Can You Hear Us Now?

A White Paper on
Connecting Minority-Serving Institutions in the West to
U.S. Advanced Cyberinfrastructure

Lariat Summit on Minority Institutions and Cyberinfrastructure in the West
Bozeman, Montana
August 14-15, 2006

Sponsors:
- Lariat Network
- National Center for Research Resources of the National Institutes of Health
- Montana State University
- University of Washington
- Western Interstate Commission for Higher Education
- Pacific Northwest Gigapop
- Internet2

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Can You Hear Us Now?

Connecting Minority-Serving Institutions[1] in the West[2] to U.S. Advanced Cyberinfrastructure

Executive Summary

Introduction: U.S. Advanced Cyberinfrastructure

Advanced information, communication, computation and collaboration technologies, known as "cyberinfrastructure," have become essential elements for research, education, and innovation in the 21st century. Explosive growth in the resolution of sensors and scientific instruments has lead to unprecedented volumes of environmental and experimental data, which can be combined, compared, and correlated across time, place, and types of data. Computational problems – from health care and public policy to national security, scientific discovery, and economic competitiveness – complement the historical focus on single disciplines. And important multidisciplinary discoveries are now made by distributed teams of experts spread around the country and the world.

A major challenge confronting the United States today is how to ensure that all colleges and universities, including those that have not traditionally benefited from leading-edge research infrastructure, can participate seamlessly in national and multinational cyberinfrastructure-enabled efforts. The minority-serving-institution community has unique expertise, knowledge, and resources to share. Advanced networking will enable these institutions to contribute to the larger community as well as focus on local research, education, health care, and economic development.

Western leaders from the fields of science, education and cyberinfrastructure recognize an urgent need for action. Over 40 leaders from these fields gathered in Bozeman, Montana, to discuss ways to connect (or better connect) minority-serving institutions in Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, and Washington.

As participants in the 2006 Lariat Summit, we developed and are now putting forth strategies and recommendations for connecting minority-serving institutions in the West to national advanced cyberinfrastructure. We are committed to engaging academic, government, and technology leaders to help us achieve our collective goals. This document is a first step towards developing both the will and the resources to ensure that minority-serving institutions are among the "connected" institutions in the West.

Strategies: Connecting All Institutions

(1) Engage and educate leaders in minority-serving institutions about the critical importance of cyberinfrastructure for the future of research and education among all higher education institutions, not just research universities.

(2) Secure resources to ensure that minority-serving institutions will be among the "connected" institutions in the U.S.

(3) Assist minority-serving institutions to develop and participate in local, regional, and national activities that will infuse the culture and practice of e-science and cyberinfrastructure down to the faculty and student levels in departments, colleges, and institutions.

Recommendations: A Western Approach

(1) Survey minority-serving institutions to collect information about (a) existing connectivity, cyberinfrastructure and support; and (b) aspirations and goals for e-learning, e-science, e-health, cultural preservation and revitalization, entrepreneurship, and economic development.

(2) Conduct an engineering study that would outline a plan and costs for connecting minority-serving institutions to regional advanced research and education networks, and through them, to national and international advanced research and education networks.

(3) Work closely on the steps above with well-established leaders in advanced research and education regional optical networks[3] in the West: the Pacific Northwest Gigapop,[4] the Front Range Gigapop,[5] and the Corporation for Education Network Initiatives in California. Partner also with emerging state initiatives, like the New Mexico Lambda Rail.

(4) Continue to develop case studies of current innovations in e-learning, e-science, and e-health among minority-serving institutions.

(5) Use survey data and case studies to build awareness and support among minority-serving institutions, federal and state agencies, funding organizations, and other partners.

(6) Create a highly participatory cyberinfrastructure initiative among Western minority-serving institutions.

(7) Collaborate with other regional and national initiatives that focus on e-science or capacity building among minority-serving institutions.

(8) Conduct demonstration cyberinfrastructure initiatives at minority-serving institutions to develop implementation and support models.

(9) Determine the feasibility of establishing regional approaches for research administration and advanced IT technical support.

Introduction

> "Having reviewed trends in the United States and abroad, the committee is deeply concerned that the scientific and technological building blocks critical to our economic leadership are eroding at a time when many other nations are gathering strength."
>
> – *Rising Above the Gathering Storm,* National Academies' Committee on Science, Engineering, and Public Policy

A Call to Action

Why hold a Western summit on connecting minority-serving higher education institutions to U.S. advanced information networks? Because the time for action has arrived.

Over the past few years, a national call to action has emerged. What is at stake is the United States' competitiveness and the future of our children. Our nation's lead, specifically in the areas of science and engineering, is being challenged as never before.

In 2005, the National Academies' Committee on Science, Engineering, and Public Policy (COSEPUP) issued a report entitled *Rising Above the Gathering Storm*, which urged a comprehensive federal effort to bolster U.S. competitiveness in science, technology, and the marketplace. In his 2006 State Of The Union Address, President Bush announced the American Competitiveness Initiative with a commitment of $5.9 billion in fiscal year 2007 to increase investments in science and technology – a doubling of federal funding for basic science research programs. Further, a National Science Foundation report, "Revolutionizing Science and Engineering Through Cyberinfrastructure," recommended the establishment of a large-scale program to create, deploy, and apply cyberinfrastructure in ways that radically empower all scientific and engineering research and allied education.

> "We must continue to lead the world in human talent and creativity. Our greatest advantage in the world has always been our educated, hardworking, ambitious people – and we're going to keep that edge."
>
> – President George Bush, 2006 State of the Union Address

Some regions of the nation are taking the federal call to action very seriously. In 2006, the University of Texas System announced that it would be spending $2.56 billion over the next decade on technology infrastructure for scientific and medical research. University of Texas System Chancellor Mark G. Yudof stated, "This investment is the largest commitment to science and technology infrastructure that has been made by a higher education system in the country since the National Academies' recent call for a comprehensive effort to bolster U.S. competitiveness in its report, *Rising Above the Gathering Storm.*" Texas recognizes that state-of-the-art equipment and facilities are essential to recruiting the world's brightest research scientists and faculty and to providing a world-class education in the sciences, technology, engineering, and health.

Louisiana, as part of its post-hurricane reconstruction efforts, is positioning itself as a world leader in supercomputing. With a 10-year investment in cyberinfrastructure, Louisiana is creating the Louisiana Optical Network Initiative (LONI), a high-speed fiber-optic network connecting supercomputers at its research universities. "Now Louisiana researchers will not only have the most advanced optical network in the country but will couple that with the most powerful distributed supercomputer resource available to any academic community," said Les Guice, Louisiana Tech University vice president for

research and development. "This is a strong message to the rest of the world that Louisiana intends to be a leader in the knowledge economy."

Our nation's leaders recognize that investing in technology infrastructure will help the U.S. hold onto its global preeminence in the marketplace of ideas and innovation. World-wide growth in technology infrastructure and increased global competition demand that action be taken here at home.

By ensuring that *all* colleges and universities benefit from investments in technology infrastructure, the participants of the Lariat Summit are answering the nation's call to action. To ignore this call is to further weaken our nation's competitiveness and to isolate our minority-serving institutions and the communities that they serve.

The U.S. National Advanced Cyberinfrastructure

Advanced information, communication, computation and collaboration technologies – known as cyberinfrastructure – have become essential elements for education and for research in the 21st century. Of particular interest to many researchers and educators is the use of these tools for "e-science," as computational discovery has emerged to complement the traditional practices of theory and experimentation. Examples abound across all scientific disciplines, as well as in the arts and humanities.

Explosive growth in the resolution of sensors and scientific instruments has led to unprecedented volumes of environmental and experimental data, which can be combined, compared, and correlated across time, place, and types of data. Computational science aids in modeling, simulation, and scenario assessment using data from diverse sources. Complex multidisciplinary problems – from health care and public policy to national security, scientific discovery, and economic competitiveness, complement the historical focus on single disciplines. And important multidisciplinary discoveries are now made by teams of experts spread across the country and around the world.

Advanced cyberinfrastructure, enabled by very high-speed research and education networks, is essential for participating in all these efforts. With today's advanced information networks, those without access and the ability to participate will be left behind 21st century innovation.
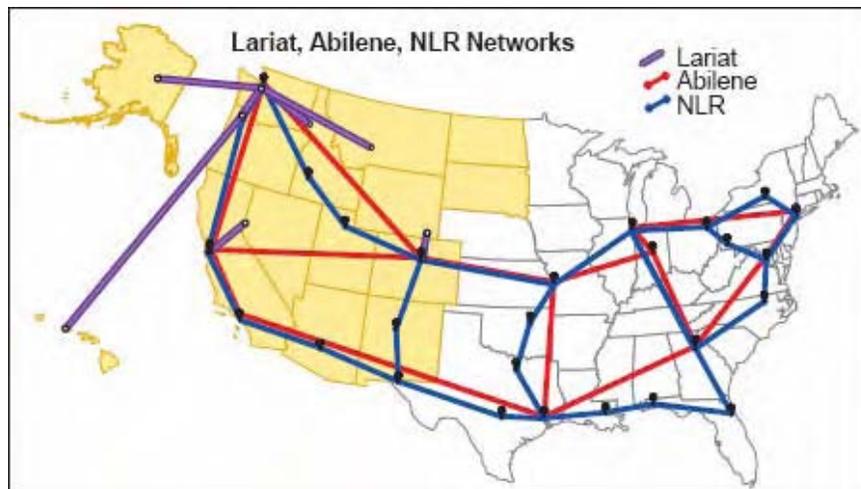

Figure 1. U.S. National Advanced Cyberinfrastructure[6]

Therefore, a major challenge confronting our nation today is how to ensure that all colleges and universities, including those that have not traditionally benefited from

expensive research infrastructure, can participate seamlessly in national and multinational e-science efforts that are cyberinfrastructure-enabled. This begins with the need for ubiquitous deployment of advanced research and education networks.

Opportunities in the West

The West faces unique challenges in responding to this opportunity – challenges of geography, sparse populations and limited resources. Yet the West also has some unique assets, including; established leaders in advanced research and education networking – the Pacific Northwest Gigapop, the Corporation for Education Network Initiatives in California, and the Front Range Gigapop; a new broadband network, called the Lariat Network,[7] which is connecting research universities in Alaska, Hawaii, Idaho, Montana, Nevada, and Wyoming to national high-speed networks; nascent state and regional optical networking efforts including the Northern Tier Networking Consortium[8] and New Mexico Lambda Rail; the resources of various higher education organizations as well as support from state legislatures; accumulated political influence of the West at the Federal level; the distinctive skills and insights of major new immigrant populations from North and South America, Asia, and Africa who bring the interpersonal knowledge and skills to work effectively in the new global marketplace; and the entrepreneurial spirit of the West.

Not only does the West have complex geography, but also its demography is increasingly a significant shaper of its destiny. The West is home to nearly 200 minority-serving institutions and many more colleges and universities that serve diverse populations and have historically underparticipated in federal research and development programs (see the appendix for a list of minority-serving institutions in the West). These institutions are often the last to be served, if they are served at all, by leading-edge advances in technology. Given the impact of advanced cyberinfrastructure on all aspects of science and, increasingly, throughout many other disciplines as well, it is essential that these institutions be connected to national advanced research and education
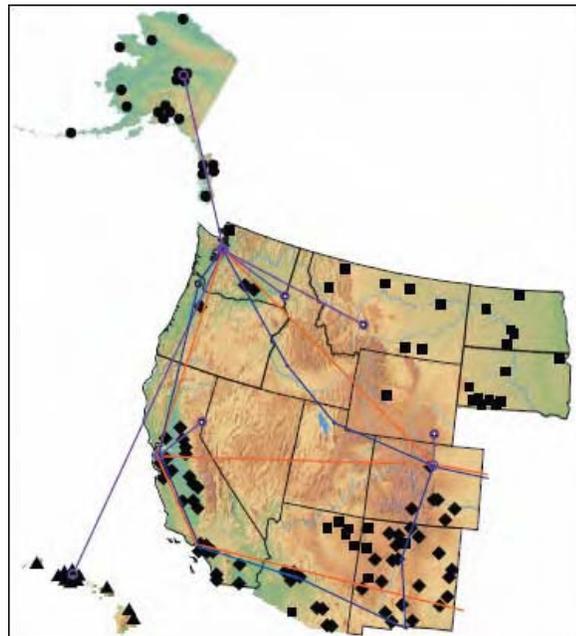

Figure 2. Minority-Serving Institutions in the West

networks. Such connections will allow the West's diverse population to participate in e-science activities; access remote data, devices, and expertise; collaborate with colleagues across the region, nation, and world; give their diverse students and faculty opportunities to engage in transformative research and educational opportunities that now characterize the life, physical, and earth sciences; and contribute their distinctive assets to developments in science, health, culture, and entrepreneurship.

Strategies: Connecting All Institutions

Western leaders from the fields of science, education, and cyberinfrastructure recognize an urgent need for action. These leaders convened in Bozeman, Montana, in August 2006 for the Lariat Summit, a two-day summit addressing cyberinfrastructure and the need to connect minority-serving institutions of higher education to advanced information networks.

Several contexts framed and informed the summit's presentations, discussions, and working sessions:

   o   The national call for increased American competitiveness in science and engineering.
   o   Recent advances in optical networking, cyberinfrastructure and science.
   o   Regional higher education investments in technology infrastructure.
   o   The value of diverse networks of intellectual, scientific and cultural resources.
   o   The potential positive impact of advanced cyberinfrastructure on underserved and rural communities in areas of telehealth and telemedicine.
   o   The consequences of inaction.

Given the national and regional context, the participants of the Lariat Summit developed a set of strategies and recommendations for connecting minority-serving institutions in the West to the national advanced cyberinfrastructure.

Strategies

(1) Engage and educate leaders in minority-serving institutions in the West about the critical importance of cyberinfrastructure for the future of research and education among all higher education institutions, not just research universities.

The existing strong culture of innovation among many minority-serving institutions and the strong interest in the highest quality resources and experiences for their students further underscore the need among minority-serving institutions for advanced information networks. By increasing access to e-science and e-health research and education, research universities and minority-serving institutions reap reciprocal benefits such as increased opportunities for collaborative research and increased exposure of minority students to scientific fields. The National Academies report, *Rising Above the Gathering Storm*, states, "Increasing participation of underrepresented minorities is critical to ensuring a high quality supply of scientists and engineers in the United States over the long-term." Cyberinfrastructure enables this increased participation and provides opportunities to engage a student talent pool from which the nation's future scientific researchers, workers, and teachers will be drawn.

(2) Secure resources to ensure that minority-serving institutions will be among the "connected" institutions in the U.S.

Minority-serving institutions want to be connected to regional and national advanced networks. They want to have access to necessary cyberinfrastructure because they:

   o   Have talented students whose potential would add to the national talent pool if they were given exposure to state-of-the-art tools.
   o   Want access to remote resources, tools, and expertise.
   o   Have expertise, knowledge, and resources that they want to share with a broader research and education community.
   o   Have community-focused needs for access.
   o   Have economic development aspirations that access to cyberinfrastructure would enable.

- o Would like to provide new jobs and careers for students locally, rather than lose them to other institutions and communities.

However, resource constraints currently limit the opportunities available to minority-serving institutions.

(3) Assist minority-serving institutions to develop and participate in local, regional, and national activities that will infuse the culture and practice of e-science and cyberinfrastructure down to the faculty and student levels in departments, colleges and institutions throughout the West.

Given the existing and numerous demands on faculty time and attention, coordinated efforts at the regional level are necessary to address faculty development around e-learning, e-science, and e-health at minority-serving institutions. Careful attention should be paid to coordination among various capacity-building efforts. Such efforts should also focus on academic disciplines, and should always be developed with an understanding of the context within which minority-serving institutions operate.

Recommendations: A Western Approach

(1) Survey minority-serving institutions to collect information about existing connectivity, cyberinfrastructure and support; and aspirations and goals for e-learning, e-science, and e-health.

There is a lack of comprehensive data about current connectivity and cyberinfrastructure and support among minority-serving institutions in the West. The importance of engaging minority-serving institutions in the design and implementation of any research or survey effort cannot be overemphasized. Such a study might be done under the auspices of a regional higher education organization (such as the Western Interstate Commission for Higher Education) but should be shaped and implemented in partnership with minority-serving institutions and regional and national networks of minority-serving institutions.

(2) Conduct an engineering study that would outline a plan and costs for connecting minority-serving institutions to regional and national advanced research and education networks.

Such a study would be similar to engineering studies conducted by Northern Tier Networking Consortium and the Northwest Academic Computing Consortium.[9] This study would outline one-time and ongoing costs associated with advanced network connectivity, and it would provide a comprehensive overview of regional fiber assets. Lastly, such a study would illuminate each institution's particular options for accessing cyberinfrastructure and participating in a related range of research and programs in science, health, arts and culture, and economic development.

(3) Continue to develop case studies of current innovations in e-learning, e-science, and e-health among minority-serving institutions.

Case studies highlighting the effective uses of cyberinfrastructure will serve as content models for other minority-serving institutions. Further, comparing a variety of approaches to project development, funding, administrative support, and technical structures, will help shape the understanding of the issues on the part of key decision makers. Refer to the appendix for examples of cyberinfrastructure case studies.

(4) Use survey data and case studies to build coordinated awareness and support among minority-serving institutions, federal and state agencies, funding organizations, and other partners.

Federal agencies (such as the National Science Foundation, National Institutes of Health, Department of Energy, Department of Education, and Institute of Museum and Library Services) and other funding providers require a thorough statement of need and coordination of resources before allocating funds for programs. As some Lariat Summit participants noted, the problematic nature of much current funding is that it is often diffuse and focused on individual principal investigators or special programs or that it tends to direct funding at the large research-oriented institutions, giving them a mandate to "fix" the problem rather than awarding funds (and mandate) to minority-serving institutions. By engaging campus experts and regional infrastructure organizations (such as GigaPOPs[10] and state education networks) early in the funding process, the problematic nature of current funding strategies can be avoided.

(5) Create a highly participatory cyberinfrastructure initiative among Western minority-serving institutions.

An organizational infrastructure similar to Northern Tier or the Lariat Network will serve to link existing efforts among Western minority-serving institutions and will bring together diverse institutions and organizations with the common goal of creating an infrastructure along the Northern Tier states of the U.S., from Minnesota to Washington. Such an

initiative would work with key regional networking organizations – the Pacific Northwest Gigapop, the Corporation for Education Network Initiatives in California, the Front Range Gigapop – and with other regional or national cyberinfrastructure and application initiatives, such as those at High Performance Computing Centers[11] or those inspired by the recent Federal Communications Commission broadband pilot program for rural health providers. The Western Interstate Commission for Higher Education (WICHE), a respected facilitator of resource sharing among the higher education systems of the West, could provide the expertise and infrastructure for such an initiative.

(6) Collaborate with other regional and national initiatives that focus on e-science or capacity building among minority-serving institutions.

Information sharing is a key driver for this initiative. By linking to other initiatives (such as the High Performance Computing Minority Serving Institution Network), capacities can be built in leading-edge scientific and health-related research and education. Training is a key component of capacity building, and careful attention should be given to the cultural context and applicability of training models.

(7) Conduct demonstration cyberinfrastructure initiatives at minority-serving institutions to develop implementation and support models.

Demonstration cyberinfrastructure initiatives in the West will, in effect, serve as a laboratory for the nation. Various implementation and support models, both campus-based and regionally distributed, can be applied and studied.

(8) Determine the feasibility of establishing regional approaches for research administration and advanced IT technical support.

Explanation: Many minority-serving institutions have severe resource constraints (and, typically, many resources at the margins go to supporting financial aid among a student population with fewer financial resources). Thus, there is concern about the attendant technical support and ongoing costs of cyberinfrastructure. For instance:

- o Costs of connectivity are much higher for many geographically remote minority-serving institutions and options for high-speed connectivity much more constrained, if it is even possible.
- o Many minority-serving institutions do not have advanced technical support for complex advanced network applications available locally – at any cost.

In addition, smaller institutions do not have adequate support for dealing with the federal government and taking advantage of all the programs that are available to them. They do not have organizations like "sponsored programs offices" to help with pre-award and post-award aspects of grants and contracts.

Conclusion

The West is mobilized and ready for connecting minority-serving higher education institutions to U.S. advanced information networks.

To delay this work would severely hinder the competitiveness of minority-serving institutions and the communities they serve in the West. To delay this work means losing the contributions of diverse communities working on problems common to their experiences and important to the nation. To delay this work means preventing faculty and students from participating more broadly in the region and the world.

In answering the national call for increasing the nation's competitiveness, the Lariat Summit is hoping to broaden the conversation to include *all* students and *all* higher education institutions in the West.

Endnotes

[1]According to the Higher Education Act (HEA) Title III, Title IV and Title V of 1965 as amended, "minority-serving institution" refers to an institution of higher education whose enrollment of a single minority or a combination of minorities exceeds 50 percent of the total enrollment. The term "minority" means American Indian, Alaskan Native, Black (not of Hispanic origin), Hispanic (including persons of Mexican, Puerto Rican, Cuban, and Central or South American origin), Pacific Islander or other underrepresented ethnic group. Source: http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst.html.

Alaska Native-Serving Institution
According to the Higher Education Act (HEA) Title III of 1965 as amended, the term "Alaska Native-serving institution" means an institution of higher education that has an enrollment of undergraduate students that is at least 20 percent Alaska Native students.

American Indian Tribally Controlled Colleges and Universities
According to the Higher Education Act (HEA) Title III of 1965, as amended, the term "Tribal college or university" is a "Tribally controlled college or university." In section 2 of the Tribally Controlled College or University Assistance Act of 1978, a "Tribally controlled college or university" is defined as an institution of higher education which is formally controlled, or has been formally sanctioned or chartered, by the governing body of an Indian tribe or tribes, and is an institution listed in the Equity in Educational Land Grant Status Act of 1994.

Hispanic-Serving Institution
According to the Higher Education Act (HEA) Title V of 1965, as amended, a "Hispanic-serving institution" is defined as a nonprofit institution that has at least 25 percent Hispanic full-time equivalent (FTE) enrollment, and of the Hispanic student enrollment at least 50 percent are low income.

Historically Black Colleges and Universities
According to the Higher Education Act of 1965, as amended, a "historically Black college or university" is defined as any historically black college or university that was established prior to 1964, whose principal mission was, and is, the education of Black Americans.

Native Hawaiian-Serving Institution
According to the Higher Education Act (HEA) Title III of1965, as amended, the term "Native Hawaiian-serving institution" means an institution of higher education that has an enrollment of undergraduate students that is at least 10 percent Native Hawaiian students.

[2]The Lariat Summit and this report focus on the Western states served by the Western Interstate Commission for Higher Education: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming.

[3]Spurred in part by opportunities emerging from the recent downturn in the telecommunications sector, the U.S. research and education community began purchasing key dark-fiber segments, the vital raw material for constructing advanced optical networks. Owning the underlying networking infrastructure, while bringing new levels of responsibility (e.g., ongoing maintenance), is increasingly viewed as essential to supporting the many collaborations spanning the research university community and thus as vital for maintaining research competitiveness. The momentum toward developing facilities-based optical networks is most pronounced at the state and regional levels. Over 20 such efforts either are already in production or are under active development. Source: http://www.educause.edu/apps/er/erm05/erm0538.asp.

[4]The Pacific Northwest Gigapop (PNW Gigapop) is a not-for-profit that serves leading-edge organizations and research and education networks throughout the Pacific Rim, providing robust, highest-speed access to current state of the art Internet; next-generation Internet services and technology; and the exclusive R&D testbeds where tomorrow's Internet technologies are being developed. Source: http://www.pnw-gigapop.net/.

[5]The Front Range GigaPOP (FRGP) is a consortium of universities, nonprofit corporations, and government agencies that cooperate in an aggregation point to share wide-area networking (WAN) services, access to the commodity Internet, access to the Internet2 research network, and access to the National LambdaRail (NLR). Source: http://www.frgp.net/intro.html.

[6]National Lambda Rail (NLR) advances the research, clinical, and educational goals of members and other institutions by establishing and maintaining a unique nationwide network infrastructure that is owned and controlled by the U.S. research community. Ownership of the underlying optical infrastructure ensures the research community unprecedented control and flexibility in meeting the requirements of the most advanced network applications and providing the resources demanded by cutting-edge network research. NLR aims to support experimental and production networks, foster networking research, promote next-generation applications, and facilitate interconnectivity among high-performance research and education networks. Source: http://www.nlr.net/about/.

Internet2, led by more than 200 U.S. universities, working with industry and government, develops and deploys advanced network applications and technologies for research and higher education, accelerating the creation of tomorrow's Internet. By bringing research and academia together with technology leaders from industry, government and the international community, Internet2 promotes collaboration and innovation that has a fundamental impact on the future of the Internet. Source: http://www.internet2.edu/about/.

[7]The Lariat Project is the first phase of IDeANet, funded by the National Center for Research Resources at the National Institutes of Health. Lariat will develop and implement a plan to provide a high-speed telecommunications network for biomedical researchers that will enable scientists and educators in Alaska, Hawaii, Idaho, Montana, Nevada, and Wyoming to take advantage of the wealth of remote research resources and expertise available to scientists in other areas of the country. Source: http://www.lariat-west.org/about/ .

[8]Northern Tier Networking Consortium is a regional network initiative aimed at providing a robust research network connection for educational institutions in the upper-Northwestern states by creating a national backbone route across the northern U.S. – the Northern Tier. Source: http://www.ntnc.org/.

[9]The Northwest Academic Computing Consortium (NWACC) comprises 30 colleges, universities, and other nonprofit organizations in Oregon, Washington, Alaska, Idaho, Montana, and North Dakota. Founded in 1987, NWACC's mission is to foster communication and collaboration among its member institutions on the development and use of advanced technology for instruction, research, and administrative operations. Source: http://web.reed.edu/nwacc/about/mission.html.

[10]Short for gigabit Point of Presence, a gigaPOP is a network access point that supports data transfer rates of at least 1 Gbps. GigaPOPs are designed for fast access to a high-speed network, such as Internet2. Each university that connects to Internet2 must do so through a gigaPOP, which connects the university's LANs and WANs to the Internet2 network. Source: http://www.webopedia.com/TERM/G/gigaPOP.html.

[11]High-performance computing encompasses advanced computing, communications, and information technologies, including scientific workstations, supercomputer systems, high-speed networks, special-purpose and experimental systems, the new generation of large scale parallel systems, and application and systems software with all components well integrated and linked over a high-speed network. Source: http://filibusta.crema.unimi.it/docs/rfc/glossary.htm.

Appendix

Acknowledgements

Cyberinfrastructure Case Studies

- o   Awakening Tongues: Advanced Networks' Role in Language Renaissance
- o   Johnson Center for Virtual Reality
- o   Remote Microscopy and Distance Learning
- o   The Center for Rapid Environmental Assessment and Terrain Evaluation
- o   Digital Pueblo Project
- o   Native People for Cancer Control

Minority-Serving Institutions in the West

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- o   North Dakota
- o   Oregon
- o   Idaho
- o   Utah
- o   Nevada
- o   Sources for Maps

Acknowledgements

Cyberinfrastructure Case Study

Awakening Tongues: Advanced Networks' Role in Language Renaissance

Lakota Language Acquisition Project – Oglala Lakota College, Pine Ridge Reservation, South Dakota
Sealaska Heritage Institute – Juneau, Alaska

Languages are an essential part of our living human heritage. Beyond serving as an effective means of communication, language reflects a people's unique view of the world. Despite their critical importance in defining a culture, over 50 percent of the world's languages are endangered.

Of the 300-plus languages indigenous to North America, nearly a third have already disappeared. Only about a quarter of those that survive are still being passed on to children. Without immediate efforts to reverse this trend, all of these languages will fall silent within the next few decades – an enormous and irredeemable loss.

Native American communities across the United States have responded by developing numerous programs designed to combat the loss of language. Using grant funds awarded by the U.S. Department of Health and Human Services, the Sealaska Heritage Institute in Juneau is producing hard copy, online and CD-ROM dictionaries of the Tlingit, Haida, and Tsimshian languages. The Kotzebue Native Village in Alaska is planning for a major extension of its existing K-6 language immersion school. The Lakota Language Acquisition Project is training language coaches, developing protocols for immersion camps, and building a lending library of tapes, books, videos, and other educational tools for the Lakota Sioux community.

Access to advanced cyberinfrastructure would increase the capacity of existing and future language preservation efforts to capture, store, and find collections of language-learning resources by facilitating the creation of multimedia-rich digital repositories. These repositories would increase access to language-preservation resources within the community and provide a framework for tribal groups to decide on which portions of their collections should be made more widely available.

Advanced cyberinfrastructure would also help connect the rich pockets of expertise within the often geographically isolated tribal communities across the West with national organizations, such as the Smithsonian Institution's National Native American Museum, the American Indian Language Development Institute at the University of Arizona, and other organizations interested in promoting and supporting existing Native American language-preservation efforts.

Cyberinfrastructure Case Study

Johnson Center for Virtual Reality
Pine Technical College

The current and upcoming cohort of students and employees are often referred to as "digital natives," having grown up immersed in a digital world of personal computers, digital music players, cell phones, video games, and the Internet. Their tolerance for traditional teaching and training materials lessens as their exposure to sophisticated media, particularly in the form of computer games, grows. To date, the integration of highly immersive, interactive, and entertaining game environments with educational content has been uneven at best.

With the mission of enabling and supporting the use of computer simulations to improve education and training at two-year institutions, the Johnson Center for Virtual Reality (JCVR) was established at Pine Technical College as a Minnesota State Colleges & Universities service center in January 2000.

The Johnson Center has produced a wide variety of industrial training simulations, mostly fully immersive, where the user feels as if he or she is inside of a three-dimensional computer-generated environment or model. In collaboration with content experts, the Johnson Center recently began work coupling high-end networked computer-game environments with well-written instructional content to create high-quality, highly engaging game-based scenarios to educate students and train personnel in a wide variety of topic areas.

These educational scenario modules will be arrayed on servers connected to an advanced networking infrastructure through a partnership with the University of Minnesota, enabling broad distribution across teaching and learning communities worldwide.

With the creation of a virtual industrial spray paint booth, virtual welding, and virtual inspection training, the Johnson Center has proven that technical innovation can provide Pine Technical College students in rural and remote Minnesota with a cost-effective way to learn marketable skills. These projects have also helped strengthen ties with the University of Minnesota and local industry partners.

The Johnson Center for Virtual Reality is helping Pine Technical College create a culture where the use of technology and advanced-networking resources enhances learning and provides access to learning not otherwise available.

With proper cyberinfrastructure access, minority-serving institutions could leverage and extend existing programs such as those being developed at the Johnson Center for Virtual Reality. For more information, please see http://www.jcvr.org/.

Cyberinfrastructure Case Study

Remote Microscopy and Distance Learning
Hayward's Interactive Remote Shared Access (IRSA) Project
California State University

With funding provided by the National Science Foundation, California State University – Hayward's Interactive Remote Shared Access (IRSA) project has developed software to remotely operate visual and analytical scientific instruments over an advanced network. The IRSA project offers remote access to a scanning electron microscope, which provides surface structure information on chemically fixed cells, microchips, crystals, rocks, and other nonliving objects.

A transmission electron microscope is also available to remotely observe internal cellular structures. It can also be used to observe negatively stained materials, such as isolated proteins, virus particles, and microbiology samples.

Remote users can view samples they have prepared and sent to the facility or view samples prepared by the facility staff. In either case, the remote user is able to take control of most of the functions of the microscope and image analysis, including filter selection, laser intensity, PMT values, pinhole size, focus, zoom, slide position, number of sections and accumulations for serial scanning, and quantitative analysis programs. Image files from each session can be saved for future viewing.

Extending access to high-speed research and education networks provides minority-serving institution researchers, educators, and students with access to scientific research capacity often unavailable to them. It also enables expanded collaboration with scientific researchers worldwide.

For more information, please see
http://www.sci.csuhayward.edu/create/.

Cyberinfrastructure Case Study

The Center for Rapid Environmental Assessment and Terrain Evaluation
University of New Mexico

In the event of a major natural or manmade environmental disaster, the lack of effective mechanisms to access and process data on changing environmental conditions can lead to negative economic impacts and could cost thousands of lives.

The assessment of environmental conditions is usually limited to the after-the-fact processing of information gathered from ground-based environmental sensors and monitors and remotely sensed imagery produced by environmental satellites. Because of receiving, processing and dissemination problems, these assessments typically occur weeks to months after the event of interest. This information is of little value to the researcher who needs to place this data in a real-time modeling framework for scientific studies or to a hazard-response team needing to make decisions while an event is occurring.
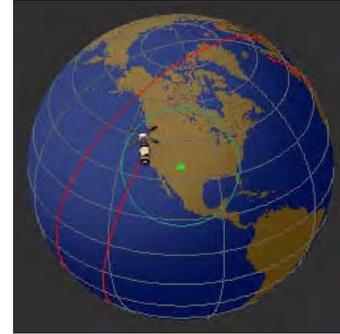
The Center for Rapid Environmental Assessment and Terrain Evaluation (CREATE), headquartered on the campus of the University of New Mexico, acquires near real-time, remotely sensed data from environmental satellites and integrates this data within the analytic and computational facilities of the center to provide rapid assessment of changing environmental conditions. The center can operate under most weather conditions, providing 24-hour coverage of the Western United States and northern Mexico and offering the ability to respond immediately to user demands considered to be of primary importance.

CREATE is currently developing the capacity to make both the real-time and archived data available over Internet2 and National Lambda Rail through web-browser-based advanced-data visualization tools. These real-time extreme-weather and environmental-monitoring tools provide a compelling example of how extending access to advanced cyberinfrastructure would expand the e-science research capacity of minority-serving institutions and add value to the communities they serve.

The Center for Rapid Environmental Assessment and Terrain Evaluation was established and funded through two federal appropriations to NASA, sponsored by Senator Jeff Bingaman, as well as through funds from the New Mexico Legislature, and various research grants.

For more information, please see http://www.unm.edu/create.

Cyberinfrastructure Case Study

Digital Pueblo Project
University of New Mexico, National Hispanic Cultural Center

New Mexico has a rich history as a leader in both cultural and artistic innovation and the advancement of science and technology. Often innovators in the arts and technology need to leave small rural communities in order to further explore and develop their talents.

With a grant from the National Science Foundation, the University of New Mexico has joined with government and private entities to establish the Digital Pueblo Project, fostering innovation and economic development in the digital arts and sciences industry and encouraging rural residents to stay in their communities.

The Digital Pueblo Project has created "technology pods," designed to serve children and adults of all ages interested in developing animation and computer graphics for film, television, arts, music, and dance. The pods are equipped with computing resources and connections to large servers and computers at the University of New Mexico and other centers, as well as with graphics software and hardware, resource and knowledge bases for training, and Access Grid technology for distance training and project collaboration.

The Digital Pueblo Project recently finished production on *Arrow to the Sun*, a new immersive media piece created for screening in the LodeStar Dome – a digital planetarium adapted to display video, animation, and art in a fully immersive hemispheric environment. Based on a Caldecott Award-winning children's book, *Arrow to the Sun* follows a young Pueblo boy's journey of self-discovery with vibrant colors and bold geometric forms. High school students worked with author and illustrator Gerald McDermott to animate the story. Pairing cultural education with science education, the piece will teach elementary-school-age children about our solar system.

Students at National Hispanic Cultural Center T-Pod discuss the Gronk animation project with students from the LodeStar Astronomy Center class over the AccessGrid.

Another recent work of the Digital Pueblo Project is *Gronk's BrainFlame*, a 14-minute, computer-animated piece created specifically for the LodeStar Dome Theater. Describing what happens at the flashpoint of a creative thought, *BrainFlame* was produced as a collaboration between Los Angeles–based artist Gronk, composer Steven LaPonsie, animator Hue Walker, and a number of Digital Pueblo Project students, who worked on the animation.

To date the Digital Pueblo Project has established two Technology Pods, both in Albuquerque, NM. One is located at the National Hispanic Cultural Center. The other is located at the LodeStar Astronomy Center, inside the New Mexico Museum of Natural History.

Extending this proven cyberinfrastructure capacity to minority-serving institutions in rural communities statewide would substantially increase the demonstrated value of this nascent project.

For more information, please see http://www.unm.edu/~atcinfo/digitalpueblo.html.

Cyberinfrastructure Case Study

Native People for Cancer Control
Center for Clinical and Epidemiological Research
University of Washington

Most American Indian and Alaska Native languages do not have a word for cancer, perhaps because until recently, cancer was a rare disease in native communities. In the past 50 years, however, cancer has become the second leading cause of death for American Indians and the leading cause of death among Alaska Natives.

These populations also experience the worst cancer-related disparities of any minority group in the U.S. in terms of poverty, lack of access to screening and high-quality care, encouragement for health-promoting behaviors, and access to clinical cancer trials. For American Indians and Alaska Natives, these factors have resulted in the poorest cancer survival rates among all racial/ethnic groups.

Native People for Cancer Control (NPCC) is one of 25 community network programs funded by the National Cancer Institute to enhance existing relationships and programs and to build new bridges that will improve education, training, and research in cancer.

NPCC will establish a collaborative and sustainable network, the Native People for Cancer Control Telehealth Network, offering tele-oncology services to promote better post-diagnosis cancer care for American Indians and Alaska Natives; improve support services for cancer sufferers, survivors, and families; and increase awareness of telehealth as a viable tool for efficient delivery of cancer care. Expert physicians and three Alaska Native faculty from the tertiary care cancer consortium in Seattle will provide post-diagnosis cancer care services via video teleconference over regional optical networks — like the Lariat Network, a regional optical research and education network — to native children and adults, including consultations on follow-up care for cancer survivors, cancer pain, and psychological problems in cancer patients and survivors, as well as training and consultations on end-of-life issues and cancer-patient support activities.

Six new tribal clinical sites in Washington will link with the Alaska Federal Health Care Access Network to bridge 60 sites serving Alaska Natives to provide access to the telehealth cancer services.

For more information on the Native People for Cancer Control project, please see:
http://depts.washington.edu/uwccer/cancer-center/about-cc/.

Lariat Summit: Connecting Minority-Serving Institutions in the West to US Advanced Cyberinfrastructure.

PACIFIC NORTHWEST GIGAPOP

■ Tribal Colleges and Universities
● Alaska Native Intitutions
▲ Native Hawaiian Institutions
◆ Hispanic Serving Institutions

Extending the Network to Alaska Native, Native Hawaiian, Hispanic-Serving, and Tribal Colleges and Universities within Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington and Wyoming.

Lariat, Abilene, NLR Networks

— Lariat
— Abilene
— NLR

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Alaska

■ Tribal Colleges and Universities
● Alaska Native Intitutions
▲ Native Hawaiian Institutions
◆ Hispanic Serving Institutions

Lariat, Abilene, NLR Networks
— Lariat
— Abilene
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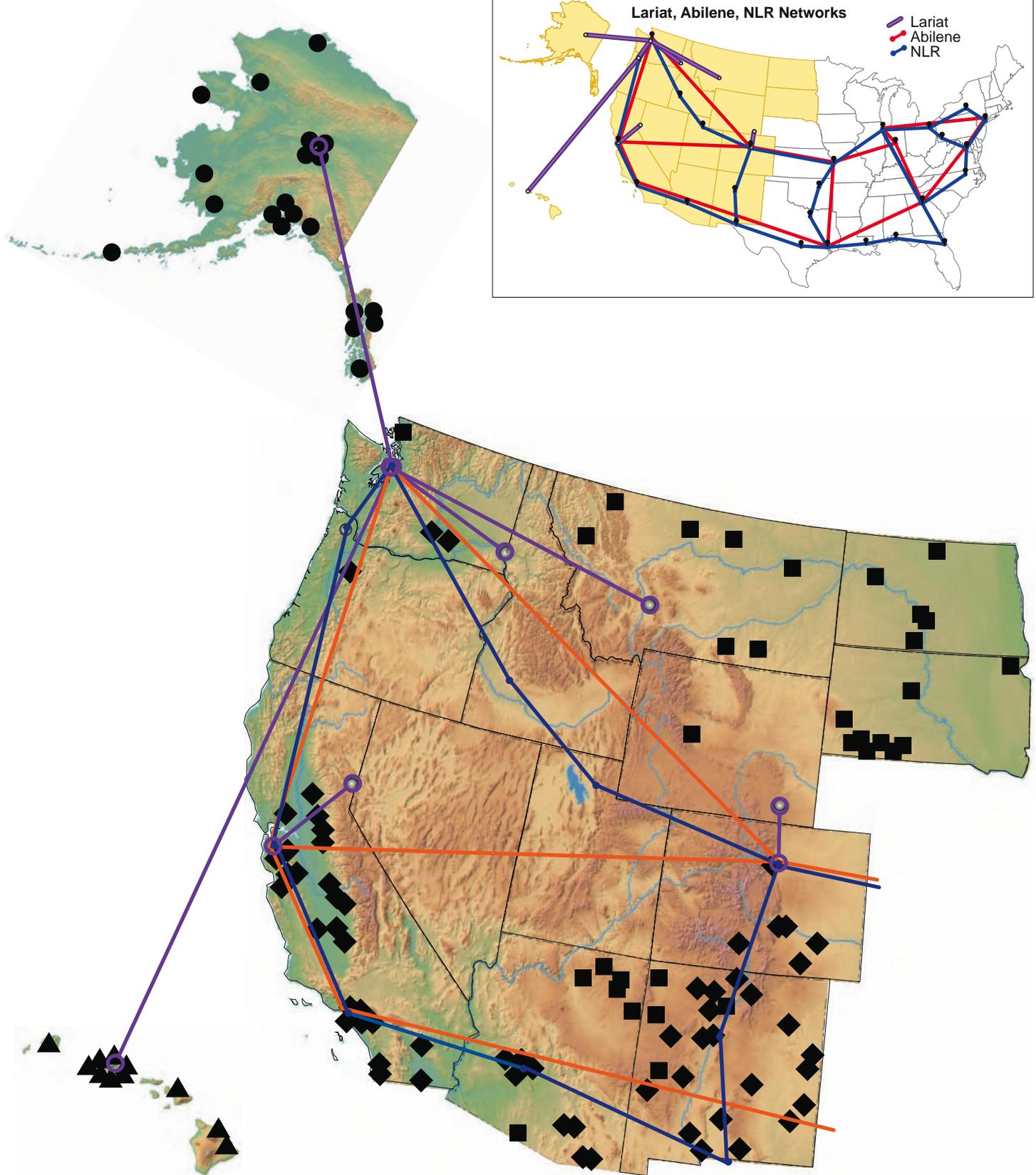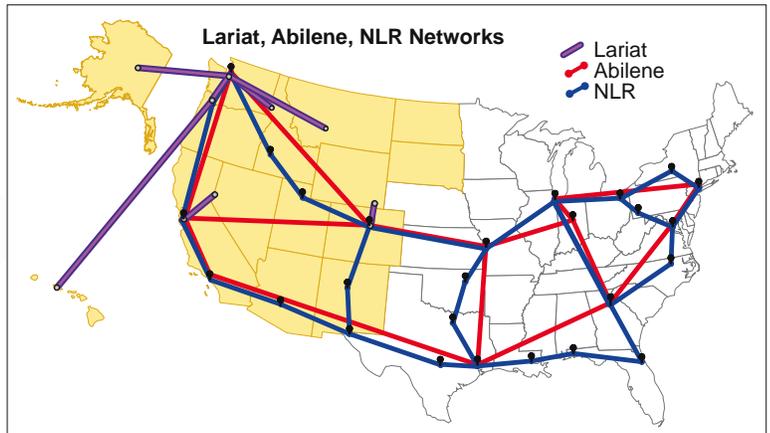
Alaska Native Institutions
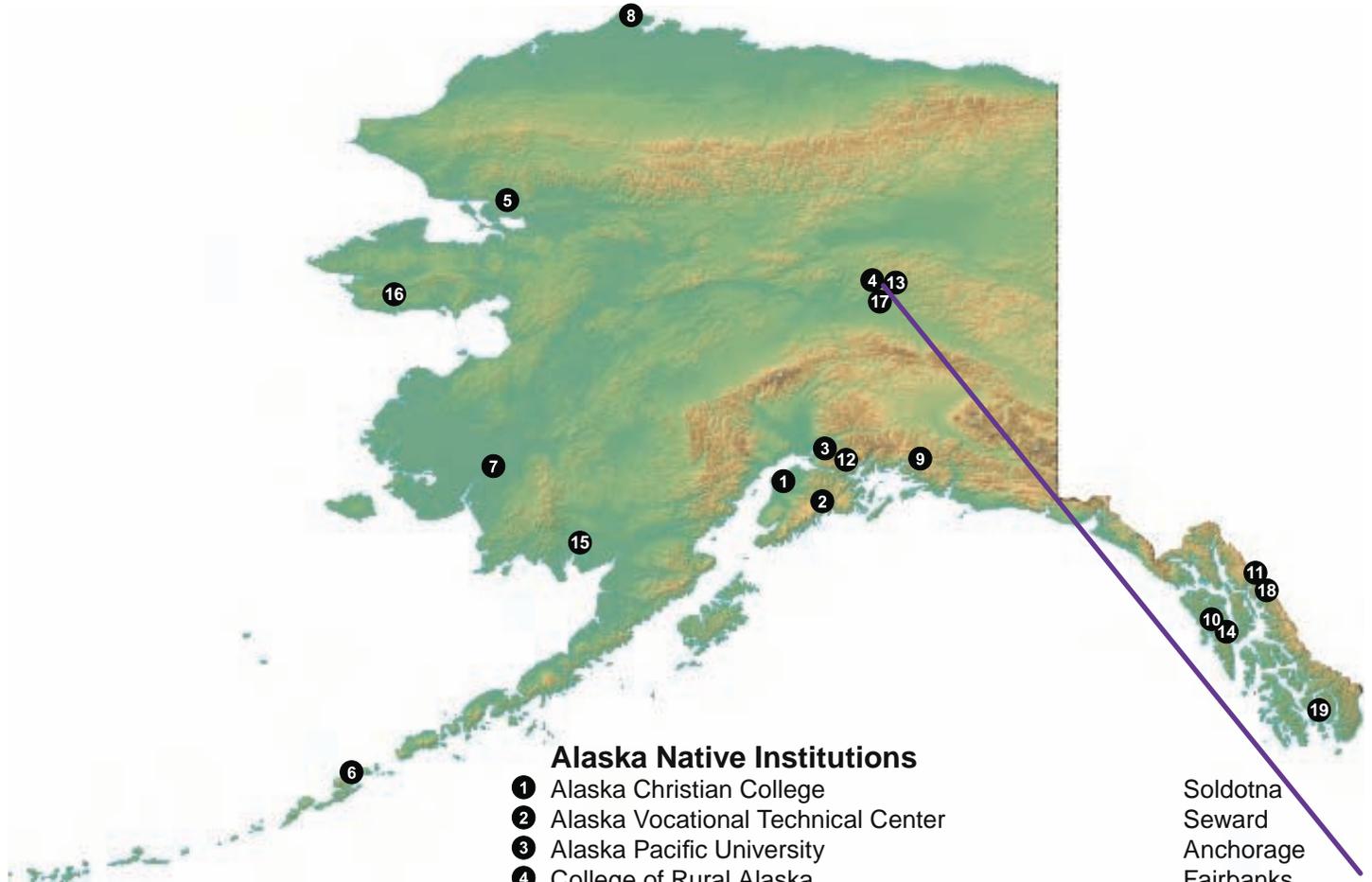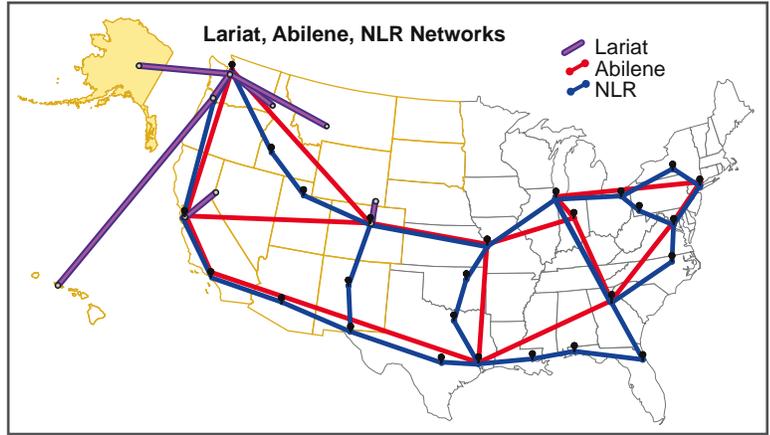
#	Institution	Location
1	Alaska Christian College	Soldotna
2	Alaska Vocational Technical Center	Seward
3	Alaska Pacific University	Anchorage
4	College of Rural Alaska	Fairbanks
5	College of Rural Alaska - Chukchi Campus	Kotzebue
6	College of Rural Alaska - Interior/Aleutians Campus	Fairbanks
7	College of Rural Alaska - Kuskokwim Campus	Bethel
8	Ilisagvik College	Barrow
9	Prince William Sound Community College	Valdez
10	Sheldon Jackson College, Sitka	Sitka
11	Southeast Alaska Tribal College	Juneau
12	University of Alaska Anchorage	Anchorage
13	University of Alaska Fairbanks	Fairbanks
14	University of Alaska at Southeast Sitka Campus	Sitka
15	University of Alaska Fairbanks Bristol Bay	Dillingham
16	University of Alaska Fairbanks Northwest Campus	Nome
17	University of Alaska Fairbanks - Tanana Valley Campus	Fairbanks
18	University of Alaska Southeast - Juneau Campus	Juneau
19	University of Alaska Southeast - Ketchikan Campus	Ketchikan

Hawaii

PACIFIC NORTHWEST GIGAPOP

- ■ Tribal Colleges and Universities
- ● Alaska Native Intitutions
- ▲ Native Hawaiian Institutions
- ◆ Hispanic Serving Institutions

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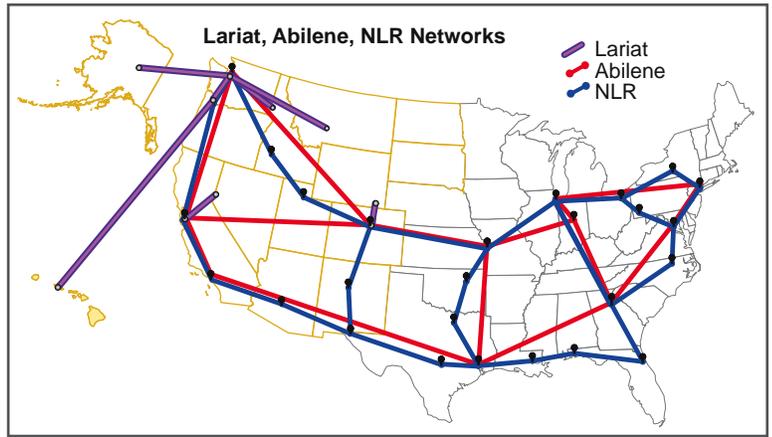
Native Hawaiian Institutions

#	Institution	City
1	Chaminade University of Honolulu	Honolulu
2	Hawai'i Community College	Hilo
3	Heald College Honolulu	Honolulu
4	Honolulu Community College	Honolulu
5	Kapi'olani Community College	Honolulu
6	Kauai Community College	Lihue
7	Leeward Community College	Pearl City
8	Maui Community College	Kahului
9	University of Hawai'i at Manoa	Honolulu
10	University of Hawai'i at Hilo	Hilo
11	University of Hawai'i – West O'ahu	Pearl City
12	Windward Community College	Kaneohe

Washington

PACIFIC NORTHWEST GIGAPOP

■ Tribal Colleges and Universities
● Alaska Native Intitutions
▲ Native Hawaiian Institutions
◆ Hispanic Serving Institutions

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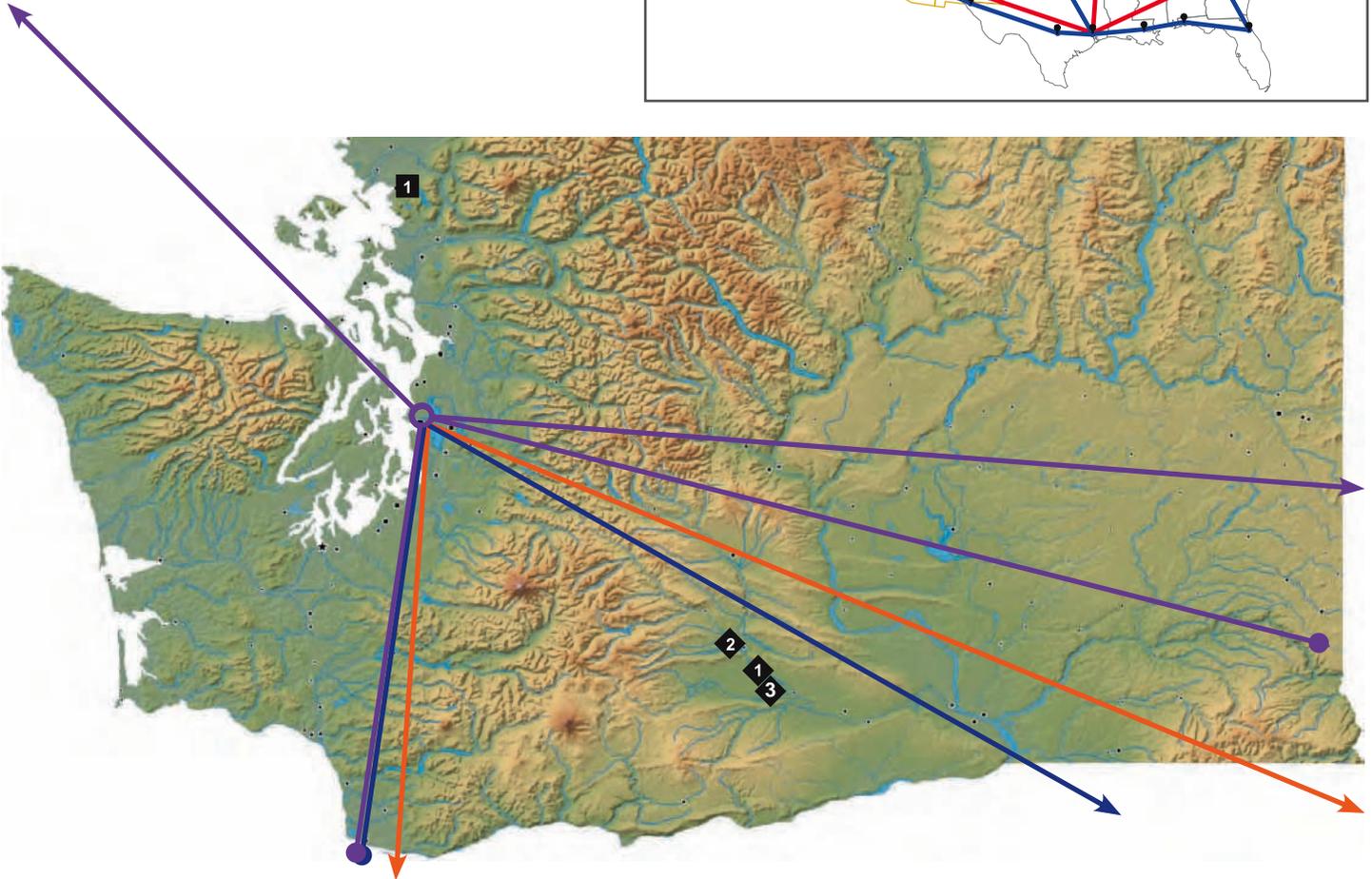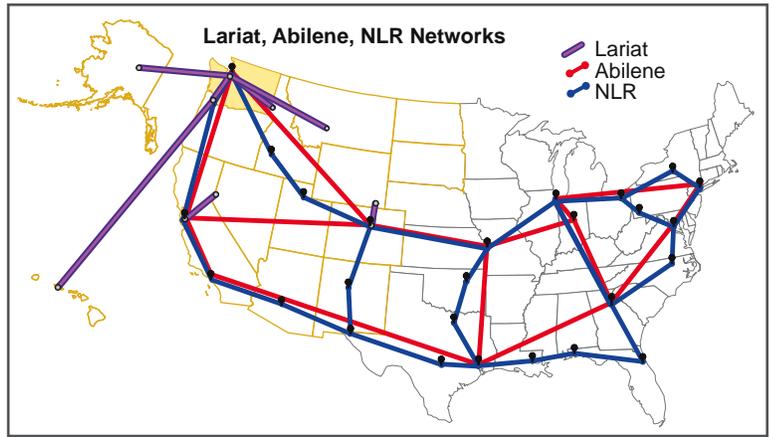
Tribal Colleges and Universities
1 Northwest Indian College   Bellingham

Hispanic Serving Institutions
1 Columbia Basin College   Yakima
2 Heritage University   Toppenish
3 Yakima Valley Community College   Yakima

PACIFIC
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California

Tribal Colleges and Universities ■
Alaska Native Intitutions ●
Native Hawaiian Institutions ▲
Hispanic Serving Institutions ◆

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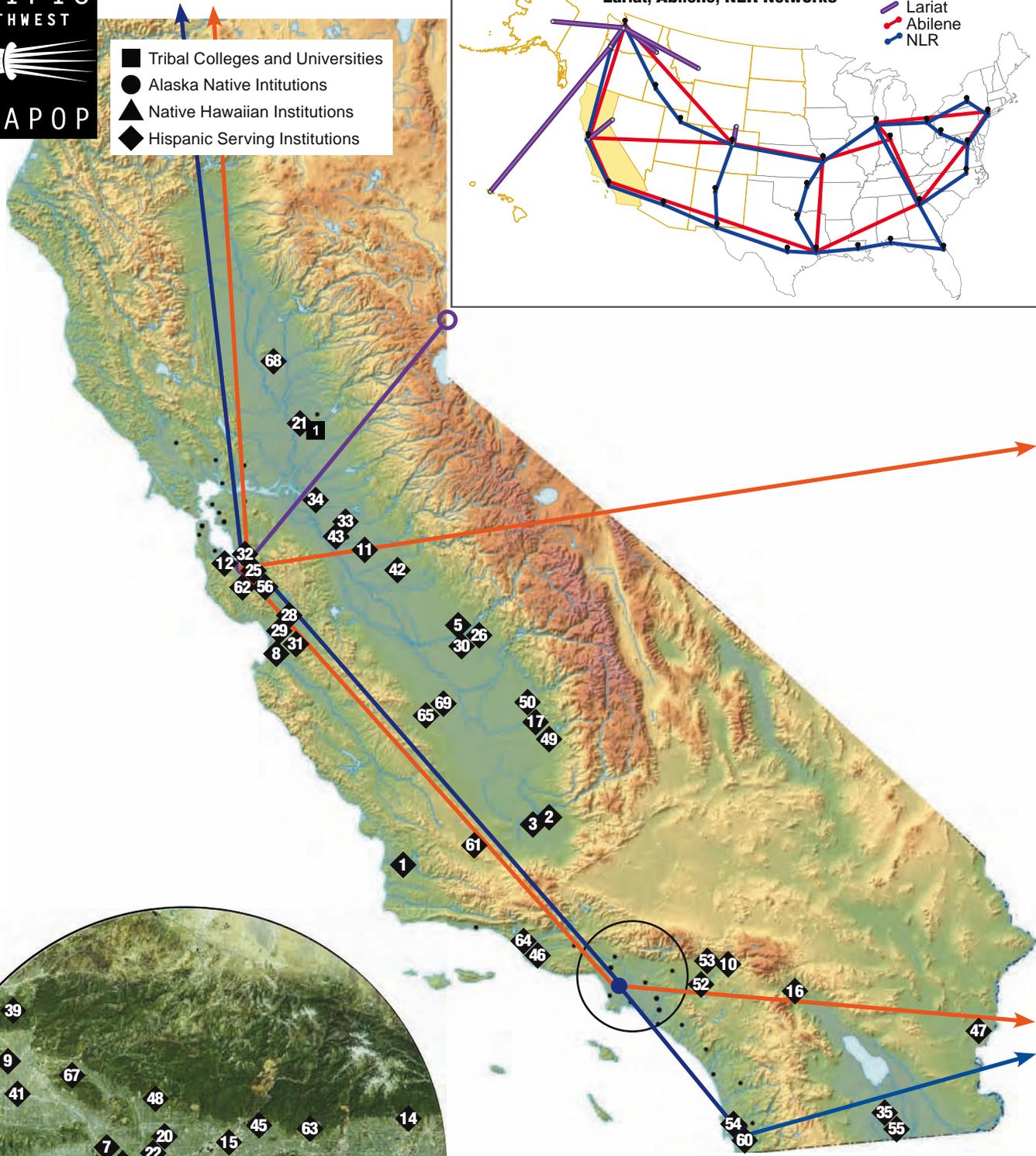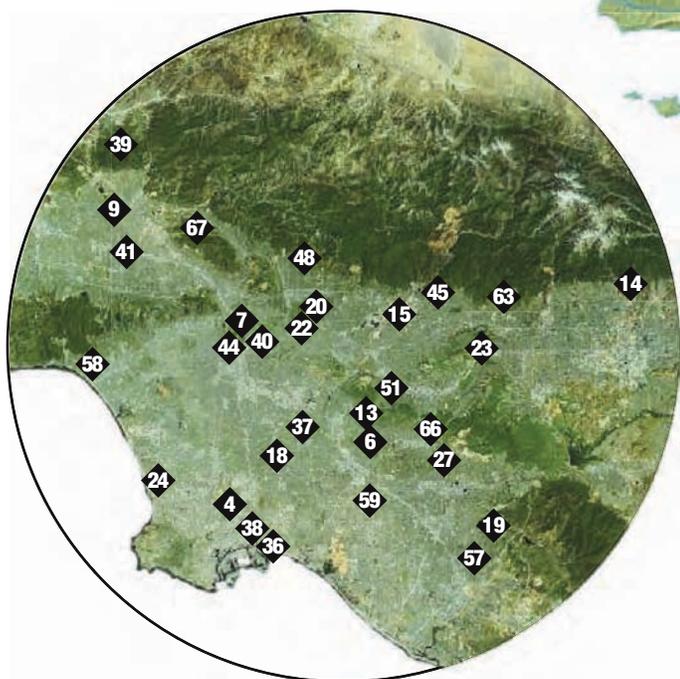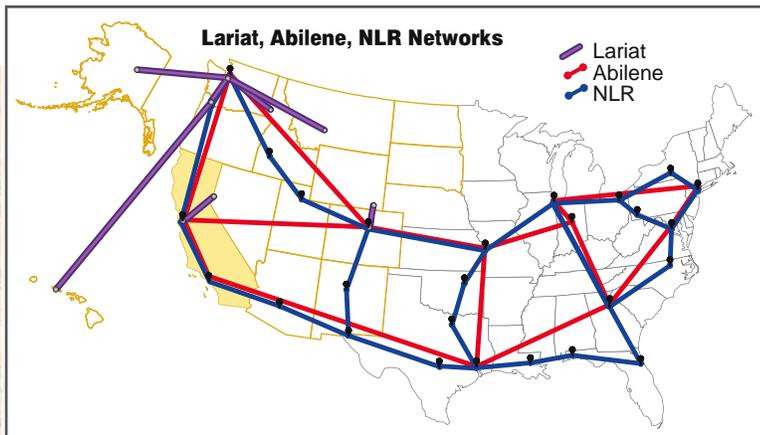
California

■ Tribal Colleges and Universities
● Alaska Native Intitutions
▲ Native Hawaiian Institutions
◆ Hispanic Serving Institutions

Tribal Colleges and Universities

1 D-Q University — Davis

Hispanic Serving Institutions

#	Institution	City
1	Allan Hancock College	Santa Maria
2	Bakersfield College	Bakersfield
3	Cal. State University-Bakersfield	Bakersfield
4	Cal. State University-Dominguez Hills	Carson
5	Cal. State University-Fresno	Fresno
6	Cal. State University-Fullerton	Fullerton
7	Cal. State University-Los Angeles	Los Angeles
8	Cal. State University-Monterey Bay	Seaside
9	Cal. State University-Northridge	Northridge
10	Cal. State University-San Bernardino	San Bernardino
11	Cal. State University-Stanislaus	Turlock
12	Canada College	Redwood City
13	Cerritos College	Norwalk Rancho
14	Chaffey College	Cucamonga
15	Citrus College	Glendora
16	College of The Desert	Palm Desert
17	College of The Sequoias	Visalia
18	Compton Community College	Compton
19	Cypress College	Cypress
20	Don Bosco Technical Institute	Rosemead
21	D-Q University	Davis
22	East Los Angeles College	Monterey Park
23	E. San Gabriel Valley Reg. Occp. Pgm	West Covina
24	El Camino College	Torrance
25	Evergreen Valley College	San Jose
26	Fresno City College	Fresno
27	Fullerton College	Fullerton
28	Gavilan College	Gilroy
29	Hartnell College	Salinas
30	Heald College-Fresno	Fresno
31	Heald College-Salinas	Salinas
32	Heald College-San Jose	Milpitas

Hispanic Serving Institutions, continued

#	Institution	City
33	Heald College-Stockton	Stockton
34	Humphreys College-Stockton	Stockton
35	Imperial Valley College	Imperial
36	Long Beach City College	Long Beach
37	Los Angeles City College	Los Angeles
38	Los Angeles Harbor College	Wilmington
39	Los Angeles Mission College	Sylmar
40	Los Angeles Trade Technical College	Los Angeles
41	Los Angeles Valley College	Valley Glen
42	Merced College	Merced
43	Modesto Junior College	Modesto
44	Mount St Mary's College	Los Angeles
45	Mt San Antonio College	Walnut
46	Oxnard College	Oxnard
47	Palo Verde College	Blythe
48	Pasadena City College	Pasadena
49	Porterville College	Porterville
50	Reedley College	Reedley
51	Rio Hondo College	Whittier
52	Riverside Community College	Riverside
53	San Bernardino Valley College	San Bernardino
54	San Diego City College	San Diego
55	San Diego State Univ.-Imperial Valley	Calexico
56	San Jose City College	San Jose
57	Santa Ana College	Santa Ana
58	Santa Monica College	Santa Monica
59	Santiago Canyon College	Orange
60	Southwestern College	Chula Vista
61	Taft College	Taft
62	The National Hispanic University	San Jose
63	University of La Verne	La Verne
64	Ventura College	Ventura
65	West Hills Community College	Coalinga
66	Whittier College	Whittier
67	Woodbury University	Burbank
68	Yuba College	Marysville

PACIFIC NORTHWEST GIGAPOP

Montana

■ Tribal Colleges and Universities
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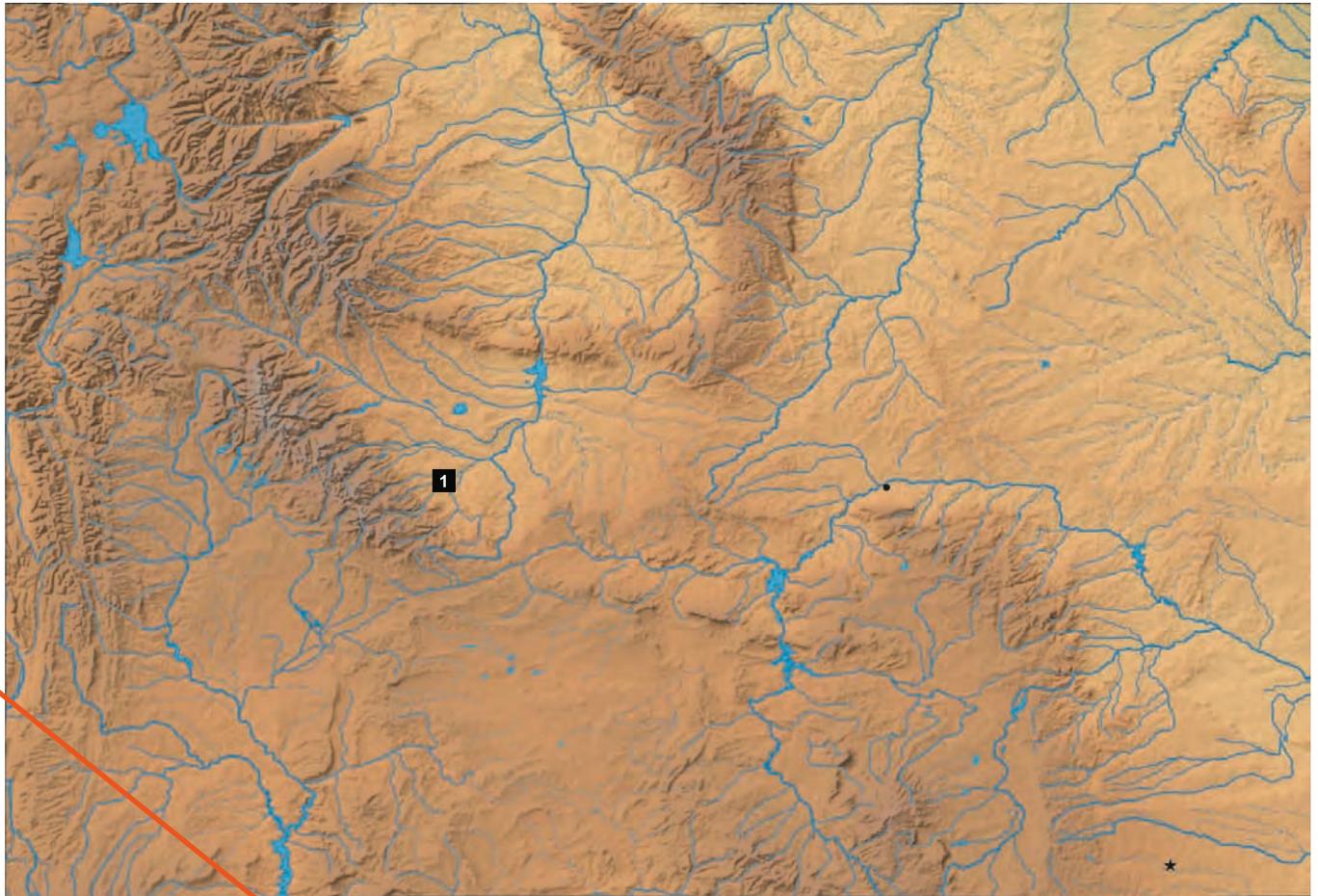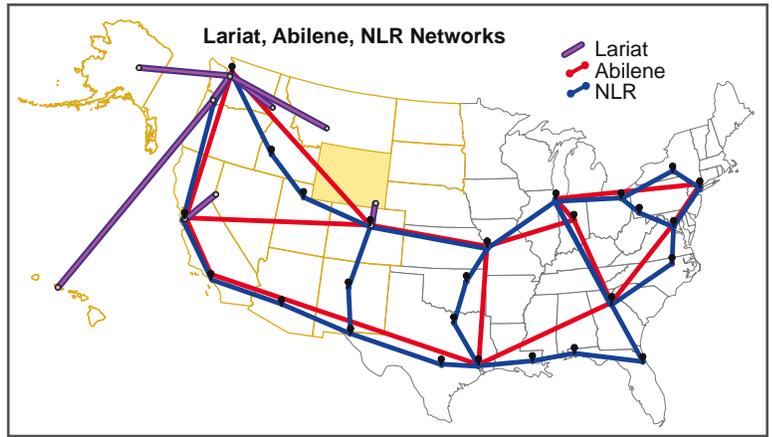▲ Native Hawaiian Institutions
◆ Hispanic Serving Institutions

Lariat, Abilene, NLR Networks

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Tribal Colleges and Universities

1	Blackfeet Community College	Browning
2	Chief Dull Knife College	Lame Deer
3	Fort Belknap College	Harlem
4	Fort Peck Community College	Poplar
5	Little Big Horn College	Crow Agency
6	Salish Kootenai College	Pablo
7	Stone Child College	Box Elder

Wyoming

■ Tribal Colleges and Universities
● Alaska Native Intitutions
▲ Native Hawaiian Institutions
◆ Hispanic Serving Institutions

Lariat, Abilene, NLR Networks

Lariat
Abilene
NLR

Tribal Colleges and Universities
1 Wind River Tribal College   Ethete

Arizona

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- ■ Tribal Colleges and Universities
- ● Alaska Native Intitutions
- ▲ Native Hawaiian Institutions
- ◆ Hispanic Serving Institutions

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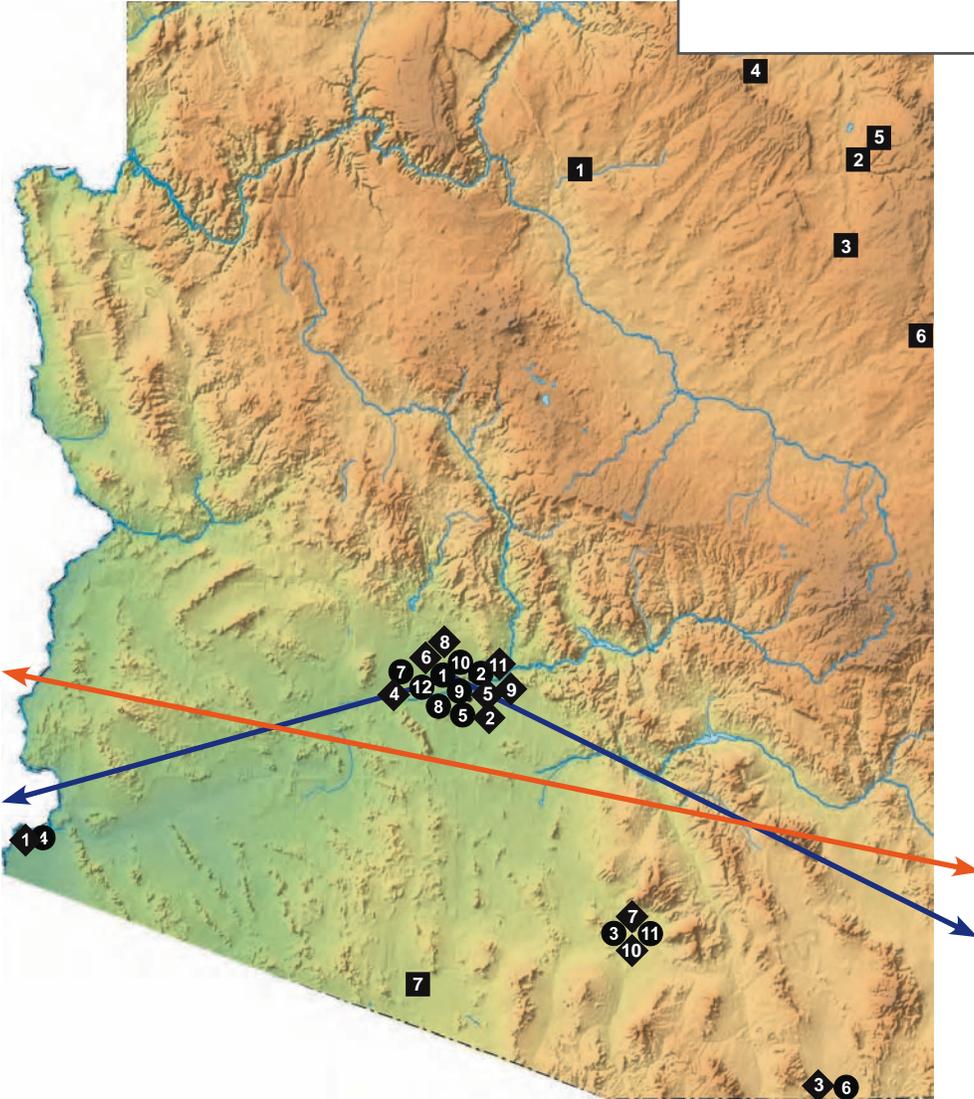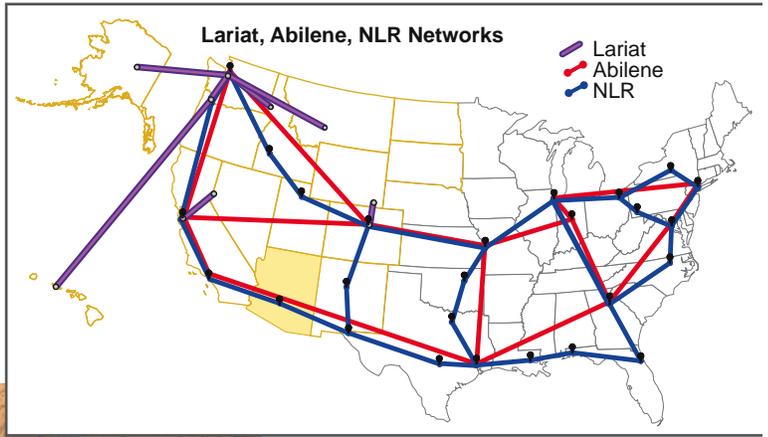
Tribal Colleges and Universities

1	Diné College - Tuba City	Tuba City
2	Diné College - Chinle	Chinle
3	Diné College - Ganado	Ganado
4	Diné College - Kayenta	Kayenta
5	Diné College - Main Campus	Tsaile
6	Diné College - Window Rock	Window Rock
7	Tohono O'odham Community College	Sells

Hispanic Serving Institutions

1	Arizona Western College	Yuma
2	Central Arizona College	Coolidge
3	Cochise College	Douglas
4	Estrella Mountain Community College	Avondale
5	Gateway Community College	Phoenix
6	International Institute of The Americas	Phoenix
7	International Institute of The Americas	Tucson
8	International Institute of The Americas	Mesa
9	Phoenix College	Phoenix
10	Pima Community College	Tucson
11	South Mountain Community College	Phoenix

New Mexico

PACIFIC NORTHWEST GIGAPOP

■ Tribal Colleges and Universities
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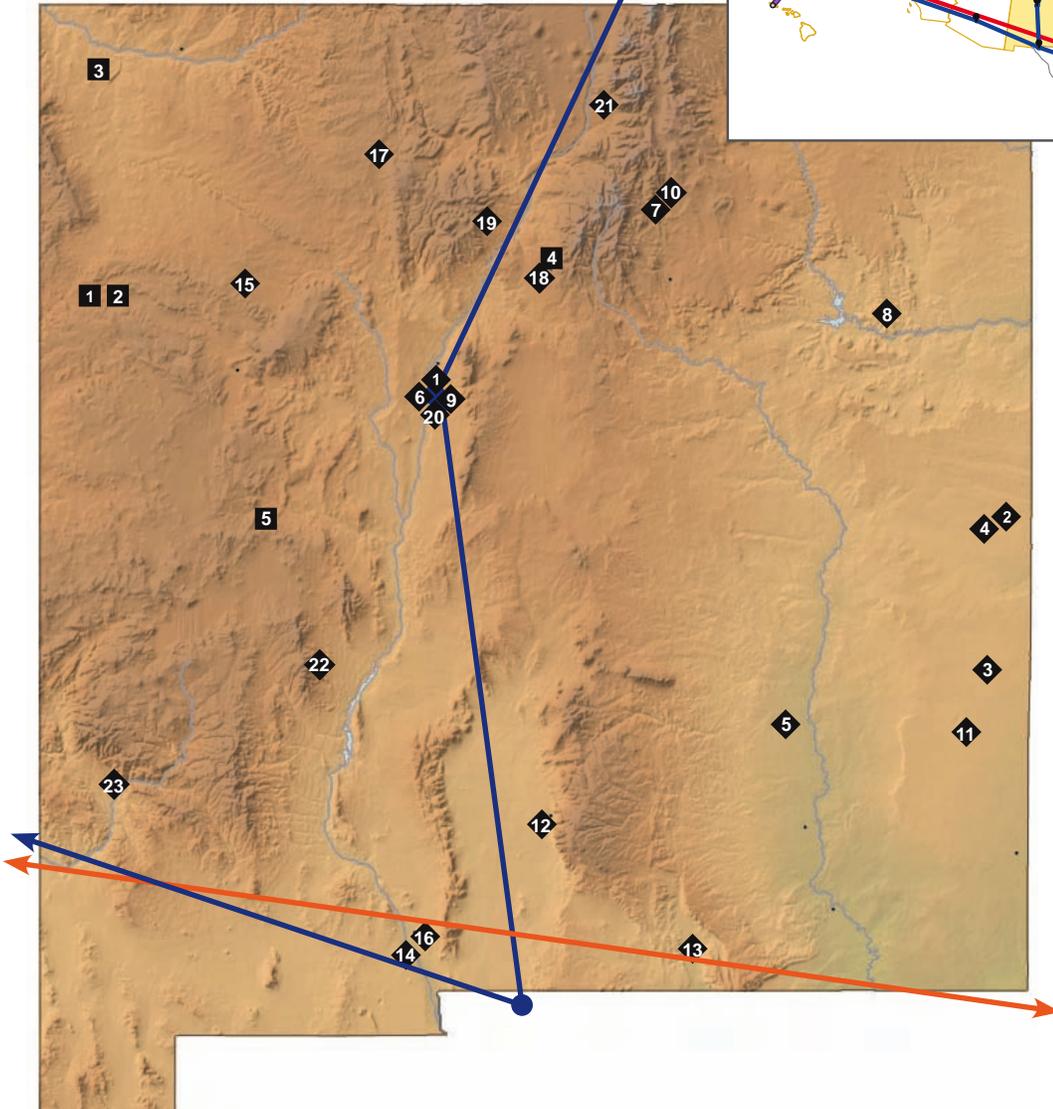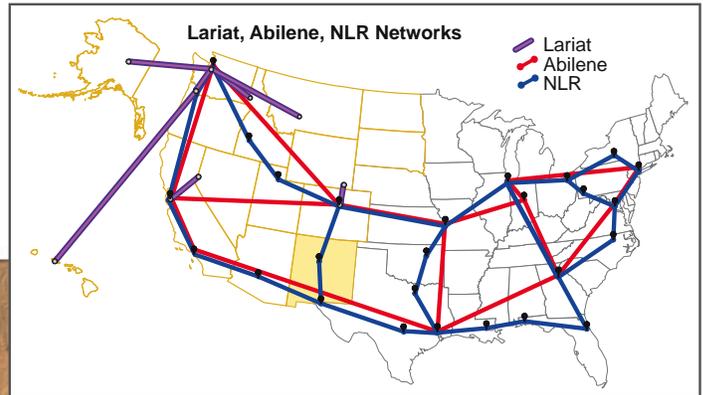
Tribal Colleges and Universitites
1	Crownpoint Institute of Technology	Crownpoint
2	Diné College - Crownpoint	Crownpoint
3	Diné College - Shiprock	Shiprock
4	Institute of American Indian Arts	Santa Fe
5	Southwestern Indian Polytechnic Institute	Albuquerque

Hispanic Serving Institutions
1	Albuquerque Technical Vocational Institute	Albuquerque
2	Clovis Community College	Clovis
3	College of The Southwest	Hobbs
4	Eastern New Mexico University-Main	Portales
5	Eastern New Mexico University-Roswell	Roswell
6	International Institute of The Americas	Albuquerque
7	Luna Community College	Las Vegas
8	Mesalands Community College	Tucumcari

Hispanic Serving Institutions, continued
9	Metropolitan College	Albuquerque
10	New Mexico Highlands University	Las Vegas
11	New Mexico Junior College	Hobbs
12	New Mexico State University-Alamogordo	Alamogordo
13	New Mexico State University-Carlsbad	Carlsbad
14	New Mexico State University-Dona Ana	Las Cruces
15	New Mexico State University-Grants	Grants
16	New Mexico State University-Main	Las Cruces
17	Northern New Mexico Community College	Espanola
18	Santa Fe Community College	Santa Fe
19	University of New Mexico-Los Alamos	Los Alamos
20	University of New Mexico-Main	Albuquerque
21	University of New Mexico-Taos	Taos
22	University of New Mexico-Valencia County	Los Lunas
23	Western New Mexico University	Silver City

Colorado

PACIFIC NORTHWEST GIGAPOP

■ Tribal Colleges and Universities
● Alaska Native Intitutions
▲ Native Hawaiian Institutions
◆ Hispanic Serving Institutions

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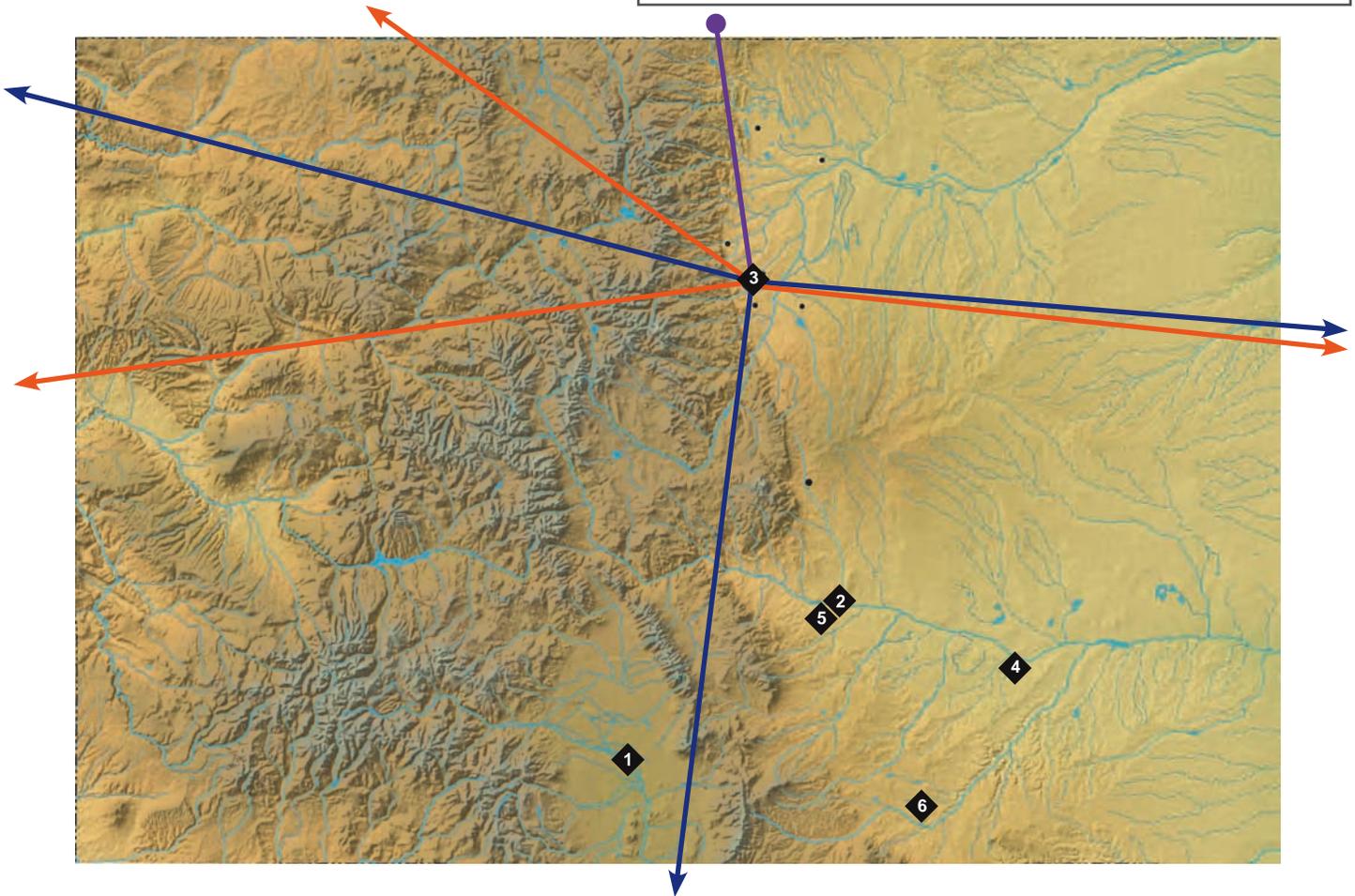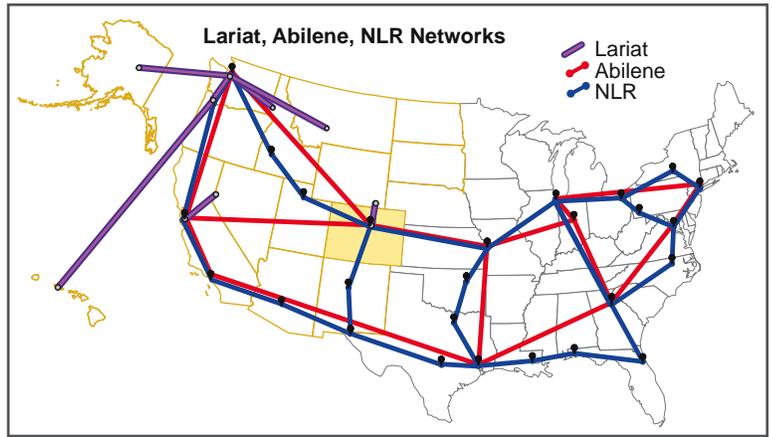
Hispanic Serving Institutions

1	Adams State College	Alamosa
2	Colorado State University-Pueblo	Pueblo
3	Community College of Denver	Denver
4	Otero Junior College	La Junta
5	Pueblo Community College	Pueblo
6	Trinidad State Junior College	Trinidad

PACIFIC NORTHWEST GIGAPOP

South Dakota

■ Tribal Colleges and Universities
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◆ Hispanic Serving Institutions
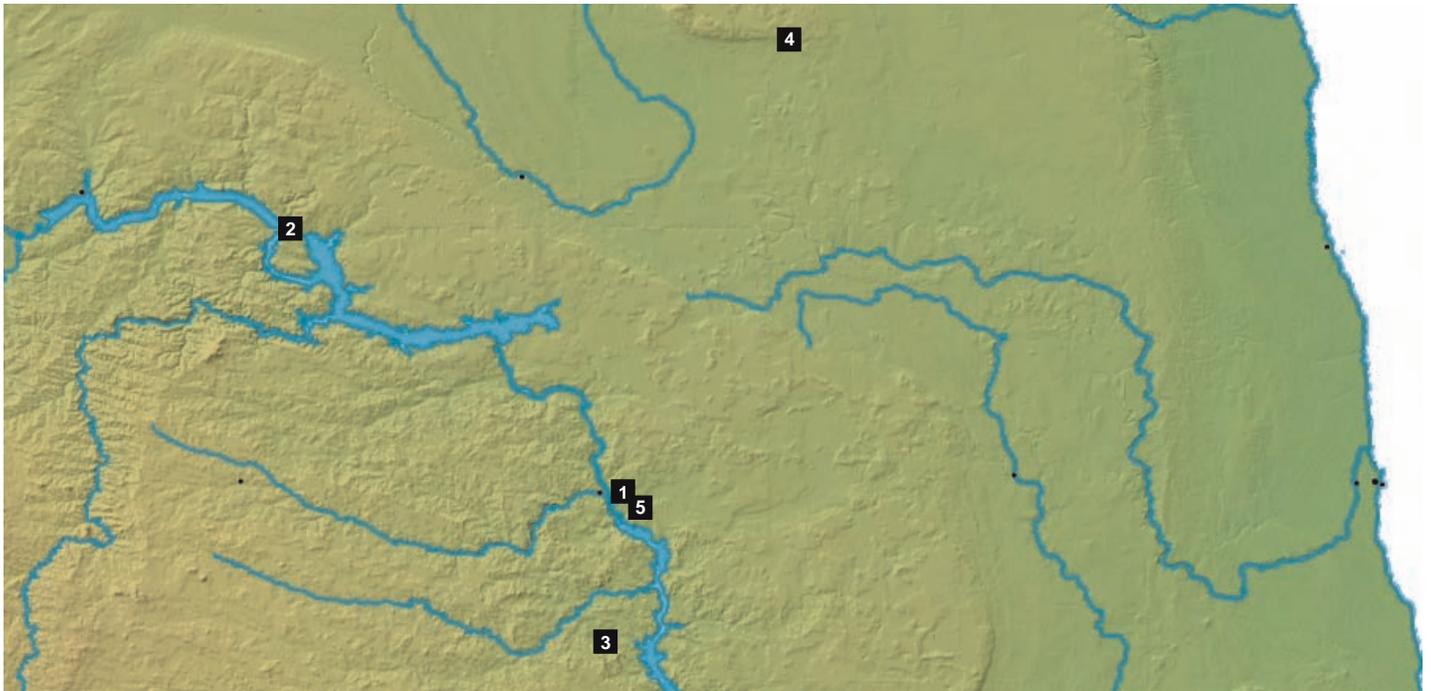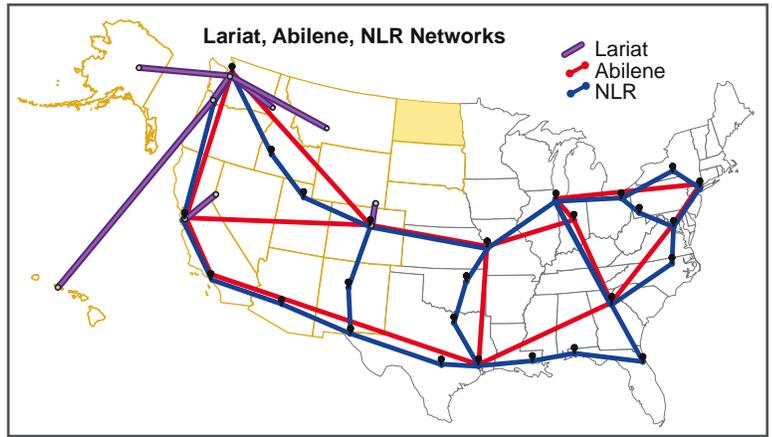

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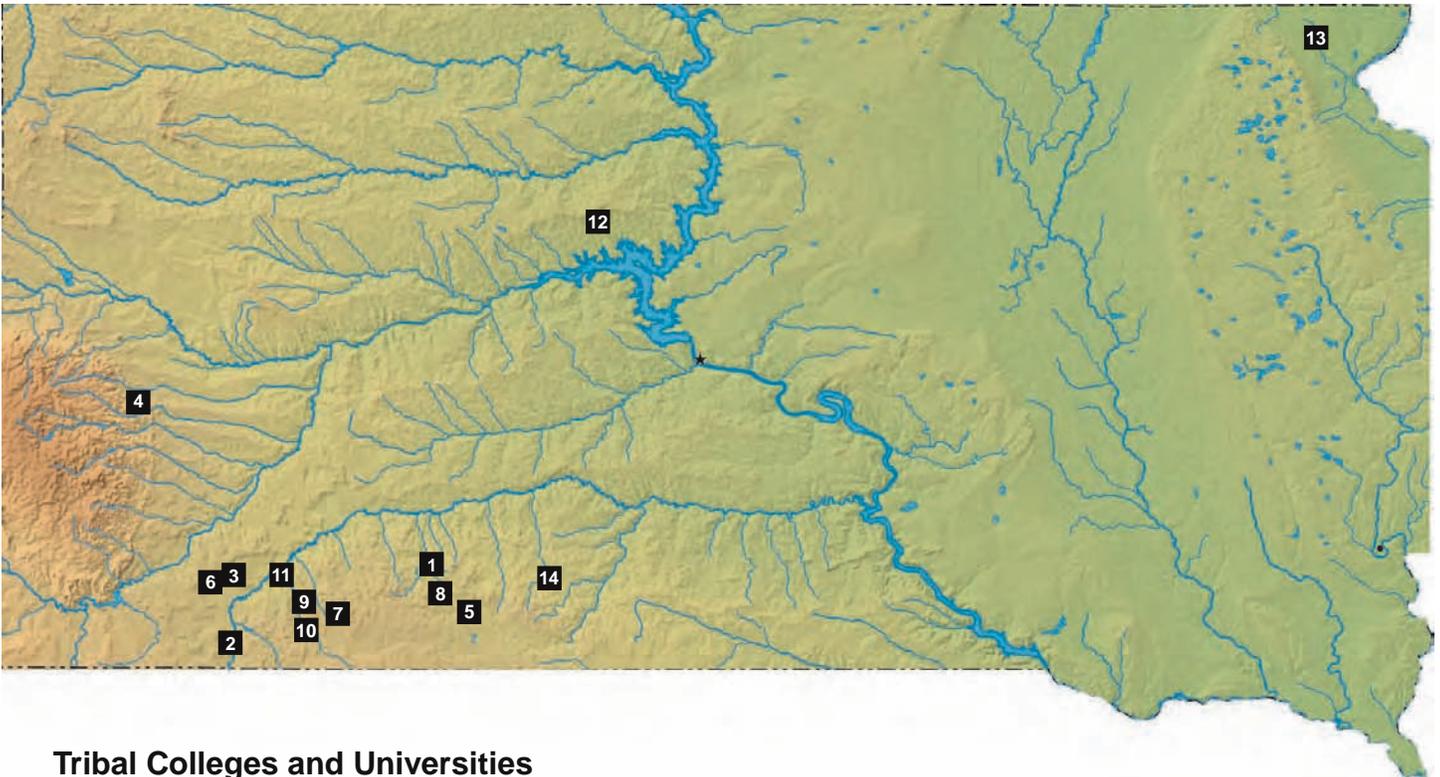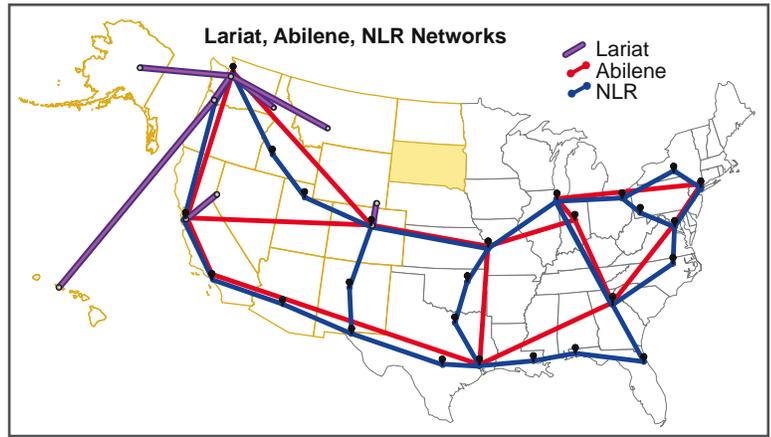
Tribal Colleges and Universities

1	Ogalala Lakota College - Eagle Nest College Center	Wanblee
2	Ogalala Lakota College - East Wakpamni College Center	Batesland
3	Ogalala Lakota College - Haka College Center	Kyle
4	Ogalala Lakota College - He Sapa Learning Center	Rapid City
5	Ogalala Lakota College - La Creek College Center	Martin
6	Ogalala Lakota College - Main Campus	Kyle
7	Ogalala Lakota College - Pahin Sinte College Center	Porcupine
8	Ogalala Lakota College - Pass Creek College Center	Allen
9	Ogalala Lakota College - Pine Ridge College Center	Pine Ridge
10	Ogalala Lakota College - White Clay College Center	Oglala
11	Ogalala Lakota College - Wounded Knee College Center	Manderson
12	Si Tanka University	Eagle Butte
13	Sinte Gleska University	Mission
14	Sisseton Wahpeton College	Sisseton

North Dakota

PACIFIC NORTHWEST GIGAPOP

- ■ Tribal Colleges and Universities
- ● Alaska Native Intitutions
- ▲ Native Hawaiian Institutions
- ◆ Hispanic Serving Institutions

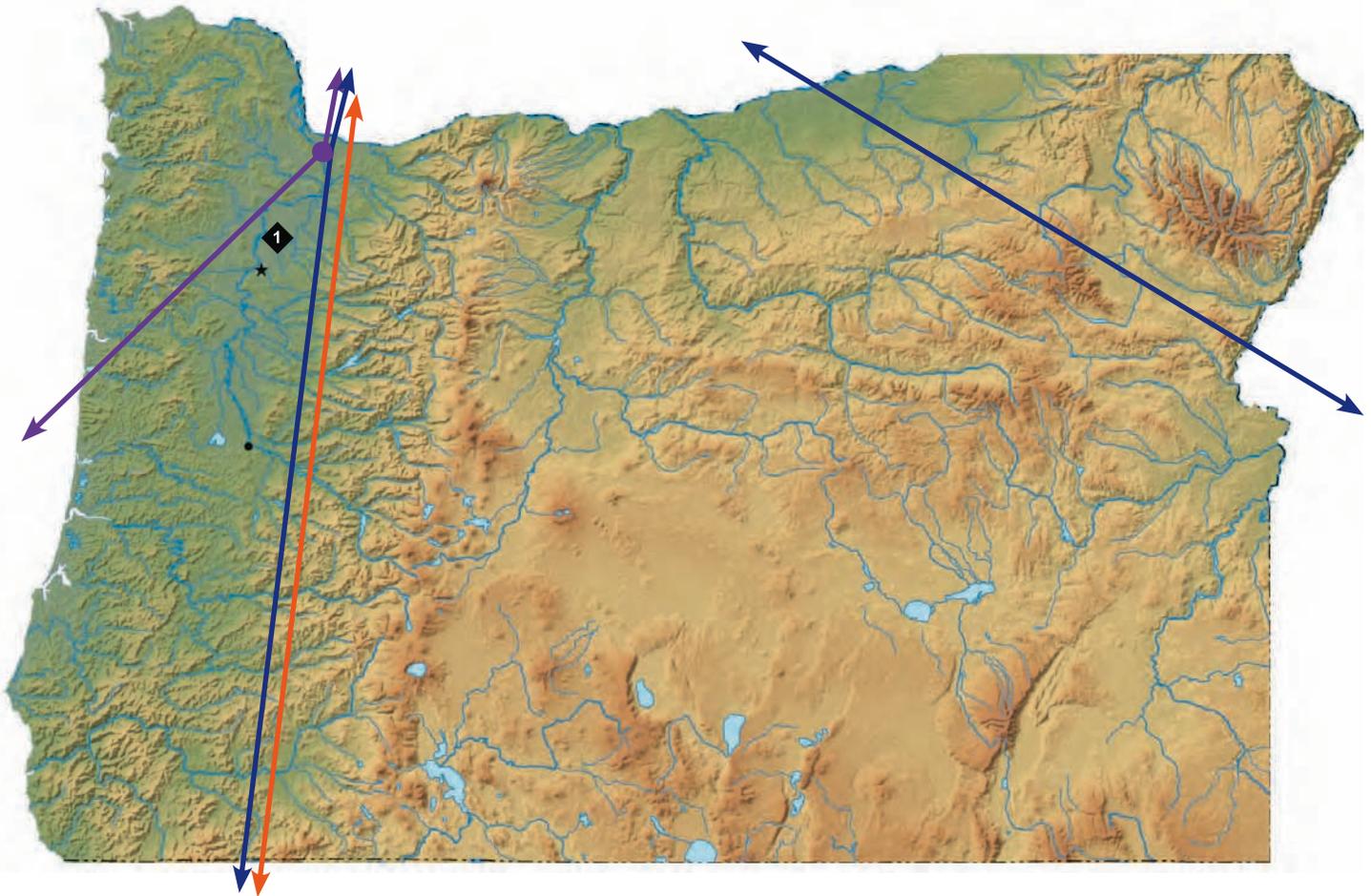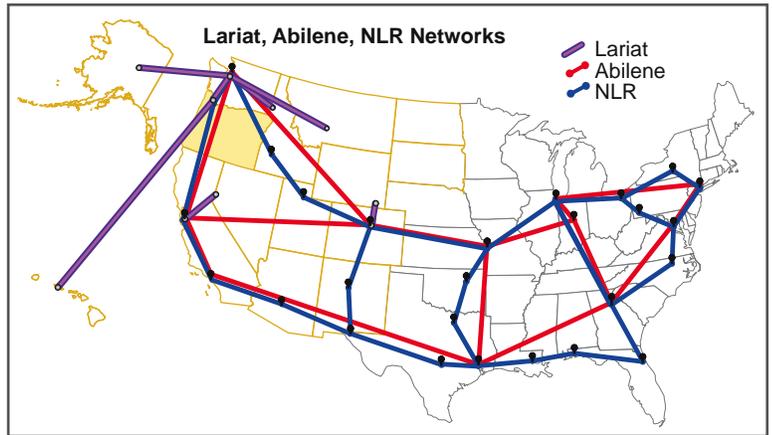Lariat, Abilene, NLR Networks
— Lariat
— Abilene
— NLR

Tribal Colleges and Universities

1	Cankdeska Cikana Community College	Fort Totten
2	Fort Berthold Community College	New Town
3	Sitting Bull College	Fort Yates
4	Turtle Mountain Community College	Belcourt
5	United Tribes Technical College	Bismarck

Oregon

PACIFIC NORTHWEST GIGAPOP

■ Tribal Colleges and Universities
● Alaska Native Intitutions
▲ Native Hawaiian Institutions
◆ Hispanic Serving Institutions

Lariat, Abilene, NLR Networks
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— Abilene
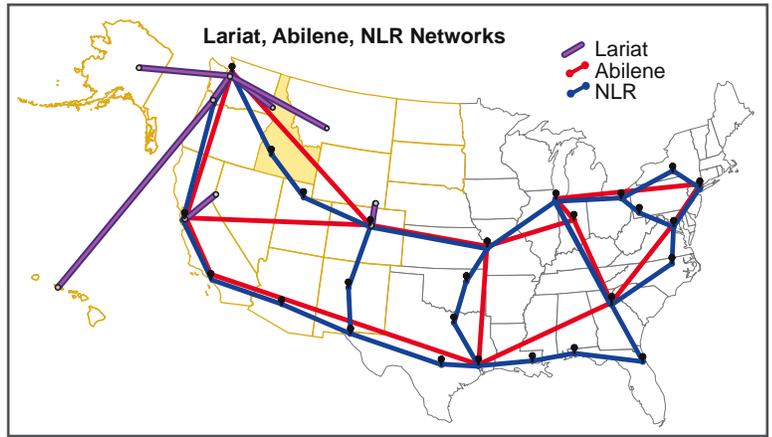— NLR

Hispanic Serving Institution
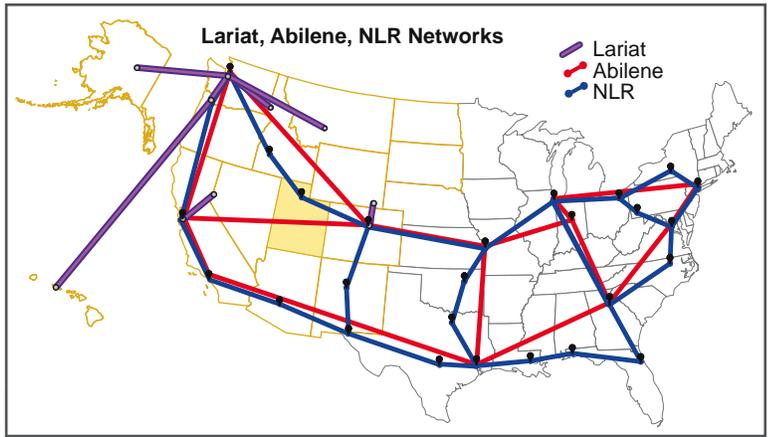
◆1 Mount Angel Seminary   St Benedict

Idaho

■ Tribal Colleges and Universities
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▲ Native Hawaiian Institutions
◆ Hispanic Serving Institutions

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Abilene
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Utah

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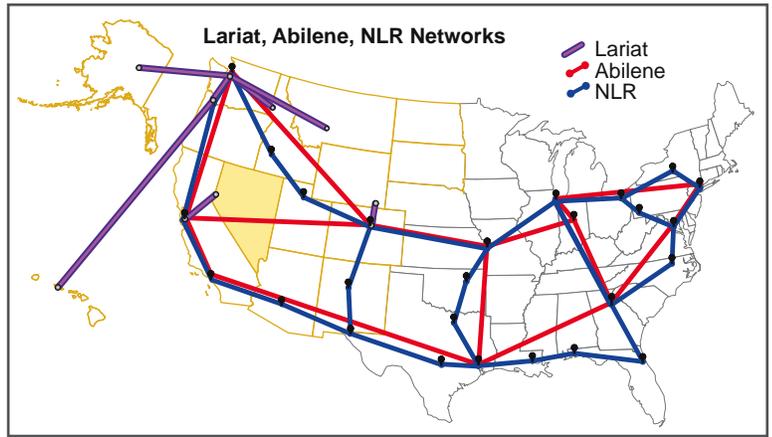**Lariat, Abilene, NLR Networks**

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Nevada

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◆ Hispanic Serving Institutions

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Lariat
Abilene
NLR

Sources for Maps:

United States Department of Education, Lists of Postsecondary Minority Institutions:
http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst.html

Alaska Native Institutions that received 2005 grant funding from the Department of Education per their eligibility:
http://www.ed.gov/programs/iduesannh/an-05.xls

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http://www.hacu.net/hacu/Default_EN.asp
http://www.csrees.usda.gov/nea/education/in_focus/multicultural_if_hispanic_inst.html

Individual University and College websites