

Network Essentials for Superintendents

Upgrade your network for digital learning

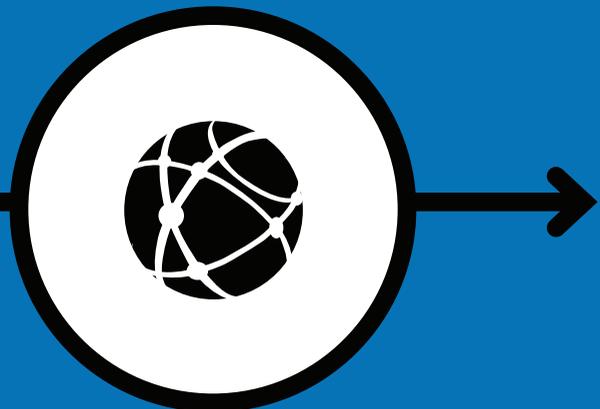
UNDERSTAND.

PLAN.

PROCURE.

“ How can I improve my network? ”

As a district leader, you can help most in the planning and implementation of a network upgrade by prioritizing it among other district projects and ensuring that it aligns with your district’s educational and technology goals. Your district network upgrade plan should serve as a clear guide for purchasing and management decisions related to your network infrastructure.



What qualities should my network have?

1. Fast enough to meet your educational goals

Understand how much bandwidth you need using the guidelines on page 7

2. Cost-effective

See tips for getting the best deal on page 15

3. Maintainable over time

Get guidance for supporting and maintaining your network on pages 10 & 16

“A clear instructional vision for how technology can be used in the classroom is the main driver of your technology plan. We have a strong plan as to how our students in grades K-12 will use devices and platforms to migrate to project- and problem-based learning. Kids can integrate technology in their projects to conduct research, be critical thinkers, and create innovative products that demonstrate what they now know.”

*Rosanna Mucetti, Assistant Superintendent
San Leandro USD, CA*

“Our superintendent was vital in communicating the infrastructure funding needs to our community and to the public and working with the school board on how to frame a referendum question that would be passed. Through surveys and listening sessions with the community, staff, and students, the district identified the most important needs for student learning.”

*Bob Boyd, Director of Technology
Kettle Moraine SD, WI*

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Understand your network.



Internet Service Provider

Internet Connection



District Office

Wide Area Network



School

Local Area Network



School

Local Area Network



School

Local Area Network

Typical school district network.

Internet Connection.

The network connection to an Internet Service Provider (ISP) that provides connectivity to the broader Internet

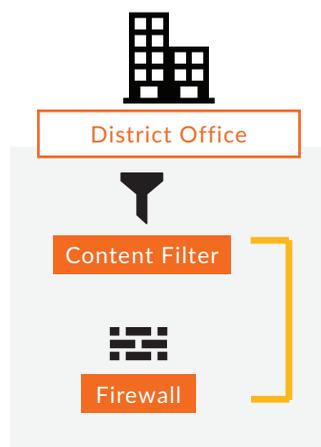
Wide Area Network (WAN).

The network connections between district locations, including the school campuses, district offices, and any support buildings

Local Area Network (LAN).

The network connections within a school or district building, including both wired connections and the equipment used to provide Wi-Fi service

A closer look.



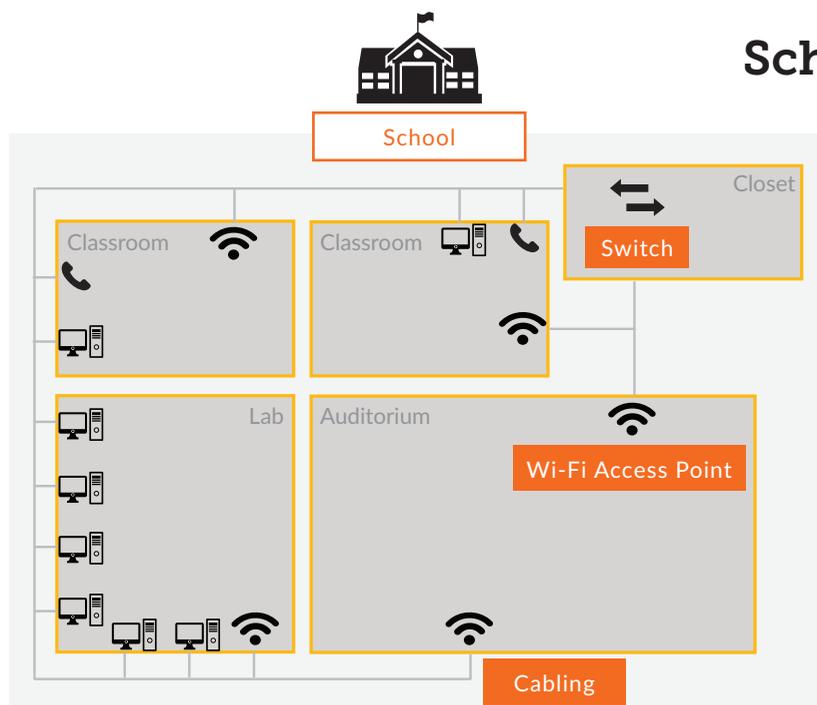
District core equipment.

Content Filter.

Limits access to web content consistent with district policy

Firewall.

Stops unauthorized access to your network from the Internet



School local area network.

Switch.

Connects all cables together to form a single network

Wi-Fi Access Point.

Allows wireless devices to connect to the school's network

Cabling.

Cables in walls connecting classrooms to the switch

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Plan your network upgrade.

Your upgrade plan should include an estimate of the amount of bandwidth you need for digital learning. Assembling a thorough list of the software and online learning tools you plan to use will help you arrive at an estimate. Ultimately, your bandwidth needs should be based on your learning goals and the technology you will use to support those goals.

Which technology model supports your learning goals?

Individual Classroom Technology Use

- Classroom technology use is variable and typically driven by individual teachers; devices are primarily in labs and on carts.
- Basic network infrastructure for the school is in place to facilitate assessments or classroom use, but not all classrooms at the same time.

Everyday 1:1 Campus-wide Technology Use

- Technology is widely available; most students interact with a computing device most school days.
- All teachers have basic digital literacy.
- Digital curriculum, but not necessarily rich media, is a major part of one or more subject areas.
- Teachers and students expect the Internet to be available when they need it.

Media-rich Technology Use

- Every student has a technology-enabled learning experience during the school day.
- Video and other rich media are used as a crucial part of the everyday learning experience.
- Instruction would not be productive if the Internet were unavailable for a day.

How much bandwidth do I need?

The two main drivers of how much network bandwidth you need:

1. How many user devices you have, including personal devices brought by students and staff
2. How much the devices will be used and the types of applications, especially video and rich media

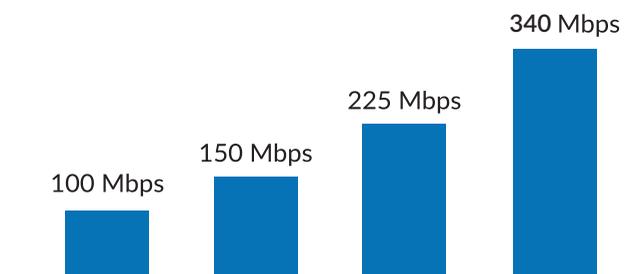
Bandwidth Guidelines

These guidelines provide a general estimate based on standards from SETDA and common practice in the field, but they are not a substitute for proper technical design based on your district's unique circumstances.

Individual Classroom	Everyday 1:1 Campus-wide	Media-rich
<p>Moderate Bandwidth</p> <p>1 Access Point per 1.5 Classrooms</p> <p>100 Kbps per student Internet bandwidth</p>	<p>High Bandwidth</p> <p>1.2 Access Points per Classroom</p> <p>1 Mbps per student Internet bandwidth</p>	<p>Very High Bandwidth</p> <p>1.2 Access Points per Classroom</p> <p>1+ Mbps per student Internet bandwidth</p>

How fast will my bandwidth needs grow?

Typical Annual Growth of Bandwidth Demand



Your upgrade plan should include an estimate of your bandwidth needs for two to three years, as well as options for increasing bandwidth within that time frame. The average school district nationally has seen the need for Internet bandwidth grow at approximately 50% every year.

Customize your needs.

Match your WAN bandwidth to your Internet bandwidth.

Your total wide area network (WAN) bandwidth across all buildings should be at least equivalent to your Internet bandwidth; your WAN needs may be much greater depending on applications that may be running just on the WAN, but not on the Internet outside your district network such as network-enabled security cameras.

Cloud-based computing affects bandwidth needs.

As your district evaluates and adopts cloud-based applications and storage (applications and storage on the Internet rather than on a local server), the growth of your Internet and WAN bandwidth needs will accelerate. All network traffic will flow locally through the WAN as well as out through the Internet connection.

How should I plan for online assessments?

We recommend that your network upgrade and investment plan focus on what is needed to support digital learning, but it is important to recognize that online assessments present an additional unique network challenge. Your network needs for online assessments will be guided by your testing logistics, most importantly:

1. Where assessments will be administered (e.g., gymnasium, computer labs)
2. The number of students expected to take assessments simultaneously

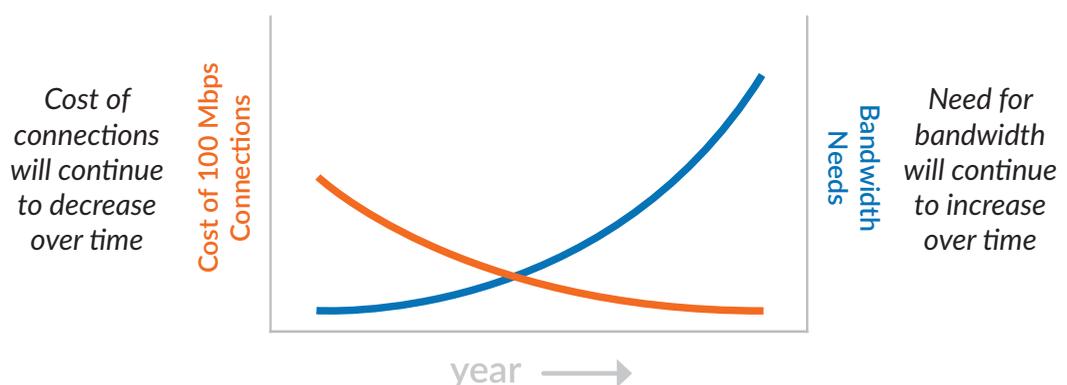
This information will allow you to decide if you have sufficient overall bandwidth or if you will need to supplement your Wi-Fi network for increased density in testing areas.

Upgrade on a timeline that's best for you.

Upgrades can be done all at once or the work and costs can be spread over time. Consider which approach best matches your goals, resources, and budget process. You may be able to negotiate a better deal with service providers and equipment suppliers by upgrading many parts of your network at once, but because new technology is introduced and prices decrease every year, it can be more cost-effective to spread out upgrades over time. Ultimately, your learning objectives and overall technology plan should set the pace of upgrades.

How should I plan for bandwidth purchasing?

We recommend purchasing for the upcoming two to three years. Trying to “future-proof” your network to last five or more years is usually not cost-effective, since both bandwidth needs and prices change rapidly.



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Assemble your team and build support.

To build a good upgrade plan, you need the right team in place. Make sure you assemble a cross-functional team that includes:

1. Technical expertise
2. Instructional input
3. Business coordination

If you don't have the right expertise in-house, consider external resources from your education service agency or local consultants.

How do I build support for network investment?

Since the costs and tradeoffs around building school networks are not obvious to most people, you should communicate early and often to all stakeholder groups for feedback, buy-in, and support, just like any other significant district project. Include your vision and plan for the network in your overall technology plan.

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We meet once a month with the presidents of the PTA. We share with them what's going on with technology, and they go back and meet with the parent groups at their schools. They've been a great sounding board for us.”

*Matt Miller, Superintendent
Mentor Public Schools, OH*

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Procure your network.

Having a reliable network that supports your learning goals must be balanced with the cost to build and maintain that network. Network costs break down into capital expenses and recurring expenses, so you must consider both when determining what you can afford. The sources of upgrade funds and how they may be spent will drive how you divide the funds between the two expense categories.

CAPITAL EXPENSES

- Equipment purchases
- Installation of cables to classrooms
- Equipment closet accessories
- Fiber WAN / Internet installation

RECURRING EXPENSES

- Monthly broadband fees
- Licenses for network devices
- Managed services
- Maintenance and support

How does my pricing compare?

School districts across the country pay vastly different prices for similar broadband services. Simply understanding how your pricing compares to your neighbor's and to your state's benchmarks can help you reduce expenses and achieve average or better-than-average pricing. Price transparency will help your team negotiate better pricing and understand how much of their limited time and resources should be allocated to that endeavor.

What funding sources should I consider?

1. Your normal operating budget
2. One-time capital sources (e.g., bonds)
3. The federal E-rate program (offers subsidies for network equipment and services)
4. External funding options (e.g., state telecommunications funds, private philanthropy)

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We were able to really keep our budget flat—or in the past three years actually reduced it. We've been able to do more with less money just by shopping around, not taking the first price, or staying with what we have.

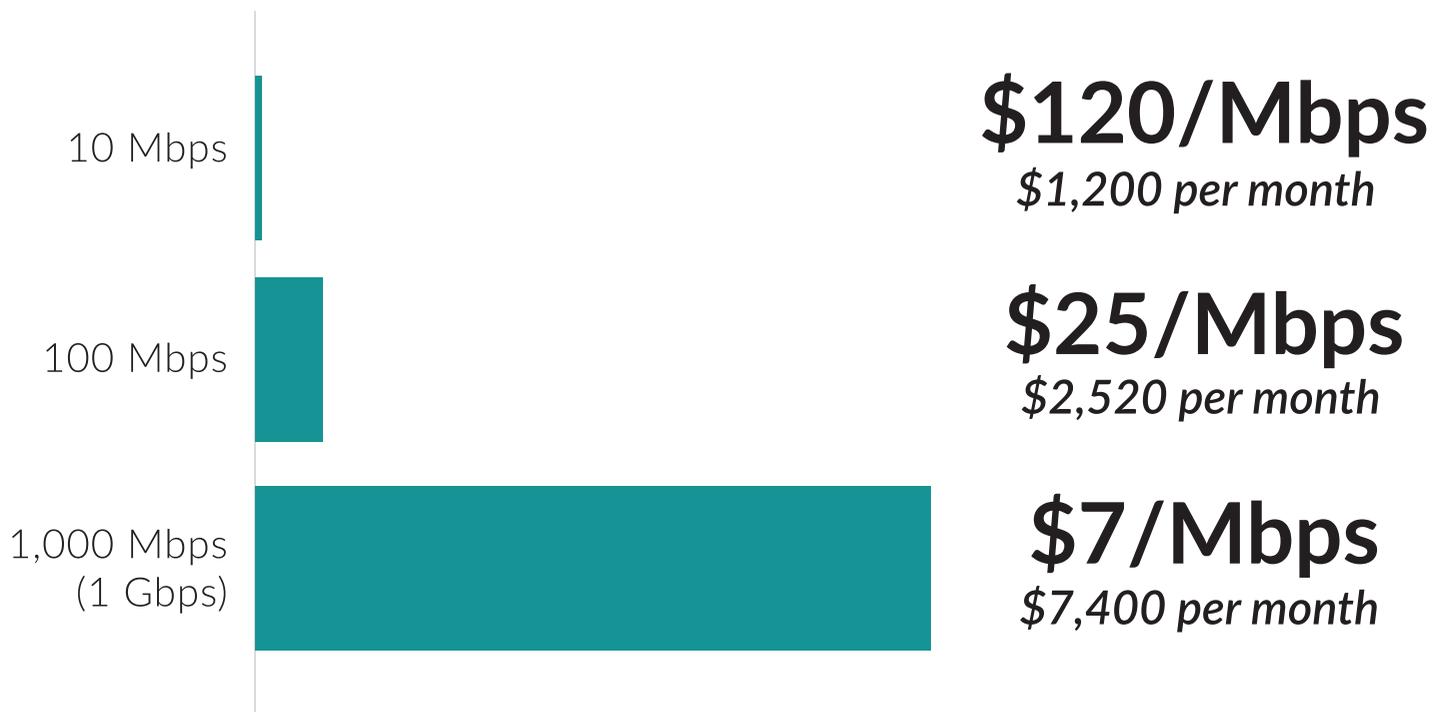
*Joseph Kuzo, Director of Technology
Quakertown Community SD, PA*

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The cost of higher speeds.

When purchasing Internet access, buying higher bandwidth connections usually results in drastically lower prices per megabit. Evaluate the price of different speed options compared to your bandwidth needs. This will help you make the right tradeoff between getting the most speed per dollar and keeping overall costs down.

Monthly Cost for Internet Access
 (2013 Lit Fiber Averages)



Source: "Connecting America's Students: Opportunities for Action." EducationSuperHighway, April 2014

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Who should I buy from?

Choosing dark fiber

While most districts buy a fiber optic circuit operated by a service provider, an increasing number of districts have elected to operate their own fiber network that they construct for themselves or lease from a provider that specializes in dark fiber networks. Dark fiber is a particularly cost-effective option for districts with high bandwidth demand and growth rates because it lets you expand capacity significantly by upgrading low-cost electronics without any change to the monthly fee.



Internet Connection and Wide Area Network.

Both the ISP and WAN connections are most often purchased from a service provider like an area telephone or cable company. There are also companies that specialize in institutional-grade fiber connections, as well as government sponsored networks dedicated to providing Internet access to schools. If one or more of these serves your area, it is likely that you will get better pricing.

Local Area Network.

Most LAN costs are non-recurring equipment costs. There are many vendors and products to choose from, so having a good handle on your technical, physical, and operational needs will give you the flexibility to pick the best solutions. For example, if your classrooms need updated wiring, that will likely be your biggest expense. But, creative problem solving can greatly reduce labor costs — such as rearranging technology resources around shared walls to limit the number of walls that need to be opened.

How do I get the best deal?

1

Design a competitive purchasing process.

It can help you determine which suppliers are best able to deliver a quality network. Having reference costs from your peers and at least three different vendor RFP bids will help your team negotiate the best price.

2

Coordinate your technical and business teams.

A close working relationship throughout the procurement process will avoid miscommunications and increase your chances of being able to take advantage of a great deal.

3

Hold suppliers accountable.

Support your team by helping to ensure that suppliers deliver as expected, by removing internal barriers, and by keeping all stakeholders on the same page.

4

Leverage expertise, but control the outcome.

Many suppliers will have more expertise in their specialty area than your team. One of your challenges is to include suppliers in your process enough to gain the benefit of that expertise while making sure that your team maintains ownership of decisions.

5

Manage risks actively.

Make sure your team meets regularly to assess and address potential project risks. For example, if you might add new online learning tools that require more bandwidth, make sure your Internet access and WAN contracts include a provision to increase bandwidth during the contract for a pre-negotiated fee.

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The more people you get competing for you as a customer, the better. Don't just post an RFP; put it on your website, talk to local media. Be very vocal about it. In the end it's going to save you big bucks.

*Will Kerr, Director of Technology
Reynoldsburg City Schools, OH*

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Supportable and sustainable networks.

It is easy to focus on the major network upgrades that you only do once every few years, but keeping that network reliable requires an investment in management tools and resources at upgrade time. In addition to keeping the network running well, these tools can help diagnose problems with devices and software, saving staff time and preventing problems. Some of these tools can be obtained for free.

What are my options for managing my network?

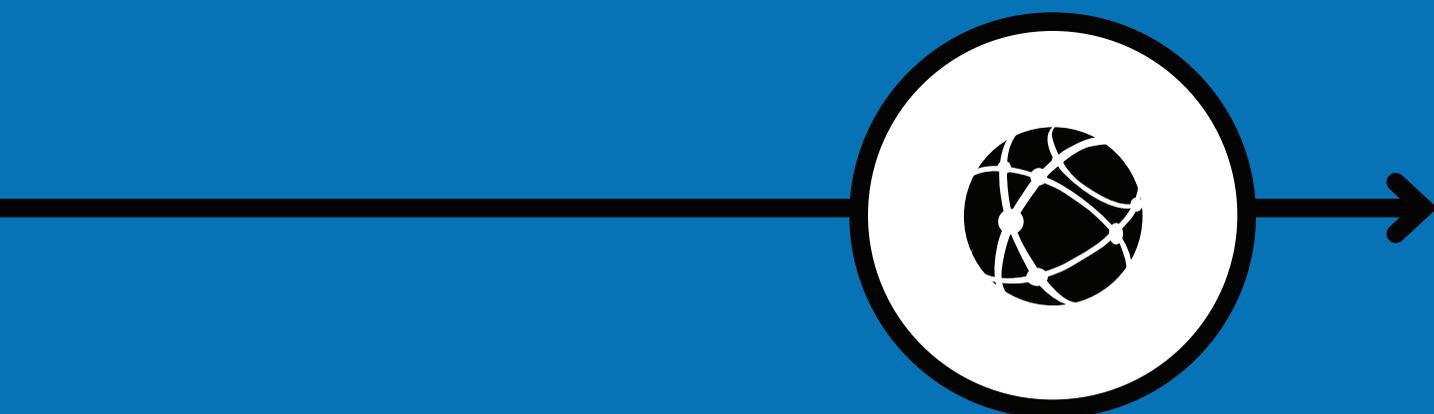
Depending on your district's size and the technical resources available, you should consider all of the methods for effectively managing your network:

- Management features of your equipment, including routers, switches, and Wi-Fi access points
- Reports from your WAN and Internet Access service providers
- Network monitoring systems that track standard metrics over time in addition to providing trouble alerts
- Complete management offerings from consultants and vendors

Where do I go from here?

EducationSuperHighway thanks the school district leaders, technology directors, and partners who provided invaluable insights to make this guide possible. We are constantly working to improve our resources, and we welcome any feedback you may have. Feel free to contact us at info@educationsuperhighway.org.

If you need help as you plan a network upgrade, there are additional resources available. Visit www.educationsuperhighway.org for the latest tools for districts.



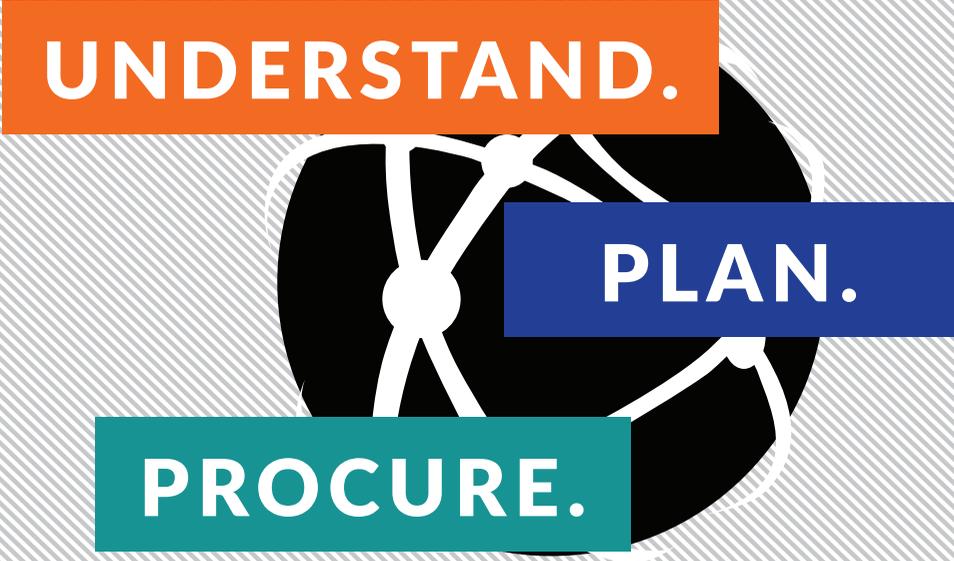
About EducationSuperHighway

EducationSuperHighway is the leading non-profit focused on upgrading the Internet infrastructure in America's K-12 public schools. We believe that digital learning represents an unprecedented opportunity to provide every student with equal access to educational opportunity and that every school requires high-speed broadband to make that opportunity a reality.

EducationSuperHighway's data-driven programs help accelerate upgrades in America's schools. We work to raise awareness of the school connectivity gap, provide technical and procurement expertise to states and districts, and advocate on behalf of students to influence policy decisions. Our work helped shape President Obama's ConnectED initiative and served as a catalyst for modernization of the Federal Communications Commission's E-rate program.

Contact us: info@educationsuperhighway.org
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A small investment of time from district leaders can yield a big impact on the way students and teachers leverage technology to improve learning opportunities.

This guide will assist district leaders in understanding, planning, and procuring the network essentials that create a strong foundation for digital learning.