**Fast Access for Students, Teachers and**

**Economic Results (FASTER) Arkansas**

**Engineering/Infrastructure Task Force Report**

**Background-**

Act 1280, passed by the 89th General Assembly, requires the Arkansas Department of Education to explore ways to establish and maintain the infrastructure and bandwidth necessary to deliver a quality digital learning experience for all Arkansas public school students. The Arkansas Department of Education formed the *Quality Digital Learning Study Group* to complete this task, with Dr. Ed Franklin of the Arkansas Association of Two-Year Colleges serving as the committee chairperson.

Governor Mike Beebe also asked Jerry Jones of Acxiom to convene the Fast Access for Students, Teachers and Economic Results (FASTER Arkansas) committee to examine, from a business perspective, the broadband needs of Arkansas public schools and how best to meet those needs. FASTER will also consider the implications of expanded broadband access for economic development and make state and federal policy recommendations regarding broadband expansion.

A subgroup of the Faster Arkansas committee, the engineering/infrastructure task force was formed to provide network engineering expertise and recommendations for the FASTER Arkansas Committee.

**Mission-**

The mission of the engineering /infrastructure task force was to review technology solutions for broadband expansion and recommend one or more network engineering solutions for Arkansas public schools.

**Scope-**

1. Review bandwidth specifications- provided by leading experts, research reports, and the *Quality Digital Learning Study Group*.
2. Review bandwidth growth projections- consideration will be given to future, expanding bandwidth needs as defined by leading experts, research, and the *Quality Digital Learning Study Group*.
3. Develop network standards and operational framework- final recommendation must include a standardized plan including a blueprint for network hardware, configurations, troubleshooting, repair escalation, etc.
   1. Provide for school district/Coop interconnectivity- Review and plan school district demarc location and interconnectivity to and interconnectivity within the individual school and administration buildings within that district.
   2. Build in adequate oversight - The network must have ongoing management of the standards and insure that standards are met by the school districts. Consider a “user group” mentality where the technology coordinators are in a collaborative environment with group communications, annual meetings, and site reviews to promote quality implementations.
   3. Ensure security- Content filtering is required for public school networks to prevent underage access to inappropriate internet content. Filtering components must be standardized and centrally managed.

**Considerations-**

1. Type of connectivity solutions- Nothing is pre-determined; objective consideration must be to all solutions that provide quality infrastructure with an eye toward long-term stability. The work is vendor agnostic.
2. Cost- While cost is always of concern in making network engineering recommendations; it is only one of many factors. In selecting a network design, cost is weighted behind the quality and long term performance of the network and ability to leverage existing assets such as dark and lit public/private fiber optic capacity.
3. Commodity Internet vs. research and education networks- It is important to understand the difference between commodity TSP services vs. special purpose networks (e.g. ARE-ON) and the advantages and disadvantages of each, including ease of access to educationally relevant content such as Internet 2.
4. Speed to market- Act 1280 requires schools to offer a digital learning course beginning 2014-15 and the 2014-15 E-rate application deadlines are approaching. Neighbor states have made substantial upgrades to their K12 networks and Arkansas must act quickly to remain academically and economically competitive.
5. The Governor has expressed a preference for collaborative, partnership solutions that optimize the use of all available public/private resources.

**Policy Options-**

Four broad policy approaches were considered for Arkansas’s broadband challenge: A) maintain the status quo, B) build/expand the K12 network using public infrastructure, C) build/ expand the K12 network using existing private infrastructure and D) develop a new public/private partnership for K12 using shared public and private infrastructure.

**Recommendations-**

1. **Connect school districts with a robust fiber-optic network**.  This applies to any solution and will require significant investments in personnel as well as network services and, where possible, regional telecommunications service provider resources.
2. **Adopt the State Educational Technology Directors Association (SETDA) recommendations for K12 bandwidth as minimum targets.** Arkansas’s network must have the capacity to provide concurrent access to world-class educational content for all students and staff with the ability to grow and adapt to meet future demands. For 2014-15, the minimum recommended bandwidth is 100Kbps/student and staff and for 2017-18 the minimum recommended bandwidth is 1Mb per student and staff.
3. **Centralize management for statewide network support services** such as billing, E-rate applications, network recommendations/implementation/construction, network monitoring, vendor management, and problem resolution while preserving the responsibility of school districts to manage local area networks that interconnect school buildings.
4. **Efficiently aggregate statewide demand** to achieve greater economies of scale, reduce costs, improve access, and deliver high-quality content. Reducing the number of networks serving education from three: DIS (CIV and APSCN), ARE-ON, and telecommunications service provider (TSPs) to one: an ARE-ON backbone with private TSP transport from ARE ON to a single district metropolitan area network, accomplishes this goal.

**Rationale/Discussion-**

1. Critical factors in successful networking are quality implementation, technical support, network monitoring/problem resolution and vendor management.
   * A large portion of the state’s school districts are not adequately networked or connected in a local or metropolitan area network (LAN/MAN). The large number of K12 network demarcs (520+) reduces network efficiency.
   * School districts are not consistently able to budget for, attract and use technical support staff.
   * The varying levels of technical support at the local level make it extremely difficult to accurately assess equipment age, condition, or capacity.
2. The federal E-rate program’s complex regulations and limited funds results in under-utilization of the program.
   * Centralizing E-rate applications at the regional or state level improves program utilization and network cost-recovery.
   * E-rate could cover up to 80% of K-12 statewide networking, fiber construction, and network services when properly utilized.
   * Arkansas may not have the expertise necessary to develop a statewide networking plan that fully utilizes the E-rate program; the state did not increase its planned bandwidth targets for the 2013-14 E-rate application cycle.
3. Many states with well-developed research and education networks use them to provide K-20 “middle mile” connectivity (North Carolina/NCREN model), strengthen government network connectivity, and improve public safety and healthcare delivery systems.
   * Of the 42 research and education optical networks in the U.S., ARE-ON is the only one that does not serve K12.
   * The ARE-ON network is an unmatched, publically-funded optical network designed to provide high speed broadband and connectivity for research and education institutions.
   * The numerous ARE-ON access points make it more economical to connect to districts, reducing transport costs.
   * Higher education institutions, hospitals and libraries in Arkansas are “anchor tenants” of the ARE-ON backbone, facilitating regional telecommunication service providers (TSPs) efforts to build out re-usable fiber infrastructure to ARE-ON hub facilities.
   * Adding K12 to ARE-ON can improve the ARE-ON network by providing the funds necessary to bring ARE-ON’s fiber optic capacity to remote and underserved areas of the state.
   * Internet 2 access in the state must go through an ARE-ON sponsored connection.
4. In states where research and optical networks are less established or non-existent, telecommunications service providers were tapped to develop a K12 networking solution (Idaho/Qwest model and Mississippi/AT&T).

**Unresolved/Outstanding Challenges-**

1. Precise cost estimates, existing private provider fiber resources and pricing models. Others states provide examples of potential cost savings but precise figures for Arkansas models are not yet available. ADE is gathering this information for other states’ costs and from the ongoing Invitation for Bids (IFB) process.
   * Pricing and fiber routes are proprietary for telecommunications service providers and could only be obtained through the IFB process.
2. Well-defined network designs. Without accurate cost information for Arkansas network routes, it is difficult to model and holistically estimate cost (capital and ongoing) or any cost savings achieved through economies of scale.
   * ARE-ON is, however, developing a network design using their backbone as the middle mile solution similar to the approach used in other states.
   * The technology subcommittee has not proposed or requested a sole-source, telecommunications service provider-designed network solution due to the inability of that solution to provide K12 schools access to Internet 2 content.
   * E-rate expertise has to be considered in any network design. It may be necessary for the state to bring in additional expertise to ensure the proposed network designs optimize potential E-rate reimbursement.