A Study of Private Data Networks in Kansas

Prepared by the Kansas Board of Regents (KBOR) in association with the Secretary of Administration and the Kansas Research and Education Network (KanREN) and presented to the Senate Standing Committee on Commerce and the House Standing Committee on Utilities

January 13, 2006

Executive summary

House Bill 2026 requires (a) a study to identify duplication of services or inefficiencies between Kan-ed and KanREN, and a plan for eliminating any that may be found; and (b) recommendations for incorporating the Kansas Wide Area Information Network (KanWIN) into Kan-ed.

This study was conducted over a six-month period, beginning in July 2005 and concluding in December 2005. Study participants included Hal Gardner, Eldon Rightmeier and Jerry Huff (KBOR/Kan-ed); Denise Moore and Dave Timpany (Department of Information Systems and Communications (DISC/KanWIN); and Doug Heacock and Cort Buffington (KanREN). The findings and recommendations were reviewed by Jim Honacki, an independent network consultant, as well as members of the constituent groups served by the networks.

The study finds there is duplication of network infrastructure and management facilities which can provide an opportunity for cost savings if this duplication can be reduced or eliminated. Consolidation of infrastructure elements could increase efficiency and potentially reduce costs. Study participants agree the systematic, staged integration of existing networks into one shared core network could provide improved cost-benefit performance.

However, consolidation will require continued collaborative planning and increased operational integration while preserving the unique interactions, agreements and service level expectations developed for each of the existing networks. At present, each network organization has separate plans underway for growth and performance enhancements. Coordinating these activities could optimize benefits and allow sharing of expense. Other potential benefits from consolidation include uniform availability of services, increased service capability, increased stability and reliability and the leveraging of expertise and manpower of the network organizations.

This study also indicates affordable last-mile connectivity is a major hurdle in connecting Kansas public institutions, and access to the public internet remains the primary application required by Kansas public institutions. The networks approach these issues differently and a collaborative plan could improve overall service to the state.

Beyond specific responses to the requirements of House Bill 2026, this study and the recommendations accompanying it provide a series of steps that will enable a coordinated approach to network services for constituent groups served by Kan-ed, KanREN and KanWIN. It is apparent collaboration and cooperation exist between the networks but to enable greater functional integration while continuing existing critical applications, a series of steps is recommended. Those steps are:

1) Integrate network planning efforts between Kan-ed and KanREN.

2) Develop a detailed, optimized, plan for a consolidated Kan-ed and KanREN infrastructure.

3) Study the benefits and requirements to consolidate the KanWIN infrastructure and its management with the optimized Kan-ed/KanREN network.

4) Provide a plan for potential KanWIN consolidation with the optimized Kan-ed/KanREN network.

5) To the extent integrated planning and consolidation show realizable cost benefits to Kansas, generate policy in support thereof. Changes in policy, regulatory and contract environments will be necessary to enable complete consolidation and enhanced capabilities. Without these changes significant limitations will degrade or prevent potential benefits.

6) Establish a funding mechanism that will reliably support combined network requirements.

7) Develop an organizational structure to operate the consolidated network while remaining responsive to individual constituent group requirements.

This study and the recommendations that follow it support this projected series of steps.

Introduction

This study is a response to the following provisions of House Bill 2026 as produced in the 2005 session of the Kansas Legislature:

> *New Sec. 4. (a) The state board of regents shall study the KAN-ED network and the Kansas research and education network for the purpose of identifying duplication of services and inefficiencies existing between the two networks. If duplication of services or inefficiencies exist, the state board of regents shall develop a plan to reduce or eliminate such duplication of services or inefficiencies. The secretary of administration and the state board of regents shall develop recommendations regarding the manner in which the Kansas wide area network may be incorporated into the KAN-ED network.*
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> *(b) On or before January 13, 2006, the secretary of administration and the state board of regents shall submit to the senate standing committee on commerce and the house standing committee on utilities joint recommendations regarding:*
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> *(1) The findings of the study provided for in subsection (a);*
> *(2) any plan for reducing or eliminating duplication of services and inefficiencies; and*
> *(3) the manner in which the Kansas wide area information network may be incorporated into the KAN-ED network.*

As requested in the legislation, the study has two primary purposes: 1) Provide findings and recommendations regarding duplication of services and inefficiencies between Kan-ed and KanREN), and 2) Provide recommendations as to the feasibility of incorporating KanWIN into the Kan-ed network.

This study contains five sections:

1) Overview: Terminology and methodology
2) Comparisons: Network comparisons and attributes
3) Distinctions: Unique characteristics of the networks
4) Collaboration: Collaboration between the networks
5) Findings: Conclusions drawn from the study

Section 1: Overview

The terminology used to describe networks and their functions can be confusing. The following definitions are presented to help readers understand the concepts discussed throughout this study.

Infrastructure: The physical and management components of a network such as circuits, routers, switches and operations centers.
(Note: the term *backbone* is used throughout this study and should be considered as synonymous with the term infrastructure.)

Network: The architecture engineered and assembled from infrastructure components to establish connectivity and provide services and applications required by users.

Local-Loop: The link between an end-user and the place where the user is connected to a network. It is usually thought of as being between an end-user site and a company office where the user accesses a local network, a long distance network or the Internet.
(Note: the term *last-mile* as used in this study should be considered synonymous with the term local-loop.)

Latency: Waiting time or the time it takes to get information through a network.

Users: The individuals or groups served by a network such as teachers, students, health care workers, law enforcement, state agencies, citizens.

Applications: The content and services required by users such as Interactive Distance Learning (IDL), the statewide human resource and payroll system (SHaRP), Internet, Internet2 and streaming media.

The following methodology was used in this study:

First, characteristics of the networks and their supporting organizations were compared. The characteristics studied include the purpose, infrastructure, user community, applications, cost model, funding model and governance model.

Second, distinctions unique to each network were examined.

Third, collaborative efforts between the network entities were reviewed.

Fourth, findings were derived based on the first three steps.

Section 2: Comparison of networks and organizational attributes

In this section, the basic attributes of each of the three networks and their organizations are compared. A tabular comparison matrix is provided in Appendix A.

(2a) Purpose

Each of the network organizations was created in response to certain specified needs.

(2a.1) The Kan-ed purpose

Kan-ed was created by the Kansas Legislature in April 2001; reference K.S.A. 75-7221 through 75-7227, the Kan-ed Act. Pursuant to K.S.A. 75-7223 (a), "[t]he purpose of this act is to provide for a broadband technology-based network to which schools, libraries and hospitals may connect for broadband internet access and intranet access for distance learning." To fulfill this purpose, Kan-ed has chosen to:

1) Create a "network of networks" by leasing equipment and facilities from approved equipment vendors and Kansas telecom providers.
2) Lower end user costs by bringing the network as close to the constituent as possible (minimize multiple supplier connections to the network).
3) Incorporate as many Kansas telecom providers as fiscally possible to promote local involvement in service delivery.
4) Promote flexibility in the local-loop by allowing local companies to connect using their chosen architecture (DSL, ATM, Ethernet, wireless etc.).
5) Collaborate with private industry in the commercial Internet market. Provide only niche services like video conferencing and access to Internet2 that industry is less capable of providing. *[Note: The Kan-ed Act does not preclude Kan-ed from providing Internet access. Kan-ed has chosen, as its part of the public/private partnership, not to act as an Internet Service Provider (ISP) in order to enhance collaboration and encourage affordable rates in the local-loop environment.]*
6) Support premise equipment purchases and local-loop access through subsidies and/or grants so that constituent institutions who cannot afford the costs of connection "may connect" to the network for Internet and distance learning.

(2a.2) The KanREN purpose

The KanREN network was originally established in 1992 by and for the KanREN higher education consortium. The purpose of the network was to interconnect Kansas colleges and universities (public and private) and provide consortium members with access to the Internet. As the network matured, consortium members directed KanREN to engineer and implement technology solutions not generally available through commercial vendors or the commodity Internet; i.e. multicast, Internet Protocol version 6 (IPv6), Quality of Service and Internet bandwidth redundancy.

In August 2002 KanREN became an independent not-for-profit corporation. The change was directed by the KanREN Executive Committee which became the KanREN Board of Directors. Incorporation allows KanREN autonomy and the ability to quickly respond to member needs. Member institutions retain control and are not bound by the restrictions perceived in other state networks. Control and agility are critical to universities and other member institutions who value KanREN services and the manner in which they are provided.

KanREN is the Kansas representative in regional higher education networks like the Great Plains Network (GPN) and the Abilene network. GPN and Abilene are associated with research and Internet2.

Today the KanREN network transports a variety of applications and services between KanREN-connected institutions. The KanREN mission is "…to provide leadership and innovation in networking technology, and [to provide] excellence and integrity in support of its members."

(2a.3) The KanWIN purpose

KanWIN was created in response to the requirements of state agencies to have access to both an intranet and connectivity to the Internet. Initially created in 1995 to support the state human resource and payroll system, KanWIN has grown to support a wide range of internal state agencies and external e-government applications.

The critical nature of many KanWIN applications (administrative, criminal justice, revenue, social services, transportation, health, legislative, etc.) has required KanWIN to become as reliable, secure, and resilient as possible at the most reasonable cost to the state agency or user community. These considerations remain core to fulfilling KanWIN's purpose today.

(2b) Infrastructure

Networks are built on infrastructure. Each organization has assembled its own infrastructure. Portions of those infrastructures are either shared or interconnected (see Section 4: Collaboration). This section describes the infrastructure and network technologies of each of the three network organizations. For reference, network diagrams are provided in Appendix B.

(2b.1) The Kan-ed infrastructure

The Kan-ed infrastructure forms a network of networks by tying local and regional Kansas networks together through a common backbone.

The network is comprised of access points, connecting circuits and aggregation circuits. Nineteen (19) access points exist throughout the state. Twenty-three (23) medium speed (155 Mbps) connecting circuits are arranged to allow alternate (or redundant) paths

between access points. Eight aggregation circuits exist to connect remote areas to one of the access points. Kan-ed refers to this architecture as an "extended-edge" network. Kan-ed is designed for regional use, statewide use and lower constituent loop costs. Equipment and connections are leased.

Kan-ed contracts with KanREN to manage its network. Last-mile connections between the constituent site and an access or aggregation point are the responsibility of the constituent and their local provider.

The Kan-ed network was designed to support up to 1,000 individual sites. Approximately 210 member sites are currently connected and 57 additional connections are pending.

(2b.2) The KanREN infrastructure

The KanREN network is a star topology consisting of six access points connected to a core location in Lawrence. The connecting circuits are very high speed (155 Mbps to 622 Mbps) and run over leased bandwidth and leased fiber. KanREN orders last-mile connections for member sites using local providers and whatever technology most effectively meets the needs of the member institution.

KanREN runs a Network Operations Center (NOC) in Lawrence for front-line support of its member institutions and Kan-ed (see Section 4: Collaboration). Technical support is provided by a Service Desk. KanREN also has an Applications and Systems group to support certain aspects of network operations.

The KanREN network has approximately 70 connected member sites.

(2b.3) The KanWIN infrastructure

KanWIN was designed for traffic primarily to-and-from Topeka. This is a natural consequence of KanWIN being the state business intranet and Topeka being the 'headquarters' for most state agencies.

The KanWIN network is comprised of three pairs of redundant access points and nine lower speed (40 Mbps) connecting circuits. The network is designed so that all applications continue full operation in the event a single access point or connecting circuit is lost. KanWIN is designed for redundancy, security and reliability. KanWIN processes the leasing of local-loop circuits for its constituents.

KanWIN is managed by a Network Control Center located in the Landon State Office Building in Topeka. The KanWIN network has approximately 625 connected sites.

KanWIN also provides and supports a local area network (LAN) infrastructure located primarily in the Capitol Complex. This infrastructure is shared by state agencies. The

LAN function of KanWIN is not included as part of this study although the costs for this are included in the budget and expense detail in Appendix C.

(2c) User community

Each of the three networking organizations provides connectivity and services to certain types of organizations and end users.

(2c.1) The Kan-ed user community

Kan-ed constituents are defined in the Kan-ed Act. Kan-ed serves schools (K-12, higher education and private schools), public libraries, and not-for-profit hospitals.

(2c.2) The KanREN user community

KanREN serves a consortium of higher education (the board of regents' universities including KU Medical Center, community colleges, private colleges and universities), K-12 school districts, public libraries, and other non-profit organizations with an education or research focus.

(2c.3) The KanWIN user community

KanWIN users are defined in statute KSA 75-4709 and include state agencies, contractors of state agencies, local units of government, K-12 schools, and not-for-profit institutions. In addition, State of Kansas residents also access e-government services hosted on KanWIN such as the Department of Transportation Road and Weather web site. The majority of customers of KanWIN are state agencies and their partners.

(2d) Applications

Applications are the activities end users engage in on the network. This section describes the applications provided by the three networks.

(2d.1) Kan-ed applications

Kan-ed provides various formats for video conferencing and access to Internet2 through KanREN. Kan-ed does not directly provide access to the Internet. The main application on the Kan-ed network is Interactive Distance Learning (IDL). Associated services include video scheduling, video conference bridging and enhanced desk top video. Kan-ed is beginning to support telemedicine and exchange of electronic medical records.

(2d.2) KanREN applications

KanREN provides Internet and Internet2 access. KanREN also provides video conferencing and streaming media services for its member institutions. Some duplication with Kan-ed exists. KanREN hosts certain applications like the KanGuard filtering

service provided by the Northeast Kansas Library System. For the most part, the KanREN network is made available to member institutions to use as a vehicle for applications of their choosing including research projects, web-delivered coursework and advanced computing projects.

(2d.3) KanWIN applications

Typically there are three types of applications operating on KanWIN:

- Applications generally associated with state government (payroll, budget, accounting, law enforcement, etc.).
- Applications providing direct and indirect services for state residents such as driver's licenses, vehicle registration, road and weather information, and access to state information like legislation and statutes (e-government).
- Access to and from the Internet for state agencies.

(2e) Cost model

Each network organization has costs relating to activities beyond support of the network itself. The costs below represent only those costs associated with network operations and support. Costs associated with last-mile connections are not included in any of the models because none of the networks bears that cost for its constituents. Budget and expense information for each organization is contained in Appendix C.

(2e.1) The Kan-ed cost model

In FY2005 the cost of Kan-ed infrastructure and network management was $4,450,130 which includes approximately $415,981 in start-up costs. Projections for FY2006 are $4,235,000. It is estimated the Kan-ed network when fully deployed will cost between $5.25 million and $5.75 million annually.

Kan-ed applies for e-rate and receives funding which lowers annual network costs. To date, Kan-ed has received approximately $470,000 in federal e-rate support. Total projected support from e-rate is $1.6 million. However, because receipt of funds is unpredictable Kan-ed is not able to incorporate e-rate funds into its budget process.

(2e.2) The KanREN cost model

The cost of operating the KanREN network for FY2005 was $2,088,289. The projected total cost for FY2006 is $2,103,570. These figures include software, hardware, circuits and network management but do not include costs associated with management of the Kan-ed network or costs related to supplementary systems services provided for members.

(2e.3) The KanWIN cost model

The cost of operating KanWIN (less the Topeka local area network) is $2,697,425 in FY2005 and $2,403,879 in FY2006. These costs include software, hardware, backbone circuits and network operations costs.

(2f) Funding model

Each network organization is funded in a different manner although all three support public institutions and receive funds from public sources.

(2f.1) The Kan-ed funding model

Kan-ed is directly funded by the State of Kansas. Funding is based on an appropriation of $10,000,000 per year from the Kansas Universal Service Fund (KUSF). Funding began in January 2003. In 2005 the legislature outlined a gradual conversion of appropriations from the KUSF to the State General Fund (SGF) as specified in HB 2026:

> *Not more than the following shall be paid from the KUSF to the state treasurer…: In fiscal year 2006, $10,000,000; in fiscal year 2007, $8,000,000; in fiscal year 2008, $6,000,000; and in fiscal year 2009, $5,500,000.*
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> *The provisions of this subsection (f) shall expire on June 30, 2009. Thereafter, state general fund moneys shall be used to fund the Kan-ed network and such funding shall be of the highest priority along with education funding.*

(2f.2) The KanREN funding model

KanREN was created through a National Science Foundation (NSF) grant. Today KanREN is "self-funded". It receives no funding appropriation from the state and no grant funding. All funds come from the institutions KanREN serves in the form of membership fees, connection fees and fees for service (which include fees paid to KanREN by Kan-ed for network management and support).

Membership fees are assessed based on organization type and size. Large institutions, primarily Regents' universities, pay higher fees and generate 62% of membership fee revenue for KanREN. Connection fees are pass-through fees that reflect the actual cost of the circuit bandwidth, Internet bandwidth, and the cost associated with delivering that bandwidth to the member site (local loop and installation costs). KanREN assesses fees for other services that fall outside the scope of what is provided as a membership benefit.

(2f.3) The KanWIN funding model

The Division of Information Systems and Communications (DISC) operates KanWIN. KanWIN users are charged a monthly subscription rate for connectivity to the KanWIN network. DISC is authorized to establish rates for information technology services under the provisions of K.S.A. 1984 75-4703(a). The Legislature does not appropriate any SGF to DISC to fund KanWIN operations. DISC generates its operating revenues based upon the information technology services provided to customers. DISC revises its rates annually based on its approved budget for the upcoming year. Rates reflect the cost to deliver a particular service plus adequate operating reserves. DISC returns any revenues gained beyond cost recovery the next year in the form of a lower rate. The DISC rate-setting methodology must comply with stringent federal audit and cost accounting guidelines as outlined in OMB Circular A-87, Cost Principles for State, Local and Indian Tribal Governments. Approximately 24% of KanWIN revenues come from SGF and the remaining 76% from non-SGF funds like special revenue and fee funds, federal funds, construction and highway funds and other funds applied for through subscriber agencies.

(2g) Governance model

Each network organization is governed in a different manner.

(2g.1) The Kan-ed governance model

Kan-ed is governed by the Kansas Board of Regents. The User Advisory Council (UAC), the Delegate Assembly (DA) and the Technical Work Group (TWG) are the primary advisory committees created to offer input and direction in the development of the program and the network. The advisory groups are made up of members from the three constituent groups (schools, libraries and hospitals) and the telecom industry.

(2g.2) The KanREN governance model

KanREN is an independent not-for-profit 501(c)(3) tax-exempt organization. KanREN is governed by a 13-member Board of Directors, elected by the membership. The Board consists of two representatives from K-12 member sites, two from community college member sites, two from private college member sites, two from regents' university member sites, one from an Internet2 member university, and three at-large members.

(2g.3) The KanWIN governance model

KanWIN is administered through DISC in the Department of Administration. Two advisory groups consisting of representatives from the KanWIN user community assist in the governance of KanWIN. The KanWIN Policy Board advises DISC on KanWIN policies. The KanWIN Technical Advisory Board advises DISC on technical matters pertaining to KanWIN.

Section 3: Distinctions

This section examines those characteristics of each network organization that distinguishes it from the others. A general distinction is that while KanWIN and KanREN are more or less at steady state, Kan-ed is still growing its connections base.

(3a) Kan-ed

There are three distinctions between Kan-ed and its peer networks. First, it was created by statute and chartered with specific requirements and limits. Second, it operates as a constituent program in addition to a network organization. Third, it addresses last-mile concerns differently than either KanWIN or KanREN.

(3a.1) The Kan-ed Statute

Kan-ed was created by statute. Two sets of interests were involved in formulating the Kan-ed Act, public institutions and the Kansas telecom industry. The result of the political process was a statute containing both requirements and limitations. Kan-ed is required to address broadband internet access and intra-net access for distance learning. However, there are limitations in how Kan-ed can fulfill these requirements. Kan-ed shall not impair existing telecom service contracts, provide for ownership or construction of state facilities or provide voice services (either switched or over internet protocol) unless associated with two-way video.

Kan-ed addressed distance learning by designing its network for video transmission. A high speed, low latency network connecting Kansas distance learning consortiums was deployed. Kan-ed is addressing the internet access requirement by implementing a plan consistent with statutory restrictions.

The Act's limitations reflect private industry's concern about unfair competition from state or municipally funded entities. Industry support was crucial to Kan-ed becoming a reality, and Kan-ed concurs with the concern and pursues a path of cooperation, not competition, with industry. Kan-ed addresses broadband Internet access by working with industry to establish an "integrated" broadband environment. Integration will allow constituent institutions access to the Internet through their local provider who also gives them access to Kan-ed's network for video or Internet2 over either a single or multiple broadband connections. Although not yet statewide, the integrated environment exists and is becoming available in more companies throughout the state.

(3a.2) The Kan-ed Program

Kan-ed is effectively a constituent-based program. The backbone network is a key ingredient in the program but only one ingredient. Other areas addressed by the program include premise equipment support, local loop sizing and pricing, content creation and acquisition.

Many institutions do not have broadband connections to the public Internet or the Kan-ed network because they cannot afford appropriate premise equipment or broadband Internet rates. Kan-ed addresses this need by offering subsidies and grants in support of Internet access and premise equipment acquisition. Other program grants are made available for content creation. Kan-ed also acquires specific content services based on constituent input.

(3a.3) Kan-ed and the Last-Mile

Kan-ed last-mile connections are bandwidth intensive (1.5 Mbps/T1 or greater) and fairly expensive ($400 to $900 per month). This is because applications like distance learning or telemedicine require greater bandwidth to provide classroom quality video. Integrating video with Internet access increases both bandwidth requirements and cost.

Kan-ed addresses last-mile concerns by extending its infrastructure (19 access points in multiple company locations) to minimize dual supplier connections in the last-mile. Essentially, Kan-ed aggregates traffic and pays for a portion of what otherwise would be an extended local loop. Twenty three companies have direct access to the Kan-ed network and the majority of Kan-ed's connected sites have single provider last-mile connections.

Kan-ed does not order or pay for last-mile connections but treats this cost as the constituent's fee for network services. Kan-ed does, however, impact last-mile costs for its constituents. Several companies including Sprint, Cox and SBC have lowered last-mile rates since Kan-ed began its operation. Between rate reduction and single supplier last-mile access, Kan-ed connected institutions can pay between 20% and 50% less than what was experienced for connections and services prior to Kan-ed.

(3b) KanREN

There are three primary distinctions between KanREN and its peer networks. First, it is a membership consortium created by Kansas educational institutions to share ideas, resources and expertise. Member institutions drive the direction KanREN takes including the decision to become a not-for-profit corporation. Second, it provides advanced networking services and technical support for its member institutions. Third, it is unique in the scale and redundancy of its Internet service.

(3b.1) Independence

KanREN is an independent not-for-profit corporation. The KanREN Board of Directors and membership chose to incorporate KanREN for a variety of reasons, chief among them being the need for greater organizational autonomy.

(3b.2) Advanced Networking Services and Technical Support

KanREN provides advanced networking services and advanced technical support to its member institutions. For example, KanREN implemented the next generation of Internet protocol (IPv6) on its backbone network. Because of this KanREN is able to support member institutions in similar implementations. KanREN provides training in network principles and implementation of new protocols upon request.

KanREN also provides access to a nationwide advanced research network – Internet2 – primarily to meet the research connectivity needs of the largest university members of KanREN. Costs associated with Internet2 connectivity are largely passed through to those university members.

KanREN is researching expansion of its network through the use of optical resources.

(3b.3) High bandwidth and Unique Internet Service Delivery

KanREN is unique in its delivery of commodity Internet service. KanREN purchases Internet bandwidth from two providers in different locations and the bandwidth available in either location is sufficient to supply at least 75% of the total amount subscribed to by all KanREN connected members. If one provider experiences a total failure, KanREN is still able to provide at least 75% of the subscribed bandwidth. This redundant provisioning requires no manual intervention or configuration and provides high quality Internet service to KanREN members. Such service is critical for university members for whom an outage of even a few minutes' duration is unacceptable. KanREN members regard the extra cost of purchasing more Internet bandwidth than needed as worthwhile given the mission-critical nature of Internet access for educational institutions.

(3c) KanWIN

There are five primary distinctions between KanWIN and its peer networks. First, it must provide 24x7x365 support for state agency services to the public. Second, it is designed for high resiliency, availability and security due to the critical nature of applications that run on the network. Third, DISC authority and fiscal operations are unique. Fourth, KanWIN provides a shared local area network. Fifth, incorporation of state-owned fiber facilities in expansion planning is unique to KanWIN.

(3c.1) Network Support

KanWIN internally staffs a 24x7x365 Network Control Center (NCC) on a year around basis. This is necessary because multiple state agencies provide services to the public that must be available outside traditional business hours. For example, unemployment claims are busiest on Sunday mornings, the Road and Weather web site must be available during inclement weather, electronic tax submissions occur at all hours of the day or night, and the Kansas Criminal Justice Information System (KCJIS) must operate

continually. Also, many agencies perform after hours 'house keeping' including on-line backups and downloads.

(3c.2) High Resilience, Availability and Security

KanWIN is designed for high resiliency and availability even in the event of the loss of a core network component. Such resiliency is required by certain agency applications like access to bill tracking services during the legislative session, access to the Secretary of State's Electronic Voter Information System during elections and law enforcement's requirements to access CJIS information at all times. KanWIN is designed to be a highly secure network so the state's vital applications are protected from intrusion to comply with stringent federal guidelines for medical and financial privacy. KanWIN must retain the ability to shut down sections of the network in the event of an incursion.

(3c.3) DISC Authority and Fiscal Operations

Authority over state telecommunications is delegated to the Secretary of Administration by statute. Under the Secretary's authority, DISC operates like a private business within state government and charges fees for the services it sells to customers. DISC has "no-limit" funding which means additional services can be purchased to meet increased demand. DISC is not limited to an annual appropriated amount. DISC maintains a 60-day cash flow that provides up-front money for new or unforeseen projects. DISC sets information technology rates annually to recover the costs for a particular service plus an allowance for 60-day cash flow. DISC plans for reinvestment and designs rates to provide for incremental upgrades to its services. A portion of each rate goes to replenish its depreciation reserve fund used for information technology investment. For-profit customers are not allowed on KanWIN unless sponsored by a state agency.

(3c.4) Shared Local Area Network

KanWIN provides a local area network infrastructure in several multi-agency facilities, primarily in the Topeka Capitol Complex. The infrastructure includes building wiring, switch equipment, routing equipment and network management support.

(3c.5) State-owned Fiber Facilities

KanWIN is preparing to move its backbone from carrier circuits (SBC and Alltel) to state-owned fiber to reduce network cost and provide increased capacity. The contract facilitating this move contains restrictions regarding what traffic can be carried over this fiber.

Section 4: Collaboration

(4.1) History

Private networks in Kansas have a history of collaboration. KanWIN and KanREN have been in operation for approximately 10 years. Kan-ed was created in 2001.

KanWIN supported the provisioning of KanREN circuits for most of KanREN's existence. The networks have at times shared bandwidth between LATAs and currently share an aggregation circuit and equipment in Kansas City. Such arrangements allow KanREN and KanWIN to share costs.

Both KanREN and KanWIN supported efforts to establish Kan-ed beginning in 1999. Staff members from both organizations testified before various legislative committees in support of Kan-ed prior to passage of the Kan-ed Act. Both organizations provided technical support and network design services in preparation of the Kan-ed Request for Proposal (RFP) and both participate on the Kan-ed Technical Work Group (TWG).

KanWIN hosted the initial Kan-ed Interactive Distance Learning sites for two years until Kan-ed completed its design and implementation. KanWIN then assisted with equipment configuration during site transition to the Kan-ed backbone.

The Kansas Board of Regents contracts with KanREN to provide network management and engineering services to Kan-ed. KanREN provides day-to-day technical support and front-line diagnostic and restoration services for Kan-ed connected sites.

KanREN hosts Kan-ed servers that provide video conferencing services and schedule distance learning classes. KanREN shares its Network Management System software with Kan-ed and maintains a complex database of network information for Kan-ed.

KanREN is a Sponsored Education Group Participant (SEGP) in Internet2, which allows KanREN to provide Internet2 access to K-12 school districts, community colleges, private colleges and universities, and public libraries. KanREN provides access to Internet2 routes for Kan-ed while Kan-ed provides funding for KanREN SEGP fees.

The Kan-ed, KanREN and KanWIN networks are fully peered which allows KanREN member institutions and KanWIN agencies (the State Department of Education, the Board of Regents and the State Library) to connect to Kan-ed. Also, KanREN and KanWIN peering provides a secure path for transfer of state payroll and human resource data between state systems and regents universities.

(4.2) Roadblocks

Statutory inconsistencies, contract restrictions and concern about competition with private industry act to inhibit collaborative efforts between the networks. KanWIN is preparing to enhance its network through the use of state owned fiber facilities. KanREN

is also investigating optical resources for increased capacity and national network participation. Kan-ed, by statute, cannot participate in such endeavors and could jeopardize its efforts with Kansas industry if viewed as unduly supporting publicly funded competition with private industry.

Section 5: Findings

Three private networks exist in Kansas to support public institutions. KanWIN and KanREN are well established being in existence for approximately ten years. Kan-ed, created by the Kansas legislature in 2001, is still growing. The information presented below is a summary of significant findings by category.

General:

1) Each network was established by different entities under different circumstances.
   a) Kan-ed is part of the Kansas Board of Regents. It was established by statute to provide an intranet for distance learning and broadband Internet access for schools, libraries and hospitals. Competition with private industry is an issue inherent in both the creation and operation of Kan-ed
   b) KanREN is a not-for-profit 501(c) (3) corporation. It was established as a consortium of educational and research institutions to interconnect and provide Internet service to consortium members.
   c) KanWIN is an arm of the Department of Administration. It was established to provide an intranet for state agencies as well as access to the Internet.

2) Each of the networks may serve certain of the same Kansas constituencies. Both KanREN and Kan-ed were created to serve higher education, K-12 schools and public libraries. KanREN serves other not-for-profit institutions while Kan-ed is charged to serve publicly funded Kansas hospitals. KanWIN may serve the same constituents.

3) This study finds no indication that any single institution receives duplicate services from more than one of the network organizations. The fact that each network may serve the same institutions appears to create confusion about who can, or should, provide service, not actual duplication of service.

Funding:

1) Funding mechanisms for each network vary. Kan-ed is funded directly by the state and, to date, charges no fees for connectivity or services. KanREN is funded through annual membership fees and fees for service while KanWIN is funded through monthly service fees. The majority of all funds received by the organizations, either directly or through a fee structure, are public monies from tax supported institutions.

2) Current methods of fee for service funding have not resulted in ubiquitous connectivity. It remains to be seen if direct state funding for Kan-ed will improve the situation.

Network Infrastructure:

1) This study finds duplication of backbone infrastructure exists. Multiple configurations of backbone networking and operation centers exist to accomplish similar purposes. Those purposes being the provisioning of Internet access, intranet services and general data transport and management.

2) Currently all three network infrastructures lease the transport elements (circuits) of their infrastructures. All three aggregate customer traffic at access points and carry traffic to customer designated locations. Beyond that, the infrastructure architectures vary significantly.
    a) Kan-ed has nineteen access points, medium speed connecting circuits (155 Mbps) and 210 connected institutions including the 70 brought to Kan-ed by KanREN. It utilizes approximately 3% of its bandwidth capacity.
    b) KanREN has six access points, very high speed connecting circuits (1000 Mbps), approximately 70 connected institutions and averages 45% to 65% utilization.
    c) KanWIN has three access points, lower speed connecting circuits (40 Mbps) and 625 connected institutions averaging 25% to 75% utilization.

3) All three networks are making independent plans for the future. Kan-ed is planning to issue a second RFP in 2006 aimed an enhancing the efficiency of its backbone. KanREN, as directed by its membership, is investigating options for expanding its backbone using optical resources. KanWIN is preparing to move from vendor leased circuits to state owned fiber for infrastructure connectivity.

4) Consolidation of private network infrastructure may be reasonable in Kansas. However, all three networks have different governance structures and are planning independently using different prerequisites and seeking different outcomes.

5) To determine if infrastructure consolidation is feasible, collaboration must continue and it must produce a comprehensive business case accurately identifying service capabilities, network efficiencies and overall savings including last-mile savings.

Premise and Last-Mile:

1) KanWIN and KanREN order and provide local-loops for their constituents. Both cost average local-loop charges and pass them on to constituents. Kan-ed does not order or provide the local-loop. Kan-ed extends its network to decrease last-mile costs leaving local loop arrangements to the constituent and local provider. Kan-ed considers last-mile cost the constituent's fee for accessing the Kan-ed network.

2) Bandwidth requirements in the last-mile differ between the networks based on applications being served.
    a) KanREN and Kan-ed circuits are generally higher bandwidth due to higher Internet requirements and the requirement to transport video.

b) KanWIN local loops are generally lower bandwidth based on agency intranet requirements and lower Internet access needs.

3) KanWIN and KanREN provide equipment and support at the customer's location as part of the network. Costs for the equipment and support are passed on to customers in the form of fees. Kan-ed subsidizes constituent video, building and network equipment needs through grant programs. Kan-ed considers grants/subsidies critical in enabling constituents to participate in the network.

4) Personnel representing all three networks consider the last-mile the primary hurdle to achieving ubiquitous, equitable, broadband service for state institutions.

Applications:

1) Access to the commercial Internet is a service required by all constituents. KanWIN and KanREN aggregate customer traffic over large connections to the Internet from commercial vendors and re-sell the service to their customers. Kan-ed is working with industry to create local-loop connections that allow the local provider to offer their own Internet service and combine it with access to Kan-ed.

2) Beyond Internet access, applications and services required by Kansas institutions vary significantly. KanWIN supports mission critical services like KCJIS and SHaRP for the State of Kansas. KanREN provides Internet, Internet2 and advanced networking services for its membership. Kan-ed supports video applications (IDL and Telemedicine) and access to Internet2 (through KanREN's SEGP the fees for which are paid for by Kan-ed).

3) Some duplication of video applications exists between KanREN and Kan-ed. Both have invested in the same desk top video conferencing apparatus rather than sharing the application. Both operate H.323 multi-point conferencing units, deploy video streaming services and have IDL applications. However, costs associated with such duplication are minimal amounting to approximately $5,000 annually.

Collaboration:

1) KanWIN, KanREN and Kan-ed have demonstrated the ability to collaborate and work with each other over a significant period of time.

2) It is apparent collaboration alone is not sufficient to achieve ubiquity in connecting Kansas public institutions.

3) Roadblocks in the form of statutory inconsistency, contract restrictions and public policy regarding competition must be addressed if progress is to be made in cost effectiveness and ubiquitous broadband service for Kansas public institutions.

Affordability and Funding:

1) Since KanREN and KanWIN existed prior to the creation of Kan-ed, it is reasonable to ask why a third network (Kan-ed) was necessary. The differences in networking approach demonstrated by Kan-ed have been noted, the primary one being the "extended-edge" concept aimed at lowering last-mile constituent access costs. It is important to note, however, that the availability of state-provided funding is what allows Kan-ed to extend its backbone, making access more affordable to public institutions.

2) The question above may be better stated, is there really a need for an entirely separate network or is a stable funding source the important factor in making network services more affordable and thus available? Kan-ed has demonstrated, as a proof-of-concept, that extending the edge of a network has merit. It has reduced costs to end-user institutions, provided alternate connectivity options and promoted competition in the telecommunications marketplace. It may also be compatible with other infrastructures should consolidation or incorporation of new concepts be envisioned. All this, however, is the result of adequate funding.

3) Finally, if ubiquitous broadband connectivity for public institutions in Kansas is a significant issue then growth is required. Growth will require investment on the part of the state. Collaborative planning can produce a highly efficient and cost-effective infrastructure but not without adequate and stable funding.

Respectfully submitted,

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Executive Director, Kan-ed
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Ms. Denise Moore
Chief Information Technology Office
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Joint Recommendations Regarding Kansas Private Networks

Presented by the Secretary of Administration and the Kansas Board of Regents to the Senate Standing Committee on Commerce and the House Standing Committee on Utilities

January 13, 2006

Foreword

The study and recommendations provided in this document have been prepared by the network organizations serving Kansas public institutions; Kan-ed, KanREN and KanWIN. The study (Tab A) provides lawmakers with a view of how these networks began, how they developed and how they operate today.

The recommendations that follow were derived from the study's findings as well as discussions by study participants during the process. The candor and professionalism of all participants is sincerely appreciated, without it substantive recommendations would not be possible.

The recommendations contained herein are organized in four parts. First, there are recommendations regarding "duplication of services and inefficiencies" between Kan-ed and KanREN. Second, there are recommendations regarding "the manner in which the Kansas wide area network may be incorporated into the Kan-ed network." Third, there are recommendations regarding the "consolidation of state networking." Finally, there are general recommendations in "support of efficient state networking."

A Few Words on Climate

In order to understand the recommendations, it will be necessary to understand the climate in which they were derived. All participants in this endeavor know each other, respect each other and work with each other but represent different interests. Like the Kansas institutions they serve, the network organizations involved in this study differ in their missions and views on how those missions are best served.

All participants agree, however, this study is about efficiency and cost effectiveness in meeting the networking needs of Kansas public institutions. They agree technology is not the primary concern affecting networking in Kansas. Technical answers exist to meet the needs of Kansas residents and institutions. The impediments complicating the Kansas networking landscape are fiscal, organizational, and legal. Such issues exist in and between both the private networking organizations and the telecommunications industry.

The participants also agree there is no "quick fix" for optimizing overall networking costs in Kansas. Backbone infrastructures are being addressed but separately by each network. Also, providing Kansans with a local-loop of sufficient affordable bandwidth in order to access a statewide backbone is a major hurdle to getting public institutions connected.

Recommendations Regarding Duplication of Services and Inefficiencies between Kan-ed and KanREN

No substantial duplication of services between Kan-ed and KanREN exists. Although both networks provide desk top, bridging and video streaming services to constituents and duplicate the technology for doing so, the cost of that technology duplication is only around $5,000 per year. Duplication to a greater extent exists in the provisioning of multiple backbone infrastructures.

Funding for Kan-ed and KanREN is associated with the Kansas Board of Regents or public universities. The Regents receive the Kan-ed appropriation and are responsible for its distribution. Regents' universities supply over 60% of KanREN's membership fee revenues. A means to effectively allocate operating funds for both enterprises may enhance funding efficiency.

KanREN and Kan-ed will address their infrastructures in FY2006 and FY2007. KanREN, by direction of its membership, desires to connect the Regents' universities through optical resources (fiber). Kan-ed desires to increase the efficiency of its extended edge network. The Secretary of Administration and the Kansas Board of Regents recommend unified planning to determine whether a single network infrastructure is, or can be, cost effective. The following items apply to this recommendation:

1) Any infrastructure procurement and implementation must meet the specifications contained within the Kan-ed Act or the Kan-ed Act must be modified to incorporate recommended network specifications.

2) A consolidated plan with statutory modifications as required and a cost analysis for funding efficiency will be prepared during the interim for the 2007 Kansas legislature.

3) The plan will address methods of last-mile access to the network and an approach to public/private partnering with industry. A preliminary diagram of a proposed consolidated infrastructure is contained in Appendix B.

4) Sufficient and stable funding must be maintained to fund a consolidated network, premise support and appropriate last-mile assistance.

5) KanREN and Kan-ed will review sharing Internet traffic. It is recommended the Kan-ed approach to integration be maintained allowing local constituents to choose local provider service should such service be in their best interest. If local service is not in the best interest of the constituent, the consolidated infrastructure may provide Internet access.

Recommendations Regarding Incorporation of the Kansas wide area information network into the Kan-ed network.

The Secretary and Kansas Board of Regents do not recommend incorporation of KanWIN into the Kan-ed network at this time. The networks' constituents are sufficiently diverse to warrant KanWIN remaining independent of Kan-ed. School video and driver's license renewal are dissimilar applications with very different requirements. A network intrusion that is acceptable to a school may not be acceptable to a state agency and it does not appear reasonable to jeopardize one function for the sake of the other.

The following information further supports maintaining separate networks:

1) DISC and KanREN/Kan-ed are different cultures. DISC administers critical services under well established methods of procedure. The governing authority and the rules under which DISC administers KanWIN are complex. Neither Kan-ed nor KanREN operate in such a manner.

2) Incorporation of the networks would require agency approval and assurance that current levels of service would be maintained or enhanced. The same type of approval would be required of Kan-ed/KanREN constituents. Sufficient time for study and socializing of incorporation has not been provided.

3) KanWIN will soon operate on state-owned facilities. This arrangement is incompatible with the Kan-ed Act which requires leasing facilities. If incorporation of the networks is to occur, this situation must be addressed and more facts specific to the cost effectiveness of ownership verses leasing are required.

Essentially, the Secretary and Board believe it best to approach the issue of network efficiency in a judicious manner. KanREN and Kan-ed should consider a single "educational" infrastructure. If that is feasible, then incorporating KanWIN should be re-considered. However, the Secretary and Board recommend KanWIN be involved in the KanREN/Kan-ed planning process. That involvement will maximize opportunities for future efficiencies without network re-design. Those opportunities include:

1) Lower constituent last-mile costs
2) Sharing resources
3) Operational efficiencies

Recommendations Regarding the Consolidation of State Networking

State networking in Kansas lacks a common focus. Three networks exist and each has an individual focus and separate plans for growth and performance enhancements. A common focus is required so that planning activities can be coordinated and optimized for joint benefits and shared expense.

To reduce existing duplication of infrastructure and management facilities in all of the networks, the Secretary and Kansas Board of Regents recommend consolidation of network and network management facilities if feasible. Systematic integration of existing networks into one shared core should provide improved cost-benefit performance. The goals of consolidation should be to preserve the unique interactions, agreements and service level expectations developed by and for each of the existing networks. Consolidation should provide a highest common denominator functionality that satisfies the requirements of each collaborating entity, provides uniform availability of services, increases service capability, increases stability and reliability and leverages expertise to the benefit of constituents of all existing networks. Consolidation should also provide the required services at a minimized cost.

The Secretary and Board view the overall consolidation process as complex and time consuming, requiring each network group to do significant technical work as well as generate appropriate business procedures and policy. Each existing network was built independently for the benefit of distinct constituent groups and each will have to adapt. No single network organization independently provides the full suite of services to all constituent groups represented by the sum of the three networks. It is the infrastructure and services operated in common between the networks that represent the greatest potential while preserving the specialization provided to each constituent group (State Administrative Computing, Higher Education, and K-12 Education, along with related library and Hospital groups).

A consolidation plan with a common focus and adequate check points to assess feasibility and effectiveness is outlined below. This plan is intended to result in legislative proposals in the 2007 legislative session.

Phase 1: The primary participants are Kan-ed and KanREN in association with the Kansas Board of Regents. KanWIN shall participate in all discussions in preparation for Phase 2 of this plan.

Develop service and responsibility definitions and clarify communication to all constituents (schools, libraries and hospitals).

Evaluate and plan for a common Kan-ed/KanREN core network. Planning should focus on eliminating duplicated core infrastructure and providing universal service availability. The envisioned core infrastructure will provide redundancy, scalability, security and logical partitioning of network needs.

Implement a common Kan-ed/KanREN core network should the planning process produce clear and convincing evidence of cost benefits and service. Authority is provided through the Kan-ed statute and approval for implementation should be provided through the Kansas Board of Regents and the KanREN Board of Directors. If it is determined that policy precludes implementation, necessary statutory changes will be proposed in the 2007 legislative session.

{Note: KanWIN integration with the Kan-ed/KanREN core will be more difficult because of the expectations of KanWIN's constituent groups, the many facets of State Administrative Networking and because different security and application profiles exist between administrative networks and education networks. Therefore, consolidation of infrastructure on a single common network is recommended to be done as Phase 2 of the consolidation plan. It should be undertaken only after the education elements have been consolidated and after detailed study and preparation is complete.}

Phase 2: Primary participants are KanWIN and a joint Kan-ed/KanREN project team.

Perform a detailed study of the benefits and requirements to consolidate the KanWIN infrastructure and its management with the optimized Kan-ed/KanREN network.

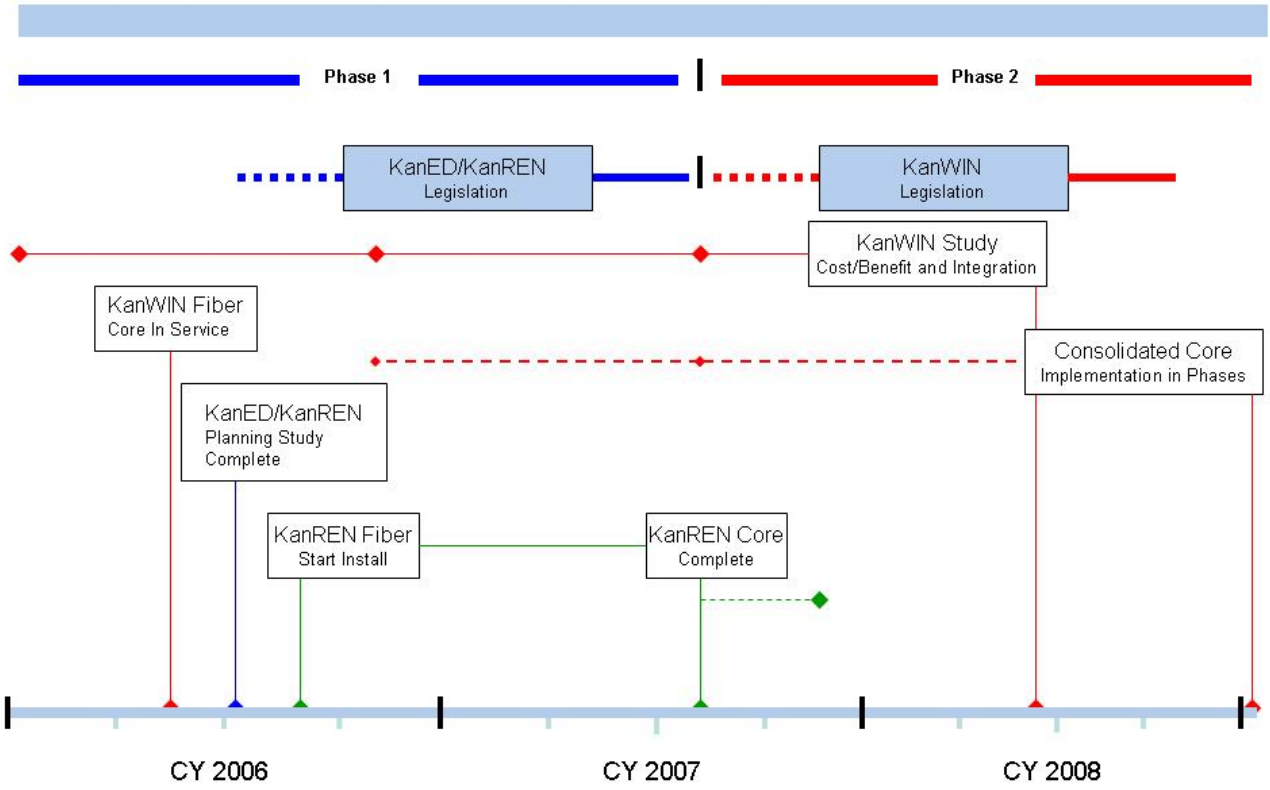
Develop a detailed plan designed to provide maximum consolidation, integration, functionality, security, stability, and economy in a network infrastructure shared and leveraged with Kan-ed/KanREN and KanWIN. It is anticipated this plan will be complete after the Kan-ed/KanREN core infrastructure consolidation, but intermediate opportunities may be identified and pursued during joint collaboration on the process.

Implement Phase 2, a completely consolidated Kan-ed/KanREN/KanWIN infrastructure should the above process produce clear and convincing evidence of cost benefits and service enhancement. Authority is provided through the existing delegation of state telecommunications authority to the Secretary of Administration and any modifications to statutes resulting from the above process. It is anticipated implementation of Phase 2 will take place after the 2007 legislative session.

A potential timeline for the activities associated with Phase 1 and Phase 2 of this process is provided on the following page.

Potential Timeline

(The report details contingencies which may advance or retard task completion)



General Recommendations in Support of Efficient State Networking

To enable the networks to provide a unified infrastructure and the greatest potential service levels and function, the Secretary and Board recommend obstacles to execution be removed. The issues are:

1) Kan-ed enabling legislation requires all network circuits and equipment be leased. The initial network implementation is a leased infrastructure of circuits and equipment. A consolidated core network which leverages State owned fiber or equipment, and/or fiber and equipment acquired or leased by KanREN will yield maximum obtainable integration and will possibly be a significant cost savings. This would require a change to the Kan-ed statute.

2) KanWIN plans to convert its core transport from leased circuits to State owned fiber. Use of this fiber, as part of the consolidated core infrastructure would permit all state constituents to benefit if their traffic can be carried over this fiber and would be an incentive to combine the KanWIN core network with the Kan-ed/KanREN core network to yield a single central infrastructure. This should result in transport savings and enhance functionality. Removal of any traffic type restrictions originating from state constituent groups will allow the KanWIN services to be provided to users and agencies who wish to use local broad band network providers to connect to the State administrative services. This will become increasingly important as the number of applications that require broad band bandwidth increase in use by state agencies and if access from citizen and employee residences to state administrative applications that require broad band becomes prevalent. The connectivity options to the present Kan-ed network permit this today, but will be prohibited, for agency and administrative use, if the contract governing the use of state owned fiber, to be used as core transport, prohibits the transport of traffic, aggregated from points on the Kan-ed access points, to state offices in Topeka.

3) Prohibitions against traffic types or applications on one network that will prevent that traffic from being used on a consolidated core network should be removed. Plans for voice over IP (VoIP) on KanREN and KanWIN will prevent consolidation with Kan-ed unless this provision is relaxed for shared infrastructure.

4) Consistent public policy to encourage collaboration with private sector providers for network services, the peering of networks and extended loop service to constituents having functional requirements that dictate it. It is desirable that public policy promotes clear communication with private industry and that open connectivity and collaboration be enabled between any consolidated state infrastructure and the various segments of the private telecommunications industry in Kansas.

The Secretary and Board recommend establishment of a funding mechanism that will reliably support combined network requirements. In order for the separate network teams to confidently strive for efficiency and maximize integration and functional and operational consolidation, there must be a committed and dependable funding mechanism. Each entity, responsible for services to a specialized group of constituents, will have to be confident in the funding commitment and stability of the consolidated, shared infrastructure in order to consider changing the status quo.

Finally, it does not appear to be optimally efficient to have three separate autonomous networks and organizations. For plan success, some coordinating authority is required. The Secretary and Board recommend the legislature develop an organizational structure to operate the consolidated network while remaining responsive to individual constituent group requirements. Management of the infrastructure is related to the funding mechanisms and the budgeting process. There is a need for a management and responsibility process to evolve that will be able to collaborate with and to collect the requirements of each constituent group (Administration, Higher Education and K-12 and others). This functional entity will have to communicate funding need and arbitrate competing requirements. It will have to determine policy relevant to the core infrastructure and negotiate connectivity by state constituents and private network enterprises in order to increase efficiency in the provisioning of networking for State of Kansas institutions.

Historically, DISC, KanREN, and Kan-ed have focused on specific constituent groups and each provides specialists which plan, develop, implement and maintain the network and applications. The new organizational structure must effectively integrate these resources as well as operate the core infrastructure, implement network and security policy and business management.

The new organizational entity should pursue public/private partnerships to address broadband and last-mile issues. The organization could align Kansas policy with emerging Federal legislation establishing Universal Service and Telecom Policy. Many states are working toward such partnerships. Creation of a broadband authority, commission or council with department level influence and both public and private sector appointments is becoming more prominent in state government thinking. Such an organization may be appropriate for Kansas.

Respectfully Submitted,

Reginald Robinson
President and Chief Executive Officer
Kansas Board of Regents

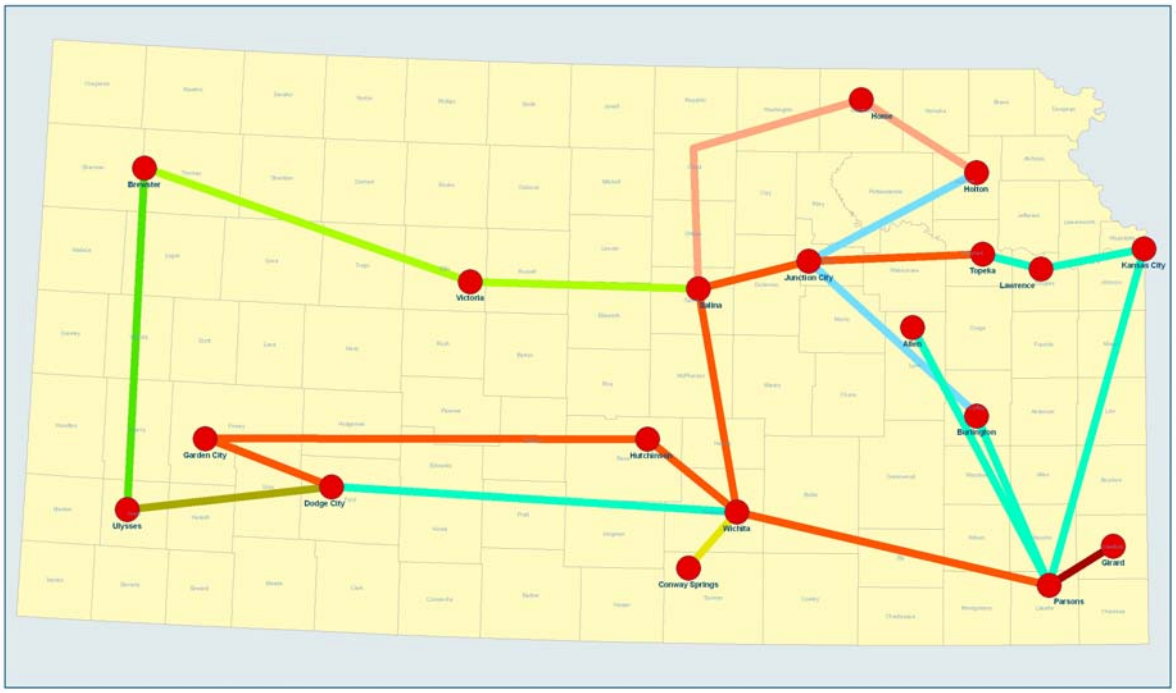
Duane Goossen
Secretary of Administration
Department of Administration

Appendix A: Network Comparison matrix

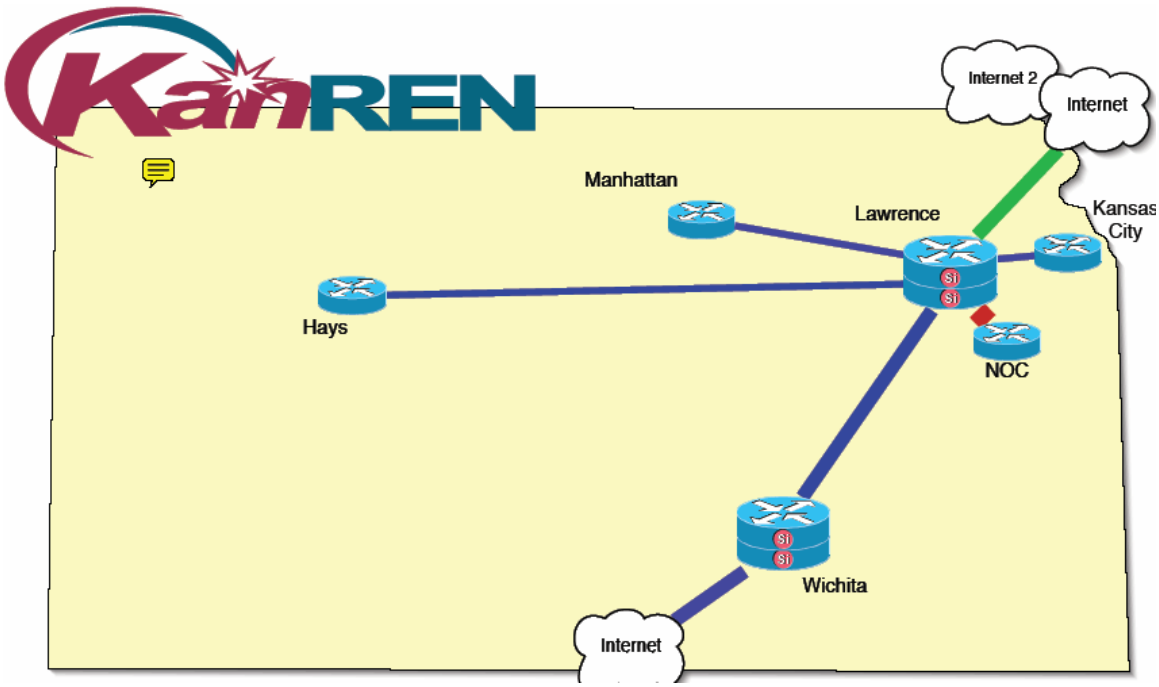
	Kan-ed	**KanREN**	**KanWIN**
Purpose	Provide a broadband technology-based network for schools, libraries and hospitals.	Provide internet access to member sites and transport for a variety of applications and services.	Provide for state government network needs, both agency internal applications and public e-gov applications.
Infrastructure	Medium speed extended-edge backbone. Last-mile connections aggregated at 19 access points. 210 sites.	High speed star topology backbone. Last-mile connections aggregated at six access points. Extended local loops, 70 member sites.	Lower speed core backbone. Last-mile circuits aggregated at three access points. Extended local loops, 625 connections.
User Community	Schools (K-12 and Higher Ed) libraries and hospitals.	Higher-ed, K-12, public libraries, other not-for-profit organizations.	State agencies, local government, K-12, other not-for-profit organizations, state residents.
Applications	IDL and desktop video. Access to Internet2. Telemedicine and Electronic Medical Record (EMR) transfer are pending.	Access to the public Internet and Internet2. Network available to member institutions to use as required.	State government applications (payroll, budget, accounting etc.) and access to the Internet. E-government services for state residents.
Cost Model	Total operating costs FY05 $4,450,130. Projected FY06 is $4,235,000. E-rate lowers cost but is unpredictable.	Total operating cost for FY05 was $2,088,289. FY 06 is projected at $2,103,570.	Total cost in FY05 was $2,697,425. FY06 projected at $2,403,879. 24% of revenues from SGF and 76% from fees and other funds.
Funding Model	State funded through KUSF. Transitioning to SGF.	Fee based. Types of fees are membership, connection, and other services.	Rate based. DISC establishes rates for services, revises rates annually.
Governance Model	Governed by the Kansas Board of Regents. Advisory Council, Delegate Assembly and Technical Work Group offer advice.	A 501(c)(3) tax-exempt organization. Governed by a 13 member Board of Directors elected by the membership.	Under Secretary of Administration. Policy Board & Technical Advisory Board advise DISC on policy and technical matters.

Appendix B: Network Diagrams

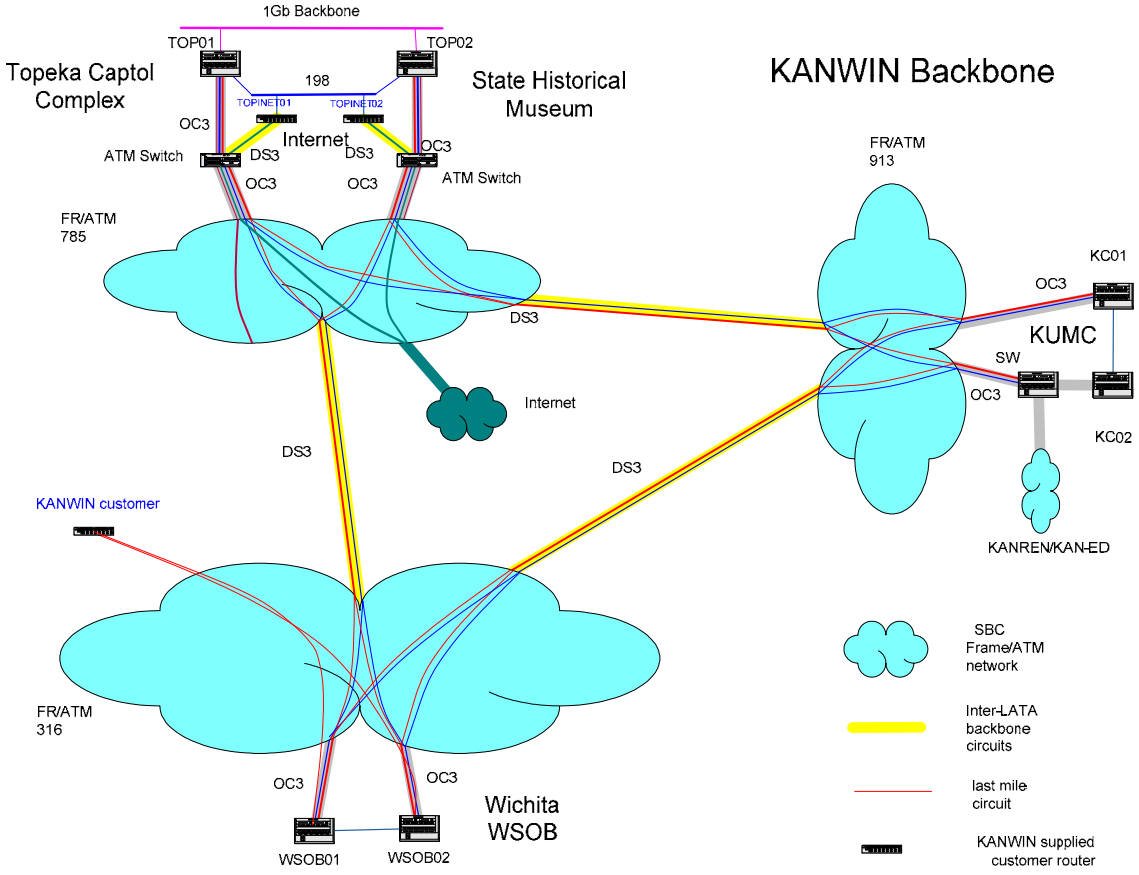
The Kan-ed Infrastructure



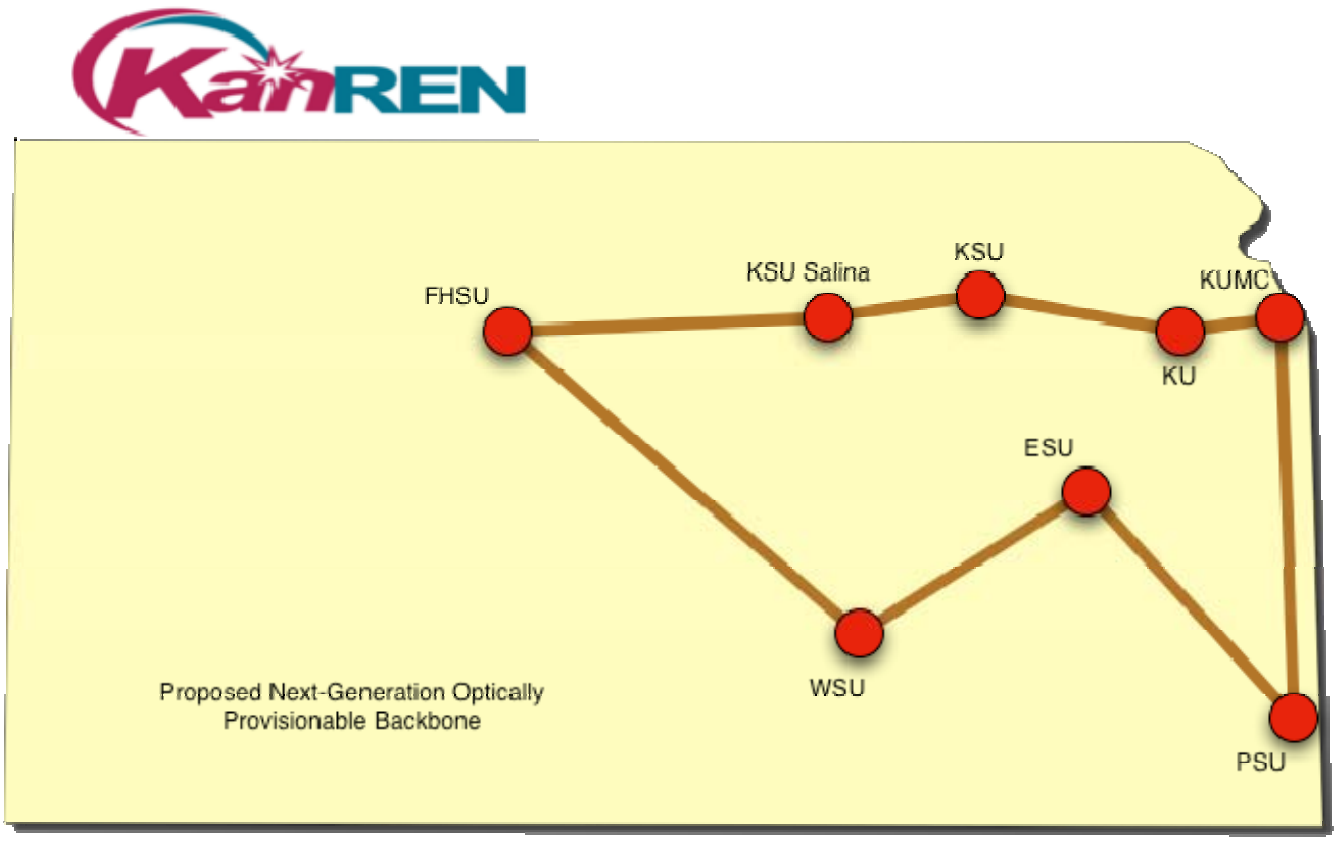
The KanREN Infrastructure
(Current View)



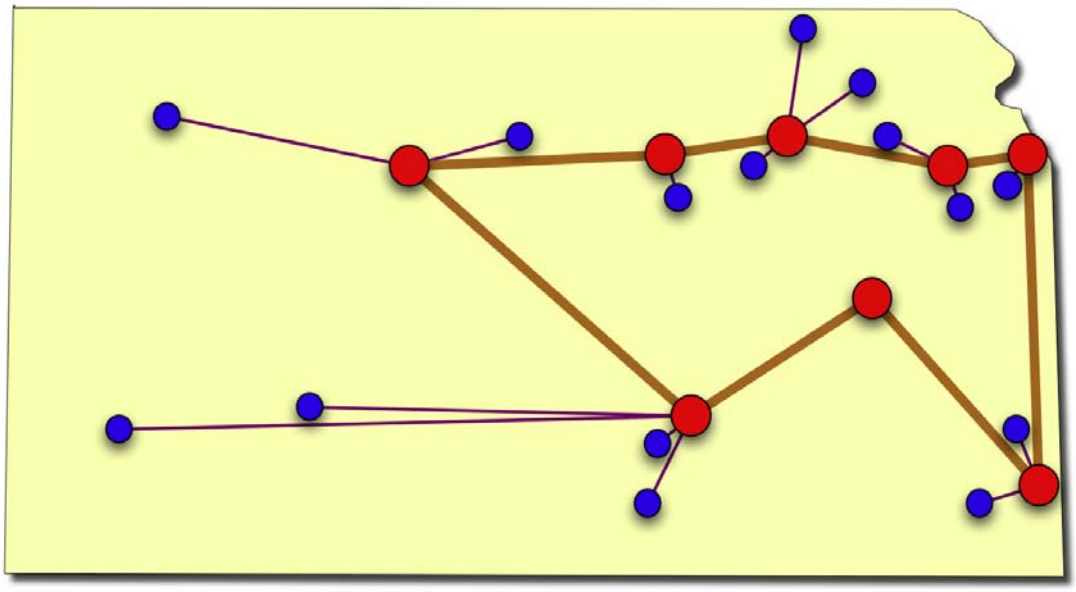
The *KanWIN* Infrastructure



A Proposed KanREN Infrastructure
(Future)



A Proposed View of a Consolidated KanREN/Kan-ed Network
(Future)



Appendix C: Budget and Expense Information

Kan-ed Budget	FY2005 - Actual	FY2006 - Estimated
TOTAL SALARIES AND WAGES (9 FTE plus KBOR Assessment)	**$663,291**	**$694,950**
Office Administration (Postage, Freight & Express Delivery, Printing, Rents, Travel)	196,359	184,800
Fees-Other Services (Content)		x
State Library - Research and Education Databases	812,772	817,000
KHA - EMSystems	248,454	248,454
LearningStation - Kan-ed Empowered Desktop	360,738	1,217,000
Teleconnect Chronically Ill Kids Telemedicine	50,759	100,000
Marratech	12,760	200,000
Higher Education Strategic Connectivity and Planning	4,223	750,000
Technical Services		
Ntwk Management, Technology Rich Classsrooms, General	115,840	1,000,000
Professional & Technical Consulting		x
Technical Implementation and Project Planning Consulting	415,981	225,000
KAN-ED Live! Web Broadcasts, Renovo Annual Maintenance	902,313	300,000
E-Rate consultant	(included)	75,000
Evaluation & Research / Survey Team	(included)	425,000
Leased Equipment/Connectivity and Services	3,781,753	3,000,000
Membership Fees & Subscriptions (Statenets, net@edu, KanREN, Arin)	91,464	20,500
Conference & Conference Sponsorship	37,870	75,000
Kan-ed Regional Chair Development (7 x $2500 & 7 x 2000)	10,338	14,000
TOTAL CONTRACTUAL SERVICES	**$7,041,624**	**$8,651,754**
TOTAL COMMODITIES (Food & Forage, Professional Supplies, Office Supplies)	**$22,724**	**$30,000**
Network Equipment & Microcomputers	136,556	10,000
Computer Hardware & Office Furniture	25,181	15,000
MCU Bridge	0	130,000
Computer Software	1,855	10,000
TOTAL CAPITAL OUTLAY	**$163,592**	**$165,000**
Content and Services Mini-Grants, General Grants	311,995	100,000
Access Parity Program (I1 and I2)	805,622	2,250,000
Enhancing Technology Equipment Grant Program	839,715	1,300,000
TOTAL GRANTS/SUBSIDIES	**$1,957,332**	**$3,650,000**
TOTAL EXPENDITURES	**$9,848,563**	**$13,191,704**
Carryover FY05		($1,500,000)
TOTAL EXPENDITURES		**$11,691,704**
E-RATE DISCOUNT (65%) on Network Connectivity/Leases		($1,700,000)
TOTAL EXPENDITURES AFTER E-RATE		**$9,991,704**

Figures shaded in green count toward network expenditures.

Network Expenditures: FY2005 = $4,450,130 FY2006 = $4,235,000

KanREN Budget	FY2005 - Actual	FY2006 - Estimated
Revenue:		
A la carte Services	35,273	35,000
Fees (Circuit, Conference, GPN, Hardware, UNL)	335,290	1,307,417
Internet Fees (including connection fees in '05)	1,495,932	528,100
Kan-ed Fees (NOC, Management)	1,135,658	910,500
Membership Fees	609,329	614,500
SEGP Management & Misc. (includes interest, e-rate in '05)	64,728	38,000
Total Revenue	**$3,676,210**	**$3,433,517**
Expenses:		
Personal (Salaries, Benefits, Travel, Training, Tools)	439,889	421,000
Office (Marketing, Maintenance)	1,600	5,500
Administrative (Accounting, Fees, Dues & Subscriptions)	49,988	31,000
- Consulting	0	25,000
Consortium (Conference, Training, Meetings, Postage/Delivery, MCU, Reserve)	25,794	99,000
- GPN Infrastructure Fees	183,500	176,000
- SEGP Membership	38,000	38,000
- Depreciation Equipment	80,038	85,000
- Depreciation Site Equipment	87,471	130,000
- Depreciation Furniture	2,917	3,000
- Site Equipment	3,228	0
- Erate expense	52,426	0
- Depreciation Capital Lease`	-1,710	0
Backbone & Server Expense (Backbone Hardware, Servers, Router Maintenance)	31,455	35,000
Connectivity Expense (Backbone Ckts, Internet Charges)	1,523,832	1,496,850
- Miscellaneous Connectivity & UNL Cross Connect	3,950	0
NOC Expenses	1,003,246	835,500
Total Expenses	**$3,525,624**	**$3,380,850**
Revenue:	**$3,676,210**	**$3,433,517**
Expenses:	**$3,525,624**	**$3,380,850**
Balance for Reserves:	**$150,586**	**$52,667**

Figures in Blue count 100% and figures in red count 32% toward network expenses.

Network Expenditures: FY2005 = $2,088,289 FY2006 = $2,103,570

KanWIN Budget Information:

Expense Category	FY 2005	FY 2006
KANWIN WAN Direct Costs		
Salaries and Wages	$324,397	$248,297
FTE Assigned	9.74	6.94
Space	28,680	19,163
Operating Cost		
Network Diagnostic Maintenance	$8,405	$20,760
Internet Access	79,905	78,995
Bandwidth & Collector Circuits	392,724	354,766
Router Maintenance	202,140	174,587
Other	103,326	13,501
Depreciation		
Existing Router Infrastructure	$301,899	$99,182
Router Infrastructure Upgrades	0	147,982
Wiring	350,079	346,239
Subtotal WAN Direct Costs	$1,791,555	$1,503,472
KANWIN WAN Indirect Costs		
Director's Office	$44,490	$14,388
Fiscal Management Services	35,000	30,770
Network Management	157,025	147,486
Network Operations	194,564	140,443
Internal WAN Support Costs		
Security	$0	$299,063
Technical Labor	474,791	160,797
Network Recovery	0	107,459
Subtotal WAN Indirect Costs	$905,869	$900,408
Total KANWIN WAN Costs	**$2,697,425**	**$2,403,879**
KANWIN LAN Costs	$2,440,183	$2,013,181
Other Indirect Costs in the KANWIN Rate	715,642	509,314
Total KANWIN Costs to Recover	$5,853,250	$4,926,374

Shaded figures count toward network expenditures.
Network Expenditures: FY2005 = $2,697,425 FY2006 = $2,403,879