible.

I would also like to thank the LEARN Board of Directors for allowing me to serve in the position of Board Chair for 2021. I am proud of the achievements of our committees and Board as a whole. I am honored to have had the opportunity to work with such an accomplished group of colleagues through the year.

Letter from the President & CEO

AKBAR KARA
LEARN

Through the process of creating the LEARN Annual Report, I continue to marvel at the volume of work that goes into meeting the needs of our participants and stakeholders. There are so many stories for us to share, making it increasingly harder to dedicate a story to each milestone. Two months into 2021, winter greeted our region with a deep freeze that impacted millions of Texans and dozens of campuses. Additionally, the pandemic continues to impact our lives, it is a testament to the resiliency of our community that there are so many impactful projects and events to highlight in these pages. With each challenge, my team and I are grateful for the lessons we are learning to continue to improve LEARN human and fiber networks.

As LEARN continued to support its members, our organization also took the spotlight in notable ways, both within the state of Texas and nationally. Perhaps our most impactful project was our partnership with the Texas State Library and Archives Commission (TSLAC) to connect ten rural libraries to the LEARN network. A project unlike anything LEARN has tackled before, LEARN staff collaborated to bring fiber into libraries in rural and remote areas of Texas. For these regions, Community Anchor Institutions (CAIs) like libraries are the lifeblood of their towns, centrally located and serving a large and diverse demographic. The LEARN/TSLAC project was a huge accomplishment for LEARN, made more impressive by the speed at which it was completed. The impact of this project on the communities it serves is meaningful and very positive; for some, this marks the first time fiber has been installed in their area. You can read more about the project and the communities it serves in this Annual Report.

Since 2004, our journey to establish sustainable and high-performance statewide resources has garnered interest from education and public service organizations. While LEARN's foundation is in higher education, research, high performance networking, and shared services, we are seeing more inquiries from CAIs such as municipal governments and nonprofits that help Texans prepare for the future. Our ability to be on the radar of a widening variety of organizations shows that the work we are doing is being recognized by CAIs engaged in public good.

In August, I was humbled to be appointed by Governor Abbot to the Governor's Broadband Development Council. This five-year appointment will ensure the interests of our members will be represented at the highest levels of state government. Being able to elevate LEARN's profile in these ways allows us to raise awareness of our impact as the Texas statewide Research and Education Network and the important contribution LEARN is making to the success of our member organizations, our state, and our nation.

As we look to the future, LEARN's role in the "Knowledge Society" is much wider than research within the higher education sphere. Our services are also helping librarians enable access to the Internet and rich content to our citizens in rural towns and suburbia. Our K–12 teachers are taking advantage of LEARN's low latency to access cloud applications for preparing kids to enter colleges and universities. Our professors at community colleges and universities are preparing the next generation of professionals that will make up the Texas workforce.

"ONWARDS AND UPWARDS! WE HOPE YOU ENJOY THIS YEAR'S ANNUAL REPORT."

Letter from the CTO

TODD HORKMAN

LEARN

Reflecting on the past year, I'm very proud of the LEARN Engineering Team's accomplishments in operational improvements as well as project execution. In 2021, our focus has been on improving our day-to-day operations to free up our critical Engineering resources to deliver on the many requests from our members.

At the end of 2020, LEARN staff developed a Network Operations Center (NOC) Strategy proposal for the Operations & Services Committee which outlined improvements to our around the clock operational support of the core production statewide network. This strategy contained two main components.

The first was to partner with iGLASS Networks (iGLASS) to deliver a full-service NOC to our members by implementing their Network Monitoring and Tier-1 Outage Remediation services. iGLASS has become a key provider and is currently monitoring all the core devices in our backbone, providing Tier-1 remediation for our BGP (Border Gateway Protocol), fiber and third-party circuit connections. As we move forward, we will continue to leverage their abilities to off-load our Network Engineers from off-hours support as appropriate.

The second was to invest in new server technology as the foundation for our internal network management systems and metrics collection. The server platform has been successfully implemented and several key systems for metric collection and graphing tools have been upgraded. Although we continue to develop and enhance our capabilities, we have already seen significant gains in metric collection, new graphing platforms and collaboration with peers and the larger research community. I'm excited for the future tools we'll be rolling out for improved data presentation in 2022.

Throughout the year, we have made multiple investments in automation technology to streamline repetitive tasks and maintenance to free up our staff. This includes Juniper software upgrades, router configuration management, virtual machine builds, and operating system patching. We also facilitated several member discussions and workshops to share our experiences in this game-changing technology. In addition to improving our operations, we also onboarded several new technical staff members to ensure our bench is strong for not only supporting the state-wide network but also supporting our members' needs in the foreseeable future.

The LEARN Engineering Team was able to deliver against several large projects. As part of a larger Cybersecurity Threat Mitigation initiative, the LEARN Engineering Team implemented redundant next-generation firewalls on the core backbone to provide advanced protection for LEARN's infrastructure. At the end of August, we completed a pilot project to bring high-speed broadband to 10 rural libraries. LEARN Engineers stepped up to the challenge to develop a new connectivity model for these types of locations. We have successfully completed this project, including leveraging our NOC to provide around the clock monitoring and support of the broadband connections. The management network is a key component for LEARN Engineering to provide reliable remote support for our Points of Presence (POPs) throughout the state. In 2021, staff successfully replaced each of the management switches and standardized configurations. Lastly, there were several significant POP moves at our member locations in Austin and Dallas, in addition to continued augmentation on the optical and packet network.

Looking ahead to 2022, I'm excited for the innovative solutions that will come from our team's involvement in several NSF grant-funded projects, new service development, and engineering several major network upgrades to core areas of our network.

MEMBERS

Angelo State University
Baylor College of Medicine
Baylor University
Blinn College
Collin College
Lamar University
National Oceanic and Atmospheric Administration (NOAA)
Parker University
Prairie View A&M University
Rice University
Sam Houston State University
South Plains College
Southern Methodist University
Stephen F. Austin State University
Tarrant County College District
Texas A&M Health Science Center
Texas A&M University
Texas A&M University-Corpus Christi
Texas A&M University System
Texas Christian University
Texas Education Telecommunications Network (TETN)
Texas State Library & Archives Commission (TSLAC)
Texas State University
Texas Tech University
Texas Tech University Health Sciences Center
Texas Tech University Health Sciences Center El Paso
Texas Tech University System
Texas Woman's University
Trinity University
University of Houston System
University of North Texas System
University of Texas at Arlington
University of Texas at Austin
University of Texas at Dallas
University of Texas at El Paso
University of Texas at San Antonio
University of Texas Health Science Center at Houston
University of Texas Health Science Center at San Antonio
University of Texas Health Science Center at Tyler
University of Texas MD Anderson Cancer Center
University of Texas Medical Branch at Galveston
University of Texas Rio Grande Valley
University of Texas Southwestern Medical Center at Dallas
University of Texas System

OVERVIEW & HISTORY

LEARN President and CEO Akbar Kara takes a photo of LEARN Board Members, TAG Members, and Staff at the Fourth Quarter Board Meeting held at Baylor Club in Waco, TX.

WHO IS LEARN?

LEARN: Lonestar Education and Research Network (LEARN) is a consortium of 44 organizations throughout Texas that includes public and private institutions of higher education, community colleges, the Texas State Library and Archives Commission (TSLAC), the National Oceanic and Atmospheric Administration (NOAA), Texas Education Telecommunications Network (TETN), and K–12 public schools. The consortium, organized as a 501(c)(3) non-profit organization, connects its members and over 300 affiliated organizations to statewide resources through high-performance optical and IP network services to support their research, education, healthcare and public service missions. LEARN is also a leading member of a national community of advanced research networks, providing Texas connectivity to national and international research and education networks, enabling cutting-edge research that is increasingly dependent upon sharing large volumes of electronic data.

A Brief History of LEARN

In early 2003, a series of meetings of research universities and health science centers in Texas were held to forge a shared vision of creating a unified high-performance optical network for higher education that could partner with an emerging national network dedicated to research. Overcoming the legacy of competition among the attendees with the fiscal and organizational challenges that laid ahead, the universities and health science centers soon reached a consensus that it was strategically important to create an organization dedicated to high-performance networking in Texas.

In the summer of 2003, the Texas Legislature endorsed the concept by proposing an initial investment of $7.5 million dollars to construct the proposed optical network for Texas. That concept was fleshed out as LEARN worked with the offices of the Governor, Lieutenant Governor, Speaker of the House, and the Department of Information Resources (DIR) to study the merit of authorizing a Texas Enterprise Fund (TEF) grant for the optical network project.

In the fall of 2003, the nascent LEARN organization, realizing that it was imperative to have a legal structure around which to center its operations, decided to use the existing Houston-based Texas GigaPOP as the 501(c)(3) structure for the new statewide organization. The following January, officers of the new organization were installed at its first Board Meeting on the Southern Methodist University campus in Dallas with the new organization being officially named "LEARN: Lonestar Education and Research Network." Thus, LEARN was officially created with a 30-member Board of Directors.

That year, the elected leadership officers announced that the State of Texas would fund a TEF (Texas Enterprise Fund) grant to provide the initial capital

funds to acquire dark fiber and equipment or leased wavelengths for a "triangle" backbone connecting Dallas, College Station, Houston, San Antonio, and Austin with additional connections to El Paso, Lubbock, Denton, Tyler/Longview, Beaumont, Galveston, and Corpus Christi.

On February 28, 2005, the Governor signed the TEF grant agreement to provide $7.28 million in funding for the optical network project. LEARN now had the organizational, political, and financial means to begin deploying the optical network for Texas.

Since its founding, LEARN has expanded both its membership and services. It now connects hundreds of thousands of students enrolled in higher education and in Texas public schools. Over 300 organizations rely on LEARN, either directly or indirectly through LEARN partners, for vital connectivity to local, statewide, national, and international network services.

Organization & Governance

LEARN's Board of Directors governs the overall affairs of the corporation, with committees advising the Board on specific operational and policy issues. The standing committees of the Board include Finance, Governance and Participation, and Operations and Services. Additionally, an Audit Committee consisting of three elected Board members and an independent advisor monitors the conduct of the annual independent audit. The Board also creates ad hoc committees when deemed necessary.

BRIAN DOURTY

University of Texas at Dallas

2021 TAG Chair

Within the authority delegated by the Board, the Executive Committee governs the affairs of LEARN in between the quarterly meetings of the full Board of Directors. The elected officers of the Executive Committee are comprised of the President and CEO, Chair, Chair Elect, Past Chair, Treasurer, and Secretary. Other than the President, the officers are elected from the members of the Board of Directors. The Executive Committee is also comprised of the Chairs of the three standing committees.

The day-to-day business of LEARN is managed by the President and CEO of the corporation, who is elected by the Board of Directors. The President and CEO leads the organization, represents LEARN at the state and national levels, employs and supervises professional, technical, and administrative staff to conduct and manage LEARN's operations.

The Technical Advisory Group (TAG) is comprised of technical experts from each of the organization's member institutions. TAG representatives are appointed by the LEARN Board of Director from the institution they represent, and the group elects a TAG Chair annually. TAG is an advisory body to the Board, LEARN's President, and Chief Technology Officer and serves an important role in helping shape LEARN's architecture, operations, and portfolio of services.

Network Infrastructure

LEARN's footprint spans over 3,200 miles across the state, connecting over 300 direct or affiliated organizations east to west from Beaumont to El Paso and north to south from Amarillo to Brownsville. LEARN is built on dense wavelength division multiplexing (DWDM) optical technology, providing the capability to transport multiple high-capacity signals over a shared optical fiber by using the different color wavelengths of laser light. DWDM is state-of-the-art technology that is very scalable and permits LEARN to leverage its initial investment in optical fiber by adding additional capacity at marginal costs. LEARN has grown to 38 DWDM on-ramps within Texas.

LEARN's network relies on agreements with the private sector that provide the long-term use of optical dark fibers and/or long-term leases of optical wavelength capacity. When dark fiber is conveyed via an indefeasible right to use (IRU) agreement, LEARN provides the infrastructure to "light" the fiber and can add additional capacity as needed without having to revise a contract with the fiber owner. In wavelength capacity agreements, the service provider provides the infrastructure and bandwidth under the terms and conditions of the agreement.

Deploying LEARN-owned high-performance routers at its 28 strategically located Points of Presence (POPs), LEARN makes it possible for its members and affiliates to bridge the last mile with their own network connections at minimal cost. In most cases, LEARN's network segments are protected through rings that ensure continued operation of the network in case of a fiber cut or other disruption to a segment.

Several university members as well as the Texas Education Telecommunications Network (TETN) operate their own networks as overlay on LEARN, which in turn are linked into LEARN's statewide fiber and packet infrastructures at LEARN POPs. LEARN collaborates closely with those other organizations to ensure that high-performance networking is made available at the lowest cost, most reliable, and highest performance level possible.

Membership & Network Services

Voting member organizations are entitled to appoint an individual to the Board of Directors and to acquire network services from LEARN. Network services are designed and provisioned based on the needs of individual members through collaboration between members and LEARN staff.

Network services, which are funded by the members who consume the services at rates which are set by the Board, sustain current and future network requirements including capital refresh at periodic intervals to sustain the state-of-the-art network.

Network Services include:

- Blended & Resilient Commodity Internet
- Cloud Bridge (Enhanced access to Google Cloud Platform (GCP), Azure, Amazon Web Services (AWS), etc.)
- Content Provider Peering & Caching
- Cross-Connect & Colocation
- Dedicated Transport
- Distributed Denial of Service (DDoS) Mitigation
- Local Switching
- MPLS Transport
- National Research & Education Networks (NREN)
- Router & Other Managed Services
- Texas Research & Education Intrastate
- Unmetered Network Services (UNS)

LEARN is currently listed as a telecommunication/ Internet service provider with the Universal Service Administration Company (USAC). Becoming a USAC telecommunications/Internet service provider allows LEARN's school, library, and rural health members to receive significant discounts through the Universal Services Fund.

The Board and the staff are committed to ensuring LEARN remains the trusted and preferred means by which its members obtain network services in Texas. There is a broad consensus among LEARN members that the organization has a unique role to play in the state in providing highly reliable, cost-effective network services to higher education, K–12, research institutions, healthcare, city and county governments, libraries and museums, not-for-profits, and public service entities. LEARN is a trusted partner and convener in these communities.

Infrastructure Performance

LEARN deploys and operates a sophisticated state-of-the-art fiber-based optical and IP network throughout the large state of Texas. The "carrier grade" optical

and packet switching technology is highly reliable and capable of provisioning high-speed bandwidth between LEARN members in Texas cities and smaller communities throughout the state. While bandwidth capacity is important, LEARN recognizes that the reliability of the network is just as important to the daily operation of its members who depend upon the network for most of their service functions.

The LEARN Network Operations Center (NOC) is an around the clock service, providing network monitoring, alarm management and customer communications. This is accomplished both automatically and proactively, utilizing LEARN's automated tools and monitoring systems that are available to NOC personnel to open tickets and notify engineers for resolution.

NOC personnel will open tickets, triage the issue, contact third-party providers, and notify LEARN engineers for remediation and resolution. Additionally, tickets can also be opened by technical staff at member organizations by either emailing or calling the NOC directly. The NOC and LEARN Engineering Team will be able to respond to network issues when they arise.

A critical component of LEARN's network reliability toolset is a comprehensive database of hardware assets, network configuration, circuits, and other strategically important data that is essential to LEARN's overall strategy of continuously improving the operational performance and efficiency of its growing network. At the end of 2021, that database had over 4,500 entries with information such as the physical location, acquisition date, service records, contract expiration dates, projected replacement cycle, etc. This information is also being used as the primary data source for our automation initiative to ensure accurate configurations across our network infrastructure.

The vast majority of LEARN's network topology is designed to provide network rings which serve as protected paths for members in the event of a failure in the network infrastructure. If one leg of the ring suffers a fiber cut or equipment failure, the network automatically reconfigures itself to use the other leg of the ring to maintain connectivity. This redundant design is a key element of the network's performance, but despite the network design, failures of a network segment do occasionally occur. In order to reduce the time required to get the segment back into operation, LEARN acquired and strategically deployed critical infrastructure spares throughout the network. Additionally, LEARN maintains maintenance and support agreements for its critical infrastructure with the vendors of both the fiber paths and the network gear.

The results of LEARN efforts to provide a highly reliable network to its members in 2021 were as follows:

- Layer 1 Dedicated Transport Services on LEARN's Backbone
  – **99.9%**
- Layer 2/3 IP/MPLS Transport Services on LEARN's Backbone
  – **99.9%**
- Connection Gateways to dedicated Research and Education backbones: Internet2 and ESnet
  – **Internet2 100%**
  – **ESnet - 99.9%**
- Commodity Internet Services
  – **GTT - 99.999%**
  – **Cogent - 99.999%**
- Content Peering and Caching
  – **MUS-IX - 99.999%**
  – **DE-CIX - 99.99%**
  – **EQ-IX - 99.99%**

Content Peering and Caching

While these performance levels are very favorable compared with other telecommunications providers, LEARN's goal is 100% reliability on all of its services. To that end, LEARN will continue to improve its technology, tools, training of its staff, and cooperation with its members/partners and network staff as it has done since the organization's inception.

ACTIVITIES & ACCOMPLISHMENTS

AN UNPRECEDENTED STORM

By Mary Goldie

The Seemingly Calm Before the Storm

Salvaging wood pallets from behind a grocery store to use as firewood. Seeking a warming center at your place of employment because the power has been out at your house for days. Breaking down and using your outdoor firepit to cook a hot meal after subsisting on canned emergency rations in your 38-degree house. Risking life and limb by driving for hours on snow and ice-covered roads just to get to a place that has Internet connectivity and electricity. Generator failure and difficulty getting fuel to run emergency generators for backup power. Water and flooding issues in data centers. These are the real experiences LEARN members and staff experienced during the historic Texas winter storm of February 2021, Winter Storm Uri. A weather event with the duration, breadth, and depth of impact of Uri would have made national news even if it happened in a state that experiences extreme winter weather events like this regularly. But when it happens in a state like Texas that is better equipped to respond to a hurricane or tornado than a winter event such as an ice or snowstorm, the impact and scope of the destruction is amplified, elevating it to a once-in-a-century incident that calls into question the validity of existing preparedness plans, emergency response strategies, and our own personal capacity to respond to the next climate disaster.

Saturday, February 13, 2021 was a sunny and mild winter day in most parts of Texas. News reports in the lead-up to that weekend urged Texans to ready for unusual winter storm conditions that were expected to reach the state by Sunday. But Sunday seemed far away while many Texans enjoyed the mild conditions on Saturday. However, several LEARN members were busy preparing their buildings, including their data centers, for the upcoming storm.

At the University of North Texas (UNT), former Chief Information Officer Chris McCoy and his team checked their data center generators in preparation for a possible loss of power due to the storm. Over the past few years, according to McCoy, UNT had consolidated their data centers to two campus locations, one acting as a primary center and another as its backup. Each center had a generator, but McCoy admits they weren't the newest or most top-of-the-line models. "We were worried, because we knew we had no redundancy and existing generators were vintage, no previous testing happened under these conditions before," says McCoy.

Travelling southward down the state, at the University of Texas at San Antonio (UTSA), Vice President of Information Management and Technology Kendra Ketchum found comfort in the fact that UTSA's data center was part of the police division, making the center less likely to experience loss of power during the storm as essential emergency response hubs like hospitals, police departments, and fire stations are mostly protected from rolling blackouts and power loss due to their critical role during such environmentally impactful episodes.

Typically, surplus power supplies could be transported from one location to another where it's needed most during weather events. But the size of Uri coupled with the fact that the Texas grid is not winterized created the perfect conditions for an unprecedented "storm", a "storm" not just of ice and snow but of systemic failures that led to statewide blackouts and dangerous conditions that caused unimaginable losses to life and livelihood.

LEARN Focus on Wellbeing of Members, Staff

At LEARN, President & CEO Akbar Kara was concerned about the staff and LEARN member organizations as the storm marched towards the state. "The most precious

Snow and ice cover the University of Texas at San Antonio campus after Winter Storm Uri.

Far left: Sunrise over Texas homes after Winter Storm Uri in February 2021.

thing we have at LEARN are our employees," says Kara. Conditions became increasingly dangerous as the weekend rolled to a close and by Monday morning, some LEARN staff were reporting that their homes were without electricity, heat, or even running water. "Many were charging their phones in their cars, taking risks to drive in the storm to find somewhere safe and warm to stay," recalls Kara.

Beyond the wellness of the staff and participating organizations, Kara was also concerned about the fitness of the LEARN network infrastructure to handle the paralyzing weather. Kara says the redundant design of the network prevented the most catastrophic outages, but a few LEARN network services did go down due to infrastructure failures at the provider level. An unmanned San Antonio facility caused another issue for LEARN when it lost its ability to cool network equipment when it lost power, leading to 140-degree temperatures in the facility, causing on-site LEARN hardware to fail. Unable to deploy staff to travel to remedy these network issues due to unsafe conditions of the roads in the state, Kara knew that some LEARN members were seeing the effects of service outages at their institutions. But with Internet and telecommunications channel statuses ranging from spotty to inoperable across the state for days during and after the storm, the full picture of Uri's impact wasn't revealed until much later.

University of Texas at Austin Storm Issues

In Austin, University of Texas at Austin Director of Networking & Communications William Green was dealing with multiple issues caused by Uri. "Sites not part of the main campus went down due to loss of power, and they were down for several hours or days at a time over four days," he remembers. "On campus, the University of Texas at Austin's data center had issues once their coolers froze, and after repair when things began to warm, (they) were unable to get enough water for the (facility) chillers," he adds, resulting in warmer temperatures in the facility (but not enough to shut down due to quick actions by staff).

University of Texas at San Antonio Uses Storm to Give Back to Community

Over at the University of Texas at San Antonio (UTSA), the university was faring better than some. UTSA lacked major infrastructure impact, they had facilities with power, and they had access to ample amounts of additional resources. These advantages led them to shift focus to figuring out two things: 1. How best to communicate statuses and updates with UTSA faculty, staff, and students and 2. How to assist their San Antonio community at-large.

As a result of these strategic efforts, UTSA opened its doors to become a warming station. "(UTSA) is part of the community in San Antonio. (UTSA) opening up warming centers for families opened us up to (helping) students and faculty AND our (wider San Antonio) community during that time," says Ketchum. Coinciding with the creation of warming centers, UTSA decided to open its campus food pantry to others, with staff taking on the role of volunteers to assemble and hand out food baskets to those in need.

"THE MOST PRECIOUS THING WE HAVE AT LEARN ARE OUR EMPLOYEES."

On the communications front, lessons were learned about communication obstacles between UTSA faculty, staff, and students during natural disasters. "We found out that we could quickly communicate to faculty and staff but not to students," says Ketchum. Ketchum, UTSA's Associate Vice President for Strategic Communications & External Affairs, Joe Izbrand, and UTSA's Vice President for University Relations, Teresa Niño, were given the responsibility of creating a task force to identify and understand critical communications during disasters. "We created the task force…to simplify critical event management. In that taskforce, we found out there was no script for when we should do certain things and when not to," reveals Ketchum. Her biggest lesson learned during UTSA's storm response? The importance of creating a strategy for critical event communication.

Effects of Winter Storm Uri at a rural farm in Texas.

Image Credit: Joey Cranmore

University of North Texas Storm Strategy Sees Successes

With storm impacts varying wildly from region to region across the state, some LEARN participating organizations didn't experience any storm impacts while others were facing disaster head on. At the University of North Texas (UNT), Chris McCoy and his team saw their cursory pre-storm checks and procedures from the weekend dramatically escalate after the storm passed north Texas. By around 10:00 PM Monday, February 15, 2021, power was out on campus, leaving both data centers dark with no cloud backup available at either site. McCoy's first response was to ask for the creation of an organized reboot plan consisting of a checklist sequence for getting the data centers back online. The planning process resulted in a seven-step NASA-style checklist for reboot that was successfully completed five days later, by Saturday, February 20th. Although the plan got UNT's data centers back online, it wasn't without its hiccups. "Hitches in this process included failed nodes, issues getting an equipment expert to assist us with restoring operations (on that end), authentication node corruptions requiring a rebuild, and some failed storage nodes," lists McCoy. In the end, two pieces of hardware were entirely lost but overall, "it was a success", says McCoy. "The recovery process started at 6 AM on Friday and as power stabilized, our team worked 38 hours straight to ensure the campus was ready for classes to start on Monday," he adds.

The use of a checklist with sequences and prerequisites was a resounding success. There were additional elements of the reboot plan that played a significant role in supporting the whole process. According to McCoy, UNT IT leadership was updated once each plan step was completed, utilizing Microsoft Teams and email to keep people in the know regarding progress. "Only three or four people were (physically) in the data center for the duration of this plan, with a single Teams channel used to run operations for the re-start," McCoy elaborates. Every 30 minutes, a process status was posted in the Teams chat channel, and as many as 40 people were on the channel at any given time says McCoy. By limiting decision making to himself, the Deputy CIO, and the CISO and having two of three decision-makers on the chat channel at any given time, the leadership team were aware and involved with the process every step of the way.

Storm Aftermath

While Winter Storm Uri was a wakeup call for LEARN and its members, leading to emergency planning reassessment and new procedural strategies, it also was an opportunity for the LEARN community to lean on each other to make it through, as it has through physical and metaphorical storms since 2005. LEARN staff checked in on members throughout the storm, keeping lines of communication open. LEARN Engineers continued to monitor the network, ensuring that it remained up as critical operations continued across the state. LEARN's members worked to help their surrounding communities. Additionally, LEARN's NOC is stationed in North Carolina, which did not feel the effects of this Texas storm; members were able to submit tickets and outages to the NOC throughout the duration of the ice storm. While the impact of this event will be felt for a long time, the efforts of LEARN and the LEARN community remain a bright example of people coming together during a time of need.

ENGAGEMENT EVENTS BRING OPPORTUNITIES TO SMALL COLLEGES AND UNIVERSITY CAMPUSES

By Mary Goldie

When six small colleges and universities in Texas partnered with LEARN to receive connectivity to the LEARN network through a National Science Foundation (NSF) grant in 2019 (NSF Award #1925553), the opportunity made campuses excited: they were about to get faster, more reliable, and congestion-free access to the LEARN backbone and LEARN services for their institutions. But beyond the possibilities provided by this connectivity, the grant proposal outlined more tangible benefits to faculty, staff, and students through the grant's planned engagement component.

The engagement component of the grant called for monthly meetings for faculty and technical staff, invitations for campus professionals to attend training and workshops, and opportunities for campuses to host engagement events for students. With COVID delaying in-person engagement until 2021, Former LEARN Manager of Administration Membership and Outreach Mary Goldie created alternative events to fill the gap including virtual presentations from industry experts. While well received, the virtual presentations were no substitute for a true campus engagement event where students could interact in real time with their colleagues and peers. As colleges and universities began to reopen in the fall of 2021, grant participating institutions were finally able to host their own in-person engagement events.

Existing Campus Event Benefits from Grant Funds

"STEM is very prominent on our campus," says Curtis White, Vice President of Information Services at St. Mary's University in San Antonio, Texas. St. Mary's University was founded in 1852 by Marianist brothers and serves around 2,300 undergraduate and 1,300 graduate students today. It is a designated Hispanic-Serving Institution, boasting a high-performance computing cluster on campus, a drone lab, and a cybersecurity program. When Goldie approached St. Mary's University to discuss having a campus engagement event on their campus, a multi-university event was proposed before the decision was ultimately made to use grant funds to support an existing long-running campus event, the Science, Engineering, and Technology (SET) Summer Research Symposium.

Working with Curtis White and Associate Professor of Biological Sciences Dr. Ahmad Galaleldeen, Goldie helped with the event. The SET Symposium was held

Far left: Wilburn and Helen Wheeler Science Center at South Plains College in Levelland, TX. Above: Kristin Bingham, Department Chair and Associate Professor of Biology at South Plains College. South Plains College hosted its inaugural Spooky Science Fest in October of 2021.

Image Credits: Mary Goldie

South Plains College Students participate in the inaugural Spooky Science Fest on October 20, 2021 in Levelland, TX.

on September 24, 2021, with around 100 students attending; the day featured poster presentations from students, judged by San Antonio area experts working in science, engineering, and technology fields. As an existing event, the impact of the symposium is easily measured. "The symposium is always a wonderful opportunity for students to share and see what other students are doing…it allows them to help learn how to explain very technical things to people who aren't familiar with (their field)," says White.

New Campus Event Created with Grant Funds

According to South Plains College Department Chair and Associate Professor of Biology Kristin Bingham, South Plains College in Levelland, Texas educates 10,000 students a semester from all over the panhandle of Texas. With a new science facility on campus, The Wilburn and Helen Wheeler Science Center, South Plains College faculty were eager to have the opportunity to show it off with their campus engagement event. "We are making massive strides to modernize our offerings on campus," says Bingham.

With the new science center as its centerpiece, Goldie worked with Bingham to help the college host its first "Spooky Science Fest". Held on October 20, 2021, the event brought around 200 students to the building as each campus STEM department took over science center study rooms to allow students to conduct experiments, dissect owl pellets, and touch exotic animals. "I hope to increase awareness and comfort level of students in the new science facility and create opportunities to discuss our science departments on campus," said Bingham prior to the event.

Bingham's hopes for the Spooky Science Fest were realized if student reaction is anything to go by.

Biology majors Mohammad Al-Sheik, Avrianna Flores, and Aron Garcia all presented posters at the event as participants in the college's Bridges to Baccalaureate program. They each had positive feedback about the fest.

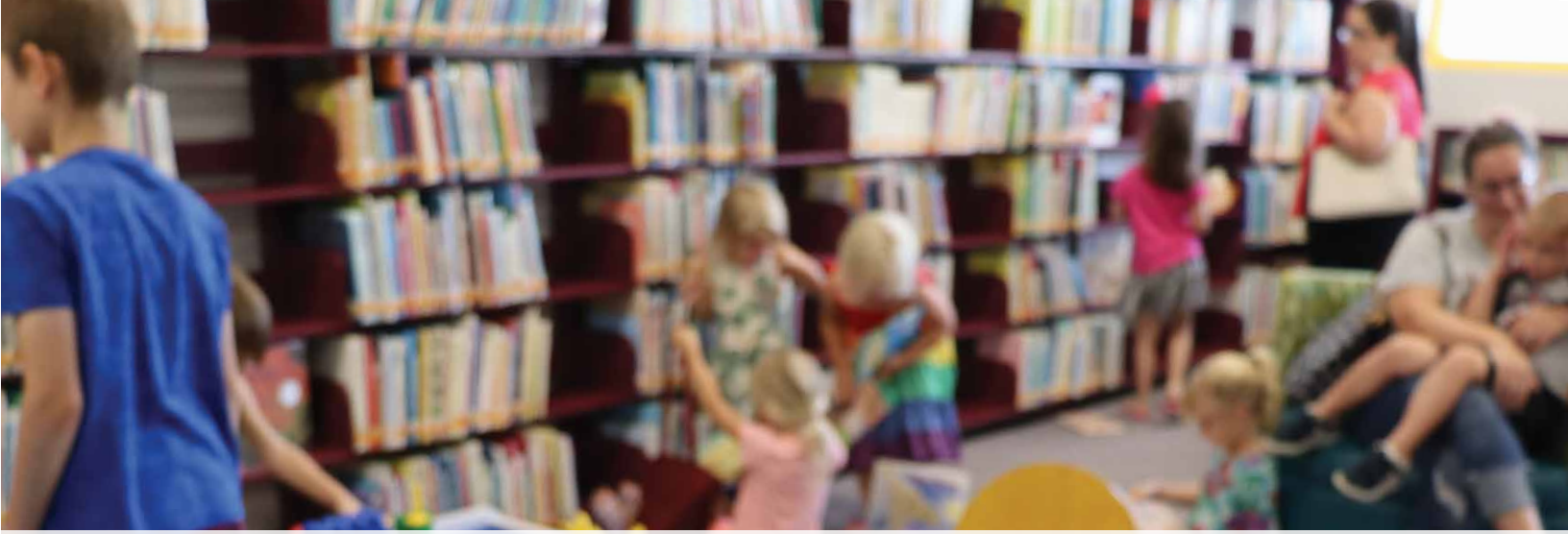
"The impact (of the event) left me speechless. To see us all come together for the love of STEM made the experience over the top," proclaims Garcia.

"I enjoyed the whole event. It was fun to interact with all the different stations that were there…people who weren't interested in science might give it a chance now after attending the event," says Flores.

"I saw some non-STEM students at the event, and I feel like events like this draw them more to science. In a sense, I feel (the event) makes STEM more approachable since students are able to see (science) is not just hard data but also things that they would find interesting and even applicable to their daily lives," adds Al-Sheik.

Future Campus Engagement Events

As LEARN was recently awarded another National Science Foundation Campus Cyberinfrastructure, or CC* grant, in 2021, more campuses will soon be able to benefit from grant funds to pursue their own campus engagement events (CC* Regional: LEARN Extending & Accelerating Participation in Science (Texas LEAPS) NSF Award #2126248). LEARN's involvement with NSF grants ensures that the LEARN network is reaching a greater number of Texas campuses, showing more organizations the value of LEARN's physical and human network.



CONVENERS OF COMMUNITY: CONNECTING RURAL LIBRARIES TO LEARN

By Mary Goldie

Across Texas, ten rural libraries are now benefiting from LEARN connectivity as part of a project with Texas State Library and Archives Commission (TSLAC). For some project libraries, connecting to the LEARN network has led to increased Internet reliability and speed. In our 2020 Annual Report, we highlighted the project and its impact on participating libraries. This year we are highlighting the impact of LEARN connectivity on communities in Texas with libraries connected to the LEARN network as part of the partnership with TSLAC.

Grapeland Public Library in Grapeland, Texas

Looking at Grapeland Public Library on a map, it looks even more remote than some other libraries in the same area of east Texas. According to TSLAC 2020 Central Statistics, Grapeland Public Library serves a population of 1,443. The library houses 9,221 books and library volunteers completed 1,026 hours of service in 2020. "Grapeland is a small rural town and if you don't live in the city limits, then your options for Internet are limited to slow satellite Internet," says Ashley Corns, Grapeland Public Library Librarian. According to Corns, a typical library visitor in this community is likely to be a retiree or a homeschooler, many are looking for a better Internet connection than what they have at home in order to search the web or complete schoolwork. When the reopening of the library after COVID closures coincided with its new connection to the LEARN

Above: Library patrons at Upshur County Library in Gilmer, TX.

network, Grapeland Public Library foot traffic doubled when looking at a year-to-year comparison.

For communities such as Grapeland, a straightforward upgrade of the library's Internet unsurprisingly makes an outsized impact. "Rural libraries tend to be chronically underfunded and struggle to have the resources to serve their communities," says retired TSLAC State Librarian Mark Smith. Therefore, the simple act of connecting a public library to the LEARN network brings a big benefit to these small and often isolated pockets of Texas.

Muleshoe Area Public Library in Muleshoe, Texas

Muleshoe is about an hour from Lubbock in far west Texas. Downtown Muleshoe consists of around three blocks of tidy storefronts: some occupied, some empty, and some nothing more than a fading façade (in the case of the old Wallace Theater for example). The quiet appearance of the area masks a thriving rural community, one with a warm and welcoming public library that hosts yoga classes, streams its story time on Facebook, and has a box of free magazines for patrons to peruse. An annual book sale brings in much needed revenue to the library, and its new LEARN connectivity gives library visitors access to far-flung corners of the world. "This project has brought Internet access to ten communities that would not be able to have speed of access in a reliable network that ties them into this larger world of education and Community Anchor Institutions and does that in a way that is affordable and sustainable for them in the long run," says Smith.

Allen Memorial Library in Hawkins, Texas

Three homeschool students in Hawkins say they love the Allen Memorial Library. Sitting at a table straining under the weight of YA (young adult) novels, to these teens, the library is fun and their favorite place to go read and meet up with friends.

Not too far from beautiful Lake Hawkins, the Allen Memorial Library has become the one-stop shop for the community of Hawkins. Librarian Norma Hallmark says printing needs are the number one reason people come to the library in the community and that because of the "office supply store" needs patrons have, Hallmark has become a notary and has started to offer stamps and envelopes for sale to the community as well.

"Hawkins has a lot of seniors in the area, some use the library computers," says Hallmark.

"Wi-Fi is great for people bringing their own devices to use. Some patrons need to stream training videos for work, and they come to the library to do it because it's an issue with their home Internet," she adds.

Fairfield Public Library in Fairfield, Texas

With a population service area of 8,900 patrons according to TSLAC's 2020 Central Statistics, Fairfield Public Library serves more patrons than most of the other libraries. However, the community of Fairfield, about an hour and a half southeast of Dallas, has a small-town feel.

Librarian Gary Wiggins started working at the Fairfield Public Library in 2016 after leaving a corporate job in the DFW area and moving to Fairfield. "Being on the Board (of the library prior to his employment), I knew the library needed technology and customer service," says Wiggins. Wiggins brought that and more to his community library, making it the place where most people in the community access computers.

Patrons at Fairfield Library Association in Fairfield, TX participate in story time.

Local Life Skills teacher Christy Gillian comes to the library with her three-year-old daughter Kennedy frequently. "We love the Fairfield Library because we can look at a greater variety of children's books than what we have at home," says Gillian. Librarian Wiggins often lets Kennedy pick a toy or treat from a box he keeps for the kids that visit the library. "I know how important it is for children to learn how to maneuver the library setting. We love how friendly and nice Mr. Gary (Wiggins) is to Kennedy," she adds.

Jacksonville Public Library in Jacksonville, Texas

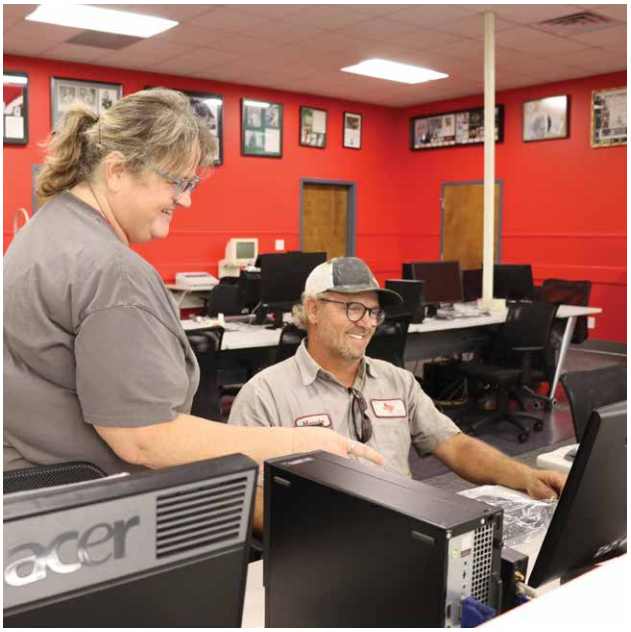
"Jacksonville Public Library is an information hub, parent decompression zone, Internet access point, and COVID vaccination spot," claims Jacksonville Public Library Children's Services employee Geraley Turner. During COVID, Turner started a virtual YouTube channel called Teen Time for the library's younger patrons. One "episode" on the channel featured a segment looking at differences between Gen X and Gen Z approaches to social issues such as online bullying, depression, and stress. A patron in the library that day overheard our conversation and chimed in to say the series helped her and her teenage son that has developmental disabilities, moving Turner to tears.

The library recently moved, leaving a spot off of a bypass dotted by fast food chains to a more central downtown location. The library's role as Jacksonville's community center is evident by the listing of ongoing library events, including a book club, back to school program, Library Literacy/Tech Share programs, poetry nights, story time, teen time, movie night, genealogy events, and "Volun-Teens", a volunteer program for Jacksonville teenagers. "We are getting more of a mix of patrons in terms of age at the new library location, more younger visitors," says Turner, explaining the more contemporary programming options.

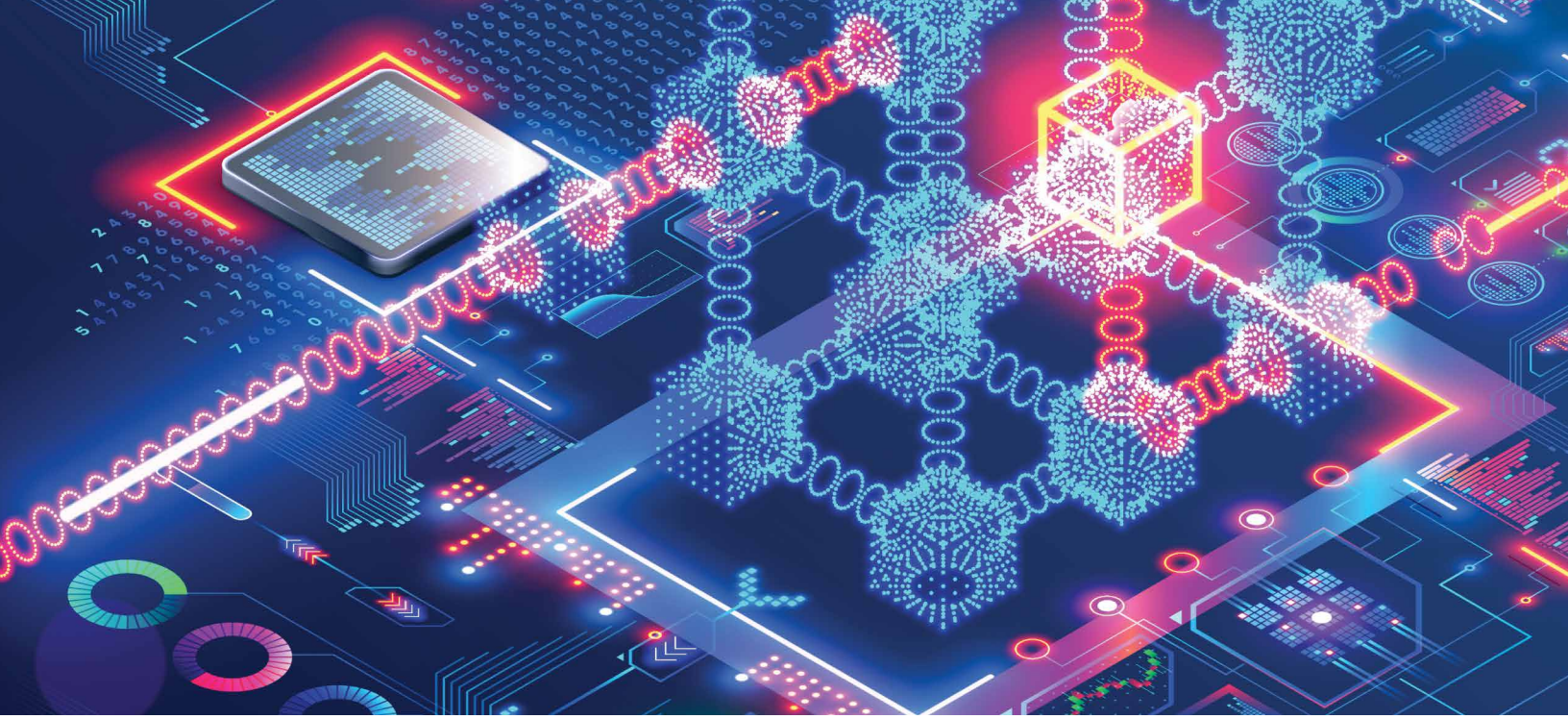
LEARN as a Community Value-Add Organization

The libraries getting LEARN connectivity through this project boast pools of volunteers, some with decades of experience. At Upshur Public Library in Gilmer, Texas, one volunteer had just started her third decade of service to the library. Just as volunteers are a value-add to libraries, LEARN hopes to be a value-add to the communities it serves through this project.

Patrons at Allen Memorial Public Library in Hawkins, TX.



Patrons at Jacksonville Library in Jacksonville, TX.



TRECIS GRANT BRINGS RESOURCES AND TRAINING TO EMPOWER EQUITABLE COMPUTING IN TEXAS

By Mary Goldie

When LEARN Met TRECIS

SuperComputing (SC), the International Conference for High-Performance Computing, Networking, Storage, and Analysis, is an event that brings together some of the most esteemed leaders in networking and computing. The collaborative nature of the conference creates a prime setting for the development of ideas, projects, and partnerships between institutions, researchers, and students that attend. In 2019, the SC19 conference brought together several industry and academia leaders in Denver, Colorado. Convening in a hallway, Pankaj Shah and Akbar Kara of LEARN met with Frank Feagans, Brian Dourty, and Gi Vania of the University of Texas at Dallas (UTD). According to Akbar Kara, the group engaged in topical conversations when National Science Foundation (NSF) grants came up.

Feagans hinted to the group that they were eager to get involved with NSF grants and the conversation was carried over to lunch. UTD attendees expressed that they were keen to do something within the cyberteams area of NSF grants, and a plan was envisioned for LEARN to play a supportive role. "The offer was that LEARN would become a collaborator and Co-PI, providing all the expertise related to cyberinfrastructure (including) performance monitoring and measurement within the network system and as technical resource advisors," recalls Kara.

With these foundations set, LEARN and UTD found an opportunity to enact their plan when presented with some big ideas from Dr. Chris Simmons, the Director of Cyberinfrastructure and Research Services at UTD. A resulting grant proposal was created and awarded in 2020 to UTD with University of Texas at Arlington (UTA),

"AS A COMMUNITY, WE ARE BETTER OFF WHEN WE HAVE EXPERTS BROUGHT IN AND MARRIED WITH PEOPLE THAT NEED HELP DOING MORE WITH THEIR RESEARCH ACTIVITIES."

University of Texas at San Antonio (UTSA) and LEARN named as collaborators. The centerpiece of the grant, Texas Education and Research Cybertraining Center (NSF #2019135), would be the creation of a Texas Research and Education Cyberinfrastructure Services (TRECIS) center.

According to the grant abstract, the center would be used as a regional hub for supporting research computing by training postdoctoral researchers in high-performance computing (HPC) and other cyberinfrastructure (CI) fields with the goal of facilitating expanded and equitable CI adoption by researchers and students with little or no familiarity or experience utilizing these resources. But what has developed since the grant was awarded extends its scope far beyond what was initially proposed, making TRECIS a key player in numerous special named projects across Texas.

Working with TRECIS

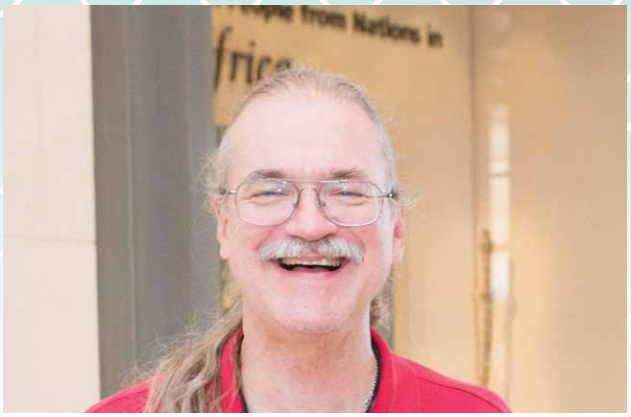
LEARN's role as the network provider for TRECIS means its involvement in the grant will expand as new elements of the grant are enacted. In the future, LEARN will be involved with network monitoring, figuring out how to do research stack with Kubernetes clusters that run containerized operations, and setting up a chain with dev ops tools, according to Chris Ott, Senior Systems Engineer at LEARN. "Seeing some of this stuff expand to a national platform would be exciting to see," adds Ott.

The success of TRECIS has exceeded the expectations of those involved with that initial hallway chat at SC19. "The success of receiving an award has led to the development of many more proposals to many varied agencies," says Gi Vania, Senior Director of Cyberinfrastructure Research Services at UTD. "We have three CIO Co-PIs on this grant plus (LEARN President & CEO Akbar Kara). Without the involvement of LEARN, the University of Texas at Dallas, the University of Texas at Arlington, the University of Texas at San Antonio, and the extra effort brought forth by (Co-PI) Frank Feagans, TRECIS wouldn't exist. Researchers are gaining help with data science…and we are gaining experience in delivering a shared resource. The UTD DMZ network provided by LEARN came to fruition due to TRECIS needs," adds Vania.

"As a community, we are better off when we have experts brought in and married with people that need help doing more with their research activities," says Kara, adding "IT will have a positive impact on struggling scientists to accelerate their research and discovery."

"Anyone in the state of Texas that is interested in research computing support and needs help with education training should look to TRECIS," says Simmons. With tools that enable real time work and the personalized guidance of grant postdoctoral researchers, Simmons believes TRECIS can apply these tools to any application or use case.

If you are interested in working with Dr. Simmons and his team or want to learn more about TRECIS, contact Dr. Chris Simmons csim@utdallas.edu.



TEXAS FOUNDING FATHERS OF RESEARCH AND EDUCATION NETWORKING

HONORING TOM EDMONSON AND KURT FREIBERGER

As LEARN Network Engineers Tom Edmonson and Kurt Freiberger celebrate their retirement in 2021 after 16 years with the organization, LEARN President and CEO Akbar Kara recalls an early meeting with Tom and Kurt shortly after he moved to Texas from New York City in 2007. Kara had been hired as the Chief Technology Officer at LEARN. "Tom took me to the most New York City thing he could think of – the deli of Central Market (grocery)!" Kara recalls.

Warm stories like this one are abound when people are asked to share their favorite moments with Tom and Kurt. As Tom and Kurt both moved into retirement in 2021, humorous highlights came up often in conversation when preparing this tribute but only in conjunction with more serious talk of the role these gentlemen played in bringing a Research and Education Network (REN) to Texas.

Ask anyone at LEARN and the broader R&E community: Tom and Kurt built the LEARN network. While Tom and Kurt were working at Texas A&M University in the early 2000s, now-retired Director & Chief Information Security Officer for Texas A&M University Willis Marti was cognizant of the skills of his top employees Tom and Kurt. He knew they could ensure the success of the LEARN network as it got off the ground in the mid-2000s and offered their expertise to build the network. Marti had the foresight to offer Tom and Kurt to assist with building the LEARN network and their continued work with LEARN led Tom and Kurt to retire as LEARN employees.

"Tom and Kurt have always taken the time to explain the network and technology on my level. They never acted like they were too busy to answer the questions," says LEARN Chief Financial Officer Kerry Mobley. "Kurt is nationally known for his neatness when installing cables, and a lot of my foundational knowledge comes from Tom," adds Mobley.

"Tom and Kurt laid the foundation for R&E (in Texas), now it benefits not just higher ed. What we build everything else on (at LEARN) will be on their foundation – it will serve generations," states Kara.

With Kurt's trusty van reaching 500,000+ miles over the years, these professionals traversed the state of Texas in the mid-2000s to build the LEARN network, eventually refreshing their original work again in 2018. That fact cannot go unstated when paying tribute to Tom and Kurt.

While Tom and Kurt are officially retiring from LEARN, they will remain "Employees Emeritus" in the hearts and minds of the LEARN community.

Above left: Diana and Tom Edmonson. Above right: Kurt Freiberger.

Tom Edmonson is honored and recognized at the 2021 Fourth Quarter Board Meeting at the Baylor Club in Waco, TX.

Tom Edmonson and Kurt Freiberger work on staging and deploying optical hardware across the state at the Texas A&M University campus in College Station, TX.

Kurt Freiberger in the ROTC Program.

Nancy and Kurt Freiberger and Tom and Diana Edmonson are honored and recognized at the 2021 Fourth Quarter Board Meeting at the Baylor Club in Waco, TX.

LEARN Staff at SuperComputing18 in Dallas, TX.

Tom Edmonson at LEARN's 10 Year Anniversary celebration held at the George W. Bush Presidential Center on Southern Methodist University's campus in Dallas, TX.

THANK YOU, TOM AND KURT, FOR ALL YOU'VE DONE FOR LEARN. WE ARE ALL FOREVER GRATEFUL.

—THE LEARN COMMUNITY

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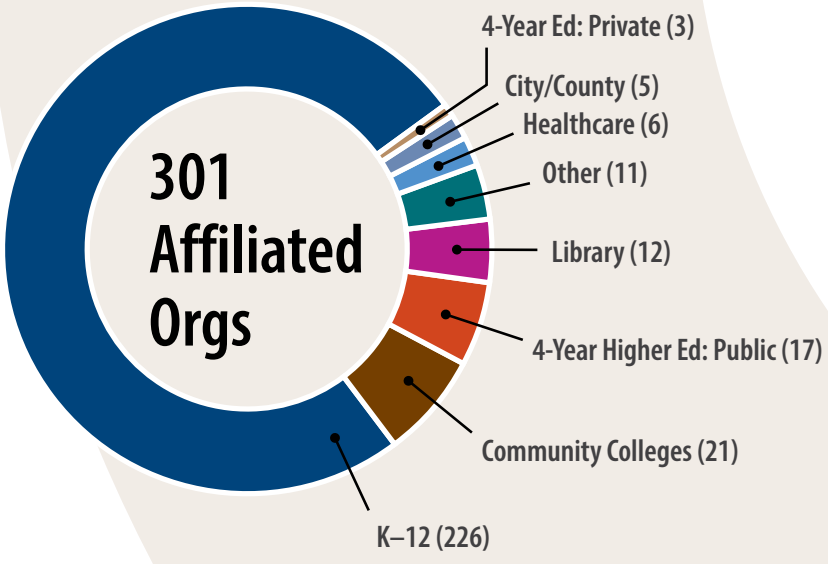

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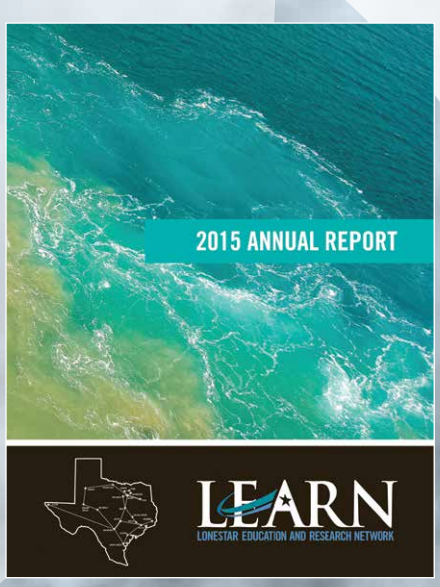
Waelder ISD
Walcott ISD
Wall ISD
Warren ISD
Water Valley ISD
Wellington ISD
West Orange-Cove CISD
Westbrook ISD
Westhoff ISD
Wheeler ISD
White Deer ISD
Wildorado ISD
Wimberley ISD
Woodville ISD
Wylie ISD
Zephyr ISD

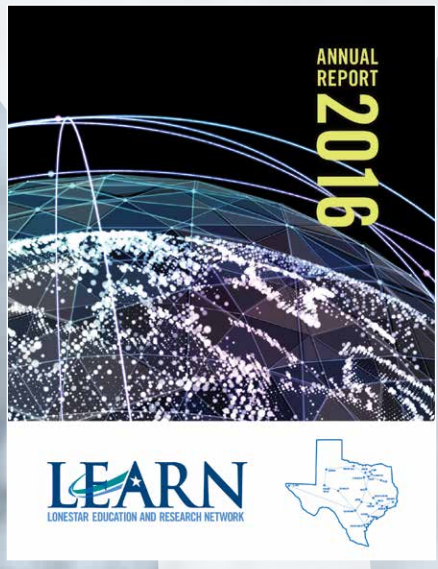
Library

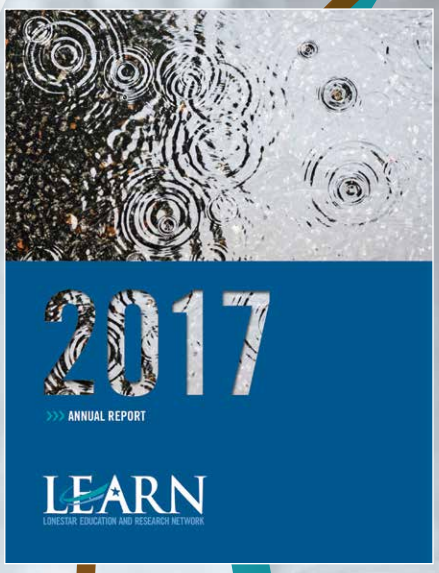
Alexander Memorial Library
Allen Memorial Public Library
Cochran County Love Memorial Library
Duncanville Public Library
Fairfield Library Association
Friona Public Library
Grapeland Public Library
Jacksonville Public Library
Lee Public Library
Muleshoe Area Public Library
Upshur County Public Library
Wharton County Library

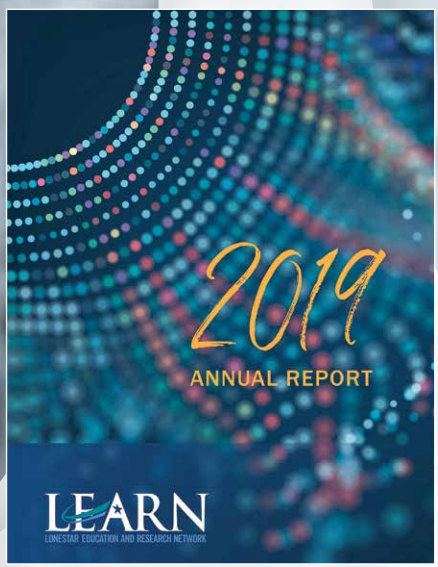
Other

Department of Information Resources
Houston Museum of Natural Science
Lower Colorado River Authority (LCRA)
Metropolitan Transit Authority of Harris County [METRO]
Texas AgriLife Extension Service
Texas AgriLife Research
Texas Engineering Experiment Station
Texas Engineering Extension Service
Texas Transportation Institute
Texas Veterinary Diagnostic Lab









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