WHITE PAPER

Deliver a connected district experience with high-capacity networking

Bandwidth-intensive applications such as streaming video, esports and online collaboration are becoming more common in K-12 schools. Hybrid learning is putting strain on school district networks. Smart networked infrastructure such as lighting, door locks and security cameras are also testing network capacity.

With such rapid innovation, K-12 school districts are quickly outgrowing their networks. Schools need an increasing amount of capacity to support modern teaching and learning initiatives — and that's especially true for large, county-wide school systems.

K-12 bandwidth demands are rising exponentially. Based on current usage trends, the nonprofit organization EducationSuperHighway says school districts should plan for internet bandwidth growth of 50 to 100% year over year.[1]

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To keep their organizations ahead of the curve, K-12 IT leaders must understand their own network demands and have a forward-looking plan for addressing them. Leaders also need to partner with a connectivity provider that can set up their school district for success by offering opportunities to expand network capacity easily as the need arises.

Demand is surging

As K-12 school systems continue to innovate, each year the amount of bandwidth needed to support these advancements increases. In response, K-12 school systems are adding more network capacity — and multi-gigabit networks are becoming more common.

For instance, hundreds of K–12 school districts across Ohio are benefitting from a boost in bandwidth after the Ohio Academic Resources Network (OARnet) recently upgraded its connectivity from 10 Gbps to 100 Gbps, with up to 200 Gbps capability available for future expansion. Since 2020, bandwidth needs among the state's school systems have grown by 76% as schools have implemented modern learning environments, one of the project's partners noted.[3]

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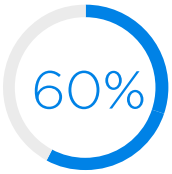
According to survey data from Project Tomorrow, 60% of high school students and 46% of middle school students say poor connectivity is a barrier to using technology in class. The problem is especially acute in urban schools, where 84% of high school students and two-thirds of middle school students report slow internet speeds.[4] These findings underscore the need for K-12 leaders to carefully evaluate their bandwidth requirements from year to year and plan with the future in mind.

Understanding key stressors

Giving every student a digital device for learning has rapidly become the standard among K-12 school systems. However, savvy K-12 leaders understand the need to plan networks with the assumption that students will be using more than one internet-connected device at a time for learning — such as a laptop, a smart phone and/or a data sensor.

As the number of learning devices in classrooms multiplies, the number of non-instructional devices connected to school networks is also increasing. These include security cameras, networked sensors and other Internet of Things (IoT) devices.

It's not just the growing number of devices that is straining K-12 networks, but the proliferation of bandwidth-intensive applications as well. Here are three key network stressors in particular.



of high school students say poor connectivity is a barrier to using technology in class.[8]

Video streaming

Much of schools' bandwidth use is driven by video streaming and this use is likely to keep rising. School districts will need to plan for internet bandwidth growth at 50% to 100% every year.[5]

Esports

Esports is rising in popularity as young gamers find a competitive and team-based outlet for their passion. The High School Esports League has more than 50,000 students competing from at least 6,000 participating schools and the organization has given away more than $600,000 in scholarships.[6] The Network of Academic and Scholastic Esports Federations (NASEF) counts about 3,500 high school esports clubs in all 50 U.S. states.[7]

For K-12 esports teams, winning doesn't just take extraordinary skill and gaming acumen. It also requires a top-notch technology infrastructure. Matches involve rapid-fire action and split-second decision making and speed matters. Even the slightest delay in network transmission could put teams at a considerable disadvantage.

A connection speed of 3 to 6 Mbps per player is needed for seamless online gaming. Now consider there are multiple players on a team. The challenge is further compounded by the fact that esports spectatorship involves live streaming matches. K-12 technology leaders have to make sure their networks can handle this additional traffic with no lag time that could disrupt performance.

Augmented and virtual reality

Augmented reality (AR) and virtual reality (VR) are becoming more prevalent in K-12 classrooms. In fact, a recent survey found that 77% of educators believe AR and VR technologies ignite students' curiosity and improvement engagement in class.[9]

Examples of how AR and VR can enhance instruction include virtual field trips that allow students to explore areas without ever leaving the classroom; virtual 3D models for science; and virtual lab experiences that allow students to work with normally dangerous tools or chemicals in a safe and age-appropriate way.

While these activities can enrich education, they are also very bandwidth-intensive. According to one estimate, an immersive, 360-degree virtual experience in HD video requires as much as 120 Mbps of bandwidth per user. However, as the quality of immersive experiences improves (and as more simultaneous usage occurs), this figure is likely to increase.[10]

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Planning for the future

How can K-12 leaders plan for such rapid growth in network use and keep ahead of bandwidth demands? Here are four critical strategies.

Understand usage trends. Effective planning begins with knowing current network utilization, where this traffic is coming from and how it's trending. Having full visibility into network usage over time gives IT leaders the insight needed to plan successfully for the future.

Anticipate growth. Consider what new applications your network will need to support in the upcoming years that aren't being supported now. Talk with curriculum leaders, students and colleagues in other districts to learn what capabilities they expect and what innovations might be coming down the road.

Plan around peak usage. To ensure you have enough bandwidth to support digital learning, estimate your needs based on "peak" events when everyone is using rich multimedia tools simultaneously. EducationSuperHighway recommends adding a 20% bandwidth "buffer" to your calculation to make sure you have enough capacity.[11]

Create a path for expansion. Design and implement flexible networks that match current demands but can expand easily to support future requirements. Making small, incremental improvements every few years is much easier than having to rip and replace your entire infrastructure. Choose a network connectivity partner that offers opportunities for growth.

How Spectrum Enterprise can help

Spectrum Enterprise has made it easy, quick and cost-effective for K-12 entities to get high-capacity circuits with up to 100 Gbps connectivity for the following services:

- **Dedicated Fiber Internet** is a fast, symmetrical service with speeds up to 100 Gbps that delivers a dedicated internet experience to keep up with the high demands of your network. The service is backed by a 100% uptime service-level agreement (SLA) guarantee all the way to the hand-off point at your location.

- **Ethernet Services** allows you to meet ever-growing data needs by connecting locations with a fast, reliable wide area network (WAN) solution backed by a 100% uptime SLA guarantee and built on a dedicated fiber infrastructure. Bandwidth up to 100 Gbps is available.

- **Wavelength Services** is a high-availability, secure and dedicated solution, that delivers consistent, ultra-low latency performance to support data-intensive applications at speeds up to 100 Gbps.

These high-speed services support a variety of K-12 uses — from esports and streaming video to augmented and virtual reality. They will enhance the performance of cloud-based platforms, improve speed and performance for remote and in-person learners alike and support full business continuity.

Spectrum Enterprise high-speed services will give K-12 school systems the flexibility to implement network solutions that meet their evolving needs as they continue to innovate. These services provide a simple way to achieve real-time connectivity between school locations, no matter how advanced your requirements or how distributed your network becomes — including for statewide or multi-county networks.

Learn how Spectrum Enterprise can help you meet your network bandwidth needs.

Learn more

1. "K-12 Bandwidth Goals," EducationSuperHighway, accessed September 6, 2024.
2. Ibid.
3. "OARnet helps K-12 school districts meet rising technology needs," Ohio Academic Resources Network, February 8, 2024.
4. Unfinished Business: Understanding the Digital Access Divide in American Schools, Project Tomorrow, 2024.
5. "K-12 Bandwidth Goals," EducationSuperHighway.
6. "Broadband Speed Guide," Federal Communications Commission, accessed September 6, 2024.
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8. Aaron Gifford, "Scholastic Esports Surging in Popularity Nationwide, Globally," GovTech, February 14, 2024.
9. Tim Bajarin, "VR's Potential Impact on the Classroom," Forbes, April 16, 2024.
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11. "K-12 Bandwidth Goals," EducationSuperHighway.

About Spectrum Enterprise

Spectrum Enterprise, a part of Charter Communications, Inc., is a national provider of scalable, fiber technology solutions serving many of America's largest businesses and communications service providers. The broad Spectrum Enterprise portfolio includes networking and managed services solutions: Internet access, Ethernet access and networks, Voice and TV solutions. The Spectrum Enterprise team of experts works closely with clients to achieve greater business success by providing solutions designed to meet their evolving needs. For more information, visit enterprise.spectrum.com.

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