Public Schools of North Carolina
State Board of Education
Department of Public Instruction

Report to the North Carolina General Assembly

School Connectivity Initiative

SL 2007-323 (HB 1473), SECTION 7.28.(d)

Date Due: January 15, 2020
DPI Chronological Schedule, 2019-2020

STATE BOARD OF EDUCATION

STATE BOARD OF EDUCATION VISION: Every public school student in North Carolina will be empowered to accept academic challenges, prepared to pursue their chosen path after graduating high school, and encouraged to become lifelong learners with the capacity to engage in a globally-collaborative society.

STATE BOARD OF EDUCATION MISSION: The mission of the North Carolina State Board of Education is to use its constitutional authority to guard and maintain the right of a sound, basic education for every child in North Carolina Public Schools.

ERIC DAVIS
Chair: Charlotte – At-Large

ALAN DUNCAN
Vice Chair: Greensboro – Piedmont-Triad Region

DAN FOREST
Lieutenant Governor: Raleigh – Ex Officio

DALE FOLWELL
State Treasurer: Raleigh – Ex Officio

MARK JOHNSON
Secretary to the Board: Raleigh

JILL CAMNITZ
Greenville – Northeast Region

REGINALD KENAN
Rose Hill – Southeast Region

AMY WHITE
Garner – North Central Region

OLIVIA OXENDINE
Lumberton – Sandhills Region

JAMES FORD
Charlotte – Southwest Region

TODD CHASTEEN
Blowing Rock – Northwest Region

DONNA TIPTON-ROGERS
Brasstown - Western Region

J WENDELL HALL
Ahoskie - At-Large

J.B. BUXTON
Raleigh – At-Large

NC DEPARTMENT OF PUBLIC INSTRUCTION

Mark Johnson, State Superintendent :: 301 N. Wilmington Street :: Raleigh, North Carolina 27601-2825

In compliance with federal law, the NC Department of Public Instruction administers all state-operated educational programs, employment activities and admissions without discrimination because of race, religion, national or ethnic origin, color, age, military service, disability, or gender, except where exemption is appropriate and allowed by law.

Inquiries or complaints regarding discrimination issues should be directed to:

Joe Maimone, Chief of Staff
6307 Mail Service Center, Raleigh, NC 27699-6307 / Phone: (919) 807-3431 / Fax: (919) 807-3445

Visit us on the Web: www.ncpublicschools.org

0819

SCHOOL CONNECTIVITY INITIATIVE

Legislative Update

Submitted to:

Joint Legislative Oversight Committee on Information Technology

Joint Legislative Education Oversight Committee

Office of State Budget and Management

State Chief Information Officer

Fiscal Research Division

Prepared by

School Connectivity and Cybersecurity Section
Technology Services Area
North Carolina Department of Public Instruction
Supported by
The Friday Institute for Educational Innovation at NC State University

Contents

EXECUTIVE SUMMARY 5

BACKGROUND 7

PERFORMANCE OVERVIEW 8

E-RATE UTILIZATION RATE BY NORTH CAROLINA.....8
FINANCIAL SUMMARY 9
K-12 INTERNET UTILIZATION AND CAPACITY ANALYSIS.....13
INTERNAL CONNECTIONS SUMMARY.....18

CONSIDERATIONS AND RECOMMENDATIONS FOR 2020 20

SUPPORTING DOCUMENTATION 25

APPENDIX A - 2019 LEA ALLOTMENTS AND SHARED SERVICES.....26

APPENDIX B – 2019 CHARTER/RESIDENTIAL/LAB SCHOOL ALLOTMENTS AND SHARED SERVICES.....29

APPENDIX C - CONNECTIVITY STAFF SALARY REPORT 34

APPENDIX D – NORTH CAROLINA E-RATE FUNDING HISTORY REPORT 35

Executive Summary

The School Connectivity Initiative (SCI) is a national leader in providing secure Internet access to every public school classroom. Through NCDPI Cooperative Purchasing Agreements, E-rate training and support, and providing client network engineering, identity management and cybersecurity[1]services, **North Carolina continues to be a national leader.** This report to the North Carolina General Assembly details the significant accomplishments achieved over the reporting period (fiscal 2018-19 and calendar 2019), financial and operational performance data, opportunities for excellence, realized risks and mitigation strategies, and recommendations for legislative action. The graphs used in this report are available online and interactive at https://go.ncsu.edu/SCIreport (courtesy of The Friday Institute).

Accomplishments

- North Carolina leads the nation in E-rate funding per student over the past five years.[2] Every classroom has wireless Internet access. Aggregate K-12 Internet capacity is 300Gbps with the average network utilization just under 60%. Firewall, content filtering, and recently added Active Vulnerability Analysis services help protect students and school business systems. Training in E-rate, Technology Leadership, and network operations best practices, as well as on-site technical assessments and assistance ensures sustainability and maximizes the return on investment in educational technology infrastructure.
- In FY2019, SCI received $31.2M in state appropriations. Supplemented by nearly $10M in federal E-rate reimbursements and nearly $47M in E-rate discounts, North Carolina public schools received nearly $88M in total value of Internet and classroom Wi-Fi infrastructure and services. **Each dollar of state funding spent on E-rate eligible goods and services delivers $3.81 in value, a return-on-investment of 281%.**
- Through analysis and modeling of E-rate filing scenarios, SCI continues to optimize E-rate Internet access applications to maximize received discount rate.
- Overall Internet capacity increased slightly and average utilization by PSUs is 59% of capacity.[3] Year-over-year per-student and overall utilization growth continued, but at a slightly lower historical rate, likely reflecting an increased adoption and effective use of filtering services and policies.
- In calendar 2019, SCI began realigning staff to expand E-rate coordination capacity and to develop the legislated Cybersecurity and Risk Management expansion within SCI.[4] Through NCREN, SCI now provides PSUs with access to the tools and expertise to conduct internal and external network security risk assessments, persistent vulnerability analysis, threat detection, and automated response.

[1] "cybersecurity risk" has the meaning given that term in section 2209 of the Homeland Security Act of 2002 (6 U.S.C. 659).
[2] https://docs.fcc.gov/public/attachments/DA-19-71A1.pdf
[3] https://www2.mcnc.org/ncren/portal/reporting/ncren_utilization_map
[4] https://www.ncleg.gov/Sessions/2019/Bills/House/PDF/H966v7.pdf

Challenges and Risks

There are two major challenges and risks in the immediate future:

- In December 2019, the FCC issued one-time E-rate program changes effective in January 2020 and recurring changes for 2021-2025 that will result in PSU requests to exceed available SCI funding.
- Cybersecurity risks and threats are rapidly increasing. Over 740 K-12 cybersecurity-related events have been publically-disclosed since 2016.[5] The FBI reports K-12 is most targeted for payroll diversion and ransomware.[6] The costs for K-12 firewall and content filtering services are increasing beyond sustainable SCI funding levels.

Considerations and Recommendations

Detailed within this report are several recommendations for legislative actions that are necessary for SCI to remain viable at the current service levels.

1. SCI recommends the legislature renew the intent of SL2017-57 SECTION 7.11.(d) on a recurring basis to permit these specific allocated funds to not revert. No cost.
2. Provide one-time funding to take advantage of 2020 E-rate program change. $15M in non-recurring funds.
3. Expand SCI funding consistent with E-rate program changes for 2021-2025. $4.6M in recurring funds.
4. Expand Cybersecurity Expansion funding, which was included in 2019 Legislative Budget HB966.[7] $550,000 in recurring funds.
5. Investment in the establishment of statewide shared cybersecurity infrastructure to protect critical school business systems and minimize instructional disruption. $5M in non-recurring funds for two years.
6. Addressing the "Homework Gap" through proof-of-concept projects with The Friday Institute and NC Department of Information Technology Broadband Infrastructure Office. $200,000 in non-recurring funds.

The opportunities before us to continue making a difference in North Carolina are great. North Carolina is a leader in taking advantage of opportunities such as these, leveraging federal funding that delivers significant value to the taxpayer and tangible results in the classroom.

The SCI team is proud to present this report to the General Assembly of the great State of North Carolina for its consideration and action.

[5] https://k12cybersecure.com/
[6] https://pdf.ic3.gov/2018_IC3Report.pdf
[7] https://www.ncleg.gov/BillLookup/2019/H966

Background

The School Connectivity Initiative (SCI) launched in earnest with the publication of the *Developing Regional Education Networks* report in May 2006. In the thirteen years since the inception of the SCI program, NC public schools have procured over $1B in network infrastructure and services utilizing $278M in State appropriations, which enabled $814M in Federal Communications Commission (FCC) E-rate[8] discount disbursements. During this time, the telecommunications and computing markets have shifted dramatically, the regulatory environment has been in near constant flux, and the NC legislature has called for and invested in a digital transition in public schools.

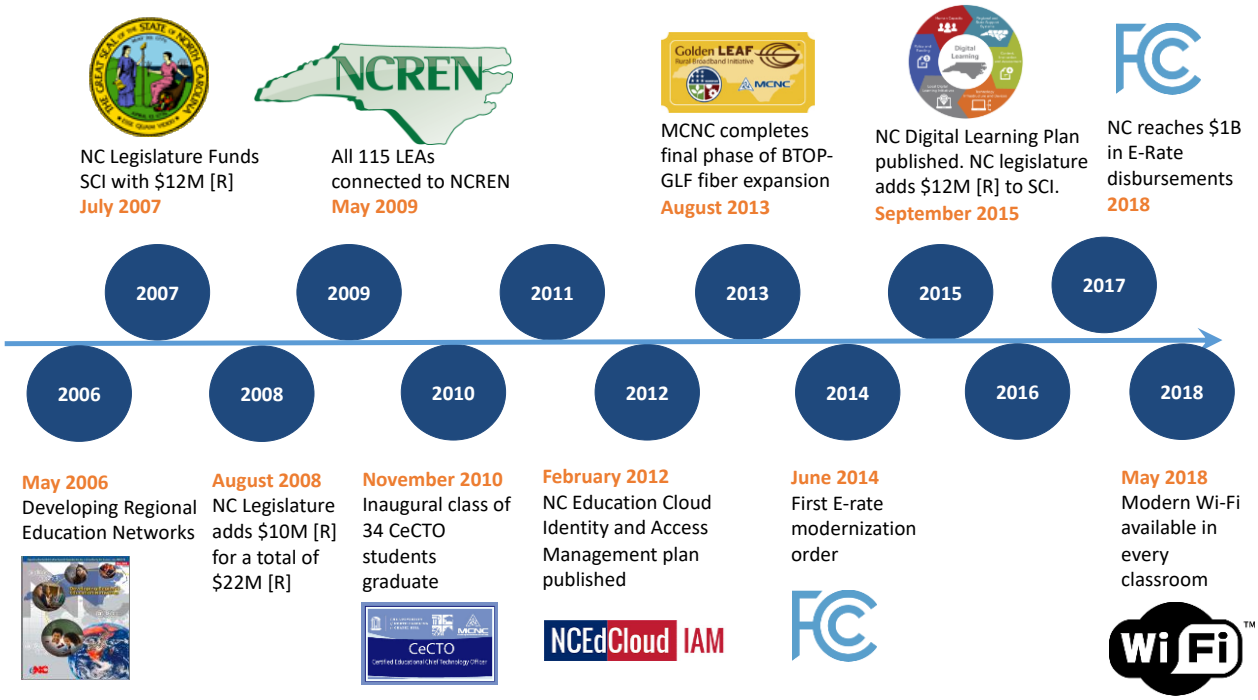


Illustration 1. SCI Milestone Timeline – 2006 through 2018

The SCI program has exhibited extraordinary productivity and adaptability over its history (Illustration 1). In its history, SCI connected all 115 LEAs to the NC Research and Education Network, using an opt-in approach, within its first year. It established the Certified Educational Chief Technology Officer (CeCTO) training program through The UNC School of Government. It developed and implemented the NCEdCloud Identity and Access Management (IAM) service. Through MCNC and the Golden Leaf Foundation, it enabled delivery of competitive fiber connectivity to rural NC schools and libraries. It has adapted to the NC Digital Learning Plan,[9] an FCC E-rate modernization order,[10] and the growth of student device 1:1 programs. K-12 contracted Internet usage has grown from about 1Gbps[11] in 2009 to 300Gbps in 2019.

[8] https://www.fcc.gov/consumers/guides/universal-service-program-schools-and-libraries-e-rate
[9] https://ncdli.fi.ncsu.edu/dlplan/
[10] https://www.fcc.gov/general/summary-e-rate-modernization-order
[11] Gbps = gigabits per second; 1,000,000,000 bits; a measure of data transfer rate

Performance Overview

The vision of the School Connectivity Initiative is to ensure all North Carolina Public School Units (PSUs)[12] have equitable access to secure and reliable high-speed Internet access, sufficient to meet their instructional and professional needs, through effective and efficient use of federal and state taxpayer funding.

It is our mission to maximize the state and local use of the Federal E-rate program to obtain the greatest discounts or reimbursements, establish common shared services that leverage economies of scale, establish Cooperative Purchasing Agreements to leverage group purchasing, enable the greatest amount of local control in PSU technology decisions, and to operate in an effective and efficient manner.

E-rate Utilization Rate by North Carolina

On February 11, 2019, the Federal Communications Commission (FCC) issued a report[13] analyzing the data available to assess the most recent five-year budgets for schools and libraries and their effectiveness in a broader distribution of funding that is more equitable and predictable for schools and libraries. This report focused on funding requests, funding approvals, and participation in the E-rate program at the discrete school level. The data is clear: **North Carolina ranked first in E-rate funds received per student ($95.79), despite being ninth in student enrollment and sixth in total amount of E-rate funding received.** SCI is recovering more from the FCC's Universal Services Fund than North Carolina taxpayers are paying into that fund and using it to make a difference in North Carolina classrooms.

In the past E-rate filing year:

- 160 E-rate funding requests submitted by 200 unique NC public school applicants
- PSUs submitted projects totaling $90.1M in value, requesting $65.4M in E-rate discounts, and received $63.8M in E-rate commitments
- 98% approval of all requests, with an average discount of 70%
- 87% of all NC E-rate requests were enabled by SCI contracts and funding

These results are directly attributable to the work of SCI's three regional E-rate coordinators providing:

- Direct assistance within PSUs for E-rate planning and filing
- Support through multiple levels of audits and appeals occurring throughout the year
- Multiple regional training events open to all E-rate eligible entities
- Planning, filing, and support for multiple state Internet consortia applications

[12] PSU is defined in SL2019-51 https://www.ncleg.gov/EnactedLegislation/SessionLaws/PDF/2019-2020/SL2019-51.pdf
[13] https://docs.fcc.gov/public/attachments/DA-19-71A1.pdf

Financial Summary

For 2019, the School Connectivity Initiative is an $87.6M program supported by $31.2M in legislative funding and leveraging FCC E-rate program discounts and reimbursements in excess of $56.4M.

Table 1 summarizes FY2019 total SCI expenses, the portion paid by E-rate, and the portion paid by State funding. The FCC groups E-rate eligible expenses into two broad categories, external connectivity expenses (Category 1) that deliver Internet and interconnect individual schools, and internal connectivity expenses (Category 2) that provide the wiring, switches, and wireless access points within each school.

(all values in millions, rounded)	Total Cost	E-rate Portion	State Portion
Category 1 Consortium Internet	$14.0	$9.9	$4.1
Category 1 School Fiber Connections (WAN)	$33.5	$26.0	$7.5
Category 2 Classroom Connections (Wi-Fi)	$29.0	$20.5	$8.5
E-Rate Eligible Totals	*$76.5*	*$56.4*	*$20.1*
Client Network Engineering	$1.8	not eligible	$1.8
Identity and Access Management	$1.5	not eligible	$1.5
Firewall Services	$1.9	not eligible	$1.9
Content Filtering Services	$4.7	not eligible	$4.7
Program Administration NCDPI, FFL, FI	$1.2	not eligible	$1.2
E-rate Ineligible Totals	*$11.1*		*$11.1*
Grand Totals	**$87.6**	**$56.4**	**$31.2**

Table 1. Financial Summary

E-rate Eligible Expenses Detail:

- ***Category 1 Consortium Internet***: SCI offers all PSUs no-cost fiber-based Internet access to a single centralized location, often the district central office, through the NC Research and Education Network (NCREN) operated by MCNC.[14] Charter schools may opt-out of this service and receive an annual $5,000 allocation for Internet service. All 115 LEAs and 154 (94%) charter schools use this E-rate eligible service.

  On behalf of all PSUs, SCI establishes NCREN Internet access through a contract with NC Department of Information Technology (NCDIT). SCI pays NCDIT the monthly full-cost invoices and applies for the federal E-rate reimbursement. These E-rate funds are then reused in within the SCI program. Cost containment strategies are discussed further in the K-12 Internet Utilization and Capacity Analysis section of this document. For 2019, Internet access cost $14M, E-rate reimbursed $9.9M, making the cost to the State $4.1M.

  In 2019:

  - 8 new charter schools were connected to NCREN

[14] https://www.mcnc.org/about

- 13 LEAs and 29 charter schools received bandwidth upgrades
- An additional 15Gbps of Internet capacity was added
- Costs remained largely flat, year-over-year

- ***Category 1 School Fiber Connections (WAN):*** To distribute Internet access from the central office to each school campus, PSUs use private service providers, such as Spectrum, AT&T, CenturyLink, and Conterra, to provide a fiber-based Wide Area Network (WAN).[15] Each of these connections are eligible for E-rate discounts of up to 90%.

  There are over 2,700 school buildings in NC. With dozens of service providers and local technical constraints, it is not feasible for SCI to provide WAN services in the same manner as Internet service. Yet SCI's goal of net-zero-local cost is still achieved. Each PSU is responsible for the procurement, management, and E-rate discount filings for their WAN. The SCI E-rate coordinators provide each PSU guidance and assistance with each step. Upon E-rate approval, the service provider bills E-rate directly for the discounted portion and invoices the PSU for the remaining non-discounted amount for service. SCI provides an allocation to the PSU to cover this discounted invoice. For 2019, PSUs received $33.5M in WAN services. E-rate provided $26M in discounts and the State provided $7.5M to PSUs.

- ***Category 2 Classroom Connections (Wi-Fi):*** With Internet service delivered to the individual school building, additional network infrastructure is necessary to distribute access to the individual classroom. In July 2014, the FCC issued an E-rate Modernization Order[16] establishing a five-year per-student-per-school budget to expand funding for robust classroom Wi-Fi. In response, SCI established Cooperative Purchasing Agreements in March 2015 with thirteen network hardware vendors and installers. Identical to the WAN process, PSUs make the purchases, the vendor bills E-rate and then invoices the PSU for the balance, and SCI allocates to the PSU an amount equal to the invoice. For 2019, PSUs received a total of $30.9M in Category 2 goods and services. E-rate provided $20.5M in discounts and the State allocated $8.5M.

Over 87% of SCI expenditures were eligible for FCC E-rate discounts. Every E-rate eligible purchase goes through multiple audits by the FCC to ensure the most cost-effective and technically sufficient solution is selected through an open and competitive bidding process. SCI's E-rate Coordinators are involved in virtually every filing and, at various levels, every audit performed. For 2019, the combined E-rate eligible expenses were $76.5M with E-rate discounts or reimbursements covering $56.4M. The final cost to the State was $20.1M. **For every $1 of state funding spent on E-rate eligible goods and services, North Carolina schools received $3.81 in total value. Each dollar of state funding spent on E-rate eligible goods and services delivers $3.81 in value, a return-on-investment of 281%**.

[15] A dozen NC LEAs connect schools via fiber that is owned and managed by either the school system or a community collaborative. SCI provides funding allotments to these districts based on actual maintenance costs.

[16] https://www.fcc.gov/document/fcc-releases-e-rate-modernization-order

E-rate Ineligible Expenses Detail:

- ***Client Network Engineering (CNE):*** Infrastructure requires knowledge and skill to deliver the desired quality results. PSUs are responsible for the long-range technology planning and the daily operation and maintenance of their infrastructure but they need assistance at times. SCI contracts with MCNC to assist PSUs with high-level troubleshooting, network design consultation, and related training events through their Client Network Engineering team. They also provide specific network, cybersecurity, and cloud services management functions for PSUs. As all network traffic passes through NCREN, MCNC is uniquely positioned to provide these services to the PSUs and is an ideal location for cybersecurity infrastructure and services deployment to be shared by all PSUs.

  In 2019, CNE delivered:

  - 170 engagements with 62 LEAs and 65 charter schools providing Technology Planning assistance, performing technology Needs Assessments, advising on network-based vendor evaluations, and providing technical guidance for E-rate Category 2 (internal networking) funding requests and subsequent deployments;
  - Four detailed PSU cybersecurity program reviews and four additional reviews in-progress;
  - Microsoft PowerShell[17] training course for PSU network administrators (19 participants);
  - Network Fundamentals training course providing foundational knowledge and networking best practices to K-12 public school network administrators that were relatively new to their role (47 participants).

  SCI is invoiced quarterly for services provided and the actual expenses incurred for each PSU engagement at a cost not to exceed $1.8M annually.

- ***Identity and Access Management (IAM):*** The 2015 appropriations act expanded the SCI budget by $12M annually effective FY2016-17 and included Identity and Access Management (IAM) services. Processing nearly one million logins per day, IAM automates the provisioning and management of nearly 2.5 million user accounts and the integration of those accounts with cloud-based applications and services. NCDPI manages the NCEdCloud IAM service through a contract with an identity services provider at an annual cost of $1.5M.

- ***Firewall Services:*** LEAs and charter schools may opt-in to the SCI firewall service offered at no-charge through a contract with NCDIT. This Cisco-based firewall service enforces local network policies and is maintained locally or by NCDIT. Currently, 88 LEAs and 129 charters utilize this service at a cost of $1.9M in state funding.

[17] PowerShell is a scripting language that helps system administrators rapidly automate tasks that manage operating systems (Linux, MacOS, and Windows) and processes.

- ***Content Filtering Services:*** LEAs and charter schools may opt-in to the SCI Content Filtering Service offered at no-charge through a contract with NCDIT. Utilizing the Zscaler platform, local school acceptable use policy is enforced on school issued student devices regardless of the device's location on or off campus. This type of service is required by the Children's Internet Protection Act[18] but is not E-rate eligible. Currently, 82 LEAs and 129 charters utilize this service at a cost of $4.7M in state funding.
- ***Program Administration***: Program administration includes SCI staff salaries and operational costs, licenses, and contracts with The Friday Institute for Educational Innovation (North Carolina State University). In fiscal 2019, six NCDPI staff members provided technical consulting, E-rate training, and related support at a combined compensation and benefits expense of $574,701.[19] A Friday Institute contract provides for planning, design, forecasting, modeling, and documentation support at an annual cost of $224,800. **Total Program Administration costs are less than 1% of the total value delivered to PSUs and less than 3% of State appropriations for the program.**

[18] https://www.fcc.gov/consumers/guides/childrens-internet-protection-act

[19] SCI provisional language allows for up to 8 FTE and $1M. See Appendix C – Connectivity Staff Salary Report for details.

K-12 Internet Utilization and Capacity Analysis

Utilization Analysis

In the early years of SCI, Internet utilization growth year-over-year was encouraging as an indicator toward Digital Teaching and Learning adoption. The year-over-year utilization growth in 2015 was 68%. Fortunately, in each successive year the annual growth rate has decreased with the 2019 annual growth rate now at 19%. We forecast this trend to continue at a rate of 10% at the end of 2021.

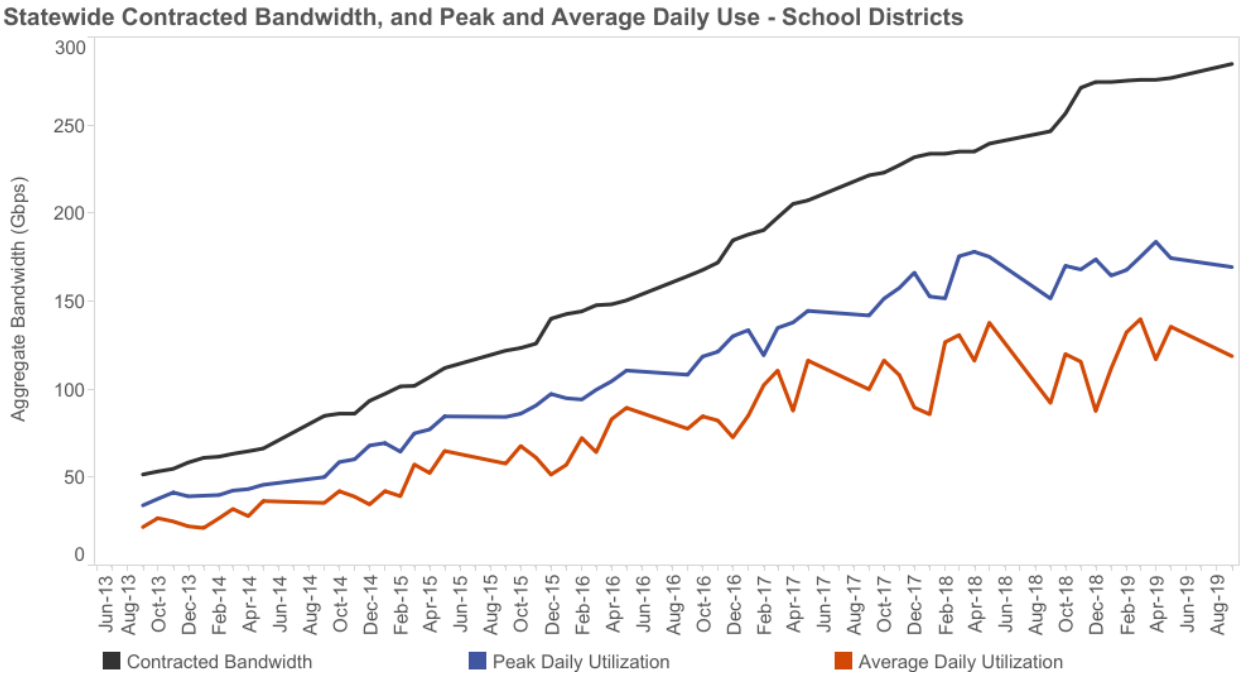


Chart 1. Capacity, Peak Utilization, and Average Daily Utilization

We believe this decrease in the aggregate annual growth rate is the result, in large part, of fewer 1:1 student device deployments and an increased adoption and effective use of filtering services that encourage more responsible K-12 Internet use.

While the rate of growth has continued to decrease, Internet utilization continues to increase on both the K-12 aggregate and per-student basis fueled by the expansion of existing 1:1 initiatives, additional instructional smart devices, “bring your own device” (BYOD) initiatives, and increased use of online instructional resources.

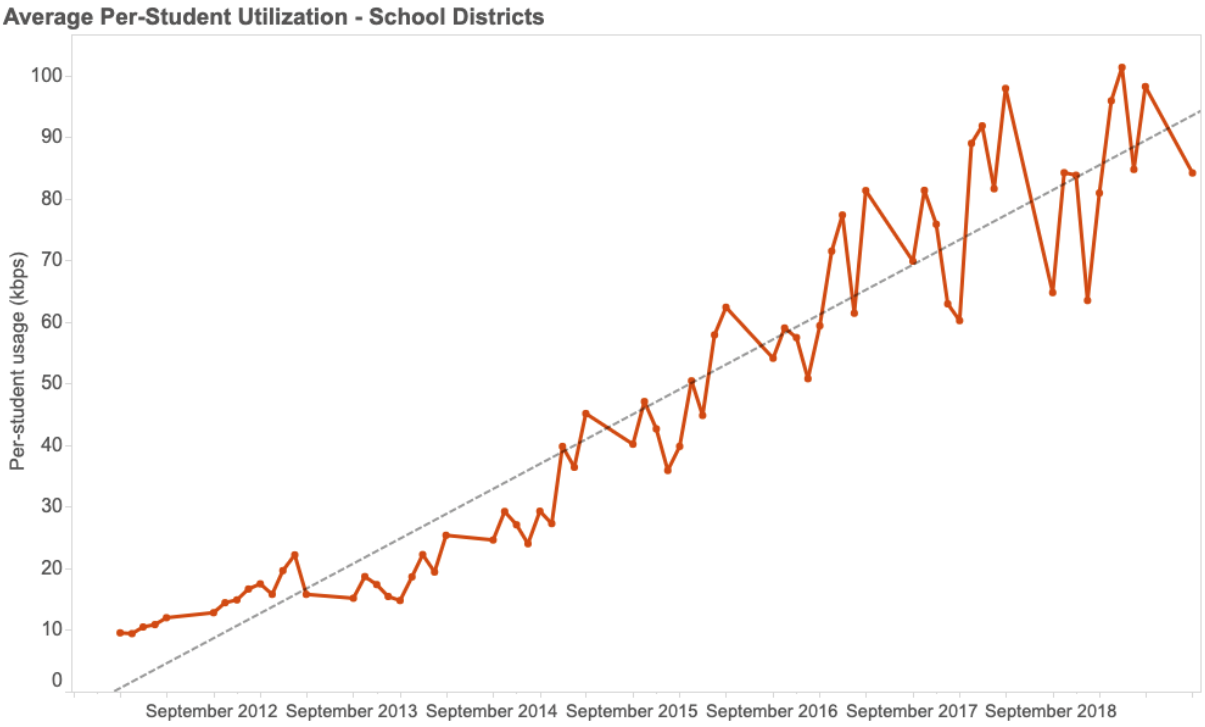


Chart 2. Internet Utilization Per-Student

Chart 2 illustrates the relationship between actual Internet use and the student population since 2012. In May 2012, the average per student utilization was 12Kbps.[20] Seven years later, in May 2019, the average per student utilization was 98Kbps per student. The significant peaks and valleys occur due to holidays and breaks during the school year, so a trend line is included.

The average daily aggregate K-12 Internet utilization is now over 150Gbps[21] and the daily peak utilization is 175Gbps. Tracking average and peak utilization over time directly informs capacity decisions to ensure there is sufficient capacity for peak utilization.

Capacity Analysis

Chart 3 illustrates the growth in Internet bandwidth capacity for districts in the 2018-2019 school year, by month. There are currently thirteen service levels (by bandwidth) in use ranging from 100Mbps to 30Gbps. Each color bar shows the bandwidth contribution in each of the service tiers.

[20] Kilobits per second = one thousand bits per second

[21] Gigabits per second = one billion bits per second, or one thousand megabits per second; a measure of data transfer rate

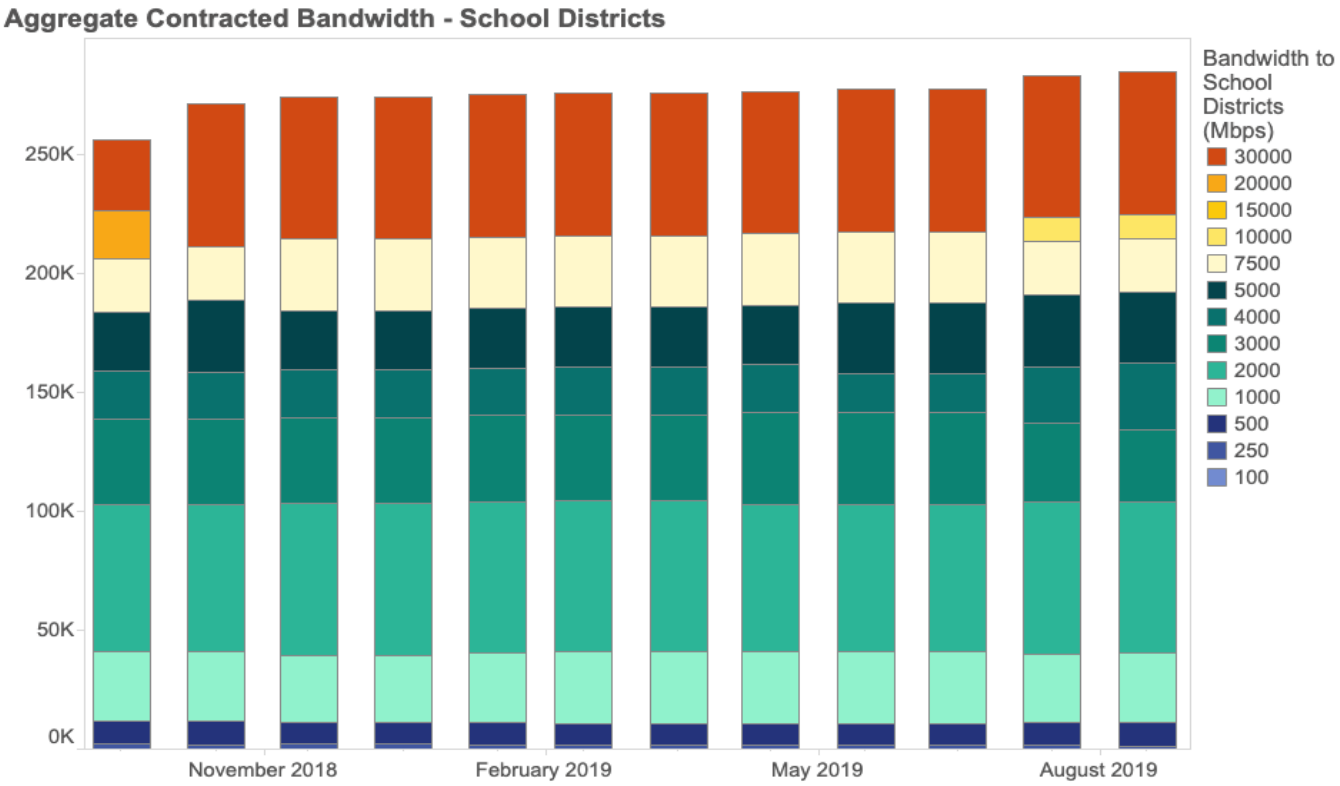
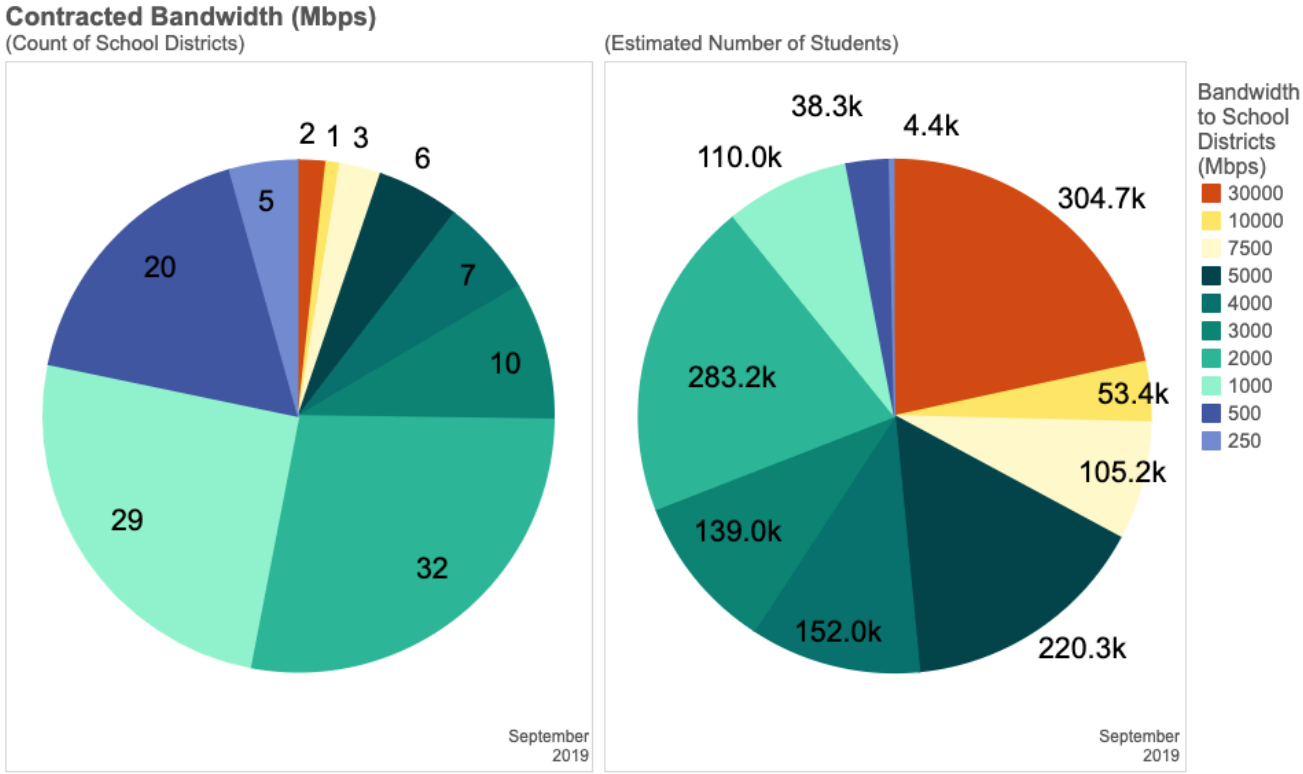


Chart 3. Aggregate Contracted Bandwidth

District aggregate capacity grew from 227Gbps in November 2017 to over 273Gbps in October 2019, while charter school aggregate contracted bandwidth stood at 18Gbps in October 2019. SCI manages the scheduling of upgrades to avoid adding new services and expense during the summer months.

Twenty-five districts remain below the 1Gbps service tier, while 90 districts receive at least 1Gbps of Internet capacity. SCI is concerned about equitable access for all PSUs, therefore capacity per student is also analyzed.



Charts 4a and 4b; Contracted Bandwidth Analysis

Charts 4a and 4b compares the number of districts and their combined student counts with respect to service level tiers to illustrate the equity of service across all PSUs. For example, Chart 4a indicates in the light blue slice that there are 5 PSUs at the 250Mbps service level and Chart 4b indicates a combined total enrollment for those same PSUs is 4.4k students. Their average network capacity is 283Kbps per student. Likewise, the 10 PSUs at the 3,000Mbps (3Gbps) have a total enrollment of 139k students and average 216Kbps per student. The statewide average is 202Kbps per student. This metric helps inform SCI in the proper planning and provisioning of service to provide the most cost-effect, sufficient, and equitable service.

Chart 5 illustrates the growth of average per-student Internet capacity since 2012 for traditional LEAs. The average per-student capacity is slightly higher for non-LEA PSUs due to their typical smaller enrollment and disaggregation (Chart 6).

A per-student capacity goal, such as 1Mbps per student, has been proposed by some national voices[22] and the FCC.[23] To the contrary, SCI employs a capacity management process based upon data-driven predictions and demonstrated need through continuous utilization monitoring that is proven to be a much more efficient and cost-effective approach than simply using an arbitrary target.

[22] https://www.educationsuperhighway.org/blog/broadband-budget-planning/ and https://www.cosn.org/sites/default/files/CoSN%20Section%20706%20Filing%20Final.pdf
[23] https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2018-broadband-deployment-report

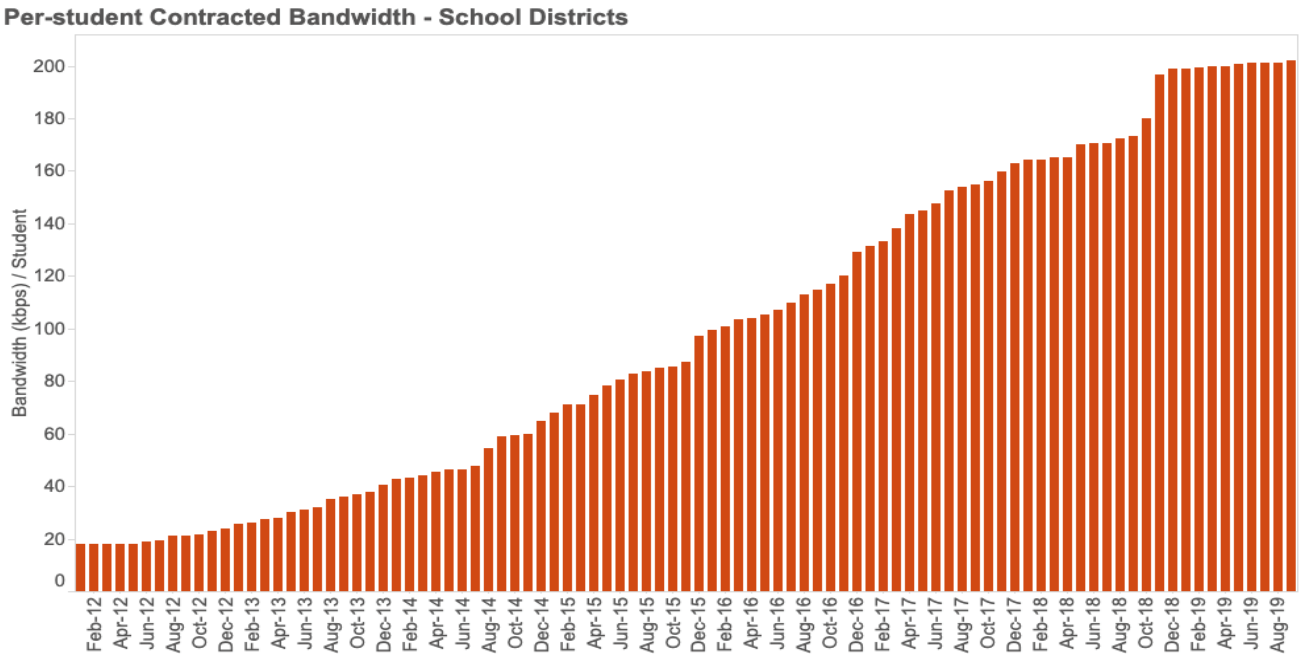


Chart 5. Average Per-Student Bandwidth Capacity (LEA School Districts)

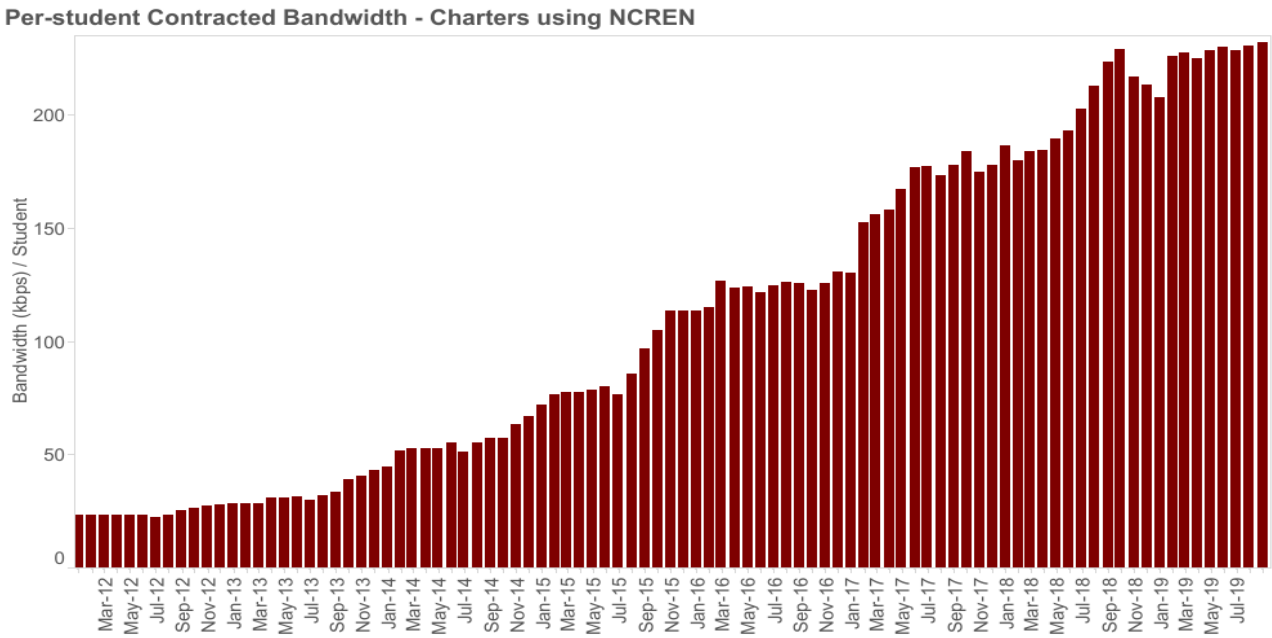


Chart 6. Average Per-Student Bandwidth Capacity (Charters and Non-LEA School Districts)

Cost containment

In each of the last four years there is a noticeable jump in capacity around the end of each calendar year. This is an intentional artifact reflecting SCI's balancing of performance and cost management. Historically, greatest utilization occurs during the month of May. At the beginning of each school year in August, there is a typical utilization spike as new initiatives are rolled out,

such as additional student devices for 1:1 programs. SCI's capacity planning reviews these key data points to ensure there is sufficient bandwidth for both the beginning of the next school year and the online testing requirements in the spring. As a result, most bandwidth upgrades become available in the November/December timeframe. However, as the data illustrates, upgrades are not confined to this time and are performed as each individual PSU's actual utilization indicates.

Internal Connections Summary

Session Law 2015-241 expanded SCI funding to support the sustainability of school internal connections by adding $2M in 2015-16 and $12M recurring in 2016-17. During 2015, the SCI team established Cooperative Purchasing Agreements (CPAs) with thirteen vendors to provide E-rate eligible wireless and wired network equipment and related services, receiving significant discounts by leveraging group purchasing power. PSUs have the option to use these contracts or to perform their own procurements. SCI does provide PSUs with an allocation equal to the non-discounted portion of approved E-rate requests for purchases made through the CPAs. This was an initial requirement for the use of funds from the federal Race to the Top program that continued through the life of these CPAs which effectively ended in March 2019. In 2019, PSUs purchased $30M in Internal Connections goods and services. SCI CPAs were used for $29M of these purchases.

Table 2 details all 2019 E-rate Category 2 Internal Connections (Wi-Fi) procurements by discount percentage for both charter schools and LEAs regardless of the contract used (a small portion of the E-rate summary below is outside of the scope of SCI funding).

For charter schools, 29% of applications received discounts less than 50%, accounting for $1.6M (43%) of the $3.8M in total cost for charter school internal connections. For LEAs, 61% of Category 2 E-rate applications received discounts in the 80-85% range, accounting for $14M of the $26.2M in total cost for district internal connections. No LEAs have E-rate discount rates below 50%.

E-rate 2018	CAT2 Discount%	Pre-Discount	Requested	Committed	Disbursed	% of Commitment	% of Total Commitment
Charters	20% - 29%	$462,415	$92,483	$92,483	$81,633	5.0%	0.4%
	40% - 49%	$1,135,351	$454,140	$454,140	$408,948	24.3%	2.2%
	50% - 59%	$1,366,734	$683,367	$683,367	$609,340	36.6%	3.3%
	60% - 69%	$189,294	$113,576	$113,576	$113,576	6.1%	0.5%
	70% - 79%	$114,345	$80,042	$80,042	$15,161	4.3%	0.4%
	80% - 85%	$522,483	$441,584	$441,584	$373,689	23.7%	2.1%
Subtotal		**$3,790,622**	**$1,865,192**	**$1,865,192**	**$1,602,347**	**100%**	**9%**
LEAs	50% - 59%	$1,081,199	$540,599	$540,599	$540,599	2.9%	2.6%
	60% - 69%	$9,669,667	$5,801,800	$5,801,800	$2,049,140	30.8%	28.0%
	70% - 79%	$1,488,375	$1,041,862	$1,041,862	$981,476	5.5%	5.0%
	80% - 85%	$14,020,804	$11,463,782	$11,463,782	$10,732,973	60.8%	55.3%
Subtotal		**$26,260,044**	**$18,848,044**	**$18,848,044**	**$14,304,189**	**100%**	**91%**
Total		**$30,050,666**	**$20,713,236**	**$20,713,236**	**$15,906,536**	100%	**100%**

Table 2. Total NC K-12 Category 2 E-rate Filings for E-rate 2018

With a total investment of almost $190M since 2015, the SCI Wi-Fi expansion program has enabled substantial progress in the development of digital-ready classrooms in NC public schools. According to the 2019 Digital Learning and Media Inventory (DLMI) data, there are 129,000 wireless access points in NC public schools, an average of 1.2 access points per classroom or 12 students per access point.

Tracking the investment in infrastructure and services provides a limited view of Digital Teaching and Learning readiness. SCI relies upon many sources that are internal and external to NCDPI to understand the holistic K-12 environment. The MCNC CNE team provides invaluable feedback on K-12 networking trends and needs. The Friday Institute develops tools to correlate and analyze extremely large data sets from local, state, and national sources to provide accurate forecasting of trends, increase accountability and reporting, and better inform policy development. These critical partnerships have been key to SCI's historical success and will remain vital in the future.

Considerations and Recommendations for 2020

The SCI offers the following considerations and recommendations for 2020.

1. **Improve SCI Allocation Flexibility – no cost**

   Issue: PSUs apply for E-rate discounts in March and await approval from E-rate, which can be received as late as December. SCI provides PSUs allocations shortly after receiving E-rate commitments, the amount of which is based on project quotes and are highly accurate. However, these allocations must be expended by the end of the next June or revert.

   In SL2017-57 SECTION 7.11.(d), the legislature provided relief over the 2017-19 fiscal biennium to permit these funds to remain available until the end of the 2018-19 fiscal year.[24] Over those two years, nearly $2M was able to "roll over" into the next fiscal year, enabling SCI to continue fully funding approved requests. However, this relief has expired. The FCC is again experiencing significant delays in issuing funding commitment decisions. Additionally, the FCC has announced immediate program changes that will very likely result in significantly higher funding demands, and SCI will not have sufficient resources to fully fund all anticipated requests. This relief is again necessary and urgent.

   Recommendation: SCI recommends the legislature renew the intent of SL2017-57 SECTION 7.11.(d) on a recurring basis to permit these specific allocated funds to not revert.

2. **Expand Category 2 Funding Consistent with FCC Rules for 2020/21 - $15M one-time**

   Issue: The FCC has instituted new one-time rules for 2020 resulting in a significant increase in available E-rate funds for PSUs.

   In 2015, when the FCC developed a five-year trial of Category 2 funding, each school received an E-rate budget amount of $150 per student over a five-year period. NC had an Average Daily Membership (ADM) of 1,537,643 students.[25] This equated to an E-rate pre-discount budget of nearly $231M. SCI estimated an average statewide discount rate of 80%, leaving about $46M for local schools to fund.[26] The E-rate discount rate calculated on a per-PSU average, rather than an individual school. Over the past five years, the average statewide discount has decreased to 74% due to the significant increase in non-district PSUs that have lower numbers of economically disadvantaged students.

   The success of NC E-rate utilization is based upon SCI allocating the funding that results in a net-zero-cost for the PSUs for E-rate eligible items. Legislative expansion of SCI's budget in 2015 of $12M provided an additional $9.2M recurring funds to take advantage of this program. SCI successfully worked with all PSUs to ensure an even distribution of funding requests over the five years.

---

[24] https://www.ncleg.net/EnactedLegislation/SessionLaws/HTML/2017-2018/SL2017-57.html

[25] 2015 ADM: https://files.nc.gov/dpi/documents/fbs/resources/data/factsfigures/2015-16figures.pdf

[26] Calculation: (($150 per student * 1,537,643 students) / 5 Years) * 20% estimated local share = $9.2M state funds

The FCC's announcement in December 2019 created a one-time extension to PSUs to utilize any remaining "E-rate budget" while also providing a significant one-time "bonus" budget amount. For NC, this creates access to $98M and requires an additional $15M above the current $9.2M in state/local funds to realize. This is a significant opportunity but also presents a significant challenge. It is anticipated that this "bonus" will result in a significant investment in cybersecurity networking equipment in 2020.

Recommendation: SCI recommends a one-time expansion of $15M for fiscal 2020-21.

3. **Expand Category 2 Funding Consistent with FCC Rules for 2021-2025 - $4.6M recurring**

Issue: The FCC has instituted new rules for funding years 2021 through 2025 that increases the per-student budget amount, establishes the budget at the district-wide level, and significantly increases the minimum budget amount for schools with less than 150 students.

In 2021 the per-student budget is raised to $167 over five years. Using an average discount rate of 74% for North Carolina public schools calculates to an additional $4.6M per year in order to fully leverage all available federal E-rate discounts.

The change from a per-school budget to a per-district budget enables PSUs to be more flexible with their budget and spread the funds across their individual schools based on needs.

The FCC is also increasing the floor budget for schools with fewer than 150 students from $9,600 to $25,000 over the five-year period. There are 156 schools (comprised of 14,072 students) in North Carolina that meet this criterion. Many are charter schools and schools focused on addressing special needs. These schools have historically been more costly to serve yet have lacked the funds to fully realize basic wireless access consistently.

Each of the FCC's decisions are in the public interest. However, these changes will increase demand on SCI funding for the local portion of these requests. For SCI to ensure that Wi-Fi, network and security equipment remain reliable and able to support future demands, an additional recurring $4.6M will be required.[27]

Recommendation: SCI recommends a recurring expansion of $4.6M beginning in fiscal 2021-2022.

4. **Expansion of School Connectivity Initiative / Cybersecurity and Risk Management - $500,000, recurring**

Issue: From HB966 "Current Operations Appropriations Act of 2019":[28]

> ***SECTION 7.8.(a)*** The State Board of Education and the Department of Public Instruction, in collaboration with the Friday Institute at North Carolina State University, shall continue the expansion of the School Connectivity Initiative client network engineering to include cybersecurity and risk management services supporting local school administrative units and charter schools. The expansion shall include the

[27] Calculation: (($167 per student * 1,590,000 students) / 5 Years) * 26% State Portion = $13.8M annually
[28] https://www.ncleg.gov/Sessions/2019/Bills/House/PDF/H966v7.pdf

following**: (1) Continuous monitoring and risk assessment:** Cloud-based solutions to discover assets, assess their security posture, and recommend corrective actions based on real-world risk reduction; **(2) Security advisory and consulting services**: Five regional security consultants working with schools to assess security posture and develop and implement improvement plans. The plans shall include security policy, building security programs, implementing effective security controls, and ongoing support for operating security governance; **(3) Security training and education services**: Security training and education for teachers, staff, and administrators.

SECTION 7.8.(b) Funds appropriated to the Department by this act for the 2019-2021 fiscal biennium for the School Connectivity Initiative and cybersecurity shall be used to develop and implement the above cybersecurity and risk management services to support public school cybersecurity and risk management service operations.

While an appropriation of $550,000 was included in HB966, it has not been passed and remains unfunded, creating increased risk for K-12.

Recommendation: SCI requests the legislation be funded.

5. **Expansion of School Connectivity Initiative / Cybersecurity and Risk Management – $5M non-recurring, for two years**

Issue: In 2019, there have been numerous cybersecurity incidents, including ransomware attacks, directed at North Carolina public sector organizations that have had severe financial and operational consequences. Schools and municipal and county governments across the country are being actively targeted by criminal organizations. Government organizations need to be accessible and available to the public as they provide many services from tax records to 911 call centers. These public organizations are often hesitant to expend limited public funds and resources to reduce risk without a verifiable and quantifiable threat. Together, these facts make schools attractive targets for cyber criminals. We find that investment in some level of centralized cybersecurity is warranted given the almost $100M per year spent on Internet access and equipment in North Carolina's public schools.

The NCREN backbone provides a unique vantage point to leverage economies of scale to protect all North Carolina public education entities, including the UNC System Universities and the Community College System. The State should consider an initial investment to fund the implementation of monitoring and response capabilities on the NCREN network. These capabilities would provide NC's education community a centralized service to detect and mitigate cyber threats before they cause a crisis. This service would allow individual institutions to reduce their likelihood of compromise, quickly contain attacks when they happen, and prevent attacks from migrating to other institutions within the state.

While we envision a full stack of cyber protection services that address the entire threat landscape, we believe there are three main capabilities that should be developed and implemented first:

- Advanced Endpoint Protection Service: capability to protect laptops, desktops, and servers from ransomware and other modern threats. Centrally operated as a service to provide 24x7 monitoring and response to detected attacks. This service would initially focus on systems that access banking, payroll and human resources applications.
- Network Monitoring and Protection Service: advanced network defense to centrally monitor network traffic, detect cybersecurity concerns, and automate response actions to protect networks and technology assets from cyber-attacks.
- Centralized Event Processing and Response Service: a centralized platform to receive event data from a variety of operating services, and correlate and process these events to detect cybersecurity concerns. This service will leverage the latest Artificial Intelligence and automation capabilities to inspect millions of events per hour from education systems across the state, so it is imperative that the service be located on or in close proximity to the NCREN backbone network. This service will include a 24x7 operations center staffed with cybersecurity analysts and engineers to oversee the threat detection and response.

Advanced cybersecurity requires a substantial initial investment. By developing a solution that is not limited to a single district or agency, the economies of scale makes such a solution cost-effective. Further, the greater the number of institutions that participate in the service, the better the threat telemetry will be, enabling more rapid responses to the incident and implementation of active defenses for other participants.

Recommendation: We propose that the State fund two years of cybersecurity services through MCNC at $5M each year to obtain statewide coverage quickly. After the initial two-year program, we believe the value of the service will be apparent and schools will opt-in and help to fund the services from local budgets. We also note that these services could be equally valuable to higher education users and the State should coordinate efforts in cybersecurity at educational institutions where practical.

6. **Addressing the "Homework Gap"[29]**

Issue: Nationally, only 33% of students have broadband Internet access at home, creating a significant "homework gap" that affects rural and economically disadvantaged the most. While outside its core scope, SCI is an integral part of the NC DIT Broadband Infrastructure Office's (BIO) four-point strategy to reduce this gap:

1. Leverage school's digital infrastructure for use by the community as a whole
2. Obtain better data on North Carolina's homework gap
3. Enhance and expand technology adoption initiatives targeted at students and parents
4. Greater use of the FCC's Lifeline program and low-cost provider programs

[29] https://www.ncbroadband.gov/connectingnc/homework-gap/

The Friday Institute has been researching a number of new wireless technologies that may specifically help with the homework gap in rural areas. SCI has been expanding E-rate educational support to public libraries and has enabled public libraries to participate in SCI's Cooperative Purchasing Agreements (without funding). Through collaboration by all three parties, we remain hopeful that the homework gap will rapidly close over the next few years.

Recommendation: A small amount of funding to either SCI or the NC DIT Broadband Infrastructure Office, properly applied, would fund proof-of-concept projects for new rural broadband initiatives that leverage cutting-edge technology.

Implications

For many charter schools and districts, without the funds received from SCI that make these vital investments a net-zero-cost locally, there would be little-to-no wireless access in the classroom. To date, demand for Category 2 has been successfully coordinated between DPI and PSUs to ensure requests never exceeded the annual funding available and every school received their share of State funding.

North Carolina is one of the few states that offers this type of funding support to their schools. Each dollar of State funding spent on E-rate eligible goods and services delivers $3.81 in value, a return-on-investment of 281%. These funds are valuable to our schools and deliver exceptional value to our taxpayers.

If the State should decide to not increase SCI funding, the SBE will be required to develop an equitable allocation policy for the distribution of available funding. If SCI is not able to fully fund eligible requests, many PSUs, especially rural schools and charter schools, will not be able to obtain the necessary local funds necessary to make up the difference. Many deserving projects will never be started.

Cybersecurity attacks have already occurred within North Carolina schools with devastating results. The cost for restoration of services, as well as the financial risk to the State for loss of data and personally identifiable information, is much higher than the cost of prevention. At some point, the State will be required to make the investment in preventative measures to reduce these risks.

Supporting Documentation

An interactive map that illustrates LEA and charter school aggregate and per-student network utilization statistics may be found at:

https://www.mcnc.org/ncren/portal/reporting/ncren_utilization_map

An interactive data dashboard of all charts used within this report may be found at:
http://go.ncsu.edu/SCIReport

The balance of this report includes supporting data as follows.

APPENDIX	DATA
A	2019 LEA PRC 073 allotments and shared services distributions
B	2019 PRC 036 charter school allotments and shared services distributions
C	The NCDPI connectivity staff salary report
D	North Carolina E-rate funding history report

Appendix A - 2019 LEA Allotments and Shared Services

The table below details the direct funding received by LEAs from SCI through PRC 073 allocations and the direct costs paid by SCI for each shared service (Content Filtering, Firewall, and Internet services).

LEAs request E-rate funds for WAN and Wi-Fi during spring of 2018 for service/delivery within the funding year between July 1, 2018 and June 30, 2019. SCI issues allocations during fiscal year 2019 to cover non-E-rate costs for eligible school connections.

ID #	*LEA Name*	WAN	Wi-Fi / Internal Connections	Content Filter	Firewall	Internet	Total
10	Alamance-Burlington	$58,824		$71,586	$35,244	$187,470	$353,124
20	Alexander County	$26,744	$25,977	$20,405	$10,156	$45,220	$128,502
30	Alleghany County	$17,280				$32,002	$49,282
40	Anson County	$19,890	$14,265			$45,647	$79,802
50	Ashe County	$22,080	$22,287		$9,192	$45,647	$99,206
60	Avery County	$16,884		$16,065	$9,192	$45,647	$87,788
70	Beaufort County	$12,652	$6,082	$20,405		$45,647	$84,786
80	Bertie County	$11,849		$20,405	$9,192	$45,647	$87,093
90	Bladen County	$53,312		$37,332	$12,372	$95,222	$198,238
100	Brunswick County	$149,748	$23,227	$54,559		$117,008	$344,542
110	Buncombe County	$106,920		$54,559		$162,974	$324,453
111	Asheville City	$40,000	$106,287	$20,405		$60,534	$227,226
120	Burke County	$73,416	$158,669	$54,559	$35,244	$116,941	$438,829
130	Cabarrus County	$119,520	$681,160	$89,113	$35,244	$175,061	$1,100,098
132	Kannapolis City	$11,708		$37,332	$12,372	$81,834	$143,246
140	Caldwell County	$86,113	$76,195		$12,372	$82,022	$256,702
150	Camden County	$17,017	$55,859	$11,848	$9,192	$32,002	$125,918
160	Carteret County	$133,165		$37,332	$12,372	$88,412	$271,281
170	Caswell County	$10,036		$9,414	$9,192	$32,002	$60,644
180	Catawba County	$96,048	$16,537			$162,974	$275,559
181	Hickory City	$49,236				$58,205	$107,441
182	Newton Conover City	$7,312		$19,977	$9,192	$57,873	$94,354
190	Chatham County	$25,531		$37,332	$12,372	$95,222	$170,457
200	Cherokee County	$26,827	$7,502	$20,405	$9,192	$108,323	$172,249
210	Edenton-Chowan	$16,136		$11,848	$9,192	$32,002	$69,178
220	Clay County	$10,800	$6,922			$102,462	$120,184
230	Cleveland County	$25,110	$151,319	$37,332	$12,372	$81,621	$307,754
240	Columbus County	$33,456	$25,703	$20,405	$9,192	$45,647	$134,403
241	Whiteville City	$3,000	$5,884			$37,802	$46,686
250	Craven County	$5,000		$49,164	$35,244	$106,709	$196,117
260	Cumberland County	$132,424		$132,687	$60,072	$233,376	$558,559
270	Currituck County	$24,894		$19,977	$11,464	$44,762	$101,097
280	Dare County	$44,602	$72,077	$33,716	$12,372	$73,070	$235,837
290	Davidson County	$243,540	$193,038	$37,332	$12,372	$88,412	$574,694
291	Lexington City	$9,216		$11,848	$9,192	$32,237	$62,493

#	LEA Name	WAN	Wi-Fi	Filtering	Firewall	Internet	Total
292	Thomasville City	$12,449	$870	($1,750)	$9,192	$45,835	$66,596
300	Davie County	$12,400	$69,932	$20,405	$9,192	$53,486	$165,415
310	Duplin County	$21,892	$52,532	$37,332	$12,372	$95,222	$219,350
320	Durham Public	$130,272		$66,391	$32,899	$136,431	$365,993
330	Edgecombe County	$20,561		$37,332	$12,372	$81,621	$151,886
340	Winston Salem/Forsyth	$115,051				$233,376	$348,427
350	Franklin County	$54,699		$36,674	$16,915	$85,991	$194,279
360	Gaston County	$72,864				$216,806	$289,670
370	Gates County	$16,141		$9,513	$7,852	$26,303	$59,809
380	Graham County	$3,000		($1,712)	$3,660	$1,683	$6,631
390	Granville County	$54,881	$79,404	$37,332	$12,372	$81,621	$265,610
400	Greene County	$12,810			$9,192	$48,766	$70,768
410	Guilford County	$166,011		$89,113		$216,806	$471,930
420	Halifax County	$12,712	$6,012	$20,405		$48,766	$87,895
421	Roanoke Rapids City	$12,480	$8,108	$11,848	$9,192	$32,002	$73,630
422	Weldon City	$6,292		$7,663	$3,660	$22,128	$39,743
430	Harnett County	$94,020	$69,898	$52,173	$39,117	($3,042)	$252,166
440	Haywood County	$41,794	$109,994			$45,647	$197,435
450	Henderson County	$61,375	$19,142	$40,290		$87,893	$208,700
460	Hertford County	$5,457	$5,922	$11,506	$9,192	$32,002	$64,079
470	Hoke County	$46,116		$37,332	$12,372	$95,222	$191,042
480	Hyde County	$3,107		$7,663	$3,660	$22,128	$36,558
490	Iredell-Statesville	$447,017	$105,629	$129,791	$60,072	$233,033	$975,542
491	Mooresville Graded	$10,445		$37,332	$12,372	$81,621	$141,770
500	Jackson County	$17,700				$45,647	$63,347
510	Johnston County	$238,680			$60,072	$305,071	$603,823
520	Jones County	$11,921	$17,787		$3,660	$19,125	$52,493
530	Lee County	$60,312	$46,731	$37,332	$12,372	$81,621	$238,368
540	Lenoir County	$42,597	$24,022			$184,093	$250,712
550	Lincoln County	$84,769	$19,430		$15,549	$81,621	$201,369
560	Macon County	$64,500				$123,452	$187,952
570	Madison County	$8,160		$20,405	$9,192	$45,439	$83,196
580	Martin County	$14,830		$11,848	$9,192	$32,002	$67,872
590	McDowell County	$42,828			$12,372	$76,822	$132,022
600	Charlotte-Mecklenburg	$351,456	$33,254	$497,918		$795,344	$1,677,972
610	Mitchell County	$22,711	$651	$11,848	$9,192	$35,477	$79,879
620	Montgomery County	$18,228	$35,583		$9,192	$48,766	$111,769
630	Moore County	$94,608		$37,332		$88,412	$220,352
640	Nash-Rocky Mount	$124,575	$163,574	$52,173	$35,244	$115,470	$491,036
650	New Hanover County	$76,919	$30,365		$35,244	$62	$142,590
660	Northampton County	$10,272		$11,848	$9,192	$32,002	$63,314
670	Onslow County	$201,240	$472,830	$54,559	$35,244	$118,695	$882,568
680	Orange County	$41,052	$15,190	$39,632	$12,372	$91,901	$200,147
681	Chapel Hill-Carrboro	$54,322		$54,559	$35,244	$118,695	$262,820
690	Pamlico County	$10,000				$19,125	$29,125
700	Elizabeth City-Pasquotank	$56,300		$30,758	$12,372	$66,976	$166,406
710	Pender County	$53,769	$70,377	$37,332		$127,067	$288,545

#	LEA Name	WAN	Wi-Fi	Filtering	Firewall	Internet	Total
720	Perquimans County	$12,554	$6,024	$11,848	$9,192	$32,002	$71,620
730	Person County	$25,740	$14,784	$37,332	$12,372	$81,621	$171,849
740	Pitt County	$261,612	$67,302	$87,855	$35,244	$173,098	$625,111
750	Polk County	$10,706			$9,192	$32,002	$51,900
760	Randolph County	$101,436		$37,332	$12,372	$81,969	$233,109
761	Asheboro City	$13,546	$7,426	$36,470	$9,192	$93,536	$160,170
770	Richmond County	$30,366		$37,332	$12,372	$81,621	$161,691
780	Robeson County	$53,568	$146,606	$74,544	$34,574	$191,648	$500,940
790	Rockingham County	$40,982		$54,559	$35,244	$118,695	$249,480
800	Rowan-Salisbury	$86,398	$98,290			$187,470	$372,158
810	Rutherford County	$15,178	$14,892	$52,122	$38,416	$112,981	$233,589
820	Sampson County	$31,458	$7,685	$37,332	$12,372	$95,222	$184,069
821	Clinton City	$25,440	$2,352		$9,192	$48,766	$85,750
830	Scotland County	$33,846	$44,501		$12,372	$81,621	$172,340
840	Stanly County	$85,456	$3,170		$12,372	$53,486	$154,484
850	Stokes County	$47,440	$31,000	$20,405	$9,192	$45,647	$153,684
860	Surry County	$53,841	$63,343	$37,332	$12,372	$81,621	$248,509
861	Elkin City	$7,000			$3,660	$32,237	$42,897
862	Mount Airy City	$18,611	$6,775	$11,848	$9,192	$32,002	$78,428
870	Swain County	$15,000	$4,563			$45,647	$65,210
880	Transylvania County	$20,052		$20,405	$9,192	$45,647	$95,296
890	Tyrrell County	$3,000			$3,660	$22,128	$28,788
900	Union County	$435,402		$83,418		$165,976	$684,796
910	Vance County	$28,152		$37,332	$12,372	$81,621	$159,477
920	Wake County	$657,728	$2,440,568			$635,366	$3,733,662
930	Warren County	$27,654		$19,977	$9,192	$44,762	$101,585
940	Washington County	$9,114	$2,506	$11,848	$9,192	($302)	$32,358
950	Watauga County	$29,430	$21,859	$14,804	$9,192	$36,642	$111,927
960	Wayne County	$84,360	$15,105		$12,372	$127,067	$238,904
970	Wilkes County			$37,332		$95,222	$132,554
980	Wilson County	$38,640	$14,215	$37,332	$12,372	$81,621	$184,180
990	Yadkin County	$50,470	$43,064	$20,405	$9,192	$53,486	$176,617
995	Yancey County	$17,297	$5,318	$7,663	$3,660	$22,128	$56,066
	TOTAL LEA	**$7,247,362**	**$6,167,575**	**$3,398,346**	**$1,384,214**	**$10,686,124**	**$28,883,621**

Appendix B – 2019 Charter/Residential/Lab School Allotments and Shared Services

The table below details the direct funding received by Charter/Residential/Lab Schools from SCI through PRC 036 allocations and the direct costs paid by SCI for each shared service (Content Filtering, Firewall, and Internet services).

Charter schools may choose to receive a $5,000 allotment in lieu of connecting to NCREN for Internet service. Charters request E-rate funds for WAN and Wi-Fi during spring of 2018 for service/delivery within the funding year between July 1, 2018 and June 30, 2019. SCI issues allocations during fiscal year 2019 to cover non-E-rate costs for eligible school connections.

ID#	*Charter School Name*	WAN Allotment	Wi-Fi / Allotment	Content Filter Svc	Firewall Service	Internet Service	Total
01B	River Mill Academy		$49,824	$7,663	$3,660	$21,560	$82,707
01C	Clover Garden					$13,568	$13,568
01D	The Hawbridge School			$5,102	$3,660	$13,568	$22,330
06A	Grandfather Academy	$5,000					$5,000
06B	Williams Academy	$5,000		$4,465	$3,660	$11,353	$24,478
07A	Washington Montessori					$10,096	$10,096
08A	Heritage Collegiate	$5,000		($95)	$3,660	($236)	$8,329
09A	Paul R Brown Leadership Academy	$5,000					$5,000
09B	Emereau: Bladen		$2,309			$10,096	$12,405
10A	Charter Day School			$12,742	$3,660	$17,773	$34,175
10B	South Brunswick Charter School			$4,389	$3,660	$10,364	$18,413
11A	Evergreen Community Charter		$36,265			$11,353	$47,618
11B	ArtSpace Charter		$5,746	$4,465	$3,660	$11,353	$25,224
11C	Invest Collegiate - Imagine	$12,600	$22,863			$22,672	$58,135
11D	Franklin School of Innovation		$21,426	$5,102	$3,660	$13,386	$43,574
11K	Francine Delany New School		$15,844	$3,993	$3,660	$10,023	$33,520
12A	Dimensions Charter School		$28,432	$4,465	$3,660	$11,353	$47,910
13A	Carolina International School					$18,235	$18,235
13C	A.C.E. Academy		$13,728	$4,465	$3,660	$11,366	$33,219
13D	Kannapolis Charter Academy	$5,000					$5,000
16B	Tiller School	$5,000					$5,000
19A	Chatham Charter			$5,102	$3,660	$12,032	$20,794
19B	Woods Charter School		$12,080	$7,544	$3,660	$22,819	$46,103
19C	Willow Oak Montessori		$25,309	$3,893	$3,660	$10,131	$42,993
20A	Learning Center		$5,727		$2,160	$18,228	$26,115
23A	Pinnacle Classical Academy			($375)		$16,498	$16,123
24B	Thomas Academy	$5,000					$5,000
24N	Columbus Charter School	$15,723		$4,465	$1,644	$10,096	$31,928
26B	Alpha Academy					$7,107	$7,107
26C	Capitol Encore Academy		$4,004			$10,096	$14,100
27A	Water's Edge Village School			$3,848	$1,644	$8,545	$14,037
29A	Davidson Charter Academy		$31,249	$3,828	$3,050	$9,654	$47,781

#	Charter/Residential/Lab School Name	WAN	Wi-Fi	Filtering	Firewall	Internet	Total
32A	Maureen Joy Charter	$7,160					$7,160
32B	Healthy Start Academy			$5,102	$3,660	$13,398	$22,160
32C	Carter Community Charter			$5,102		$13,398	$18,500
32D	Kestrel Heights School	$21,050	$25,941	($1,125)		$21,560	$67,426
32H	Research Triangle Charter Academy	$5,000					$5,000
32K	Central Park School For Children	$12,840		$4,465	$3,660	$11,366	$32,331
32L	Voyager Academy			$11,848	$9,192	$32,237	$53,277
32M	Global Scholars Academy			$5,102	$3,660	$13,398	$22,160
32N	Research Triangle High School		$7,987	$11,848	$9,192	$32,237	$61,264
32P	Institute Dev. Of Young Leaders		$486	$4,477	$1,644	$11,286	$17,893
32Q	Reaching All Minds Academy			$4,565	$4,796	$11,496	$20,857
32R	Excelsior Classical Academy		$31,425	$4,465	$5,763	$11,366	$53,019
32S	KIPP Academy			$4,465		$11,353	$15,818
33A	North East Carolina Preparatory		$1,584			$19,936	$21,520
34B	Quality Education Academy		$1,575	$5,102	$3,018	$13,568	$23,263
34D	Carter G Woodson School		$10,025	$4,465	$3,660	$11,353	$29,503
34F	Forsyth Academy	$5,000					$5,000
34G	The Arts Based School	$5,000					$5,000
34H	NC Leadership Academy			$6,434	$3,660	$18,614	$28,708
35A	Crosscreek Charter	$6,781	$27,848				$34,629
35B	Youngsville Academy	$5,000					$5,000
36B	Piedmont Community Charter	$7,570		$7,663	$3,660	$21,560	$40,453
36C	Mountain Island Charter		$109,330	$10,623	$9,357	$31,630	$160,940
39A	Falls Lake Academy		$10,807			$21,560	$32,367
39B	Oxford Preparatory High School				$1,644	$14,894	$16,538
41B	Greensboro Academy	$5,000					$5,000
41C	Guilford Preparatory Academy	$883	$480	$4,345	$3,660	$10,927	$20,295
41D	Phoenix Academy Inc	$5,000					$5,000
41F	Triad Math and Science Academy			$7,663	$3,660	$23,534	$34,857
41G	Cornerstone Charter Academy			$5,102	$3,660	$13,568	$22,330
41H	College Prep & Leadership Academy			$5,131	$3,660	$12,923	$21,714
41J	Summerfield Charter Academy	$5,000					$5,000
41K	Piedmont Classical High School		$9,074	$7,733	$3,660	$20,790	$41,257
41L	Gate City Charter Academy	$5,000					$5,000
41M	Next Generation Academy		$4,170			$9,240	$13,410
41N	Experimental School Greensboro		$21,031	$2,688	$2,160	$6,720	$32,599
42A	KIPP Halifax College Preparatory			$4,465		$9,874	$14,339
43C	Anderson Creek Academy		$4,339	$2,280	$4,277	$10,096	$20,992
44A	Shining Rock Classical Academy			$4,835	$3,660	$12,533	$21,028
45A	Mountain Community School		$16,492	$3,993	$3,660	$9,884	$34,029
45B	FernLeaf Community Charter			$3,993	$3,660	$10,023	$17,676
49B	American Renaissance School	$6,035	$41,880	$7,663	$3,660	$21,560	$80,798
49D	Success Institute Charter			$3,848	$1,644	$9,587	$15,079
49E	Pine Lake Preparatory		$120,596	$11,848	$9,192	$35,477	$177,113
49F	Langtree Charter Academy	$5,000					$5,000
49G	Iredell Charter Academy	$5,000					$5,000
50A	Summit Charter					$17,393	$17,393

#	Charter/Residential/Lab School Name	WAN	Wi-Fi	Filtering	Firewall	Internet	Total
51A	Neuse Charter School		$49,580	$7,663	$3,660	$19,125	$80,028
51B	Johnston Charter Academy	$5,000					$5,000
53B	Ascend Leadership Academy			$3,580	$3,660	$9,600	$16,840
54A	Children's Village Academy			$7,663		$24,803	$32,466
55A	Lincoln Charter School	$6,147	$103,744	$12,103	$9,192	$35,678	$166,864
58B	Bear Grass Charter School			$7,663	$3,660	$19,125	$30,448
60B	Sugar Creek Charter	$1,464	$5,861	$7,663		$23,534	$38,522
60D	Lake Norman Charter		$13,884	$11,848		$31,551	$57,283
60F	Metrolina Regional Scholars Academy		$2,798	$4,465	$3,660	$11,353	$22,276
60G	Queens Grant Community School			$7,663	$3,660	$23,534	$34,857
60I	Community School of Davidson	$7,200	$158,564	$7,663	$3,660	$23,534	$200,621
60J	Socrates Academy		$20,237	$5,353	$3,660	$13,958	$43,208
60K	Charlotte Secondary School		$15,664	$5,102	$3,660	$13,568	$37,994
60L	KIPP Charlotte	$5,181	$10,904	$4,687	$3,660	$11,885	$36,317
60M	Corvian Community School	$3,420		$4,465	$4,302	$11,353	$23,540
60N	Aristotle Preparatory Academy		$1,270	$3,993	$3,660	$10,014	$18,937
60P	Charlotte Choice Charter			$4,465	$3,660	$11,353	$19,478
60Q	Invest Collegiate					$11,353	$11,353
60S	Bradford Preparatory School		$88,955	$7,663		$21,560	$118,178
60U	Commonwealth High School					$11,353	$11,353
60V	Charlotte Learning Academy		$6,390		$3,660	$11,353	$21,403
60Y	Pioneer Springs Community	$26,863	$12,746	$3,993	$3,141	$10,023	$56,766
61J	Thunderbird Preparatory Academy			$4,465	$3,660	$11,353	$19,478
61K	United Community School			$4,213	$3,660	$10,488	$18,361
61L	Stewart Creek High School					$10,023	$10,023
61M	Charlotte Lab School			$8,313	$3,660	$24,730	$36,703
61N	Queen City STEM School		$49,026	$5,102	$3,660	$13,568	$71,356
61P	VERITAS Community School		$13,113	$3,993	$3,141	$10,023	$30,270
61Q	Mallard Creek STEM Academy	$5,000	$43,709	$5,131	$3,660	$13,045	$70,545
61R	Matthews Charter Academy	$5,000					$5,000
61S	Unity Classical Charter School	$5,000					$5,000
61T	Movement Charter		$22,987		$3,660	$11,353	$38,000
61U	UpROAR Leadership		$31,246	$4,465	$3,660	$11,353	$50,724
61W	East Voyager Academy	$5,000	$31,245	$4,270	$4,186	$10,708	$55,409
61X	Mountain Island Day Community		$35,396	$4,712	$3,660	$13,204	$56,972
63A	Academy of Moore County				$3,141	$11,366	$14,507
63C	Moore Montessori Community			$4,032	$6,845	$9,132	$20,009
64A	Rocky Mount Preparatory			$7,663	$3,660	$19,125	$30,448
64B	Global Achievers School	$5,000	$12,154				$17,154
65A	Cape Fear Center for Inquiry			$8,017	$3,660	$23,701	$35,378
65B	Wilmington Preparatory Academy	$5,000					$5,000
65C	Douglass Academy			$3,848	$1,644	$9,587	$15,079
65D	Island Montessori Charter				$3,660	$11,353	$15,013
65F	Coastal Prep		$2,175	$5,131	$3,660	$13,045	$24,011
65G	Girls Leadership Acad. Wilmington		$2,796	$4,465	$3,660	$11,353	$22,274
65Z	UNCW DC Virgo				$2,770		$2,770
66A	KIPP Gaston College Preparatory			$8,073		$19,418	$27,491

#	Charter/Residential/Lab School Name	WAN	Wi-Fi	Filtering	Firewall	Internet	Total
67B	Z.E.C.A. School of Arts and Tech			$4,465	$3,660	$10,096	$18,221
68A	Eno River Academy		$26,499	$7,988	$3,141	$19,936	$57,564
68C	Expedition School					$11,366	$11,366
69A	Arapahoe Charter School				$3,660	$12,032	$15,692
70A	Northeast Academy of Aerospace		$15,016	$4,465	$3,660	$10,124	$33,265
73A	Bethel Hill Charter		$3,798	$4,465	$3,660	$10,096	$22,019
73B	Roxboro Community School			$7,663	$3,660	$19,125	$30,448
74B	Ignite Innovation Academy - Pitt		$18,420	$4,465	$3,660	$10,096	$36,641
74C	Winterville Charter Academy	$5,000					$5,000
76A	Uwharrie Charter Academy	$14,147			$3,660	$14,022	$31,829
78A	Communities in School Academy			$3,993	$3,660	$10,023	$17,676
78B	Southeastern Academy			$4,465	$6,228	$11,353	$22,046
79A	Bethany Community Middle		$1,989		$3,660	$11,040	$16,689
80B	Essie Mae Kiser Foxx Charter School	$5,000					$5,000
81A	Thomas Jefferson Classical	$5,340	$72,691	$7,663	$3,660	$23,534	$112,888
81B	Lake Lure Classical Academy		$23,704	$6,241	$3,660	$17,527	$51,132
84B	Gray Stone Day School			$7,663	$3,660	$21,560	$32,883
86T	Millennium Charter Academy	$5,000					$5,000
87A	Mountain Discovery Charter School			$3,848	$3,660	$20,250	$27,758
88A	Brevard Academy			$4,465	$3,660	$17,407	$25,532
90A	Union Academy Charter School		$54,504	$7,663	$3,660	$21,560	$87,387
90B	Union Day School		$32,809			$9,339	$42,148
90C	Union Preparatory Academy	$5,000					$5,000
91A	Vance Charter School					$19,125	$19,125
91B	Henderson Collegiate	$285	$3,487	$6,637	$4,088	$15,514	$30,011
92B	Exploris Middle School			$4,465	$3,660	$11,353	$19,478
92D	Magellan Charter		$49,202	$4,465	$3,660	$11,353	$68,680
92E	Sterling Montessori Academy			$6,167	$3,660	$17,062	$26,889
92F	Franklin Academy					$15,175	$15,175
92G	East Wake Academy		$30,271	$11,848	$9,192	$35,477	$86,788
92K	Raleigh Charter High School			$4,465	$3,660	$11,353	$19,478
92L	Torchlight Academy	$1,290			$3,660	$11,353	$16,303
92M	PreEminent Charter School	$5,000					$5,000
92N	Quest Academy	$5,000					$5,000
92P	Southern Wake Academy		$42,156	$7,663	$3,660	$19,125	$72,604
92Q	Hope Charter Leadership Academy			$3,993	$3,660	$10,023	$17,676
92R	Casa Esperanza Montessori			$4,465	$3,660	$11,353	$19,478
92S	Endeavor Charter		$15,452	$4,465	$3,660	$11,292	$34,869
92T	Triangle Math and Science Academy			$7,663	$3,660	$23,534	$34,857
92U	Longleaf School of the Arts		$1,800		$3,660	$7,661	$13,121
92V	Wake Forest Charter Academy	$5,000					$5,000
92W	Cardinal Charter Academy	$5,000					$5,000
92Y	Envision Science Academy		$21,518	$7,766	$3,660	$23,660	$56,604
93A	Haliwa-Saponi Tribal School		$3,972	$4,465	$3,660	$10,096	$22,193
93J	PAVE Southeast Raleigh Charter		$546	$4,345	$3,660	$10,927	$19,478
93L	Central Wake Charter High School					$5,343	$5,343
93M	Peak Charter Academy	$5,000					$5,000

#	Charter/Residential/Lab School Name	WAN	Wi-Fi	Filtering	Firewall	Internet	Total
93N	Pine Springs Prep			$6,537	$3,660	$18,556	$28,753
93P	Rolesville Charter Academy	$5,000					$5,000
93R	Raleigh Oak Charter High		$15,181	$4,032	$3,660	$10,080	$32,953
94Z	Northeast Regional Biotech/Ag			$4,465	$3,660	$10,096	$18,221
95A	Two Rivers Community School			$4,465	$3,660	$11,353	$19,478
96C	Dillard Academy			$4,213	$3,660	$10,588	$18,461
96F	Wayne Preparatory			$4,835	$4,088	$12,293	$21,216
97D	Bridges Academy		$2,860	$4,389	$3,660	$9,830	$20,739
98A	Sallie B Howard School for the Arts	$7,561					$7,561
98B	Wilson Preparatory Academy		$20,200	$7,663	$3,660	$19,125	$50,648
298*	Eastern NC School for Deaf			$5,102	$3,660	$13,428	$22,190
298*	Governor Morehead School			$4,465	$3,660	$11,353	$19,478
298*	North Carolina School for Deaf			$5,102	$3,660	$13,568	$22,330
	Charlotte Community (closed)					$10,224	$10,224
	SEGS Academy (closed)				$3,660		$3,660
	TOTAL non-LEA (Charter, Residential, Lab)	**$339,540**	**$1,910,395**	**$676,489**	**$479,516**	**$2,252,725**	**$5,658,665**

* DPI Residential Schools did not receive PRC 036, but their shared services are provided here for completeness of the data.

Appendix C - Connectivity Staff Salary Report

Table C1 summarizes NCDPI positions paid from School Connectivity Initiative funding and their respective compensation and benefits. The salaries remain unchanged from the previous fiscal year.

Title of Position and Description of Duties	Compensation and Benefits
Lead Connectivity and E-rate Analyst: provides LEA/Charter School Technical Consulting, Strategic Planning, Project Management	$122,880
Lead E-rate Analyst: provides LEA/Charter School Technical Consulting, Strategic Planning	$105,627
E-rate Program Administrator: provides E-rate Education and Consultation Services	$89,910
E-rate Program Administrator: provides E-rate Education and Consultation Services	$105,032
Education Consultant II: Assists with Digital Teaching and Learning Integration	$91,648
Technology Support Center Analyst: Provides help desk support for SCI related calls	$59,604
Total	$574,701

Table C1. NCDPI School Connectivity Staff Compensation and Benefits

In September 2019, SCI began a staff realignment to meet the changing needs of the program. The increasing number of charter schools, the FCC changes in the E-rate program, and the expansion of responsibility into K-12 cybersecurity required the creation of a manager position (filled) and restructuring an open position into a fourth regional E-rate coordinator. Upon completion, the SCI team will consist of a manager, four regionally based E-rate Program Administrators (E-rate Coordinators), and a small portion of a Technology Support Center Analyst. There will be no change in total costs.

Appendix D – North Carolina E-rate funding history report

The following report, as of December 8, 2019, shows North Carolina public school E-rate funding requests, the total pre-discount amount for all requested services, the amount of E-rate funding being requested, the amount of funding ultimately committed by the FCC, the amount of funding disbursed, and the utilization of funds (disbursed/committed). Note that there are still disbursements outstanding for 2018, and commitments pending for 2019.

For the 2019 E-rate funding year, only 13% of the $56M in committed funding has been disbursed – this is typical as the funding year began July 1, 2019. For comparison, at the same time last year, the 2018 utilization was only 20%. There are also requests totaling $2.4M for 2019, for which the FCC has not yet made a commitment decision. The estimated 2019 commitment from the FCC is $73M. This illustrates a significant factor in the complexity of the E-rate funding cycle: the FCC is still making decisions on 2018 applications while at the same time disbursing funds for the 2019 year, and processing bid applications for the 2020 year. SCI assists PSUs in dealing with multiple E-rate "years" at the same time as managing the state's multiple applications. The state is beholden to the FCC concerning the speed at which E-rate applications are processed.

It is notable that in 2018, North Carolina reached a billion dollars in disbursed funds over the life of the E-rate program. The blue area in table D-1 below highlights the years in which the School Connectivity Initiative was in place. The dark blue area from 2015 to 2019 highlights the years under the modernized E-rate rules.

One major change in E-rate modernization was to phase out voice services from the program. That phase out is now complete and is one of the reasons the pre-discount rates were much higher prior to 2016. The FCC decided to remove voice from the program, but also changed the rules enabling *every* school to receive at least some Category 2 funding for Wi-Fi (internal connections) each year. This rule change in 2015 is a major reason that the percent rejected decreased drastically from 2015 and onward. For E-rate year 2016 and 2015, the state received $5.9M and $10.4M in E-rate disbursements for voice services. LEAs and charters have had to adapt their voice services or use local funds to make up for this loss.

The E-rate modernization program that enabled North Carolina to procure Wi-Fi for every school has had a significant impact, enabling all schools with the infrastructure required for digital teaching and learning. The other key factor in this success was the decision, beginning in 2015, for the General Assembly to expand the School Connectivity Initiative to enable North Carolina to maximize the E-rate utilization in the state.

While demand for Internet bandwidth in K-12 has increased dramatically over the last decade, the cost per ADM has stayed relatively flat. In the WAN, service providers have become more competitive in many counties, thus reducing costs or allowing significant bandwidth increases for about the same price.

Year	Pre-Discount	Requested	Committed	Disbursed	Requests	Utilization
1998	$31,248,326	$21,645,083	$21,511,196	$17,384,524	1,889	81%
1999	$42,380,935	$29,274,407	$28,605,610	$24,662,986	1,596	86%
2000	$30,508,564	$21,002,184	$20,915,884	$17,740,889	1,006	85%
2001	$30,523,010	$20,651,680	$20,144,577	$16,038,416	1,199	80%
2002	$64,746,623	$50,079,180	$48,117,223	$39,646,446	1,664	82%
2003	$63,794,563	$48,166,547	$45,339,691	$37,042,927	1,733	82%
2004	$53,567,285	$39,003,187	$37,480,433	$30,336,639	1,757	81%
2005	$69,542,747	$52,402,111	$51,030,249	$43,984,441	1,481	86%
2006	$65,998,628	$48,949,041	$47,416,846	$40,370,952	1,041	85%
2007	$80,815,176	$61,004,856	$58,121,112	$49,861,383	1,420	86%
2008	$76,189,274	$57,591,762	$56,599,752	$50,540,986	1,063	89%
2009	$84,043,533	$63,271,541	$61,342,689	$52,875,403	1,071	86%
2010	$103,239,144	$81,017,781	$77,603,821	$66,523,395	1,207	86%
2011	$93,841,666	$73,363,498	$72,422,641	$63,982,881	1,012	88%
2012	$102,566,340	$80,911,689	$80,307,116	$71,645,193	966	89%
2013	$88,604,720	$67,927,050	$67,492,385	$60,547,108	844	90%
2014	$89,910,436	$69,046,241	$68,598,967	$60,510,973	825	88%
2015	**$142,218,601**	**$107,523,612**	**$107,484,302**	**$103,002,672**	**1,693**	**96%**
2016	**$136,729,435**	**$97,006,422**	**$96,995,187**	**$88,889,091**	**1,247**	**92%**
2017	**$89,891,678**	**$60,187,517**	**$60,094,638**	**$55,406,525**	**985**	**92%**
2018	**$88,470,920**	**$63,803,936**	**$63,795,980**	**$49,770,315**	**1,108**	**78%**
2019	**$92,146,899**	**$71,248,757**	**$68,845,806**	**$9,215,318**	**1,630**	**13%**
TOTAL	**$1,720,978,503**	**$1,285,078,082**	**$1,260,266,106**	**$1,049,979,463**	**28,437**	

Table D1. North Carolina E-rate Utilization (1998 – 2019)

Table D2 shows only Category 2 funds associated with the Wi-Fi Expansion Program,[30] which began in 2015, funded initially by Race to the Top, then by the State. Under this program, DPI developed statewide convenience contracts with 14 vendors. The educational discounts offered by the vendors provided significantly lower pricing for even the small districts, enabling all schools to maximize their buying power while allowing choices from multiple vendors.

Year	Pre-Discount	Requested	Committed	Disbursed	Requests	Utilization
2015	$43,509,331	$35,243,726	$35,173,206	$34,851,336	597	99%
2016	$54,273,492	$40,740,557	$38,477,846	$37,554,789	692	98%
2017	$28,500,975	$19,464,491	$17,422,048	$17,085,583	537	98%
2018	$29,681,299	$20,356,254	$19,777,287	$15,116,167	800	76%
2019	$34,217,403	$25,354,385	$22,781,782	$2,747,490	1,122	12%
TOTAL	**$190,182,500**	**$141,159,413**	**$133,632,169**	**$107,355,366**	**3,748**	

Table D2. E-rate Utilization through SCI Category 2 Contracts

[30] FCC Form 470 number 855450001286650 funded FRNs only.