

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	WC Docket No. 13-184
Modernizing the E-rate Program for	)	
Schools and Libraries	)	
	)	

**Comments of ApplianSys on the proposed Eligible Services List - adopting the Eligible Services List  
before the Notice of Proposed Rulemaking is acted on risks C1 waste and complexity**

ApplianSys LLC. (“ApplianSys”), pursuant to the Proposed Eligible Services List released August 2 2019, respectfully submits its comments and observations on the potent.

**CACHEBOX** delivers significant value for schools and, if all were encouraged to deploy caches, the FCC would dramatically reduce the cost of delivering internet access to districts nationwide, saving over \$120m per annum<sup>1</sup>. The current jeopardy around caching’s eligibility is therefore highly concerning and should be resolved as quickly as possible.

There is unanimous support for retaining the current Category 2 budget approach as proposed in Wireline Competition Bureau’s Notice of Proposed Rule Making. This includes the retention of caching as a C2 eligible service.

Adopting the proposed Eligible Services List before a decision has been made on the Notice of Proposed Rule Making would be a mistake that would make caching unavailable to many districts for purely clerical reasons.

In addition to the inclusion of caching having broad support amongst districts and state Departments of Education<sup>2</sup>, caching supports Order 50-54 of the 2014 modernization order: *Goal 2: Maximizing the Cost-Effectiveness of E-rate Spending*. Greater adoption of caching would “maximize the benefit of each dollar spent” and enable E-rate to support the suggested addition of other services like cybersecurity<sup>3</sup> with a lower increase in funding across the board.

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<sup>1</sup> See *ApplianSys Notice of Ex Parte, Proceeding: 13-184, Filing 1106325423061, November 2018*

<sup>2</sup> See *comments submitted to proceeding 13-184 by West Virginia Department of Education, New Mexico Department of Education, Florida Department of Education, South Carolina Department of Education, Kentucky Department of Education, Funds for Learning, Education Super Highway and more.*

<sup>3</sup> See *comments submitted to proceeding 13-184 by New Mexico Department of Education, South Carolina Department of Education, Kentucky Department of Education, Funds for Learning*

In previous submissions to the FCC<sup>4</sup>, ApplianSys explained, with evidence from schools' networks, why caching delivers the performance benefits that it does in K12:

- Peak demand for online content in schools is typically more than 7 times average demand
  - Traffic spikes consist of repeat requests for identical content
  - To avoid congestion, schools and the organizations that advise them, base capacity requirements on these short but troublesome traffic spikes
  - Catering for peaks with bandwidth alone is wasteful
- Purchasing sufficient capacity to avoid congestion does not guarantee fast access to content
  - Large software update files download at low speed even through high-capacity connections
    - ✕ Congestion caused by this is exacerbated by the growing volume of devices in schools
- Caching take-up on E-rate has been low to date, with outdated and incorrect perceptions of the technology as expensive, ineffective and difficult to manage
  - ApplianSys shared traffic and cost analyses at districts with caches to show how the technology delivers significantly faster content at lower cost than bandwidth alone

We've reproduced our analysis of bandwidth costs and 'with caching' projections using 2019 data and found that, as expected, schools are getting access to better value capacity as connectivity prices fall organically.

**2018 schools bandwidth spend compared to 2019 – no caching**

	Total Bandwidth (Mbps)	Bandwidth per Student (Mbps)	Total Monthly Cost	Total Annual Cost	Avg. Monthly cost per Mbps
<b>2018</b>	20,939,980	0.49	\$40.3m	\$483.8m	\$5.77
<b>2019</b>	27,536,743	0.70	\$40.2m	\$482.5m	\$4.16
<b>Difference</b>	6,596,763	0.21	-\$0.1m	-\$1.4m	-\$1.61
<b>Difference (%)</b>	32%	44%	-0.3%	-0.3%	-28%

**Total Bandwidth (Mbps)** - Demand for internet capacity grew by 32% in 2019 versus 2018

**Bandwidth per Student (Mbps)** – Growth represents greater capacity per student with the national average getting close to 1Mbps per student target

**Total Monthly Cost** - As bandwidth costs fall, the additional capacity purchased has not resulted in higher spend but has actually fallen slightly

**Total Annual Cost** - Better value will see schools pay \$25m less for capacity in 2019 than they did in 2018

**Avg. Monthly cost per Mbps** - The average monthly cost is dramatically reduced, getting closer to the FCC's average per Mbps target of \$3.23\*.

<sup>4</sup> See ApplianSys Notice of Ex Parte, Proceeding: 13-184, Filing 1106325423061, November 2018

But the organic cost reductions would be amplified significantly if all schools deployed caches.

***Projected costs if caching used by all schools, 2018 compared to 2019***

	Internet access needed with a cache (Mbps)	Internet access per student needed with cache (Mbps)	Monthly cost of bandwidth with caching	Annual cost of bandwidth with caching	Monthly cost per Mbps with caching
<b>2018</b>	13,460,917	0.31	\$33.2m	\$398.8m	\$5.43
<b>2019</b>	15,395,334	0.39	\$30.36m	\$350.2m	\$3.77
<b>Difference</b>	1,934,417	0.08	-\$2.87m	-\$48.6m	-\$1.66
<b>Difference (%)</b>	14%	25%	-9%	-9%	-31%

**Internet access needed with a cache (Mbps)** - 14% more bandwidth required in 2019 versus 2018 if caching ubiquitous. Less than half the growth-rate with caching alone.

**Internet access per student needed with cache (Mbps)** - With bandwidth hogs removed and core content served from cache, nearly half the bandwidth per student is required compared to bandwidth alone.

**Monthly cost of bandwidth with caching** - As with bandwidth only, the monthly cost is reduced 2019 vs 2018, but at a significantly greater rate when caching used – 0.3% compared with 9%.

**Annual cost of bandwidth with caching** - The total annual cost of bandwidth with caching also reduces as a result of lower bandwidth costs, better controlled bandwidth demand and improved caching performance.

**Monthly cost per Mbps with caching** - With caching the reductions in Monthly per Mbps costs would be amplified, bringing the average down to just \$3.77 per Mbps. Very close to the FCC target average that we calculated last year of \$3.23 per Mbps\*

*\*Deduced by calculating the number of schools that would be in each of FCCs target price brackets (0-50Mbps, 50-100Mbps etc.) assuming all at 100Kbps per student, applying the targets costs and averaging the results.*

	10Gbps	1Gbps	500Mbps	200Mbps	100Mbps	50Mbps	Avg
What schools paid 2018	\$1.99	\$2.96	\$12.29	\$15.12	\$23.27	\$98.76	\$5.77
What schools pay now	\$1.59	\$2.50	\$9.31	\$16.18	\$25.21	\$97.60	\$4.16
FCC targets	\$0.75	\$3.00	\$5.50	\$9.00	\$12.00	\$14.00	(\$3.23)
With caching	\$0.44	\$1.97	\$6.66	\$12.01	\$19.69	\$76.87	\$3.77

Given suggestions from State DoEs and interest groups to dramatically increase Category 2 funding in response to July's Notice of Proposed Rule Making, caching is an essential tool for schools and the FCC to control Category 1 spending, releasing budget for other important network equipment.

Our growing body of evidence from school districts (much of which is published at [why-schools-cache.appliansys.com](http://why-schools-cache.appliansys.com)) confirms that, even as districts reach or exceed bandwidth targets adopted with the 2014 modernization order, caching is essential for the delivery of usable internet in class and controlling future spend. Here is a selection of comments received from School Districts in 2019:

"Without the **CACHEBOX**, Schoology would not load in a large classroom. With **CACHEBOX**, it loaded well."

**Kevin Powell, Technology Coordinator, Canton Central Catholic High School, OH**

"**CACHEBOX** works well and caching keeps us manageable in terms of bandwidth growth."

**Glenbard Township High School District 87, Ryan Snyder, Network Administrator, IL**

"Teachers are able to do stuff without worrying about lag from student to student. They want to do more and more now."

**Marshal Graham, Carl Junction School District R 1, MO**

"Overnight we went from not being able to stream music and have to instruct teachers to be offline during various testing windows, to being able to do all of these things and more without interruption."

**Ferric Fuller, McCormick County School District, SC**

"**CACHEBOX** has allowed us to maintain our current Internet speeds for the past 4 years w/o an increase."

**Chris Ashmore, Irvington Community Schools, IN**

In addition to the negative impact on value, adopting the ESL before the Notice of Proposed Rule Making endangers another E-rate' modernization goal and a common focus for schools themselves: *Goal 3 - Making the E-rate Application Process and Other E-rate Processes Fast, Simple and Efficient (order 55-62)*.

Acting on the Eligible Services List before decisions are made on the broader scheme will introduce unnecessary confusion and complexity for applicants. There will essentially be a two-tier system for schools to navigate with some able to apply for some services and others not.

In the previous two years, there have been ~2.5 months between notices of Proposed ESL and notices of Adopted ESL. Maintaining this schedule, the commission must act on the modernization order before 18<sup>th</sup> October which seems achievable given that the WCB proposes a continuation of current approaches. If, however, this is unlikely, adoption of the ESL should be delayed as long as possible.

The ESL for 2018/19 was not adopted until 16 November 2018 without causing issues for districts and in previous years, exceptional circumstances have led to the extension of form 470/471 deadlines, again, with minimal impact.

We hope that the FCC agrees that the high value presented by caching - both to the districts that deploy them and to the Universal Service Fund that funds schools' internet access - is sufficient to take whatever steps necessary to ensure that essential funding is not made unavailable to districts due to slow adoption of the Category 2 Notice of Proposed Rulemaking.