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, 2021

NCDPI Chronological Schedule, 2020-2021

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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:

The North Carolina Department of Public Instruction, Technology Services School Connectivity and Cybersecurity section, in cooperation with The Friday Institute for Educational Innovation at NC State University.

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Executive Summary

The North Carolina (NC) School Connectivity Initiative (SCI) is a national leader in providing adequate and secure Internet access to every public-school classroom across the state. Through NC Department of Public Instruction (NCDPI) Cooperative Purchasing Agreements, E-rate training and support, the provision of client network engineering, and identity management and cybersecurity[1] services, North Carolina is ranked first in federal funds received per student and continues to be a national leader. This report to the North Carolina General Assembly details the significant accomplishments achieved over the SFY2020 and calendar 2020 reporting period. Included are 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 interactively at https://go.ncsu.edu/SCIreport courtesy of The Friday Institute for Educational Innovation at the NC State University (The Friday Institute).

Accomplishments

- North Carolina has led the nation in E-rate funding per student over the past five years.[2] Every classroom has wireless broadband 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 (AVA) 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 SFY2020, SCI received $31.2M in state appropriations. Supplemented by nearly $10M in federal E-rate reimbursements and nearly $65.3M in federal E-rate discounts, North Carolina public schools received nearly $95M 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 $3.41 in value.**
- 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 Public School Units (PSUs) is 59% of capacity.[3] Year-on-year per-student and overall utilization growth continued, but at a slightly lower historical rate, likely reflecting an already increased adoption, effective use of filtering services and policies and lower average on-site classroom attendance for the year.
- In calendar 2020, SCI began realigning staff to expand E-rate coordination capacity and to develop the legislated Cybersecurity and Risk Management expansion within SCI.[4] Through the North Carolina Research and Education Network (NCREN), SCI provides PSUs with access to the tools and expertise to conduct internal and external network security risk assessments,

[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

persistent vulnerability analysis, threat detection, and automated response.

Impact of COVID Pandemic

When COVID began in early 2020, SCI and MCNC had just completed the necessary bandwidth upgrades, as March is our target date for upgrades to ensure adequate bandwidth availability to schools for online year-end testing. At that time, we considered the potential savings by reducing contracted bandwidth capacity across the network, but no action was taken due to the unknown duration of the stay-at-home orders and the one-time charges for circuit changes. In addition, the potential savings would only net 15%, even at a 50% capacity reduction due to the one-time costs and the bandwidth pricing structure.

Refer to section "K-12 Internet Utilization and Capacity Analysis" for graphical representation and discussion of the sudden drop of bandwidth utilization in schools during March 2020 and the subsequent recovery levels by October 2020.

Challenges and Risks

Two major challenges for the immediate future:

- Cybersecurity risks and threats are rapidly increasing. Over 740 K-12 cybersecurity-related events have been publicly 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.
- In December 2019, the FCC adopted E-rate program changes for 2021-2025 that increased each school's budget by nearly 12% and added flexibility by permitting district-wide spending calculations, versus per-school, which combined will result in greater utilization of E-rate funding but will cause PSU requests to exceed available SCI funding to maintain zero-net-cost to the PSU.

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. Specifically, SCI recommends:

1. **No Cost**: The General Assembly renew the intent of SL2017-57 SECTION 7.11.(d) on a recurring basis to permit these specific allocated funds to not revert. This is necessary due to nature of the federal E-rate calendar, which spans over 3 calendar years for each fiscal year.
2. **$4.6M Recurring**: Expansion of SCI funding consistent with E-rate program changes for 2021-2025.
3. **$550k Recurring**: Expansion of cybersecurity funding, for five regional cybersecurity consultants, as was previously included in legislation but remained unfunded.[7]
4. **$5M Recurring**: Establishment of statewide shared cybersecurity infrastructure to protect critical school business systems and minimize instructional disruption.

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

5. **$250k Non-Recurring:** Fund a second year of initiative of addressing the "Homework Gap" through proof-of-concept projects with The Friday Institute and NC Department of Information Technology (NCDIT) Broadband Infrastructure Office. The first-year funding was provided by the CARES act.

The opportunities before us to continue making progress for North Carolina is great. The State is a leader at taking advantage of opportunities such as these by 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.

Background

The School Connectivity Initiative launched in earnest with the publication of the *Developing Regional Education Networks* report in May 2006. In the 14 years since the inception of the SCI program, NC public schools has procured over $1B in network infrastructure and services utilizing $278M in State appropriations that enabled $814M in Federal Communications Commission (FCC) E-rate[8] disbursements. During this time, the telecommunications and computing markets have shifted dramatically and the regulatory environment has been in near constant flux. The NC legislature has called for and invested in a digital transition in public schools.

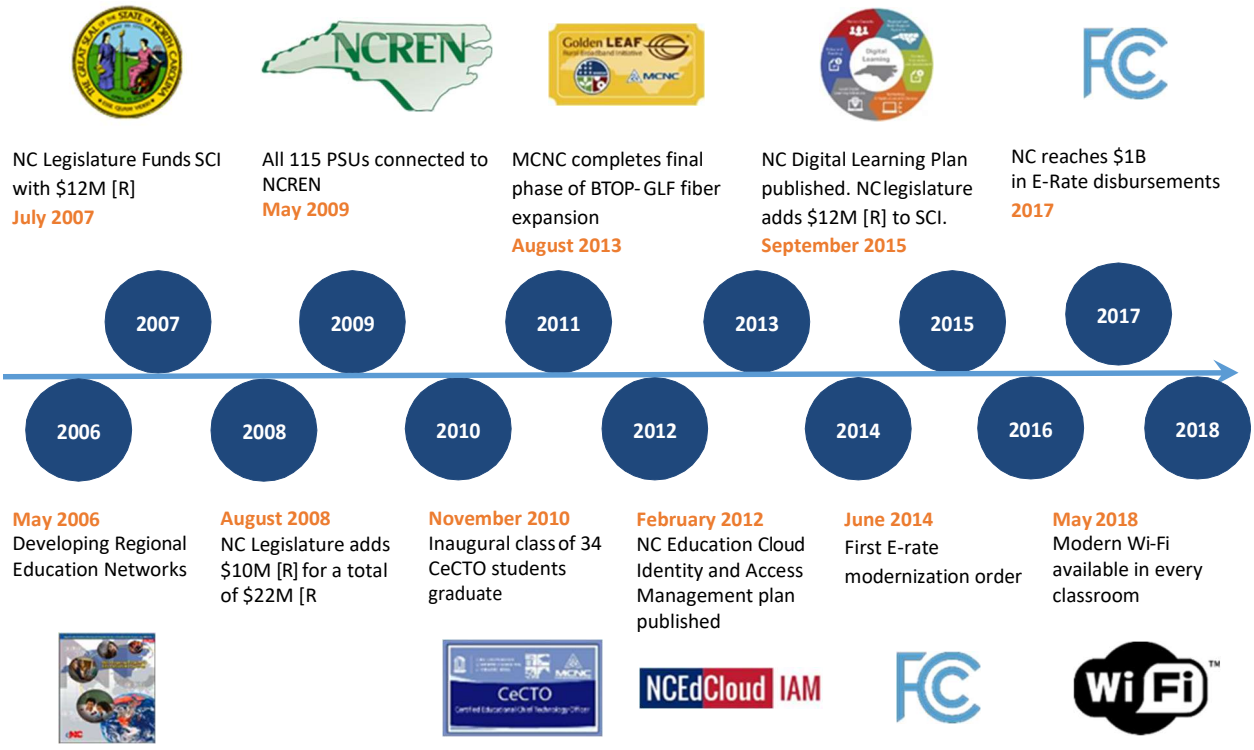

Figure 1: SCI Milestone Timeline - 2006-2018

Figure 1 illustrates how the SCI program has exhibited extraordinary productivity and adaptability over its history. Within its first year, it connected all 115 PSUs to the NC Research and Education Network using an opt-in approach. It established the Certified Educational Chief Technology Officer (CeCTO) training program through The UNC School of Government and developed and implemented the NCEdCloud Identity and Access Management (IAM) service. Through MCNC and the Golden Leaf Foundation, the program enabled delivery of competitive fiber connectivity to rural NC schools and libraries, adapted to the NC Digital Learning Plan,[9] FCC E-rate modernization orders, and the growth of

[8] https://www.fcc.gov/consumers/guides/universal-service-program-schools-and-libraries-e-rate
[9] https://ncdli.fi.ncsu.edu/dlplan/

student device 1:1 program. From 2009 to 2019, the K-12 contracted Internet usage grew from approximately 1Gbps[10] to 300Gbps.

[10] Gbps = gigabits per second; 1,000,000,000 bits; a measure of data transfer rate

Performance Overview

The vision of the SCI is to ensure all NC PSUs 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 CPAs and common shared services that leverage economies of scale, enable the greatest amount of local control in PSU technology decisions, and 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[11] 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. 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 funding received. Public schools are recovering more from the FCC's Universal Services Fund than North Carolina taxpayers are paying into it and using it to make a difference in North Carolina classrooms.

In the past E-rate filing year:

- 205 PSUs submitted 2,265 applications, and increase of 10% and 35% respectively, for a total of $77M
- 94% approval of all requests, with an average discount of 75%, a decrease of 2% each
- 84% of all NC E-rate requests were enabled by SCI contracts and funding, a decrease of 3%

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

- Direct assistance within PSUs for E-rate planning and filing
- Individualized support through multiple levels of audits and appeals occurring throughout the year
- Multiple regional training events open to all E-rate eligible entities, including public libraries
- Planning, filing, and audit support of multiple state Internet consortia applications
- Assistance to The Friday Institute in data analytics and the development of algorithms to determine the optimal E-rate filing strategy to maximize E-rate discounts, cost-analysis, and ensuring equitable distribution of allocated funding.

Financial Summary

For SFY2020, the School Connectivity Initiative is an $95M program supported by $30M in legislative funding and leveraging FCC E-rate program discounts and reimbursements in excess of $65M.

[11] https://docs.fcc.gov/public/attachments/DA-19-71A1.pdf

Table 1 summarizes SFY2020 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.

(values in $M)	Total Cost	E-rate Portion	State Portion
Category 1 Consortium Internet	14.8	12.1	2.7
Category 1 School Fiber Connections (WAN)	35.5	28.2	7.3
Category 2 Classroom Connections (Wi-Fi)	34.1	25.0	9.1
E-Rate Eligible Subtotal	$ 84.4	$ 65.3	$ 19.1
Firewall Services	1.9		1.9
Content Filtering Services	4.4		4.4
Identity and Access Management	1.5	not eligible	1.5
Client Network Engineering	1.8		1.8
Program Administration NCDPI, FFL, FI	1.0		1.0
E-rate Ineligible Subtotal	$ 10.6		$ 10.6
Total	**$ 95.0**	**$ 65.3**	**$ 29.7**

Table 1: Financial Summary SFY2020 ($M)

E-rate Eligible Expenses Detail:

Over 88% 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 during the audit process. For SFY2020, the combined E-rate eligible expenses were $84.4M (+18%), E-rate discounts or reimbursements were $65.3M (+25%) and the final cost to the State was $19.1M (+3%).

For every $1 of state funding spent on E-rate eligible goods and services,
North Carolina schools received $3.41 in total value.

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 NCREN operated by MCNC. Charter schools may opt-out of this service and receive an annual $5,000 allocation for Internet service. All 115 PSUs and 163 charter schools (88%) 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 SFY2020, Internet access cost $14.8M, E-rate reimbursed $12.1M, making the cost to the State $2.7M. Year-on-year:

- Total Internet costs increased by 15%
- E-rate discounts received increased by 21%
- Final state costs after E-rate discounts decreased by 7%
- Internet capacity increased to nearly 300Gbps (+9%)
- Nine new charter schools were connected to NCREN
- Thirty-six PSUs and 61 charter schools received bandwidth upgrades

When the COVID pandemic began in March 2020, SCI and MCNC had just implemented the necessary bandwidth upgrades initiated in December, based on meeting performance thresholds. March is our target date for upgrades due to year-end online testing. At that time, we considered the potential savings if we were to reduce the contracted capacity across the network. It was unknown how long the stay-at-home orders would last. There are also one-time charges for circuit changes. As the state's cost for Internet service is nearly 70% funded by E-rate reimbursements, even a 50% reduction in total cost would only net a 15% overall reduction to the bottom line when including the charges to decrease and then increase the circuits at the end of the pandemic.

The section "K-12 Internet Utilization and Capacity Analysis" further in this report examines the impact of the COVID pandemic on Internet utilization and capacity.

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, or Conterra, to provide a fiber-based Wide Area Network (WAN). Each of these connections are eligible for E-rate discounts of up to 90%.

With over 2,700 school buildings in NC and 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. 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, resulting in a net-zero-local cost to the school. For Fiscal Year 2020, PSUs received $35.5M in WAN services. E-rate provided $28.2M and the State provided the remaining $7.3M to PSUs. Year-on-year:

- WAN total costs increased 6%
- E-rate discount amount increased by 9%
- Final cost to the state decreased by 4%

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. 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.

In July 2014, the FCC issued an E-rate Modernization Order 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. For E-rate Funding Year 2019, PSUs received $34.1M in Category 2 Classroom Connections (Wi-Fi) goods and services. E-rate provided $25M and the state provided the remaining $9.1M to PSUs. Year-on-year:

- Wi-Fi total costs increased 18%
- E-rate discount amount increased by 20%
- Final cost to the state increased by 12%

As E-rate Year 2020 (July 2020 through September 2021) would be the sixth year of the FCC's five-year program, the FCC granted schools to both utilize any remaining budget in addition to another year of $157 per student.

In the January 2020 SCI Legislative Update, SCI estimated the total available PSU E-rate budgets and calculated a potential shortfall of nearly $15M. SCI communicated with PSUs on the potential shortfall and encouraged frugal filing for true needs. If requests were to exceed available funding, SCI would develop an allocation plan to distribute available funds in the most equitable manner. When the filing closed in April 2020, SCI notified the General Assembly through Fiscal Research that the $15M would not be needed. However, there remains an urgent need. The E-rate filings for Funding Year 2020 (July 2020 through September 2021) indicate a severe strain on SCI funding:

- 183 PSUs filed 2082 E-rate funding requests, an increase of 35% and 86%, respectively
- 26% increase in total project costs to $42M
- 23% increase in E-rate funding to $31M
- 33% increase in required state funds to $11.8M in state funds

The state funding percentage increase is due to a significantly higher than normal filings by PSUs with lower E-rate discount levels. As illustrated in Table 2, the significantly higher volume (+369%) of PSUs at the 50-59% discount rate shifts a significant portion of the costs to the State. SCI is accelerating its filings for E-rate reimbursement on Internet invoices in order to maintain sufficient cash flow to meet this immediate demand, but we estimate we will not be able to sustain this past March 2021.

E-rate	REQUESTS			Pre-Discount			E-rate Request			State Funding		
Disc%	2019	2020	YoY	2019	2020	YoY	2019	2020	YoY	2019	2020	YoY
20-29	14	10	-29%	145,700	150,357	3%	47,481	35,483	-25%	98,219	114,873	17%
40-49	55	63	15%	1,088,775	1,165,354	7%	435,510	466,142	7%	653,265	699,212	7%
50-59	32	150	369%	927,911	7,525,596	711%	463,956	3,762,798	711%	463,956	3,762,798	711%
60-69	80	74	-8%	8,332,604	1,982,532	-76%	4,999,562	1,189,519	-76%	3,333,042	793,013	-76%
70-79	68	166	144%	617,784	3,168,304	413%	432,449	2,217,813	413%	185,335	950,491	413%
80-89	870	1,619	86%	23,005,166	28,850,529	25%	18,895,211	23,386,774	24%	4,109,955	5,463,756	33%
	1,119	**2,082**	**86%**	**$ 34,117,940**	**$ 42,842,672**	**26%**	**$ 25,274,169**	**$ 31,058,529**	**23%**	**$ 8,843,771**	**$ 11,784,143**	**33%**

Table 2: Year-on-Year Wi-Fi E-rate Filings

The FCC, on December 20, 2019, established an E-rate Modernization rule (2019-27219)[12] that "…makes permanent the 'category two budget' approach", permits district-wide budgets, and increases the five-year per-student budget by 11% to $167[13]. For NC public schools, this is a five-year budget amount of $267M for local network infrastructure within a school. **For SCI, this will require an average of $16,032,000 in recurring funds each fiscal year for Wi-Fi alone to provide PSUs the non-E-rate portion of project costs and maintain a net-zero-cost to the PSU.** This assumes (1.6M students x $167 x 30% average state portion) / 5 years.

In response to this Rule, in February 2020 SCI established new CPAs with 23 original equipment vendors and 30 resellers, more than doubling the E-rate eligible goods and services available to schools while increasing vendor competition to achieve lower costs. These contracts are for five years, with five optional one-year extensions.

E-rate Ineligible Expenses Detail:

- ***Firewall Services:*** PSUs 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 130 charters utilize this service at a cost of $1.9M in state funding. Utilization and costs remain at last year's levels.
- ***Content Filtering Services:*** PSUs may opt-in to the SCI Content Filtering Service offered at no-charge through a contract with NCDIT. Utilizing the MCNC's 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, 81 LEAs and 136 charters utilize this service at a cost of $4.7M in state funding. Costs remain at last year's levels.
- ***Identity and Access Management (IAM):*** The 2015 appropriations act expanded the SCI budget by $12M annually effective SFY2017 and included 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.
- ***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 CNE team. They also provide specific network, cybersecurity, and cloud services management functions for PSUs. As all network

[12] Federal Register: Modernizing the E-Rate Program for Schools and Libraries
[13] E-rate C2 Budget Tool FY2021+ | USAC | Data Platform

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 2020 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 training course for 19 PSU network administrators.
- Network Fundamentals training course providing foundational knowledge and networking best practices to 47 K-12 public school network administrators that were relatively new to their role.

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.

Program Administration: Program administration includes SCI staff salaries and operational costs, licenses, and contracts with The Friday Institute. In fiscal 2020, five NCDPI staff members provided technical consulting, E-rate training, and related support at a combined compensation and benefits expense of $582,277. A Friday Institute contract provides for planning, design, forecasting, modeling, and documentation support at an annual cost of $280,000. 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.

K12 Internet Utilization and Capacity Analysis

Utilization Analysis

In the early years of SCI, Internet utilization growth year-on-year was encouraging as an indicator toward Digital Teaching and Learning adoption. The year-on-year utilization growth in 2015 was 68%. Fortunately, in each successive year the annual growth rate has decreased, with the 2019 annual growth rate at 19%. Substantial impacts were experienced when the COVID pandemic hit in March of 2020.

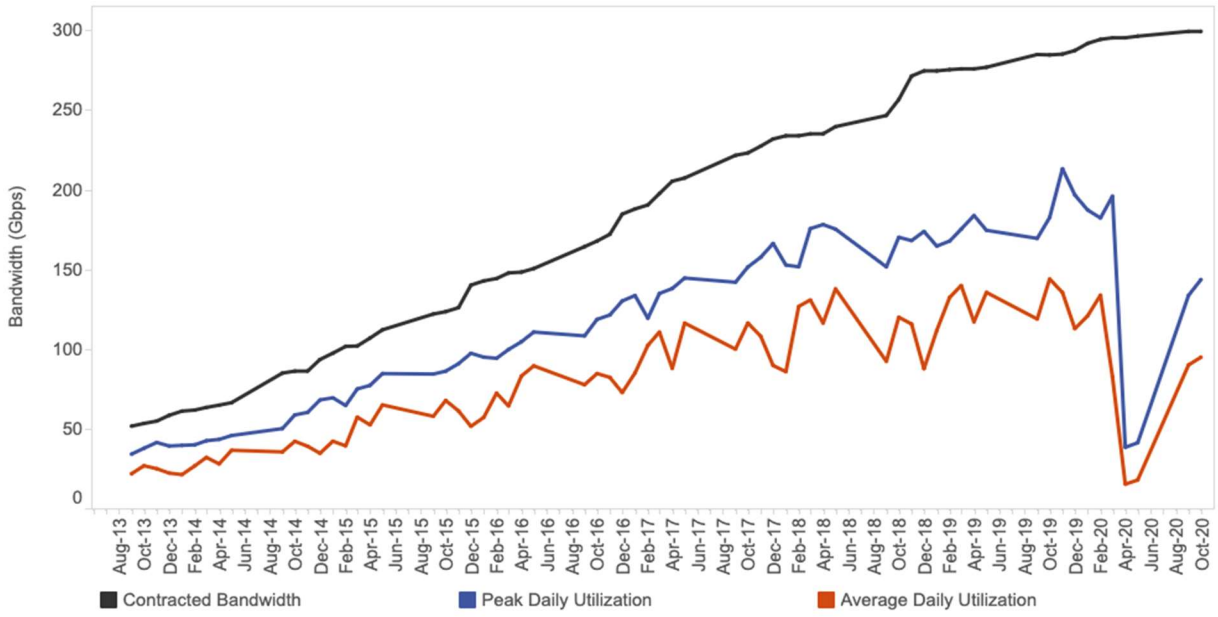

Figure 2: Statewide Contracted Bandwidth, Peak, and Average Use - School Districts

The closing of schools due to COVID makes this year's analysis and future predictions very difficult for two important reasons. First, the extreme impact on utilization during stay-at-home orders created a massive drop in utilization and the growth as remote learning in the widely varied implementations on a per school basis. Second, as the pandemic wanes, students will return to schools with the thousands of laptops provided for the remote learning demand. It is highly likely that many schools that were not fully engaged in digital teaching and learning prior to the pandemic will have, by necessity, embraced it and will continue to use these techniques when returning to the classroom. As such, we cannot predict utilization for the next year at the same level of accuracy as previous years. We will continue to use the previous rate of 10% for budgeting.

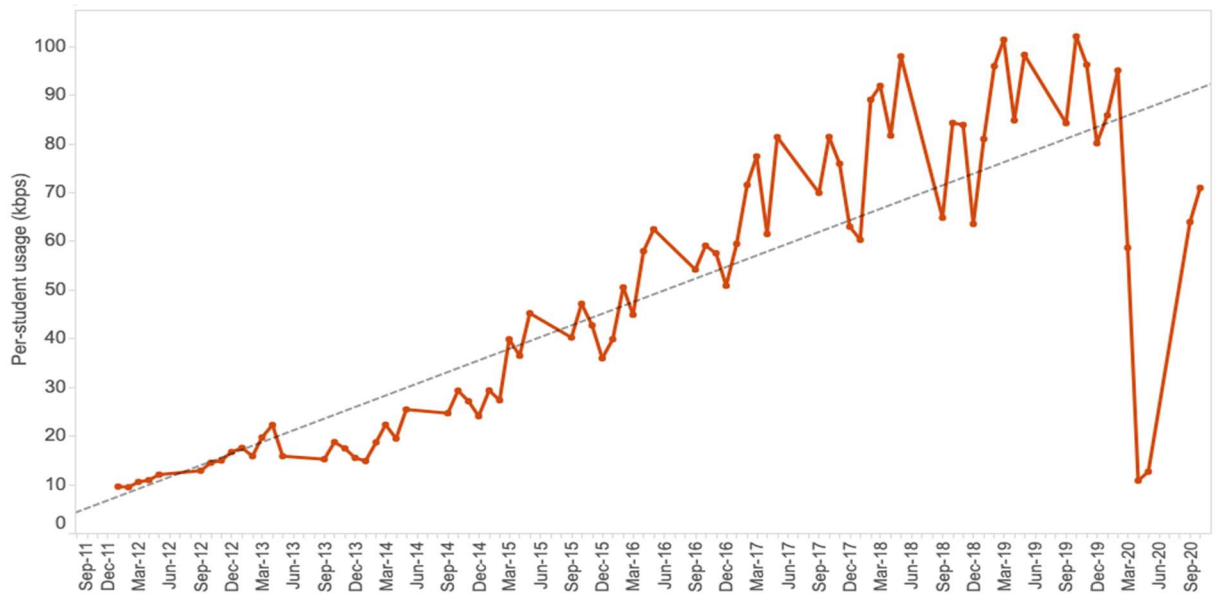

Figure 3: Average Per-Student Utilization - School Districts

Figure 3 illustrates the relationship between actual Internet use and the student population from September 2011 through October 2020. In May 2012, the average per student utilization was 12Kbps. Seven school years later, in October 2020, the average per student utilization was 102Kbps per student. The significant peaks and valleys occur due to holidays and breaks during the school year, so a trend line is included.

Prior to the COVID closings, the average daily aggregate K-12 Internet utilization was nearly 135Gbps and the daily peak utilization was over 200Gbps. Tracking average and peak utilization over time directly informs capacity decisions to ensure there is sufficient capacity for peak utilization. However, this statistic will be greatly impacted by the pandemic.

Capacity Analysis

Figure 4 illustrates the growth in Internet bandwidth capacity for districts in the 2019-2020 school year, by month. There are currently 13 service levels (by bandwidth) in use ranging from 100Mbps to 30Gbps. Each color bar shows the bandwidth contribution in each of the service tiers.

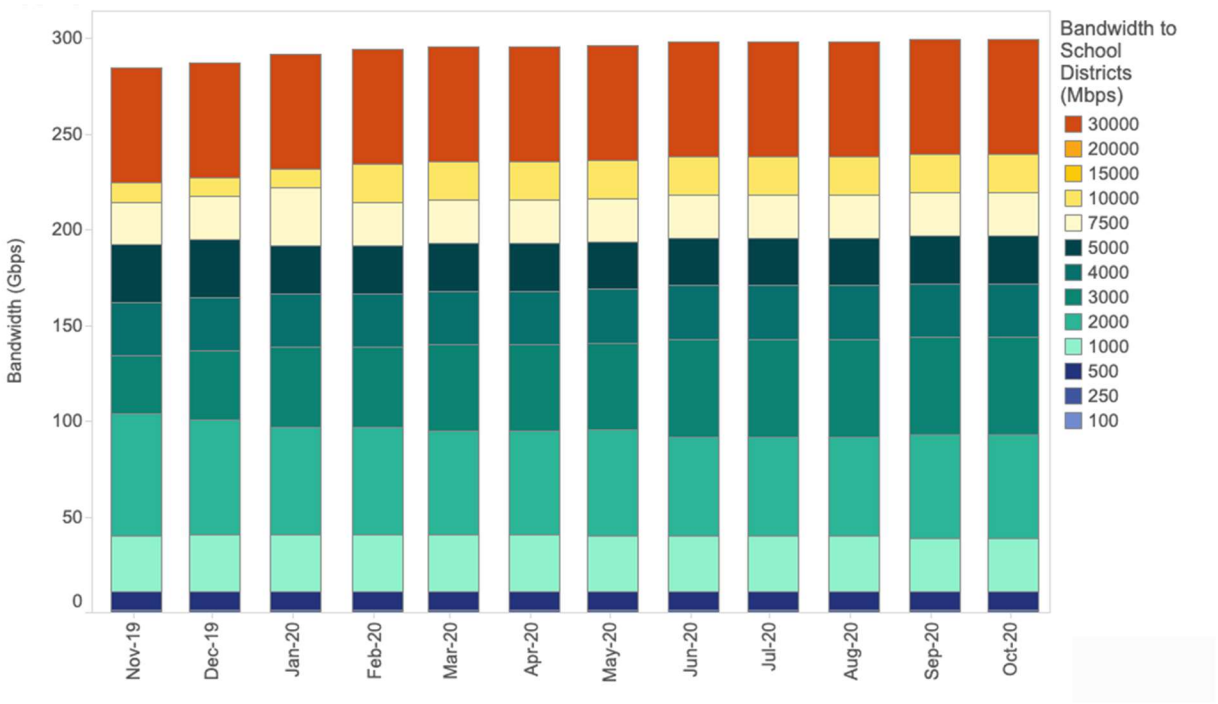

Figure 4: Aggregate Contracted Bandwidth - School Districts

District aggregate capacity grew slightly from 273Gbps in November 2019 to almost 300Gbps in October 2020, while charter school aggregate contracted bandwidth grew from 18Gbps in November 2019 to 25Gbps in October 2020. SCI manages the scheduling of upgrades to avoid adding new services and expense during the summer months.

Nineteen districts remain below the 1Gbps service tier, while 96 districts receive at least 1Gbps of Internet capacity. SCI is concerned about equitable access for all PSUs, therefore capacity per student is also analyzed.

SCI is concerned about equitable access for all PSUs, therefore capacity per student is also analyzed and presented.

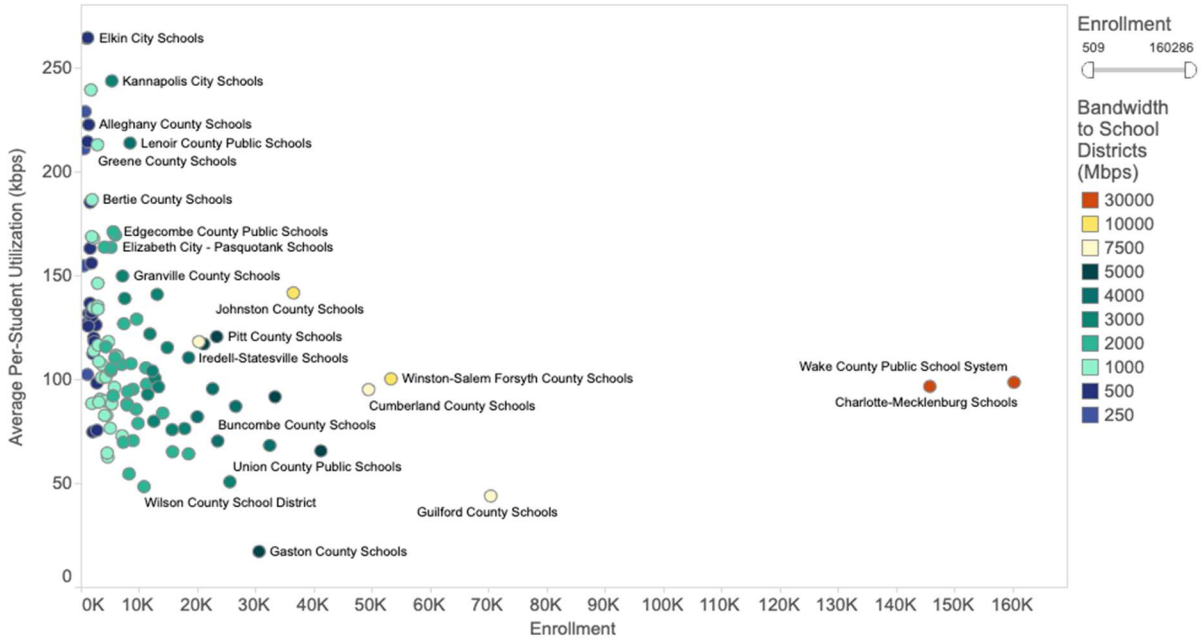

Figure 5: Enrollment and Average Per-Student Utilization by District (Pre-COVID Feb. 2020)

Figure 5 compares the contracted bandwidth to the utilization per student. As can be seen, the district size has little bearing on the circuit speed. Instead, the measure average utilization dictates the size of the connection which is procured. This ensure that each school has ample capacity without spending additional funding on unnecessarily large connections.

Prior to COVID closings, the statewide average utilization was about 200Kbps per student.

The reader is encouraged to visit https://go.ncsu.edu/SCIReport to view the interactive version of Figure 5 for more details.

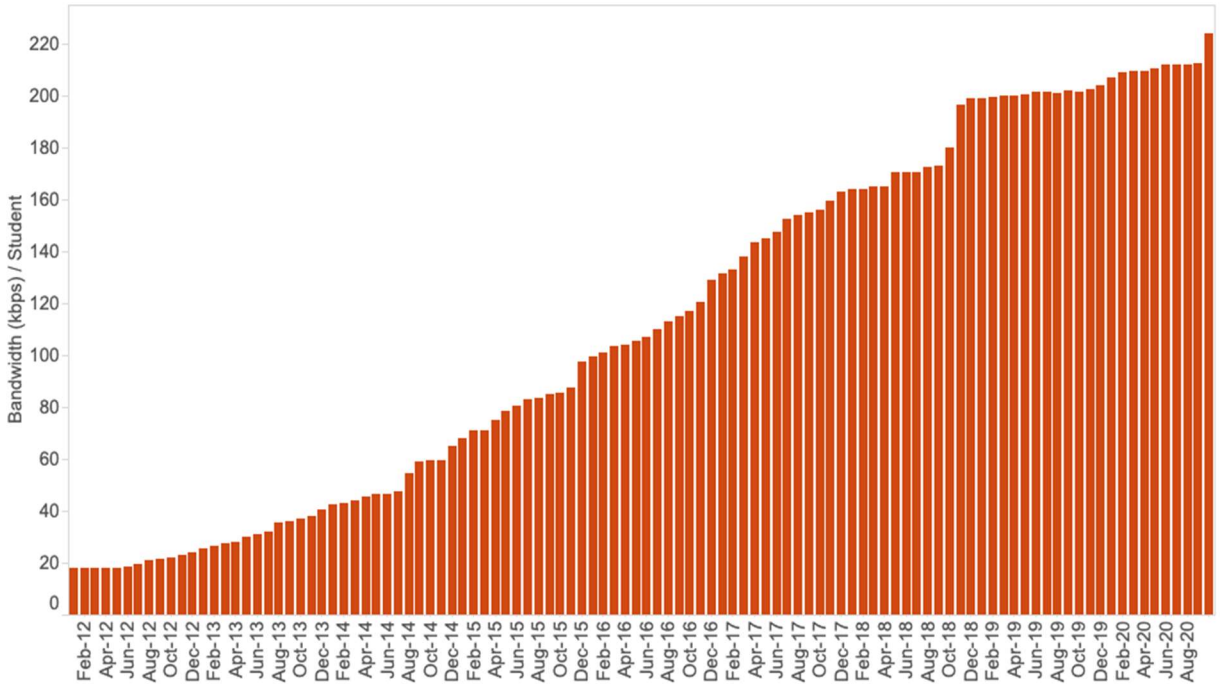

Figure 6: Per-Student Contracted Bandwidth - School Districts

Figure 6 illustrates the growth of average per-student Internet capacity since February 2012 for traditional LEAs. The average per-student capacity is slightly higher for charter schools, in Figure 7, due to their typical smaller enrollment and disaggregation.

A per-student capacity goal, such as 1Mbps per student, has been proposed by some national voices and the FCC. 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.

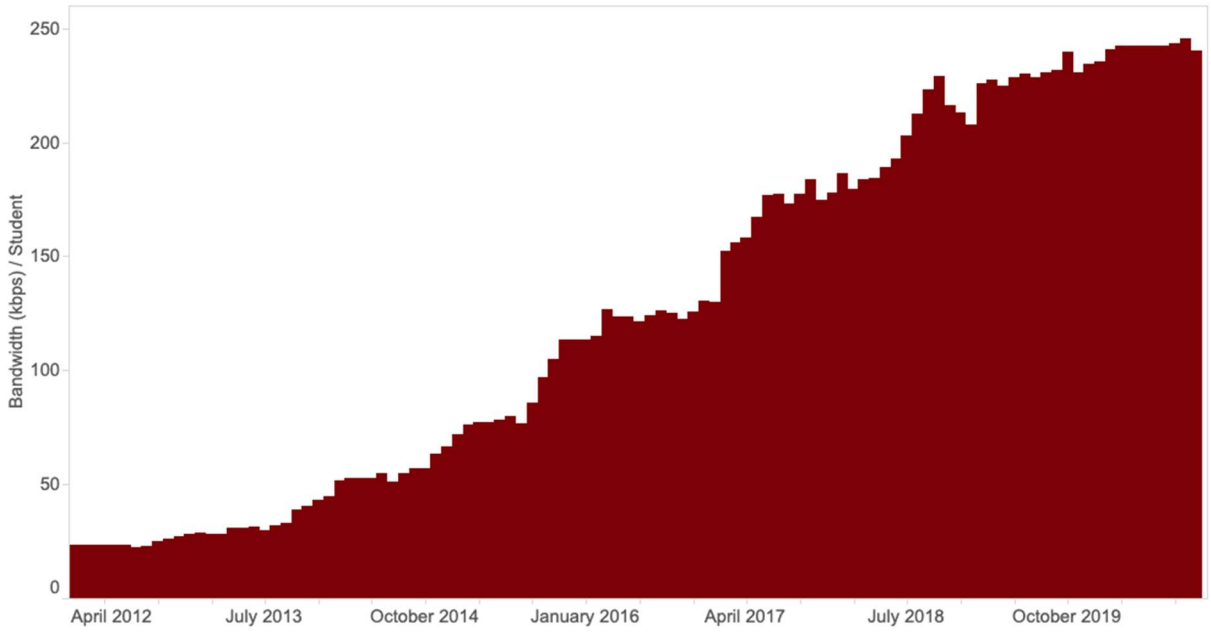

Figure 7: Per-Student Contracted Bandwidth - Charters Using NCREN

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 to SCI balancing of performance and cost management. Historically, the greatest utilization occurs during the month of May. At the beginning of each school year in August there is typically a 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 CPAs with 13 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 3 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, or 43% of the $3.8M in 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 3: Total NC K-12 Category 2 E-rate Filings for 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 2021

Improve SCI Allocation Flexibility

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 consumed by the end of the next June or they will 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. 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 prevent these funds from reverting.

Expand Category 2 Funding Consistent with FCC Rules for 2021-2025

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 that contain a total 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.[14]

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

[14] Calculation: (($167 per student * 1,590,000 students) / 5 Years) * 26% State Portion = $13.8M annually

Expansion of School Connectivity Initiative / Cybersecurity and Risk Management

Issue: From HB966 "Current Operations Appropriations Act of 2019":[15]

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 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. The funding will be used for five regional cybersecurity consultants.

Recommendation: SCI requests the legislation be funded with a recurring $550K.

Expansion of School Connectivity Initiative / Cybersecurity and Risk Management

Issue: In 2019, there have been numerous cybersecurity incidents, including ransomware attacks, directed at NC 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 utilize 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 NC 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 the NC education community a centralized service to detect and mitigate cyber threats before a crisis evolves. This service would allow

[15] https://www.ncleg.gov/Sessions/2019/Bills/House/PDF/H966v7.pdf

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:

1. 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.
2. 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.
3. 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 make 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 funds these cybersecurity services through MCNC with a recurring $5M to obtain statewide coverage.

Addressing the "Homework Gap"

Issue: Nationally, only 33% of students have broadband Internet access at home, creating a significant "homework gap" that affects the rural and economically disadvantaged the most.

The lack of home internet access became painfully clear to many families with K-12 students during the COVID pandemic. Tens of millions of dollars in of cellular hotspots were distributed to K-12 students across the state as a result of COVID. Unfortunately, many students do not live near a cellular tower and these hotspots simply did not work.

There are several promising new wireless technologies that could be used in locations where fiber and/or cellular service are not available. These technologies include TV White Space, Low Earth Orbit Satellite, Private LTE, millimeter wave mesh networks and others.

The State Board approved a $250,000 research study in late 2020 which is just now beginning. That research is being completed with input from the NCDIT Broadband Infrastructure Office's (NCDIT BIO), specifically using their 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 regarding the NC 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

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 (NCDPI, The Friday Institute, NCDIT BIO), we remain hopeful that the homework gap will rapidly close over the next few years.

Recommendation: Provide a second year of non-recurring $250k to fund this research, to be completed in cooperation with PSUs, to test new technologies in an additional set of locations that are not readily served by fiber or reliable cellular service.

The majority of these funds would be provided to school districts to procure the various experimental technologies and service. A detailed evaluation of the technology and a report citing specific recommendations for NCDPI, the NC State Board of Education (NCSBE) and the FCC would be developed.

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 NCDPI 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 NCSBE 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 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://portal.mcnc.org/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	2020 LEA PRC 073 and PRC 135 allotments and shared services distributions
B	2020 Charter School PRC 036 and PRC 135 allotments and shared services distributions
C	The NCDPI connectivity staff salary report
D	North Carolina E-rate Funding History Report
E	School Connectivity Initiative K12 Cybersecurity Report

Appendix A: 2020 LEA Allotments and Shared Services

Presented below are details of the direct funding received by LEAs from SCI through PRC 073 and PRC 135 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 2019 for service/delivery within the funding year between July 1, 2019 and June 30, 2020. SCI issues allocations during fiscal year 2020 to cover non-E-rate costs for eligible school connections.

PSU#	LEA Name	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
010	Alamance Burlington	51,676	44,329	74,664	35,244	188,448	47,940	442,301
020	Alexander County	17,649	13,556	21,420	9,192	46,224	9,176	117,217
030	Alleghany County	17,280	-	-	-	32,304	3,463	53,047
040	Anson County	19,890	3,916	-	-	46,224	8,558	78,588
050	Ashe County	22,080	5,353	-	9,192	46,224	6,925	89,774
060	Avery County	16,884	8,897	21,420	9,192	46,224	4,409	107,026
070	Beaufort County	14,024	-	21,420	-	46,224	16,467	98,135
080	Bertie County	11,849	-	21,420	9,192	46,224	6,561	95,246
090	Bladen County	37,261	-	39,168	12,372	97,260	10,705	196,766
100	Brunswick County	154,241	18,353	18,972	-	124,020	26,725	342,311
110	Buncombe County	106,920	320,167	69,921	-	188,448	47,951	733,407
111	Asheville City	43,490	26,220	21,420	-	60,360	8,433	159,923
120	Burke County	78,071	12,907	56,916	35,244	120,420	24,047	327,605
130	Cabarrus County	119,520	446,189	92,412	35,332	178,044	52,678	924,175
132	Kannapolis City	11,708	10,401	46,563	12,372	98,468	12,864	192,376
140	Caldwell County	82,045	81,448	-	12,372	82,788	22,790	281,443
150	Camden County	14,894	21,639	12,552	9,192	32,304	2,956	93,537
160	Carteret County	67,868	2,293	39,168	12,372	88,860	16,835	227,396
170	Caswell County	10,036	-	12,552	9,192	32,304	6,610	70,694

PSU#	LEA Name	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
180	Catawba County	96,048	-	-	-	162,912	29,616	288,576
181	Hickory City	49,236	50,340	-	-	57,888	9,096	166,560
182	Newton-Conover	7,312	10,327	21,420	9,192	60,360	6,184	114,795
190	Chatham County	421,485	-	39,168	12,372	97,260	16,552	586,837
200	Cherokee County	26,025	4,310	21,420	9,192	109,356	7,898	178,201
210	Edenton-Chowan	9,309	28,795	12,552	9,192	32,304	4,917	97,069
220	Clay County	10,800	14,833	-	-	97,344	3,144	126,121
230	Cleveland County	24,300	-	43,605	12,372	92,196	33,407	205,880
240	Columbus County	25,797	36,525	21,420	9,192	46,224	15,481	154,639
241	Whiteville City	3,000	18,311	-	-	46,224	6,306	73,841
250	Craven County	69,617	-	56,916	35,244	120,420	32,989	315,186
260	Cumberland County	136,355	752,394	136,788	60,072	237,720	111,764	1,435,093
270	Currituck County	26,576	-	21,420	9,192	46,224	7,219	110,631
280	Dare County	28,457	24,124	39,168	17,115	82,788	8,986	200,638
290	Davidson County	72,785	83,794	39,168	12,372	88,860	35,666	332,645
291	Lexington City	5,417	4,660	17,725	9,424	44,775	7,942	89,943
292	Thomasville City	12,450	-	-	9,424	45,252	6,686	73,812
300	Davie County	2,390	16,699	21,420	9,192	53,400	11,709	114,810
310	Duplin County	21,892	88,923	39,168	12,372	97,260	23,401	283,016
320	Durham County	112,929	63,210	74,664	35,579	146,652	84,596	517,630
330	Edgecombe County	20,560	-	39,168	12,372	82,788	15,845	170,733
340	Winston-Salem Forsyth	115,172	-	-	-	299,221	126,231	540,624
350	Franklin County	54,827	2,263	39,168	12,372	88,860	20,306	217,796
360	Gaston County	90,221	-	-	-	218,556	67,908	376,685
370	Gates County	24,211	8,579	12,552	9,013	32,304	3,572	90,231
380	Graham County	3,000	-	8,112	4,040	21,816	2,798	39,766
390	Granville County	60,290	-	51,000	12,372	107,876	14,579	246,117

PSU#	LEA Name	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
400	Greene County	13,707	-	10,710	9,192	49,800	9,335	92,744
410	Guilford County	166,011	-	114,600	-	261,990	146,381	688,982
420	Halifax County	12,712	5,801	21,420	-	49,800	10,331	100,064
421	Roanoke Rapids City	12,480	-	12,552	9,192	32,304	6,881	73,409
422	Weldon City	6,292	-	8,112	3,660	22,284	3,473	43,821
430	Harnett County	94,020	147,437	74,664	35,579	331,368	46,810	729,878
440	Haywood County	28,274	21,893	-	-	46,224	15,434	111,825
450	Henderson County	42,372	2,663	56,916	-	120,420	26,452	248,823
460	Hertford County	7,865	5,031	12,552	9,192	32,304	8,042	74,986
470	Hoke County	20,932	-	39,168	12,372	97,260	20,379	190,111
480	Hyde County	2,889	-	8,112	3,660	22,284	2,025	38,970
490	Iredell-Statesville	453,206	262,174	136,788	60,072	243,624	38,891	1,194,755
491	Mooresville GSD	10,445	52,843	39,168	12,372	82,788	9,929	207,545
500	Jackson County	17,700	18,385	-	-	46,224	8,294	90,603
510	Johnston County	238,680	659,679	-	61,804	342,804	72,774	1,375,741
520	Jones County	3,540	-	-	5,736	32,941	3,140	45,357
530	Lee County	65,304	1,940	39,168	12,372	82,788	21,201	222,773
540	Lenoir County	29,828	-	-	-	188,052	23,469	241,349
550	Lincoln County	84,515	34,081	739	18,384	84,513	20,773	243,005
560	Macon County	64,500	25,268	-	-	118,044	10,261	218,073
570	Madison County	9,235	-	21,420	9,424	46,104	5,417	91,600
580	Martin County	12,519	-	12,552	9,192	32,304	7,615	74,182
590	McDowell County	42,828	25,848	-	12,372	77,988	13,931	172,967
600	Charlotte-Mecklenburg	304,510	887,554	536,112	-	856,476	286,404	2,871,056
610	Mitchell County	23,112	110	12,552	9,192	35,928	4,225	85,119
620	Montgomery County	18,228	15,128	-	9,192	49,800	9,501	101,849
630	Moore County	169,257	-	49,521	-	106,626	23,190	348,594

PSU#	LEA Name	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
640	Nash-Rocky Mount	78,971	-	56,916	35,244	120,420	35,190	326,741
650	New Hanover County	43,014	97,467	-	35,244	325,824	55,087	556,636
660	Northampton County	10,209	-	12,552	9,192	32,304	6,459	70,716
670	Onslow County	102,492	152,061	70,227	35,332	142,272	50,443	552,827
680	Orange County	45,294	60,738	39,168	12,372	88,860	12,656	259,088
681	Chapel Hill-Carrboro City	42,318	289,152	56,916	35,244	120,420	18,335	562,385
690	Pamlico County	10,000	-	-	-	19,620	3,465	33,085
700	Elizabeth City-Pasquotank	30,944	-	39,168	12,372	82,788	14,271	179,543
710	Pender County	53,769	-	39,168	-	126,336	17,505	236,778
720	Perquimans County	12,554	-	12,552	9,192	32,304	4,113	70,715
730	Person County	25,740	49,072	39,168	12,372	82,788	10,268	219,408
740	Pitt County	199,302	-	92,412	35,244	178,044	59,620	564,622
750	Polk County	10,706	-	-	9,192	32,304	4,621	56,823
760	Randolph County	108,511	-	39,168	12,372	82,788	34,020	276,859
761	Asheboro City	13,546	43,459	(1,785)	9,192	(4,450)	10,542	70,504
770	Richmond County	30,366	15,342	39,168	12,372	82,788	19,064	199,100
780	of Robeson County	45,558	246,941	92,412	35,579	218,556	70,102	709,148
790	Rockingham County	43,851	-	56,916	35,244	120,420	25,889	282,320
800	Rowan-Salisbury	112,881	153,628	-	-	188,448	40,763	495,720
810	Rutherford County	15,178	10,909	56,916	35,244	120,420	18,946	257,613
820	Sampson County	31,458	4,471	39,168	12,372	97,260	19,456	204,185
821	Clinton City	8,850	-	-	9,192	49,800	7,048	74,890
830	Scotland County	33,846	-	-	12,372	82,788	15,929	144,935
840	Stanly County	125,971	52,217	-	12,372	85,905	17,455	293,920
850	Stokes County	27,862	3,073	21,420	9,192	46,224	11,616	119,387
860	Surry County	53,841	11,094	39,168	12,372	82,788	16,491	215,754
861	Elkin City	7,000	18,207	-	5,736	32,700	2,412	66,055

PSU#	LEA Name	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
862	Mount Airy City	17,835	9,117	12,552	9,192	32,304	3,634	84,634
870	Swain County	15,000	619	-	-	46,224	3,975	65,818
880	Transylvania County	20,052	-	21,420	9,192	46,224	7,778	104,666
890	Tyrrell County	3,000	-	-	3,660	22,284	2,019	30,963
900	Union County	489,216	-	38,505	-	178,044	67,768	773,533
910	Vance County	27,114	28,223	16,065	12,372	82,788	18,530	185,092
920	Wake County	530,794	2,346,123	-	-	856,476	268,156	4,001,549
930	Warren County	27,841	-	21,420	9,192	46,224	5,982	110,659
940	Washington County	9,114	1,842	12,552	9,424	64,608	4,746	102,286
950	Watauga County	29,430	6,470	21,420	9,424	46,224	8,726	121,694
960	Wayne County	39,600	4,418	-	20,084	147,672	47,220	258,994
970	Wilkes County	44,760	43,229	39,168	-	97,260	20,776	245,193
980	Wilson County	19,320	-	39,168	12,372	82,788	28,794	182,442
990	Yadkin County	50,470	-	21,420	9,192	53,400	10,959	145,441
995	Yancey County	17,985	15,518	12,182	11,925	31,469	5,034	94,113
		$ 7,048,371	**$ 8,052,980**	**$ 3,629,506**	**$ 1,405,726**	**$ 12,215,962**	**$ 3,011,312**	**$ 35,363,857**

Table 4: SCI Funding to LEAs Through PRC073 and PRC135

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

Presented below are the details of direct funding received by Charter/Residential/Lab Schools from SCI through PRC 036 and PRC 135 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.

PSU#	Charter School	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
00A	NC Cyber Academy	-	-	-	-	-	3,728	3,728
00B	NC Virtual Academy	-	-	-	-	-	5,542	5,542
01B	River Mill Academy	-	-	4,040	8,408	22,845	2,000	37,293
01C	Clover Garden	-	7,593	-	-	13,692	2,000	23,285
01D	The Hawbridge School	-	-	3,660	6,558	17,897	2,000	30,115
01F	Alamance Community School	-	-	-	-	-	2,000	2,000
06A	Grandfather Academy	5,000	-	-	-	-	-	5,000
06B	Williams Academy	-	-	3,660	6,632	18,639	2,000	30,931
07A	Washington Montessori	-	-	-	-	10,332	2,000	12,332
08A	Three Rivers Academy	-	-	3,660	-	-	2,000	5,660
09A	Paul R Brown Leadership Academy	-	5,597	5,481	4,032	10,188	2,000	27,298
09B	Emereau: Bladen	-	-	-	-	10,332	2,000	12,332
10A	Charter Day School	-	17,919	4,040	23,784	23,784	2,131	71,658
10B	South Brunswick Charter School	-	19,498	4,840	4,560	11,436	2,000	42,334
11A	Evergreen Community Charter	-	-	-	-	19,668	2,000	21,668
11B	ArtSpace Charter	-	-	3,660	4,560	11,436	2,000	21,656
11C	Invest Collegiate - Imagine	5,040	5,933	-	-	23,784	2,553	37,310
11D	The Franklin School of Innovation	-	-	3,660	7,446	19,743	2,000	32,849
11K	Francine Delany New School	-	-	3,660	4,032	11,109	2,000	20,801

PSU#	Charter School	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
12A	The New Dimensions School	-	4,441	3,660	4,560	11,436	2,000	26,097
13A	Carolina International School	-	4,149	-	(380)	20,863	2,000	26,632
13B	Cabarrus Charter Academy	-	281	-	-	-	2,004	2,285
13C	A.C.E. Academy	-	-	4,040	4,560	11,448	2,000	22,048
13D	Concord Lake STEAM Academy	5,000	-	-	-	-	2,000	7,000
16B	Tiller School	5,000	-	-	-	-	2,000	7,000
19A	Chatham Charter	-	-	4,040	5,448	12,324	2,000	23,812
19B	Woods Charter School	-	-	3,660	8,112	23,784	2,000	37,556
19C	Willow Oak Montessori	-	-	4,040	4,032	10,188	2,000	20,260
20A	The Learning Center	-	-	4,040	3,800	18,988	2,000	28,828
23A	Pinnacle Classical Academy	8,976	68,871	-	-	23,784	2,175	103,806
24B	Thomas Academy	5,000	-	-	-	-	2,000	7,000
24N	Columbus Charter School	-	-	2,696	4,560	10,332	2,000	19,588
26B	Alpha Academy	-	-	-	-	11,448	2,024	13,472
26C	The Capitol Encore Academy	-	3,325	5,481	3,420	10,332	2,000	24,558
27A	Water's Edge Village School	-	-	1,644	3,852	8,736	2,000	16,232
29A	Davidson Charter Academy	-	-	4,040	4,856	12,852	2,000	23,748
32A	Maureen Joy Charter	540	5,204	-	5,872	17,286	2,000	30,902
32B	Healthy Start Academy	-	-	3,660	7,890	21,125	2,000	34,675
32C	Carter Community Charter	-	-	-	5,448	13,524	2,000	20,972
32D	Kestrel Heights School	16,850	10,090	-	-	21,816	2,000	50,756
32H	Research Triangle Charter	5,000	-	-	-	-	2,000	7,000
32K	Central Park School for Children	12,840	15,802	4,040	4,560	11,448	2,000	50,690
32L	Voyager Academy	-	-	9,192	12,552	32,700	2,946	57,390
32M	Global Scholars Academy	-	-	3,660	5,448	13,524	2,000	24,632
32N	Research Triangle High School	-	-	9,192	12,552	32,700	2,000	56,444
32P	The Institute for the Development of You	-	-	2,696	4,560	11,448	2,000	20,704

PSU#	Charter School	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
32Q	Reaching All Minds Academy	-	-	3,660	4,560	11,448	2,000	21,668
32R	Excelsior Classical Academy	-	13,019	6,480	4,560	11,448	2,000	37,507
32S	KIPP Durham College Preparatory	-	-	-	1,520	6,671	2,000	10,191
32T	Discovery Charter	-	16,161	4,370	3,360	8,490	2,000	34,381
33A	North East Carolina Preparatory School	-	12,347	-	6,972	22,707	2,131	44,157
34B	Quality Education Academy	-	-	4,040	5,448	13,692	2,000	25,180
34D	Carter G Woodson School	-	-	3,660	4,560	11,436	2,000	21,656
34F	Forsyth Academy	5,000	-	-	-	-	2,000	7,000
34G	Arts Based School	5,000	-	-	-	-	2,000	7,000
34H	The North Carolina Leadership Academy	-	72,009	4,040	8,112	23,784	2,071	110,016
34Z	App State - Academy at Middle Fork	-	-	-	-	-	-	-
35A	Crosscreek Charter School	1,781	-	-	-	-	2,000	3,781
35B	Youngsville Academy	5,000	-	-	-	-	2,000	7,000
36B	Piedmont Community Charter	13,297	50,440	3,660	8,112	21,816	2,951	100,276
36C	Mountain Island Charter	-	-	9,192	12,552	35,928	3,361	61,033
36F	Ridgeview Charter School	-	14,441	-	3,024	7,560	2,000	27,025
36G	Team CFA - Community Public Charter	-	29,791	-	3,360	8,400	2,000	43,551
39A	Falls Lake Academy	-	36,316	-	-	21,816	2,400	60,532
39B	Oxford Preparatory High School	-	-	2,696	-	19,620	2,000	24,316
41B	Greensboro Academy	5,000	-	-	-	-	2,000	7,000
41C	Guilford Preparatory Academy	905	520	4,040	4,560	11,436	2,000	23,461
41D	Phoenix Academy Inc	7,558	49,424	-	1,680	4,245	2,207	65,114
41F	Triad Math and Science Academy	-	-	3,660	8,112	23,784	2,739	38,295
41G	Cornerstone Charter Academy	-	4,798	4,040	5,448	13,692	2,712	30,690
41H	The College Preparatory and Leadership	-	-	3,660	5,448	13,524	2,000	24,632
41J	Summerfield Charter Academy	5,000	-	-	-	-	2,000	7,000
41K	Piedmont Classical High School	-	-	3,660	8,112	21,816	2,000	35,588

PSU#	Charter School	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
41L	Gate City Charter Academy	5,000	-	-	-	-	2,000	7,000
41M	Next Generation Academy	-	-	-	-	10,080	2,000	12,080
41N	The Experiential School of Greensboro	-	-	4,040	4,328	10,854	2,000	21,222
41Q	Revolution Academy	-	-	-	-	-	2,000	2,000
42A	KIPP Halifax College Preparatory	-	-	4,040	5,448	13,524	2,000	25,012
42B	Hobgood Charter School	-	15,709	-	4,032	9,132	2,000	30,873
43C	Anderson Creek Club Charter School	-	-	3,660	4,560	10,332	2,000	20,552
43D	Achievement Charter Academy	-	-	-	-	-	2,000	2,000
44A	Shining Rock Classical Academy: CFA	-	-	3,660	5,448	13,692	2,000	24,800
45A	The Mountain Community Sch	-	-	4,040	4,032	10,080	2,000	20,152
45B	FernLeaf Community Charter School	-	6,114	3,660	4,032	10,080	2,000	25,886
49B	American Renaissance School	5,820	-	4,040	8,112	21,816	2,000	41,788
49D	Success Charter School	-	1,869	1,644	1,284	9,636	2,000	16,433
49E	Pine Lake Preparatory	-	53,925	9,192	12,552	35,928	4,036	115,633
49F	Langtree Charter Academy	5,000	-	-	-	-	3,389	8,389
49G	Iredell Charter Academy	5,000	-	-	-	-	2,000	7,000
50A	Summit Charter	-	-	-	-	19,140	2,000	21,140
50Z	Catamount School	-	-	-	-	-	-	-
51A	Neuse Charter School	-	-	3,660	8,112	19,620	2,088	33,480
51B	Johnston Charter School	5,000	-	-	-	-	2,000	7,000
53B	Ascend Leadership Academy	-	-	4,040	6,336	20,400	2,000	32,776
53C	MINA Charter School of Lee County	-	-	-	-	-	2,000	2,000
54A	Children's Village Academy	1,050	3,998	-	8,112	23,784	2,000	38,944
55A	Lincoln Charter School	6,147	-	9,192	12,552	35,928	4,626	68,445
55B	West Lake Preparatory Academy	-	-	-	-	-	2,000	2,000
58B	Bear Grass Charter School	-	8,629	3,660	8,112	19,620	2,000	42,021
60B	Sugar Creek Charter	1,464	10,560	-	2,704	23,784	3,731	42,243

PSU#	Charter School	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
60D	Lake Norman Charter	-	3,743	-	12,552	32,304	4,508	53,107
60F	Metrolina Regional Scholars Academy	-	21,614	3,660	4,560	11,436	2,000	43,270
60G	Queens Grant Community School	-	-	4,040	8,112	23,784	2,690	38,626
60I	Community School of Davidson	5,400	-	3,660	8,112	23,784	3,040	43,996
60J	Socrates Academy	-	-	4,040	8,112	21,816	2,000	35,968
60K	Charlotte Secondary School	-	-	3,660	5,448	13,692	2,000	24,800
60L	KIPP: Charlotte	2,398	2,566				2,000	6,964
60M	Corvian Community School	3,658	47,836	4,040	7,816	22,755	2,406	88,511
60N	Aristotle Preparatory Academy	-	-	3,660	4,032	10,080	2,000	19,772
60P	Charlotte Choice Charter	-	-	4,040	4,560	11,436	2,000	22,036
60Q	Invest Collegiate	-	-	-	-	11,436	2,000	13,436
60S	Bradford Preparatory School	-	37,990	4,582	8,112	21,816	3,143	75,643
60U	Commonwealth High School	-	-	-	-	11,436	2,000	13,436
60Y	Pioneer Springs Community School	-	6,945	3,660	4,032	10,080	2,000	26,717
61J	Lakeside Charter Academy	-	8,769	3,660	4,560	11,436	2,000	30,425
61K	United Community School	-	-	4,040	4,560	11,196	2,000	21,796
61L	Stewart Creek High School	-	-	-	-	10,080	2,000	12,080
61M	Charlotte Lab School	-	-	3,660	8,112	23,784	2,000	37,556
61N	Queen City STEM School	-	-	4,040	6,558	17,897	2,000	30,495
61P	VERITAS Community School	-	-	3,660	4,032	10,080	2,000	19,772
61Q	Mallard Creek STEM Academy	-	-	4,040	5,448	13,692	2,000	25,180
61R	Matthews-Mint Hill Charter Academy	5,000	-	-	-	-	2,000	7,000
61S	Unity Classical Charter School	5,000	-	-	-	-	2,000	7,000
61T	Movement School	-	-	4,840	-	15,552	2,000	22,392
61U	UpROAR Leadership Academy	-	-	4,040	4,560	11,436	2,000	22,036
61V	Bonnie Cone Classical Academy	-	-	-	1,680	4,200	2,000	7,880
61W	East Voyager Academy	-	-	3,660	5,448	13,692	2,000	24,800

PSU#	Charter School	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
61X	Mountain Island Day Community Charter	-	2,725	4,040	8,112	23,784	2,000	40,661
61Y	Steele Creek Preparatory Academy	-	-	-	-	-	2,000	2,000
62A	Tillery Charter Academy	-	2,134	-	-	6,849	2,000	10,983
62J	Southwest Charlotte STEM Academy	-	-	-	2,688	6,720	2,000	11,408
62K	Movement School Eastland	-	-	-	-	-	2,000	2,000
63A	The Academy of Moore County	-	16,665	4,040	3,420	11,448	2,000	37,573
63B	Sandhills Theatre Arts Renaiss	-	-	-	-	-	2,000	2,000
63C	Moore Montessori Community School	-	2,510	3,826	4,032	9,132	2,000	21,500
64A	Rocky Mount Preparatory	-	1,810	3,660	8,112	19,620	2,353	35,555
65A	Cape Fear Center for Inquiry	-	-	3,660	8,112	23,784	2,000	37,556
65B	Wilmington Preparatory Academy	5,000	-	-	-	-	2,000	7,000
65C	Douglass Academy	-	1,992	2,696	4,002	10,006	2,000	20,696
65D	Island Montessori Charter	-	18,921	4,040	3,420	11,436	2,000	39,817
65F	Coastal Preparatory Academy	-	17,284	3,660	5,448	13,692	2,000	42,084
65G	Girls Leadership Academy of Wilmington	-	-	4,040	4,560	11,436	2,000	22,036
65H	Wilmington School of the Arts	-	-	-	-	-	2,000	2,000
65Z	DC Virgo Prep Academy	-	-	3,660	-	-	-	3,660
66A	KIPP Gaston College Preparatory	3,504	-	-	8,112	19,620	2,808	34,044
67B	Z.E.C.A. School of Arts and Technology	-	1,659	4,040	4,560	10,332	2,000	22,591
68A	Eno River Academy	-	4,485	3,355	8,112	19,620	2,000	37,572
68C	The Expedition School	-	-	-	-	11,448	2,000	13,448
69A	Arapahoe Charter School	-	-	3,660	4,086	12,324	2,000	22,070
70A	NE Acad. of Aerospace & AdvTech	-	-	4,040	5,152	11,660	2,000	22,852
72A	Elaine Riddick Charter School	-	-	-	-	-	2,000	2,000
73A	Bethel Hill Charter	-	-	4,040	4,560	10,332	2,000	20,932
73B	Roxboro Community School	-	-	3,660	8,112	19,620	2,000	33,392
74C	Winterville Charter Academy	5,000	-	-	-	-	2,000	7,000

PSU#	Charter School	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
74Z	ECU Lab School	-	-	-	-	-	-	-
76A	Uwharrie Charter Academy	14,147	-	4,040	-	19,620	3,718	41,525
78A	CIS Academy	-	-	4,040	4,032	10,080	2,000	20,152
78B	Southeastern Academy	-	-	3,446	4,560	11,436	2,000	21,442
79A	Bethany Community Middle	-	-	4,040	2,280	11,436	2,000	19,756
79Z	Moss Street Partnership School	-	-	-	-	-	-	-
80B	Essie Mae Kiser Foxx	-	2,049	-	3,024	7,560	2,000	14,633
81A	Thomas Jefferson Classical	5,340	-	3,660	8,112	23,784	2,968	43,864
81B	Lake Lure Classical Academy	-	-	3,660	8,112	23,784	2,000	37,556
84B	Gray Stone Day School	-	9,605	3,660	8,186	21,982	2,000	45,433
86T	Millennium Charter	5,000	-	-	-	-	2,000	7,000
87A	Mountain Discovery	-	-	3,072	3,852	19,524	2,000	28,448
88A	Brevard Academy	-	-	4,040	4,560	17,016	2,000	27,616
90A	Union Academy	-	10,569	3,660	8,112	21,816	4,256	48,413
90B	Union Day School	-	19,243	-	-	10,188	2,000	31,431
90C	Union Preparatory	5,000	-	-	-	-	2,139	7,139
90D	Monroe Charter	-	-	-	-	-	2,000	2,000
90F	Apprentice Academy HS	-	15,741	-	2,352	5,943	2,000	26,036
91A	Vance Charter School	-	-	-	4,056	19,620	2,070	25,746
91B	Henderson Collegiate	1,038	1,667	3,660	8,112	19,620	2,902	36,999
92B	Exploris Middle School	7,008	16,647	3,660	1,180	11,436	2,000	41,931
92D	Magellan Charter	-	-	3,660	4,560	11,436	2,000	21,656
92E	Sterling Montessori Academy	-	10,732	3,660	8,112	23,784	2,000	48,288
92F	Franklin Academy	-	-	-	-	19,620	3,566	23,186
92G	East Wake Academy	-	-	9,192	12,552	35,928	2,632	60,304
92K	Raleigh Charter High School	-	46,514	4,040	6,336	17,610	2,000	76,500
92L	Torchlight Academy	-	-	3,660	3,420	11,436	2,000	20,516

PSU#	Charter School	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
92M	PreEminent Charter School	5,000	-	-	-	-	2,000	7,000
92N	Quest Academy	5,000	-	-	-	-	2,000	7,000
92P	Southern Wake Academy	-	15,528	3,660	8,112	19,620	2,000	48,920
92R	Casa Esperanza Montessori	-	8,562	3,660	4,560	11,436	2,000	30,218
92S	Endeavor Charter	-	2,676	4,040	4,560	11,436	2,000	24,712
92T	Triangle Math and Science	-	42,579	3,660	8,112	23,784	2,002	80,137
92U	Longleaf School of the Arts	-	2,908	4,040	2,016	9,132	2,000	20,096
92V	Wake Forest Charter Academy	5,000	-	-	-	-	2,000	7,000
92W	Cardinal Charter	5,000	-	-	-	-	2,024	7,024
92Y	Envision Science Academy	-	-	3,660	8,112	23,784	2,000	37,556
93A	Haliwa-Saponi Tribal School	-	-	4,040	4,560	10,332	2,000	20,932
93J	PAVE Southeast Raleigh Charter	-	-	4,040	4,560	11,436	2,000	22,036
93L	Central Wake Charter High	-	-	-	-	5,760	2,000	7,760
93M	Peak Charter Academy	5,000	-	-	-	-	2,000	7,000
93N	Pine Springs Preparatory Academy	-	16,270	4,040	8,112	24,813	2,000	55,235
93P	Rolesville Charter Academy	5,000	-	-	-	-	2,000	7,000
93Q	Carolina Charter Academy: CFA	-	31,051	-	6,504	17,301	2,000	56,856
93R	Raleigh Oak Charter	-	-	4,040	4,032	10,080	2,000	20,152
93T	Cardinal Charter Academy	-	-	-	-	-	2,000	2,000
94A	Pocosin Innovative Charter	-	-	-	-	-	2,000	2,000
94Z	NE Regional Biotech/Agri	-	-	3,660	4,560	10,332	2,000	20,552
95A	Two Rivers Community	-	-	3,660	4,239	11,436	2,000	21,335
96C	Dillard Academy	-	-	4,040	4,560	11,436	2,000	22,036
96F	Wayne Preparatory	-	40,699	3,826	7,446	21,261	2,000	75,232
97D	Bridges Academy	-	-	4,040	4,560	10,332	2,000	20,932
98A	Sallie B Howard School	7,561	-	-	-	-	2,312	9,873
98B	Wilson Preparatory Academy	-	5,732	3,660	8,112	19,620	2,006	39,130

PSU#	Charter School	WAN	Wi-Fi	Filtering	Firewall	Internet	CyberSec	Total
295	Innovative School District	-	-	-	-	-	2,000	2,000
298	Deaf and Blind Schools	-	-	3,660	5,448	13,488	-	22,596
		$ 262,322	**$ 1,067,193**	**$ 498,603**	**$ 797,651**	**$ 2,500,955**	**$ 441,088**	**$ 5,567,812**

Table 5: SCI Funding to Charter, Residential, and Lab Schools Through PRC036 and PRC135

Appendix C: Connectivity Staff Salary Report

Table 6 summarizes the NCDPI fully burdened positions paid from SCI funding.

Title of Position and Description of Duties	Compensation and Benefits
School Connectivity & Cybersecurity Manager Provides PSU Technical Consulting, Strategic Planning, and Project Management	141,323
Lead E-rate Program Administrator Provides PSU Technical Consulting, Strategic Planning	120,246
E-rate Program Administrator II Provides E-rate Education and Consultation Services	116,364
E-rate Program Administrator I Provides E-rate Education and Consultation Services	108,006
E-rate Program Administrator I Provides E-rate Education and Consultation Services	96,338
	$ 582,277

Table 6: 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 and four regionally based E-rate Program Administrators (E-rate Coordinators).

Appendix D: North Carolina E-rate funding history report

The following report, as of December 11, 2020, 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 2019 and commitments pending for 2020.

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 $1B dollars in disbursed funds over the life of the E-rate program. Table 7 highlights the years in which the School Connectivity Initiative was in place, and the period from 2015 to 2019 being 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. PSUs 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 cost or allowing significant bandwidth increases for roughly 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%

	Year	Pre-Discount	Requested	Committed	Disbursed	Requests	Utilization %
	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%
SCI In-Place	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	77,710,898	66,523,395	1,207	86%
	2011	93,841,666	73,363,498	71,838,985	63,957,308	1,012	89%
	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	60,482,772	825	88%
Modernized E-Rate Rules	2015	142,186,694	107,499,098	107,477,481	102,888,815	1,692	96%
	2016	136,517,423	96,838,830	96,827,595	88,956,010	1,246	92%
	2017	89,717,376	60,046,696	59,953,817	55,475,125	984	93%
	2018	88,052,351	63,468,534	63,460,578	55,100,604	1,106	87%
	2019	90,655,434	69,924,248	69,870,253	58,444,474	1,601	84%
	2020	90,732,287	68,798,007	55,072,886	5,159,245	2,182	9%
	TOTAL	**$ 1,809,382,536**	**$ 1,351,883,251**	**$ 1,315,236,223**	**$ 1,109,666,041**	**30,585**	

Table 7: 1998-2020 NC E-rate Utilization

Table 8 shows only Category 2 funds associated with the Wi-Fi Expansion Program, which began in 2015, funded initially by the State with Race to the Top. Under this program, NCDPI 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. In February 2020, new CPAs, with 23 original equipment vendors and 30 resellers, were established for the next five years. This more than doubles the E-rate eligible goods and services available to schools while increasing vendor competition to achieve lower costs.

Year	Pre-Discount	Requested	Committed	Disbursed	Requests	Utilization
2015	43,509,331	35,243,726	35,173,206	34,848,226	597	99%
2016	54,112,168	40,613,575	38,350,865	37,701,108	692	98%
2017	28,456,003	19,427,135	17,384,691	17,085,583	537	98%
2018	29,410,379	20,138,474	19,478,840	18,905,635	800	97%

Year	Pre-Discount	Requested	Committed	Disbursed	Requests	Utilization
2019	34,145,405	25,294,432	22,890,972	17,133,523	1,127	75%
2020	42,861,745	31,073,852	20,416,675	1,549,606	2,083	8%
Total	**$ 232,495,030**	**$ 171,791,194**	**$ 153,695,248**	**$ 127,223,681**	**5,836**	

Table 8: NC E-rate Utilization Through SCI Contracts (2015-2020)

Appendix E: School Connectivity Initiative K12 Cybersecurity Report

Legislation

SL2020-4 (HB1043) SECTION 3.3.(11)- $4,500,000 to the Department of Public Instruction, in response to COVID-19, to (i) establish a statewide shared cybersecurity infrastructure to protect school business systems and minimize instructional disruption and (ii) for district cybersecurity monitoring and support in consultation with the School Connectivity Initiative. The Department shall evaluate the sufficiency and sustainability of the cybersecurity infrastructure and services provided pursuant to this subdivision and report the results of its evaluation no later than October 1, 2020, to the Joint Legislative Education Oversight Committee and the Joint Legislative Oversight Committee on Information Technology.[16]

Background Considerations

Funding Parameters of Legislation

- SECTION 1.6 – State agencies shall not use funds received pursuant to COVID 19 Recovery Legislation for recurring purposes.
- SECTION 2.2 – The purpose of the Fund is to provide necessary and appropriate relief and assistance from the effects of COVID 19, consistent with the provisions of this act and subsequent legislation addressing the effects of COVID 19. "All funds allocated from the Fund must be used for necessary expenditures incurred due to the public health emergency with respect to COVID 19. Only expenditures incurred during the period that begins on March 1, 2020, and ends on December 30, 2020, are eligible for funding from this Fund."

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Recommendation 5: Expansion of School Connectivity Initiative / Cybersecurity and Risk Management - $5M non-recurring, for two years. Leverage the centrality of NC Research and Education Network (NCREN) to deliver:

- Advanced Endpoint Protection Service
- Network Monitoring and Protection Service
- Centralized Event Processing and Response Service

Research & Evaluation

Research began by first quantifying the existing K12 environment and risks. Table 1 illustrate the breakdown of all PSU staff, their workstations, and business servers. Student devices and accounts were intentionally excluded due to volume and presumed lower risk of affecting business systems through phishing and malware. Students generally have limited access levels to systems.

[16] https://www.ncleg.gov/EnactedLegislation/SessionLaws/HTML/2019-2020/SL2020-4.html

Role	Classification	LEA	Non-LEA	Total
Administrators	Official Administrator, Manager	2,026	360	2,386
	Principal	2,433	254	2,687
	Asst. Principal, Non-Teaching	3,005	215	3,220
	Subtotal	7,464	829	8,293
Teachers	Elementary	49,465	4,012	53,477
	Secondary	26,814	2,360	29,174
	Other	17,644	1,151	18,795
	Subtotal	93,923	7,523	101,446
Professionals	Guidance	4,067	220	4,287
	Psychological	774	31	805
	Librarian, Audiovisual	2,090	70	2,160
	Consultant, Supervisor	1,659	120	1,779
	Other	8,103	406	8,509
	Subtotal	16,693	847	17,540
Other	Teacher Assistant	21,344	1,395	22,739
	Technicians	1,675	64	1,739
	Clerical, Secretarial	9,811	445	10,256
	Service Workers	19,704	408	20,112
	Skilled Crafts	3,120	37	3,157
	Laborer, Unskilled	385	41	426
	Subtotal	56,039	2,390	58,429
	TOTAL	174,119	11,589	185,708

Table 1: PSU Staff Breakdown

Classification	Operating System	Quantity
Staff Workstations	Windows	137,628
	MacOS	27,339
	Linux	123
	Subtotal	165,090
Business Server	Windows	6,581
	MacOS	389
	Linux	917
	Unix	19
	Subtotal	8,176
	Total Endpoints	173,266

Table 9: Technology Endpoints

School Connectivity Initiative (SCI) team also reviewed the most recent K12 cybersecurity events and the "patient zero" root cause. We found several attack vectors related to phishing emails, a lack of effective patch management, and weak network perimeters.

For two months, SCI and MCNC met to further define the scale and scope of risks towards developing a solution that met the legislative directives. MCNC operates the NCREN which provides NC K12 Internet access, content filtering, firewall support, and also offers other cybersecurity services. Their longstanding relationships with NCDPI, NCDIT, and K12 provided invaluable insight.

SCI contacted NCDIT to research existing state contracts that could be leveraged. The only convenience contracts were for anti-virus software and security assessments.

On June 17, the "K12 Cybersecurity Needs Survey" was sent to all PSU technology leaders. Responses were received from 128 PSUs representing over 73% of the North Carolina student population. There were 88 LEAs (77% representing 1.12M students) and 40 charter/regional schools (20% representing 30,000 students), all ranging from the smallest LEA and Charters (Hyde Co and Marjorie Williams, with 591 and 110 students respectively) to the largest (Wake Co and Lincoln Charter, with 162,743 and 2,594 students respectively).

The survey revealed a wide variety of cybersecurity readiness levels and needs exist in K12. Responders indicated need for cybersecurity response planning and training, behavioral-based anti-ransomware/malware protection, systems monitoring services, email filtering, business system backups, and network segmentation assistance.

On July 21, 2020 NCDPI issued RFI "40-NCDPI Cybersecurity" seeking responses from vendors offering cybersecurity products and services. When the RFI closed on August 11, 30 responses were received from small and large companies. In reviewing the responses, NCDPI found that some vendors did not

offer solution pricing, as every PSU environment is unique in topology, maturity, and size. North Carolina State Board of Education (NCSBE) leadership indicated that the NCSBE would not consider leveraging the RFI information for a future procurement.

From this research, several possible solutions were identified. NCDPI consulted with legal and other sources to determine each solution's feasibility within the framework of the legislation and state procurement laws, and resulted in establishing the following constraints:

- The nature of the COVID-19 funding, as well as the amount, would not permit multi-year contracts and any associated discounts.
- No convenience contracts exist to collectively meet the variety of needs for all PSUs.
- No existing contracts may be amended due to the expansive scope necessary.
- The amount of funding without any recurring commitment reduces the number PSU participants and/or performance level of services.

Conclusions & Actions Taken

The NCSBE directed NCDPI to allocate the cybersecurity funds as stated below. The NCSBE approved these allocations at the August 6, 2020 meeting.

- $547,600 – Cybersecurity Awareness Training. Each PSU will be provided access to an Automated Security Awareness Program through KnowBe4 to provide cybersecurity awareness training to all PSU staff (186,000). NCDPI will establish minimum curriculum and participation levels while enabling each PSU to select specific content, track participation, and conduct effectiveness assessments. KnowBe4 is used by NCDIT for all state agencies. The NCDIT contract was amended to permit NCDPI to utilize this contract through June 2022.
- $500,000 - Cybersecurity Assessments. Through an amendment with the existing Client Network Engineering (CNE) contract with MCNC, by the end of December 2020 a "Cybersecurity Program Review" (CPR) will be conducted on at least fifty city/county school systems. For each CPR, MCNC will provide a formal document of findings and recommendations to assist the PSU:
    - Align their security program with commonly accepted best practices for protecting information assets.
    - Understand areas of relative strength and opportunities for improvement in their existing cybersecurity program.
    - Address gaps identified and take actionable steps that can reduce cybersecurity risk and improve the organization's overall governance strategy based on provided comments and observations.
    - After December, the remaining sixty-five city/county school systems will be assessed, with a target completion of April 1, 2021 and funded by the original CNE contract.
- $3,452,400 – Allocation to Public School Units. Provide funds to PSUs for use on approved cybersecurity products. The proposed allotment is based on the 50%/50% ADM/poverty formula with a minimum amount of $2000 per eligible PSU in order to provide meaningful amounts. This recommendation stems from the fact that research showed that there are varying needs across all PSUs and there is no single solution to benefit all.