



October 23, 2017

VIA ELECTRONIC FILING

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

**Re: Comments of ApplianSys on Category Two Budgets
Modernizing the E-rate Program for Schools and Libraries -- WC Docket No. 13-184**

Dear Ms. Dortch:

ApplianSys LLC. ("ApplianSys"), pursuant to the Public Notice released September 22, 2017 (DA 17-921), respectfully submits its observations and comments on the sufficiency and utilization of the Category two budget, as well as ways to improve its administration on the above-referenced docket¹.

A: Sufficiency and Utilization of Category Two Budgets

Introduction

ApplianSys is a server appliance specialist that designs, builds and markets a range of network appliances. We offer the only fit-for-purpose solution dedicated to schools web caching to have figured in the E-Rate program. It has been overwhelmingly the most selected option under the "caching" heading since this was added to the annual Eligible Services List under Category Two from FY2015.

With hundreds of our appliances installed across school districts in more than 40 states, we are well-positioned as a service provider to provide feedback on the sufficiency of Category Two budgets, as well as to how applicants have used their budgets for Category Two services.

Our current submission builds on ApplianSys' comments on the proposed FY2018 Eligible Services List and recent ex-parte meetings with the Commission's staff². We illustrated, via numerous K-12 case studies, that caching has had a far greater impact on bridging the Digital Divide than the Commission originally envisioned. Caching is:

- Speeding up access to personalized, flexible digital learning
- Enabling schools to do more with less bandwidth, effectively reducing broadband spend

We also shared our analysis of FY2017 E-Rate data which indicated a widespread lag in the adoption of caching technology with a surprising number of schools not following through on purchasing and implementing caching. Specifically,

- Only about 8% of over 7,500 eligible entities filing Form 470s requested bids for caching
- Only 37% of those actually selected a caching solution (as tracked on Form 471), at a projected value of nearly \$9M

¹ See *Wireline Competition Bureau Seeks Comment on Category Two Budgets*, WC Docket 13-184, DA 17-921 (September 22, 2017)

² See details at [ApplianSys' filings on ECFS, July – September 2017](#)

Category Two funds are crucial to extending connectivity to make innovative digital curricula and independent flexible learning available to every student. So our analysis, together with general data on the significant under-utilization of Category Two funding provided by third-parties such as Funds for Learning and EducationSuperHighway, paints a troubling picture.

In summary, based on our K-12 experience, ApplianSys contends that schools are not drawing down Category Two funding as envisioned for several reasons.

- The funding model, in effect, incentivizes schools to rely heavily on bandwidth upgrades and not only under-specifies Category Two needs, but forces choice between complementary internal connection technologies.
- In addition, some schools don't have enough Category Two budget for their five year internal connection needs. The budget allocation under the Category Two model can be woefully insufficient for small and rural schools in particular.
- The burdensome administrative process can create long and unacceptable delays for schools that need to put the technologies in place in a timely manner.

Funding Model Under-Specifies Category Two Needs and Forces Choice between Complementary Technologies

A fundamental issue is that the current approach to funding E-Rate — whereby broadband as Category One enjoys unlimited and priority funding whereas the technologies and services to make broadband available inside classrooms are separated out as Category Two and capped at a \$150 per student budget — **is at odds with the stated intent of the 2014 Modernization Order to provide a 'whole network' approach to connecting schools and students.**

In reality, the e-learning network needed for modern internet-enabled independent learning is an interdependent ecosystem, as illustrated in Figure A. There's no value in strengthening one link in the school's technology chain disproportionately to the other. Everything needs to be in balance. Failing that, the weakest link will define the limits of the network's capabilities.

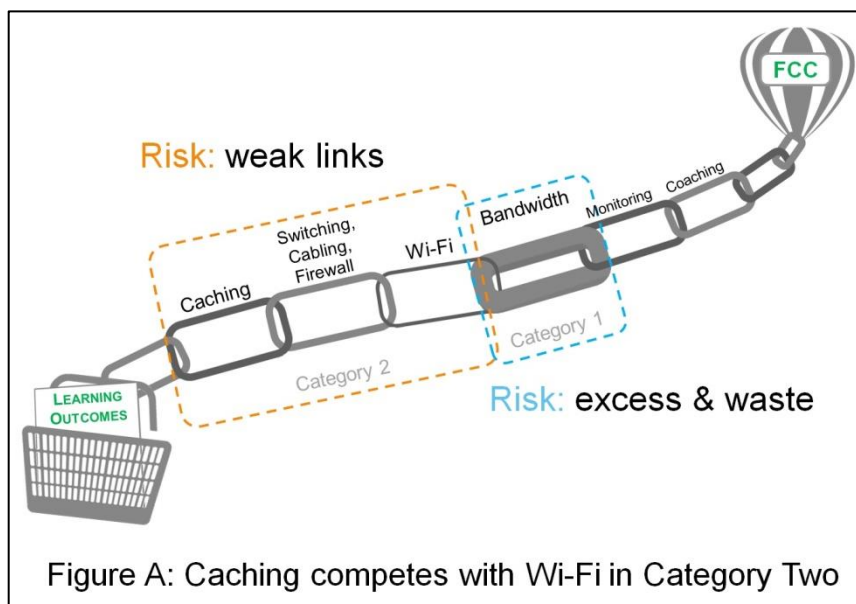


Figure A: Caching competes with Wi-Fi in Category Two

Bandwidth is, in effect, pumped up excessively in the FCC model today. Unlimited funding under Category One pushes schools to rely solely on bandwidth upgrades, which is neither a cost effective nor prudent use of E-Rate funds.

Most pertinent to this discussion is the fact that **the current Category Two funding cap of \$150 per student every 5 years is counter-productive to E-Rate modernization goals. It has the effect of forcing schools to choose between funding either caching or Wi-Fi - and not be able to do both.**

However, both caching and Wi-Fi are essential in delivering speedy access to digital learning given the unique demands facing schools.

- Today, a typical school's web traffic spans HTTPS content and video, from modern content delivery networks (CDN), to learning management systems (LMS) and login-protected content - to bandwidth-intensive software updates that increase in size every year.
- Not all traffic is equal. Objects arrive at the edge of the K-12 network at a variety of different speeds, many of them sub-optimal in terms of the browser responsiveness needed to support e-learning and timed assessments.

ApplianSys **endorses the need for robust Wi-Fi.** Without it, LAN speeds made possible by caching are throttled by the Wi-Fi infrastructure and the potential for fast responsive browser performance is thwarted.

With an appropriate combination of caching and Wi-Fi, a 'whole network' approach can be properly supported:

- Large video files and software updates that normally swamp a school's Internet connection when multiple devices access them concurrently, can be downloaded just once and then served from memory for all subsequent requests.
- While removing this extremely bandwidth-heavy traffic from the upstream Internet connection and/or WAN link, caching **also** delivers that same data at LAN speeds, meaning that – instead of clogging up the Wi-Fi for hours – they clear the LAN in seconds. **IF** the Wi-Fi is suitably provisioned.

Adequate Wi-Fi infrastructure is a key component of the modern network that enables the rich digital learning that transforms education. There has certainly been laudable progress in providing on-campus Wi-Fi access as a direct result of E-Rate funding.

The FCC recognized in 2014 that its \$150 estimate was at the lower end of the range for the models of internal connections deployments. And these had a singular focus on Wi-Fi. We believe this effort fell short by not considering the reality of the combined, complementary internal connections technology needed to deliver connectivity and speedier access in the classroom. Today, by having Wi-Fi and caching compete in the same limited funding pool, we risk under-resourcing one of them when both need to be strong links in the proverbial chain.

Consider the case of [St. Johns County School District](#), a large district of over 32,000 students spread across 39 schools in Florida. The district implemented caching – initially at their own expense and to eliminate rural disadvantage for some of its schools – in combination with its existing capacity, with great success. St. Johns was able to cache content that arrived at slow speeds from the internet – only to find that their old Wi-Fi set up was then a bottleneck and needed to be addressed. More commonly, schools put off caching until they have sorted out their Wi-Fi – which is no better.

St. Johns is also further evidence of our argument that, in reality, caching is a substitute for bandwidth capacity. It was a fiscal win for the E-Rate program for St. Johns to choose the significantly less expensive path of caching. St. Johns reached the FCC's 2016 bandwidth target of 100Kbps per student, but the cost of this connectivity is huge. Reaching the 2018 target of 1Mbps per student will require an unrealistic budget, even with E-rate support in Category One.

We contend that schools should have to choose between bandwidth and caching – not between Wi-Fi and caching. We need to help schools put the right balance of these two technologies in place.

We urge the FCC to consider competition between bandwidth and caching as a thoroughly constructive approach to eliminating wasteful E-Rate spend on excessive bandwidth, and for potentially freeing up additional funds for Category Two spend:

- The focus in Category One should be on helping a school get the best possible value from its bandwidth investment before addressing any need to increase bandwidth capacity in due course. Today, broadband spend is uncontested, whereas it should be in competition – driving a like for like comparison – with caching:
 - Category One could be extended to include caching so that broadband and its substitute (caching) compete on an equal footing
 - If Category One should remain 'Broadband-only', then Category 2 should be suitably provisioned so that Caching (and Wi-Fi) can both be adequately resourced as a suitably funded (and therefore no less attractive) alternative to Broadband

Our findings over the three years in which caching has been designated as a Category Two technology are that adoption of caching has been slow while broadband over-spend is becoming commonplace.

Reasons for this slow adoption are varied, but there are clear themes related to Category 2 budgets and affordability.

Insight and Observations on Why Schools are Under-Utilizing E-Rate Category Funding

Amongst schools who are seeking to buy or have bought caching from ApplianSys, some clear themes are emerging as to why they are under-utilizing Category Two funding to make these purchases. These include:

- **The significant delay – from 8 to 18 months - between the point that they decide to seek quotes and the actual installation and deployment of a purchased appliance due to lengthy USAC bidding, selection, filing and approval processes.** This includes delays and difficulties in getting timely answers from USAC. Schools simply can't wait that long to alleviate their issues.
- **Their difficulty in keeping track of the balance of Category Two funds available to them over the five year period.** They may inadvertently overspend and face unexpected funding denials. Alternatively, there may be a mismatch in what each side believes is available – including situations where the school or consultants are surprised to learn that USAC records show no remaining funds.
- **The per-student basis (with funding prioritized for schools with higher percentages of students that are eligible for free and reduced school lunches) for determining Category Two funding can put small, often rural schools at a significant disadvantage.** They end up only qualifying for the minimum \$9,200 pre-discount funding floor that has to be eked out over several complementary internal connections technologies over a five year period.

As a result, schools intentionally fund their caching purchase outside of E-Rate or are unable to proceed with their intended purchase via E-Rate. Here are several illustrative case studies on these themes and outcomes.

Delano Joint Union High School District (Delano JUHSD) in California is an example of a school that deliberately chose not to use Category Two (nor Category One) funding after careful evaluation.

When faced with options to relieve congestion of their 1Gbps pipe caused by growing demand, **Delano JUHSD** evaluated a bandwidth upgrade against caching. The cost of the bandwidth upgrade was prohibitive– an extra \$500K per year – even when offset by Category One funding, and so their decision to buy a CACHEBOX 310 appliance for \$15K

was clearly a prudent financial decision. However, purchasing it via E-Rate's Category Two would have meant a significant delay in installation of anywhere from 8 to 18 months due to the lengthy filing and approval processes. They ultimately funded it from a school's technology budget to put caching to work immediately. This is not a solitary example in our experience as to why schools are not using Category Two funds to purchase eligible equipment.

In the case of **Maine School Admin District 49 (MSAD 49)**, we offer an example of a school district whose experience spans the period before and after caching was eligible for E-Rate support.

MSAD49, a small rural school district in Maine comprising 6 schools, funded CACHEBOX from their school budgets in 2014 prior to Category Two support for caching. In 2017, with the steady addition of devices to their network, they need to upgrade their CACHEBOX appliance. They have filed a Form 471 but are unsure whether they will be able to fund this new equipment in FY2017 because according to USAC's records, they have used up their Category Two budget. In reality, this was a surprise to the E-Rate consultant employed by the school and the technical director and they are still trying to determine if they've actually run out of funds or whether this is an administrative error. As a result, the purchase is in a holding pattern and there is frustration about how to resolve this matter. They may end up considering a model for minimum needs (but not one that allows them to scale as well for projected future demand) that can be funded outside of E-Rate.

Funding under E-Rate is ultimately not a great deal for small rural schools in areas where, not only is bandwidth expensive and thus, even with E-Rate support, their upgrade cost is prohibitive, but also the per student basis for Category Two funding results in the minimum E-Rate budget. **Dillingham City School District** in Alaska with 463 students is an example of such a school.

Dillingham are currently paying \$87K pcm for 20Mbps of bandwidth – and began to consider caching when they realized that a 50Mbps upgrade would cost \$202K! To put this in context, some schools in California pay 34 cents per Mbps. Ultimately, it was financially prudent to not only deploy caching in lieu of a bandwidth upgrade but to purchase CACHEBOX outside of E-Rate using their school's tech budget. The E-Rate path would have swallowed up the entire \$9K of Category Two funding available and left them unable to cover other tech needs in this funding cycle.

B: Budget Calculation, Administration and Process Improvements

Budget Calculations

In the event that the Commission keeps the current funding model, we urge the FCC to improve their Category Two cost models to go beyond WLAN deployments and account for **all** of the other Category Two technologies.

We also urge the FCC to revamp the funding formula, including the pre-discount funding floor of \$9,200, which places schools with a lower student count in rural areas with more expensive bandwidth at a disadvantage. They receive much less Category Two E-Rate budget than large urban schools in particular. These are schools that could virtually double the capacity of their existing bandwidth with the cost-effective addition of caching under Category Two. And their need is particularly urgent given the acknowledged widening rural disadvantage. The FCC should consider giving schools with this profile a higher cap per student or raising the pre-discount funding floor.

Administration and Process Improvements

In the previous section, we identified related shortcomings that lead to under-utilization of E-Rate Category Two Funds. In summary,

- **Significant delays**, up to 18 months, in being able to install and deploy a caching appliance due to lengthy USAC bidding, selection, filing and approval processes.
- **Difficulty in maintaining an accurate, shared accounting of the balance of Category Two funds** available to schools over the five year period. This is a manual calculation with a sliding scale over time and the burden of keeping it straight falls on schools and consultants.

We build on these in this section as well as introduce additional issues and suggest improvements to the E-Rate process and administration.

Filing of Service Provider Invoice (SPI) Billing; Lack of Transparency over time for Category Two Balance

We have heard directly from many schools that the SPI billing method is difficult to use. It is predicated on USAC's assumption that schools can manually apply a formula and track their funding themselves over a five year period. This is complicated by the fact that the available discount declines over this time. The issue here is that service providers and schools lack the knowledge to apply this correctly. The result is discrepancies that cause schools to go back and forth with USAC several times and/or abandon the use of E-Rate funding.

E-Rate consultants face similar challenges in applying the formula and so it is a let-down for the thousands of schools who rely heavily on them (and pay them) to try to keep the details straight.

USAC should develop an online calculator that displays the available Category Two budget for each school at any point in time.

Overall, if all parties - service providers, schools and consultants - were on the same page as USAC as to the amount of budget left to spend, then we believe there would be greater uptake of Category Two funds. This issue is more urgent in FY2018 as we approach the end of the five year cycle.

Bureaucracy with no Flexibility

The predicament of Fairview Independent School District in Kentucky in the FY2017 cycle is also instructive for USAC about the need for common-sense flexibility in their processes.

Fairview was denied funding because they did not state "caching" on their Form 470. They referenced 'Managed Internal Broadband Services' within their Category Two request instead and included the CACHEBOX brand on the same form. USAC's rationale for the denial was that this wording (in lieu of 'caching') would prevent a fair and open bidding process. Specifically, *'The FCC Form 470 that established the competitive bidding process for this FRN did not include service of this type; therefore it does not meet the 28 day competitive bidding requirement.'*

ApplianSys suggests that instead of issuing a blanket denial, USAC could have asked the school to provide evidence that this wording had not undermined a fair and open bidding process. And if so proven, allowed them to purchase and install the needed equipment now. Funding could have been recovered under the BEAR method in the FY2018 cycle. As it stands the school has to decide whether it can find the funds outside of E-Rate or should start its filing all over again under E-Rate FY2018. Their need for caching as a cost-effective solution under Category Two is urgent as they currently max out their 100Mbps pipe, using 98Mbps at peak times.

Visibility in Notification Process for Service Providers

Today, the 15 day notice only goes to the applicant. The service provider has no visibility to this communication. If the request is not actioned by the applicant within 15 days, their funding application is moved to the back of queue, essentially creating a further delay. In reality, this hits schools who have few internal resources to stay on top of E-Rate paperwork and deadlines the hardest.

We urge USAC to take the small but highly effective step of sending the change notifications to the service provider as well as the applicant. Service providers can be a valuable partner to USAC because they are likely to reach out proactively to help the school meet the deadline. In turn, this should help to increase timely compliance and ultimately reduce the backlog for USAC.

E-Rate Consultants

The fact that a majority of schools now rely on paid E-Rate consultants is a key indicator that the E-Rate process is complex and burdensome. Based on our experience, **ApplianSys contends that E-Rate process consultants actually impede open and fair bidding in the following ways:**

- Some prepare Form 470s with language that says that they will only accept Category Two bids that address every item that a district has requested. The consultants appear to do this to make their jobs easier as it restricts the number of bids they will have to review. This places a vendor like ApplianSys with a narrow technical specialty at an immediate disadvantage as in effect, we cannot bid just on caching. More importantly, this means that schools don't receive all potential bids including those for newer or more cost-effective technologies such as caching.
- Also, some consultants do not forward questions submitted by us to the end-users at a school. Their answers are essential for a vendor to accurately size and bid on the solution. A proposed solution that has more (or unnecessary) functionality than needed is a waste of funds for a school.

In Closing

ApplianSys urges the Commission to consider our observations and recommendations on Category Two budgets and for improving the administration of the E-Rate program. They are essential to helping the FCC ensure provision of equitable access to a personalized, digital 21st century education and extending the E-Rate program for many years.

Respectfully submitted,

/s/ Roger Clark

Roger Clark
General Manager
K12 Web Acceleration Technologies
Appliansys LLC
Roger.Clark@appliansys.com