Alan Buzacott
Executive Director
Federal Regulatory Affairs

1300 I Street, NW, Suite 400 West
Washington, DC 20005

Phone 202 515-2595
Fax 202 336-7922
alan.buzacott@verizon.com

April 30, 2014

Ex Parte

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Modernizing the E-rate Program for Schools and Libraries
WC Docket No. 13-184

Dear Ms. Dortch:

On April 28, 2014, Kathleen Grillo, Chris Miller and Alan Buzacott of Verizon met with Trent Harkrader, Patrick Halley, Lisa Hone, James Bachtell, Nick Alexander, Charles Eberle, Jonathan Chambers, Michael Steffen, Jon Wilkins and Dana Shaffer to discuss the above-captioned proceeding.

I. Verizon 2014 Form 471 Analysis

In the meeting, we presented the results of Verizon's analysis of schools' 2014 connectivity. For its analysis, Verizon obtained Form 471 Block 5 connectivity information for the approximately 300 school districts in the Verizon ILEC footprint in which (i) 50 percent or more of the district's students qualify for the free and reduced lunch program; and (ii) enrollment is 2,000 or more students. If the school district did not file a 2014 Form 471 or provided no Block 5 information, Verizon supplemented the Form 471 analysis with a review of district technology plans and other public sources of connectivity information. We reviewed data for all schools in the Verizon ILEC footprint, not just the smaller number of schools that purchase Internet access and other services from Verizon.

Verizon's analysis shows that, by the 2014 school year, even the most economically disadvantaged school districts in its ILEC footprint will have achieved or made significant progress towards the primary ConnectED goal – *i.e.*, to connect schools "at speeds no less than

100 Mbps and with a target of 1 Gbps."[1] Specifically, Attachment 1 demonstrates three things about the Verizon 2014 data set: (1) most of the school districts surveyed by Verizon will have fiber circuits connecting the district's schools; (2) most of the surveyed districts' circuits will operate at 100 megabits per second or more – ConnectED's "minimum" speed; and (3) many schools will be connected at gigabit speeds – ConnectED's "target" speed.

We explained that the widespread adoption of 100 megabit per second and gigabit services by even the most economically disadvantaged school districts confirms that those services are affordable under the current E-rate program. We said that two key factors, in addition to E-rate discounts, are contributing to the affordability of 100 megabit and gigabit services. The first factor is the scalability of commercial fiber services, which allows dramatic increases in network capacity with only moderate increases in cost.[2] The second factor is intense competition in the provision of Ethernet services, which is driving down prices for commercial Ethernet services by more than 10 percent per year.[3]

We also explained that the same factors that are contributing to the affordability of 100 megabit and gigabit services will allow the E-rate program to meet the ConnectED goals within the existing E-rate budget. Schools' significant progress towards these goals occurred while using less than one-half of the E-rate budget for high-capacity services. We also said demand for priority one services declined between 2013 and 2014 even though the bandwidth for which schools are seeking E-rate support increased significantly.

II. EducationSuperHighway Presentation and White Paper

In the meeting, we also discussed several statements made by EducationSuperHighway (ESH) in its recently-filed Form 471 Item 21 results presentation and white paper.[4]

A. Access to Broadband

ESH asserts that "40 million students lack adequate access to broadband."[5] ESH arrived at its 40 million student figure by evaluating the 2013 bandwidth purchased by districts based on a two-part test. ESH deemed a school to have "adequate access to high-speed broadband" only if the district was purchasing at least (1) a gigabit wide area network (WAN) connection per school; and (2) 100 kbps of Internet access per student.[6] In fact, it appears that all schools in a district would

---

[1] The White House, Office of the Press Secretary, *ConnectED: President Obama's plan for Connecting All Schools to the Digital Age*, http://www.whitehouse.gov/sites/default/files/docs/connected_fact_sheet.pdf, at 2 (2014) ("ConnectED Fact Sheet").

[2] *See* EducationSuperHighway ("ESH"), *Connecting America's Students: Opportunities for Action*, at 17 ("[D]ramatic increases in WAN capacity can be achieved with moderate increases in cost.") ("ESH White Paper") *attached to* Letter from Evan Marwell, ESH, to Marlene H. Dortch, FCC (April 10, 2014) ("ESH ex parte").

[3] *See* Application and Public Interest Statement of Comcast and Time Warner Cable, MB Docket No. 14-57, at 88 (April 8, 2014).

[4] *See* ESH Ex Parte; *see also attached* ESH White Paper; ESH, *An Analysis of E-Rate Spending* ("ESH Results Presentation").

[5] ESH Results Presentation at 3.

[6] ESH White Paper at 3-4.

"fail" ESH's test if even one of the district's schools had a sub-gigabit connection.[7] ESH determined that 80 percent of schools in its sample fell short of one or both bandwidth thresholds, and then extrapolated from that result to an estimate that 40 million students lacked "adequate access to high-speed broadband."

The components of ESH's test are loosely based on ConnectED's bandwidth goals and the State Educational Technology Directors Association's (SETDA) recommendations.[8] However, neither the ConnectED targets nor SETDA recommendations are intended to provide standards for defining "adequate access to broadband" in the *2013* school year. Rather, ConnectED and SETDA both set goals for schools to meet *in the future*. For example, ConnectED calls for its targets to be met "within five years." Similarly, SETDA describes its recommended bandwidth parameters as a target for the 2014 school year.[9] SETDA also makes clear that its 2014 target bandwidth recommendation of 100 kbps per student is designed for schools that have fully implemented a bandwidth-intensive, one-to-one learning program.[10]

ESH's definition of "adequate access to broadband" is not realistic because it exceeds the level of bandwidth that most schools needed in order to meet their educational needs in 2013. In 2013, bandwidth levels below ESH's definition provided "adequate access to broadband" for even those school districts at the forefront of the transition to one-to-one learning. Notably, Mooresville Graded School District – the site of President Obama's ConnectED announcement – would have *failed* ESH's test in 2013 because it was buying less than 100 kbps per student of Internet access capacity.[11] For districts that were behind Mooresville in implementing one-to-one programs in 2013, SETDA's *Broadband Imperative* report makes clear that "adequate access to broadband" could be achieved well below 100 kbps per student. In fact, SETDA recommended a 50 kbps per student broadband connection for schools with "a partial 1-to-1 laptop program."[12]

---

[7] *See* ESH White Paper at 41 ("Average bandwidth per circuit for the district was calculated as the average download speed … across all WAN services reported by a district. Districts and their associated number of schools…were assigned to readiness categories based on the following delineations: …Not meeting Current Goals: <1 Gbbps per circuit.")

[8] See SETDA, *The Broadband Imperative: Recommendations to Address K-12 Educational Infrastructure Needs*, http://www.setda.org/priorities/equity-of-access/the-broadband-imperative/ (May 21, 2012) ("*Broadband Imperative*").

[9] *Broadband Imperative* at 25.

[10] According to SETDA, a school would upgrade its network to provide a minimum of 100 kbps per student broadband connection when "Internet-based educational technologies and practices have been integrated into the curriculum" and students are actively using their devices to access rich, multimedia-enhanced educational content from the Internet. According to SETDA, "[t]he reliance on dozens of bandwidth intensive activities, coupled with large numbers of concurrent users, requires this jump in bandwidth" to 100 kbps per student. *Broadband Imperative* at 23.

[11] Mooresville upgraded to 500 Mb/s Internet access capacity from 250 Mb/s in the 2013-14 school year. https://sites.google.com/a/mgsd.k12.nc.us/mgsd-digital-conversion-v1/mgsd-statistics. Mooresville's 2013 Form 471 indicates that the district has 5,882 students. Mooresville's 2013 Internet access capacity was therefore 85 kbps per student (500 Mbps / 5,882 students), less than ESH's 100 kbps per student benchmark.

[12] *Broadband Imperative* at 23.

In addition, ESH provided no underling connectivity data. ESH simply reports that 80 percent of schools failed its test, without providing any data that would allow the Commission to assess how many schools were generally close to meeting ESH's test and how many were lagging further behind. For example, ESH did not provide the percentage of schools with fiber connections, the distribution of fiber circuit bandwidths, or the distribution of Internet access bandwidths. To the extent the ESH White Paper provides any underlying data, it confirms what Verizon's Form 471 analysis found – that many schools have either met or are making significant progress towards the ConnectED goals.[13] Notably, ESH reports that at least 37 percent of the schools in its sample already had gigabit connections in 2013.[14] And, ESH reports that the median school was buying 76 kbps per student of Internet bandwidth in 2013,[15] only slightly less than Mooresville's 85 kbps per student and well above the 50 kbps per student that SETDA found was sufficient for schools with a partial one-to-one program.

B. Affordability

ESH asserts that "affordability is the #1 challenge to meeting the ConnectED goals."[16] In the meeting, we explained that does not appear to be correct. For many schools, 100 megabit and gigabit services are affordable under the E-rate program. As a practical matter, the fact that many schools are already buying 100 megabit and gigabit services demonstrates that those services are affordable.

Moreover, the pricing information in ESH's White Paper provides further evidence that commercial fiber services are affordable under the E-rate program. At the price that ESH reports for a gigabit circuit, a school in the 90 percent discount band would pay approximately $3 per student *per year* after the E-rate discount (*see* Attachment 4). A school in the 80 percent discount band would pay less than $6 per student per year. Based on published estimates of the costs of implementing a one-to-one learning program, the per-student costs of gigabit connectivity would be far outweighed by the cost of devices ($255 per year according to one estimate[17]); software costs ($128 per student per year); tech support ($75 per student per year); and professional development ($63 per student per year).

---

[13] ESH asserts that "the rate of change is not fast enough to meet the President's goals" and that "it will take 7 years to reach the current ConnectED goals." *See* ESH Executive Summary, at 2 *attached to* ESH Ex Parte. However, this assertion is based on the questionable assumption that the percentage of schools meeting a different test – its "SchoolSpeedTest" – will increase linearly, at a rate derived from only two historical data points. Standard technology adoption forecasting methods, including those used in the National Broadband Plan, recognize that the rate of adoption changes over time. *See* National Broadband Plan OBI Technical Paper No. 1, pp. 45-46

[14] ESH White Paper at 8, Chart 4 (showing 37 percent of schools meeting ESH's WAN benchmark of 1 gigabit per school).

[15] *Id*. at 5.

[16] ESH Results Presentation at 4.

[17] Project RED, *The Technology Factor*, Table 9.1, *available at* http://pearsonfoundation.org/downloads/ProjectRED_TheTechnolgyFactor.pdf,

The ESH White Paper also recognizes that, because of the scalability of commercial fiber services, "dramatic increases in WAN capacity can be achieved with moderate increases in cost."[18] In particular, ESH reports that "a 1 Gbps circuit, which is ten times faster [than a 100 megabit circuit], is only 40% more expensive."[19] That does appear to be correct. As is shown in Attachment 4, at the prices reported by ESH, the difference in cost between a 100 megabit circuit and a gigabit circuit is only 88 cents per student per year for a school in the 90 percent discount bracket.

We also addressed three more specific affordability arguments made by ESH.

First, ESH asserts that the "wealthiest districts are three times as likely as the poorest districts to meet ConnectED goals."[20] This claim is based on ESH's determination that 39 percent of schools in districts with a free and reduced lunch (FRL) percentage of less than one percent met ESH's test, while 14 percent of schools in districts with a free and reduced lunch percentage of more than 75 percent met ESH's test. ESH also found that 20 percent of the remaining schools, with a FRL percentage of 1-74 percent, met its test.

We explained that the differences between the results for ESH's three FRL ranges are not material; in all three ranges, the percentage of schools meeting ESH's test is so low that the results only confirm ESH's test is not a reasonable benchmark for 2013.[21] Moreover, the marginally "better" result for the "less than 1 percent FRL" districts is not significant, for two reasons: (1) the "less than 1 percent FRL districts" represent only 1.4 percent of the nation's students; and (2) the marginally higher result is likely reflective of unique characteristics of the "less than 1 percent FRL" districts that are unrelated to their FRL percentage. As is shown in Attachment 3, the "less than 1 percent FRL" districts are much smaller than other districts: They have fewer schools, smaller schools, and are far more likely to be single-school districts. Because of a quirk in ESH's application of its test, small districts – especially single-school districts – are more likely to meet ESH's test.[22]

Second, ESH asserts that "schools meeting the current ConnectED goals pay 1/3 the price." This is misleading. It implies that schools meeting the ESH bandwidth test in 2013 had access to lower prices. But the comparison that ESH is actually making is based on *cost per megabit*, not *price*. Specifically, ESH determined that the *per-megabit cost* for schools meeting its test is one-

---

[18] ESH White Paper at 17.

[19] *Id.*

[20] ESH Results Presentation at 16.

[21] In addition, it is likely that there was comparable variation between the various E-rate discount bands that ESH has combined in its broad "1-74 percent FRL" range.

[22] Small districts are unlikely to have a Wide Area Network. *See* ESH White Paper at 47. Under ESH's methodology, schools without a Wide Area Network only have to meet one component of ESH's two-part test (the 100 kbps per student Internet access requirement); *see* ESH White Paper at 42 ("Districts reporting only Internet Access spend were assigned the same readiness category as their Internet Access readiness."). For example, a single-school district with 180 students and a 20 mbps cable modem service would pass ESH's test (20 mbps / 180 students = 111 kbps per student). By contrast, a 180-student school that is part of a larger district with a WAN would need a gigabit connection to meet ESH's test.

third the per-megabit cost for schools not meeting its test.[23] The observation that schools that meet ESH's test have lower per-megabit costs than schools with less bandwidth is not surprising – and it is simply a restatement of ESH's "economies of scale" observation.[24] Simply put, schools' per-megabit costs decline as they upgrade bandwidth.[25] Far from indicating an affordability challenge, the fact that per-megabit cost declines as bandwidth goes up *contributes to* affordability. As ESH itself explains (correctly), schools can dramatically increase bandwidth with only moderate increase in cost.[26]

Third, ESH asserts that "schools meeting the current ConnectED goals budget 450% more per student."[27] In particular, ESH claims that sample districts with 100 kbps Internet access pay $7.16 per student per year for Internet access after the E-rate discount, while districts with less than 100 kbps Internet access pay $1.59 per student per year after the E-rate discount. In the meeting we said that we do not understand these data points. They appear to be inconsistent with other data in the ESH White Paper. As is shown in Attachment 5, other information provided in the ESH White Paper indicates that the average annual per-student cost of Internet access is currently $4.81, after the E-rate discount, and would be approximately $6.14 if all schools were buying 100 kbps per student Internet access, a difference of 27 percent, not 450 percent.

C. E-Rate Budget

In its White Paper, ESH argues that the size of the E-rate fund should increase and presents several different estimates of how significantly the fund should grow. In one set of estimates, which ESH refers to as the "status quo pricing" estimates, ESH estimates that the E-rate fund would have to spend $2.4 billion per year in order to achieve ESH's "current goal" of a gigabit connection per school and 100 kbps per student Internet access, and $11 billion per year to achieve ESH's "five year goal" of a gigabit connection per school and 1 megabit per second per student of Internet access.[28]

In the meeting, we explained that the ESH's "status quo pricing" estimates are based on an unrealistic assumption about schools' purchasing behavior. Those estimates assume that schools would increase bandwidth at the *same per -megabit cost that they are paying today*.[29] That does

---

[23] *See* ESH White Paper at 12.

[24] *Id*. at 16-17.

[25] Using the pricing data in ESH's report, the per-megabit cost of WAN circuits is $77.50 for a 10 mbps circuit, $8.99 for a 100 mbps circuit, $1.24 for a gigabit circuit, and $0.22 for a 10 gigabit circuit. *See* ESH White Paper at 17, Chart 16.

[26] *See id*, at 17.

[27] ESH Results Presentation at 2.

[28] ESH White Paper at 27.

[29] For example, ESH's "status quo" estimate assumes that a 1,000-student district that is currently paying $29 per megabit ($1,450 per month for a 50 megabit circuit) would pay $29,000 per month to meet ESH's 1 megabit per student target (1,000 megabits x $29/megabit). In reality, a1,000-student district that needs 1,000 megabits would buy a gigabit Internet access service, for which ESH reports a price of $8,000 per month, far less than the $29,000 per month estimate generated by ESH's unrealistic "constant price per megabit" assumption.

not make sense and does not reflect either current pricing or rational purchasing behavior. In reality, to increase bandwidth in today's market a school district can simply buy a higher-bandwidth Internet access service at a lower cost per megabit. ESH's unrealistic "constant price per megabit" assumption for Internet access purchasing explains and undermines ESH's $11 billion status quo estimate for its "five year goal."

Estimates based on more realistic assumptions about schools' purchasing behavior show that the ConnectED goals can be readily achieved within the existing E-rate budget. In fact, ESH itself provides estimates that make the more realistic assumption that schools will increase bandwidth by buying higher capacity services, thereby taking advantage of economies of scale. Using that more realistic assumption, ESH estimates that "Internet Access and WAN for all schools could be upgraded to meet Current Goals at a total cost of $1.6 billion annually – only 20% higher than current data network subsidies."[30] This is ESH's true "status quo" estimate. It assumes no changes in the E-rate program rules and assumes no changes in schools' purchasing behavior. Rather, it simply recognizes that districts will take advantage of economies of scale, as they have in the past. And even this estimate overstates the required E-rate support, as it assumes no decline from 2013 prices.

D. ESH Proposed E-Rate Strategies

Finally, we discussed two of ESH's proposed "strategies."

First, we discussed ESH's argument that "widespread deployment of dark fiber could save up to 70-90 percent annually for district WAN."[31] We pointed out that ESH's cost comparison looks only at ongoing operating costs and ignores the multibillion-dollar up-front investment that would be required for schools to self-provision dark fiber networks. We also explained that this "strategy" would do nothing to accelerate the availability of fiber services to schools, which Verizon's Form 471 analysis and ESH's own data show are already widely served with scalable commercial fiber services.

Second, we discussed ESH's assertion that there is a wide range of prices across districts even when bandwidth and locale are held constant. We explained that prices for lit fiber services reflect several factors. For example, prices depend on:

- The carrier selected by the customer. ESH's sample includes dozens of different service providers.
- The specific service ordered by the customer. Not all "gigabit" services are the same. For instance, providers typically offer at least two different types of Ethernet services, generically referred to as "E-line" and "E-LAN" services.[32]

---

[30] ESH White Paper at 28.

[31] ESH Results Presentation at 29.

[32] *See, e.g.*, http://metroethernetforum.org/Assets/Technical_Specifications/PDF/MEF6-1.pdf.

- The configuration and features selected by the customer. For instance, for an E-Line service, the price depends on the quantity, type, and bandwidth of the Ethernet virtual circuits specified by the customer.
- The volume – *i.e.*, the quantity of circuits ordered by the customer. ESH's sample includes data for districts buying a single circuit and for districts buying hundreds of circuits.
- The term of the contract. ESH's sample includes circuits subject to month-to-month pricing and circuits covered by contracts with terms of three years, five years, or even longer.
- The structure of the contract. Contracts may be structured to have a higher up-front cost and lower monthly charges, or the reverse.
- The vintage of the contract.

As this list illustrates, the price paid by a school depends on a combination of factors, including the service type, features, term, and volume. ESH's "pricing transparency" argument ignores the fact that the price paid by a different school district would reflect a different combination of factors.

Sincerely,

/s/

Alan Buzacott

cc: Trent Harkrader
Patrick Halley
Lisa Hone
James Bachtell
Nick Alexander
Charles Eberle
Jonathan Chambers
Michael Steffen
Jon Wilkins
Dana Shaffer

Attachment 1: Form 471 Circuit Data

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
CA	601710	ADELANTO ELEMENTARY	8,603	83.4%	14	14		1	13	14		1	13	
CA	602820	ANTELOPE VALLEY UNION HIGH	26,036	61.9%	14	15	6	8	1	15	6	8	1	
CA	600017	APPLE VALLEY UNIFIED	14,785	58.5%	15	14			14	14			14	
CA	603600	AZUSA UNIFIED	10,487	72.9%	17	37		18	19	37		18	19	
CA	603690	BALDWIN PARK UNIFIED	19,904	60.8%	23	22			22	22			22	
CA	603840	BANNING UNIFIED	4,579	90.7%	9	10			10	10			10	
CA	604020	BARSTOW UNIFIED	6,155	70.3%	12	15			15	15			15	
CA	604110	BASSETT UNIFIED	4,526	88.3%	7	9		7	2	9		7	2	
CA	604230	BEAR VALLEY UNIFIED	2,739	70.2%	7	9			9	9			9	
CA	604290	BEAUMONT UNIFIED	8,506	60.3%	10	15	1	2	12	15	1	2	12	
CA	604440	BELLFLOWER UNIFIED	13,948	66.6%	15	37			37	37			37	
CA	607560	CARPINTERIA UNIFIED	2,327	58.4%	8	5	5			5	5			
CA	607950	CENTRAL ELEMENTARY	4,826	51.9%	7	9			9	9			9	
CA	609070	COACHELLA VALLEY UNIFIED	18,478	90.2%	23	23		3	20	23		3	20	
CA	609690	CORCORAN JOINT UNIFIED	3,381	78.1%	10	6			6	6			6	
CA	610050	COVINA-VALLEY UNIFIED	13,907	55.2%	17	21		19	2	21		19	2	
CA	616300	CUCAMONGA ELEMENTARY	2,726	69.1%	4	5			5	5			5	
CA	611110	DESERT SANDS UNIFIED	29,114	59.6%	34	58			58	58			58	
CA	600033	DOS PALOS ORO LOMA JOINT UNIFIED	2,324	83.0%	8	8			8	8			8	
CA	611460	DOWNEY UNIFIED	22,811	66.8%	20	20	1	16	3	20	1	16	3	
CA	611520	DUARTE UNIFIED	3,971	68.4%	8	9			9	9			9	
CA	611910	EASTSIDE UNION ELEMENTARY	3,370	85.3%	5	6		5	1	6		5	1	
CA	612180	EL RANCHO UNIFIED	10,351	71.1%	14	13		1	12	13		1	12	
CA	613200	EXETER UNION ELEMENTARY	2,008	59.3%	4					1	1			
CA	600035	FARMERSVILLE UNIFIED	2,628	88.3%	6	2		2		6		6		
CA	614250	FOWLER UNIFIED	2,431	75.5%	8	8			8	8			8	
CA	615180	GILROY UNIFIED	11,076	61.5%	16	16			16	16			16	
CA	616325	HACIENDA LA PUENTE UNIFIED	20,934	72.8%	35	41			41	41			41	
CA	616920	HEMET UNIFIED	22,248	72.7%	27	2			2	2			2	"Type and speed of connection(s) of schools to each other and/or to district office: - 1000Mbps fiber, Verizon SES (formerly TLS) - Time Warner Cable Internet connection to Idyllwild (5Mbps up/down)" (2012 technology plan, page 50)
CA	600014	HESPERIA UNIFIED	23,120	62.6%	31	5		1	4	20		1	19	"The wireless WAN consists of point-to-point licensed microwave connections running at 155 Mbps. This microwave network is provided as a telecommunications service by Conterra ...." (2012 technology plan, page 22)
CA	617850	HUENEME ELEMENTARY	8,109	72.4%	11	14		2	12	14		2	12	
CA	619700	KINGS CANYON JOINT UNIFIED	9,765	68.4%	20	2		1	1	2		1	1	"[T]he District Wide Area Network was upgraded to a wireless system that employs licensed radios to deliver 100 and 35 megabit speeds to all schools." (District 2010 technology plan, page 22)
CA	620190	LA HABRA CITY ELEMENTARY	5,418	73.7%	9	12			12	12			12	
CA	600027	LAKE ELSINORE UNIFIED	22,039	54.6%	26	28			28	28			28	
CA	620880	LANCASTER ELEMENTARY	14,442	71.8%	20	23			23	23			23	
CA	621870	LINDSAY UNIFIED	4,150	74.7%	10	12		10	2	12		10	2	

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
CA	621930	LITTLE LAKE CITY ELEMENTARY	4,799	69.0%	9	11			11	11			11	
CA	622410	LOMPOC UNIFIED	9,877	59.4%	16	1		1		1		1		"The fiber optic backbone put into place by COMCAST Cable that brings two fiber optic strands for data to each school site at 1 gigabit/second (Gb/s) must grow to the targeted bandwidth capacity for school sites in of 10 G/s to accommodate the increasing data and instructional needs of schools." (2010 technology plan, page 53)
CA	622500	LONG BEACH UNIFIED	84,606	69.3%	91	75			75	75			75	
CA	600015	LUCERNE VALLEY UNIFIED	2,567	51.4%	7									
CA	623610	MANTECA UNIFIED	23,376	50.1%	29					32		1	31	
CA	624230	MCFARLAND UNIFIED	3,328	96.8%	6	3		3		3		3		
CA	625230	MOJAVE UNIFIED	2,652	68.1%	8	6		4	2	6		4	2	
CA	625320	MONROVIA UNIFIED	5,941	58.8%	11	11			11	11			11	
CA	625800	MORENO VALLEY UNIFIED	36,762	76.0%	38	20			20	20			20	"[Moreno Valley USD] Information Systems/Technology is partnering with Sunesys .... This service will use fiber optic cables and provide bandwidth of 1Gbps to each school site." (District website)
CA	625860	MORONGO UNIFIED	9,205	60.7%	17	20			20	20			20	
CA	626220	MOUNTAIN VIEW ELEMENTARY	2,823	60.3%	4	13			13	13			13	
CA	627690	NORWALK-LA MIRADA UNIFIED	20,402	63.8%	27	67			67	67			67	
CA	627780	NUVIEW UNION	2,209	68.5%	5	7			7	7			7	
CA	628170	OCEAN VIEW	2,519	81.2%	4	3		3		3		3		
CA	628470	ONTARIO-MONTCLAIR ELEMENTARY	22,579	85.3%	32	37			37	37			37	
CA	629220	OXNARD	15,870	81.9%	22	79			79	79			79	
CA	629550	PALM SPRINGS UNIFIED	23,620	80.7%	28	32			32	32			32	
CA	630180	PERRIS ELEMENTARY	5,590	91.1%	8	10			10	10			10	
CA	630210	PERRIS UNION HIGH	10,589	61.7%	8	18			18	18			18	
CA	631320	POMONA UNIFIED	28,180	77.8%	45									"All 42 sites share a central gigabit connection to the Internet via California K-12 High Speed Network." (2013 Technology Plan, page 34)
CA	632070	REDLANDS UNIFIED	21,368	52.4%	25	29			29	29			29	
CA	632760	RIO ELEMENTARY	4,486	71.5%	9	9		1	8	9		1	8	
CA	633390	ROMOLAND ELEMENTARY	2,987	73.3%	4	6			6	6			6	
CA	633750	ROWLAND UNIFIED	15,700	64.2%	22									
CA	634170	SAN BERNARDINO CITY UNIFIED	54,348	83.4%	78	96		10	86	96		10	86	
CA	634440	SAN JACINTO UNIFIED	9,637	62.1%	14	15			15	15			15	
CA	635250	SANGER UNIFIED	10,752	71.3%	20	22			22	23			23	
CA	635360	SANTA BARBARA ELEMENTARY	5,642	62.1%	13	17		8	9	17		8	9	
CA	635670	SANTA MARIA JOINT UNION HIGH	7,793	57.0%	4	6	2	4		6	2	4		
CA	605580	SANTA MARIA-BONITA	14,182	83.0%	19	3		3		3		3		
CA	635730	SANTA PAULA UNIFIED	3,661	79.1%	7	9		1	8	9		1	8	
CA	636970	SNOWLINE JOINT UNIFIED	8,302	54.2%	12	13			13	13			13	
CA	637560	SOUTH WHITTIER ELEMENTARY	3,563	71.2%	7	9		8	1	9		8	1	
CA	638700	TAFT CITY	2,091	75.5%	7	9		9		9		9		
CA	691135	VAL VERDE UNIFIED	19,657	79.6%	21	22			22	22			22	
CA	641040	VICTOR ELEMENTARY	11,639	73.7%	18	21		20	1	21		20	1	

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
CA	636972	VICTOR VALLEY UNION HIGH	13,930	62.8%	12	11	1	2	8	11	1	2	8	"Victor Valley High School is connected via a Gigabyte fiber connection. All other sites are connected via a Transparent Lan (TLS) supplied through Verizon. Each school is 100MB with the District Office at 1GIG." (2012 technology plan, page 36)
CA	642000	WEST COVINA UNIFIED	14,647	61.9%	16	17		1	16	17		1	16	
CA	642150	WESTMINSTER ELEMENTARY	9,722	68.1%	17	18			18	18			18	
CA	642450	WHITTIER CITY ELEMENTARY	6,524	64.9%	12	15			15	15			15	
CA	642480	WHITTIER UNION HIGH	13,570	59.4%	7	7		1	6	7		1	6	
DC	1100030	DISTRICT OF COLUMBIA PUBLIC SCHOOLS	44,186	73.3%	129	1			1	1			1	"By 2008, even before the Federal Communications Commission's (FCC) 2010 National Broadband Plan, DC-Net met the plan's standard of 1 gigabit per second (Gbps) access for schools and libraries…" (DC CTO testimony, page 5)
DC	1100008	FRIENDSHIP PCS	3,979	75.0%	6									
DC	1100031	KIPP ACADEMY PCS	2,069	85.3%	8	7	5	2		7	5	2		
DE	1000190	CAPITAL SCHOOL DISTRICT	6,321	59.0%	12									Included in statewide funding request. FRN (#2679743) Block 5 shows 237 fiber circuits, of which 128 are 100 mbps or greater and 109 are 10 mbps.
DE	1000200	CHRISTINA SCHOOL DISTRICT	17,190	60.1%	29									see above
DE	1000230	COLONIAL SCHOOL DISTRICT	9,871	59.3%	14									see above
DE	1000680	INDIAN RIVER SCHOOL DISTRICT	8,683	61.4%	14									see above
DE	1000790	LAKE FOREST SCHOOL DISTRICT	3,837	53.4%	7									see above
DE	1001530	SEAFORD SCHOOL DISTRICT	3,508	68.3%	7									see above
DE	1001850	WOODBRIDGE SCHOOL DISTRICT	2,179	69.6%	3									see above
FL	1200870	HILLSBOROUGH	194,525	55.9%	302	239		237	2	239		237	2	"As part of its agreement with [Hillsborough County Public Schools], Bright House Networks is providing private Metro Ethernet connectivity, enterprise voice trunking and analog voice lines to all of the district's 300 facilities." (Press release)
FL	1201230	MANATEE	44,249	53.7%	81	10	1	9		10	1	9		"The district WAN is comprised of over 120 miles of district owned fiber optic cable in five separate ring topologies all buried at a minimum of three feet deep." (District procedure document)
FL	1201530	PASCO	66,994	51.5%	108	87		76	11	87		76	11	
FL	1201590	POLK	95,178	65.6%	161	119	9	107	3	119	9	107	3	
MA	2502790	BOSTON	56,037	74.4%	139	139		139		139		139		
MA	2503090	BROCKTON	15,828	72.8%	22	24	2	20	2	28	2	24	2	
MA	2503540	CHELSEA	5,570	81.8%	9	2		2		3		3		"The school buildings are all networked and connected through a fiber backbone." (2012 technology plan, page 15)

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
MA	2503660	CHICOPEE	7,875	58.4%	15	1		1		1		1		"CELD (Chicopee Electric Light) has run fiber to all school department buildings. Currently all School Department buildings are live on the fiber network and communicate to the Telecom Department." (2010 technology inventory, page 9)
MA	2504770	EVERETT	6,142	69.5%	7	12	1	3	8	12	1	3	8	
MA	2504830	FALL RIVER	9,873	76.5%	17	9	2	7		9	2	7		"District WAN is provided through a [Ethernet Virtual Private Line] fiber network." (2013 technology plan, page 16)
MA	2504890	FITCHBURG	4,881	67.9%	9	9	7	2		21	19	2		
MA	2505480	GREATER LOWELL REGIONAL VOCATIONAL	2,056	55.7%	1	1		1		1		1		
MA	2508440	GREATER NEW BEDFORD REGIONAL VOCAT	2,132	53.1%	1					1		1		
MA	2506270	HOLYOKE	5,896	82.5%	11	1		1		1		1		"Through the HPS fiber WAN, Holyoke Gas and Electric (HG&E) provides high-speed, high bandwidth internet access to every school within the district." (2012 technology plan, page 21)
MA	2506660	LAWRENCE	12,784	87.1%	28	19		1	18	19		1	18	"[Technology department] currently maintains and supports a wide area network (WAN) with fiber connection from the District office to all schools." (District website)
MA	2507020	LOWELL	13,600	72.5%	21	27	2	1	24	27	2	1	24	
MA	2507110	LYNN	13,547	78.6%	24	1		1		1		1		"We have installed Fiber Optic cables and associated networking from our central data center to all school buildings." (2013 technology plan, page 21)
MA	2507170	MALDEN	6,565	58.7%	7	8		8		8		8		
MA	2508430	NEW BEDFORD	12,538	71.2%	26	25		23	2	25		23	2	
MA	2509630	PITTSFIELD	5,978	54.7%	12	14	8	5	1	15	8	6	1	
MA	2509930	RANDOLPH	2,876	53.6%	6	7		7		7		7		
MA	2510050	REVERE	6,229	73.3%	11	3		2	1	3		2	1	
MA	2510380	SALEM	4,565	55.1%	10	10		10		10		10		
MA	2510890	SOMERVILLE	4,855	68.3%	11	1		1		1		1		
MA	2511010	SOUTHBRIDGE	2,204	69.2%	5	6		6		6		6		
MA	2511130	SPRINGFIELD	25,213	84.2%	45	57	1	40	16	57	1	40	16	
MA	2513230	WORCESTER	23,930	70.1%	45	56	43	10	3	56	43	10	3	"The wide area network (WAN) connectivity to every school is at least 10Mbps, with the potential to upgrade any school to 1Gbps as necessary... " (2012 technology plan, page 25)
MD	2400090	BALTIMORE CITY PUBLIC SCHOOLS	83,800	84.0%	191	200		1	199	200		1	199	
MD	2400180	CAROLINE COUNTY PUBLIC SCHOOLS	5,517	52.5%	10	5		5		18	1	17		"Implemented a fiber-optic wide area network (WAN). This new WAN transfers data between schools at 1000 Mbps." (2010 technology plan, page 6)
MD	2400300	DORCHESTER COUNTY PUBLIC SCHOOLS	4,647	59.5%	13	13	1	12		15	3	12		

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
MD	2400510	PRINCE GEORGE'S COUNTY PUBLIC SCHOO	126,662	54.4%	207	166		161	5	171	5	161	5	"I-net allows [district] to provide high speed circuits to classrooms at a lower cost operation. Whilte the school system remains dynamic, nearly all middle and high schools and administrative buildings are served by I-net fibers at 1 gigabit speed. The initial 57 buildings have now been expanded to about 60 buildings." (County report, page 13)
MD	2400570	SOMERSET COUNTY PUBLIC SCHOOLS	2,920	65.6%	9	3		1	2	3		1	2	
MD	2400690	WICOMICO COUNTY PUBLIC SCHOOLS	14,382	52.0%	25	16		2	14	16		2	14	
NJ	3400960	ATLANTIC CITY	6,687	77.7%	10	1		1		1		1		
NJ	3401260	BAYONNE	9,242	58.1%	12	2		1	1	2		1	1	
NJ	3402250	BRIDGETON	5,136	90.5%	8	1			1	1			1	
NJ	3402640	CAMDEN CITY	12,599	76.8%	30	34	34			34	34			
NJ	3402670	CAMDEN COUNTY VOCATIONAL	2,124	72.3%	2	2		2		2		2		
NJ	3402820	CARTERET BOROUGH	3,679	59.3%	5	6			6	6			6	
NJ	3412270	CITY OF ORANGE TOWNSHIP	4,396	60.3%	10	16		14	2	16		14	2	
NJ	3403270	CLIFFSIDE PARK	2,652	53.1%	6	2	1	1		2	1	1		"Presently, our high school serves as our main hub for the district using Fiber TLS connection lines. Each of our elementary schools, along with our central office, communicates to the high school using Fiber TLS connection lines at 10Mbps." (2013 technology plan, page 14)
NJ	3403930	DOVER TOWN	2,968	70.6%	5	5		4	1	7	2	4	1	
NJ	3404230	EAST ORANGE	9,939	70.7%	20	20		14	6	20		14	6	
NJ	3404590	ELIZABETH	22,737	88.2%	34	78		2	76	78		2	76	
NJ	3404740	ENGLEWOOD CITY	2,855	62.7%	5	3	1	2		3	1	2		"The district will be upgrading to Verizon 100 mg TLS connection to all schools and administrative buildings." (2010 technology plan, page 9)
NJ	3404800	ESSEX COUNTY VOCATIONAL S	2,071	86.6%	4	6		6		6		6		
NJ	3405760	GARFIELD	4,490	63.3%	10	2		2		4		4		"The District's Wide Area Network (WAN) presently connects all Garfield Board of Education owned buildings through a Private Fiber Optic GIG-E Network to the district Technology center located in the high school." (2010 technology plan, page 7)
NJ	3406000	GLOUCESTER CITY	2,043	63.9%	3	1		1		1		1		"Internet service is currently being handled by FastPath GIGe 150M service at the high school... and a FastPath GIGe 75M at Mary Ethel Costello School." (2013 technology plan, page 4)
NJ	3406270	HACKENSACK	4,880	52.1%	7	16		15	1	16		15	1	
NJ	3407290	HILLSIDE TOWNSHIP	3,077	55.0%	6	7		1	6	7		1	6	
NJ	3407680	IRVINGTON TOWNSHIP	7,164	66.6%	12	11		11		11		11		
NJ	3407830	JERSEY CITY	27,657	74.8%	38	97		43	54	97		43	54	
NJ	3408220	LAKEWOOD TOWNSHIP	5,269	90.1%	6	8	1		7	8	1		7	
NJ	3408610	LINDEN	6,017	51.3%	11	5		5		5		5		"Installed 12 strand single mode dark fiber connecting every location with two gigabit ether-channel links..." (2013 technology plan, page 8)

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
NJ	3408640	LINDENWOLD BOROUGH	2,232	68.8%	4	2		2		3		3		
NJ	3408850	LODI	3,281	51.9%	7	1			1	1			1	"A 10 Mb fiber based EPL (Ethernet Private Line) network is the campus-wide technology communications backbone for the District. and is leased through Verizon. These lines connect the seven local schools and administrative offices to network central located at Lodi High School." (2013 technology plan, page 4)
NJ	3408940	LONG BRANCH	4,968	78.8%	9	9	1		8	10	2		8	
NJ	3410320	MILLVILLE	6,021	64.0%	10	9		9		9		9		
NJ	3411160	NEPTUNE TOWNSHIP	4,483	51.4%	8	3	2	1		3	2	1		
NJ	3411220	NEW BRUNSWICK	7,422	79.5%	10	18			18	18			18	
NJ	3411340	NEWARK	33,862	86.4%	74	84			84	84			84	
NJ	3411460	NORTH BERGEN	8,026	53.1%	7	8		8		8		8		
NJ	3411640	NORTH PLAINFIELD BOROUGH	3,238	53.8%	5	5		5		5		5		
NJ	3412540	PASSAIC CITY	13,281	86.4%	16	33	25	6	2	33	25	6	2	
NJ	3412630	PASSAIC COUNTY VOCATIONAL	3,246	70.2%	1	1	1			1	1			
NJ	3412690	PATERSON	24,383	86.1%	44	1		1		1		1		"[T]he Paterson Public School District owns a 24 mile state of the art fiber optic network that provides voice, video, and data services to all District buildings" (Board of Education minutes, page 43)
NJ	3412840	PENNS GROVE-CARNEYS POINT	2,207	66.2%	5	6		5	1	6		5	1	
NJ	3412870	PENNSAUKEN TOWNSHIP	5,487	62.1%	11	16			16	16			16	Form 471 listed 16 circuits with a bandwidth of "1". Assumed to be 1 gigabit.
NJ	3412930	PERTH AMBOY	10,468	61.0%	10	2			2	2			2	"Our private fiber-optic WAN includes 36 strands of multi-mode and single-mode fiber between each school and the network operations center." (2013 technology plan, page 5)
NJ	3413140	PLAINFIELD	6,381	76.2%	15	15			15	15			15	
NJ	3413200	PLEASANTVILLE	3,191	82.8%	7					23		23		
NJ	3413530	RAHWAY	3,796	54.6%	6	3	2		1	3	2		1	"Our six schools are connected by fiber lines to the main switch located at Rahway High School." (2013 technology plan, page 4)
NJ	3414280	ROSELLE BOROUGH	2,749	68.8%	7	10			10	19	8	1	10	
NJ	3416290	TRENTON	8,705	66.1%	20	25			25	25			25	
NJ	3416380	UNION CITY	10,595	92.1%	14	20	2	7	11	21	3	7	11	
NJ	3416800	VINELAND CITY	9,594	67.0%	16	3	2	1		3	2	1		"[W]e have run fiber optics to connect 22 school buildings and 5 City buildings throughout Vineland. " (district website)
NJ	3417580	WEST NEW YORK	6,671	75.6%	9	3	2		1	3	2		1	"Thirteen locations are connected in a ring topology utilizing a 2 Gigabit (GB) private fiber Wide Area Network (WAN). We are in the process of upgrading that bandwidth to 20 Gigabit." (2013 technology plan, page 5)
NY	3602460	ALBANY CITY SCHOOL DISTRICT	8,728	59.7%	15					6			6	"[A]ll the remote sites are presently connected with fiber cable WAN provided, and serviced through Tech Valley Communications via an existing contract." (2013 RFP, page 7)
NY	3602940	AMITYVILLE UNION FREE SCHOOL DISTRICT	2,929	60.5%	5	6		6		6		6		

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
NY	3604870	BINGHAMTON CITY SCHOOL DISTRICT	5,819	63.1%	10	22			22	22			22	
NY	3605280	BRENTWOOD UNION FREE SCHOOL DISTRIC	16,833	65.9%	17	9		2	7	9		2	7	"All remote campuses are connected back to the NOC with fiber on utility poles running throughout the community." (2012 technology plan, page 29)
NY	3605850	BUFFALO CITY SCHOOL DISTRICT	33,543	79.2%	57	79			79	79			79	
NY	3606240	CAMDEN CENTRAL SCHOOL DISTRICT	2,419	52.0%	6									
NY	3606870	CENTRAL ISLIP UNION FREE SCHOOL DISTR	6,604	60.8%	8	8	8			8	8			"We currently have 1000mbps WAN infrastructure, which will allow for smooth transfer between the local machine and local storage servers." (2011 technology plan, page 30.)
NY	3607980	COHOES CITY SCHOOL DISTRICT	2,004	59.2%	5	1		1		1		1		"6 Pairs of light single mode fiber connecting [4 schools] at 10 GB. 24 Pair single mode fiber connecting [2 schools] at 10 GB. 12 pair multi-mode fiber connecting [2 schools] at 10 GB." (2011 technology plan, page 2)
NY	3608310	COPIAGUE UNION FREE SCHOOL DISTRICT	4,720	62.1%	5	7		7		7		7		
NY	3627810	EAST RAMAPO CENTRAL SCHOOL DISTRICT	8,118	63.6%	14	3		3		3		3		Technology plan wide area network diagram shows 100 Mbps Verizon Transparent LAN Service (Ethernet) connections to all schools. (2012 technology plan, page 11)
NY	3610560	ELMIRA CITY SCHOOL DISTRICT	7,086	55.7%	13	15			15	15			15	
NY	3610620	ELMONT UNION FREE SCHOOL DISTRICT	3,975	50.2%	6	8			8	8			8	
NY	3611550	FREEPORT UNION FREE SCHOOL DISTRICT	6,587	52.3%	8									
NY	3611970	GENEVA CITY SCHOOL DISTRICT	2,256	56.5%	4									"Local Area Network between all five buildings. Connected with single and multimode fiber." (District website)
NY	3614130	HEMPSTEAD UNION FREE SCHOOL DISTRICT	6,491	64.8%	12	10			10	10			10	
NY	3614970	HUDSON FALLS CENTRAL SCHOOL DISTRICT	2,361	52.3%	5									
NY	3615300	INDIAN RIVER CENTRAL SCHOOL DISTRICT	4,106	58.6%	8									
NY	3615900	JOHNSON CITY CENTRAL SCHOOL DISTRICT	2,558	57.9%	4	1			1	1			1	"[W]e have established a wide area network (WAN) comprised of a combination of a 1gb fiber optic backbone at the High School, an 8gb connection to the Elementary-Middle School using multi-link trunking and a 1gb fiber optic connection to the Transportation Complex." (District website)
NY	3616740	LANSINGBURGH CENTRAL SCHOOL DISTRIC	2,382	50.9%	4									
NY	3619170	MEXICO CENTRAL SCHOOL DISTRICT	2,331	51.3%	5									"Between buildings, data is routed ... either dedicated optical fiber (between Mexico Elementary School and Mexico High School) or optical fiber leased from Time-Warner's infrastructure ..." (2013 technology plan, page 45)
NY	3620100	MOUNT VERNON SCHOOL DISTRICT	8,817	67.2%	16	15		1	14	15		1	14	
NY	3620490	NEW ROCHELLE CITY SCHOOL DISTRICT	10,889	53.4%	10	1		1		1		1		
NY		NEW YORK CITY DOE	972,899	73.6%	1,495	1,382	1263	116	3	1382	1263	116	3	

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
NY	3620700	NEWBURGH CITY SCHOOL DISTRICT	11,623	65.2%	15									"The District's wide area network is comprised of fully diverse and redundant network topology provided by Lightower Fiber Networks." (2012 technology plan, page 27)
NY	3620820	NIAGARA FALLS CITY SCHOOL DISTRICT	7,235	65.4%	11	12			12	12			12	
NY	3600135	NYC SPECIAL SCHOOLS - DISTRICT 75	22,129	68.1%	57									
NY	3622650	PEEKSKILL CITY SCHOOL DISTRICT	2,975	64.6%	5	1		1		1		1		"The current Wide Area Network (WAN) is composed of each school connected via 100mb fiber connections to the High School." (2012 technology plan, page 31)
NY	3623460	PORT CHESTER-RYE UNION FREE SCHOOL	4,183	59.4%	6									
NY	3623760	POUGHKEEPSIE CITY SCHOOL DISTRICT	4,451	73.7%	7	7	1		6	7	1		6	
NY	3624990	ROOSEVELT UNION FREE SCHOOL DISTRICT	2,829	84.6%	6									"Each school is currently connected by fiber back to the High School." (2011 technology plan, page 9)
NY	3626010	SCHENECTADY CITY SCHOOL DISTRICT	9,918	65.4%	19									"The network is comprised of a high-speed fiber optic ring which circles the city… The network supports 100 Mb switched Ethernet..." (2010 technology plan, page 6)
NY	3628590	SYRACUSE CITY SCHOOL DISTRICT	21,247	77.8%	34	46			46	46			46	
NY	3628950	TROY CITY SCHOOL DISTRICT	4,094	62.3%	8	1	1			1	1			
NY	3629370	UTICA CITY SCHOOL DISTRICT	9,481	76.7%	12									"10GB connection between Proctor High School and each of the remaining schools and district office." (2011 technology plan, page 5)
NY	3630960	WESTBURY UNION FREE SCHOOL DISTRICT	4,415	83.6%	6	2	2			2	2			
NY	3631800	WYANDANCH UNION FREE SCHOOL DISTRICT	2,123	64.0%	4	4		1	3	4		1	3	
NY	3631920	YONKERS CITY SCHOOL DISTRICT	24,562	67.4%	38	42			42	42			42	
PA	4200140	AGORA CYBER CS	5,861	63.6%	1	3	3			3	3			
PA	4202100	ALBERT GALLATIN AREA SD	3,596	58.1%	9	2			2	2			2	"Each of the individual schools is connected via 1GB fiber optics." (2008 technology plan, page 3)
PA	4202280	ALLENTOWN CITY SD	17,354	86.6%	23	5	2		3	5	2		3	
PA	4202340	ALTOONA AREA SD	7,984	54.4%	13	1			1	1			1	"All classrooms are connected to the school district's private fiber optic ring." (District website)
PA	4200035	CHESTER COMMUNITY CS	2,734	80.4%	1	2			2	2			2	
PA	4205860	CHESTER-UPLAND SD	4,244	77.7%	9									
PA	4205910	CHICHESTER SD	3,373	51.1%	6	6		6		6		6		
PA	4206150	CLEARFIELD AREA SD	2,401	55.4%	6	6		6		6		6		
PA	4206660	CONNELLSVILLE AREA SD	4,886	55.0%	11	3	1	1	1	3	1	1	1	
PA	4206860	CORRY AREA SD	2,319	55.2%	6	5		5		5		5		
PA	4209300	ERIE CITY SD	12,452	73.2%	23	22		1	21	25	3	1	21	
PA	4210950	GREATER JOHNSTOWN SD	3,162	76.2%	4	5			5	5			5	
PA	4216290	GREATER NANTICOKE AREA SD	2,244	56.1%	5	1	1			1	1			
PA	4211420	HANOVER AREA SD	2,000	52.3%	5									
PA	4211580	HARRISBURG CITY SD	7,827	82.1%	13	12			12	12			12	
PA	4211700	HAZLETON AREA SD	10,301	63.9%	10									Form 471 shows 100 mbps circuits,with a quantity of "100".
PA	4211880	HIGHLANDS SD	2,742	59.2%	6									
PA	4213140	LANCASTER SD	10,972	77.4%	20	19			19	19			19	
PA	4213440	LEBANON SD	4,581	71.6%	7									

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
PA	4214940	MCKEESPORT AREA SD	3,823	57.3%	6									"Each building is connected via a 1 GB fiber connection, this allows for network resources to be centralized." (2013 comprehensive plan, page 41)
PA	4216620	NEW CASTLE AREA SD	3,307	62.4%	7	7			7	10	2	1	7	
PA	4216740	NEW KENSINGTON-ARNOLD SD	2,116	61.6%	6	8		1	7	8		1	7	
PA	4216980	NORRISTOWN AREA SD	6,821	69.1%	11	2		2		2		2		"[F]iber optic connections ... link every school to the administration building" (District website)
PA	4218090	OIL CITY AREA SD	2,148	54.3%	6	1	1			5	5			
PA	4218590	PENN HILLS SD	4,284	56.4%	5	8		1	7	8		1	7	
PA	4218990	PHILADELPHIA CITY SD	155,856	80.6%	266	282		1	281	282		1	281	
PA	4219170	PITTSBURGH SD	27,711	68.7%	67	86			86	86			86	
PA	4219680	POTTSTOWN SD	3,097	63.9%	7									" Internet access, curriculum software and other essential electronic resources are served over a fiber-optic network connecting our seven schools and district administration building." (District website)
PA	4219710	POTTSVILLE AREA SD	3,034	52.2%	3									"The wide area network consists of fiber optics and wireless communications. The district administrative building, middle and high school are connected via fiber optics. The elementary center is connected via 400 Mb wireless link. The district's internet connection is fiber optics." (District website)
PA	4220040	READING SD	18,194	90.6%	24	1		1		1		1		
PA	4221090	SCRANTON SD	9,679	59.7%	18	18			18	18			18	
PA	4221240	SHAMOKIN AREA SD	2,578	57.8%	3	6		6		6		6		
PA	4221330	SHARON CITY SD	2,099	68.2%	5									
PA	4222400	SOUTHEAST DELCO SD	4,051	67.6%	6	6		6		6		6		
PA	4223490	TITUSVILLE AREA SD	2,077	53.1%	6	5		5		5		5		
PA	4224150	UNIONTOWN AREA SD	3,022	55.2%	9	10	8	2		10	8	2		
PA	4226300	WILKES-BARRE AREA SD	6,995	65.2%	9	2		2		2		2		Approved motion that "a contract be awarded to PenTeleData ... to provide an upgrade to the District's current WAN capacity from 1GB bandwidth to a maximum 10GB bandwidth." (School board minutes, March 11, 2013, page 6)
PA	4226390	WILLIAM PENN SD	5,305	75.4%	11	1	1			1	1			
PA	4226460	WILLIAMSPORT AREA SD	5,415	56.4%	9	8		8		8		8		
PA	4216500	WOODLAND HILLS SD	4,050	71.7%	8	1			1	1			1	
PA	4225950	WYOMING VALLEY WEST SD	4,855	57.3%	9	11		11		13	2	11		
RI	4400120	CENTRAL FALLS	2,820	80.9%	6	7	1	6		7	1	6		
RI	4400840	PAWTUCKET	8,767	75.2%	16	15		15		15		15		
RI	4400900	PROVIDENCE	23,381	83.0%	49					1		1		"Providence currently contracts with Oshean, Cox communications, and Fibertech to provide its fiber optic Wide Area Network. In addition, a private fiber is installed." (2013 technology plan, page 3)

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
RI	4401200	WOONSOCKET	6,015	62.7%	11	1		1		1		1		[network diagram shows 100 Mbps connections from schools to administration building] (2012 technology plan, pages 19-20)
TX	4811700	BROWNWOOD ISD	3,609	64.8%	9									
TX	4811790	BRYAN ISD	15,751	71.5%	27	1		1		1		1		"The district has a fiber-based Metropolitan-Area-Network (MAN)." (2011 technology plan, page 2)
TX	4812220	BURNET CISD	3,353	57.0%	7					2	2			"With one exception, all of the campuses in the district are connected at 1GB speeds via fiber optic cable." (2013 technology plan, page 4)
TX	4812480	CALHOUN COUNTY ISD	4,227	63.7%	9	1		1		1		1		"The district has a wide area network (WAN) connecting all the campuses together by fiber or T1 lines. Currently there are two T1 lines and 2 PRI lines." (2013 technology plan, page 6)
TX	4813050	CARROLLTON-FARMERS BRANCH ISD	26,159	60.1%	46	7			7	50	43		7	
TX	4817070	DICKINSON ISD	9,118	61.1%	15	14		1	13	14		1	13	
TX	4819170	FERRIS ISD	2,438	78.0%	5									
TX	4819350	FLORESVILLE ISD	3,784	55.8%	8	2		1	1	2		1	1	
TX	4819840	FREDERICKSBURG ISD	2,966	51.6%	6	4		4		4		4		
TX	4820340	GARLAND ISD	57,833	58.2%	75	2			2	2			2	"The [Garland ISD] Enterprise Communications group has created a highly developed and progressive private fiber optic network..."
TX	4820700	GILMER ISD	2,432	54.3%	4	1	1			1	1			
TX	4820760	GLADEWATER ISD	2,037	65.8%	7	1	1			1	1			Texas K-12 CTO Council survey: Gladewater ISD reports WAN capacity of "1 GB".
TX	4821060	GONZALES ISD	2,624	69.9%	5									
TX	4821150	GOOSE CREEK CISD	21,098	65.1%	30	32			32	32			32	
TX	4800292	HARMONY SCIENCE ACAD (WACO)	2,517	66.2%	4					7	7			
TX	4822970	HENDERSON ISD	3,337	58.6%	5	3		3		3		3		"The districtwide network backbone is driven by 1000Mbps circuits ..." (2012 technology plan, page 7)
TX	4824180	INGLESIDE ISD	2,152	52.6%	5	8	1	7		8	1	7		
TX	4824420	IRVING ISD	34,243	80.6%	40	48			48	48			48	
TX	4824590	JACKSONVILLE ISD	4,968	79.4%	8	1		1		1		1		"Single mode fiber links to all sites." (2013 technology plan, page 1)
TX	4825620	KILGORE ISD	3,887	58.5%	6									
TX	4829010	MARBLE FALLS ISD	4,070	60.7%	7	2	1	1		2	1	1		
TX	4836240	QUINLAN ISD	2,555	68.1%	6	2	2			3	3			
TX	4837020	RICHARDSON ISD	36,070	56.7%	57	2		2		2		2		"Basic infrastructure design provides 10 Gigabit connections among all six core facilities which include .... four high schools. In addition, each edge campus (middle school, elementary or administration facility) will establish one 10 Gigabit connection to its primary core site ...." (2013 technology progress report, page 103)
TX	4838360	RUSK ISD	2,132	61.3%	5	1		1		1		1		
TX	4838700	SAN ANGELO ISD	14,696	59.2%	27	29			29	39	10		29	

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
TX	4838900	SAN FELIPE-DEL RIO CISD	10,423	71.2%	14	2		1	1	2		1	1	"All campuses connected via 10Gb fiber-optic WAN." (2012 technology plan, page 5)
TX	4840080	SHERMAN ISD	6,787	64.9%	14	30		1	29	30		1	29	
TX	4840740	SOMERSET ISD	3,790	79.3%	8	5		5		5		5		
TX	4841280	SPRINGTOWN ISD	3,460	53.4%	6					3		3		"All campuses and Administrative offices (except for Reno Elementary which is connected via 802.11a - 100 mb) are connected to the Technology Center via 1 GB fiber." (2013 technology plan, page 3)
TX	4841350	STAFFORD MSD	3,232	63.8%	7	1		1		1		1		
TX	4841820	SULPHUR SPRINGS ISD	4,145	62.4%	8	1	1			1	1			
TX	4843920	VAN ISD	2,311	50.5%	4	1		1		1		1		
TX	4845900	WILLIS ISD	6,442	60.0%	10	1		1		1		1		
VA	5100060	ACCOMACK CO PBLC SCHS	5,088	64.9%	13	2		2		15	2	13		
VA	5100120	ALEXANDRIA CITY PBLC SCHS	11,999	51.1%	19									"The City's Institutional Network (I-Net) which connects over 90 City government and Alexandria School facilities currently relies on a private (dark fiber) optic network provided to the City by Comcast under a franchise agreement." (City IT plan, page 83)
VA	5100480	BRUNSWICK CO PBLC SCHS	2,097	80.8%	5	6		6		6		6		
VA	5100510	BUCHANAN CO PBLC SCHS	3,333	64.8%	11	14	8	6		15	9	6		
VA	5100750	CHARLOTTE CO PBLC SCHS	2,104	54.1%	7					3		3		"The Network Map illustrated in Figure 3.2A, illustrates the flow of our Trillion Wireless WAN System, which includes the three sites connected via fiber." [Network map shows mix of 100 mbps, 36 mbps, and 20 mbps connections] (2013 technology plan, page 20-21)
VA	5101110	DANVILLE CITY PBLC SCHS	6,416	72.7%	17	17	17			17	17			
VA	5101140	DICKENSON CO PBLC SCHS	2,521	52.9%	9	8	7	1		8	7	1		
VA	5101170	DINWIDDIE CO PBLC SCHS	4,570	54.4%	8	10		1	9	10		1	9	
VA	5101510	FREDERICKSBURG CITY PBLC SCHS	3,220	52.7%	5	1		1		1		1		District 2010 technology plan: "During the 2010 – 2011 SY the Division received its own Gigabit fiber ... as a result of our partnership with the City of Fredericksburg. We will continue to work with the City of Fredericksburg to connect the remaining two schools with a Gigabit fiber." (2010 technology plan, page 18)
VA	5101740	GREENSVILLE CO PBLC SCHS	2,669	68.8%	4									
VA	5101860	HARRISONBURG CITY PBLC SCHS	4,621	67.6%	8	9		6	3	9		6	3	
VA	5101980	HOPEWELL CITY PBLC SCHS	4,235	64.7%	8	1		1		1		1		
VA	5102190	LEE CO PBLC SCHS	3,597	57.4%	14	13		1	12	13		1	12	
VA	5102340	LYNCHBURG CITY PBLC SCHS	8,629	58.3%	17	2	1		1	2	1		1	"In cooperation with the City of Lynchburg, the Lynchburg City Schools maintains a city-wide fiber optic network backbone to connect most of the school division's sites." (2010 technology plan, page 19)
VA	5102390	MANASSAS PARK CITY PBLC SCHS	2,957	53.1%	4	1	1			1	1			
VA	5102460	MECKLENBURG CO PBLC SCHS	4,816	58.0%	10	13		13		13		13		

State	NCES District ID	District Name	Students (NCES 2010)	FRL %	Schools (NCES 2010)	Circuit Data (Form 471 Block 5)								Other Sources
						Fiber Circuits by Bandwidth Range				All Technologies by Bandwidth Range (Fiber + Cable + Fixed Wireless)				
						Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	Total Circuits	>=10 mb < 100 mb	>=100 mb < gigabit	gigabit +	
VA	5102640	NEWPORT NEWS CITY PBLC SCHS	30,488	52.7%	45	1		1		1		1		"[Newport News Public Schools] has a solid technology foundation. All of its school and administraive sites are connected by a NNPS-owned, high speed, high capacity, fiber optic network." (District website)
VA	5102670	NORFOLK CITY PBLC SCHS	33,787	63.4%	53	67		67		67		67		
VA	5102910	PETERSBURG CITY PBLC SCHS	4,557	73.2%	9	13	4	8	1	13	4	8	1	
VA	5102940	PITTSYLVANIA CO PBLC SCHS	9,258	53.3%	19	12	1	11		13	2	11		
VA	5103000	PORTSMOUTH CITY PBLC SCHS	14,674	58.2%	26	27	2	23	2	27	2	23	2	
VA	5103240	RICHMOND CITY PBLC SCHS	23,454	69.4%	53	56			56	56			56	
VA	5103300	ROANOKE CITY PBLC SCHS	13,039	62.2%	26									District 2010 technology plan: Technology plan states that technology department will "maintain division-wide fiber network to all schools." (2010 technology plan, page 15)
VA	5103420	RUSSELL CO PBLC SCHS	4,299	51.5%	14	13	12	1		13	12	1		
VA	5103690	STAUNTON CITY PBLC SCHS	2,665	51.0%	6	3	1	2		3	1	2		"All schools and educational buildings will continue to be connected through fiber links that provide high-speed connectivity to each other and to shared internet access." (2010 technology plan, page 13)
VA	5104050	WINCHESTER CITY PBLC SCHS	3,950	53.1%	6	18		10	8	18		10	8	
VA	5104080	WISE CO PBLC SCHS	6,655	52.8%	17	14	12	2		14	12	2		"Fiber circuits provide connectivity to all schools." (2010 technology plan, page 32)

Attachment 2: EducationSuperHighway 2013 Test vs. ConnectED Initiative Goals

	Connectivity Parameters	**Date**
EducationSuperHighway "Current Goal"	• Internet access: 100 kbps per student • WAN: 1 Gbps connection per school	Pass/fail test applied to 2013
ConnectED Initiative	• "The ConnectED initiative will, within five years, connect 99 percent of America's students, through next generation broadband (at speeds no less than 100 Mbps and with a target of 1 Gbps) to … their schools and libraries."	Within five years
SETDA Recommendation (*Broadband Imperative*, 2012)	• External connection to the ISP of "at least 100 Mbps per 1,000 students/staff" • Internal wide area network (WAN) connections of "at least 1 Gbps per 1,000 students/staff"	Target for 2014-2015 school year

Attachment 3: Comparison of Districts by Free and Reduced Lunch Percentage

	Percent of Students Eligible for Free and Reduced Lunch (FRL) (Districts)						
	<1% FRL	1-19 % FRL	20-34 % FRL	35-49 % FRL	50-74 % FRL	75-100 % FRL	Total
Share of students	1%	11%	16%	20%	38%	13%	100%
Share of schools	2%	9%	15%	21%	37%	14%	100%
Avg. Schools per district	2.9	5.1	5.6	5.9	7.6	5.8	5.5
% of districts single-school	69%	25%	21%	17%	19%	47%	27%
Avg. Students per district	950	3,110	2,963	2,804	3,781	2,662	2,724
Avg. Students per school	329	604	527	474	499	463	493

Source: 2010 NCES

Attachment 4: Annual Per-Student Wide Area Network Cost @ ESH-Reported Prices

Annual Per-student 100 Megabit WAN Cost @ ESH-Reported Price						
Discount Band	**Students (NCES) (note 1)**	**Avg. Students per School (note 1)**	**ESH-reported Circuit Price (per month)**	**E-rate Discount**	**School Cost After Discount (per month)**	**Per-student Cost After Discount (per year) (see note 2)**
< 1 % FRL	1,228,522	275	$899.00	20%	$719.20	$31.38
1-19 % FRL	7,728,648	665	$899.00	40%	$539.40	$9.74
20-34 % FRL	7,993,588	580	$899.00	50%	$449.50	$9.31
34-49 % FRL	8,698,414	525	$899.00	60%	$359.60	$8.23
50-74 % FRL	13,175,284	500	$899.00	80%	$179.80	$4.32
75-100 % FRL	10,115,484	468	$899.00	90%	$89.90	$2.30
Average annual per-student cost, after E-rate discount						$6.95

Annual Per-student Gigabit WAN Cost @ ESH-Reported Price						
Discount Band	**Students (NCES) (note 1)**	**Avg. Students per School (note 1)**	**ESH-reported Circuit Price (per month)**	**E-rate Discount**	**School Cost After Discount (per month)**	**Per-student Cost After Discount (per year) (see note 2)**
< 1 % FRL	1,228,522	275	$1,242.00	20%	$993.60	$43.35
1-19 % FRL	7,728,648	665	$1,242.00	40%	$745.20	$13.46
20-34 % FRL	7,993,588	580	$1,242.00	50%	$621.00	$12.86
34-49 % FRL	8,698,414	525	$1,242.00	60%	$496.80	$11.36
50-74 % FRL	13,175,284	500	$1,242.00	80%	$248.40	$5.96
75-100 % FRL	10,115,484	468	$1,242.00	90%	$124.20	$3.18
Average annual per-student cost, after E-rate discount						$9.60

Note 1: Calculated from 2010 school-level NCES data (slightly different from the data in attachment 3, which is based on the district's FRL percentage)

Note 2: Annual per-student cost after discount =
12 * (ESH-reported circuit price) * (1 - E-rate discount) / (Avg. students per school)

Attachment 5: Annual Per-Student Internet Access Cost @ ESH-Estimated Support

	Internet Access Cost per Student @ ESH-estimated current E-rate support			
1	ESH's estimate of current E-rate support for Internet access (per year)	$470	million	ESH report, chart 5
2	Average E-rate discount	66.5%		ESH report, page 47
3	Pre-discount cost of Internet access (per year)	$707	million	L1 / L2
4	School share of Internet cost	33.5%		
5	School cost of Internet access (per year)	$237	million	L3 x L4
6	Students	49.2	million	NCES
	Average annual per-student cost, after E-rate discount	**$4.81**	**per student**	L5 / L6

	Internet Access Cost per Student @ ESH-estimated E-rate support for 100 kbps/student			
1	ESH's estimate of E-rate support for Internet access @ 100 kbps/student (per year)	$600	million	ESH report, chart 28
2	Average E-rate discount	66.5%		ESH report, page 47
3	Pre-discount cost of Internet access (per year)	$902	million	L1 / L2
4	School share of Internet cost	33.5%		
5	School cost of Internet access (per year)	$302	million	L3 x L4
6	Students	49.2	million	NCES
	Average annual per-student cost, after E-rate discount	**$6.14**	**per student**	L5 / L6