Agency	Project	FY2005-06	FY2006-07
Department of Education	Distance Learning—Infrastructure, Programming, and Training	$10,000,000	$10,000,000

SUMMARY OF REQUEST (Executive Summary from the Proposal)

The Distance Learning—Infrastructure, Programming and Training Project intends to capitalize on the three strategic initiatives of the NITC in order to improve the access, content and training opportunities of distance learning to address the essential education expectations for all Nebraska schools. These initiatives include:

- Network Nebraska.   The primary objective of Network Nebraska is to develop a broadband, scalable telecommunications infrastructure that optimizes the quality of service to every public entity in the State of Nebraska.   Potential benefits of Network Nebraska include lower network costs, greater efficiency, interoperability of systems providing video courses and conferencing, increased collaboration among educational entities, and better use of public investments. Specific technologies required: Network routers that can ensure differentiated qualities of service for various data applications.

- Statewide Synchronous Video Network. This initiative will establish an Internet Protocol-based, high bandwidth network that will interconnect all existing and future distance learning and videoconferencing facilities in the state. Benefits include greater sharing of educational courses and resources; more efficient use of available resources; and one-to-many videoconferencing capabilities for alerts and emergency situations. Specific technologies required: School site routers, Aggregation point routers, School site Codecs (Coder-Decoders), School LAN upgrades, Distance learning scheduling/management system.

- Nebraska eLearning Initiative. This initiative will promote the effective and efficient integration of technology into the instructional process and will utilize server-based course management software to deliver enhanced educational opportunities through web-based instruction. A standards-based eKnowledge repository will provide students and teachers equitable access to rich instructional resources. Specific technologies required: Primary and Secondary course management software servers, Digital content library, School site content servers, eKnowledge repository server.

FUNDING SUMMARY

Network Nebraska

Account Description	FY 06 Adj Req	FY 07 Adj Req	Ongoing
Backbone Transport Costs (preK-12)	$ 500,000	$ 1,000,000	$ 1,500,000
Subtotal	**$ 500,000**	**$ 1,000,000**	**$ 1,500,000**

Statewide Synchronous Video Network

Account Description	FY 06 Adj Req	FY 07 Adj Req	Ongoing
School Site Router Hardware	$ 800,000	$ 800,000	$ 0
School Site Router Maintenance	$ 250,000	$ 250,000	$ 250,000
Aggregation Point Router Hardware	$ 1,300,000	$ 0	$ 0
Aggregation Router Maintenance	$ 200,000	$ 200,000	$ 200,000
School Site Codec Hardware	$ 1,500,000	$ 1,500,000	$ 0
School site Codec Maintenance	$ 200,000	$ 200,000	$ 200,000
Ancillary Equipment/LAN upgrades	$ 1,200,000	$ 1,700,000	$ 500,000
Scheduling/Management system	$ 745,000	$ 725,000	$ 350,000
Training and Support	$ 200,000	$ 200,000	$ 200,000
Subtotal	**$ 6,395,000**	**$ 5,575,000**	**$ 1,700,000**

eLearning Initiative and Knowledge Repository

Account Description	FY 06 Adj Req	FY 07 Adj Req	Ongoing
Course Mgt Software Licensing	$ 60,000	$ 100,000	$ 160,000
Primary, Secondary Server/Licensing	$ 175,000	$ 330,000	$ 295,000
Discovery Digital content library	$ 125,000	$ 250,000	$ 250,000
Site-based content servers	$ 1,650,000	$ 1,650,000	$ 0
Content server installation	$ 300,000	$ 300,000	$ 0
Training and Support	$ 245,000	$ 245,000	$ 245,000
eKnowledge Repository	$ 300,000	$ 300,000	$ 300,000
Acute content shortage resources	$ 250,000	$ 250,000	$ 250,000
Subtotal	**$ 3,105,000**	**$ 3,425,000**	**$ 1,500,000**

PROJECT SCORE

Section	Reviewer 1	Reviewer 2	Reviewer 3	**Mean**	Maximum Possible
III: Goals, Objectives, and Projected Outcomes	12	14	14	13.3	15
IV: Project Justification / Business Case	25	20	25	23.3	25
V: Technical Impact	16	20	18	18.0	20
IV: Preliminary Plan for Implementation	6	8	9	7.7	10
VII: Risk Assessment	6	8	10	8.0	10
VIII: Financial Analysis and Budget	10	15	19	14.7	20
			TOTAL	**85**	100

REVIEWER COMMENTS

Section	Strengths	Weaknesses
III: Goals, Objectives, and Projected Outcomes	- The narrative provides a good overview of the scope and intent of the project. - Strong tie to the objectives of the Ed Council - Outcomes and beneficiaries very well defined. Outcomes are clearly in line with current NITC direction of Network Nebraska in terms of traffic aggregation, collaboration and open standards support.	- The narrative does not include any indication of how the content will be provided. The infrastructure must be put in place to deliver content, however, the content must be readily available and it is not clear how this content will be developed. - Statewide scheduling system is not a given and may not be needed; proposal seems very "centralized" compared to a more robust, regionalized, redundant which would be more a efficient transport bandwidth. - While measurement and assessment methods do appear to be a bit weak they are simply a construct of methods from other projects which are well defined. While this is nominally a weakness it is not a functional problem.
IV: Project Justification / Business Case	- The narrative provides solid fiscal and technical justification for moving forward with this proposal. - The potential benefits to the project are truly phenomenal. In addition to the well stated benefits of the project there is a significant but more esoteric benefit to be gleaned. This project would play a significant role in bridging the digital divide not only from and education perspective but also in a secondary way from an economic development perspective. The presence of high bandwidth IP services in local telco/cable COs will facilitate availability of those services to business, local government and private customers as well as K12.	- Overlooks the value of the current installed infrastructure when only states $20M; tendency to oversell benefits--may not be lower network costs; expand on opportunities there will be; minimizes tech support/role of ESUs; QoS of "carts"--don't oversell
V: Technical	- The narrative provides information on how the	- The narrative does not adequately provide an

Section	Strengths	Weaknesses
Impact	proposed technology offers a better technical fit for K12 schools along with an indication of the greater cost-effectiveness of this solution. - Better use of current bandwidth; in line with current state standards/recommendations - Distance learning specifications are well defined for a document at this level	indication of how "server farms" will be used and the content they will house. Most importantly, ongoing costs of these server farms are not mentioned nor is there any indication of inducements for teachers to provide content. - Network design vague; providers may determine design and price based on $$ available; centralized vs. distributed design a concern (related to eLearning initiative). - E-Learning implementation guidelines are not well defined. While a general plan is in place no standards are specified to guarantee interoperability or upgrade protection.
VI: Preliminary Plan for Implementation	- The narrative addresses the minimum technical information with some mention of the content that will be delivered. - For a document at this level of development this is fine - though obviously there is a tremendous amount of detail work and problem solving that is glossed over.	- The narrative does not adequately address incentives for content development or how this will be funded. - overly optimistic about moving remaining schools not using statewide backbone--July 1, 2005 not possible.
VII: Risk Assessment	- The narrative provides some overview of likely barriers to adoption as the local level. - There are very few risks to this approach from a technology point of view. In fact - this approach moves from a very high-risk implementation (the current non standardized aging implementation) to a standardized lower risk model. The assessment that risk will be in terms of end user buy-in is very accurate and seems to be appropriately anticipated and addressed.	- The narrative does not adequately factor in the likely resistance of those urban districts that may not see the value of distance learning within their district. - overlooks power of local control attitude of local regional DL coordinators; big political battle looms.
VIII: Financial Analysis and Budget	- The narrative provides an accurate overview of how the proposed monies will be spent. - Seems to be reasonable assuming skilled and progressive project management. Good project management and implementation team leadership will be an absolute key to both functionality and staying under budget. This cannot be done in a business as usual fashion but must be designed up as a scalable open standards based future proofed solution - which is not a model that K12 has consistently adopted in the past.	- The notion of achieving postalization of Internet rates in this fashion puts the State in a position of funding schools differentially. Further, unless the plan is tied to consolidation practices the full economic benefit cannot be realized. Finally, no incentive is provided to urban districts that might be interested in producing content if there were financial incentives. - without knowing actual network design, costs of network questionable; schedule system dollars need not established.

EDUCATION COUNCIL COMMENTS

The Education Council encourages continued efforts to seek other funds and to work with providers to keep annual (recurring) costs to schools at or about the same rate as they currently pay. If this funding request is not successful or only partially successful, there is an additional risk that schools will cease to participate in distance learning and the network upgrade project due to increased costs. However, that same risk exists if the system is not upgraded with State sponsorship and the annual costs increase significantly when a new contract comes due. We encourage the NITC, its work groups, task groups, and councils to continue to coordinate discussions to find a mutually beneficial solution for the telecommunications providers and the educational community.

APPENDIX

AGENCY RESPONSE TO REVIEWER COMMENTS

Section	Agency Response to Reviewer comments in *bold italics*
	Weaknesses
III: Goals, Objectives, and Projected Outcomes	- The narrative does not include any indication of how the content will be provided. The infrastructure must be put in place to deliver content, however, the content must be readily available and it is not clear how this content will be developed. ***This is an excellent question and due to the brevity and technical nature of the I.T. project proposal, it was not described in detail. The content or programming portion of the proposal will be addressed through several different mechanisms in order to achieve equitable educational opportunity.*** ***First, the Synchronous Video Network Upgrade will allow each school the capacity to send and receive multiple, simultaneous videoconferencing channels in order to enhance their course exchange with other schools. The NITC Technical Panel's Statewide Synchronous Video Work Group has been discussing the implementation of an entrepreneurial approach to course origination that would stimulate content development for small and large schools. The same system also allows ad hoc, just-in-time videoconferencing to occur with science centers, museums, and informal education centers from all over the country.*** ***Secondly, the eLearning Initiative (Section VIII: Financial Analysis and Budget) identifies purchase of a Discovery Digital content library which is the rich media resources that will be accessible to every school, teacher and learner for immediate download or for enhancement of web-based courses.*** ***Thirdly, the eLearning Initiative provides for an eKnowledge Repository that functions as the digital storehouse for teacher-developed and commercial content. Searchable, retrievable, and compliant with SCORM standards, the courses, modules, or units of instruction will be able to be exported to the Repository from any major course management software server. Also, the eLearning Initiative identifies $250,000 per year for acute content shortage resources. This may include the purchase of distance learning teacher contracts who can offer a variety of video and online courses (e.g. Foreign Languages, Calculus, AP courses) to a number of schools across the State throughout the day. It also allows for purchase of content from commercial providers (e.g. Class.com, NovaNet)*** - Statewide scheduling system is not a given and may not be

Section	Agency Response to Reviewer comments in *bold italics*
	Weaknesses
	needed; proposal seems very "centralized" compared to a more robust, regionalized, redundant which would be more a efficient transport bandwidth. ***NDE agrees that a statewide scheduling system may not be needed. Regionalization of education programming is an attractive option to reach self-sufficiency and one that is being discussed by the Statewide Synchronous Video Work Group; either within community college areas or within a consortium of schools or Educational Service Units.*** ***True, early results from the IP-based video system used by the Southeast Nebraska Distance Learning Consortium show that school-to-school interaction and course exchange can occur without a scheduling system. However, to facilitate a true Statewide Synchronous Video system, some mechanism needs to be put in place to allow other communities of interest to interface with education and to allow outside entities to view scheduled usage and open opportunities to use videoconferencing facilities without having to place a phone call or e-mail to each site coordinator.*** - While measurement and assessment methods do appear to be a bit weak they are simply a construct of methods from other projects which are well defined. While this is nominally a weakness it is not a functional problem. ***Indeed, each Initiative within the overall project proposal will have its own measurement and assessment methods. The "increased number of educational opportunities and instructional resources should translate into increased student progress and achievement and more equitable learning for students all over the State" is the overall goal that would also lend itself to subsequent measurements.***
IV: Project Justification / Business Case	- Overlooks the value of the current installed infrastructure when only states $20M; tendency to oversell benefits--may not be lower network costs; expand on opportunities there will be; minimizes tech support/role of ESUs; QoS of "carts"--don't oversell ***Although the third paragraph in this section refers to very large bandwidth (DS3 or 45 megabit connections), the wording probably does not adequately address the foresightedness of the original projects to trench fiber to 95% of Nebraska's high schools. The "lower network costs" refers to the cost comparison between upgrading as an entire system versus upgrading as individual schools, ESUs or distance learning consortia.*** ***Under Item #5 Networking, it is true that ESUs have done a great job with Internet aggregation, consolidating 500+ school districts into eight major Internet aggregation points. Network***

	Agency Response to Reviewer comments in *bold italics*
Section	**Weaknesses**
	Nebraska has the capacity to take that arrangement one step further; to allow all schools to combine their Internet demand with other public entities in order to get even lower pricing. Case in point, Network Nebraska's Internet1 unit pricing has decreased by 55% over the past 14 months through leveraged buying power. *The Quality of Service of the interactive IP video service delivered through the mobile carts will largely be ensured through dedicated bandwidth and packet management software within Network Nebraska or out over Internet2. Only when the videoconferencing connection is made over the commodity Internet will the signal be considered as 'best effort'.*
V: Technical Impact	- The narrative does not adequately provide an indication of how "server farms" will be used and the content they will house. Most importantly, ongoing costs of these server farms are not mentioned nor is there any indication of inducements for teachers to provide content. *The content that will be housed is the course content that will be developed and stored by individual teachers.* *The Financial Analysis and Budget section does mention $295,000 ongoing for acquisition, maintenance and growth of the primary and secondary servers and licensing. Currently, the NWSDAC purchasing consortium for K-12 has one dual-processor server with a capacity to serve 20,000 users. The primary/secondary server farm strategy would link several servers together for course management software and content management while using several load balancing database servers on the front end. The technology of these systems is emerging. Regionalized or distributed design of content and course management services is also an option, in order to scale to 150,000 users statewide.* *The planned use "server farms" is intended to provide a server architecture that is more scalable and cost-effective when supporting large numbers of users. Traditional large servers require a large up-front investment in a big server environment, and then smaller investments in extra RAM, processors, network interfaces, etc. up to a point, when another large server is required to replace or complement the original. Server farms, on the other hand, require a larger initial investment in a hardware-based load balancer and a number of servers, but theoretically avoid the long-term capacity/performance cap because as more capacity is needed (or as a machine fails), one simply adds another small server into the farm & extend the capabilities. It is also easier to establish fail-over systems and redundancies*

	Agency Response to Reviewer comments in *bold italics*
Section	**Weaknesses**
	with server farms because they are more modular. Due to the more modular nature of server farms, ongoing costs are expected to be more modest.
	- Network design vague; providers may determine design and price based on $$ available; centralized vs. distributed design a concern (related to eLearning initiative).
	Detailed network design documents have not been rendered. Early design options from providers suggest a 45mbps ATM infrastructure to each school within a region with aggregation routers used to partition the Internet1 and Internet2 to the statewide backbone.
	The eLearning network design will likely be more centralized at the beginning of the project, with one or 2 distributed sites at ESU's that could be used for fail-over or better performance for western Nebraska locations. As the project matures, the network would be widely distributed out to the ESU's with multiple fail-overs, with a problem with the machines or network at one ESU failing over to access the servers at one of the other ESU's.
	Ideally, the eLearning network design would complement the larger Network Nebraska Initiative as well--expanding as the network does, and providing value to the institutions that buy in to the project.
	- E-Learning implementation guidelines are not well defined. While a general plan is in place no standards are specified to guarantee interoperability or upgrade protection.
	In terms of technology, there are well-established interoperability standards that vendors must comply with in order to be competitive. Strong compliance with these standards must be a criterion for selection of a vendor. In terms of standards of content across institutions in Nebraska, the eLearning Initiative will work with member institutions to establish these standards.
	A few examples of interoperability standards are http://imsproject.org/ and http://www.adlnet.org/index.cfm?fuseaction=ADLTechnologies (SCORM standards being an important example of ADL technologies). SCORM represents a collection of specifications and standards that are built upon standards taken from other organizations [such as IMS] and extends their capabilities.
	There are four parts to the SCORM standard: (i) the content description, (ii) the API which is a set of methods that enable

Section	Agency Response to Reviewer comments in *bold italics*
	Weaknesses
	the use of contents by any kind of SCORM compliant Learning Management System (LMS), (iii) the data model, that enables data to be stored in a way related to the use of the content by a LMS, and, (iv) Metadata (LOM), to standardize the attributes which describe the learning content. *SCORM's main advantage is that it is based on a stable technical standard that is XML. The SCORM API implemented by the learning content object (also called SCO or Sharable Content Object) provides total independence from the LMS.* *The eLearning Initiative and eKnowledge Repository will rely on SCORM standards for each Learning Management System (LMS) that interacts with it.*
VI: Preliminary Plan for Implementation	- The narrative does not adequately address incentives for content development or how this will be funded. *At the outset of the project, the licensing, training, and implementation of course management software for teachers and students will take priority. During the first two semesters of implementation for teachers, they will be converting their existing web material to the course management software system and also be writing new material on the course management system to supplement each of their courses. Once a critical mass of experienced users has been established (2006-08), the content development incentives can be established, primarily at the local level. The Financial Analysis and Budget section does prescribe $250,000 per year for development of acute content shortage resources as well as $300,000 per year for administration of the searchable eKnowledge Repository.* - overly optimistic about moving remaining schools not using statewide backbone--July 1, 2005 not possible. *"It is possible that 90%-100% of the remaining school districts could join the network as early as July 1, 2005, pending e-Rate approval and reimbursement." IS an optimistic projection and is also quite feasible.* *The State of Nebraska school districts, with the help of the ESUs, have already aggregated themselves into eight Internet purchasing units (ESUs 13-14; ESUs 10, 11, 15, 16; ESUs 1, 2, 7, 8, 17; ESU 3; ESU 9; ESU 18; ESU 19; ESU 4, 5, 6). Of these eight purchasing units, two are already on Network Nebraska (ESUs 10, 11, 15, 16; ESU 18), representing 164 school districts and about 80,000 students. Serious discussions are already underway with the other six purchasing units and each of their Internet Service Provider contracts are either up for bid in 2005-06 or the units are considering purchasing a*

	Agency Response to Reviewer comments in *bold italics*
Section	**Weaknesses**
	portion of their Internet service from Network Nebraska in order to take advantage of Internet2.
VII: Risk Assessment	- The narrative does not adequately factor in the likely resistance of those urban districts that may not see the value of distance learning within their district.

Correct, resistance could be considerable as long as urban districts continue to view "distance learning" as a series of static classrooms with one course exchanged per class period with one origination site and up to three receive sites. The network upgrade would not only preserve these assets but also add perhaps hundreds of IP video units from carts, desktops, and laptops, enabling students, teachers, and administrators routine access to "just-in-time" learning or videoconferencing. It would also allow unprecedented access to web-based content and totally online classes offered by a remote origination point.

The resulting network of 267 largely rural districts on 45-meg or 100-meg, flexible use circuits allows many entrepreneurial possibilities.

Urban districts may want to explore marketable services addressing acute content shortages, training, advanced courses, and staff development to smaller districts. They are also in a unique position to partner with informal education entities from urban centers (e.g. Henry Doorly Zoo, Folsom Children's Zoo, SAC Museum, etc…) to offer ad hoc content to rural districts.

- overlooks power of local control attitude of local regional DL coordinators; big political battle looms.

A number of task group and work group meetings have been held to address the concerns of the DL coordinators. The discussions have focused on increased networking potential to achieve enhanced educational services for every school. The proposed 45 or 100mbps flexible use circuits to every school that carry web-based classes and multiple IP videoconferences will technologically accommodate this goal, regardless of the political or jurisdictional challenges. Providers have shared that the overall network upgrade project is most feasible by using a federated approach that upgrades all the affected schools at the same time, even before their current contracts expire. |
| VIII: Financial Analysis and Budget | - The notion of achieving postalization of Internet rates in this fashion puts the State in a position of funding schools differentially. Further, unless the plan is tied to consolidation practices the full economic benefit cannot be realized. Finally, no incentive is provided to urban districts that might be interested in producing |

	Agency Response to Reviewer comments in *bold italics*
Section	**Weaknesses**
	content if there were financial incentives. ***The preK-12 Backbone Transport funding attempts to recognize that in order to establish a statewide education network, some intrastate transmission of data would be necessary. Those cost algorithms have not been discussed or allocated. The FY06- FY07 amounts simply create a funding placeholder to make data transport on the backbone non-cost-prohibitive.*** - without knowing actual network design, costs of network questionable; schedule system dollars need not established. ***The estimated costs for the wide area high bandwidth networking and the scheduling system were derived from industry and provider quotes.***