Building Indigenous Future Zones: Four Tribal Broadband Case Studies

With support from the Internet Society

Community NETWORKS

By H. Trostle
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About the Institute for Local Self-Reliance

The Institute for Local Self-Reliance (ILSR) is a 46-year-old national nonprofit research and educational organization. ILSR's mission is to provide innovative strategies, working models, and timely information to support strong, community rooted, environmentally sound, and equitable local economies. To this end, ILSR works with citizens, policymakers, and businesses to design systems, policies, and enterprises that meet local needs; to maximize human, material, natural, and financial resources, and to ensure that the benefits of these systems and resources accrue to all local citizens. More at **www.ilsr.org**.

About the Author

H. Trostle (They/Them) is a researcher and activist. They are currently a Project Manager for the Community Broadband Networks program at the Institute for Local Self-Reliance, having previously been a Research Associate prior to graduate school. H. has a Master's degree in Urban and Environmental Planning from Arizona State University. There they focused on Indigenous Planning, and they believe that planning is an exercise in tribal sovereignty. Their undergraduate degree was in Political Science and Classical Languages at Macalester College in Saint Paul, Minnesota. They are a member of the Cherokee Nation of Oklahoma. Find more work at **hrtrostle.tech**.

Acknowledgements

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We know the Internet is a powerful tool for change. Connectivity has a direct impact on socioeconomic benefits in Indigenous communities, including self-determination, governance, improved health outcomes, economic development, and culture and language preservation. For rural and remote Indigenous communities, the Internet is a lifeline to an increasing number of essential services online, and even sovereignty. As Brandon Makaawaawa, Deputy Head of State of the Nation of Hawaii, said after partnering with the Internet Society on the Nation's first Internet infrastructure build, "In order for our sovereign Nation to evolve independently, it is critical that we have control over our connectivity. We consider this national infrastructure, and in many ways, these are our first roadways."

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Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

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Table of Contents

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

i

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ILSR

Community
NETWORKS

Introduction

The COVID-19 pandemic has brought to the forefront the importance of infrastructure, especially in Native Nations. The most important pieces of physical infrastructure that COVID-19 responses require are running water and Internet access. Many communities still do not have adequate access to these necessities. Internet access is critical for working from home or accessing social safety net programs in this time of crisis.

This paper intends to offer insight into Internet infrastructure development in the more than 574 Native Nations across the U.S. According to our last count, there are approximately 40 tribally owned networks across the lands of 65 Native Nations, and there are another 37 Native Nations working in partnerships with private providers. For readers unfamiliar with Native Nations, we have provided an incredibly brief history of colonialism and economic development before laying out the inequities of Internet access. This history is necessary to understand the rise of the movement for Spectrum Sovereignty and Network Sovereignty, which are key to meeting Internet infrastructure needs in Native Nations.

Public policy should learn from the errors of the past and find solutions to bridge the digital divide that will help create wealth in Native Nations. There are many ways to address the digital divide, but not all of them lead to economic development or recognize the importance of sovereignty. Native Nations are sovereign over their data, and have the obligation to protect that information and use it for the betterment of tribal citizens. Past US federal public policy in Indian Country has often been rooted in paternalism and led to more problems.

Select case studies in this report highlight the many different ways that Native Nations have built their own Internet Service Providers (ISPs). The goal is not just to address the digital divide, but to encourage development and enact sovereignty. Improving Internet infrastructure has the opportunity to provide a new boost to local economic development initiatives. Owning and operating this infrastructure also supports Native Nations' sovereignty by keeping power and data within the communities rather than relying on an external provider. Imagine a community with 20,000 families each with a $50/month Internet connection – that is more than $1 million each year that could be leaving the community or staying local to build wealth.

Land Acknowledgement

ILSR's offices are located on land that was, and is, stewarded by Indigenous peoples. ILSR recognizes, supports, and advocates for the sovereignty of Native Nations.

Minneapolis, Minn.: Bdote, the land where the two rivers meet, is part of the traditional territory of the Dakota people and has served as a gathering place for many Indigenous peoples.

Washington, D.C.: The traditional territory of the Anacostan and Piscataway peoples.

Portland, Maine: The traditional territory of the Wabanaki Confederacy, which is currently comprised of the Penobscot, Passamaquoddy, Maliseet, Abenaki, and Micmac nations.

Welcome to Indian Country

Native Nations are Indigenous communities whose relationship with this land stretches long into the past. They are self-governing, but, contrary to common belief, they do not all have reservations. There are 574 federally-recognized tribes in the U.S., and more than 60 state-recognized tribes. There are also many unrecognized tribes, which may choose to seek state or federal recognition.

Colloquially, Indian Country refers generally to Native Nations in the United States. Legally, it mainly refers to allotted lands and lands within reservation boundaries. This legal term, however, excludes many communities in Hawaii and Alaska: Hawaiian homelands, tribal statistical areas and Alaska Native Villages. The term tribal Lands is used by the Federal Communications Commission (FCC) to account for all of these differences.

Reservations were created through treaties with the federal government. Resources and land are often held in trust by the federal government, which means that the land is not subject to state

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Spectrum Sovereignty:
This refers to the sovereign right of Native Nations to access and use radio frequencies. There is a growing movement to recognize the spectrum that covers Indian Country as a federal trust responsibility (a natural resource that is managed by the federal government on behalf of Native Nations).

Network Sovereignty:
Dr. Marisa Duarte uses this term to describe how infrastructure for Internet access supports Native Nations' sovereignty through self-determination.

Learn more at MuniNetworks.org/content/indigenous-networks

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

1

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jurisdiction, though federal laws and policies do apply. Moreover, the land cannot be collateralized for loans. Allotted land refers to land that was formerly part of a single community land base that was then given directly to Native American families. Many of these allotted lands were then sold to non-Natives, which has created a patchwork effect on many reservations. These many variations in land policies are just one example of the ways in which Native Nations have been harmed by the long history of U.S. settler colonialism.

Settler colonialism includes the death and displacement of many Native Nations, including the Trail of Tears in the 1830s and the Dakota War of 1862. The Dawes Act (1887) attempted to force Western lifestyles and individual land ownership onto members of Native Nations. It also encompasses the period of boarding schools in the 1800s and 1900s that attempted to socially assimilate Native Americans by removing access to community and culture. In 1934, the Indian Reorganization Act attempted to force Native Nations to adopt Western systems of governance and economic development under the control of the federal government. Settler colonialism further includes the legal termination of many Native Nations, such as the Amah Mutsun, in the 1940s through 1960s. This is when the federal government declared that some Native Nations were so assimilated and doing sufficiently well economically that treaties no longer applied. The 1960s also featured a push to move Native Americans into cities, away from reservations, and further assimilate them into the U.S. economy.

It is only recently in U.S. history that the federal government has followed consistent policies that attempt to support Native Nations. In 1975, the U.S. Congress adopted the Indian Self-Determination and Education Assistance Act, which enabled Native Nations to have an active role in economic development in the era of self-determination. The federal government created the Office of Native Affairs & Policy within the FCC in 2010 to work with Native Nations on developing Internet infrastructure.

Economic Development

This history of settler colonialism has created challenges for economic development initiatives in Indian Country. Economic development that respects culture and promotes community is effective, and every Native Nation is different. But there are three broad areas of economic development policy that are helpful for Native Nations. These are 1) Natural Resources, 2) Gaming, and 3) E-commerce & Microbusinesses. Understanding this background is important context for getting Internet access right.

This should be taken as only the most basic overview of economic development in Indian Country. Every Native Nation has its own unique history and culture. These broad generalizations are provided to contextualize the role of Internet infrastructure in Indian Country's economic development.

Natural Resources

The federal government had little interest in economic development in Native Nations until the 1900s, but the focus was often then on extracting natural resources through logging, fishing, and mining. For many Native Nations, this type of economic development did not necessarily align with cultural values, and it created a tension between economy and tradition that did not previously exist. In the early 1900s, Native Nations' economic development policy was largely controlled by the U.S. government.

Even democratizing projects of that era had a goal of resource extraction. The 1934 Indian Reorganization Act (IRA), also called the Indian New Deal, enabled Native Nations to adopt constitutions and formalize governance structures. The U.S. government provided example constitutions, which were similar to governing documents used by corporations. In general, these IRA constitutions made it easier for the U.S. government to form deals regarding natural resource development in Native Nations. Natural resource markets, however, are not always predictable, and decades of federal management created issues in terms of environmental stewardship.

Native Nations began to take back control of their economic policy in the 1970s with the 1975 Indian Self-Determination and Education Assistance Act. Native Nations had the ability to

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

2

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contract with and receive grants from the federal Indian bureaucracy. Instead of the funding going to a federal agency that then provided services to Native Nations, Native Nations received the funding and provided the services themselves. This meant that Native Nations could begin to set their own economic development agenda.

Gaming

In the mid-1970s, a U.S. Supreme Court case about state and tribal regulatory power set the legal groundwork for gaming to take off as a new avenue of economic development. Native Nations began to operate bingo halls and casinos, while state governments pushed back. In 1987, the U.S. Supreme Court upheld the legality of tribal gaming.

In 1988, U.S. Congress then implemented a complete system of regulation regarding these gaming operations with the Indian Gaming Regulatory Act dividing them into Class I (traditional, small prizes), Class II (bingo), and Class III (slot machines and other gambling). The law stipulates that, if a state allows commercial casinos or gaming operations, a federally recognized tribe can pursue gaming in which Native Nations and state governments negotiate State Compacts concerning the type and number of gaming operations in each state. The National Indian Gaming Commission, established by the 1988 Act, supports more than 240 federally recognized Native Nations in 29 states with their gaming operations.

Native gaming is a multi-billion-dollar industry. The National Indian Gaming Commission valued the 2018 gross revenue of Indian Gaming at $33.7 billion.[1] Revenue has been slowly increasing over the past decade,[2] but not every gaming operation has seen the same amount of growth. Many Native Nations are far from cities, and gaming operations have to be conducted on tribal land.

Native governments use these funds to support tribal governance and social services as well as reinvest in gaming operations to grow the industry. Some tribal governments also channel some of the revenue into per capita payments, or per cap. Native Nations that do have per cap may give a small sum every year or larger payments monthly – It depends on the particular economic situation of each Native Nation. These funds, however, are not guaranteed. The COVID-19 pandemic has shown that gaming operations may need to be closed for a significant period of time and there are signs that changes to state and federal law over time may allow other entities to also build gaming operations that would likely cause a decline in revenues for Native Nations. Some have viewed the opportunity to build a broadband network as not only providing a vital service, but diversifying future revenues. However, gaming operations are only one part of the economy on Native Nations and many do not have gaming operations at all.

E-Commerce & Microbusinesses

Recently, there has been a rise in e-commerce and microbusinesses. Microbusinesses are very small businesses. Some examples are: local roadside stands, new graphic designers, and Etsy craft makers. These startups may rely on Internet infrastructure to sell their work.

The federal government offers some support to Native American small businesses. The U.S. Small Business Administration has an Office of Native American Affairs that provides technical support to small businesses and offers entrepreneurial empowerment workshops. The Indian Arts and Crafts Act of 1990 is also very important to microbusinesses because it prevents false advertising of work as Native American made if it was not made by a federally recognized tribe.

Native Nations are encouraging the growth of small businesses and microbusinesses to boost their local economies. Small businesses are an engine for economic growth in the United States: they account for 47.3 percent of all jobs and 99.9 percent of all businesses in the U.S.[3] In Native Nations, there is a concern of economic leakage, where people spend their money outside of their local community because there are few small businesses.

Internet Infrastructure

It is within this historically charged and changing environment that infrastructure development has taken place in Native Nations. The U.S. government did not focus on ensuring infrastructure

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

3

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development in Native Nations until recently. Basic infrastructure is still lacking on many reservations. In 2017, the National Congress of American Indians submitted a report to Congress and the Administration stating that "only 88 percent of Native people received drinking water that met all applicable health-based standards."[4] They also found that "14.2 percent of Tribal households do not have access to the most basic electric services."[5]

It is no wonder that Native Nations also face challenges getting high-speed Internet access. The minimum broadband speed set by the FCC is only 25 Mbps download and 3 Mbps upload on a fixed (non-satellite) connection. High-speed Internet access in Native Nations has long trailed that of rural and urban areas in the U.S. (Figure 1). The rural-urban digital divide is well-known. What is less well-known: tribal lands have not seen an increase in high-speed Internet access at the same rate as rural areas.
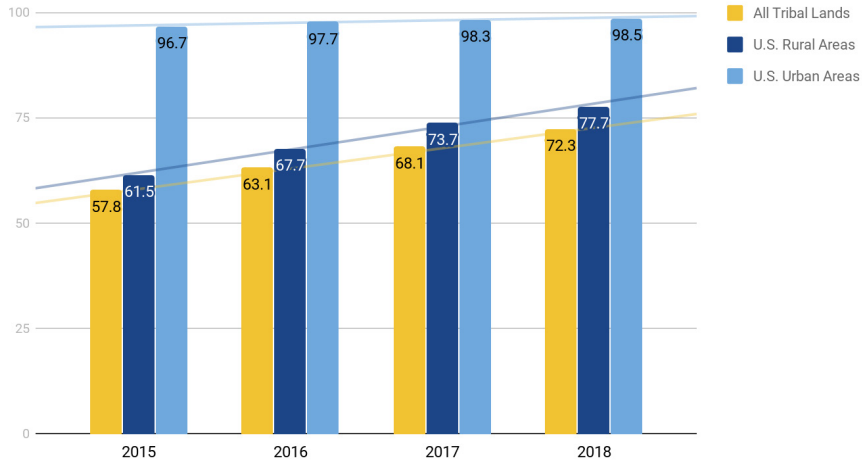
High-Speed Internet Access Deployment

Figure 1: High-Speed Internet Access Deployment in Tribal Lands 2015 - 2018 (2020 FCC Broadband Deployment Report)

This tribal lands data also understates the problem in the lower 48 states because it accounts for more highly connected areas including the Hawaiian Homelands. As of December 2018, only 56.9 percent of tribal lands in the lower 48 states had high-speed Internet access (Figure 2).[6]

2018 Tribal Lands Data Disaggregated

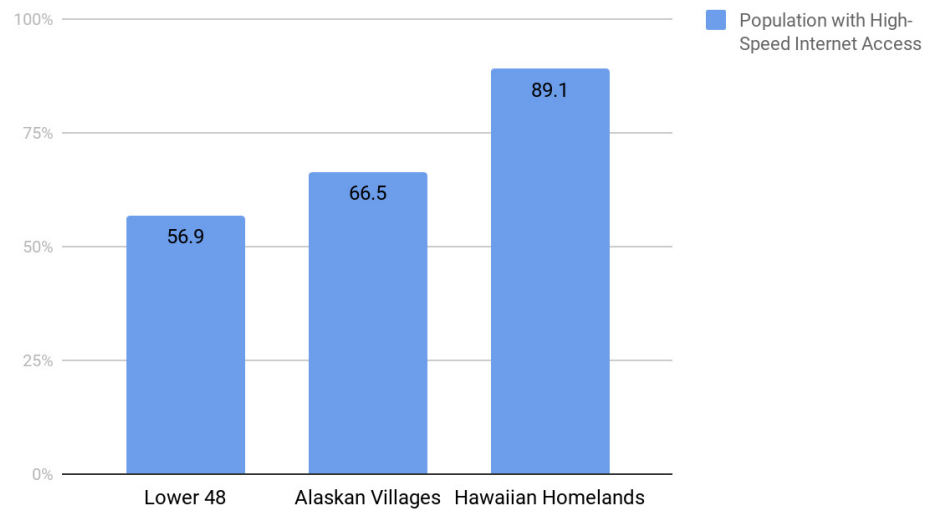Figure 2: High-Speed Internet Access Deployment in Tribal Lands 2018 (2020 FCC Broadband Deployment Report)

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Four Tribal Broadband Case Studies

4

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Southern California Tribal Digital Village is a wireless network that is managed and operated by the Southern California Tribal Chairmen's Association.[22] The network provides service to 19 tribes near San Diego. At least 40 percent of the 9,000 people have access to the network. It uses almost every piece of available unlicensed or lightly licensed spectrum in the area to extend coverage. Matthew Rantanen stated that the tower at the head-end of the network literally cannot support any more gear. They have even had to get point to point licenses with the FCC to continue to push the network further. "There's a shortfall with the availability out there," stated Rantanen.

The Tribal Digital Village was built from the ground up to serve a particular need in the communities. COVID-19, however, has demanded more resources from the network than ever before. Managing the network is a complex task. Short-term, low-cost solutions can turn into larger expenses down the road, and Rantanen is focused on developing the network in a sustainable way. "Spectrum is a great tool to serve communities, but it is not as scalable as fiber," Rantanen explained in describing the different approaches to Internet infrastructure. Tribal Digital Village is still expanding and exploring cost-effective ways to serve the rural communities.

The FCC Office of Native Affairs & Policy is working to address these disparities. The FCC created the office in 2010 to develop policies and programs to improve Internet access on tribal lands. The office creates and leads outreach FCC efforts to Native Nations regarding any policy changes that might impact their connectivity. The office also oversees the Native Nations Communications Task Force.

Spectrum Sovereignty

One step to better Internet infrastructure is increasing the authority of Native Nations to manage the electromagnetic spectrum over their lands, called Spectrum Sovereignty.

This refers to the sovereign right of Native Nations to access and use spectrum. A growing movement recognizes the spectrum that covers Indian Country as a natural resource similar to mineral and water rights. The federal government has a history of trying to control such natural resources, rather than recognizing that they fall under the purview of treaties and the federal trust responsibility. The trust responsibility refers to how certain resources and lands are held in trust by the federal government for the benefit of Native Nations. Under current policy, Native Nations have not received funding from the auctioning and licensing of spectrum over their land that is managed by the FCC.

Spectrum is all around us. It includes radio frequencies, and it is divided into different frequency bands. But it is more than just FM radio and TV signals. It is an essential resource for wireless Internet service. Currently, the FCC auctions licenses for spectrum to entities based on distinct geographic units. Native Nations have little opportunity to participate in this system because the system tends to be optimized for large communication corporations and the geographic units do not often align with the boundaries of Native Nations. This approach makes it difficult for Native Nations to operate radio stations or develop wireless Internet service. There are some spectrum bands that are unlicensed or only lightly regulated, allowing anyone to use them with pre-approved off-the-shelf equipment. Some wireless networks, such as the Southern California Tribal Digital Village, use this spectrum to provide Internet access.

Recognizing that Native Nations should have access to spectrum, the FCC created a Rural Tribal Priority Window for the auctioning off of a specific band of spectrum in 2020. The 2.5 GHz band had been previously designated mainly for Educational Broadband Services[7] but it later became clear that this band could also be used for Internet access. Unfortunately, the FCC had paused licensing of the 2.5 GHz band in the early 1990s. Understanding the better use of this band, the FCC is now looking to distribute overlay licenses that do not interrupt the continued use of the 2.5 GHz band by current license holders. Instead, these overlay licenses enable people to use all of the currently unused portions of the band in their area. The FCC could have simply allocated this spectrum to the Native Nations, but decided to continue with an auction format after allowing Native Nations to claim rights to their territory if interested.

Native Nations had to act by August 3, 2020 to enter the auction process, though only rural tribal areas were eligible where the FCC designated that sections of the band were unused. The 2.5GHz band must still be used for the public good, and there are requirements on how long licensees can keep the spectrum if they do not begin using it. Some advocated for Native Nations taking advantage of this auction regardless of whether there were specific plans on how to use the 2.5GHz band because the auction did not require plans to be laid out in advance. Others recommended entering the auction with types of ready-made networks that can operate in the 2.5GHz band. Adopting an approach that recognizes Spectrum Sovereignty preempts the need for such arguments, since Native Nations can manage spectrum using similar systems to what they have developed for other natural resources.

Red Spectrum Communications

Coeur d'Alene Tribe in Idaho
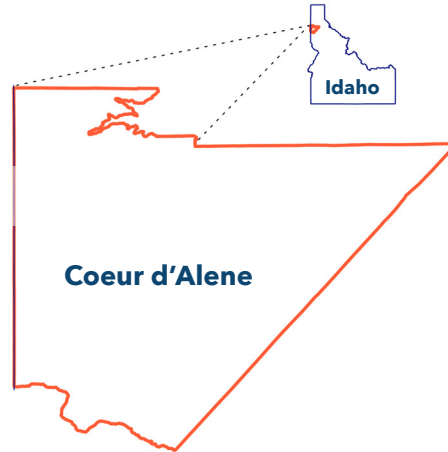
About the Coeur d'Alene Tribe

The Coeur d'Alene Tribe are the Schitsu'umsh, meaning "those who were found here."[8] They have always lived in Idaho, Washington, and Montana as it is their ancestral homeland. There are more than 2,000 tribal members, and the reservation is about 345,000 acres in northern Idaho.[9] The Coeur d'Alene Tribe have built a casino and hotel that usually has $20 million in profits each year, and they also operate the Benewah Medical Center, which serves 10,000 patients (both Native and non-Native) in the area.[10] The tribal school is housed in a $5 million facility, and the Education Department also works in collaboration with Idaho's state college system on a language degree program.[11]

Brief History of Red Spectrum Communications

The network started out of an unfulfilled need in the community. In the early 2000s, the Coeur d'Alene reservation still relied on dial-up. In 2004, the maximum speed available via dial-up on the reservation still fell short of 56 Kbps. The dial-up depended on old copper lines that had been put into the ground almost one hundred years ago, and the signal degraded quickly on that infrastructure. Valerie Fast Horse, now the Director of Information Technology at Coeur d'Alene, saw an opportunity to improve Internet speeds and access. As a federally recognized tribe, the Coeur d'Alene Tribe can access several federal programs (many through the U.S. Department of Agriculture (USDA)) to fund Internet infrastructure.

In 2004, the Coeur d'Alene Tribe applied for a Community Connect Grant through USDA Rural Development. They received funds to build a small wireless network providing up to 1.5 Megabits per second (Mbps). By 2010, however, it became evident that the demand for connectivity was more than what the wireless network could handle. There was not enough unlicensed spectrum to meet their needs, and the challenge of signal interference was increasing. At the time, the federal government enacted the American Recovery & Reinvestment Act (ARRA), with billions of dollars in broadband subsidies available.

In 2012, the Coeur d'Alene received ARRA funding to build a fiber network to support the wireless network. They received about $12.2 million, half loan and half grant, through the USDA Rural Utilities Service to build both middle-mile and Fiber-to-the-Home. The middle mile was necessary to move the local Internet traffic off of the reservation and to the wider web. Frontier

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

6

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had wanted to charge the Coeur d'Alene Tribe $22,000 each month to access its middle mile network, but building their own would be much more economical over the long term.

The Technology Department continues to improve upon the wireless network to support all the users. With COVID-19, the network has experienced increased strain. Users report more lag if there are multiple devices trying to use the network simultaneously. Staff are doing what they can, but they are limited in the capacity of the spectrum available to them for wireless subscribers.

Network Details

Population Served

Approximately 1,600 households are currently connected with about 90 more waiting to be connected. The wireless and fiber service areas cover approximately 4,000 people total.

The wireless service area is much larger than the fiber service area, but Red Spectrum is seeking to expand the fiber service area. There are only a few Fiber-to-the-Home towns on the reservation. Red Spectrum Communications connects the tribal school with a 10Gb connection and the tribal government center with a 5Gb connection.

PRICES & SPEEDS
TABLE 1

Speed Tier	Price
Lifeline Broadband Service	$49.95
10 Mbps	$59.95
25 Mbps	$79.95
100 Mbps (Available on Fiber)	$124.95

Funding

Most of the funding for the wireless and fiber projects came from the USDA in the form of grants and loans with the Community Connect program and the ARRA. The total cost to build the network, including the middle mile, was a little over $12 million. The fiber network took up the bulk of the funding (about $10.2 million). The wireless networks had a lower initial capital cost (about $2.3 million) but the operating costs, such as changing equipment on towers, are much higher than on the fiber.

Expansion Plans

Red Spectrum Communications has submitted a grant and loan application for a project to expand and bring Fiber-to-the-Home to Plummer, Idaho, the largest city on the reservation. The town is home to about 1,000 people, and the community has few options for wired Internet access.

Managing spectrum and setting up networks

In developing the initial application for the Community Connect grant back in 2004, Information Technology Director Fast Horse had looked to the Tribal Digital Village network in California for an example of a successful wireless project. Red Spectrum Communications has grown from there, and it uses both the 2.4 GHz and the 5GHz bands of unlicensed spectrum to provide service in their wireless area. Fast Horse is keeping an eye on the new technology for the 6GHz band, which she expects will be available by the end of this year. The 6GHz band has a lot more capacity and can relieve network congestion.

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

7

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Takeaways for Other Native Nations

To close our interview, we asked Fast Horse what she thinks other Native Nations should know about building Internet infrastructure. She pointed out that, at the time, no one else was building on the reservation because no one wanted to take on the work. She also highlighted that "you need to really make sure that tribal members are invested in it, especially tribal members with technical skills." Fast Horse stressed that it is best to hire locally and develop local talent.

Ultimately, she pointed out that technology is progressing rapidly, and it is not like water or sewer infrastructure where there is no possibility of competition. Wireless towers will still be useful as equipment changes, but providing good service is a continuing challenge as needs and utilization also change. She noted that although the fiber in the ground is future proof, you still have to make sure to change the electronics about every decade on the headend.

Hoh Nation & Starlink

While several Native Nations have taken on the challenge of building their own networks for Internet service, this is not the only option for better connectivity. The Hoh Tribe in western Washington decided to try a new approach to improve their Internet access – Starlink, a project from SpaceX.
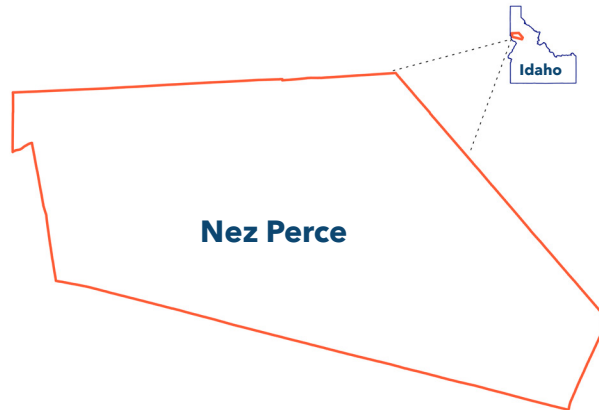
After meeting with Starlink representatives, the Hoh Tribe decided to be a beta tester for this new service. Starlink currently connects 18 homes in the community with speeds greater than 179 Mbps down. Speed tests from several beta testers in Washington clock the upload capacity between 10-40 Mbps. Community members now have access to distance learning and telehealth with this high-speed service. The Hoh Tribe itself pays for these connections for this first year, but next year the Hoh Tribe plans to shift billing to households directly.

Satellite Internet service is usually known for its poor quality, but Starlink is different. It uses low Earth orbit satellites to provide high-speed connections, and it can be a connectivity solution for remote areas where building a network is not feasible. Starlink can provide service to households directly or offer backhaul for wired or wireless networks distant from existing points of presence to interconnect to the Internet.

StarLink looks to be a high-quality solution for the present, but the Hoh Tribe are still pursuing the building of their own network in the long term. [26]

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

8

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Nez Perce Tribe Department of Technology Services

Nez Perce Tribe in Idaho

About the Nez Perce Tribe

The Nez Perce Tribe are the Nimiipuu people whose land is in Idaho, Washington, and Oregon. They entered into a treaty with the U.S. in 1855, and this treaty set the boundaries of a 7.5 million acres of reservation. The U.S., however, discovered gold on the lands, and, after settlers continued to trespass and steal land, the U.S. forced the Nez Perce to sign another treaty in 1863. This treaty reduced the land base to only 750,000 acres. Later, the federal government again attempted to reduce the lands held by the Nimiipuu people through the Allotment Act, which created the checkerboard of land rights within the reservation today.[12] The Nez Perce Tribe operates two casinos: The Clearwater River Casino & Lodge and the It'se Ye-Ye Casino.[13]

Brief History of the Fiber and Wireless Projects

Like many fiber and wireless projects, the wireless network came out of a feasibility study for better connectivity between the government offices. In the 2000s the government was using bundled T1s and homes still relied on dial-up connections. Danae Wilson, Manager of the Nez Perce Tribe Department of Technology Services, explained how remote offices would start an email with attachments in the morning, and it would take all day for the email to actually send. The Nez Perce Department of Fisheries especially needed better connectivity at remote offices to collect and transmit a significant amount of data. At one point, they were physically moving laptops in Pelican cases to transfer data between offices because it was faster than using Internet service.

The Nez Perce started to deploy fiber in Lapwai where the tribal headquarters are located in 2000. They connected 18 locations and added additional fiber over subsequent years to connect more communities and remote facilities. As a model in building the network, the Nez Perce looked to some municipal models.

It all started to come together in 2009 when the Nez Perce tribal law enforcement were looking to connect their five towers, including some that were rather remote. They combined funding from the Idaho Gem Grant Program with a USDA Community Connect grant to deploy a few towers. Orofino to Lapwai, Idaho, was the first fixed wireless connection. Over the next three years, the network served its purpose but still proved to be insufficient. The goal of the fiber and wireless network was never to turn a profit, and the service is not run as a tribal enterprise. Instead, it is set up and run entirely as a tribal utility. Tribal enterprises are for commercial activities, whereas tribal utilities are supported by the Nation and focus on delivering needed services. In 2010, the Nez Perce Networks began selling service to home customers, local businesses and government/city entities. The Tribe has also leased tower space to cellular companies to improve cellular service on the reservation.

The tribe did a lot of research when the federal government made available funding programs for high-speed Internet service, including the Broadband Technology Opportunities Program (BTOP) through the American Recovery & Reinvestment Act of 2009 (ARRA). They applied for a BTOP in the first round but were not selected. They were successful in the second round, however, and the Nez Perce wireless project finally received funding. The tribe built a wireless ring around the reservation with 23 towers and co-located facilities on 12 additional towers. Public-private partnerships with local governments and cell phone companies were critical to access the towers they needed.

In 2020 the Nez Perce Tribe funded 21 miles of fiber from Spaulding, Idaho to Clarkston, Washington. The Department of Technology Services has allowed private entities to lease this fiber.

Network Details

Population Served

Nez Perce Networks serves between 1,500 and 2,000 customers. With a State of Idaho CARES Act grant, Department of Technology Services is planning to expand fiber to another 300 homes by the end of 2020. Those fiber connections will be in the Lapwai area, but planning for other communities within the reservation is on going.

PRICES & SPEEDS

TABLE 2. WIRELESS

Speed Tier	Price
Basic	$25
Plus	$45
Premium	$65

TABLE 3. FIBER

Speed Tier	Price
20 Mbps	$45
50 Mbps	$65
100 Mbps (Available on Fiber)	$85
120 Mbps	$105

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Four Tribal Broadband Case Studies

10

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Funding and Expansion

In total, the network cost an estimated $23 million. The Native Nation had to draw on a variety of programs to find the funding for all the projects: ARRA BTOP, USDA programs like Community Connect, RBOG, RBEG; the Idaho Gem Grant Program and the Idaho Broadband Grant. The Nez Perce Tribe has financially contributed to all of these projects, including fully funding the 21-mile fiber run. The Department of Technology Services continues to watch for funding opportunities to continue expanding the network.

Managing spectrum and setting up networks

The wireless network they have built uses both licensed and unlicensed spectrum. It depends upon the location and the types of services they need to provide. The hybrid mesh network uses spectrum in both the 2 and 3 GHz bands and is designed to use fiber backhaul as much as possible. The Tribe was recently awarded the licensed spectrum they applied for under the Tribal Priority Window for 2.5GHz spectrum. They will begin planning for build-out to meet the requirements of the license.
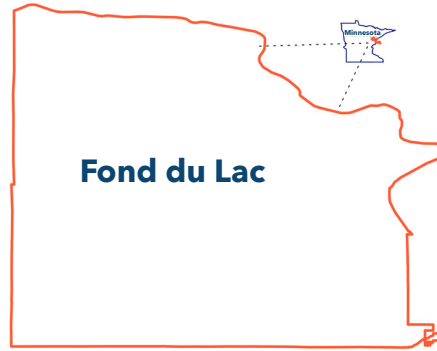
Takeaways for Other Native Nations

Department of Technology Services Manager Wilson stressed that there are many different models for providing Internet service and there is no one size fits all approach. It also does not have to be grandiose. Building little by little is still a good approach. Wilson said that it is important "to build from intent and purpose."

Wilson also highlighted that federal programs can have widely varying requirements that might not fit every community's needs. Some programs have specific requirements about profitability and return on investment, but Indian Country does not always fit these standard models. Backhaul and middle mile may not be as accessible. Applying for funding through the USDA can also be difficult because the USDA has a non-compete clause restricting the number of funded USDA areas.

There are other challenges Wilson identified: matching funds for some of the federal programs and negotiating partnerships. Access to Rights of Way and the services of the tribal employment rights offices are values that are not usually calculated into the match. Private Internet Service Providers, even when they receive federal funding, may still choose to overlook Indian Country because they do not want to navigate the Rights of Way and meet the standards for local training and employment through the Tribal Employment Rights Offices. It is hard to get commercial loans because tribes cannot collateralize federal lands. Wilson said that this means that the USDA is often the main loan source for broadband services in Indian Country.

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

11

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Aaniin Fiber Services

Fond du Lac Band of Lake Superior Chippewa

Fond du Lac

About the Fond du Lac Band

The Fond du Lac Band is one of the six bands of Ojibwe, which together are federally recognized as Minnesota Chippewa. The Ojibwe have lived in the Great Lakes area for more than a thousand years. The La Pointe Treaty of 1854 established the Fond du Lac Band's reservation in Carlton and St. Louis County, Minnesota. The reservation is known as Nagaajiwanaang, "where the water stops." There are more than 4,000 people in the Fond du Lac Band.[14] They operate two casinos, Black Bear Casino Resort and Fond du Luth Casino. Fond du Lac also operates FDL Gas & Grocery, FDL Propane, and FDL Sand & Gravel as tribal enterprises.

Brief History of Aaniin Fiber Services

Aaniin was built through years of careful research and feasibility studies. Jason Hollinday, the Director of Planning at Fond du Lac Planning Division, explained how the Fond du Lac Band approached the problem of getting high-speed Internet service throughout their communities.

In 2006, they started to compare wireless and hardwired network types, such as cable and fiber. The original plan called for ten wireless towers throughout the reservation to deliver Internet service to people's homes. There were a number of issues with this plan, however, one of which was geography. Northern Minnesota has many hills and forests, and the wireless technology at the time was not going to be able to penetrate to many remote areas. It was, however, fairly inexpensive, and Fond du Lac moved forward with seeking grants for the project. They weren't funded and Hollinday says they were told that the project was "economically infeasible."

Undaunted, they changed tactics and considered alternatives, allowing them to be prepared when the market changed drastically in 2010. The price of fiber and equipment for a Fiber-to-the-Home network fell enough to make a network feasible on paper. They worked with the Blandin Foundation in Minnesota and pursued grants through the USDA.

Community members, however, needed Internet service faster than the fiber network was likely to be built. The Fond du Lac Band already had an institutional network between government buildings. They added 13 wireless hotspots to several of these buildings in 2013. The hotspots have a range of about ¼ mile, and still serve as a stop-gap measure for community members without reliable Internet service at home.

In 2015, they were finally awarded a USDA Community Connect Grant. Two Minnesota Border to Border Broadband Grants were later approved as well and one Housing & Urban Development (HUD) Indian Community Development Block Grant. In total, it was about $9 million in grants, and the Fond du Lac Band matched half that amount with $4.5 million in cash on hand. They had secured all the funding needed to build out a next-generation network.

Starting out, some of the grants required them to build to areas without Internet service of at least 10 Megabits per second (Mbps) download and 1 Mbps upload. Unserved areas were prioritized. Later grants supported building the network to areas without 25 Mbps download and 3 Mbps upload. This enabled the Fond du Lac band to reach the rest of the reservation. The Blandin Foundation had assisted with community outreach about the project. In a series of public meetings, community members talked about what they would like to do with the Internet service. Hollinday described a little bit of doubt from some members, such as "Well we'd never get that here, but if we did have it…," because the project sometimes seemed too good to be true. The network went live in Fall 2019.

The network, however, continues to expand across the reservation, connecting more people. People are still learning all the capabilities of the Internet service. Since 2014, Fond du Lac has offered a summer camp for teens to create smartphone and iPad apps. Each student creates an app and is given an iPad to take home. The program also supports cultural knowledge. For instance, some of the apps from 2014 went into detail about beading, plants, and the Ojibwe language.[15] The possibility of expanding outside of the reservation boundaries has been considered, but the focus right now is on making sure all community members have access to a reliable connection. Using gaming money and possibly further grants to build a fiber network in nearby areas could create a long-term diversified revenue stream for the community.

Network Details

Population Served

Hollinday shared that there are 510 accounts for customers, which he explained as being approximately 1500 - 2000 people. There are about a dozen businesses connected to the network, not including home businesses.

PRICES & SPEEDS
TABLE 4.
There are three service options currently available: Essential Home, Advanced Home, and Automation Home. Essential Home provides basic Internet Service, and the prices listed below include a $13 equipment rental fee.

Speed Tier (Download / Upload)	Monthly Price
50 Mbps / 50 Mbps	$67.95
100 Mbps / 100 Mbps	$87.95
250 Mbps / 250 Mbps	$100.95
500 Mbps / 500 Mbps	$120.95
1 Gbps / 1 Gbps	$140.95

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

13

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The Advanced Home service costs an additional $8 monthly (starting at $75.95) and includes a mobile app to manage the network and parental controls.

The Automation Home option is designed for automating the home. It starts at $86.95 a month for 50 Megabits per second (Mbps) (an additional $19 more than the Essential Home service). It includes an Amazon Alexa and a home automation hub.

A lower cost option called Essential Flats, starting at $60.95, will be introduced at the end of 2020 for apartments.[16]

Funding

The network cost about $13.5 million in total. About $9 million came in the form of grants from a USDA Community Connect grant, two MN Border-to-Border Broadband grants, and a HUD Indian Community Development Block Grant. The Fond du Lac Band contributed $4.5 million in funding up front.

Expansion Plans

Hollinday said that they are still working to bring the network to the entire reservation, but they may later consider expanding into neighboring communities.

Managing and Setting Up the Network

COVID-19 has created increasing demand for Internet service, which so far has not strained the network. They are focusing on problem-solving issues common to any new network, such as improving customer service and adjusting to problems on the fly. For the first year of operation, they contracted out customer service, but if the problem is something physical, there are a couple of crews on call that will go out to fix it.
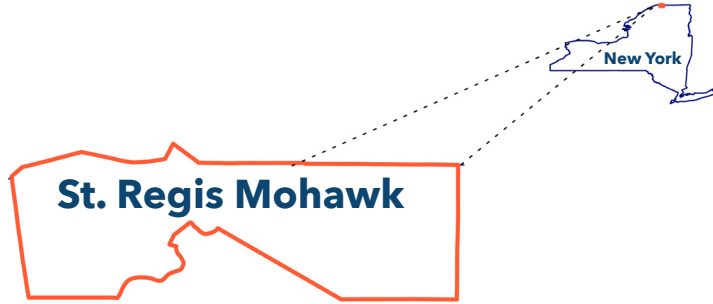
Takeaways for Other Native Nations

Hollinday found the key to Aaniin's success was a combination of background research and public outreach. Before embarking on this project, the Fond du Lac Band had spent years digging into what would make sense in their community. They had considered multiple avenues to bring Internet service to remote areas and had weighed the full cost of building a network. They also made sure to fully include the community in their project. Working with the Blandin Foundation, they held public meetings to learn what the community members wanted and designed the network to meet their expectations.

Doing background research and involving the community early in the process are all forms of pre-planning, steps taken before officials decided to pursue a specific course of action. All of these forms of pre-planning are useful for filling out grants. It creates a clear narrative that grant agencies can follow to see how an Internet service project will impact the community. Hollinday credits this pre-planning as "the difference between applying for early grants and now."

When the Fond du Lac Band had first applied for broadband grants in the mid-2000s, the Planning Division had not done as much pre-planning. They knew that their community needed Internet service and that the wireless project made the best economic sense at the time. But without pre-planning, they were not able to communicate that to grant agencies. When the market changed in 2010, the Planning Division realized Fiber-to-the-Home was actually feasible. They did more background research and involved the community. This showed grant agencies a clear narrative of why the community needed Fiber-to-the-Home.

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Four Tribal Broadband Case Studies

14

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Mohawk Networks

St. Regis Mohawk Tribe

About the St. Regis Mohawk Tribe

The St. Regis Mohawk Tribe is a single community, known as Akwesasne, meaning "land where the partridge drums."[17] It is crossed by the Canada-United States international border (New York - Quebec/Ontario), but tribal members are able to freely cross this settler-colonial border under the terms of the Jay Treaty of 1794. Both the United States federal government and the New York State government have separate government-to-government relationships with the St. Regis Mohawk Tribe. The community is home to about 1500 households. There are three tribal enterprises: the Akwesasne Mohawk Casino Resort. Akwesasne TV, and Mohawk Networks.

Brief History of Mohawk Networks

Mohawk Networks started out as an idea in the mid-2000s to provide everyone in the community reliable Internet access. It took close to a decade to determine the best project plan and to secure funding. This was one of the first fiber networks to be built by a Native Nation using funding from the American Recovery and Reinvestment Act (ARRA). Mohawk Networks uses both Fiber-to-the-Home and fixed wireless to connect everyone in the community.

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Four Tribal Broadband Case Studies

15

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Allyson Mitchell, General Manager at Mohawk Networks, described how it took a couple years to build out the fiber network, stringing about 70 miles of fiber along poles throughout the community. They made sure the anchor institutions, such as government buildings, were connected first, but the network was built methodically from one side of the community to the other. It cost approximately $15 million to build, but by 2015, the fiber network was completed and fully operational.

At the same time that the St. Regis Mohawk Tribe was planning for the fiber network, there was another project in the works to address the digital divide in the community. Connectivity is only one piece of the equation; devices are also important. In 2010, a Broadband Technology Opportunity Program grant brought 60 public computers to key places throughout Akwesasne, including the Boys & Girls Club, the Cultural Center, and the Office of the Aging's Senior Center.[18] With this project, everyone can access the Internet, even if they do not have a home connection through Mohawk Networks.

Now that Mohawk Networks' fiber network is complete, the network can be extended out to new homes as they are built. But there is also a fixed wireless option available. Mohawk Networks' fixed wireless network is a separate project that ensures connectivity for rural areas, and the flat terrain makes it easy to reach everyone with high-quality Internet access.

The fixed wireless can even reach off-territory, and Mohawk Networks offers service in parts of Franklin and Lewis Counties. Mohawk Networks is one of the few Native Nations' networks providing Internet access beyond the borders of its reservation. This is an opportunity for economic development that serves both the tribe and neighboring non-tribal towns with high-quality Internet access.

Network Details

Population Served

The network reaches 1500 households using Fiber-to-the-Home (southern portion of community) and fixed wireless (northern portion of community and off-territory).

PRICES & SPEEDS

TABLE 5. FIBER INTERNET ONLY

Speed Tier (Download/Upload)	Monthly Price
25 Mbps / 10 Mbps	$59.99
50 Mbps / 20 Mbps	$69.99
100 Mbps / 50 Mbps	$99.99

There are also bundled options with Video and Voice service available.

TABLE 6. WIRELESS

Speed Tier (Download/Upload)	Monthly Price
25 Mbps / 10 Mbps	$69.98

Funding

$10 Million for the fiber project came from the American Recovery and Reinvestment Act. The funding required matching funds of $5 million from the St. Regis Mohawk Tribe.

Expansion Plans

Mohawk Networks is expanding to homes incrementally as they are built in the community.

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

16

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Managing Spectrum and Setting Up the Network

The wireless network was a separate project from the fiber network. It provides Internet access for rural farms, and Mohawk Networks maintains the ability to expand the reach of the fixed wireless network off-reservation.

Takeaways for Other Native Nations

Mitchell, the General Manager, drove home the importance of financial sustainability and choosing good partners. Since Mohawk Networks was one of the first fiber networks built by a Native Nation, they worked with external consultants, and it is necessary to choose "partners that understand how to work with tribes," explained Mitchell.

She also underscored the need to have good finance and accounting teams to manage grants. With reimbursable grants, money has to be available upfront to cover expenses, and the team needs to understand what counts as an eligible expense for the grant. Raising the capital for a project is not enough, operational expenses have to be taken into account. "The most important aspect is understanding the financial requirements and having a long term plan," said Mitchell.

Key Lessons

These case studies highlight key lessons Native Nations, lending institutions, and the federal government can use when considering a network project. The recommendations are generalized from the experiences relayed in these case studies. Every Native Nation is different and must consider what works best for their particular communities. The lessons laid out below, however, are important for lending institutions and the federal government. They should look to address how their processes can be barriers to Native Nations' network projects.

1. Improve Access to Capital

Native Nations do not have the same access to capital as municipalities or as private Internet service providers. Reservation land cannot be used as collateral for a loan because the land is held in trust by the federal government. This means that Native Nations have had to be creative when looking for funding. Many rely on loan opportunities from the USDA, but the USDA cannot fund both a Native Nation's network project and a cooperative's network project in the same area. Some Native Nations fully fund sections of projects and build out incrementally.

Lending institutions should address their processes for lending to Native Nations to determine how to better support network projects. The federal government should regularly evaluate funding opportunities for network projects by Native Nations. The Office of Native Affairs & Policy at the FCC should work with the USDA to ensure that Native Nations' sovereignty is being fully considered when overlapping network projects are proposed.

2. Avoid Single-Purpose Funding

The federal government has many different departments and programs. Many have funding opportunities for network projects, but there is a problem. This funding is often limited to a single purpose, such as connecting Indian Health Services facilities or schools & libraries. This means that there may be multiple network projects in the same community, but no way for residents to access Internet service at home. The Schools, Health, & Libraries Broadband Coalition encourages a concept called "To and Through Anchors" to get past these silos.[19]

New technology can make this problem obsolete, but federal government programs must adjust contract language. For example, fiber networks can have dedicated strands for specific facilities in keeping with the initial federal program, but the excess network capacity could be used for residential home Internet service.

3. Recognize the Preparation Needed to Take Advantage of Opportunities

Native Nations that have already started projects or have plans to start projects can easily jump on new funding opportunities. Having a small project shows dedication to providing Internet service and is a good way to build a network incrementally. This also means that there is a core team of network professionals ready and waiting for the next funding opportunity to be available. For example, Red Spectrum Communications was able to scale up because the team was ready for the funding opportunities in ARRA.

4. Tribal Employment Rights Offices Are a Value-Add

Training and hiring locally is a benefit to the community, and this means that contracted workers do not have to travel far to work on a project. The Tribal Employment Rights Offices provide a value often overlooked by lending institutions or the federal government. These offices make sure that the community is benefiting from the new job opportunities that a network project brings.

5. Respect Native Nations' Right to Spectrum

The FCC should not lease licenses to spectrum over any Native Nations to non-native entities. Spectrum should be treated as a natural resource, and the FCC should recognize Native Nations' autonomy in determining how to use spectrum for Internet access. The DIGITAL Reservations Act by Congresswoman Deb Haaland (NM-01) and U.S. Senator Elizabeth Warren (D-Mass.) would require this of the FCC and also create a Tribal Broadband Fund for Native Nations' wireless projects.

Conclusion

These case studies offer examples of just a slice of the important work being done in Indian Country by Native Nations to improve Internet access themselves. Much more is on the horizon, in part supercharged by the 2.5 GHz licenses now available to hundreds of tribes.
When considering how to improve Internet access in Indian Country, the Federal government must recognize the importance of tribal sovereignty. The Internet Society's 2020 Indigenous Connectivity Summit Policy Recommendations lays out clear proposals regarding tribal sovereignty and broadband funding for both the U.S. and Canadian governments[27]:

- "An Indigenous Broadband Fund and centralized data base that captures funding opportunities, eligibility, and information on how to apply should be created."
- "Indigenous representatives should be hired on a salaried basis to serve as liaisons to assist communities with their applications for funding and participation in policy processes."
- "Federal grants should be created and tailored to Indigenous communities for basic planning, digital inclusion, and network operation and maintenance."
- "If federal funds are allocated to private, non-Indigenous entities operating on Indigenous lands, that entity should be required to train community members to maintain the network on their own land or at minimum hire community members for local labor. They should also be required to service a higher penetration rate to ensure homes are serviced as well as businesses."

The Indigenous Connectivity Summit is held annually by the Internet Society. It includes tribal leaders, industry experts, academic researchers, and others to discuss Internet access in Indigenous communities. Policymakers should review the policy recommendations from these annual summits.

The U.S. Federal Government has recently passed the Consolidated Appropriations Act, a stimulus bill, which includes ~$1.3 billion in aid to Indian Country for broadband networks. This could greatly expand tribally owned networks. The previous COVID-19 relief bill, the CARES Act, provided Native Nations with funding, which enabled several of them to set up wireless networks. But the CARES Act included restrictions on how the money could be spent and when

the money had to be spent by. The Consolidated Appropriations Act extended these deadlines by a year to 2021 because unused funds must be returned to the federal government. Providing funding without reasonable deadlines and regulations is not useful.

Native Nations are already working to close the digital divide, and the Federal government and lending institutions can help. These case studies show how some have taken advantage of funding opportunities to build next-generation networks. They have envisioned how their communities will move forward with reliable Internet access, and they have found ways to combine funding from multiple sources to make that a reality. This is only a small segment of the tribally owned broadband projects in the U.S. The movement for data sovereignty, spectrum sovereignty, and network sovereignty is much larger.

Glossary

• **Allotted Lands –** These are lands that were part of reservations that the federal government assigned to nuclear family units under the Dawes Act in 1887 and the Curtis Act in 1898. This was a process to try to dissolve the strength of Native Nations and encourage Native families to adopt Western lifestyles.

• **American Recovery & Reinvestment Act (ARRA) –** This was economic recovery legislation passed by Congress in 2009 following the 2008 recession. The program had several grant and loan programs, including Broadband Technology Opportunities Program (BTOP) and Broadband Initiatives Program (BIP).

• **Bands (spectrum) –** The FCC manages the radio waves of the electromagnetic spectrum and has it split into specific frequencies, such as 2.5GHz.

• **Border to Border Broadband Development Grant Program –** This is a program specific to the state of Minnesota, which provides funding for up to 50 percent of the infrastructure cost. The maximum grant amount is $5 million.

• **Broadband –** This is a policy term used by the federal Communications Commission. The speed has increased over the years. From 2015-2020, it referred to a speed of at least 25 Megabits per second (Mbps) download and 3 Mbps upload on a fixed connection.

• **Broadband Initiatives Program (BIP) –** This $2.5 billion program was managed by the Rural Utilities Services (RUS) within the U.S. Department of Agriculture (USDA). It was designed to bring broadband to remote and rural areas. See American Recovery & Reinvestment Act (ARRA)

• **Broadband Technology Opportunities Program (BTOP) –** This $4.7 billion program was managed by the National Telecommunications and Information Administration (NTIA) of the Department of Commerce (DOC). It was designed to bring broadband to areas with little to no Internet access. See American Recovery & Reinvestment Act (ARRA)

• **Co-locate –** Wireless towers may be owned and used by one entity, but agreements can be made to share these towers. The wireless towers often have space for more equipment than one entity needs, so other companies or governments can put their equipment in the extra space.

• **Community Connect Program –** The USDA runs this program to expand Internet access. It provides grants to private companies, Native Nations, local governments, or cooperatives to bring Internet service to areas with speeds of less than 10 Mbps download and 1 Mbps upload. See U.S. Department of Agriculture (USDA)

• **Digital Divide –** This refers to the gap between areas that have Internet service and technology and areas that do not have the same options in Internet service or technology. It is often connected to underlying systemic inequities, such as racism and poverty.

• **E-Commerce –** Commercial transactions over the Internet. E-Commerce is a growing part of the U.S. economy.

• **Economic Development –** This is the process in which communities generate more wealth

and improve their social circumstances. Economic development also includes community development.

• **Electromagnetic Spectrum –** This all around us, and it includes: microwave, radio, visible light, infrared, ultraviolet, x-ray, and gamma ray. It is a range of frequencies based on wavelength, which is why it is called a spectrum.

• **Federal Trust Responsibility –** The federal government holds reservation land in trust. This means that the federal government has to use and manage the natural resources to the benefit of the Native Nations.

• **Fiber-to-the-Home –** A fiber-optic line is attached directly to the home or business, connecting to the Internet service. Fiber-optic lines are used throughout Internet infrastructure because they offer extremely high capacity and are very reliable. Fiber-to-the-Home is considered the gold standard for Internet access.

• **Fixed Connection –** This refers to a connection that is not mobile. It can be wireless, but generally excludes geostationary satellite. It is most often a direct cable or line into the building.

• **Gaming –** Gambling is highly regulated. A mid-1970s U.S. Supreme Court case established the legal basis for tribal gaming, and in 1987 the U.S. Supreme Court confirmed that tribal gaming is legal. A 1988 Act by U.S. Congress created regulations and established the National Indian Gaming Commission. The regulations are Class I (traditional, small prizes), Class II (bingo), and Class III (slot machines and other gambling). Native Nations and State governments negotiate State Compacts concerning the type and number of gaming operations in each state.

• **Gbps –** See Kbps/Mbps/Gbps

• **High-Speed Internet Access –** This is different from broadband because there is no legal and policy definition of what counts as high speed. Sometimes used to refer to connections order of magnitude faster than broadband. Sometimes used in marketing to confuse subscribers into thinking a slow connection is broadband.

• **Housing & Urban Development (HUD) Indian Community Development Block Grant –** Native Nations can use these grants to fund development projects, including broadband and housing, in areas that are predominately low to moderate income.

• **Indian Country –** Colloquially, this refers generally to Native Nations in the United States. Legally, it mainly refers to allotted lands and lands within reservation boundaries. This excludes many communities in Alaska whose lands are not held in trust by the federal government.

• **Internet Access –** This is the capability to receive Internet service at a location. This does not mean that there is currently Internet service at that particular location. As of 2020, federal statistics consider all locations within a census block served if an Internet access provider claims it can serve at least one address in a census block, the smallest geographic unit of measurement in the U.S. Census.

• **Internet Infrastructure –** The physical technology that provides Internet service. This includes wireless transmitters, satellites, fiber optic lines, cable, and DSL.

• **Kbps/Mbps/Gbps –** Kilobits per second/Megabits per second/Gigabits per second. These are units of measuring Internet service speed. 1000 Kbps is 1 Mbps. 1000 Mbps is 1 Gbps.

• **Licensed and Unlicensed (spectrum) –** In order to use most bands of spectrum in specific areas, one has to request permission from the FCC. Some bands of spectrum do not require the FCC's permission to use (unlicensed) as long as equipment operates according to prescribed rules. These are mainly the 900 MHz, 2.4 GHz and 5.8 GHz bands.

• **Matching Funds –** Grant and loan programs often require matching funds, which is money that the entity applying for the program has to have on hand. The entity often only has to match a percentage of the amount of the grant/loan. For instance, a $10 million grant might require 50% matching funds, which means that the entity has to have $5 million on hand to contribute to the $15 million project.

• **Mbps –** See Kbps/Mbps/Gbps

• **Mesh Network –** This refers to a non-hierarchical network. This means that data can re-route and travel the most optimal path with the least congestion from one node to another node through the network. There is no set path that data must travel through the network to reach its destination.

• **Microbusiness –** These are very small businesses that are often run by one person or a single family. They can be anything from roadside stands (in person) to Etsy or Ebay merchants (online).

• **Middle Mile –** A nebulous term for the network that connects from the neighborhood (but not the houses that are on the "last mile") to the network backbone that connects to the rest of the Internet. It is often fiber-optic.

• **Native Nations –** These are the Indigenous communities whose relationship with this land pre-dates the formation of the United States. They are self-governing.

• **Natural Resources –** These are the resources of the land, such as timber, oil, and fish. They are naturally occurring resources and depend on climate and locale.

• **Network Sovereignty –** Dr. Marisa Duarte uses this term to describe how infrastructure for Internet access supports Native Nations' sovereignty through self-determination.

• **Office of Native Affairs & Policy –** The Federal Communications Commission created an Office of Native Affairs & Policy in 2010. This Office is dedicated to ensuring government to government relations between the Federal Communications Commission and Native Nations.

• **Per Capita Payments or Per Cap –** A Native Nation may give a sum of money every month or year to each citizen of the Nation. Not every Native Nation has per cap.

• **Reservation –** These are lands that are reserved by treaties to Native Nations. federal laws and policies apply on reservations, but they are not governed by state law. Reservations are not lands given to Native Nations, but are lands held in trust by the federal government and resources on the lands are to be managed for the benefit of the Native Nation.

• **Right of Way –** This refers to small sections of land, often along roadways, that are owned and managed by the local government or Native Nation. This right of way is usually used for installing utilities or other infrastructure.

• **Settler Colonialism –** This is a term often used in American Indian Studies to describe the impact of how people from one area of the world settled in and colonized another area of the world. Examples of settler colonial societies include the U.S., Canada, Australia, and New Zealand. This has a continuing impact on Indigenous peoples.

• **Sovereignty –** Native Nations have governmental control over their peoples and their lands. This has been passed down since time immemorial.

• **Spectrum Sovereignty –** This refers to the sovereign right of Native Nations to access and use radio frequencies. There is a growing movement to recognize the spectrum that covers Indian Country as a federal trust responsibility (a natural resource that is managed by the federal government on behalf of Native Nations).

• **Tribal Lands –** This is a policy term that refers to all types of Native Nations' lands. The Federal Communications Commission uses this term to refer to reservations, allotted lands, and Hawaiian homelands.

• **U.S. Department of Agriculture (USDA) –** The U.S. Department of Agriculture is a federal agency that supports rural economies. It is primarily associated with farmers and produce, but it has holistic programs designed to support rural communities. The USDA has several grant and loan programs, including the Community Connect Program, to increase Internet infrastructure in rural areas.

Building Indigenous Future Zones:
Four Tribal Broadband Case Studies

21

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