I. Project Purpose

Problem:

Barriers to Access for Tribes and Pueblos

We, as Native American communities, are grappling with issues that are central to our cultural survival and continuity. In the new millennium many Tribes like ourselves are actively exercising our powers as Sovereign Nations in an attempt to ensure cultural sustainability for future generations. Most Tribes are now addressing the following issues: **1)** maintaining our cultural heritage; **2)** indigenous language retention; and **3)** utilizing and extending education programs for tribal and non-tribal members. Tribal museums and cultural centers (a relatively recent phenomenon) are at the forefront of these struggles.

In the past museums have often represented a negative aspect of Euro-American society, with a history of taking indigenous patrimony and human remains. The adversarial relationships between indigenous communities and museums led to the passage of the *Native American Graves Repatriation Protection Act* (NAGPRA). This act of Congress stipulated that Tribes could petition for the repatriation of the remains of their ancestors, associated funerary objects, and additional cultural patrimony. An outcome of this act is that it obliged Sovereign Nations to build their own museums and establish Tribally controlled exhibits. Our new museum collections and exhibits are a consummate mechanism for Tribal re/authorization, for by controlling the space, location, and depiction of our Tribal cultures. However, our centers are often in remote reservation locations, and unconnected to larger mainstream museum support systems and organizations. We are neither networked between ourselves nor into the larger digital arena.

The Tribal consortium submitting this application includes the Pueblos of Zuni, Jemez, and Pojoaque, the Indian Pueblo Culture Center of Albuquerque, the Jicarilla Apache Nation, in addition to the University of New Mexico. We have joined forces because the issues of sovereignty and technology have become paramount, especially for Tribal museums and culture centers. The consortium members need connectivity, trained staff to operate systems equipment, and access to training and long distance education programs. Although we have some access to federal granting programs these are mostly limited to housing, employment, and welfare programs, while the arts, languages, and cultures are completely overlooked. Yet, the arts, languages, and cultures are the "riches" of our Tribes, defining the scope of our culture. Our cultural practices (including language and the arts) are integral to our identities.

In the southwest, home to Pueblo, Navajo, and Apache reservation communities, the "digital divide" is keenly felt. Here, we have begun to venture into the world of technology and web networks, but have reached major stumbling blocks associated with connectivity and access to training resources. We feel that by sharing resources and working together we can overcome these problems. Currently New Mexico is a poor state that lacks major connectivity infrastructure, especially to reservation communities [See Appendix VIII, IX #1 & #2]. With broadband internet access the Tribal museums and culture centers of our consortium will be able to; provide cultural information, such as exhibits of Native American art (both traditional and contemporary); develop language-retention programs; establish e-commerce as a viable economic alternative to the many artists that live in tribal communities; access long distance education and training programs. In essence the problems this proposal seeks to address are: **1)** broadband Internet connectivity; **2)** equipment; and **3)** trained systems personnel.

Solution:

Establish a Tribal Access Grid

In an effort to address these issues the Arts of the Americas Institute (AAI) of the University of New Mexico (UNM) along with five Tribal museums and culture centers have formed a consortium, with technical assistance from UNM's Albuquerque High Performance Computing Center (AHPCC). The immediate goal of the consortium is to: **1)** establish broadband connectivity at each site and network them with UNM and AHPCC through an Access Grid; **2)** obtain equipment (graphic computer workstations) for each site; **3)** hire systems personnel at each site; **4)** provide training for personnel at each site; and **5)** deliver inter-active long distance education and professional training courses.

The Consortium, with the assistance of the AHPCC will develop and implement an Access Grid that will establish and connect five computer labs with broadband Internet connections, via a combination of Satellite, T1 & T3 technologies. The Access Grid will provide networked telecommunications access so that each of the consortium members can develop the following: **1)** web-based exhibitions and databases; **2)** cultural education programs for Tribal members in traditional language and the arts; **3)** cultural education programs for non-tribal members available through the www; **4)** access long distance education and training programs in the areas of museum training and professional artist development; **5)** develop their own long distance education programs to disperse over the Access Grid; and **6)** develop e-commerce capabilities for artists in their communities as viable and culturally appropriate economic development initiatives.

UNM will provide technical assistance and training (AHPCC), in addition to developing a long distance education training program for Tribal museum employees and volunteers (AAI). Each Consortium member has specific detailed projects that they will develop. [For detailed descriptions of the partners and consortium members see Appendix II, III, IV, V and VI respectively].

The Access Grid will allow the communities most affected by the digital divide to play a centralized role in developing programs directly designed by them, thereby countering the uneven effects of the telecommunications revolution. With assistance and support from our technical partners, the AHPCC research facility, and Networx Inc (NI) a private telecommunication infrastructure networking organization, plus the New Mexico Department of Tourism, Indian Tourism Program (NMDTITP), the consortium seeks TOP funds for FY 2001 to support the use of advanced network technologies, namely broadband Internet communications to create connectivity between all consortium members.

II. Innovation

Access Grid - Blueprint for a National Model

The Access Grid we propose is to be modeled on the innovative National Computational Science Alliance (NCSA) Access Grid. Popularly known as the Access Grid this provides the technological means to conduct remote meetings, site visits, training sessions, and educational events. Each Access Grid node will have hardware and software applications that support large-format multimedia displays enabling users to share presentations, voice, text, video, and browsers. These "designed spaces" contain the high-end audio and visual technology needed to provide a high-quality compelling user experience, necessary for long distance education.

The New Mexico Access Grid project is intended to serve as a national model for Native communities, especially Tribal museums and culture centers. It will; **a)** illustrate how Tribes can use and develop educational programs based on emerging broadband connectivity; **b)** provide the means to retain cultural integrity utilizing emerging technologies, and **c)** demonstrate the value of partnerships with

technology and education-based institutes; partnerships between isolated and marginalized communities are an effective means to pool resources and achieve larger goals. One of the main aspects of this model is that the Tribes themselves will develop their programs according to their own culturally appropriate guidelines – a new phenomenon called cyber sovereignty

By proposing a combination of satellite, T1 and T3 lines as the most viable technological solution to solve the issue of broadband connectivity in New Mexico, the Access Grid provides a blueprint model for development in other less accessible regions of the United States. The combined solution of these technologies provides room for expansion as new technologies adapt and evolve thereby challenging existing bandwidth capabilities.

Cyber Sovereignty

Setting up community access computer labs at each of the Tribal cultural centers–IPCC, Walatowa, Jicarilla, Poeh, and A:shiwi–constructs the foundation on which Cyber Sovereignty can be built. It will put the tools of the technologic trade into the hands of the people who most need it. Furthermore the labs will function to centralize the mechanics of knowledge so that control over information, origin, and flow is firmly grounded within the Tribes themselves, and then exchanged between the Tribes through the Access Grid.

The unique model we propose here, seeks to redress current inequalities by establishing an organizational structure based on networks rather than hierarchies. This decentralized and horizontal model is a creative partnership that will empower communities that until now have only minimal technological infrastructure in place for their use. Inaugurating a consortium of technological, educational, and Tribal players provides a framework in which Cyber Sovereignty can evolve and progress as the unique needs and desires of each Tribal location are met. This framework provides a limitless model for duplication throughout the state and nation.

The better access Tribes have to information through advanced telecommunications infrastructure, the more effectively we will be enabled to control our own destinies, including but not limited to, cultural determinations, economic development, and political empowerment. Establishing the Access Grid will enhance development at a critical juncture in New Mexico's telecommunications evolution, and allow the state to move with comparable speed into the new millennium.

Distance Learning

The Access Grid will facilitate the delivery of a new curriculum that will be included in a long-distance education class so that the staff members of the Tribal/Pueblo culture centers will have access to professional museum training. AAI/UNM has recently received funds from the Educational Foundation of America (EFA) to develop a museum studies program with a strong Native American component. TOP funding will make this program accessible to isolated communities.

Poeh Arts will develop a series of courses on professional-artist development (such as how to write an artists statement, label slides, take proper photos of work, etc.). Poeh also will develop an e-commerce site providing an outlet with which to sell student art. Other consortium members will design web sites to provide information about their communities. By framing the content of these website themselves they will control how their culture is defined for the outside world thereby correcting misinformation, and dispelling stereotypes.[For details see Appendix V]

Creative Partnerships Combining Education and Technology

Each of the nine partners will bring something unique to the table: **1)**UNM/AAI will provide long-distance delivery courses in the area of Native American museum studies, as well as access to a searchable database of Native American artists presently being created by the Bainbridge Bunting Memorial Slide Library (BBMSL) which will serve as a valuable educational tool [The BBMSL is described in Appendix VI]; **2)** The AHPCC will train a total of five systems administrators (one per site) who will provide the backbone technical support for each of the communities served; **3)** Networx Inc. will provide end user equipment for each of the community access labs to be established at each of the cultural centers; **4)** The NMDTITP will provide training for economic development in the area of e-commerce; **5)** Each of the five Tribal centers of the consortium will develop their own interactive programs that will include, but will not be limited to; virtual tours, galleries, collections, and exhibits; educational programs for local school and Tribal members on language, cultural practices, Tribal history; youth workshops; distance learning programs through UNM; databases of historic photographs and art; a virtual collection of repatriated cultural objects; e-commerce; and an archival depository; **6)** A program coordinator at UNM will oversee all aspects of the project.

III. Diffusion Potential

Provide Network Connectivity - Technical Diffusion

The problems addressed by the Access Grid are common to Native communities throughout the US. More specifically the Southwestern region of the United States is characterized by distance and a landscape that is not a viable environment for telecommunications companies to provide service. The combination of satellite, T1 & T3 as a network solution will utilize and extend existing T1 & T3 lines where feasible, and institute satellite connectivity where it is obvious a cabling solution is not practicable.

Two of the five Tribal communities reside in areas severely underserved by cable technology. These are the Jicarilla Apache Culture Center in Dulce, and the A:shiwi Museum at Zuni. Satellite technology provides the most viable means to link these sites, enabling people to take advantage of broadband solutions as a means to establish network capabilities. The additional benefit of satellite for these outlying areas is that it can be easily upgraded as demands increase and bandwidth becomes available. Due to its urban location within Albuquerque, the Indian Pueblo Cultural Center (IPCC) has a T3 line close by, and can therefore be networked with the T3 cabling option. The Poeh Arts Center, at the Pojoaque Pueblo, has a T1 running to its established computer lab; in addition they can utilize a T3 line that runs from the Los Alamos National Laboratory for distance learning. Jemez Pueblo will utilize a T1 connect that runs nearby. The combination of satellite technology, T1 and T3 lines provides both a viable

economically sound option, and an acceptable bandwidth solution for high frequency exchange of information between sites.

Community Dissemination - Enhance Digital Participation

Establishing the Access Grid structure will enhance community, cultural and economic development, thereby acting to empower traditionally disempowered communities. Cyber Sovereignty is a critical issue in the present period of rapid telecommunications expansion. Because most Tribes have not yet exercised their rights and authority to regulate telecommunications services within reservation boundaries, state regulatory agencies or private monopolies have controlled services into Indian Country. The creation of Tribal information economies would significantly improve the economic situation of Tribes, opening up opportunities for the production of a virtual workforce. With sufficient technological infrastructure Tribes will be able to compete in the wider open market of technology industries. In short, an up coming generation of Native Americans will profit, not just themselves, their Tribes, and their communities, but will augment the infinite market that is a defining feature of the new era of globalization.

Economic Empowerment Zones

E-commerce is an area that would create economic empowerment zones in communities that have traditionally relied on the sale of goods in immediately accessible local markets.[1] This would provide a much-needed boost to the infrastructure for communities where arts and crafts are crucial for the spiritual and economic survival. It would also provide other means for growth. For instance at Zuni and Jemez Pueblos, 75% of households gain a significant portion of their income from arts production. With no e-commerce capabilities currently in place due to the lack of network connectivity, they rely on more traditional means to sell their art. An e-commerce option would enable them to both strengthen their economic base, providing a broader market for the exhibition and sale of art, *and* develop an internal structure of web savvy artists who would in turn benefit from the opportunities currently only available to those on the other side of the digital divide. A broadband communications infrastructure will provide the backbone communications structure between the Tribes, which can be both extended to other outlying Tribal communities, and benefit local non-Tribal communities.

Educational Enrichment

The implementation of the Access Grid will act to convey information between sites, and foster cultural enrichment zones. Each Tribe in the consortium has expressed different needs and desires to utilize available technological resources, but there are many areas, which overlap, providing points of contact for the exchange of information. For example, the IPCC, Jemez Pueblo, and Pojoaque Pueblo have all expressed a keen interest to access distance learning programs in museum studies. Specifically, the IPCC intends to undertake the major task of cataloging and putting an entire archival collection online and the Access Grid will provide critical infrastructure to network this archive with the nineteen Pueblos it oversees. Walatowa intends to explore the possibility of utilizing virtual reality technology as a

[1] For a discussion of 'economic empowerment zones' see *The Benton Foundation Report*, "Native Networking: Telecommunications and Information Technology in Indian Country," April 1999.

means to provide virtual tours of areas 'off limits' to visitors–due to cultural and religious concerns–while educating them as to why the area is off limits. The Jicarilla Apache Tribe plans to create a virtual collection of Native American Graves Protection and Repatriation Act (NAGPRA) objects. These objects cannot be returned directly to Jicarilla Tribal members. Instead, the Tribe has determined that the collection, presently housed by the Smithsonian Institution and other museums, should be recorded and archived in the virtual realm. Given the expedience of a network grid that will link the Pueblos together, this technological feat would serve to provide an educational exchange that will create a truly diverse classroom of ideas. [See Appendix V, for detailed descriptions].

Distance learning programs will enhance local educational opportunities in terms of better access to a greater variety of higher education classes and programs. Providing a link between isolated communities and the more vibrant areas of the state is a vital means for cultural enrichment. Sharing resources, such as archival information, catalogues, and collections will broaden Tribal access to Native materials, allowing Tribes to maintain control over how, where, and who has access.
[See Appendix VII, for a Diagrammatic View of Diffusion Potential]

IV. Project Feasibility

- **Technical Approach**

The Access Grid Node site will utilize existing Internet technologies and new Internet 2-type technologies: T3 (10 Mbs.—Duplex) Internet Access. An Access Grid Node uses a combination of Internet technologies, video & audio streaming, and Internet 2 technologies, software & multicasting, all into one package to create a collaborative environment. This collaborative environment, housed on a T3 minimum broadband Internet connection, will provide the backbone network for the Access Grid Node. AHPCC will provide the backbone server support. The center's resources include several high performance computing platforms and resources, among them the 512 processor Intel Linux Roadrunner supercluster, several smaller clusters for research and computing, as well as an advanced IBM cluster hybrid and an advanced Visualization Laboratory utilizing both an SGI Origin and the supercluster resources.

- **Interoperability**

Interoperability of systems as well as technology will be a guiding feature of the Tribal Access Grid. The Tribal Access Grid will provide two-tiered access based on the capabilities of each region to be served. Zuni and Jicarilla will be served via satellite connection with an upload of 256 Kbs, Poeh Arts, and IPCC will be served via T3, and Jemez Pueblo a T1. The two-tiered approach is the best means to meet the needs of each consortium member. Those with the slower rates of connection (satellite and T1) will initiate an Internet based network, while those with the faster bandwidth will conduct high-end capabilities such as video & audio streaming.

- **Technological Alternatives**

A number of technical alternatives have been examined. Providing a single networked system (such as a T3) is not economically viable or technically feasible at this point in time. The combination of satellite, T3, and T1 provides the best solution. The dynamic nature of these technologies will facilitate easy hardware upgrades and allow for the evolution of new interface environments.

- **Scalability**

There are multilateral possibilities for the growth and scale of the Tribal Access Grid. This system can expand as needs occur and technologies become viable. The system can be expanded on a number of levels, namely; **1)** Expanding the network reach of the Tribal Access Grid as technology becomes feasible. As satellite technology improves it will provide the most viable means for communication in a networked environment that covers large distances; **2)** Expanding the geographical reach of the Tribal Access Grid to transfer information between Tribal and non-Tribal sites; **3)** Expanding the breadth of information transferred through the Tribal Access Grid, especially those distance learning capabilities that rely on streaming relays.

- **Sustainability**

The Tribal Access Grid will be sustained both organizationally and economically in the following ways:

Organizational

This proposal has been structured with administrative and technological support. There will be ongoing training provided by a systems administrator at each site. In addition, AAI will provide cumulative organizational evaluations to determine efficiency.

Economic

In short revenue will be generated through:

- Course Fees
- Advertising
- Subscription/Use Fees
- Foundational Support
- Guestlink Fees
- ECommerce

Establishing the Access Grid will provide a sustainable network for economic development primarily in the area of e-commerce. Currently the NMDTITP is seeking an outlet for e-commerce development among the Tribes, in order to create economic self-sufficiency for the Culture Centers, the artists in the community, and the Tribes as a whole. The Director of the Division of Indian Tourism, for the State of New Mexico Lorentino Lalio, has worked with each of the Centers in this proposal–helping them locate monies for building construction, and developing training in cultural heritage tourism as an economic base.

In year three the TOP participants will pay 50% of the network connectivity fees, and 75% of the systems trainees salary from income generated through e-commerce, and class enrollment. Year three is a transition year, in which the centers will gradually move into the sustainable open market.

V. Community Involvement

- **Characteristics of End Users:** The end users will be the Tribes themselves. Currently computer usage among Tribal members is drastically lower than the national average. The Tribes and Pueblos already have resolutions in place that address the need to improve technology disparity issues, and this provides firm evidence of their commitment and involvement to close the digital divide. Recently, all the schools and Tribal libraries received Internet connections through the Bill and Melinda Gates Foundation. Building on this established framework, the access labs will enable Tribes to acquire familiarity with a computer interface at the local community level. This will make it possible for communities to engage a system of knowledge, writ large for other people of the globe, in a familiar setting. Having equipment on-site will not only familiarize entire communities with how integral the communications process is to our world, but will enable a new generation to grow up familiar with the changes technology brings. This generation will develop their own unique skill-set with relation to accessibility and interface. These skills have the potential to blossom in many directions, e.g. graphics design, software design, hardware development and maintenance, computer education, distance learning, e-commerce development, web design etc.

- **Possibilities for End User Access:** The Access Grid will enable end-users to have greater access. Once the network infrastructure and equipment are in place, connectivity will create access to a multiplicity of shared resources. By establishing an Access Grid for both learning *and* commerce the end user base will be broadened extensively. The impact of a network infrastructure will not only be to bring together the disparities of less developed rural areas with the more developed urban district and satellite communities of Albuquerque, but will enable a relationship between the two disparate regions that breaks traditional barriers to learning and capability.

Empowering the Tribes with hands-on training, accessibility, education and connectivity with the University of New Mexico, and networking between the sites, is the key means to establish Cyber Sovereignty. This includes establishing e-commerce, which will not only provide a free and fair trading market for goods, but will provide the economic incentive for Tribes to develop their own technological skill base which they can market outside of their isolated communities. The Tribes will therefore be enabled to market both goods–art, baskets, pottery etc.–and services–graphic design, web development, systems analyst, etc. Following a historical precedent set in motion at the turn of the century by anthropological fieldwork, this digital disparity has dislocated Native communities from modern technology, and further, perpetuated a racial inequality. This proposal seeks to redress this issue by providing onsite training, and end user equipment at the community level.

Addressing issues of cultural empowerment, Cyber Sovereignty provides the means for educational frameworks to evolve from the very heart of the communities they serve. Establishing a virtual infrastructure in the realm of distance learning that connects hitherto ruptured Tribal units within a networked grid of interactive information structures, is a viable means to enhance cultural interchange with positive outcomes which divide into three areas of impact:

1) Impact on End Users

- The economic benefits of establishing an Access Grid, cannot be over emphasized. Each Tribal community networked by broadband infrastructure will have access to the vast global market that the Internet cultivates. Economic development and empowerment are attributes that go hand in hand, and the Tribal Communities included in the consortium are keen to sell their art, and demonstrate their culture in the new markets that are now available in the virtual sphere.

- Providing the Access Grid, is a necessary step to advancing distance learning. Education is a crucial impact, especially among a population significantly at a disadvantage compared to those living close to educational establishments. Accessibility to a broadband network will address this.

- A primary impact of the Access Grid will be the training it will provide for a new up-coming cadre of computer professionals, enabled to utilize their skills to benefit their communities and the market at large. Access to education and professional training courses will provide the skills for Tribes to develop their own material to put on the access grid

2) Impact on Secondary End Users

- Impacts beyond the Tribal communities will be relevant for all of rural New Mexico and beyond. Establishing satellite links, and providing T1 &T3 lines is a primary step that will provide backbone infrastructure that other communities living in the region will be able to link with and consequently extend. This will integrate Tribal members living outside of their communities and further build solidarity between disparate individuals, communities more specifically non-Tribal cultures, because it will provide access to cultural data and information, museum archives, and education.

- The multicultural features of New Mexico, mean that the Access Grid will provide network infrastructure that can serve the interests of all, while encouraging dialogue between different groups. An exemplary relationship between different groups operating within a democratic framework is essential if a comprehension of Cyber Sovereignty is to be successfully reached.

VI. Evaluation

The evaluation will be carried out by administrative personal secured by the AAI. The evaluation will address new approaches and innovations developed with this project in an effort to demarcate a national model. Three main issues will be addressed: **[1]** Network efficiency; **[2]** Community development enhancement; and **[3]** That the Access Grid meets or exceeds the provisions laid out in this proposal; long-distance education and museum training; providing a vehicle for professional artists to showcase their work between the different Art Centers; enable presentation of virtual tours and exhibits of Native artifacts and environments; develop archives, collections and databases; and e-commerce opportunities.

Utilizing the implementation of Pre-Post Design statistical indicators, (e.g. percentage indicators, chronological statistical data, etc.), the report will provide an indicator of how the Access Grid has created change over time. Baseline data collection will occur before the TOP program commences and be compared with outcome data after the 3rd year. Data will then be gathered every six months. Surveys will be directed towards **a)** staff at Culture Centers, **b)** artists; and **c)** other community

members that are actively involved with their local culture centers, to measure both qualitative and quantitative data.

Qualitative and quantitative data will be gathered in three ways; **[1]** a bi-annual review **[2]** a quarterly focus group; and **[3]** an annual survey. The annual survey will culminate in a written review for TOP evaluation. AAI will initiate a three-year contract with an independent facilitator who will collect data and write mini-reports every six months, produce annual reports, and one final report at the end of TOP funding. This will be generated by collating the information from the bi-annual survey and quarterly focus group meetings. In additional material will be gathered on a more informal level through discussions with project participants, observation, needs assessments, interviews with project staff, formal interviews with a sample of students accessing long distance education courses, and general surveys of all students. This will be followed by a series of surveys, complimented with statistical information.

The final report will include general indicators of the political environment and history of project, as well as demographics, social contextual information, and economic growth indicators. The reports and results of the evaluation will be posted on the AAI web site and also through quarterly updates shared with all participants.