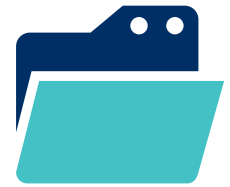


State K-12 Broadband Leadership 2019

Connecticut Case Study



STATE K-12 BROADBAND LEADERSHIP

Connecticut is committed to ensuring scalable, high-performance, cost-efficient broadband to its public schools and libraries. The [Connecticut Commission for Educational Technology](#) (Commission), created in 2000, serves as the educational technology advisor to schools, libraries, and institutions of higher education and started with a mission to connect public schools and libraries to the internet. The Commission created and oversees the [Connecticut Education Network \(CEN\)](#), the first among — and one of only a few — state networks in the country to connect every district to fiber. CEN connects virtually every institution of higher education as well as 62% of libraries in the state, in addition to serving as the primary public resource in K-12 broadband provision and support in the state. CEN is a member of Internet2 and The Quilt, both of which help with policy and advocacy for K-12 and other anchor institutions. In addition to acting as the governing body of the Network, the Commission has worked with advocacy groups such as EducationSuperHighway to provide no-cost technical and procurement support to districts through the Connecting Connecticut Classrooms (C3) initiative. The [Connecticut Department of Education](#) advises on E-rate, and the [Connecticut Office of Consumer Counsel](#) has undertaken research and advocacy efforts to help ensure access to affordable broadband to communities and learners outside of traditional institutions. In addition to these state entities, six [regional service centers](#) offer fee-for-service technical support to districts.

1.8 Million Citizens Served

Community Anchor Institutions	Public K-12 Districts	Public Colleges & Universities	Private Colleges & Universities	CT Public Libraries	CT Municipal Government	CT Government Branch	Open Access
Connected	170	19	17	144	102	2	38
CT Total	170	19	20	238	169	3	n/a
% of Total	100%	100%	85%	51%	60%	66%	n/a

Connecticut does not provide state funding for direct external connections or internal wireless connections. However, since CEN operates on a cost-recovery basis, the network can offer virtually unlimited and low-cost broadband services to the state's schools, colleges, and libraries. CEN members appreciate education-specific services, including bundled Internet and secure transport via multiple 100-Gbps backbones, content caching, CIPA filtering, distributed denial of service (DDoS) mitigation, and managed firewalls. CEN school districts may purchase tiered bandwidth services within 1 Gbps, 10 Gbps, and 100 Gbps fiber optic Ethernet handoff options. Connecticut offers districts the option to purchase from a statewide contract for internal wireless connections. Currently, the state does not plan on funding internal wireless connectivity for school districts but has launched an awareness and education campaign to encourage the use of E-rate funds.

STATEWIDE K-12 EDUCATION BROADBAND NETWORK

The [Connecticut Education Network \(CEN\)](#) was launched in 2000 and in 2005 became the first statewide network in the country to connect every district to fiber. CEN's estimated operating budget is \$6.8 million, of which \$3.2 million is consumed by the K-12 community. Currently, 100% of school districts use the network, serving more than 600,000 students, faculty, and staff. In total, CEN connects 1.8 million citizens statewide.

HIGHLIGHTS

Connecticut's approach to addressing broadband for schools was to build a regional statewide network to provide ubiquitous and equitable service and connect all districts as well as other educational institutions such as regional education centers, libraries, colleges, and universities. Connecticut was the first in the country to connect all districts to an all-optical network in 2005 and then in 2013 upgraded all districts to a 1Gbps handoff standard. CEN has set a high bar for internet service in the state and region.

Connecticut Education Network (CEN)



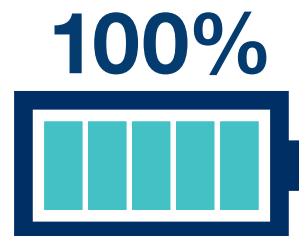
Launch Year
2000



\$7 Million
Estimated
Operating Budget



1.8 Million
Number of Users
Served



100%
of LEAS use the
Network

NETWORK PERFORMANCE

CEN operates an all-optical, high performance, low-latency, multi-gigabit network throughout Connecticut. The fiber footprint brings CEN services to every town, providing ubiquitous and equitable access to all communities. CEN's design, leveraging a meshed network core and resilient edge ring design, brings unparalleled reliability and resiliency to its members. The entire network is specifically tuned for large research-intensive transfers. As a result, CEN can deliver low-latency, intensive Internet and network-based voice, video, and data services. All Internet services include, at no additional cost,

advanced security features such as distributed denial of service (DDoS) detection and mitigation and CIPA Web content filtering. CEN observes the principals of Net Neutrality and provides the ability to burst on demand without penalties, caps, throttling, or otherwise impeding traffic. CEN's partnership with Internet2 allows the member base to connect to other regional networks as well as cloud providers at no additional cost.

CEN provides a 24x7 Network Operation Center (NOC) that monitors the infrastructure for device up/down status, utilization, trend analysis, change management, and event escalation. As part of performance management, CEN analyzes network trends on a monthly and annual basis, including 95th percentile usage; peak usage; data volume; utilization data for business and non-business hours; traffic destined for the commodity Internet, Internet2, peering exchanges, and on-net caches; and DDoS activity.

NETWORK UPGRADE PROCESS

Connecticut's process for providing network upgrades includes capacity management to add additional bandwidth as needed, including failover conditions and customer-funded fiber builds. Connecticut has historically funded network upgrades with state bond funds as well as federal E-rate dollars, awarded for special construction and extensions of the existing network. Connecticut gathers data on customer satisfaction for continual improvement and to help determine network upgrade needs. Data is collected for continual improvement channels via help desk (ticketing) system feedback and time to resolve, word of mouth, and input from members of three advisory councils. Based on this input, the network provides upgrades in a strategic, tactical, and proactive manner. These upgrades serve the broad base of needs from connected members, who provide advice and counsel.

OFF CAMPUS ACCESS

Various state agencies, library consortia, community-based groups, and the State Broadband Office coordinate efforts to support student access to off-campus connectivity. State efforts include the promotion of discounted and free access programs, community partnerships, and connecting anchor institutions. Off campus access strategies are driven by availability in rural and urban areas; affordability in urban areas; and adoption rates, regardless of availability and affordability.

The Commission leads state-level efforts to advise communities on connecting students of all ages to broadband outside of traditional learning institutions and provides guidance across leadership, measurement, resources, and sustainability. The Commission developed the [Digital Equity Toolkit](#), a set of recommended steps and resources to help communities get students of all ages online outside of school, with access to high-quality devices and the skills to make the best use of these learning tools. The Commission is undertaking a pilot program for libraries, institutions of higher education, and schools to connect students throughout their community via the Eduroam authentication framework. Additionally, many communities have undertaken initiatives to raise awareness of low-cost broadband programs (e.g., Comcast Internet Essentials). A number of districts deploy hotspots or 3G-enabled devices to enable students to get online outside the home. Even as schools, libraries, and universities increasingly leverage the power of technology to support teaching and learning, many students do not have access to the devices, broadband, or training they need to learn.

DISTRICT IMPLEMENTATION

Connecticut provides [guidance](#) to districts on external broadband connections between the school networks and the state network on a district-by-district basis. Connecticut references the 2016 SETDA recommendations as a resource for districts as they consider their current and future planning for external broadband connections. CEN also consults directly with schools regarding their external broadband and managed wireless connectivity needs.

Farmington Public School Example

[Farmington Public Schools](#)

highlights how CEN supports teaching and learning in the district, including the unique

relationship between CEN and the district. CEN provides immense support to the curricular needs of Farmington students and teachers. State-mandated online testing and the need for students to develop higher-level competencies in digital learning have driven demand for internet connectivity. CEN provides a ready, reliable, resilient, and cost-effective connection to Farmington schools. This means that our teachers, students, and administrators can connect with subject-matter experts and peer groups, and access the vast amount of digital learning resources available online, anytime. Farmington students of all ages regularly engage with authors, industry experts, and peers via web conferencing technology. Our students are heavily engaged in robotics and computer science, and they leverage Internet2 resources provided through CEN. The benefits of CEN reach beyond basic internet connectivity

to the resilience and reliability of the services that the network provides, such as DDoS mitigation, network monitoring, and content filtering, all at no additional cost. Farmington considers CEN a partner, colleague, and friend in the delivery of a high-quality educational experience to our students.



CEN IMPACT

- Offer reliable and resilient, high-bandwidth connections for E-Sports club competitions.
- Host regional science Olympiad and Lego FIRST Robotics competitions for 300+ attendees with little impact on bandwidth and connection speeds..
- Support multi-location Hour of Code events for K–12 students and the community with no significant impact on bandwidth.

Norwalk Public Schools Example

At [Norwalk Public Schools](#), having a network that is reliable, cost effective and service oriented has been a key factor in the success of our educational technology initiatives. Norwalk has approximately 11,600 students and 2,000 employees. We are a one to one chromebook district currently in grades 6-9 and are expanding this program in the upcoming year. We have over 14,000 district devices (not including personal devices such as phones) connected to our network. Since most of our applications, resources and assessment are online, having a quality network connection is important. The CEN offers support to make sure we can deliver quality instruction and resources to our students. This understanding of a school district's needs is critical, especially to small school systems who may not have the resources to support their environment.



We rely on CEN not only as an internet service provider, but as a partner that understands our needs as a school system.



– Ralph Valenzisi, Chief of Digital Learning and Development,
Norwalk Public Schools

FUTURE PLANS

CEN has just completed its 2019–2024 strategic plan. The plan will move CEN forward in the coming years by clarifying its value to the state and by advancing the needs of its diverse and expansive community. CEN’s goals for the coming years include the following:

- **Provide Value** – Diversify and scale services cost-effectively to enhance Internet and network capabilities, strengthen security, and increase understanding of how to leverage those technologies.
- **Ignite Innovation** – Empower members through a suite of services tailored to their needs that encourage excellence and innovation.
- **Foster Collaboration** – Engage the local membership and members of the national research and education community to develop and share resources and insights that address the professional and technology needs of each member constituency.
- **Promote Advocacy** – Raise awareness and support of CEN’s value by equipping members and policymakers with timely and accurate information about the network.
- **Enhance Core Resources** – Pursue opportunities to further leverage, develop, and enhance CEN’s core technology and human resources for the foundational success of the program in pursuit of member needs.