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## Broadband Access in Arkansas Schools

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## Summary Points

- In rural areas of Arkansas, there is a disparity in broadband access in K-12 schools.
- AR Digital Learning Act, online assessments, and Gov. Hutchinson’s commitment to high school computer science courses require high quality broadband access.
- ARE-ON is an existing fiber optic network that K-12 schools are currently prohibited from accessing.
- The Quality Digital Learning Study, CT&T, and EducationSuperHighway have all been commissioned to study broadband in Arkansas.
- Department of Information Services has issued a request for proposals to create a statewide network for the 2015-16 school year, a year earlier than advised.
- Arkansas currently spends \$15 million dollars on connectivity.
- The disparity in broadband could be fixed by reallocating money spent on copper wiring and allowing schools to access ARE-ON.

## Broadband Access in Arkansas Schools

*With the computer-based Partnership for Assessment of Readiness for College and Career (PARCC) test, the Arkansas Digital Learning Act, and Governor Hutchinson’s efforts to increase participation in computer science courses, the Arkansas Legislature is discussing actions to take in order to close the “digital divide” in the state. This brief will explore the technological requirements of providing the recommended bandwidth to schools, the barriers to the provision of that service, and potential steps for the Arkansas Department of Education to take in order to ensure that every Arkansas student has fast, consistent access to the Internet to support their learning.*

### Introduction

The Internet has become a staple of everyday life. Recently the Federal Communications Commission (FCC) reclassified the Internet as a public utility.<sup>1</sup> Access to this utility is inconsistent across the country, however, particularly for rural areas.

Broadband access in rural areas presents very specific challenges. Potential investments in infrastructure are high and the return on investment is low. This market reality has left millions in rural areas without fast and consistent Internet access, including many Arkansas K-12 schools.

Rural areas present the most imminent issues with broadband access, and there is high need across Arkansas. Successful compliance with state and federal education policies for assessment and curriculum requires high quality Internet access in our schools.

### This Brief

Introduction P.1  
 Definition of Basic Broadband P.1  
 Motivation for Expanding Broadband P.2  
 Current Arkansas Broadband Status P.3  
 Moving Forward P.5  
 Policy Recommendations P.5

### Definition of Basic Broadband

Broadband access is a fast, consistent means of connecting to the Internet. The Federal Communication Commission (FCC) defines basic broadband service as providing consumers the ability to download 1-2 Megabits of data from the Internet in 1 second (1-2 Mbps).<sup>2</sup> This speed represents the average rate at which data is delivered through a communication line, also known as bandwidth. Bandwidth is measured in Kilobits (Kbps), Megabits (Mbps, 1000 Kilobits), or Gigabits (Gbps, 1000 Megabits). These rates measure how much data one consumer is able to download in one second from a single connection. To maintain connection speeds, bandwidth must increase as the number of people accessing the Internet from the same connection increases.

While broadband access is broadly defined as any fast, reliable Internet connection, there are different means of connecting to the Internet in a fast and reliable way. There are currently six different means of Internet delivery: fiber optic, DSL (symmetrical and asymmetrical), cable modem, broadband over power lines, wireless, and satellite. These are compared based on bandwidth speeds in Table 1.

Fiber optic technology offers the best way to reliably provide the necessary 100-1000 Mbps to schools. Cox, which serves Arkansas, advertises fiber optic Internet from 1 Mbps to 10,240 Mbps (10 Gigabits).<sup>3</sup> Once fiber optic cables are in place, telecommu-

nication companies project it would be relatively easy to go back and increase transmission capacity as technology continues to progress and greater Internet speeds are needed.<sup>4</sup> However, there is currently less infrastructure in place for fiber optic Internet than for any other type.

The lack of fiber optic Internet infrastructure across the state seems to be a classic case of market failure. The higher the concentration of people in an area, the greater the potential in Internet subscriptions, and the greater the potential for profit for telecommunication companies. In rural areas, companies would need to lay more cable for fewer customers, requiring greater initial investment which will take longer to recoup. In addition, the lack of competition across the state—best seen when looking at the number of providers in each region—further discourages companies from investing in the infrastructure necessary to expand rural broadband access. It is unlikely that private business will fill the gaps in broadband access if the government, whether at the state or federal level (or a combination of the two), does not implement policies encouraging such behavior.

Arkansas already has a high-speed fiber-optic network over 2,200 miles long. In 2006, Gov. Mike Huckabee supported the creation of Arkansas Research and Education Optical Network (ARE-ON), a network connecting Arkansas's colleges, health centers, and emergency centers.<sup>5</sup> The mission of the network is to “support and enhance education, research, public service, and economic development” and currently provides 1-10 Gigabit connections.<sup>6</sup> Although currently excluded from accessing this statewide, high-speed network, could ARE-ON be the best option for providing broadband to K-12 schools in Arkansas?

### Motivation for Expanding Broadband to K-12 Schools

Students need fast, consistent Internet connections to support their learning. In 2013, Education Secretary Arne Duncan stated that all schools should have at least a 100 Mbps connection and eventually a 1000 Mbps (1 Gigabit) connection.<sup>7</sup> The State Educational Technology Directors Association (SETDA) likewise recommended “1 Gbps external Internet connection per 1,000 students and staff and 10 Gbps internal local area network (LAN) connection per 1,000 students and staff” by the 2014-15 school year.<sup>8</sup>

#### PARCC

PARCC (the Partnership for Assessment of Readiness for College and Careers) exams will replace the majority of Arkansas' Benchmark and End-of-Course exams beginning in spring 2015. These new assessments are based on the Common Core State Standards (CCSS) and require a strong Internet connection. Currently, PARCC has a paper-and-pencil exemption for schools without adequate Internet access; however, this exemption will be phased out. Paper-and-pencil assessments cannot provide as many accessibility options for students and are more expensive to administer than computer-based assessments.

Table 1: Basic Broadband Definitions and Speeds<sup>9</sup>

Internet Type	Definition/Transmission Method	Delivery Speed
<b>Fiber Optic</b>	Converts data from the Internet into light energy, which is transmitted through thin glass cables.	Max: 1000 Mbps to 10,240 Mbps
<b>Digital Subscriber Line (DSL)</b>	Relies on the copper wiring of landline phone technology to transmit signals from servers to users. Offered in symmetrical and asymmetrical.	Max: 30 Mbps Symmetrical DSL has equal upload/download speed; asymmetrical has faster download speed.
<b>Cable Modem</b>	Delivered through the same coaxial cables that broadcast television signals and requires a cable modem box.	Max: 30 Mbps, same as DSL
<b>Broadband over power lines</b>	Emerging technology sending Internet frequencies through power lines.	Speeds are comparable to DSL and cable modem Internet
<b>Satellite</b>	Satellites broadcast Internet from space to personal satellite dishes. Requires satellite dishes and has latency (delay) times 19 times greater than DSL, cable and fiber optic.	Speeds vary
<b>Wireless</b>	Uses radio signals to broadcast Internet signals to users. Mobile broadcasts from one fixed signal to another fixed or a LAN connection. Requires a physical Internet connection. Mobile is used for smart phones.	No published research on max speeds. Current speeds: 3G, 4G, and Long Term Evolution (LTE). LTE is fastest.

The PARCC assessments are only one aspect of student Internet use, which also includes formative assessments, learning programs, and research projects. With the increasing usage of online learning and assessment, it is obvious that Arkansas schools need quality Internet connectivity.

### **Digital Learning Act**

The 2013 Digital Learning Act (Arkansas Act 1280) requires all high school students “to take at least one digital learning course for credit to graduate.”<sup>10</sup> Regardless of where students go after high school—whether the workplace, technical college, community college, or a four-year university—they will inevitably need to work with computers and online resources. The Arkansas Legislature decided that this was one way to help prepare students for this reality. Meeting this requirement, however, will require schools to have functioning—and often times, improved—broadband connections that multiple students can access simultaneously.

### **Computer Science Initiative**

As a part of his “New Jobs Plan”, Gov. Hutchinson pledged to offer computer science courses—including coding—as a math or science credit in every Arkansas high school within 4 years. The goal of the bill is to make Arkansas a leader in technical education and prepare students for our information-based economy. In order to achieve this goal, however, students will need access to high quality technology and broadband access in addition to courses in computer science.

## **Current Arkansas Broadband Status**

One of the key questions in the discussion about broadband/movement to expand broadband to all Arkansas K-12 schools is “How much internet access do districts currently have?” To date, the Arkansas legislature and/or governmental agencies have conducted three studies attempting to answer this question. A common topic in these studies is making use of the state’s fiber optic network, ARE-ON. We offer some background on the creation of ARE-ON and how it fits into the debate over K-12 Internet access in Arkansas as well as a summary of each study conducted regarding Arkansas broadband.

A brief review of each study is presented below in Table 2, and links to the full studies are available at the end of this brief.

*Table 2: Arkansas Broadband Studies and Results*

<b>Study</b>	<b>Authorizer/Funder</b>	<b>Findings</b>	<b>Recommendations</b>
<b>Quality Digital Learning Study</b>	AR General Assembly to survey schools on deployment of broadband to schools	<ul style="list-style-type: none"> <li>• ~80% of public schools had inadequate connectivity.</li> <li>• Some districts had 3 Kbps/student and others had 800+ Kbps/student.</li> <li>• Costs range from \$1.20 to \$280 per Mb</li> </ul>	Allow K-12 schools to access ARE-ON, work to adopt the federal broadband recommendations, and manage statewide broadband.
<b>Education SuperHighway</b>	FASTER Arkansas, backed by the Walton Family Foundation and Gov. Mike Beebe	<ul style="list-style-type: none"> <li>• 51% of districts meet current broadband standards, 37% nationally.</li> <li>• 230,000+ Arkansas students lack adequate connectivity.</li> <li>• Smackover meets 2018 connectivity</li> <li>• Arkansas spends \$15 million annually on connectivity, \$6 million on copper wiring</li> <li>• All but 25 districts spend \$13per Mb/month, Smackover spends \$1.50</li> </ul>	Redirect \$6 million toward fiber optics and use ARE-ON as the backbone of fiber optic connectivity. Providers take the service from ARE-ON to the districts and schools.
<b>CT&amp;T</b>	Arkansas Legislative Council & Bureau of Legislative Research	<ul style="list-style-type: none"> <li>• 65% of districts and charter schools meet 100 Kbps/student, 8 districts meet 2018 standard.</li> <li>• 34% of districts do not meet 2014 standards.</li> <li>• 160 school locations lack existing fiber optic facilities to provide service.</li> <li>• Estimated cost to complete construction at \$5.3 million, \$1.1 million after E-rate.</li> </ul>	State network should operate for 2015-16 year before considering backbone model. State needs to establish adequate internet at in districts not meeting current standard and cancel APSCN connections.



## **ARE-ON**

The biggest untapped broadband resource for Arkansas's K-12 schools is the Arkansas Research and Education Optical Network (ARE-ON). ARE-ON was established in 2006 by the University of Arkansas through a \$6.4 million grant from Gov. Mike Huckabee. It is an existing network that consists of 2,200 miles of fiber optic cables connecting Arkansas's colleges, health centers, and emergency centers.<sup>11</sup> The network currently provides 1-10 Gigabit connections and serves as the high-speed fiber optic backbone throughout the state.<sup>12</sup>

In discussing the challenge of expanding broadband access in Arkansas, it is helpful to reflect on the similar challenge surrounding telephone access. In 1997, the Arkansas Legislature recognized that there was a market failure in the telecommunications industry, in that there was a need in rural areas for telephone service, but no supply because of prohibitive infrastructure investment requirements. In response, the government decided to subsidize infrastructure investments to improve telephone access by providing financial support for the construction of the telephone lines. Private companies then sold contracts to individuals, and the contract prices were also loosely regulated to ensure their reasonableness.

The Telecommunication Regulatory Reform Act of 1997 states that "a government entity may not provide, directly or indirectly, basic local exchange service" (Section 9(b)).<sup>13</sup> This prohibits the government from providing a service that the private sector could offer to consumers. The Legislature recognized, however, that "it's appropriate to provide incentives and regulatory flexibility to allow incumbent local exchange carriers that serve the rural areas to provide existing services and to introduce new technology and new services in a prompt, efficient and economical manner" (Section 2(3)).<sup>14</sup>

In 2011, the Legislature recognized a similar market failure in broadband Internet, and passed Act 1050. This amended the 1997 Telecommunications Regulatory Reform Act. As originally proposed by Representatives Vines, Barnett, Rice, Eubanks, and Wren, K-12 schools in Arkansas would have been able to access ARE-ON under Arkansas Act 1050, but the bill was amended before passage to eliminate K-12 schools from accessing ARE-ON.<sup>15</sup>

When asked about this added prohibition to the original act, several legislators responded "that they didn't remember why the restriction was included, but others said there was fear of competitions between private providers and the government."<sup>16</sup> Telecommunications companies or their representatives may have been worried about a slippery slope, whereby the government starts out by providing broadband to a limited group of organizations, but then expands their service to consumers in rural areas as well. The industry has not spoken publicly on the issue.

This exclusion of ARE-ON access for K-12 Arkansas schools was upheld in the Digital Learning Act of 2013 and has recently come under fire by proponents of broadband access expansion. The implications of this limitation are becoming

more clear as Arkansas seeks to expand the use of technology in schools and needs to expand broadband infrastructure.

ARE-ON is addressed in each of the three studies commissioned by the Legislature concerning the state of broadband in Arkansas. The studies are summarized below.

### **Quality Digital Learning Study Committee**

The 89<sup>th</sup> Arkansas General Assembly formed the Quality Digital Learning Study Committee (QDLSC) to "establish and maintain the necessary infrastructure and bandwidth to sufficiently facilitate and deliver a quality digital learning environment in each school district and public charter school."<sup>17</sup> The QDLSC was meant to study "the deployment of high-speed broadband to schools; research technology to improve teaching and learning through professional development and provide access to digital learning; identify short- and long-term infrastructure, broadband, and digital learning needs of Arkansas public schools; and devise methods to establish and maintain sufficient broadband capacity in schools."<sup>18</sup>

QDLSC conducted surveys of schools through the Arkansas Department of Education. Initial findings showed that close to 80% of public school administrators said school's Internet connectivity was "inadequate to meet administrative needs".<sup>19</sup> They also found that the amount and cost of bandwidth available to schools varied greatly. Some districts had 3 Kbps per student and others had more than 800 Kbps per student, with costs ranging from \$1.20 per Megabit up to \$280 per Megabit.<sup>20</sup> These findings led the committee to recommend that the Legislature change Act 1050 of 2011 to allow K-12 schools to access ARE-ON. QDLSC also recommended that the state run a centralized broadband network and work to adopt the 2015 and 2018 federal broadband recommendations.

There were multiple limitations to this study, which the Arkansas Cable Telecommunications Association cited in opposition to the recommendations. They cited the weaknesses of the surveys and the respondents. They also cited the prohibition of putting private providers in direct competition with the government, as ARE-ON is a state-run network.

### **EducationSuperHighway**

Gov. Mike Beebe and the Arkansas Department of Education commissioned a study by EducationSuperHighway (ESH), with the goal of developing a plan to lead the nation in meeting the ConnectED goal of connecting all students to high-speed internet and meeting the standards established by ConnectED, the FCC, and SETDA.<sup>21</sup>

ESH surveyed districts, finding that 58% of districts meet the 2015 standard of 100 Kbps/student which is better than the national average of 37% of districts meeting the 2015 standard.<sup>22</sup> This still leaves roughly 230,000 Arkansas students, however, without adequate broadband connectivity.

The most significant finding from ESH showed that districts pay an average of \$13 per Mbps through district purchases. In contrast, the ADE pays an average of \$286 per Mbps for ac-

cess provided through the Arkansas Public School Computer Network (APSCN). APSCN accounts for 58% of the total Internet access costs, but only provides 5% of the total bandwidth, likely due to APSCN's use of copper-based connectivity.<sup>23</sup> It should be noted that copper wiring was the only source of connectivity available in many locations. Total spending on K-12 Internet access is \$19 million, of which \$11 million goes to APSCN.

ESH went on to recommend that the ADE should redeploy the \$11 million in a more efficient way. There were 3 options: 1) direct Internet access with state contracts with Internet Service Providers for districts, 2) regional aggregation at regional points to connect districts, and 3) statewide aggregation using a backbone, possibly provided by ARE-ON.<sup>24</sup>

### CT&T

The Legislative Council and the Bureau of Legislative Research commissioned Little Rock-based CT&T to collect data on broadband and networking capabilities of every K-12 public school in the state of Arkansas. CT&T was meant to assess the readiness of K-12 schools for Act 1280 to facilitate digital learning. CT&T sent personnel to each of the K-12 school districts and charter schools in Arkansas to gather information on broadband and network connectivity.

They found 168 districts meet the 2015 standard, 8 districts meet the 2018 standard, and 89 districts do not meet the 2014 connectivity standard.<sup>25</sup> Their estimate to complete construction to provide fiber optic facilities was \$5.3 million (\$1.1 million after E-rate). Currently, there is \$8.9 million in E-Rate reimbursements to the Department of Information Services that have been on hold at the FCC since 2012.<sup>26</sup>

Like ESH, CT&T found that the ADE covers the \$11.3 million bill for the APSCN connectivity. CT&T also found that the state could get each district to the 2015 standards at no extra cost.

### Moving Forward

In March, 2015, Arkansas opened the bidding process for the state's school broadband network. The contract is for seven years and requests pricing from private providers for broadband services. The winning vendor would be allowed to increase the costs over the contract and allows the vendor to sell access services to school districts.<sup>27</sup>

A letter sent to school superintendents said the "state will be financially responsible for providing Internet access to district hubs", while districts would be responsible for connecting individual buildings to the networks.<sup>28</sup> In some cases school buildings will need to be rewired with fiber and new equipment capable of handling the bandwidth will need to be installed. Initial funding will be provided for districts to have a minimum of 100 Mbps/student in order to reach the FCC goal of 100 Kbps/student. The conversion would be set to begin in July 2015, with a majority of K-12 schools meeting sufficient access mark by the end of the 2015-16 school year and full completion by June 30, 2017.<sup>29</sup>

## Policy Recommendations

Many questions still need to be answered about broadband access in Arkansas school districts. Even when broadband access is expanded, challenges lie ahead. First, internet is useless if schools do not have the devices to connect to the internet and to use the fast broadband connections. Second, teachers, administrators, and support staff need to be able to make use of fast broadband access and up-to-date devices. Third, with increased Internet access, districts will need to revamp their acceptable use of policies and enforcement on campus so that schools have effective firewalls that prevent students from accessing inappropriate content or illegally downloading media.

Based on the available information, we offer the following two policy recommendations: 1) stop spending money on copper wiring and 2) open up ARE-ON to K-12 schools. For the first recommendation, copper wiring is expensive and not cost-effective considering it is less efficient than the available broadband provided by the state's fiber optic network. Opening up ARE-ON requires more information, but the available information points to changing the law to allow K-12 schools access to ARE-ON.

Arkansas educators are working hard to prepare students for success in college and careers, and schools need fast, consistent Internet connections to support student learning. The Digital Learning Act and computer-based assessments require improved broadband for students to participate. Due to the research of broadband, testimonials, and recommendations from the studies conducted, fiber optic Internet seems to be the most reliable form of broadband. Connecting all K-12 schools to fiber optic Internet will require investment, but the state could reduce it through re-allocating a sizable portion of the \$15 million currently being spent on old and unreliable infrastructure. Connecting all K-12 schools through fiber optic Internet would help bring the entire state of Arkansas closer to the minimum amount of advised broadband access and set Arkansas up to be a leader in available technology and connectivity for K-12 students. Providing fast, consistent Internet connections to all Arkansas students is an investment in Arkansas' future.

## Sources and Resources

### Quality Digital Learning Study

<http://www.arkansased.gov/divisions/policy/quality-digital-learning-study>

### EducationSuperHighway

<https://fasterarkansas.com/wp-content/uploads/2014/12/Smarter-Spending-for-Smarter-Students-Arkansas-Report-December-2014-1.pdf>

### CT&T

[http://c.ymcdn.com/sites/www.theaaea.org/resource/resmgr/Broadband/BLR\\_K12\\_Network\\_Study\\_Report.pdf](http://c.ymcdn.com/sites/www.theaaea.org/resource/resmgr/Broadband/BLR_K12_Network_Study_Report.pdf)

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