

State of North Dakota  
Information Technology Department

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**Statewide Technology Access for  
Government and Education Network  
(*STAGEnet*)**

**Strategic Plan**



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# North Dakota Statewide Network

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## **Background**

North Dakota's lack of population density has proven challenging as urban North Dakota strives to provide its rural counterparts comparable services when new technologies arise. And it is for many of the same reasons rural America struggles to meet those same needs throughout the nation – cost and geography.

Rural America keeps the nation's pulse beating strong creating an interdependence between cities and rural communities that cannot be ignored. Rural America provides the food and natural resources cities need for survival and the cities provide a market place for rural goods. America has undergone many tough economic times and it is often rural America that suffers most. Digital communications contain the critical link between urban and rural America to maintain the nation's social and economic health. Broadband access allows rural Americans to participate in activities such as telehealth, telecommuting, distance learning, improved emergency communications, culture, democracy, and the global economy. All of which are important to the lives of North Dakota citizens and are potentially addressed through the provision of a statewide network.

In the 1930s, the federal government stepped in to assist the implementation of electricity to rural America by creating the Rural Electric Administration (REA) which hastened the delivery of power to all locations in the country. In addition, cooperatives and federal programs also allowed telephone service to reach rural America. Today's rapidly growing service is high speed internet connectivity, specifically broadband and related services.

North Dakota is among the nation's most rural states. North Dakota is the nineteenth largest state geographically and the third smallest in population. The state has 9.3 people per square mile; over half of the population lives in the state's ten largest cities. While the State has succeeded in providing internet connectivity via a statewide network to connect government and education that spans to the state's four corners, many rural communities are still underserved putting them at risk from receiving high speed internet services relating to public safety, health, and education. It is imperative to maintain the health of North Dakota's network infrastructure because it provides access and connectivity not only for state and local government but also to schools, public libraries, and health care facilities.

## **Executive Summary**

North Dakota's response to providing internet connectivity to government and education entities began with the North Dakota Statewide Technology Access for Government and Education Network (STAGEnet). Created from the 1999 Legislative Session, STAGEnet provides internet and networking services to government and education entities. It provides broadband connectivity, internet access, video conferencing, and other networking services. All state agencies, colleges and universities, local governments, and K-12 public schools are required to participate in STAGEnet.

The vision of STAGEnet is to provide a secure, reliable, and cost-effective network with the scale and flexibility to support the convergence of data, voice, and video to meet and surpass the business objectives of government and education. This implementation of e-government and e-education brings a wealth of new opportunities to city and rural residents alike by providing a win-win situation to the State, schools, and citizens.

STAGEnet is governed as a partnership between government and education. The governance structure includes representatives from state and local government and K-12 education, colleges, and universities. These committees aid in planning, prioritizing, approving standards and policies, making service level decisions, coordinating among constituencies, communicating, and identifying and providing resources for STAGEnet. Ultimately, the decision-making authority for STAGEnet belongs to the State of North Dakota's Chief Information Officer, who manages the Information Technology Department and oversees the State's technology activities within government and education.

The success of STAGEnet remains contingent upon and has been a result of many private sector business partnerships developed through the anchor tenant model. ITD, which manages and operates STAGEnet, believes this model maximizes the balance of government investment and private sector opportunities to meet the needs of citizens. Working together, partners will seek ways to deliver broadband internet access throughout North Dakota so that citizens in rural and metro communities have the same opportunities available to them. This model has allowed the State and private sector businesses to successfully deliver affordable high-speed internet access to schools and citizens in rural communities that would otherwise not have this type of access. The State of North Dakota strives to keep pace with the industry's technological advances to address the business requirements of STAGEnet's consumers.

This strategic plan was developed by the State of North Dakota Information Technology Department and will be updated with new information as needed.

## Mission Statement

The State of North Dakota's Information Technology Department along with STAGEnet partners will develop and enhance a statewide network to service its primary consumers. STAGEnet will exist to provide a secure, reliable, and cost-effective network that has the scale and flexibility to support the convergence of data, voice, and video to meet and surpass the business objectives of government and education.

## Vision

STAGEnet strives as a collaborative spirit to architect an enterprise infrastructure through partnerships with all levels of government and education. In addition, the committee will seek out partnerships with the service provider community in an effort to help deliver equal access throughout North Dakota. Past and future collaborative efforts will continue to provide great opportunities for STAGEnet. Partnering together on strategic data, video, and voice projects will continue to reshape STAGEnet for the future and provide its users an innovative communications infrastructure.

## Value of a Statewide Network

The value provided by North Dakota's statewide network (STAGEnet) is defined by the following:

- **Reliable** – Network reliability and security is universally achieved and provided through many diverse customer requirements.
- **Accessible** – Access continues to expand to all borders of North Dakota through new strategic opportunities provided by existing and new providers.
- **Affordable** – Affordable and cost effective access is provided to the network's customers through the use of cooperative architecture and volume purchasing.
- **Flexible** – Designed to provide a wide range of services and connectivity to government and education, the network inherently provides a high degree of flexibility in addressing unique needs and new services.
- **Innovative** – Architecture is designed to meet the needs of many customers resulting in an enterprise infrastructure where innovation can thrive and stimulate new opportunities.

## **Strategic Goals & Objectives**

The State of North Dakota intends to fulfill the mission of STAGEnet by utilizing an anchor tenant model, a development model for which the State of North Dakota will work with private sector businesses, to deploy increased bandwidth and wireless capability throughout North Dakota. Partnerships with local providers often spurs the deployment of new technologies in both rural and metro communities. When new technologies are brought in to service government agencies and public schools, local consumers often gain new services as a result.

The following objectives illustrate how the State will achieve the development and maintenance of its statewide network:

### **Objective 1: Develop Statewide Network Access Through an Anchor Tenant Model**

By developing partnerships with local telecommunications providers, the State of North Dakota can provide internet services to rural and metro government agencies and schools thereby giving local providers the ability to offer new telecommunications services to area residents. The State of North Dakota will establish partnerships with local telecommunications providers to address current and future needs of STAGEnet relating to increased bandwidth, low network latency, reliable service, security, privacy, wireless connectivity, and low-cost access. As the single largest user of telecommunications networks, STAGEnet will ultimately drive the deployment of new telecommunications services that become available to local consumers.

### **Objective 2: Increase Bandwidth as Required**

Demands for internet access continue to increase by government and education entities to support business functions that ultimately benefit citizens. Many citizens no longer consider going to an office to stand in line as an acceptable form of interaction with government. To meet those needs state government requires fast and reliable internet connectivity to function during peak access times and to accommodate failover. As the demand for greater bandwidths continues to rise, the core's capacity, too, must increase to help manage the additional workload created from greater bandwidth demand. Because broadband demands are growing quickly, it's necessary for the State of North Dakota to consider the infrastructure being deployed. The State's infrastructure must be able to accommodate bandwidth demands which could potentially double every 24-36 months.

### **Objective 3: Expand Network Connectivity**

Broadband services are no longer one of life's luxuries. It is becoming a way of life. In tough economic times, the risk of pandemics, and the rising costs of fuel and energy, people are looking for alternate ways to conduct business. E-commerce, mobile computing, video conferencing, and Voice-Over-IP are all services that are becoming integrated as business standards for state governments or public schools.

Mobility of the workforce and education are becoming increasingly important. Employers and teachers are currently evaluating the use of technology incorporating remote locations. Plus, Ethernet services have allowed many rural schools to remain open and meet their classroom technology needs, primarily through the use of video conferencing. For example, STAGEnet hosts about 15,000 video conferences for K-12 schools and approximately 1,000 for state government agencies annually.

In order for state government and education to deliver the necessary services to its people, a network infrastructure must be in place and available to all communities. To meet the business needs of STAGEnet's stakeholders, bandwidth must continue to increase to support new technologies.

#### **Objective 4: Improve Statewide Mobile Communications**

A multi-technology strategy to improve mobile connectivity can help address internet coverage issues in remote areas. In order to advance North Dakota's statewide network, STAGEnet must be upgraded to extend greater bandwidth, broadband services, and depth to all rural communities using wireline, fiber optic, wireless, and other commercially viable emerging technologies.

North Dakotans are underserved in the area of Public Safety. Although the current infrastructure is adequate for voice telecommunications, limited bandwidth does not lend itself well for modern day data services. Emergency communications in North Dakota requires a statewide mobile broadband emergency communications network that is accessible anywhere, anytime to first responders and other public safety partners. Current estimated voice coverage simulations may be viewed at <http://www.nd.gov/des/state-radio/radio-coverage-area-maps/>.

The ability to consolidate communication functions and services into an improved streamlined service model built around the Internet Protocol (IP) could give the state many valuable applications that could be used by government agencies and schools as well as North Dakota citizens. The absence of those types of technologies continues to limit and delay future State initiatives. Examples of desired initiatives that send data from mobile and/or fixed base stations throughout North Dakota for a number of functions include:

- Weather Station Data Transmission
- Live Weather Feeds for the Department of Transportation(DOT) and the Public
- DOT's Weights-in-Motion System
- Live Police and Emergency Vehicle Video Transmission
- Radio Frequency Identification (RFID) Applications
- State Message Board Solutions
- Geographic Information Systems (GIS) Applications for First Responders

To meet strategic objectives the State will again use the anchor tenant model to spur deployment of a broadband networks that can support the convergence of voice and data technologies. The resulting networks will be made available to local telecommunications consumers as well as public safety entities. The increased bandwidth will help public safety entities communicate more effectively in their efforts to serve and protect citizens statewide.

#### **Key Success Measurements**

The success of STAGEnet will be measured by the following:

- Percent of North Dakota land mass with PSBL in-band interoperable public safety broadband and public safety P-25 voice coverage. Target is 98%
- Percent of North Dakota residents with broadband access. Target is 100%
- Number of telecommunications private sector jobs created/saved. Tracking



## Appendix B: Network Demographics

Since the inception of the state's original network in 1983, it has quadrupled its growth and services and technology demands continue to increase. STAGEnet provides the circulatory system for state government and education. In order to continue to maintain fast, secure, and reliable service, the STAGEnet infrastructure requires upgrading now to support the technology needs of today and the future to serve both rural and metro North Dakota citizens.

Currently, STAGEnet supports:

- 800+ locations
- 100,000 devices
- 80,000 computers
- 10,000 phones
- 16,000 video conferences (15,000 were delivered to K-12)

The State provides more than 100 online services to citizens. In education, rural schools provide courses through video conferencing to students giving them access to curricula they may not otherwise be able to participate in. Schools have been able to deploy antivirus protection and internet filtering solutions to districts cost effectively through STAGEnet.

As a result of the State's commitment and accomplishment of providing a reliable statewide network to combine government and education entities, citizens in many rural communities have reaped the benefits of high-speed internet access resulting from the partnerships formed with local telecommunications companies. As government and education entities begin to transition their workforce and teaching curricula to engage mobile access, broadband and wireless connectivity are quickly becoming increasingly important. STAGEnet today and in the future will play a critical role in maintaining a sense of normalcy and continuation of business during a time of crisis when communication is so important.

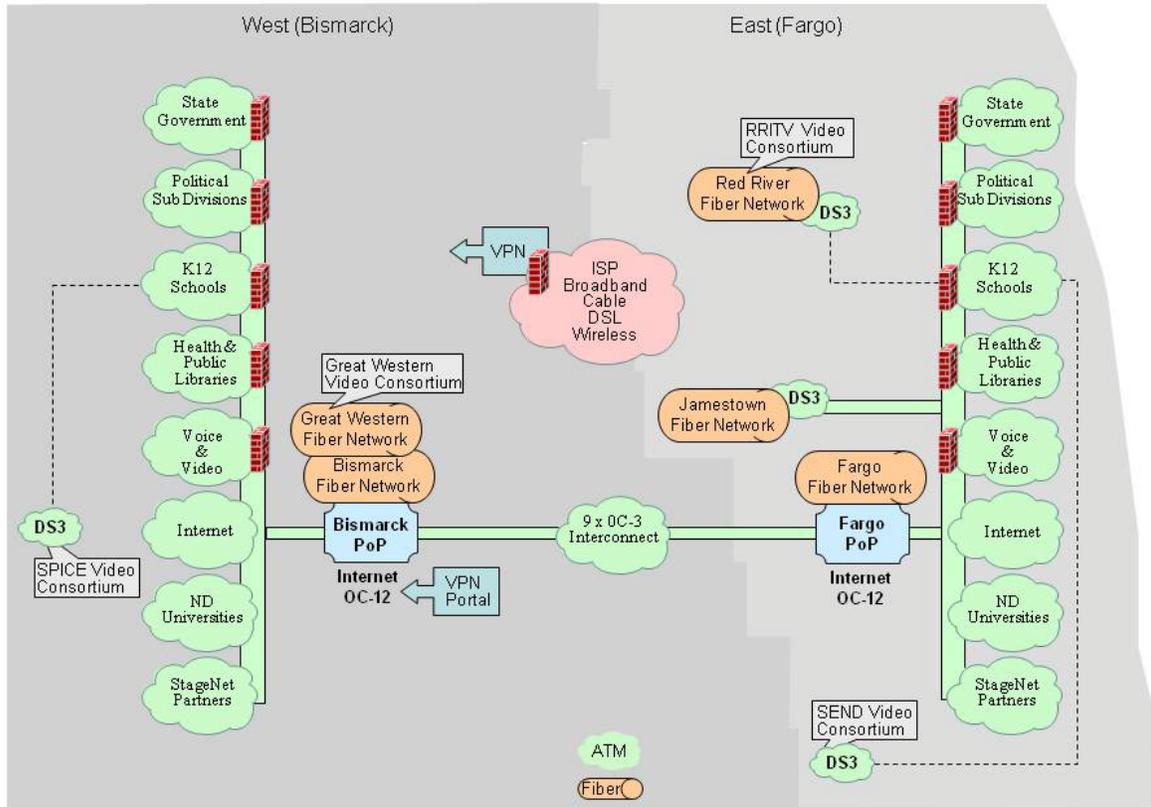
## Appendix C: STAGEnet Timeline

1983	Two university networks were merged into the state government consolidated network. Few other states have been able to merge higher education networks with state government.
1995	Migrated to Frame Relay. The State required a solution with higher speed and more bandwidth. That need spurred the industry to deploy frame relay that had speeds of 56Kbps to 1.5Mbps.
1999	Statewide Network RFP issued for ATM service. The need for QoS for video and higher speeds again spurred the industry to deploy a bigger and faster network. ATM offered speeds of 1.5Mbps to 6Mbps.
2000	Implementation of the Statewide Technology Access for Government and Education Network (STAGEnet): <ul style="list-style-type: none"> <li>• Rebuilt core network</li> <li>• Doubled bandwidth</li> <li>• 456 sites connected (202 schools)</li> <li>• Video sites increased from 58 to 257</li> </ul>
2001	Internet demand increased and the State upgraded to 2 OC3 connections (one in Bismarck and one in Fargo).
2004	Internet demand increased and the State upgraded to 2 OC12 connections (one in Bismarck and one in Fargo).
2006	STAGEnet Infrastructure Services Upgrade. Increased the core from 2 nodes to 4 nodes with a 2.5GB Resilient Packet Ring: <ul style="list-style-type: none"> <li>• Connections increased to 675</li> <li>• Video sites increased to 350</li> <li>• Wireless solutions were added</li> <li>• Migration to VoIP began</li> </ul>
*2009-2010	STAGEnet Ethernet Services deployment. The increase of bandwidth and video use spurred the industry to provide a Statewide Ethernet solution. The conversion to 10Mbps to K-12 schools began in June 2009 with state government following.
*2010	Increase the network's core bandwidth Increase internet bandwidth as required
*2011	Planning the deployment of a 700 MHz 4G wireless broadband solution coordinated with neighboring states.

\*Indicates planned events

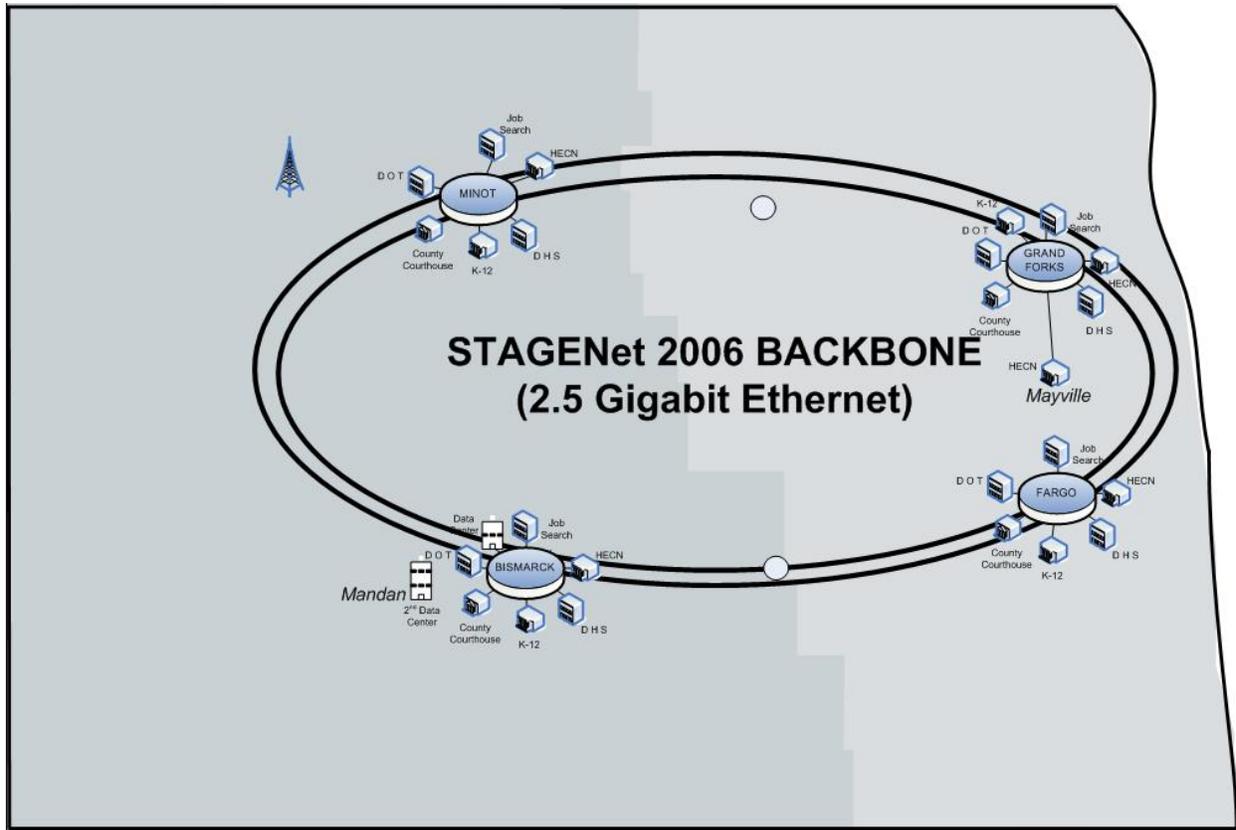
## Appendix D: STAGeNet 2001-2005 Backbone

### STAGeNet



This diagram represents a high level overview of STAGeNet as it was architected between 2001 and 2005. It depicts two core backbone nodes in both Bismarck and Fargo with its outlying customer base. All participating government entities and their access to the internet are also represented. Several network video classroom consortiums are included for K-12 schools. This infrastructure was built using carrier provided ATM services as well as some outlying fiber optic connectivity.

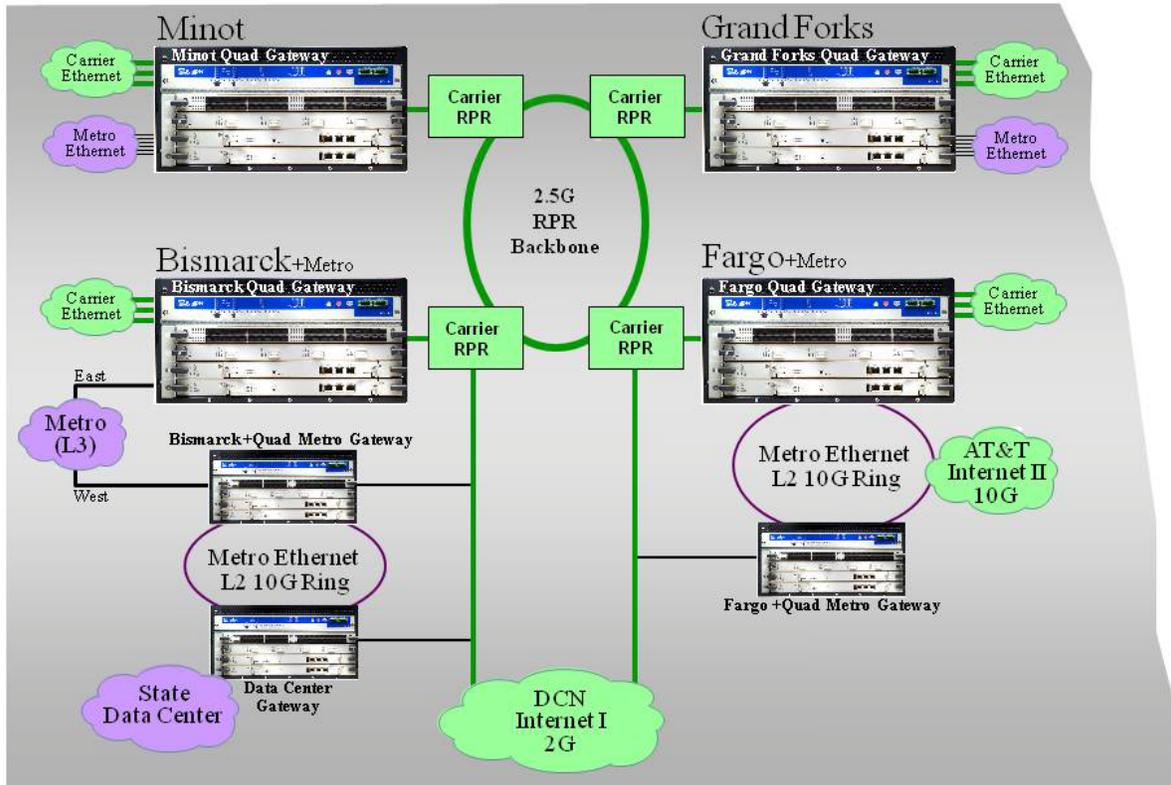
## Appendix E: STAGeNet 2006 Backbone



This diagram represents the expansion of STAGeNet's core backbone from two nodes to four. The objective was to build ring (RPR) architecture to support failover in the event of a failure between any two nodes. In addition, the resulting solution provided a growth from OC3 (45M) to OC48 (2.5G).

## Appendix F: STAGeNet 2009 Backbone

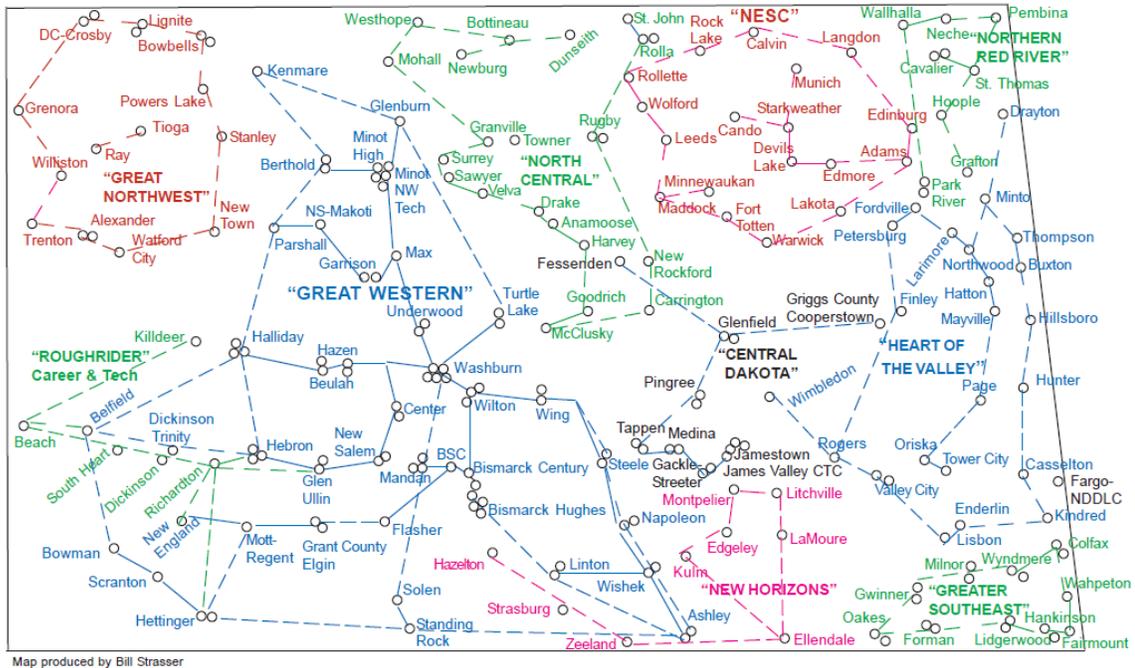
STAGeNet 2009 Backbone



This diagram represents a high level overview of STAGeNet as it will be deployed starting in June 2009. This new architecture will replace all carrier ATM services with new carrier based Ethernet Transport services. This will provide last-mile upgrades from ATM 1.5M circuits to 5M, 10M, 100M, and 1G Ethernet circuits. All areas shaded in green represent carrier provide services.

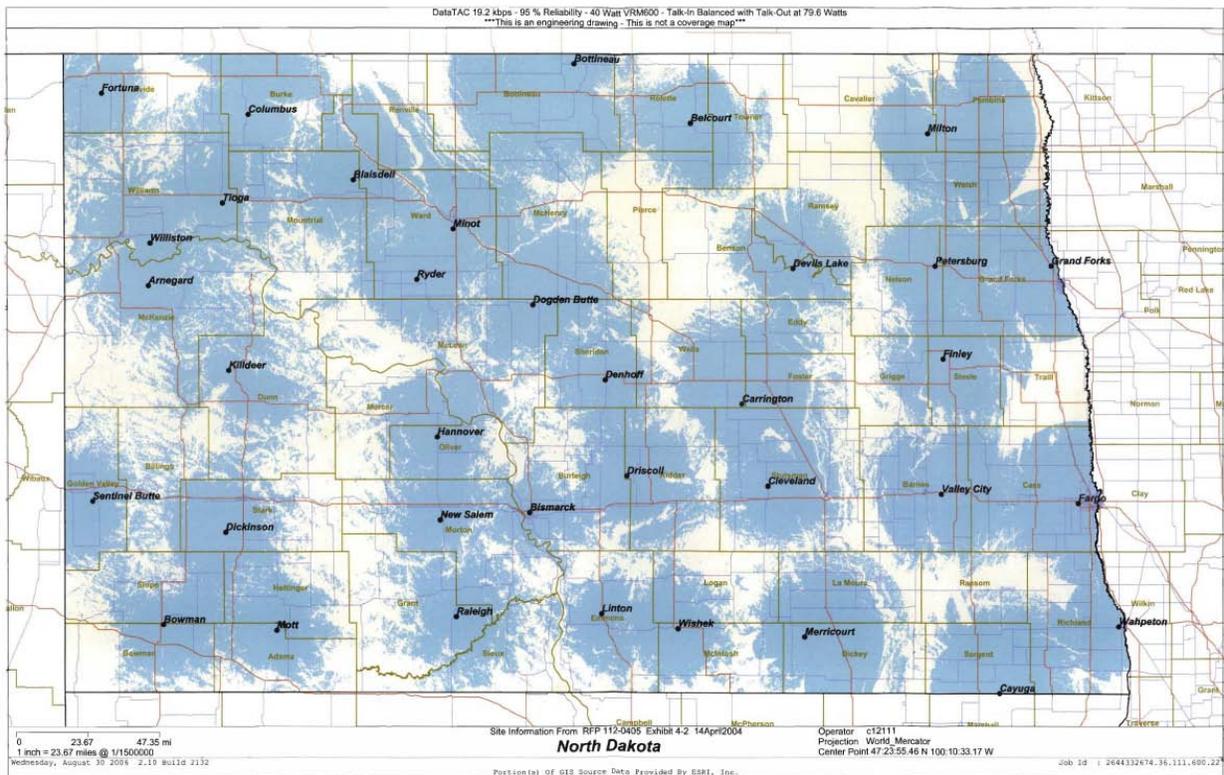
## Appendix G: Distance Learning Map

### K-12 Distance Learning in North Dakota - June, 2008



One of North Dakota's strengths is its effective use of distance learning applications. This map illustrates the extensive use of video conferencing among North Dakota's 187 K-12 school districts. There are currently 286 video conferencing locations within the K-12 community with an increase of 30 locations projected for 2009-2010 school year. The majority of connectivity between locations is currently utilizing fiber optic facilities and transmitting between 5MB and 1GB speeds. Those consortiums using ATM connectivity will be upgraded to 10MB Ethernet service during the summer of 2009.

## Appendix H: State Radio Towers



This map illustrates the placement of North Dakota’s State Radio Towers. It indicates talk-in and talk-out ranges at 95 percent reliability. While the State of North Dakota operates radio towers statewide that provide wireless law enforcement capabilities, there are many age-related shortfalls that exist with the current infrastructure. The current infrastructure runs at 19.2Kbs and does not support new and emerging voice and data technologies that could benefit public safety entities in their efforts to serve and protect citizens. The deployment of a 4G network across the state could support voice and data radio, mobile phones, and emerging technologies such as automatic vehicle location and identification, in-vehicle video streaming, and weather data transmission.