

Arkansas Statewide Interactive Video Service: Education as an Anchor Tenant

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The value of Distance, Flexible and ICT-based Education in specific contexts
Primary, Secondary or Technical Education

Abstract: Arkansas Statewide Interactive Video Service: Education as an Anchor Tenant

The State of Arkansas has deployed a multi-protocol interactive video network (supporting H.320 and H.323) that supports approximately 521 systems and averages 19,000 conference hours a month. A majority of the usage of the State of Arkansas Interactive video network is educational (K-12 and higher education).

The interactive video network in Arkansas allows poor rural schools to offer both core curriculum but also advance and specialized courses that otherwise would not be available. Students are able to meet or exceed the academic requirements established by the State of Arkansas via the interactive video network through virtual field trips (to NASA, the Smithsonian, etc), standardized core curriculum from the Arkansas Department of Education's Distance Learning Center (which originates educational content), and concurrent credit courses (Universities on the video network offer courses that provide the student with credits that are simultaneously recognized by the Arkansas Higher education and the Department of Education).

Equally important to the State of Arkansas is the role that educational sites play as an "anchor tenant" on the interactive video network. These sites create an enterprise wide economy of scale that makes interactive video a viable option for hospitals, government, and criminal justice. These applications and the services that can be provided over interactive video are equally important to the rural citizens of Arkansas and it is the "anchor tenant" of education that is making this possible.

The State of Arkansas interactive video network, which is outsourced contracted to AT&T, received the North America Best Polycom Solution of the Year, 2005 Service Award.

Keywords:

Arkansas, Interactive Video, Network, Anchor Tenant, Rural

1. Introduction

This case study is intended to document the development of the multipurpose statewide enterprise network in the state of Arkansas. Although this case study will provide an overview of all aspects and partners involved in this development, the paper will predominantly focus on primary education in Arkansas as an anchor tenant. Primary education in Arkansas is of particular importance to the development of the current statewide interactive video network.

The case study will accomplish this in four major sections: History of the state of Arkansas Enterprise Network, History of the state of Arkansas Video Network, Developing Education as a Telecommunications Anchor, and Developing Education as an Application Anchor.

This initial case study is qualitative in nature and will hopefully serve as the basis for further detailed and in-depth quantitative research.

2. History of the State of Arkansas Enterprise Network

A time of pivotal network development for Arkansas occurred between 1998 and 1999. During this time period many items were either legislated into law or established by mutual decision that resulted in the development of a common network infrastructure.

Act 914 of the 81st Arkansas General Assembly created the Department of Information Systems, (DIS), as outlined in the Arkansas Information Systems Act of 1997. Of the things specified in this act, two crucial elements were that DIS would 1. make technological acquisitions that met State needs and were consistent with coordinated efforts to maximize standardization and cost-effectiveness and 2. plan and manage information technology infrastructures.

Act 249 of the 81st Arkansas General Assembly required the State Department of Education to reduce the amount of paperwork required to be reported to the department by local school districts through the utilization of information technology and the development of a network linking the districts and the department. This act resulted in the creation of the Arkansas Public School Computer Network (APSCN).

Arknet, an organization that consisted of 70 member institutions that were predominantly Arkansas colleges and universities, operated its own frame relay network that was a mixture of 56k and t1 circuits. In July of 1998 Arknet relinquished control of its network and turned over the operation to the Arkansas Department of Information Systems¹.

These actions and important pieces of legislation established the Department of Information Systems as a technology agent that was to provide technology and telecommunications solutions that maximized the compatibility of information technology. As such DIS became the aggregate provider of telecommunications services to state government agencies, colleges, universities, and K-12 in the state of Arkansas. DIS began providing telecommunication solutions that benefited from economies of scale in two important areas: 1. these solutions that shared a common network backbone, and 2. these solutions benefited from bulk purchasing via the competitive bid process.

3. History of the State of Arkansas Video Network

Similar to the aggregation of telecommunication resources for the data network in the state of Arkansas, interactive video followed a similar path of development.

In 1999, the Department of Education and the Department of Higher Education provided the Arkansas Compressed Interactive Video Network with \$1.1 million dollars to support the needed improvements to the video network. The contribution allowed for a network upgrade that provided for 240 simultaneous conference connections, added ISDN dial-out off network access, consolidated scheduling, and most importantly kept local sites from covering the full monetary burden of the upgrade.

The network utilized the ITU-T H.320 standards for interactive conferencing. The network architecture employed dedicated leased lines, fractional T1 circuits running at 384 kbps, rather than the more commonly associated ISDN circuit. This was done in order to provide a cost effective non-blocking service. As such users of the interactive video network were not subject to a monetary penalty for use, as is the case with the per-minute charges associated with ISDN, but rather users were encouraged to maximize their value by utilizing the service. Seven Ezenia bridges were geographically dispersed across the state to minimize the cost of the dedicated leased line local loop connectivity.

The integrated statewide H.320 interactive video network became known as "VNet". In the year 2000 the VNnet network initially connected 174 systems across the state and provided video conferencing services primarily to institutions of higher education. The video network averaged 5,300 conference hours per month. By the year 2004 the video network grew to a total of 275 systems and the average number of conference hours grew to 9,200.

In 2003 the Department of Electrical Engineering at University of Brasilia began participating in video conferences with the University of Arkansas for Medical Sciences, the Arkansas Public Administration Consortium, and the University of Arkansas at Little Rock Department of Political Sciences. Through these exchanges the State of Arkansas became increasingly interested in the network that was developed and implemented by the University of Brasilia. In 2000 the University of Brasilia had initiated an H.323 interactive video network. This network was comprised of twenty five systems, two bridges, and one gatekeeper. The interactive video network procured its telecommunication services from Embratel (see attachment B). The lessons learned and experience gained by the University of Brasilia was shared with the Joint Technology Committee of the Arkansas State Legislature in 2003.

As the dedicated H.320 network reached capacity and end of life in 2004 it became necessary for DIS to provision a new interactive video network. A critical component for consideration in the design of the new network was the H.323 protocol as well as continued support for the legacy H.320 systems still in operation.

Department of Information Systems released an RFP in 2005 for bridging, scheduling, and core support for interactive video service in the state of Arkansas and awarded that service to AT&T. The new network was designed to support multiple interactive video protocols (H.320 and H.323). At the core of the

interactive video network are six Polycom MGC 100s that are located in AT&T central offices. These locations are Fayetteville, Jonesboro, Pine Bluff, and Little Rock. The bridges are cascaded, centrally controlled, and centrally scheduled to provide continuity of service to all of the VNet subscribers.

It is technically possible to converge both the data network and the video network at the local loop connection for interactive video users that are running H.323 systems. Bandwidth that was provided separately to H.320 interactive video systems can now be consolidated into the bandwidth provided to the data network thus resulting in a more cost efficient delivery of bandwidth (see attachment A). Efficiency of bandwidth delivery is maximized as bandwidth is aggregated on demand at the local loop. Therefore 100% of the local bandwidth is available when video conferencing is not operational and only 650 kbps per system is dynamically allocated when video conferencing is operational. AT&T received the North American Best Polycom Solution of the Year, 2005 Service Award for the development and operation of this network.

The consolidated and integrated statewide H.320 and H.323 multi-protocol interactive video network has grown substantially since 2004. The VNet network currently connects 521 systems across the state and averages 19,000 conference hours per month. The network has nearly doubled in two years.

Although the majority of conferences that occur on the network continue to be educational the dynamic has changed. The previous video network supported primarily colleges and universities while the current network primarily supports K-12 video conferencing.

4. Education as an Anchor Telecommunications Tenant

In 1994 Tom Kalil, who was at the time the technology director of the Clinton administration's National Economic Council, proposed the notion of government as an anchor tenant that would procure services from the local telecommunication companies to be used for governmental purposes². Doing so would mean investing in the local telecommunications infrastructure and would therefore provide increased telecommunications access to general consumer. This anchor tenant relationship that was conceptualized by Kalil can be found in Arkansas.

The Arkansas Department of Education is estimated to spend approximately \$12 million dollars in Arkansas fiscal year 2007. It will do so by providing connectivity to K-12 institutions of which \$3.6 million is specifically related to the provision of connectivity to support interactive video. The Arkansas Department of Education is the largest consumer of state provided bandwidth and accounts for over half of total amount billed out by the Department of Information Systems for connectivity.

Although the Department of Information Systems acts as an aggregator by acquiring telecommunication services on behalf of other state entities, the bulk of the investment comes directly from the Arkansas Department of Education. This investment in telecommunications then provides for the maintenance and upgrading of telecommunications services in the state. According to Ed Drilling, President AT&T Arkansas, "The role of education in Arkansas as a telecommunications anchor tenant helps to provide the funding necessary for continuous improvement in the public telecommunication network in Arkansas."

It may be possible to hypothesize that the investment in public telecommunications for educational purposes in Arkansas provides a positive economic stimulus. Research conducted by Cronin et al. in 1993 identified that telecommunications investment rises with economic growth, while economic growth similarly rises with investment in telecommunications³. If the later holds true, it may indeed be probable to hypothesize that the investment made by education in telecommunications in Arkansas may positively correlate with economic growth.

5. Developing Education as an Application Anchor Tenant

The rise of education as an anchor tenant is not only the technical result of cost aggregation; but it also becomes defined as an anchor tenant in its utilization of the network. It is not merely enough to build the capacity necessary for interactive video, it is equally necessary to build the capacity to provide educational content.

To develop application content for the distance learning network the Arkansas Department of Education has developed the Distance Learning Center. The Distance Learning Center houses twenty three interactive video systems through which twenty three instructors provide core courses that are required by the Department of Education. The Distance learning center uses instructors that are specially trained to teach via interactive video thus insuring that the proper pedagogical approaches are applied to these distance learning courses. These courses are provided to Arkansas K-12 schools free of charge and on a first come-first serve basis.

Additional course content can be accessed by K-12 schools from alternative providers of interactive video courses if the provider has received certification from the Arkansas Department of Education to provide instruction. These secondary providers generally charge for their course offerings; however they tend to offer a wider variety of courses than just core curriculum. These courses range from language courses, special education, business development, and early college credit. There are currently four hundred courses that are being offered in approximately ninety-two subject areas⁴. Courses offered include, but are not limited to algebra, calculus, English composition, French, geometry, physics, Spanish, and World History.

Once the network has been provided and once course content has been developed it is then necessary to provide a communication medium through which course offerings can be disseminated to K-12 institutions throughout the state. Arkansas has developed the "K-12 Curriculum Portal" through which content providers can advertise their academic course offerings to content consumers. This centralized portal provides the organization necessary for schools to "shop" for courses that would otherwise be unavailable to the school. This central portal is so effective in providing the needed information required for content providers and content consumers to arrange for and enter into service agreements that individual schools, which have traditionally been consumers, have even begun to offer courses themselves for marketing to other schools.

Rural school districts may choose to use interactive distance learning when they can not find a qualified licensed teacher. It can also provide districts with the

flexibility in scheduling if a student can not take a course when it is offered locally. Distance learning provides efficient, effective, and equitable access to rigorous educational content by: 1. helping to alleviate the increasing shortage of available qualified teachers in Arkansas, 2. providing additional course scheduling opportunities for students currently forced to choose between courses that are scheduled infrequently or concurrently, 3. providing an opportunity for students to access an enriched curriculum and additional courses beyond those mandated by the Standards for Accreditation of Arkansas Public Schools, and 4. developing and making available online professional development and instructional resources for all teachers and administrators

K-12 institutions not only utilize interactive video for core classes; they have also begun to use these systems for course enrichment content. Geography poses a challenge to the applicability of enriched course content via traditional field trips in Arkansas as many of the schools are categorized as rural. Increasingly schools in Arkansas with interactive video are electing to provide their students with enriched course content via the “virtual field trip”. Virtual field trips can provide significant learning opportunities that otherwise would not be made available to students in rural Arkansas schools. This is significant as recent research from Garner and Gallo indicates that both traditional field trips and virtual field trips equally promote learning⁵. Since the implementation of the new multi-protocol interactive video network in the fall of 2005 schools have scheduled virtual field trips to such places as NASA, The Museum of Television & Radio History, and Arizona State University’s “Send your students to Mars”.

A specific example of a virtual field trip occurred in the Spring of 2006 when a group of students from Corning High School virtually toured the Museum of Television & Radio History in Los Angeles California. This was made possible via a bridged video conference that utilized the Little Rock MCU. The conference bridge dialed up the Corning High School system over the statewide video network while simultaneously dialing out to a public IP over the Internet. In this instance the Internet provided the necessary quality of service required for clear video and audio. If this had not been the case ISDN dial-up services would have been necessary to establish this conference and would have resulted in additional per minute transport charges.

6. Conclusion

Education acts as an anchor tenant for interactive video in two distinct ways: 1. it provides the bulk of the monetary resources required to implement and maintain a statewide enterprise interactive video network in Arkansas, and 2. it provides the necessary application utilization required to justify the existence of the statewide enterprise interactive video network. Both factors are interrelated as such a network can not be built with out the appropriate level of funding and conversely the network can not continue to operate without the appropriate level of utilization to justify the expense.

In Arkansas there are four main reasons that explain the high utilization of the interactive video network: 1. a shared common enterprise infrastructure, 2. an abundance of quality course content, 3. a means through which content providers and content consumers can coordinate, and 4. there is no monetary penalty for

use. These four factors combine to insure that K-12 schools in Arkansas will utilize video conferencing once it has been implemented.

Education as an anchor tenant for interactive video provides other interactive video applications such as healthcare, administrative conferencing, and criminal justice to be viable. First these applications do not have to bare the full economic burden of building out their own infrastructure and second these applications can become operational with minimal development time as the infrastructure required to support them is already in existence.

Education in the State of Arkansas provides a significant contribution to the state as it functions an anchor tenant. This anchor tenant role results in an enterprise wide economy of scale that makes interactive video a viable option for hospitals, government, and criminal justice.

Attachment A

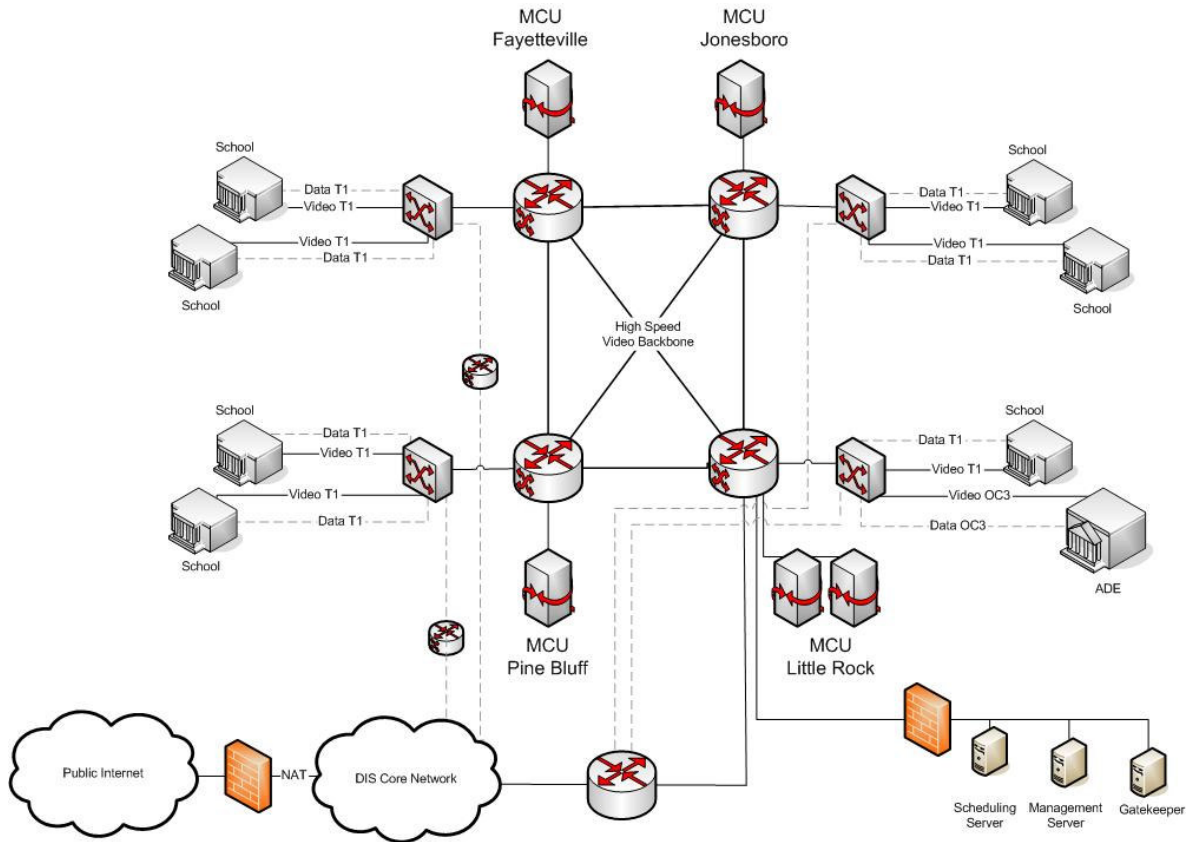


Figure 1: Topology of the current State of Arkansas interactive video network

Attachment B

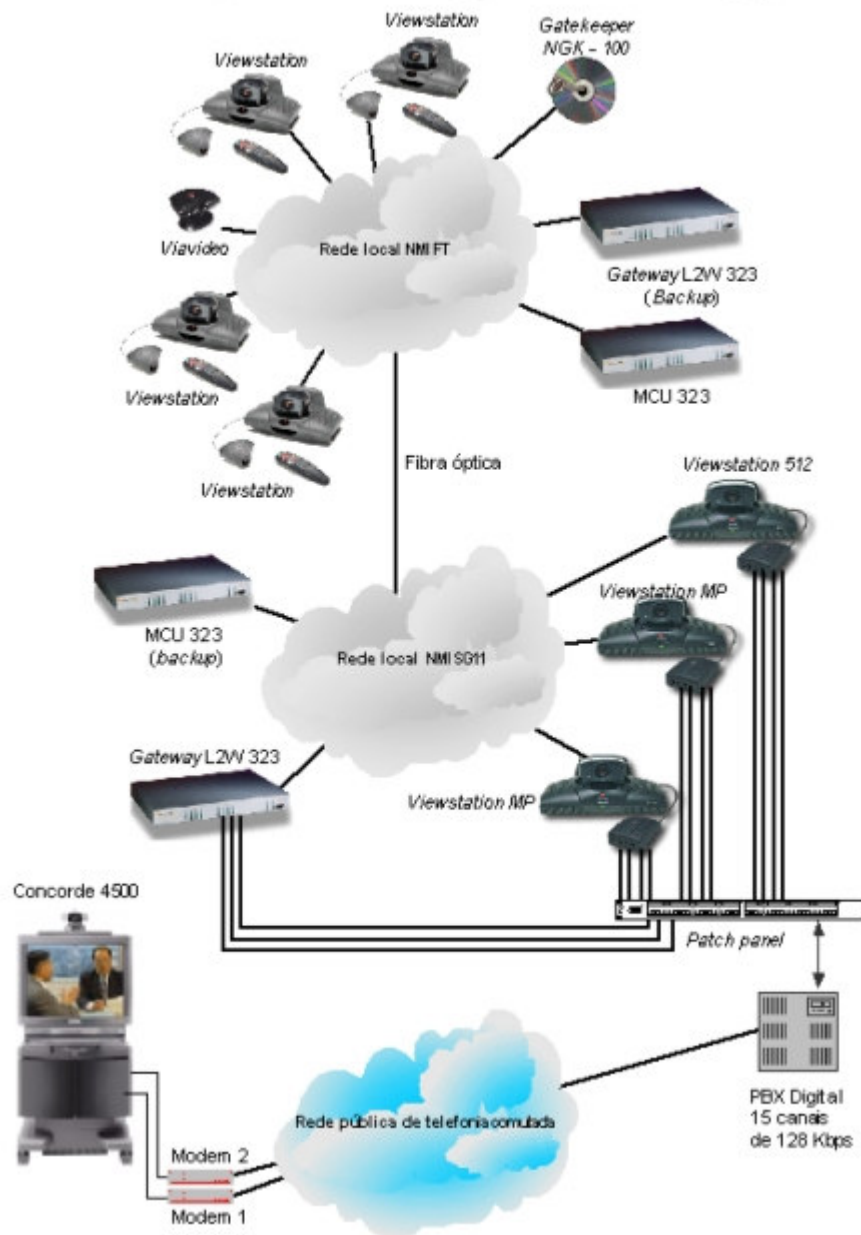


Figure 2: Topology of the University of Brasilia interactive video network

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