**NEW MEXICO
DEPARTMENT OF
INFORMATION TECHNOLOGY**

The New Mexico Broadband Program

Broadband Assessment and Recommendations: Education, Healthcare, and Economic Development

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The New Mexico Broadband Program
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Introduction

Project Rationale

Education, healthcare, and economic development are three critical sectors that impact the lives of all New Mexicans, and all those sectors rely on technology. That reliance includes high-speed, reliable, broadband infrastructure as well as a huge array of technology applications. This report inventories current and emerging broadband and technology requirements, identifies barriers meeting technology needs, articulates gaps, and describes a path forward. The policy recommendations outlined will enable government and industry to develop technology initiatives to bolster education, healthcare, and economic development in New Mexico – and thus strengthen the state as a whole.

These recommendations are needed because New Mexico ranks in the bottom quarter of states with minimally adequate broadband.[1] Even more critical is the lack of broadband in rural areas where 25% of the state's population and 39% of the businesses reside.[2] It was estimated in 2012 that nearly half (47%) of the New Mexico rural population did not have access to adequate broadband, twice the national average.[3] While officially only 5% of the New Mexico urban population lack broadband access, this figure is actually much higher outside the immediate metropolitan areas. Representatives from Albuquerque, Santa Fe, Las Cruces, and Farmington reported a lack of access in the less populated areas of their counties.[4]

There are multiple efforts underway in New Mexico to address these concerns. The assessment and recommendations in this report will be incorporated into a broader Statewide Broadband Strategic Plan being developed by the Columbia Telecommunications Corporation and due for completion in 2014.

Report Objectives

This report's authors strived to achieve the following objectives:

- Identify existing and potential services that rely on broadband technology in the three sectors.
- Inventory existing facilities and services.
- Complete a gap analysis identifying service needs and barriers in each sector.
- Identify potential funding sources.
- Offer strategic policy changes that may improve access to and use of broadband and technology.

Report Authors

With input from the NM Broadband Working Group, this report was developed by:

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[1] (NM Department of Information Technology, 2012) Minimally adequate in this context means at least 4Mbps download speed and 1 Mbps upload speed.
[2] (U.S. Census Bureau, 2010), (NM Dept. of Workforce Solutions)
[3] (U.S. Department of Commerce, 2011)
[4] (NM Broadband Interviews, 2013)

Broadband Working Group

This report was informed by a statewide working group, comprised of experts in education, healthcare, economic development, tribal needs, and broadband deployment. Every attempt was made to ensure all regions of the state were represented. Participants at the 2012 Statewide Broadband Summit were also represented in the group to ensure the summit recommendations were given consideration.

The working group's membership and meeting summaries are provided in the appendix of this report.

Project Funding

This report is part of a collaborative funding grant opportunity between the New Mexico Department of Information Technology (NM DoIT) and the National Telecommunications and Information Administration (NTIA). The five year $6.0 million project titled the New Mexico Broadband Program (NMBBP) is tasked with identifying broadband availability and enhancing adoption (access and subscription) of broadband within New Mexico. The NMBBP funds terminate at the end of December 2014.

Methodology

Statewide Survey and Interviews

This report was informed by a statewide survey that the broadband working group (described in the previous chapter) helped create. Targeted follow-up interviews gathered additional information. The survey instrument is posted at: www.doit.state.nm.us/broadband/bb_workgroup.shtml

The online survey went to:

- Education: public schools, colleges, and universities
- Health: Hospitals, clinics, and other healthcare providers
- Economic development: chambers of commerce, MainStreet programs, economic development organizations, regional governmental councils, and rural electric cooperatives.

The distribution lists were provided by the NM Department of Information Technology, NM Public Education Department, NM Department of Health, NM Economic Development Department, New Mexico First, New Mexico Technet, Employment and Economic Information Center of NM, and New Mexico Telehealth Alliance.

The online survey was open for 14 weeks between May and August. Potential respondents received three or more email reminders, and non-responding organizations deemed critical due to size or geography received a phone reminder as well.

Table 1: Survey Respondents by Employment Sector[5]

In which of the following sectors do you primarily work?
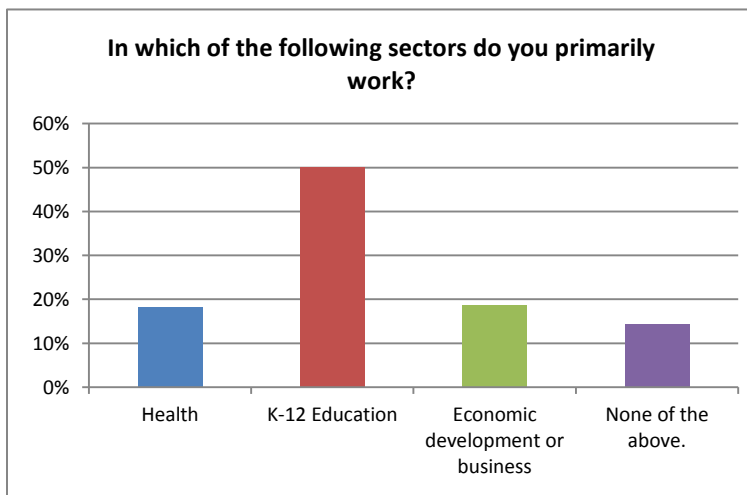
Representatives from the three targeted sectors answered the survey, totaling 441 respondents from all 33 New Mexico counties. Table 1 illustrates the breakdown by sector. (Most of the "none of the above" respondents were either institutions of higher education, municipalities, or businesses.)

Of the total respondents, 40% answered on behalf of a multiple facility institution (such as a school district or healthcare entity with multiple clinics). Of New Mexico's 89 school districts, 84 were represented either by the survey and/or interviews.

A majority of the respondents (63%) represented institutions with 50 or more employees, and over a third had 250 or more employees. This breakdown makes sense, given the fact that the survey targeted so many government institutions. However, New Mexico's actual employment base is dominated by small businesses, which represent 96% of all employers and which hire 55% of the private sector labor force.[6] This data implies that additional research may be needed to fully understand the needs of small and medium-sized businesses. In this report, the perspectives of private employers are primarily represented by chambers of commerce and government-funded economic development organizations.

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[5] (NM Broadband Survey, 2013)
[6] (U.S. Small Business Administration)

Table 2: Number of Employees per Survey Respondent Institution[7]

How many employees work at your institution?
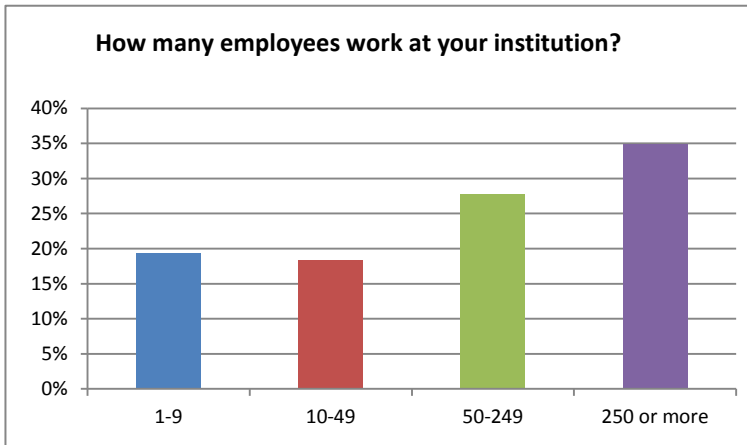
Interviews

Report authors conducted follow-up interviews with people working in all three sectors. Approximately 60 school administrators, teachers, and school board members were interviewed, as well as 17 healthcare professionals, and 18 economic development representatives. Interviews were conducted in June, July, and August 2013.

A complete list of organizational interviews is provided in the appendix of this report.

Methodology Caveat: Connect the Dots

This report is organized into three main sections, but that division can be misleading. Education, healthcare, and economic development are absolutely intertwined. The economy cannot grow without a prepared workforce, and new businesses choose to open in locations where they can enjoy powerful education systems as well as solid healthcare networks.

These linkages appeared in the NM Broadband Survey. Just over a third (39%) of professionals answering the economic portion of the survey believe that their schools are meeting the economic development needs of their communities. Almost half (49%) believe there are adequate healthcare services in their area to support economic development. The critical role of public libraries was also repeatedly mentioned.

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[7] (NM Broadband Survey, 2013)

Policy Recommendations

The following policy recommendations were developed by working group members and were informed by this report's subsequent chapters on education, healthcare, and economic development.

Cross-cutting Recommendations

1. **Buying collaboratives:** Pursue a state buying cooperative to purchase bandwidth for educational, healthcare, and public safety facilities.[8] The work should take place in collaboration with existing private industry providers.
   a. Option 1: Replicate key components of the Utah Educational Network (UEN), which partners with internet service providers to create a statewide buying cooperative delivering high-speed internet to schools, higher education institutions, public libraries, and other community anchor institutions at reduced rates.[9]
   b. Option 2: Create a public access network operated by higher education or the NM Department of Information Technology using a hybrid of state and private networks.

2. **Smart funding:** Improve the distribution and acquisition of state and federal government funds for broadband.
   a. Align the timing and amounts of broadband-related grants (capital and non-capital dollars) so that communities can submit multiple applications at the same time and collect enough funds to finish projects completely (rather than piecemeal).
   b. When possible, align with foundation funding cycles as well.
   c. Ensure that the most relevant entities are engaged, including the Federal Communications Commission, U. S. Department of Agriculture, and National Telecommunications & Information Administration.

3. **Matching and infrastructure funds**: Create a revenue source for federal broadband matching funds as well as long-term infrastructure investments.
   a. Make the fund available for healthcare, education, and other public entities.
   b. To build the fund, consider surcharge or surtax structures.
   c. Consider enabling the fund to also provide loans for infrastructure build-outs.
   d. Make funds available to New Mexico universities to fund and deliver high speed, low latency research networks capacity.

> **Learning from Other States**
>
> **Utah Educational Network:** The Utah Legislature formally established UEN as the statewide delivery system for education in Utah in 1989. As broadband fiber optic technology has replaced microwave, UEN now connects all Utah school districts, schools and higher education institutions. It is managed by the University of Utah.
>
> The UEN also provides networking support, security monitoring, internet filtering, video and web conferencing, teaching tools, E-rate support and other education services.
>
> *(Source: www.uen.org)*
>
> **California Emerging Technology Fund:** This nonprofit was statutorily established to close the "Digital Divide" by accelerating the deployment and adoption of broadband to unserved and underserved communities and populations. The fund invests in digital literacy, telehealth, educational networks, and community infrastructure.
>
> Priorities include rural communities, urban poor and disadvantaged communities that lack computers and affordable internet, disabled populations that lack technology accessibility.

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[8] Develop the program to build on – not duplicate – existing mission of Cooperative Educational Services, which coordinates buying of services, supplies and equipment for member schools in New Mexico. Such a cooperative could be managed by an existing organization (such as CHECS, DoIT, PED) or a new entity (depending in part on which of the other recommendations in this report move forward).
[9] (State of Utah, 2012, p. 4)

e. Require public entities to adopt high-level capacity sharing agreements to encourage shared infrastructure investments.

f. Potentially model on the California Emerging Technology Fund.

4. **Centralized network management:** Urge aggregation of state-managed networks by a single entity with advanced networking capacity, and negotiate a statewide rate for all state offices. Allow counties and municipalities and educational facilities to participate.

a. Provide adequate resources for the NM Department of Information Technology to provide oversight of the network and respond to the needs of state agencies within a reasonable timeframe.

b. The network should serve as a service bureau without the authority to veto agency requests for service, and it should be able to provide assistance in design and selection of network services and equipment.

c. Coordinate inter-state service network drop/add locations to support regional collaborations.

d. Select a network manager among existing public entities through a formal proposal and selection process.

5. **Rights of way and franchises:** Streamline the right of way and franchise process and approval.

a. Simplify the right of way process and approval across state and federal land, especially BIA and BLM which today can take up to three years for a simple clearance.

b. Encourage local and state policies to "dig once," laying multiple types of lines, conduits or other infrastructure when roads or right of ways are impacted. (For example, if transmission lines are being laid along a public easement, put in broadband conduit at the same time, and vice versa.)

c. Counties and municipalities should consider requiring the provision of broadband services to educational and healthcare sites as part of any franchise or right of way agreement with cable and broadband providers or content providers.

d. A networking plan with a time table should be required to expand coverage throughout the franchise territory.

6. **Tribal issues:** Advance broadband connectivity and education among tribal communities.

a. Create a marketing plan that will gain commitment from tribal leaders/elders to support expansion of broadband services from the Local Exchange Carriers, Internet Service Providers, and public infrastructure that serve the tribal territories.

b. Develop an educational program to teach tribal members how to use the internet help with health and wellness, education, and family communications.

c. Advance access to common telecommunications infrastructure for programs like the FCC Rural Health Care Pilot Program/Southwest Telehealth Access Grid, which provides wireless broadband to chapter houses on the Navajo Nation.

7. **Broadband Programmatic Entity**: Create through legislation an independent nonprofit entity to continue many of the basic tasks currently provided by the NM Broadband Program to include the following actions.

a. Track and notify appropriate respondents of funding opportunities and maintain an online grants database.

b. Create a grant collaborative to provide a neutral environment for funding partnerships, grant preparation, and grant administration.

c. Facilitate statewide planning with public and private interests to establish and maintain broadband projects, including infrastructure construction, technical assistance, and education.

d. Continue to update and maintain the NM Broadband Map that illustrates internet availability by location and assesses service gaps.

e. Continue broadband supportive training (digital literacy, business, health, etc.), partnering with public libraries.

f. Distribute DoIT's broadband mapping through the University of New Mexico Open Data Repository.

Education Recommendations

8. **Backbone connectivity management:** Provide consistent and cost-effective connectivity for all schools by establishing a statewide educational network to provide and manage broadband backbone connectivity from the K-12 school district to the internet, university networks, and other regional services.[10]

    a. Shift from the current system of all school districts managing backbone connectivity on their own.

    b. Centralized broadband management would mitigate the funding shortfall caused by changes in E-Rate subsidies that eliminated funding for maintenance support of networking equipment.

    c. Use the existing university networks (e.g., CHECS) as the primary backbone carrier, and arrange coordination of the new K-12 system by a skilled entity (within state government or a contractor) that can design a comprehensive network, negotiate and install components, and provide long-term management.[11]

    d. Meet or exceed the short term goal of 100 kb per student and teacher. Create a plan to deliver a minimum of 1 GB of network service to K-12 organizations.

    e. Task the new network with applying for and managing E-Rate funding on behalf of all districts for the statewide network. The districts would be responsible for applying for all networking within their district and maintaining it accordingly.

    f. Significantly reduce the existing cost of connectivity by taking advantage of economies of scale and bulk buying.

9. **Internal connectivity support:** Create or enhance a technical support group for small and medium-sized school districts to provide networking assistance for district local area networks. Services should include:

    a. Network and equipment support

    b. Compliance with child safety laws as well as protection against malicious programming and SPAM

    c. Management of web, email, and social media communications environments through effective network segmentations

10. **E-Rate:** Modernize the management of federal E-Rate program in New Mexico, and create a support system for districts to:

    a. Assist districts to ensure their E-Rate funding is actually received and used in a manner that ensures compliance with E-Rate regulations.

    b. Collect all library and school responses to E-Rate rulings in a central location so they can be sent to the federal government as a unified statement from New Mexico.

    c. Assist each school district in developing its technology plan.

    d. Position key higher educational entities to provide services to E-rate applicants so that common public infrastructure can be leveraged.

    e. Achieve this central support system by:

        i. Option 1: Centralize an E-Rate collaborative structure that provides an integrated framework for state agencies, public libraries, and schools to participate.

        ii. Option 2: Task the NM Public Schools Facility Authority with coordination, training, and support of all E-Rate applications from public schools and libraries (with input from the NM Public Education Department, NM Department of Information Technology, NM State Library, Regional Educational Cooperatives, and school districts).

11. **Technically savvy educators:** Provide professional development and training to teachers and other school staff to use technology to its greatest advantage.

    a. Prioritize training for administering the PARCC assessments, which begin in 2013.

    b. Expand opportunities for educators to have access to, and the ability to use, technology-based content, resources, and tools where and when they need them**.**

    c. Encourage teacher leaders to participate in peer-coaching training so that they can play a role in helping their schools build the capacity for both effective collaboration and meaningful integration of technology.

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[10] Many other states have adopted this approach effectively, including Colorado and Utah.

[11] The New Mexico Council for Higher Education Computing/Communication Services (CHECS) is a non-profit organization whose members are professionals from the computing services divisions in every institute of higher education within New Mexico. Over 30 institutions participate in CHECS.

d.   Develop a suite of online/professional development courses for all educators starting in 2014.

e.   Charge the schools of education to develop a teaching force skilled in online instruction.

12. **PARCC Readiness:** Ensure that schools have the equipment and training needed to administer PARCC testing.

a.   Provide additional funding to the NM Public Education Department or the statewide network manager for equipment and technical support to schools to assist in their PARCC readiness (See p. 21 for a details on the numbers of computers needed.)

b.   Provide a facility readiness tool for schools to assure testing environment is adequate and appropriate for testing.

c.   Provide an emergency fund for use by the NM Public Education Department for last minute support of schools for PARCC assessment.

13. **Software/application standards:** [12]

a.   Provide assistance to school districts in using advances in learning sciences and technology to enhance Science, Technology, Engineering and Math (STEM).

b.   Provide assistance to school districts and other entities in developing, implementing, and sharing learning resources that tap the flexibility and power of technology to reach all learners anytime and anywhere.

c.   Create eligibility, quality, and accountability standards for all digital content, courses, and providers that assure quality at the lowest possible cost.

d.   Provide a content repository of state-owned/developed and Open Educational Resources digital content for use in all schools across NM, potentially including incentives for authors.

e.   Provide online professional development for teachers and administrators on the effective use of these digital tools and content by 2014.

f.   In cooperation with the universities, plan and deliver open textbook options for New Mexico K-12 schools.

g.   Inform broadband planning by speed testing all education facilities using existing tool at: http://www.doit.state.nm.us/broadband/speedtest.shtml

Healthcare Recommendations

14. **Telehealth coordination:** Statutorily designate the NM Telehealth Alliance as the central coordinating entity for telemedicine within the state.

a.   Improve health outcomes, decrease costs, and reduce duplication of services through streamlined coordination.

b.   Share collaboration, long-term planning, and funding opportunities.

c.   Create a statewide board representing private and public sector health entities.

d.   Review statutes associated with the Health Information Technology Commission, potentially sun-setting it. [13]

15. **Telehealth data:** Develop a central online data warehouse on telehealth and health information exchange services, utilization, and impact.

a.   Use data to provide analytics to determine the impact of telehealth and health information exchange services.

b.   Update and maintain a list of healthcare provider entities having telehealth capability and develop a comprehensive list of all healthcare facilities within New Mexico that assesses technological readiness for telehealth. A map illustrating the locations of healthcare facilities within New Mexico can be found at: http://www.doit.state.nm.us/broadband/map_gallery/CASA_Medical.pdf#toolbar=1

c.   If a statewide telehealth coordinating entity is designated (see previous recommendation), house the data warehouse within that entity.

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[12] (NM Public Education Department, 2013)

[13] The Health Information Technology Commission was established by law during Governor Bill Richardson's administration but is currently not meeting and has no appointees.

16. **Telehealth infrastructure fund:** To address New Mexico's healthcare professional shortages and create long-term cost-savings through the use telemedicine, create a telehealth infrastructure fund to cover costs of equipment and training.
    a. Provide one-time funding for specific pilot locations.
    b. Provide modest recurring funds for maintenance.
    c. Although needs are critical in many regions of the state, consider priority support to southeastern New Mexico, where health professional shortages are particularly acute.

17. **Reimbursement rates:** Continue development of fair reimbursement rates for telemedicine services by both private and public payers.
    a. Support the implementation of Senate Bill 69 passed in the 2013 NM legislative session.
    b. Ensure alignment between state law and existing Medicaid regulations.

18. **Remaining up-to-date:** Keep healthcare professionals current on the latest developments in healthcare delivery and use of telemedicine.
    a. Use telehealth to deliver Continuing Education Credits and other professional development so healthcare professionals stay current on rapidly evolving healthcare research and treatment information.
    b. Decrease professional isolation and improve recruitment and retention of healthcare providers through collaboration on telehealth.
    c. Provide training to hospitals on how to integrate telehealth into their workflow and internal systems.
    d. Potentially assign these tasks to the NM Telehealth Alliance, if it is adequately funded.

19. **Health facility infrastructure:** Meet the essential technical and infrastructure needs of hospitals and other healthcare facilities.
    a. Provide qualified network professionals within healthcare facilities to ensure telehealth and other technologies are adequately supported and deployed.
    b. Quantify and apply broadband speed standards for healthcare facilities, and create a facilities standards requirements document to set benchmarks for facilities.
    c. Ensure disaster recovery and backbone redundancy through diverse physical paths so that connectivity never goes down.
    d. Inform broadband planning by speed testing all healthcare facilities using existing tool at:
       http://www.doit.state.nm.us/broadband/speedtest.shtml

Economic Development Recommendations

20. **Education and outreach**: Conduct a long-term broadband publicity effort emphasizing economic benefits, status, and actions required.
    a. Hold an annual economic development broadband summit updating business and political leaders on progress, needs, and plans.
    b. Make broadband issues an agenda topic at all economic, rural development, and business conferences.
    c. Assign a staff member at the NM Economic Development Department to work with NM Department of Information Technology on broadband issues in order to attract businesses to New Mexico.
    d. Provide market information on broadband availability to inform relocating/expanding businesses considering New Mexico. Tie in education and healthcare information. Model on similar websites in other states.
    e. Create a series of large, portable state and county map displays showing broadband coverage.

21. **Strategic planning**: Working with existing economic development groups, prepare a five-year plan of business-sector broadband needs, costs, and priorities with annual updates emphasizing physical and financial capabilities and gaps, including a cost benefit analysis.
    a. Incorporate into the NM Department of Information Technology planning process.
    b. Incorporate the universities' economic development planning into the state's broadband planning.
    c. Require a broadband analysis in all local economic development plans.

    d. Request an annual report by the NM Economic Development Department and the NM Economic Partnership analyzing the state's ability to meet the broadband needs of relocating/expanding businesses.

    e. Collaborate with industry cluster associations to identify and meet the broadband needs of their members.

    e. Inform broadband planning by speed testing all businesses using existing tool at: http://www.doit.state.nm.us/broadband/speedtest.shtml

22. **Partnerships**: For each local project, create a task force comprised of key organizations and agencies in long-term broadband support for economic development.

    a. Request the Governor designate broadband improvement as an administration priority.

    b. Educate legislative committee chairs on broadband importance, needs, and gaps.

    c. Create a coordinated task force between major employers, national labs, industry associations, and electrical cooperatives to identify broadband needs and requirements that enhance economic development.

    d. Task the Small Business Administration (SBA) and the Small Business Development Centers (SBDC) to educate their clients about how to best utilize broadband.

    e. Identify and support leaders of local broadband initiatives to assist in implementation through project completion.

    f. Leverage broadband initiatives to meet the needs of economic development, education, and healthcare, thus saving money and meeting a wider range of community needs.

Education Needs

Introduction

Today's students must develop complex problem-solving skills, preparing them for a rapidly changing global economy. In order to meet our schools' long-term technology needs, we must understand the applications used in the schools (today and in the future) as well as the infrastructure or "backbone" required.

Since the late 1980's, technology has been slowly becoming an integral part of our educational delivery system. Its slow movement was a result of a combination of high cost, low availability of educational programming, and lack of skilled technical support for schools. As time progressed, equipment prices have come down, the internet's ease of use, and the availability of information has skyrocketed. Through federally subsidized programs, almost every school has at least some access to this wealth of knowledge. Educational programming now addresses virtually every subject imaginable. Yet there has been no clear and consistent leadership in development of technology-based curriculum, standards, or access.

On October 2010, the State of New Mexico adopted a new set of educational standards called The Common Core State Standards Initiative. This initiative, created by the National Governors Association Center for Best Practices, Council of Chief State School Officers, was adopted by the U.S. Department of Education and 45 states to date. These new standards and the online assessment component are the driving factor in educational technology today, setting the direction for a new digital learning environment.

Since 2010 the state's school districts have been part of a four-year implementation plan to move the state solidly into the Common Core curriculum. However, due to a lack of resources, keeping up with the plan's requirements has been next to impossible. The technical specifications required by this curriculum and its assessment were released in 2011 and called for broadband connectivity that could only be met by approximately 20% of the districts at the time. Today it is estimated that approximately 60% can meet the technical network requirements, but there is still a major problem in end-user equipment.

> **Technology Applications in NM Schools**
>
> The following technologies are being used in classrooms across New Mexico, but without specific standards:
>
> - Educational software
> - Keyboarding
> - Testing
> - Teacher paperwork
> - Individualized Education Plans
> - Teaching materials and tests
> - Drawing and illustration programs
> - Smart Boards
> - Classroom websites
> - Video streaming
> - Presentations (PowerPoint, video, websites, digital projection, etc.)
> - Family resources (homework, teacher communication, grades, etc.)

This study looks more closely at just where the state's education community is and what gaps need to be filled, if we are to be successful in deploying the new Common Core Standards equitably throughout the state. A survey and interviews were conducted with educators, administrators, school board members and representatives of the NM Public Education Department to look realistically at the problems of technically meeting this challenge.

Next Steps

So, how can education systems change a historical pattern of not recognizing how technology can transform education, and in fact use technology to improve student learning? Traditional educational models may not be able to keep up with the demand for new

thinking skills and techno-savvy workers.[14] The broadband infrastructure, facility wiring, and computers in many schools are often out-of-date.[15] With the ubiquitous nature of the internet and new technologies – and their declining costs – educators might be tempted like 'kids in a candy store.' With so many online curricula and innovative hardware options, educators must choose wisely and remain current with changing skills.

To help address this issue, a new national technology plan has taken shape with several recommendations:[16]

- Classrooms must create much more personalized, engaging, and interesting learning environments.
- Educational systems must harness the power of technology to effectively use measurement and data, including better assessments.
- Increasingly, teachers must have high levels of technical skills to be successful.
- Broadband must be available universally, with all students having electronic devices at school.

Existing Technology Uses in Education

As expected, the survey indicated that practically all levels of school personnel use the internet to do their jobs. This breakdown includes district administration, principals, teachers, counselors, facilities management staff, and students.[17] Additionally, technology is deployed in numerous ways, as illustrated by the following table. Educational institutions are also illustrated on the NM Department of Information Technology online map: http://www.doit.state.nm.us/broadband/map_gallery/CASA_Education.pdf#toolbar=1.

Table 3: Educational Technology Usage by Context[18]

In what contexts does your school system use education technology?
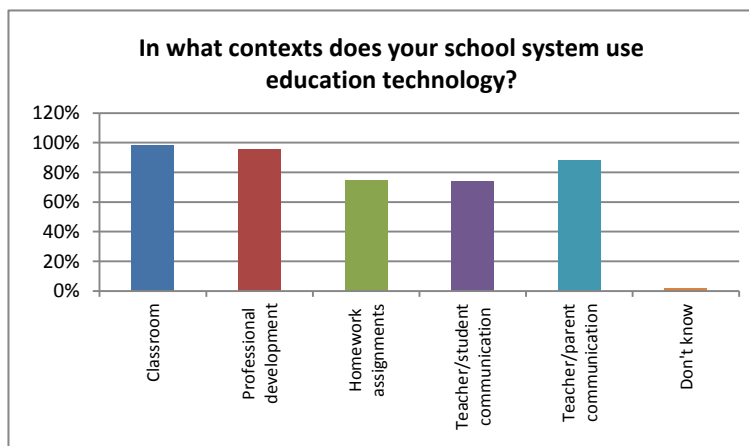
Classroom Teaching Uses

Almost all the K-12 survey respondents report that they use technology in the classroom. However, the type of technology is widely varied and largely inefficient.[19] In some cases, Smart Boards[20] are used as a teaching tool in conjunction with server-based educational software. In other cases, classrooms may have three or four computers for the whole class to share. While this practice can be said to promote collaboration, the limitations are evident. Most schools do have one or more computer labs with multiple workstations, but use and availability of these spaces varies by the facility.

The labs are effective for their intended purposes such as teaching computer skills, CAD, languages, testing etc.[21] However, they do not meet the concept of a blended learning curriculum. The decisions for technology selection and use vary by school district. These decisions are often driven by what individual teachers want versus a district-wide policy or appropriate evaluation.[22] This is not to

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[14] (U.S. Chamber of Commerce)
[15] (NM Broadband Interviews, 2013)
[16] (U.S. Office of Educational Technology, 2010)
[17] (NM Broadband Survey, 2013)
[18] (NM Broadband Survey, 2013)
[19] (NM Broadband Interviews, 2013)
[20] Smart Boards are interactive white boards, usually with touch screens. They are used in classrooms to present information dynamically, bringing together content from the internet, PowerPoint and other documents, while enabling teachers or students to draw, highlight, or insert language on the screen.
[21] (NM Broadband Interviews, 2013)
[22] (NM Broadband Interviews, 2013)

say that the educational software being selected and used is not effective. Most has some value to the students, but the lack of coordination within districts results in a lack of continuity between schools.

Homework

About 75% of the K-12 facilities answering the survey report the use of technology in homework assignments. This primarily takes the form of online research and the use of word processing software for reports. Rural districts have problems in this area due to the inconsistent availability of broadband service and frequent lack of availability of technology at home.

Professional Development

More and more professional development opportunities are available online. In the past, districts had to bring in programs for teachers. The online world allows for self-paced learning opportunities. Teachers and administrators reported in interviews that this trend is growing, especially among younger teachers.

Communication with Parents and Teachers

Schools in larger school districts provide for teacher – student and teacher – parent communication using specific online applications designed to protect the student and family. Where available, this has become a very popular tool with teachers and parents alike.

Potential Uses

Academic Standards and Testing

New Mexico is one of 45 states to adopt the new Common Core Standards, which measure the knowledge and skills young people need to compete in a global economy. With this curriculum comes a new online assessment program called the Partnership for Assessment of Readiness for College and Careers (PARCC). Educators hope that these online PARCC exams will bring excellent educational value, but they will create a new technology demand on school districts and their broadband networks. The testing goes into effect in the 2013-2014 school year.

National Trends and Opportunities

Learning versus teaching: Students can get facts/data they need online, enabling teachers to devote classroom time to concepts and skills.

Shift to digital textbooks and materials: The cost reduction potential in both the cost of the textbook and the logistics associated is prompting school to move to digital texts.

Online courses and distance learning: This will be especially attractive for rural school districts without the resources to offer a broad choice of classes.

Community computer labs: Rural districts can set up annexes in community facilities (like libraries) for students without technology at home.

Tablets and smartphones: The proliferation of such devices expands options for students, teachers, and parents. Many schools now have "Bring Your Own Devices" (BYOD) policies on appropriate use.

Shared Learning Collaborative: A cloud for each state to store data for every student, connecting student achievement data to relevant web resources.

Expanded assessments for career development: Along with the movement to PARCC assessments, more career targeted assessments (such as WorkKeys) will be in demand by employers and colleges for specific jobs.

Virtual field trips: Skype, online videos, and other tools can enable teachers to bring distant people and places into the classroom.

The technology requirements for the first year will be difficult to meet with acceleration after that. Around 10% of the schools report they are unable to receive an acceptable level of broadband service to make PARCC testing possible.[23] Several districts will have to transport students to other schools where connectivity is not an issue. Professional development will be a critical tool in preparing teachers and administrators regarding how this new curriculum should be taught, the role of technology, and testing.

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[23] Data on school technology is updated regularly at: http://ped.state.nm.us/ped/ITDivisionApps.html.

Today, while 60% of the schools and districts that answered the survey believe they are ready to implement Common Core Standards, only 50% say they are ready to implement PARCC testing.

Barriers

Of the 212 K-12 schools that answered the survey, all but two have internet at their facility. So it appears that basic broadband access is not the biggest barrier. The quality of that connection varies by location, however.

Financial and Personnel Barriers in Schools

As you might expect, there are a great many financial factors that affect the ability of schools districts to better deploy technology. Paying for adequate connectivity is a challenge for urban and rural districts, but rural schools face unique challenges. Broadband access is more expensive in rural New Mexico than urban areas. The federal E-Rate program covers these costs for some districts, but even those districts must pay 10% to 20%. Changes in E-Rate rules moved maintenance contracts into "Priority 2" classification. This means that in all likelihood they will not be funded, leaving the districts to cover that significant cost themselves or function without the coverage. *(See p. 21 for a description of E-Rate.)* In addition, since rural school districts tend to be the farthest behind in their connectivity, the cost to upgrade now to meet the requirements of PARCC testing has a higher impact.

There is a shortage of qualified technical support personnel for school districts. Again, the greatest need is in rural areas. Qualified networking professionals earn considerably less working in a school district instead of the private sector.[24]

Student Voices

According to the National Association of State Boards of Education: [25]

- Students increasingly use websites such as Facebook and YouTube to collaborate with each other on school projects (30% of students in grades 6-8, and 46% of students in grades 9-12).
- About a third (32-39%) of students would like their schools to provide tools for communicating with their classmates, organizing their schoolwork, communicating with their teachers, and collaborating with their classmates on school assignments.
- Many students also wish they had school-wide internet access, safe chat rooms to discuss course materials with classmates, and school portals with access to school and class information.
- Of students interested in online learning, 36% said reading digital text was better for their personal learning style. However, only 28% of all students surveyed felt the same way.

Technology and PARCC Roll-Out

Even if a school district has capable networking professionals on staff, many facilities own obsolete computers and equipment. The NM Public Education Department estimates that for the first year of PARCC testing, approximately 7,000 new computers will be needed in schools. For the second year, once Windows XP machines are no longer allowed, approximately 30,000 machines will be needed. In addition, many districts do not have network equipment sufficient to handle the higher bandwidths required by PARCC and the emerging digital learning environment. Though most of those districts' schools are eligible for E-Rate, the current funding cycle makes it difficult to apply for and receive the updated equipment needed in a timely manner. Networking equipment can be replaced only in multiple year cycles. In some cases, equipment purchased through E-Rate was technically underspecified and given this funding cycle limitation, results in delays in updating equipment needed for the constantly evolving network requirements.

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[24] (NM Broadband Interviews, 2013)
[25] (National Association of School Boards, 2012)

Based on interviews with school board members, many do not believe there is enough time to raise funding necessary to increase bandwidth, acquire the updated technology, as well as install and test systems in time for PARCC testing.

Table 4: Percentage of Those Who Believe Their District Is Ready to Implement Common Core State Standards

Do you believe your district is ready to implement Common Core State Standards?

- Don't know 20%
- No 21%
- Yes 59%
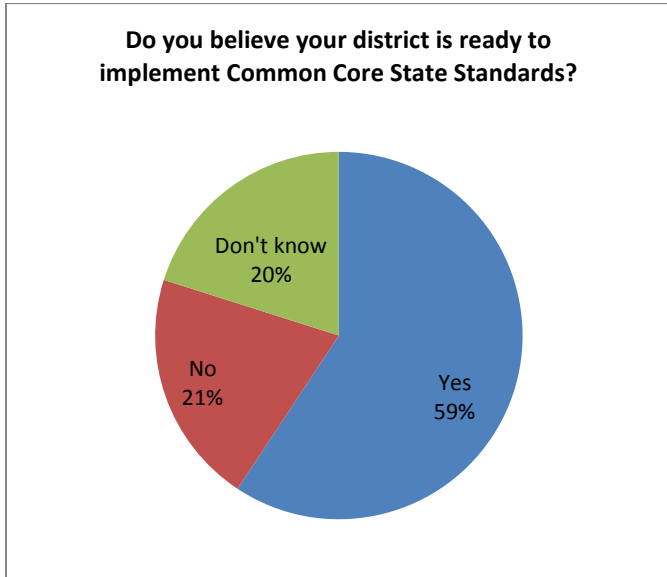
Table 5: Percentage of Those Who Believe Their District will be Ready to Implement Common Core assessments

Do you believe your district will be ready to implement PARCC)for 2014-2015 school year?

- Don't know 26%
- No 22%
- Yes 52%
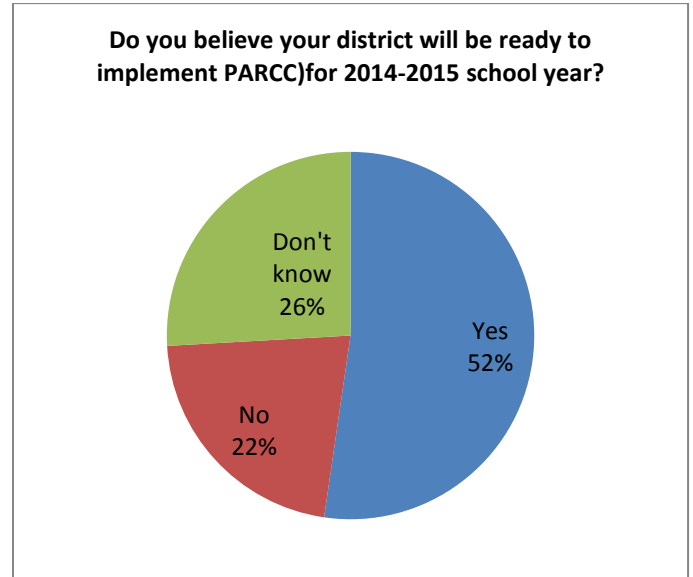
Table 6: Type of Broadband Used at District or School Facilities[26]

How is broadband service currently delivered to your district and school facilities?
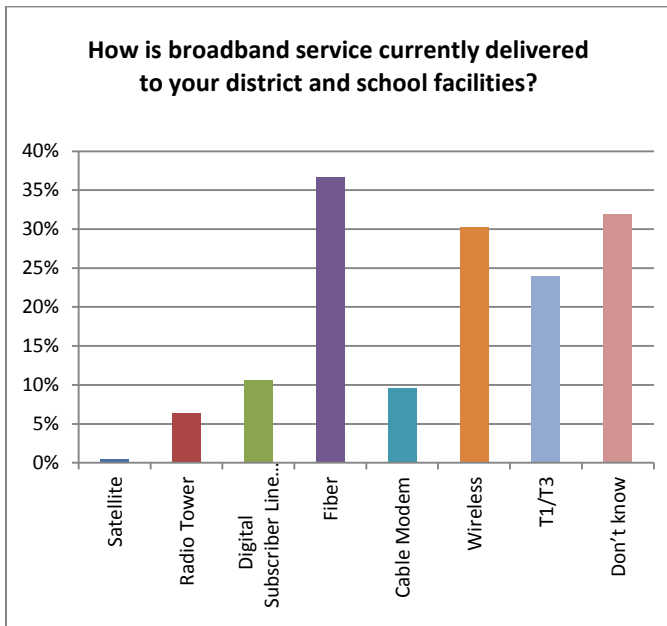
Table 7: Barriers to Effectively Using Technology[27]

What are the biggest barriers to effectively using technology in learning?

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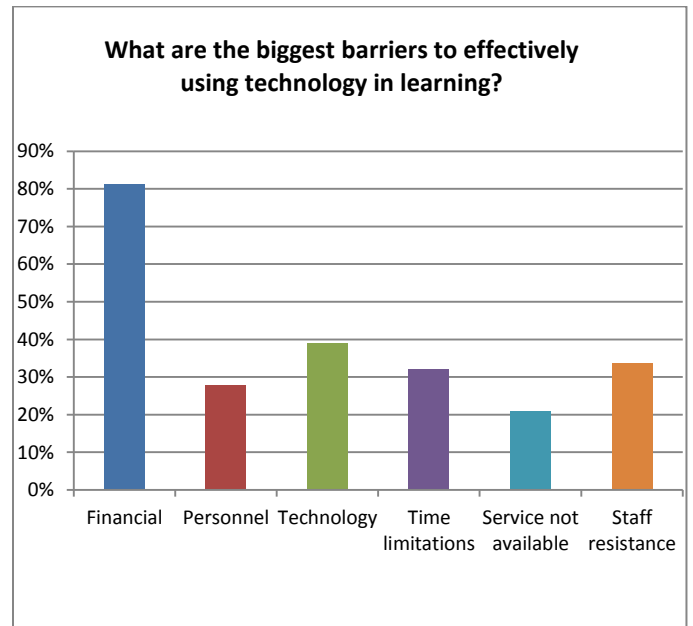
[26] (NM Broadband Survey, 2013)

[27] (NM Broadband Survey, 2013)

Gap Analysis

The survey and subsequent interviews revealed key gaps in broadband service and technology in New Mexico's school districts. With the exception of Albuquerque and Las Cruces, most school districts are operating with the amount of bandwidth they believe they can afford. Often, this amount is enough to handle current needs, but not sufficient to handle either the demands of PARCC or the emerging digital learning environment.[28] In locations where backbone connectivity is adequate, connectivity between schools within a district is full of holes. While bandwidth connectivity to the school district aggregation point may be adequate, the internal network linking school buildings can vary significantly.[29]

Projected Connectivity Needs in NM Schools [30]	
Connectivity target of Common Core Standards and PARCC testing (external network)	100 kb per student
Connectivity target of Common Core Standards and PARCC testing (internal network)	1 mb per student
Projected connectivity target by 2018 (external network)	1 mb per student
Projected connectivity target by 2018 (internal network)	10 mb per student
Statewide connectivity load (presuming 350,000 students and teachers)	100 kb per student/teacher, or 35 gb total
Complete digital learning environment[31] (external network)	1 mb per student
Complete digital learning environment (internal network)	10 mb per student

The unmet needs are primarily in rural schools. The needs remain unmet due to cost to provide service. Service providers are often unwilling to invest in these areas due to low population and take rates in such rural areas.

The most prevalent gaps throughout the state are:

- Adequate bandwidth, both to the backbone and between school district facilities[32]
- Wired and wireless delivery within school facilities, especially older buildings
- Inadequate technical support at the school district level and lack the experience to formulate a sound technology plan
- Lack of expertise to insure a maximum subsidy grant from E-Rate program

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[28] (NM Broadband Interviews, 2013)
[29] (NM Broadband Interviews, 2013)
[30] As of July 2013
[31] The "digital learning environment" in this context includes implementation of Common Core curriculum utilizing a blended learning environment of online and teacher based course material.
[32] NOTE: Backbone connectivity refers to the high speed connection between the internet and the school district aggregation point. From that point on the district supports its own network connecting its schools and other buildings. The speed of connectivity between buildings is often not consistent depending on location.

Hardware and Software

According to our interviews, schools have been making do with the equipment they have available. In the case of end-user equipment (computers, tablets, terminals, etc.), districts extended the life of these devices through operating system upgrades. While this practice has helped keep costs down, PARCC testing and more advanced digital learning applications will prove these systems inadequate. Cost savings can often be improved in the case of applications software. Districts often opt for expensive school server-based applications rather than less expensive "cloud-based" options that provide for management and maintenance of the software on remote servers as part of their service.

Education Conclusion

The slow pace of technology integration into the education sector has been a result of cost, availability of educational applications, and a lack of skilled technical support for schools. Now that equipment and internet access is more affordable than in the 1980s and 1990s, almost every school has at least some access to this wealth of knowledge. Educational software or applications address virtually every subject imaginable. Yet, there has been little clear and consistent leadership in development of technology based curriculum, standards, or access.

New Mexico's adoption of the Common Core State Standards is a step in the right direction. Its roll-out will require technical and financial support to fully realize the potential of this dramatic change in our use of online testing.

Across the board, schools need support to access technology and use it well. The implementation of Common Core Standards, new curricula, hands-on learning in the classroom, and other innovations requires more than just deployment of computer equipment and high-speed internet. It also requires leadership, authority, and finances. See the policy recommendations chapter for suggested reforms.

See the policy recommendations chapter for specific ideas for advancing the role of broadband in New Mexico's educational system.

E-Rate

E-Rate is the commonly used name for the Schools and Libraries Program, which is administered by the Universal Service Administrative Company (USAC) under the Federal Communications Commission. The program provides discounts to assist most U.S. schools and libraries to obtain telecommunications and internet. It is one of four programs funded through a Universal Service fee taxed to companies that provide interstate or international telecommunications services. Funding support depends on the level of poverty and the urban/rural status of the population served. Support ranges from 20% to 90% of the costs of eligible services.

Funding subsidies are classified in two categories: Priority 1 and Priority 2. Priority 1 services are always funded. Priority 2 are usually only given to high level poverty schools and depends on the available funding left in the annual budget after all Priority 1 funds have been committed.

Priority 1:
- Telecommunication Services
- Telephones
- Digital Transmission Services (T1, DSL, etc.)
- Internet access

Priority 2:
- Internal connections (wiring, switches, etc.)
- Basic maintenance of Internal Connections
- "Two and Five Rule" – These services can only be funded twice every five years

(Source: USAC)

Healthcare Needs

Introduction

There is a critical and urgent need for broadband that adequately supports healthcare services in New Mexico.[33] Our statewide shortage of healthcare providers, coupled with our large rural and tribal populations, makes it difficult to provide quality care to all New Mexicans.[34]

In addition, federal healthcare reform aims to provide every American with medical coverage, a policy change that will increase the demand for preventive and other health services. The change in the healthcare industry movement from "fee-for-service" payment structures to "pay-for-performance" reimbursement approaches is one reform that aims to:[35]

- Improve the individual patient experience
- Enhance community health with better outcomes
- Decrease cost

These efforts to keep people healthier, avoid high-dollar complications, and decrease the need for emergency services are logical but challenging steps during this period of healthcare system transformation. Key changes underway include:

- New Mexico Medicaid modernization via the Centennial Care program
- Anticipated increase in Medicaid beneficiaries by nearly 200,000
- Launch of Health Insurance Exchanges
- Projected increases in Medicare rolls as more "baby boomers" retire

Role of Technology

Advances in health information technology will help New Mexico meet these needs. Telehealth, electronic medical records, remote monitoring, and integration of mobile devices are tools to help provide the right care, at the right place, at the right time – even to those in remote, rural, and underserved communities. In addition, the general public and patients can be part of these changes using web-based services, patient portals, computers, and mobile devices that again increase the demand for broadband services across New Mexico.[36]

Existing Technology Uses

There are several active programs providing telehealth and health information exchange services in New Mexico. These include programs in both the public and private sector. A statewide study of New Mexico telehealth patients found that 79% believed their telehealth visit was "as good" as an in-person healthcare visit and that over a third (38%) would have had to travel over 40 miles if the telehealth service had not been available.[37] Leading entities include the New Mexico Telehealth Alliance, the UNM Center for Telehealth, the Southwest Telehealth Access Grid, and the NM Health Information Collaborative. (See APPENDIX C: Telehealth Organizations, p. 43, for more information.) There are also many health facilities using telehealth listed on the NM Department of Information Technology online map: http://www.doit.state.nm.us/broadband/map_gallery/CASA_Medical.pdf#toolbar=1

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[33] (Alverson, 2012), (Whitten P H. B., 2010), (Whitten P H. B., 2010)
[34] (Alverson DC S. S., 2004), (Kaufman, 2010), (Helitzer D, 2003), (Arora S, 2007)
[35] (Bashshur, 2009, pp. 1-11), (Alverson D. N., 2012, pp. 29-37), (Jackson GL, 2011, pp. 623–627)
[36] (Moya M, 2010, pp. 16:945-949), (Alverson DC H. B., 2008, pp. 957-963), (Simmons S, 2008, pp. 968-971)
[37] (UNM Department of Psychiatry Center, 2013)

Survey Respondents

These entities provide over-arching support for telehealth, but to really understand how technology is being used in healthcare delivery, one must turn to local providers. Over 75 large and small healthcare entities answered the survey, representing a wide range of facilities.

Table 8: Survey Participants by Healthcare Facility Type[38]

What kind of facility do you represent?

- School-based health clinics 5%
- Tribal 638 4%
- Indian Health Services 5%
- Hospital 24%
- VA/Community-based outreach clinic 4%
- Public health (DOH) 8%
- Medical group 11%
- Skilled nursing facility or long-term care 8%
- Independent practice 8%
- Clinic 18%
- Critical access hospital 5%
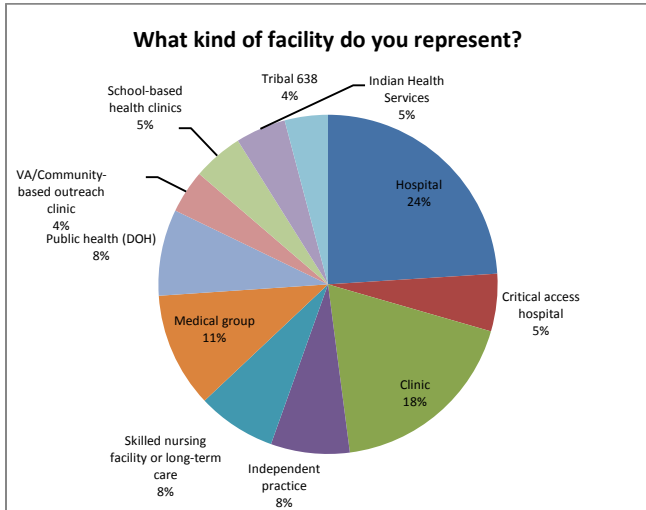
Table 10: Estimated Number of Patient Encounters per Facility per Year[40]

About how many patient encounters does your facility have per year?

- Fewer than 100
- 100-500
- 501-1,000
- 1,001-5,000
- 5001-10,000
- More than 10,000
- Don't know
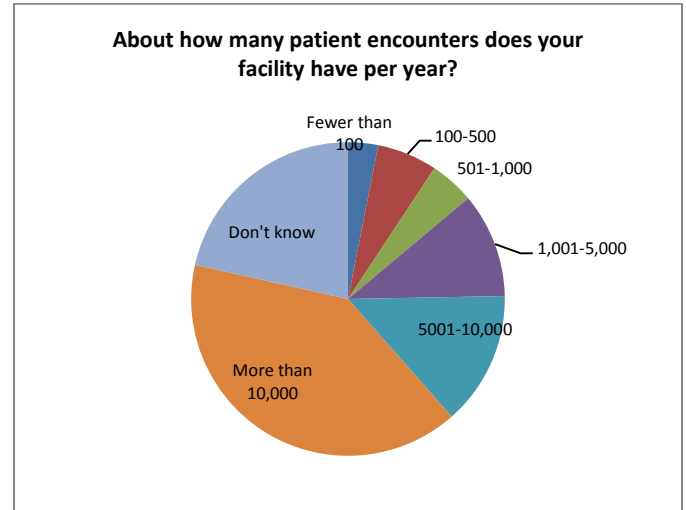
The survey also reflected large, mid-sized, and small provider groups. About a quarter of the healthcare survey respondents represented organizations with ten or fewer providers. Another quarter represented large organizations with 50 or more providers.

Table 9: Healthcare Delivery Providers Represented by Organization[39]

How many healthcare delivery providers do you represent?

- My organization does not represent… 12.9%
- Don't know 8.1%
- Greater than 100 21.0%
- 51-100 8.1%
- 26-50 11.3%
- 11-25 14.5%
- 1-10 24.2%
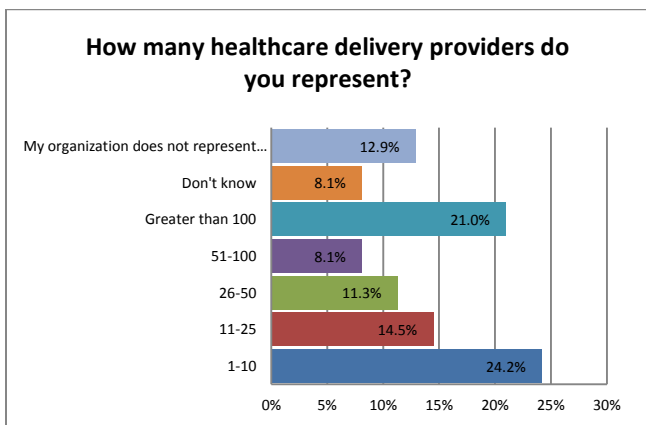
The healthcare entities that answered the survey offered a wide range of patient care, with the two most frequently listed services being lab and radiology.

Table 11: Facilities Housed at Location[41]

Which of the following facilities are housed at your location/organization?

- Delivery room
- Intensive care unit
- Lab
- Operating room
- Outpatient surgery
- Pediatrics
- Radiology
- Urgent care
- 24/7 emergency…
- None

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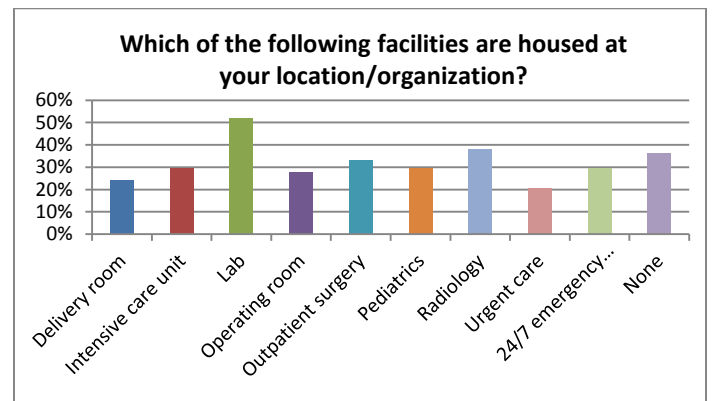
[38] (NM Broadband Survey, 2013)
[39] (NM Broadband Survey, 2013)

[40] (NM Broadband Survey, 2013)
[41] (NM Broadband Survey, 2013)

Telehealth Uses

Survey respondents were asked what services they provide and how. The table below on imaging services provides one example. Respondents also checked off a list of 64 specialist services they provide, or would like to provide.

Table 12: Imaging Services Provided Onsite and Telehealth[42]

What imaging services do you provide or want to provide?

	Cardiology imaging	CT imaging	Dental imaging	MRI	Radiology	Non-cardio ultrasound
■ Provide onsite	24	21	10	18	22	19
■ Send via telehealth	5	5	1	4	5	4
■ Receive via telehealth	4	3	0	3	3	3
■ Would like to send via telehealth	7	4	5	4	4	6
■ Would like to receive via telehealth	10	8	8	8	8	9

For every imaging and specialty service listed in the survey (a total of 70 services), at least one healthcare facility indicated it would like to send or receive that service via telehealth. For most services, at least seven facilities indicated interest. And for a handful of services, 10 or more facilities expressed interest in sending or receiving via telehealth. The highest valued services to receive included cardio imaging, dental imaging, patient education, and non-cardio ultrasound. Table 13 on p. 25 provides further details on the services most frequently provided or wanted via telehealth.

However, from the survey it appears that healthcare providers may be unaware of additional services that can absolutely save lives. For example, telehealth can provide support for people experiencing acute strokes and help their local providers better evaluate and potentially avoid brain da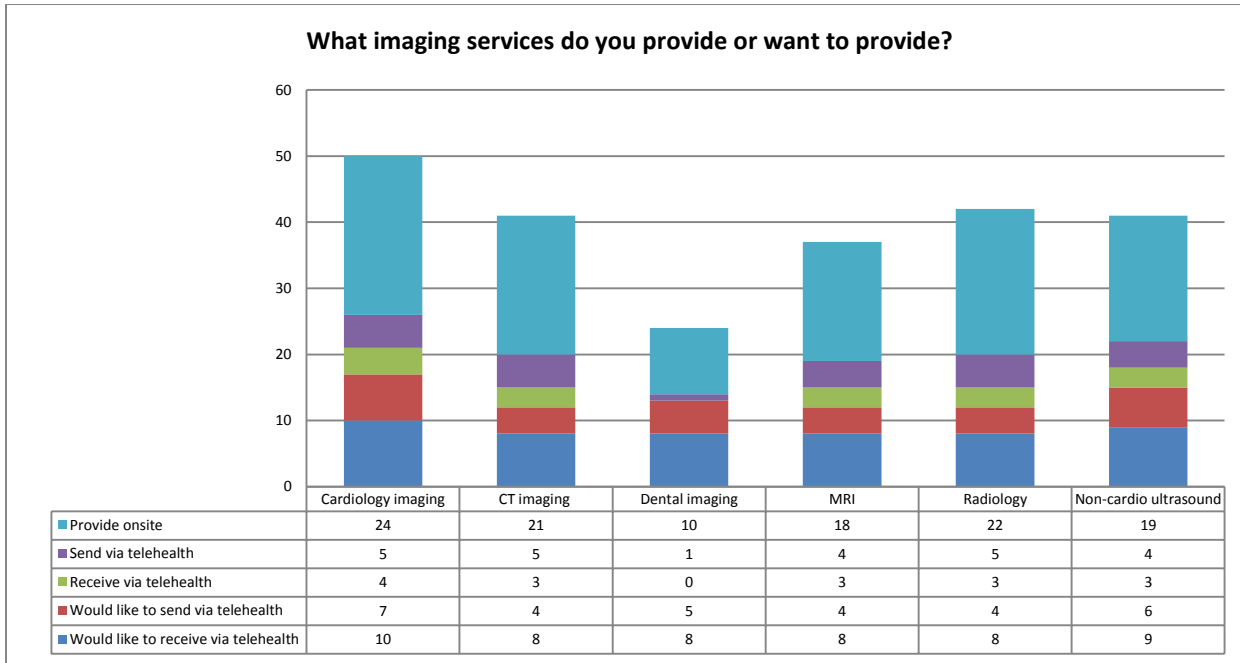mage in those patients. Such specialist consultation can deliver new treatments for head trauma and determine if the patient needs to be transferred to a higher level facility. The survey results also imply that healthcare providers may not even know about the availability of more common services. In several cases they indicated they wanted to send or receive telehealth services that are already provided or under development from the University of New Mexico Health Sciences Center. The center is also developing new services such as dermatology, neurological services, orthopedics, genetic counseling, cancer care, oral health, and many more. Other healthcare organizations are expanding telehealth networks for home care, substance abuse counseling, and additional behavioral health services. Promotion of a central directory of available telemedicine services would help those providers. All of these developing and emerging telehealth applications will require adequate, affordable broadband.

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[42] (NM Broadband Survey, 2013) Note: While 77 healthcare facilities answered the survey, respondents could skip questions to which they did not know the answer. The details of imaging and specialty services were not readily known by all respondents, so the number of answers are lower for these questions.

Table 13: Specialties Provided or Desired by Healthcare Entity Survey Respondents[43]

Healthcare Specialty or Service	# of facilities that provide onsite	# of entities that send or receive via telehealth	# of entities that would like to send or receive via telehealth
Allergy/Immunology	11	1	9
Alzheimer's/Dementia	9	2	7
Asthma/COPD	13	3	8
Behavioral/Mental Health	24	11	12
Brain Injury Support	9	6	7
Cardiology	15	1	9
Cardiology Imaging (i.e., cardio ultrasound, EKG)	24	9	17
Cognitive Impairment	11	5	4
CT scans	21	8	12
Dental Imaging	10	1	13
Dental/Oral Health	9	0	12
Dermatology	4	2	12
Diabetes	17	2	9
Ear, Nose, Throat	12	0	8
Education: Health Student	13	1	12
Education: Patient	25	1	16
Education: Provider	16	4	13
Gastroenterology	10	1	8
Home Visits	9	3	9
Infectious Diseases	11	0	8
MRI	18	7	12
Nephrology/Renal/Kidney	8	0	8
Neurological Services	7	2	7
Non-cardio ultrasound (i.e., fetal, abdominal)	19	7	15
Nurse Advice Line/Triage	8	1	10
Nutrition	17	0	8
Oncology	12	1	11
Pain Management	18	1	9
Pediatric Services, Specialty	5	0	9
Prevention/Wellness	16	1	9
Radiology	22	8	12
Rheumatology	5	1	10
Stroke	11	4	5
Substance Abuse	9	1	10
Vision Services/Ophthalmology	5	1	8

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[43] (NM Broadband Survey, 2013)

Health Information Technologies

The adoption and expansion of a health information exchange (HIE) consolidates a patient's health record derived from a variety of healthcare organizations and different electronic health records (EHRs). This structure enables providers to collaborate on patient diagnosis, share lab data, avoid medication conflicts, and make life-saving patient information available during emergencies. All healthcare organizations need to be connected into the HIE that is currently being managed by LCF Research as the New Mexico Health Information Collaborative (NMHIC).

Table 14: Percentage of Medical Record Usage[44]

Do you use electronic medical records?
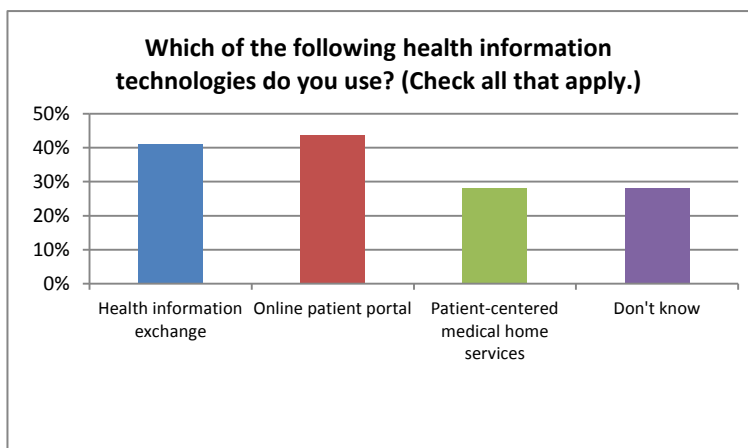
- Don't know 2%
- No 21%
- Yes 77%
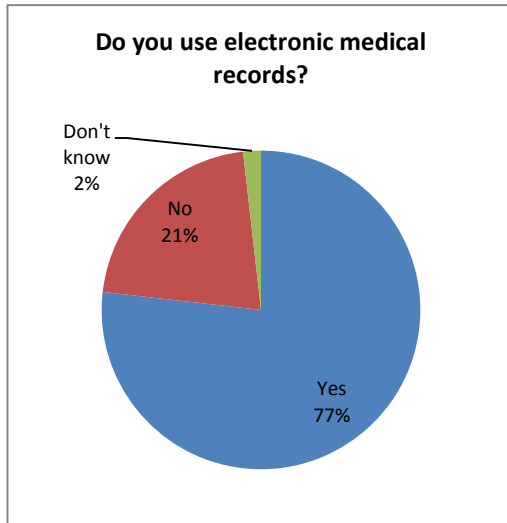
Leading national organizations have developed programs and financial incentives to encourage the adoption of electronic health and achieve "meaningful use with associated monetary incentives."[45] In New Mexico, this effort is championed by LCF Research, which has achieved projected milestones in EHR adoption among primary care providers and small practices.[46]

A similar effort involves health information exchanges that allows healthcare providers and their affiliated organizations to securely share a patient's health information and create a consolidated patient health record from a variety of healthcare organizations. LCF Research developed the statewide HIE. Patient data is generally accessed through a secure web portal and can be viewed with the patient's consent or in a life-threatening situation. Patients have the option to opt out of information sharing on the HIE.

Effective application of electronic medical records, including use of HIEs, will require adequate broadband connections to all healthcare provides to allow sharing of the health information quickly and securely. Eventually, failure to adopt electronic medical records by healthcare providers will result in monetary penalties.

Table 15: Health Information Technologies Usage

Which of the following health information technologies do you use? (Check all that apply.)

Categories: Health information exchange, Online patient portal, Patient-centered medical home services, Don't know

Emerging Services

There is no doubt that the use of technology in healthcare will continue to grow. This increase will be driven largely by the adoption of telehealth, health information exchanges, and established standards for using broadband to support these applications.[47] These standards and the integration of telehealth and HIE will require more updated hardware and software, better and faster broadband connectivity, and better professional development in hospitals, clinics, and

[44] (NM Broadband Survey, 2013)
[45] (Centers for Medicare and Medicaid Services, 2013)
[46] (LFC Research)
[47] (Federal Communication Commission, 2010)

private practices, including skilled nursing facilities. Additional emerging services include:

- *Use of mobile devices like tablets and smartphones*: The proliferation of such devices with the ability to receive services and information offers opportunities to expand access to healthcare services and avoid expensive patient travel.
- *Shared healthcare expertise and collaboration*: On the horizon is an internet-based "cloud" for each state to store data for every patient. This type of development will improve coordination of care. It will also make more efficient use of limited resources by decreasing the need for individual healthcare providers or their organization to obtain the hardware and systems needed to support telehealth and HIE. The use of centralized software as a service managed by service providers in the "cloud" can support several different healthcare provider systems.
- *Expanded healthcare workforce*: Telehealth can engage students in pursuing healthcare careers, extend courses and training, and encourage service in their rural communities. Furthermore, these expansions in telehealth can encourage development of careers in information technologies and network engineering.
- *Online learning for providers, continuing education units, students in rural settings, and patients*: Rural areas can set up annexes in community anchor healthcare facilities, community centers, schools, or libraries for healthcare providers, students, and patients that may lack the ability to afford the necessary technology at home. Integration of mobile devices such as smart phones and tablets may facilitate access, but still require adequate, affordable, broadband internet and cellular services.

Table 16: Percentage of Healthcare Survey Respondents Using Mobile Devices[48]

Does your organization use mobile devices for your healthcare services? (i.e., smart phones, tablets)
- Yes 41%
- No 52%
- Don't know 7%
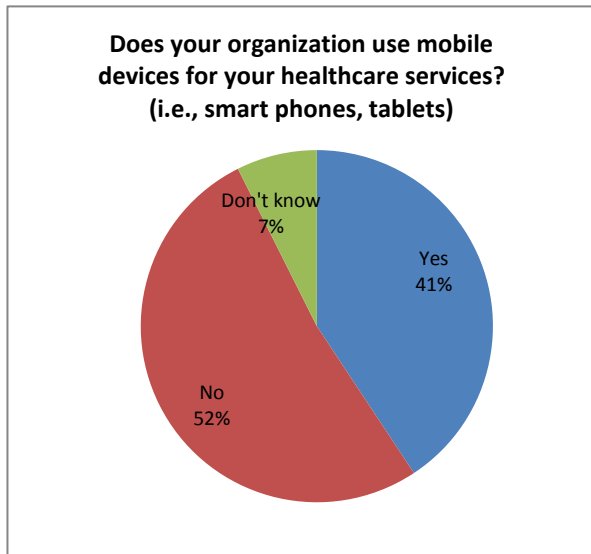
Table 17: Percentage of Healthcare Entities that Qualify for Internet Access Subsidy[49]

Do you qualify for any subsidy to help pay for your internet access?
- Yes 16%
- No 30%
- Don't know 54%

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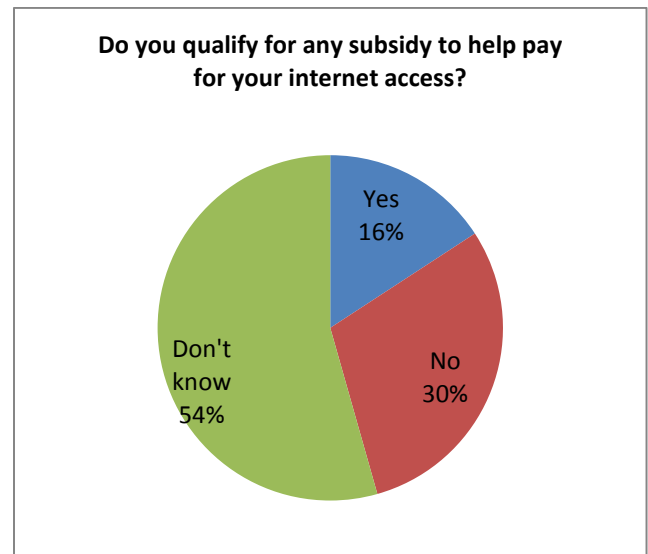
[48] (NM Broadband Survey, 2013)

[49] (NM Broadband Survey, 2013)

Barriers

Survey respondents to the healthcare portion of the NM Broadband Survey cited financial cost as the biggest barrier to using telehealth to its fullest extent. Government funding sources exist to help some healthcare facilities cover these costs, but most survey respondents were unaware of them. The Federal Communication Commission, the U.S. Department of Agriculture, and other sources provide internet subsidies. Some of these subsidies (Federal Communications Commission: Universal Service Rural Healthcare Program or the Healthcare Connect Fund) cover 65% of costs, but many healthcare providers have difficulty paying the 35% match.[50]

Reliable, high-speed broadband, coupled with modern wiring and equipment in facilities, are the most immediate barriers facing healthcare entities. These needs are very similar to those faced by educational institutions. Suggestions for addressing these barriers are presented in the policy recommendations chapter.

An additional barrier is resistance by healthcare providers to telehealth and other health technologies. This finding points to the possible need for increased education among healthcare providers about technology opportunities.

Table 18: Barriers to Providing Telehealth[51]
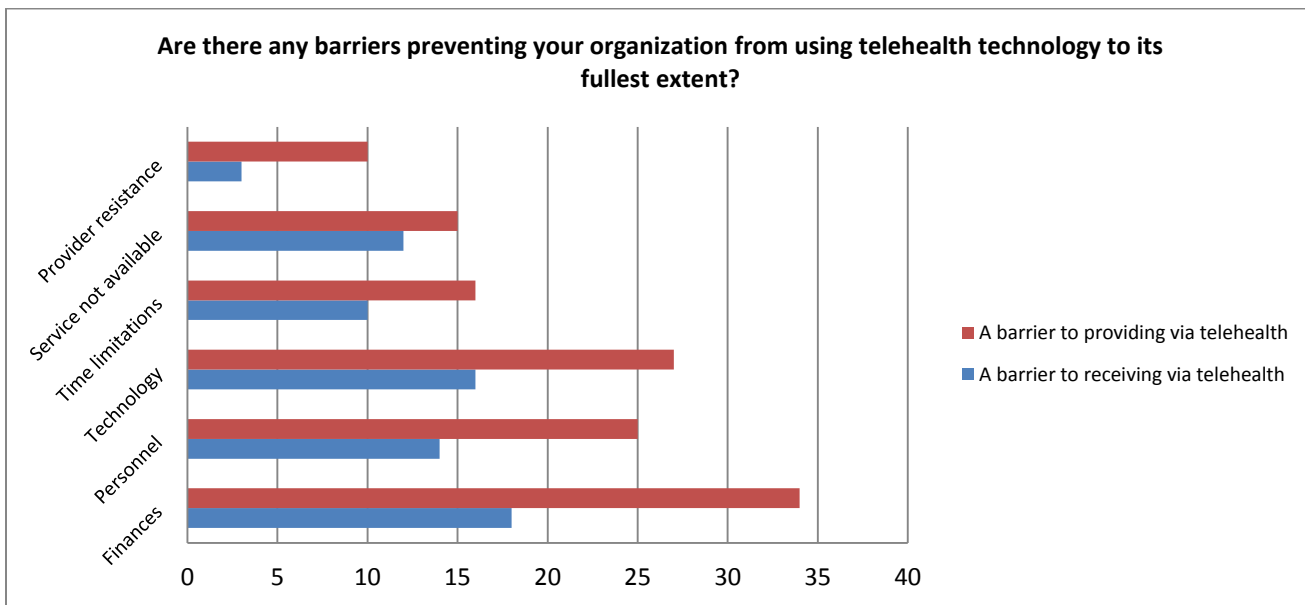
Reimbursement

One barrier that New Mexico is addressing is appropriate reimbursement for healthcare services provided via telemedicine. In 2013, Senate Bill 69 became law, requiring commercial healthcare to cover telehealth services. The bill also requires payment rates be consistent with rates paid for in-person consultation. As a result, New Mexico Medicaid is currently revising its regulations for using telemedicine for covered benefits to mirror SB 69. These changes should increase the use of telemedicine and thus the demand for adequate broadband in healthcare facilities. Close attention must be paid to the implementation and public education of the new law and regulations.

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[50] (Alverson, 2012), (Whitten P H. B., 2010), (Whitten P H. B., 2010)
[51] (NM Broadband Survey, 2013)

Healthcare Connect Fund

In December2012, the Federal Communication Commission created the Healthcare Connect Fund (HCCF) to expand access by health care providers to robust broadband networks. This fund reforms and modernizes the previous Rural Healthcare Program.[52]

Key Features

- Supports broadband connectivity and broadband networks for healthcare providers
- Encourages use of consortium to save costs and expand access to healthcare resources
- Provides 65% discount on broadband services, equipment, and connections to qualifying healthcare facilities
- Requires a 35% match
- Funding begins January 1, 2014

Eligibility

- Public or not-for-profit hospitals, rural health clinics, community health centers, health centers serving migrants, community mental health centers, local health departments or agencies, post-secondary educational institutions/teaching hospitals/medical schools, or a consortia of the above
- Non-rural healthcare providers may participate if they belong to a consortium that has a majority of rural healthcare providers
- The largest facilities (400 + patient beds) are eligible, but support is capped if non-rural

Healthcare Gap Analysis

Networking Technology

Telehealth requires quality broadband. Videoconferencing among doctors, uploading digitized x-rays, or sharing MRI results online all take far more bandwidth than simple emails or internet searches. Professionals anticipate increased healthcare digital traffic with more data, larger data files, and more use of multi-person online meetings. With those expanded uses, more capacity for broadband connectivity is anticipated. Furthermore, network redundancy is absolutely essential for institutions devoted to public health and emergency response.

With the exception of Albuquerque and some larger statewide healthcare provider organizations, such as Presbyterian Healthcare Services, most healthcare providers appear to be operating with a minimum of bandwidth needed for their hospitals or clinics.[53] Large healthcare data files that can include high resolution images, video conferencing, and increased health data traffic often require up to 100 megabits per second (Mbps) connections to both send and receive large data files. Even in locations where the internet backbone is adequate, local connectivity in the "last mile" between hospitals, clinics or private practices within a community have major gaps.[54] Healthcare providers are also in need of end user equipment capable of complying with telehealth or health information exchange requirements. It is estimated that there is a need for symmetric 100 Mbps just to meet current and planned telemedicine services.[55]

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[52] (Federal Communications Commission, 2013)
[53] (NM Broadband Interviews, 2013)
[54] (NM Broadband Interviews, 2013)
[55] (Federal Communication Commission, 2010)

Telehealth Coordination

Currently, federal, state, and private funds are spent on telehealth programs with little or no attention to coordination with other programs. Existing and proposed programs create a patchwork of telehealth solutions with overlaps and gaps. New Mexico needs an organization – perhaps the existing Telehealth Alliance – to provide the following telehealth-related services:[56]

- *Clinical Coordination:* Identifying healthcare delivery needs, finding organizations to deliver healthcare services, monitoring the delivery, and ensuring improved health outcomes.
- *Technical Coordination:* Identifying the proper technical solution for healthcare service delivery including equipment evaluation, telecommunications connectivity, reuse of existing resources, scheduling, network management, support, and maintenance.
- *Health Information Technology:* Managing information exchange among healthcare providers and ensuring compliance with federal, state, and other standards.
- *Administrative Services:* Reimbursement issues, administrative policy and procedures, legislative issues, and general management of the telehealth process.

Healthcare Conclusion

An affordable broadband network with appropriate quality of service, reliability, disaster recovery, redundancy, and security is critical for our state and its communities in accessing needed healthcare services that can be provided through telemedicine and health information exchange. In addition, our state's shortage of healthcare providers points to technology as a tool to both provide services from a distance and educate the next generation of medical professionals. These activities will require a common vision and collaborative team approach that includes healthcare professionals, public and private telecommunication providers, network engineers, and other companies developing appropriate end-point technologies and software. Adequate, affordable broadband is critical for providing the right care, at the right time, at the right location.

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[56] (NM Telehealth Alliance, 2013)
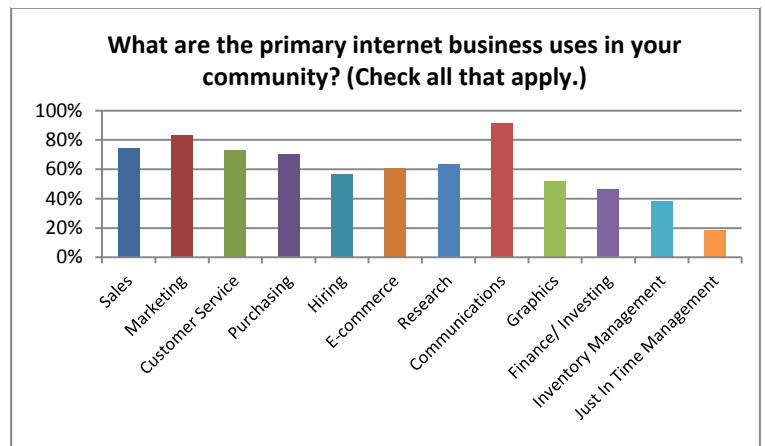
Economic Development Needs

Introduction

The importance of broadband for economic development cannot be overstated. Many experts consider access and acceptable speed the key to business expansion. Government and university research studies find a strong link between broadband and economic development job growth. A U.S. Small Business Administration survey found high speed internet to be as essential as water, sewer, and electric utilities.[57] A respected national site selection study found that relocating companies do not even consider regions without adequate broadband services.[58] One New Mexico local economic developer interviewed for this report said broadband is one of three required criterion of relocating companies (a second being adequate education, which also relies on broadband).

The NM Broadband Working Group validated that broadband is essential in promoting New Mexico's economic commerce, potentially creating jobs and new industries, and improving those businesses' access to local, regional, national, and international markets. To create that job growth, New Mexico needs a modern communications infrastructure, telecommuting options, and technology-based vocational education and training.[59] The NM Department of Information Technology further emphasizes the need to strengthen rural economics, support individual institution technology requirements, and resolve right of way and siting issues.[60]

Table 19: Internet Uses in Business Communities

Existing Economic Development Uses

New Mexico businesses use broadband in a wide range of customer-driven and business-to-business applications, according to survey responses.[61] Foremost among these is communications, followed closely by sales and marketing, and then customer service and purchasing. The table illustrates the varied uses, highlighting the importance of high-speed broadband for both routine and specialized needs.

Potential Economic Development Uses

New Mexico's state and local economic development organizations share two main goals: pursue out-of-state employers and help existing employers grow. In both efforts, economic developers prioritize targeted industries in which leaders believe our state offers a competitive advantage and/or a sizeable number of new jobs. In most cases, these targeted industries require either rural user access or extremely high speed and bandwidth. As a result, the need for adequate and geographically accessible broadband will become even more acute to support the state's future economic growth plans. The following table illustrates the industry targets for different economic development entities in our state.

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[57] (Columbia Telecommunications Corporation, 2012, p. 1)
[58] (Site Selection Magazine, 2011)
[59] (NM Department of Information Technology, 2013)
[60] (NM Department of Information Technology, 2013)
[61] (NM Broadband Survey, 2013)

Table 20: NM's Targeted Industries and Their Internet Needs

Industries	Who Targets It			Internet Investment Requirements
	Local Economic Developers[62]	NM Economic Dev. Department[63]	NM Legislature Job Council[64]	
Aerospace		☑	☑	High speed
Agriculture (Value Added)	☑	☑	☑	Rural infrastructure
Arts and Crafts			☑	Rural infrastructure
Cyber security-Private Engineering and Transactions			☑	High speed
Defense		☑	☑	High speed
Energy (Conventional & Renewable)	☑	☑	☑	Rural infrastructure
Federal Laboratory R&D			☑	High speed
Film and Digital Media	☑	☑	☑	High speed
Health and Social Services			☑	Rural infrastructure
Higher Education			☑	High speed
Manufacturing	☑	☑	☑	High speed
Mining	☑	☑	☑	Rural infrastructure
Professional Services	☑	☑	☑	Rural
Self-employed-Consulting			☑	Rural infrastructure
Technology (Existing and Emerging)	☑	☑	☑	High speed
Tourism	☑	☑	☑	Rural infrastructure
Warehousing, Distribution, Logistics, and Transportation	☑	☑	☑	Rural infrastructure

"Loan Eagles" and Telecommuters

Increasingly, economic developers look for ways to attract a substantial number of professional, independent contractors and consultants, often referred to as "Lone Eagles." These professionals typically work from home and increase the state's economic base by bringing out-of-state money into New Mexico. The state's climate, cost of living, scenery, and outdoor resources make it attractive to this group. Broadband access is absolutely essential to grow this sector.[65]

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[62] This column was created from economic development responses in the NM Broadband Survey, 2013. Industry targets of communities that did not answer the survey are not included.
[63] (NM Economic Development Department, 2013)
[64] (NM Legislature Jobs Council , 2013)
[65] (Lautman, 2011). The term "Loan Eagles" was initially coined by Philip Burgess, Center for the New West.

A related concept, telecommuting, has not been a major need in New Mexico compared to other more densely populated areas. However, the increasing costs of transportation and other factors can lead to consideration for offsite work. Adequate broadband with videoconferencing capabilities offers a way for more workers to work from home, reducing their commuting costs and time.

Future Unknowns

National economic development experts point out that many potential uses are not yet realized and will develop as technology improves and applications develop. They emphasize it is difficult to know potential needs until possibilities appear.

Barriers

There are a number of barriers to meeting the full broadband needs of New Mexico's current and future economy. Most of these barriers apply to education and healthcare needs as well.

Costs to Invest in Rural Areas

In order to provide wireless or fiber broadband, companies must make substantial investments in infrastructure, which may be difficult to recoup in rural areas. New Mexico has just over 121,500 square miles and a population of only 2.08 million.[66] The average population per square mile is only about 17 (and much lower outside the few urban areas). As a result, customer fees are often set high in rural areas to recover broadband investment costs. Businesses outside the metropolitan statistical areas are widely disbursed and generally small with more than 85% having less than 10 employees. These smaller companies are less able to pay high fees, further decreasing the revenue needed to support broadband access. Most smaller communities do not have a large enough tax base or financial reserve to help finance necessary infrastructure.

Provider Concerns

Provider service decisions are sometimes set company-wide at corporate headquarters, which means a lower return on investment in New Mexico compared to other states in the service area. This places the state at the back of the line in infrastructure. This is exacerbated by uncertainty of future user needs and technology changes. One major provider stated that needs double every 9-12 months. In some areas it is estimated there may be a single customer per mile of cable laid, on average. One service estimate for eastern New Mexico is $300 million for fiber to begin to serve a 25,000 sq. mile area.

Geographic

Physically rough and mountainous terrain over long distances makes it untenable to lay fiber everywhere, which leaves wireless as a possible alternative. However, a wireless system is considered slower and less reliable.

Community Support

Control and interpersonal issues sometimes prevent state, regional, and local organizations from working cooperatively together on a plan that would benefit all. This even applies in some cases to state operations. Some communities have not made economic development enough of a priority to justify pursuing broadband for business purposes.
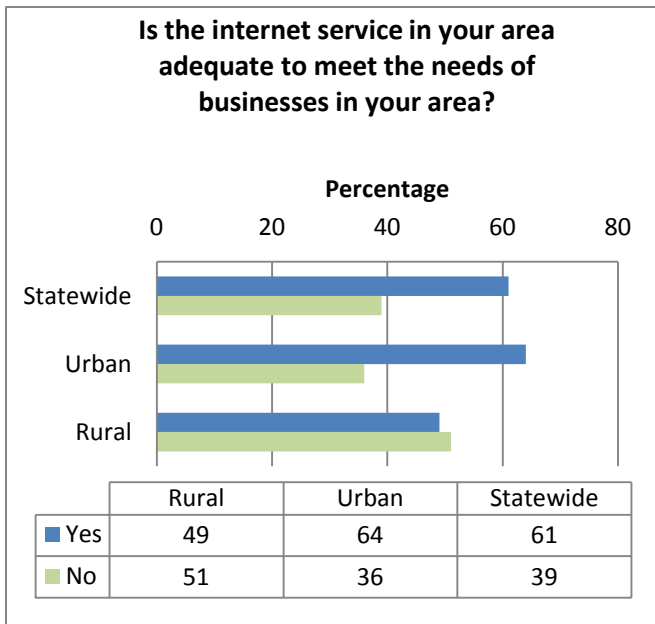
Expertise

Local organizations often lack the expertise or time to apply for complex and lengthy governmental grants. If a community does receive such a grant, managing it can be even more problematic. Many areas do not have a champion organization or individual who understands and tirelessly pursues the broadband needs for the community or region.

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[66] (U.S. Census Bureau, 2012)

There is limited understanding, much less evaluation, of the possible administrative and financial options including private, public and public-private partnerships.

Table 21: Percentage Who Say Business Internet is Adequate

Is the internet service in your area adequate to meet the needs of businesses in your area?

Percentage

	Rural	Urban	Statewide
■ Yes	49	64	61
■ No	51	36	39

Lost Business

Broadband service is affecting job growth. Over a fourth of the survey respondents reported they had missed out on a business relocation or expansion due to inadequate broadband. Another 40% were unsure, which implies that the missed opportunities rate could be much higher. One city official interviewed cited the loss of both a call center and a data center because of inadequate service. Another city lost a key employer to a different New Mexico town because it could provide similar broadband at a lower cost.[68]

Future Adequacy

When asked about future broadband needs, only 38% of the economic development organizations that took the survey believed broadband service in their area would be adequate in the near future.[69] Over a third said definitely not. For example, one community in southwestern New

Legal and Social

There are a number of regulatory, legal, or societal issues that can get in the way of broadband build-outs or improvements. For example, the federal definition of rural communities occasionally excludes those that would logically qualify (such as Espanola being federally designated as "non-rural"). Right of way issues, especially across tribal or federal lands, are often difficult to negotiate and result in lengthy delays or even refusals. The "not in my back yard" attitude delays installation of towers or cable conduits. Lastly, the New Mexico anti-donation clause prevents donation of public resources or monies to private companies unless a product or service of equal value is received.

Gap Analysis

Many (44%) of the economic development survey respondents reported that internet service in their area is inadequate to meet current business needs, with lack of infrastructure being the top-cited cause by far. Furthermore, there are significant connectivity differences even within urban counties. Respondents in Albuquerque, Farmington, Santa Fe, and Las Cruces emphasized that service was considerably slower in the large rural areas outside each of their central city hub.[67]

Table 22: Percentage of Economic Development Respondents Reporting Lost Business

Have you lost any business relocation or expansion opportunities due to technology/broadband limitations?

Yes 25%
Don't know 41%
No 34%

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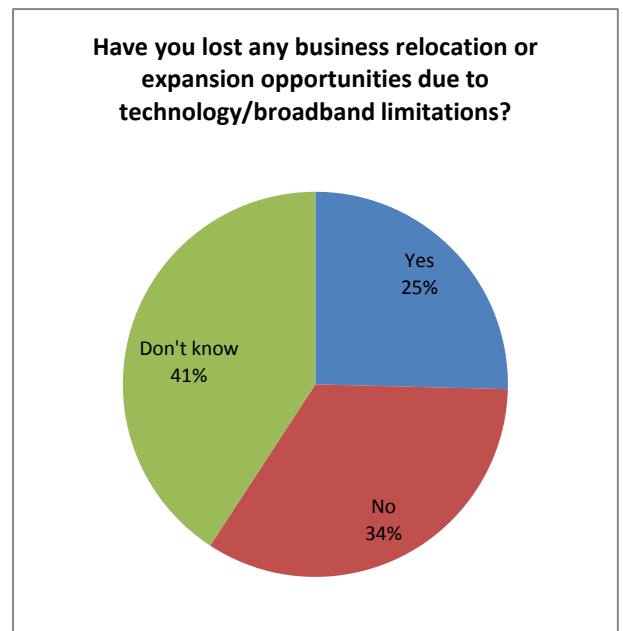
[67] (NM Broadband Survey, 2013)
[68] (NM Broadband Survey, 2013)
[69] (NM Broadband Survey, 2013)

Mexico reported that their current broadband is barely adequate, and there are no plans underway to improve it.

According to a national survey of urban and rural broadband users and providers, a speed of at least 100-120 Mbps is the minimum necessary to attract new business and help local companies grow.[70] One national survey reports that the optimum for business recruitment is 1 gigabit.[71] While this fast speed may be applicable to some New Mexico businesses, particularly in urban areas, the primary concern at the present should be the expansion of basic broadband to a much wider geographic area, with an absolute minimum of 4 Mbps download and 1 Mbps upload speeds.[72] These figures are the minimum criteria for the nation for typical users, and New Mexico does not meet that standard in many locations.

Table 23: Percentage of Economic Dev. Respondents Who Believe Internet will be Adequate in Near Future

Do you expect internet service in your area to be adequate in the next 1- 3 years to meet business needs?

Economic Development Conclusion

Broadband access is critical for economic development, enabling businesses to communicate, market, create, and perform a number of other essential functions. New Mexico lags behind other states in access to adequate broadband, which threatens the economic competitiveness of the state's businesses and overall well-being. While major New Mexico cities may meet the basic broadband needs of most businesses, many rural and semi-rural municipalities do not. With broadband now considered an essential business utility, some communities have already lost potential companies due to their limited access and others are being told they will be noncompetitive.

Major expansion plans for targeted industries where the state has a competitive advantage such as aerospace, logistics, back office support, information technology, value added agriculture, film and media, and independent professional consultants are threatened by the lack of high speed access. Barriers to expansion include high costs, lengthy geographic distances and difficult terrain, low population density, low individual and community incomes, lack of understanding, legal and social issues, and few strong advocates at the state and local levels.

Concrete solutions for moving forward are offered in policy recommendations chapter.

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[70] (Settles, 2013) Note: This business target speed is different from the FCC proposed speed cited elsewhere in this report.
[71] (Settles, 2013)
[72] (Federal Communications Commission, 2012)

Technical Analysis

General Information

2010 Census estimates show that New Mexico has the lowest technology adoption rate of all states, at 64%. According to a year-end 2011 Federal Communications Commission report, 66% of rural New Mexico gets broadband service at speeds of at least 3 Mbps downstream and 768 Kbps upstream.

Technology Access in NM Households	
Total NM Households	809,399
Total NM Broadband Adoption	58%
% of NM Households with Dialup Only	5%
% of NM Households with a Computer, but No Internet	9%
% of NM Households with No Computer	28.5%
Total Urban Households in NM	592,076
Urban Broadband Adoption Rate	61%
Total Rural Households	217,324
Rural Broadband Adoption Rate	48%

Source: NTIA, 2010

An aggregated total of over $4 billion is spent annually by New Mexico residents, businesses, and institutions for telecommunication services (phone, cable, mobile, satellite, and internet), with most of that amount leaving the state. If one percent of that total were reallocated annually for broadband infrastructure, access, and service upgrades, the 1st-Mile Institute estimates New Mexico could cost-effectively achieve the state's objectives of "broadband for all" within ten years.

Technical Gap Analysis

NOTE: Some of this content was presented in the education, healthcare, and economic development chapters. It is synthesized to provide an overall summary.

Inventory of Products and Services

There is a lack of affordable, reliable, universal service in many New Mexico rural communities. Phone and cable companies now compete to provide voice, video and data services, with copper wires and coaxial cable in the process of being replaced by fiber optics and wireless systems.

- Fiber optics: The primary medium for long-haul telecommunications, increasingly but slowly being deployed in the local loop, municipal networks and FTTP (fiber to the premises) networks.
- Cable: Provided by Cable TV providers, via coaxial cables and fiber networks, in urban and many rural communities, with cable franchise agreements.
- DSL: Digital Subscriber Line technology has replaced prior means (ISDN, dialup) of transmission over twisted-pair copper wires. DSL can transmit at low broadband rates, but will not be adequate for many near-future applications.
- Fixed and Mobile Wireless: Our broadband needs will require integrated wired (fiber) and wireless systems, the latter for near-ubiquitous signal coverage everywhere.   Fixed wireless (LTE, WiFi) is often the economically viable means for rural broadband access.

- Satellite: Available almost everywhere (except where terrain creates signal shadows), but with signal and cost issues.   The only rural broadband connectivity option in many places.

An interactive map of all services is available at: : http://nmbbmapping.org/mapping/

Pricing and Cost of Service

Prices vary significantly throughout the state. It is the least expensive in major urban areas where the large population can support a competitive environment. In rural areas, sparse population, low socio-economic residents and low adoption rates result in a lack of competition and high rates.

Even with subsidies available through the FCC E-Rate and Health Connect Programs, many school districts and healthcare facilities have difficulty qualifying for funding or – if they do – have trouble paying the required match. (See pages 18 and 29 for information of these programs.)

Underlying Capabilities

Where fiber is available, upload and download speeds are excellent to the initial termination sites. A breakdown occurs once distributed throughout some school districts. Most rural districts have an inadequate local network for the district. The second most common technology used is copper T-1 connections. This is very expensive but often is the only reliable option available. All of the delivery options have significant points of failure respective to reliable upload and download capabilities.

Service Limitations

Obviously the initial limitations deal with overall availability of broadband service in general. This is primarily in last mile and middle mile provisioning. This impacts not only the bandwidth to the district but connectivity between district facilities. 200 megabits to a school district can be diluted when trying to reach out to a school building that must rely solely on T-1s or Wireless. Even when service is available, schools, hospitals, and economic development sectors lack the technical ability to:

1. Design a sophisticated network adequate for their sector's or community's needs
2. Knowledgably apply for subsidies or grants
3. Provide the ongoing support and maintenance to keep the network running well

Service Adequacy

Fiber exists from Colorado to El Paso (commonly referred to as the "north-south backbone") offering a maximum capacity of 250 gigabits. However, rural reach is extremely varied. (See maps earlier this section for bandwidth availability by type and region.)

The number of unserved households in New Mexico varies widely, depending on source. However all agree that Catron, Hidalgo, and Mora Counties have been poorly served to date, along with most of the low-density populated southeastern and southwestern expanses of the state. In all rural counties, the farther from the county central business center, the more likely the residences are to be underserved.

Dig Once

A challenge to expanding broadband infrastructure in New Mexico is the cost of laying conduit. Other states and municipalities have adopted "dig once" ordinances to reduce costs. For example, if a county grants a permit to dig up a water line, it can lay conduit at the same time for broadband fiber or energy transmission. In New Mexico, some communities have legal barriers that prevent them from laying multiple types of pipe or conduit at the same time.

Dynamic Scaling

Each chapter in this report offers sector-specific targets for broadband speed. However, networking experts increasingly point to "dynamic bandwidth assignment," which enables users to adapt their speeds based on needs. For example, a typical school system might function well on a medium level of broadband, but it needs to triple its usage during its annual super-computing challenge. Infrastructure than can let institutions scale up or down is a key goal for future broadband.

Funding Opportunities

There are various ways communities can finance their broadband and other technology needs. The following table offers funding sources as well as resources for grant information. Practically all major projects require a combination of funding sources and public-private partnerships. See p. 13 for more information on partnerships. (Note: Opportunities are alphabetized by sector.)

Title	Description	Sector
CenturyLink and Innovate+Educate	Innovate+Educate and the CenturyLink Clarke M. Williams Foundation launched a "Teachers and Technology" competitive grant program for teachers who demonstrate an innovative use of technology with students. **Deadline: January 10, 2014.** Apply online: www.innovate-educate.org/centurylinkgrant.	
Community Connect (Community –Oriented Connectivity Broadband Grant Program)	The Community Connect program serves rural communities where broadband service is least likely to be available, but where it can make a tremendous difference in the quality of life for citizens. Funds may be used to build broadband infrastructure and establish a community center which offers free public access to broadband for two years. Eligibility – Grants are available to a single community with a population less than 20,000 which does not have broadband transmission service. http://www.rurdev.usda.gov/utp_commconnect.html	Cross-cutting
Community Development Block Grant	The Community Development Block Grant is a flexible program that provides communities with resources to address a wide range of unique community development needs. It can be used for infrastructure if 50% of local residents are below 80% of poverty. http://portal.hud.gov/hudportal/HUD?src=/states/new_mexico/community/cdbg	
Community Facility Grants	Community Facility Grants assist rural areas and towns of up to 20,000 in population to develop essential facilities. Grants are authorized on a graduated scale. Grants are available to public entities such as municipalities, counties, and special-purpose districts, as well as non-profit corporations and tribal governments. In addition, applicants must have the legal authority necessary for construction, operation, and maintenance of the proposed facility and be unable to obtain needed funds from commercial sources at reasonable rates and terms. http://www.rurdev.usda.gov/HAD-CF_Grants.html	Cross-cutting
Connect America Fund	The Federal Communications Commission has reformed its Universal Service Fund (USF) and Intercarrier Compensation (ICC) systems to accelerate broadband build-out to those living in rural areas and have no access to a robust broadband infrastructure. http://www.fcc.gov/encyclopedia/connecting-america	Cross-cutting
Connect to Compete	Connect to Compete is a national private and nonprofit sector partnership created to increase broadband adoption and digital literacy training in disadvantaged communities. The initiative is designed to help residents improve outcomes in education, health, and employment through broadband opportunities and technology solutions. www.connect2compete.org	Cross-cutting
Farm Bill Broadband Program	This program is designed to provide loans for the costs of construction, improvement, and acquisition of facilities and equipment to provide broadband service to eligible rural communities. Loans are provided when no less than 25% of the households in the proposed service territory is offered broadband service by no more than one incumbent service provider, and broadband service is not provided in any part of the service territory by three or more incumbent service providers. http://www.rurdev.usda.gov/utp_farmbill.html	Cross-cutting
Fundsnet Online Services	Fundsnet Online Services is a resource to research information about grants, fundraising, philanthropy, foundations, and 501(c)(3) non-profits organizations. http://www.fundsnetservices.com/	Cross-cutting

Title	Description	Sector
Grants.gov	The Grants.gov program is managed by the U.S. Department of Health and Human Services. The system houses information on over 1,000 grant programs and vets grant applications for 26 federal grant-making agencies. www.grants.gov	Cross-cutting
Legislative Appropriation	Appropriation requests are initiated through the U.S. House of Representatives, U.S. Senate, and New Mexico Legislature.	Cross-cutting
National Telecommunications & Information Administration (NTIA)	NTIA manages two broadband grant programs funded by the American Recovery and Reinvestment Act: the Broadband Technology Opportunities Program (BTOP) and the State Broadband Initiative (SBI). These programs support the deployment of broadband infrastructure, enhance and expand public computer centers, encourage sustainable adoption of broadband service, and promote statewide broadband planning and data collection activities. http://www.ntia.doc.gov/category/grants	Cross-cutting
Private Foundations	Foundations such as the Gates Foundation, the MacArthur Foundation, and many others have made broadband expansion to rural areas a priority. Regional foundations generally invest in the practical needs of their immediate areas. The focus of foundations varies, but many have an emphasis on technology. A comprehensive database is maintained by the Foundation Center, at: http://foundationcenter.org/	Cross-cutting
Telecommunications Infrastructure Loan Program	This program makes long-term, direct, guaranteed loans to qualified organizations for financing the improvement, expansion, construction, acquisition, and operation of telephone lines, facilities, or systems to furnish and improve telecommunications service in rural areas. Eligibility – Loans are available to entities providing telephone service in rural areas. Traditionally these have been telecommunications companies and cooperatives. www.rurdev.usda.gov/utp_infrastructure.html or www.rurdev.usda.gov/RUStelecomprograms.html	Cross-cutting
Society of Research Administrators	The society maintains a website for researching funds available from local, state, federal, and international governments. www.srainternational.org	Cross-cutting
Council for the Advancement and Support of Education (CASE)	CASE is a professional association serving educational institutions and advancement professionals who work on their behalf in alumni relations, communications, development, marketing and allied areas. CASE helps its members build stronger relationships with their alumni and donors, raise funds for campus projects, produce recruitment materials, market their institutions to prospective students, diversify the profession, and foster public support of education. http://www.case.org/About_CASE.html	Education
eSchoolNews.com	This resource is a source for K-12 and higher education grants. http://www.eschoolnews.com/	Education
E-Rate	The E-Rate program makes telecommunications and information services more affordable for schools and libraries. The Federal Communications Commission uses the federal Universal Service Fund (USF) to provide discounted telecommunications, internet access, and internal connections to eligible schools and libraries. www.fcc.gov/guides/universal-service-program-schools-and-libraries	Education
U. S. Department of Education Discretionary Grant Programs	This resource lists programs and competitions under which the U. S. Department of Education has invited or expects to invite applications for new awards and provides actual or estimated deadline dates for the transmittal of applications under these programs. http://www.ed.gov/grantapps	Education
Distance Learning & Telemedicine (DTL)	DTL is designed to meet the educational and healthcare needs of rural residents through loans, grants, and loan/grant combinations for advanced telecommunications technologies. Eligibility – Loans and grants are available to entities providing education and medical care	Healthcare

Title	Description	Sector
	via telecommunications including corporations or partnerships, Indian tribes or tribal organizations, state or local units of government, consortia, and private for-profit or not-for profit corporations. . http://www.rurdev.usda.gov/UTP_DLT.html	
First Responder Network Authority (FirstNet)	FirstNet is an independent authority within the U. S. Department of Commerce's National Telecommunications and Information Administration (NTIA). FirstNet seeks to build, deploy, and operate the network in consultation with federal, state, tribal, and local public policy entities. Funding is available from the State and Local Implementation Grant Program administered by NTIA to support state, regional, tribal, and local jurisdictions' efforts to plan and work with FirstNet to ensure the network meets their wireless public safety communications needs. http://www.ntia.doc.gov/category/firstnet	Economic Development
Rural Business Enterprise Grants	Rural Business Enterprise Grants (RBEG) provides funds to finance and facilitate development of small and emerging businesses. Eligibility – Applicants include public bodies (cities, towns, counties, states, authorities, etc.), nonprofit corporations, and federally-recognized Indian tribal groups in rural areas. Applications are accepted year round. There is no maximum level of grant funding. However, smaller projects are given higher priority. Generally grants range $10,000 up to $500,000. http://www.rurdev.usda.gov/BCP_rbeg.html	Economic Development
Rural Community Development Initiative	This initiative provides technical assistance and training funds to qualified intermediary organizations to develop their capacity to undertake housing, community facilities, and community and economic development projects in rural areas. http://www.rurdev.usda.gov/HAD-RCDI_Grants.html	Economic Development
State Loans	State loans and guarantees are available for infrastructure development.	Economic Development
Subscription Subsidies	Government subscription subsidies, tied to employer employment expansion, are available in some cases, but must be researched independently.	Economic Development
Surtax	Surtaxes on subscriber services are set aside for infrastructure development.	Economic Development
Tribal Infrastructure Fund	The Indian Affairs Department operates the Tribal Infrastructure Fund. It awards grants to qualified projects submitted by a federally recognized Indian nation, tribe, or pueblo located wholly or partially in New Mexico or any of its governmental subdivisions. Each Indian nation, tribe or pueblo is limited to applying for one "planning" project, one "design" project, and one "construction" project (up to three applications) in a funding cycle. http://www.iad.state.nm.us/	
Value Added Producer Grants	The primary objective of the Value Added Producer Grants (VAPG) program is to help agricultural producers enter into value-added activities related to the processing and/or marketing of bio-based value-added products. Grant funds may be used for economic planning activities or for eligible working capital expenses. http://www.rurdev.usda.gov/BCP_VAPG.html	Economic Development

Appendices

APPENDIX A: Definitions

The following terms are used throughout this report. Definitions are compiled from multiple sources.[73]

Backbone: An internet backbone refers to one of the principal data routes between large, strategically interconnected, networks and core routers on the internet. A backbone is a very high-speed data transmission line that provides networking facilities to relatively small but high-speed Internet Service Providers (ISPs).

Bandwidth: In digital systems, the bandwidth of the system is the speed at which data is transmitted over the system measured in bits per second (bps).

CLEC: A Competitive Local Exchange Carrier (CLEC) is a company (i.e., AT&T) that competes with the already established local telephone business (i.e., Pacific Bell) by providing its own network and switching or by reselling the local telephone company's phone service. The term distinguishes new or potential competitors from established local exchange carriers (LECs) and arises from the Telecommunications Act of 1996 which was intended to promote competition among both long-distance and local phone service providers.

DSL: Digital subscriber line is a family of technologies that provide internet access by transmitting digital data over the wires of a local telephone network.

End-user: The individual who will ultimately be using an information technology (IT) product or service. Understanding and evaluating end-users is particularly important for hardware and software vendors, as well as other IT solutions/services firms when it comes to designing and shaping their products/services to fit users' needs. An end-user is generally assumed to have limited capabilities, thus distinguishing them from pro-users or power-users.

ILEC: An Incumbent Local Exchange Carrier such as Pacific Bell or GTE is a telephone company in the U.S. that was providing local telephone service when the Telecommunications Act of 1996 was enacted.

Kbps: Kbps stands for kilobits per second (thousands of bits per second) and is a measure of the speed data travels on a data transmission medium such as twisted-pair copper lines, coaxial cable, or optical fiber.

Last Mile: Describes the final leg of a connection between a service provider and the customer. In DSL and cable systems, this is the most frequent bottleneck and the most expensive to resolve. The service provider may run a faster fiber network into the neighborhood but deliver the "last mile" (which could be considerably less than a mile) with phone lines that cannot sustain fast speeds.

Mbps: Mbps stands for megabits per second (millions of bits per second) and is a measure of bandwidth (the amount of data that can flow in a given time) on a data transmission medium such as twisted-pair copper line, coaxial cable, or optical fiber.

Middle Mile: The network connection between the "last mile" and greater internet. For instance, in a rural area the middle mile would likely connect the town's network to a larger metropolitan area where it interconnects with major carriers. Examples of middle mile carriers in New Mexico include Plateau Telecommunications and RediNet.

Tier 1 Carrier: A tier-1 carrier is an Internet Service Provider (ISP) that can serve its coverage area entirely through settlement-free collaboration with other carriers, rather than having to pay tolls to other companies for using parts of a third party's internet provider network. Tier-1 carriers tend to have large coverage areas, footprints/infrastructure, and financial resources. Examples include AT&T, Verizon, and Century Link.

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[73] (Technopedia), (Netaction), (Community Broadband Networks)

APPENDIX B: Working Group Membership and Meetings

The 2013 New Mexico Broadband Working Group provided essential advice and guidance for this report.

Members

- Dale Alverson, NM Telehealth Alliance
- John Badal, Sacred Wind Communications
- Michael Belgarde, Navajo Area Indian Health Service
- Terry Boulanger, NM Technet
- Terry Brunner, US Department of Agriculture
- Tom Bush, NM Public School Facilities Authority
- Gar Clarke, NM Department of Information Technology
- Jason Collet, Western New Mexico University
- Casey Crotty, San Juan Independent Practice Association
- Gil Gonzales, University of New Mexico
- Joe Guillen, NM School Board Association
- Spencer Hamons, Taos Health Systems
- Gene Hendrick, NM Rural Alliance
- Myron Johnson, Navajo Area Indian Health Service
- Norman Kia, Clovis Community College
- Lester Lee, Navajo Tribal Utility Authority
- Charles Lehman, Employment & Econ. Info. Center of NM
- Robert Longstreet, NM Primary Care Association
- Richard Lowenberg, 1st-Mile Institute
- Daniel Lucario, Acoma Pueblo
- Priscilla Lucero, Southwest NM Council of Government

- Bernadette McGuire-Rivera, NTIA (retired)
- Rose Poston, New Mexico PBS-Sandia Pueblo
- David Pruitt, IBM-Laguna Pueblo
- Gloria Rendón, NM Coalition of School Administrators
- Eric Renz-Whitmore, New Mexico Technology Council
- Evelyn Rising, Southeast Region HERO
- Ferdi Serim, NM Public Education Department
- Duncan Sill, North Central NM Economic Development Department
- Betsy Stringam, NM State University
- Grant Taylor, Hobbs Chamber of Commerce
- Juan Torres, NM Economic Development Department
- James Tutt, Nizhoni Smiles, Inc.
- Buddy Vaughan, Plateau Telecommunications
- Evan Williams, Northwest NM Council of Government

Staffing-New Mexico First

- Heather Balas
- Charlotte Pollard
- Melanie Sanchez Eastwood

Working Group Meetings

Working group members attended a series of meetings where they reviewed plans, data, and analysis and provided input and direction for the technical team. The following table summarizes the topics addressed by the group and the type of input provided.

Meeting	Date	Topic	Input
1	3/27/13	Group Orientation & Data Collection Plan	- Identified the most important things to consider or be included when developing the sector strategic plans - Reviewed a statement summarizing the key points of the summit recommendations and developed a statement that would guide their work in advising the strategic planning process - Reviewed the data collection plan and provided feedback - Reviewed the first draft of the survey and offered suggestions for improvement - Reviewed and expanded the survey stakeholder list
2	6/28/13	Survey Data Findings	- Reviewed the survey and interview data findings and discussed agreements, differences, concerns, surprises, and preliminary conclusions - Offered suggestions for additional outreach to increase broader participation from tribes, healthcare providers, and economic development groups and to increase regional representation throughout the state
3	8/29/13	Strategic Plan Conclusions & Recommendations	- Reviewed the draft report and offered suggestions for improvement - Drafted additional recommendations

APPENDIX C: Telehealth Organizations

There are several New Mexico organizations and programs actively involved in telehealth, including some key leaders listed in the following table.

Program/Organization	Description
New Mexico Health Information Collaborative[74]	This collaborative houses New Mexico's health information exchange (HIE) network and the community collaborative that has supported its development with time and funding. The HIE pulls together an electronic, patient medical record in real-time for the provider and the patient to view. A provider can view the patient record, including the most current medical history, recent labs, and test results from participating healthcare facilities where the patient has received care. For participating healthcare facilities, the health information is exchanged electronically, privately, and securely with the patient's consent.
New Mexico Telehealth Alliance[75]	The alliance is a nonprofit organization with an active board that is broadly representative of several public and private volunteer stakeholders with an interest in telehealth in New Mexico. The alliance provides a platform for communication, coordination, and potential collaboration regarding telehealth activities, as well as addressing a spectrum of issues that impact telehealth in our state.
Other Telehealth and HIE Programs	There are several other active telehealth programs in New Mexico, both for-profit and not-for-profit. Healthcare organizations such as Presbyterian Healthcare Services are using telemedicine for home healthcare and adult intensive care. The Veterans Administration and NM Department of Health provide healthcare services using telehealth, as well as systems to share the health information exchange. Private companies such as New Mexico Software are providing tele-radiology services and acute tele-stroke care.
The Southwest Telehealth Access Grid[76]	This project is building telehealth network infrastructure (i.e., construction, hardware, and operation costs) for rural New Mexico and parts of the Navajo Nation. The UNM Center for Telehealth leads a collaboration of healthcare organizations including the Primary Care Association, San Juan Regional Medical Center, and Mental Health Services in Carlsbad, Albuquerque Area Indian Health Services, Navajo Nation-Ft. Defiance and Winslow service units, Presbyterian Health Systems, UNM Hospital, and UNM Health Sciences Center. Future participants in this developing network include the LCF Research Health Information Collaborative (NMHIC) and the Arizona Telemedicine Program.
University of New Mexico Center for Telehealth (CfTH)[77]	The center improves access to healthcare services provided through the UNM Heath Sciences Center. It offers over 20 active telehealth programs using a variety of telehealth platforms. One of those telehealth programs is Project ECHO[78] which has become a nationally and internationally recognized model for providing healthcare support for managing complex, chronic diseases through education, case review, and team-based consultative services.

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[74] (New Mexico Health Information Collaborative, 2013)
[75] (NM Telehealth Alliance, 2013)
[76] (UNM Southwest Telehealth Access Grid, 2013)
[77] (UNM Center for Telehealth and Cybermedicine Reserch, 2013)
[78] (UNM Project ECHO, 2013)

APPENDIX D: NM Broadband Access and Deployment Rates

Table 24: Percentage of New Mexicans with Access to Broadband by County and Type (2011)[79]

NM County	Fiber	Cable	DSL	Fixed WL
Bernalillo	1	92	86	0
Catron	0	0	51	0
Chavez	0	83	49	99
Cibola	0	35	27	0
Colfax	0	11	41	40
Curry	15	74	63	99
DeBaca	0	0	84	97
Dona Ana	0	68	54	98
Eddy	0	45	80	99
Grant	0	37	50	0
Guadalupe	0	0	89	63
Harding	0	0	64	0
Hidalgo	1	0	75	0
Lea	0	79	90	100
Lincoln	0	71	80	97
Los Alamos	0	59	79	0
Luna	0	28	46	0
McKinley	0	20	20	0
Mora	0	0	0	0
Otero	9	56	53	98
Quay	0	54	67	5
Rio Arriba	0	0	64	0
Roosevelt	43	40	54	99
Sandoval	0	75	74	0
San Juan	0	62	40	0
San Miguel	0	26	52	0
Santa Fe	0	64	59	0
Sierra	0	64	76	0
Socorro	0	47	55	0
Taos	0	8	26	0
Torrance	0	25	15	20
Union	0	0	66	0
Valencia	0	72	45	0

Table 25: NM Adoption and Deployment Rates by Speed (2011)

	SLOW 768 kbps/200 kbps or faster	MEDIUM-SLOW 3 Mbps/768 kbps or faster	FAST 6 Mbps/1.5 Mbps or faster
Adoption rate: Percentage of NM households adopting broadband	56.5	35.1	22.2
Deployment rate: Percentage of NM population with broadband access	93.0	85.8	71.4

Speeds

The Federal Communications Commission sets a nationwide speed benchmark for broadband deployment. This target is driven by the goal that users can send and receive data, graphics, and video. As noted previously in this report, the FCC updated the benchmark in 2011 to 4 Mbps download and 1 Mbps upload. The middle speed in the table above is below that target.[80]

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[79] (Federal Communications Commission, 2011) Note: Some of the 'zeros' in the fixed wireless column may not be correct, but are what is available from the FCC. For example, Sacred Wind reports providing fixed wireless access to 16.8% of McKinley County residents and 6.2% in San Juan County.

[80] (Federal Communications Commission, 2012, p. 18)

APPENDIX E: Public Broadband Initiatives[81]

Entity	Project
Albuquerque	As the state's largest city, Albuquerque is a center for cross-country and cross-state fiber transport and connectivity. It is also the key location for co-location and data centers, as well as for the University of New Mexico (UNM) one of the state's three research universities. Primary interconnection points of presence and data centers include: 505 Marquette, Big Byte, and Oso Grande. Albuquerque is served by CenturyLink and numerous other providers, yet has some unserved and underserved neighborhoods and has experienced past wireless network initiative failures. The city is currently considering a partnered fiber and wireless initiative.
Aztec	The City of Aztec, a community of about 6,600 people, uses its municipal fiber network to serve government, schools, and other entities. In 1998 the city and school system coordinated to install the original fiber and all entities share ownership. The school wanted better, affordable connectivity for students while the city wanted economic development opportunities. Community leaders used E-Rate funding and a Gates Foundation grant to construct the original fiber aerial route. Municipal government facilities, the public library, and all ten Aztec municipal school facilities connect to the fiber network. The city is also using its fiber network to support a free downtown WiFi Network.
CityLink Fiber, Inc.	Albuquerque based CityLink Fiber, Inc. provides neutral, open access, metropolitan, dark fiber for a wide range of communications needs and public/private sector users on a non-discriminatory basis. The company designs, engineers, installs, and maintains the fiber network for all of its customers. CityLink has two, downtown Albuquerque, fiber rings totaling 12 miles which connects over 50 commercial and residential buildings. It received a franchise from the City of Albuquerque to deploy fiber and provide services throughout the city, with schools to be connected at no cost. The firm provides advanced voice, video, and data services to residential and business users. The company is the first to bring fiber to the home (FTTH) to Albuquerque. It supports open access networks, and has a wholesale model that allows other service providers to make use of its fiber network. CityLink's service will start by providing home users with 50 Mbs of service for an estimated $69.95 a month, plus installation. The company will also provide 100 megabit/second service for an estimated $129.95 a month, plus installation. The service will be symmetrical in its speed offerings.
Farmington	The City of Farmington has been extending its fiber network and services within the city and east to Bloomfield and Aztec, and west to Kirtland. Farmington currently has about 80 miles of fiber, primarily sharing the fiber network of Farmington Electric Utility System, maximizing use of unused strands, by affordably leasing bandwidth for economic development. They also share fiber with the school district and San Juan Regional Hospital, as well as with FastTrack and Brainstorm Internet, their provider.
Kit Carson Electric Cooperative (KCEC)	Kit Carson Electric Coop was awarded $63.7 million in RUS-BIP funds (the largest ARRA broadband award in NM) to build an open access fiber optic, middle-mile network to connect every home and business in the KCEC service territory and to inter-connect with the REDI Net. KCEC is the only rural electric coop in New Mexico that also provides telecommunications services within its service region, via Kit Carson Telecom. KCEC is in a strategic partnership with Pulse Broadband, an advanced fiber-optic telecommunications leader serving rural markets, to build the fiber-to-the-home network throughout its service area. The area is comprised of more than 29,000 homes and businesses in Taos, Colfax, and Rio Arriba Counties. Pulse Broadband will act as project manager and project engineer. The company is currently deploying the fiber network using its right-of-ways and poles from Taos, north to Arroyo Seco, and south to Penasco. Further extension is planned.
Las Cruces	The City of Las Cruces has long been considering ownership or partnerships to build fiber optic and wireless open service provider networks. It was unsuccessful in its applications for ARRA broadband stimulus funding. The Las Cruces area includes a number of business, governmental, educational, telehealth, and library networking facilities. The High Tech Consortium (HTC) of Southern NM, brings together a number of Las Cruces government, institutional, and business leaders, as well as other expert advisors to help educate and make recommendations for the city and the region's networked future. New Mexico State University (NMSU), one of the state's three research universities, is a primary leader in the region's broadband networking expertise, education and jobs training, and technical infrastructure and applications development. It has been a major hub for the Digital Pathways program, Internet 2, CHECS Net, and the NM LambdaRail Network. It was also a primary NM CAC Gateway site. NMSU will be a leading partner on any regional networking initiative.

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[81] The majority of content in this table was provided by the 1st-Mile Institute.

Entity	Project
Los Alamos	The City and County of Los Alamos has long attempted to plan and deploy a local, fiber optic network. The latest initiative has undergone an extensive planning and decision-making processes with concurrent public and County Council hearings. The project is not yet funded or approved. The goal of the project is to provide open and advanced broadband communications and has been designed to provide a secure, reliable, and dedicated 1 gbps fiber-optic connection to every residence and business in Los Alamos County. The model is based on open access principles where Los Alamos County would serve as the wholesale network operator, not a retail service provider.
Regional Economic Development Initiative Network (REDI Net)	REDI Net, a project of the North Central New Mexico Economic Development District, is now owned and operated by local and tribal governments through a Joint Powers Agreement. REDI Net was made possible with a $10.5 million NTIA-BTOP CCI grant. The high-bandwidth, open access, 140 mile fiber-optic, middle-mile network is now operational. All profits are to be reinvested in the network. Initial active, first-mile, interconnection partners include Kit Carson Telecom, ENMR/Plateau and Cibola, with more expected to join. Santa Fe and Santa Fe County plan to further extend and connect to the REDI Net in the near future.
Santa Fe City and County	Santa Fe Civic Housing Authority received a $.2 million ARRA NTIA Public Computing Centers (PCC) award to establish a computer lab with training programs for is residents and neighbors. Boys and Girls Clubs of Santa Fe, as a partner with Zero Divide in San Francisco, received a portion of a six state $ 1.4 million NTIA Sustainable Broadband Adoption (SBA) grant for public-access computer labs and training. Santa Fe has been planning a fiber initiative for many years, in part to interconnect with the REDI Net. The city is poised to announce the selection of Cybermesa to undertake an open fiber network deployment within the city, with an initial $1 million city investment. CenturyLink, Plateau Communications, and the NM Department of Information Technology may directly participate in this initiative. Santa Fe County is currently planning fiber and wireless deployments and services as a key part of its updated County Economic Development Plan. It is also prepared to invest $1 million in county funds to possibly connect the Santa Fe Community College and other key sites to the REDI Net.
South Central New Mexico	This region includes Las Cruces which is along the primary north-south fiber corridor (Rio Grande Optical Network) that extends through New Mexico from Texas to Colorado. The greater region, which extends west to Truth or Consequences and northwest to Ruidoso, also includes the City of Alamogordo, Holloman AFB, White Sands Missile Range, the new Spaceport America facilities, and small towns such as Cloudcroft and Tularosa. There are a number of economic development initiatives focused on this high growth region. Broadband networking is seen as key the region's future. The NM Department of Information Technology's Wire New Mexico, NM LambdaRail, CHECS-Net, library, and telehealth network upgrades and distance learning networks are centered in and planned to be extended in this region. Rural providers are building local fiber and wireless networks throughout the area.

APPENDIX F: Tribal Broadband Initiatives

New Mexico tribal communities may benefit from the Federal Communication Commission's recently established Office of Tribal Affairs and Policy and from the Native Nations Broadband Task Force, which now includes representatives of Pueblos and the Navajo Nation.

Pueblos[82]

Eight of the 19 pueblos in New Mexico are located in the four county, north central region. All of them are variously involved in broadband deployments. Many have been recipients of USDA RUS and NTIA broadband grants and ARRA stimulus awards. Most of the pueblos are in need of improved broadband completion and services, as well as training and access centers.

Pueblo	Project
Acoma	Acoma Pueblo is served by CenturyLink and Comcast, but the pueblo has unmet broadband needs. It is currently involved in some limited broadband development efforts.
Jemez Pueblo	Jemez Pueblo has determined needs and has been involved in some broadband development efforts with Zia Pueblo, Windstream Communications, wireless providers, the BIA (a provider), the state, and others.
Laguna	The Laguna Pueblo Broadband Network is a comprehensive telecommunications system comprised of fiber-optic circuits, fixed wireless towers, and equipment that provides broadband and other high-speed internet services to every home and building in the six villages of Laguna Pueblo. The $3.3 million project was made possible through six coordinated Community Connect Grants through the USDA-RUS Broadband Initiatives Program, with the technical assistance of Sacred Wind Communications and NeoNova Network Services.
Nambe	Nambe Pueblo leases space on its towers to wireless-communications companies to extend cellular phone service into much of the Pojoaque Valley area. As needs for a variety of networking services and applications is growing, the entire region is interested in ways to utilize fiber optic backbone and local networking capabilities. Granting of right of way easements, continue to be a difficulty.
Ohkay Owingeh	Ohkay Owingeh Pueblo deployed and has been operating a wireless network for its residents and institutional facilities. The pueblo's information technology staff has clearly determined their need for participatory use and investment in regional open fiber infrastructure and services. The pueblo is a REDI Net partner and will benefit from connections to and applications of this open fiber initiative.
Pojoaque	Qwest Communications was granted authority to continue to provide telecommunications services in the Pojoaque area. Pojoaque High School and Pojoaque Valley Schools have long-held licenses for Instructional Television Fixed Service (white space), which has value for newly allocated wireless spectrum services provision, which the Federal Communications Commission is planning to offer via auction. The pueblo is a REDI Net partner and will benefit from connections to and applications of this open fiber initiative.
San Ildefonso	San Ildefonso Pueblo was awarded $ 1.2 million in ARRA RUS-BIP funding for development and extension of its Tewa Communications (TewaCom) wireless network. The pueblo's TewaCom, an initial partner on the REDI Net open fiber network, was to provide wireless Internet service to over 2400 households in the 1000 square mile upper Rio Grande Valley, including San Ildefonso Pueblo, El Rancho, Jaconita, and Jacona, up to the El Rito Highway. TewaCom recently let its subscribers know that it would be closing at the end of August 2013.
Santa Clara	Santa Clara Pueblo is a REDI Net partner, and will benefit from connections to and applications of this open fiber initiative.
Tesuque	The Tesuque Pueblo and the Tribal Police Department developed a Master Plan for wireless and fiber networking. They were a pilot site for rollout of the state's TRAX records management system, and deployed an E-911 dispatch system via connection to Nevada. They recognized the need for wide-ranging and long-term training and education programs to be conducted at their multi-jurisdictional facility, which includes networked computer learning labs. The pueblo is a REDI Net partner, and will benefit from connections to and applications of this open fiber initiative.
Zia Pueblo	Zia Pueblo has determined needs and has been involved in some broadband development efforts with Jemez Pueblo, Windstream Communications, wireless providers, the BIA (a provider), the state, and others.
Zuni	Zuni Pueblo, along with the Pecos area, is among the least-served areas of the state. The pueblo had been served by Century Telephone Co., Inc. and is now served by CenturyLink. The copper inter-exchange network cable from Zuni to Grants was replaced with fiber. Fiber access points were constructed for Pescado, Ramah, and El Morro. A technology assessment is currently in process in Zuni, and the pueblo is also attempting to support a community computing center.

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[82] The majority of content in this table was provided by the 1st-Mile Institute.

Navajo Nation

The Navajo Tribal Utility Authority (NTUA) is the lead tribal agency managing the three-state (UT-AZ-NM) Navajo Nation's $32.2 million NTIA-BTOP infrastructure award which is completed. With tribal and private sector matching funds, this total $46 million initiative includes fiber optic infrastructure and an overlay of wireless towers and services, in partnership with CommNet Wireless. This will give more than 30,000 households and 1,000 businesses access to improved wireless internet and cell phone service. An additional 1,100 community institutions, including public safety, health, social services, and emergency care facilities are expected to benefit from the new infrastructure. In addition, an $8 million commercial data center has opened , renting server capacity to businesses and organizations.

Mescalero Apache

The Mescalero Apache Telecom, Inc., (MATI) is a tribal-owned rural telco, offering VoIP services out of region over a broadband wireless network owned by a separate wireless internet service provider. The telco replaced its Siemens Class 5 switch with a soft switch in region and then used that soft switch — along with wireless local loop connections — to help it expand out of region.

APPENDIX G: Other Broadband Initiatives[83]

Entity	Project
FastTrack Communications	FastTrack Communications, based in Durango, CO, was formed in 2002 by two rural electrical cooperatives, La Plata Electric Association and Empire Electric Association. The organization brings state-of-the-art telecommunications to underserved rural areas. Its telecom technology powers local businesses, community institutions, and communications carriers at very reasonable rates in Colorado and New Mexico. FastTrack applies its profits to building fiber infrastructure to school districts, colleges, governments, local airports, and other vital community cornerstones. The telecom service area extends from Denver-Grand Junction-Montrose in Colorado to Farmington-Aztec-Albuquerque in New Mexico. The service offers options from data transport, internet, multiprotocol label switching (MPLS), voice, and integrated products to co-location over 430 miles of fiber optic network line..
PNM	The Public Service Company of New Mexico, is an energy transmission and provision company. It has rights-of-way, towers, and poles. The company deploys wireless and fiber optic lines to manage and monitor its operations. It does not want to be in the regulated telecommunications business, but it does develop and share fiber infrastructure with others (governments, tribes, companies, etc.) via individualized contractual agreements.
Spaceport America	Spaceport America located in Sierra County about 30 miles east of Truth or Consequences and 45 miles north of Las Cruces, will be a major user of high-bandwidth network connections and applications. The Spaceport Authority has completed initial fiber optic network deployment. Substantial state funds were used to locate a buried CenturyLink fiber optic line and an open path millimeter wave communication link over the 5 miles that separate the vertical launch area (VLA) from the Spaceport Operations Center (SOC) to support both internet and telephone connectivity.
White Sands Missile Base	A fiber-optic network provides broadband connectivity throughout much of the base, the largest military installation in the U.S., a roughly 100-mile-by-40-mile area extending from just south of San Antonio to Las Cruces. An initial 1,200 mile, 10-Gigabit fiber network, supplemented by another 1,900 miles of copper cabling, was upgraded and expanded.
National LambdaRail Network and Internet2	Founded by the U.S. research and education community, NLR is the ultra high-performance, 12,000-mile innovation platform for a wide range of academic disciplines and public-private partnerships. NLR's network consists of leased optical fiber activated using Dense Wave Division Multiplexing (DWDM), enabling each fiber pair to support about 32 wavelengths or networks, which enable an ultra-high data transmission rate of 320 gigabits/second. UNM's Albuquerque Gigapop (ABQ-G) is an aggregation point for the NLRN, providing high-bandwidth accessibility to New Mexico institutions, with particular focus on research and education within the state. ABQ-G was designed and implemented as a high-tech connection for research and education between rural and urban institutions in New Mexico, and serves as an essential link between Native American Indian reservations, schools, hospitals and emergency services, reduces network costs for members and contributes to economic development. With the five-fold level of internet access increase, this interconnection network puts New Mexico at the forefront of national bandwidth connectivity. UNM is also a partner, user and network aggregation point for Internet2.

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[83] The majority of content in this table was provided by the 1st-Mile Institute.

APPENDIX H: Telecom Carriers, Providers, Infrastructure Companies, and Initiatives[84]

See Appendix A for definitions of terms.

Tier One Carriers	
AT&T	The nation's largest 4G network is a provider of wireless, Wi-Fi, high speed internet, voice, and cloud-based services with extensive coverage in New Mexico. In the first half of 2013, AT&T invested more than $35 million in its wireless and wired networks in the state, including launch of 4G LTE in Farmington, Gallup, and Las Cruces and upgrades in Albuquerque. This investment builds on the nearly $175 million that AT&T has invested in its New Mexico wireless and wired networks from 2009 through 2012.
CenturyLink	See extended description under ILECs, below.
Level 3	Provides core transport, internet protocol, voice, video, and content delivery for most of the medium to large internet carriers. It has centers in Albuquerque and Las Cruces/El Paso.
Sprint Corporation	The holding company provides wireless services and is a major global internet carrier, operating an OC-192 Internet backbone. In July 2013 it acquired Clearwire and its 4G WiMAX network, adding to its Sprint Nextel LTE network, with extensive coverage in parts of New Mexico.
Time Warner Telecom	The company provides business-class managed voice, internet, and data network services. It specializes in ethernet and transport data networking, internet access, local and long distance voice, VoIP, and security to enterprise organizations and communications services companies throughout the U.S. and globally. It has facilities in Albuquerque.
Verizon Wireless	The largest wireless carrier in the U.S. based on number of subscribers, building and operating a large-scale 4G LTE network, with coverage in most areas of New Mexico.
XO	The company has a high-bandwidth fiber long-haul termination point in Tularosa.
Zayo Group	In Late 2011, the company acquired 360networks, a provider of fiber network telecom services and intercity metro fiber network, including three high-capacity point of presence (PoP) locations in Albuquerque and one in Santa Fe.

Cable Companies	
Baja Broadband	Serves Alamogordo, Ruidoso Clayton, Logan, High Rolls, Carrizozo, and Truth or Consequences.
Cable One	Provides services in Rio Rancho and Roswell.
Comcast	The largest cable company in the U.S. offers Xfinity triple play services in its fully digital markets. The company provides services in Albuquerque and Santa Fe.
Time Warner	Provides services in Anthony, Chaparral, Santa Teresa, Sunland Park, Vado, Mesquite, La Mesa, Berino, and San Miguel.
US Cable	Serves the Espanola-Dixon area and the Hobbs-Carlsbad area. The company was awarded $ 4.5 million in RUS BIP funds.

[84] The majority of content in this table was provided by the 1st-Mile Institute.

Incumbent Local Exchange Carriers	
New Mexico Exchange Carrier Group (NMECG)	The NMECG was formed to improve communications within the industry as well as with legislators and the state regulatory commission. Its main objective is to help small, telephone companies in New Mexico provide excellent telecommunications services at affordable rates. The NMECG's eleven rural telecom company members cover approximately 61,108 square miles with approximately 46,532+ access lines. Total fiber deployment is approximately 2,500+ miles and growing. All eleven companies offer Internet service; with most companies providing ASDL services. While NMECG companies are aggressively investing in fiber, wireless and services upgrades, subscriber take-rates are lower than needed. See map of service areas by companies: http://nmecg.com/page3/page3.html. **Most of the following companies are members of this group. Members are noted with *.**
Baca Valley Telephone Co., Inc. (BVT)*	BVT has a service area covering more than 2,600 square miles in Union and Colfax Counties. In addition to residential service in the Des Moines and Maxwell exchanges, they provide cellular service, internet access, business telephone, security systems, and network cabling throughout northeastern New Mexico and southeastern Colorado. Broadband services via cooper/fiber or satellite connections are available to all customers.
CenturyLink Communications, Inc.	In 2011, the company merged with Qwest Communications and is the largest of the Incumbent Local Exchange Carriers (ILECs) in New Mexico. It connects customers through 80,000+ miles of fiber optic cable. The company has over 100 Gbps of bandwidth in/out of the state, with OC-192 connectivity to all but three of its central offices in New Mexico. In July 2011, CenturyLink announced that it completed a $258 million capital investment within specific categories ordered by the New Mexico Public Regulatory Commission (PRC). The goal was to expand broadband to 83% of New Mexico's residents, and the company has reached 85%. CenturyLink's broadband service now reaches an average of 75% of customers in rural areas they serve. There were 535,000 Qwest access lines by the end of 2010. CenturyLink is investing heavily in its fiber-to-the-node deployments where the company runs fiber-optic cables to a neighborhood and uses copper loops to link homes to the node. This gives customers download speeds of up to 20 mbps. Their various DSL Internet speeds currently range from 1.5 mbps to about 12 mbps downstream, with 896kbps to 1.5 mbps upstream.
Dell Telephone Cooperative, Inc.*	Dell Telephone Cooperative, in southern NM, serves the Timberon Exchange via a fiber connection and has had a fiber connection into El Paso, TX and Las Cruces, NM for the last several years. It continues to increase DSL services to customers, some of whom are 20 to 30 miles from the main switching center.
Plateau *	Plateau Telecommunications aka ENMR Telephone, is the largest telephone cooperative in New Mexico, with (13,000) access lines in eastern New Mexico and western Texas. It formed more than five decades ago by farmers, ranchers and other citizens to provide telephone services to the rural citizens in eastern New Mexico. The Plateau, NTIA-BTOP funded Middle Mile project supported enhanced broadband capabilities in the region by lighting a more than (2,000) mile ring of fiber and constructing 74 miles of new fiber in five communities. The project connects more than 200 anchor institutions (educational institutions, public safety organizations, healthcare facilities, and government agencies) at discounted rates and at speeds of up to 1 Gbps. In its eastern ILEC service area, Plateau has deployed fiber connectivity services to locations in the communities of Anton Chico, Clayton, Conchas Dam, Corona, El Valle, Farwell, Texas, Fort Sumner, Grady, House, Logan, Mosquero, Ranchvale, Roy, San Jon, Santa Rosa, Trementina and Vaughn. The company has built fiber networks in Belen, Clovis, Edgewood, Estancia, Las Vegas, Moriarty, Mountainair, Raton (ownership transferred to Baca Valley Telephone), Roswell, Springer and Tucumcari. Plateau has also finished FTTP builds in the city limits of Clayton, Farwell, Texas, Fort Sumner and Logan and is currently working on a complete fiber overbuild in Santa Rosa. In addition, Plateau has fiber to the Simms Building (NM DoIT) and to the Redi-Net POP on Rodeo Road in Santa Fe.
La Jicarita Telephone Cooperative, Inc.*	La Jicarita Telephone Cooperative, serving the Mora-Wagon Mound area, was awarded $11.8 M. in ARRA RUS-BIP funds to provide fiber to homes and premises in the Wagon Mound and Mora exchanges. In prior years, La Jicarita was one of the leaders in providing DSL to rural New Mexico. All of its service area remotes are fiber-fed and placed within 15,000 feet of subscribers for provision of DSL and video services. Nearly 100% of customers can subscribe to DSL, though current penetration rate is under 40%.
Leaco Telephone Cooperative Inc.*	Leaco Telephone Cooperative received a recent $29 M. USDA RUS loan to provide fiber-to-the-home for Tatum and Maljamar. Leaco provides DSL to the communities of Dexter, Hagerman, and Tatum.. It provides fiber connections for internet access to schools in its service area and to schools in the Lovington and Hobbs area. Leaco additionally has Wi-Fi hot spots in Dexter and Hagerman.

Penasco Valley Telephone Cooperative Inc. *	Penasco Valley Telecommunications (PVT), based in Artesia, NM, was awarded $ 9.6 M. in ARRA RUS-BIP funding. PVT believes that wireless local loop technology is a low-cost, low-maintenance way to reach its out-of-region customers with VoIP and data services. A few years ago, in an Federal Communications Commission auction, PVT won enough 700MHz spectrum to cover about 40 miles., It is using a broadband system from Vecima Networks Inc. The base station cost less than $100,000, and the CPE was less than $300. The company offered 1.5mbps service to subscribers in its wireless coverage area. In recent years, PVT also installed 33.6 miles of fiber and new electronic equipment to shorten the loop to subscribers.
Sacred Wind Communications, Inc. *	Sacred Wind Communications serves a large northwest region, adjoining the Navajo Nation and including some of the most rural and underserved populations in the state. Sacred Wind Communications is a provider and partner for Navajo communities, many without water or electricity. Sacred Wind upgraded the copper system acquired from Qwest Communications in 2006, and constructed a robust fixed wireless network that delivers reliable and high capacity services to its customers. The company's network is IP-based and can provide broadband to virtually every home and business in its service area. Sacred Wind has constructed a fixed wireless telecommunications network, reputed to be the largest for voice and broadband in the country, hooking up customers' homes by way of a small roof-mounted antenna. In 2011, the company added solar-powered phone service to its product line, allowing homes and chapter houses without electricity to have telephone service.
Tularosa Basin Telephone Co. Inc. (TBTC) *	TBTC. provides local, long distance, DSL, and internet access services to customers from the Cloudcroft, High Rolls, Mountain Park, Carrizozo, and Tularosa exchanges. TBTC provides wireline service to more than 5,100 customers and internet service to approximately 2,600 customers in an area that spans more than 1,200 square miles. The company has its headquarters in Tularosa. Though 98% of TBTC customers can have broadband services today, it currently has slightly over 30% penetration.
Valley Telephone Group, Inc. *	Valley Telephone Cooperative, Inc. (VTC), established in 1962, provides telecommunications services to over 7,000 rural and remote customers in southeastern Arizona and southwestern New Mexico. DSL is available to over 80% of its rural customers in southern New Mexico, and a double-digit penetration rate has been achieved. Playas, NM is being upgraded to fiber to the premises. The Valley TeleCom Group provides dedicated point-to-point digital transport via fiber optic facilities. The fiber optic network runs from Tucson, Arizona to El Paso, Texas and has the capability of speeds between DS1 and OC192 to transport voice, video and data.
Western NM Telephone Co., Inc. *	Western New Mexico Telephone Company, DBA as Western New Mexico Communications (WNM) has a serving area encompassing 15,048 square miles of Southwestern New Mexico, from the desert of the Lordsburg area to rugged mountains of Reserve, to the high plains of Datil and Magdalena. The company, based in Cliff, NM, serves approximately 6,400 customers with over 7,200 access lines. It has 3,659 miles of buried cable, 327 miles served by microwave towers, and 400 miles of high-volume fiber-optic cable. Total estimated investment for fiber from 2006 through 2008 was $5.5 M. The company completed upgrading its 'legacy' switch network with IP (Internet Protocol) enabled switches in 2007. Currently approximately 75% of the customer locations have DSL available, including in Alamo, a part of the Navajo Nation. WNM applied for and was awarded $11.5 million in ARRA RUS-BIP funds, which it declined.
Windstream Communications Inc.	Since 2005, Windstream Communication, has aggressively expanded its fiber network and broadband services to their entire NM serving area, which includes large mult-county regions around Espanola, Truth or Consequences, Ruidoso, Carlsbad and Hobbs. Currently 100% of customers have access to broadband via DSL or satellite services. Windstream also completed construction of a fiber route into the Jal exchange in 2008. From the Espanola service area, Windstream currently reaches to outside of Pojoaque, Chimayo, Los Alamos and San Ildefonso. While 83% of WIN's nearly 85,000 residential and business access lines are broadband addressable, the penetration rate is only around 25% (nearly 18,000 broadband customers).
Yucca Telecom *	In June 2005, Roosevelt County Rural Telephone Cooperative and subsidiary Yucca Communications, formed to compete against Qwest in Portales. Yucca Telecom is a telecommunications provider that offers telephone service, long distance, high-speed internet, and two-way radio services. Yucca Telecom serves 2216 access lines, with more than (1447) miles of buried cable, encompassing eight exchanges. The service area covers 3400 square miles in Roosevelt, Curry, DeBaca, Chaves and Lea Counties, in eastern NM. Yucca Telecom built a city-wide fiber optic network in Portales. Yucca Telecom has also supplied Fiber Optic Broadband service to the Texico Public School since 1997. All area schools are connected to fiber.

CLECs, ISPs, WISPs and Other Service Providers

There are currently 37 Competitive Local Exchange Carriers (CLEC) licensed in New Mexico.[85] These entities, many of which previously offered slower speeds, now deploy fiber where possible. Many are partnering with municipalities and open fiber providers to serve gap areas. The following table is not necessarily complete due to frequent changes in the industry.

CLECs, ISPs, WISPs and Other Service Providers	
Advanta	Farmington based ISP.
Blackrock	Blackrock Networks serves the Los Alamos-Whiterock region.
Brainstorm Internet	Brainstorm Internet, based in Durango, CO, provides high speed wireless services in the Farmington, NM area, at 1.5-5.0 Mbps throughput. It also has set up WiFi hotspots at sites in Farmington, Aztec and Bloomfield.
Cibola	Cibola Wireless has a 1000 subscriber regional service area in north-central NM. New coverage will be offered for the south-southwest quadrants of Santa Fe, and most of the Eldorado area.
CNSP	CNSP has service throughout Santa Fe County and the north-central NM region, including Pecos, Espanola, Los Alamos, Rio Rancho, Sandia Park and Albuquerque, with towers on Tesuque and Pajarito Peaks and other sites. They resell DSL and offer wireless internet (down-load speeds up to 10 Mbps), business class broadband (up to 1 Gbps) and cellular phone service.
Cyber Spectra	Cyber Spectra, based in Espanola, has wireless coverage reaching San Ildefonso, Pojoaque, Tesuque and surrounding areas.
Cybermesa	Cyber Mesa is based in Santa Fe, delivering large circuits from Las Cruces to Taos. It has equipment in Espanola, Santa Fe, Eldorado, Rio Rancho, Albuquerque, Roswell, Alamogordo and Silver City, where it can offer DSL, voice circuits, large data circuits, fixed wireless and long distance. It plans to offer wireless services to Abiquiú, Arroyo Seco, El Rito, Española, Hernandez, La Mesilla, Medanales, San Pedro, Santa Cruz, Sombrillo, Velarde, Santa Clara and Ohkay Owingeh.
D & D	D&D Broadband is a Farmington based WISP.
Fastwave	Fastwave is a wireless broadband provider based in Las Cruces, offering 2 Mbps - 5 Mbps symmetrical service, with a coverage area of approximately 2000 square miles on the East Mesa, West Mesa, behind A mountain and up to 15 or more miles North and South of Las Cruces.
Frontier	Frontier Communications Corporation is a telephone company mainly serving rural areas and smaller communities. It provides broadband services in northwest New Mexico, with offices in Shiprock and Crownpoint.
Higher Speed	Located in Edgewood, Higher Speed Internet provides wireless in the Estancia, Edgewood, Stanley, Galisteo regions.
La Canada	La Canada Wireless Association is a regional (homeowners') cooperative serves a growing area from Santa Fe, Eldorado and Glorieta, to Lamy and Galisteo and surrounds.
Lobo	Lobo Internet Services, based in Moriarty, has wireless coverage in Albuquerque, Rio Rancho, in the east mountains, in Santa Fe, Moriarty, Stanley and Estancia.
SCSConnect	Headquartered in Gallup, NM, SCSConnect has offices in Gallup and Albuquerque. It serves the Four Corners region - New Mexico, Arizona, Colorado and Utah, with Motorola products and wireless internet service, using CenturyLink backhaul.
SentivaNet	SentivaNet had Centurylink backhaul, but report it was too costly to continue. They now have a high-bandwidth wireless link from Cibola, via Tesuque Peak to Glorieta, and are considering service towards San Isidro, and other gap areas.
Southwestern Wireless	Southwestern Wireless, based in Roswell, with additional offices in Artesia, Ruidoso Downs and El Paso areas, serves most of the southwestern quadrant of NM, with fixed wireless and numerous broadband middle-mile connection points.

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[85] (NM Public Regulation Commission), (1st-Mile Institute)

APPENDIX I: Organizations Consulted for this Report

Representatives from the following organizations were interviewed for this report during June though August, 2013. Interviewers are listed for each.

Education Sector

- Century Link, T. Boulanger
- Consortium of Higher Education Computing/Communications Service, T. Boulanger
- Isleta Pueblo, T. Boulanger
- N.M. Exchange Carriers Association, T. Boulanger
- NM Dept. of Public Education , T. Boulanger
- NM Public School Facility Authority , T. Boulanger
- Plateau Communications, T. Boulanger
- School Superintendents Association , T. Boulanger
- Six Northern Pueblos, T. Boulanger
- State School Boards Association, T. Boulanger
- Teachers from 18 School Districts , T. Boulanger

Healthcare Sector

- Albuquerque Health Partnerships, D. Alverson
- American Telemedicine Association, D. Alverson
- Health Insight NM, D. Alverson
- Johnson & Associates, D. Alverson
- LCF Research, D. Alverson
- Lovelace Clinic Foundation, D. Alverson
- Molina, - D. Alverson
- N.M. Dept. of Health, D. Alverson
- Navajo Nation, D. Alverson
- Net Med Express, T. Boulanger
- New Mexico Health Resources, D. Alverson
- NewHeart, T. Boulanger
- NM Hospital Assoc., D. Alverson
- Optum Health, D. Alverson
- Physician Assistant Network, D. Alverson

- Policy Insights Group, D. Alverson
- Presbyterian Hospital, T. Boulanger
- Sangre de Cristo Community Health partnership, T. Boulanger
- UNM Center for Telemedicine, D. Alverson
- UNM HSC, D. Alverson
- United Health Group, D. Alverson
- Taos Health Systems, D. Alverson

Economic Development Sector

- Association of Commerce & Industry, T. Boulanger
- Association of Commerce and Industry, C. Lehman
- Century Link, C. Lehman
- Eastern Plains Council of Governments, C. Lehman
- Greater Raton Economic Development, T. Boulanger
- Las Cruces Economic Development, T. Boulanger
- Los Alamos Economic Development , T. Boulanger
- Navajo Tribal Utility Authority, T. Boulanger
- NM Workforce Connection One Stop Centers , C. Lehman
- Northeast NM Economic Development Organization, T. Boulanger
- Northern N.M. Economic Development District, T. Boulanger
- Northern NM Workforce dBd., T. Boulanger
- PNM, T. Boulanger
- Public Service Company of New Mexico, C. Lehman
- Rio Arriba County, T. Boulanger
- Santa Fe County , T. Boulanger
- Southwest New Mexico Economic Development Partnership, T. Boulanger
- The Partnership, T. Boulanger
- US Department of Agriculture , C. Lehman

APPENDIX J: Current and Past Funding Investments in New Mexico

The following table summarizes the range of broadband grants impacting New Mexico in the last five years. Not all the funds listed were spent in the state. Several are part of larger multi-state initiatives.[86]

Grantee	Granter	Total Grant Amount	Description
Baca Valley Telephone Company	National Telecommunications & Information Administration, RUS-BIP	$3,300,000	The Baca Valley Telephone Company, Inc. project will provide fiber optic connectivity to a number of new cabinets and existing buildings and deploy a last-mile access system intended to provide ADSL2+ broadband services to households and businesses in two separate proposed funded service areas located in the northeast area of New Mexico. This project will serve subscribers located in Union and Colfax counties, and consists of two service areas. Des Moines is composed of 194 census blocks located in and around the village of Des Moines, NM. Maxwell is composed of 36 census blocks in the community of Maxwell, NM. This project will serve 373 establishments, 71 of which are businesses and rural establishments that include farms and ranches.
Communication Service for the Deaf, Inc.	National Telecommunications & Information Administration, BTOP-SBA	$14,988,657	Broadband's ability to expand educational and employment opportunities is especially meaningful for Americans who are deaf or hard of hearing. Communication Service for the Deaf, Inc. (CSD) expands broadband adoption among people who are deaf and hard of hearing and provide them with online tools to more fully participate in the digital economy. The left column includes moneys spend in other states.
Connect America Fund	Federal Communications Commission	$2,986 $2,314,150 $134,675	The Federal Communications Commission has adopted reforms of its Universal Service Fund (USF) and Intercarrier Compensation (ICC) systems to accelerate broadband build-out to the 18 million Americans living in rural areas who had no access to robust broadband infrastructure. The reform expands the benefits of high-speed internet to millions of consumers in every part of the country by transforming the existing USF into a new Connect America Fund (CAF) focused on broadband. New Mexico results in the first phase of the Connect America Fund: • Total Locations Receiving Support: $2,986 • Total CAF Support: $2,314,150 • Total Unserved Fixed Broadband: $134,675 (Download/Upload Speed: 3Mpbs/768kbps) • Number of Counties Supported: 9 • Number of Census Blocks Supported: 460 Many low-income rural and urban families in New Mexico will benefit by qualifying for reduced rate ($9.99) broadband service from providers cooperating with the Federal Communications Commission in addressing the digital divide. CenturyLink and Comcast are providers.
ENMR/Plateau	National Telecommunications & Information Administration, BTOP-CCI	$11,252,066	The ENMR/Plateau Middle Mile project intends to enhance broadband capabilities for critical community anchor institutions in eastern New Mexico and west Texas by lighting a more than 1,600-mile ring of fiber and constructing 74 miles of new fiber in five communities. The

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[86] Content in this table came from multiple sources including the 1st-Mile Institute, NM DoIT, and websites for the funding sources.

Grantee	Granter	Total Grant Amount	Description
			project plans to connect more than 200 anchor institutions – including educational institutions, public safety organizations, healthcare facilities, and government agencies – at speeds of up to 1 Gbps. In addition, the network intends to offer wholesale services and facilitate broadband expansion to an estimated 20 communities and an area with nearly 700,000 homes, over 36,000 businesses, and 263 anchor institutions.
ENMR/Plateau	National Telecommunications & Information Administration, BTOP-CCI	$16,460,815	To provide much-needed broadband capacity to critical community facilities in underserved west Texas and eastern New Mexico communities, ENMR/Plateau plans to construct 189 miles of new fiber and utilize 418 miles of additional existing fiber to create a middle mile broadband network spanning central and eastern New Mexico and parts of western Texas. Expanding its $11.2M BTOP Round One infrastructure award, ENMR plans to deploy its network into additional underserved areas with 1 Gbps middle-mile speeds. The project proposes to facilitate distance learning and education for tens of thousands of residents by significantly improving broadband connections at schools and higher education institutions. ENMR/Plateau plans to partner with both New Mexico and Texas colleges and universities, regional utility companies, and other service providers as needed to further maximize use of fiber and broadband capacity.
Hughes Network Services	National Telecommunications & Information Administration, RUS-BIP-Sat	$58,800,000	This approximately $59 million award, will allow Hughes Network Systems to offer satellite broadband service to rural residential and commercial subscribers nationwide. Approximately 258,685 people stand to benefit, as do roughly 3,200 businesses. In addition to the jobs this project will support upfront, it will provide a foundation for economic growth and job creation for decades to come.
Kit Carson Electric Cooperative	National Telecommunications & Information Administration, RUS-BIP	$63,700,000	Kit Carson Electric Cooperative in Northern New Mexico intends to build a last mile, open access, fiber network to bring broadband to underserved residents, including Native American Pueblos, community anchor institutions, and critical community facilities; to enable Smart Grid technology for sustainable energy development; and to create new jobs and foster economic development. The network will create a 2,400 mile broadband network which will connect approximately 20,500 households, 3,600 businesses, 183 critical community institutions and two American Indian pueblos.
La Jicarita Rural Telephone Coop	National Telecommunications & Information Administration, RUS-BIP	$11,800,000	This award will allow La Jicarita Rural Telephone Cooperative to offer full fiber capabilities to rural establishments with broadband service speeds of up to 18 Mbps. This last-mile project, along with a middle-mile component, will allow the company to provide affordable higher speed last-mile services to a majority of its subscriber base that would otherwise go underserved. Approximately 3,000 people stand to benefit, as do roughly 40 businesses and 8 community institutions.
Mission Economic Development Agency	National Telecommunications & Information Administration, BTOP-PCC	$3,724,128	The Mission Economic Development Agency, in collaboration with the National Association for Latino Community Asset Builders and a national network of Latino-serving economic development organizations, plans to create 12 new public computer centers and expand five existing ones in 13 communities throughout the U.S.. Each center expects to operate on the project's centrally managed network and provide computer training and adult education to a low broadband adoption, high unemployment target population through a

Grantee	Granter	Total Grant Amount	Description
			standardized English-Spanish training curriculum. The project expects to add a total of 263 new workstations and replace 37 existing workstations. This enables the centers to serve an additional 2,500 users per week and train an estimated 3,000 users per year. Broadband capabilities at each center will be increased to speeds of 1.5 Mbps.
Navajo Tribal Utility Authority	National Telecommunications & Information Administration, BTOP-PCC	$32,190,067	Navajo National Middle Mile/Last Mile Project proposes to bring high-speed affordable broadband services to the Navajo Nation by deploying 550 miles of new aerial fiber-optic cable and 59 new or modified microwave towers covering 15,000 square miles in Arizona, Utah, and New Mexico. The proposed service area has rugged terrain, significant poverty, and more than 60% of residents lack basic telephone service. The project expects to directly connect 49 Chapter Houses, which serve as community centers for the Navajo population, at speeds from 10 Mbps to 10 Gbps. Last mile wireless services will be offered at speeds between 1 and 3 Mbps through the project's wireless partner, CommNet Wireless.
Navajo Tribal Utility Authority (CommNet Wireless)	National Telecommunications & Information Administration, BTOP-CCI	$32,200,000	The Navajo National Middle Mile/Last Mile Project proposes to bring high-speed affordable broadband to the Navajo Nation by deploying 550 miles of new aerial fiber-optic cable and 59 new or modified microwave towers covering 15,000 square miles in Arizona, Utah, and New Mexico. The proposed service area has rugged terrain, poverty, and more than 60% of residents lack basic telephone. The project expects to directly connect 49 Chapter Houses, which serve as community centers for the Navajo population, at speeds from 10 Mbps to 10 Gbps. Last mile wireless services will be offered at speeds between 1 and 3 Mbps through the project's wireless partner, Commnet Wireless.
New Mexico Department of Information Technology	National Telecommunications & Information Administration, NTIA-BTOP-CCI	$38,699,997	To enhance broadband access to community anchor institutions while upgrading the state's public safety communications capabilities, the NM Department of Information Technology proposes a two-tiered project that addresses both objectives via a single network infrastructure. First, the project will complete the ten-year analog-to-digital upgrade of the state's microwave network by replacing 19 of the network's towers that, along with the existing infrastructure, connect to a 100 Gbps backbone network at several key points statewide. Second, SIRCITS proposes to utilize the microwave network's towers to deploy a new interoperable 700 MHz public safety wireless broadband network in the Albuquerque and Santa Fe metro areas that would cover 220 square miles, 14 site locations, provide 1,500 first responder end-users with speeds of up to 7.5 Mbps, and benefit a population of about 600,000 residents. Some goals of the new public safety network include streaming critical patient data from paramedics to hospital personnel; field access to records management systems for criminal, fingerprint, and mug shot information; building blueprints and infrastructure diagrams on the go to enable access for firemen; and video applications to improve situational awareness at incident command posts.
New Mexico Department of Information Technology	National Telecommunications & Information Administration, BTOP-SBDDP	$4,762,287	With State Broadband Capacity Building project, the New Mexico Department of Information Technology will build on the framework created by the New Mexico Integrated Strategic Broadband Initiative in 2008. The funding will support reorganization and expansion of statewide broadband capacity building by developing subcommittees

Grantee	Granter	Total Grant Amount	Description
			for the following areas: infrastructure, technical planning, applications, legislation, education, governance, tribal issues, and broadband providers. In addition, the department will hold public forums and an annual conference.
			With Technical Assistance funding, the department plans to catalogue all broadband and technology training programs located within the state, and then identify areas that lack training resources in order to improve planning. NMDoIT will also provide direct technical assistance to tribes to facilitate their participation in the broadband mapping project and to improve their internal geographic information system capacity.
			The Data Collection, Integration, and Validation project was originally funded for broadband planning activities and two years of data collection. In September of 2010, this project was amended to extend data collection activities for an additional three years and to identify and implement best practices.
New Mexico State Library	National Telecommunications & Information Administration, BTOP-SBA	$1,457,488	The New Mexico State Library has partnered with the University of New Mexico, Global Center for Cultural Entrepreneurship, and 1st-Mile Institute to propose Fast Forward New Mexico, an initiative to increase statewide broadband adoption and promote computer literacy and Internet use. The project intends to reach vulnerable populations, Hispanic and Native American users, small businesses, and entrepreneurs through small group trainings at public and tribal libraries in 15 communities across the state. The partners estimate the project will result in 3,000 new household broadband subscribers, 1,000 new business and institutional broadband subscribers, and 3,200 new users at public computer centers. They intend to develop programs for first-time computer users that will address computer literacy and internet usage. The NM State Library also plans to provide training in computer and internet use for small organizations and business owners. According to a report by the Kauffman Foundation and the Information Technology and Innovation Foundation, the Fast Forward New Mexico project intends to improve New Mexico's ranking of 46th nationally in percentage of internet users, 49th in e-government, and 36th in broadband telecommunications when compared to other states.. This proposal is part of Governor Bill Richardson's five-year plan to phase in "broadband for all."
North Central New Mexico Economic Development District	National Telecommunications & Information Administration, BTOP-CCI	$10,565,792	Areas of rural north central New Mexico rely significantly on dial-up service, and much of the region lacks affordable, high-bandwidth network services for community anchor institutions and small businesses. The North Central New Mexico Economic Development District's REDI Net project plans to deploy a middle-mile fiber optic broadband network across the counties of Rio Arriba, Los Alamos, and northern Santa Fe, and to five Native American tribal communities. The project proposes to enable distance learning and advanced technology applications at schools and community colleges, and promotes energy efficiency by enabling "smart grid" applications for regional rural electric cooperatives. REDI Net plans to utilize the network to provide support for locally based businesses, especially in the technology, media, and renewable energy industries. The project also intends to offer higher levels of security and reliability for public safety and telemedicine in the region. The REDI Net middle mile fiber optic broadband network in rural

Grantee	Granter	Total Grant Amount	Description
			northern New Mexico will serve 123 community anchor institutions, with market potential of 19,227 households and 1,332 businesses. This project includes partnerships with tribal governments and last-mile strategy with seven service providers.
One Economy Corporation	National Telecommunications & Information Administration, BTOP-SBA	$28,519,482	The 21st Century Information and Support Ecosystem project proposes to implement a comprehensive program of computer training, wireless Internet access, broadband awareness marketing, and online content and applications to residents of 159 affordable and public housing developments and low-income communities in 50 cities and towns across 31 states and the District of Columbia. The amount in the left column includes moneys spent in other states. In New Mexico, the organization worked with underserved Hispanic communities in Albuquerque.
Peñasco Valley Telecom	National Telecommunications & Information Administration, RUS-BIP	$9,600,000	Peñasco Valley Telephone Cooperative, Inc., will deliver high-speed broadband to unserved areas in its ILEC territory. The project will deploy fiber and electronics to allow for broadband service offerings to customers who are unable to access DSL today, including wireless capabilities for difficult-to-reach areas, as well as provide for additional fiber capacity.
Santa Fe Civic Housing Authority	National Telecommunications & Information Administration, BTOP-PCC	$176,400	Santa Fe Civic Housing Authority received a Public Computing Centers award to establish a computer lab with training programs for its residents and neighbors
Telecommunications Infrastructure Loan Program	U.S. Department of Agriculture	$82,000,000 Combined	This program makes long-term direct and guaranteed loans to qualified organizations for financing the improvement, expansion, construction, acquisition, and operation of telephone lines, facilities, or systems to furnish and improve telecommunications service in rural areas. Eligibility – Loans are available to entities providing telephone service in rural areas. Traditionally these have been telecommunications companies and cooperatives. http://www.rurdev.usda.gov/utp_infrastructure.html Awards in New Mexico since late 2009 include: • Agavue, LLC • Tularosa Basin Telephone Coop • Leaco • Western NM University • Regional Education Coop #9 • Nizhoni Smiles, Inc • Roosevelt County Telephone Cooperative, Inc.
University Corporation for Advanced Internet Development	National Telecommunications & Information Administration, BTOP-CCI	$62,540,162	As part of a longstanding project to connect essential community anchor institutions across the country, and facilitate closer collaboration and long-term benefits for education, research, healthcare, public safety, and government services, the University Corporation for Advanced Internet Development (UCAID) is working on a comprehensive 50-state network benefitting approximately 121,000 community anchors. In New Mexico, the partner organization is UNM. The amount in the left column includes moneys spent in other states.
Wildblue	National Telecommunications & Information Administration,	$19,500,000	This approximately $20 million award will allow Wildblue Communications to offer satellite broadband service to rural

Grantee	Granter	Total Grant Amount	Description
Comunications	RUS-BIP-Sat		residential and commercial subscribers in regions 1, 2, and 3. Approximately 110,150 people and 4,896 businesses stand to benefit. In addition to the jobs this project will support upfront, it will provide a foundation for economic growth and job creation for decades to come.
Windstream Communications	National Telecommunications & Information Administration, RUS-BIP	$2,300,000	This award, matched by $757,950 in private contributions, will allow Windstream to extend its broadband network to provide service to unserved homes and businesses in the areas of Chimayo, Dixon, Peñasco, Rio Chama, Ruidoso, Rio Arriba, Tierra Amarilla, Truth or Consequences and Vallecitas. The project will use industry standard ADSL2+ (Asynchronous Digital Subscriber Line) protocols offering broadband service speeds of up to 12 Mbps. Approximately 10,000 people may benefit, as will 50 businesses and 2 community institutions. The company estimates the project will create 29 jobs.
ZeroDivide	National Telecommunications & Information Administration, BTOP-SBA	$1,384,242	ZeroDivide's Generation ZD Digital Literacy Program focuses on regional training and broadband access program for low-income youth in communities across several Western states that will encourage the development of a new generation of broadband users. The total amount in the left column includes moneys spent in other states. In New Mexico, the organization provided support for a computer lab and training programs at Boys and Girls Club of Santa Fe.

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