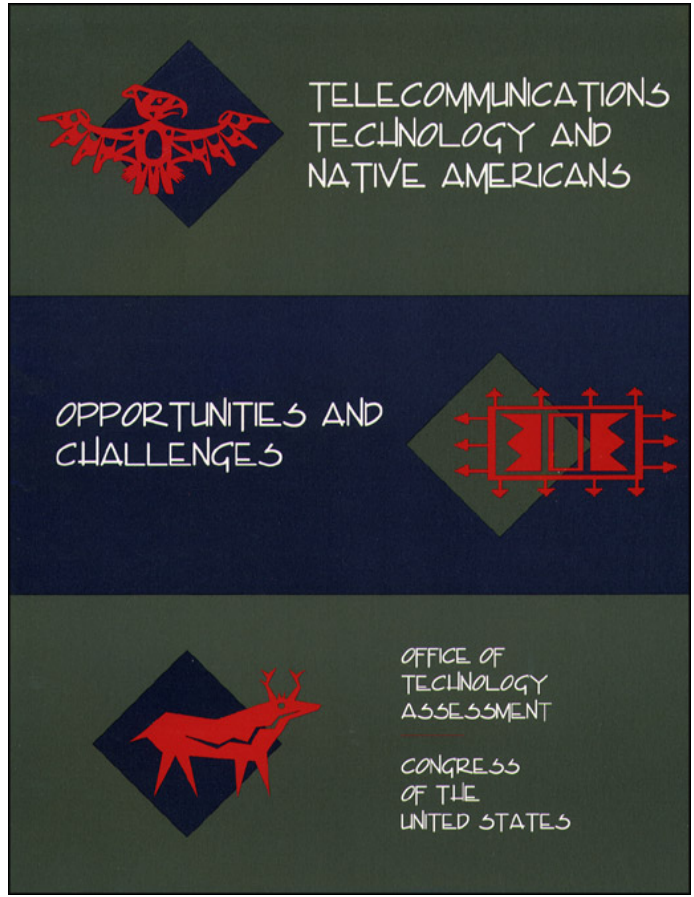
Telecommunications Technology and Native Americans: Opportunities and Challenges

August 1995

OTA-ITC-621





Recommended Citation: U.S. Congress, Office of Technology Assessment, *Telecommunications Technology and Native Americans: Opportunities and Challenges*, OTA-ITC-621 (Washington, DC: U.S. Government Printing Office, August 1995).

Foreword

Telecommunications Technology and Native Americans: Opportunities and Challenges examines the potential of telecommunications to improve the socioeconomic conditions of Native Americans—American Indians, Alaska Natives, and Native Hawaiians—living in rural, remote areas, and to help them maintain their cultures and exercise control over their lives and destinies.

The report discusses the opportunities for Native Americans to use telecommunications (including computer networking, videoconferencing, multimedia, digital and wireless technologies, and the like) in the realms of culture, education, health care, economic development, and governance. It also explores the challenges and barriers to realizing these opportunities, notably the need to improve the technology infrastructure (and access to it), technical training, leadership, strategic partnerships, and telecommunications planning on Indian reservations and in Alaska Native villages and Native Hawaiian communities.

Prepared at the request of the Senate Committee on Indian Affairs, this is the first federal government report on Native American telecommunications. It provides a framework for technology planning and policy actions by Congress and relevant federal agencies, as well as by Native leaders and governments. Native Americans were involved throughout the study. OTA made site visits to six states and consulted with Native leaders and technology experts in about two dozen other states. Computer networking was used extensively for research and outreach, and OTA developed the Native American Resource Page for this study, a World Wide Web home page accessible via OTA Online (http://www.ota.gov/nativea.html).

OTA appreciates the assistance of the project advisory panelists, a majority of whom are Native American, and federal agency workshop participants, as well as the many Native government, federal and state government, library, educational, business, and other groups and individuals who participated in the study. OTA values their perspectives and comments; the report is, however, solely the responsibility of OTA.



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Note: OTA appreciates the valuable assistance and thoughtful comments provided by the advisory panelists. The panel does not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

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Summary and Policy Implications 1

As the Internet, electronic mail, compact discs, and digital telephones sweep through much of the United States, Native American activists are asking themselves whether and how the new technology can empower Native communities. Or will the new technology of telecommunications and computers serve only as a modern-day version of the telegraph and railroad that ran right through Indian lands with little benefit to the tribes? Will the technology serve to bring together or further disconnect Alaskan and Hawaiian Natives from their continental and island homelands?

At the time of the American Revolution, what is now the United States was home to hundreds of indigenous peoples with a variety of forms of self-government, organized at the tribal, village, or island level. Today's Native Americans—American Indians, Alaska Natives, and Native Hawaiians—are the descendants of these indigenous peoples.[1] Over the last 200 years, indigenous peoples have struggled to maintain their cultures, sovereignty, and self-determination in the face of population pressures and ever-expanding national and state governments.

The established framework of federal Indian law recognizes tribal sovereignty, a federal trust responsibility for those tribal lands and resources ceded to or taken by the United States, and a commitment to tribal self-determination over programs and services vital to tribal well-being. Federal law and policy apply this framework to the 550 federally recognized Indian tribes—in-



[1] *Native Americans* are defined in this report to include American Indians, Alaska Natives (Indian, Aleut, and Eskimo), and Native Hawaiians who are descendants of indigenous peoples who lived in geographic areas now comprising the United States.

TABLE 1-1: Population Profile of Native Americans

Native Americans (total estimated 1990 population)[a]	***Population***
American Indians	1,875,000
Alaska Natives	**86,000**
(52% Eskimo, 12% Aleut, 36% Indian)	
Native Hawaiians	211,000
Grand total	2,172,000
Native Americans living in rural or semi-rural areas	
American Indians	
Reservations and trust lands	**437,000**
Tribal Jurisdictional Statistical Areas (Oklahoma)	201,000
Tribal Designated Statistical Areas	54,000
Other rural/semirural areas (est.)	250,000
Alaska Natives	
Alaska Native Village Statistical Areas	47,000
Native Hawaiians	
Rural/semi-rural areas (est.)	70,000
Grand total rural/semi-rural	1,059,000

[a]The U S Census Bureau relies heavily on self-identification by respondents to obtain Information on race and ethnicity American Indian tribes and Alaska Native villages vary in how they determine tribal membership, typically based on family lineage and/or blood quantum Native Hawaiians are variously defined as having a family lineage and/or a specified blood quantum traceable to 1778, the time of Captain James Cook's arrival on Hawaiian shores

SOURCE: Office of Technology Assessment, 1995, based on inreformation from the 1990 Census of Population in the following U.S., Bureau of the Census documents Statistical Abstract of the *United States,* 1994 (Washington, DC U S Government Printing Office, 1994); County & City *Data Book,* 1994 (GPO, 1994); 1990, *Social and Economic* Characteristics. *Hawaii,* 1990 CP-2-13 (GPO, September 1993), and "We the First Americans, " September 1993

cluding about 220 Alaska Native tribal or village governments (Indian, Aleut, or Eskimo). Federal policy on Native Hawaiians is more ambiguous, although the United States has apologized for its role in the overthrow of the Hawaiian Kingdom. The strong parallels between the history and experience of Native Hawaiians with those of American Indians and Alaska Natives provide a basis for including Native Hawaiians within this framework.

Telecommunications technology offers many opportunities to help Native Americans deepen their cultural roots, empower their communities, strengthen Native governments, and address daunting challenges such as very high unemployment and poverty rates and poor health conditions. *The promise of telecommunications is by no means assured, however.* Indeed, if Native Americans, collectively, do not gain better understanding and control of this technology, the result could be to further undermine Native culture, community, sovereignty, and self-determination.

No single technological solution will address Native American needs. A variety of technologies, working together or complementing one another, will best meet their diverse needs. Computer networking, satellite videoconferencing, computers and software, telefacsimile, digital switching, broadcast radio, cable TV, and cellular or wireless communications all have a role to play. Even the basic telephone is important because many (perhaps as much as one-half) rural Native homes do not have a telephone today. For purposes of this report, all of these technologies collectively are referred to as *telecommunications technology.*

This report focuses primarily on the one-third of Native Americans who are residents of tribal reservations and trust lands, Alaska Native villages, and Native Hawaiian communities located in rural, remote areas (see table 1-1). The report also has implications for other Native Americans who live in rural or semirural areas (about 15 percent) or in metropolitan areas (about one-half).

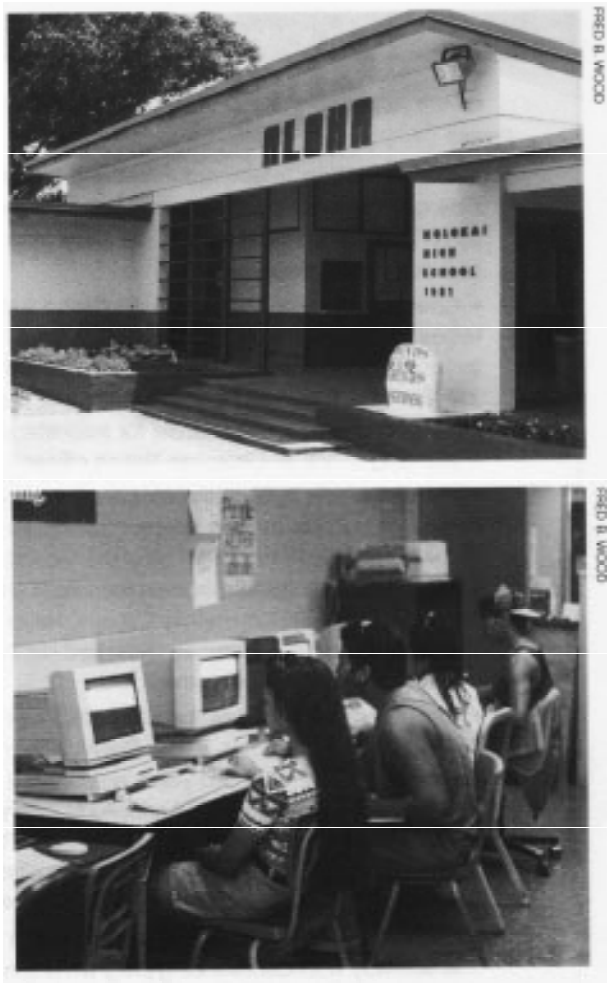
OPPORTUNITIES AND CHALLENGES

During the course of this study, the Office of Technology Assessment (OTA) has observed aremarkable increase in the level of interest in telecommunications by Native Americans (see appendix A for a partial list of Native computer networking). Some major organizations, such as the National Congress of American Indians and the American Indian Science and Engineering Society, are including sessions on telecommunications or the information superhighway at annual conferences and meetings. The tribal and community colleges that serve Native Americans—in the contiguous 48 states, Alaska, and Hawaii—have taken a strong leadership role in developing and demonstrating new telecommunications applica-

tions. Various grassroots groups, from Americans for Indian Opportunity to Pacific Islanders in Communications, are advocating Native use of telecommunications-from the development of Native-oriented programming to operation of computer networks. OTA's own Native American home page, developed for this study and accessible via the Internet (see appendix B), has attracted widespread interest among Native American technology activists and advocates.

OTA also has observed an increase in the number and variety of Native American telecommunications pilot projects and demonstrations (see box l-l). Exemplary projects identified during the OTA study span the country east to west—from the Oneida Nation's fiberoptic wired community in upstate New York, to the Navajo Nation's tribal telecommunications initiative in New Mexico, Arizona, and Utah, to the North Slope Borough's use of distance learning in Alaska above the Arctic Circle, to the Hawaii community college system's two-way videoconferencing among several rural island locations.

Despite these positive signs, Native Americans face significant barriers and challenges in realizing the potential of telecommunications. At this time, it is difficult to predict whether the ultimate outcome will be more positive than negative for Native Americans. Two possibilities are described below.



Top: Molokai High School on Molokai Island, Hawaii. ***Bottom:*** *Molokai High School students using personal computers in the classroom.*

■ An Optimistic Year 2000 Scenario

Most Alaska Native villages, many American Indian reservations, and some Native Hawaiian communities are geographically isolated. Under an optimistic scenario, distance education and telemedicine provide widespread access to a range of educational and medical information and services not otherwise available or affordable. Telecommunications facilitates the shift to disease prevention and health promotion, not just health care and treatment, as the long-term strategy for overcoming serious Native health challenges. Schools, libraries, community service centers, and family wellness clinics broaden access to technology-enhanced services. Telecommunications improves the economies of scale for producing and distributing Native-oriented educational materials and Native programming to widely dispersed Native Americans living in both metropolitan and rural areas.

Telecommunications helps stimulate economic development in Native areas. Telecommunications proves to be a necessary, though not sufficient, condition for economic revitalization. In this scenario, telecommunications is used to: 1) create jobs in Native-owned telephone, computer, broadcasting, and related companies; 2) market Native-produced arts and crafts electronically; 3) develop and promote tourist and recreational activities on or near Native lands; 4) pro-

BOX 1-1: A Sample of Native American Telecommunications Activities

Where applicable, the Uniform Resource Locator for use with Internet browsers is listed in parentheses.

- **Oneida Nation Telecommunications Infrastructure Development** (Oneida, New York)
  Fiberoptic wiring to government offices, community centers, and new houses. Internet access provided by NYSERNet, Inc. First tribal home page (http://nysernet.org/oneida/) tells the Oneida story of culture and community development.
- **Cherokee Nation Telecommunications Activities** (Oklahoma)
  In one project, the Cherokee Nation developed a financial information system for the Department of the Interior's Office of Self-Governance. In another project, in partnership with NASA (National Aeronautical and Space Administration) Science Internet, the Sequoyah High School and the W.W. Keeler Complex will be connected to the Internet for scientific and educational use. In the future, the Cherokee Nation is planning to link all Cherokee Nation offices.
- **Navajo Nation Telecommunications Partnerships and Planning (New** Mexico, Arizona, Utah)
  Individual projects include Internet access through the Crownpoint Pilot Project and the Information Technology Office's development of the Technology and Information Resource Plan. Partnerships to develop telecommunications human resources and infrastructure are forming with Crownpoint Institute of Technology, Navajo Community College, National Aeronautical and Space Administration, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, University of New Mexico, and Northern Arizona University, among others.
- **Confederated Tribes of the Chehalis Telecommunications Committee** (Oakville, Washington)
  The Confederated Tribes of the Chehalis formed the five-person Communication, Information, and Technology Committee two years ago, after a series of demonstrations and training from the USDA (United States Department of Agriculture) Extension Indian Reservation Program. Spurred by this activity, the Affiliated Tribes of Northwest Indians (ATNI) in Portland recently created a similar committee, the Telecommunications and Technology Committee. The ATNI has 50 member tribes from Montana, Oregon, Washington, Idaho, and Alaska (Native villages).
- **North Slope Borough Distance Education Delivery** (Barrow, Alaska)
  This two-way videoconferencing program originates from a high school studio in Barrow. Video, text, and graphics are transmitted to the North Slope's remote schools via a full-time dedicated satellite link. Courses such as trigonometry and Inupiat studies/language are now available at schools in remote locations.
- **Nation of Hawai'i Home Page**
  This home page (http://hawaii-nation.org/nation/), supporting the restoration of the Nation of Hawai'i, was put together by the executive administration of the Nation of Hawai'i in Waimanalo, Hawaii, with support from the Educational and Cultural Organization to Advance Restoration and Transition (ECOART), also located in Waimanalo. Hawaii Online, in Honolulu, Hawaii provided Internet access.
- **Hawaiian Language Revitalization**
  The Komike Hua'oleo (Hawaiian Lexicon Committee) is creating several hundred new Hawaiian words for technology (e.g., modem, hard drive, font, format, left justification, export text, computer monitor, and bulletin board service). Keola Donaghy, an immersion teacher and computer consultant, working with Hale Kuamo'o, the Hawaiian Language Center at the University of Hawaii at Hilo, developed the "Leoki" electronic bulletin board service interconnected through Hawaii FYI, a free state dial-in network.
- **Tribal Telephone Providers**
  The Office of Technology Assessment located four tribes with telephone companies: Cheyenne River Sioux Tribe Telephone Authority, Eagle Butte, South Dakota; Gila River Telecommunications, Inc., Chandler, Arizona; Ft. Mojave Telecommunications, Ft. Mojave, Arizona; and Tohono O'Odham Utility Authority, Sells, Arizona. The San Carlos Apache Tribe, San Carlos, Arizona, is waiting for a loan approval from the USDA Rural Utilities Service to buy its local telephone exchange.

BOX 1-1: A Sample of Native American Telecommunications Activities (Cont'd.)

▪A Sample of Telecommunications Support Organizations

Native American Public Broadcasting Consortium, Lincoln, Nebraska
Pacific Islanders in Communications, Honolulu
Intertribal Geographic Information Systems Council, Pendleton, Oregon
BIA Geographic Data Service Center, Lakewood, Colorado
United Native American Network, Burlington, Washington
Americans for Indian Opportunity, Bernalillo, New Mexico—supporter of the INDIANnet BBS
Electronic Pathways Alliance, Santa Fe
(http://hanksville.phast.umass.edu/defs/independent/ElecPath/elecpath.html)

▪A Sample of Online Information Resources (see appendix B for complete list)

BIA (Bureau of Indian Affairs) Division of Energy and Mineral Resources, Golden, Colorado
(http: //snake2.cr.usgs.gov/)
Indian Health Service (http://www.tucson.ihs.gov/)
USDA Extension Indian Reservation Program (gopher://134.121.80.31:70/1/eirp/eirp.70)
Sioux Nation (http://www. state.sd.us/state/executive/tourism/sioux/sioux.html)
Indian Pueblo Cultural Center (http://hanksville.phast.umass.edu/defs/independent/PCC/PCC.html)
Heard Museum (http://hanksvillephast.umass.edu/defs/independent/Heard/Heard.html)
Navajo Community College (http://hanksville.phast.umass.edu/defs/NCC.html)
American Indian Science and Engineering Society (http://bioc02.uthscsa.edu/aisesnet.html)
American Indian College Fund (http://hanksville.phast.umass.edu/defs/independent/AICF.html)
Native American Rights Fund (http://hanksville.phast.umass.edu/miSc/NARF.html)
National Indian Policy Center
(gopher://gwis.circ.gwu.edu.:70/11/Centers%2c%20Institutes%2c%20and%2OResearch%2Oat%20GWU/Centers%20and%20Institutes/National%20Indian%20policy%20 Center)

SOURCE: Office of Technology Assessment, 1995.

vide expertise and competitive skills to Native entrepreneurs; 5) provide infrastructure for business startups in Native areas; and 6) manage Native land and natural and financial resources.

Telecommunications technology allows Native Americans to share and broaden their culture electronically within and among Native communities. Computer graphics, software, and multimedia help strengthen and disseminate Native art, language, and dances. Native cultural materials are shared electronically by community and cultural centers, libraries, and schools that serve Native Americans. Native-produced TV and radio programming is distributed over Native-owned cable and radio stations and via other stations that reach Native American populations.

Native governments-whether at the tribal, village, or community level—routinely use videoconferencing and computer networking to facilitate participation and consultation with their geographically dispersed members. This same technology helps strengthen intertribal collaboration and facilitates the participation of Native organizations in relevant activities of state and federal governments. Native governments receive federal and state services electronically and deliver services electronically to tribal or village members where appropriate. When federal and state governments are "reinvented," Native Americans use telecommunications to influence the outcome so it is sensitive to their values and visions for the future.

A Pessimistic Year 2000 Scenario

The inadequacies of rural Native American economies and telecommunications infrastructure continue to prove too great to overcome. Under



Left: *Satellite earth station at the Salish Kootenai College on the Flathead Indian Reservation, Montana. The college downloads video programming via satellite for classroom use. Right: American Indian video programming is provided to students and the tribal community via the low-power public television station located at the Salish Kootenai College.*

this pessimistic scenario, unemployment rates still exceed 50 percent on many Indian reservations and in most Alaska Native villages, contributing to continuing family, health, and substance abuse problems. Most reservations and villages still have weak economies that make generating or attracting investment capital difficult. As a group, American Indians continue to be the most disadvantaged in the United States with regard to basic telephone service. In the year 2000, about one-half of American Indian homes in rural areas still do not have any telephone service, far below nationwide averages, reflecting continuing infrastructure deficiencies, low family income, and, in some cases, cultural preferences.

In this scenario, the lack of Native leadership on telecommunications continues to limit efforts to plan for and implement infrastructure improvements. The vast majority of tribes, reservations, villages, and island communities still do not have a telecommunications strategy or a process in place for developing a strategy or plan. Nor do any of the major nationwide Native American federations or intertribal organizations. This places the Native American community at a disadvantage because many other segments of the United States have long since fully mobilized on telecommunications issues.

The absence of federal policy or coordination on Native American telecommunications continues through the year 2000, thereby curtailing the development of an appropriate and effective federal role. The Federal Communications Commission (FCC) still does not have a Native American policy, nor has it applied the framework of federal Indian law to telecommunications. The federal agencies that serve Native Americans have yet to develop an interagency approach to meeting the telecommunications requirements of Native Americans and building telecommunications expertise at the tribal, village, or community level. While many agencies do support various individual projects, the sum is still less than the parts.

The lack of infrastructure, leadership, planning, funding, and policy means-under this pessimistic scenario—that many of the rural, remote Native areas are left on the sidelines of the telecommunications revolution. These areas are unable to capture the potential educational, health, economic, social, and cultural benefits of telecommunications applications. In this year 2000 scenario, Native Americans run the risk of being exploited by, rather than controlling, the technology. Without meaningful and extensive Native involvement, telecommunications ends up further undermining Native culture and values and disenfranchising, rather than empowering, Native Americans.

POLICY IMPLICATIONS

Native American telecommunications policy and activities are clearly lagging behind both: 1) other

areas of Native American policy (e.g., self-governance, education, and health care); and 2) the telecommunications policy development and initiatives in the majority society. While Native American telecommunications activities are increasing, the rate of change in the majority society has accelerated markedly in recent years. This reflects the current emphasis on the national information superhighway, and the further transition of the United States into a post-industrial information economy and society.

Absent some kind of policy interventions, Native Americans are unlikely to catch up with, and probably will fall further behind, the majority society with respect to telecommunications. This takes on greater importance given the likely benefits of telecommunications to Native Americans that may be deferred, diminished, or foregone under the policy status quo. *OTA has identified eight major components to a comprehensive policy framework on Native American telecommunications*. The first four emphasize a lead role for Native groups and governments—the empowerment of Native Americans in telecommunications—with the federal government in a supportive role. The second four emphasize the need to rethink and refocus federal policy strategies to recognize and strengthen Native American telecommunications infrastructure and sovereignty. These require a major federal government role, but also extensive Native American participation to ensure that Native values and sovereignty are strengthened, not weakened.

Empowering Native American Telecommunications

Tribal, federal agency, and congressional actions could focus on implementing these four essential elements of an overall Native American telecommunications policy framework.

Grassroots Tribal/Village/Community Empowerment

At the grassroots level, one key is developing *local sources of telecommunications expertise*. Tribal and community colleges are important sources of expertise, as are the small but growing group of Native computer and telecommunications activists and grassroots groups. Native-owned telephone and cable companies and radio stations could provide expertise, especially if the small number now operating could be increased. Another key is developing a *grassroots telecommunications plan*. Local tribal/village/community leaders could set up a *telecommunications committee or task force*, as has been done by, for example, the Navajo Nation (Arizona/New Mexico/Utah) and the Affiliated Tribes of the Chehalis (Washington).

The committee, in consultation with community leaders and members, could develop a plan or vision of how telecommunications could best meet local Native educational, health, economic and social development, cultural, and other needs. The plan could encourage technology-enhanced collaboration among Native service providers—the integrated delivery of services could be a key goal. A grassroots, bottom-up approach would help assure responsive, culturally sensitive, and self-empowering Native American telecommunications. The support of local tribal, village, and community leaders is essential to success.

National Native Leadership

To complement a grassroots emphasis, another key is *strengthening Native American leadership on telecommunications at the national level*. The groundwork is already in place. Groups that are in the forefront on Native telecommunications[2] could work with regional and national groups such as the Alaska Federation of Natives, National

[2]Examples include the American Indian Higher Education Consortium, American Indian Science and Engineering Society, Pacific Islanders in Communications, Native American Public Broadcasting Consortium, Intertribal Geographic Information Systems Council, Americans for Indian Opportunity, and Indigenous Communications Association.

BOX 1-2: Matching Telecommunications Technology with Native Needs

An affordable deployment of telecommunications infrastructure in rural, remote Native areas might include three levels or tiers of service:

Tier 1: Basic telephone service (with digital switching), single-party line with touchtone and dial-up access (with modem) to computer networks and Internet gateways; cable, broadcast, and/or satellite TV/radio; wireless/cellular telephone where appropriate.

For: Individual Native homes, small businesses, and schools.

Tier 2: Tier 1, plus high-speed modem or direct connection to computer networks/Internet; one-way full motion videoconferencing (with two-way audio) or slow scan/compressed two-way video via land lines/satellite.

For: Community communication centers, tribal and Native governments (if separate from community centers), tribal and community colleges, some larger businesses.

Tier 3: Tiers 1 and 2, plus very-high-speed data communication links and two-way, full-motion video-conferencing (fiberoptic trunk lines to fiber or satellite backbone).

For: Major medical centers, universities, business parks, or enterprise zones.

SOURCE :Office of Technology Assessment, 1995.

Congress of American Indians, and appropriate Native Hawaiian support groups and service providers (e.g., Alu Like) to set up formal committees and develop a *coordinated Native American telecommunications strategy.* This eventually could lead to a "Native American Telecommunications Association" or the equivalent.

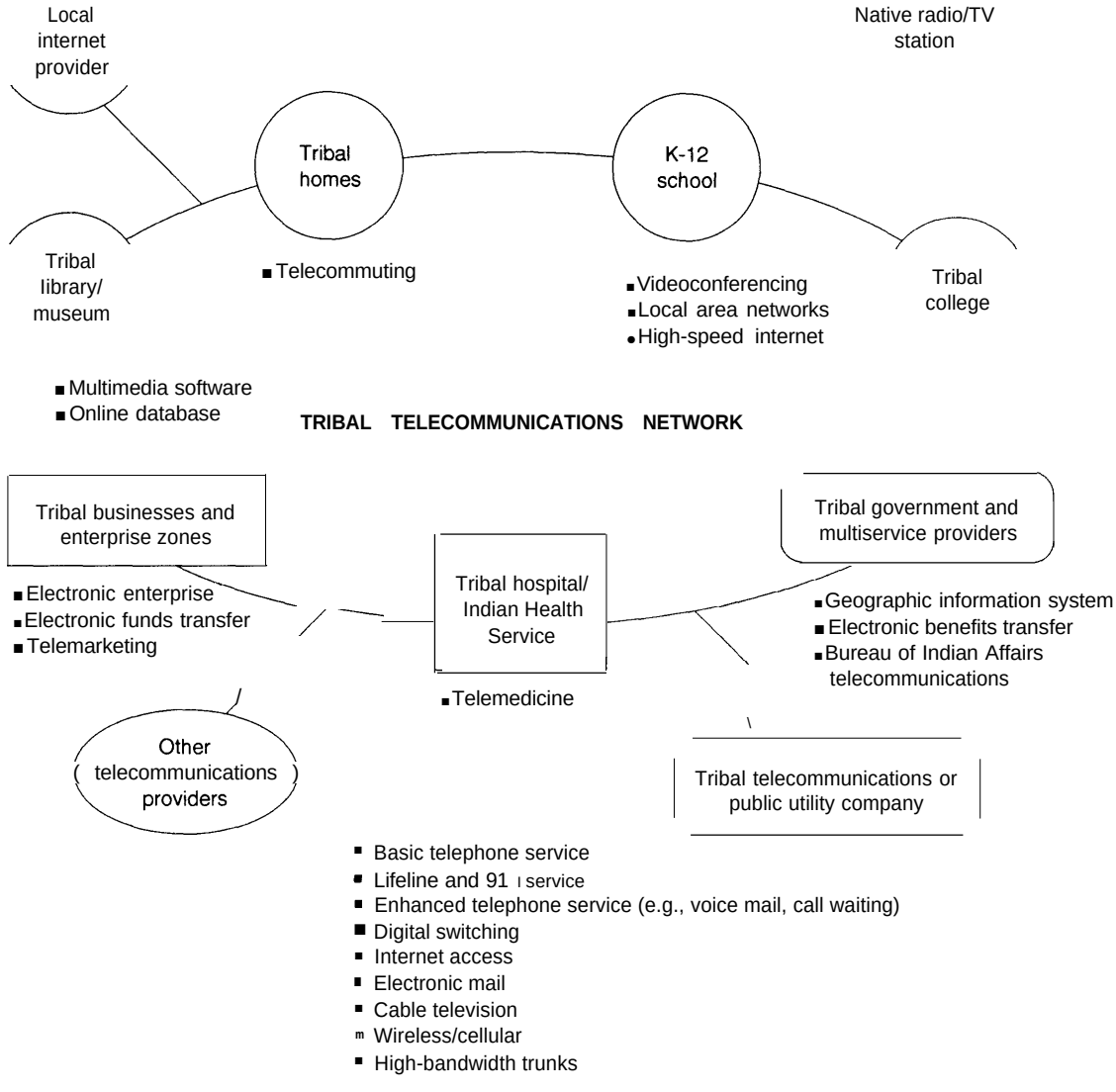
Also, Native organizations could work with universities to develop *leadership programs in telecommunications. The* Universities of Alaska and Hawaii (and their associated rural campuses and community colleges) seem well suited for this role, as would various universities with American Indian programs. Community colleges and universities would be logical focal points for telecommunications education and training. And Native organizations could work with the private sector, as well as educators, to establish local and regional *telecommunications technical assistance centers and programs.*

Integrated Infrastructure Development

The financial resources currently and prospectively available to many rural Native communities are insufficient to support development of the telecommunications infrastructure by multiple, independent groups. Both funds and expertise are in short supply. This makes it imperative that telecommunications investments be for technologies and systems that are compatible, complementary, user-friendly, and cost-effective. Pilot projects are important for assessing the potential benefits, costs, and problems associated with tribal/village use of telecommunications, and provide a basis for sound decisions on infrastructure investment and development. A two-or *three-tier telecommunications infrastructure* will be necessary in many rural Native areas (see box 1-2) to match technology and services with needs on an affordable and practical basis.

The concept of a community communication center warrants serious consideration, especially in Native areas where it is unrealistic for most homes and offices to have anything more than basic telecommunications in the short- to medium-term. A local high school, community college, library, community/cultural center, family wellness clinic, multiservice delivery center, or tribal/village office could be designated as a community communication center where a wide range of telecommunications equipment and services are available to residents, including students and en-

FIGURE 1-1: Tribal Telecommunity

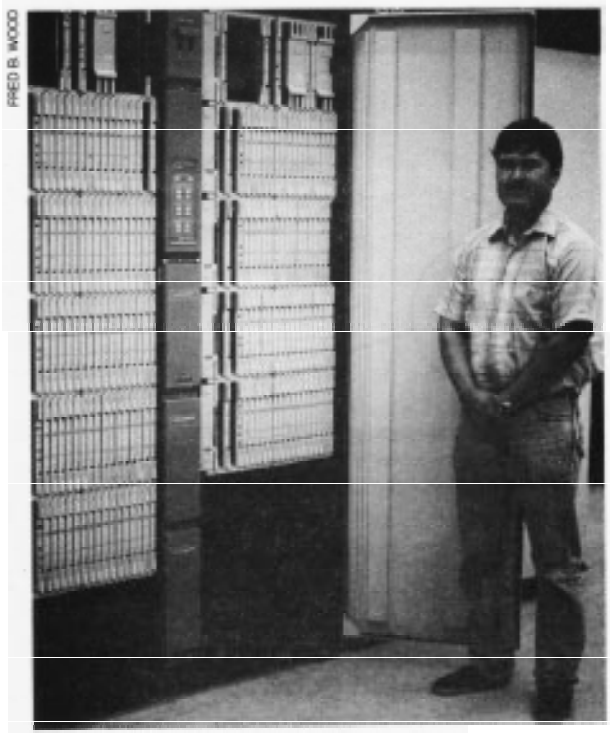


SOURCE: Madonna Peltier-Yawakle, July 20, 1994, and Office of Technology Assessment, 1995

trepreneurs. A slightly expanded version would include several key community buildings in a community telecommunications network (see figure l-l). Either way, the intent would be to provide videoconferencing, computer networking, multimedia, and other services sooner than would otherwise be possible, and to achieve considerable economies of scale by aggregating demand for and use of a common telecommunications infrastructure.

Native Entrepreneurial Activity

The formation of Native-owned and -operated businesses—and especially telecommunications





Above: The OTZ Telephone Cooperative serves the 3,000 residents of Kotzebue, Alaska, 35 miles above the Arctic Circle. ***Left:*** *Digital switching center at the OTZ Telephone Cooperative. Digital technologies are essential to modern telephone service.*

businesses—is one of the best ways to: 1) develop grassroots expertise and leadership in telecommunications; 2) create new jobs on Indian reservations and in Native villages and communities; 3) stimulate the Native economy; and 4) potentially open up new opportunities for Native businesses to compete in regional, national, and international markets. Success stories like the Cheyenne River Sioux Tribe Telephone Authority (South Dakota) demonstrate that Native-owned and -operated telephone, cable TV, satellite broadcast TV, and cellular and wireless companies are within reach. The same holds true for Native-owned and -operated radio stations. But, again, expertise and capital are limited at present. *Federal grant and loan programs could be reviewed and reprogrammed or restructured to place greater emphasis and focus on supporting Native telecommunications entrepreneurs. Native leaders could consider ways to apply some portion of tribal revenues to support telecommunications start-up ventures.*

■ Refocusing the Federal Role

Consistent with empowering Native communities, Congress and appropriate federal agencies could take action in the following areas to develop a federal policy on Native American telecommunications policy, with the involvement of Native American groups, leaders, and telecommunications activists.

Interagency Strategy and Funding

Dozens of federal agencies provide some support for Native American telecommunications, but these efforts are uncoordinated and fragmented. The executive branch, with the support and oversight of Congress, could develop an interagency strategy to provide direction and coordination. This could include an interagency task force or working group. The Bureau of Indian Affairs (BIA), Indian Health Service (IHS), Administration for Native Americans (ANA), and National Telecommunications and Information Administration (NTIA), among others, could combine efforts to strengthen the telecommunications infrastructure in Native areas. Improvements in federal agency telecommunications capabilities should

be viewed in the context of tribal, village, and community infrastructure development needs. Local and federal initiatives should complement each other where possible. Electronic clearinghouses could be used to provide information on relevant programs and projects, accessible by Native American leaders and technology activists as well as federal personnel.

The strategy could be designed to: 1) help ensure that efforts to downsize and reinvent federal agencies give appropriate weight to Native telecommunications needs and legitimate Native projects; 2) encourage tribes, villages, and communities to assume self-direction and control where they have the interest and capability; and 3) establish new mechanisms for interagency and Native government-federal-state partnerships, for example, by crafting more creative and effective interagency agreements and coordinating mechanisms that pool resources and technical support.

Interagency coordination could help ensure that best use is made of scarce federal dollars for telecommunications education, training, pilot-testing, and infrastructure development in Native communities. Even under the best of circumstances, *finding the funds for Native American telecommunications will be difficult.* Native Americans need to make up for previous underinvestment in telecommunications at a time when most traditional funding sources are under increasing pressure, and other basic needs such as housing, food, roads, hospitals, and schools continue unabated. Only recently have Native groups begun to take advantage of grant or loan programs that, for example, provide support for educational technology, rural telephony, rural public radio, and grassroots computer networking. These are among the programs vulnerable to budget cuts.

Telecommunications Policy

Over the past two years, Native American telecommunications activists have asserted that *federal telecommunications policy ignores or contradicts the principles of Indian law and federal Indian policy.* Based on its research, OTA reached a similar conclusion. The federal agencies with major responsibility for telecommunications policy, such as the FCC and NTIA, have not applied Indian law to telecommunications policy. The agencies with lead responsibility for Indian and other Native programs, such as the BIA, IHS, and ANA, do not have a Native American telecommunications policy, nor are they effectively engaged in the wider telecommunications policy debate. The federal government does not have a coherent focus on telecommunications policy as it relates to Native Americans.

The FCC and NTIA could initiate policy inquiries on Native American telecommunications, and invite active participation from tribal governments, Alaska Native and Native Hawaiian organizations, Native technology activists, state regulators, private companies, and the like. These policy initiatives could address both the need for and content of a government-wide policy statement and strategy, and specific topics like sovereignty and self-determination, universal access, and strategic partnerships.

Sovereignty and self-determination

At present, sovereignty is primarily applicable to Indian tribes and Alaska Native villages, and several options are possible. Tribal telecommunications law is in its infancy. Precedents from Indian law suggest that those tribes that wish to assume some degree of telecommunications authority and responsibility now vested in the states and the FCC could legally do so. Some tribes may wish to operate under current state and/or federal authority; others, especially the larger tribes, may choose to establish their own tribal telecommunications agency or authority. The existing balance of federal-state relationships would need to be adjusted to accommodate heightened tribal involvement. *A fundamental question is the extent of tribal authority over telecommunications on tribal lands (e.g., physical infrastructure) and in the air over tribal lands (e.g., frequency spectrum).* The FCC could set up an office of tribal or Native American affairs, include tribal govern-

ments that so desire in regulatory proceedings on a basis similar to states, and over time develop a regulatory policy specifically on Native American telecommunications.

Universal access

Since 1934, federal telecommunications policy has, in effect, cross-subsidized low-density, high-cost rural areas with revenues from the high-volume, high-profit metropolitan areas and interstate routes—thereby improving rural access. *Many rural tribes and villages clearly have a continuing need for universal service fund (USF) cross-subsidies, both directly to Native-owned and -operated telecommunications companies and indirectly to other rural telephone cooperatives and companies that serve tribal or village areas.* Many rural Native Americans would be further disadvantaged if the USF were weakened or discontinued.

The current universal service mechanism could be strengthened by increasing the types and number of USF contributors, expanding the definition of universal service, and possibly creating minimum set-asides for Native rural areas. The implications of universal service options for rural Native areas could be explicitly addressed in ongoing FCC and NTIA policy inquiries. Tribes could be represented on the joint federal-state board that helps determine USF procedures and allocations.

Strategic partnerships

Strategic partnerships with tribes, villages, communities, and Native service providers could be encouraged by the FCC, NTIA, and Congress. Bell operating companies and other local phone companies, cable TV companies, long-distance carriers, competitive access carriers (including electric power utilities), computer companies, and rural telephone cooperatives serving or adjacent to Native American areas—or desiring to serve these areas—could be urged, required, or given incentives to upgrade service. This could be done in collaboration with Native leaders or even in formal partnership with newly created Native-owned telecommunications companies.

The Native telecommunications infrastructure could be given higher priority under the Rural Utilities Service (RUS) guaranteed or subsidized telephone loan programs and technical assistance activities. Native-owned companies are eligible, but few tribes or villages have the expertise or awareness to take advantage of RUS programs. A portion of NTIA and the Corporation for Public Broadcasting grant funds could be allocated to rural Native groups and governments for infrastructure development. These funds could be limited to loans, or some mix of loans and grants (including various forms of matching and incentive grants). The few tribes with significant gaming revenues could invest some portion of net profits into telecommunications, as a handful are already doing, and leverage gaming-related telecommunications facilities for broader tribal applications.

Information Policy

Federal officials need to explicitly consider Native American perspectives when formulating information policy. Native concerns about privacy and about cultural and intellectual property rights on the information superhighway are similar to those of other users. Two specific problems are: 1) controlling access to sensitive religious, spiritual, and ceremonial information transmitted electronically; and 2) protecting the integrity of the information content (e.g., Native artwork or traditional healing) from alteration, misrepresentation, or misuse. *As Native governments make more extensive use of telecommunications and computers, they will need to address a wide range of information policy issues.*

Indian tribes already have significant authority to set rules and regulate use of information on their own reservations. However, tribal members are citizens of both the tribe and the United States—thus constitutional and federal issues such as privacy, security, freedom of speech and press, and the like are relevant. Also, to the extent that tribal information flows electronically on an intertribal or interstate basis, Native American groups will need to collaborate with federal and state regulato-

ry authorities, commercial telecommunications companies, and a range of public and private sector users. Native American leaders and advocates will, in any event, need to participate more actively in federal and state information policymaking to ensure that Native views are fully considered.

Further Research and Evacuation

This is the first federal government report on Native American telecommunications. The report builds, in part, on the work of Native American activists and researchers who have been among the first to grasp the potential and risks of telecommunications (see box 1-3). *Clearly, the field of Native American telecommunications is still in its early stages. While some policy decisions could be responsibly made today, future applications and policymaking would benefit from significant, continued research on many of the topics discussed in this report.*

Also, development of cost estimates was beyond the scope of this report, and will not be feasible until more detailed infrastructure requirements and options are specified. The absence of cost data need not delay strategic policy actions, however. Nor does this report consider the telecommunications needs of Native Americans living on other Pacific Islands such as the U.S. territories of Guam and American Samoa and the U.S. Commonwealth of the Northern Marianas Islands. An improved telecommunications infrastructure could help strengthen the ancestral, cultural, and economic ties between Native Hawaiians and Pacific Islander Americans.

BOX 1-3: Native Voices on Telecommunications

"For reasons which may become apparent over time, I have become a scout or a runner in this Internet. I drop songs as my offerings as I seek along this new migration path, the Cyber-Bearing Crossing, a new route for singing, a new trail for the dust of our clinging to the tribal contract with this sacred creation. "

—Turtle Heart (Ojibway Indian), Johannesburg, CA[1]

"1 want to see a dream become reality. If any American Indian wishes to communicate to another individual or tribe, that the capability to do so is available, so we can perpetuate our ways, language, and people into the far reaches of the future...As Sequoyah was included in history for his attempts, let us continue the good struggle for equality in communication, so we can all have a voice and be heard "

—Andrew Conseen Duff (Eastern Band of Cherokee), Cherokee, NC[2]

"Let us move forward to the future carrying with us the best from the past. The time has arrived for the revitalizing and reawakening of our community... Behind the project lies this vision: Native Hawaiians wiIl be able to obtain Information and referral to Hawaiian and other social services from a single point of access on each of the major Hawaiian Islands, "

—Haunani Apoliona, Alu Like ("working, striving together, Natives of Hawai'i"), Honolulu, HI[3]

"Native Hawaiian peoples are in danger of being left behind in the telecommunications age., .[O]pportunities for employment, training, and 'bridging the communications gap'. .. between Native Hawaiians because of our island geography (especially in rural locales) would be enhanced by establishment of a 'Native Hawaiian Telecommunications Network."

—Ku Kahakalau and Jim Hunt, Honoka'a, The Big Island, HI[4]

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[1] Dan Pacheco, "Circles of Light: Tribal Elders Finding Role for Wizardry of Internet, " *Denver Post, Mar 291995* p. 1F.

[2] AndreW Conseen Duff, "Community Initiative, " statement prepared for the Americans for Indian Opportunity Ambassador Program, n.d. and "A Tradition of Information Gathering," statement prepared for the National Information Infrastructure hearings, Apr. 12, 1995, Santa Fe, NM

[3] Haunani Apoliona, "Toward Collective Action, " Task Force on Hawaiian Services, Nov. 25, 1991, p 2, and "Mult-Service Centers Demonstration Project, " *Alu Like Annual Report 1992,* Honolulu, Hl, p 6

(continued)

BOX 1-3: Native Voices on Telecommunications (Cont'd.)

"More than twenty years ago, when the North Slope Borough was first formed, we dreamed of a locally controlled school system where our children would be able to obtain high school diplomas without ever leaving the North Slope...Who would have predicted that one day our students would shrink distances even further through the use of computers and sophisticated video networks?"

—Pat Aamodt, Superintendent, North Slope Borough School District (86 percent Inupiat Eskimos), Barrow, AK[5]

"Over the centuries, American Indians have not enjoyed the benefits of social and economic progress. Now poised at the beginning of an information revolution, we must ensure that Indians have access to the communications technologies that will enable them to participate in this revolution. "

—Bambi Kraus (Tlingit), National Indian Policy Center, Washington, DC[6]

"The need to clarify matters of tribal and federal jurisdiction in the field of telecommunications and information policy is now reaching a critical point...If tribes do not participate at this juncture, then tribes WI I be omitted entirely and will spend infinite resources to backpedal into this fast moving field. "

—Randy Ross (Otoe-Missouria Tribe), Rapid City SD, and Ellen R. Kemper, Esq., Santa Fe, NM[7]

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[4]Ku Kahakalau and Jim Hunt, "Native Hawaiian Telecommunications Network, " n.d.

[5]"Annual Report 1993 -1994," North Slope Borough School District, Barrow, AK, p 5

[6]U.S. Congress, Senate, Committee on Indian Affairs, *Oversight Hearing To Examine the Feasibility Of Creating a Permanent Indian Research Center,* S. Hrg. 103-161, 103d Congress, 1st sess. (Washington, DC U S Government Printing Office, May 20, 1993)

[7]Randy Ross and Ellen R. Kemper, "Datafication in Tribal America, " paper prepared for the Aberdeen Area (SD) Tribal Chairmen's Health Board, July 25, 1994.

SOURCE Off Ice of Technology Assessment, 1995

Federal policy could redirect agency research programs and encourage the development of centers of telecommunications expertise in Native organizations and universities that serve Native Americans. Federal agencies that support pilot projects and infrastructure development for Native American telecommunications could be required to include an evaluation component. The Office of Management and Budget could require the federal statistical agencies to improve the collection of data on American Indians, Alaska Natives, and Native Hawaiians—as individual racial and ethnic groups and as Native Americans collectively—with a special focus on demographics and telecommunications in rural Native areas.

Also, an appropriate federal agency, university research center, and/or Native organization could, for example: 1) conduct surveys of Native American telecommunications needs and infrastructure (see appendix C for an illustrative survey research instrument on baseline infrastructure); 2) maintain and update the Internet-accessible Native American Resource Page developed by OTA for this study (see figure 1-2 and appendix B); and 3) help the Native American research community make best use of the already significant range of telecommunications resources available to them (see box 1-1 and appendix A on computer networking for Native Americans).

FIGURE 1-2: Front Page of OTA's Native American Resource Page on the World Wide Web



Telecommunications Technology and Native Americans: Opportunities and Challenges

Project Information:

The Office of Technology Assessment's Industry, Telecommunications and Commerce program is in the process of conducting a study entitled *Telecommunications Technology and Native Americans: Opportunities and Challenges. This* study was requested by the Senate Committee on Indian Affairs and will address Native Americans, Alaskan Natives, and Native Hawaiians. For further information about this study, the Telecommunications and Native Americans project proposal and summary can be found on the Office of Technology Assessment's ftp server.
OTA Homepage URL: http:/www. ota.gov/
OTA ftp server URL: ftp://otabbs.ota.gov/

On-line Resource Categories:

Government Resources

Art and Cultural Resources

Academic Resources

Organizations and Networks

See appendix B for further details.
SOURCE: Office of Technology Assessment, 1995.

Telecommunications Technology and Native American Cultures

2

Culture—including language, spirituality or religion, creative expression, historical interpretation, traditions, values, and identity—is a cohesive force in Native American society. For much of U.S. history, federal policy had the effect of subjugating Native cultures to that of the majority society. This was true for American Indians in the contiguous 48 states; Indians, Aleuts, and Eskimos in Alaska; and Native Hawaiians in Hawaii. Many of today's social and economic problems are generally believed to have been caused or exacerbated by the erosion and loss of culture. Thus, renewing and strengthening Native cultures is considered by Native Americans and others to be a necessary condition for rebuilding healthy Native American communities. In recent decades, federal policy has shifted to recognize the importance of Native American cultures.

Telecommunications technology—broadly defined to include telephone, videoconferencing, computer networking, information systems, multimedia, radio/TV, and the like—offers considerable potential to help Native Americans reestablish and strengthen their cultures. It offers new opportunities to save endangered Native languages, including traditional stories and histories, and to perpetuate language with new educational software and greater opportunities to converse with other Native speakers. Using telecommunications, cultural information (including art, songs, stories, dances, research findings, genealogies, and historical interpretations) can be easily shared and distributed among rural and metropolitan Native American communities. It also allows Native Americans, as individuals or through institutions, to broaden public awareness of their cultures. Museums, libraries,



and schools would greatly benefit from telecommunications technologies. They routinely share cultural information and try to promote broader understanding of Native cultures among the U.S. population at large. Culturally sensitive social service institutions would also benefit from readily available cultural material, such as traditional healing research or genealogical information systems.

While sharing cultural material may help broaden public awareness, it also could work against the promotion of Native American cultures if the material were nonauthentic. The ease of transmitting and manipulating digitized material using telecommunication technologies could exacerbate ongoing cultural problems, such as: 1) continuation of negative stereotypes of Native peoples; 2) non-Native Americans posing as spiritual leaders and elders in public forums; and 3) the difficulty of protecting sacred information, such as sacred sites of worship and rituals, from both the general public and unauthorized community members.

Realizing the benefits will require leadership, training, and adequate funding. Mitigating the problems will require tribal and public information policies for access, freedom of speech, privacy, and security for both users and providers of information and cultural material. To ensure that the technology empowers Native Americans in revitalizing their cultures, Native Americans will need to have a central role in controlling, managing, and implementing these technology-enhanced cultural opportunities. If not, there is the potential that non-Native Americans, knowingly or unwittingly, might disseminate inaccurate information or perpetuate negative cultural stereotypes. If Native Americans do not take an active role, federal and state information policies may not be sensitive to the cultural values of Native American communities. An overall strategy to strengthen Native cultures might include formulating an information policy, providing legal protections for cultural property rights, and coordinating efforts to use scarce financial resources by distributing them effectively among many competing projects.

NATIVE AMERICAN CULTURAL AND COMMUNITY CHALLENGES

For years, Native American cultures and communities have been subjugated by federal and state laws and policies of assimilation (see box 2-1). However, despite years of repression, Native American values, cultures, and religions have endured. Traditional core values include honoring the Earth, according children and elders a very high level of respect, and living a balanced life in which the needs of community, family, and self are all attended to. And traditional Native Americans show reverence for the environment, Mother Earth and Father Sky, in everyday actions and decisions. Moreover, many are less concerned with an individual's role in the economy, a "job" or "career," than with living a life that reflects valued traditions. These core values have been difficult to pursue in recent times.

Many Native American communities face social and economic challenges far greater than most of the United States. High-school dropout rates, suicide, alcoholism, unemployment, and poverty within Native American communities are among the highest in the United States. Specifically,[1] the suicide rate for American Indians is more than twice the rate for all other nonwhites; American Indian youth have the highest high-school dropout rate of any minority group; the poverty rate for American Indian families is 24 percent compared with 10 percent for the general population; and the poverty rate for several Indian tribes is more than 40 percent (quadruple that of the general population).

A recent Bureau of Indian Affairs (BIA) survey concluded that BIA high school students "engage in behaviors that put them at risk for significant

[1]Harold L. Hodgkinson, with Janice Hamilton Outtz and Anita M. Obarakpor, *The Demographics of American Indians: One Percent of the People; Fifty Percent of the Diversity* (Washington, DC: Institute for Educational Leadership, Inc., Center for Demographic Policy, 1990).

BOX 2-1: Historical Note: Repression of Indian Culture

in the 1890s, Captain A E Woodson brought remarkable energy to his job as an Indian agent When he arrived at the Cheyenne and Arapaho reservation in Oklahoma, he found the Indians "indulging m the grass dance and enjoying the medicine feasts without molestation. " Accordingly, his '(first act was to forbid dances and feasts..." Once begun, Woodson launched himself wholeheartedly into the business of forbidding. He undertook to prohibit the practices of medicine men or shamans, the custom of sharing goods with relatives, traditional forms of marriage, and visits to other reservations. When the Cheyenne and Arapaho people resisted [Captain Woodson's] interference in their lives, their defiance only convinced Woodson that he was in the right. "An agent must sacrifice any desire to be popular, " Woodson wrote, "if he be Inspired to do his whole duty."[1]

When the Cheyenne and Arapaho people resisted his orders and hired another white man to pursue his removal, Woodson wrote to the Department of the Interior, explaining his struggle with his charges. The Indians, he said, showed "a rebellious spirit in opposition to the methods which have been inaugurated with the sanction and approval of your office..." This resistance had gone as far as "an open expression of disapproval of my regime, which IS distasteful to the old men who are wedded to barbarous customs..." Woodson [explained that he] had simply "endeavored to institute newer, and in my opinion, better methods tending to the improvement of the condition of these people..." The Department's response was, for Woodson, very gratifying. The Indians had to be restrained "from the indulgence in any practices which tend to continue them in barbarism. ," [wrote the Department].

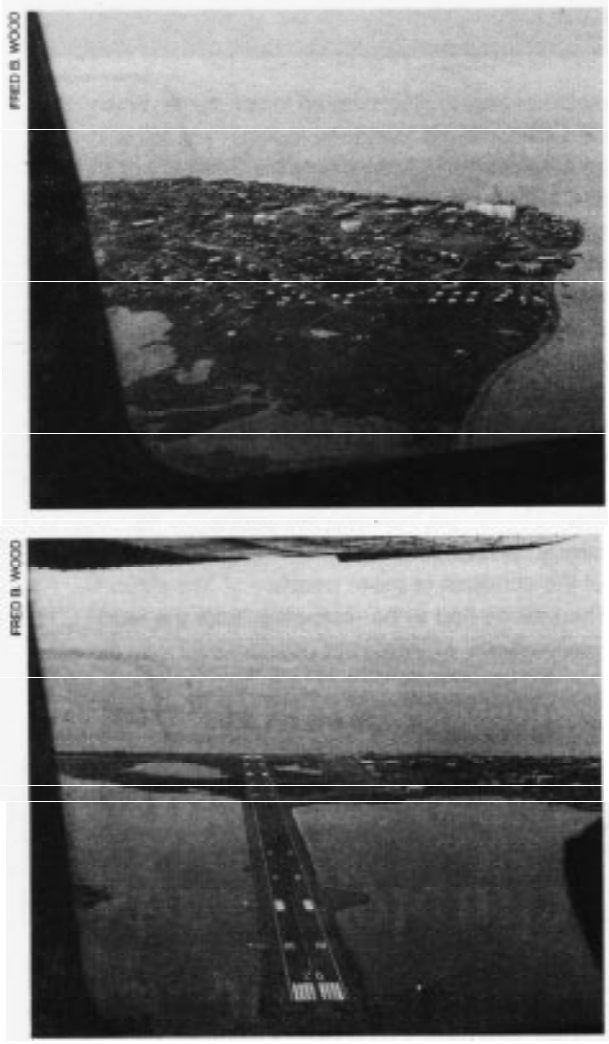
SOURCE Excerpted from Patricia Nelson Limerick, Ph.D., "The Repression of Indian Religious Freedom, ''NARFLega/Revlew, native American Rights Fund, n d Bracketed material provided by OTA for clarity.

[1]United States Office of Indian Affairs, *Report of the Commissioner of Indian Affairs 1895* (Washington, DC U S Government Printing Office, 1895), p 229, and *Report of the Commissioner of Indian Affairs 7898* (Washington, DC: U.S. Government Printing Office, 1898), p 234

mortality, morbidity, disability, and social problems which extend from youth into adulthood."[2] Some statistics from this report include the following: 13 percent of students reported carrying guns during the previous 30 days;51 percent were involved in a physical fight during the previous 12 months; 10 percent were threatened or injured with a weapon on school property during the past 12 months; 43 percent had five or more drinks in a row in one day during the past 30 days; 12 percent reported that they had been pregnant or had impregnated someone; and 29 percent seriously considered attempting suicide during the past 12 months.

Underlying these social problems is frequently a lack of strong cultural identity at the individual, tribal, and pantribal levels. The question of who is an "Indian," "Alaska Native," or "Native Hawaiian" divides Native Americans into separate political groups. The problem stems from the fact that authenticity is not just a matter of blood quantum, but is rooted in the unquantifiable notions of spirituality and cultural or community affiliation. Between 1980 and 1990, the U.S. Census measured a 38-percent increase in the American in dian and Alaska Native population. This large increase has been attributed to two phenomena other than real growth in the Native American popula-

[2]A total of 5,217 BIA high school students at 45 BIA high schools responded. Charles Geboe, Lana Shaughnessy, and John Reimer, *1994 Health Risk Behaviors of High School Students Attending Bureau of Indian Affairs Schools* (Washington, DC: Bureau of Indian Affairs, Office of Indian Education Programs, 1994).



Top: *Eskimo Village of Kotzebue, Alaska, as seen from the air Located about 600 air miles northwest of Anchorge, the village is inaccessible by land and surrounded on three sides by water that is frozen most of the year.* ***Bottom:*** *A single runway serving Kotzebue provides the only year-round access.*

tion—mixed-blood Native Americans changing their affiliation to Native American; and non-Native Americans self-identifying themselves as Native American. Perhaps the positive portrayal of Native Americans in the mass media in the last decade is partly responsible for this change. These shifts have brought into sharp focus the lack of consensus on a definition of Native American or a mechanism to determine authenticity of cultural identity. The determination of authenticity is important not only for political and legal determinations of eligibility for entitlements or rights, but also for the protection and development of spiritual and cultural values.

American Indians and Alaska Natives also face major environmental problems on lands that include two-thirds of the nation's uranium deposits, significant deposits of oil and natural gas, and millions of acres of forests.[3] Pollution from past industrial and extraction activities and dumping of waste materials persist on several reservations. And some reservations and Alaska Native villages are struggling with sanitation problems.[4]

Many Native communities must cope with a high degree of physical isolation. Most Alaska Native villages are reachable year-round only by air, have limited access by water (during the brief summer), and have no road connections. Many American Indian reservations are in remote rural areas, several hours or more away by car from the nearest small city or metropolitan area. Many Native Hawaiian communities, although accessible byroads, are located in the outlying, more remote areas and islands. Also, inter-island travel between Hawaiian communities is primarily by air,

[3] Some enviironmental initiatives include: l) Niiwin, a coalition of Wisconsin tribes facing off with the Exxon Corp. over a metallic-sulfide mine adjacent to the Mole Lake Reservation; 2) California Indians for Cultural and Environmental Protection, working to atop sewer sludge dumping on rancherias in southern California 3) Citizen Alert Native American Program, opposing a national radioactive waste repository at Yucca Mountain, a sacred site; 4) Eyak Rain Forest Preservation Fund, protecting land, water, and forests in Alaska's Prince William Sound. the site of the Exxon Valdez disaster, 5) Snoqualmie Falls Reservation Project, defending a sacred site at Snoqualmie Falls from an expanded hydroelectric facility; and 6) Native Action, protecting the sacred Sweet Grass Mountains of Montana where a moratorium on gold mining will soon expire. David Tilsen, electronic mail posted on the aisesnet general list server, Apr. 25, 1995.

[4] For a discussion of the geographic, social, and economic settings of remote Alaska Native villages and the problems providing safe water and waste sanitation systems, see U.S. Congress, Office of Technology Assessment, *An Alaskan Challenge: Native Village Sanitation,* OTA-ENV-591 (Washington, DC: U.S. Government Printing Office, May 1994).

as is the case for most travel between Alaska Native villages.

As a consequence of rural isolation, and frequently a lack of jobs on the reservations, Native Americans may make several major moves to and from reservations or rural areas as they balance economic necessity with their desire to maintain family and cultural ties. Thus, although this report primarily addresses the needs of Native Americans who live in rural areas or reservations, the distinction between a "rural" and "urban" Native American will become blurred over time (see box 2-2). Policy designed today to help rural and reservation Native Americans will likely affect urban Native Americans at some later time, and vice versa for policy designed to affect urban Native Americans.

The well-being of Native Americans and their communities is a function of their: 1) cultures and core values; 2) physical, spiritual, and mental health of individuals and families; 3) quality and level of education, health care, and other vital local services; 4) employment prospects and conditions; 5) environmental health; and 6) effectiveness and responsiveness of the tribal, village, or community government leaders and elders.[5] A strong sense of the interconnectedness and interdependence of these components is central to Native concepts of well-being and cannot be overemphasized. The ability to communicate is critical to maintaining these connections.

In many respects, mainstream society is beginning to recognize and incorporate Native American core values and notions of well-being. Education is now "lifelong learning." The medical profession has a growing awareness of how environment, cultural traditions, and family support contribute to physical and mental health. The very notion of "health" includes feelings of well-being. Some Native beliefs, such as opposition to mining, run counter to the mainstream. Others, such as protecting the environment against pollution, are shared by the mainstream society and are an important public priority.

In reality, often the components of community do not work well together because of political conflicts and tensions, scarce resources, and daunting socioeconomic challenges. Partnerships, joint ventures, and interagency councils are all attempts to create the necessary links for community organizations to share resources and interact to solve problems. In general, federal policies for Native Americans need to consider Native American concepts of culture and community, such as "honoring the earth" and "community interconnectedness." Successful policies are most likely to result from significant Native American participation.

RENEWING AND STRENGTHENING NATIVE LANGUAGES

Native Americans have a rich oral tradition that continues today. The written form of most Native languages developed after the arrival of European settlers. However, to this day, some Native stories and histories are communicated only orally or pictographically to maintain the tradition. For example, some nations of the Iroquois Confederacy have maintained rituals of storytelling that have never been written down. State and federal policy, after decades of Native language suppression, now recognizes the importance of language re-

[5] A number of nonprofit organizations provide cultural and community services and resources. See, e.g., Americans for Indian Opportunity (Bernalillo, NM); American Indian College Fund (New York, NY); American Indian Ritual Object Repatriation Foundation (New York, NY); American Indian Resource Council (Oakland, CA); American Indian Science and Engineering Society (Boulder, CO); Association on American Indian Affairs (New York, NY); Honor Our Neighbor's Origins and Rights (Milwaukee, WI); Indigenous Environmental Network (Bemidji, MN); Indigenous Women's Network (Lake Elmo, MN); Institute of American Indian Art (Santa Fe, NM); Native American Council (New York, NY); Native American Rights Fund (Boulder, CO); Native California Network (Bolinas, CA); North American Indian Women's Association (Gaithersburg, MD); Northwest Renewable Resources Center (Seattle, WA); Solidarity Foundation (New York, NY); and United National Indian Tribal Youth (Oklahoma City, OK).

BOX 2-2: Native American Mobility

"At the moment, the question (How are they doing) can just barely be asked of American Indians, in that the information about them is so uncoordinated and fragmented."

"The 1980 census data on the 'demographic, social, and economic characteristics of American Indian tribes' were only released in a Census Bureau publication dated February 7, 1990, a full decade after the last census was finished!"

"At a time when policy makers are beginning to rely on demographic data for decision-making and program planning, it is a disgrace that data on American Indians are so scarce. " [1]

Approximately two-thirds of Native Americans live away from reservations and rural hometowns—many to go to school or work in more urban areas.[2] This statistic, however, does not indicate the frequency of back and forth movements or the underlying forces at work. Two factors shape this dynamic: a strong need to maintain familial, cultural, and religious ties; and employment opportunities. Office of Technology Assessment staff discussed this topic during numerous interviews and constructed the following representative scenario of Native American mobility.

Many native Americans spend their youth and retirement predominantly m their homelands Many first leave the reservation to attend a boarding school or college. Others leave to attend a vocational. professional, or graduate school. Still others may first leave to attend a professional conference or meeting A large number of Native American youth are growing up in urban areas, yet maintain close ties with relatives by visits and participation in religious and cultural activities. Some may even spend the summer months with relatives or friends to learn traditional ways and participate in activities such as farming, hunting ranching, cooking, and a wide variety of arts including crafts, weaving, and pow-wow dancing Many adults find employment off the reservation. This could be a few miles or a few hundred miles away from home, Those far away must and do make extraordinary efforts to visit friends and family, visit sacred sites, and participate in religious rites and ceremonies. in retirement years, many may make a final move back to the reservation. Others may move back temporarily or permanently to take care of aging parents.

This picture has two Important implications. First, there is not a static division between those who choose to live on or away from reservations and villages, but rather a strong back-and-forth mobility This means that telecommunications infrastructure on reservations and in rural villages will likely benefit the majority of Native Americans at some point in their lives. Moreover, declining costs and/or enhanced telecommunications such as videoconferencing and computer networking will promote ties and "community" regardless of space and time. Second, the balance between "cultural pull" and "employment push" might be significantly changed by telecommunications applications that spur economic development on reservations, For example, employment in teleservices, electronic commerce, telecommunications companies and Native programming are all opportunities that reservations and rural areas might embrace to increase the number of jobs, On the other hand, these opportunities are already available off the reservations and are motivating new college graduates and other wage-earners to leave the reservations

[1] Harold L. Hodgkinson, with Janice Hamilton Outtz and Anita M Obarakpor, *The Demographics of American Indians, One Percent of the People, Fifty Percent of the Diversity* (Washington, DC Institute for Educational Leadership Inc., Center for Demographic Policy, 1990), pp. iv-1.

[2] The 1990 census reported that 437,431 American Indians and Alaska Natives (22.3 percent) out of a total of 1,959,234 live on reservations or associated trust lands. Another 200,789 (1 O 2 percent) live within former reservation areas in Oklahoma, "Tribal Jurisdiction Statistical Areas, " where tribes retain certain types of tribal jurisdiction. Another 47,244 (2.4 percent total, or 55 percent of Alaska Natives) live on Alaska's one reservation, the Annette Islands Reserve or in an "Alaska Native Village Statistical Area, " which delimits living areas of tribes, bands, clans, groups, villages, communities, or associations Jack Utter, *American Indians. Answers to Today's Questions* (Lake Ann, Ml National Woodlands Publishing Company, 1993), p 20

SOURCE Off Ice of Technology Assessment, 1995

newal and strengthening-primarily to Native peoples, but also to the mainstream society. Microcomputers and software offer new opportunities to record, teach, and utilize languages, in written, graphic, and oral forms.

Prototypes appear to be successful. For example, microcomputer keyboards, fonts, and operating system software have been adapted for the Native Hawaiian language 'Olelo Hawai'i (see box 2-3). And students on the Hualapai Reservation in Arizona and the Pine Ridge Reservation in South Dakota are learning their Native languages via multimedia programs that allow them to check their pronunciations with the computer voice.[6]

Software flexibility and new computer programming tools facilitate the development of educational language applications. Multimedia technology, moreover, allows inclusion of audio, video, pictures, and icons to make the application "user-friendly." The development of standardized hardware and software tools would reduce the cost and increase the availability of applications that help record and teach Native languages. A common and portable technology platform seems essential, given the large number of Native languages (187 in North America by one estimate).[7]

Once Native languages are put into electronic form, they would then be suitable for a variety of other electronic applications. Electronic Native language dictionaries could be prepared and copied via diskette, CD-ROM, or online. The Native languages could be used in Native electronic bulletin boards (e.g., the Leoki Hawaiian language bulletin board), and in Native audio, video, and film material prepared for educational and cultural purposes.

Learning a Native language requires more than classroom instruction; it is reinforced through informal everyday use. The Leoki bulletin board provides an opportunity for those learning Hawaiian to practice the language by creating anonline community of interest that includes Hawaiian speakers locally and around the world. For example, Hawaiian speakers in California now use Leoki to connect with Hawaiian speakers in Hawaii.



Top: *Honokaa High School located in the rural community of Honokaa, The Big Island, Hawaii.* ***Bottom:*** *A Honokaa high school teacher demonstrates use of personal computers for Native Hawaiian language instruction. Computer software offers new opportunities for students to learn Native language and culture.*

[6] A.J.S. Rayl, "New Technologies, Ancient Cultures," *Omni,* vol. 15, No. 10, August 1993. p. 48.

[7] In North America, 149 out of 187 languages (80percent) are no longer being taught to children. Catherine Gysin, "The Horizon" *Utne Reader,* vol. 57, May/June 1993, pp. 23-24. Leanne Hinton of the University of California at Berkeley estimates that there are between 200 and 250 Native languages in North America and 500 of them are in California. Tino Ramirez, Hawaiian Language Is Flourishing Via Cornputers, Internet" *The Honolulu Advertiser,* Feb. 19, 1995, p. A5.

BOX 2-3: Technology for Reestablishing 'Olelo Hawai'i, the Hawaiian Language

"I am proud to be Hawaiian. I learn hula, we sing Hawaiian songs, and I like to listen to Hawaiian music on the radio. I like to help people and I like being one 'ohana and sharing things with others. I also like to eat Hawaiian food. "1—Kelsey, age 8

'Olelo Hawai'i became a written language when missionaries arrived in Hawaii in the early 1800s Until the overthrow of the Hawaiian monarchy in 1893, newspapers flourished and both native Hawaiian and missionary children were bilingual in 1896, 'Olelo Hawai'i was outlawed, and the language declined until 1978 when the State of Hawaii legally recognized it again Today, there are Hawaiian language Immersion programs such as the Punana Leo Hawaiian language preschool program (six schools on five Islands), and the Kula Kaiapuni Hawai'i program for elementary school children supported by the Hawaii Department of Education.

The use of computers and telecommunications in Hawaiian schools can greatly reinforce the learning process. Keola Donaghy, an Immersion teacher and computer consultant. modified computer keyboards and software Working with Hale Kuamo'o, the Hawaiian Language Center at the University of Hawaii at Hilo, Donaghy developed the Leoki electronic bulletin board service (BBS) with an Hawaiian language graphical user interface (GUI). Donaghy has created Hawaiian fonts, translated programs into Hawaiian and is working on translating a computer operating system The Komike Hua'oleo (Hawaiian lexicon committee) is creating several hundred new Hawaiian words for technology (e g modem, hard drive, font, format, left justification, export text, computer monitor, and bulletin board service).

The Leoki BBS has greatly benefited teachers and students alike. It offers electronic mail, public conferences, chat sessions, online references (e.g., English-Hawaiian and Hawaiian-English dictionaries), and online periodicals (e. g , the Hawaiian Language Center publishes a monthly newspaper in Hawaiian An online voting booth allows polls to be taken on important issues Teachers can order books, videos, audiotapes, and other learning materials with online forms Use of Leoki has resulted in tremendous savings in U.S. mail and Inter-island phone charges For now, Leoki is interconnected through the Hawaii FYI network, but in the future it will be an on-ramp to the Internet and a bridge to native Hawaiians on the mainland, as well as students enrolling in Hawaiian language courses in high school, college and adult continuing education classes throughout Hawaii.

[1] Joyce Ahuna-Ka'ai'ai (ed.), *He Alo A He Alo Face to Face: Hawaiian Voices on Sovereignty* (Honolulu, HI: American Friends Service Committee, 1993), p 99

SOURCE: Office of Technology Assessment, 1995, based on information from Keola Donaghy, "'Enehana Kamepiula Technology for a Hawaiian Speaking Generation, " *Ties That Bind 1994 Conference* Proceedings (Cupertino CA Apple Computer 1994) pp. 71-80

Radio and television broadcasting are another way to reinforce Native language learning. For example, tribal radio station KNNB, on the Fort Apache Indian Reservation in Arizona, runs XI-second spots in Apache language instruction. The Apache tribe is also in the process of developing an Apache-language TV station.[8]

Advocates for the survival of endangered languages can join list servers and online discussions

[8] Ronnie Lupe, "Chairman's Corner," *Fort Apache Scout,* vol. *33, No. 26,* Apr. 14, 1995, pp. 2-3.

BOX 2-4: The Internet, the World's Largest Internetwork

An *internetwork* is a computer network of interconnected computer systems and networks that can seamlessly communicate. The Internet is the largest such global internetwork, estimated to have about 48 million users (assuming 10 users per host computer) in more than 146 countries (electronic mail connectivity) The global internetwork has many names such as the "Net," the ''Matrix," or "Cyberspace" in February 1995, about 48,000 networks (4.8 million host computers) worldwide made up the Internet. And these numbers are growing very fast.

The Internet began in 1969 with ARPANET, the first wide area network (WAN) that was a project of the U.S. Department of Defense's Advanced Research Projects Agency. ARPANET was a defense prototype to demonstrate uninterrupted communications with packet-switching technology, as might be necessary during wartime. in 1985, the National Science Foundation (NSF) installed a new national backbone (i.e., a high-capacity link between regional networks). For several years, the Internet primarily served the information, computing, and communications needs of scientists and engineers. The first applications were remote use of computers, file transfers, and electronic mail (e-mall)

Since 1985, NSF's open interconnection policy has catalyzed network expansion beyond defense and research networks to include government, education, and commercial networks, and beyond the United States to include the whole world. This expansion was fostered by an established transmission protocol, the Internet Protocol (1P), that all new entrants agreed to use (85 countries now have full IP backbone connectivity). Today, there are many IP internetworks in addition to those that comprise the Internet.

Altogether there are thousands of individual applications running on the Internet, but the top 10 comprise about 97 percent of the traffic. Some of the most-used applications, in terms of percent of total bytes of traffic in February 1995 on the NSF backbone, are the Gopher search application (2.6 percent), telnet remote computer use (3.2 percent), smpt electronic mail (5 percent), netnews news service (9 percent), World Wide Web browser (20 percent), and FTP file transfers (27 percent).[1]

in the future, even more growth is expected, most of it from new commercial traffic Business applications such as electronic data interchange and electronic cash are newly available, and electronic commerce pilot projects—such as CommerceNet in California's "Silicon Valley ''—are in the works This change in orientation from research to commerce will present new challenges, but has the potential to turn the Internet into the nation's premier economic resource, serving government, academia, and industry.

[1] Information from the National Science Foundation FTP file server, ftp://nls.sf net/statistics/nsfnet/1995/n5f-9502.highlights.

SOURCE: Office of Technology Assessment, 1995.

on the Internet (see box 2-4).[9] Large commercial subscription networks and smaller electronic bulletin board services also provide forums for online discussions of Native languages.

The challenge of renewing Native languages should not be underestimated. An entire generation has grown up not speaking their traditional languages. Many elders are now trying to revive their languages by teaching their grandchildren or going into the schools to speak with language students. Most believe that language and lore can only be taught in person where facial expressions,

[9] For example, the Australian National University maintains an Internet list server (an electronic forum whereby electronic mail is distributed to all subscribers to the "list") on endangered languages. To subscribe, send electronic mail to majordomo@ coombs.anu.edu. au. in the body of the message, type "subscribe Endangered-Languages-L <your e-mail address>."

gestures, and tones are conveyed in personal settings. The elders are in the best position to teach and pass on language and traditional cultures. If elders are encouraged and assisted in the use of the technology to record the language and work with software developers, the resulting language and culture applications will greatly benefit from their knowledge and wisdom. Without the guidance of elders on technology use for Native cultural purposes, students will be primarily exposed to, and will likely adopt, the language and culture of the mainstream.

PROTECTING SACRED SITES AND OBJECTS

Native Americans accord great importance and reverence to sacred land sites and objects, and instruments for religious, ceremonial, and burial purposes.[10] Federal policy recognizes the importance of these sites and objects, and requires agencies to be sensitive to the effects of federal programs and activities on Native American religious beliefs and practices. For example, federal law requires federal agencies and federally funded institutions (approximately 5,000) to compile inventories of burial remains—Native American skeletons, funerary and sacred objects, and other items of cultural importance—and to repatriate these items when requested by the tribe or village of origin, in accordance with the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA).[11] Increasingly, these groups are required to consult with Native leaders as part of their scientific research (e.g., for permits to study collections or to pass completed studies to tribal councils for prepublication review) or for land-use planning to ensure that Native religious and cultural values are considered and sacred sites and objects protected.

Computer information systems with electronic databases are ideally suited for keeping track of information on millions of artifacts and sacred sites through initial inventories and continuing updates from Native groups, scientists, and land managers. The description and location of sensitive sites could be included in geographic information systems maintained directly by tribes and other Native groups, or by relevant federal agencies (tribal access and integrity would need to be ensured). Electronic inventories and timely information could be distributed to Native leaders using computer networking. For example, the National Park Service announces NAGPRA review committee meetings on the Internet and maintains the National Archeological Database (see box 2-5).

Privacy is a concern, however, because some sacred sites may be so sensitive that widespread public knowledge could compromise their sanctity. Native groups would need to be involved from the outset to ensure appropriate inventory (and site) security and privacy. In some cases, sensitivity may be so high that online dissemination would be too risky. The pace of reclamation and repatriation is also a concern; many tribes do not have the resources to handle and store large numbers of artifacts. Computer networking has accelerated the rate of activity—meetings, conferences, rules-making, and decisionmaking—of many concerned parties, while leaving others (notably non-networked Native Americans) uninformed and without reasonable opportunities to participate.

Videoconferencing could be used to facilitate Native consultations with federal land managers. Tribes and villages are frequently located in remote areas that are far from the federal regional headquarters offices, making travel to meetings

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[10] See Todd Wilkinson, "Ancestral Lands," *National Parks*, vol. 67, No. 7-8, July 1993, pp. 30-35.

[11] See Virginia Morell, "An Anthropological Culture Shift," *Science*, vol. 264, April 1994, pp. 20-22; Ellen K. Coughlin, "Returning Indian Remains," *Chronicle of Higher Education*, vol. 40, No. 28, Mar. 16, 1994, pp. A8-A9, A16; and June Camille Bush Raines, "One Is Missing: Native American Graves Protection and Repatriation Act: An Overview and Analysis," *American Indian Law Review*, vol. 17, No. 2, 1992, pp. 639-664. To subscribe to an electronic forum on NAGPRA, send the message "subscribe nagpra-l" to majordomo@world.std.com.

BOX 2-5: The Online National Archeological Database

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 is the latest legislation in a series of laws that protect Native American archeological artifacts, culture, and/or religious freedom, Including the American Antiquities Act of 1906, National Historic Preservation Act of 1966, American Indian Religious Freedom Act (AIRFA) of 1978, the Archeological Resources Protection Act of 1979, and the National Museum of the American Indian Act (NMAIA) of 1989.[1] Another bill, the Native American Cultural Protection and Free Exercise of Religion Act, was considered in 1994, but was not enacted.

NAGPRA has created a great need for computer information services and databases. Museums must inventory collections and notify tribes (including Alaskan and Hawaiian villages). And tribes are being swamped with paper inventories sent to them from hundreds of museums. The Department of the Interior's National Park Service, with funds authorized by Congress, created the online National Archeological Database (NADB) to gather, as well as disseminate, information related to preserving America's archeological heritage. NADB assists the implementation of NAGPRA policy with a special NAGPRA module.

NADB also features a reports module with 100,000 citations of archeological investigations, a permits module with federal excavation permits issued before 1984, and mapping capabilities at the state and local levels. The Park Service works in partnership with federal, state, local, and tribal government agencies, professional societies, and educational and scientific organizations to keep NADB records up to date. The reports module is updated with help from state historic preservation officers, state archeologists, and the Department of Defense, The permits module is updated with help from the Smithsonian's National Anthropological Archives.

The NAGPRA module features guidance on implementing NAGPRA. It provides the full text of NAGPRA as well as regulations. It identifies contacts for Indian tribes and federal agencies and reports on activities and meetings, including the NAGPRA review committee.

The NADB-Reports and NADB-NAGPRA databases are now available via modem, remote login, or Internet. The U.S. Army Corps of Engineers can access NADB through its automated network, CEAP.

[1] For a detailed discussion of federal legislation and regulations, including how cultural resources management and tribal religious values can be integrated into the review process established by the National Environmental Policy Act of 1969 (NEPA), see Dean B Suagee, "American Indian Religious Freedom and Cultural Resources Management Protecting Mother Earth's Caretakers, " *American Indian Law Review, vol.* 10, No 1, 1983, pp. 1-58

SOURCE: Office of Technology Assessment, 1995, based on information from the U.S. Department of the Interior, National Park Service, Archeological Assistance Division, "NADB Access" (pamphlet), Washington, DC, 1994

and hearings difficult or impossible. While face-to-face interaction may be preferable, the electronic equivalent may be a more effective substitute than telephone or mail.

RECORDING, DEVELOPING, AND SHARING NATIVE CULTURES

Computer and communication technologies are revolutionizing the ability of Native Americans to record, develop, and share cultural resources. Native activities, traditions, sites, and sounds can be stored on videotape, videodisc, and CD-ROM; transmitted by radiowaves, copper telephone lines, and fiberoptic cables; and broadcast/displayed by radio, TV, or computer monitor. New electronic works of art that reflect and inspire Native cultures are possible in multimedia formats. When digitized, these electronic materials can be

transmitted over any distance without loss of quality or integrity—for example, within a single tribe or local community, among several tribes or villages across the country, or across regional or national networks of institutions and communication outlets that reach Native Americans. Also, unlike a phonograph record or analog audiotape, CD-ROMs do not wear out. However, like records and record-players, CD-ROMs and CD-ROM players may become obsolete over time, replaced with cheaper, higher capacity, or smaller versions. Nevertheless, these advanced technologies—for recording, developing, and sharing—help bring together the emerging Native American cultural infrastructure.

Native leaders, elders, historians, artists, filmmakers, composers, storytellers, and advocates feel a strong need to maintain and develop Native cultures, and increasingly understand the potential of telecommunications technologies. Provision for Native programming must accompany new wires and conduits. Native-language, Native-produced, and Native-relevant programming is an effective response to the onslaught of mass media that Native activists and scholars decry as a key contributor to cultural erosion. New technologies for Native programming include video camcorders, digital audiotape recorders, and a multitude of software applications for everything from desktop publishing to computer animation.

Because many of these technologies are designed for personal use, home-grown productions are proliferating. For example, students and professors at the Oglala Lakota College on the Pine Ridge Reservation in South Dakota are "creating CD-ROMs on everything from the Bigfoot Massacre in 1890 to the Wounded Knee Uprising in 1973 . . . [and] in Window Rock, Arizona, the Navajo tribe is creating a CD-ROM on their traditional world view."[12]

Recently, the Ojibwe K-9 schools on the White Earth Reservation in Minnesota started using a Native-made CD-ROM entitled "Culture and History of the White Earth Ojibwe." This CD-ROM, the result of a two-year effort to record oral histories and scan historical documents and photographs, was supported by a $50,000 grant from the Blandon Foundation. Before it was created, "teachers had little information about the tribe—most couldn't even pronounce Ojibwe words [and] students had little understanding of the culture and heritage that shaped their ancestors' lives."[13]

The number of advocacy and Native media arts centers that train or support Native programming is small. There is only one national training center, the Indigenous Broadcast Center, for Native Americans in public radio broadcasting. Other groups include the Indigenous Communications Association, Native American Public Broadcasting Consortium, Institute of American Indian Arts, Native American Producers Alliance, Aboriginal Film and Video Artists Alliance, and Pacific Islanders in Communications. Given the cultural imperative and limited monetary support, these centers have learned to "do more with less." Because of the broadcast nature of media arts and the ability to easily share digitized multimedia, support for Native programming will help to maintain, develop, and share Native cultures. As noted by Native filmmaker Loretta Todd, one of

[12]Rayl, op. cit., footnote 6, p. 48.

[13]Peggy Healy Stearns, "History Comes Alive: A School District Creates Its Own CD-ROM on Local Native American Culture," *Electronic Learning*, vol. 13, No. 2, October 1993, pp. 8-9.





Left: *Cultural Center of the Oneida Nation, New York. The Center houses Native art galleries, educational facilities, and a gift shop for visitors and tourists. Right: An Oneida Nation computer specialist demonstrates the first home page implemented by an Indian tribe. The home page provides information on the history and culture of the Oneida Nation. The Oneida Nation believes that making cultural information available to other tribes and the general public through the Internet will help promote the rebirth and understanding of the Oneida culture. The home page is accessible via the Oneida World Wide Web site (see appendix B for details).*

the key concerns of Native filmmakers "is the need to heal our community. . . the practical side to this means getting access to equipment, to broadcasting opportunities."[14]

Current efforts to train new Native programmers appear to be innovative and high in quality. For example, the Indigenous Broadcast Center, a project of Alaska Public Radio Network, was recently awarded grants from the National Alliance for Media Arts and Culture (NAMAC) in Oakland, California, and the National Endowment for the Arts (NEA) .[15] The NEA grant will create partnerships between Native radio producers and artists to produce feature-length radio arts pieces. The NAMAC grant will be used to conduct the fourth annual award-winning Alaska Native Youth Media Institute, an intensive eight-day residential hands-on workshop led by Alaska's top media professionals in radio, video, and journalism.

About 120 tribal and village museums or cultural centers focus on the history and culture of individual Native groups.[16] Few use electronic technology today, but tribal cultural centers could be future users of electronic cultural materials. Several commercial CD-ROMs on Native Americans are available for tribes that lack the resources to create their own.[17] Exposure to multimedia CD-ROMs could stimulate greater local interest in producing materials.

Telecommunications technology could benefit local schools and community colleges that serve areas with high concentrations of Native Americans. Many such schools and colleges already make at least some use of instructional technology (including educational software, film, video, and/or distance-learning videoconferencing), and thus seem to be good candidates for new electronic materials as part of history, culture, and language courses. For example, the Red Lake Elementary

[14] Sally Berger, "American Indians: The Films of a Native Daughter," *Interview,* vol. 23, No. 4, April 1993, p. 113.

[15] "IBC Receives Specialized Training and Institute Institute Grants," *Tundra Times,* vol. 34, No. 5, Jan. 18, 1995, p. 5.

[16] Morell, op. cit., footnote 11, p. 22.

[17] For example, "The American Indian: A Multimedia Encyclopedia" is available for $295 from Facts on File, a company based in New York City. Vicki Wood, "Reflections on History: The American Indian," Electronic Learning, vol. 13, No. 2, October 1993, p. 35.

and High Schools in Minnesota received an award from the INFORMS (Internet for Minnesota Schools) program to establish a reservation-to-reservation Internet "key pal" program.[18] The students will be encouraged to learn language arts, geography, Ojibwe culture, and computer technology. They will develop a database of American Indian schools, along with their Internet addresses, which will be made accessible on the INFORMS Gopher and World Wide Web servers.

Technology could, likewise, assist libraries and information centers that serve Native American communities, whether stand-alone or collocated with another institution such as a school or service center. Although historically paper-based, libraries are now accustomed to providing information using various media. They would likely be ready users of new electronic cultural materials, assuming, as with schools, that training and resource issues could be resolved. Many libraries now maintain record, tape, video, and software collections, as well as CD-ROM database systems and computer networks.

In a recent project, NYSERNet, Inc., with financial and equipment grants from the J.M. Kaplan Foundation and Apple Computer, connected five rural libraries and the Onondaga Indian Nation in New York to the Internet.[19] The premise of the project was "that the public library can serve as the intermediary, or 'linking agent,' between the rural population and the evolving network of electronic information."[20] Critical to the success of the project was personalized support for participants. The barriers included high long-distance telephone charges, limited access to points-of-presence, and lack of awareness in the broader community. These libraries were not specifically involved in building a new library-wide information system, but the project did demonstrate successful use of resources on the Internet, considered to be the largest virtual library in the world.

In another application, Apple Computer sponsored Project Jukebox through its Apple Library of Tomorrow grant program.[21] The goal of Project Jukebox was to record oral histories. The project team encountered a common dilemma—to make the audio recordings widely available while protecting the rights of the interviewees. Users of Project Jukebox are now required to acknowledge that they have read the release agreement before proceeding (see box 2-6). A scaled-down database will be provided to the National Park Service, presumably for use by tourists in national parks. The database will also be archived using digital audiotape and, in time, will be available on CD-ROM.

No one is certain what the library of the future will look like, or what role it will play in the emerging National Information Infrastructure (see box 2-7). Tribal libraries may want to maintain electronic databases pertaining specifically to Native American issues, or even to specialize in one area such as Indian law. They may choose a dominant role in cultural protection, support of self-governance, or public outreach. In partnerships, libraries could avoid duplication of effort by sharing their electronic databases through an intertribal library computer network. Libraries might also consider becoming community information and communication centers, especially in remote and economically depressed areas that lack adequate access to residential telephones.

Native newspapers and newsletters could be strengthened through use of telecommunications

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[18]Posting on the MINN-IND (Minnesota Indian) list server, Mar. 4, 1995. To subscribe to MINN-IND, send an e-mail request to dborn@maroon.tc.umn.edu.

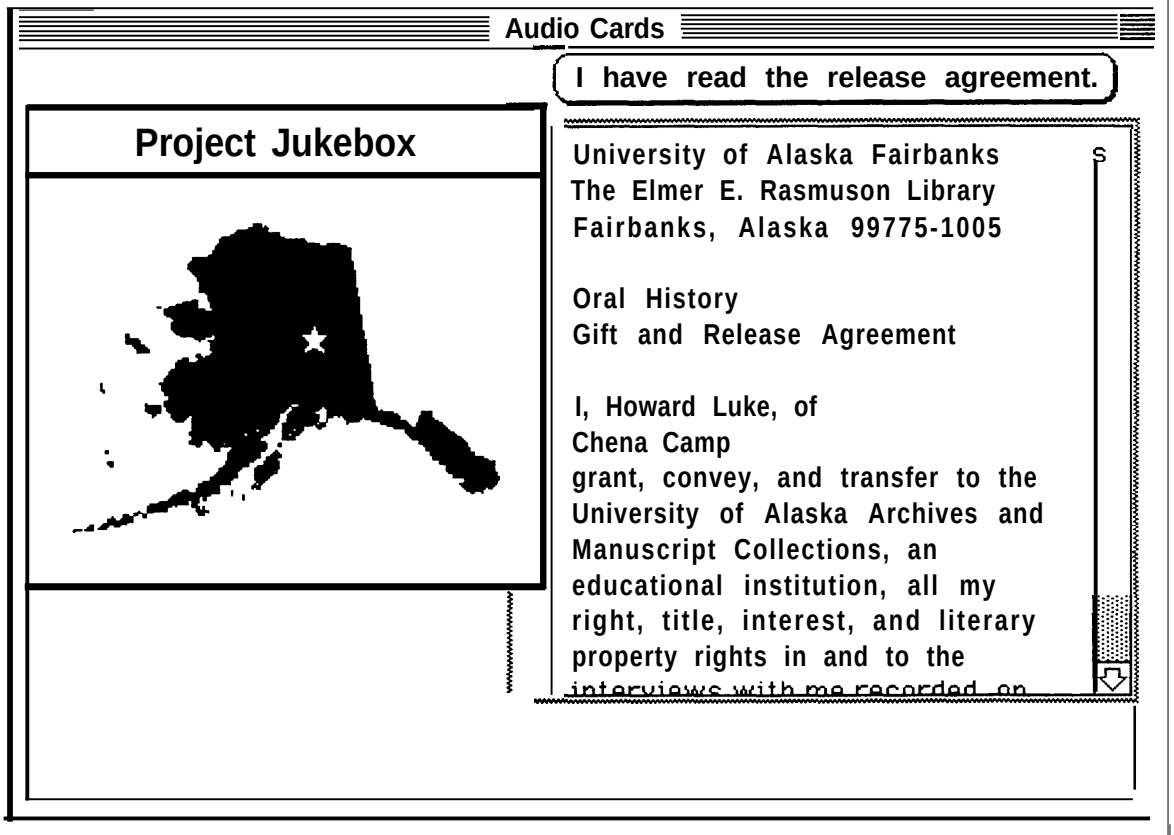
[19]Charles R. McClure, Waldo C. Babcock, Karen A. Nelson, et al., *The Project GAIN Report: Connecting Rural Public Libraries to the Internet*, project evaluation report prepared for NYSERNet, Inc., Feb. 15, 1994 (Manlius, NY: Information Management Consultant Services, Inc., 1994).

[20]Ibid. p. 1.

[21]Project Jukebox was a project of the Elmer R. Rasmuson Library at the University of Alaska Fairbanks campus. An early description with preliminary results is described in Steve Cisler (ed.), *Apple Library of Tomorrow 1990 to 1992* (Cupertino, CA: Apple Library, 1993).

BOX 2-6: Protection of Culturally Sensitive Information: Project Jukebox

Without clicking on the acknowledge button "1 have read the release agreement, " a user of Project Jukebox (sample screen shown here) cannot listen to audio recordings of culturally sensitive oral histories, or view and print photos and text from the transcript, The release agreement holds a user liable for any subsequent misuse of the information.



SOURCE: Office of Technology Assessment, 1995, based on material in Steve Cisler (ed.), *Apple Library of Tomorrow* 1990 to 1992 (Cupertino, CA. Apple Library, 1993), p 8

technology. About 300 newspapers and newsletters, mostly small and very-low-budget, cover Native cultural events, issues, and artists, and could benefit from intertribal electronic distribution of news and easy, affordable electronic access to cultural materials. Radio and TV stations (including cable TV) also can use satellite links to receive and send Native programming, and thus better serve Native communities. A leading example is the American Indian Radio on Satellite (AIROS) project designed to increase Native programming on the 26 tribal radio stations. It is co-sponsored by the Native American Public Broadcasting Consortium and Indigenous Communications Association, with Corporation for Public Broadcasting funding.

in sum, electronic technologies can strengthen the ability of Native artists, filmmakers, storytellers, and historians to produce cultural materials, and make it easier for cultural institutions serving Native Americans (e.g., museums, schools, li-

BOX 2-7: Information Technologies and Tribal Libraries

in Indian America we have two major information problems;
others have little accurate information about us from our perspective, and we
have poor access to reformation from others which could benefit us. "-James May (Cherokee)

The U S National Commission on Libraries and Information Science (NCLIS) conducted an extensive three-year study on challenges critical to the development of tribal libraries and information services for native Americans [1] More than 130 tribes and villages participated in hearings, site visits, and surveys The study addressed issues such as the role of new information technologies, the special problems of cultural and language preservation as oral traditions erode; and the role of libraries in all areas of Native life, especially to provide access to tools, technologies, literacy and basic job skills training, and resources to successfully enter the Information Age.

Two of 10 challenges Identified by the Commission are to develop museum and archive technologies and to encourage application of newer information network technologies. Ironically, tribal libraries are trying to preserve cultural traditions and wisdom of the past while forging new paths into the future The Commission found that "with a few exceptions Indian reservations are deplorably bereft of the equipment, expertise, and knowledge necessary to employ the new library and information technologies ..."[2] Strategies put forth to address this problem Included

- acquiring digital computing and telecommunications technology,
- training native American librarians, possibly through distance-learning activities with state library agencies and graduate schools, and
- establishing intertribal networking, resource-sharing, and the development of special databases

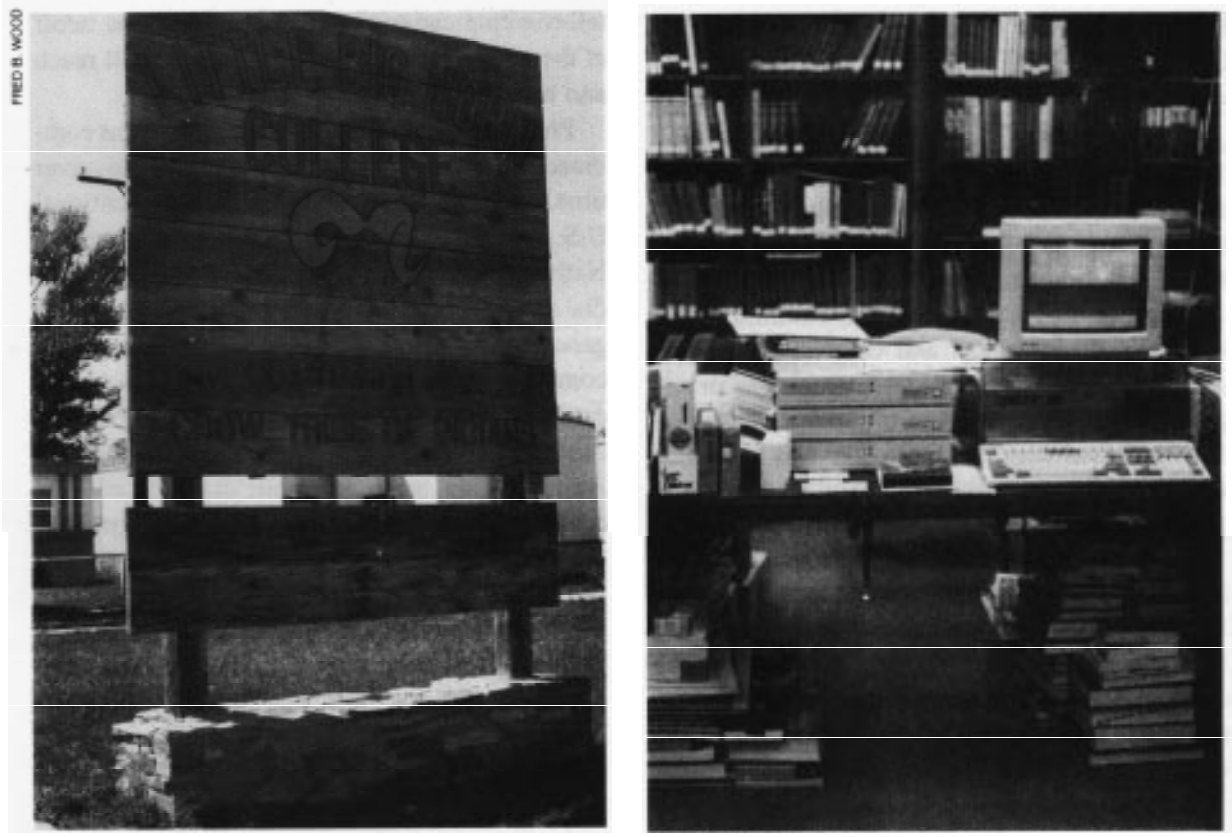
The Commission specifically recommended "that consideration should be given to a legislative initiative to establish a National Native American Electronic Network enabling the tribes and villages to communicate, cooperate, and share information services and materials rapidly The Network should be designed to address the multiplicity of special library and information needs of Native Americans and have the capability to interface with other national library and reformation networks and databases "3

Tribal, state, and federal policy makers can learn from initiatives such as Alaska's Statewide Library Electronic Doorway (SLED) SLED IS providing Internet access to every public library in Alaska Moreover, SLED computer servers wiII provide electronic databases such as library and government reference materials As remarked by Steve Smith, one of the creators of SLED, libraries do not want to become "custodians of book warehouses "4 This feeling IS shared by Native Americans in the wake of the federal policy of self-determination, tribes are finding that the tribal library is assuming increasingly important roles as both an archive and an up-to-date information source for culture, education, business, law, governance and tribal policy

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[1] U S National Commission on Libraries and Information Science, *Pathways to Excellence: A Report on Improving Library and Informaflon Services for Native American Peoples* (Washington, DC December 1992)
[2] Ibid, p 20
[3] Ibid, p 14
[4] Lee Dye Alaskans To Use SLED on Information Highway, " *Los Angeles Times,* July 5, 1994, p 5

SOURCE Off Ice of Technology Assessment, 1995



Left: *Little Big Horn College at the Crow Indian Reservation, in Crow Agency Montana. Tribal colleges typically provide library and information services as well as education for the local Indian community* ***Right:*** *The library at the Little Big Horn College is full of books, periodicals, and electronic media-including the CD-ROM station shown here.*

braries, the media) to reach more people more effectively. Native museums can use computer networking and videoconferencing, for example, both to improve communication and collaboration among themselves, and to form partnerships with schools, libraries, and radio stations. The portability of electronic cultural materials, whether on diskette or CD-ROM or transmitted online, increases their potential reach, not only to Native Americans living on or near Native communities, but to those who live in the major metropolitan areas.

Two major caveats are in order. First, most Native communities are short on technical expertise and financial resources. Local schools, museums, and libraries will need training, technical support, and funding for equipment and telecommunications access, as well as local leadership, if the potential is to be realized. Second, some Native cultural material may be sensitive and not suitable for electronic dissemination, such ascertain religious rites or ceremonies. Many songs and dances are tied to spirituality. Their sanctity derives from the real-life performance within a defined context such as at a sacred site or with certain spiritual leaders. When taken out of context (displayed on a computer terminal, for example), or if altered (by using computer software), sacred songs and dances could be considered disrespectful or irreverent. Policies for defining and protecting Native cultural privacy and integrity in an electronic environment need to be established by the Native tribes, villages, and communities that are the original source of the cultural material.

BROADENING PUBLIC AWARENESS OF NATIVE CULTURES

Several national or regional museums specialize, or have a major subfocus, on Native cultures. These include the Smithsonian Institution's National Museum of the American Indian[22] (NMAI) in Washington, DC and New York City; Heard Museum in Phoenix; Southwest Museum in Los Angeles; and Bishop Museum in Honolulu. The museum administrators and curators are beginning to visualize electronic technologies as an important complement to the traditional means of conveying culture and an effective way to extend access to museum displays, exhibits, and programs far beyond the physical structures.

The NMAI is in the beginning stages of creating the Fourth Museum (so-called because it is the fourth of four planned NMAI facilities). The Fourth Museum is considering prerecorded audiotapes and videotapes, videoconferencing, computer networking, electronic databases, and interactive multimedia to disseminate Native programming and to put the museum's collections and cultural programs online. A secondary goal is to raise public awareness of the status of the other three NMAI facilities. Currently, an exhibit is open at the U.S. Customs House in downtown New York City. A Cultural Resource Center in Maryland is scheduled to be completed in 1997, and a Mall Museum near the National Air and Space Museum is scheduled for completion in 2001. Some skeptics, pointing to a lack of basic telecommunications on many reservations, scoff at the notion that the Fourth Museum will reach and benefit many Native Americans.

Programs produced by Native Americans combined with new electronic outlets could, over time, provide a better balance to the conventional U.S. textbook, film, and news media treatment of Native American cultures and history.[23] Past media coverage, especially of American history, is generally regarded as having been seriously incomplete and inaccurate (although some note a recently improving trend). New technologies and declining costs present opportunities for Native Americans to originate more material of high quality, accuracy, and authenticity and to distribute that material locally and nationally.[24] American Indian TV is but one example of local Native programming (see box 2-8). Although such programming has rarely been distributed by mass media outlets, this may be changing as evidenced by shifting viewer preferences[25]and a new Native American radio talk show.[26] As a consequence, the major production companies, media outlets, and cultural institutions may take more notice.

Technology-based cultural awareness opportunities include the use of Native electronic cultural materials (especially software, videos, and films) to support U.S. history and culture courses at the K-12 and college levels, in public libraries, and in areas of the country that do not have significant concentrations of Native Americans. Also, Native-produced audio programming could be

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[22] The NMAI was established by the National Museum of the American Indian Act, Public Law 101-185, Nov. 28, 1989.

[23] See, e.g., Robert F. Berkhofer, Jr., *The White Man's Indian: Images of the American Indian from Columbus to the Present* (New York, NY: Alfred A. Knopf, Inc., 1978).

[24] One catalog indexes and describes more than 175 Native American programs produced for public television and available on videotape to public television stations, schools, libraries, and educational users. Native American Public Broadcasting Consortium, *Catalog of Programming 1993-94* (Lincoln, NE: 1994).

[25] In 1993, cable entrepreneur Ted Turner launched a year-long series of shows about Native Americans, including several movies, a six-hour documentary series, and a 20-part series of reports. Richard Zoglin, "Ted Turner Goes Native," *Time*, vol. 142, No. 24, Dec. 6, 1993, pp. 86-87.

[26] Native America Calling, coproduced by the Native American Public Broadcasting Consortium and the Alaska Public Radio Network, will be the first nationally distributed, live call-in radio talk show. It will be distributed by the AIROS satellite network and is scheduled to premiere in June 1995.

played on commercial and public radio stations in the major media markets. And Native-produced video programming could be used on cable and public television stations. Cable is well suited because of the large number of channels, including public and educational access channels, offered in the medium to large markets.

Interactive multimedia centers, or kiosks, have a significant future role. A Native American interactive multimedia center or room could be added at museums that do not otherwise have a significant Native American exhibition or collection. A Native American interactive interpretative kiosk might be tried at selected national parks, monuments, historic sites, and perhaps other federal (and state) locations that have Native cultural or historic significance. These kiosks could use Native-produced multimedia and videos.

Computer networking is now being used by Native Americans, researchers, and the general public to discuss Native cultural topics and issues. Electronic mail, electronic "chat" sessions or conferences, electronic bulletin boards, and the electronic distribution of Native cultural materials and programming are all in use. Native American discussion groups are included on the major commercial and public computer conferencing networks. The several Native American electronic bulletin boards and electronic information offerings should soon be referenced in federal and library directories. About 75 electronic bulletin boards are Native American owned/operated and pertain to Native American issues (see appendix A for a partial listing).

A current threat to the promotion and development of Native American culture, spirituality, and values on computer networks is ethnic fraud—non-Native Americans posing as elders, shamans, medicine men/women, and the like. Although these imposters are eventually discovered, they frequently perpetrate cultural libel—putting forth misinformation on sensitive cultural ideas and values—for many months and then can easily reappear under a new online name. Today, there is no effective legal recourse for libel in public forums on computer networks. Some public computer network forums may have to be regulated and/or mediated to better protect and serve the cultural interests of Native Americans. One could envision three classes of computer discussions—private, regulated/mediated, and public—to serve the different needs of Native Americans, including privacy, protection against fraud, and free speech (this is also true for the majority society).

DEVELOPING A NATIVE CULTURAL EMPOWERMENT STRATEGY

The Native American community faces a dilemma. On the one hand, several key trends are coming together to present new opportunities for Native American cultural empowerment: 1) the shift in federal policy that now encourages the reaffirmation and strengthening of Native culture rather than its repression, 2) the resurgence in grassroots Native interest in cultural history and activities, and 3) the considerable potential of telecommunications. On the other hand, developing overall strategies is difficult, in part because of the cultural diversity of Native Americans and the fragmentation of activities and funding sources. The absence of an overall strategy becomes more critical, however, in times of fiscal austerity.

The basis for cultural empowerment might include cultural property rights and legal protections, such as those provided by NAGPRA and the Indian Arts and Crafts Act (IACA) of 1990,[27] and emerging Native policies for copyright, security, and privacy of Native information. The IACA is intended to promote commerce and reduce counterfeiting and deceptive marketing practices by imposing large penalities—up to $250,000 and five years of incarceration for a first offense—to

[27] An online open forum for discussion of Indian law and policy is the "triballaw" list server. To subscribe, send an e-mail message to LISTSERV@thecity.sfsu.edu. In the body of the message, type the following: subscribe triballaw <yourname>.

BOX 2-8: American Indian TV: Native Programming on a Shoestring

"I am here for a purpose, and that purpose is to continue on to be my grandmother's messenger, to disseminate pieces of our culture. That is what my grandmother told me to do. She would often tell me, 'Please let the greater world outside know what is going on here-of who we are and where we come from. . . '[1]---Ray Young Bear (Mesquakie)

American Indian IV (AITV) is a monthly half-hour program distributed in southern California to about 2.25 million cable subscribers, including about 100,000 Native Americans in the metropolitan Los Angeles area. The program goals are to dispel myths and negative images about Indians by showcasing Indians in contemporary settings—Indian rappers, opera singers, attorneys, surgeons, ballet dancers, and skateboard champions—and to build Indian community and outreach The program is largely the effort of one man, Don Thornton (Cherokee), who may spend as much as 80 hours a week for the "sheer joy of producing a show he believes in "

The program began as a simple community access health show funded by a grant from the Indian Health Service. The American Indian Clinic provides a small production studio. AITV is currently searching for ways to expand to a broadcast UHF or VHF channel and to produce the show weekly. To date, AITV has archived 90 hours of programming for a year and a half of work, and has traveled to a dozen states. A monthly newsletter with a calendar of events and viewing times currently reaches 2,000 homes,

Using an upbeat format, the program highlights community issues and promotes Indian performers, leaders, role models, and organizations, It has featured national Indian leaders such as Wilma Mankiller, Chief of the Cherokee Nation; Oren Lyons, Chief of the Onondaga Nation, and Senator Ben Nighthorse Campbell of Colorado. The program also features Indian entertainers such as Wes Studi, Floyd "Red Crow" Westerman, and Gary Farmer. Despite a shoestring budget, AITV has managed to line up non-Indian celebrities such as Arnold Schwartzenegger, Steven Seagal, Jay Leno, Robert Duvall, and Paul McCartney in connection with Indian-specific events and issues. in a humorous way, each show awards a dubious honor to those who have gone out of their way to offend the Indian community—the "Custer-Had-It-Coming-Award !"

SOURCE. Office of Technology Assessment, 1995, based on information from materials provided by Don Thornton, producer, AITV April 1995

[1] David Moore and Michael Wilson, "Staying Afloat in a Chaotic World A Conversation with Ray Young Bear," *Callaloo,* vol. 17, No. 1, winter 1994, pp. 205-208.

those who knowingly violate the prohibition.[28] Protection and enforcement of such policies are difficult for online information, however, and some Native Americans may choose not to put sensitive cultural material into electronic formats.

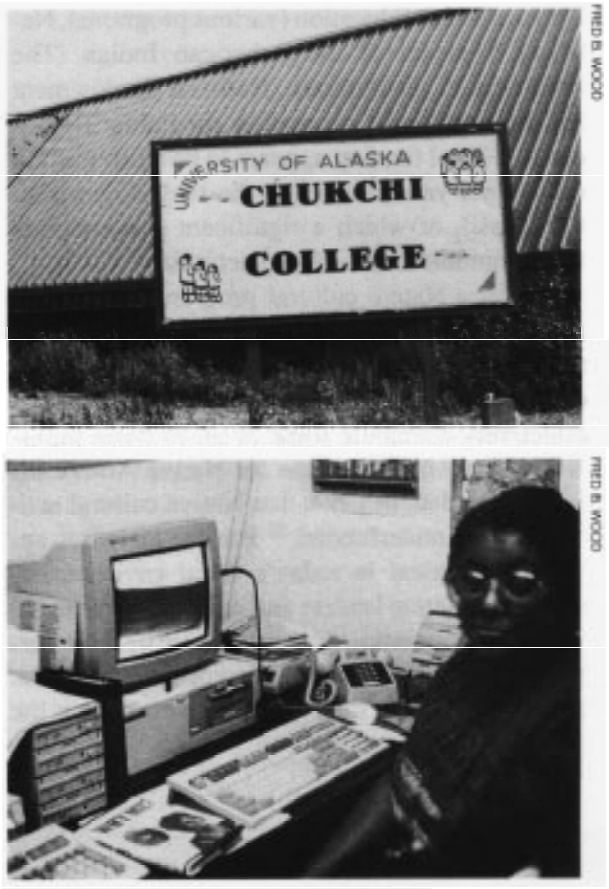
Cultural empowerment might also include policies that encourage the identification and strengthening of bonds with blood relatives. in formation systems that trace genealogies can help individuals to verify ancestry, establish tribal or Alaska village membership, strengthen knowledge of their-cultural roots, identify relatives, and/or create or renew feelings of belonging and purpose. Policies for the development and use of

[28] For further discussion, see Jack Utter, *American Indians: Answers to Today's Questions* (Lake Ann, MI: National woodlands Publishing Company, 1993). pp. 81-82.

genealogical information systems might include decisions on which records could be put into electronic form, and on controlled access to records to ensure the appropriate amount of confidentiality and privacy.

In Hawaii, art interagency task force comprised of representatives from the Department of Health, the State Archives, the Office of Hawaiian Affairs, and the Department of Hawaiian Home Lands addressed the issue of Hawaiian genealogy.[29] It discovered a large demand for genealogical services and developed a plan for the Hawaiian Genealogy Project with input from interested individuals and organizations. The plan made recommendations for legislation as well as administration and funding. The project will include the online Hawaii Population Database (developed by the Genetics Department of the University of Hawaii), which contains primary records (birth, death, and marriage) collected from 1841 to the present, and secondary records such as the 1900 and 1910 Federal Census files. Other potential secondary sources include documents at the State Archives, libraries, courts, and the Bishop Museum. The task force recommended that information and assistance be centralized at one-stop centers located on Kauai, Oahu, Molokai, Maui, and Hawaii, and that electronic information be shared through telecommunications linkages. The project was to have been fully functional by 1995, but is less than one-quarter complete due to a lack of funding.

The federal role in recent years has been to support Native language[30] renewal and cultural development. Financial support, however, is modest and spread among several federal agencies and programs. These include, for example, the Administration for Native Americans* in the Department of Health and Human Services, Bureau of Indian Affairs (Department of the Interior), National Park Service (Department of the Interior),



Top: *In Alaska, most colleges serving Native communities are part of the University of Alaska system. Chukchi College serves Kotzebue and other Eskimo villages in remote northwest Alaska. The Kotzebue public library is collocated with Chukchi College.* **Bottom:** *The Kotzebue public library has a small collection of books and periodicals along with a CD-ROM station and online computer terminal that are available to the local community*

[29] Hawaiian Genealogy Project Master Plan (Honolulu, HI: State of Hawaii Interagency Task Force, 1991).

[30] On October 30, 1990, the Native American Languages Act, Title I of Public Law 101-477, declared federal policy "to preserve, protect, and promote the rights and freedoms of Native Americans to use, practice and develop Native American languages," as cited in Utter, op. cit.. footnote 28, p. 84.

[31] "On Oct. 26, 1992, President Bush signed into law a legislative measure that will help counter the loss of Native languages. It authorizes the Administration formative Americans to make grants to tribal governments and other groups to teach children, train educators and interpreters, and compile histories, develop teaching materials, and acquire equipment for language lessons" (Indian Country Today, Nov. 5, 1992), as cited in Utter, op. cit., footnote 28, p. 83.

Department of Education (various programs), National Museum of the American Indian (The Smithsonian Institution), National Endowment for the Arts, and Corporation for Public Broadcasting. Total funding appears to be a few million dollars per year (excluding the NMAI construction costs), of which a significant part supports telecommunications-related activities.

Because Native cultural programs are spread among several agencies and lack an overarching strategic plan or concept, an unintended consequence of overall federal budget cuts could be to effectively dismantle some or all of these initiatives. The Administration for Native Americans had concluded, in 1994, that Native cultural activities were underfunded.[32] Budget increases appear impractical in today's fiscal environment. But some Native leaders and cultural activists are urging consideration of new ways to preserve current funding or forestall disproportionate cuts. Advocates believe that, while Native culture is the primary responsibility of each individual tribe, village, and community, the federal trust responsibility appropriately extends to providing some modicum of financial support—especially in light of many decades of federal efforts to undermine Native cultures.

National tribal leaders, together with American Indian, Alaska Native, and Native Hawaiian cultural leaders, could work with a designated federal agency, perhaps the Administration for Native Americans, to inventory and disseminate online all current federal programs for Native American cultural activities, and develop both funding and administrative options. Moreover, they could work on further developing policy on cultural property rights. The result could be an overall strategy that would focus attention on Native American cultural empowerment and coordinate efforts to make best use of scarce financial resources.

[32] Administration for Native Americans officials, personal communication, Nov. 18, 1994.

Telecommunications Technology and Native American Community-Building

3

The community is a core value and basic institution of Native American cultures and societies. Until the last several decades, federal policy had the effect of dispersing, weakening, or dismantling Native communities. The health and well-being of Native Americans suffered as a result. Federal policy now encourages community-building and empowerment, but many Native communities face major socioeconomic challenges—including high unemployment and poverty, physical isolation, poor health, and diminishment or loss of cultural identity.

Telecommunications technologies can make significant contributions to the well-being of Native communities in the areas of education, health care, economic development, environmental protection, and governance. The technology can help strengthen community-building efforts within and between rural Native communities, and make it easier to share the lessons learned. One can envision the use of videoconferencing, computer networking, multimedia, and wireless links on many Indian reservations and in many Native villages and communities in ways that are both acceptable and adaptable to their cultures. Several Native American communities have already recognized the potential and are in various stages of planning and implementing some of the first Native American telecommunications pilot projects. Others have begun forming telecommunications committees to plan for future community-wide infrastructure and policy.



To realize the full potential of telecommunications, however, major hurdles must be overcome. Many Native areas have limited or no telecommunications infrastructure, and lack the leadership, knowledge, training, and funding needed to take advantage of these technological opportunities. And federal policies de-

signed for the majority society may inadvertently overlook distressed rural Native American communities. These communities will need to consider the creation of publicly accessible telecommunications centers and community networks, enabling them to share costs and resources and gain community-wide acceptance.

TECHNOLOGIES AND INFRASTRUCTURE FOR COMMUNITY-BUILDING

Key Technologies

Key technologies discussed here include videoconferencing, computer networking, multimedia, and wireless links. It should be noted that more complex technologies are built from combinations and variations of simpler technologies. When technologies are combined in an application (to solve everyday social problems), they form a *system*. Examples include public electronic kiosks used for information dissemination or electronic benefits transfer, and computer information systems, such as a Geographic Information System (GIS), that use specialized software, computers, and databases.

Videoconferencing (also called interactive video) includes both one-way and two-way compressed or full-motion video and two-way audio. The fully interactive approach uses both two-way audio and two-way video, while one-way video combines a single video channel—usually from the speaker to a remote audience—with a regular telephone or speaker phone circuit or the equivalent. Videoconferencing has been in active use for about 15 years. Applications include business conferencing, distance education, and telemedicine. The costs of studio equipment (e.g., cameras and monitors) and transmission equipment (e.g., for uplinks and downlinks on satellites, or landline circuits) are dropping. Desktop videoconferencing uses personal computers or videophones for videoconferences among individuals or small groups.

Computer networking involves the transmission of messages, mail, images, and other information in electronic digital form between computers, regardless of location, connected by a telecommunications link. Computer networking began about 25 years ago in the days of time-shared mainframe computers, and took a grassroots, user-oriented turn about 15 years ago with the advent of the relatively inexpensive microcomputer. Computer networking includes electronic bulletin boards, computer conferencing, list servers (computers that send messages on specified topics to subscribers signed on to the list), and so-called file servers (computers with remotely accessible files of information)—many of which can be accessed on a dial-up basis rather than through a dedicated link.

Computer networks come in all sizes. They span buildings, towns, regions, and countries. Local area networks (LANs), the smallest, are generally located within one building. Computers joined over long distances are called wide area networks (WANs). LANs and WANs can be connected to form internetworks. The largest internetwork today, spanning the globe, is the Internet (see box 2-4). Computer networking, technologies, and users have matured to the point where many private companies are viewing networking as a major business tool and emerging consumer market—well beyond the scientific and research communities that fostered the first computer networks.

Computer software applications manipulate a variety of formats such as numbers (e.g., spreadsheets), words (e.g., word-processing), pictures, sounds, and video. Multimedia is the integration of all these formats in one software application.[1] The user can interact with multimedia programs in flexible ways, for example, by cutting and pasting

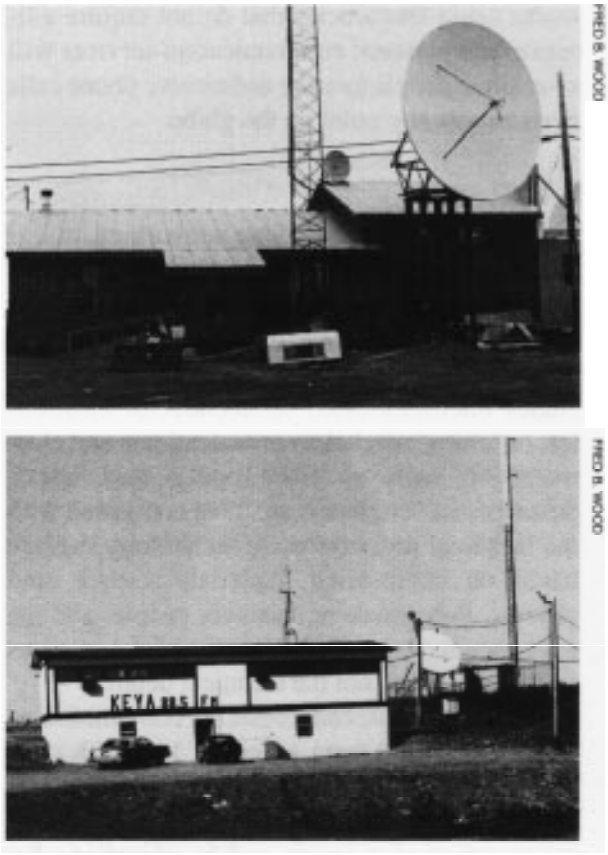
[1]Discussions on hypertext markup language (html)—the language of multimedia home pages on World Wide Web sites (a type of computer file server on the Internet)—are provided in Gary Welz, "New Dimensions: A Multimedia Revolution Is Unfolding on the Net," *Internet World*, March 1995, pp. 31-33, 36; and Mathew Gray and Eric Richard, "Make Multimedia Friendly," *Internet World*, March 1995, pp. 26-28.

together pieces of songs and video clips to create new works. Multimedia applications require microcomputers with special audio and video cards, software called a "viewer" or "player,"[2] and enough memory to store the multimedia files to be viewed.

Microcomputers increasingly use compact disk-read only memories (CD-ROMs) and include an internal CD-ROM reader to accommodate large and/or numerous text, image, or multimedia files. CD-ROMs are based on the same technology as compact disks (CDs), used for music, and videodisks, used for movies. Each CD-ROM, a thin 4.75-inch-diameter disk, can hold about 200,000 pages of text, an hour of audio, or a few minutes of video. Other high-density memory options, in various electronic, magnetic, and optical formats, are being developed and market-tested.

Wireless technologies span a wide frequency range-from the low frequencies used for AM radio to the high frequencies used for satellite and microwave communication. Radio and television broadcasting has been providing Americans with entertainment, education, and information for decades. Satellites have long been used to span the continent and link countries for transmitting phone calls, television programs, and data. Microwave links are used by telephone companies to carry phone calls, and by private companies and public utilities to monitor and manage gas pipelines, railroads, and the electric grid.

Today, the number of wireless applications and markets is exploding as more technologies are developed for the business and consumer markets. Advances in digital technology (replacing older analog techniques), coupled with new markets, have resulted in lower costs and greater access/use by individuals and small businesses. For example,



lop: Radio station KOTZ serving the Eskimo village of Kotzebue, Alaska. The station originates some programming locally and retransmits national programming picked up from satellite feeds. ***Bottom:*** *Radio station KEYA serving the Turtle Mountain Indian Reservation, Be/court, North Dakota. Tribal radio stations play a vital role in providing culturally sensitive educational, entertainmant, and news programs.*

the 26 Native radio stations can use a satellite link to receive Native programming through the American Indian Radio on Satellite (AIROS) project. AIROS subleases a satellite channel from the National Public Radio satellite system. Cellular phones and paging services are adding thousands of users each day; computer companies are developing low-power, short-link wireless net-

[2]For a discussion on file formats, viewers, and players for still-video (image), motion-video, and audio files, see Richard W. Wiggins,''Files Come in Flavors: Finding and Using Viewers and Players," *Internet World,* March 1995, pp. 52-53,55-56.

[3]For discussions of wireless technologies and their role within the larger context of the National Information Infrastructure, see U.S. Congress, Office of Technology Assessment, *Wireless Technologies and the National Information Infrastructure,* in progress.

works using frequencies that do not require a license; and personal communication services will soon allow people to make and receive phone calls from almost any point on the globe.

Systems

Videoconferencing, computer networking, multimedia, and wireless are generic technologies that can be considered at both the technical and general applications levels. As a rule, the technology base of modern telecommunications and computers includes microfabricated semiconductor electronics, or "chips"; digital communications; and electro-optics such as fiber optics and lasers. Scientists and engineers are most concerned with the technical descriptions of technology that are based on engineering, materials science, and physics. Policymakers, business people, and the public are more interested in general descriptions and applications, not the technical detail.

When specific technologies are combined in an application, they form a *system*. In health care, common systems might include telemedicine, community health information networks, or clinical information systems; and in education, distance learning and interactive multimedia training are examples. Other systems include telecommuting, telemarketing, televillages, electronic democracy, personal communication systems, video-on-demand, and groupware. At the systems level, design principles extend beyond the purely technical aspects to include human preferences and work habits, as well as plans for manufacturing, marketing, installation, and operation.

The "information system" is a generic term for a combination of one or more electronic databases and software to manipulate the information from the database. Information systems may be included in networks of computers or simply in stand-alone computers. The hundreds of different types of information systems include, for example, executive information systems, clinical information systems, online library card catalogs, and accounting systems.[4] Service agencies, in particular, use information systems to track multiple services provided to each client for as long as a lifetime. Some large commercial information systems include airline computer reservation systems, automated teller machines, and real estate multiple-listing services.

Electronic kiosks are essentially microcomputers with user-friendly multimedia software. They are usually located in public places such as libraries, supermarkets, and community centers. Most kiosks tested or in use provide a range of information about federal, state, and/or local government services. Some have limited transactional capability, such as issuing a receipt or short printed document, accepting a credit card payment, or renewing a driver's license. Future kiosks may offer a wide range of informational and transactional services. Several federal, state, and local government agencies are pilot-testing various applications with the intent of eventually using kiosks to deliver many government services electronically.[5]

Electronic benefits transfer (EBT) is the use of cards similar to credit or debit cards to qualify for and receive various government benefits. Several federal and state agencies are pilot-testing and, in some cases, operating EBT systems for the delivery of welfare benefits, food stamps, unemployment compensation, social security payments, and/or child and maternal health support (e.g., the federal Women, Infants, and Children program). EBT might also be used to provide eligible recipients with credit for education and training pro-

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[4]For a discussion of library information systems, see U.S. Congress, Office of Technology Assessment, *Informing the Nation: Federal Information Dissemination in an Electronic Age*, OTA-CIT-396 (Washington, DC: U.S. Government Printing Office, October 1988); and for a discussion of scientific and technical information systems, see U.S. Congress, Office of Technology Assessment, *Helping America Compete: The Role of Federal Scientific and Technical Information*, OTA-CIT-454 (Washington, DC: U.S. Government Printing Office, July 1990).

[5]For further discussion, see U.S. Congress, Office of Technology Assessment, *Making Government Work: Electronic Delivery of Federal Services*, OTA-TCT-578 (Washington, DC: U.S. Government Printing Office, September 1993).

grams, issue health insurance reimbursements, and disburse government grants and contracts, among other services. The current Administration has announced the goal of implementing nationwide EBT to deliver federal benefits within five years.[6]

One system that is important to many Native American tribes and villages is the Geographic Information System. GISs integrate several types of hardware, software, and electronic databases, and are used for a wide variety of geographic information-dependent purposes such as land and natural resource management, demographic modeling, business marketing, and environmental research. Each GIS can be configured to best accomplish a unique set of goals, usually using a specialized database. The major commercial GISs are now converging and are widely applicable to Native American communities.

Telecommunications Infrastructure

Potentially large cost-savings could be realized by organizing telecommunications technologies around a community telecommunications center such as a school, library, tribal office, health clinic, or multiservice center. The requisite technologies would be collocated at one or a few centrally accessible community centers, rather than in homes and offices. Such centers could form part of a two-tier technology infrastructure in which a basic low-bandwidth[7] level of telecommunications service is provided to homes and perhaps offices (e.g., telephone,[8] dial-in capability with modem to electronic bulletin boards, and cable, broadcast, or satellite TV/radio), and a more advanced medium-bandwidth level is provided to selected community centers (e.g., computer networking, including access to online information databases, using higher speed modems or direct connections). An even more advanced high-bandwidth level and range of services might be defined for major medical centers, colleges, or businesses; or for geographically centralized Native businesses where additional economies of scale may apply, such as a Native business park, incubator, or enterprise zone.

The telecommunications infrastructure needed to provide a basic level of service to Native American homes will vary depending on geographic, demand, and market considerations. Some of the most remote areas will require wireless technologies. For example, most Alaska Native villages depend on satellite-based delivery because the villages are out of reach of cellular radio or broadcast (except satellite-linked). In the villages, small rural telephone and cable (and some local radio) companies serve the so-called last mile.

Many Native Hawaiian rural communities, by comparison, are linked (or could be linked) by both telephone and cable landlines (provided by large telephone and cable companies or their subsidiaries), with microwave and fiberoptic cable for inter-island hops and satellite links or undersea cable to the mainland. Most of these communities are within current or potential range of broadcast and cellular radio.

American Indian reservations vary in their degree of similarity to remote Alaskan villages and rural Hawaiian communities. Some reservations are within a few miles of major transcontinental

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[6]Ibid.

[7]The term *bandwidth* is a technical word indicating the amount of data, audio, or video information traveling through a conduit in a given time. Fiberoptic cables can carry data at bandwidths a million times larger than copper wire twisted-pairs used for most telephone lines. While the transmission medium has an inherent upper-bandwidth limit, other system components—such as terminal equipment that sends or receives the data, known as modems (modulator-demodulators)—may create bottlenecks in the transmission system.

[8]According to a May-June 1992 poll of seven areas served by Native American public radio stations, telephone penetration was very low. The percentages of households with a telephone were as follows: KIDE, Hoopa, CA (70 percent); KSHI, Zuni, NM (63 percent); WOJB, Hayward, WI (55 percent); KSUT, Ignacio, CO (54 percent); KNNB, Whiteriver, AZ (51 percent); KTDB, Pine Hill, NM (39 percent); and KABR, Alamo, NM (26 percent). *Who Listens to Native American Public Radio*, prepared by Dr. E. B. Eiselein for the CPB Native American Listening Data Project (Kalispell, MT: A & A Research, 1992).

telephone trunk lines, while others depend on rural telephone and cable companies for minimal service. Many Native Americans living in rural areas still do not have basic telephone service because it is too expensive or unavailable. Only four tribes own and operate telephone companies, and a few are considering or are in the process of buying exchanges. There are about 26 tribal radio stations and the number is increasing (see box 3-1 and table 3-1). About 12 tribes own and operate broadcast or cable TV companies (see box 3-2).

At a more aggregated market level, community communication centers could be located in community colleges, high schools, libraries, hospitals or clinics, and tribal/village government offices. The smallest Native communities may be able to justify only one or two centers, most likely located at an educational and/or health care facility. Larger communities may be able to set up a "community network"[9] that links the various schools, health clinics, multiservice centers, tribal offices, and the like. The key is to aggregate demand to make the communication centers or community networks as cost-effective and affordable as possible.

Opportunities to apply key technologies and systems in Native American communities exist in education and research, health care, economic development, environmental protection, and governance.

EDUCATION AND RESEARCH

Educators, researchers, and educational administrators are learning and developing new concepts for telecommunications-based education systems, including telecourses via videoconference or radio/television broadcast, CD-ROM databases, online databases, interactive multimedia training, software applications such as computer art and desktop publishing, electronic student records, and school/campus information systems.[10] The key technologies—videoconferencing, computer networking, multimedia, and wireless links—underlie these systems. While some of these systems (e.g., electronic student records and college/university information systems) have been widely deployed throughout the United States, others (e.g., telecourses and interactive multimedia training) are still under development and/or unaffordable. Pilot projects are testing their effectiveness and efficiency and gauging their affordibility. Native American education professionals will want to do the same—based on their own criteria for effectiveness, efficiency, and affordability.

Videoconferencing

Videoconferencing could be used for distance learning for K-12, university, vocational, trade, and adult education.[11] Schools in smaller tribes, villages, and communities rarely have the critical mass of students, let alone the resources, to offer a full range of courses. Videoconferencing could be used to supplement onsite offerings and help diversify the curriculum, and as a vehicle for continuing teacher education. The American Indian Higher Education Consortium (AIHEC) has these goals, among others, in mind for tribal colleges

[9]Sources of information about community networking include the National Public Telecomputing Network, Moreland Hill, OH, info@nptn.org; Center for Civic Networking, Washington, DC, rciville@civicnet.org; and The Morino Institute, Reston, VA, info@morino.org. The Morino Institute also has a comprehensive inventory of public-access networks at their World Wide Web site, http://www.morino.org/.

[10]For general discussions of telecommunications and other technologies for education, see U.S. Congress, Office of Technology Assessment, *Linking for Learning: A New Course for Education*, OTA-SET-430 (Washington, DC: U.S. Government Printing Office, November 1989); and U.S. Congress, Office of Technology Assessment, *Teachers and Technology*, OTA-EHR-616 (Washington, DC: U.S. Government Printing Office, April 1995).

[11]One distance-learning electronic mailing list is DEOS-L, the Distance Education Online Symposium (The Pennsylvania State University). To subscribe, send an e-mail message to listserv@psuvm.psu.edu. Also, Usenet News has the alt.education.distance newsgroup.

BOX 3-1: Slow Growth of Native Radio

in the Sioux language, radio is described as words that fly through the air "-Frank Blythe

Today, there are 11,767 radio stations in the United States)[1] with 93 offering regular native programming (typically one to three hours per week).[2] But "Native Radio" is considered to be the 25 to 30 predominantly Native-owned and -operated stations, only four of which are commercial, whose primary mission is to deliver native programming-largely local news, Native-relevant Information, Native-language programming, and Native-produced music, information, talk shows, and news.

Since the first Native Radio station began broadcasting in 1971, Native Radio has slowly but steadily grown in Indian Country (see table 3-1). Why did it take so long? Largely, Indian tribes were uninformed, discouraged, and battling unemployment and poverty. Most Native stations required startup funds from state or federal grants, as well as technical assistance and Institutions for training managers, broadcasters, and programmers. Lastly, the stations needed ongoing funding for operations and development of Native programming. They had Iittle experience in any of these areas.

Today, however, the situation has changed. native stations have learned the business. They are supported by volunteers, fund drives, underwriting by corporations and foundations, federal grants, and training programs set up in local schools. Operating costs, Including salaries, are frequently paid by school boards or tribal councils. The Institution of "Native Radio" has gone national with the formation of the indigenous Communications Association (ICA) and the ability to deliver Native programming nationwide through the American Indian Radio on Satellite (AIROS) project—a joint effort of ICA and the Native American Public Broadcasting Consortium (NAPBC), Native programming is further supported by the NAPBC and Pacific Islanders in Communication, in turn supported by the Corporation for Public Broadcasting (CPB)

There IS now a pipeline of up-and-coming young native radio managers, broadcasters, technicians, and programmers. Six more stations wiII begin broadcasting within a year The experiences of once Isolated radio stations are now being shared through the ICA. The future, however, is still uncertain Most stations feel they are barely surviving. The problems are not changing lack of money, Inadequate staffing and training,[3] lack of Native-language skills, lack of native programming, tribal interference, poor facilities and equipment, and in some cases, competition. "Lack of money" is an understatement. Most of these stations serve some of the most Isolated areas of the country where poverty is the rule, in 1971, the Navajo Pine HiII (station KTDB) community had only a 2 percent telephone penetration rate and, because of the lack of electricity, KTDB distributed 500 portable radios. Electricity just came to the Navajo Alamo reservation (station KABR) in 1982 and telephones in 1986.

Despite the problems, native visionaries are planning for the future, With help from ICA, stations are finding new ways to raise money, especially from tribal governments, and are applying for more grants The ICA Itself, with the expiration of supporting grants from CPB, must find new support to survive What little native programming that does exist is now widely available through NAPBC's library. Stations are striving to upgrade facilities to Implement new Digital Audio Broadcasting and Tape (DAB and DAT) technology, as well as to install dishes to receive broadcasts through AIROS (currently 15 stations have dishes). native broadcasters are questioning their role in the National Information Infrastructure (Nil). While radio broadcast is generally overlooked in the Nll debate, it is very Important for rural reservations, especially those areas without phones or electricity or access to any other information source.

SOURCES Off Ice of Technology Assessment, 1995, with information from Michael C Keith, *Signals in the Air: Native Broadcasting in America* (Westport, CT: Praeger Publishers, 1995), and Michael C Keith, Communication Department, Boston College, Boston MA, personal communications, February 1995

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[1] *Broadcasting and Cab/e,* Mar 6, 1995, p 73

[2] A total of 93 stations reported offering Native programming in 1992 *Broadcasting and Cab/e Yearbook (New* Providence NJ: R.R. Bowker, 1994), p B575

[3] The Alaska Public Radio Network's Indigenous Broadcast Center IS the only national training center specifically for Native Americans

TABLE 3-1: Characteristics of Noncommercial Native Radio Stations

Station	First aired	Location	Power	Population	Language	Supporters
KYUK	1971	Bethel, AK		**4,500**	Yup'ik	State, CPB
KTDB	1972	Pine Hill, NM		**2,000**	Navajo	School Board
KOTZ	1973	Kotzebue, AK	10 KW		Inupiaq	Village
KEYA	1975	Belcourt, ND	19 KW	10,000	Etwaychik	Tribe
KDLG	1975	(Nushagak Bay) AK	10 KW		Yup'ik	School Board
KBRW	1975	Barrow, AK	10 KW		Inupiaq	Local, state, CPB, DoC-NTIA, Corp.
KSUT	1976	Ignacio, CO	**450 W**	2,300+	Ute	Tribe, College
KINI	1978	(Rosebud) SD	**57** KW		Lakota	Owned by Catholic Mission
KSHI*	1978	Zuni, NM	**100 W**	**10,000**	Zuni	Tribe, CPB
KIDE*	1980	Hoopa, CA	195 W	1,800+	Hoopa	Tribe, DoC-NTIA
KSKO#	1981	McGrath, AK	**10** KW	**5,000**	-None-	
WOJB	1982	Hayward, WI	100 KW	**3,800**	Ojibwe	Tribe
KNNB	1982	Whiteriver, AZ	630 W	**11,000**	Apache	Tribe, HUD, DoC-NTIA
KILI	1983	Porcupine, SD	100 KW	**37,400**	Lakota	
KMHA	1983	New Town, ND	100 KW	**3,000**	Mandan	Tribe
KABR	1983	Alamo, NM	Low	**1,300**	Navajo	School Board, DoC-NTIA, DoED-OIE
CKON	1984	(Akwesasne) NY	**350 w**		Mohawk	Some Advertising, Canada
KCIE	1990	Dulce, NM	**100 w**		Apache	
KGHR^		Tuba City, AZ	100 **w**	16,000	Navajo	School Board, DoC-NTIA
KCUK	1990	Chevak, AK	**10 w**		Cup'ik	School Board, State, Fed.

KDLG repeater stations:

KSDP	Sandpoint, AK
KIAL	Unalaska-Dutch Harbor, AK
KUHB	Saint Paul-Pribilof Islands, AK
KNSA	Unalakleet, AK

Other repeaters or translators:

KBRW reported having 5 translators via satellite.
KSUT reported having 6 translators.
KSKO reported 2 repeaters.

NOTES

A "repeater" rebroadcasts a signal at the same frequency, while a "translator" rebroadcasts at a different frequency
Language refers to any amount of Native language programming
Supporters is an Incomplete list and does not imply amount or type of support

()	Names in parenthesis are reservations Only radio in region
# ^	KSKO may alternate majority control of its governing body from Native to Anglo KGHR is owned by the high school board and operated by high school students (It is a National Public Radio repeater station from KNAU in Flagstaff, AZ)
DoC-NTIA	U S Department of Commerce, National Telecommunications and Information Administration (Public Telecommunications Facilities Program)
CPB	Corporation for Public Broadcasting
HUD	U S Department of Housing and Urban Development
DoED-OIE	U S Department of Education, Off Ice of Indian Education
Corp.	Specifically Shell 011, ARCO, and BP Exploration
Fed	Unspecified federal grant

SOURCES: Office of Technology Assessment, 1995, with Information from Michael C Keith, *Signals in the Air: Native Broadcasting in America* (Westport, CT: Praeger Publishers, 1995); E.B. Eiselein, *Who Listens to native American Public Radio?, Report of the CPB Native American Listening Data Project* (Kalispell, MT: A&A Research, June 1992), and Michael C Keith, Communication Department, Boston College, Boston, MA, personal communications, February 1995

BOX 3-2: Native Television

While Native radio has hobbled along since 1971 (see box 3-l), Native television is virtually nonexistent. The primary barrier to participation is high costs, but lack of experience and training is also a problem Some Native Americans are also wary of television's potential to culturally assimilate and erode Native values. This fear is lessened when stations are Native-owned and broadcast some measure of native programming

Michael C Keith, in the course of his research on native broadcasting, identified only a few native owned and -operated TV and cable stations. As sketched below, these stations (and a few others identified by the Off Ice of Technology Assessment) serve specific communities and offer Native programmin—glocal news, Native-relevant information, Native-language programming, and Native-produced music, information, talk shows, and news

Cable TV Stations

- *Navajo Nation TV 5* (Arizona)
  Programming: Public Broadcasting System (PBS) programming and five hours weekly of Navajo-language features
  Plans to offer signal on UHF band to avoid cable hookup. Currently has 5,000 subscribers
- *Sioux Satellite Cable (serving* Lower Brule and West Brule Reservations, South Dakota)
  Programming Locally produced information, children's shows, and Native-language features
  Founded in 1991 Broadcasts five days per week
- Cherokee *Cable Vision* (Eastern Band of Cherokee Reservation, North Carolina)
  Programming. Monthly live telecast of tribal council meeting. People call in during the meeting
- *Blackfeet Tribe TV* (Montana)
- WSBC Seminole *Cable TV* (Florida)
- *Choctaw Cable WHTV* (Mississippi Band of Choctaw Indians, Pearl River Reservation, Mississippi)
  Programming. Affiliated with The Learning Channel and carries live coverage of tribal events and American Indian-oriented news and documentaries. in the process of expanding to SIX other Choctaw reservations nearby

Over-the-Air TV Stations

- *KYUK in Bethel, Alaska*
  Programming English and Yup'ik-language programming for a mixed audience.
- *Navajo Nation "Purple Cow" TV* (serving Rock Point Reservation)
  Programming PBS and two hours per week of news, documentary, and educational training features produced by students and staff at the Sauer and Rock Point Community Schools
  Founded in 1987 Plans to build new studios with help of schools and the Navajo Nation

Other Native-owned and -operated TV stations have been supported by grants from the Commerce Department's National Telecommunications and Information Administration (NTIA), through NTIA's Pub-Iic Telecommunications Facilities Program (PTFP),[1] One of the largest PTFP awards is the American Indian Higher Education Consortium (AIHEC) distance-learning network, which links 29 U.S.-based tribal colleges using satellites. Many native American PTFP public television grantees are participants in the AIHEC grant The PTFP awards Include

PTFP Grants for Over-the-Air Public Television

- Three grants (1984, 1985, 1986) to *Navajo Community College (Arizona)* to establish a system of SIX low-power television stations to transmit locally produced programming (AIHEC member)

(continued)

[1] National Telecommunications and Information Administration, "PTFP Native American Awards July 1994 "

BOX 3-2: Native Television (Cont'd.)

- A 1982 grant to *Ojibwa Community College* (Michigan) to construct a translator to bring public television to the Keweenaw Bay Indian Reservation
- A 1982 grant to *Dull Knife Community College (Montana)* to establish a low-power television station to serve the Cheyenne Reservation. A 1985 grant provided a translator. (AIHEC member)
- A 1986 grant to *Salish-Kootenal College (Montana)* to establish a low-power television station to bring a PBS signal to the Flathead Indian Reservation via the Rural Television Service, Inc. (RTS) based in Carson City, Nevada A 1992 grant activated a translator to extend the signal to the Reservation communities of Arlee, Evaro, and Dixon (AIHEC member)
- Note SKC TV today is a UHF station offering PBS service to most of the Flathead reservation, but soon wiIl face competition from the University of Montana, Missoula, which plans to construct a full-power VHF PBS station with an NTIA/PTFP grant
- A 1985 grant to *Browning Public Schools (Montana)* to establish a low-power television station to bring a PBS signal to the Blackfeet Reservation via the RTS system
- A 1985 grant to the *Mescalero Apache Tribe (New Mexico)* to establish two low-power television stations to bring a PBS signal to that reservation via the RTS system. A 1989 grant Improved studio equipment for local programming.
- Three grants to *Rogers State College (Oklahoma)* to construct (1 985), improve (1 988), and extend PTV service to the native American population of northeast Oklahoma with greater transmission power (1990)

PTFP Awards for Nonbroadcast Television

- A 1980 grant *to Metlakatla Indian Reservation (Alaska)* for a video production studio to produce Native programming for the local cable TV
- A 1992 grant to *Northern Arizona University* for duplex microwave distance- learning systems from the Flagstaff campus to *Mojave Community College, Mojave Indian Reservation (Arizona)* and Northland Pioneer Community College, connected to learning centers at the *Fort Apache Reservation* A 1993 grant extended the system to two towns on the *Navajo Reservation* and to one location on the *Hopi Reservation*
- Grants in 1979 and 1982 to *Eastern Band of Cherokee Indians (North Carolina)* to construct a cable TV system for the reservation
- A 1993 grant to *Standing Rock College (North Dakota)* to activate a distance-learning system interconnected via telephone lines between its main campus, a remote-learning center on the Reservation, and the University of North Dakota (AIHEC member)

Based on this Information, OTA estimates that there are at least six Native-owned and -operated cable TV stations and about the same number of over-the-air, low-power television stations

SOURCES Off Ice of Technology Assessment 1995, with information from Michael C Keith, *Signals in the Air: Native Broadcasting in America* (Westport CT: Praeger Publishers 1995), and Michael C Keith, Communication Department, Boston College, Boston, MA personal communication February 1995

(see box 3-3). With a three-year National Telecommunications and Information Administration planning grant and a follow-on demonstration grant, AIHEC plans to deploy and demonstrate a videoconferencing system using satellite technology. If successful, this technology could be extended to Native American K-12 schools, and to non-Native colleges and universities with Native American populations.[12] AIHEC is also considering a role for the network as part of tribal commu-

[12]Facts and figures on 200 colleges and universities with Native American students have been compiled for the first time in *AISES Annual College Guide for American Indians 1994-1995* (Boulder, CO: American Indian Science and Engineering Society, 1994).

BOX 3-3: The AIHEC Distance-Learning Network

- The American Indian Higher Education Consortium (AIHEC) comprises 29 tribal colleges Three are four-year institutions and the rest are two-year community colleges The colleges are located in 12 states distributed as follows, Montana (7), North Dakota (5), South Dakota (4), New Mexico (3), Wisconsin (2), Minnesota (2), and one college each in Michigan, Nebraska, Kansas, Washington, California, and Arizona.
- Over FY 1992-94, Congress made available to the Commerce Department's National Telecommunications and Information Administration (NTIA) a total of $1 million ($250,000 in 1992 and again in 1993, and $500,000 in 1994) to help AIHEC plan how best to use telecommunications technologies to fulfill its mission The project takes the form of a cooperate agreement between NTIA and AIHEC and is being administered by NTIA's Public Telecommunications Facilities Program.
- Consultants for the AIHEC planning grant include Nebraska ETV in Lincoln, the native American Public Broadcasting Consortium (NAPBC), and two experts in telecommunications. Nebraska ETV developed and operates the AG*SAT Network and cofounded the SERC Network. NAPBC has experience in radio and television production as well as program acquisition and distribution Moreover, NAPBC has a strong reputation working with and for Native American public broadcasting. The expert individuals have experience in developing distance-learning networks that are successfully up and running.
- The first-year report recommended that that the first phase of equipment purchase should consist of a C/Ku-Band satellite receive-only antenna and classroom video equipment for each AIHEC school and the AIHEC Washington, DC, headquarters The estimated cost IS $600,000. The second-year report recommended that each school be equipped with a Very Small Aperture Terminal (VSAT) satellite uplink/downlink with a compressed video attachment and a video origination classroom Furthermore, a network-switching center would presumably complete the AIHEC network. This equipment would cost $39 million, phased in over four years
- When fully Implemented, the AIHEC network wiII allow AIHEC to help Native Americans participate in the emerging National Information Infrastructure in the future, the AIHEC network might also be used as an on-ramp to computer networks such as the Internet
- in spring 1995, AIHEC expanded the scope of the project to include assisting tribal colleges in the development of local telecommunications infrastructure. With AIHEC and tribal college help, communities can more broadly deploy and use computer networks.

SOURCE: Office of Technology Assessment, 1995, with information from "The AIHEC Telecommunications Development Project, June 29, 1994, " unpublished document, "American Indian Higher Education Consortium Telecommunications Network: Building Our Future as a People Through Telecommunications" (pamphlet), and Gary Garrison, Telecommunications Project Manager, AIHEC, Lincoln, NE, private communications, March 1995

nity communications centers located at tribal colleges.

Moreover, if videoconferencing partnerships could be formed between tribal and non-Native colleges, learning and research could be enhanced in a multitude of academic areas, including anthropology, linguistics, Native American studies, alternative medicine, and subsistence/sustainable economics. Universities with Native populations might want relevant educational programming and real-time courses produced and taught by Native Americans, such as the AIHEC system could provide. And tribal colleges might seek to broaden the range of their offerings with courses provided by large universities.

Tribal colleges also might want to participate in nationally available videoconferences. For example, the JASON project—administered by the JASON Foundation for Education but supported by an alliance of public, private, government, and nonprofit institutions—allows school children to observe scientific researchers working in remote geographic areas and ask them questions during real-time videoconferences. Founded in 1989 by the discoverer of the *R.M.S. Titanic*, Dr. Robert Ballard, the JASON Project hopes to achieve high



Left: *Students using a personal computer laboratory at the Little Big Horn College on the Crow Indian Reservation, Crow Agency Montana.* ***Rlght:*** *The Little Big Horn College encourages students to use computers for doing class projects and homework. AJl students have access to computer laboratories.*

visibility among scientists, educators, and students throughout the United States and participating countries.[13]

Videoconferencing has wide potential for Native Americans' education. Successful projects are under way in, for example, the North Slope Borough School District in northernmost Alaska, the Lower Yukon and Kuskokwim School Districts in the delta region of Alaska, and the University of Hawaii's community college system.

■ Computer Networking

Computer networking is becoming a key research tool for students and faculty to access various remote databases and documents, exchange draft materials for collegial review, or arrange participation in academic conferences. These applications should be equally helpful in the Native American educational and research environment, especially for exchanging information with other Native American researchers and for accessing the growing number of electronic bulletin boards, file servers, and list servers on Native American topics (see appendix A for a more detailed discussion).

Electronic mail and, to a lesser extent, desktop computer conferencing are becoming more commonplace as a complement to traditional teaching methods, and allow students as young as 3rd grade to reach out electronically to other communities and even nations. These systems offer real potential for helping Native students indifferent tribes,

[13] The JASON Project maintains several list server discussion groups, a Gopher server, and a World Wide Web home page (http: //seawifs.gsfc.naaa.gov/scripts/JASON.html). Until 1995, interactive satellite broadcasts were watched from Primary Interactive Network Sites (PINS) such as NASA-AMES Research Center, Denver Museum of Natural History, Maui High Performance Computing Center, Bell Museum of Natural History in Minnesota, The Williams Companies in Oklahoma, University of Wisconsin in Milwaukee, and the National Geographic Center, as well as several other sites. This year, for the first time, people around the world were able to participate in the JASON VI Expedition live via the Internet (videoconferencing on the Internet uses MBONE technology).

villages, and communities to interact electronically with each other and perhaps become computer pen pals, especially if travel to other areas and meeting face-to-face is prohibitively expensive.

The Bureau of Indian Affairs (BIA) has, for many years, operated the Educational Native American Network (ENAN). ENAN allows teachers, BIA Office of Indian Education Programs officials, and students to communicate using electronic mail. ENAN was created to serve the BIA school system as a communications hub to facilitate math/science curricula development and discussions on applications of educational technology. ENAN is accessible either by dialing in or through a direct connection to the Internet (using remote login, also called Telnet). The majority of ENAN users do not have direct connections, and thus they dial in to ENAN using a modem. Low-quality phone lines frequently cause a major problem; they may slow transmission speeds or be entirely ineffective for accessing the network.

ENAN has several pilot projects to offer more advanced services. In some cases, it serves as an Internet provider by offering SLIP/PPP connectivity (Serial Line Interface Protocol/Point-to-Point Protocol, a service that allows computers to become Internet nodes with nondigital telephone lines). Access with SLIP/PPP is critical in order to use World Wide Web browsers such as Mosaic and Netscape, and more exotic applications such as Internet Relay Chat (IRC). In the near future, ENAN will be able to offer Internet access through Integrated Services Digital Network (ISDN) lines, digital lines offered by telephone companies. Moreover, ENAN now maintains an Internet World Wide Web home page.[14] Finally, ENAN is helping to develop new technology by serving as a Beta tester for eSoft company's Internet Protocol Adapter (IPAD), a networking technology.

ENAN is a four-person operation with advanced technical capability, but without adequate resources (or a mandate) to provide technical assistance to tribes. Nevertheless, it has allowed many educators and students to become familiar with the technology and has encouraged planning for future development of computer networking. ENAN provides as much technical assistance as it can with its limited resources. Unfortunately, the queue for technical assistance is long.

The American Indian Science and Engineering Society (AISES), a national Native American student and professional organization with chapters at colleges and universities nationwide, maintains the AISES Information System (AIS) and AISESnet for its members.[15] AIS, by arrangement with New Mexico Technet, an Internet provider, is a "1-800" dial-in "on-ramp" to the Internet for which AISES members are allocated 10 hours per month free use. AIS supports such well-known Internet applications as Gopher (menu-based user interface to electronic databases), Telnet (to log in to other computers), electronic mail (e-mail), and dial-up capability to bulletin board services (BBSs). It does not, however, support a World Wide Web browser such as Mosaic. AISESnet, in contrast to AIS, is an Internet-accessible Gopher server with information such as a resume database, four moderated discussion groups (also called list servers), and a World Wide Web home page.[16] AISESnet is not an on-ramp, but a destination for information and an electronic forum for discussion.

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[14]The ENAN World Wide Web home page can be accessed at http://oiep.unm.edu:/enan/home.html.

[15]Emo Notah, Computer Technician, American Indian Science and Engineering Society, Boulder, CO, personal communication, April 1995.

[16]The AISESnet discussion groups can be subscribed to by sending an e-mail request to listproc@listserv.umt.edu with the message "subscribe <list name> <your name>" in the body. There are four lists—AISESnet_General, AISESnet_Discussion, AISESnet_Drum, and AISESnet_Alcohol. AISESnet_Alcohol is an anonymous list; e-mail addresses of participants are not revealed. The AISESnet World Wide Web home page can be accessed at http://bioc02.uthscsa.edu/aisesnet.html.

The National Science Foundation (NSF), long a supporter of telecommunications infrastructure for science and education, funded a Native American Telecommunications Forum[17] where, for the first time, telecommunications issues and strategies were explored by a group of Native American experts and advocates. NSF has, in addition, awarded the Electronic Pathways Alliance a planning grant to develop a national Native American center for telecommunications technical assistance.

Another NSF program related to Native Americans is the All Nations Alliance for Minority Participation (AMP), administered by Montana State University. AMP awards have been made to Fond-Du-Lac Community College (Minnesota) to encourage students to attain undergraduate and graduate degrees in computer science and engineering, and to Sinte Gleska University (South Dakota) to develop teacher leadership in mathematics and science education for more than 1,000 American Indian elementary students. NSF also supports the Rural Systemic Initiatives (RSI), all but one of which directly involve or impact Native Americans. RSI grants have been awarded to the "four corners" Navajo reservation region of Utah, Colorado, Arizona, and New Mexico (the UCAN project); the Alaska Federation of Natives; and a group of California and Nevada tribes. In all, between FY 1991 and FY 1994, NSF has provided more than $6 million in direct support to 12 tribally controlled colleges.[18]

The National Aeronautics and Space Administration (NASA), another independent federal science and technology agency, supports a few projects that benefit Native Americans. Foremost is the American Indian Science and Technology Education Consortium initiative that has created partnerships between six off-reservation universities—including Oklahoma State University, which has a large Native American student body—and five tribal colleges. The goals are to help the universities serve the tribal colleges as a resource for institution-building, and to develop culturally relevant model programs for math/science education for Native American students of all ages from preschool to graduate school. The telecommunications goals are to create an online database, accessible through the Internet, for curriculum models and to provide Internet access and computers to the tribal colleges. Another NASA project connects the Sequoyah High School and the W.W. Keeler Complex of the Cherokee Nation of Oklahoma to the Internet through the NASA Science Internet. The Cherokee Nation plans to develop a network for all its offices in a 14-county area.

The Department of Defense (DOD) recently expanded the Infrastructure Support Program for HBCUs/MIs (Historically Black Colleges and Universities/Minority Institutions) to include tribal colleges. This program, funded at about $15 million per year since 1992, received another $10 million in 1995 to extend grants and contracts to tribal and women's colleges. This program is managed by the Army Research Office, but includes funds from the Air Force Office of Scientific Research, Office of Naval Research, and Advanced Research Projects Agency. The program is intended to promote collaborative research in major laboratories; strengthen programs in engineering, science, and math; fund instrumentation purchases; and provide technical assistance to enhance the ability of minority institutions to successfully compete for future DOD funding.

The National Indian Policy Center, at George Washington University in Washington, DC, uses computer networks to disseminate commissioned Native American research and policy analysis reports, as well as other information such as census

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[17] *First Native American Telecommunications Forum: Final Report*, prepared for the National Science Foundation (Bernalillo, NM: Americans for Indian Opportunity, February 1994).

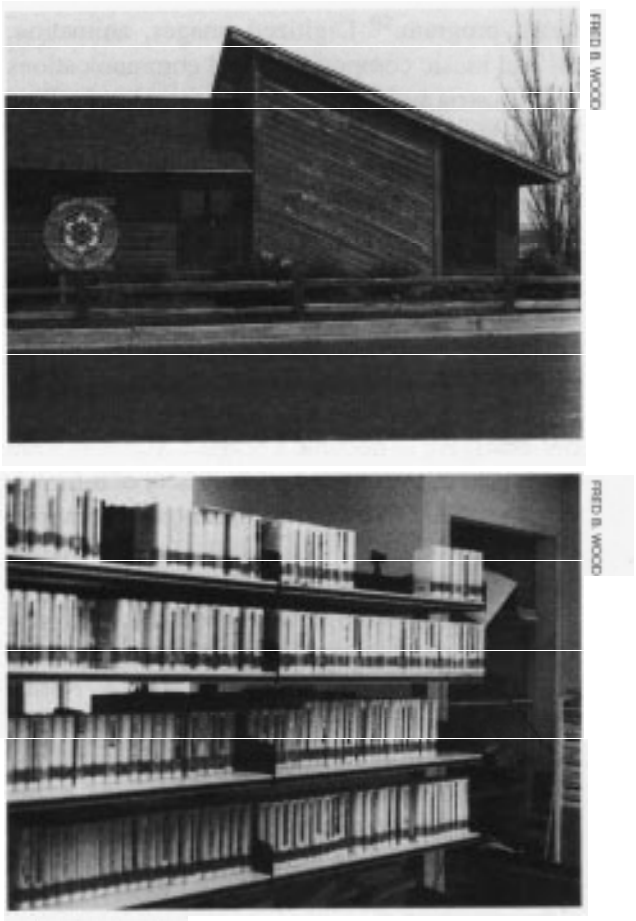
[18] Nora Sabelli, Program Director, Networking Infrastructure for Education, National Science Foundation, Washington, DC, personal communication, April 1995.

data and treaties. One of the center's purposes is "to serve as an information clearinghouse for Native Americans."[19] This online database is funded by the Administration for Native Americans (Department of Health and Human Services).

Overall, Native students, teachers, researchers, and educational leaders are embracing computer networking and other new educational technologies with good results. Many K-12 schools, community colleges, and libraries have received pilot-project funds for computer networking. However, on the downside, funding is inadequate to allow the majority of schools, and noninstitutional educators in general, to participate. And Native policies for use and access are generally nonexistent. Moreover, without proper supervision and informed use, Native educators are concerned that computer networking could expose Native youth to undesirable and potentially harmful information (e.g., exposure to personal lifestyles and perspectives that run counter to Native values, as is the case with some television shows).

■ Multimedia

Multimedia offer potential for recording and presenting Native cultures, histories, and concepts of health and wellness, and for representing and explaining Native communities and peoples. The development of multimedia software by and for Native Americans, overall, is in the very early stages. The potential market is likely to be significant, based on results of pilot tests and experience to date. K-12 and community college students and teachers have demonstrated their ability to effectively use computers and computer software when given the opportunity (i.e., equipment, time, encouragement, and training). This appears to be the case across the spectrum of American Indian, Alaska Native, and Native Hawaiian communities that have experimented with computers in the classroom.



Top: Applied Science Building at the Oglala Lakota College on the Pine Ridge Indian Reservation, Kyle, South Dakota. This building houses the colleges instructional technology **center** *Bottom: Videotape collection available to teachers and students at the Oglala Lakota College.*

For example, Apple Computer funded the Pine Ridge High School on the Pine Ridge Reservation and the Nazlini Boarding School on the Navajo Reservation through its Crossroads Educational

[19] The other two purposes to commission Native American research and policy analysis, and to sponsor seminars and conferences on issues of concern to American Indians and Alaska Natives. Research grants are awarded in seven areas: cultural rights and resources, economic development, education, health and human services, law and administration of justice, natural resources and environmental protection, and tribal governance. National Indian Policy Center pamphlet Washington, DC, 1994.

Grant program.[20] Digitized images, animation, art and music composition, and communications with Austria and Australia became reality for Pine Ridge High School students after they received Apple computers and network access. The Oglala students shared pow-wow dancing, Lakota legends, and video introductions of themselves with computer pen pals. Students could find information for essays using a multimedia encyclopedia. One student wrote a summary of Darwin's theory of evolution. Another student used multimedia computer art to show two dolphins swimming and one emerging to become a seagull. Students were motivated to search for a wide variety of information to include in their own multimedia compositions.

The positive experience of these Native Americans, ranging from grade-schoolers to thirty-somethings (not unusual in tribal colleges), is indicative of the future potential for Native American multimedia. If Native Americans are to have a major role in the actual development and marketing of Native American multimedia, a concerted entrepreneurial initiative (with education, training, and funding elements) will be needed.

HEALTH CARE

Health care professionals are learning and developing new concepts for telecommunications-based health care systems, including telemedicine,[21]community health information networks, electronic patient records, clinical information systems, and electronic claims-processing. These systems are still in development and their full potential is unknown. However, pilot projects indicate that a profound change could occur in the delivery of health care via telecommunications over the next decade.[22] Native American health care professionals have their own concepts for Native health. They will want to pursue the development of health care delivery systems that are culturally acceptable and adaptable to the groups they serve.

Videoconferencing

Telemedicine is broadly defined as the use of information technology to deliver medical services and information between sites. Two-way videoconferencing is a key technology component of telemedicine systems. Telemedicine combines videoconferencing with the informational capabilities of computers. The remote location of many Native communities means that medical and health care services are limited. Primary health care provided to Indian reservations, Alaska Native villages, and Native Hawaiian communities through remote health clinics and small hospitals has improved in recent years. Access to medical specialists, however, continues to be limited.

Telemedicine could facilitate remote consultations between onsite providers and specialists at major medical centers in metropolitan areas, supported by the electronic transmission of diagnostic x-rays, magnetic resonance imaging (MRI) scans, and the like (known as teleradiology). It also could increase the opportunities for medical and health personnel at remote locations to participate in continuing medical education without having to leave their communities. These benefits might also extend to family health counselors, social workers, nutritionists, and other professionals working in the community to help improve Native American health. To be cost-effective, a videoconferencing facility might be shared for medical, social, and educational purposes.

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[20]Cindy Hamilton, "Combining High-Tech with Lakota Legend: Pine Ridge Students Utilize Computers To Communicate Their Culture," *Winds of Change*, summer 1993, pp. 34-36.

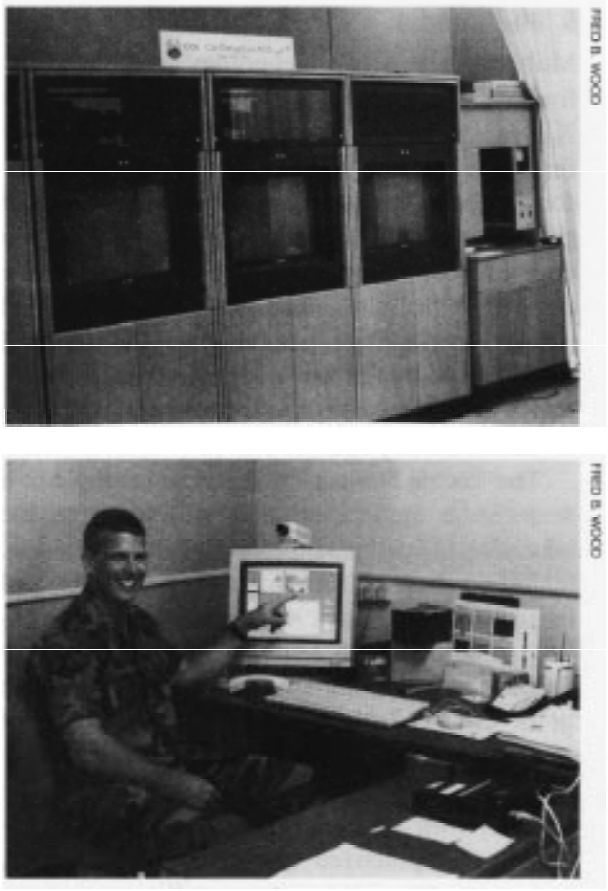
[21]Jane Preston, M.D., F.A.P.A., *The Telemedicine Handbook: Improving Health Care with Interactive Video* (Austin, TX: Telemedicine Interactive Consultative Services, Inc., 1994).

[22]For discussions about telecommunications and information technologies in health care, see U.S. Congress, Office of Technology Assessment, *Information Technology and the Health Care System*, in progress; and James S. Logan and David G. Swartz, *Aberdeen Area Indian Health Service: Telemedicine Assessment Final Report* (Oklahoma City, OK: Logan & Associates, Inc., Mar. 30, 1995).

A good example of shared use of telecommunications infrastructure is the Distance Delivery Consortium headquartered in Bethel, Alaska. The consortium is a partnership of medical, educational, and governmental organizations and telecommunications companies with the shared objective of developing effective telecommunications applications, such as telemedicine and distance learning, in this part of rural Alaska. Distance-learning applications include high school courses, health education, and teacher in-service training. The Yukon-Kuskokwim Health Corp. hopes that telecommunications will play a key role in promoting preventive health and community wellness strategies.

■ Computer Networking

Computer networking is another key component of telemedicine in general, and of community health information networks, computerized patient records, clinical information systems, and electronic claims-processing in particular. Computer networks can be used to exchange patient records among various providers and locations; conduct remote searches of medical and health databases; file health insurance claims (e.g., using electronic data interchange); and receive payments for medical services and insurance reimbursements (e.g., using electronic funds transfer).[23] These applications are being extensively researched in the general health care community, and seem particularly appropriate for Native health care facilities located considerable distances from tertiary care providers, medical specialists and researchers, and insurance companies. Computer networking potentially offers an effective means to collect and exchange information on Native health perspectives and practices. The use of computerized patient records for Native Americans would require attention to the same privacy and security concerns raised by medical consumer advocacy groups.[24]



Top: *Videoconferencing room at Tripler Army Medical Center Honolulu. The U.S. Army and Department of Veterans Affairs, in collaboration with the University of Hawaii School of Medicine, intend to use telecommunications to improve patient care for military personnel and veterans throughout the Pacific Basin-including Oahu, the neighbor islands, Guam, and American Samoa. Bottom: Prototype desktop videoconferencing system at Tripler Army Medical Center*

Like other areas of technology discussed, it will be helpful for Native American groups to participate in the wide range of current or future pilot tests and demonstrations. In this way, the potential benefits and problems can be understood from a Native American perspective.

[23] Ibid,

[24] For a discussion, see U.S. Congress, Office of Technology Assessment, *Protecting Privacy in Computerized Medical Information,* OTA-TCT-576 (Washington, DC: U.S. Government Printing Office, September 1993).

Multimedia

Multimedia is a key technology in medical information and training systems that could benefit Native Americans. For example, multimedia offers the potential to record and present detailed information on the human body, simulate medical procedures, model human physiology, and use computer-aided design tools to design prosthetic devices. With multimedia software, computerized patient records could include images, videos, and audio recordings as well as text to describe a patient's symptoms, diagnoses, treatment, and overall health history and condition.

The Visible Human Project is an example of a multimedia application that will improve the education of health care professionals nationwide, including Native American professionals and those that serve Native Americans. This project is funded through the federal High Performance Computing and Communications Program as one of its "Grand Challenges." The project will create an electronic "image library" of three-dimensional images of the male and female body that will be accessible through computers and computer networks. Computerized tomography (CT), MRI, and cryosection images at one millimeter separation will be stored on 70 to 80 CD-ROMs and will likely be available via the Internet.[25]

Wireless

Many Native American telemedicine systems will need to use wireless technologies to meet the demands of weather, terrain, and remote locations. Videoconferencing and computer networking depend on microwave and satellite links to reach the most remote facilities. In the future, personal communications systems may play an important role.

One of the earliest telemedicine demonstrations (started in 1972), Space Technology Applied to Rural Papago Advanced Health Care (STARPAHC),[26] linked a medical van to two hospitals via analog two-way microwave television and audio transmissions. STARPAHC was a joint project of NASA, Lockheed Missiles and Space Co. (now Lockheed/Martin), Indian Health Service (IHS), Department of Health, Education and Welfare (now Health and Human Services), and the Papago Tribe (now Tohono O'Odham). The lessons learned for telemedicine were the necessity for advanced planning, including early development of an evaluation plan, clear definition of objectives, and the active involvement of the community.[27]

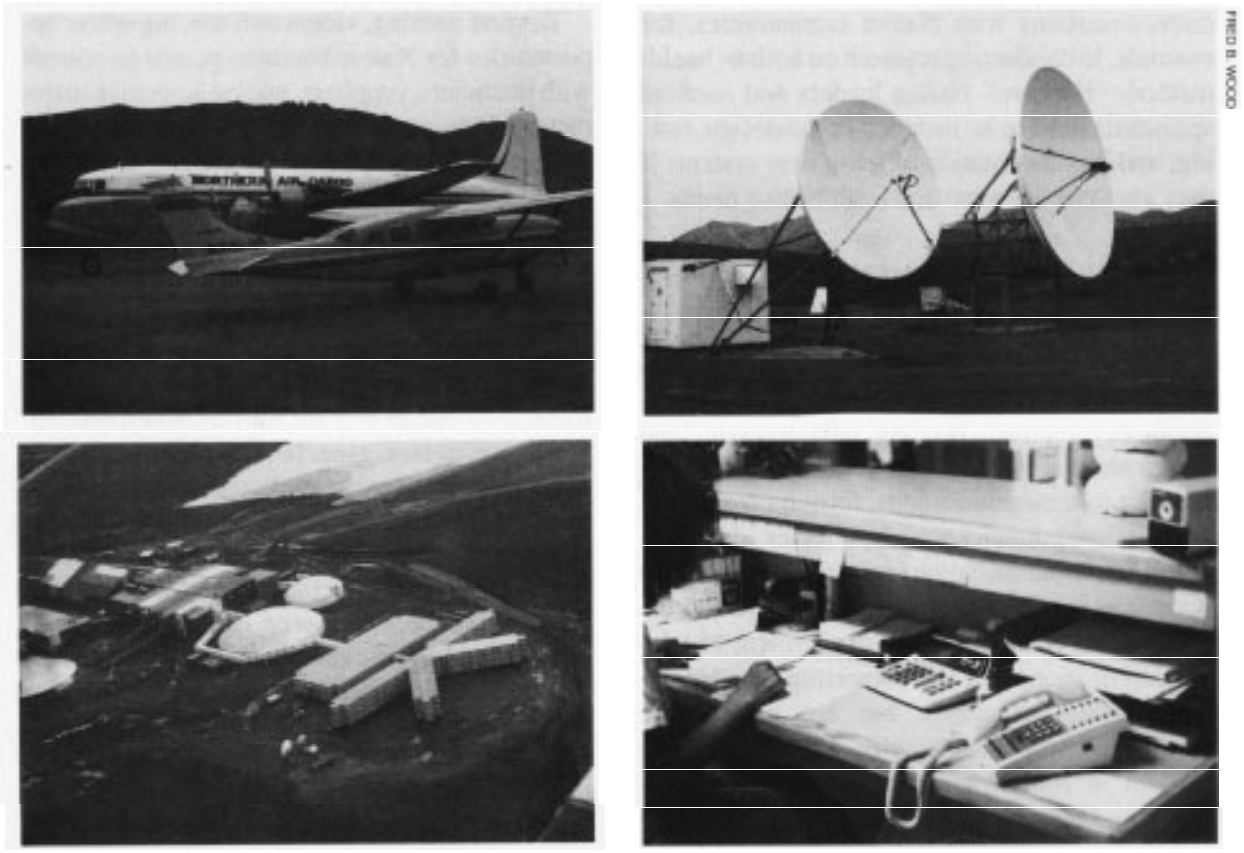
A recent telemedicine project carried out by the IHS and NASA used satellite technology to link one IHS facility on the Pine Ridge Reservation (Oglala Sioux) in South Dakota with the Mayo Clinic in Rochester, Minnesota. The objectives were twofold: "1) to determine the technical requirements for a large group practice to provide professional education and clinical consulting services to a geographically-remote Indian reservation, and 2) to determine whether these services are perceived as useful by the health care professionals, the community health representatives,

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[25]National Library of Medicine, "The Visible Human Project," Fact Sheet, April 1993.

[26]R. Bashshur, *Technology Serves the People: The Story of a Co-operative Telemedicine Project by NASA, the Indian Health Service, and the Papago People* (Tucson, AZ: Indian Health Service, 1979).

[27]"Through active participation in the STARPAHC project, the Papago have demonstrated a very serious interest in what this technology can offer their people. The tribal representatives who were members of the Executive Health Staff diligently participated in all the preparatory design meetings pertaining to this project, learning the basic terminology to deal intelligently with each issue put before them on the discussion table, be it related to the design of the mobile health unit, power generation for the relay stations, or the broadband/narrowband choices in transmission and display equipment. . . . The Papago insisted on, and they achieved, an explicit acknowledgment of their own primary health objectives, namely, to live as a people in harmony with nature, as the primary objective of STARPAHC. The evaluation plan developed for STARPAHC recognized the Papago objective as the project's basic objective." Ibid., p. 55.



Top left: *Aircraft parked at the Red Dog Mine,* about *IOO air miles above the Arctic Circle. The dirt airstrip and propeller-driven planes are typical of remote Alaska locations that are otherwise inaccessible.* ***Bottom left:*** *Red Dog Mine,* a *joint venture of an Alaska Native corporation and a private company* ***Top right:*** *Satellite dishes at the Red Dog Mine. All telecommunications must be via satellite; land line connections are not feasible.* ***Bottom right:*** *The Red Dog Mine is heavily dependent on telecommunications for administrative, inventory scheduling, ordering, payroll, personnel, and other purposes.*

and the patients of the reservation."[28] Based on a questionnaire filled out by employees of the Pine Ridge Hospital, community health representatives, and Mayo Clinic participants, the project was considered technologically successful, feasible, and useful. Costs could be reduced by using the telecommunications line for both health education and patient care. Other savings might accrue by using telemedicine to identify patients who could be treated in Pine Ridge rather than in a distant medical facility, which would incur transportation costs. Indirect savings might accrue through more effective and efficient treatment plans, and through early identification of health problems. The lessons of this project were not meant to be generally applicable to all tribes. Even for the Oglala Sioux tribe, affordability, regulatory, and political barriers to permanent deployment were not addressed.

Native Americans on reservations and in Alaska villages will require special use of wireless links to reach the most remote locations. Wireless computer networking could offer Native American communities access to free or low-cost medical and health information databases. Health institutions around the country may benefit from better

28 Thomas E. Kottke, Leonard Little Finder, Mary Alice Trapp, and Laurel Panser, "The Pine Ridge Indian Reservation/ Mayo Clinic / NASA Telemedicine Project: A Feasibility Study;" abstract, *Second International Conference on the Medical Aspects of Telemedicine and Second Annual Mayo Telemedicine Symposium,* Apr. 6-7, 1995, p. 2.

communications with Native communities, for example, in conducting research on holistic health methods. However, Native leaders and medical specialists need to be included in the design, testing, and implementation of these new systems if they are to be accepted and meet Native needs.

ECONOMIC DEVELOPMENT AND ENVIRONMENTAL PROTECTION

Businesses, entrepreneurs, community services, and government offices—in areas such as economic development, housing, infrastructure, land use, or environmental protection—are increasingly using telecommunications, forming or encouraging telecommunications businesses, or developing telecommunications infrastructure. Native American communities are generally behind the mainstream economy in the deployment of telecommunications and the ownership of telecommunications companies, but are increasingly aware of the potential benefits. Economic development in Native American communities, villages, and tribes is generally predicated on a requirement to protect the environment and honor the earth. Geographic Information Systems allow Native American communities to take care of their land and natural resources in culturally relevant and sustainable ways. In general, Native American businesses and regulators can emulate or adapt mainstream uses of telecommunications.

Videoconferencing

Videoconferencing could be a useful tool to Native Americans for job-related training and career exploration. A videoconferencing capability in Native communities would help to open up access to the already extensive teletraining opportunities in numerous job, career, and skill areas. Native American groups may be able to negotiate more favorable package rates when acting collectively. Also, Native groups may be able to collectively achieve a critical mass that can support the development or adaptation of training materials specifically for Native Americans.

Beyond training, videoconferencing offers opportunities for Native business people to consult with financiers, suppliers, and customers in major metropolitan areas (and potentially overseas) as part of Native product development, financing, and marketing efforts.

Computer Networking

Computer networking is rapidly becoming an important tool of successful businesses in the major metropolitan areas and telework centers. This is likely to be true as well for Native-owned and -operated businesses, especially those located in remote areas. Illustrative applications include tracking private-sector business opportunities using computerized trading, sales, and marketing databases; monitoring government contracting opportunities via the *Commerce Business Daily* and other federal agency announcements available online; exchanging market leads with other Native enterprises; identifying venture capital, banking, and government funding sources for minority enterprises; and marketing Native products and services over the rapidly growing electronic enterprise networks.

Effective use of computer networking by Native business people would require significant training on both the conceptual and technical levels. Providing affordable access to the technology and resolving intellectual property issues (e.g., copyright and trademark protection) that concern electronic entrepreneurs would also need to be addressed.

Many other tribal businesses may want to use an information system or establish a local area network to support company operations. Commercial systems for small businesses without in-house technical expertise are increasingly available at declining costs. Tribal companies may also consider connecting to wide area networks, such as the Internet, for electronic commerce or telemarketing. While this currently requires technical assistance, in the future it should be as easy as establishing and using a telephone connection—given a modern telecommunications infrastructure.

Computer networking,[29]especially the Internet, has become an increasingly important business tool in the last few years. The exchange of business forms using electronic data interchange is widely available, including on the Internet. Hundreds of businesses now have multimedia home pages on the Internet that advertise their wares and services or provide online consulting. The number of commercial domains (a *domain* is a local area network with at least one host computer connected to the Internet) on the Internet is now greater than 25,000 and is increasing by about 1,000 per month.[30] The strongest growth is coming from computer, publishing, and financial companies. As a result of enormous growth and a high profile, people across the United States are asking how they can get on the Internet (see box 3-4). The answer is not straightforward because the Internet industry is changing rapidly, and is still quite complex for the layperson.[31]

Importantly, several major electronic commerce and digital cash projects currently under way are working on privacy and security problems[32] as well as marketing concerns. For example, CommerceNet[33] in California's Silicon Valley is a government-sponsored project of Enterprise Integration Technologies, with participation by WestRen, the operator of the Bay Area Regional Research Network (BARRNET), and Stanford University. Similarly, the Microelectronics and Computer Technology Corp. (MCC), a government-supported consortium of approximately 80 companies, is developing the Enterprise Integration Network (EINet), a business network that will run applications over the Internet. The high-speed data networking services will be provided by Sprint. Directory, encryption, and eventually electronic funds transfer services will be available.

CD-ROM Databases

CD-ROM optical storage allows more than 200,000 pages of text or 10,000 images to be stored on one 4.75-inch-diameter disk. Large numbers of historical, legal, business, and other records can be archived more easily and made available using CD-ROM technology for storage.

For example, the Zuni Tribe in New Mexico, in conjunction with the Institute for the North American West, has proposed the Zuni Watershed CD-ROM Project. It would make about 70,000 pages of reports and maps and 500 historical photographs available to Zuni planners, managers, officials, and students.[34] Between 1970 and 1990, the Pueblo of Zuni collected historical documents and expert testimony to support its bid to recover aboriginal lands illegally taken, as well as for compensation for the severe soil erosion caused by logging, over-grazing, and other activities detrimental to the Zuni watershed. In 1990, based largely on these documents, the Zuni Tribe

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[29]For a broad discussion on the potential and challenges of telecommunications and information technologies for U.S. business and the economy, see U.S. Congress, Office of Technology Assessment, *Electronic Enterprises: Looking to the Future*, OTA-TCT-600 (Washington, DC: U.S. Government Printing Office, May 1994).

[30]"Commercial Domains Break 25,000 Mark," *The Internet Letter*, vol. 2, No. 3, Dec. 1, 1994.

[31]For a discussion about electronic commerce on the Internet, establishing a World Wide Web presence, and accessing the World Wide Web, see Larry Press, "Commercialization of the Internet," *Communications of the ACM*, vol. 37, No. 11, November 1994, pp. 17-21.

[32]See U.S. Congress, Office of Technology Assessment, *Information Security and Privacy in Network Environments*, OTA-TCT-606 (Washington, DC: U.S. Government Printing Office, September 1994) and *Issue Update on Information Security and Privacy in Network Environments*, OTA-BP-ITC-147 (Washington, DC: U.S. Government Printing Office, June 1995).

[33]A general discussion of the future of electronic commerce is presented in Jeff Ubois, "Wheels of Commerce: An Interview with CommerceNet's Cathy J. Medich and Jay M. Tenenbaum," *Internet World*, April 1995, pp. 62-64, 66, 68.

[34]Roger Anyon, Director, Heritage and Historic Preservation Office, Pueblo of Zuni, Zuni, NM, fax to Office of Technology Assessment, U.S. Congress, Washington, DC, Oct. 14, 1994.

BOX 3-4: How Do Native Americans Get Internet Access?

'(How do we get Internet access?" This IS a question being heard with Increasing frequency in Indian Country. The answer is not simple. The foremost requirement is having an Internet access or service provider nearby. Required hardware includes a computer and a modem for a regular phone line, or a terminal adapter for a digital line such as Switch 56 or Integrated Services Digital Network, or a direct connection through a local area network (LAN) or campuswide network. Required software includes communications software and at least one applications software package, for example, for electronic mail, file transfers, remote log-in to another computer, or browsing menus and home pages. in some situations, applications software will be on the Internet provider's computer to which your computer is connected. This is the case for commercial services such as America Online, Prodigy, and CompuServe The exact hardware and software required will depend on the Internet provider and data-rate limitations imposed by noisy phone lines. There are numerous books and magazines that guide Internet beginners[1]; however, finding a computer-savvy friend helps significantly, See box 2-4 for a description of the Internet.

Commercial provision of Internet access began sometime after 1985. in that year, the National Science Foundation (NSF) encouraged the Internet to expand beyond university- and laboratory-based networks A few years later, plans were made to privatize the regional Internet networks and the NSF backbone All NSF subsidies to the backbone ended in April 1995 The transition has not been smooth, a competitive shakeout is in progress even as the market is emerging. Costs, pricing strategies, future needs, and the regulatory environment are all uncertain. Currently, rates and services vary considerably. A barrier to affordability occurs when the user requires a long-distance, rather than a local phone call to reach the Internet host computer, as is the case in many rural areas.

Today, there are public and private providers of Internet, including.

- the original Internet regional networks,
- some online consumer services such as America Online, Prodigy, and CompuServe (these currently provide electronic mail through the Internet, but plan to offer Internet browser services),
- numerous community networks such as the Blacks burg Electronic Village, Virginia; Taos Telecom - munity, New Mexico, Big Sky Telegraph, Montana, Prairienet, Illinois, and Boulder Community Network, Colorado,

(continued)

[1] *See, e.g., The Internet Unleashed* (Indianapolis, IN: Prentice Hall Computer Publishing, 1994) See also *Internet World, Wired* or *Boardwatch* magazines

settled its claim for damages against the United States for $25 million.

The primary goal of the CD-ROM project is to make the document collection available to those involved in sustainable development, history, and culture of the Zuni Tribe. A secondary goal is to create a model for other tribes interested in using CD-ROM technology to make historical and other tribal records available.

Geographic Information Systems

Many tribes today are concerned with sustainable land development, environmental protection, and obtaining accurate land records.[35] To plan for

[35] For tribes, whose entire place in the federal system is based on the historical question of land—who owns it and who has given it up or has had it taken—land records are crucial and GIS is a much-needed and valuable tool." Phil lip Martin, Chief, Mississippi Band of Choctaw Indians. Philadelphia, MS, fax to Office of Technology Assessment, U.S. Congress, Washington. DC, May 2, 1995.

BOX 3-4: How Do Native Americans Get Internet Access? (Cont'd.)

- utility, [2] cable, [3] and software [4] companies;
- government programs such as the Extension Indian Reservation Program (Department of Agriculture, Extension Service), ETAnet (Department of Labor, Employment and Training Administration), and the Tribal Technical Assistance Program (Department of Transportation, Federal Highway Administration),
- local and long-distance phone companies, and
- hundreds of Internet resellers.

Several mergers and buyouts among commercial providers are currently under way. For example, in November 1994, America Online bought Advanced Network Services, a joint venture established by MCI, IBM, and the University of Michigan to operate the NSFNet and sell Internet access to organizations At about the same time, MCI announced a service that combines Internet access, electronic mail, and electronic shopping. BBN Internet Services Corp. recently bought Nearnet and BARRNET, regional Internet service providers in the northeast and San Francisco Bay Area, respectively.[5] The market is likely to be quite volatile over the next few years.

How one gets Internet access depends on whether the user IS an individual or organization, small or large business, public or private, and so forth. Most large educational Institutions, government agencies, and businesses are creating their own local area networks that are, in turn, being connected to the Internet. Primary and secondary schools are slowly getting Internet access, some through a grant or service subsidy from the telephone company. North Carolina has a statewide initiative to hook up all schools government offices, health care clinics, and research facilities The key is to find a person or organization with similar needs and circumstances, and follow in their footsteps.

SOURCE Off Ice of Technology Assessment, 1995

[2] "Electric Company Plans Unlimited T-1 Internet Access at $1995 a Month, " *The Internet Letter,* Feb. 1, 1995, pp. 1-2

[3] John McQuillan, "Reinventing the Internet for Broadband?" *Business Communications Review,* March 1995, pp. 12,14

[4] "Microsoft Plans Wide Range of Internet Services Microsoft Network To Provide Billing in 19 Currencies, " *The Internet Letter,* Feb. 1, 1995, p 3

[5] Reports of mergers from Joanne Cummings and Fred S Knight, "Internet Service Providers To Ride a Familiar Roller Coaster, " *Business Communications Review,* January 1995, pp. 67-68

business development, housing developments, utilities, environmental protection, parks, and wildlife areas, the tribes first require detailed maps of their reservations, including information on natural resources and terrain. Many reservations, trust lands, and Native Hawaiian homelands are poorly mapped out and have uncertain boundaries. The last comprehensive reservation survey measurements were made in 1949 by the Bureau of Land Management. Geographic Information Systems can play a key role in assisting tribes, Alaska Native villages, and Native Hawaiians with their own land management responsibilities.

Today, about 50 tribes run their own GISs and have formed a consortium, the Intertribal GIS Council, to share their concerns and knowledge. Most of these tribes received early exposure, consulting services, and training through the BIA's Geographic Data Service Center (GDSC) .[36] The tribes can buy GIS software at government rates.

[36] Information from interviews with the four-person staff and contractors at the BIA Geographic Data Service Center in Lakewood. CO, Nov. 18, 1994.

Basic GIS technology is now more user-friendly and can run on many types of computers. Advanced GISs require faster computers, more memory, and high-bandwidth networking. While this makes GIS more useful, it also adds considerably to the cost.

Tribes are struggling with long-distance, dial-in charges and looking for affordable ways to implement wide area networks to keep the costs of GIS networking down. Some tribes are dependent on a single person who is knowledgeable enough to make use of and maintain a tribal GIS. But if that person should leave, the tribe must train or hire another person—not always easy to do. Although GDSC policy encourages tribes to be self-sufficient, smaller tribes frequently fall back on GDSC training and consulting.[37]

One type of useful data is remotely sensed imaging using satellite or airborne imagers, coupled with coordinate information from a Global Positioning System. Acquiring such information can be expensive, but if important enough, even small tribes might pay.[38]

John Goes In Center, president of Innovative GIS Solutions, develops GISs for Native Americans. His experiences indicate that most GISs lack a "cultural layer of data" that Native Americans want.[39] Moreover, he believes that GISs are not being fully used because of a lack of culturally relevant needs assessments and problems getting traditional tribe members and tribal councils to recognize the potential. Tribes are understandably reluctant to invest in technology whose benefits are not clearly understood.

Telecommunications Infrastructure

Native-owned telecommunications and other technology-based companies are an important source of economic development and job creation.[40] Many such companies today are as easily located on a reservation as in a city. For example, a Turtle Mountain tribal company in North Dakota, Uniband, Inc., has contracts with the Treasury Department, Internal Revenue Service, Indian Health Service, and North Dakota Fish and Game Department to develop electronic information systems and perform data entry and network management. Companies such as Uniband are creating new market demands for an advanced telecommunications infrastructure.

Gaming operations also drive the development of telecommunications infrastructure. The Oneida Indian Nation of New York,[41] for example, uses computer networks and information systems for managing its gaming enterprises, and is investing some earnings in advanced communications to serve community needs such as health care, education, cultural centers, and other business enterprises. The new business enterprises, in turn,

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[37]Beth Wenstrom, Cartographer, Land Titles and Records Office, Bureau of Indian Affairs, Sacramento, CA, personal communication, May 1995.

[38]Gary Emery, GIS Analyst, Forestry Division, Hoopa Valley Tribal Council, Hoopa, CA, personal communications, May 1995. For background discussions, see OTA, *Helping America Compete: The Role of Federal Scientific and Technical Information*, op. cit., footnote 4; U.S. Congress, Office of Technology Assessment, *Remotely Sensed Data from Space: Distribution, Pricing, and Applications*, Background Paper (Washington, DC: Office of Technology Assessment, July 1992); and U.S. Congress, Office of Technology Assessment, *Remotely Sensed Data: Technology, Management, and Markets*, OTA-ISS-604 (Washington, DC: U.S. Government Printing Office, September 1994).

[39]As expressed in a presentation given at the 1994 National Congress of American Indians conference in Denver, CO, Nov. 13-18, 1994.

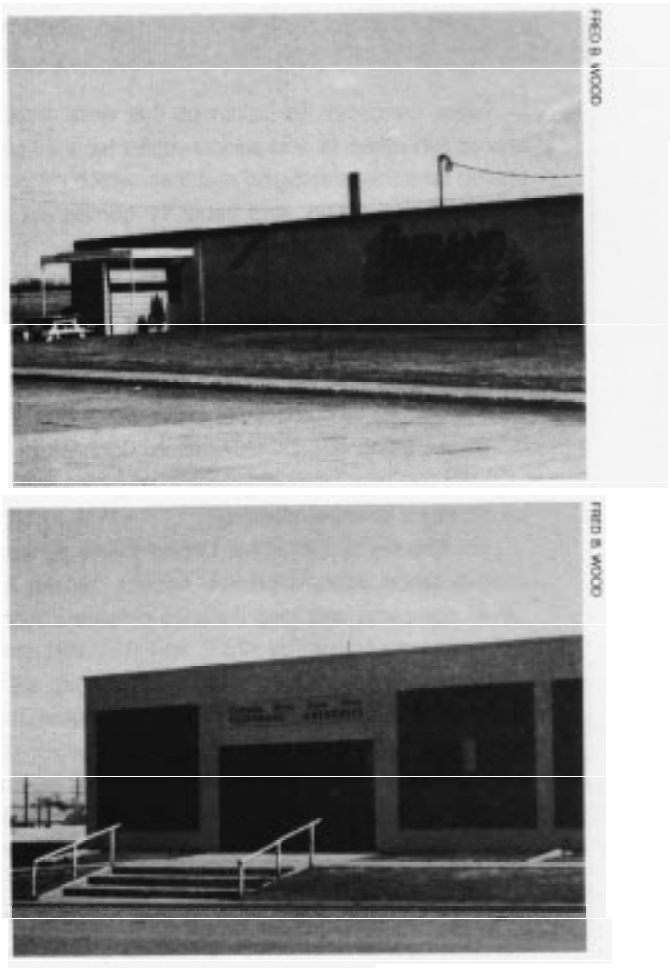
[40]See, for example, a discussion of five industries identified to present immediate, feasible opportunities for Indian reservations: manufacturing (including telecommunications equipment), telecommunications and information services, and three industries that are heavy users of telecommunications and information technologies (environmental services, tourism, and retail) in National Center for American Indian Enterprise Development, *Growing Market Opportunities for Indian Reservation Enterprises*, prepared by UIDA Consulting Group (Mesa, AZ: April 1991).

[41]The Oneida Indian Nation of New York was the first Indian Nation to establish a home page at http://nysernet.org/oneida/. This home page chronicles the ongoing community development, including its community-wide use of computer networking.

further drive infrastructure development with additional needs for computer networking, telemarketing, and information systems.

Other gaming operations have driven demand for satellite broadcasts and "1-800" telephone service capability. For example, in 1991, MegaBingo was broadcast live via satellite every evening for 15 minutes from the Creek Nation Bingo Hall in Tulsa, Oklahoma, to 47 sites in 10 states and 31 reservations.[42] The Coeur D'Alene Tribe in Idaho is waiting for approval to conduct a lottery with toll-free "1-800" calls from 36 states and the District of Columbia (where lotteries are legal). Payments would be made via credit cards.[43] The major investor, Denver-based Unistar Entertainment, Inc., is paying for a lottery office on the reservation to be equipped with high-speed computers, fiberoptic phone lines, and perhaps a microwave radio hookup.[44]

Several Native entrepreneurs have developed small software development and computer/network consulting companies. For example, Jim Bradley (Tlingit) has developed two telecommunications companies-United Native American Network (UNAN), a nonprofit corporation with a Native American board of directors, and United Native American Telecommunications (UNAT), a for-profit sole proprietorship (see box 3-5). Although the market for services on reservations is currently limited, these businesses have telecommunications, software, and computer engineering expertise that will be assets if markets develop in the future. Many Native entrepreneurs want to move back to the reservation and are looking for opportunities to serve Native American communities. Some could develop telework and information businesses similar to Uniband, provided the telecommunications infrastructure is available.



Top: *Uniband, a data processing company located on the Turtle Mountain Indian Reservation, North Dakota.* ***Bottom:*** *Cheyenne River Sioux Tribe Telephone Authority in Eagle Butte, South Dakota.*

Others, such as UNAN or UNAT, can provide or drive the infrastructure.

Industries such as banking and insurance also drive the development of telecommunications infrastructure to support computer networking and information systems. For example, the Native Indian Alliance Insurance Company[45] serves only

[42] National Center for American Indian Enterpricse Development, op. cit., footnote 40, p. 71.

[43] See Bunny Anquoe, "Attomeys General Attack Lottery" and "Gaming War of Words Continues on the Hill,'' *Indian Country Today,* Apr. 6, 1995.

[44] "Coeur D'Alene's Lottery Plans Attract Investment Partners," *Fort Apache Scout,* Apr. 14, 1995.

[45] Darrel A. Fitz, President, Native Indian Alliance Insurance Co., Anadarko, OK, at the National Congress of American Indians conference. Denver, CO, personal communication, Oct. 17, 1994.

BOX 3-5: UNAN and UNAT—Native American Telecommunications Entrepreneurship

Telecommunications industries that were once separate are converging as each abandons older analog technologies and adopts digital technologies For example, telephone companies are replacing analog switches with digital switches, which allow the companies to offer fast data communications and computer networking And cable TV companies now have the technology to offer new digital phone services Cellular phone, radio, and broadcast TV industries are currently developing digital technologies for the future, Within the past decade, new companies have formed to offer computer online services, electronic databases, videoconferencing, paging services, and access to computer networks such as the Internet The legislative and regulatory arenas for telecommunications Industries are likewise changing and converging. Congress is trying to create a smooth transition to a level regulatory playing field for all competitors in the digital age.

Amidst these telecommunications technology and regulatory changes, Jim Bradley (Tlingit) has founded two telecommunications companies that could serve as models for Native American telecommunications entrepreneurship.

Jim Bradley first founded United Native American Telecommunications (UNAT), which today offers long-distance, interLATA (Local Access Transfer Area), and local telephone and data communications. UNAT competes with Iong-distance providers such as AT&T and MCI, Alaska providers including Alascom (recently bought by AT&T) and GCI, and some local telephone companies (here, UNAT operates as a Competitive Access Provider). UNAT has a long-distance, common-carrier license from the Federal Communications Commission, a Washington State Public Utilities Commission Intrastate license, and an Alaska business license. Its Alaska business derives mostly from Department of Defense contracts UNAT is also providing telecommunications Internationally, for example, in Botswana. Although it is a sole proprietorship, the company policy broadly promotes native American telecommunications, it actively hires Native Americans and provides scholarships and training to students who aspire to careers in telecommunications.

Bradley's second business, United Native American Network (UNAN), is a 501 c nonprofit corporation offering videoconferencing and computer networking services to Native American educational and health organizations It IS financed with 25 percent of the profits from UNAT and has an all-Indian board of directors A new facility under construction (close to the Swinomish, Skagit, and Lummi Indian reservations in Washington State) will house six distance-learning production studios and a videoconferencing room UNAN aspires to be an Information hub and telecommunications services resource for all Native American educators and health care providers, including social services such as substance abuse prevention programs. Some specific goals include developing a computerized patient records' database and Interactive distance-learnlng programs for adult education Both UNAT and UNAN were founded and operate without federal grants or loans.

SOURCE: Office of Technology Assessment, 1995, with information from Jim Bradley, President and CEO, United native American Telecommunications, Burlington, WA, personal communications, April 1995

tribes, and underwrites auto and burial insurance o meet the regulations and cultural needs of each tribe. The company plans to use computer networking for marketing and transactional purposes, and will likely use flexible computer software configurations to tailor information systems to company specifications.

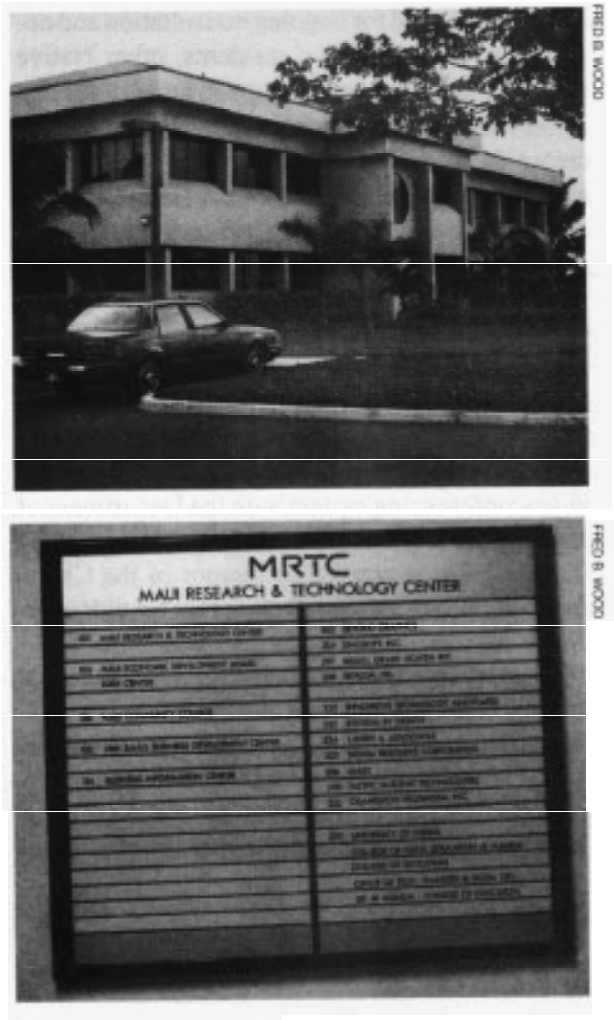
There is currently a chicken-and-egg dilemma on many reservations regarding the supply and demand of data communications. Commercial providers will not invest in infrastructure until there is demand, and demand will not develop in the absence of supply. One solution is for Native tribes/villages/communities to work closely or partner

with telecommunications companies or to form their own companies or cooperatives to develop local telecommunications infrastructure.

-GOVERNANCE

Tribal governments, including Alaska Native village governments, vary widely in form and function. Some carry out limited activities and rely heavily on state and federal governments. Others are variously responsible for: roads, water, sewer, electricity, housing, telecommunications, law enforcement, courts, emergency services, social services, education, health care, environmental protection, and economic development. Whatever the level of activity, tribal governments are engaged in maintaining govemment-to-govemment relationships with federal and state governments; working to uphold prior treaties and laws; and developing future laws and agreements. Current issues that Native American governments are pursuing at the federal and/or state levels include federal/state recognition; jurisdiction for taxation and criminal prosecution; recovery of lands taken pursuant to broken treaties; religious freedom; control over lands and resources held in trust; education, health care, and social services; the regulation of gaming; land use such as hunting, fishing, and grazing; and water rights.

Tribal governments are beginning to recognize and assume responsibility to plan for, encourage, and regulate the myriad uses of telecommunications in their communities. They are following the lead of many state and local governments that are developing telecommunications infrastructure, using or supporting new telecommunications applications for governance and commmunity-building, and regulating telecommunications. Projects include, for example, statewide high-bandwidth telecommunications infrastructure for schools, health facilities, and government offices; electronic town halls; online dissemination of regulations and codes; telecommuting centers; and police information systems.



Top: *Maui Research and Technology Center located in Kihei on Maui Island, Hawaii. Bottom: MRTC houses the Maui Supercomputing Center, various economic development and educational offices, and several small business start-up companies. MRTC is a partnership of the federal, state, and county governments and the private sector.*

■ Videoconferencing

As Native tribes, villages, and communities assume greater responsibility for their own gover-

nance,[46] the need for ongoing consultation and negotiation with their own residents, other Native groups, and federal and state government agencies is likewise growing. Videoconferencing could increase the level of communications—without incurring excessive additional cost (relative to the costs of traveling)—among various Native leaders and groups.

Videoconferencing could help Native groups participate more frequently and effectively in various federal agency proceedings, meetings, hearings, and the like. For example, the Cherokee Nation is advocating either a tribal or government-led initiative or partnership to implement a videoconferencing system with the Department of the Interior's Office of Self-Governance (OSG). The Self-Governance Coordinator of the Cherokee Nation sees a cost-effective role for videoconferencing in communicating with the OSG. "Tribes and the Office of Self-Governance need to meet at least monthly, but also as needed to solve imminent problems. A typical meeting will include about six tribal people and three government people. Videoconferencing could save significant travel time and expenses for these meetings."[47]

At a minimum, for videoconferencing to be successful: 1) Native leaders and citizens must be comfortable using the electronic medium to complement the face-to-face in-person meetings that traditionally are preferred; and 2) videoconferencing must be affordable and cost-effective.

Computer Networking

Computer networking is growing at the federal, state,[48] and local levels of government. Numerous applications seem relevant to Native governments, including electronic mail among Native leaders and with citizens; timely access to notices of federal and state agency hearings, meetings, and rulemakings relevant to Native concerns; access to a wide range of federal environmental, energy, statistical, criminal justice, and other databases[49] that bear on areas of tribal or village government; filing of federal and state taxation and financial documents (e.g., using electronic data interchange); payment/receipt of funds (e.g., using electronic funds transfer); and, most importantly, delivery of federal services via Native governments and Native service-providers (e.g., using electronic benefits transfer).

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[46]For a discussion of traditional and modern tribal governments, see Sharon O'Brien, *American Indian Tribal Governments* (Norman, OK: University of Oklahoma Press, 1989). The policy of "self-determination" was formalized and strengthened with passage of the Indian Self-Determination and Education Assistance Act, Public Law 93-638, Jan. 4, 1975, "an Act to provide maximum Indian participation in the Government and education of the Indian people; to provide for the full participation of Indian tribes in programs and services conducted by the Federal Government for Indians . . ." The Indian Self-Determination and Education Assistance Act Amendments of 1988, Public Law 100-472, amended the original act by adding a new title, as follows: "Title III—Tribal Self-Governance Demonstration Project." In the first year, 20 tribes were authorized, for not more than five years, to plan, conduct, consolidate, and administer programs, services and functions authorized under previous acts, thus exerting considerable tribal control over federal Indian programs. The Indian Self-Determination Act Amendments of 1994, Public Law 103-413, again amended the original act by adding "Title IV—Tribal Self-Governance," which made the demonstration project permanent (20 new tribes are selected each year to participate).

[47]Charles Head, Self-Governance Coordinator, Cherokee Nation, Tahlequah, OK, personal communication, May 9, 1995.

[48]For example, California now makes all state legislative information—the Constitution, bills, laws, amendments, agendas, votes, etc.—available via an FTP server (leginfo.public.ca.gov) on the Internet. "California Legislative Information Now Online Without Cost," *Boardwatch*, April/May 1994, p. 78.

[49]For example, the National Indian Policy Center (NIPC) maintains online information such as treaties on a George Washington University file server (Gopher and World Wide Web) whose Internet address is gwis.circ.gwu.edu. The successive menu choices to get to the NIPC are first, "Centers, Institutes, and Research at GWU," followed by "Centers and Institutes," and finally, "National Indian Policy Center."

Internet networking is becoming a critical component of governance and grassroots democracy.[50] Several federal Internet sites—including the Library of Congress's "Thomas"[51]system, the Government Printing Office's "GPO Access," and two sites maintained by the House of Representatives[52]—carry key federal documents such as the *Federal Register, U.S. Code*, *Code of Federal Regulations, Congressional Record*, and congressional bills. Many colleges, universities, and nonprofit organizations maintain other Internet sites with useful free information related to governance. For example, Project Vote Smart, a grassroots democracy organization with 35,000 volunteers, makes available—by Internet and dial-in electronic bulletin boards—the public statements and voting records of political candidates.[53]

Native governments vary widely in their current use of computers and computer networking. A few tribes are already operating at levels of computerization comparable to that of the most advanced state or local governments. However, many tribes and villages would require considerable improvements in technology and training—and, in many cases, a shift in perception about the role of computers—to make effective use of computer networking. The federal government, too, varies widely in its use of computers and computer networking, and in its plans to interconnect with state, local, and Native governments.[54] Many of the networking applications being explored by federal agencies are relevant to Native governments.

One use of computer networking is for grant application and monitoring, demonstrated by the National Science Foundation. Native governments frequently apply for grants from the Bureau of Indian Affairs, Indian Health Service, Administration for Native Americans, and other agencies. A second application of computer networking is in contract negotiation and administration. As Native governments and community service-providers contract for federal monies for schools, health care, social services, and self-governance, computer networking can help minimize administrative overhead and paperwork.

Ongoing federal policies of self-determination and self-governance will likely necessitate increased cooperation between Native governments and federal agencies to develop information systems that meet each partner's needs. For example, the Cherokee Nation, under a 1994 Memorandum of Understanding with the Department of the Interior's Office of Self-Governance, developed the OSG Database, a financial information and reporting system for the Tribal Self-Governance Demonstration Project.[55] Today, half of the governments participating in self-governance with the OSG have access to the system with a "1-800" telephone number. Only authorized users have access. The cost of development was $135,000, including the initial hardware and software. With

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[50]For a discussion of citizen participation in government, and computer-assisted access to government, see Jim Warren, "How Citizens Can Pursue Practical, Potent, Grassroots Political Action—Net-Based, Computer-Aided," *Boardwatch*, April/May 1994, pp. 74-78.

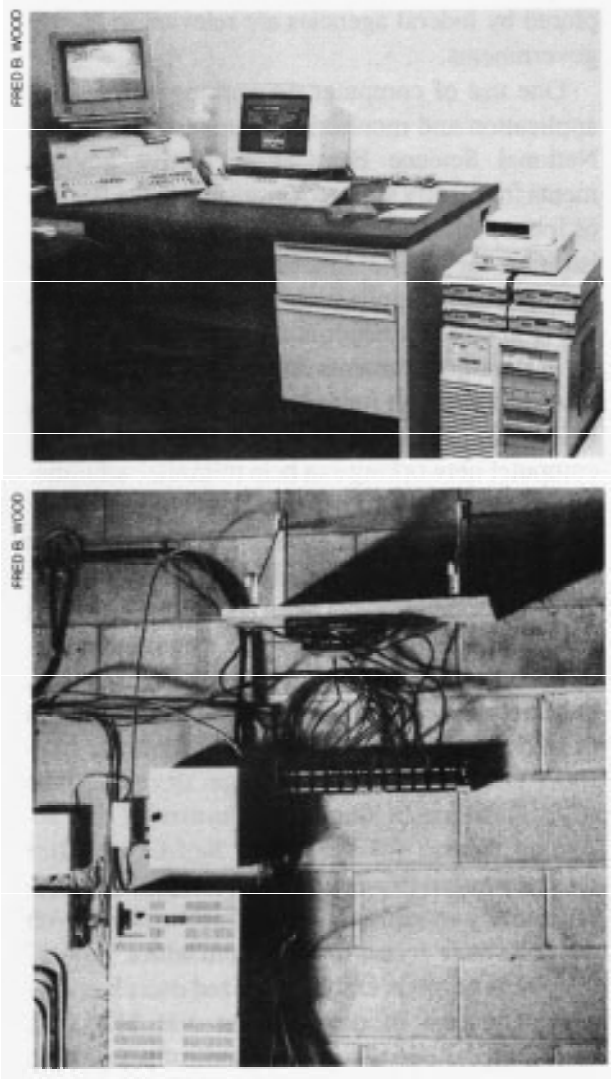
[51]The Library of Congress makes legislative information, such as the full text of all versions of congressional bills and the *Congressional Record* (searchable by keywords or bill number), available on the Internet through Thomas, a World Wide Web site at http://thomas.loc.gov/.

[52]The House of Representatives' Gopher server can be reached at gopher.house.gov; and the World Wide Web server can be reached at http://www.house.gov.

[53]The Project Vote Smart Gopher server can be reached at gopher.neu.edu under the menu title Project Vote Smart. Alternatively, one can reach the Project Vote Smart Bulletin Board Service at 503-737-3777.

[54]See OTA, *Making Government Work: Electronic Delivery of Federal Services*, op. cit., footnote 5.

[55]See footnote 46. In 1994, the Department of the Interior's Office of Self-Governance (OSG) serviced 26 tribes in the lower 48 states, and 70 tribal and village governments in Alaska. In 1996, the OSG plans to deliver $200 million in funds to 45 tribes in the lower 48 states, and 130 tribal and village governments in Alaska.



Top: Network control computers at the Oneida Nation's tribal headquatrters building in Oneida, New York. The Oneida Nation makes extensive use of computers to support tribal administration. ***Bottom:*** *A portion of the fiberoptic telecommunications network that links tribal buildings and homes of the Oneida Nation.*

this system, OSG employees can concentrate more on timely delivery of funds and financial data integrity, rather than on time-consuming paper methods of fund reporting and financial administration.[56]

The desire of many Native communities to take more responsibility for their own self-governance, and the shift of functions from the federal (and sometimes state) government to tribal/village governments, is increasing the impetus to use computers as an administrative and management tool. Moreover, Native governments, including many tribes and especially the Alaska Native regional and village corporations, carry out business and government functions that require specialized information systems. The use of computer networking and videoconferencing for expressing views and reaching consensus may be problematic for some Native groups with a tradition of face-to-face, consensual, deliberative decisionmaking.

■ Kiosks and Electronic Benefits Transfer

Kiosks and electronic benefits transfer could be used, separately or in combination, to deliver information and benefits to Native American communities.[57] This could substantially increase delivery efficiencies in rural areas. In the more remote areas, kiosks could be collocated with a community communication center at a local school, health care facility, multiservice center, or tribal/village government office. These kiosks could be designed to provide access to a wide range of information. They also could disburse specified monetary benefits for health and social services, either by placing credit on a smart card or by dispensing cash if the kiosk includes an automated teller machine.

TELECOMMUNICATIONS ACCESS FOR COMMUNITY-BUILDING

Education, health care, economic development, environmental protection, and governance will each have a range of needs for telecommunications infrastructure. Many of these community applications can benefit from videoconferencing, computer networking, multimedia, and wireless

[56] Arlene Brown, Financial Officer, Office of Self-Governance, Department of the Interior, personal communication, May 1995.

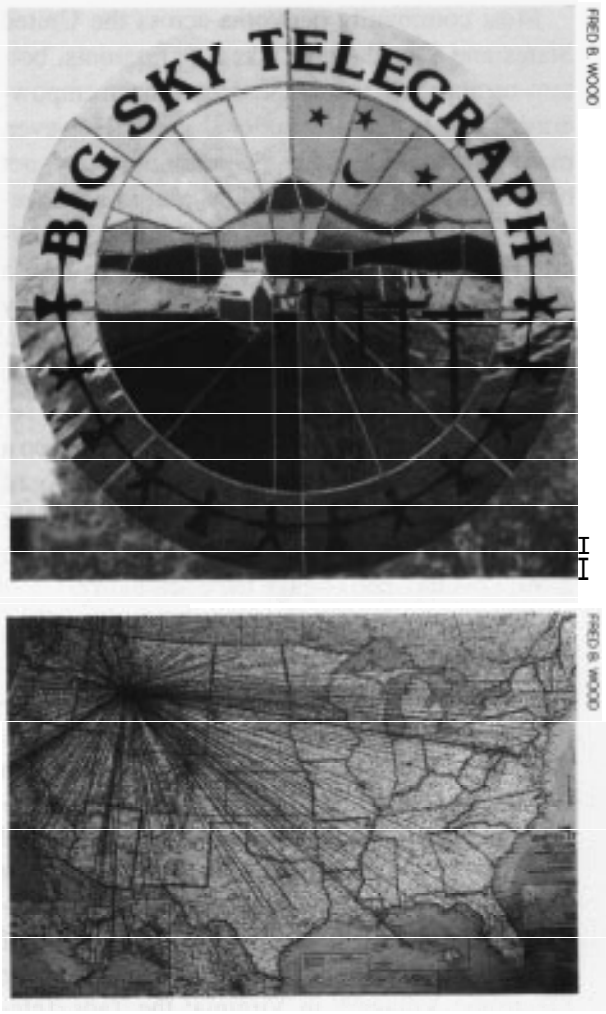
[57] See OTA, *Making Government Work: Electronic Delivery of Federal Services,* op. cit., footnote 5.

technologies. However, for community-building, the telecommunications infrastructure must be both cost-effective and accessible. In many Native communities, this will require cost-sharing partnerships combined with strategies to broaden access. Two promising possibilities for community-building are: 1) creating publicly accessible telecommunications technology centers affiliated with schools, health care centers, government offices, and the like; and 2) creating community computer networks. Community telecommunications centers and community computer networks offer new solutions to contemporary social needs. Results of pilot tests and projects to date are generally favorable, but further research and evaluation are necessary.

■ Community Telecommunications Centers

Some highly leveraged opportunities for community telecommunications centers include the AIHEC network centers at the tribal colleges and Internet accessible computer terminals at K-12 schools. Native educational institutions would need to look beyond their traditional role of serving only enrolled students and assume anew role of serving the broader Native American community. Other possibilities include providing health care facilities, libraries, or cultural centers with public information terminals ardor Internet connectivity. Radio or TV stations with digital satellite uplinks and downlinks also could serve as telecommunications centers or gateways for data and video transmissions with other networks. For example, the American Indian Radio On Satellite program might work with Native American governments to help them utilize satellite links.

Schools, hospitals, government agencies, radio stations, and other institutions in Native American communities might also consider partnering with each other or becoming champions of a community network. For example, the Sisseton-Wahpeton Sioux Tribe Telecommunications Committee is helping four entities—a tribal community college, K-12 tribal school, tribal government, and IHS local service unit-establish local area networks. Each local area network will be interconnected to form a wide area network and connect with the Internet.[58]



Top: *Big Sky Telegraph is a community-based computer network headquartered at Western Montana College in Dillon, Montana. Big Sky is dedicated to empowerment of grassroots Americans-including Native Americans-through the use of computers and telecommunications.* ***Bottom:*** *Map showing teleconnections between Big Sky Telegraph and the contiguous states, Alaska, and Hawaii.*

[58] Sisseton-Wahpeton Sioux Tribe Telecommunications Committee, "Telecommunications Project," unpublished paper, Agency Village, SD, n.d.

Most community networks across the United States and Canada have taken a grassroots, bottom-up approach that emphasizes citizen empowerment rather than institutional goals. However, many Native American communities may not have a critical mass to support a grassroots movement. As a consequence, a Native American government or other institution may have to take a lead role. A community network owned or run by one or a few organizations, rather than a community-appointed board of directors or the equivalent, would need to ensure that the network remains true to community values and needs. Even a community-based board could lose touch if board members do not have diverse backgrounds and are unwilling to continually challenge the network to grow, develop, and engage the community.

Community Computer Networks

Community computer networks, largely grassroots efforts initiated by concerned community members, caught the attention of the mainstream in 1992. At about the same time, the Internet became popular with the media and the public, and the federal government put forth the concept of an information superhighway (also known as the National Information Infrastructure).[59] Examples of community networks include the Blacksburg Electronic Village[60] in Virginia; the Taos Telecommunity in New Mexico; Big Sky Telegraph in Montana;[61] Prairienet in Illinois; and the Boulder Community Network in Colorado.[62] Networks such as Prairienet that subscribe to the National Public Telecomputing Network are trademarked Free-Nets™ and follow the model of the Cleveland Free-Net. Other community networks are variously called public access networks, community computing, electronic bulletin board services, telecommunities, or televillages. Most are accessible through both public centers and home computers, and through the Internet.

Activists and observers of community networking stress that the basic concept of community networking is an ongoing cyclical *process* whereby community needs are discovered, solutions negotiated, changes made, and results evaluated for the next round. The basic goals are grassroots empowerment; community-driven vision; developing local expertise; and providing content and services to meet local needs and constraints. The Morino Institute suggests several criteria critical to the growth of current community networks and the establishment of future community networks:[63]

- make positive social change the goal,
- understand the needs and engage the efforts of the community,
- build a strong and open technological base,
- make information available that is relevant to and in the context of the community,

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[59]See Jay Weston, "Old Freedoms and New Technologies: The Evolution of Community Networking," *Free Speech and Privacy in the Information Age Symposium*, University of Waterloo, Canada (invited paper), Nov. 26, 1994, available by e-mail from jweston@ccs.carleton.ca or through the Electronic Frontier Foundation World Wide Web site http://www.eff.org/pub/Publications/; and Doug Schuler, "Community Networks: Building a New Participatory Medium," *Communications of the ACM*, vol. 37, No. 1, January 1994.

[60]For a description, see Rajiv Chandrasekaran, "In Virginia, a Virtual Community Tries Plugging Into Itself," *The Washington Post*, Apr. 11, 1995, pp. A1, A12.

[61]See Frank Odasz, "Community Economic Development Networks: A Grassroots Leadership Challenge," *Internet Research*, vol. 4, No. 1, spring 1994.

[62]For more information via e-mail write to webmaker@bev.net for the Blacksburg Electronic Village, feedback@laplaza.taos.nm.us for the Taos Telecommunity, info@prairienet.org for Prairienet, and coordinator@bcn.boulder.co.us for the Boulder Community Network. The World Wide Web home pages for these community networks are http://www.bev.net, http://laplaza.taos.nm.us, http://www.prairienet.org, and http://bcn.boulder.co.us.

[63]The Morino Institute, "Assessment and Evolution of Community Networking," paper presented by Mario Morino at the *Apple Conference on Building Community Computing Networks*, Cupertino, CA, May 5, 1994.

BOX 3-6: Forward-Thinking Community-Building

My friend, a Seneca scholar, once remembered that many people have a mental snapshot of native people taken 300 years ago, and they want to retain that image . . Perhaps we are approaching a time when everyday Americans want to become better Indians than the Indians themselves . . . Certainly I believe that ancient tribal cultures have important lessons to teach the rest of the world about the interconnectedness of all living things and the fact that our very existence is dependent upon the natural world we are rapidly destroying Our languages are still strong, ceremonies that we have been conducting since the beginning of time are still being held, our governments are surviving, and most importantly, we continue to exist as a distinct cultural group in the midst of the most powerful country in the world, Yet, we also must recognize that we face a daunting set of problems and issues—continual threats to tribal sovereignty, low educational attainment levels, double-digit unemployment, many homes without basic amenities, and racism. To grapple with these problems in a forward-thinking, positive way, we are beginning to look more and more to our own people, communities, and history for solutions, We have begun to trust our own thinking again.

Wilma P. Mankiller, Principal Chief, Cherokee Nation

SOURCE Reprinted from native American Programs, Department of Housing and Urban Development, *Our Home: Giving Form to Traditional Values, Design Principles for Indian Housing* (Washington, DC 1994)

- ensure broad-based access,
- plan for growth, establish a sustaining economic model, prepare for competition, and
- collaborate to form a powerful community computer network movement nationally.

The lessons learned from current efforts could be valuable for Native American communities, each with its own cultural, social, economic, and political needs that could be met, in part, by creating its own community network.[64] Possible champions of Native American community networking might include Native technology activists, community leaders, Native American governments, community service providers, tribal colleges and libraries, and local businesses. Native American community networking needs to be forward-thinking and contribute to community-building, and it also must be firmly rooted in Native cultures and values (see box 3-6).[65]

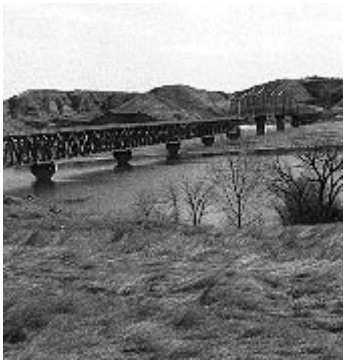
[64]For a discussion of the opportunities and challenges of telecommunications for rural communities, including some Native American communities, see OTA, *Making Government Work: Electronic Delivery of Federal Services,* op. cit., footnote *5;* and U.S. Congress, Office of Technology Assessment, *Rural America at the Crossroads: Networking for the Future,* OTA-TCT-471 (Washington, DC: U.S. Government Printing Office, April 1991).

[65]For discussion of grassroots Native computer applications, see chapter 2; Patric Hedland, "Ancient Tales Online," *Online Access, Summer* 1992, pp. 8- 11; and Cynthia Denton, "The American Indian Share-Art Gallery," *Whole Earth Review,* summer 1991, pp. 36-37.

Native American Sovereignty and Telecommunications Policy

4

Sovereignty is the ability of a group of people (e.g., a tribe, village, town, or state) to control its own affairs, culture, and communities; sovereignty is essential to self-governance. In the colonial era, what is now the United States was home to hundreds of indigenous groups with a variety of forms of self-government, organized primarily at the tribal or village level. Over the last 200 years, indigenous groups struggled to maintain their sovereignty. The established framework of federal Indian law recognizes tribal sovereignty, a federal trust responsibility for those tribal resources and powers ceded to or taken by the United States, and a commitment to tribal self-determination or self-control over programs and services vital to tribal well-being. Federal Indian policy, as reflected in presidential statements and agency directives, applies this framework to the 550 federally recognized Indian tribes—including about 220 Alaska Native tribal or village governments (Indian, Aleut, or Eskimo). Federal policy on Native Hawaiians is more ambiguous. However, the historical parallels between Native Hawaiians, American Indians, and Alaska Natives are significant and provide a basis for including Native Hawaiians within this framework.



The Federal Communications Commission (FCC) has the primary federal responsibility for regulation of telecommunications. The FCC does not have an Indian policy. So far as the Office of Technology Assessment can determine, the FCC has not applied the major principles of Indian law to federal telecommunications policy. Nor has the FCC applied federal Indian policy as enunciated by every President from Nixon through Clinton and by several federal agencies. The reality is that the current federal (and state) telecommunications policy regime has developed without

consideration of Indian law and without a tribal telecommunications policy, and therefore has effectively, if unintentionally, eroded and limited the sovereignty of tribes in this area. A basic question is the extent of tribal authority over telecommunications on tribal lands (e.g., physical infrastructure) and in the air over tribal lands (e.g., frequency spectrum). Principles of Indian law and policy can be applied to telecommunications. However, "[f]ederal telecommunications policy and regulation have developed continuously since 1934. Indian telecommunications policy cannot be written overnight; it must evolve."[1]

HISTORICAL CONTEXT: AMERICAN INDIANS AND ALASKA NATIVES

A fundamental issue is the sovereignty of Native Americans over their own affairs, cultures, livelihoods, lifestyles, and destinies. When Europeans first discovered and settled in North America, what is now the 48 contiguous states was the home of hundreds of indigenous Indian tribes—each with its own form of self-governance and with control over hunting, fishing, water, land, and other resources vital to survival. Likewise, when the Russians, Europeans, and Euro-Americans explored subarctic and arctic North America, what is now Alaska was the home of many indigenous Native (Aleut, Eskimo, and Indian) tribes. Similarly, when European explorers first discovered and settled in Hawaii, these islands were populated by indigenous peoples with their own form of self-governance.

The history of the United States is, in part, a struggle of indigenous peoples and governments trying to maintain their sovereignty in the face of population pressures and expanding national and state governments. The experience of American Indians, Alaska Natives, and Native Hawaiians is similar in that all had preexisting forms of government, typically at the tribal or village level; and all had significant control over their own land, resources, and cultural practices. Their experience varied, however, as the United States expanded westward and southward.

The most immediate conflict was with Indian tribes in the contiguous 48 states. Initially, the United States treated the tribes as independent sovereign entities, under United States protectorate, but having the full rights and powers of separate nations. U.S.-Indian treaties of this era largely stipulated terms and conditions of trade, commerce, travel, and military alliance, as would be typical of relationships between sovereign nations. In the early 1800s, however, U.S. policy changed, formalized in the Indian Removal Act of 1830, to one of removing eastern Indians to areas generally west of the Mississippi River in order to accommodate the westward movement of settlers from the east coast. Tribes were treated as so-called domestic dependent nations, and the United States assumed a trust relationship with Indians in exchange for Indian land. Treaties of this period generally provided monetary and other compensation to Indians and guarantees against the taking of remaining Indian lands. In the mid to late 1800s, U.S. policy shifted again under pressure from settlers, immigrants, and fortune seekers moving into the Great Plains, Rocky Mountains, Pacific Northwest, and California. During this time, the United States moved many Indians onto reservations, and forced or coerced tribes to agree to reservation treaties in return for health, education, and financial support. From the late 1870s to early 1930s, U.S. policy encouraged assimilation of Indians into the majority society.[2]

The Indian Reorganization Act of 1934 marked the next change in U.S. policy, which once again emphasized Indian self-government and a renewed attention to the U.S. trust relationship with Indians and treatment of tribes as quasi-sovereign entities. This policy lasted until the early 1950s,

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[1]James A. Casey, Esq., Fletcher, Heald & Hildreth, Rosslyn, Virginia, personal communication, Apr. 27, 1995.

[2]See, e.g., Alice B. Kehoe, *North American Indians: A Comprehensive Account* (Englewood Cliffs, NJ: Prentice Hall, 1992); and Vine DeLoria, Jr., *American Indian Policy in the Twentieth Century* (Norman, OK: University of Oklahoma Press, 1985).

when efforts were made to terminate tribes and U.S.-tribal relationships and encourage Indians to relocate to urban areas.[3]

The modem era of U.S. policy began in the mid- 1960s with renewed emphasis on Indian and tribal self-determination and on government-to-government relationships between tribes and the United States, and reaffirmation of the U.S. trust responsibilities. Key milestones in modem U.S. Indian policy include the Indian Civil Rights Act of 1968, Indian Self-Determination and Education Act of 1975, Indian Child Welfare Act of 1978, and Indian Religious Freedom Act of 1978.[4] These acts, collectively, were intended to help restore Indian rights as indigenous peoples, including the right to establish and maintain their own forms of self-government.

From 1776 through 1870, the United States negotiated, and the U.S. Senate ratified, 370 treaties with Indian tribes.[5] The federal government currently recognizes about 330 tribes; state governments recognize about another 60; and perhaps 100 tribes are petitioning for federal recognition.[6] Recognition brings with it acknowledgment of a formal government-to-government relationship, eligibility for various federal services, and opportunity to establish a trust for land and resources. Tribes vary widely in their populations, geographic size, cultural traditions, economic and natural resources, definition and conditions of membership, and form of government. Most tribes have several hundred to a few thousand members; only a few have more than 10,000 members (e.g., the Navajo Nation, Oglala Sioux, and San Carlos Apache).[7]

The federal government also recognizes 220 Native villages in Alaska. The Alaska Native history differs from the American Indians in that most Alaskan indigenous peoples did not sign treaties with the United States, and many have remained on their traditional lands until the present time. The large, remote expanses of Alaskan wilderness helped to buffer pressures from settlers. The interests or conditions of Alaska Natives



Top: Standard government-issue sign at the western boundary of the Turtle Mountain Indian Reservation, state highway 5, North Dakota Bottom: On the other side of the highway, a *welcome sign designed and built by the Turtle Mountain Band of Chippewa Indians*

[3] Ibid.

[4] Ibid.

[5] Jack Utter, *American Indians: Answers to Today's Questions* (Lake Ann, MI: National Woodlands Publishing Co. 1993), esp. pp. 49-50.

[6] Arlene Hirschfelder and Martha Kreip de Montano, *The Native American Almanac: A Portrait of Native America Today* (New York, NY: Prentice Hall, 1993), see esp. pp. 237-272, appendix I, "Native American Tribes by State."

[7] Veronica E. Tiller (cd.), *Discover Indian Reservations USA* (Denver, CO: Council of Energy Resource Tribes, 1992).



Top: *The "Eskimo Building" houses Alaska* **Native** *companies and the u.S. Postal Service office in Kotzebue, Alaska. Note the mailbox at the right. Bottom: Communication lifelines for remote Eskimo villages include the U.S. Postal Service via airplane and telecommunications via satellite.*

received little attention for over a century, from the time of Russian explorations, to the 1867 sale of Alaska to the United States and the establishment of the Territory of Alaska in 1912, to Alaska statehood in 1958. The formal recognition of Alaska Native villages as governing entities resulted from pressures to: 1) establish Native territories within State of Alaska public lands, 2) resolve disputes over land-title claims that were blocking oil-field development, and 3) respond to a nascent Native rights movement represented by the Alaska Federation of Natives. The Federation played a key role in negotiations leading to enactment of the Alaska Native Claims Settlement Act of 1971. The act settled land claims in return for monetary compensation and the establishment of 12 regional Native corporations and about 200 individual Native village governments.[8]

The current Native corporation and village structure includes:[9]

- Ahtna, Inc. (with two Athabascan Native villages);
- Aleut Corp. (with 13 Aleut Native villages);
- Annette Island Reserve (including the Tsimshian Tribe and Metlakatla Indian Community Council);
- Arctic Slope Regional Corp. (with five Eskimo Native villages);
- Bering Straits Native Corp. (with 16 Eskimo villages);
- Bristol Bay Native Corp. (with 24 Eskimo and Aleut villages);
- Calista Corp. (44 Eskimo and Athabascan villages);
- Chugach Natives, Inc. (four Aleut and Athabascan villages);
- Cook Inlet Region, Inc. (three Athabascan villages);
- Doyon, Ltd. (32 Athabascan and Eskimo villages);
- Koniag, Inc. (seven Aleut villages);
- NANA Regional Corp. (10 Eskimo villages); and
- Sealaska Corp. (11 Tlingit and Haida villages).

Alaska villages always have been and continue to be very small—a few hundred to a few thousand persons. The majority of the approximately 80,000 Alaska Natives (Eskimos, Aleuts, and Indians) live in these rural villages. In contrast, about 35 percent of the roughly 1.9 million Indians in the contiguous 48 states live on Native land (reservations, rancherias, and pueblos); about 15 percent live in rural areas near Native

[8]Kehoe, *North American Indians,* op. cit., footnote 2, esp. ch. 9, pp. 480-563, "The Arctic and Subarctic."

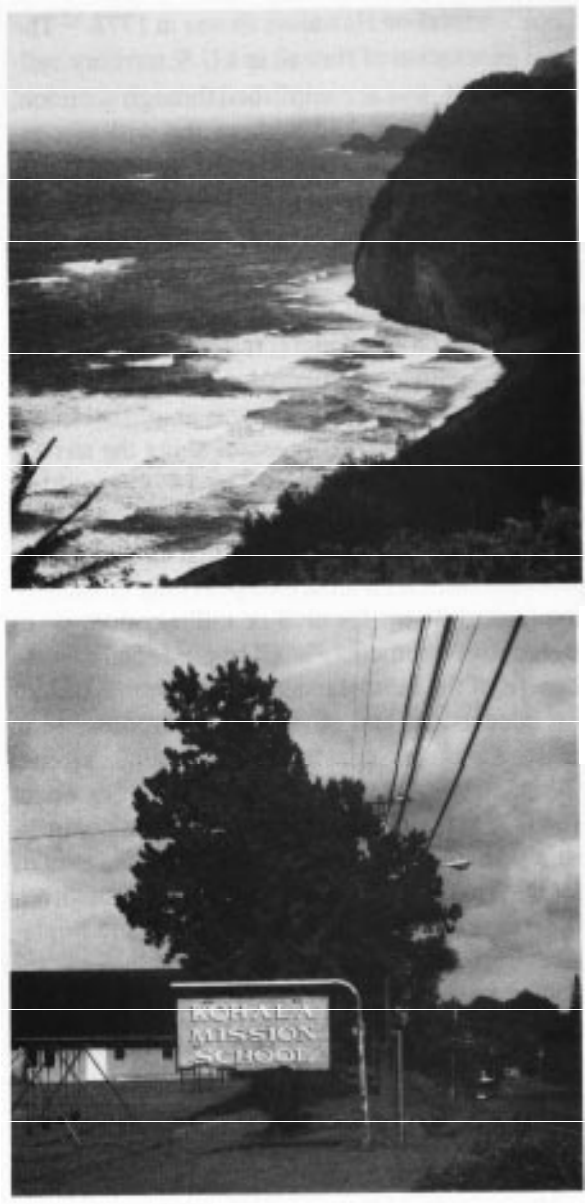
[9]Hirschfelder and Kreipe de Montano, op. cit., footnote 6, pp. 238-240.

land; and the remaining 50 percent live in metropolitian areas.[10] The vast majority of 225,000 Native Hawaiians [11] do not live in separately identified Native communities; only a few thousand live on Native lands, although many more live in small, rural towns on the various Hawaiian Islands.

HISTORICAL CONTEXT: NATIVE HAWAIIANS

Unlike tribal reservations and Alaska Native villages, Native Hawaiians do not have tribal lands or tribal governments. Those with 50 percent or more Hawaiian blood can apply to live on Hawaiian homelands. Native Hawaiians live throughout the Hawaiian Islands. Those Hawaiian communities with significant Native populations are not recognized or organized as self-governing Native communities per se, and do not have a status equivalent to Indian reservations or Alaska Native villages. Most Native Hawaiians live in cities and towns organized under Hawaii's state and county governments. Also, Native Hawaiian groups, unlike many Indian tribes, do not have treaty relationships with the United States that underpin the formalized federal trust responsibility for Indians. And federal Indian policy, as enunciated by Presidents Nixon through Clinton and by several federal agencies, does not explicitly include Native Hawaiians. These policies are largely framed in terms of federally recognized tribes (including Alaska Native tribes and villages) .12

A deeper analysis indicates, however, that the many parallels between Native Hawaiian and American Indian history provide a basis for defining a form of federal trust responsibility for Native Hawaiians as well. Historical accounts document the exploitation and manipulation of Native Hawaiians by European and American business and military interests since the time of Captain James



Top: *Pololu Valley and Kohala Mountains meet the sea on the Big Island,* Hawaii, *typical of scenic, remote areas of the Hawaiian Islands.* ***Bottom:*** *The Kohala Mission School, like most small rural schools in Hawaii, is located on a coastal road along which run telephone, cable 71/ and electrical power lines—thus opening up at least the Possibility of enhanced educational telecommunications applications.*

[10] U.S. Bureau of the Census, 1990, cited in ibid., pp. 36-43.

[11] Defined as any individual who is a descendent of indigenous peoples who, prior to 1778, lived in the area that is now the State of Hawaii.

[12] Ibid.

Cook's arrival on Hawaiian shores in 1778.[13] The 1893 annexation of Hawaii as a U.S. territory, ratified in 1898, was accomplished through coercion, misrepresentation, and without the willing consent of Native Hawaiians.[14] U.S. President Grover Cleveland concluded that there was U.S. complicity in the illegal overthrow of the Native Hawaiian government, but he was unable to change the course of events.[15]

Recognition of a federal responsibility for Native Hawaiians was reflected in the congressional joint resolution of 1898 and was amplified in the 1900 legislation formally establishing the territorial government of Hawaii. The 1898 resolution ceded absolute title for Hawaiian public lands to the United States, but provided that all revenue or proceeds from such land, except as may be used by the United States for civil or military purpose or by local governments, "shall be used solely for the benefit of the inhabitants of the Hawaiian Islands for educational and other public purposes."[16] In 1921, Congress enacted the Hawaiian Homes Commission Act. This act authorized that about 188,000 acres of public land under the commission's jurisdiction be leased to Native Hawaiians for 99 years at a nominal fee. Native Hawaiian advocates are critical of both the intent and implementation of this act, which, nonetheless, reflected some measure of congressional concern and responsibility for the deteriorating socioeconomic conditions of Native Hawaiians.[17]

The federal interest in and responsibility for Native Hawaiians was further reinforced in 1959 when Hawaii was admitted as a state, under the Admissions Act. This act returned most ceded lands to the state, but requires the state to hold all ceded lands:[18]

1. as a public trust for the support of public schools and other public educational institutions,
2. for the betterment of the conditions of Native Hawaiians,
3. for the development of farm and home ownership on as widespread a basis as possible,
4. for the making of public improvements, and
5. for the provision of lands for public use.

Most importantly, the act states that use of these lands—and proceeds and income therefrom—shall be only for the five purposes, "and their use for any other object shall constitute a breach of trust for which suit may be brought by the United States."[19] A 1978 Hawaiian constitutional convention amended the state constitution to establish a State Office of Hawaiian Affairs to administer public land trust funds for the betterment of Native Hawaiians and carry out various other functions on behalf of all Hawaiians.[20]

Since statehood, Congress has enacted or amended several statutes that establish a federal responsibility for various social, health, educational, and training programs serving Native Ha-

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[13]See, e.g., Michael Dougherty, *To Steal a Kingdom: Probing Hawaiian History* (Waimanalo, HI: Island Style Press, 1992); and Richard A. Wisniewski, *The Rise and Fall of the Hawaiian Kingdom* (Honolulu, HI: Pacific Basin Enterprises, 1979).

[14]Ibid.; and Joyce Ahuna-Kaaiai (ed.), *He Alo A He Alo—Face To Face: Hawaiian Voices on Sovereignty* (Honolulu, HI: American Friends Service Committee, 1993).

[15]Michael Kioni Dudley and Keoni Kealoha Agard, *A Hawaiian Nation II: A Call for Hawaiian Sovereignty* (Honolulu, HI: Na Kane O Ka Malo Press, 1990).

[16]Melody Kapilialoha MacKenzie (ed.), *Native Hawaiian Rights Handbook* (Honolulu, HI: Native Hawaiian Legal Corp., 1991), p. 15.

[17]Ibid.

[18]Admissions Act of Mar. 18, 1959, Public Law 86-3.

[19]Ibid.

[20]Hawaii State Constitution, Article XII, Sections 4-6. Also see MacKenzie, op. cit., footnote 16, pp. 19-20. Note that for purposes of the Native Hawaiian Homes Act and the Admissions Act, and therefore the Hawaiian Constitution, *Native Hawaiian* is defined as someone with 50 percent or more Hawaiian blood. Hawaiian is defined as someone with any quantum of Hawaiian blood.

waiians. In some cases, Congress has granted broad authority to departmental heads to provide funding to Native Hawaiians or organizations directly representing Native Hawaiians; in other instances, Congress has specified a funding amount or stipulated a percentage budget set-aside for Native Hawaiians.[21] In enacting the Native Hawaiian Health Care Act of 1988, for example, Congress established a clear federal role and responsibility for helping improve the overall health conditions of Native Hawaiians, and a commitment to the heavy involvement of Native Hawaiians in developing their own health care plan and a network of community health clinics.[22] In 1993, Congress enacted a joint resolution that apologized to Native Hawaiians for the U.S. role in the illegal 1883 overthrow of the Kingdom of Hawaii.[23]

In sum, there are significant historical and policy parallels between Native Hawaiians and American Indians and Alaska Natives.[24] The federal responsibility for the overall well-being and economic livelihood of Native Hawaiians could be reasonably construed to extend to the realm of telecommunications—as a key part of the infrastructure needed to deliver health and educational services to Native Americans and provide them with training and career opportunities.[25] The exercise of a federal responsibility for Native Hawaiian telecommunications would differ because there are, at present, no formally recognized or constituted Native Hawaiian governments similar to Indian tribes and Alaska Native villages. This might change in the future, however, as the Native Hawaiian sovereignty movement matures.[26] Native Hawaiian activists are asserting Native rights in such areas as land, water, fishing, trail and shoreline access, adoption, and religion.[27]

Native Hawaiian organizations and advocacy groups are increasingly aware that telecommunications and computer technologies offer significant leverage for improving the well-being and independence of Native Hawaiians—whether within the current state and county forms of government or some alternative. The State of Hawaii provides a variety of telecommunications services to all Hawaiians, including Native Hawaiians. Examples of these services include: 1) Hawaii Interactive Television System (HITS), a two-way videoconferencing and distance-learning network connecting the University of Hawaii campuses at Manoa and Hilo, three community colleges (Maui, Kauai, and Kapiolani), and the public television station KHET; 2) Hawaii Wide Area Integrated Information Access Network (HAWAIIAN), a digital microwave system that can carry data, voice, radio, and compressed digital video signals between various educational and government locations on the islands of Kauai, Oahu, Lanai, Maui, and the Big Island; and 3) Hawaii FYI, a videotext service that provides access to educational and government information, operated by the Hawaiian Information Network Corporation (Hawaii Inc.)—a public corporation es-

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[21]MacKenzie, op. cit., footnote 16, pp. 294-303.

[22]Public Law 100-690.

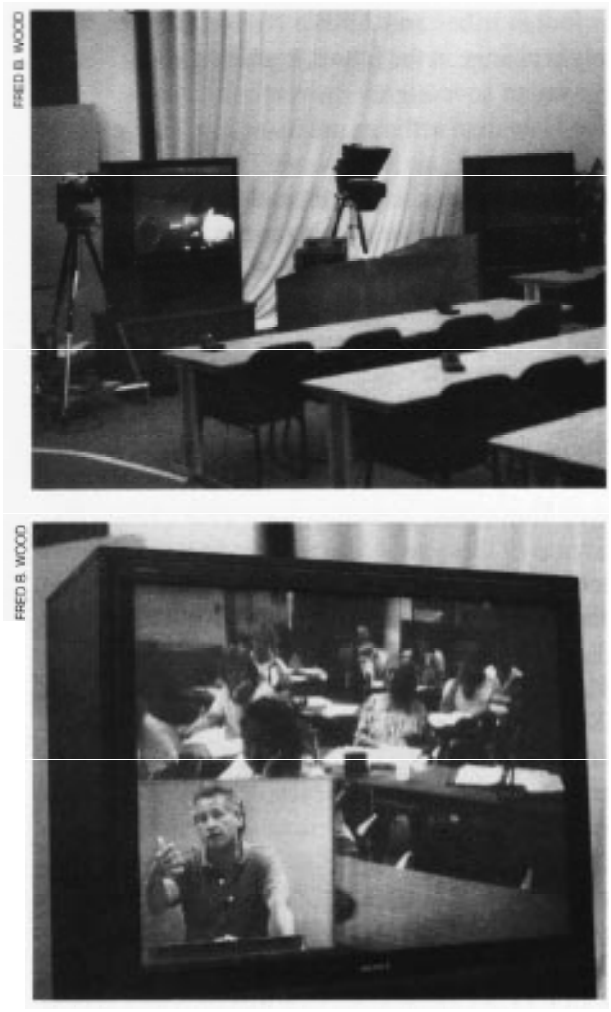
[23]S.J. Res. 19, a joint resolution to acknowledge the 100th anniversary of the Jan. 17, 1893, overthrow of the Kingdom of Hawaii and to offer an apology to Native Hawaiians on behalf of the United States for the overthrow of the Kingdom of Hawaii, 103d Congress, 1st session, enacted as Public Law 103-150, Nov. 23, 1993, and accompanying report, U.S. Congress, Senate, Committee on Indian Affairs, Senate Rep. 103-126, Aug. 6, 1993; reprinted in Richard J. Scudder (ed.), *The Apology to Native Hawaiians* (Kapolei, HI: Ka'imi Pono Press, 1994).

[24]Also see, e.g., Linda S. Parker, *Native American Estate: The Struggle Over Indian and Hawaiian Lands* (Honolulu, HI: University of Hawaii Press, 1989).

[25]The definition of *Native Hawaiian* for determining program eligibility is complicated because of the integration of Native Hawaiians into the general population and differing views on blood quantum or other standards that should apply.

[26]See Dudley and Agard, op. cit., footnote 15.

[27]See MacKenzie, op. cit., footnote 16.



***Top: University of Hawaii** at Hilo videoconferencing room-a standard set-up for the Hawaii Interactive Television System, a distance learning network connecting the University of Hawaii campuses and communitty colleges. **Bottom:** Split screen capability allows videoconferencing participants to view the instructor and students at one or more island locations.*

tablished to develop the Hawaiian information industry.[28] Notwithstanding these noteworthy programs, grassroots Native Hawaiian groups are concerned that "Native Hawaiian peoples are in danger of being left behind in the telecommunications age."[29]

INDIAN LAW AND TELECOMMUNICATIONS [30]

Central principles of federal Indian law and policy (as evidenced by statutes, treaties, executive policy, and judicial opinions) include the federal trust responsibility, tribal sovereignty, and tribal self-determination. [31]

These principles evolved over centuries, and have been clarified and strengthened in recent decades in ways that Indians hope will preclude a return to earlier federal policies that at times supported the: 1) removal of Indians from tribal lands through treaties that were broken or unilaterally abrogated by the United States; 2) outright taking of Indian lands through fraud, deceit, and military force; 3) assimilation of Indians into mainstream American life by changing or suppressing Native customs, dress, language, religion, and culture; 4) forced removal of Indian children from their tribal communities to remote boarding schools; and 5) termination of the federally recognized status of tribes as a way to reduce federal responsibility, move land out of trust status, further integrate Indians into American society, and relocate Indians from reservations to major cities and metropolitan areas.[32]

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[28] David Lassner, University of Hawaii at Manoa, "Educational Telecommunications in Hawaii," memo dated April 1994.

[29] Jim Hunt, Honokaa High School, Honokaa, HI, "Native Hawaiian Telecommunications Network," n.d.

[30] This section is based on research and analysis conducted for OTA by Karen Funk and Sandra Ferguson, Esq., Hobbs, Straus, Dean & Walker, Washington, DC.

[31] See, e.g., Francis Paul Prucha (ed.), *Documents of United States Indian Policy (* Lincoln, NE: University of Nebraska Press, 1990): DeLona, op. cit., footnote 2; Fremont J. Lyden and Lyman H. Legters (eds.), *Native Americans and Public Policy* (Pittsburgh, PA: University of Pittsburgh press, 1992); Stephen Comely, *The Return of the Native: American Indian Political Resurgence* (New York, NY: Oxford University Press, 1988); Hirschfelder and Kreipe de Montano, op. cit., footnote 6.

[32] See Utter, American Indians, op. cit., footnote 5, esp. pp. 241-262, "A Summary History of United States Indian Policy"; and generally Kehoe, *North American Indians,* op. cit., footnote 2; Donald L. Parman, *Indians and the American West in the Twentieth Century* (Bloomington, IN: Indiana University Press, 1994); and Carl Waldman, *Atlas of the North American Indian* (New York, NY: Facts on File, 1985).

The essence of the federal trust responsibility is to ensure the survival of Indian communities. Under the trust responsibility, Indians possess rights as a group, in addition to rights as individuals. The unique status of Indian tribes is based on the historical relationship between tribes and the federal government.[33] The federal trust responsibility includes serving as trustee of tribal lands and natural and financial resources, and providing services necessary to the health and welfare of Indian tribes.[34]

A continuing challenge is updating the scope and definition of the trust responsibility to reflect modem life. In original treaties, for example, the federal government often promised to provide teachers, doctors, and annuities (in the form of food and supplies) to tribes in return for cession of tribal lands.[35] If the trust responsibility is to have meaning, it must keep pace with changing social and economic realities. This adjustment has been made in areas such as health, education, and land and resource management as tribes and the relevant federal agencies have gained experience as partners in the government-to-government relatiship.[36] Including telecommunications within the trust responsibility would seem a logical next step because ensuring adequate telecommunications services and infrastructure is important to the well-being and survival of tribes.

Tribal sovereignty is, likewise, along-standing principle of Indian law. The concept of tribal sovereignty dates back to legal precedents established by the European colonists in their relations with tribes. European nations entered into at least



Top: *The Hawaii Information Network Corporation operates Hawaii FYI, a computer service that provides public access to educational and government information.* ***Bottom:*** *In partnership with the Polynesian* **Voyaging Society** *and others, Hawaii FYI provided reformation on the voyage of the seagoing canoe Hokulea and background materials on voyaging traditions, canoe-building, navigation, and the like.*

[33] Morton v. Mancari, 417 U.S. 535 (1974). See generally Sharon O'Brien, *American Indian Tribal Governments* (Norman, OK: University of Oklahoma Press, 1989).

[34] See Frank Pommersheim, "Tribal-State Relations: Hope for the Future," *South Dakota Law Review,* Vol.. 36, 1991, pp. 239,245.

[35] Ibid.

[36] See generally Dean B. Suagee, "Self~determination for Indigenous Peoples at the Dawn of the Solar Age," *University of Michigan Journal of Law,* vol. 25, 1992, pp. 701-712.

175 treaties with Indian tribes before 1776, and, as noted earlier, the U.S. government negotiated and ratified 370 Indian treaties. The U.S. Constitution placed Indian tribes on a par with foreign nations in granting Congress the power to regulate commerce.[37]

The basic governmental power of tribes is not delegated by Congress; rather it is inherent and can only be abrogated if Congress expresses a clear intent to do so. Tribes possess "inherent powers of limited sovereignty which ha[ve] never been extinguished."[38] Indian tribes are distinct from both states and foreign nations. An early seminal Supreme Court case described tribes as "domestic dependent sovereigns."[39] While this terminology is still used,[40] "limited sovereignty" more accurately describes the governmental authority of tribes.

Within their reservations, tribes generally retain all powers other than those given up in treaties, taken away by an act of Congress, or taken away through implied divestiture.[41] Tribes have the authority to govern their own internal affairs and to exercise civil regulatory jurisdiction within reservation boundaries. In sum, tribes have jurisdiction over a wide range of activities on Indian lands, although the federal government frequently has concurrent jurisdiction. Thus, it would appear that tribes could legally assert authority over telecommunications on Indian lands.

Self-determination is an inherent part of sovereignty, and has become a cornerstone of federal Indian policy reflected in statutes and presidential statements. Congress has enacted legislation to assist the tribes in their efforts to achieve economic and governmental self-determination. The Indian Reorganization Act of 1934 was intended to strengthen tribal governments. And the Indian Self-Determination and Education Assistance Act of 1975, as amended, provided tribes with the right to take over programs administered by the Bureau of Indian Affairs (BIA) and Indian Health Service (IHS) by entering into self-determination contracts or self-governance compacts.[42] The Self-Determination Act applies not only to federally recognized tribes in the contiguous 48 states, but to Alaska Native villages (Indian, Eskimo, and Aleut) or regional or village corporations defined in or established under the Alaska Native Claims Settlement Act of 1971.[43] There are currently 330 federally recognized tribes in the contiguous 48 states and 220 federally recognized Native villages in Alaska (including both villages and regional organizations).[44]

Telecommunications is not a primary or major function of the BIA and IHS. As these agencies

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[37]U.S. Constitution, Article I, section 8, Sept. 17, 1787.

[38]See David H. Getches, Charles F. Wilkinson, and R. Williams, *Federal Indian Law*, 3rd Ed. (St. Paul, MN: West Publishing, 1993). Also see *United States* v. *Wheeler*, 435 U.S. 313, 322-323 (1978).

[39]See Pommershein, op. cit., footnote 34, p. 244 (citing *Cherokee Nation* v. *Georgia*, 30 U.S. (5 Pet.) 1, 17 (1931)).

[40]*Oklahoma Tax Commission* v. *Citizen Band Potawatami Indian Tribe*, 11 S.Ct. 905, 909 (1991).

[41]*Oliphant* v. *Suquamish Indian Tribe*, 435 U.S. 191, 201-11 (1978). According to the Court in *Oliphant*, tribes had been implicitly divested of their inherent sovereignty to exercise criminal jurisdiction over non-Indians.

[42]25 U.S.C. Subsec. 13a, 450-450n, 455-458e; 42 U.S.C. Sec. 2004b (1988).

[43]Alaska Native Claims Settlement Act of 1971, U.S. Stat. 85:688 et seq. The act was intended to resolve long-standing land claims by Native groups. The act allowed Native Americans to retain ownership of about 44 million acres of land, and compensated them for lands previously taken or given up under terms of the act. Federal and state buyout funds were used to capitalize Native regional and village corporations.

[44]The U.S. Department of the Interior's list of federally recognized tribes includes 220 tribes in Alaska. For Alaska, use of the term *tribe* is somewhat misleading because of the inclusion of Alaska Native villages and regional organizations recognized as governing bodies, as well as American Indian tribes indigenous to Alaska. On occasion, the OTA has used the term *village* because the vast majority of federally recognized tribes in Alaska are actually Alaska Native villages. By the 1930s, the legal status of Alaska Natives had been generally equated to that of American Indians. See Felix S. Cohen, U.S. Department of the Interior, *Handbook of Federal Indian Law* (Washington, DC: U.S. Government Printing Office, 1941, reprinted by William S. Hein Co., 1988), esp. pp. 404-406.





Top: *The Confederated Salish and Kootenai Tribes maintain a modern tribal headquarters complex on the Flathead Indian Reservation in Pablo, Montana.* ***Bottom:*** *Salish-Kootenai Tribal College building in the foreground; Mission Mountains in the background. The college brings computers and telecommunications to students from this scenic reservation located in northwestern Montana.*

get more involved in distance learning, telemedicine, geographic information systems, and other telecommunications-related activities, however, tribes could seek self-determination in this area as well. The principle of tribal self-determination also could be extended to other federal agencies that have major telecommunications responsibilities.

In sum, telecommunications could be included within the basic framework of federal trust responsibility, tribal sovereignty, and tribal self-determination. The historical context and evolution of federal Indian law and policy provide a strong conceptual basis for doing so.

FEDERAL INDIAN POLICY POTENTIALLY APPLICABLE TO TELECOMMUNICATIONS*

There are no current presidential or agencywide policies that specifically address Indian telecommunications. However, presidential and agency policies do provide a framework that could be applied. Presidential policy applies to all federally recognized tribes and Alaska Native villages; some agency policies extend to Native Hawaiian groups and state-recognized tribes as well.

■ Presidential Policies

On July 8, 1970, President Nixon issued a policy that reaffirmed the unique status of Indian tribes and the tribal-federal relationship based on "solemn obligations entered into by the United States Government." President Nixon stated that:[46]

> We must assure the Indian that he can assume control of his life without being separated involuntarily from the tribal group. And we must make it clear that Indians can become independent of federal control without being cut off from federal concern and support.

[45] This section is based on research analysis prepared for OTA by Karen Funk and Sandra Ferguson, Esq., Hobbs, Straus, Dean & Walker, Washington, DC.

[46] President Richard Nixon, Statement to the Congress of the United States, The White House, July 9, 1970.

President Nixon proposed legislation to allow tribes to contract with federal agencies to administer programs, and to provide federal funding for Indian educational programs directly to tribes to administer. These initiatives resulted in the landmark Indian Self-Determination and Education Assistance Act of 1975 noted earlier.

In 1983, President Reagan issued his Indian policy statement, which declared:[47]

> Our policy is to reaffirm dealing with Indian tribes on a government-to-government basis and to pursue the policy of self-government for Indian tribes without threatening termination. In support of our policy, we shall continue to fulfill the federal trust responsibility for the physical and financial resources we hold in trust for the tribes and their members.

In 1991, President Bush reaffirmed the Reagan policy as the cornerstone of the Bush position on Indian affairs, and stated that:[48]

> This government-to-government relationship is the result of sovereign and independent tribal governments being incorporated into the fabric of our Nation, of Indian tribes becoming what our courts have come to refer as quasi-sovereign domestic dependent nations. Over the years this relationship has flourished, grown, and evolved into a vibrant partnership in which 500 tribal governments stand shoulder to shoulder with other governmental units that form our Republic.

In 1994, President Clinton articulated his Indian policy in a meeting with tribal leaders:[49]

> Today I re-affirm our commitment to self-determination for tribal governments. Today I pledge to fulfill the trust obligations of the federal government. Today I vote to honor and respect tribal sovereignty based upon our unique historical relationship.

President Clinton also issued a memorandum to the heads of all executive departments and agencies directing them to: 1) ensure that each department or agency is operating in a manner consistent with government-to-government relationships with tribes, 2) consult with tribal governments before taking action that will affect Indian tribes, 3) evaluate departmental or agency programs regarding impact on tribes, and 4) remove any procedural impediments to working directly and effectively with tribes on matters that affect trust property or tribal government rights.[50]

Some federal departments and agencies have issued Indian policy statements, but not those agencies or agency units that have primary responsibility for telecommunications. Presidential policy is, prima facie, applicable.

Federal Agency Policies

Several federal agencies have issued formal Indian policy statements that could serve as examples for agencies with major telecommunications responsibilities. Agency policy statements uniformly recognize the unique status of tribal governments and support tribal self-determination.

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[47]President Ronald Reagan, Statement by the President on Indian Policy, The White House, Jan. 24, 1983.

[48]President George Bush, Indian Policy Statement, The White House, June 14, 1991.

[49]President Bill Clinton, Indian Policy Statement, The White House, Apr. 29, 1994.

[50]President Bill Clinton, "Government-to-Government Relations with Native American Tribal Governments," Memorandum of Apr. 29, 1994, *Federal Register*, vol. 59, No. 85, May 4, 1994, pp. 22951-22952.

The Departments of the Interior, Energy, Agriculture, Commerce, and Justice, as well as the Environmental Protection Agency (EPA), have comprehensive formal policies on agency-tribal relationships.[51] Some other agencies have subject-specific policies, for example, the National Park Service's policy to protect and preserve culturally-sensitive or sacred sites on Indian lands.[52]

EPA's policy is illustrative of a comprehensive approach that could be applied to telecommunications. EPA issued its first guidance on Indian policy in 1984.[53] The initial policy recognized tribal governments as sovereign entities with primary responsibility for setting and enforcing environmental standards on Indian reservations, and the need for EPA to support tribal efforts to develop their own environmental regulatory programs.[54] The policy also acknowledged federal responsibility for environmental enforcement on Indian lands in the absence of tribal programs. EPA further refined and enhanced its Indian policy in 1991 and 1994.[55]

The thrust of EPA's policy is to strengthen the ability of tribal governments to develop and administer environmental programs themselves and to work as partners, to the extent necessary, with state and federal environmental regulatory agencies. This approach would seem directly applicable to telecommunications.

Key elements of EPA's approach to tribal relationships include:

1. *Issuance of a clear policy that explicitly recognizes tribal sovereignty and commits the agency to further the ability of tribal governments to exercise self-determination.*
2. *Agency advocacy for legislative and regulatory changes that support the Indian policy.*

After the 1984 EPA policy was issued, and with EPA's and tribal support, Congress enacted amendments to treat tribes as states for certain

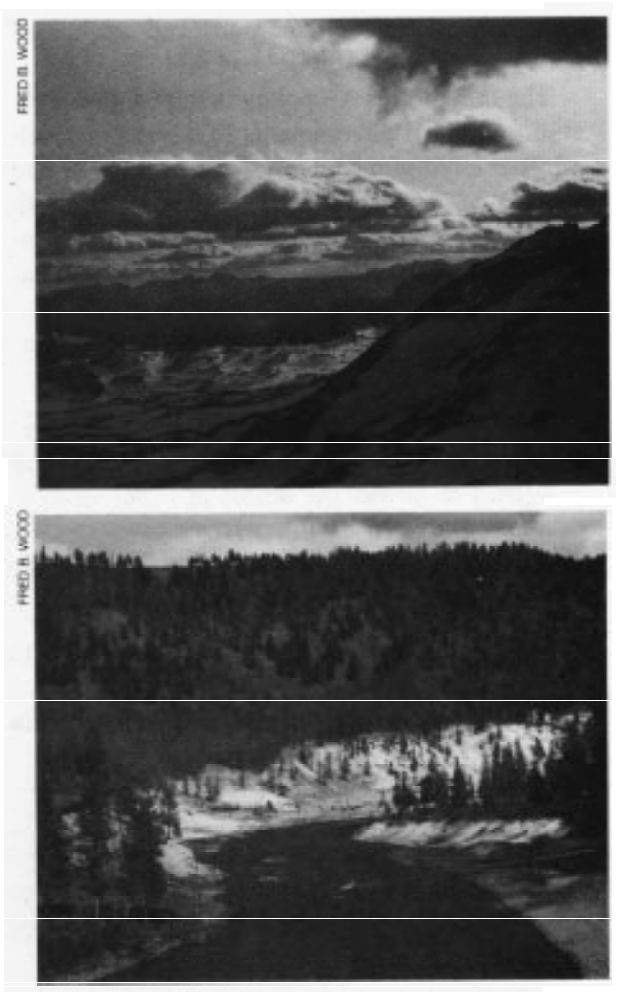
[51]See, U.S. Department of the Interior, Memorandum from Ada E. Deer, Assistant Secretary for Indian Affairs to the Assistant Secretary for Fish and Wildlife and Parks, "Indian Fish and Wildlife Policy," June 23, 1994; U.S. Department of Energy, "American Indian Policy," July/August 1994; U.S. Department of Agriculture, Departmental Regulation No. 1020-6, "Policies on American Indians and Alaska Natives," Oct. 22, 1992; U.S. Department of Commerce, "American Indian and Alaska Native Policy of the U.S. Department of Commerce," Mar. 30, 1995; U.S. Department of Justice, Office of the Attorney General, "Department of Justice Policy on Indian Sovereignty and Government-to-Government Relations with Indian Tribes," June 1, 1995; U.S. Environmental Protection Agency, Memorandum from Carol M. Browner, Administrator, to all employees on "EPA Indian Policy," Mar. 14, 1994.

[52]See the National Historic Preservation Act of 1966 as amended in 1980 and 1992 regarding the role of Indian tribes. The act, as amended, permits tribes, at their option, to assume any or all of the responsibilities normally carried out by state historic preservation officers, and to enter into contracts or cooperative agreements to administer federal historic preservation responsibilities on Indian lands. A tribe must have an historic preservation plan approved by the Secretary of the Interior in order to assume these responsibilities.

[53]U.S. Environmental Protection Agency, Memorandum from Alvin L. Alm, Deputy Administrator, "Indian Policy Implementation Guidance," Nov. 8, 1984.

[54]Ibid.

[55]U.S. Environmental Protection Agency, Memorandum from William K. Reilly, Administrator, "EPA/State/Tribal Relations," July 10, 1991, and Memorandum from Carol W. Browner, op. cit., footnote 51.



Top: *View of Yellowstone National Park from the northeast; Washburn Mountain Range in the distance. The National Park Service has responsibility for protecting Native American ceremonial, sacred, and burial sites on parklands.* **Bottom:** *View of Yellowstone River looking southeast near Tower Junetion, Wyoming. The Shoshoni and Crow Indians once lived and hunted in much of what is now northwestern Wyoming and Yellowstone National Park.*

purposes under the Safe Drinking Water Act; the Comprehensive Environmental Response, Compensation, and Liability Act (also known as CERCLA or Superfund); the Clean Water Act; and the Clean Air Act.[56] EPA streamlined the process by which tribes apply for funding and technical assistance.

3. *Provision of funding and technical assistance to tribal governments.*

   EPA provides finding to tribes under general EPA authority as well as specific statutes. The Indian Environmental General Assistance Act of 1992[57] provides funding to tribes and tribal consortia for the planning and development of tribal environmental management capabilities. The Indian Regulatory Enhancement Act of 1990[58] authorizes the Administration for Native Americans (in the Department of Health and Human Services) to provide grants to tribal governments for the development of tribal environmental programs. EPA also provides a wide range of informational and technical assistance to tribal governments.

4. *Ongoing communications with tribal governments.*

   EPA has committed itself to listening and learning about tribal environmental needs, providing environmental information and education for tribal officials and members, and involving tribal governments in EPA's planning and policymaking. EPA has established a Tribal Operations Committee comprised of tribal representatives and EPA managers to help ensure tribal input on decisions that may affect tribes. The Committee includes 18 tribal representatives and at least one EPA representative from each EPA region that includes federally recognized tribes.

5. *Establishment of a central agency office on Indian affairs.*

   In response to a recommendation from its Tribal Operations Committee, EPA established, in 1994, a central office on tribal environmental

[56] See Safe Drinking Act, 42 U.S.C. Sec. 300j-ll(a)(l) (1988); Comprehensive Environmental Response, Compensation, and Liability Act 42 U.S.C. Sec. 9626 (1988); Clean Water Act 33 U.S.C. Sec. 1377 (1988); and Clean Air Act, 42 U.S.C. Sec. 7601(d) (1988).

[57] Public Law 102-497, 106 Stat. 3258 (1992).

[58] Public Law 101-408, 104 Stat. 883 (1990).

affairs. The office oversees implementation of presidential and agency Indian policies and carries out other informational and coordination functions. It serves as a clearinghouse on tribal environmental information and programs; coordinates agencywide tribal training, education, and technical assistance programs; facilitates communications with tribes on agency rulemaking, policymaking, and program implementation; and coordinates EPA's tribal activities with those of other federal agencies.

In sum, the major elements of EPA's tribal policy and its implementation appear relevant and potentially transferable to other federal agencies, including those with major telecommunications responsibilities.

FCC POLICIES ON MINORITIES[59]

The Federal Communications Commission, an independent regulatory agency of the federal government, has the primary federal responsibility for regulation of telecommunications. The FCC does not have an Indian policy that explicitly recognizes and treats tribes as governmental entities. It does, however, have a minority policy that, by extending certain preferences to individuals through agency regulations, may incidentally benefit entities owned by tribes or by Indian and Alaska Native people.

■ FCC Broadcast Licensing

In 1978, the FCC adopted a policy to promote the participation of minorities in the broadcast industry, largely through the provision of minority preferences in regulations governing licensing procedures for radio and television broadcast stations.[60] In 1982, Congress codified the FCC's minority policy and directed the agency to establish rules and procedures that give significant preference to minority applicants for licenses or construction permits. The intent was to increase the diversification of broadcasting ownership.[61]

The policy appears to have had little effect on Native American broadcasting ownership. Na-



Top: *Native American computer artwork displayed at the Little Big Horn College in Crow Agency, Montana.* ***Bottom:*** *Historical photos of Crow Indian chiefs. Computers and telecommunications can help reproduce and disseminate Indian history to younger generations.*

[59] This section is based on research and analysis conducted for OTA by Karen Funk and Sandra Ferguson, Esq., Hobbs, Straus, Dean & Walker, Washington, DC.

[60] Federal Communications Commissimt, "Statement of Policy on Minority Ownership of Broadcasting Facilities," 68 FCC 2d 979, 980, n. 8 (1978), and "Commission Policy Regarding Advancement of Minority Ownership in Broadcasting," 92 FCC 2d 849,850 n. 1 (1982).

[61] Communication Act Amendments of 1982,47 USC Sec. 309(i)(3)(A) (1982).

tionwide, there are an estimated eight Native-owned low-power broadcast TV stations, and an estimated 26 Native-owned broadcast radio stations. More broadly, the FCC minority ownership policy is under scrutiny due to allegations of abuse or unintended consequences of minority preferences, and as part of the government-wide review of affirmative-action policies. Recently enacted legislation repeals tax incentives for minority-owned communications companies.[62]

FCC Spectrum Auction Policy

In 1994, the FCC's spectrum auction policy extended preferences to minorities and certain other disadvantaged individuals and entities. These preferences are intended to assist minorities in purchasing wireless telecommunications licenses (known as Personal Communication Systems or PCS) through the FCC's competitive bidding process.[63] FCC rules provide preferences to so-called designated entities that include small businesses, rural telephone companies, and businesses owned by minorities or women.[64] The FCC auction of the PCS spectrum licenses reserved for designated entities was challenged in the U.S. Court of Appeals for the District of Columbia, but the complaint was withdrawn before the court could review the constitutionality and legality of the preferences provided to designated entities.

Tribally owned and operated companies seeking PCS licenses could qualify as small businesses and/or rural telephone companies as well, if the tribal governments meet the financial qualifications.[65] In this way, FCC policy can potentially benefit tribal governments that bid for PCS spectrum. Also, because Native Americans are included within the definition of "minority," tribally owned and operated companies are eligible for minority preferences (to the extent such preferences continue to be available).

FCC Cellular Spectrum Lottery

The Federal Communications Commission's PCS spectrum auction policy reflected, in part, the results of the cellular spectrum lottery. The FCC and Congress determined that the free allocation of spectrum through a lottery was inefficient, failed to take advantage of competition, and resulted in a loss of significant potential revenue to the federal government. Also, minority and small businesses, including tribally owned businesses, experienced various management and financial difficulties, thus the justification for giving preferences to "designated entities" in the PCS policy.

At the time of the cellular lottery (November 1988), the Gila River Tribe of Arizona had negotiated to purchase US West's telephone infrastructure serving the reservation. Gila River Telecommunications, Inc. (GRTI), a tribally owned telephone company, sought a cellular license and, as the only provider serving the reservation, would have been the likely licensee. However, GRTI was not yet operating. To qualify for participation in the lottery, GRTI installed telephone service to two residences on the reservation. Although GRTI was selected as the tentative

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[62]H.R. 831, Public Law 104-7, Apr. 11, 1995. See Angele A. Gilroy, *The Viacom Transaction and Beyond: The Federal Communications Commission Tax Certificate Program*, 95-319 SPR (Washington, DC: Congressional Research Service, Mar. 2, 1995); and Jack Taylor, "Health Insurance for the Self-Employed: Restoration of the Deduction and Related Revenue-Raisers," Congressional Research Service, Issue Brief IB95032, Apr. 18, 1995.

[63]The Omnibus Reconciliation Act of 1993 added Sec. 309(j) to the Communications Act of 1934, which gave the FCC authority to use competitive bidding procedures to auction PCS frequency spectrum.

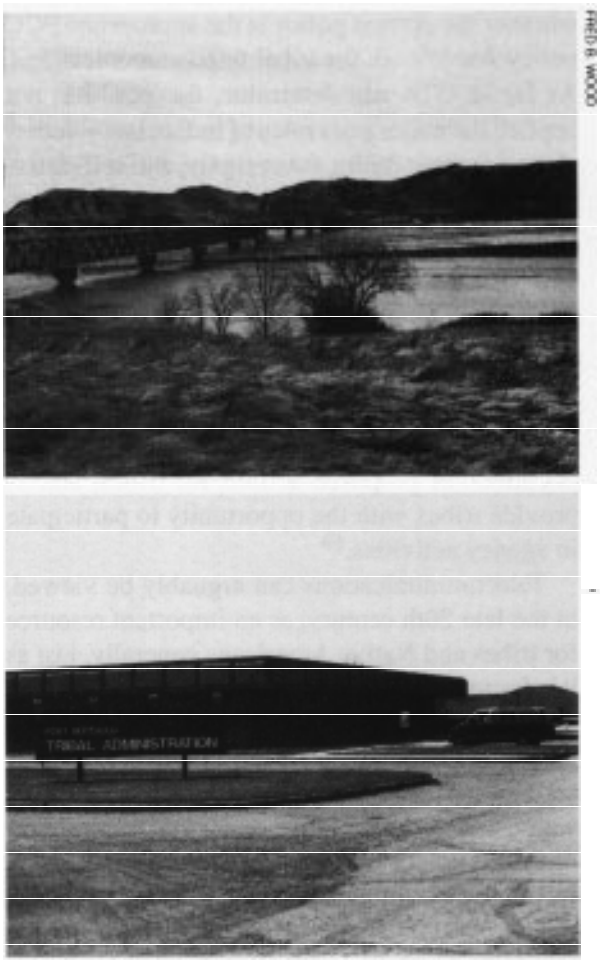
[64]"Designated entities" are allowed to bid in a separate spectrum auction established especially for disadvantaged groups. FCC rules also provide the following to designated entities: bidding credits; installment payment options; and tax and investment benefits.

[65]FCC rules exclude tribal assets and gross revenues, except for gaming revenues, in determining eligibility of tribally affiliated companies for "designated entity" status.

licensee, other telephone companies (including US West) challenged the selection on the grounds that GRTI was not art operating telephone company. The FCC encouraged a negotiated settlement. . The final agreement gave US West a minority partnership in the cellular license in return for financing the construction.[66]

The Fort Mojave Tribe of Arizona also participated in the cellular lottery and was selected as the tentative licensee for the reservation service area. A private telephone company challenged the result, and asked the FCC to deny Fort Mojave's application. At the time, the Fort Mojave Tribe was planning to set up a phone company, but did not yet own or operate a company. The tribe argued that the FCC eligibility rules were either not applicable or should be waived on the basis of tribal sovereignty and federal laws and policy that encourage tribal self-determination. The FCC ruled against the tribe, denying the request for a waiver and asserting that federal Indian policy was not determinative. [67]

The Seminole Tribe of Florida tried a different strategy. The tribe had never owned or operated a telephone company and had not sought to purchase telephone infrastructure from the two nontribally owned phone companies serving the reservation. The tribe decided to attempt to participate in the cellular lottery based on a claim of tribal jurisdiction over the reservation service area. At that point in time, the FCC had not yet ruled in the Fort Mojave case, and the FCC's views on this general topic were unknown. The local telephone companies were willing to negotiate. The FCC did not have to rule on the Seminole case because the tribe was able to negotiate minority partnerships in the cellular licenses of both established phone companies.[68]



Top: **State** *route 23 highway bridge crossing Lake Sakakawea on Fort Berthold Indian Reservation, North Dakota. View looking east from the Four Bears Casino and tribal administration complex.* ***Bottom:*** *Fort Berthold tribal administration building. The Three Affiliated Tribes (Arikara, Hidatsa, and Mandan) are using casino revenues to help make infrastructure improvements on the reservation-including computer and telecommunications upgrades.*

■ Fundamental Question

FCC policies have not, to date, worked very well or consistently for tribal governments. The fundamental question for Native Americans, however, is not how well the FCC policy is working, but

[66] The Gila River discussion is based on a site visit and meeting between the OTA contractor, Hobbs, Straus, Dean & Walker, and GRTI representatives.

[67] The Fort Mojave discussion is based on an OTA contractor (Hobbs, Straus et al.) meeting with David Irwin, Esq., the attomey who handled the Fort Mojave case before the FCC. The tribe subsequently was successful in organizing and operating a tribal telephone company.

[68] The seminole discussion is based on an OTA contractor (Hobbs, Straus, et al.) telephone interview with the tribal attorney.

whether the current policy is the appropriate FCC policy framework for tribal telecommunications. As far as OTA can determine, the FCC has not applied the major principles of Indian law—federal trust responsibility, sovereignty, and self-determination—to federal telecommunications policy. Nor has the FCC applied federal Indian policy as enunciated by every President from Nixon through Clinton and by several other federal agencies. The Clinton policy requires all federal agencies, not just those with major tribal responsibilities, to: 1) deal with tribes on a government-to-government basis; 2) carefully consider the implications of proposed actions for tribes; and 3) provide tribes with the opportunity to participate in agency activities.[69]

Telecommunications can arguably be viewed, in the late 20th century, as an important resource for tribes and Native Americans generally, just as it is for many other segments of American society. Telecommunications, and especially the electromagnetic frequency spectrum, could be viewed as another natural resource along with land, forests, water, and the like. Native American telecommunications policy is in its most formative stages. A fundamental question is the extent of tribal authority over telecommunications—both on the ground (e.g., physical infrastructure) and in the air over tribal lands (e.g., frequency spectrum). Indian advocates believe that this authority is reserved for the tribes, as sovereign governments, and should be so recognized by the federal government. If the federal government wishes to assume this authority, advocates believe, then it should do so explicitly with the understanding that telecommunications would become part of the federal trust responsibility—in this sense, viewed no differently than lands and other natural resources ceded by tribes to the U.S. government over the last 200 years in return for monetary and other compensation. This compensation could be in the form of telecommunications infrastructure and services over which, according to the principle of self-determination, tribes would have significant control. The reality is that the current federal and state telecommunications policy regime has developed in the absence of tribal telecommunications policy and therefore has, unintentionally, eroded and limited the sovereignty of tribes in this area.

Native American telecommunications activists believe strongly that tribes must find their own role in telecommunications. In the words of James A. Casey, Indian telecommunications attorney:[70]

> The applications of federal Indian law to the telecommunications regulatory regime must be two-sided. The tribes must lead the way. The federal government will not be able to force the tribes into this area if they do not want to go, and the tribes that want to go will have their own ideas about the meaning of the word "sovereignty." Somewhere, the two sides will have to meet.
>
> The main federal focus should not be, at this time, to define the tribal role, but to encourage tribes to play a role. While this approach is *ad hoc*, it is the only approach that will insure that the issues are dealt with adequately. Federal telecommunications policy and regulation has developed continuously since 1934. Indian telecommunications policy cannot be written overnight; it must evolve.

[69]President Clinton, Memorandum, op. cit., footnote 50.

[70]Casey, op. cit., footnote 1.

Policy Framework for Native American Telecommunications

5

The federal government does not have an overall policy framework or strategy for Native American telecommunications. Continuation of the policy status quo is likely to compromise the ability of Native Americans to realize the potential of telecommunications to enhance Native cultures, communities, and self-governance. The most highly leveraged options include those that strengthen telecommunications expertise and planning at both the tribal/village/community and intertribal/national levels. Also, the high cost of rural telecommunications, combined with the weak economies in many rural Native areas, means that coordinated, integrated approaches to telecommunications infrastructure development are essential. This includes options to aggregate both supply and demand in order to bring costs down and achieve economies of scale and scope. On the demand side, community communication centers and networks warrant serious consideration. On the supply side, encouraging the formation of Native-owned and -operated telecommunications companies; an upgrade of service by, and/or partnerships with, existing private telecommunications companies; and shared use of federal telecommunications systems can help.



Telecommunications could be specifically addressed in proposals to: 1) consolidate federal programs such as block grants to the states and tribes; 2) reorganize federal agencies serving Native Americans; and 3) implement electronic delivery of services to and by Native governments and individual Native Americans. Information about federal telecommunications programs and activities could be shared and accessed electronically by Native leaders, activists, planners, and technology experts via the Internet and other computer networks. This could help Native groups

become more active participants in developing policies on telecommunications, universal access, privacy, intellectual and cultural property rights, and other issues of concern to many Americans, including Native Americans. Future applications and policymaking would benefit from significant, continuing research and program evaluation on many of the topics discussed in this report—the first by the federal government on Native American telecommunications.

The federal agencies with major responsibility for telecommunications policy, such as the Federal Communications Commission (FCC) and National Telecommunications and Information Administration (NTIA), have not applied Indian law to telecommunications policy. The federal agencies with lead responsibility for Native programs, such as the Bureau of Indian Affairs (BIA), Indian Health Service (IHS), and Administration for Native Americans (ANA), do not have a Native American telecommunications policy. These agencies do support some noteworthy telecommunications projects that benefit Native Americans.

A Native American telecommunications policy framework could, for example, affirm that telecommunications is essential to ensuring Native well-being and survival, and could include telecommunications infrastructure as part of a modern "information age" interpretation of the federal responsibility for Native well-being. The policy could afford flexibility to individual tribes, villages, and communities, recognizing that they will have differing levels of interest and capability in assuming telecommunications responsibilities. The policy could encourage Native governments and service providers that wish to assume self-direction and control of telecommunications in Native areas to do so. Agency-specific policies could address a wide range of programs that affect the viability of tribal/village/community telecommunications activities and enterprises. These programs include, for example: 1) Rural Utilities Service loans; 2) universal service funds; 3) FCC frequency spectrum allocations; 4) NTIA grants; 5) BIA educational technology and geographic information systems support; and 6) IHS telemedicine and health information systems support. The policy could establish new mechanisms for interagency, tribal-federal, and tribal-state collaboration and coordination. For example, the joint federal-state board on the universal service fund could be expanded to include tribal representation. Key policy elements could be included in statutory guidance, such as amendments to existing Native American and telecommunications laws, or a separate "Native American Telecommunications Act" or the equivalent.

NEED FOR A POLICY FRAMEWORK

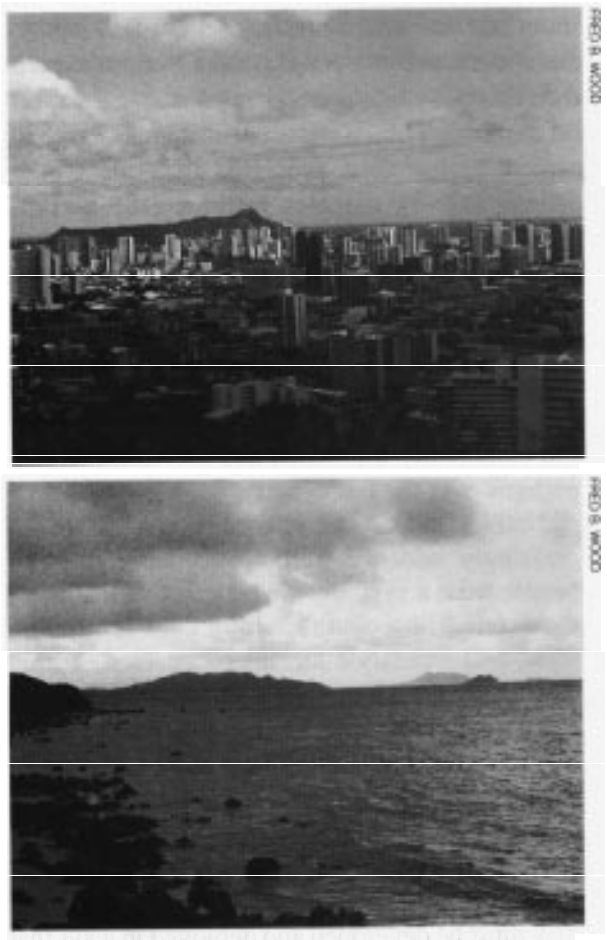
A threshold policy question in any Office of Technology Assessment (OTA) study is whether policy actions beyond continuation of the status quo (usually not entirely static, however) warrant serious consideration.

For this study, the answer seems straightforward. Native American telecommunications policy and activities are clearly lagging behind both: 1) other areas of Native American policy (e.g., self-governance, education, social services, and health care); and 2) the telecommunications policy development and initiatives in the majority society. Native American telecommunications activities are increasing, and likely will continue to do so absent any special policy interventions. But the rate of change in the majority society has itself accelerated markedly in recent years, due in part to the current Administration's reinventing government and national information infrastructure ini-

tiatives, and more generally to the continuing transition of the United States into a post-industrial information economy and society.[1]

Absent policy interventions, it is unlikely that - Native Americans will catch up with the majority society with respect to telecommunications, and they may fall further behind. This assumes even greater importance, given the potential benefits of telecommunications that may be deferred, diminished, or foregone under the policy status quo. Even if the more optimistic visions of Native American telecommunications are not realized, achieving just an "average" result is likely to be highly leveraged because Native American telecommunications policy is very incomplete and underdeveloped. Neither the federal government nor the national tribal and Native American leadership has an overall policy strategy or framework for Native American telecommunications.

Native Americans, as a group, are under considerable stress. They have significantly higher rates of unemployment, poverty, high school dropouts, alcoholism, cirrhosis, and suicide compared with national averages. The BIA estimates that unemployment on or near reservations averages about 50 percent (double the 1990 U.S. Census estimate of 25.7 percent using a narrower definition of unemployment).[2] Unemployment on some reservations is as high as 70 to 80 percent. American Indian and Alaska Native high school graduation rates are about 10 percent below the national averages, and college graduation rates are



Top: *Oahu, an island of contrasts. The majority of the island's population live in Honolulu, the state capitol of Hawaii, shown here looking southeast toward Diamond Head and the Pacific Ocean beyond.* ***Bottom:*** *Wide expanses of beaches and mountains reaching the sea are typical of rural Oahu and the neighbor islands where many Native Hawaiians live. View from Makapuu Beach looking northwest toward Waimanalo Bay, Kaiwa Ridge, and Ulupau Crater beyond.*

[1] See Vice President Gore, *Creating a Government That Works Better & Costs Less: Report of the National Performance Review* (Washington, DC: U.S. Government Printing Offlce, Sept. 7, 1993); Information Infrastructure Task Force, "The National Information Infrastructure: Agenda for Action,'' National Telecommunications and Information Administration, Washington, DC, Sept. 15, 1993, and "National Information Infrastructure: Progress Report 1993 -1994," National Telecommunications and Information Administration, Washington, DC, Sept. 13, 1994; Emilio Gonzalez, *Connecting the Nation: Classrooms, Libraries, and Health Care Organizations in the Information Age* (Washington. DC: National Telecommunications and Information Administration, U.S. Department of Commerce, June 1995); and U.S. Congress, Office of Technology Assessment, *Making Government Work: Electronic Delivery of Federal Services,* OTA-TCT-578 (Washington, DC: U.S. Government Printing Office, September 1993).

[2] See Indian and Native American Employment and Planning Coalition, "Will the Real Unemployment Rate in Indian Country Please Stand Up,'' Mar. 1, 1993, and "The Indian Labor Force: A Portrait in Numbers" May 1993. Also see George Russell, *American Indian Digest: Facts About Today's American Indians,* 1995 Edition (Phoenix, AZ: Thunderbird Enterprises, Inc., 1994).

about half the national averages.[3] The IHS reports that American Indians and Alaska Natives experience mortality rates considerably above the rates for the entire U.S. population—tuberculosis (520 percent higher than average), alcoholism (433 percent higher), diabetes mellitus (188 percent higher), accidents (166 percent higher), homicide (71 percent higher), and suicide (54 percent higher).[4] The health conditions of Native Hawaiians are, likewise, considerably worse than those of the general population. This situation is attributed, in part, to serious erosion of Native culture, family and community traditions, and diet and exercise patterns over the last century.

Native leaders and advocacy groups are increasingly addressing the well-being of their people from a systemwide perspective that takes into account how culture, family, community, lifestyle, and workstyle are interconnected. Within this community framework, telecommunications can be an important facilitator and, in some cases, a necessary—although not by itself sufficient—prerequisite for improving the well-being of Native Americans.[5]

Native Americans who research or experiment with telecommunication technologies stress that they must be developed and deployed in ways that enhance Native culture and values.[6] Native Americans historically have struggled to preserve and defend their cultures within the dominant, majority society. In recent decades, the advent of electronic communications—especially TV, film, videos, and popular music—and the new electronic media of computers, software, and satellites present a formidable challenge. Because Native culture has been eroded in the past by the mass media, some Native American leaders are understandably cautious or even resistant to adopting new telecommunication technologies without first gaining confidence that technology applications will be sensitive to and strengthen Native culture. The new media could, indeed, have adverse impacts on Native culture unless Native Americans have a central role in understanding and guiding their use and in developing programming and informational materials.[7]

Telecommunications can play a multifaceted role in improving the overall well-being of Native communities. In the absence of policy interventions, however, much of this potential is likely to be lost or indefinitely deferred. And the opportunity for Native Americans to take control of their telecommunications destiny may be seriously compromised.

If these opportunities are to be realized and the risks minimized, an overall policy framework or strategy—a package of initiatives and options—on Native American telecommunications is needed. No single policy option will address all Native American telecommunication needs. Many options could be implemented or influenced in a variety of ways—not necessarily by any one person (or group), organization, or institution.

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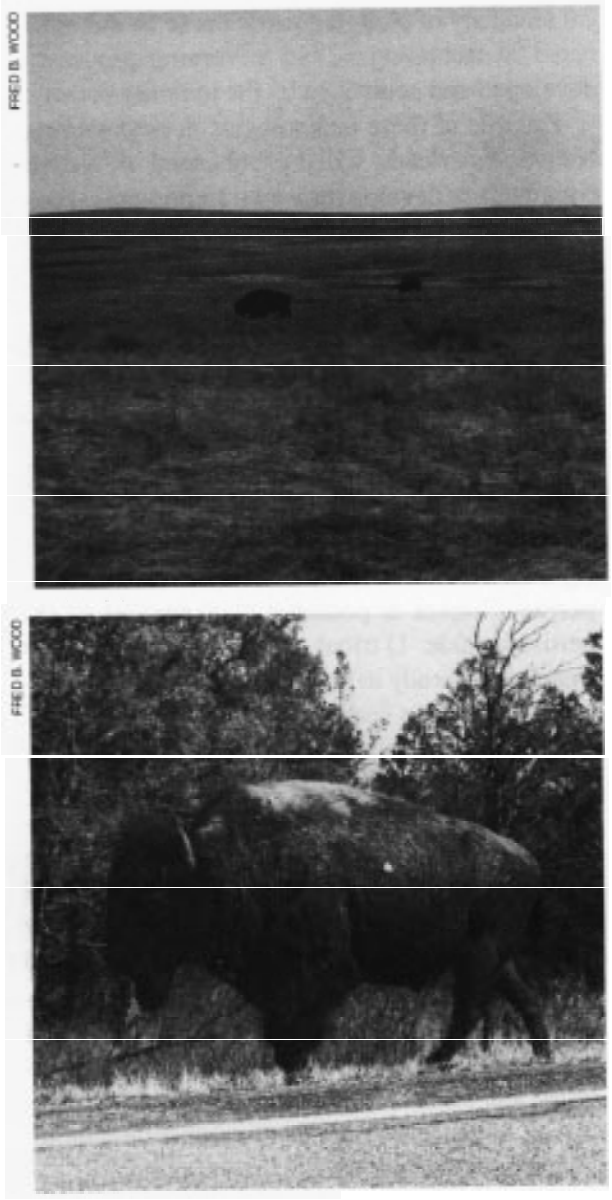
[3]Ibid.

[4]Indian Health Service, U.S. Department of Health and Human Services, *Trends in Indian Health—1993* (Rockville, MD: Indian Health Service, 1993). Also see U.S. Congress, Office of Technology Assessment, *Indian Health Care*, OTA-H-290 (Washington, DC: U.S. Government Printing Office, April 1986), and *Indian Adolescent Mental Health*, OTA-H-446 (Washington, DC: U.S. Government Printing Office, January 1990).

[5]For detailed discussion, see chapter 3.

[6]See chapter 2.

[7]See, e.g., George D. Baldwin, "American Indian Identity and Tribal Sovereignty in Cyberspace," paper prepared for the Workshop on Legal, Ethical, and Technological Aspects of Computer Network Use and Abuse," American Association for the Advancement of Science, Oct. 7-9, 1994; Randy Ross, "Tribal Rights and Cultural Identity in Cyberspace," *ArtPaper*, vol. 12, No. 10, June 1993, p. 10; and George D. Baldwin, "Networking the Nations: Information Policy and the Emerging Network Marketplace," *Journal of Navajo Education*, vol. 9, No. 2, winter 1992, pp. 47-53.



Top: *Many Indian tribes of the Great Plains depended on buffalo for food and clothing; white settlers and loss of natural habitat reduced the buffalo herds to a few surviving in protected areas, such as the Theodore Roosevelt National Park in North Dakota, shown here.* ***Bottom:*** *Buffalo grazing along the side of a scenic drive near Squaw Creek Campground, Theodore Roosevelt National Park.*

Among the many actors in Native American telecommunications are:

- tribal, village, and community leaders and governments,
- grassroots Native American advocates and service providers,
- national Native American professional and advocacy organizations,
- individual Native American telecommunications specialists and activists,
- federal and state government agencies,
- private sector profit and nonprofit organizations with an interest in Native Americans,
- communication and computer companies, and
- the U.S. Congress.

OTA has identified eight major components to a comprehensive policy framework on Native American telecommunications. Each component includes several policy options. The first four policy components emphasize a lead role for Native groups and governments-the empowerment of Native Americans in telecommunications—with the federal government in a supportive role. The second four policy components emphasize the need to rethink and refocus federal policy strategies to recognize and strengthen Native American telecommunications infrastructure and sovereignty. These require a major federal government role, but with extensive Native American participation to ensure that Native values and perspectives we understood and reflected in policy actions.

EMPOWERING NATIVE AMERICAN TELECOMMUNICATIONS

Tribal/village/community, federal agency, and congressional actions could focus on implementing these four essential components of an overall Native American telecommunications policy framework.

■ Grassroots Tribal/Village/Community Empowerment

At the grassroots level, one key is developing local sources of telecommunications expertise and tribal/village/community telecommunications plans and visions. Native American communities are struggling to regain control over their lives and destinies. Telecommunications technology has the potential to accelerate and strengthen the drive for Native empowerment; if rooted in local expertise and control, it also can help reverse the histori-





Top: *Learning Resource Center at the Kauai Community College, located on the outskirts of Lihue, Kauai Island, Hawaii, and the focal point for educational technology on campus.*
Bottom: *Kauai and other community colleges of the University of Hawaii system bring videoconferencing and distance learning to many Native Hawaiian students.*

cal tendency of Native Americans to be subordinated to technologies and governing processes developed and controlled by the majority society.

The role of these technologies in empowering Native Americans will be enhanced if Native communities develop their own technological understanding, expertise, and leadership. Telecommunication technologies offer many opportunities for use in Native governance and service delivery, and in the administration of the various governmental functions (e.g., health, education, human and social services, transportation, resource and environmental management, economic development, and public safety) being assumed by many Native communities.[8]

Native communities would benefit from having their own sources of telecommunications expertise. Current or potential local sources of expertise include: 1) tribal and community colleges (many are already using microcomputers and distance learning to some degree); 2) tribal/village/community governments (most make some use of computers for administrative and financial purposes, while a few are implementing more advanced applications);[9] 3) K-12 and health care staff familiar with telecommunications (e.g., for distance learning or telemedicine); 4) community training centers (where telecommunications and computer skills are taught or used); 5) local computer enthusiasts and entrepreneurs (a still small but growing group of Native activists using the Internet and other computer networks); and 6) telephone, cable, and computer companies and radio/TV stations serving Native communities.

Native government and educational leaders could develop strategies to increase local expertise, and seek out the necessary financial resources (new or reprogrammed funds from both public and private sources). Native government leaders

[8] For further discussion, see chapter 3.

[9] Surveys conducted for the National Indian Policy Center, The George Washington University, indicate that the majority Of tribes have computers to carry out administrative functions, but only about 10 percentrept having access to the Internet (l 8 tribes out of 143 responded as of April 1995). Also see testimony of Bambi Kraus, Assistant Director, National Indian Policy Center, in U.S. Congress, Senate, Committee on Indian Affairs, ***Oversight Hearing To Examine the Feasibility of Creating a Permanent Indian Research Center,*** S.Hrg. 103-61 (Washington, DC: U.S. Government Printing Office, May 20, 1993), pp. 16-19.

and local activists may wish to create a telecommunications coordinating committee or task force to provide additional impetus and focus.[10] These committees could include representatives from education, government, health care, information technology entrepreneurs, telecommunications providers, and others with relevant expertise and interest.

An important part of empowerment is effective local planning. Only a few Native reservations, villages, and communities have a telecommunications strategy or vision; most have, at best, some fragmented planning activities but no coherent picture or understanding of what telecommunications can do to further their well-being. Native education and health care are the two areas where Native communities are more likely to have initiated some degree of serious telecommunications coordination and planning, reflecting in part national program initiatives in distance learning and telemedicine.[11]

No single technology fix exists for meeting Native American needs. The greatest leverage is likely to result from a range of telecommunication technologies working in concert as part of tribal/village/community plans. Computer networking, satellite videoconferencing, computers and software, electronic imaging and production, telephone, telefacsimile, digital switching, broadcast radio and TV, cable TV, and cellular or wireless telephone are among the technologies likely to play significant but different roles.

Finding the exact mix of technologies will be a challenge and will depend on the geography, demography, and economy of each community; the types of applications and users; and the development of the telecommunications infrastructure in areas where Native Americans live and work.

Most Native reservations, villages, and communities would benefit from developing a plan or vision of how telecommunications could best meet their cultural, educational, health, economic development, and other needs. (See box 5-1 on the Navajo Nation Telecommunications Initiative.) Even if rudimentary, a plan could provide some sense of direction and cohesiveness to local efforts at deploying and using these technologies. Also, a plan could provide local leaders with a framework for understanding and gauging government proposals and private sector projects that may be forthcoming. With an organized strategy, Native communities could be more proactive in the telecommunications arena with regard to both federal agencies and private vendors. The support of tribal, village, and community leaders is essential to success.

Native leaders could begin by considering the visions of grassroots telecommunications activists—those from the local Native community and elsewhere. Native communities could draw on and adapt—to the extent appropriate—the prior experience of numerous cities, towns, and states in developing telecommunication plans and community networks.[12] The national Native American leadership may wish to sponsor or develop sources of planning assistance for local Native communities, including workshops and conferences on Native telecommunications infra-

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[10]The Sisseton-Wahpeton Sioux Tribe, in Agency Village, South Dakota, for example, has established a Telecommunications Committee to develop a strategy for cooperative telecommunications infrastructure development and related training and technical support. Participants include the tribal government, tribal college, Indian Health Service, Bureau of Indian Affairs, and representatives of tribal housing, planning, education, economic development, gaming, and natural resource activities. See Oct. 17, 1994, letter from Arnold R. Ryan, Tribal Chairman, Sisseton-Wahpeton Sioux Tribe, to Donald Bad Moccasin, IHS Area Director, Aberdeen, South Dakota, and "Sisseton-Wahpeton Sioux Tribe Telecommunications Project," planning paper, n.d.

[11]See, e.g., James S. Logan and David G. Swartz, *Aberdeen Area Indian Health Service: Telemedicine Assessment Final Report* (Oklahoma City, OK: Logan & Associates, Inc., Mar. 30, 1995). Also see Gonzalez, *Connecting the Nation*, op. cit., footnote 1, and W. Curtiss Priest, "Cost-Effective Networking of Schools and Homes," vision paper, Center for Information, Technology, and Society, Melrose, MA, July 7, 1995, available by e-mail from bmslib@mitvma.mit.edu.

[12]See OTA, *Making Government Work*, op. cit., footnote 1.

BOX 5-1: Navajo Nation Telecommunications Partnerships and Planning

As policies for the nation's "information superhighway" and telecommunications reform efforts are debated on Capitol Hill, the country is proceeding with a variety of public-private sector partnerships and cost-sharing arrangements. Native Americans are also searching for opportunities to participate. Native American organizations and federal agencies such as the American Indian Higher Education Consortium (AIHEC), the American Indian Science and Education Society (AISES), the Bureau of Indian Affairs (BIA), and the Indian Health Service (IHS) have pilot projects in distance learning, telemedicine, electronic mail, and online database services. Partnerships among governments, schools, hospitals, libraries, and the private sector will likely be necessary to further develop and diffuse successful applications and to cost-share the infrastructure. The Navajo Nation Telecommunications Initiative is such a partnership.

The Navajo Nation's Information Technology Office in the Office of the President/Vice President is attempting to integrate and facilitate all the disparate projects currently under way under the umbrella of a comprehensive Technology and Information Resource Plan While several Navajo leaders, with the backing of President Albert Hale, are championing the projects, state and federal agencies are providing technical assistance and/or seed money; and a cadre of volunteers is contributing consulting services pro bono. The private sector will be selling or donating hardware and services Participants include:

- from the federal government, Department of Energy's Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratory; National Aeronautics and Space Administration (NASA); California Institute of Technology's Jet Propulsion Laboratory; Bureau of Indian Affairs, Indian Health Service, Department of Defense Advanced Research Projects Agency; and Electronic Pathways All lance, funded by the National Science Foundation.
- from health and education, Navajo Community College; Crownpoint Institute of Technology; Crown point Public Schools, Navajo Nation Library System; Office of New Mexico State Senator Leonard Tsosie, New Mexico State Library, University of New Mexico's Medical School and Native American Studies program, Northern Arizona University (NAU); and Tucson's Mayo Clinic West.
- from the private sector, Navajo Communications Co.; New Mexico Technet in Albuquerque; Motorola, and long-distance carriers.

(continued)

structure development. Current or reprogrammed federal funds, as well as private sector funds (e.g., foundation grants), may be available for these purposes.

National Native Leadership

To complement a grassroots emphasis, another key is strengthening Native American leadership on telecommunications at the national level. A handful of Native American researchers and activists recently have begun a dialog on strategies for Native American telecommunications. The number of Native American meetings, conferences, articles, and pilot projects with a telecommunications theme is increasing, but is still minimal.

National Native American organizations are beginning to focus on telecommunications, but still lag their non-Native counterparts. Specialized groups are more active. The American Indian Higher Education Consortium, for example, is taking a lead role on distance education for tribal colleges. The Native American Public Broadcasting Consortium and the Indigenous Communications Association are providing leadership on strengthening the Native radio network. Pacific Islanders in Communications, the Indigenous Communications Association, the Intertribal Geographic Information Systems Council, and other grassroots and professional groups are helping raise awareness in Native communities about

BOX 5-1: Navajo Nation Telecommunications Partnerships and Planning (Cont'd.)

Many projects, such as the Crownpoint Pilot Project, will provide agencies with Internet access through modems, dedicated data lines, fiberoptic trunk lines, and wireless links for canyon and desert areas. Another project is NAU's distance-learning project that uses microwave links to deliver courses from NAU to the reservation. Also, NASA and the community colleges are working together to develop curricula to train fiberoptic cable installers and network managers. The Information Technology Off Ice IS responsible for integrating these efforts and facilitating working partnerships, which includes the creation of an external advisory committee composed of individuals from the national labs, industry, and academia. The office recently started to develop a human resource program.

The long-term goal for the Navajo Nation is to develop telecommunications Infrastructure for all 133,000 reservation Navajos in an area covering 25,000 square miles in New Mexico, Arizona, and Utah. Navajo elders and leaders anticipate benefits in health care, education, social services, tribal government, environmental protection, and economic development. Moreover, online applications in the Navajo language will help strengthen the language. Perhaps the greatest benefit will be to stem the tide of Navajo who leave the reservation for education and employment. As expressed by New Mexico Senator Leonard Tsosie, a Navajo, "Many hope that providing the reservation with the latest (telecommunications) technology will bring more Navajo youth back home."[1]

SOURCE Office of Technology Assessment, 1995, with information from John Billison, information Technology Office, Navajo Nation; Teresa Hopkins, Agency Network Project, Navajo Nation, Tommy Lewis, President, Navajo Community College, William Bostwick, Staff, Computer Information and Communications Division, Los Alamos National Laboratory, Gary Coulter, Special Assistant for Education and Outreach, NASA (on leave from Colorado State University), Jake Jacobson, Manager, Advanced Communications Lab, Jet Propulsion Laboratory, and Steve Grey, Director, American Indian Program, Lawrence Livermore National Laboratory, personal communications, February-April 1995

[1]Crownpoint Community Network project home page, press release (Reuter), Albuquerque, NM, Sept 26, 1994

the telecommunications revolution. And Americans for Indian Opportunity and the American in dian Science and Engineering Society have focused attention on the larger opportunities and challenges of telecommunications.

The major umbrella organizations, however, notably the National Congress of American in dians (NCAI) and Alaska Federation of Natives (AFN), are just beginning to organize around this topic. The NCAI held a conference session on tribal telecommunications, [13] and has passed a resolution to establish a standing committee on "tele communications access and ownership issues for tribal Nations."[14] These organizations could not only set up formal committees, but also develop strategies on telecommunications policy (or the national information infrastructure or a similar focus), such has been done over the last several years by the National Conference of State Legislatures, the Council of State Governments, and similar non-Native organizations.[15] Such committees typically help organize conference sessions, pre-

[13]"Where the Red Road Meets the Information Highway," National Congress of American Indians Annual Conference, Denver, CO, NOV. *16, 1994.*

[14]National Congress of American Indians, Resolution #94-DEN-EF-lCH-124, "Communication Based Delivery of Health Care, Education, and Economic Development for American Indians," Denver, CO, NOV. 13-18, *1994.*

[15]See OTA, *Making Government Work,* op. cit., footnote 1.

BOX 5-2: First Americans Commission for Te

in 1978, the American Indian Telecommunications Satellite Demonstration Project linked the Crow Indian Reservation in Montana and the All-Indian Pueblo Council, Inc., in New Mexico with federal officials in Washington, DC. The National Aeronautics and Space Administration (NASA) provided technical consultative services, facilities, and satellite time, and Indian tribes planned and conducted the program,.Nontribal participants Included the Congress; White House; Departments of Interior (including the Bureau of Indian Affairs), Agriculture, and Health, Education, and Welfare; Humboldt State University, Arcata, CA, California State University, Long Beach, CA; and the Office of the Governor of Montana.

A NASA report concluded that the three-day project successfully demonstrated the technical feasibility of providing two-way Interactive television with the TV signals transmitted by satellite.[1] Moreover, the report concluded that videoconferencing strengthened the tribal, federal, and congressional processes and opened up the legislative process.[2] Participants recognized that both tribal and federal government support, and tribal needs analysis, would be needed before a long-term project could be implemented, Many tribal participants, including the host tribes, came together a year later to form the First Americans Commission for Telecommunications (FACT).

FACT, incorporated in May 1979, represents the first concerted effort on the part of native American tribes and Individual activists '(to employ communications systems, including satellite telecommunications, to more effectively convey and share policy, program, and technical Information between 1) Native peoples and the federal government; 2) Individuals and groups of Native people, and 3) native peoples and educational institutions."[3] in a special White House briefing to the Domestic Council,[4] June 1979, FACT outlined the potential of satellite communications in rural native areas. Telecommunications technologies have since expanded to include direct broadcast TV, computer networking, land-line videoconferencing, and within a few years, perhaps, wireless personal communications devices utilizing low-earth-orbiting satellites. But the impetus for telecommunications, after 16 years, has not changed significantly. And, although FACT is now defunct, its objectives are alive, with new technologies and a new generation of activists.

SOURCE: Office of Technology Assessment, 1995, with information from materials provided by Jerry C Elliott, High Eagle, Assistant Chief Technologist, Technology Transfer and Commercialization Office, Lyndon B Johnson Space Center, National Aeronautics and Space Administration, Houston, TX

[1] National Aeronautics and Space Administration, *American Indian Telecommunications Satellite Demonstration Project, Summary Report* (Houston, TX: Lyndon B Johnson Space Center, May 1979)

[2] Another NASA-supported project at about the same time specifically Investigated the role that satellite videoconferencing might play in improving the dialog between Congress and the public Fred B Wood, Vary T Coates, Robert L Chartrand, and Richard F Ericson, *Videoconferencing Via Satellte: Opening Congress to the Peep/e,* Summary Report (Washington, DC The George Washington University, February 1978)

[3] *Constitution and Bylaws of the First Americans Commission for Telecommunications, Inc.,* Jan. 10, 1979.

[4] *The First Americans Commission for Telecommunications, Inc., Proposal for Satellite Telecommunications,* submitted to The White House Domestic Council, June 1979

pare policy and planning papers, develop relationships with universities and think tanks, seek project grants, and testify before legislative bodies. Native groups could establish an umbrella intertribal telecommunications organization. Prior efforts to do so were not successful (see, for example, box 5-2), but the technology and timing seem more favorable now.

Universities that provide leadership education to Native Americans could include a component on telecommunications. Some major universities with American Indian academic or research pro-

grams, such as Harvard, Cornell, Washington State, and George Washington Universities, also have telecommunications expertise located elsewhere around campus. The same applies for the Universities of Alaska and Hawaii (and their associated community colleges), which provide educational and leadership services to Alaska Natives and Native Hawaiians, respectively. Leadership programs, such as the National Executive Education Program for Native American Leadership administered by Northern Arizona and Harvard Universities, could do likewise. Other universities that serve large Native populations, such as Oklahoma State, Arizona State, New Mexico, Northern Montana, and Oregon State, could develop Native American telecommunications programs.[16] Also, some community service organizations could provide leadership and technology training at the grassroots level for current and aspiring leaders. Native organizations could partner with the private sector, as well as educators, in developing telecommunications technical assistance centers in Native areas. Various other regional and specialized Native groups also could participate.[17]

Integrated Infrastructure Development

Tribal, village, and community cost-sharing is essential to develop telecommunications infrastructure. Most Native communities do not have the market and financial resources to develop multiple, independent, uncoordinated telecommunications infrastructures. Infrastructure is defined here to include the necessary training and technical support, as well as hardware and software (e.g., computers, printers, networks, switches, video equipment, and satellite earth stations). Funds and expertise for building an adequate infrastructure are in short supply. In rural Native areas, the cost of telecommunications infrastructure can be several times national or metropolitan area averages due to fragmented supply and demand and multiple service areas, in addition to the inherently higher costs of reaching remote, dispersed users.[18]

The large unmet need for basic educational, social, and health services in Native communities, coupled with the continuing constraints on the overall federal budget, means that federal funding for Native American telecommunications infrastructure is likely to be less than desired or needed. This bleak fiscal outlook increases the need to maximize the use of available funds.

Telecommunications infrastructure is more costly to deploy in many Native communities because of their remote, isolated locations combined with weak local economies. One effective strategy is to aggregate the local telecommunications market through close cooperation among schools, health clinics, family and community service centers, tribal or local governments, and businesses located on or near Native reservations, villages, or communities.[19] These groups may be unable to afford new technologies when acting individually,

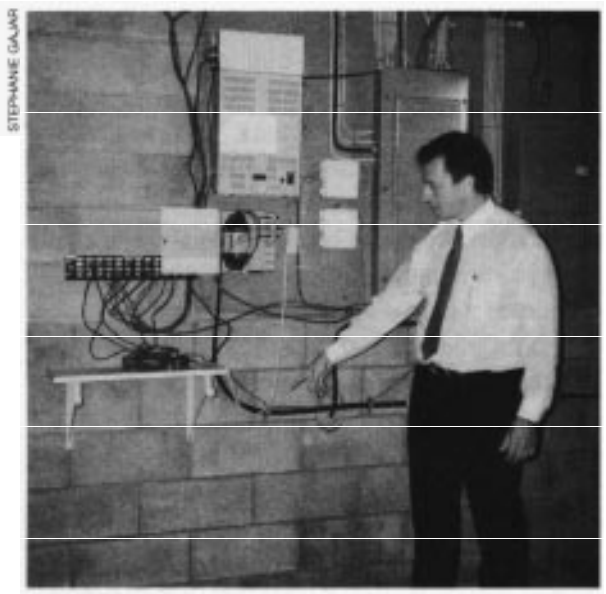
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[16]For an overview of American Indian higher education programs, see American Indian Science & Engineering Society, *Annual College Guide for American Indians* (Boulder, CO: AISES Publishing, Inc., 1994).

[17]Other groups include, e.g., the National Indian Youth Council, Association of American Indian Physicians, Native American Journalists Association, Native American Bar Association, First Nations Development Institute, Native American Rights Fund, and various regional intertribal councils. See National Indian Policy Center, "Tribal Representation in Washington, DC: Its Past and Future Role in Executive Branch and Congressional Policy-Making," The George Washington University, Washington, DC, November 1993.

[18]Frank H. Tyro, Director, Media and Teleproductions, Salish Kootenai College, Flathead Indian Reservation, Pablo, MT, personal communication, May 3, 1995; and Marvin P. Mitchell, Head, Audiovisual/Video Communications, Mayo Clinic, Rochester, MN, personal communication, May 2, 1995.

[19]See chapter 3. On community computer networking, see, e.g., Frank Odasz, "Community Economic Development Networks: A Grassroots Leadership Challenge," *Internet Research*, vol. 4. No. 1, spring 1994, pp. 2-6; and The Morino Institute, "Assessment and Evolution of Community Networking," paper presented by Mario Morino at the *Apple Conference on Building Community Computing Networks*, Cupertino, CA, May 5, 1994. Also see Gonzalez, *Connecting the Nation*, op. cit., footnote 1, and Priest, "Cost-Effective Networking," op. cit., footnote 11.





Top: *The Oneida Nation is implementing an advanced telecommunications network to meet a range of tribal needs for members living on the reservation near Oneida, New York.* ***Bottom:*** *The Oneida network includes a fiberoptic backbone linking tribal administrative, cultural, law enforcement, housing, and community service facilities.*

but when acting collectively they may be able to pool resources and justify the investment. Also, the aggregated market may be sufficient in some cases to attract outside investments or enhanced offerings from telecommunications service providers (e.g., telephone, cable, and computer companies), or even help to justify the establishment of Native-owned and -operated telecommunication and computer companies. Market aggregation also could apply regionally and nationally, as the American Indian Radio on Satellite project is doing for the production and distribution of Native American radio programming.

Both the recipients of federal funds (in this case, Native tribes, villages, and communities) and the funding agencies would benefit by carefully examining proposed telecommunications investments to increase the chances that technologies and systems are compatible, complementary, user-friendly, and cost-effective. This review could extend to expenditures for relevant federal agency telecommunications systems because many of these connect with field offices located in or near Native communities. An integrated approach should help minimize overlap and duplication, and maximize both the leverage of the infrastructure investment and the return on taxpayer dollars.

Pilot projects provide an important opportunity to assess the potential benefits, costs, and problems associated with tribal/village/community use of telecommunications. A few pilot projects have been completed or are under way, typically with some federal support. But the number and breadth of projects are still limited compared to the range of possible applications.

Additional projects would be helpful, especially in defining the role of telecommunications in the areas of cultural heritage, community well-being, economic development, and governance. Cultural heritage as defined here includes tribal/village/community traditions, ceremonial activities, religion, and art. Community well-being includes education, health care, family wellness, nutrition, and recreation. Economic development covers technical, human resource, financial, management, and market factors that affect business startup, relocation, and job creation. Governance includes selection/election of local officials, conduct of tribal/village government meetings and policymaking, administration of various tribal/village government functions, and citizen moni-

toring of and participation in these activities. In reality, of course, the overall health of Native communities depends on the interaction of all these elements.

Pilot projects could explore how an integrated tribal/village telecommunications infrastructure can best support applications to specific aspects of community life. The community communication center is a concept to consider, especially in areas where it is unrealistic for most homes and offices to have anything more than basic telecommunications in the short to medium term. A local high school, community college, library, multiservice center, or tribal/village office could be designated as a community communication center where a wide range of telecommunications equipment and services is available to residents, including students and entrepreneurs (also see chapter 3). Such a center may be able to offer videoconferencing, computer networking, multimedia, and other services that may not be affordable or cost-effective in most individual homes and many businesses for some time. The multiservice center concept also is relevant as a way of providing technology-enhanced "one-stop shopping" for a range of social, economic, and health services.[20]

Native Entrepreneurial Activity

Formation of Native and tribally-owned and -operated telecommunications companies is a highly leveraged way to create jobs and stimulate local economic development. Native American reservations, villages, and communities range from the relatively affluent to the impoverished. Overall, however, most Native communities face serious difficulties in providing jobs for able-bodied adults or heads of families. Unemployment and poverty rates average about 50 percent on Indian reservations and in Alaska Native villages. Most jobs are government-related. Significant private sector job creation has been limited to a relatively few reservations and villages—primarily those with marketable natural resources and/or significant and accessible tourist attractions. Native Hawaiian unemployment is lower than rural Indians and Alaska Natives, but still higher than national and state averages.

Today, the number of Native-owned and -operated telecommunications companies is very small—a few telephone and cable companies and radio stations. Native entrepreneurs wishing to form telecommunications companies must overcome significant financial, technical, and human resource barriers. Some Native communities may find that needed telecommunications are accessible and affordable from non-Native companies. Many Native communities may not have a market large enough to justify and sustain the formation of new telecommunications providers. Contiguous or adjacent Native communities could, in some cases, join forces to create a larger market. Congress could direct the NTIA and FCC, and other relevant federal agencies, to review how Native telecommunications entrepreneurs might be encouraged in locations where market conditions are at least minimally supportive. Success stories like the Cheyenne River Sioux Tribe Telephone Authority (see box 5-3) demonstrate that Native-owned and -operated telephone, cable TV, satellite broadcast TV, and cellular and wireless companies are within reach. Also, Native leaders could consider ways to apply some portion of tribal revenues to support telecommunications startup ventures.

Although Native telecommunications companies alone will not guarantee an economic revival, they can help leverage the use of telecommunications in at least four important ways: 1) facilitating the education and training of a skilled, marketable workforce in Native communities (a key factor in business location and investment decisions); 2) providing part of the technology infrastructure many businesses and investors now consider to be essential (e.g., to facilitate telecommuting, remote computer applications, electronic data interchange, and the like) and, thus, indirectly attract-

[20]For related discussion, see chapter 3.

BOX 5-3: Cheyenne River Sioux Tribe Telephone Authority: A Catalyst for Reservation Development

The Cheyenne River Sioux Tribe (CRST) Telephone Authority, one of only a few tribally owned telephone cooperatives, is a story of tribal business and community leadership. Delivering basic telephone service since 1958, it now serves as a driver for economic development, and continues to assess the future advanced telecommunications needs of the community, including its schools and hospitals Oversight is provided by an independent board as well as the tribal government. The federal government has also had a role by providing critically needed loans and grants.

Located in central South Dakota, the Cheyenne River Indian Reservation has 9,000 Lakota-Sioux members and covers 46,000 square miles, in 1977, the town of Eagle Butte housed one exchange with multiparty lines that were subject to outages due to ice storms. With the help of a Rural Electrification Administration (REA) loan, a newly created Telephone Authority purchased and consolidated local telephone systems and put in new underground lines for single-party service. Today there are five digital switches linked with fiberoptic cables, and the penetration rate is 72 percent. Ducts to hold future fiberoptic cable extend to the edge of town in anticipation of distance-learning and telemedicine applications.

The Telephone Authority diversified in 1984 into customer premise equipment (CPE) with the formation of CRST Telephone Sales and Service. Three years later, it purchased local companies and created Cheyenne River Gas and Cheyenne River Cable TV, which offers Direct Broadcast Satellite. These businesses now employ 55 local people. in 1994, with an Indian Community Development Block Grant, the Telephone Authority set up the Lakota Thrifty Mart, a 17,000-square-foot supermarket that employs 35 local people. The Telephone Authority has plans for a convenience store and gas station in a remote community.

Eagle Butte is now the third fastest-growing town in South Dakota. And the future looks good. With a $20,000 license purchased in 1991 for a Super 8 Motel and a recent guaranteed loan from the Small Business Administration, the tribe wiII soon have its first 40-room motel. With this facility the tribe is planning to draw on its native culture to attract tourism. And the tribally owned Buffalo Corporation is reintroducing buffalo on the reservation. While not yet a profitable business venture, the presence of buffalo symbolizes both economic prosperity and spiritual wellness.

(continued)

ing jobs; 3) creating jobs in computer, communication, and other high-technology companies that decide to locate on or near reservations or in Native villages; and 4) indirectly creating jobs by expanding markets for Native products and services through intertribal, regional, national, and international telemarketing—to the extent the companies and jobs are actually located in or near Native communities and are open to Native Americans.

REFOCUSING THE FEDERAL ROLE

Consistent with empowering Native American communities, Congress and appropriate federal agencies could take action in the following areas to develop a federal Native American telecommunications policy, with the involvement of Native American groups, leaders, and telecommunications activists.

▮ Interagency Federal Strategy and Funding

Dozens of federal agencies administer hundreds of federal programs that serve Native Americans. Several already provide some support for Native American telecommunications, but these efforts are uncoordinated and fragmented. Agencies with relevant programs include, for example, the Bureau of Indian Affairs in the Department of the in

BOX 5-3: Cheyenne River Sioux Tribe Telephone Authority: A Catalyst for Reservation Development (Cont'd.)

The feeling of community renewal and hope permeated the recent 1994 Jimmy Carter Work Project, sponsored by Habitat for Humanity. Thirty homes were built by volunteers from all over the country. The Telephone Authority donated $100,000 worth of outside telephone plant, and every employee and board member volunteered for at least a day to help build the homes. Thus 17 years after the CRST Telephone Authority received a Rural Electrification Administration (REA, now the Rural Utilities Service) loan former President Jimmy Carter stood on the reservation and remarked, "I think [the REA] is one of the finest organizations that I've ever known, REA has a solid foundation with farms, with agricultural families, its historical Importance, its ability to bring people together in a democratic organization and let them say what is best for their own community..." Today the Telephone Authority is waiting for approval of another RUS loan to further upgrade and extend telecommunications Infrastructure, and may apply for an RUS grant for a distance learning pilot.

This story Illustrates the Importance of tribal leadership as well as federal support for reservation development Says Orville Mestes, director of the Office of Planning and Economic Development, "One of the things that's happened as a result of the successful ventures of the Telephone Authority is management expertise. We are training our own people to become managers. I think that's key to anything. " According to Bernie La Plante, Manager of the Thrifty Mart, "We took inexperienced workers and gave them the chance to learn the grocery business from the ground up. " As explained by J. D. Williams, General Manager of the CRST Telephone Authority, "There is skepticism abut Indian people running their own businesses We've had our failures, but I think that CRST Telephone Authority and the Cheyenne River Sioux Tribe (are) proving the skeptics wrong. "

SOURCE: Office of Technology Assessment, 1995, with information from J D Williams, General Manager, Cheyenne River Sioux Tribe Telephone Authority, Eagle Butte, SD, personal communication, February 1995, and Jim Felter, "A Prophecy Fulfilled Building the Lakota Community" *Rural Telecommunications Journal of the National Telephone Cooperative Association,* November/December 1994 pp. 14-18

terior, Administration for Native Americans and Indian Health Service in the Department of Health and Human Services, Office of Indian Education in the Department of Education, Native American Programs Division in the Department of Labor, Rural Utilities Service (RUS) in the Department of Agriculture, National Telecommunications and Information Administration in the Department of Commerce. National Science Foundation, Smithsonian Institution, National Endowment for the Arts, and Corporation for Public Broadcasting.[21] Also, many of the activities and working groups of the Administration National Performance Review and National Information Infrastructure programs are relevant to Native Americans, and these initiatives cut across virtually every federal agency and program.

Interagency Strategy

The federal executive branch, with the support and oversight of Congress, could develop an interagency strategy to help provide direction and

[21]Several other agencies also have relevant programs, such as the: National Park Service, Fish and Wildlife Service, and Bureau of Land Management in the Department of the Interior; Department of Energy (including various research laboratories); Army Corps of Engineers and Advanced Research Projects Agency, among others, in the Department of Defense; regional educational research laboratories in the Department of Education: Federal Highway Administration in the Department of Transportation; Department of Housing and Urban Development; Economic Development Administration in the Department of Commerce; Environmental Protection Agency; Small Business Administration; and National Aeronautics and Space Administration.

coordination for Native American telecommunications activities. This could include an interagency task force or working group. The strategy could identify opportunities to make the best use of scarce federal dollars for telecommunications education, training, pilot-testing, and infrastructure development in Native American communities.

The strategy could include use of existing or new electronic clearinghouses to provide information on relevant programs and projects, accessible by Native American leaders and technology activists as well as federal personnel. An electronic clearinghouse would help ensure that federal agencies are at least aware of what others are doing. It also would help Native American activists and advocacy groups learn about federal plans and programs, and have timely opportunities to participate. The clearinghouse could be managed and operated directly by a federal agency, a Native organization or university program serving Native Americans, or a private company (ideally, Native-owned and -operated).

The clearinghouse could include a Native American electronic home page with pointers to home pages of all agencies with information and programs relevant to Native American telecommunications. OTA developed a home page for this study, known as the "Native American Resource Page," that includes links to a variety of other home pages with Native American information (see appendix B). The clearinghouse presumably would be accessible via the Internet and other computer networks.

Over the last decade, Congress has systematically revised and updated many statutory programs to clarify their applicability to Native Americans (e.g., various education, health care, employment, training, and housing programs). Typically, these changes specifically identify American Indians and Alaska Natives, and less frequently Native Hawaiians, as eligible for program services and funding, and occasionally stipulate a required percentage or dollar set-aside for Native Americans. Statutory revisions concerning BIA and IHS programs have further reinforced



Top: *Byron Glacier located about 50 miles southeast of Anchorage, is one of hundreds of glaciers in Alaska; glaciated mountain ranges dominate the landscape in many parts of the state.* ***Bottom:*** *The federal government plays a major role in Alaska, in part because of the large expanse of National Forests, Parks, Preserves, and Wildlife Refuges, and has a responsibility for respecting and protecting Alaska Native sacred sites and cultural traditions.*

the congressional intent that, where feasible, program management and administration be shifted from federal agencies to tribal/village governments. Other statutory actions have continued the shift toward reinforcing Native culture and empowering Native communities to be responsible for their own governance.

The current Congress is considering a wide range of program consolidations and block grant proposals, as part of the larger deficit reduction effort. Native American leaders are concerned that program consolidations may have the unintended effect of reducing Native participation in program decisions and management, possibly cutting funding for Native programs, and undermining the federal trust responsibility and commitment to

Native self-determination. The current budgetary outlook obviously intensifies competition for scarce funds, and increases the difficulty of securing funding support for new and emerging priority areas such as telecommunications. Congress could provide programmatic guidance to ensure that Native American telecommunications activities get adequate attention.

Congress and the President could direct the Administration to conduct a cross-cutting review of all federal programs and activities that are relevant to Native American telecommunications. The Office of Management and Budget (OMB, in the Executive Office of the President) and NTIA, for example, could coordinate the review. The review could organize relevant programs around key themes such as: 1) developing local telecommunications infrastructure; 2) providing education and training on telecommunications applications; 3) strengthening tribal, Alaska Native, and Native Hawaiian expertise in telecommunications planning; 4) supporting the formation of Native-owned and -operated telecommunications companies; and 5) designing creative strategies to leverage telecommunications for education, health care, multiservice delivery, and economic development. This could provide a framework for estimating current funding and other support for Native telecommunications, including both government-wide totals and allocations to the thematic areas. The results should help identify new opportunities for collaborative, multipurpose investments and activities, and provide a stronger basis for ensuring that the federal commitment to Native American telecommunications is sustained at the level desired by Congress. Absent such a framework, it will be difficult, if not impossible, to understand the aggregate implications of numerous separate programmatic and budget decisions that may impact Native telecommunications.

Guidance from Congress, the White House, OMB, and/or NTIA could extend to the Information Resources Management (IRM) and National Performance Review (NPR) programs of the BIA, IHS, and other agencies with a major mission related to Native Americans. Aspects of the National Information Infrastructure (NII) program that are most relevant to Native Americans also could be included. Specific NPR, NII, and IRM plans could be prepared for: 1) electronic delivery of federal (and other) services to Native Americans over the NII; 2) pilot-testing of telecommunications applications in Native American communities; and 3) development of Native American telecommunications infrastructure.[22] These plans also could address the need for tribes and Native organizations to make use of the NII for a wide range of self-governance functions.

Agency-Specific Strategies

NTIA could develop a strategy that gives higher priority in current grant programs to building Native American telecommunications expertise and infrastructure.[23] NTIA could establish a new grant program for tribes and Native organizations that consolidates PEACESAT[24] and a portion of resources currently allocated to the Public Telecommunications Facilities Program[25] and the Telecommunications and Information Infrastructure Applications Program. NTIA would be a logical agency to coordinate with the National Institute of Standards and Technology, also in the Department

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[22]BIA and IHS, for example, could pool their IRM and telecommunications resources in a joint effort to meet both agency and tribal needs. Randy Ross, Telecommunications Consultant, Rapid City, SD, personal communication, Apr. 8, 1995.

[23]For example, NTIA is funding a planning grant for tribal councils to explore options for computer networking. Roanne Robinson, Special Assistant, NTIA, personal communication, May 3, 1995.

[24]PEACESAT stands for the "Pan-Pacific Educational and Communications Experiment by Satellite" program that uses satellite telecommunications for distance education and telemedicine between the Hawaiian and other Pacific Islands.

[25]See NTIA, "NTIA/PTFP Native American Grants," December 1994. NTIA provided funding to various tribal governments and organizations for construction of public radio and television facilities.

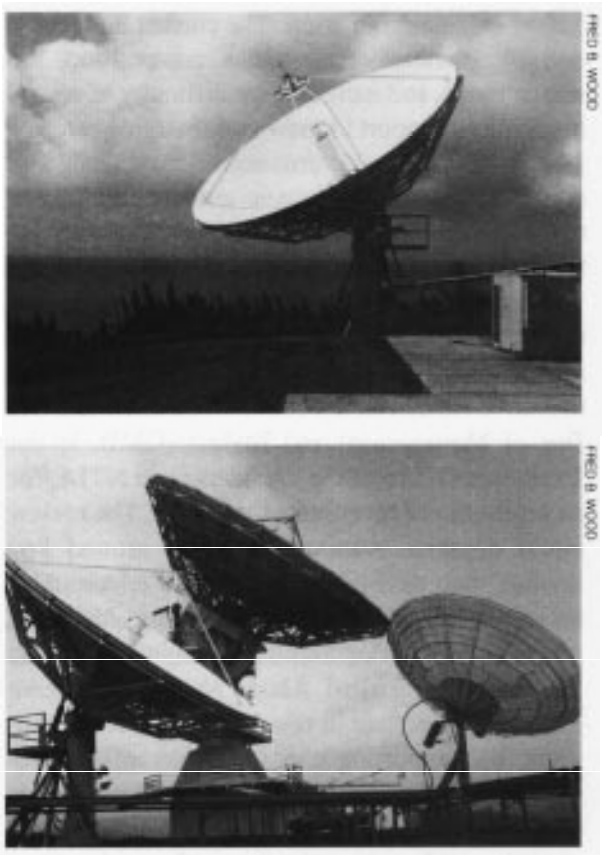
of Commerce—as well as with the FCC-on tribal telecommunications security and standards issues, and with the Office of Information and Regulatory Affairs (in the Office of Management and Budget, Executive Office of the President) on tribal privacy, intellectual property rights, and information management topics.

The Rural Utilities Service (formerly the Rural Electrification Administration, within the Department of Agriculture) could clarify and strengthen its policy on tribal participation. Rural telephone companies owned and operated by tribes or Native Americans are eligible to apply for telephone equipment and infrastructure loans. Few applications are received from Native organizations, however, due to their limited awareness of the program and limited expertise and capital. RUS could develop an outreach program to better inform tribal and other Native governments about RUS loan eligibility and application requirements. RUS could work with BIA, ANA, and other agencies to upgrade technical assistance available to tribes.

RUS also could coordinate with the FCC, and probably NTIA, to make sure that various federal policies and programs work to encourage, rather than discourage, the formation of tribal and Native-owned and -operated telecommunications companies.[26] To ensure that the sum is greater than the parts in facilitating the formation and viability of Native telecommunications enterprises, RUS, FCC, and NTIA could review a wide range of policies and programs: RUS loans; universal service funds; NTIA grants; financial accountability; frequency spectrum auctions or assignments; tribal partnerships with commercial telecommunications companies; technical network and interconnection requirements; and compatibility of RUS, FCC, state regulatory, and tribal telecommunications rules and procedures.

The Bureau of Indian Affairs, Indian Health Service, and Administration for Native Americans could develop both individual and coordinated strategies in Native telecommunications. The BIA and IHS serve the 550 federally recognized tribes and Alaska Native organizations. ANA serves, in addition, about 60 state-recognized tribes, tribes seeking federal recognition, and various Native Hawaiian and Native Pacific-Island American groups.

The BIA uses telecommunications for its own agency purposes, provides some technology support for tribal schools (e.g., classroom computers,



Top: *Satellite earth station operated by COMSAT at Paumalu on the north shore of Oahu Island, Hawaii.* ***Bottom:*** *Satellites provide vital telecommunications links between the Hawaiian Islands and both the mainland and other Pacific Islands. The COMSAT facility at Paumalu monitors telemetry necessary for operational control of satellites sewing the Pacific Basin.*

[26] RUS also administers a distance learning and medical link grant program. See U.S. Department of Agriculture, RUS, "Distance Learning and Medical Link Grant Program Application Kit'' Washington, DC, Dec. 1, 1994, and "The Information Superhighway and the Rural Utilities Service." n.d.

distance learning, computer networking[27]), and supports computer systems for the benefit of tribes at its Geographic Data Service Center and Division of Energy and Mineral Resources (e.g., the National Indian Oil and Gas Evaluation and Management System, National Indian Energy and Mineral Resources Database, and National Indian Seismic Evaluation System). BIA does not, however, have a policy or strategy for the overall development of tribal telecommunications capabilities or infrastructure, although it is working on a draft strategy under the leadership of its Information Resources Management office. IHS also uses telecommunications for its own agency purposes, provides technology support to tribal hospitals, and actively promotes telemedicine, teleradiology, computerized medical records, and other telecommunications-based medical and health applications. IHS has a general strategy on medical technology development, including telecommunications, but has not fully linked this strategy to other aspects of tribal telecommunications such as infrastructure development. ANA primarily administers grant programs for social, economic, and, recently, cultural development on reservations and in Native villages. ANA is interested in telecommunications, but does not have a policy or strategy or programmatic emphasis on telecommunications.

These three agencies could develop a coordinated strategy for the development of telecommunications expertise and plans at the Native community level. The agencies could find ways to leverage scarce resources by training local technical experts, using the BIA and IHS telecommunications infrastructure where appropriate and feasible, and collaborating with telecommunications policy and funding agencies (e.g., the FCC, NTIA, RUS) and with other federal agencies that serve Native Americans (e.g., Small Business Administration, Economic Development Administration, Agriculture Extension Service, Federal Highway Administration, and Employment and Training Administration).

Most importantly, BIA, IHS, and ANA could develop a clear vision of the role of telecommunications infrastructure in meeting larger policy objectives, such as strengthening Native self-governance and improving the delivery of services to Native Americans. This vision could be closely tied to agency reinvention activities under the National Performance Review. Native leaders, groups, and activists would need to be centrally involved in the creation and implementation of a strategic telecommunications vision, as well as detailed followup plans.

Telecommunications Policy

Over the past two years, Native American telecommunications activists have asserted that federal telecommunications policy ignores or contradicts the principles of Indian law and federal Indian policy.[28] Based on its research, OTA reached a similar conclusion. The federal agencies with major responsibility for telecommunications policy, such as the FCC and NTIA, have not applied Indian law to telecommunications policy. The agencies with lead responsibility for Native American programs, such as the Bureau of Indian Affairs, Indian Health Service, and Administration for Native Americans, do not have a Native American telecommunications policy; nor are they effectively engaged in the wider telecommunications policy debate. The federal government does not have a coherent focus on telecommunications policy as it relates to Native Americans.

The NTIA and FCC could initiate policy inquiries on Native American telecommunications, and invite active participation from tribal govern-

[27]Including ENAN, the Educational Native American Network.

[28]See, e.g., Americans for Indian Opportunity, *First Native American Telecommunications Forum* (Bernalillo, NM: Americans for Indian Opportunity, December 1993), final report prepared for the National Science Foundation; James A. Casey, Esq., Fletcher, Heald & Hildreth, Arlington, VA, "Sovereignty," discussion paper, Jan. 30, 1995, and "Tribal Sovereignty and Telecommunications Opportunities: A Brief Discussion," n.d.





Left: *AT&T Long Lines ship docked in Honolulu Harbor preparing to lay undersea fibre optic cable between several of the Hawaiian Islands.* ***Right:*** *Undersea fiberoptic lines complement satellites in linking Hawaii electronically with the rest of the world. GTE Hawaiian Telephone Co. contracted with AT&T to lay interisland fiberoptic cable that connects with trunk lines on the islands and transoceanic undersea links to the U.S. mainland and Pacific Rim.*

ments, Native technology activists, state regulators, private companies, and the like.[29] These policy initiatives could address both the need for and content of a government-wide policy statement and strategy, and specific topics like sovereignty and self-determination, universal access, and strategic partnerships.

Government-wide Policy Statement

Congress and the President could designate a lead agency, such as NTIA, to develop and draft a policy statement that would apply established Indian policy principles[30] to Native American telecommunications. NTIA could work with the FCC, state telecommunications or public utility regulatory commissions, tribal and other Native governments, and other relevant individuals and organizations in preparing a draft policy. Broad participation and review by tribes and other Native governments, and by Native leaders and telecommunications activists, would help ensure a credible result.

The policy statement could, for example: 1) define the applicability of the federal trust responsibility to telecommunications, an essential component of ensuring tribal well-being and survival; 2) clarify the role of tribes as sovereign governments-equivalent to states—for the purpose of regulating and operating tribal telecommunications where tribes wish to do so; and 3) encourage tribes to develop the capacity for self-determination regarding telecommunications activities on tribal lands. The policy statement might also address more specific telecommunications policy topics such as: universal access on tribal lands, allocation of federal frequency spectrum to tribal governments, interoperability of telecommunica-

[29] The White House has appointed one American Indian—LaDonna Harris, President, Americans for Indian Opportunity—to the Administration's National Information Infrastructure Advisory Council, a private and public sector advisory committee that makes recommendations to the Secretary of Commerce. Information on NIIAC activities, including Native American testimonies at a meeting in Santa Fe, NM, on Apr. 12, 1995, can be found on a Department of Commerce Gopher server, gopher://iitf.doc.gov.

[30] See chapter 4.

tions systems on tribal lands, and quality of tribal telecommunications service.

A federal policy presumably would apply to all federally recognized tribal and Alaska Native governments (approximately 550 in total). The policy could, however, afford flexibility to individual tribes, recognizing that they will have differing levels of interest and capability in assuming telecommunications responsibilities. And tribal interest and capability likely will change over time. The policy could direct federal agencies to apply these principles—to the extent appropriate—to state-recognized tribes and Native Hawaiian groups or communities. The policy could establish new consultative mechanisms to improve coordination and collaboration between tribes, Alaska Native villages, Native Hawaiian communities, and their respective state government telecommunications agencies.

Congress could amend federal telecommunications law, and the Communications Act of 1934 in particular, to include a clear statement acknowledging the unique status of tribal governments, requiring tribal involvement in all aspects of telecommunications policy, and mandating the NTIA, FCC, and other appropriate federal agencies to develop detailed policy and legislative proposals. Tribal telecommunications provisions could be included in broader telecommunications policy reform bills, or through subsequent amendments or separate legislation—such as a "Tribal and Native American Telecommunications Act" or the equivalent. Congress could amend other statutes to provide guidance to relevant federal agencies on their role in Native American telecommunications. Where appropriate, legislation could address various agency policy and programmatic initiatives.

The FCC could develop an American Indian and Alaska Native tribal policy, or a broader Native American policy; set up an office of tribal or Native American affairs; and include tribal governments in regulatory proceedings on the same basis as states. This would be particularly important on issues such as universal access and sales of rural telephone exchanges that may significantly affect reservation and other Native American areas. Tribes could be represented on the joint federal-state board that helps determine universal service fund procedures and allocations.[31] Also, the FCC could consider giving preference or priority to participating tribes in auctions or allocations of frequency spectrum over Indian lands where this is desired by and would benefit tribes.[32] The FCC could review its policies, programs, and rulemakings to ensure that Indian policy principles are applied to any activities that have significant impacts on tribes and tribal lands. The FCC could open up a new formal notice of inquiry and rulemaking on Native American telecommunications issues.

The logical application of Indian law and federal Indian policy[33] to the jurisdiction of the FCC would suggest that the FCC: 1) recognize tribes as governmental entities and make the distinction between minorities as individuals under existing minority policy, and tribes as governments under Indian policy; 2) thoroughly consider the implications of proposed FCC actions for tribes; 3) afford tribes opportunity for full participation in FCC rulemakings; 4) encourage tribal self-determination with regard to telecommunications on tribal lands; 5) afford tribes a governmental status equivalent to that of states with regard to telecommunications regulation and operations on tribal lands, for those tribes desiring this status; and 6) encourage increased cooperation between and among state and tribal governments and the FCC.

A major challenge would be defining a new telecommunications regulatory regime that involves the FCC, states, and tribes working as part-

[31]The federal-state board could be expanded by administrative or legislative action to include some tribal representation.

[32]See chapter 4 for discussion of the FCC's current policies.

[33]For detailed discussion of Indian law and policy, see chapter 4.

ners in government-to-government relationships. These relationships could be complex.[34] As a general rule, state governments lack jurisdiction over tribes and over Indians living on reservations, unless Congress has expressly granted such jurisdiction. However, states generally do have jurisdiction over non-Indians living on reservations, unless: 1) preempted by federal law;[35] 2) the non-Indians have consented to tribal jurisdiction; or 3) the exercise of state authority would infringe on the ability of a tribe to govern itself or would threaten the economic security, health, or welfare of the tribe.[36] Thus, if a tribe's jurisdiction is challenged, a court will conduct an inquiry into the nature of the state, federal, and tribal interests at stake to determine if the state may regulate activity on tribal lands. If the activity is subject to regulation under federal statute, then the court will analyze whether state regulation is preempted. If no federal statute applies, then the court will balance the interests of the tribe and the state. In the field of telecommunications, the existing balance of federal-state authorities and responsibilities would, presumably, need to be adjusted to accommodate heightened tribal involvement.[37]

The essence of the tribal telecommunications policy challenge is the application of principles of tribal sovereignty to this technological arena. Tribal telecommunications policy is in its infancy. Tribal technology advocates believe that telecommunications offers the potential to help revitalize Native communities while preserving and strengthening Native values and traditions. This is only likely to occur, however, if tribal sovereignty that is now established policy in the realms of education, health care, public works, and governance is extended to another key part of the community infrastructure—telecommunications. Native American advocates believe that only in this way can tribal sovereignty in cyberspace be reasonably ensured.[38]

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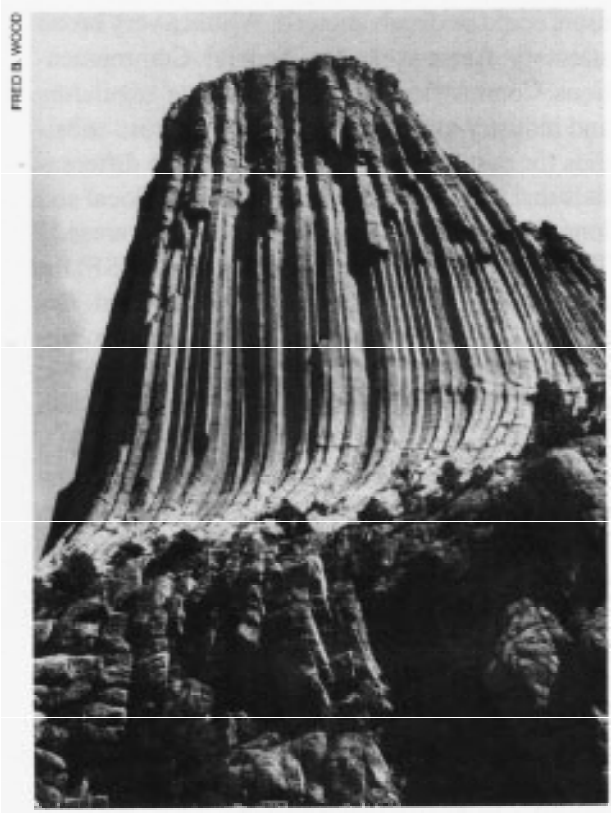
[34]State laws and legislative activity on Native American issues are extensive. See, e.g., Kimberly A. Morin, *1994 State Legislation on Native American Issues* (Denver, CO: National Conference of State Legislatures, September 1994); and Alex White-Tail Feather, James B. Reed, and Judy Zelio, *State-Tribal Legislation: 1992 and 1993 Summaries* (Denver, CO: National Conference of State Legislators, February 1994). For an example of the complexities involved, see the 1995 proceedings of the South Dakota Public Utilities Commission on the proposed acquisition of local telephone exchanges by a tribally-owned telephone company (Owl River Telephone, Inc., a wholly owned subsidiary of the Cheyenne River Sioux Tribe Telephone Authority).

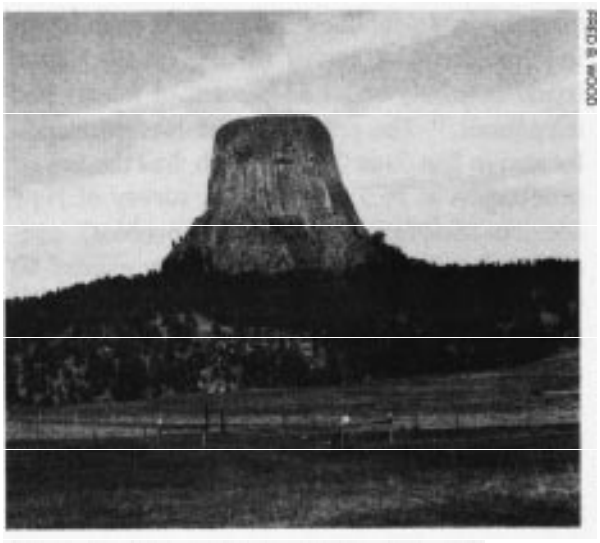
[35]See, e.g., *New Mexico* v. *Mescalero Apache Tribe*, 462 U.S. 324, 338-44 (1983).

[36]*Montana* v. *United States*, 450 U.S. 544, 565-66 (1981).

[37]The increasing involvement of tribal governments in the public utility industry, e.g., energy and electric power, may provide some insights and precedents for tribal telecommunications activities. The Energy Policy Act of 1992 (Public Law 102-486) essentially decentralized the electric power industry by expanding the range of companies that can enter the electric power generation market and ending electric power company monopoly control over interstate transmission lines. Title 26 of the act encouraged tribes to develop and regulate energy sources such as solar and wind energy, hydropower, and cogeneration. The involvement of tribes in the energy business has, however, created complex tribal-state-federal regulatory issues that may be indicative of the kinds of issues likely to arise should tribes became major players in telecommunications. See generally Martin V. Kirkwood, "Federal and State Regulation of Tribal Utilities," *Natural Resources & Environment*, vol. 7, No. 4, spring 1993, pp. 27-29, 59-61.

[38]This phrase derives from Baldwin, "American Indian Identity and Tribal Sovereignty in Cyberspace," op. cit., footnote 7; and Randy Ross, "The Net and Federal Indian Law," statement prepared for the National Information Infrastructure Advisory Council meeting, Santa Fe, NM, Apr. 12, 1995. Tribal legal advocates believe that tribes should have legal authority over telecommunications on or over Indian lands, and that the federal trust responsibility should include frequency spectrum allocation and use. Karen Funk and Sandra Ferguson, Esq., Hobbs, Straus, Dean & Walker, Washington, DC, personal communication, Feb. 6, 1995; James A. Casey, Esq., Fletcher, Heald & Hildreth, Washington, DC, personal communication, Apr. 27, 1995; John Tahsuda, Esq., Holland & Hart, Denver, CO, personal communication, Apr. 28, 1995.





Left: *Devil's Tower stirred the imagination of Indians, who called it* Mateo Tepee, *meaning Grizzly Bear Lodge.* Kiowa *and Cheyenne Indian legends hold that the rock rose into the air protecting tribal members from a gigantic bear leaving claw marks gouged into the rock.* ***Right:*** *Devil's Tower rises 1,200 feet above the Belle Fourche River in northeast Wyoming, Devil's Tower National Monument was established in 1906 as the first national monument. Over the generations, the Shoshone, Comanche, Kiowa, Crow, Arapaho, Cheyenne, and Sioux Indians, among others, came to this area to camp and hunt.*

Universal Access

The universal service component of national telecommunications policy could be revised to better meet Native American needs. Native Americans living in rural areas historically have had limited access to telecommunications. This results from the higher costs and technical difficulties of serving geographically remote areas, combined with the distressed socioeconomic conditions in many Native communities. American Indian reservations and Alaska Native villages are, as a whole, among the most underserved areas of the United States with regard to telecommunications. There-cent increase in pilot tests and small-scale operational projects in rural areas is encouraging. But the gap is still wide between the technologies and services available in major U.S. metropolitan areas and those in rural, remote areas that are home to more than one-third of all Native Americans.

With regard to basic telephone service, the nationwide rural telephone penetration rate averages 91.6 percent of homes.[39] While less than the 95.6 percent average in urban areas, the rural average seriously overstates actual telephone penetration in rural Native American communities. Analysis of U.S. Census data indicates that rural Native Americans as a group have an average telephone penetration rate of 55 percent-the lowest of any ethnic group in any geographic area. [a]This means that almost half of rural Native homes do not have

[39] National Exchange Carrier Association, Inc., "Comments" prepared in response to NTIA Notice of Inquiry of Universal Service and Open Access Issues, Docket No. 940955-4255, Dec. 14,1994, p. 24.

[40] Ibid. Note that the 55 percent penetration estimate was a weighted average based only on communities with 50 percent or higher Native American population. For further details, contact the National Exchange Carrier Association. Also see Bureau of the Census, U.S. Department of Commerce, News Release No. CB94-127, Aug. 22, 1994, on Native American reservation household telephone penetration.

that almost half of rural Native homes do not have telephones. Telephone penetration is even lower in some areas. A survey of the Navajo Nation found that only about 35 percent of homes had telephones.[41] The portion of the Navajo Nation located in San Juan County, Utah, had the lowest penetration at 26.5 percent.[42] A survey of New Mexico reservations (including pueblos) concluded that "rural reservations rarely exceed 60 percent [residential telephone] penetration."[43] Alaska Natives and Native Hawaiians in rural areas generally have higher telephone penetration rates than rural American Indians, but still below the national averages.

Low telephone penetration in rural Native areas generally reflects a combination of infrastructure deficiencies, low family income, and, in some cases, cultural preferences. Some rural Native Americans prefer not to have a telephone for cultural or lifestyle reasons, even when costs are significantly subsidized through universal service funds and telephone lifeline programs.[44]

The principle of universal access dates to the early days of telephony, and reflects the congressional and governmental desire that all areas of the nation have reasonable access to telecommunications services. Congress was concerned that individual telephone customers, local users, and rural users could be disadvantaged. Within a very broad statutory framework, the Federal Communications Commission worked with state regulators and industry to establish a system of cross-subsidies (or cost-shifting) to reduce the rate differentials that would otherwise exist between local and long-distance calls, and rural and urban areas.[45] This includes a Universal Service Fund (USF) for rural areas (administered by the National Exchange Carrier Association) and a telephone lifeline assistance program (offering low-cost basic service) for low-income users in rural and urban areas.[46]

Also, Congress established a rural telephone program, now administered by the Rural Utilities Service, within the U.S. Department of Agriculture, to provide subsidized and government-guaranteed loans to rural telephone companies.[47] Congress acted on the assumption that rural, remote America would be disadvantaged because of the inherently higher costs of telephone service in areas with much lower customer density and much longer distances to wire (i.e., higher costs spread over fewer customers).[48]

Advancing technologies and services, deregulation, and increasing competition have compli-

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[41]Rodger Boyd, testimony before the National Telecommunications and Information Administration and New Mexico State Corporation Commission, Hearing on Universal Service, Albuquerque, NM, Dec. 16, 1993.

[42]Ibid.

[43]Miller Hudson, John Cordova, and Stan Pino, "New Mexico Tribal Telecommunications Research Study 'Community of Interest Network—Information Highway Project,'" prepared by TakeOne Productions, Denver, CO, for US West, Jan. 30, 1995. US West also sponsored a similar study of Arizona tribal telecommunications.

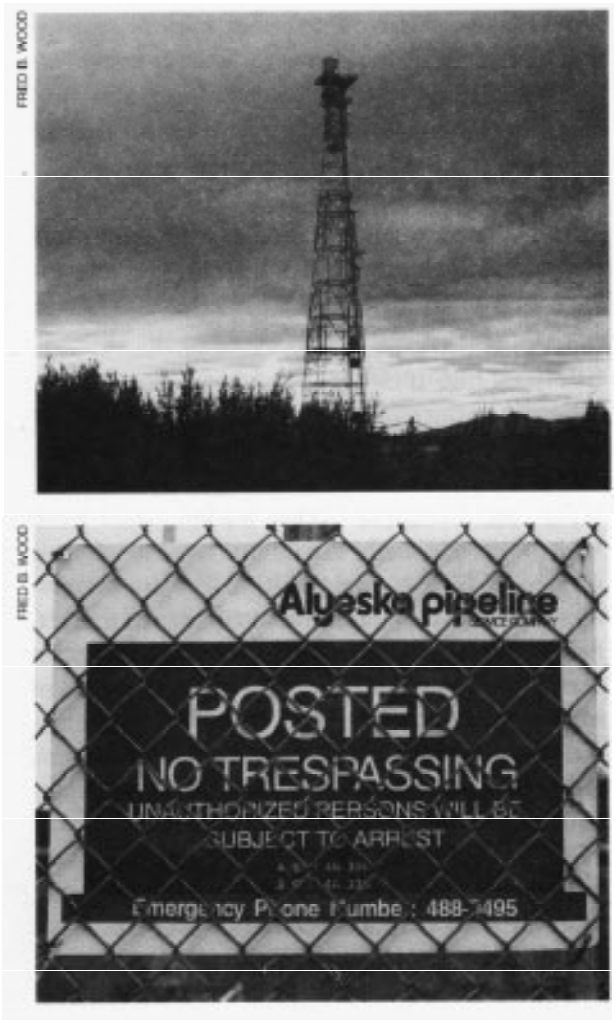
[44]GTE Telephone has found this often to be the case in its New Mexico service area. Duane G. Johnson, Assistant Vice President, Regulatory Affairs and Government Relations, GTE Telephone, Irving, TX, personal communication, May 2, 1995.

[45]See generally, U.S. Congress, Office of Technology Assessment, *Rural America at the Crossroads: Networking for the Future*, OTA-TCT-471 (Washington, DC: U.S. Government Printing Office, April 1991).

[46]See National Exchange Carrier Association, "An Industry Agent of Universal Service," Washington, DC, Nov. 9, 1994.

[47]See Rural Electrification Administration, U.S. Department of Agriculture, *Rural Electrification Act of 1936, With Amendments as Approved Through December 17, 1993*, Informational Publication 100-1 (Washington, DC: Rural Electrification Administration, 1994), and "An Overview of the REA Telephone Loan Program," n.d.

[48]OTA, *Rural America at the Crossroads*, op. cit., footnote 45.



Top: *Microwave relay tower along the Richardson Highway and the Trans-Alaska Pipeline, operated by the Alyeska Company This tower is located between Paxson and Delta Junction, Alaska.* ***Bottom:*** *The Alyeska Company depends on microwave communication links for telephone service along much of the pipeline route. Pipeline operations, maintenance, and security depend on telecommunications.*

cated the definition and implementation of universal access. Congress is in the process of revising national telecommunications policy, and could consider and refine the universal access proposals to specifically address Native American needs. The FCC is examining universal access as well, and could give greater attention to the implications for Native tribes, villages, and communities.[49] Also, NTIA is studying universal access as part of the NII initiative.[50] These inquiries could focus more explicitly on the availability of universal service funds and telephone lifeline services in rural Native areas. Pending legislation would reaffirm the national commitment to universal service and provide statutory guidance to the FCC in its efforts to revise and update universal service in light of changes in technology and competition.[51]

Congress, the FCC, and NTIA could consider, from Native American Perspectives: 1) the definition of universal service (e.g., what technologies and services to include); 2) benchmark levels of service (e.g., need and ability to pay for specific types of services, and surrogate indicators like per-capita income or customer density per square mile); 3) cross-subsidies required (based on assumptions about services, costs, needs, and ability to pay); and 4) alternative ways to provide the cross-subsidies (e.g., surcharge on service costs, percentage of gross revenues, reserve capacity, or customer vouchers). Congress and the Administration could review and possibly revise the RUS's rural telephone programs that currently or potentially benefit Native American service areas (specifically including Native Hawaiian commu-

[49] Federal Communications Commission, Notice of Inquiry on Amendment of Part 36 of the Commission's Rules and Establishment of a Joint Board, Common Carrier Docket No. 80-286, Aug. 30, 1994.

[50] National Telecommunications and Information Administration, U.S. Department of Commerce, Notice Of Inquiry of Universal Service and Open Access Issues, Docket No. 940955-4255, Sept. 13, 1994.

[51] See S.652, the "Telecommunications Competition and Deregulation Act of 1995," 104th Cong., 1st Session, passed as amended by the U.S. Senate; and H.R.1555, the "Communications Act of 1995," 104th Cong., lst Session. Also see U.S. Congress, Senate, Committee on Commerce, Science, and Transportation, Telecommunications Competition and Deregulation Act of 1995, S.Rpt. 104-23 (Washington, DC: U.S. Government Printing Office, Mar. 30, 1995). See generally Angele A. Gilroy, Congressional Research Service, "Telecommunications Regulatory Reform," CRS Issue Brief IB95067, Apr. 21, 1995 (updated regularly).

nities as well as American Indian reservations and Alaska Native villages).

The general opinion of Native activists and leaders is that universal service should be a dynamic, not static, concept. Telecommunications services available to rural Native areas should improve over time in approximate parallel with service upgrades in non-Native rural areas and metropolitan areas. In this view, basic telephone service—a goal not yet achieved in many rural Native areas—should be a minimum standard; enhanced services will be needed if rural Native Americans are to fully leverage the technology for educational, health care, economic development, and other purposes.[52] In large part because of universal service funds and RUS loans, rural telephone companies have been able to upgrade rural telephone equipment and networks in recent years—digital switching is now commonplace and fiberoptic backbone is increasing rapidly.[53] However, reservation areas are among the most expensive to serve and among the last to get the technology upgrades.

Without universal service funds, telephone rates in rural areas could, and probably would, increase significantly—estimated at 30 percent or more.[54] Given the already depressed incomes on many Indian reservations and in most Alaska Native villages, this would further impede realization of even basic telephone service for many Native Americans. Telephone penetration rates drop significantly for households with an annual income under $20,000, and even more dramatically when annual income dips below $10,000.[55] Many rural Native household incomes fall within this range, and thus are most vulnerable to rate increases.[56]

Strategic Partnerships

Strategic partnerships between the private sector and tribes, villages, communities, and Native service providers could be encouraged by the FCC, NTIA, and Congress. Native leaders could work with the private sector to examine ways to upgrade service to Native communities. Private companies could develop their own estimates of market, demand, and cost factors in Native American areas. The companies could estimate what mix of market forces, customer demands, cross-subsidies, federal (and other governmental) programs, and perhaps nonprofit-sector programs would result in upgraded services to Native Americans.

This could involve participants such as regional Bell operating and other telephone companies; long-distance telephone carriers; competitive access carriers (including electric power utilities);

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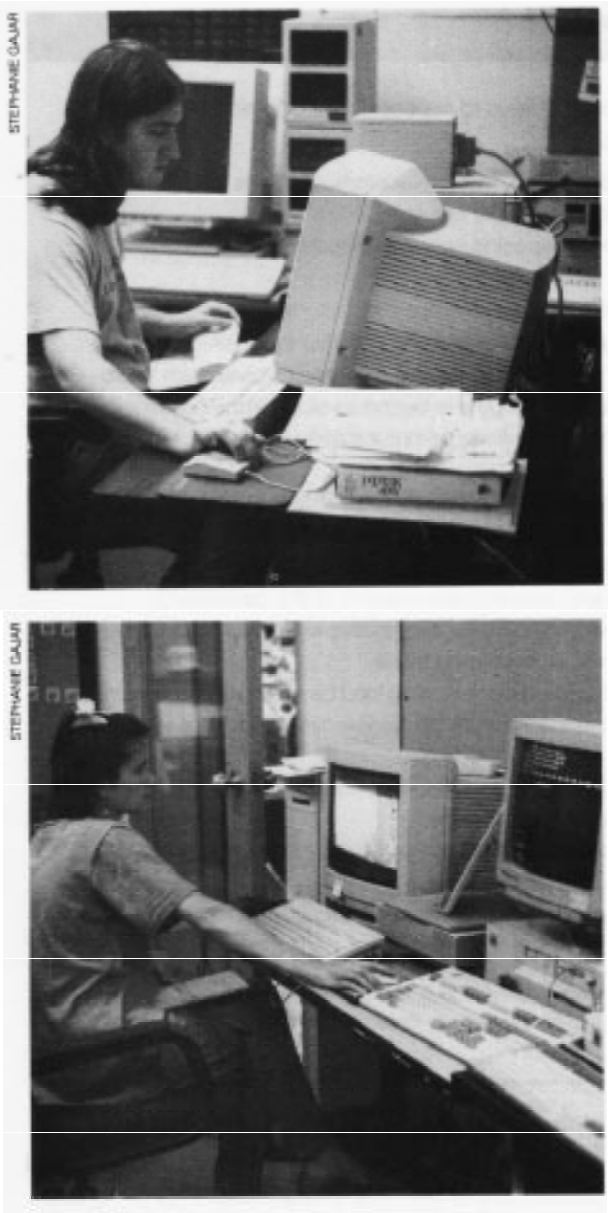
[52]See National Telecommunications and Information Administration, U.S. Department of Commerce, *The NII Field Hearings on Universal Service and Open Access: America Speaks Out* (Washington, DC: NTIA, September 1994), a report of the Information Infrastructure Task Force, Telecommunications Policy Committee. Also see statement by LaDonna Harris, Americans for Indian Opportunity, Bernalillo, NM; James H. May, California State University at Chico; and George Baldwin, Henderson State University (now at California State University at Monterey Bay), "Opinion Statement on Universal Service for American Indians and Alaska Natives," prepared for the National Telecommunications and Information Administration, n.d.

[53]See Rural Electrification Administration, U.S. Department of Agriculture, *1993 Statistical Report: Rural Telephone Borrowers*, Informational Publication 300-4 (Washington, DC: REA, August 1994); and National Exchange Carriers Association, "Building the Telecommunications Infrastructure in Rural America: Achievements Toward the Promise," Washington, DC, November 1993.

[54]See Rocky Mountain Telecommunications Association, Scottsdale, AZ, and Western Rural Telephone Association, Santa Rosa, CA, Universal Service Subcommittee, "Universal Service in the Nineties," A Western Alliance Report, n.d.; Carol Weinhaus, Sandra Makeeff, Peter Copeland, et al., "What is the Price of Universal Service? Impact of Deaveraging Nationwide Urban/Rural Rates," Telecommunications Industries Analysis Project, School of Business, University of Southern California, July 25, 1993; and Carol Weinhaus, Teresa Pitts, Rob McMillan et al., "Abort, Retry, Fail? The Need for New Communication Policies," Telecommunications Industries Analysis Project, College of Business Administration, University of Florida, Oct. 10, 1994.

[55]See NECA, "Comments," op. cit., footnote 39; Jorge Reina Schement, Alex Belinfante, and Larry Povich, "Telephone Penetration 1984-1994," paper prepared for the Federal Communications Commission's Chairman Reed Hundt, Oct. 17, 1994; Jorge Reina Schement, Rutgers University, "Beyond Universal Service: Characteristics of Americans Without Telephones, 1980-1993," Mar. 1, 1994.

[56]For the Navajo Nation, for example, about 55 percent of households have annual incomes below $19,000. See Boyd, op. cit., footnote 41.



Top: *NYSERNet's computer operations center in Liverpool, New York. NYSERNet, Inc., provides computer networking services, training, and technical support to educational, research, governmental, and other users-including Indian tribes.* ***Bottom:*** *NYSERNet provides Internet connectivity for the Oneida Nation in New York. The Oneida Nation has developed home page that is accessible via Internet at http:llnysernet.orgloneidal. Also see appendix B.*

rural telephone cooperatives; cable television companies; cellular telephone, satellite, and other wireless companies; radio/TV broadcasting stations; and computer technology, service, and networking companies. The examination could identify economic development, community infrastructure, and other policies, in addition to telecommunications policy, that might work together to help upgrade service.

Telephone companies, for example, vary in their approach to the rural reservations and villages in their service zones. Some are upgrading service to rural areas, including reservations. Some companies provide grants or other forms of special assistance to Native and other underserved rural areas. Others are selling off rural telephone exchanges that are too costly to serve or do not fit in with corporate objectives. Tribes have a major say, if they wish to exercise it, in who provides telecommunications on reservation lands and how it is achieved. In some situations, tribes may wish to enter into formal partnerships with telecommunications providers, or organize their own tribally controlled and operated telecommunications companies and cooperatives. The results of a New Mexico tribal telecommunications survey identified 12 keys to successful introduction of new technologies in tribal communities (see box 5-4).

The few tribes with significant gaming revenues could invest some portion of net profits in telecommunications infrastructure and services, including the formation of tribal telecommunications companies or partnerships. The Indian Gaming Regulatory Act[57] permits use of net revenues from tribal gaming to fund tribal government operations and programs, provide for the general welfare of the Indian tribe and its members, and promote tribal economic development. Investments in tribal telecommunications and tribal telecommunications companies and partnerships, properly defined and organized, should serve one or more of these purposes.

[57] Public Law 100-497, 25 USC Sec. 2710(b)(2)(B).

BOX 5-4: Keys to Building Telecommunications Infrastructure in Native American Communities

A survey of New Mexico tribes and pueblos identified 12 keys to successful introduction of telecommunications technology in traditional Indian communities:

1. Form collaborate relationships with key participants early in the telecommunications infrastructure development process and emphasize perceived community needs.
2. Determine individual and community goals before proposing specific telecommunications service options.
3. Provide specific information about the strengths and weaknesses of new telecommunications technology and how the technology can contribute to individual and community goals.
4. The new telecommunications technology—and the participants and partners involved with implementation—must be "culturally appropriate" if the technology is to become valued in the community.
5. Exercise sensitive and appropriate interpersonal cross-cultural communication skills and behaviors when working in and with Indian communities.
6. Demonstrate an awareness, sensitivity, and appreciation for issues related to the preservation of traditional cultural and sacred places.
7. Tell the entire story about an operational telecommunications development project, including the role local participants played in changing the living and learning environment of the community
8. New telecommunications technology and/or services should be sustainable and should build on existing capacities for addressing community needs, desires, and goals.
9. New telecommunications technology should be targeted at increasing total benefits to the community. Long-term benefits to providers, partners, and entrepreneurs will also be optimized if this strategy is employed.
10. Knowledge about new telecommunications technology should be disseminated with care so that the effectiveness of the technology is fully and accurately understood.
11. Communicate all anticipated outcomes of telecommunications projects to clients, decisionmakers, and the broader public in a culturally influential and comprehensible way.
12. Design and Implement telecommunications development projects in partnership with others so as to maximize benefits and minimize costs at the community level.

SOURCE: Office of Technology Assessment, 1995, based on Miller Hudson, John Cordova, and Stan Pine, "New Mexico Tribal Telecommunications Research Study 'Community of Interest Network—information Highway Project," prepared by TakeOne Productions, Denver, CO, for US West, Jan 30, 1995

▮ Information Policy

Federal officials need to explicitly consider Native American perspectives when formulating information policy. And Native groups need to be encouraged to develop positions on privacy, intellectual property rights, and other information policy issues.

For more than a decade, computer activists and advocates in the U.S. research and business communities have been concerned about the risks and complications, as well as the benefits, of using electronic networks to retrieve, distribute, and exchange information.[58] Paramount among information policy issues are privacy, intellectual

[58]See, e.g., OTA, *Making Government Work,* op. cit., footnote 1; U.S. Congress, Office of Technology Assessment, *Finding a Balance: Computer Software, Intellectual Property, and the Challenge of Technological Change,* OTA-TCT-527 (Washington, DC: U.S. Government Printing Office, May 1992): and *Critical Connections: Communication for the Future,* OTA-CIT-407 (Washington, DC: U.S. Government Printing Office, February 1990). Also see U.S. Office of Management and Budget, Circular A-130, "Management of Federal Information Resources," June 25, 1993, and the "Paperwork Reduction Reauthorization Act of 1995," Public Law 104-13.

(and cultural) property rights, security, computer crime, and electronic freedom of speech and press. These concerns have been intensified by the decreasing costs of computers and telecommunications and the rapid increase in the use of networks in recent years.

Native Americans familiar with electronic networks are concerned that telecommunications could increase the likelihood of electronic invasions of tribal privacy, and electronic abuse or misuse of information, products, and services created or provided by tribes and tribal members.[59] One concern is that sensitive Native religious and spiritual information, if computerized, could more easily be accessed by unauthorized persons and used for inappropriate purposes. Computer networking makes it more difficult to verify the authenticity of users; some non-Indians have been using Indian names and computer addresses on the Internet. Native arts, crafts, and traditional practices are especially vulnerable to misuse and misrepresentation. Non-Natives may use or sell Native artwork electronically without authorization or fair compensation, or may advertise and sell non-Native art as Native. These kinds of activities are clear violations of privacy and intellectual property rights, and also compromise Native cultural identity and self-determination.

The volume of Native information and cultural materials created and marketed electronically is still small, as is the number of tribes and Native Americans using computer networking. Computer and telecommunications use by Natives is growing rapidly, however. Younger generations are much more familiar with the technology than their tribal elders, and will further accelerate the growth of computer networking and use of multimedia and other electronic technologies that are well suited to recording and sharing Native culture. Also, as Native governments make greater use of telecommunications, they will need to give heightened attention to protecting the privacy and security of medical and other personal information needed for tribal administration and for delivery of health, social, and employment services.[60]

Native Americans, therefore, have a significant and growing interest in the overall evolution of U.S. privacy and intellectual property policy, as well as development of tribal-specific policies that may vary depending on local values and customs. Native participation in national information policymaking efforts seems essential to ensure that policies reflect Native concerns and protect the religious and cultural heritage of Native Americans.

Regional and national Native groups, such as the National Congress of American Indians and Federation of Alaska Natives, could include information policy issues within the purview of any telecommunications committees that they establish. Grassroots groups, such as the Indigenous Communications Association, Americans for Indian Opportunity, and Pacific Islanders in Communications, could collaborate with non-Native computer advocacy and community networking groups concerned with similar issues. The National Public Telecomputing Network, Big Sky Telegraph, Center for Civic Networking, Computer Professionals for Social Responsibility, American Library Association, Consortium for School Networking, and Electronic Frontier Foundation are among the many organizations with whom Native groups might seek common understanding and alliances. Similarly, the American Indian Science and Engineering Society could collaborate with

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[59]See Ross, "Tribal Rights and Cultural Identity in Cyberspace," op. cit., footnote 7; Baldwin, "American Indian Identity and Tribal Sovereignty in Cyberspace," op. cit., footnote 7; and George D. Baldwin, "Public Access to the Internet: American Indian and Alaskan Native Issues," paper prepared for the John F. Kennedy School of Government, Harvard University, February 1994.

[60]See, generally, OTA, *Making Government Work*, op. cit., footnote 1; *Protecting Privacy in Computerized Medical Information*, OTA-TCT-576 (Washington, DC: U.S. Government Printing Office, September 1993); *Information Security and Privacy in Network Environments*, OTA-TCT-606 (Washington, DC: U.S. Government Printing Office, September 1994); and *Issue Update on Information Security and Privacy in Network Environments*, OTA-BP-ITC-147 (Washington, DC: U.S. Government Printing Office, June 1995).



Left: *US West participant at the 1994 annual conference of the American Indian Science and Engineering Society. AISES members include American Indian students, faculty, and science and technology professionals from industry and government.*
Right: *Intel Corporation computer display at the 1994 AISES conference in San Jose, California. AISES provides a forum for discussion of telecommunications and information technology policy issues relevant to American Indians.*

the Institute of Electrical and Electronics Engineers and the American Association for the Advancement of Science. NTIA could initiate an inquiry specifically on tribal information policy issues. The National Science Foundation could fund policy analysis by Native Americans and Native groups on these issues. Universities with Native American programs could add courses and develop curricula on Native information policy.

Native communications professionals appear to agree on the potential of electronic technologies to reaffirm and strengthen Native culture. But they are concerned about "tribal rights and sovereignty in the realm of cyberspace."[61] They want to ensure that telecommunications policy will promote the cultural and economic progress of Native peoples, rather than perpetuate the historical subjugation of Native Americans to the majority society.[62]

■ Further Research and Evaluation

This is the first federal government report on Native American telecommunications, and, to the best of OTA's knowledge, the first comprehensive report on this topic. The report builds, in part, on the work of Native American telecommunications activists and researchers who have been among the first to understand the potential. Clearly, the field of Native American telecommunications is still in its early stages. While some policy decisions could be responsibly made today, future applications and policymaking would benefit from

[61] Baldwin, "Public Access to the Internet," op. cit., footnote 59.

[61] See Americans for Indian Opportunity, *First Native American Telecommunications Forum,* op. cit., footnote 28.

significant, continued research on many of the topics discussed in this report.

During the course of this study, OTA identified a variety of areas for further research, including:

1. identification of the prerequisites of effective Native leadership and governance with regard to telecommunications;
2. impacts of telecommunications applications and policy options on diverse Native cultures;
3. reinvention of Native governments, in part through the use of telecommunications;
4. statistics and demographics on Native Americans and their use of telecommunications;
5. statistics on the current and evolving telecommunications infrastructure in Native communities;
6. impacts and sustainability of telecommunications pilot projects in Native communities;
7. effects of telecommunications on Native customs, values, well-being, and economic prospects;
8. need for telecommunications infrastructure development, applications, and services in Native areas;
9. cost estimates of various telecommunications projects and programs;
10. role of telecommunications in successful Native entrepreneurial efforts;
11. evaluation of federal and state programs relevant to Native American telecommunications;
12. development of Native American information policies on both tribal/village/community and national levels;
13. application of library and information science to Native American telecommunications infrastructure development and policies; and
14. legal, regulatory, and constitutional issues associated with Native American telecommunications.

This report does not consider the telecommunications needs of Native Americans living on other Pacific Islands such as the U.S. territories of Guam and American Samoa and the U.S. Commonwealth of the Northern Marianas Islands.[63] While the thrust of this report is generally applicable, further research would be needed to better understand how telecommunications could help improve socioeconomic conditions on the Pacific Islands and help strengthen the ancestral, cultural, and economic ties between Native Hawaiians and Pacific Islander Americans.

Federal policy could redirect agency research programs and encourage the development of centers of telecommunications expertise in Native organizations and in universities that serve Native Americans.[64] Native research centers could be encouraged to use telecommunications both to conduct research and to disseminate the results (see box 5-5). Federal agencies that support Native American telecommunications pilot projects and infrastructure development could be required to include an evaluation component. The Office of Management and Budget (in the Executive Office of the President) could require the federal statistical agencies to improve data collection and analysis on American Indians, Alaska Natives, and Native Hawaiians—as individual racial/ethnic groups and as Native Americans collectively. The statistical agencies could develop and issue a special report, or series of reports, linking demographic characteristics, socioeconomic and health conditions, and use of telecommunications technology—with a special focus on rural Native areas.

An appropriate federal agency, university research center, and/or Native organization could, for example: 1) conduct a survey of Native American telecommunications infrastructure (see appendix C for an illustrative survey research instrument); 2) maintain and update the Internet-

[63]Other islands formerly part of the U.S. Pacific Island Trust Territories include the Federated States of Micronesia, Republic of the Marshall Islands, and Republic of Palau (in the process of implementing a compact of free association).

[64]Among the several universities with relevant programs are Harvard, Northern Arizona, Washington State, George Washington, Syracuse, Illinois, and California State at Monterey Bay.

BOX 5-5: Electronic Clearinghouse Activities of the National Indian Policy Center

The National Indian Policy Center (NIPC) conducts or sponsors research on a wide range of Indian policy issues and operates a clearinghouse for the dissemination of research results and other relevant information in a variety of formats—paper, telefacsimile, and electronic. NIPC is funded by the Administration for native Americans (within the Department of Health and Human Services) with additional support from The George Washington University, where the Center is located.

NIPC prepares or sponsors research reports in seven major areas: 1) cultural rights and resources, 2) economic development, 3) education, 4) health and human services, 5) law and administration of justice, 6) natural resources, and **7)** tribal governance. Most research reports are available in hard copy or online From March 1 through September 30, 1994, NIPC received about 4,000 requests for research reports—roughly 70 percent of requests were for electronic copies and 30 percent for paper copies. During this same period, NIPC received about 27,000 other requests for online clearinghouse information that was downloaded electronically by users at remote locations.

Based on a three-month sample (January 1 through March 31, 1995), NIPC estimates that requests for research reports are distributed approximately as follows: educational institutions (including those with American Indian programs), 38 percent, tribal governments, 27 percent; Indian organizations, 18 percent, federal government agencies, 9 percent; and state governments, 8 percent.

NIPC is currently expanding its clearinghouse activity to include information on hearings and pending legislation relevant to Native Americans and testimony by tribal leaders and government officials before congressional committees. For these purposes, NIPC uses broadcast telefacsimile for the roughly 450 tribal governments that have telefacsimile equipment and uses mail for the rest.

NIPC would like to expand use of the Internet for distribution of reports and other clearinghouse information to tribal governments At present, however, only a small minority of tribal governments has access to the Internet A 1995 NIPC survey found that only 18 tribal governments reported being on the Internet, out of 150 tribes responding. Another 16 tribes reported that they were considering or in the process of obtaining Internet access Until more tribal governments have and use Internet, NIPC will continue to rely on the telephone, telefacsimile, and mail.

SOURCE: Office of Technology Assessment, 1995, based on Bob Arnold, Bambi Kraus, and Orna Weinroth, National Indian Policy Center, 1995, personal communications Also see National Indian Policy Center *Progress Report on the Feasibility Study for a National Indian Policy Center* (Washington, DC The George Washington University, NIPC, Aug. 15, 1991); NIPC brochure, n.d. ; and U.S. Congress, Senate, Committee on Indian Affairs, *Oversight Hearing To Examine the Feasibility of Creating a Permanent Indian Research Center,* S.Hrg. 103-61 (Washington, DC: U.S. Government Printing Office, May 20, 1993)

accessible Native American Resource Page developed by OTA for this study (see appendix B);[65] and 3) help the Native American research community make best use of the already significant range of telecommunications resources available to them (see appendix A on computer networking for Native Americans).

[65]Internet traffic suggests significant interest in the Native American Resource Page. During the period Jan. 10 through Apr. 4, 1995,this page was accessed 8,282 times accounting for about 6 percent of total Internet inquiries to OTA and 23 percent of total information downloaded from the OTA Internet site.

Appendix A: Computer Networking for Native Americans

A

Computer networking is a powerful tool available to Native Americans who have access to the necessary computer equipment, telecommunication lines, and technical assistance. The Office of Technology Assessment has used computer networking to locate and obtain information on Native American issues. Project staff have used dial-up connections and the Internet (with a full-time dedicated connection) to access various Gopher servers,[1] electronic mail list servers (e-mail listservs), electronic bulletin board services (BBSs), file transfer protocol (FTP) servers, and World Wide Web (WWW) servers that contain information on Native American issues, concerns, and culture.

PROJECT EXPERIENCE WITH COMPUTER NETWORKING

Gopher Servers

To find Native American computer sites and documents, OTA project staff began with a search of what is known as "Gopher space." Gopher is a computerized menu-based system. The searches were facilitated by using a tool called "Veronica" (an acronym for Very Easy Rodent-Oriented Net-wide Index to Computerized Archives). Veronica searches Gopher servers all over the world for file and directory names with key words entered by the user.[2] Through these searches, project staff found a significant amount of information relevant to Native American topics, including lists of electronic discussion groups (list servers) and BBSs on topics related to indigenous peoples.

Organizations maintaining Native American Gopher servers include the National Indian Policy Center (NIPC) at George Washington University and the Extension Indian Reservation Program (EIRP) of the U.S. Department of Agriculture. The NIPC Gopher server contains information on topics such as culture, education, environmental protection, and tribal governance. The host address is gwis.circ.gwu.edu. The successive menu choices to get to the NIPC are first "Centers, Institutes, and Research at GWU," followed by "Centers and Institutes," and finally, "National Indian Policy Center." The EIRP Gopher at 134.121.80.31:70/1/eirp/eirp.70 contains information

[1]A server is a computer that stores files and "serves" them to other computers referred to as clients.

[2]For a discussion on search strategies for Native American topics see Jeanette M. Mueller-Alexander and Helen J. Seaton, "Researching Native Americans: Tips On Vocabulary, Search Strategies and Internet Resources," *Database*, April 1994, pp. 45-56.

on tribal and federal courts, grant information, events in Indian country, and Native American literature as well as many other topics. Other Gopher servers are listed in OTA's Native American Resource Page developed for this study (see appendix B).

Anonymous File Transfer Protocol Servers

OTA discovered only a few anonymous FTP servers (compared with several Gopher servers and many WWW servers) with Native American information. Cornell University has an anonymous FTP server at ftp.cit.cornell.edu with several files addressing Native American topics in the directory pub/special/Native-Profs. OTA found information such as tribal college addresses, lists of federally recognized tribes (along with their phone numbers and addresses), examples of Native fonts for different computer operating systems, and issues of *Native American News*.

Another anonymous FTP site, ftp.netcom.com, contains lists of Native American BBSs and electronic mail list servers under the directory /pub/am/amcgee/indigenous.

List Servers

Project staff subscribed to several e-mail listservs. Some listservs are broadcast and others function as electronic discussion groups whereby e-mail posted by one member of a group is sent to every other member of the group. Some listservs are moderated to screen out offensive language or irrelevant material. Many listserv e-mail messages are archived and thus can be read at any time. As part of project outreach, OTA posted its project proposal on a few listservs. For additional outreach and information-gathering, OTA distributed selected research questions to appropriate e-mail forums, bulletin boards, and news groups oriented toward Native Americans and others.

To subscribe to a listserv, send the e-mail message "subscribe <list name> <your name>" to a subscription e-mail address. In some cases, a personal e-mail address is used instead of <your name>. Subscription to a list is necessary to post messages on it.

OTA subscribed to the following listservs (with the exception of NATIVEPROFS-L and STRONGDOG-LIST whose membership is restricted) described by the list name, supporting organization and/or topic, and subscription address.

- AISESNET, covers issues relevant to the American Indian Science and Engineering Society (AISES) or to Native Americans more generally, send an informal request to demeler@selway.umt.edu
- DRUGS AND ALCOHOL/AISESNET, an anonymous list maintained by AISES on drug and alcohol issues, send an informal request to demeler@selway.umt.edu
- DRUM GROUPS/AISESNET, a list maintained by AISES about and for pow-wow drum groups, send an informal request to demeler@selway.umt.edu
- EIRP, Extension Indian Reservation Program of the U.S. Department of Agriculture, listproc@listproc.wsu.edu
- IND-NET, general American Indian issues maintained by EIRP, listproc@listproc.wsu.edu
- INDKNOW, indigenous knowledge systems and traditional ecological knowledge and developments, listproc@u.washington.edu
- IROQUOIS, Iroquoian languages, listserv@vm.utcc.utoronto.ca
- NAGPRA-L, Native American graves protection and repatriation, nagpra-l-request@world.std.com
- NAT-EDU, Native education, listserv@indycms.iupui.edu
- NAT-HLTH, Native health, listserv@tamvm1.tamu.edu
- NAT-LANG, languages of indigenous peoples, listserv@tamvm1.tamu.edu
- NATCHAT, general topics of interest to Native Americans, listserv@tamvm1.tamu.edu
- NAT-WORK, work issues of Native Americans, listserv@tamvm1.tamu.edu
- NATIVE-L, general topics of interest to Native Americans, listserv@tamvm1.tamu.edu
- NIRI, broadcasts by the National Indian Policy Center, listserv@gwuvm.gwu.edu
- NATIVEPROFS-L, a private listserv for Native American professors, listserv@cornell.edu
- MINN-IND, American Indian issues in Minnesota and midwest states, listserv@vm1.spcs.umn.edu
- STRONGDOG-LIST, a private listserv for people interested in the poetry of Turtle Heart, an Ojibway artist and director of the American Indian Computer Arts Project, majordomo@soft21.s21.com (To subscribe write your e-mail address instead of your name in the body of the e-mail.)

- TRAILS, tribal libraries, maiser@slis.lib.uoknor.edu
- TRIBALLAW, laws and policy that affect North American Native Americans, listserv@thecity.sfsu.edu

Bulletin Board Systems

Project staff also investigated dial-up BBSs. With a modem and terminal (or computer), users can dial into these systems and perform a number of tasks. BBSs often have several electronic discussion groups and/or real-time chat sessions. In addition, they provide access to electronic mail, libraries of files available for downloading, and ways to upload or contribute information. The large amount of information in these systems, however, can make it difficult to find items of particular interest among the hundreds of trivial postings and announcements. BBSs vary in their degree of organization; most provide a menu, while some offer search capability and/or an index.

A list of BBSs in North America that are either operated by or oriented toward indigenous peoples can be found on the anonymous FTP server ftp.netcom.com in the directory pub/am/amcgee/indigenous/my_indigenous_related_lists/ in the file natvbbs.msg. More than 75 electronic bulletin boards are listed as Native-owned or -operated.

World Wide Web Servers and Browsers

OTA also used Mosaic and Netscape, two interactive, user-friendly interfaces (or WWW browsers), to access WWW and other types of servers on the Internet. WWW browsers combine text and graphics to lead a user to points of interest that may otherwise be difficult to locate. They display menus (e.g., Gopher menus or WWW home pages) and allow one to display or download files from FTP, Gopher, and WWW servers in a user-friendly way. For example, OTA staff accessed online information from several tribes, agencies, universities, and organizations including the Fourth World Documentation Project and the Oneida Nation of New York.

The Fourth World Documentation Project's online archive contains more than 300 documents on Fourth World nations in the Americas, Africa, Asia, Europe, Melanesia, and the Pacific. Included are essays, position papers, resolutions, treaties, organizational information, and the United Nations documents, speeches, and declarations. This archive is split into directories that contain information on certain geographical areas, such as the FWDP/Americas/ directory. Under the /Resolutions/ directory there are several areas relating to Native Americans, including Navajo-Hopi Land Commission Papers, the National Congress of American Indians Resolutions, Tribal Government Resolutions, and much more. This archive can be found at http://www.halcyon.com/FWDP/fwdp.html.[3] It can also be accessed through an anonymous FTP site at ftp.halcyon.com in the pub/FWDP directory.

The Oneida Nation of New York has created a WWW page to express Oneida history and culture and illustrate ongoing community development. The Oneida Nation wired a housing development with fiberoptic cable, began developing a native font and interactive computer program to revive their language, and created an online Treaties Project. This home page is frequently updated and can be accessed at http://nysernet.org/oneida/.

After browsing the Internet for a few weeks, OTA project staff developed the Native American Resource Page, a WWW home page with descriptions and links to more than 50 Native American sites. Thereafter, OTA used the home page on a regular basis for research purposes. The OTA Native American Resource Page can be accessed at http://www.ota.gov/nativea.html (see appendix B for a description).

LIMITATIONS OF COMPUTER NETWORKING

Overall, computer networking has been useful to OTA in searching for information, but not without difficulties. One problem with Internet searching is that files of information are not well organized or cataloged.

[3]Addresses used with WWW browsers are referred to as URLs (Uniform Resource Locators).

While the keyword search capabilities of Veronica and information pointers of WWW home pages are helpful, more advanced methods for organizing and searching are needed.[4] There is no catalog or directory that organizes all of the materials on the Internet. For now, successful searching is much like solving a mystery. Each source, like a clue, leads to another and, in the end, to the material one is seeking.

One problem for Native Americans with computer networking is the limited number of Native participants. Many Native Americans do not have or cannot afford computers with modems and/or access to the Internet. The long-distance phone charges required by many dial-in systems are also a barrier. While this is true for Americans in general, the lack of these resources appears more pronounced in Native American communities. Also, OTA found that some e-mail listservs created to discuss Native American concerns apparently are dominated by non-Native Americans, and may not reflect Native points of view and experiences.

[4]Search tools are under development worldwide. For example, Hyper-G, similar to and compatible with WWW technology, is one such tool under development to better organize and categorize very large amounts of information. The hyper-g discussion group can be subscribed to by sending the e-mail message "subscribe hyper-g <your name>" to the e-mail address listproc@iicm.tu-graz.ac.at.

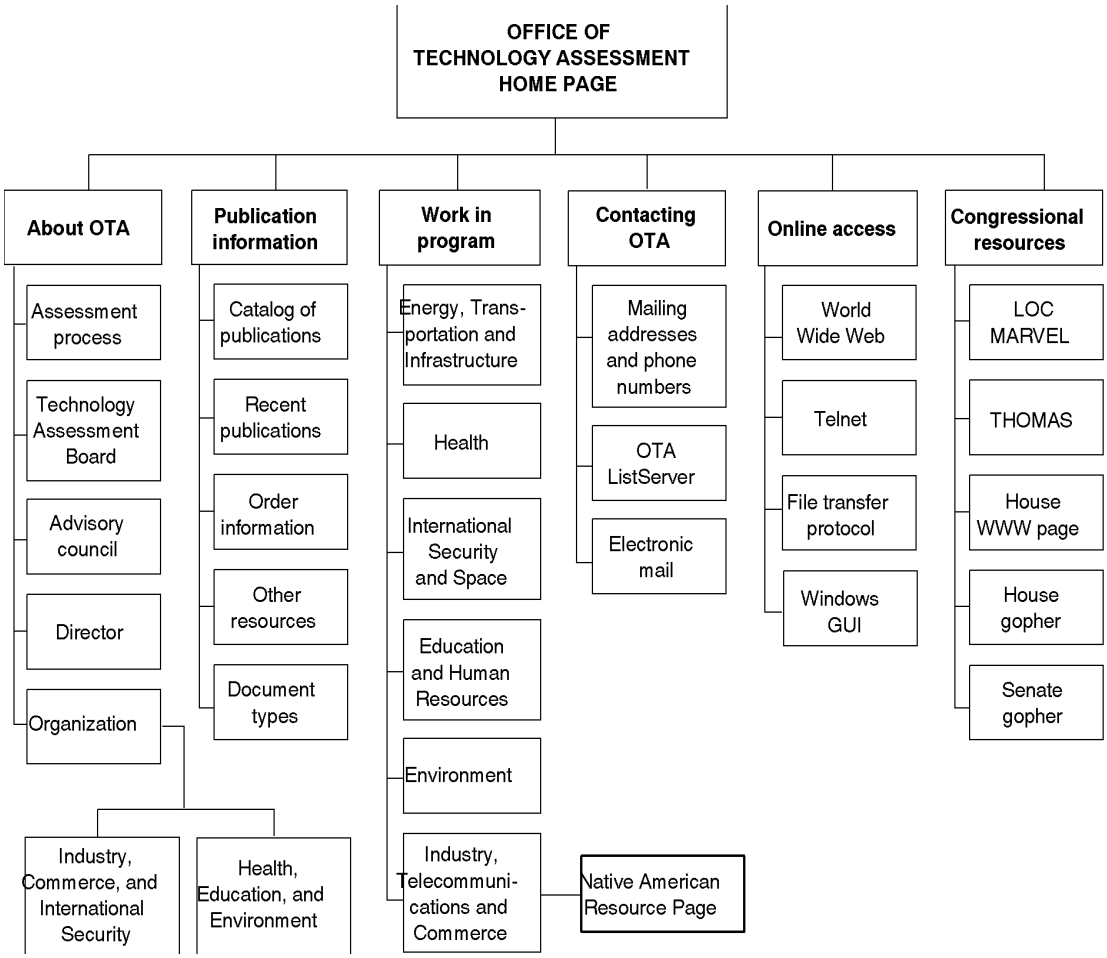
Appendix B: OTA on the Internet: The Native American Resource Page

B

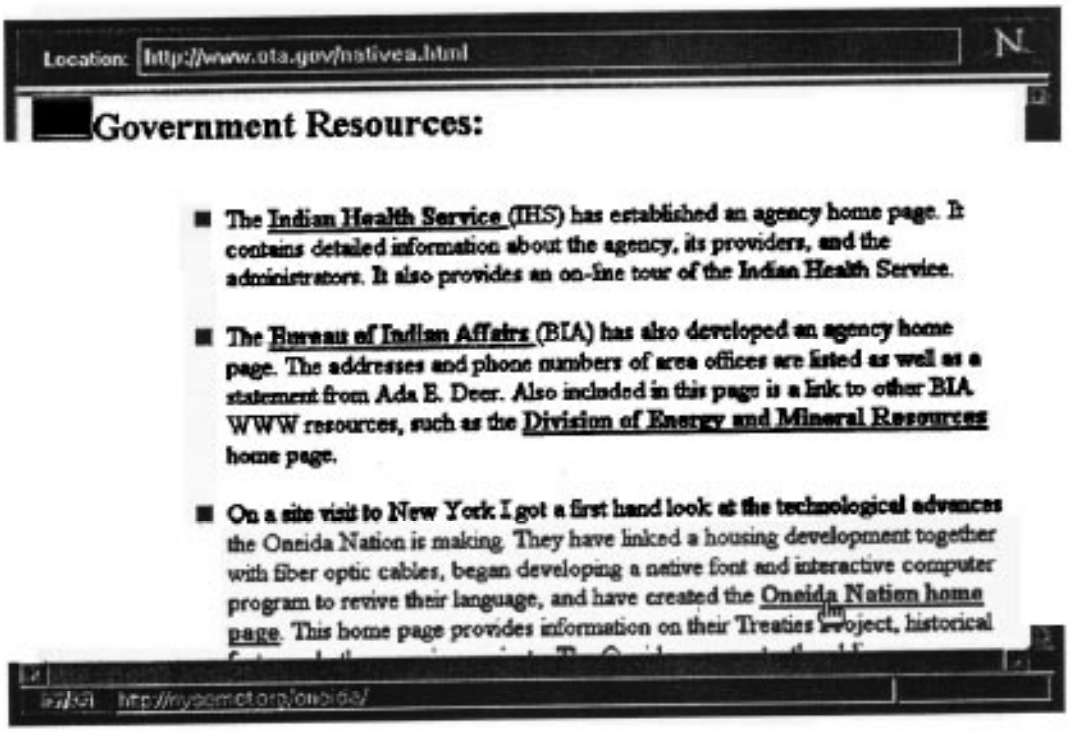
During the course of the OTA's study on Telecommunications Technology and Native Americans, the project staff frequently used the Internet, a global computer network, as a research and outreach tool. Project staff found that Internet access to World Wide Web (WWW) computer sites—using browsers such as Mosaic, Netscape, or Cello—was the most user-friendly application. These WWW browsers combine text and graphics to lead users through the Internet maze and help locate specific points of interest. WWW browsers help users connect directly to File Transfer Protocol (FTP), Gopher, Telnet, and WWW sites around the world.

To fully use the Internet, OTA staff created the Native American Resource Page. This WWW home page is a directory of many electronic resources related to or of interest to Native Americans and indigenous peoples. In addition to project information, more than 50 FTP, Gopher and WWW sites can be accessed directly through this page. The Native American Resource Page can be accessed by the public at the following address (known as a uniform resource locator (URL)): http://www.ota.gov/nativea.html.

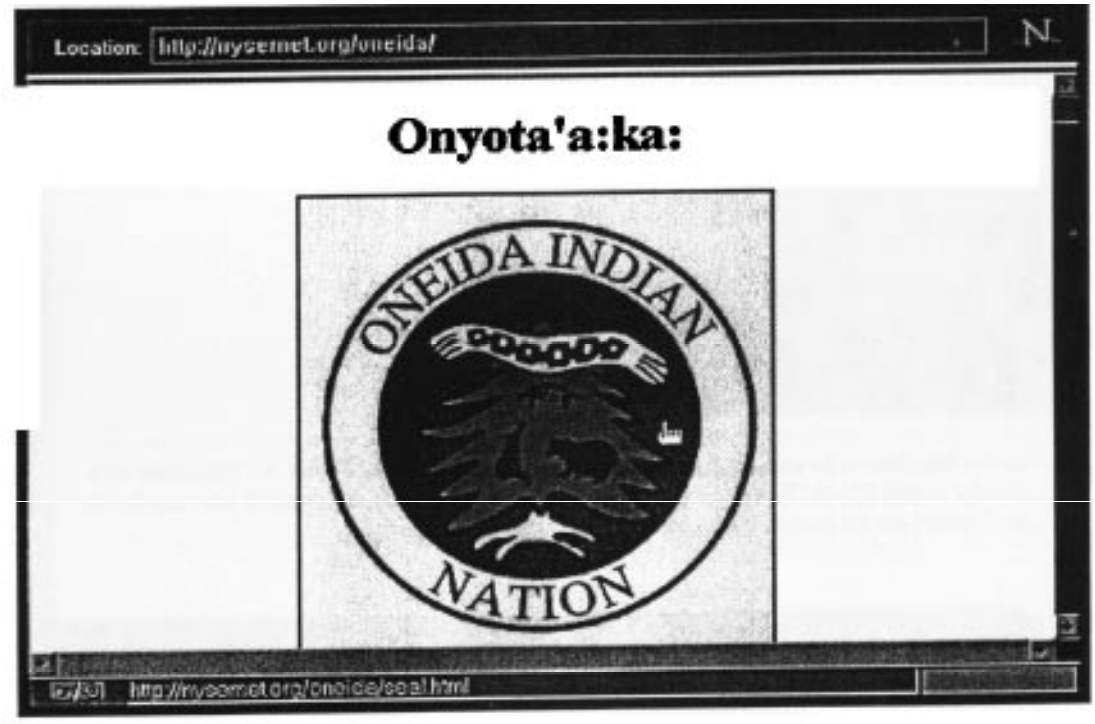
The Native American Resource Page is a subsection of the Office of Technology Assessment WWW home page. The URL for the OTA home page is http://www.ota.gov/. The structure of the information in the OTA home page is outlined in the chart.



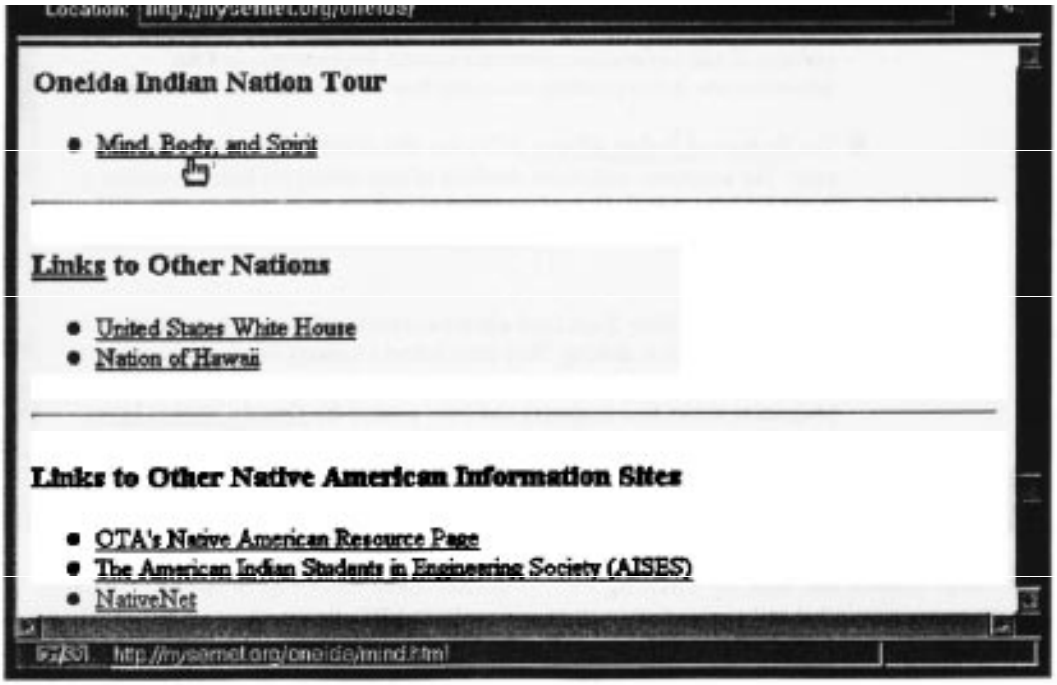
The Native American Resource Page includes short descriptions about each linked site. These descriptions highlight the information contained at each location and provide a hypertext link to that site. Clicking the mouse pointer on the highlighted text (also known as a hypertext link) connects the user to the computer at the remote site. This action begins the information transfer process. The pictures below illustrate this by showing each computer screen exactly as a user would see it. From the Native American Resource Page the Oneida Nation home page can be selected. Note that when the mouse pointer comes in contact with the hypertext link it changes from an arrow to the image of a hand.

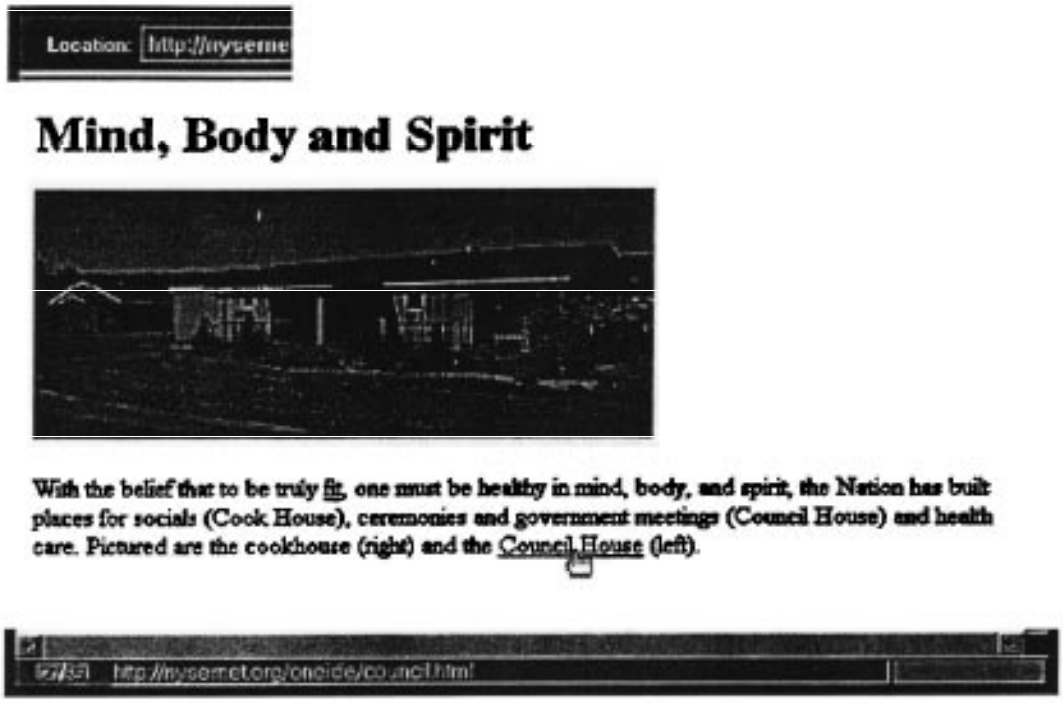


After the user selects the link by clicking the mouse button, a command that is encoded in the hypertext is sent to the URL or site address requesting access to the information at that site. The information returned is the home page, Gopher menu, or ITP directory stored at that location. Below is the Oneida Nation home page that has been transferred to the user's computer.

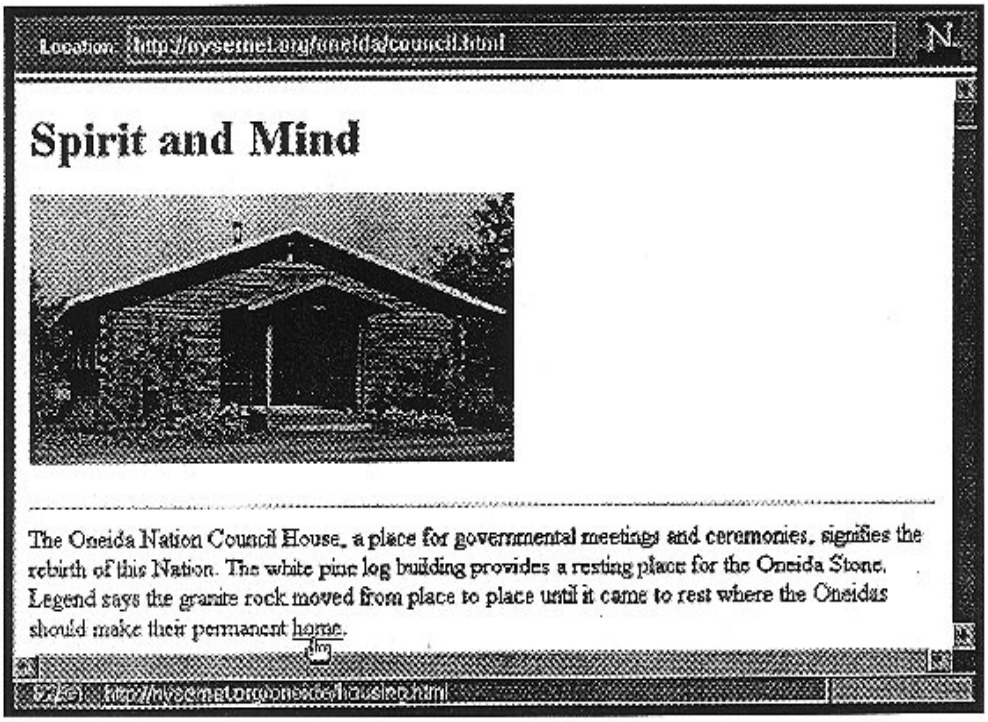


The Mind, Body, and Spirit page also has a link to information about the Oneida Nation Council House, The Council House page has a short explanation of its significance and uses for the Oneida people. This page also contains a link to information about the legend of the Oneida Stone.





From the first page of the Oneida Nation home page, the user can take a tour of the Oneida Nation by clicking on the Mind, Body, and Spirit link as shown in the example below. This transfers an image of the Oneida Nation Cook and Council Houses and gives a short description of some of the Oneida beliefs.





Telecommunications Technology and Native Americans: Opportunities and Challenges

Project Information:

The Office of Technology Assessment conducted a study titled Telecommunications Technology and Native Americans: Opportunities and Challenges, at the request of the Senate Committee on Indian Affairs. For further information about this study, the project proposal and summary can be found on OTA's ftp server.
OTA Home Page URL: http://www.ota.gov/
OTA ftp server URL: ftp://otabbs.ota.gov/

Online Resource Categories:

- ***Government Resources***
- ***Art and Cultural Resources***
- ***Academic Resources***
- ***Organizations and Networks***
- ***Miscellaneous***

Clicking on the icon will return you to this category listing.

GOVERNMENT RESOURCES:

- The Administration for Native Americans (ANA) home page provides information about ANA programs and staff.
  ANA URL: http://www.acf.dhhs.gov/ACFPrograms/ANA
- The Indian Health Service (IHS) has established an agency home page that contains detailed information about IHS services and staff, and an on-line tour of IHS.
  IHS URL: http://www.tucson.ihs.gov
- The Bureau of Indian Affairs (BIA) home page contains information about BIA services and staff, and a link to other BIA WWW resources such as the Division of Energy and Mineral Resources home page.
  BIA URL: http://info.er.usgs.gov/doi/bureau-indian-affairs.html
  BIA Energy and Mineral Resources URL: http://snake2.cr.usgs.gov
- The U.S. Department of the Interior's Bureau of Land Management has an Internet site called the Native American Information Forum covering topics such as Government to Government relations, the Indian Minerals Steering Committee, and the Native American Graves Protection and Repatriation Act.
  Native American Information Forum URL: http://napo1.napa.nm.bim.gov/naif.html
- The Bureau of Indian Affairs Office of Indian Education Program (OIEP) has a WWW site that provides information on the mission, goals, programs, and activities of OEIP.
  Office of Indian Education Programs URL: http://oiep.unm.edu/oiep/home.html
- The Oneida Nation of New York home page provides information on the history and culture of the Oneida Nation as well as a project to archive and disseminate Indian treaties.
  Oneida Nation URL: http://nysernet.org/oneida/
- The Citizen Band Potawatomi Tribe WWW site includes a brief tribal history, an explanation of the tribal name, a description of the tribal seal, and a link to other Native American resources via the Yahoo Directory.
  Citizen Band Potawatomi URL: http://www.qns.com/~barrettj/homepage.htm
- The United South and Eastern Tribes (USET) home page, sponsored by the Oneida Nation of New York, includes information about the USET organization, membership, resolutions, and links to other Native resources.
  USET URL: http://oneida-nation.org/uset/uset.htm
- The United Keetoowah Band WWW site contains information on the tribal offices, council, committees, and news, and the proceedings of a Native American symposium.
  The United Keetoowah Band URL: http://www.uark.edu/depts/comminfo/ukb/welcome.html
- The Great Sioux Nation of Sough Dakota has created a home page that provides a glimpse into Sioux history and culture.
  Sioux Nation URL: http://www.state.sd.us/state/executive/tourism/sioux/sioux.htm
- The Nation of Hawaii WWW site includes information on the legal foundation for the restoration of Hawaiian independence.
  Nation of Hawaii URL: http://hawaii-nation.org/nation

ART AND CULTURAL RESOURCES:

- The National Museum of the American Indian (NMAI) site provides information and views of some exhibits from the George Gustav Heye Center at the historic Alexander Hamilton U.S. Customs House in lower Manhattan.
  NMAI URL: http://www.si.edu/organiza/museums/amerind/start.htm
- The Rainbow Walker Music Home Page specializes in traditional and contemporary Native American music and music education.
  Rainbow Walker URL: http://www.teleport.com/~rnbowlkr/
- The Aboriginal Art Gallery includes the works of Canadian artists Sydney Kirkness and Fred Pashe, provided in cooperation with the Aboriginal Super Information Highway.
  Aboriginal Art Gallery URL: http://Alpha.Remcan.Ca/abinfohwy/aboartgl/
- The Native American Literature site, developed by Glenn Welker, includes stories, poetry, music, speeches, documents, earth prayers, and writings of Native youth.
  Native American Lit. URL: http://ukanaix.cc.ukans.edu:80/~marc/natlit/native_lit_main.html
- The Canadian Native Art Page highlights the works of artists from the Caribou region of British Columbia, and includes a variety of art forms such as paintings, carvings, chalk, and pen and ink.
  Canadian Native Art Page URL: http://vortex.netbistro.com/pg/natart.html
- The Indian Pueblo Cultural Center page provides information on and directions to each Pueblo, a description of Cultural Center facilities, and lessons on Pueblo etiquette and rules.
  Indian Pueblo Cultural Center URL: http://hanksville.phast.umass.edu/defs/independent/PCC/PCC.html
- The American Indian Computer Arts Project (AICAP), created by Turtle Heart, an Ojibwe artist, facilitates the exchange of ideas on Native American art topics and issues and sharing of artwork.
  AICAP URL: http://www/mit/edu:8001/activities/aises/aicap/archive/aicap.html
- The Native American Art and Education Center, offered by the Powersource Gallery, includes a collection of Native American artistic symbols.
  Native American Art and Education Center URL: http://www.powersource.com/powersource/gallery/default.html
- The Ojibwe Language and Culture Page provides an introduction to the Ojibwe language and culture.
  Ojbiwe Language and Culture URL: http://www.williamette.edu/~tjones/languages/ojibwe-main.html
- The American Indian Culture Page includes links to Native cultural information such as the BIA home page, Institute of American Indian Arts, American Indian Art Museum, and results of a Webcrawler search on Native Americans.
  American Indian Culture Page URL: http://LAHS.LosAlamos.K12.nm.us:80/sunrise/work/piaseckj/homepage.html

- The Native American Art Gallery (NAAG) provides authentic, finished American Indian art along with the NAAG newsletter, a statement from the NAAG president, and a guided tour of the gallery.
  NAAG URL: http://www.netroam.com/NAAG/index.html
- The Heard Museum home page provides information about museum programs and activities; the museum specializes in Native American and Southwestern material, both historical and contemporary.
  Heard Museum URL: http://hanksville.phast.umass.edu/defs/independent/Heard/Heard.html
- The Electric Gallery provides an opportunity to view and purchase Southwestern artwork from your desktop computer.
  Electric Gallery URL: http://www.egallery.com/egallery/magic.html
- The California Indian Library Collection home page includes information on California Indian cultural materials, tribal bibliographies, a short illustrated text on California Indian basketry, and more.
  California Indian Library URL: http://www.mip.berkeley.edu/cilc/brochure/brochure.html
- The Wabimeguil Art Home Page features the artwork of the Cree Indian artist Wabimeguil, and offers a tour of the gallery, information on the artist, and a means to purchase art from your desktop computer.
  Wabimeguil URL: http://sol.worldlinx.com/wabimeguil

ACADEMIC RESOURCES:

- The National Indian Policy Center (NIPC), located at The George Washington University, maintains a gopher server with information on Indian culture, education, economic development, environmental protection, and governance, and is accessible through the Library of Congress. New and "hot" information can be found under the heading "Useful Data".
  NIPC URL: gopher://gwis.circ.gwu.edu.:70/11/Centers%2c%20Institutes%2c%20and%20Research%20at%20GWU/Centers%20and%20Institutes/National%20Indian%20Policy%20Center
- The American Indian Higher Education Consortium (AIHEC) home page has information on the mission, goals, and organization of AIHEC, and mailing addresses of the AIHEC tribal colleges.
  AIHEC URL: http://www.fdl.cc.mn.us/AIHEC/aihec.html
- The Salish Kootenai College, located in Pablo, Montana, on the Flathead Indian Reservation, operates a WWW site that provides information on the tribal college mission, goals, programs, and campus.
  Salish Kootenai College URL: http://www.skc.edu/
- The Native Education Initiative (NEI) site provides information about this collaborative effort among regional educational laboratories funded by the U.S. Department of Education's Office of Educational Research and Improvement, and links to Native educational resources in the Southwestern Region.
  NEI URL: http://diogenes.sedl.org/NEI.html

- Cornell University maintains a file transfer protocol site with information on tribal college addresses, federally recognized tribes (with phone numbers and addresses), examples of Native fonts for Macintosh and Windows, and the Native American Newsletter.
  Cornell University URL: ftp://ftp.cit.cornell.edu/pub/special/NativeProfs
- The Fond du Lac Tribal and Community College site includes information about the college, an Ojibwe to English (and vice versa) translator, and other American Indian materials.
  Fond du Lac URL: http://www.fdl.cc.mn.us
- The Educational Native American Network (ENAN), located at the University of New Mexico's College of Education, provides access to information about ENAN history, goals, and plans, and to the ENAN hot list that includes connections to organizations involved with American Indian education.
  ENAN URL: http://oeip.enm.edu/enan/home.html
- The American Indian College Fund home page includes the annual report and information from a consortium of U.S. colleges operated by tribes for their own students but open to all.
  American Indian College Fund URL: http://hanksville.phast.umass.edu/defs/independent/AICF.html
- The Navajo Community College, the first tribally controlled college to be established in the United States, maintains a home page with information about the college campus and curriculum.
  Navajo Community College URL: http://hanksville.phast.umass.edu/defs/NCC.html
- The Southwestern Indian Polytechnic Institute (SIPI) also maintains a home page with information about education programs and curriculum.
  SIPI URL: http://kafka.sipi.tec.nm.us/homepage.html
- Native Americans at Princeton, a student organization and support group, maintains a home page with information and links on various Native American topics.
  Native Americans at Princeton URL: http://www.princeton.edu/~naap/index.html
- The Native Book Centre is a mail order house for Native books with an on-line catalog containing over 1,100 titles (books, videos, audio tapes) on Native American topics.
  The Native Book Centre URL: http://www.9to5.com/9to5/NBC
- The University of Arizona's American Indian Studies Program has a home page with information on the program, American Indian Graduate Center, Native American Resource Center, and Pow Wows, and a link to Red Ink, a Native American online publication.
  The University of Arizona's American Indian Studies Program URL: http://aisp.harvill.arizona.edu
  Red Ink URL: http://grad.admin.arizona.edu/AIGC/RedInk/RED_INK.HOMEPAGE.HTML
- How2 is an online tutorial for creating WWW pages and was created to assist Indian schools and students gain access to Internet resources.
  The How2 URL: http://hanksville.phast.umass.edu/~pgiese
- The 'Arctic Circle' WWW Site is intended to increase interest in the peoples and environment of the Arctic and Subarctic regions, with a strong focus on indigenous Alaskans.
  The Arctic Circle URL: http://spirit.lib.uconn.edu/Arctic Circle/

ORGANIZATIONS AND NETWORKS:

- The Society of Native American Culture (SNAC) headquartered at North Carolina State University maintains a WWW site with information about SNAC goals, officers, members, meetings, upcoming events, and links to other Native American organizations.
  Society of Native American Culture URL: http://www2.ncsu.edu/ncsu/stud_orgs/native_american/index.html
- The Fourth World Documentation Project (FWDP) maintains an online archive with over 300 documents on Fourth World Nations in the Americas, Africa, Asia, Europe, Melanasia, and the Pacific. The archive includes essays, position papers, resolutions, treaties, and the like, including Navajo-Hopi Land Commission papers and National Congress of American Indians resolutions under FWDP/Americas/Resolutions.
  FWDP URL: http://www.halcyon.com/FWDP/fwdp.html
- Electronic Pathways, a group developing a national electronic infrastructure for Native Americans, has a WWW site with information on Electronic Pathways goals and activities.
  Electronic Pathways URL: http://hanksville.phast.umass.edu/defs/independent/ElecPath/elecpath.html
- The American Indian Science and Engineering Society (AISES) WWW site includes information about AISES goals and local chapters as well as a jobs database and links to other sites.
  AISES URL: http://bioc02.uthscsa.edu/aisesnet.html
- The Extension Indian Reservation Program (EIRP) gopher site includes information on tribal and federal courts, grants, events in Indian country, Native American literature, and links to the Native Education Centre, Enviro Link, and the Institute for Global Communications, among others.
  EIRP URL: gopher://134.121.80.31:70/1/eirp/eirp.70
- The Native American Net Server is a gopher site with information on Indian law, Native American newsletters, job opportunities, Native American fonts, and electronic bulletin board connections.
  Native American Net Server URL: gopher://alpha1.csd.uwm.edu:70/11/UWM%20Information/Native%20American%20Net%20Server
- The Inter-tribal Network is a gopher site with information on Native American book reviews, law, legislation, and grant opportunities.
  Inter-tribal Network URL: gopher://cscns.com:70/11/News%20and%20Information
- The Native American Rights Fund (NARF), a nonprofit organization that defends and promotes the legal rights of Indians, maintains a home page describing the NARF mission, goals, and activities.
  NARF URL: http://hanksville.phast.umass.edu/misc/NARF.html
- The NativeNet Information Network, part of NativeNet coordinated by Gary Trujillo, permits users to browse through information resources on indigenous peoples around the world.
  NativeNet URL: http://kuhttp.cc.ukans.edu/~marc/native_main.html
- The Urban Native Education Society, Native Education Centre maintains a gopher site with reviews of books and films with native themes, a collection of speeches on Native issues, and various FreeNet information.
  Native Education Centre URL: gopher://gopher.native-ed.bc.ca

- CodeTalk, named after the Native American code talkers (heroes of two world wars), provides information on government programs, electronic consultation, and links to other Native American Internet sites.
  CodeTalk URL: http://www.codetalk.fed.us/
- The Native American Journalist Association (NAJA) WWW site includes information about NAJA, news from The Native Voice newspaper, and links to Internet sites of interest to Native American journalists.
  The NAJA URL: http://www.medill.new.edu/naja

MISCELLANEOUS:

- Several Internet listservs, newsgroups, and FTP sites address Native American issues, and can be located under the Native Indian and Alaskan networks heading of the following URL.
  Misc. URL: ftp://ftp.netcom.com/pub/am/amcgee/indigenous/
- A list of Bulletin Board Systems/Services in North America that are either operated by or oriented toward indigenous peoples, accessible by modem or Internet, can be located at the following URL.
  Misc. URL: ftp://ftp.netcom.com/pub/am/amcgee/indigenous/my_indigenous_related_lists/natvbbs.msg

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Last updated June 27, 1995.

For an update on the current status of the Resource Page, or to suggest additions and revisions, please send an Internet message to kbreitbach@ota.gov.

Appendix C: Native American Telecommunications Infrastructure: Survey Instrument

C

This is an illustrative survey instrument that could be used or adapted by Native organizations and/or appropriate federal agencies to obtain information on telecommunications infrastructure and services available to Native Americans.

Thank you for volunteering to respond to this survey.

The [Native American organization or federal agency or Native research group] is seeking information on the **telecommunication services available to Native Americans living in rural, remote areas** on American Indian reservations, in Alaska Native villages, and in Native Hawaiian communities. This information will help us analyze the potential of telecommunications to meet Native American needs for cultural preservation, education, community wellness, economic development, and governance.

This survey is being provided, via the Internet where feasible, to persons who have volunteered to compile this information for specific reservations, villages, or communities. We will mail or fax the survey to respondents without Internet access. You may respond by sending your information to [Internet address, fax and phone numbers, mailing address of organization or agency conducting the survey].

We would appreciate receiving your response by [date selected].

Thanks very much for your participation.

A. NAME AND ADDRESS OF TRIBE, NATION, VILLAGE, OR COMMUNITY:

Name_____

Address _____

_____

_____

Person(s) responding to this survey:

Name_____

Address if different from above_____

_____

_____

Phone No._____

Fax No._____

Internet electronic mail address_____

Dial-up electronic mail address

and phone number_____

B. BASIC TELEPHONE PROVIDER AND SERVICE

Name and address of telephone company(ies) serving your reservation, village, or community:

Name_____

Address _____

_____

_____

Phone No._____

Fax No._____

Is this telephone company (write 'yes' where applicable):

_____ fully tribally owned?[1]
_____ partially tribally owned?
_____ tribally operated?
_____ staffed by tribal members?

What percentage of tribal homes and businesses have telephones?

_____ % homes
_____ % businesses

For homes without phones, which reasons apply? If more than one reason applies, please rank 1, 2, 3 . . . where 1 is the most important.

_____ do not want phone
_____ phone service too expensive
_____ phone service not available
_____ other reason (please state)

Please indicate the type of telephone services available to tribal homes and businesses (write 'H' for homes, 'B' for businesses, 'H-B' for both).

_____ basic single-line service
_____ basic party-line service
_____ touchtone service
_____ call-waiting service
_____ voice mail service
_____ digital data communication

C. OTHER TELECOMMUNICATION APPLICATIONS

Please indicate which of the following telecommunication and information services are used by your local high school, community college, library, hospital, and tribal government (write 'S' for local K-12 school, 'C' for community college, 'L' for library, 'H' for hospital, and 'G' for local government):

_____ personal computers
_____ CD-ROM
computer networking—
_____ Internet
_____ electronic mail
_____ electronic bulletin board
videoconferencing—
_____ 1-way video, 2-way audio
_____ 2-way video
_____ slow scan video
_____ full motion video
_____ over telephone lines
_____ over satellite links
_____ over fiber optic link

D. PERSONAL COMPUTERS IN THE HOME AND BUSINESS

Please indicate the percentage of homes and businesses that have microcomputers and modems:

percentage with personal computers
_____ % homes
_____ % businesses
percentage with modems
_____ % homes
_____ % businesses

E. CABLE TELEVISION SERVICE

Name and address of cable television company(ies) serving your reservation, village, or community:

Name _____

Address_____

_____

Phone No._____

Fax No._____

Is this cable TV company (write 'yes' where applicable):

_____ fully tribally owned?
_____ partially tribally owned?
_____ tribally operated?
_____ staffed by tribal members?

[1] NOTE: Throughout this survey instrument, please interpret "tribe" to mean, as appropriate for your own geographic location, American Indian tribe or Nation, Alaska Native tribe or village, or Native Hawaiian community (to the extent applicable).

What percentage of tribal homes have cable TV?

_____ % homes

For homes without cable TV, which reasons apply? If more than one reason applies, please rank 1, 2, 3 . . . where 1 is the most important.

_____ do not want cable TV
_____ cable TV service too expensive
_____ cable TV service not available
_____ other reason (please state)

For areas with cable TV service, please indicate:

_____ number of channels of basic TV service
_____ number of public access channels
_____ number of premium or pay TV channels

F. OVER-THE-AIR BROADCASTING SERVICES

_____ Does your area receive over-the-air broadcast television signals (yes or no)?
_____ If yes, how many channels can be received?
_____ % What percentage of tribal homes have a television?

For homes without a TV, which reasons apply? If more than one reason applies, please rank 1, 2, 3 . . . where 1 is the most important.

_____ do not want TV
_____ cannot afford TV set
_____ too few or no TV signals available
_____ other reason (please state)

_____ Does your area receive over-the-air radio signals (yes or no)?
_____ If yes, how many stations can be received?
_____ % What percentage of tribal homes have a radio?

For homes without a radio, which reasons apply? If more than one reason applies, please rank 1, 2, 3 . . . where 1 is the most important.

_____ do not want radio
_____ cannot afford radio receiver
_____ too few or no radio stations available
_____ other reason (please state)
_____ Does your area have a local radio station (yes or no)?

If yes, is this radio station (write 'yes' where applicable):

_____ fully tribally owned?
_____ partially tribally owned?
_____ tribally operated?
_____ staffed by tribal members?

Name and address of local radio station:

Name _____

Address _____

_____

Phone No._____

Fax No._____

G. DIRECT BROADCAST SATELLITE AND WIRELESS SERVICES

Does your area have (write 'yes' where applicable):

_____ direct broadcast satellite television service?
_____ satellite telephone service?
_____ cellular telephone service?
_____ pager service?

If yes to any of the above, please list the company(ies) providing service below:

Name_____

Address _____

_____

Phone: _____

Fax:_____

H. TELECOMMUNICATIONS PLANNING

Does your tribe, village, or community have (write 'yes' where applicable):

_____ a telecommunications plan
_____ a telecommunications planning committee or council
_____ a telecommunications training program
_____ a telecommunications educational program at a community college or high school

If yes, please provide details.

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