2019

ANNUAL REPORT

LEARN

LONESTAR EDUCATION AND RESEARCH NETWORK

TABLE OF CONTENTS

Introduction
- LEARN's Network Topology • 1
- 2019 Executive Committee • 2
- Letter from the Chair • 3
- Letter from the President & CEO • 4
- Letter from the CTO • 5
- Member Organizations • 6

Overview & History • 7
- Who is LEARN? • 8
- A Brief History of LEARN • 8
- Organization & Governance • 9
- Network Infrastructure • 10
- Membership & Network Services • 10
- Infrastructure Performance • 11

Activities & Accomplishments • 12
- The Backbone of Basic Research • 13
- Backbone Upgrade by the Numbers • 16
- LEARN Organizes Statewide CISO Meeting • 18
- LEARN Hosts Internet2 CAP Fall Retreat • 20
- LEARN Awarded $800K by NSF • 21
- Libraries: Community Anchors for Digital Inclusion • 24
- K–12 Schools Benefit from LEARN Connections • 25
- EPOC Deep Dive with Trinity University • 26
- LEARN Emergency Response for Blinn College • 28

Appendices • 29
- Board of Directors • 30
- Affiliated Organizations • 32

LEARN
LONESTAR EDUCATION AND RESEARCH NETWORK

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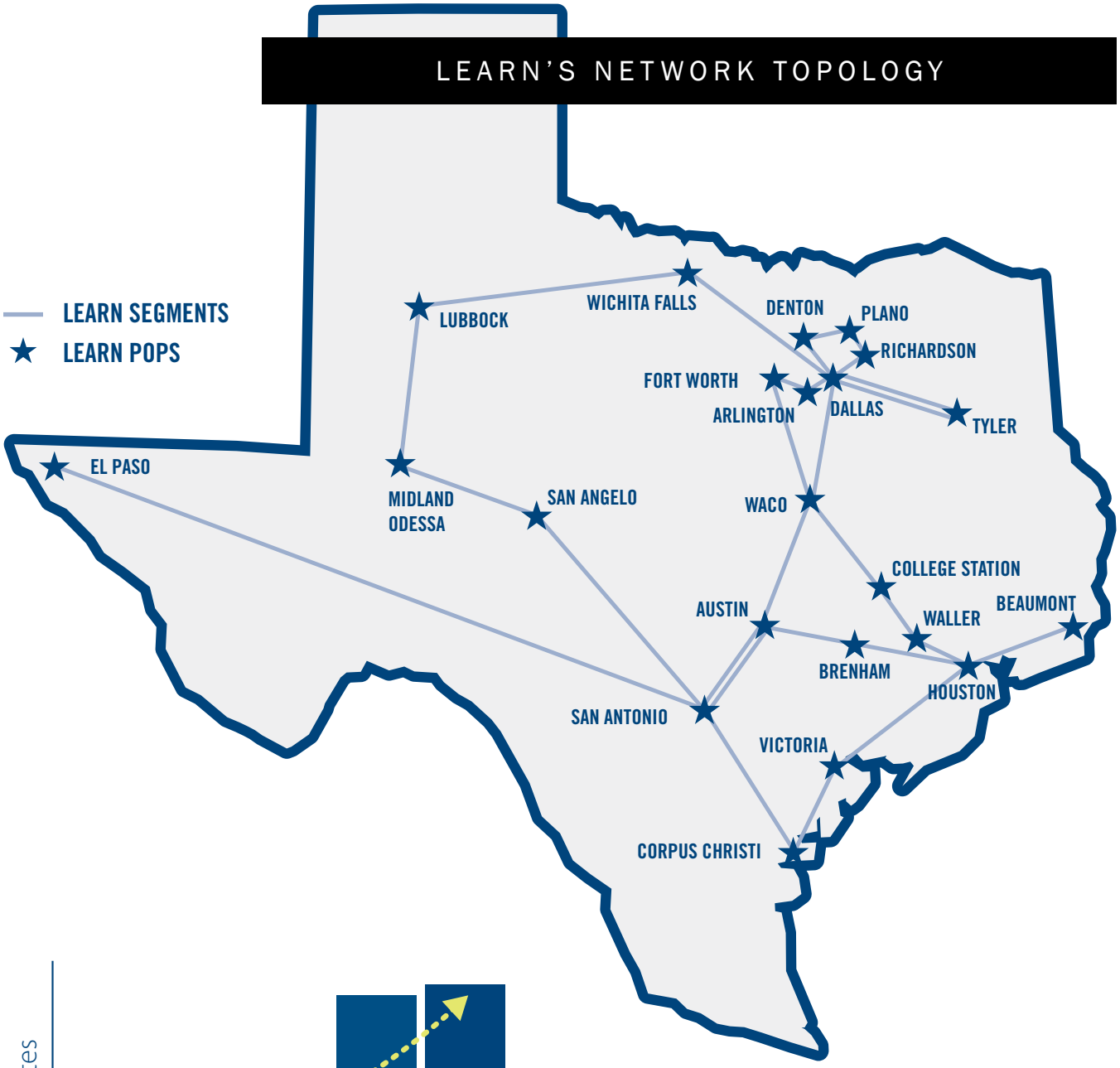
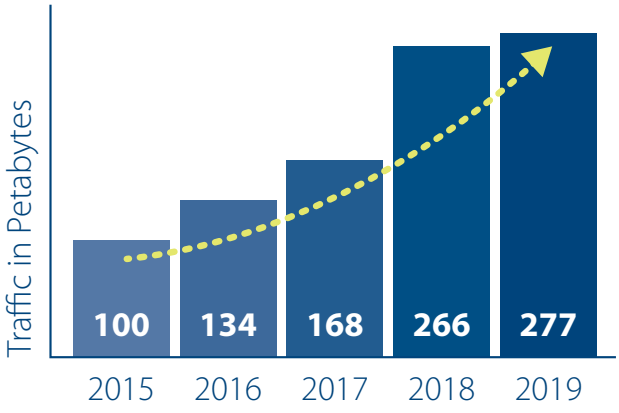
LEARN'S NETWORK TOPOLOGY





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.

EXECUTIVE COMMITTEE

Chair:

JEFFREY GRAHAM

University of Texas Rio Grande Valley
utrgv.edu

Chair Elect:

MARK STONE

Texas A&M University System
tamus.edu

Past Chair:

KEN PIERCE

Texas State University
txstate.edu

Secretary:

MICHAEL HITES

Southern Methodist University
smu.edu

Treasurer & Chair, Finance Committee:

DOUG FOX

Angelo State University
angelo.edu

Chair, Operations & Services Committee:

BOB HARTLAND

Baylor University
baylor.edu

Chair, Governance & Participation Committee:

JIM BRADLEY

Trinity University
new.trinity.edu

President & CEO:

PANKAJ SHAH

LEARN
tx-learn.net

LETTER FROM THE CHAIR

On behalf of our LEARN Board of Directors, I present to you LEARN's 2019 Annual Report. This past year LEARN leveraged its position as the statewide Research and Education Network to strengthen access and collaboration to non-profits across the state. In the report, you will have an opportunity to read about some of the fantastic work that is being done by the LEARN staff and its members in support of this mission.

The members continue to define the priorities and drive the agenda and as outreach continues and LEARN's story is known to more organizations, growth has continued.

This year marked another first, through its collaboration with four smaller schools in the state, LEARN was able to secure a NSF grant as the lead organization allowing us to bring the research network to more schools in support of their research mission. Collaboration has not been limited to Texas, as the past year has seen collaborations regionally with neighboring state Research and Education Networks.

In addition to being the largest gathering of higher education Chief Information Officers (CIOs) in Texas, once again, LEARN brought the state's Chief Information Security Officers (CISOs) to Waco for a well-received day of collaboration and learning.

LEARN continues to be a vibrant and collaborative community and as such we have much to be proud of. Being a part of such an organization and serving as the Board Chair has been an amazing and humbling experience I will always remember. We are lucky to have the LEARN staff as they are very talented, hardworking and dedicated. Thank you and I look forward to what the future brings.

JEFFREY GRAHAM

University of Texas Rio Grande Valley

LETTER FROM THE PRESIDENT & CEO

Dear Colleagues,

2019 was a rewarding year for LEARN. We were awarded our first National Science Foundation (NSF) grant for $800,000; completed a significant backbone upgrade; made some internal improvements through automation; and we joined a regional collaboration with our Research and Education Networks in our neighboring states.

The LEARN team successfully wrote and were awarded our first NSF grant as a lead organization. This two-year $800,000 award titled CC* *Regional: Accelerating Research and Education at Small Colleges in Texas via an Advanced Networking Ecosystem Using a Virtual LEARN Science DMZ* (Award # 19-25553) enables us to expand LEARN's role in Texas as a statewide Research and Education Network. Our vision is to establish a community of equally engaged scholars and administrators at similar campuses in Texas beyond this initial set of four.

LEARN's optical backbone is the foundation of all LEARN services, and in 2019 the LEARN Engineering team completed a significant backbone upgrade. Replacing the aging legacy optical system with newer generation hardware will fulfill our member requirements for the next 10 years.

Meanwhile, under the leadership of our CFO Kerry Mobley, we will continue to reduce costs for our members by proactively finding projects such as new colocation space, consolidating and moving rack/power needs for long-term savings, and through commodity Internet renewals and negotiating favorable rates for blended Commodity Internet Services (CIS).

Another rewarding project was the regional collaboration of the Research and Education Networks in Texas, Arkansas, Louisiana, and Oklahoma. This consortium, called Midsouth U.S. Internet Exchange or MUS-IX, are working together to promote, improve, and sustain advanced networking services in support of research, education, and their respective missions. MUS-IX will share access to commodity networks, transit/peering connections, content caches, access to cloud providers, colocation (space, power, and cross-connect), and hardware.

In 2019, our core focus was automation. We reviewed our internal processes and added some best practices to projects including post-project debriefs with an assessment of the time and effort spent on each project. We introduced new applications and tools to streamline workflows such as Netbox and we are continuing efforts to ramp up NetSuite by utilizing its event management and reporting features. This solidifies NetSuite as LEARN's financial and data management system. We also continued to explore new services for various verticals thereby adding more value for our members.

PANKAJ SHAH

LEARN

LETTER FROM THE CTO

LEARN's Engineering Team completed key strategic technology projects in 2019. The team completed a major optical backbone upgrade, added 5 new nodes/POPs, relocated 2 major POPs, and added 3 Terabit Core Routers. The team also connected 8 Education Service Centers to the LEARN network. LEARN Engineers contributed to the success of the SC19 (Super Computing) show by volunteering time and expertise to enable SCinet, the world's fastest network.

Most notably, LEARN Engineers worked diligently on replacing the aging Nortel Common Photonic Layer (CPL) optical backbone with the latest generation of Ciena coherent optical and Waveserver technologies. This 18-month project was completed in August 2019 by 8 Engineers and spanned 1,800 route miles and touched 27 facilities across Texas. Replacing the aging optical network mitigates overall risk and future-proofs LEARN to take advantage of 44 waves around the backbone ring that are capable of supporting 400G per wave. Such upgrades are possible as the LEARN Board of Directors consistently ensured that adequate life cycle refresh funds were set aside each year for all technology refresh projects.

Further, with the completion of the optical backbone upgrades, LEARN was able to provide a technologically advanced infrastructure to support multiple 100G waves for its members, for LEARN's IP backbone, for the regional collaboration, and for a virtual Science DMZ, which will initially benefit our four participating and emerging schools in the NSF Area 2 Grant, CC* Regional Connectivity for Small Institutions, which LEARN was recently awarded.

With the completion of the optical backbone upgrade, the LEARN Engineering Team also focused on other projects, such as installing new nodes on the core backbone, including nodes at Infomart, Arlington, Austin Chicon and Austin Data Foundry; enabling a new POP at Angelo State University and augmenting the bandwidth to 40G in West Texas; upgrading the North Texas Denton Ring bandwidth to 30G; successfully upgrading and replacing the Network Database and Management System; and connecting over a dozen new members and affiliates.

At SC19, held in Denver, Colorado, LEARN Engineers helped LEARN member, University of Texas at Dallas (UTD), deliver 100G between their High Performance Computing (HPC) cluster on the show floor. This 100G connection used LEARN's backbone and ESnet's national backbone capabilities. The HPC team at UTD successfully used 100G circuit to carry demo traffic from Dallas to Denver. Additionally, LEARN Engineers participated on the WAN Transport Team, which is responsible for delivering multiple Wide Area Network circuits to the Denver Convention Center. This year LEARN and other volunteer Engineers brought over 4.4 Terabits of bandwidth into Denver to support HPC and other demonstrations at the international conference.

In 2020, the vision for the LEARN Engineering Team is to continue the momentum with enabling the Midsouth U.S. Internet Exchange (MUS-IX), a regional collaboration project, deploy automation technologies, expand access to self-service portal, investigate DDoS mitigation options, operationalize a full service NOC, and continue to bring more value for our members.

AKBAR KARA

LEARN

MEMBER ORGANIZATIONS

Angelo State University
Baylor College of Medicine
Baylor University
Blinn College
Lamar University
National Weather Service
Northeast Texas Consortium of Colleges & Universities (NETnet)
Prairie View A&M University
Rice University
Sam Houston State University
Southern Methodist University
Stephen F. Austin State University
Texas A&M Health Science Center
Texas A&M University
Texas A&M University - Corpus Christi
Texas A&M University System
Texas Association of Community Colleges
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 and history

WHO IS LEARN?

LEARN: Lonestar Education And Research Network (LEARN) is a consortium of 41 organizations throughout Texas that includes public and private institutions of higher education, community colleges, the Texas State Library and Archives Commission (TSLAC), the National Weather Service, and K–12 public schools. The consortium, organized as a 501(c)(3) non-profit organization, connects its members and over 300 affiliated organizations 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 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 would partner with an emerging national network dedicated to research. Overcoming the legacy of competition among the attendees and the fiscal and organizational challenges that lay 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 and to participate in the emerging national network.

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.

Also, in the summer of 2003, the Texas Legislature endorsed the concept of providing an initial investment of $7.5 million dollars to construct the proposed optical network for Texas. That concept was fleshed out in 2004 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 that year, the elected leadership officers announced that the State of Texas would fund a TEF 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 upon LEARN, either directly or indirectly through LEARN

2019 TAG Chair:
GI VANIA
University of Texas
at Dallas

partners, for vital connectivity to local, statewide, national, and international network services.

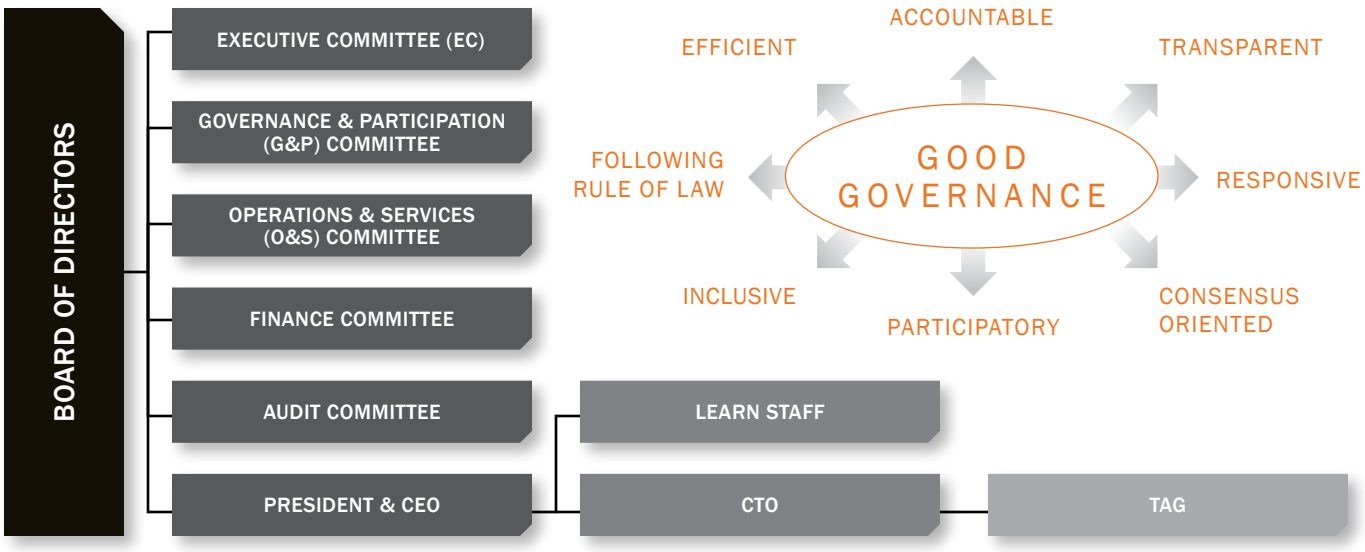
ORGANIZATION & GOVERNANCE

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 of the Board as necessary.

Within the authority delegated by the Board, the Executive Committee is comprised of the elected officers of the corporation and the Chairs of the three standing committees, develops the Board agendas and governs the affairs of LEARN between meetings of the Board. 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 day-to-day business of LEARN is managed by the President and CEO of the corporation, who is elected by the Board. The CEO employs and supervises a professional

LEARN'S GOVERNANCE STRUCTURE



technical and administrative staff to conduct and manage LEARN's operations, including a Chief Technology Officer who is responsible for the health of the network.

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 member from the institution they represent, and they elect the TAG Chair. TAG is an advisory body to the Board, President, and LEARN's 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 its 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 32 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 provisions the infrastructure and bandwidth under the terms and conditions of the agreement.

Deploying LEARN-owned high-performance routers at its 26 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 overlays on LEARN's network, which in turn are linked into LEARN's statewide fiber and packet infrastructures, at LEARN's POPs. LEARN collaborates closely with those other organizations to ensure that high-performance networking is made available at the lowest cost, best reliability, and highest performance 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 those members and the 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 keep the network state-of-the-art.

Network Services include:

- Layer 1 Dedicated Transport Services Between LEARN Points-of-Presence (POPs),
- Layer 2 IP/MPLS Transport Services,
- Service Level Agreement (SLA) based Layer 2 connections to Cloud Service Providers (AWS, Google, & Azure),
- Routed Layer 3 IP Services,
- Connection Gateways to the National Research and Education Networks (Internet2 and Energy Sciences Network, and on 100G ramps to reach Pacific Wave International Exchanges),
- Seamless access to on-net data centers
- Inter-POP Port aggregation & Co-location Services
- Commodity Internet Services (100G burst capacity spread across 4 POPs),
- Low-Latency High-Capacity Access to Content and Application Providers (Peering and Caching Services),
- DDoS Mitigation Service,
- Managed Network Service and Consultation, and
- Unmetered Network Service.

LEARN is currently listed as a telecommunication/Internet service provider with the Universal Service Administration

Company (USAC). Becoming a USAC telecommunications/ Internet service provider permits LEARN's school, library, and rural healthcare customers 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's members that the organization has a unique role to play in the state in providing highly reliable, cost-effective network services to the higher education, K–12, research institutions, healthcare, city and county governments, libraries and museums, and not-for-profits and public service entities. LEARN is a trusted partner and convener in these communities.

INFRASTRUCTURE PERFORMANCE

LEARN deployed and operates a sophisticated state-of-the-art fiber-based optical and IP network throughout the large state of Texas. That "carrier grade" optical and packet switching technology is highly reliable and capable of provisioning high-speed bandwidth between LEARN's 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.

To ensure that LEARN's network operates at "five nines" or greater reliability, LEARN operates a Network Operations Center (NOC) under an agreement with Texas A&M University, 24 hours a day, 7 days a week, 365 days a year. The NOC serves as the central point for monitoring and managing the overall health and performance of the network. LEARN Engineers have a suite of network management tools at their disposal as well as the training they need to manage the configuration of the network, monitor the performance of the network segments and their components, diagnose and isolate the cause of performance issues, and manage incidents until they are resolved. LEARN's staff works closely with its members to align the network management practices and performance with their needs.

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 are essential to LEARN's overall strategy of continuously improving the operational performance and efficiency of its growing network. At the end of 2019, that database had over 4,500 entries with information such as the acquisition date, service records, contract expiration dates, projected replacement cycle, etc.

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 redundancy 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's efforts to provide a highly reliable network to its members in 2019 were as follows:

- WaveNet Layer 1 Services on LEARN's Backbone **– 100% Uptime**
- FrameNet or Layer 2 Services **– 99.99% Uptime**
- Layer 3 Services on LEARN's Backbone **– 99.999% Uptime**
- Connection Gateways to Internet2 **– 100% Uptime**
- WaveNet Services on the Beaumont Spur **– 99.9% Uptime**
- Commodity Internet Services **– 100% Uptime**

While these performance levels are very favorable compared with other telecommunications providers, LEARN's goal is to give its members 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 staffs as it has done since the organization's inception.

activities and accomplishments

THE BACKBONE OF BASIC RESEARCH

By Aaron Dubrow

The moment had come. Fourteen years after leadership from LEARN's higher education founding members established the first high-speed Research and Education Network in Texas, it was time to replace and upgrade the network backbone.

Originally built with support from the State of Texas and 30 founding members and having grown to support over 300 direct and affiliate members, LEARN had squeezed as much performance out of their equipment — the longest serving Nortel equipment in operation — as possible. But customer support for the hardware was coming to an end. A new backbone was needed to support the next decade's data-enabled research and education.

Planning for the new backbone began in 2017. The first new hardware arrived in summer 2018 and in August 2019, LEARN announced it had completed the new backbone connecting more than 20 sites across the state.

In the process, LEARN's Engineers crisscrossed the state, travelling more than 60,000 miles, removing existing equipment, and installing and testing new optical cards and networking cables.

"The amount of bandwidth that we can carry now is, conservatively, 44 channels per fiber, each at 200 Gigabits per second, or 9 Terabits total," said Akbar Kara, LEARN's Chief Technology Officer. "We can double that with advanced electronics available today."

For comparison, the average U.S. household receives around 100 megabits/second of bandwidth or .00001% of the LEARN network capacity.

FASTER, FURTHER AND MORE ROBUST TRANSMISSIONS

The new backbone uses the latest Ciena optical networking hardware and offers the capabilities that LEARN's members need at a favorable price per bit of performance.

The new equipment isn't only faster, it's also longer-range. "The signals are much stronger," said Pankaj Shah, LEARN's President and CEO. "It can throw light further from point A to point B." This means fewer intermediary amplification sites — the beige huts in the middle of the highway that extend the length a signal can travel — and more efficient transport.

"Overall, we reduced the number of active components, so there's less to fail," Kara said. "That increases the overall robustness of the network and removes risk."

As part of the upgrade, LEARN added four new sites: one — Infomart in Dallas —that is the largest hub for traffic in their network, but was previously not integrated into the backbone; two in Austin; and a final new node at the University of Texas at Arlington (UTA) to expand data movement related to the Large Hadron Collider (LHC) experiments among other projects. "We were able to augment scope and add new sites, too," Kara said.

In the decade since the initial backbone build-out, new capabilities have been added to optical networking. In the old days, Engineers had to go to a site and unplug fibers to test a device and learn from that the distance where the fiber cut was located.

"We now have the ability to test the fiber while the network is live. This allows us to look at the health of the fiber, especially during a fiber cut," Kara explained. "That testing capability can tell us if the cut is a few meters or 50 kilometers away. That helps us start remediation more quickly."

PERFORMING NETWORK MICROSURGERY

Replacing the backbone without disrupting the connections of LEARN's hundreds of academic members required "microsurgery" on its network. Placing Ciena Waveservers on the old network, they were able to, first, test the fiber along each section of the network to assure it could handle the new high-speed, high-intensity signals. Where it couldn't, LEARN worked with fiber providers to upgrade the fiber jumpers and other networking equipment. Once the links were tested, they took sections of the old system down node by node so traffic could be routed through the unbroken section of the ring to avoid interruptions.

"We had it baked into our strategy to have this Waveserver platform to help with the transition and then absorb them into the network," Kara said.

The approach worked, but it required a lot of coordination, not just among LEARN and its members, but also the technology and fiber providers, Ciena, CenturyLink, AT&T and Equinix.

"We spent a significant amount of time in training with Ciena and collaborating with experts who had deployed this equipment to get their help learning how to do it. That helped us save quite a bit of money," said Tim Woodbridge, LEARN Network Planning and Project Coordinator. "It took longer, but now we're trained on it. We don't have questions about what was done and it's good for our ongoing support as well."

FIRST (DATA) MOVERS

When asked about the new network, Kara says he is most excited about its ability to provide 16 to 18 Terabits per second of data if and when it is needed in the future. In this respect, LEARN is a trailblazer.

"We are probably the first Research and Education Network that is using the Ciena platform with Raman technology and having all cohering optical signals on the networks," he said. "That's pretty unique."

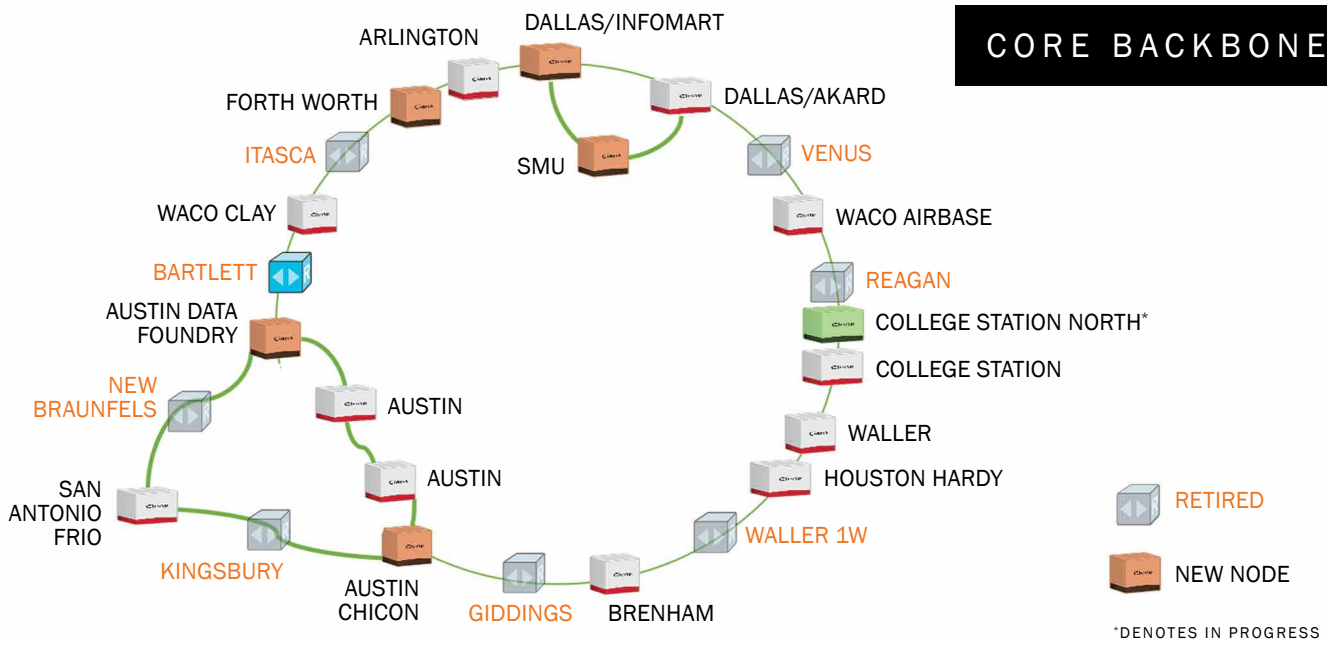
ESnet — the high-speed computer network serving the U.S. Department of Energy scientists and their collaborators worldwide — has asked to run tests on LEARN's network to inform their future plans.

"National networks like Internet2 are deciding to use the same technology as us and can tap into our best practices," Shah said. "That means LEARN will be compatible with the national networking infrastructure."

SUPPORTING BIG SCIENCE

In the coming years, the new backbone will enable previously impossible research for Texas high energy physicists collaborating with the LHC. University of Texas at Arlington (UT Arlington), Southern Methodist University, and Texas Tech University are all prominently using LEARN backbone nodes on their campuses as an on-ramp for

CORE BACKBONE



data movement to support LHC experiments, which can use more than 13 gigabits of capacity on a given campus when the CERN facility is running.

"Our research computing and data transfer needs are going to go up by orders of magnitude," said Jeff Neyland, UT Arlington Chief Information Officer. "It is critical for us to be able to not only support that increase in volume, but to support it efficiently so we can eliminate the greatest number of hops and connect to all the other science networks around the country and around the world. LEARN is an important strategic partner in helping us provide that capability."

And it's not only the raw bandwidth that benefits campuses like UT Arlington. "We're using their equipment, but we're also relying on LEARN expertise to deliver the most effective, high-speed communications and keep us running well," Neyland said.

In the coming years, LEARN will serve as a key collaborator on FABRIC — a unique national research infrastructure to enable cutting-edge research at-scale in networking, cybersecurity, and distributed computing, supported by a $20 million NSF award (Award # 19-35966)

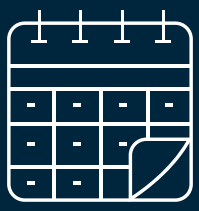
— and will provide 1 Terabit of connectivity to the Texas Advanced Computing Center (TACC) at University of Texas at Austin to enable leadership-class national supercomputing efforts for its new Frontera supercomputer, the fastest at any university in the world.

"Those are examples of how the network is going to pay dividends and help researchers achieve their discovery goals," Kara said. "The end-user is going to see a congestion-free backbone. And because we have a lower total cost of ownership, we're able to pass on savings to our members. They'll get more value for the same spending."

Fourteen years ago, creating the LEARN backbone cost $4 million. This time around, LEARN built an even better backbone for $1.8 million. Realizing they may not get one-time money from the state, as they had originally, LEARN's Board of Directors decided years ago to create a lifecycle refresh fund to pay for the new backbone. That strategy paid off and enabled LEARN to upgrade their network without additional contributions from the state or its members.

"By having this architecture, the LEARN network has shored up its sustainability," Kara said. "It is now future-proofed, expandable, and reliable."

BACKBONE UPGRADE BY THE NUMBERS



18 MONTHS
TO COMPLETE THE BACKBONE REFRESH

5 POPS ADDED

90+ CROSS-CONNECTS DEPLOYED

4 POPS AUGMENTED

120 HOTEL NIGHTS

4 POWER UPGRADES

220 COMPONENTS/ PARTS DEPLOYED

6 SITES DECOMMISIONED

1000 FIBER ROUTE MILES UPGRADED

23 LOCATION AUGMENTED

73 OVERNIGHT TRIPS

64,000 MILES DRIVEN

=

3 ENGINEERS DRIVING COAST-TO-COAST ACROSS THE US 5X EACH

LEARN ENGINEERS

LEARN's Technical Staff were presented with a recognition award at the December 2019 Board of Directors Meeting. Each Engineer displayed exemplary services to achieve milestones which contributed to the success of this project.

Two of our Engineers, Tom Edmonson and Kurt Freiberger, have been with LEARN since its inception and each have over 30 years of experience in telecommunications. Tom and Kurt built the original LEARN network that was refreshed as part of this project. The rest of our Engineering Team each have at least a decade of experience and are well-known and respected both locally and nationally in the community. All LEARN Engineers highlight the professional quality of our staff and are considered subject matter experts in their field.

This project required extensive planning, a well-coordinated implementation, and an ability to overcome unforeseen obstacles. We want to thank our Engineering Team for their tremendous efforts on the optical backbone upgrade and simultaneously keeping the operations running smoothly. Without their diligence, hard work, late nights, and early mornings, we wouldn't have been able to complete this project. Fantastic work!

"Teamwork is the ability to work together toward a common vision. The ability to direct individual accomplishments toward organizational objectives. It is the fuel that allows common people to attain uncommon results."

– ANDREW CARNEGIE

From left to right:

Byron Hicks,
Senior Network Engineer

David Nichols,
Network Engineer

Tim Woodbridge,
Network Planning & Project Coordinator

Sudarshan Gururaj,
Network Systems/Software Engineer

Ivan Amigo,
Optical Engineer

Kurt Freiberger,
Manager, Field Service/Colocation

Sal Ghani,
Systems/Network Engineer

Pankaj Shah,
President & CEO

Akbar Kara,
Chief Technology Officer

Bob Hartland,
Chair, LEARN Operations & Services Committee

Not pictured: Tom Edmondson, Manager, Deployment

Image Credit: LEARN

LEARN ORGANIZES STATEWIDE CISO MEETING

By Zachary Woodbridge

Most Chief Information Security Officers (CISOs) of large institutions have little time to foster relationships with other leaders in their field. Knowing this, LEARN worked to organize a statewide meeting for the CISOs of Texas higher education institutions.

"LEARN is always looking to be a convener," says Amy Santana, Director of Administration, Membership and Outreach for LEARN. "Nobody else plans events like this."

Nineteen CISOs attended from across the state, mostly from Texas universities. Dan Basile, Executive Director of the Security Operations Center for the Texas A&M University System (TAMUS), was among them. Basile said, "We're always trying to increase the level of communication within cyber-security. There's a lot of meetings and conferences but within the LEARN organization we have a great community. In the past we had a similar meeting, but this is the restart of that communication. We see the same challenges at different scales. Having a face-to-face discussion with the attendees builds relationships."

Jon Allen, CISSP, EnCE, CISO and Interim CIO at Baylor University, mentioned the meeting as a safe forum to share information without vendors and supervisors driving the discussion. Allen said, "It's an opportunity to have CISOs in the state of Texas talk through current struggles and upcoming challenges. We're building that level of collegiality that we need. Information Security people share their knowledge but in higher education, we're very dependent

on having good information from trusted resources, like other CISOs. The meeting is a safe place to discuss and think about what we need to achieve at our own universities as well as how we can help other Texas universities."

A majority of the attendees agreed that the biggest benefit of the meeting was networking with others in the field and finding out about all the resources available to them. Basile stated, "Because of this meeting, we're talking about statewide licensing agreements; how we can work together to get software costs down and expand services across the state." Most in the security field of IT fall into a unique niche. Networking with these experts allowed for the CISOs to identify each other's strengths and develop partnerships.

Another major benefit noted by attendees was the value of feedback and solutions other institutions offered. LEARN orchestrated the conversations. They set up an atmosphere where open talks could prove productive to the attendees. They set the framework and let a handful of CISOs from the LEARN community fill in the topics and discussions.

Topics ranged from speaking about their specialties to the challenges different experts are facing. Basile talked about his work with TAMUS across the state through their many universities and state agencies. "LEARN knew who the specialists were and knew who to grab from where across the state to have such a successful meeting and share their vision and what is happening. LEARN really helped open the conversation around it," said Basile.

Allen spoke about the work he's doing at Baylor University and across the nation. Allen said, "We spoke about what threats campuses are facing, federal and state requirements, assessing vendors when acquiring new products; really a whole range of topics. Things will pivot and change from an agenda quickly and it's nice to share candidly. We can talk about current issues and follow up with an email to get help with a problem that another CISO has already faced. Money and technology solutions sometimes aren't the fastest, so having external solutions via these other CISOs helps."

Basile remarked, "We need to do this meeting more than twice a year! I really appreciate the work LEARN put into this event. These things are hard to set up. Taking that off our plate and creating an environment where we can share info is hugely beneficial for everyone."

Allen said, "Regardless of size, public, private, high or low research volume, we're all faced with the same problems in cyber-security and Information Security today. It's no secret that our threat factors are sophisticated and well-resourced. It's a challenge every day to stay a step ahead. We acknowledge the world as it is today; we will all get breached, but we can minimize the impact and downtime when we have the best tools available, given the resources allotted."

Allen finished by saying, "The meeting was a great opportunity for collaboration, and I appreciate LEARN supporting it. It was a great place for an exchange of information that benefited everyone who attended."

LEARN HOSTS INTERNET2 CAP FALL RETREAT

By Zachary Woodbridge

In the fall of 2019, LEARN hosted a Fall Retreat for Internet2's Community Anchor Program (CAP) at the Perot Museum of Nature and Science, a fitting location, to discuss the future of infrastructure technology. There, CAP had two days of talks about CAP's strategy, direction, and vision. CAP is Internet2's program that works with regional and local Research and Education Networks (RENs) across the country, connecting these institutions to advanced broadband capabilities. The supported institutions include K–12 schools, public libraries, colleges and universities, healthcare institutions, museums, and other cultural and performing arts organizations. CAP's mission is to utilize the RENs to promote learning in ways they previously never thought possible.

"We do programs like the Presidential Primary Sources Project for K–12 schools and work on grants about library broadband, speed and quality," said Stephanie Stenberg, Director of CAP at Internet2. "We also blog about various tech projects and facilitate options such as high-speed conferencing."

At the conference, CAP discussed many aspects of Internet2 and how to better serve the RENs. Other than LEARN, representatives from other regional Research and Education Networks were in attendance including: UMASS (Massachusetts), TETN (Texas), Edge (New Jersey), CENIC (California), KINBER (Pennsylvania), I-LIGHT (Indiana), Nevada System of Higher Education (Nevada), NETnet/ UT Health Science Center at Tyler (Texas), Link Oregon (Oregon), and OARnet (Ohio).

One major talking point during the conference was the UETN eduroam Pilot Program, spoken on by Mike Zawacki, Trust & Identity Program Manager for Internet2. This pilot program will be a significant talking point for years to come as the pilot wraps up and may be a potential opportunity for other RENs, including LEARN, in the near future.

Other noteworthy talking points included the Texas State Library and Archives Commission (TSLAC) Director and Librarian Mark Smith who spoke on digital inclusion and supporting library networks. UT at Austin's Texas Advanced Computing Center (TACC) Executive Director Dan Stanzione spoke on supercomputing and TACC's activities; representatives from the Utah Education and Telehealth Network (UETN) presented with Mike Zawacki on the UETN eduroam pilot and its implications; higher education representatives from around the country spoke on CAP higher education communities. The group also discussed potential partnership opportunities for CAP and CAP's role in curriculum and content.

"What CAP does best is convene and communicate," said Stenberg. "A lot of time is spent convening communities and communicating the benefits of Internet2 or REN networks in general." At the fall retreat, Stenberg gave an update on CAP and how things developed throughout the year, reported on a summer workshop, talked about partnership opportunities for CAP as well as CAP's role in curriculum and content.

"One of CAP's main takeaways was everyone's thoughts on our long-term vision for CAP. Everyone was great on giving feedback. It was exciting to have everyone in the same room talking about that," said Stenberg.

"We very much appreciate LEARN hosting the event. There are so few instances where everyone can get together and share stories. Having that face-to-face interaction is invaluable. At the end of the day it benefitted CAP greatly to have a communing of all the minds to help us with our vision and objectives."

TSLAC's Mark Smith presented on digital inclusion and supporting library networks.

Image Credit: LEARN

UT Austin's TACC Executive Director Dan Stanzione spoke on supercomputing and TACC's activities.

Image Credit: LEARN

LEARN AWARDED $800K BY NATIONAL SCIENCE FOUNDATION (NSF) TO ACCELERATE RESEARCH AND EDUCATION AT SMALL COLLEGES IN TEXAS

By Aaron Dubrow

South Texas College, a community college in the Rio Grande Valley with an enrollment of 34,000 — many of whom are distance education students and 70% of whom are the first in their family to attend college — is home of the offices for the North American Advanced Manufacturing Research and Education Initiative (NAAMRE). The research center trains workers to help fuel the region's manufacturing economy and support innovation in rapid response manufacturing. But doing so requires access to large remote datasets for visualization and immersive reality, which are challenging to support.

South Plains College, in the Texas Panhandle, enrolls more than 3,000 students each semester and is the site of the Center for Clinical Excellence, a state-of-the-art nursing simulation facility that houses four simulation suites to train future healthcare workers remotely. However, their high-fidelity virtual manikins require gigabyte-size file updates which regularly take the equipment out of service for students.

The colleges are two of the four initial partners on a new project, led by LEARN, to improve regional network connectivity for smaller colleges and universities in Texas and support research and educational efforts for those currently without access to high-speed networking.

In September 2019, LEARN was awarded its first National Science Foundation grant as a lead organization — a two-year $800,000 CC* Regional award titled *Accelerating Research and Education at Small Colleges in Texas via an Advanced Networking Ecosystem Using a Virtual LEARN Science DMZ* (Award # 19-25553) — that will help develop a program for regional network connectivity for smaller colleges and universities in Texas.

"This NSF grant enables us to expand LEARN's role in Texas as a statewide research and education network," said Pankaj Shah, Principal Investigator for this grant and President and CEO at LEARN. "Our vision is to establish a community of engaged scholars and administrators at similar campuses in Texas beyond this initial set of four."

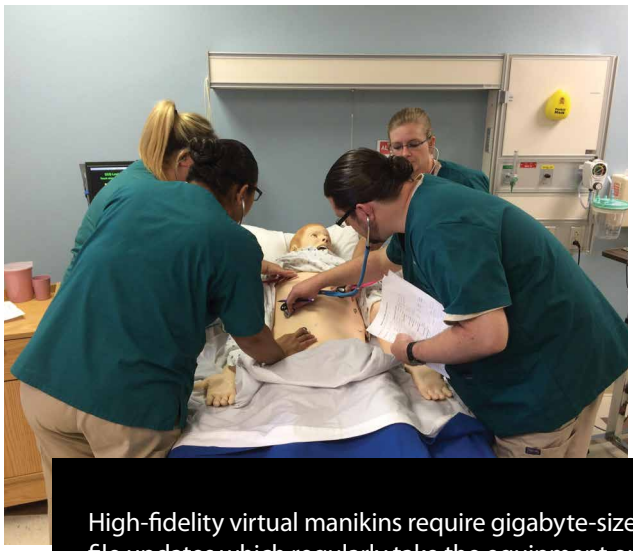
Nationally recognized for academic strength, interdisciplinary focus, and undergraduate research, Trinity University's strength in STEM made them an ideal participant for LEARN's NSF Grant.

Image Credit: Trinity University

The U.S. is determined to broadly increase STEM opportunities for scholars and students at small colleges and universities. The LEARN-led project focuses on this national need and brings sophisticated technology and accompanying expertise to students and faculty choosing to pursue STEM research-focused opportunities in the small college environment. Through this project, these colleges can be incorporated into the advanced research and education technology community that LEARN has cultivated across the state.

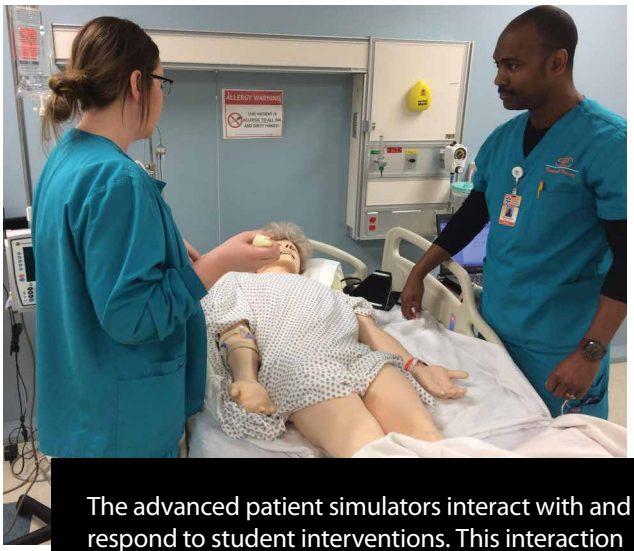
The initial set of four diverse colleges — McLennan Community College, South Plains College, South Texas College, and Trinity University — have unique needs and programmatic foci, but many shared goals that can be addressed by faster, more advanced network infrastructure and access to high-performance computing.

Increased bandwidth will allow the Health Occupations Division at South Plains College to keep current equipment online and decrease the downtime for students. At McLennan Community College, a primarily African-American and Hispanic-serving institution in Waco, increased networking capacity will support the Texas



High-fidelity virtual manikins require gigabyte-size file updates which regularly take the equipment out of service for students.

Image Credit: South Plains College



The advanced patient simulators interact with and respond to student interventions. This interaction requires students to utilize critical thinking and decision making skills.

Image Credit: South Plains College

Integrated Diving and Ecological Studies Laboratory — T.I.D.E.S. — allowing participants in the unique program to move data to/from campus from remote sites in the Caribbean, share data collection among multiple sites, and access cloud resources in research and instruction.

"This NSF-funded program opens up many opportunities for small and medium-sized higher education institutions in Texas to participate in the same statewide and national forums as the various large university systems and private universities, which are already members of LEARN," said Jeff Graham, LEARN Board Chair and Vice President of Information Technology at University of Texas Rio Grande Valley.

Through partnerships with the Texas Advanced Computing Center (TACC) at the University of Texas at Austin, Internet2, The Quilt, and the Engagement and Performance Operations Center (EPOC), LEARN hopes the project can be extended more broadly to other research and education networks across the United States and to the smaller campuses in their regions.

"We wholeheartedly embrace the theme of this project," said Dan Stanzione, Associate Vice President for Research at the University of Texas at Austin and Executive Director of TACC. "LEARN, as a regional cyberinfrastructure (CI) organization in the Southern U.S., can and should play a substantial role in expanding utilization and access to research and education CI to less resourced colleges and universities."

LEARN will provide a carrier class IP/MPLS network built over the advance optical and fiber-based infrastructure to the participating schools, enabling a virtual overlay for Science DMZ and high-performance computing traffic. A Science DMZ architecture enables campuses to remove network friction thereby increasing the throughput of data flows that support research and discovery.

The grant will enable up to 10 gigabit per second (Gbps) connections into participating campuses. LEARN staff will install an intelligent network switch to optimize research and other data flows and they will also install a suite of tools such as a perfSONAR to monitor network performance between campus and sites in Texas and beyond.

"This is a big technological leap forward for South Plains College – aside from this being our first NSF grant, we will now have access to resources and training that has not been available in the past," said Ryan Fitzgerald, Co-PI for this grant and Dean of Dual Enrollment and Distance Education at South Plains College. "As a large, rural community college, this grant will allow our institution to provide the same network connectivity that large universities provide their students and staff."

CYBERINFRASTRUCTURE COMMUNITY OF PRACTICE

A primary objective of this project is to develop a cyberinfrastructure (CI)-enabled community of small colleges to foster the growth of research and research-related education and training in institutions where there have been historical limitations.

LEARN Members at research-intensive universities represent a tremendous pool of resources and expertise for smaller

colleges that have similar missions to prepare their students to compete in a technologically advanced workplace.

A community of practice driven by similar goals and needs can grow and benefit from a culture of knowledge and resource sharing. As part of the grant, LEARN will form and foster a "CI community of practice" for the smaller, under-resourced institutions in Texas. The outcomes of this collaboration will be faster, more efficient uptake of technologies and the deployment of services needed to support excellence in teaching and research in the classroom, as well as the professional development of faculty members and IT staff.

A critical element of the strategy for building a community of smaller institutions is providing a LEARN Engineer to conduct outreach activities, provide technical training, assist campus IT staff in implementing network changes, and assist faculty, staff and students to effectively use the new network infrastructure and data transfer capabilities. The LEARN Engineer will be the catalyst for the formation of a "small college CI community of practice" through engagement with IT and faculty stakeholders on all campuses.

"Being able to partner with LEARN and have access to their expertise is a force multiplier for us," said Jim Bradley, Co-PI for this grant and CIO at Trinity University. "This program will allow our researchers to access advanced computational services at scale without requiring us and many other smaller universities to replicate expensive local infrastructure. This serves everyone in Texas well and creates a great model for the country."

PROJECT OBJECTIVES

1. **Establish a small college collaborative environment within the LEARN community**
2. **Improve network connectivity/ services at each college campus for research and education**
3. **Establish a network performance monitoring infrastructure**
4. **Establish a means to facilitate the transfer of large data sets**
5. **Deliver technical training to personnel at each campus**
6. **Develop and implement an outreach program for informing/educating faculty, staff, and students at each college, and develop and disseminate project results.**

INSTITUTION	ENROLLMENT	CITY	PROPOSED UPGRADES
McLennan Community College	9,000	Waco	1. Access to virtual Science DMZ 2. Access to data transfer node 3. Add perfSONAR node 4. R&E connectivity to LEARN at 1Gbps (10Gbps Port)
South Plains College	3,000	Levelland	
South Texas College	34,000	McAllen	
Trinity University	2,500	San Antonio	1. Access to virtual Science DMZ 2. Access to data transfer node 3. Add perfSONAR node 4. Currently connected to LEARN (10Gbps Port)

LIBRARIES: COMMUNITY ANCHORS FOR DIGITAL INCLUSION

By Mark Smith

Libraries have always been a key link for education and lifelong learning in society. In today's information-driven, technology-dependent world, libraries of all sizes across Texas have become indispensable hubs for technology and digital inclusion. Here are just a few examples of how Texas' small-community public libraries use high-speed Internet to benefit their communities:

- **Hondo Public Library**
  (population served: 9,305)
  In response to the City of Hondo's 2015 Master Plan, Hondo Public Library (HPL) identified several strategic ways the library could support the city's efforts. These key areas include access to early literacy; opportunities for youth programming and engagement; training and opportunities for individuals of workforce age; and access to services for impoverished families and seniors. HPL identified a workforce development cybersecurity training program, CyberPatriots, that HPL would host for area teens to get them interested in computer science and security careers. In order to run the software that students would be debugging, HPL needed to utilize their high-speed Internet access and updated library technology.

- **New Boston Public Library**
  (population served: 4,661)
  For most residents of New Boston in far northeast Texas, the library is the only access to computing, printing, faxing, and the Internet. New Boston Independent School District estimates only 25 percent of households with school-aged children have Internet access in the home, a concerning statistic as students grades 6–12 are issued Chromebooks with which to do assignments and homework. The Library recently switched Internet Service Providers to receive a faster broadband speed that allowed them to enable Wi-Fi for the first time. With this connectivity, library staff can assist patrons to print from their mobile phones, offer a space for students to do homework on their Chromebooks, and provide a free, welcoming space for those needing to connect to the Internet.

- **Pottsboro Area Public Library**
  (population served: 3,479)
  Pottsboro Area Public Library recently won a national Institute of Museum and Library Services (IMLS) grant to implement an

A child develops critical thinking and digital literacy skills using the e-sports program at the Pottsboro Area Public Library.

Image Credit: Pottsboro Area Public Library

e-sports program at the Library, with the goal of supporting the development of critical thinking and digital literacy skills in young people (ages 10–18) through this competitive wing of multiplayer gaming. Because e-sports requires streaming video, large amounts of bandwidth and a reliable network are essential to creating a successful environment for players and spectators alike. Most of Pottsboro's $50,000 grant is being used for high-speed broadband connectivity and technology such as gaming computers and headsets. All library patrons will now benefit from the high-speed connection in addition to the e-sports programming.

The Texas State Library and Archives Commission (TSLAC) has a stated goal of supporting digital inclusion in Texas. One project supporting this goal is Libraries Connecting Texas, which provides technical assistance to libraries to access higher-speed Internet by enrolling in E-Rate, a federal discount program for schools and libraries. Through this program, in 2018 and 2019, TSLAC helped 144 libraries across Texas increase their Internet speeds by over 1,000 percent on average. One of those was the Euless Public Library, which went from a 1.5 Mbps connection to 500 Mbps, an increase of over 33,000 percent!

Texas public libraries provide their communities a key link to high-speed Internet for education, job search, economic development, healthcare information, small business development, and much more. TSLAC is an active supporter of LEARN and is seeking opportunities for libraries to participate in the LEARN network.

K–12 SCHOOLS BENEFIT FROM LEARN CONNECTIONS

By Zachary Woodbridge

LEARN has provided services to the Texas Education Telecommunication Network (TETN) since 2008, connecting thousands of students for more than a decade. In Texas, K–12 schools work with TETN through their regional Education Service Centers (ESCs). "Large school districts can connect to LEARN via the eight regional ESCs we support," says Lee Williams, Network Engineer at TETN. Over the years of support from LEARN, Williams says two key services benefit the K–12 schools the most.

The first key service is Peering & Caching. Peering & Caching is a service where LEARN partners with common content providers like Netflix and Google to locally cache repetitive content, effectively allowing a school to download a movie once instead of hundreds of times. This allows schools to save on costs, bandwidth and data usage, allowing for less traffic on the network. "Every year we've expanded the list of peers we work with," Williams explained. "It really helps cut Internet costs for these larger school districts."

Peering & Caching allows ISDs to potentially provide better service because it's safer and faster. If the Internet is down, a school could still access key services through caching like educational videos hosted online.

The second service Williams says makes a substantial difference is LEARN's DDoS Mitigation Service. "Thanks to LEARN, TETN is able to provide DDoS protection to our schools," Williams said. In recent years, DDoS attacks have been more frequent. It's also easier to find the right person or service to attack a network. So easy, in fact, that a student at a Texas high school can easily place an attack. LEARN's DDoS Mitigation Service means more network uptime and less successful attacks.

Between the DDoS Mitigation Service and Peering & Caching, TETN can provide its ESCs with better service, protection and network stability, all while lowering external traffic and costs. "I'm the only Network Engineer at TETN. Partnering with LEARN helps us access the support and resources a single Engineer couldn't provide. We're very glad to be working with LEARN to enrich Texas K–12 schools," said Williams.

EPOC DEEP DIVE WITH TRINITY UNIVERSITY

By Zachary Woodbridge

Early in 2019, LEARN worked with Trinity University on a National Science Foundation Campus Cyberinfrastructure Regional (NSF CC* Regional) grant for upgraded infrastructure. Trinity University is a school with a lot of momentum around their infrastructure; whereas other institutions may use such a grant for more basic research connections, Trinity was looking for an advanced setup.

As a previous grant used to develop a high-performance computing (HPC) cluster was coming to an end, Trinity University was looking at the NSF CC* Regional grant as a new opportunity to continue building out their infrastructure. Where the HPC grant was fully faculty-driven, this NSF CC* Regional grant was an opportunity for collaboration between faculty researchers and IT experts.

To be included in the new grant were potential use cases for different departments, which would be conducted by Courtney Cunningham, Information Services Coordinator for Trinity University. "We needed to know which teams may benefit from an advanced network, depending on what was built," said Cunningham. But, Cunningham noted, there's a legacy of not connecting infrastructure and researchers. "The IT infrastructure team does not typically interact directly with the faculty researchers. Luckily, LEARN knew of an organization that could help us."

While preparing the grant and a way to connect infrastructure with researchers that would utilize the grant, Jim Bradley, Chief Information Officer of Trinity University in San Antonio, was speaking to Pankaj Shah, President and CEO of LEARN. Shah mentioned the Engagement and Performance Operations Center (EPOC), jointly led by Indiana University (IU) and Energy Science Network (ESnet), had received grant money to mediate the process for Trinity University (Award # 18-26994).

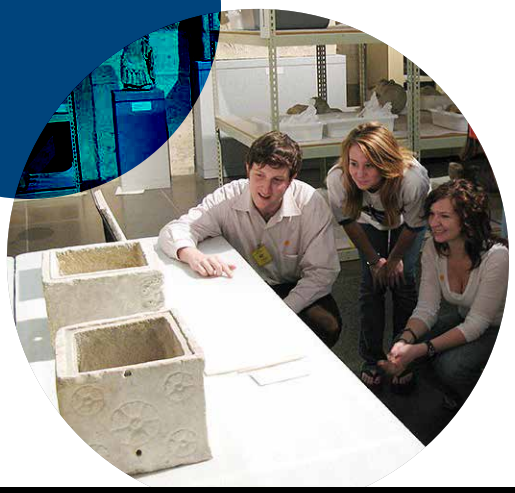
EPOC is a production platform for operations, applied training, monitoring, and research and education support. In their "Deep Dive" sessions with organizations like Trinity University, they perform an in-depth look at infrastructure capabilities as well as the researchers' needs. In short, said Dr. Jennifer Schopf, Director of EPOC, they help bridge the communication gap between IT and research.

"We've done eight or more Deep Dives this year alone," said Dr. Schopf. "We ask specific questions that help aim the discussion through a neutral party." In doing so, together with the infrastructure and researchers, they identify actionable items to develop the infrastructure necessary to further research efforts.

The meeting was held after the spring semester when most the staff would be free to attend. "We invited the entire faculty, professors, researchers, academic affairs and everyone else," said Cunningham. Among the attendees was the CIO for Trinity University, their network team, and six or more research participants from a variety of fields. "It wasn't just science researchers. We had a classical studies professor speaking about archeological research."

Each researcher spoke about their studies, what they can't do, and what they'd like to see happen, such as secure connections to other research centers and larger data storage. The entire dialogue was mediated by Jason Zurawski, Co-Principal Investigator with EPOC. Zurawski said, "We started this grant to address a gap in the community. A lot of organizations like LEARN and Trinity University receive grants for cyberinfrastructure. The missing piece was the link between the networking and the researchers they're serving. The gap had to be addressed. We're the glue between the scientists and technologists; we smooth communication lines between these groups so the end-users know how to leverage and use it."

"[Zurawski] listened and delivered a report later after some follow-up questions with a roadmap of what our



The classical studies department offers an interdisciplinary program that melds history, art history, anthropology, religion, gender studies, and philosophy in studying the ancient Mediterranean world. Courses focus on languages and cultures of ancient Greece and Rome as well as their impact on contemporary society.

Image Credit: Trinity University

faculty needs are and how to meet the needs," said Cunningham. "He helped our university by bringing in staff and expertise we wouldn't have had access to otherwise." As a result, EPOC identified three key actionable items Trinity University needed to focus on for their new grant, including LEARN-derived upgrades to their infrastructure.

Zurawski said Trinity was uniquely interesting to him. "We've gone to other universities but this one pulled in a diverse set of science drivers. They have classical studies and archeology involved with some underwater work and a case on drones in geoscience fieldwork, for example. Trinity was a crowning achievement. I like going into smaller facilities. We mostly work with large facilities like major tier one universities. The 'small guys' have been left behind in regard to technology. Their researchers are doing very interesting things without the high-tech support the bigger universities get."

"First, Trinity already had HPC resources from a couple years ago. They have great use cases that could benefit from increased abilities or greater connectivity. Their need wasn't great enough to go out and ask but bringing them together with clearly defined needs helped administration respond immediately or schedule it for the future. Now projects can go on more successfully because of the highlighted needs that were addressed," said Zurawski.

Cunningham has these final remarks: "It was interesting to help bridge a gap that we didn't know we had. Getting everyone together and hearing each other's side — what networking has done and vice versa, really deepened the communication between two entirely different departments. Both sides agreed it was a wonderful meeting that we should continue annually, if not sooner. We're probably going to schedule another meeting in the future."

Bradley said, "The expertise of [Zurawski] was truly amazing and valuable. He was able to extract from our researchers things we hadn't heard before. He was talking to them as a peer — something an IT person can't do. We heard stories and problems with research, feelings of excitement that don't transfer to an official report. We just hadn't had the right conduit and EPOC provided that. It's still paying off with the relationships we've built with the researchers."

Bradley has been affiliated with LEARN in three roles at Texas universities. "It's an enormously valuable organization. I love to say LEARN is "us." It's not just a thing we deal with, it's a member-driven organization of engaged CIOs that are worried about not just their own needs but the needs of the state of Texas. There is enormous talent of the professionals that work there but LEARN is also this wonderful group of people that connects us with other leaders in higher education."

EPOC

LEARN EMERGENCY RESPONSE FOR BLINN COLLEGE

By Zachary Woodbridge

Blinn College has been a subscriber to LEARN since its inception. Around two years ago, Blinn College became a member, transferring their network services to LEARN. They had a meeting to discuss reducing cost and improving services which resulted in LEARN designing a network that could do both.

"We've been with LEARN since the beginning," said Michael Welch, Dean of Academic Technology Services for Blinn College. "First we connected to our home campus in Brenham going back to the Houston POP with no redundancy. We worked with LEARN to convert a site heading towards Austin to go that way as well. They created a special project so they could finance the conversion to go two directions so we could have redundancy."

Last year, Blinn College further increased services to add a node in Brenham on campus to provide redundancy and increased speed. Welch said they needed the improvements to match the college's growth. "LEARN was flexible and worked with us. They added a POP so we would have a router here in Brenham." With the new node on the Brenham campus, Blinn could also act as the community anchor institution for other research, education and public service organizations in the area. "Institutions in the Brenham area lack service provider competition where affordability and reliability have always been a challenge. LEARN's backbone was tapped to serve this region which resulted in a tenfold increase in bandwidth to meet the growing needs," said Akbar Kara, Chief Technology Officer for LEARN.

But in September, a thunderstorm took out their fiber connection before their backup was fully constructed. Welch noted that their emergency connection was down as well — a worst-case scenario for any institution.

"LEARN jumped into action to get us back up on a secondary path." Welch said LEARN helped integrate an emergency circuit until fiber was repaired, bringing services back online as fast as possible.

In total, services were offline for around half a day, which would have taken substantially longer to bring back online if LEARN hadn't responded so promptly. Welch was thankful when reflecting on LEARN's response, noting their college is much smaller compared to some of the major Texas universities. "They've consistently responded to our needs to accommodate. That's what makes them unique and a great partner," says Welch.

appendices

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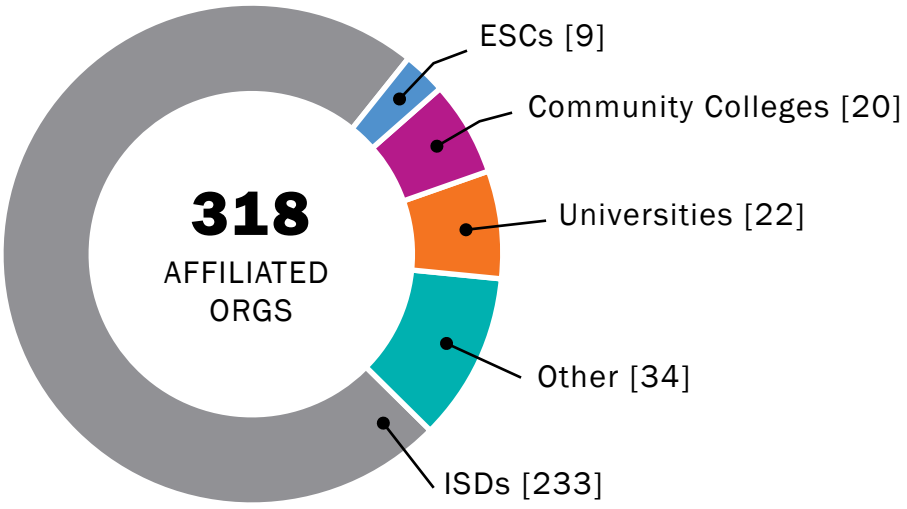
Austin Community College
Brazosport College
Del Mar College
Galveston College
Grayson College
Hill College
Houston Community College System
Kilgore College
Lamar Institute of Technology
Lamar State College - Orange
Lamar State College - Port Arthur
Midland College
Northeast Texas Community College
Panola College
Paris Junior College
Tarrant County College District
Texarkana College
Trinity Valley Community College
Tyler Junior College

ESCS

Education Service Center - Region 3
Education Service Center - Region 5
Education Service Center - Region 6
Education Service Center - Region 7
Education Service Center - Region 9
Education Service Center - Region 13
Education Service Center - Region 14
Education Service Center - Region 15
Education Service Center - Region 16

ISDS

Adrian ISD
Albany ISD
Alief ISD
Angleton ISD
Anson ISD
Apple Springs ISD
Ascension Academy
Aspermont ISD
Austin ISD
Austwell-Tivoli ISD
Baird ISD
Bangs ISD
Bartlett ISD
Bellevue ISD
Big Sandy ISD
Blackwell CISD
Blanco ISD
Blanket ISD
Bob Hope Charter School 1
Boling ISD
Booker ISD
Borger ISD
Bovina ISD
Boys Ranch ISD
Brady ISD
Brazos ISD
Breckenridge ISD
Bronte ISD
Brookeland ISD
Brookesmith ISD
Brownwood ISD
Buna ISD
Burkburnett ISD
Burkeville ISD
Burnet CISD
Burton ISD
Canadian ISD
Canyon ISD
Centerville ISD (Trinity County)
Channing ISD
Chester ISD
Childress ISD
Chillicothe ISD
Christoval ISD
CISO ISD
Clarendon ISD
Claude ISD
Clyde CISD
Coldspring-Oakhurst CISD
Coleman ISD
Colmesneil ISD
Colorado ISD
Comanche ISD
Comfort ISD
Comstock ISD
Crockett County CSD
Cross Plains ISD
Crowell ISD
Dallas Independent School District
Darrouzett ISD
DeLeon ISD
Denton Independent School District
Deweyville ISD
Dime Box ISD
Dimmitt ISD
Doss CSD
Early ISD
Eastland ISD
Eden CISD
Ehrhart School
Electra ISD
Eula ISD
Evadale ISD
Flatonia ISD
Follett ISD
Fort Elliott CISD
Giddings ISD
Gold Burg ISD
Gonzales ISD
Goodrich ISD
Gorman ISD
Grandview-Hopkins ISD
Granger ISD
Grape Creek ISD
Grapeland ISD
Groom ISD
Gruver ISD
Gustine ISD
Hamlin Collegiate ISD
Happy ISD
Hardin-Jefferson ISD
Harper ISD
Harrold ISD
Hart ISD
Hartley ISD
Haskell CISD
Hawley ISD
Hedley ISD
Henrietta ISD
Hermleigh ISD
Higgins ISD
Highland ISD
Highland Park ISD
Holliday ISD
Ira ISD
Irion County ISD
Jacksboro ISD
Jarrell ISD
Jim Ned CISD
Johnson City ISD
Kelton ISD
Kirbyville CISD
Knox City-O'Brien CISD



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Kountze ISD
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La Grange ISD
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Latexo ISD
Lefors ISD
Leggett ISD
Leon ISD
Lexington ISD
Little Cypress-Mauriceville CISD
Lockhart ISD
Loraine ISD
Lovelady ISD
Lueders-Avoca ISD
Luling ISD
Madisonville CISD
Mason ISD
May ISD
McDade ISD
McLean ISD
Memphis ISD
Menard ISD
Merkel ISD
Meyersville ISD
Miami ISD
Midway ISD
Miles ISD
Moran ISD
Munday CISD
New Braunfels ISD
Newton ISD
Nixon-Smiley CISD
Nocona ISD
Normangee ISD
Northside ISD
Nueces Canyon CISD
Nursery ISD
Olfen ISD
Onalaska ISD
Orangefield ISD
Paint Creek ISD
Paint Rock ISD
Pampa ISD
Panhandle ISD
Panther Creek CISD
Plemons-Stinnett-Phillips CISD
Port Arthur ISD
Prairie Lea ISD
Prairie Valley ISD
Pringle-Morse CISD
Quanah ISD
Ranger ISD
Richland Springs ISD
Rising Star ISD
River Road ISD
Robert Lee ISD
Roby CISD
Rochelle ISD
Rockdale ISD
Rocksprings ISD
Roscoe Collegiate ISD
Rotan ISD
Round Rock ISD
Round Top-Carmine ISD
Rule ISD
Runge ISD
San Saba ISD
Sanford-Fritch ISD
Santa Anna ISD
Schleicher ISD
Schulenburg ISD
Shamrock ISD
Shepherd ISD
Shiner ISD
Sidney ISD
Silverton ISD
Snyder ISD
Sonora ISD
Spearman ISD
Spring Creek ISD
Spurger ISD
Stamford ISD
Sterling City ISD
Strake Jesuit College Prepatory
Stratford ISD
Sunray ISD
SUPERnet
Sweet Home ISD
Sweetwater ISD
Texas Leadership Charter Academy
Texas School for the Blind
Texhoma ISD
Texline ISD
The Raven School (Gulf Coast Trade Center)
Thorndale ISD
Thrall ISD
Trent ISD
Tulia ISD
Vega ISD
Veribest ISD
Victoria ISD
Vidor ISD
Vysehrad ISD
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
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Woodville ISD
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Sul Ross State University
Sul Ross State University Rio Grande College
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Texas A&M Kingsville
Texas A&M University Central Texas
Texas A&M University Commerce
Texas A&M University San Antonio
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University of Houston Downtown
University of Houston Victoria
University of Houston-Clear Lake
University of Mary Hardin-Baylor
University of North Texas at Dallas
University of North Texas Health Science Center
University of Texas at Tyler
University of Texas Health Science Center at Tyler
University of Texas Permian Basin
West Texas A&M University

OTHER

Alamo Area Council of Governments
Brazos Valley Affordable Housing
Brazos Valley Council of Governments
Brazos Valley Council on Alcohol and Substance Abuse
Brazos Valley Small Business Development Council
Bryan/College Station Chamber of Commerce
Citizens Medical Center
City of Austin
City of Denton
City of San Angelo
Department of Information Resources
Duncanville Public Library
Guadalupe Valley Hospital
Houston Methodist Hospital
Houston Museum of Natural Science
Lower Colorado River Authority (LCRA)
Metropolitan Transit Authority of Harris County [METRO]
Mission Hospital
NOAA
Orange County
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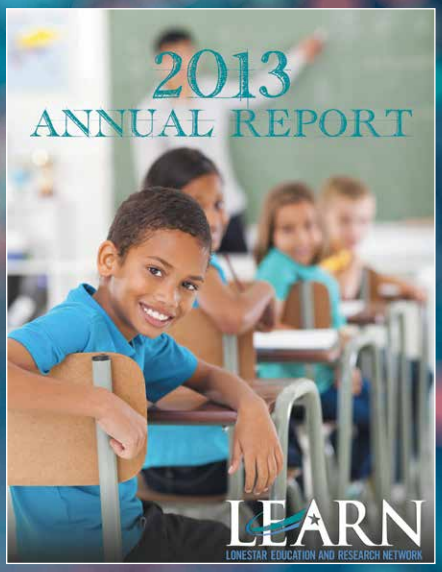

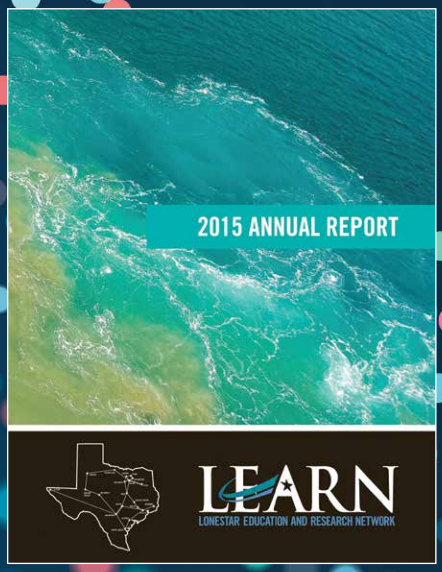

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