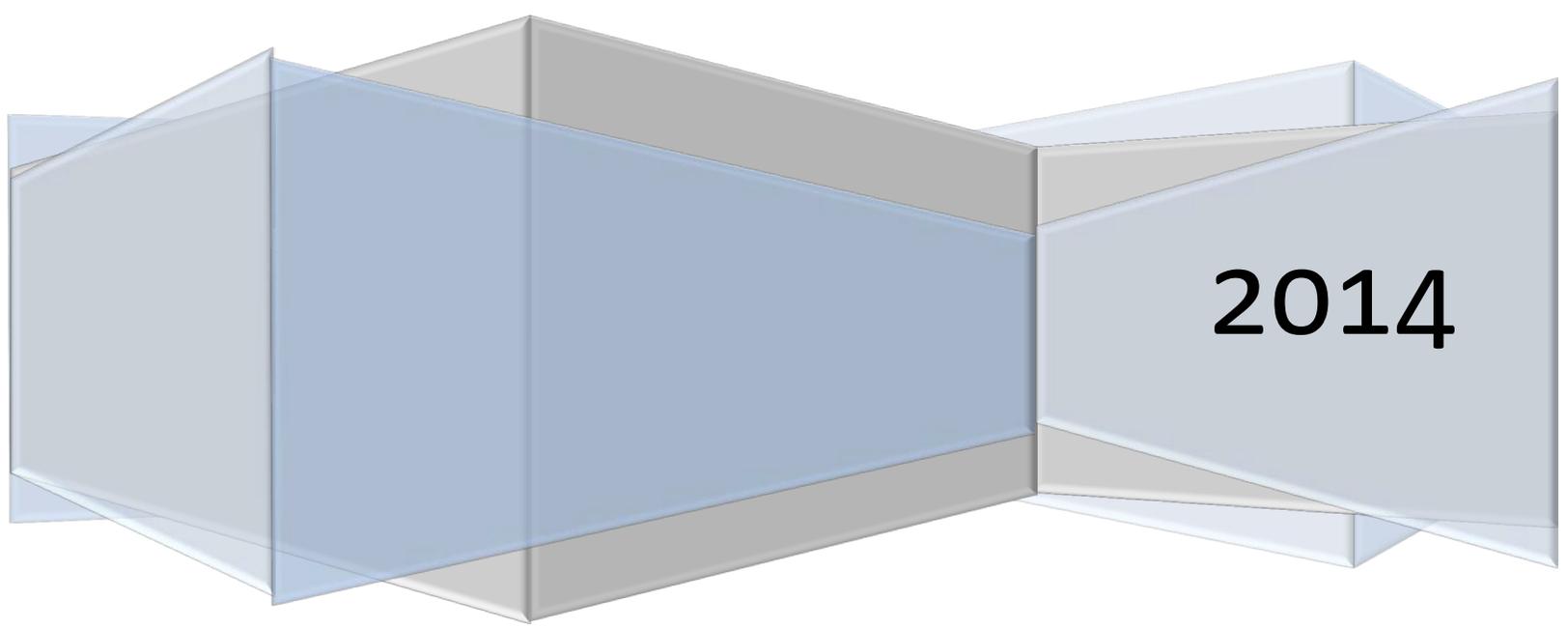


CoSN's 2nd Annual E-rate and Infrastructure Survey

In Partnership with AASA, The School
Superintendents Association and MDR



2014



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Key Findings/Executive Summary

In September of 2014, CoSN partnered with AASA – The School Superintendents Association and MDR to survey school district leaders regarding the current state of broadband and technology infrastructure in U.S. school districts. The survey collected data from K-12 school district administrators and technology leaders/Chief Technology Officers about E-rate, broadband, and infrastructure in school systems across the country. Since this is the second year the survey has been conducted, we were able to gather greater insights into the current state of education technology infrastructure and the access and connectivity challenges educators encounter. Educators, without question, face increasing demand for bandwidth for many reasons, including mobile learning, online assessments, growing numbers of devices in school settings, and digital content.

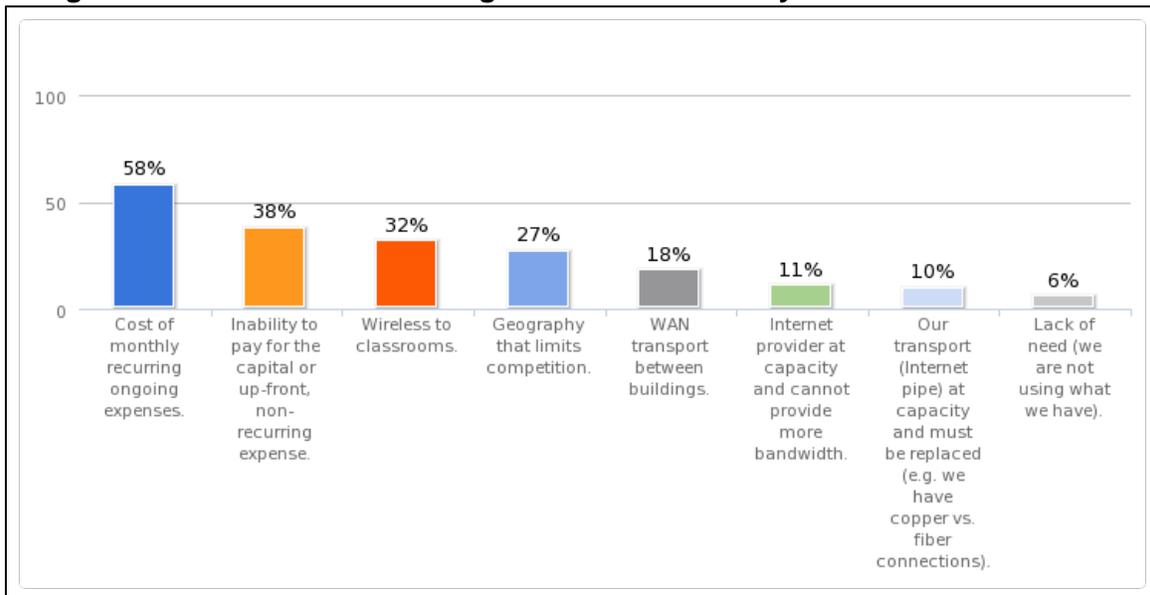
CoSN's 2nd Annual E-rate and Infrastructure Survey comes at a particularly important time in terms of the policy discussion. In March 2010, the Federal Communications Commission (FCC) published the National Broadband Plan, which called for broadband that is abundant, affordable, and reliable. The plan not only recognized the need for residential connectivity but also identified Community Anchor Institutions, including schools and libraries, as gathering places that require more bandwidth to accommodate the demand of multiple users in one place. For these Community Anchor Institutions, the National Broadband Plan recommended a 1 Gbps connection. President Obama launched his ConnectED initiative in 2013, calling for improved broadband access for schools to 100 Mbps in the short term (two to three years) and 1 Gbps in the long term (five to seven years). The FCC's July 2014 E-rate reform order adopted short-term goals for broadband access of 100 Mbps and long-term goals of 1 Gbps.

This survey of education and technology stakeholders from the nation's schools was designed to provide valuable data to aid in the critical E-rate choices the FCC must make over the coming months.

Key Findings

School systems across the country (especially those in rural communities) lack broadband capacity and experience high costs in their efforts to deliver adequate internet access to classrooms. Capacity and cost are consistently the two greatest impediments to expanded connectivity, regardless of community type. **84% of responding districts indicated that their needs are not being met by the E-rate program**, showing little improvement over last year, when districts noted a similar gap. Only 9% of the districts indicated that they have adequate bandwidth to fully meet the demand for online assessments and digital content anticipated over the next 18 months. The FCC will need to **significantly increase the E-rate cap if ConnectED connectivity goals are to be reached.**

Most Significant Barriers to Increasing Internet Connectivity in School Districts



High Costs & Adequate Funding

- **The affordability of Internet access is the biggest barrier to robust connectivity for the second year in a row** (named by 58% of school districts).
- **The cost of connectivity in rural districts is even higher.** For example, 10% of rural districts pay over \$250 per Mbps per month, at times up to a staggering \$800 per Mbps. By contrast, 37% of rural districts pay \$10 or less per Mbps per month, while 49% of urban/suburban districts pay \$10 or less per Mbps.
- **Capital or up-front, non-recurring expense is the second biggest barrier (38%) to increasing robust Internet connectivity in school districts.**
- **Funding is the biggest obstacle (60%) to meeting the FCC's short-term goal of 100 Mbps/1,000 students.**
- **60% of the districts surveyed reported using consortium buying services for bandwidth/Internet access, up from 44% last year.** Many districts participate in more than one purchasing cooperative, and rural districts are more likely to participate than urban and suburban districts.

- **WAN costs in suburban and urban districts are significantly more expensive because individual connections must be made to each building in a district.** 20% of urban/suburban districts pay more than \$100/Mbps, compared to only 13% of rural districts.
- 51% of districts reported that the FCC's decision to phase out E-rate support for voice and other services will have a **significant negative fiscal impact** on them.

Lack of Capacity

- 34% of districts reported that their Internet failed for 3 or more days a year. Shockingly, 5% of the districts experienced **30 or more days of downtime**, a rough equivalent of almost one day per week during the school year.
- 45% of districts indicated that they do not have the capacity to deploy a 1:1 initiative.
- 25% of districts reported that **not a single school in their district** could meet the FCC's short-term goal of 100 Mbps/1,000 students.
- 68% of all districts said that not a single school in their district could meet the FCC's long-term connectivity goal of 1,000 Mbps (1 Gbps); this shortfall was even more concentrated in rural areas, where 73% of rural districts have no schools that could meet this goal.
- Alarming, 34% of all districts reported WAN speeds of 100 Mbps or less, which is one-tenth of the minimum connection speed recommended by SETDA. Rural districts fared even worse, with 44% reporting WAN connections of 100 Mbps or less 17% of rural districts (12% of all districts) reported that their typical Internet transport connection is over slower technologies (T-1, copper, DSL, Satellite, or Microwave), making it nearly impossible to reach 1 Gbps speeds.
- 27% of the survey respondents reported that geography is a limiting factor (up 7% from last year).
- 11% reported their provider is already at capacity, and 10% reported that their transport pipe was at capacity, hindering changes.
- Districts struggle to achieve reliable Internet connectivity. 60% of districts indicated they were using only one Internet provider, leaving them vulnerable in case of an outage. The numbers are worse in rural school districts, where 65% use only one Internet provider.

The Last Mile Challenge

- **Lack of Competition.** When asked for the number of providers responding to E-rate requests for services, 6% of school districts received no responses and 26% received only one response. 80% of large districts (with more than 50,000 students) and 59% of urban and suburban districts received three or more bids for E-rate services.
- **Rural districts have slower internal data connections.** 80% of urban/suburban districts report a typical connection between data switches and router at 1 Gbps or greater, compared with only 65% of rural districts.
- **Wi-Fi in rural districts is much less likely to meet current technical standards.** Only 25% of rural districts have Wireless Access Points that support the most current standards (802.11n/ac). Even among very large districts, the most prepared, only 59% have WAPs that meet the 802.11n/ac standards.

High costs, inadequate funding, lack of capacity, and the last mile issue remain key challenges for schools and school districts working to transform their learning environments.

CoSN surveyed over 29,000 district technology leaders and received 584 responses over approximately three weeks. This level of response has a less than 5% margin of error with a confidence rate of more than 95%. Responses came from 47 states (Delaware, Rhode Island, Utah, and the District of Columbia not reporting) with diverse geographic types and sizes, which reflects the overall landscape of schools in our country today.

Overview

In September of 2014 CoSN partnered with AASA – The School Superintendents Association and MDR to survey school district leaders regarding the current state of broadband and technology infrastructure in U.S. school districts. The survey collected data from K-12 school district leaders and technology directors about E-rate, broadband, and infrastructure.

Based on this new survey, we know that school systems across the country lack broadband capacity, particularly in rural areas, and high costs remain the greatest impediment to improving capacity. This survey data highlights the harsh reality that we are failing to deliver adequate, affordable, reliable, high speed broadband access and internal connectivity to classrooms across the country.

The 2014 survey responses came from 47 states (Delaware, Rhode Island, Utah, and the District of Columbia not participating). Over 1,000 district administrators and technology leaders/Chief Technology Officers contributed to the survey, with 584 providing full responses. Survey respondents represented urban, rural, and suburban districts as well as large, medium, and small districts. This diversity in respondents provides data for districts with different needs, including identifying priorities and challenges facing our schools as they transition to the digital learning environments that students need to become college, career, and life ready.

Distribution of Respondents by Location, Size, and E-rate Discount

This year's survey respondents come from all parts of the country and are distributed by location, size, and E-rate discount in similar percentages to those that the National Center for Education Statistics reports¹.

Location of School Districts	Percent
Urban	14.4%
Suburban	27.5%
Rural	58.1%

Size of School District	Percent
Under 2,499	45.6%
2,500-14,999	40.6%

¹ In 2010-11, more than half of all operating regular school districts were located in rural areas (57 percent), while 20 percent of districts were located in suburban areas, 18 percent in towns, and 5 percent in cities <http://nces.ed.gov>.

15,000-49,999	10.0%
Over 50,000	3.8%

E-rate Discount	Percent
90% and above	11.7%
89% to 70%	46.6%
69% to 50%	22.9%
49% to 30%	13.5%
Less than 30%	5.3%

E-rate

For the second year, the vast majority of school districts (86%) indicated that E-rate funding was not enough to fully meet their needs.

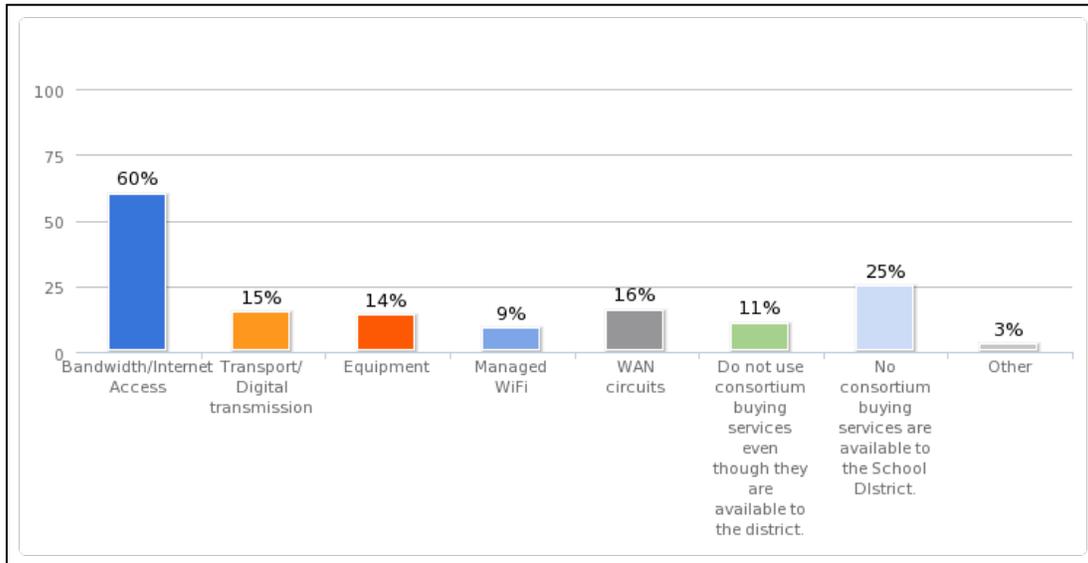
Impact of Phase Down of Plain Old Telephone Service (POTS) on School Districts

Significantly Impacted by POTS phase down	47%
Somewhat Impacted by POTS phase down	42%
No Impact by POTS phase down	11%

Comment by Survey Participant:
 "Taking away the funding for POTS (plain old telephone services) over the next few years will force schools to spend money in areas that were previously funded. This puts a significant strain on the budget."

The FCC and others have promoted consortium buying to lower overall E-rate costs. Consortium buying advantages for districts are threefold: bulk buying reduces costs, capital expenses help build investments, and consortium expertise shares highly technical staffing. **This year, 60% of the districts surveyed reported using consortium buying services for bandwidth/internet access, up from 44% last year.** Many districts participate in more than one purchasing cooperative.

Participation in Consortium Services for E-rate

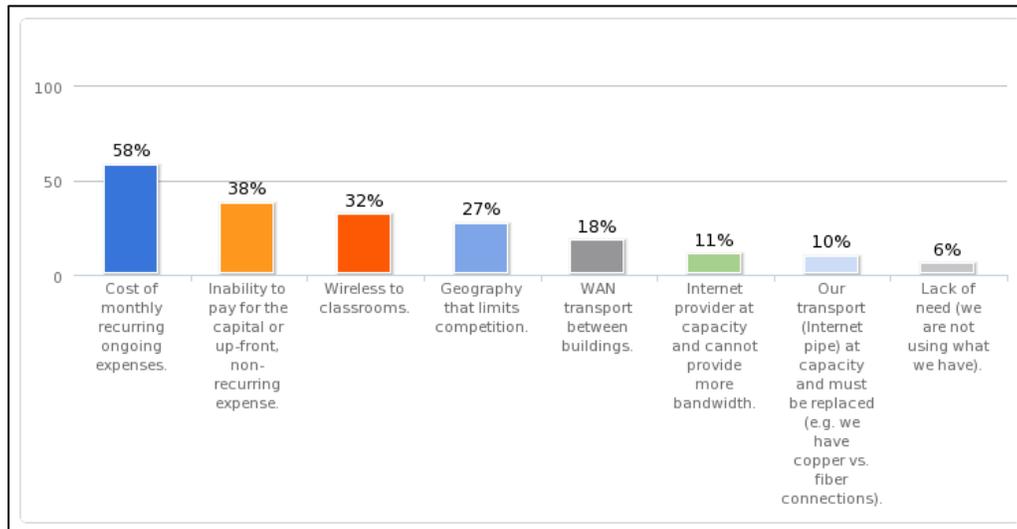


It also appears, however, there is room for expanding consortium purchasing for non-bandwidth/internet costs. Districts reported low levels of other consortium purchasing: 15% for transport, 14% for equipment, 8% for managed Wi-Fi, and 16% for WAN circuits. It is important to note that 25% of districts reported that buying consortium services are not available to them, while 12% reported they had access to consortium buying but do not use it.

High Cost

The high cost of internet access remains the single biggest barrier to robust connectivity in schools today. For the second year in row, the cost of monthly recurring/ongoing expenses (58%) was the top concern for school districts across the country. Capital, upfront non-recurring costs (38%) weighed in as the second biggest barrier to increasing Internet connectivity. Overall costs for internet access are decreasing, yet school districts still struggle to cover the increases in bandwidth needs and their accompanying costs.

Most Significant Barriers to Increasing Internet Connectivity



There was a huge range in internet costs: 27% of the districts indicated that their monthly cost per Mbps was less than \$5, yet **32% indicated theirs was over \$50 per Mbps, straining tight district budgets. 10% of rural districts continue to pay extremely high rates of over \$250 per Mbps per month, and at times topping \$800 per Mbps per month.**

Current Cost per Mbps per Month for Internet and WAN Connection

% of Schools	No Cost	Less than \$1	\$1-5	\$5-50	\$50-100	\$100-250	\$250-800 or more
Internet Connection	8%	6%	13%	40%	14%	9%	9%
WAN Connection	26%	9%	11%	31%	9%	6%	7%

Capacity

45% of the school districts indicted they do not currently have the connectivity and infrastructure to deploy a 1:1 initiative, a 12% improvement from the 2013 survey results. Even with this growth, nearly half of the nation's schools remain unable to accommodate the overall infrastructure and connectivity needed to provide technology rich learning environments. Only 41% of districts report that all of their schools meet the FCC's short term goal of 100MbpsM/1000 students. **Unfortunately, 27% of districts still report that not a single school**

in their district can meet this short term goal. While that represents a 15% improvement over last year, it is still troubling.

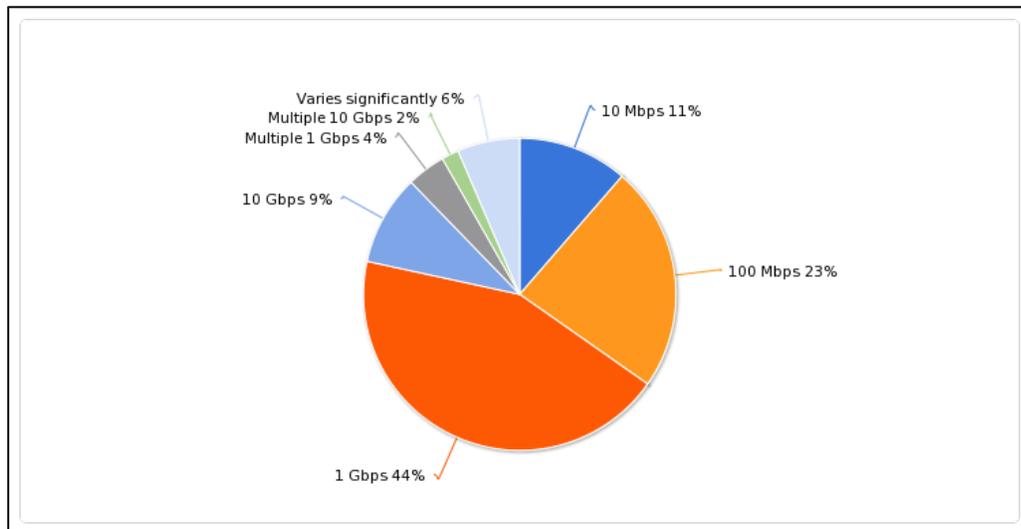
When asked what percent of their schools can meet the long-term FCC internet connectivity goal of 1000 Mbps (1 Gbps) per 1000 students, 69% of all districts and 73% of the rural districts replied none.

Percent of Schools Meeting FCC Bandwidth Goals

% of Schools	None	10%	25%	50%	75%	90%	100%
FCC short term goal (100 Mbps/1000 students)	27%	4%	6%	7%	8%	7%	41%
FCC long term goal (1 Gbps/1000 students)	69%	4%	5%	4%	5%	3%	10%

Survey respondents identified significant capacity issues as a barrier limiting internet connectivity. 11% of the districts reported their providers were at capacity and the districts could not purchase additional bandwidth (see chart on page 9). Alarming, survey respondents indicated that 34% of all districts report WAN speeds of 100 Mbps or less, one tenth of the minimum connection speed needed to meet the SETDA recommendation for WAN speeds. 44% of rural districts report WAN connections of 100Mbps or less, and 16% of those districts report glacial speeds of less than 10Mbps. In comparison, 20% of urban/suburban districts report WAN speeds of 100Mbps or less. Internet connections are only as fast as the slowest part of the network, so districts with a 10Mbps connection will experience severe difficulty with instruction, online assessments, and other educational purposes.

Current District WAN Access (Connections between Schools)



The current state of internet access is already concerning, and when the survey looked at projected growth over the next three years, the outlook was even more dismal. 69% of districts do not believe they have sufficient Internet Connectivity for the next 18 months, and 56% do not believe they have enough WAN Connectivity.

Projected Growth of Internet Connectivity in the School District	Percent
We have sufficient internet bandwidth for today and the coming 18-months.	31%
Our connectivity growth for the next 18 months will be 500% or more.	2%
Our connectivity growth for the next 18 months will be 100%-500%.	25%
Our connectivity growth for the next 18 months will be 20%-100%.	24%
Our connectivity growth will be less than 20% over the next 18 months.	9%
We are totally lacking in bandwidth.	6%
Not sure.	3%

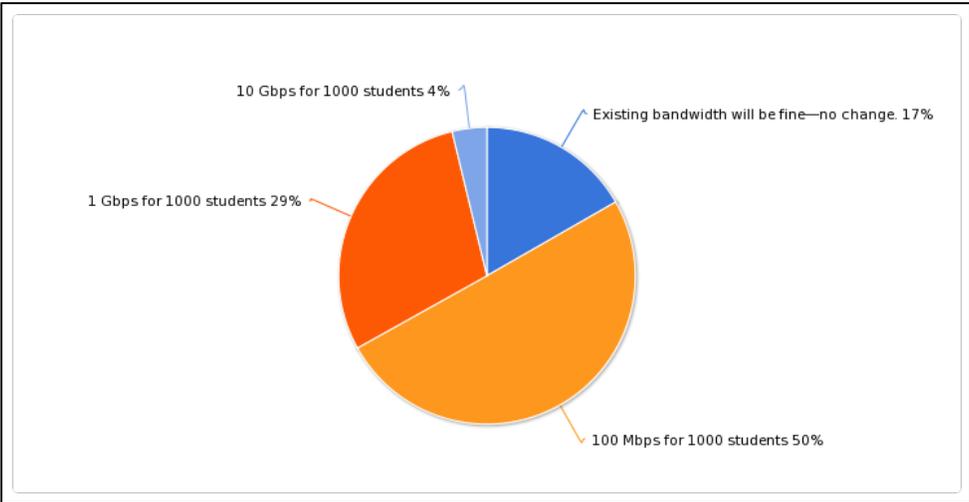
Projected Growth of WAN Connectivity in the School District

	Percent
We have sufficient WAN bandwidth for today and the coming 18 months.	39%

Our growth for the next 18 months will be 500% or more.	4%
Our growth for the next 18 months will be 100%-500%.	20%
Our growth for the next 18 months will be 20%-100%.	21%
Our growth will be less than 20% over the next 18 months.	7%
We are totally lacking in bandwidth.	4%
Not sure.	5%

When asked about projected growth over the next three years, only 17% of respondents indicated that “existing bandwidth will be fine.” The other 83% will need additional bandwidth over the next three years.

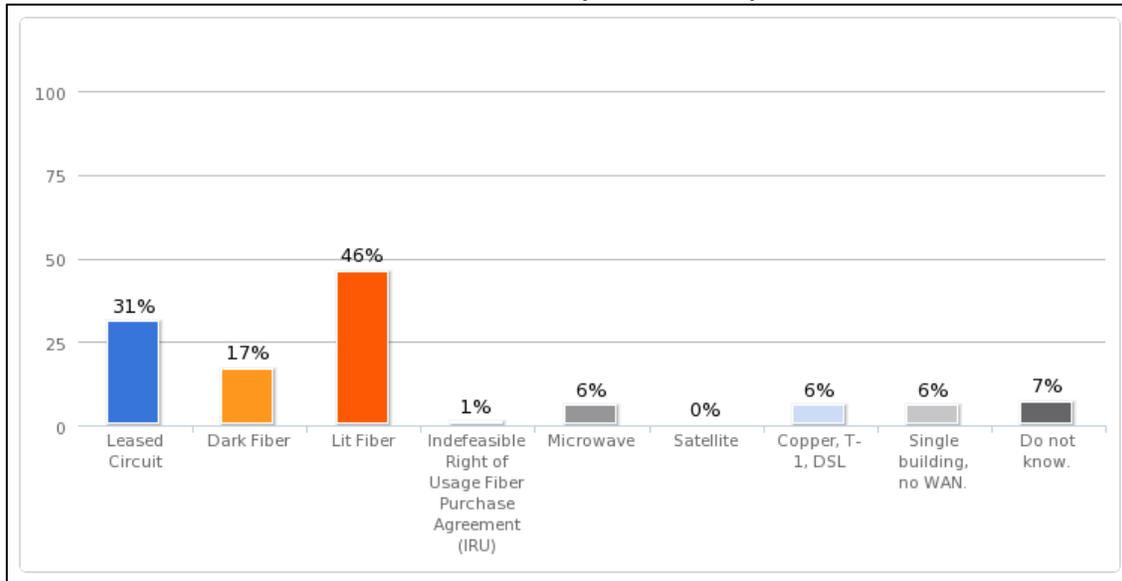
Projected Growth for Internet Bandwidth Over Next Three Years



12% of all districts and 17% of rural districts report that their typical Internet transport connection is over slower technologies that could never support broadband speeds needed to achieve FCC goals (T-1, copper, DSL, Satellite or Microwave).

Transport Types for Current WAN Circuits

(All Districts)



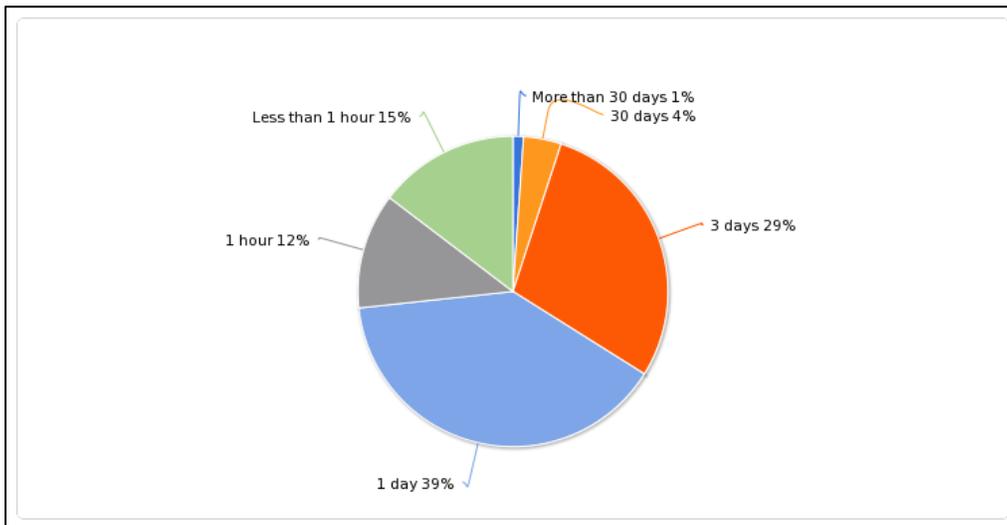
Lack of capacity also affects growth. 68% of districts reported they do not have sufficient Internet Bandwidth for the next 18 months, and 61% do not have enough WAN bandwidth (see Charts on page 10).

Reliability

Districts struggle to achieve reliable internet connectivity. The survey looks at three areas of reliability: 1) downtime, 2) providers delivering services to the district, and 3) number of service proposals received during the E-rate process.

34% of districts reported that their internet was down 3 or more days a year. Shockingly, 5% reported 30 or more days of down time, almost one day per week during the school year. Reliability is the key to a successful digital transformation, so any district dealing with this type of down time will find it is unable to make a transformation with confidence.

Internet Downtime Experience in One Year



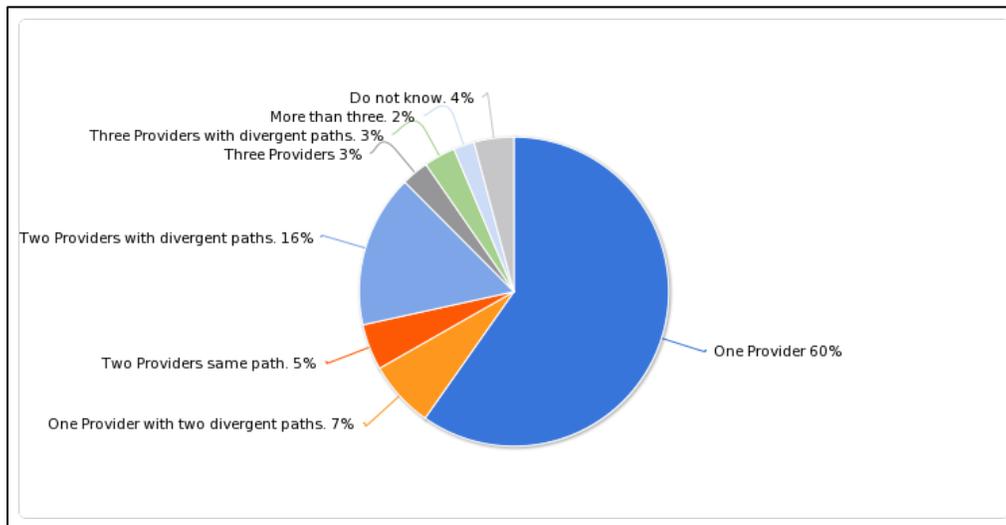
We also polled districts on their results with E-rate requests for services. 6% of school districts received no responses to their request for E-rate bids and 26% received only one response, limiting the effectiveness of the E-rate program for them. In contrast, 80% of large districts (with more than 50,000 students) have an abundance of service options. This healthy competition between providers gives districts better pricing; unfortunately, most districts don't get the advantages of competition.

Number of Qualified Providers/Proposals for Services Received This Year for E-Rate Telecommunications Services

Bids/Proposals Received	% of Responses
No Bids/Proposals Received	6%
1 Bid/Proposal for Services	26%
2 Bids/Proposals for Services	25%
3 Bids/ Proposals for Services	20%
More than 3 Bids/Proposals for Services	23%

60% of all districts (65% of rural districts) report only having one provider for internet services. Single point of failure networks are not considered best practice and leave a district vulnerable in case of an outage, another harmful cause of lack of competition in the marketplace.

Number of Providers currently selling Internet Bandwidth to District



Factors Driving Change

Why do districts want increased internet bandwidth? Their top three priorities are:

- 1) Online Assessments
- 2) Digital Content
- 3) More students with devices

Rationale for Internet Bandwidth Growth

Item	Score ¹	Overall Rank
Online assessments.	2662	1
Digital content.	2425	2
More students with devices.	2161	3
More devices per student.	1703	4
New usage models from teachers.	1541	5
Parents demanding electronic resources.	525	6

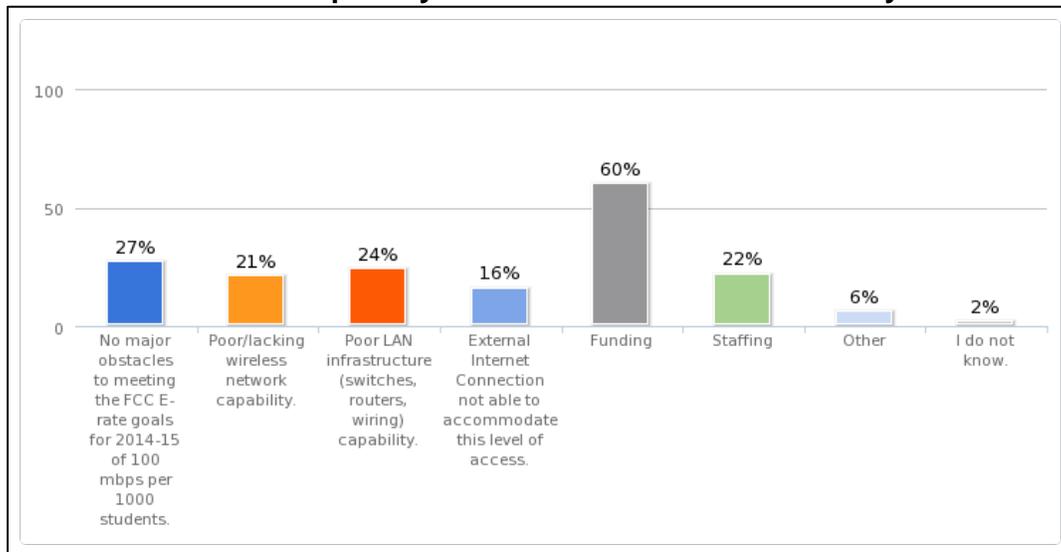
¹ Score is a weighted calculation.

Online Assessments ranked first overall, but districts with more than 50,000 students ranked Digital Content as their top priority. This ranking of technology drivers will be interesting to watch in the coming years, particularly as state online assessments become the norm, use of digital content replaces print textbooks, devices in classrooms become ubiquitous, and online/blended learning expands. All of these trends are driving the need for broadband connectivity and robust infrastructure in the classroom.

Barriers to Change

The survey asked two questions about the barriers and limiting factors for districts in achieving the FCC short term goal of 100Mbps/per 1000 students and related barriers to Internet connectivity. The same barrier was ranked number 1 in both questions: funding.

Biggest Obstacle to Meeting the Goal of 100 Mbps Adopted by the FCC for Internet Connectivity



Additional barriers, such as poor LAN infrastructure (24%), staffing (22%), and poor wireless (21%) were also challenges identified by districts. This ranking is consistent with last year's survey responses.

Current State of Infrastructure

The survey asked a series of questions about districts' abilities to deliver adequate bandwidth. These questions were designed to identify where pinch points within the network limit internet access. A pinch point anywhere along the path will limit the complete network, so an understanding of districts' network infrastructures is crucial.

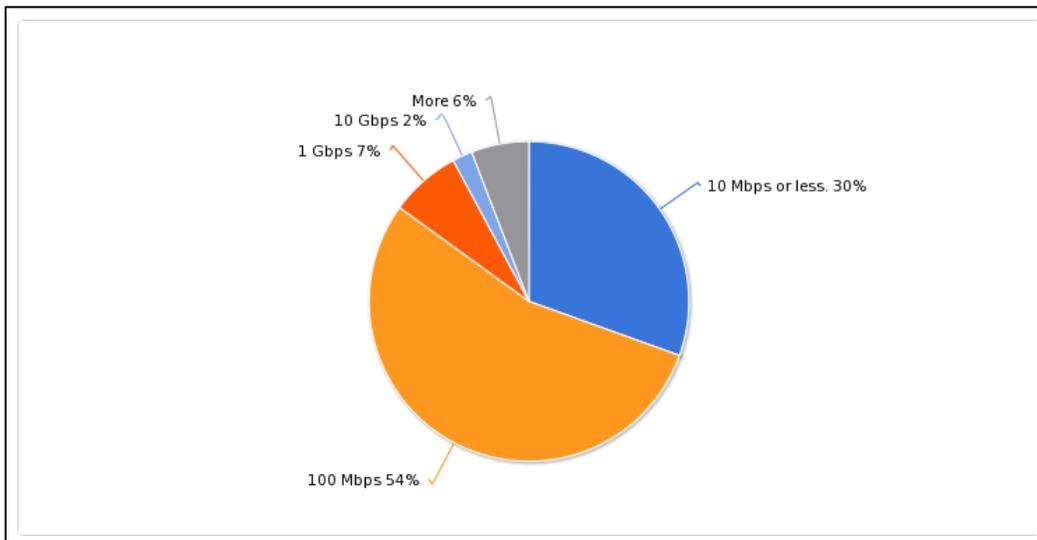
The survey asked about network equipment components at each point that would need to be upgraded to deliver broadband speeds. 91% of districts identified at least one infrastructure upgrade essential to meet the FCC goals. 45% need both short term (100Mbps/1000 students) and long term (1000Mbps/1000 students) upgrades while 41% have sufficient short-term infrastructure but will need long-term upgrades.

Network Upgrades Required to Support the FCC Short & Long-term Goals (firewall, content filter, DMZ switching, gateway routers)

Upgrades needed	% of Districts
No upgrades needed	9%
No short term but long term	42%
Both long term & short term	45%
Don't Know	4%

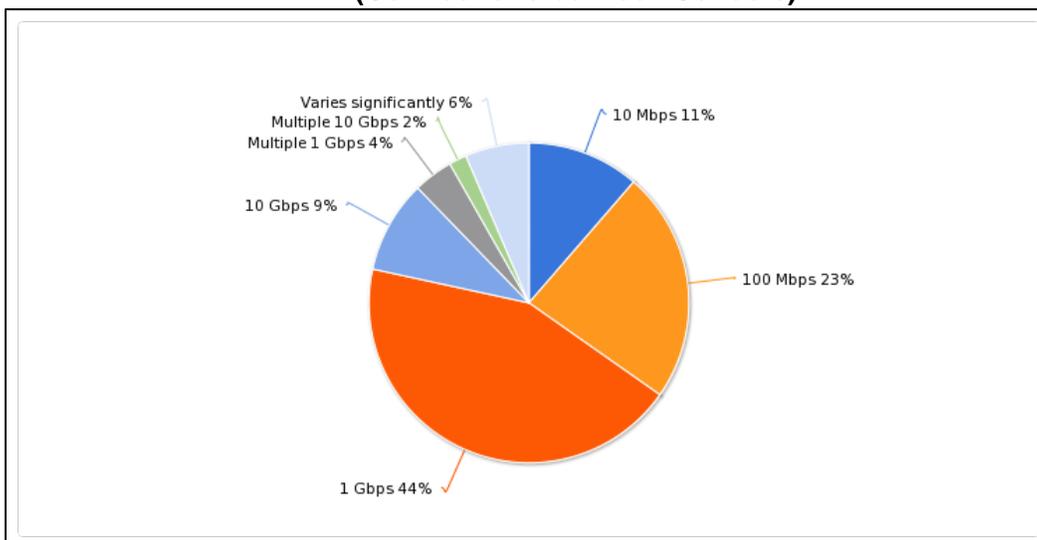
The survey also asked about the external internet connection (bandwidth) coming into the district. 30% reported the current bandwidth per 1000 students was very slow: 10Mbps or less. This speed is 1/10 of the FCC's short term goal and 1/100 of the FCC's long term goal, meaning that one third of the districts responding have a severe pinch point in delivering adequate bandwidth at the external connection.

Current Internet Connection (Bandwidth) Per 1000 Students



WAN connection between schools and the district's external internet is also a weak point in many cases. 33% report speeds at 100Mbps or less, and 11% at 10Mbps or less. WAN speeds of 1Gbps are the FCC's long term goal, but only 15% of the districts indicated they had reached this speed.

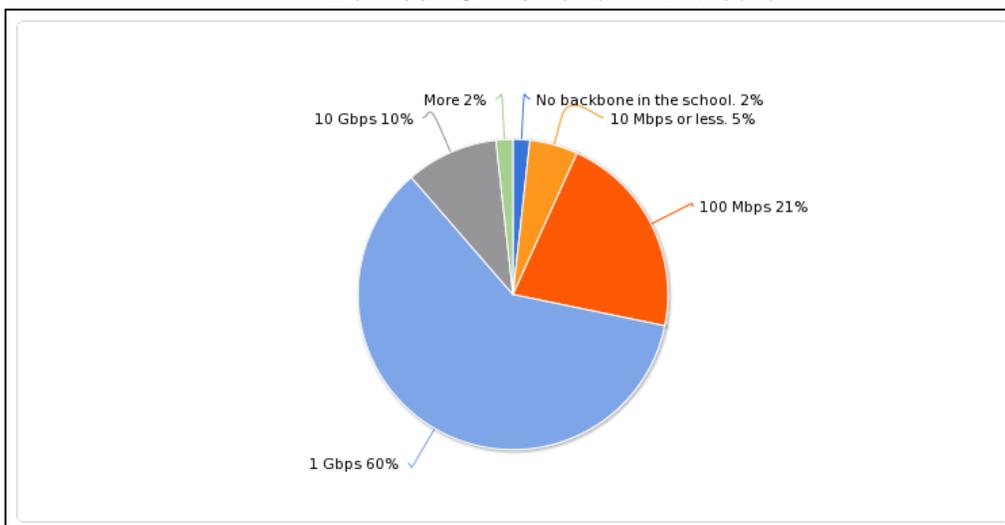
**Current District WAN Access
(Connections between Schools)**



The next pinch point comes between schools' WAN router and the switches in schools, where 28% of districts report having connections of 100Mbps or less. They will need to address this issue before fully being able to implement broadband connectivity goals.

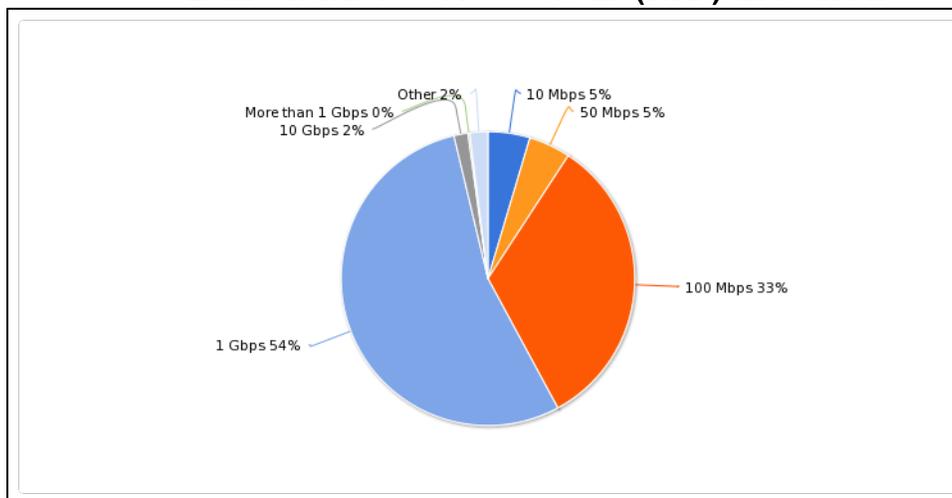
Current Connection Speed

Between Switch and WAN Router



43% of districts report a wireless access point (WAP) connection speed of 100Mbps or less. This internal school backbone should be 1Gbps to accommodate the aggregation of all the WAP connections, but, again, we find that a significant number of districts cannot meet the FCC's modest threshold.

Current Connection Speed
Between Wireless Access Point (WAP) and Switch

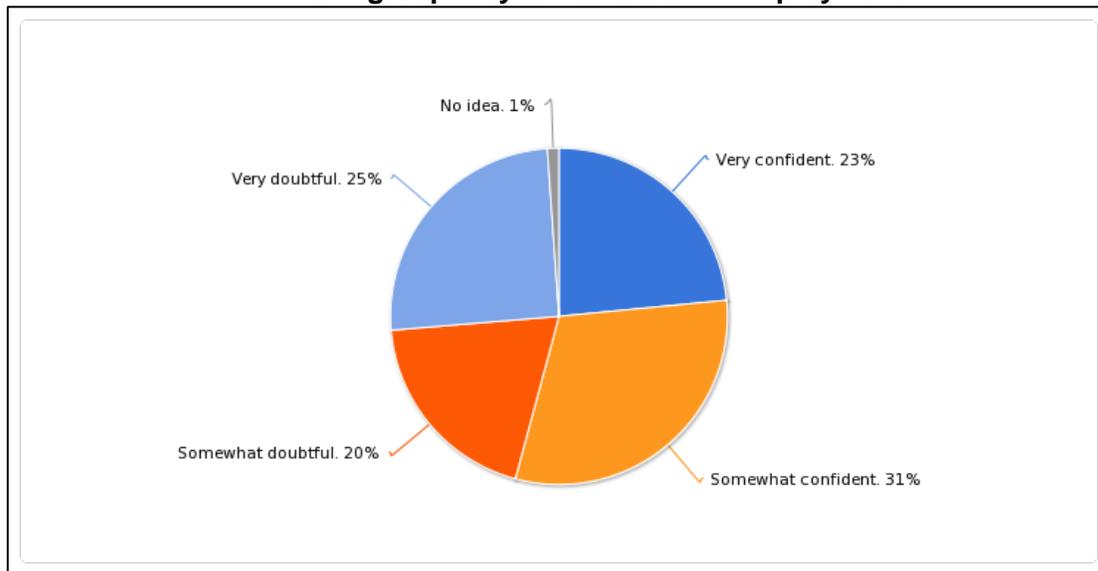


This series of network connections points out the dire state of school infrastructure and highlights why schools identify funding as the single biggest barrier to their digital conversions.

Wireless Infrastructure

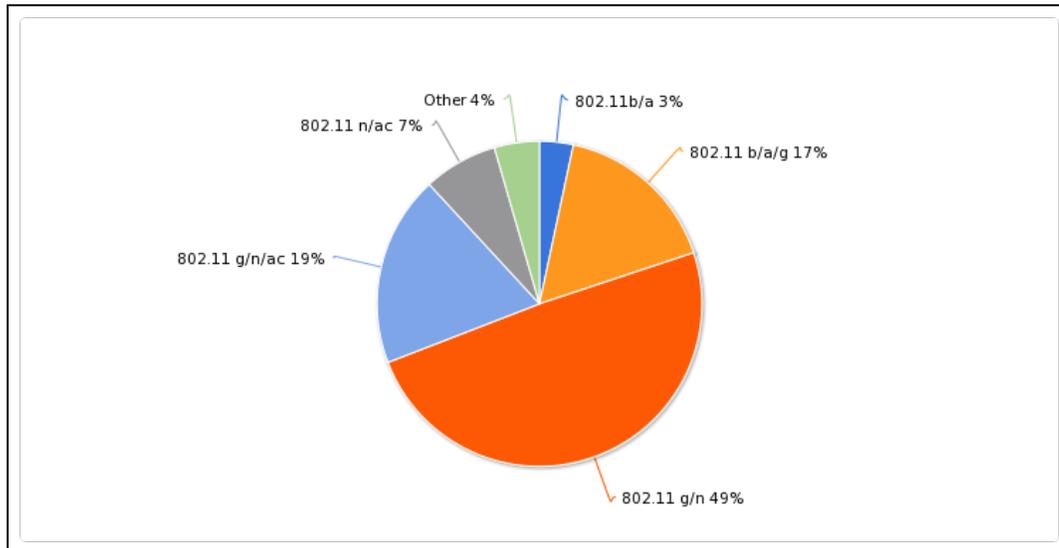
Last year, only 57% of elementary schools and 64% of secondary schools reported having all classrooms fully equipped with wireless Internet connectivity. This year, the survey asked more detailed questions about the types of wireless connectivity they have. Recent changes in wireless standards have accelerated the obsolescence of typical districts wireless infrastructure. Only half of the schools surveyed had confidence in their infrastructure's ability to handle a 1:1 deployment.

Current Confidence in School's Wireless Network Having Capacity to Handle a 1:1 Deployment?



The wireless arena is changing rapidly, and just having a connection to classrooms is not sufficient. When asked about the predominate wireless standard for classrooms, more than 60% of the school districts reported they are using old and out dated wireless speeds (802.11 a/b/g/n). Only 26% of the districts were able to accommodate the newest wireless standard, 802.11ac (new devices come with the ac standard). Only 56% of the districts reported WAP connections of 1Gbps or greater, again leaving many classrooms connecting at slower speeds.

Current Standard for Wireless Access Points (WAP) in Schools

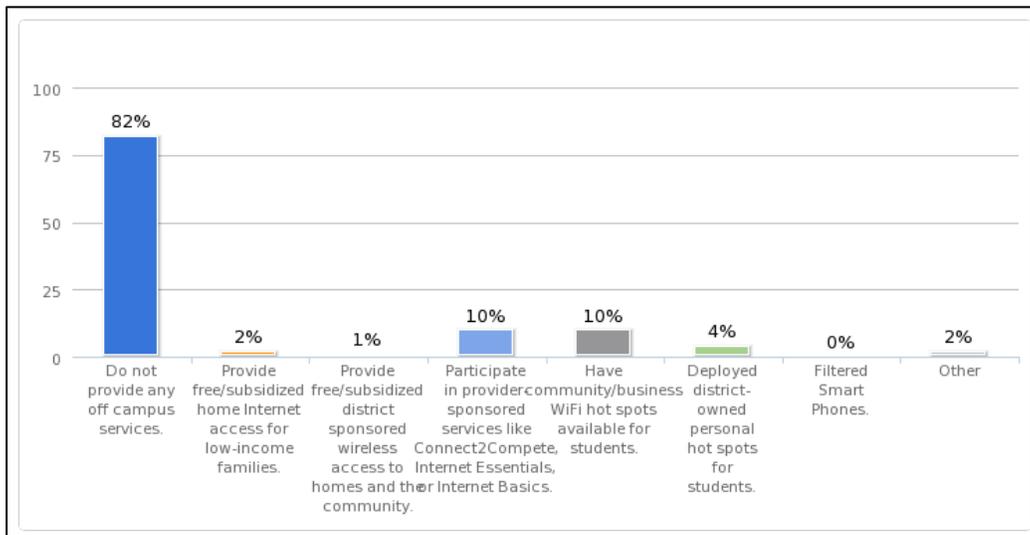


Off Campus and Devices

Students working in a truly digital environment do not stop learning when the school bell rings at the end of the day. Off campus access for students is becoming an issue that schools will need to address. This is a particular priority because digital content will begin to replace print textbooks at scale over the next three years, according to the [CoSN 2014 IT Leadership Survey](#).

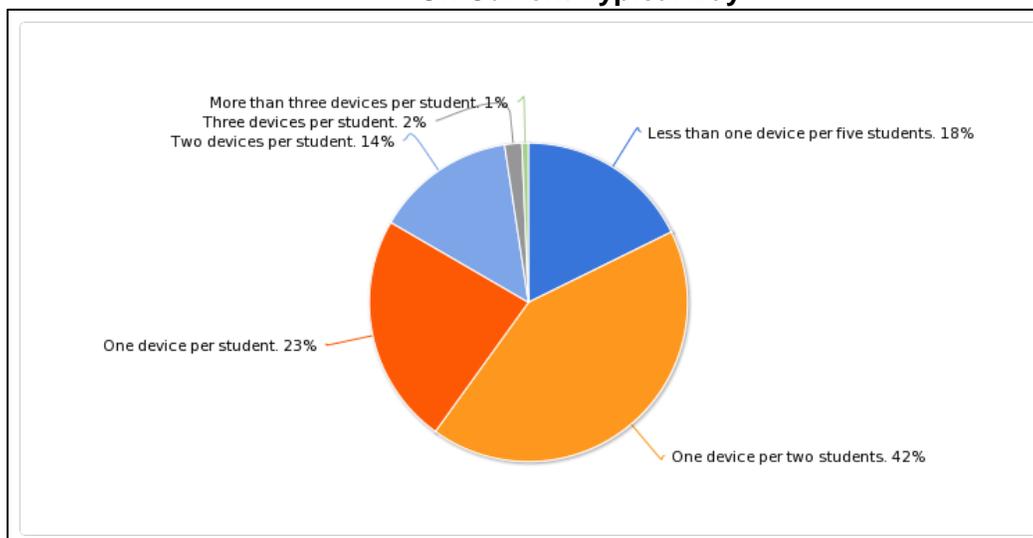
Most districts have not yet begun to address issues of home and off campus access. 82% of districts reported that they are not providing any type of off campus services for their students at this time. Districts' strategies are reflected below.

School District Off-Campus Strategies



Mobile learning encourages students to use many types of devices and a robust digital learning environment demands multiple devices per student. Respondents identified significant growth in student devices (whether owned by the district or by the student) as one of the top three trends driving Internet bandwidth growth. Districts were surveyed about the number of devices connected to district networks today and asked for estimates of the number in three years.

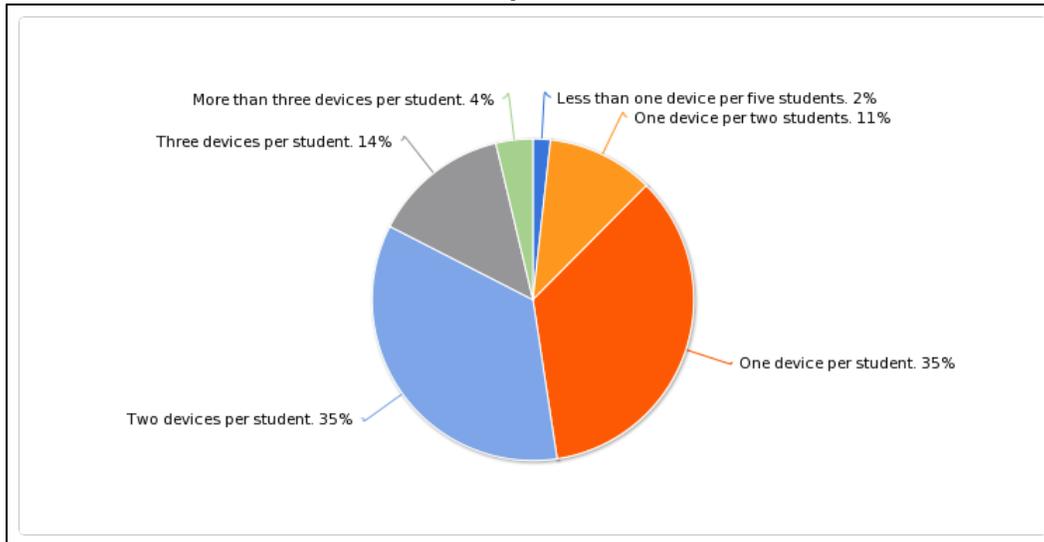
Estimated Number of Devices School Network On Current Typical Day



60% of districts indicated that they had less than one device per student, but that isn't a static figure: 88% estimated that in three years they will have at least one device per student, and a

full 53% expect two or more devices per student. This explosive growth will put additional demand on both internet access and internal infrastructure over the next three years.

Estimated Number of Devices on School Network Anticipated in 3 Years



Summary

The 2nd Annual CoSN E-Rate and Infrastructure Survey, conducted in partnership with AASA and MDR, identified serious deficiencies and problems in every area investigated.

- **High Costs** – 1Gbps connections are offered in parts of the US at \$70 per month (7 cents/Mbps), yet the survey data shows that schools across the country continue to pay 100x or 1000x this rate. It is no surprise that schools identify cost as the single biggest barrier to internet connectivity.
- **Capacity** — Everywhere districts turn, the connections and equipment are limiting and growth estimates are skyrocketing, making successful delivery of bandwidth to the classroom questionable at best.
- **Reliability** – Excessive downtime, limited competition, and a lack of services create difficult and unpredictable learning environments for students and staff.
- **Increasing digital needs are driving the demand for broadband and robust education networks** – the digital transformation to online assessments, digital content, and individual student devices have exploded access needs.
- **Infrastructure** — Aging and non-existent internal connections must be replaced to ensure that external internet connections are available in the classroom.
- **Wireless Connectivity** – Wireless standards continue to evolve, impacting the design and budget for districts and the need to ensure compatibility with devices.
- **Off Campus and Devices** — The lack of devices and off campus access create looming needs that districts are just beginning to address.

The phenomenal demand for internet access to classrooms continues to grow at the same time that districts are experiencing budget pressures. The [2014 CoSN IT Leadership Survey](#) found that 66% of districts face flat or declining technology budgets. **If schools are going to meet the short and long term goals of the FCC, then the E-Rate cap must be increased.** In the absence of such an increase, schools will be unable to provide students with the rich and robust technology empowered learning environments necessary for success in today's world.