

# Bandwidth Management Strategy

## *K12 web traffic activity at the TCP-IP level*

**The FCC and Tech Directors across K12 are looking for best value in bandwidth management. ApplianSys has worked with Districts to measure and analyse web traffic activity and the findings cast light on how schools will need to plan for capacity and performance in the years ahead.**

### Does bandwidth management strategy need to change?

The nature of web traffic has changed beyond all recognition: a decade ago no-one used video, and software updates and apps were a tiny proportion of global traffic. A typical web page then was about 80KB and that kind of page would have taken a student around 2-3 minutes to read. That equates to a per-user bandwidth consumption of around half a KB per second.

Today the value of video and other media rich web-based resources is properly understood, measured by national research programs like Project RED and, with independent 1:1 technology enabled learning properly implemented, is seen to be delivering better learning outcomes at lower cost.

Video typically consumes around 150-200x more bandwidth than content commonly accessed in schools a decade ago.

At the same time, a large proportion of internet capacity is consumed by software downloads, from operating system updates to apps and anti-virus patches. In US K12 it can be the majority of traffic on any given day compared with almost none a decade ago. Today's devices can easily consume several Gigabytes of software updates at a time.

Over in the classroom, teaching and learning is undergoing a fundamental shift, with many schools investing in one device per student, and extending the utilisation of that capability right across the curriculum.

Meanwhile – as always – budgets are tight, tech resources stretched, and the rate of change that tech teams need to keep pace with is rapid.

These are the ingredients for serious challenges – and it wouldn't be surprising if tech teams and their directors were scrambling to keep up with all the latest best practice and developments.

### Schools need more capacity year on year

At some point in time, every school experiences the effect of demand outstripping capacity. And that means congestion. Our usual response to congestion – whether we're talking road network or internet connectivity - is to increase capacity.

And that's what US K12 has been doing for many years. By upgrading links more room is created for existing traffic. And of course there is more room for the new traffic that will result from the rollout of more devices, and wider implementation of e-Learning.

With more capacity, traffic that was congested can now flow freely. Of course, better traffic flow encourages increased use – e-learning take-up accelerates. And capacity is an issue once more.

So you end up in an endless annual bandwidth upgrade cycle.

But if bandwidth is cheap, surely that doesn't matter? If you can keep ahead of demand, avoiding congestion by preemptively purchasing more bandwidth, then where's the issue?

## Signs of diminishing returns

Tech directors are increasingly seeing signs that a bandwidth upgrade does not solve all the problems and has its own side-effects:

Winfield R-IV Schools District in Missouri were looking for better browser speeds, and – after doubling their bandwidth - to their surprise and dismay saw no improvement in speeds in the classroom.

In terms of costs, large Districts like St Paul Public Schools, Minnesota were seeing demand increase at such a rate that the financial efficacy of annual upgrade was brought into question. It wasn't just the cost of the bandwidth that was a concern – though over the term of the contract that was a significant problem by itself - but the cost of upgrades to network equipment that needed more performance to deal with the increased bandwidth, as well as the cost of license hikes for applications like filtering.

Anaheim, Arlington Heights, Glenbard – Districts like these, in search of better user experience, were already on **multi-gigabit** connections. Yet speed in the classroom - to support e-learning, timed assessments, online testing and the like – wasn't quite there, even when the network was relatively quiet.

The FCC has been grappling with the costs issue in recent years and, with their really big picture view, it has also taken a keen interest in speed itself – reflected in the modernisation order of 2014.

So why might bandwidth upgrades be delivering less value for money as time goes by? After all – bandwidth is getting cheaper. So what is going on?

## K12 web traffic activity research

We've conducted extensive research across K-12 in 40 States - in buildings of all shapes and sizes - and the findings suggest valuable insights into the nature of internet connectivity and web traffic movement – particularly in terms of how it affects the classroom. We get a clear understanding of why schools might be getting diminishing returns from bandwidth upgrades – and what they can do about it.

The issues the research narrows in on are

1. Web traffic activity at the TCP-IP-level and what that reveals about value for money in the ongoing provision of bandwidth in K12
2. The nature of the relationship between bandwidth capacity on the one hand and network performance on the other, and what that means for traffic management strategy to support wider eLearning and the move towards 1:1

The research goes on to measure and compare web activity at the TCP-IP level on bandwidth-only networks vs caching-aided networks.

Finally we look at the particular needs and use-case of K12 and how that informs the type of caching solution that a schools district would need if it was to get appropriate bang for its E-rate buck.