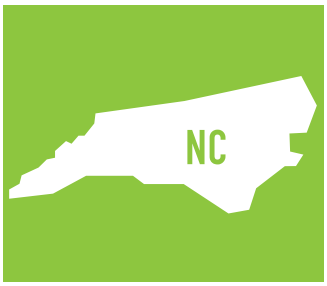
A Closer Look at Wi-Fi—How Four States Are Taking a Leadership Approach to Internal Broadband Connectivity

In addition to the state survey, SETDA and ENA brought together education technology leaders from four different states—Illinois, New Mexico, North Carolina, and Utah—to share how they are promoting equitable internal broadband access among their schools. These brief reports demonstrate the innovative and varied approaches being adopted and successfully implemented across the nation.

Creating Statewide Equitable Access Opportunities for North Carolina's Schools



Over ten years ago, the North Carolina Department of Public Instruction (NCDPI) and its partners MCNC, the Friday Institute and North Carolina State University, and North Carolina's Information Technology Services (ITS) sponsored the School Connectivity Program, which provides funding to the state's K–12 schools for high-speed broadband Internet access, equipment, and support services.

In 2013, North Carolina's state legislature passed a law mandating its schools transition to digital instruction by 2017. To support the school districts' efforts, the School Connectivity Program's original partners expanded the program to include funding for enhanced internal broadband connectivity. Today, approximately 80 percent of North Carolina's schools have access to what state leaders have termed "digital learning ready Wi-Fi," or Wi-Fi that is robust enough to successfully support a school-wide, one-to-one (1:1) learning environment.

ESTABLISHING A FUNDING CHANNEL

North Carolina's connectivity model is certainly unique. "Our school districts are basically 100 percent funded," says Michael Nicolaides, CIO of the North Carolina Department of Public Instruction. This is accomplished by the districts filing for and receiving funding from the E-rate program and the NCDPI funding the remaining broadband and internal connection costs. The state has set aside 32 million dollars in recurring funds for connectivity.

> **"Initially, we had approximately 20 million dollars to support the School Connectivity Program. Those funds cover the broadband costs schools incurred after E-rate, the WAN, the statewide client network engineering services we provide, and training. After the E-rate modernization and our digital learning law was passed, we reassessed the program and determined that we could sustain connectivity down to the user with an additional 12 million dollars."**
>
> — Phil Emer, Director of Technology Planning and Policy, The Friday Institute

CAPACITY AND UTILIZATION

Although the state is not interested in monitoring its schools' content, it is significantly invested in ensuring its schools are optimizing their connectivity. The NCDPI has created an interactive map of North Carolina's school districts that shows usage, and because of that, the state knows what an all-digital school serving approximately 6,000 students looks like from both a peak usage and nominal usage perspective. It also knows what an all-digital large district with more than 10,000 students looks like, and from this perspective, it turns out they do not look the same. This data enables state technology leaders to quickly identify and address anomalies or viruses that may be impacting a school district's network.

> **"Because our federal and state governments are paying the bill in North Carolina, we need to be diligent about monitoring usage and capacity in our schools—not in a big brother type of way, but to ensure we are being good stewards of the money."**
>
> — Phil Emer, Director of Technology Planning and Policy, The Friday Institute

PROVIDING A MANAGED SERVICE OPTION

To ensure all of North Carolina's schools have robust and reliable broadband connections, the state's School Connectivity Program includes access to the state's client network engineering service, which is a cadre of network engineers who help the state's school districts with a variety of issues, including their WAN, security threats, and problems with service providers. The engineers are available to assist with a district's internal broadband connections as well, but that is a more challenging task for the team because the school district often provides and manages its own Wi-Fi instead of a professional provider.

Right now, state education technology leaders are very focused on assessing the types of services that need to be provided to ensure that districts with varying levels of wireless capabilities and skillsets look similar from one side of the state to the other.

"Schools need to be able to monitor their networks, recognize when there is an issue, understand why there is an issue, and know how to fix it," says Emer. "Resolving all those problems can be difficult, but that's what we consider an equitable and manageable, end-to-end connectivity model. That's why we included a managed wireless service provider option in our statewide request for proposal (RFP) for internal broadband connections."

DIGITAL LEARNING READY WI-FI

Although Nicolaides and Emer acknowledge there is Wi-Fi in every school in North Carolina, they quantify the state's Wi-Fi penetration in terms of quality—estimating that approximately 80 percent of its schools have "digital learning ready Wi-Fi." Digital learning ready Wi-Fi is defined by their team as sufficient Wi-Fi coverage to support substantial and simultaneous online learning among a school's students. They have established several benchmarks to help schools assess and gauge if their wireless network is digital learning ready.

The team created an algorithm for shared learning spaces that essentially calculates approximately 1.2 APs per classroom. They also consider the number of students per AP. Those are two defined benchmarks, but they also consider components such as technical and wiring design, radio frequency and density coverage, how a district mixes 2.4 and 5 GHz radios, and the extent to which a school district is managing their infrastructure. Each of these elements is going to vary from school to school, particularly with the state's charter schools because many of those schools are located in strip malls that have drywall instead of cinderblock. The AP ratio needed for a school with cinderblock is not the same for a charter school with drywall.

THE FUTURE

The future is always difficult to predict, but Phil Emer and Michael Nicolaides have identified some key areas where they believe they will see significant growth pertaining to internal broadband connections.

1. Consider a managed service

Developing an effective model that brings monitoring, maintenance, engineering, and support together while still allowing students to learn in an unfettered way.

> **It's easy to procure equipment and bolt it to the ceiling. What's challenging is designing your wireless network in such a way that the wireless connection is consistent and robust. For us, one of the solutions we've used to solve that problem is a managed service."**
>
> — Phil Emer, Director of Technology Planning and Policy, The Friday Institute

BENCHMARKS TO CONSIDER

- **An algorithm for shared learning spaces**
- **Overall access to AP by student ratio**
- **Technical and wiring design standards**
- **Examples of 2.4 and 5 GHz radios**

2. Rethink the current network architecture

School district networks should consider new models for coordination of services and do not necessarily need to continue the current typical model where all network elements link back to a central location.

> **We still architect school district networks in a way that homes everything back to the district central office or a particular high school. I'm not sure that the current model will continue to make sense in the future though. I can see network components like the firewall and content filter being provided from within the Internet Service Provider network."**
>
> — Phil Emer, Director of Technology Planning and Policy, The Friday Institute

3. Allocate more resources toward network security

The security of student data and network content should be at the forefront of decision making for IT leaders.

> **With the recent ransomware attacks, I think security needs to be much more front and center and wrapped into connectivity services."**
>
> — Phil Emer, Director of Technology Planning and Policy, The Friday Institute