ANNUAL REPORT

Activities and Achievements of the CEN Member Network

2020

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CONNECTICUT EDUCATION NETWORK
55 FARMINGTON AVE. HARTFORD, CT

2020 Annual Report

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Member Colleagues,

As we reflect on 2020, themes of perseverance, resilience, and collaboration ring clear throughout the tech community as life was permanently changed due to the COVID-19 global pandemic. While terms like 'uncertain times' or 'unprecedented' have become cliché when describing the impacts the coronavirus pandemic caused, they certainly are descriptive of how rapid change and adaptation though social distancing and hybrid work/learn schedules rippled through the community with permanent effects still to come.

Ryan Kocsondy
CEN Director

Through this, the Connecticut Education Network (CEN) continues its active commitment of fulfilling our five-year strategic plan introduced in early 2019. Developed in concert with our member community, in the past year we have upheld our new mission and vision. Our plan captured the needs of the community as we continue to leverage the CEN platform and engage, innovate, and expand service offerings. With the pandemic on our doorsteps, we worked diligently with members to understand the implications of the COVID-19 crisis, and its effects on IT responsibilities for on-premise vs cloud hosted services and hybrid models for telework, telemedicine, and distance learning.

As we look to close out this decade and hope for a speedy return to "normal," we want to celebrate the positives that 2020 has brought us. Through the pandemic we were able to welcome 36 new partners into our member community, made additional capacity available through the Bandwidth Bonus program, and furthered our commitment to our member first approach by announcing a 2% rate reduction across the board. CEN IS our membership, is celebrating 20 years of serving our state's community anchor institutions, and our commitment to our members remains unwavering.

We appreciate your flexibility and resiliency this year, and your continued support.

Ryan Kocsondy

1.8 mill +
Citizens Served

CEN and its member institutions provide connectivity to nearly half the population of the state throughout the calendar year delivering on its mission and vision to provide value beyond connectivity to the Internet.

649
Member Institutions

2020 marked another year of consistent membership growth and retention. 26 new member organizations plus 20 new circuits for existing members extends the CEN footprint and increases its reach to more Connecticut citizens.

$30.2 mill
Cost Avoidance Savings

In 2020, members realized cost avoidance 'savings' of more than $30.2M. Up $5M from last year, the CEN platform continues to deliver unprecedented ROI to its member and the State of Connecticut.

819
DDoS Attacks Mitigated

Distributed Denial of Service (DDoS) attacks render Internet connections inoperable causing devastating operational disruptions. CEN's DDoS protections save countless hours and expense by ensuring networks remain up even while under attack.

68
Advisory Council Members

Member representatives participate in and lead advisory councils improving engagement and services through the Engagement & Development Advisory Council and Technical Service Advisory Council.

10
Full Time Staff

The size of the CEN team remains consistent while the physical network and suite of services continue to grow demonstrating a high level of productivity and efficiency in fulfilling the mission and vision.

The network has an aggregate uptime of 99.99 % and maintains very high levels of service even when individual components fail.

99.99%
Uptime

CEN continually monitors and graphs port performance across the infrastructure measuring capacity, availability, and error count of each interface ensuring a high-quality experience.

21,925
Active Ports

The network is built out of a system of complex interconnected devices that are performance tuned and monitored 24x7. With a 158:1 ratio of managed device to technical staff, CEN operations are highly efficient and effective.

784
Network Devices Managed

Down 10% due to COVID related work/learn from home, the network transfers a tremendous amount of content supporting member operations in education, healthcare, state and local government, research, and business administration.

207.5 PB
Data Transferred

Purpose built for performance and capacity; the network can handle the most demanding environments in support of CEN member needs.

2.14 TBPS
Backbone Capacity
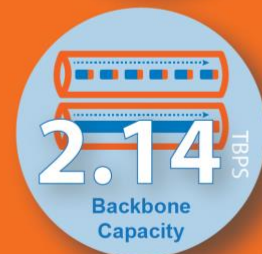
The 24x7 Network Operations Center (NOC) and technical staff respond to incidents assisting members with problems and inquiries. Nearly half of the incidents are initiated by CEN technicians addressing issues in a proactive manner.

2612
Incidents Closed

2020 Annual Report

Goals & Strategies

The goals and strategies in this plan represent the needs of the community and the overall approach to what CEN must do to remain competitive and relevant (Goal 1), to differentiate itself from commercial counterparts and ensure continual alignment with our members (Goals 2-4), and to provide foundational support of the overall platform on which all other goals depend (Goal 5).

Vision

CEN serves as the trusted partner through which Connecticut's digital and human networks connect, collaborate, and share resources to realize the full potential of digital learning, research, and citizenry.

Mission

Empower our member institutions to execute their missions through technology, collaboration, and digital transformation with secure, reliable, and value-added network and Internet solutions.

2019-2024 STRATEGIC GOALS

1 | Provide Value - Expand the service portfolio to provide value and enhance Internet and network capabilities at scale, heighten security, and increase the overall knowledge and understanding of those technologies and services.

2 | Ignite Innovation - Empower members through a suite of services tailored to their needs that encourage excellence and innovation.

3 | Foster Collaboration - Engage the local membership and national R&E community to provide technical and functional network services that serve the specific needs of CEN member communities.

4 | Promote Advocacy - Pursue activities to enhance brand awareness such that members and policy decision makers are engaged in activities to help articulate CEN's value proposition and impact public policy initiatives.

5 | Enhance Core Resources - Pursue opportunities to leverage, develop, and enhance CEN's core technology and human resources for the foundational success of the program in pursuit of member needs.


Goal 1: Provide Value

Providing value to members continues to be CEN's top priority. CEN delivers value through the inherent design and operation of a network that is unique compared to the competition and through service initiatives that deliver measurable savings and efficacy for CEN's members.

CT Libraries Fiber Consortium Project

The CT Libraries Fiber Consortium Project continued in its fifth year of connecting Connecticut libraries with the assistance of federal E-rate and matching Connecticut State Library bond funds. Many of the sites are in underserved communities where connectivity options have remained relatively unchanged for decades. This project provides high quality service at reasonable costs to bridge gaps in the digital divide and to help libraries continue to thrive as community assets. The current project across all phases (1-5) will bring total fiber-connected libraries to 168 (including 47 branches), representing 70% of all 239 libraries statewide. In Phase 5, an additional 17 sites have committed to the project. The total savings on funding years 1-5 are $1,680,360 (FCC/USAC E-rate dark fiber IRU savings). In January 2020, CEN was awarded a sixth phase for 2021. Phase 6 will target the remaining eligible libraries.

DDoS Mitigation Service

CEN's Distributed Denial of Service (DDoS) detection and mitigation service protects members from an increasing number of attacks that can disrupt and even halt Internet-based service and operations. CEN's DDoS Mitigation Service prohibits the attack with little or no interruption in member Internet service. Without CEN's DDoS mitigation service, member
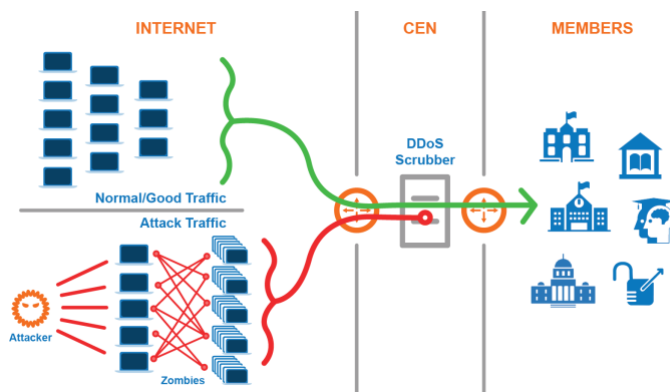
organizations would experience a significant interruption in their Internet service and be forced to buy costly emergency DDoS mitigation services. CEN's DDoS mitigation service protects member's Internet facing resources 24x7, saving them time and money and providing peace of mind. These services are included in member's Internet access offering at no additional cost.

Threat Mitigation System (TMS) Overview

Number of TMS Mitigations	Volume of Traffic Passed by TMS	Volume of Traffic Dropped by TMS	Volume of Largest TMS Mitigation	Rate of Largest TMS Mitigation	Duration of Longest TMS Mitigation
833	20.80 TB	45.26 TB	6.49 TB	19.99 Gbps	27d 10h 48m
↓14.83%	↑158.31%	↑33.90%	↑73.28%	↓0.21%	↑3047.78%

Denial of Service (DoS) Alert Summary

Number of DoS Alerts	Volume of DoS Alert Traffic	Volume of Largest DoS Alert	Rate of Largest DoS Alert	Duration of Longest DoS Alert
8464	257.40 TB	10.30 TB	61.03 Gbps	2d 19h 21m
↓22.75%	↑48.36%	↑33.33%	↑58.58%	↓13.23%

Cost Avoidance

CEN's portfolio of services generated estimated savings of $30.2 million in annual cost avoidance for member organizations in 2020. The savings were calculated comparing the CEN member cost to the alternative cost for members procuring the same services individually.

CEN Service	Aggregated CEN Cost	Alternative Member Cost	Comments
Internet Access	$6.8 M	$12.6 M	Compared to average service cost in MA/NY/RI
DDoS Mitigation	$122 K	$22.8 M	Compared to MS Azure subscription price of $2,944/month
iBoss Filtering	$226 K	$613 K	Comparison of best alternate consortia rates.
Securly Filtering & Student Safety	$734 K	$1.4 M	Comparison of best alternate consortia rates.
Bandwidth Bonus	$41 K	$774 K	Assumes member utilization for an average of 9 months.
Totals	**$7.9 M**	**$38.1 M**	**Cost Avoidance of $30.2M**

PEGPETIA Grant (http://www.ct.gov/pura/cwp/view.asp?Q=490944&puraNav_GID=1702)

The Wadsworth Athenaeum, The Mystic Aquarium and Sea Research Foundation, and Goodwin University were awarded PEGPETIA grant funding to connect to CEN and join the community. This initiative provides these members with a significant upgrade in the speed, capacity, and

reliability of their vital Internet connection and direct access to CEN resources and other network members.

FY22 Bandwidth Pricing Reduction

CEN's continued membership and service delivery growth combined with aggressive cost management has enabled a bandwidth price reduction for FY22, beginning July 1, 2021. This price reduction averages 2% across all bandwidth tiers providing savings to CEN members of all sizes. Based on FY21 bandwidth tier subscriptions, this price reduction will save the CEN membership more than $35K per month in FY22. This price reduction continues CEN's 20-year history of annually reducing or maintaining member bandwidth pricing. In comparison, many local commercial broadband providers raised rates and/or fees beginning Jan 1, 2021.

Pandemic Response Leadership

The COVID pandemic created numerous technical and operational challenges for our community. CEN demonstrated its commitment to the member value proposition by quickly extending the following additional services to member organizations.
- Bandwidth Bonus Program
- 1:1 and Student Safety for Learning at Home
- Field Hospitals Startup and Support

Bandwidth Bonus Program

With the sudden shift to remote learning in 2020, Connecticut K-12 schools, colleges, and universities had to quickly transform their teaching and learning models. With many schools choosing to run on a hybrid classroom schedule, their bandwidth demands increased substantially. CEN's Bandwidth Bonus Program provided K-12 members with more bandwidth to meet these demands with minimal impact on their operating budgets.

1:1 and Student Safety for Learning at Home

CEN's 2020 partnership with Securly provided K-12 members with trusted CIPA filtering and student safety management for K-12 learners in-class and at-home with significantly discounted member's only pricing. Securly also provides full visibility into student's online activity, coverage, and security wherever the device is in use, and scans in real-time with AI based notifications for nudity, bullying, self-harm, and/or violence. Currently, 28 member K-12 districts are utilizing the partner program providing total cost savings of $619K.

CEN's longstanding partnership with iboss continued to grow with the 2020 deployment of the iboss Cloud Service as an added tool for CIPA compliant web filtering on individual devices, necessary for 1:1 and at-home learning initiatives. To date, 39 member K-12 districts and two libraries have enabled the iboss Cloud service for 134,390 individual learners. The iboss Cloud (and CEN hosted) services are included at no additional cost in K-12 and libraries member's bandwidth subscription.

Field Hospitals Startup and Support

CEN supported connectivity to Connecticut's multiple COVID Field Hospitals at our member partner institutions. The CEN team collaborated with state universities, health care providers, the National Guard, and state organizations to quickly supply the necessary connectivity for vital Internet and network resources in a matter of hours/days. As the field hospitals were decommissioned, connections at the state universities were re-used for clinical providers administering COVID tests.

Membership Growth

CEN continues to expand its membership base and its connectivity services for existing members. In 2020, membership grew by 26 to 649, or 4.2%, from a base of 623 at the end of 2019. Current member totals are tabulated below. In addition to new members, 20 new connections were built to serve additional locations for existing members.

	Public K-12 Entities	Private K-12 Schools	Public Colleges & Universities	Private Colleges & Universities	Public Libraries	Municipal Gov't	Public Safety	State Gov't Branches	Open Access
Connected	186	21	19	19	160	112	89	3	40
CT Total	194	106	19	20	238	169	n/a	3	n/a
% of Total	96%	20%	100%	95%	67%	66%	n/a	100%	n/a

2020 New Members:

- The Community Foundation for Greater New Haven
- News 12 Networks
- East Granby Fire and Rescue
- Ansonia Police Department
- Watertown Police Department
- Town of Madison
- Stonington Free Library
- Acton Public Library – Old Saybrook
- East Hampton Public Library
- Town of Winchester
- Stonington Police Department
- Mystic & Noank Library
- Ferguson Library - Stamford
- Goodwin University
- Winsted Fire Department
- Winchester Volunteer Fire Department
- Quinebaug Valley Emergency Communications, Inc.
- Global Jet Services
- Pomfret Library Public
- Sprague Public Library
- Park City Prep Charter School
- Andover Town Hall
- Cross Street Fire Department Middletown
- Litchfield Historical Society
- Connecticut Judicial Branch
- North Branford Police Department
- North Branford Fire Department
- Hayward Volunteer Fire Co. Colchester
- Newington Community Television

2020 New Connections (for existing members):

- University of Saint Joseph School of Pharmacy
- University of Saint Joseph School for Young Children
- EdAdvance Terryville, Danbury (x2), and Torrington
- Newfield Branch Library - Bridgeport
- East Side Branch Library - Bridgeport
- Willington Center Elementary School
- Hamden Hall Davis Campus
- Harry Bennett Branch Library - Stamford
- South End Branch Library - Stamford
- Weed Memorial & Hollander Branch Library - Stamford
- Jackson Laboratory - Sacramento, CA
- Albertus Magnus College, student housing
- Yale University Medical Campus

Disconnected in 2020:
- Perkin Elmer
- Village Mortgage
- Elm City Prep (Achievement First)
- Stamford Academy

The 'Nutmeg Network' – The CEN:PSDN Partnership

The Nutmeg Network, conceived in 2009, is a term to describe two purpose built statewide networks: the Connecticut Education Network (CEN) and the Public Safety Data Network (PSDN). Combined, they connect over 1000 points of presence across the state and provide service to nearly every community anchor institution through resilient, flexible, fiber based, high-performance networks.

> CEN, established in 2000, serves at Connecticut's 'Trusted Internet Partner' supplying high-performance and high-capacity Internet, peering, and value-added services to schools, colleges and universities, libraries, state and municipal governments, healthcare, research, and open access institutions.

> PSDN, established in 2009, serves as the primary provider of a secure, closed communication network, connecting first responders to statewide services such as E911, COLLECT, and shared radio 'P25' system.

This unique partnership, the 'Nutmeg Network,' allows for the State of Connecticut to provide unparalleled connectivity to community anchors. Directly connected PSDN entities such as local police, fire, and municipal governments, can gain access to CEN's high performance Internet service through their existing PSDN connection where capacity allows.

Goal 2: Ignite Innovation

The CEN team, in collaboration with member advisory councils, ignites innovation by creating, expanding, and delivering services tailored to meet specific member needs.

Firewall Service

The CEN Firewall Service https://ctedunet.net/managed-firewall/ provides an enterprise grade, high availability, high capacity, next generation firewall protection service that can easily scale with member bandwidth growth. Enhanced security is a priority need for members, and CEN has leveraged economies of scale to procure and implement a solution larger and more feature-rich than what members would otherwise utilize on their own. There are currently two E-Rate eligible versions offered. The CEN Virtual Firewall Service offers

members a co-managed solution whereby member IT staff directly manage their rule sets, policies, and on-going monitoring and alerts. The CEN Managed Firewall Service allows members to off-load firewall setup, management, and monitoring to CEN's Managed Security Service Provider (MSSP) providing a significant reduction in member IT staff workload and an enhanced level of management. Currently, 16 members have subscribed to the service.

Cloud Connect Service

The CEN Cloud Connect Service (https://ctedunet.net/cloud-connect/) provides direct connectivity to the major cloud providers at scale to benefit member's business and service needs. In partnership with Internet2, *no-cost transport* is available for community anchor institutions to Amazon Web Services, Google Cloud Platform, and Microsoft Azure Express Route. Since it was announced in April, four members have subscribed and are in various stages of progress.

Rapid Private Interconnect Service

CEN's Rapid Private Interconnect (RPI) service offers dedicated ports, bandwidth, and cross connects to any NEREN and/or Internet2 POP (Points of Presence) regionally and nationally. For members who require dedicated physical connections or capability, diversity, and/or increased security, RPI offers dedicated 10 Gbps connections in a fee-based model.
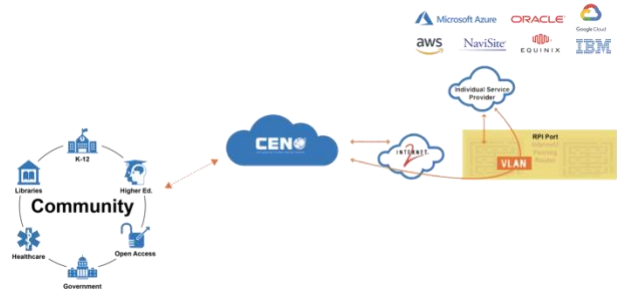
Eduroam

The goal of Eduroam (https://www.eduroam.us/) is to reduce the student digital divide and to provide a more seamless network access experience. Tom Dillon, CETs Infrastructure Advisory Council Chair, is coordinating activities with the support of CEN. Pilot program participants include: Metro Hartford Information Systems (MHIS), Trinity College, Middletown Public Schools and Library, Wesleyan University, New Haven Public Schools, SCSU, and Stratford Public Schools. The City of New Haven has also committed to the service as part of their COVID pandemic response.

Goal 3: Foster Collaboration

CEN was created and built on a model featuring collaboration. For over 20 years, these collaborative efforts are apparent in the unique processes and projects CEN undertakes with its members and vendor partners. These efforts begin with CEN's member advisory councils and member engagement events which provide the primary forums for establishing CEN's goals and initiatives.

CEN Member UNconference

Due to the COVID pandemic, the format of CEN's Annual Member Conference was revised for safe engagement, and its content was designed to meet member's rapidly changing technology needs. The CEN Engagement and Development Advisory Council (EDAC), chaired by Karen Warren of Wesleyan University and Rebecca Osleger of Suffield, provided the leadership in developing an agenda of eight sessions delivered virtually as the CEN UNconference.

THE UNCONFERENCE

Topic	Number of Attendees	Date
Keeping Students Safe at Home - Featuring Securly	39	6/17
Keeping Students Safe at Home - Featuring iboss	27	6/25
Network Recommendations in the Age of COVID-19	71	7/16
Data Privacy and Contact Tracing	86	7/22
Effective Vulnerability Management with MERIT	35	8/13
Using Personas for Accessible Design	19	9/30
No-Cost Cybersecurity Tools and Resources with the MS-ISAC	55	10/21
Goodness Gracious, Great Walls of Fire: CEN's Border Firewall for Advanced Protection	41	11/13

Volunteer Cyber Incident Response Team

From June to September, 24 participants met for the Volunteer Cyber Incident Response Team (VCIRT). CEN's Director Ryan Kocsondy represented CEN. The initiative was similar to the CEN member mutual aid concept discussed with the membership in 2019, and it was decided to table the CEN initiative and contribute to the DESPP initiative with similar goals. Unfortunately, after four months of discussions, the group was unable to reach a consensus on a unified framework for a volunteer cyber incident response team. Committee co-chairs from CIRMA and National Guard called a vote for 4 options presented and discussed (1- National Guard,

2-CTIC, 3-Mutual Aid, 4- Continue Working Towards Goal). Nine of the 24 participants responded and voted; the National Guard proposal received 5 votes while the Continue Working Towards Goal received 4. Committee chairs presented the summary to the Sate Cybersecurity Committee in late September.

Virtual CEN Member Town Halls
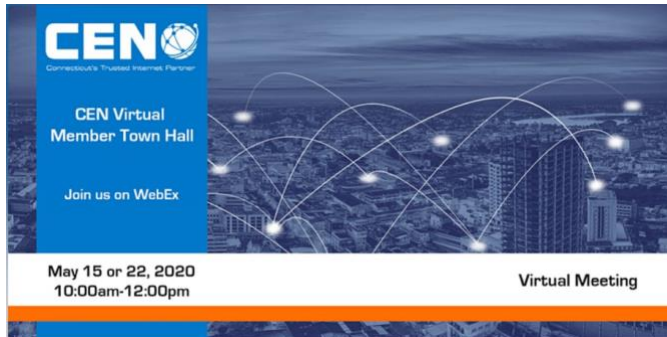
The CEN team hosted two virtual Member Town Halls in May to present CEN network and service updates, to solicit member feedback and input on needs, and to facilitate a forum for sharing solutions to common challenges. 129 CEN members attended, and the agenda included:

- Cloud Update (Peering, Cloud Connect, RPI)
- Network Enhancements (NYC connection)
- 1:1 Initiatives

- Filtering & Student Safety (iboss Cloud & Securly)
- Member Conference Plans
- Advisory Council Updates
- Open Forum

Members Spotlights

This year, CEN worked with the member community to create Member Spotlight articles. For over 20 years, CEN and our members have built a unique collaboration of innovation, creativity, and value for the benefit of Connecticut students, researchers, educators, municipal and state leaders, librarians, technicians, business owners, and our state citizenry. CEN's first Member Spotlight profiled the Central Connecticut State University / CEN partnership to create CCSU's state of the art E-Sports Gaming Center. These articles can be found under the Engagement tab of CEN's website (https://ctedunet.net/spotlightarticles/#).

Goal 4: Promote Advocacy

CEN connects community anchor institutions in every Connecticut town and city. Beyond the physical connectivity network, CEN's network of organizations and people enable its leadership role in advocating for community needs in multiple areas including technology, security, and digital learning.

Office of the Governor – Broadband Deployment Group

Director Kocsondy participated in the Governor's initiative to address technology and broadband issues amplified by the pandemic. The near-term goal was to provide solutions to address remote learning, telehealth, business, and other activities through the COVID crisis. The first output in response to this need is the Everyone Learns Initiative. This initiative offers $43.5M in state funding to help bridge the digital divide through a 3-pronged approach providing funding for student devices, residential connectivity, and Wi-Fi hotspots. Also discussed were issues related to broadband mapping, last mile connectivity, make ready provision on utility poles, and overall competitive options for residential broadband.

Everyone Learns Initiative – Wi-Fi Hotspot Project

https://ctedunet.net/everyonelearnswifiinitiative/
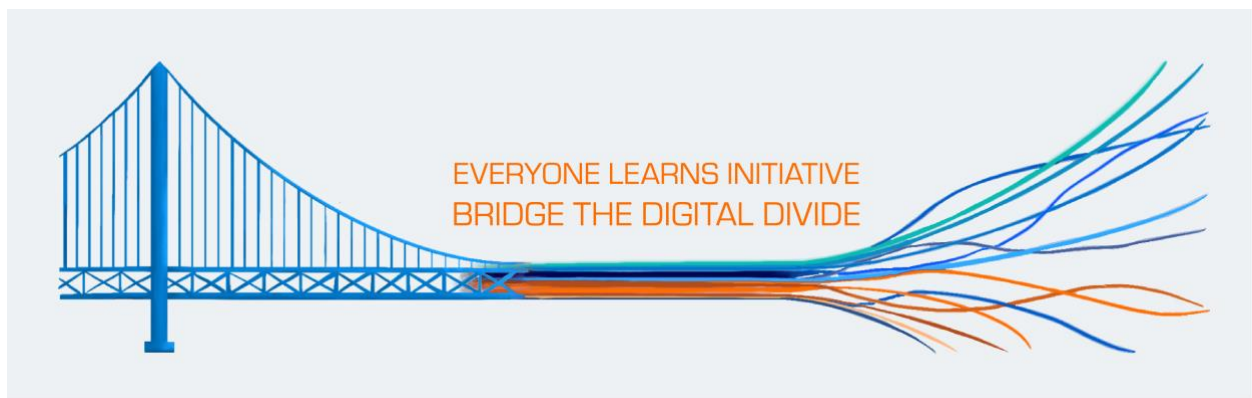
In late 2020, CEN undertook efforts to help reduce the digital divide in Connecticut. In conjunction with Governor Lamont's Everyone Learns Initiative, CEN led the project to bring connectivity to those who need it the most with the installation of public Wi-Fi hotspots targeting the 40 Connecticut cities and towns with highest percentage of residents without access to broadband internet. Goals of the project were to:

- Leverage the network and member locations to provide Wi-Fi Hotspots across 40 targeted towns and cities
- Maximize authorized funding to provide walk-up/drive up Wi-Fi service through external/on-building mounted 802.11AX wireless access points
- Manage the WiFi service provided at no cost to the member organizations for one year; all projects costs are covered by the Everyone Learns Initiative
- Provide lasting impact by donating the wireless access point to the participating member location to run at their discretion after the first year for use

Regional and National Collaboration

The Quilt

CEN Director, Ryan Kocsondy, was elected Chair for The Quilt CEO Roundtable. He currently serves as the Secretary of the Board and is a member of The Quilt Executive Committee.

The Quilt is the national coalition of non-profit U.S. regional R&E (research and education) bodies representing 40 networks across the country. Quilt members provide advanced network services and applications to more than 900 universities and thousands of other educational and community anchor institutions. The goal of The Quilt is to promote consistent, reliable, interoperable, and efficient networking services that extend to the broadest possible community and to represent common interests in the development and delivery of advanced cyberinfrastructure that enables innovation through education and research.

SHLB

CEN became a member of the Schools, Health & Libraries, Broadband Coalition (SHLB) organization that promotes broadband for anchor intuitions and their communities helping fulfill their mission: *"For every anchor institution in the country to have affordable, high-quality broadband that serves the needs of the institution and is open and accessible to the surrounding community."* Doug Casey, Executive Director of the CET, represents CEN, the CET, and Connecticut as a board member.

CEN supported a letter to advocate for full funding of FCC efforts for broadband mapping which must include Community Anchor Institutions, who to date have been left out. Mapping efforts historically focus on residential and business, and this effort is to ensure a more comprehensive approach and to set a new baseline impacting future policy decisions. SHLB was able to acquire 55 signatories from various states in support of this cause. The Broadband Mapping Letter was sent to Congress on December 4th.

Internet2 Community Anchor Program

CEN worked in collaboration with the CAS (Connecticut Association of Schools) and Internet2 CAP (Community Anchor Program) to present free remote learning opportunities for Connecticut K-12 schools, made available through CEN's partnership with Internet2. The event showcased a number of resources including but not limited to connecting with scientists to remotely operate an electron microscope, learning about our nation's presidents from real historians, and touring US national parks with national park rangers.

On October 15th Internet2 held a Community Anchor Program Presentation. Rachael Collard, CEN Marketing and Communications Coordinator, represented CEN as a panelist on 'Next Steps for Research & Education Networks: learning from the Pandemic.' This program included 12 CAP presentations on lessons learned through COVID and how to leverage this newfound urgency to produce results and reach new communities.

Goal 5: Enhance Core Resources

CEN's bedrock of core resources are its physical assets and the team that converts those assets into services of value for the benefit of all members, their communities, and the State of Connecticut. CEN continually strives to enhance the capabilities of these core resources to ensure the long-term success of the CEN program and its members organizations.

The Network

The platform for all CEN activities and the overall success of the program is the physical network itself. The network is an asset comprising multiple layers of fiber and equipment that provide connectivity to all corners of the state. The network once again attained an aggregate 99.99% uptime, even when failures impacting the core and backbone connectivity brought down portions of it. Daily peak bandwidth topped out at 123 Gbps, up from 104 Gbps last year, and passed a total of 207.5 PB of traffic, down from 234 PB primarily due to the COVID crisis and mass exodus to remote work and learning during the spring and early months.

2020 Network Statistics

Backbone Capacity	Total Traffic (Up/Down)	Network Devices Managed	Active Interfaces (ports)	Peak Traffic	Backbone Availability	Core Node Availability	Aggregate Availability
2.14 Tbps	207.5 PB	786	21,925	123 Gbps on 2020-02-04 13:39:00	99.98%	99.99%	99.99%

CEN Team

CEN's staff are key to the success of the program. This year, Fiscal Manager, Rori Ziegwied, joined the CEN team in a split position with UConn ITS. In addition, Deanna LaVoie joined the team as a special payroll graphic illustrator, and Richard LeFave continued his valued service as a volunteer consultant. In total during 2020, CEN had 10.5 full-time staff members, a special payroll position, a volunteer consultant, and 5 part-time student workers.

Rori Ziegwied
Fiscal Manager

Deanna LaVoie
Graphic Illustrator

Dick LeFave
Consultant

GlobalNOC

In addition to CEN's full-time technical staff, CEN members have access 24/7/365 to staff from the network operations center to resolve issues quickly. GlobalNOC provides world-class, carrier-grade support in network monitoring, engineering, and software development to Research and Education Networks across the US. Because they are part of the R&E Community, they understand CEN member needs and function as an extension of the CEN technical team.

Server Infrastructure Upgrades

CEN completed a server infrastructure replacement project this year implementing the Nutanix solution. New compute infrastructure was acquired to replace ageing equipment, and CEN will continue to invest in this infrastructure in FY21. This replacement will save staff management time, increase capacity and resiliency, lower power consumption, and reduce rack space.

Internal Security Architecture Update

Technical staff implemented a privileged access management and password solution to further protect the 'keys to the kingdom' and enhance security. The new solution manages and audits privileged accounts, provides alerts of any abnormal use of credentials, assures adherence to compliance standards, and stores all passwords in a secure vault.

The internal infrastructure firewall design and architecture was overhauled, and multiple DMZs were implemented to micro-segment functional service. In addition, a new remote access VPN gateway service was introduced enabling secure remote work just prior to COVID crisis becoming reality.

Domain Name System (DNS) Service Upgrades

CEN partially upgraded its DNS Service infrastructure with the implementation of the Infoblox PT Appliances supporting authoritative DNS hosting for members. This upgrade provides additional built-in DDoS mitigation within the appliances for added protection. This service also enables DNS firewall and BloxOne threat intelligence capabilities for 1:1 needs and agent-based reporting as a no-cost member service included with bandwidth commitments.

Core Infrastructure Consolidation

Throughout the year, staff reviewed configurations and further optimized traffic flows by consolidating existing member peering off legacy equipment onto more capable hardware for added stability and ease of support. Configuration management is never exciting; though, it is a necessary component to keeping the network up to date for providing resilient and scalable services.

Hubsite Upgrades

$1.5M of Connecticut bond funds were allocated to the replacement of devices at the distribution layer of the network that are at end of life / end of support. These hub sites serve intermediate connection points for member sites throughout the network. These new devices replace old in eighteen locations with enhanced uplink port speed and capability, reduced power consumption, and reduced rack space use. Even higher capacity devices with greater capacity edge ports and uplinks will be deployed in the four busiest parts of the network. Designs have been completed, equipment received, configuration templates built, and implementations started in late 2020 and with completion in 2021.

Extranet Projects

In collaboration with the North East Research and Education Network (NEREN: MA, ME, NH, NY, RI, VT), CEN's capability and reach was extended into the two busiest telco areas in the Northeast, Boston and New York City (NYC) in 2019. In 2020, connectivity into Boston and NYC has resulted in more diverse Internet options, lower commodity Internet pricing, increased commercial peering, new backhaul opportunities to Ashburn (VA) and Chicago, and peering partnerships with other Regional Optical Networks (RONs) within the research and education network space. When complete, the extranet project will align a Tier 1 Carrier/ Backbone Internet Service Provider and Internet2 to each of the 3 Core sites at 100 Gbps handoff each.
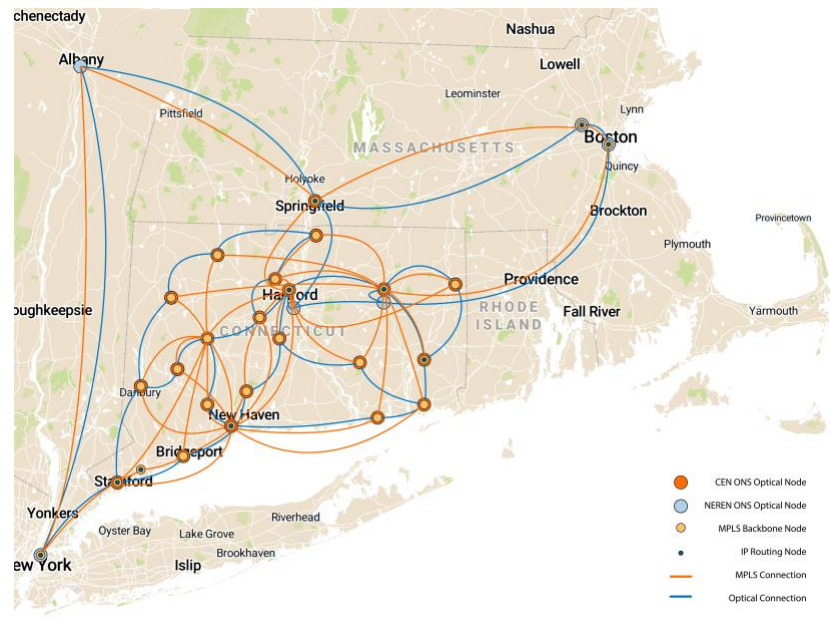
With capacity established in 2019 in Boston and Cambridge, Massachusetts, 2020 realized an increased peering to 30 Gbps in the Mass-IX exchange and a direct peer with our NEREN colleague OSHEAN at 40 Gbps. In February 2020, CEN provisioned 2x100 Gbps connectivity at the 32 Avenue of the Americas, New York City, data center. At this data center in March 2020, CEN provisioned a 100 Gbps link (60 Gbps commitment) with the DE-CIX global peering exchange allowing for 10 Gbps peer to Apple on April 8th and another 10 Gbps to Microsoft on April 27th, and an additional 30 Gbps with Google. At that same location, CEN also implemented a second 100 Gbps connection to Internet2 adding resilience and capacity to the national R&E fabric and cloud connect options.

Financial Performance

CEN continued to deliver value added products and services to its members despite the COVID challenges discussed in the earlier sections.

With state appropriations completely removed and little chance of returning, revenue from member billings is projected to increase in FY21 due to incremental growth of network services and a one-time passthrough project estimated at $1M. FY21 includes a 2% ISP rate reduction.

On the expense side of the ledger, CEN has continued its investment in both product/services infrastructures to ensure excellent service delivery as well as augmentation of development resources to deliver expanded new programs such as a member portal and the pass-through project mentioned earlier. In addition, increases in the staff line item reflects positions carried over from FY2020 and planned to be filled in 2021. Increases in maintenance and support reflect the expansion of the infrastructure supporting current and new members.

FY20-2021 CEN Operational Performance ($)
July 1 - June 30

	FY20 Actual	FY21 Projected	
Revenue			
State Appropriation	$ -	$ -	
Member Billing	$ 5,835,423	$ 7,005,338	(1)
Member Billing AR	$ 318,482	$ 286,863	
USAC (E-rate) Reimbursement	$ 1,808,708	$ 1,500,000	
Member Conference	$ 92,570	$ 455,000	
Member Conference AR	$ -	$ -	
Total Revenue	$ 8,055,183	$ 9,247,201	
Expenses			
Staff (Salary & Benefits)	$ 1,705,060	$ 2,413,601	(2)
CET (Salary, Benefits, SW)	$ 327,287	$ 360,059	
Contractual	$ 1,367,819	$ 1,310,121	(3)
Fiber & Fiber Maintenance	$ 2,228,436	$ 2,495,003	
Hardware	$ 584,473	$ 839,305	(4)
HW & SW Maintenance	$ 917,737	$ 1,148,624	(5)
Member Conference	$ 135,603	$ 383,720	(6)
Professional Services	$ 4,862	$ 210,200	(7)
Total Expenses	$ 7,271,277	$ 9,160,633	
Gain / (Loss)	$ 783,906	$ 86,568	

(1) FY21 includes $1M offsetting revenue & expense for TIIP Project
(2) Position searches for 3 planned roles in FY21
(3) Projected includes TIIP project passthrough monies
(4) Projected includes TIIP project passthrough monies
(5) Increased HW purchases in projections since MOU established
(6) FY21 Projected revenue and expense related to planned in person event; conference will be virtual due to COVID19
(7) FY21 projected towards professional services for Member Portal & TIIP project

2021 Outlook

As we look ahead to 2021, we hope for a return to normalcy for our member community. As COVID-19 hopefully wanes and we can resume regular operations, we can take advantage of the positive aspects of the rapid technological changes COVID brought about for remote work, learning, and telehealth. A look back at the pandemic and lessons learned will also help provide context for our community's strategy moving forward. We will re-assemble the core group and re-engage the membership for a mid-point check in as well as future visioning activity. CEN wants to thank our membership again for working with us these past months to provide resources and support to help overcome the uncertainties from the pandemic that we could not have foreseen. Thank you again for your flexibility, resiliency, and perseverance, and we hope 2021 will bring even more success and growth for our community.

Acknowledgements

CEN leadership would like to formally acknowledge and thank:
- The CEN staff for their dedication and diligent work in support of the network
- The CEN membership for their loyalty, perseverance, and resilience
- The Commission (CET) for their leadership and advocacy on behalf of the program
- Mark Raymond, CIO for the State of CT, and Michael Mundrane, VP & CIO for UConn, who serve as trusted advisors to the program
- Doug Casey for his thoughtfulness, leadership, and advocacy for CEN through the CET
- Governor's office and the legislature who are critical and integral to CEN's long-term success
- Richard LeFave for his volunteer efforts in support of CEN and other state entities

In Memory of George Medeiros
September 29, 1964 - January 1, 2021
In 2008 George joined the State of Connecticut, BEST team as an IT Subject Matter Expert specializing in fiber optic network design and engineering support. George was a longtime colleague and friend to many on the CEN and DAS-BEST teams, as he was a foundational team member and leader who interacted with so many over the years. George was passionate about music and motorcycles. He loved to ride. George, although quiet by nature, had a quick wit and a great sense of humor. George was a true family man. His family was everything to him. George was kind, caring, loving, wise and selfless man. He will be forever loved and dearly missed.