New Mexico
Integrated Strategic Broadband Initiative

Preliminary Broadband Findings, Options, and Recommendations

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Some information on networks, capacity, and systems are treated as private and confidential, and so this report contains only what we were able to obtain through public sources and what was freely contributed. This report strives to provide a useful preliminary survey and analysis of plans, initiatives, needs, problems, options and recommendations, for better understanding of next step broadband decision-making processes and actions that may be taken by the State of New Mexico.

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Executive Summary

President Bush, visiting Albuquerque in early 2004, called for "Broadband for All by 2007." Early in 2007, noting lack of action, FCC Commissioner, Michael J. Copps, announced that, "The United States is the only developed country in the world without a Broadband Strategy."

The U.S. continues to fall further behind other nations with respect to broadband deployment and access, technology-based innovation, and overall economic competitiveness. At this same time, New Mexico is near the bottom of the list of states served by broadband telecommunication infrastructure, access and services.

In various surveys, the U.S. tends to rank from 12th to 20th in the world, and New Mexico households are near the bottom of ranking in the nation for broadband access. Over 50% of US households now have broadband access; the percentage of New Mexico households is significantly lower.

While New Mexico is one of the least well-served states in this country with respect to broadband infrastructure, access and services, and while there are many reasons for this, it is important to understand that this does not have to be the case.

New Mexico is promoting its economic and social future with initiatives for renewable energy, film/media production, high speed computing, research and innovation, education, jobs creation, healthcare, and rural development, but the necessary broadband networks and services continues to lag.

Statewide Broadband Initiatives Survey

The following list of statewide broadband projects and initiatives are in various stages of planning or implementation, are not yet adequately connected, and would benefit greatly from a New Mexico Integrated Strategic Broadband Initiative.

- Past years' initiatives to improve telecommunications access and services in New Mexico, (Connect New Mexico, START, Connect Rio Arriba (Chama) and the Taos La Plaza project), have all lost funding, momentum and key champions, and are now nearly inactive or forgotten.
- Qwest Communications, as a result of 2007's AFOR Settlement Agreement with State of New Mexico (PRC), must upgrade specified facilities and infrastructure throughout the state over three years, provide a small rebate to customers, and partially fund State network education projects.
- Many state, county and local government agencies and institutions are as underconnected as the communities they serve. Thirty of the State Courts still have only 56 kilobits per second dial-up access.
- The State Librarian is currently investigating the most efficient and cost effective way to enhance connectivity to 75 libraries.

- Governor Richardson appointed a Board to oversee and make decisions to extend deployment, connections to, and applications for the 40 Gigabit per second National LambdaRail Network, in New Mexico, but progress to extend NM LambdaRail connections has been slow.
- Wire New Mexico, the State's 'mission-critical' fiber and microwave backbone network, is being deployed to provide high capacity state, county and local government inter-connections. In trying to balance public and private interests, the Legislature passed HB-75. HB-75 restricts Wire New Mexico from education, economic development, and other community access and applications and may be a barrier to reducing telecom costs for both the state and other public and private needs.
- The State Department of Homeland Security was awarded a more than $8,000,000 Public Safety Interoperable Communications grant from the U.S. Department of Commerce-NTIA this year. It will provide State and local public safety agencies with critical funding for needed improvements in public safety communications interoperability.
- The State purchased one of the world's three most powerful supercomputers from SGI. The Computing Applications Center requires high bandwidth connections from the Encanto supercomputer to over forty gateway sites throughout the state to support a wide variety of applications (e.g. massive processing, visualization and simulation) for education, health, sciences, environment, and more.
- IDEAL New Mexico, the Public Education Department's distance learning initiative, proposes delivery of online curriculum applications to even the most rural state schools, yet lacks the networked infrastructure to do so adequately. The CHECS program, which provides discounted broadband connectivity services to colleges and universities throughout the state, needs overhauling to meet current network upgrade and competitive pricing demands.
- Internet to the Hogan, based in Crownpoint, has been awarded a connection to the NM LambdaRail at UNM to serve much of the Navajo Nation. Additionally, a number of New Mexico Native American communities have received U.S. Department of Agriculture RUS grants or loans to provide broadband access and services to their under-served, rural, low-density populations. Laguna Pueblo and San Ildefonso are deploying wireless networks, and CLECs such as Sacred Wind are extending tele-services to their rural area communities.
- UNM Health Sciences Center is taking the lead on a multi-partnered project, which was awarded over $15,500,000 by the FCC's Rural Healthcare Pilot Program for development of a rural New Mexico-Arizona broadband tele-health network and services.
- Sandoval County has embarked on one of the nation's most ambitious wireless broadband projects. With a peering connection to NM LambdaRail, the project plans to provide low cost, high speed services throughout a large rural area, including seven native pueblo communities.

- The State Department of Transportation is developing a telecommunications rights-of-way plan for state highways. As an example of a costly lost opportunity is the fact that there is no conduit or fiber along I-25 between Albuquerque and Santa Fe, and that there are no plans to deploy conduit along the RailRunner right-of-way while it is under construction.

Despite all of these developments, many rural New Mexico communities are still severely under-connected to even the most basic broadband (DSL) infrastructure and services. New Mexico's poor rural and urban communities are still on the wrong side of the digital divide. Economic development pressures, plus urgent needs to connect schools, medical centers, libraries, local government and residents, are forcing some cities and counties to act on their own.

- In the little town of Tularosa, the local rural telephone company is now connecting every home, institution and business with a fiber to the premises (FTTP) network, realizing that it would be a high-benefit investment; the switch to fiber costs only a little more than a copper DSL upgrade. Rural exchange carriers are engaged in similar fiber deployments in Portales and other towns.
- The City of Las Cruces, as well as some northern New Mexico municipalities (Los Alamos, Espanola, Santa Fe) are currently considering ownership or partnerships to build their own fiber optic and wireless open service provider networks.
- The City of Albuquerque issued an RFP for a citywide wireless network in the summer of 2007. The RFP was quietly cancelled in the fall. Albuquerque, the state's largest city and main networking hub, has a downtown fiber ring, has critical commercial fiber co-location and peering centers, and recently awarded an open access fiber franchise to local company, CityLink, Inc.
- Santa Fe City and County are currently attempting to bring fiber optic and NM LambdaRail access and services to the Santa Fe Studios film/media production campus in the Community College District, with intentions to possibly extend the fiber network throughout the region.
- The NM Municipal League, led by its former President, Espanola Mayor, Joseph Maestas, passed a Resolution in 2006 and 2007, which advocated for community owned open access fiber broadband networks for New Mexico municipalities.

Governor Richardson's film and media initiative, science, technology, health, education and economic development programs, and energy and water projects all require enhanced broadband fiber and wireless network infrastructure. All would benefit from being included as part of a New Mexico Integrated Strategic Broadband Initiative.

The New Mexico DoIT, with new consolidated authority (by Executive Order), has just released its Strategic IT and Telecommunications Plan for FY 2010. While its authority applies to the works of State agencies and initiatives, DoIT could add strength to and greatly benefit from participation in a New Mexico Integrated Strategic Broadband Initiative.

At recent ad-hoc meetings, numerous State agency, university, and institutional representatives agreed that cooperation on a shared statewide open-access fiber-optic network, rather than separate agency and applications networks, would be of strategic advantage, would result in substantial cost savings, and would eliminate competing proposals for limited State legislative and federal funds. A Governor's Initiative was determined to be the best means to achieve these objectives.

Representatives of state telecommunications providers (ILECs and CLECs) have expressed cautious preliminary interest in and willingness to discuss details for a shared, public-private, open access fiber network. If properly structured to be non-competing, there might be willingness to rescind HB-75, which currently places restrictions on uses of Wire New Mexico (and the NM LambdaRail Network).

Energy utility companies in New Mexico (PNM, FastTrack, etc.) might consider investing in and sharing their fiber networks as part of a larger statewide network. They might also deploy demand-side energy monitoring, metering and management applications, which would result in substantial energy savings, and may even eliminate need for some proposed power plants. Energy providers have substantial fiber assets on poles and transmission towers, with much of it in rural areas of the state, but do not want to be regulated as telecommunications providers.

An innovative State-brokered broadband partnership with the ILECs could benefit the companies and their shareholders, would extend investments and mitigate risks, and could effectively extend future-proof, high-bandwidth deployments and services delivery, while setting a powerful example for the future of cooperative network development in this country.

A shared, open-access fiber network deployed to serve State agencies' needs and initiatives and also accessible for commercial and community interconnections would eliminate many current technical and economic barriers while developing necessary political support for programs that may otherwise be perceived to have limited gains.

The cost to implement a statewide 'broadband for all' strategy should be much lower than the current patchwork approach of building duplicative private networks. This shared network could be built without increased taxes or large increases in state funding. Well over one billion dollars are now spent annually on telecommunications services in this state.

If properly implemented, an open access statewide high performance network could recoup its costs in a timely manner while generating tens of millions of dollars annually for the State and New Mexico communities; would substantially reduce service costs to end users; would result in symmetrical bandwidth provision; and would add many more competitive services choices.

Purpose of an Integrated Broadband Initiative

A New Mexico Integrated Strategic Broadband Initiative could coordinate a number of critical tasks.

- It could coordinate existing and pending network deployments.
- It could address technical, economic, security and strategic decision-making in a more coordinated and inclusive way.
- It could help substantiate planning, investment, cost-savings and economic development benefits for statewide broadband improvements.
- It could strategically coordinate and leverage support for collaborative state networking initiatives, which would otherwise be competing for limited state funds.
- It could offer a comprehensive, dynamic vision for New Mexico's networked broadband future.

With support from the Governor's Office, State agencies and the Legislature, this Initiative should be undertaken with a focus on public/private partnerships that are respectful of existing private sector investments. It should have inclusive, multi-sector state and local representation. It could provide the foundation for advocacy, research and education, partnership development, policy-making, economic investment, seed funding, pilot projects, leadership training and constituency building.

This Initiative can help to more fully realize State programs for economic development and innovation, jobs creation, lifelong education, healthcare, supercomputing applications, film and media production, tele-work, energy conservation and rural community revitalization while shining a spotlight on New Mexico as a much needed example for national broadband policies and strategies.

Report Objectives

There were two objectives in the development of this report. The first, more immediate objective was to determine how the New Mexico Computing Applications Center (NM CAC) might best arrange for high-bandwidth connections between the Encanto supercomputer and 40+ gateway sites around the state.

The second objective was to substantiate the value of a New Mexico Integrated Strategic Broadband Initiative, which is intended to be a long term effort to address this state's networked future.

To identify a technically sound and cost efficient solution for the NM CAC, it is important to understand that effort as interdependent with the second objective of an Integrated Strategic Broadband Initiative for New Mexico. The NM Computing Applications Center (CAC) plans to tele-connect over 40 sites around NM as gateways to the Encanto supercomputer. The Center will partner not only with universities and colleges, but also with businesses, for-profit and not-for-profit organizations, K-12 schools, IDEAL NM,

Wire NM, tele-health centers, museums, libraries, workforce development and economic development groups, and with communities.

Therefore, the CAC needs to draw on a wide range of connectivity capabilities in the state, and has started an initiative to better understand both the public and private aspects of wide-spread connectivity. The NM CAC has determined that there is a need to develop an integrated strategic plan to determine how the Center can meet its needs for high-speed affordable broadband connectivity as well as those of its full range of public and private partners throughout the state of New Mexico.

The report includes a comprehensive needs and assets assessment and analysis; results of fact-finding meetings; preliminary mapping of current and proposed public and private telecom infrastructure in the state; strategies for broadband investments by the State and State agencies, private sector companies, regional community and economic development authorities and local governments; and key recommendations for next steps.

Recommendations

These recommendations represent a wide range of strategies and options that could be pursued to improve connectivity in the state, improve rural access to broadband services, to create more affordable broadband services, and to increase private sector business opportunities.

Implement a Governor's Integrated Strategic Broadband Initiative

Create and facilitate an inclusive, planning, mapping, decision-making and implementation process to identified goals and objectives.

An Advisory Board should be created that represents broad public and private sector interests and participation. Ideally, an Executive Director would be responsible for day to day management and coordination of Initiative processes, and would work closely with state agencies and the private sector.

Working Groups

Form required working groups to make next-step and long-term decisions and recommendations. Working groups should be inclusive of expert representatives from public and private entities.

- Economic and Financial Working Group
- Infrastructure and Services Mapping Working Group (state and local governments should inventory existing fiber assets)
- Technical Working Group

- Legislative, Regulatory, Policy and Legal Working Group (governance, agreements, partnerships, process management, contracting)
- Education & Communications Working Group
- Workshops and Conference Group

Mapping

A Working Group representing the many interests and providers of map data should begin a project to map the state's infrastructure, services, providers and primary user communities.

- Mapping is a necessary tool for decision-support. It is a key means by which to study areas of need in the state, and to do gap analysis.

Demand Aggregation

Aggregate governmental demand for bandwidth. This would mean that separate networking requirements would be integrated and shared by agencies such as the NM CAC, libraries, telehealth facilities, school districts, communities and the commercial services providers, resulting in lower capital costs to each, with potential for income generation for all parties, while paying for the costs of fiber broadband infrastructure deployment and maintenance.

- A shared, open-access fiber network, deployed to serve State agencies' needs and initiatives, accessible for commercial and community interconnections, would eliminate many current technical and economic barriers while developing necessary political support for programs that may otherwise be perceived to have narrow vested interests and limited gains.
- Shared open-access networking could reduce costs and reduce competition for limited legislative dollars and separate, proprietary high-cost network solutions while fostering healthy-marketplace tele-services competition. Shared networks could generate increased revenues for all participating public and private entities.
- Well over one billion dollars are now spent annually on telecommunications in this state, so there are ample funds to implement a statewide 'broadband for all' strategy simply by spending a small fraction of those telecom fees differently.
- If properly implemented, an open access, statewide high-performance network could recoup its costs in a timely manner while generating tens of millions of dollars annually for the State and New Mexico communities; could substantially reduce service costs to end users; could result in symmetrical bandwidth provision; and could add many more competitive service choices.

Public/Private Partnerships

Work with incumbent and competitive local exchange carriers (ILEC and CLEC) to plan and deploy a shared, open-access, high-bandwidth network, to be used for business private sector service delivery; by government, including film and media, K-12 schools and higher education, supercomputing applications center gateways, tele-health facilities, libraries, economic development initiatives; telecommunication services providers; and communities.

- The key to New Mexico's broadband future is to develop public-private partnerships that create win-win economic models that benefit private sector firms by increasing telecom provider access to larger aggregated markets. Public sector entities and institutions can become anchor tenants in new, larger aggregated markets; in an open access marketplace, public sector costs for telecom services should decrease, freeing up funds for other important needs.
- An innovative, state-brokered public/private partnership with the ILECs could benefit those firms and their shareholders, could extend investments and mitigate risks, and could extend future-proof, high-bandwidth deployments and services delivery while setting a powerful example for the future of cooperative network development in this country.
- Energy utility companies in New Mexico (PNM, FastTrack, etc.) could invest in and share their fiber networks as part of a greater statewide network. This would allow them to more quickly deploy demand-side energy monitoring, metering and management applications, which would result in substantial energy savings, and may even eliminate need for some proposed new power plants. Assuring reliable power for networks is also a critical requirement.

Policy and Regulation

The Legislature, Attorney General's Office and the Public Regulations Commission should consider strategies to increase innovation and competition, based upon recommendations from the proposed Policy Working Group.

Infrastructure Development

The State should encourage and help to enable local fiber-to-the-premises (FTTP) deployments. Optical fiber offers the greatest amount of bandwidth, the lowest per-megabit price and the greatest security for transmitted traffic.

- Few cities in New Mexico of any size have the financial capacity to proceed on their own to develop entire fiber-to-the-premise networks. Therefore, the state government could assist cities and towns, and/or regional aggregations of towns to develop FTTP via leveraging state investments (e.g. low interest or no interest loans).

- Local and regional telecom infrastructure projects have a variety of funding sources available, including general obligation bonds, municipal leasing, revenue bonds, self help initiatives, and private investment and loans.
- NM DoT, local Public Works departments and other agencies should be encouraged to update conduit ordinances to encourage or to require the option of installing duct doing construction, renovation or repair along highways, roads and streets; utility, sewer and water lines rights of way. Installation of adequately sized conduit for future fiber deployment should be specified. The largest cost of fiber deployment, by far, is the initial construction – and this cost can be avoided or greatly reduced by this policy.
- Cooperation and economically fair incentives are also needed to facilitate permitting processes.

Funding

A State Broadband Improvement Fund should be created. The proposed Economic Working Group should consider and make recommendations for the creation of a New Mexico Broadband Improvement Fund. The fund would provide financial assistance (including grants and loans) to facilitate broadband education, applications and services development, and infrastructure deployments, especially in underserved rural areas and communities.

- Investment moneys for this Fund may come from the offset savings and income derived from enacting Initiative recommendations, including service income from open, shared networks; energy savings from demand-side electricity management; telework and telecommuting; cost-saving conversion of outmoded, legacy-based networking systems, to new, future-proofing technology solutions; tax and investment incentives; and other solutions.
- Pilot projects and regional/municipal, public-private broadband networking initiatives, could be supported with tax incentives and innovative, competition-leveraging initiatives.

Outreach and Education

Initiate an outreach and education process to help government staffers, legislators, civic, business and institutional leaders and community representatives better understand the community and economic development value of investment in telecom infrastructure.

- Prepare online materials, print publications, and conduct regional community workshops
- Promote successful New Mexico State government and community-based broadband networking projects as part of the education effort.
- Document and evaluate the progress of local, regional, and state broadband initiatives.

- Host a (national) NM Broadband Economics Conference: “Info/Eco”, (Spring 2009). Though there are many conferences that address the technologies for broadband networking, there has been very little attention focused on the sustainability and economic value of such projects. New Mexico could take the lead on this as key part of it’s Integrated Strategic Broadband Initiative.

Background

Technical Background

FCC Updated Definitions of Broadband

Earlier this year the FCC finally released new definitions of broadband.

- First Generation: 200 Kilobits Per Second up to 768 Kilobits Per Second
- Basic Broadband: 768 Kilobits Per Second to 1.5 megabits per second (Mbps)
- 1.5 Mbps to to less than 3 Mbps
- 3 Mbps to less than 6 Mbps
- 6 Mbps to less than 10 Mbps
- 10 Mbps to less than 25 Mbps
- 25 Mbps to less than 100.0 Mbps
- 100 Mbps and beyond

This is a major improvement over the old definition of "200 kilobits" as broadband. By this old definition, the country has very high levels of broadband penetration, but made the U.S. the laughingstock of the rest of the world. In much of Europe, residential broadband tends to be north of 40+ MEGABITS, or about 200 times more capacity than the FCC definition.

The graded scale is useful because it can provided benchmarks to measure progress in a community or region. If the FCC has provided targets, that would have been even better. For example, a ten year target could be to have 90% of businesses and homes in the "100 Mbps and beyond" category, and indeed, U.S. community broadband projects like the ones in Danville, Virginia and Galax, Virginia are deploying "100 Mbps and beyond" today. CityLink's effort in Albuquerque is the only residential 100 megabit fiber project identified in New Mexico.

The Open Networking Model

There are many reports indicating that the U.S. is falling further behind other nations, with regard to broadband access, innovation and global economic status. It is clear that our current broadband deployments model is not working in the way that it must.

The open networking model is not so much based on a technical solution as it is on an economic model of creating large, aggregated markets for telecom with multiple services and multiple service providers--which creates competition, choice, and lower prices for services. Open services networks are based upon:

- Shared infrastructure to reduce the cost of building and maintaining the network
- Open, competitive marketplace of content and services

- Increased opportunities for local and regional businesses, especially local and regional service providers
- Equitable, affordable access throughout the state
- Symmetric connectivity to facilitate new work from home and home-based entrepreneurial activities
- Increasing local economic development activity by creating new opportunities for local income generation
- Win-win economic outcomes for providers and service users

Proposal for an Open Broadband Future

The following is extracted from the Executive Summary of the July 2005 White Paper from the Public Knowledge white paper titled *Principles for an Open Broadband Future*.

www.publicknowledge.org/content/papers/open-broadband-future

The U.S. needs to enact a clear set of principles for broadband services to ensure that these networks are widely deployed, open, affordable and accessible to all consumers. Without such principles, there is great danger that any future legislation on these issues will become a grab bag of special interest provisions. Therefore, the following principles should be the starting point for any telecommunications legislation ...

Broadband networks should be:

1. open to competition from any entity, including municipalities;
2. open to the attachment of any equipment the user chooses, as long as it does not harm the technical operation of the broadband network;
3. open and accessible to consumers, application developers, and information service providers and to other networks, without restrictions or degradation, except for law enforcement or for network management purposes;
4. open, available and affordable to all consumers, regardless of income, race, geographic location, or disability; and
5. Open to a maximally efficient number of licensed and unlicensed wireless providers.

National Background and Initiatives

With a new administration entering office in our nations capitol next year, interest groups from many public and private sector groups are now calling for a national broadband strategy.

There are now over ten states, including Virginia, Kentucky, Tennessee, North Carolina, New York, Massachusetts, Colorado and California with official Governors' broadband initiatives.

The goals of many state initiatives are to bridge digital divides; to address network neutrality issues; to produce infrastructure mapping as the basis for decision-making for enhanced networked deployment and access; to affect possible regulatory changes; and to spur economic development and innovation, extended education, tele-healthcare services and e-government strategies.

Many of these states are, in part, simply enacting strategies that subsidizing, in one way or another, continued investment in copper (DSL) systems and services. While rural areas benefit in the short term from increased access to low performance broadband, rural areas dependent on copper-based delivery of broadband will be at a significant economic development disadvantage when trying to compete with other regions (and countries) with fiber in rural areas. There are also (12) states that have legislated barriers to local or municipal broadband entry.

New Mexico has chosen neither of these strategies, and is now poised to set a national example while pragmatically addressing its own on-the-ground needs.

Legislative Background

Nationally, a number of Senate and House bills are pending, or being prepared and argued. A few of note, follow.

House Resolution 1292, June 20, 2008

It is resolved that the House of Representatives "establishes a national next-generation broadband network goal to bring, by 2010, with capability of transmitting data at 10 megabits per second and by 2015 at 100 megabits per second.. to begin, by the end of 2009, to enact specific legislation and adopt policies to implement this"

The Broadband Data Improvement Act (S.1492 and HR3919)

Currently, there are two bills pending before Congress (S.1492) the Broadband Data Improvement Act and (HR 3919) the Broadband Census of America Act of 2007. These bills would improve information gathering about current broadband deployment and assist in targeting resources to areas in need of such services. A recent FCC order requires more focused broadband data collection from broadband providers but does not address other important broadband mapping elements contained in the pending legislation.

Congress may adopt legislation this year that provides federal government support for State initiatives using public-private partnerships to identify gaps in broadband coverage and to develop both the supply of and demand for broadband in those areas. The ability to accelerate deployment and adoption by bringing together governments, broadband providers, business, labor, farm organizations, librarians, educators, and consumer groups in public-private partnerships is greater than the ability of these diverse players standing alone.

Adopting a national policy to stimulate increased take rates where broadband is already available, and deployment where it is not, could have dramatic and far reaching economic impacts. For example, a Connected Nation study released in February 2008 estimated the total annual economic impact of accelerating broadband access across the nation to be more than $134 billion. In addition, to the $134 billion total benefit, the study found that increasing broadband adoption by another seven percent could result in:

- $92 billion through an additional 2.4 million jobs per year created or retained;
- $662 million saved per year in reduced healthcare costs;
- $6.4 billion per year in mileage savings from unnecessary driving;
- $18 million in carbon credits associated with fewer CO2 emissions.
- $35.2 billion in value from hours saved per year from accessing broadband at home

The Broadband Census Act of 2007

The Broadband Census Act of 2007 will improve collection of nationwide broadband data.

On October 10, 2007, New Mexico Congresswoman Heather Wilson co-sponsored the Broadband Census Act of 2007. The Telecommunications and Internet Subcommittee of the House Energy and Commerce Committee unanimously approved the Broadband Census of

America Act of 2007, which promotes the further development of nationwide broadband services by improving collection of data and mapping. Under the bill, the Federal Communications Commission would use a consumer survey to gather pricing and service information rather than rely on telecom. companies for data. The bill also aims to assist under-served communities in taking concrete steps to improve broadband deployment in their areas.

The Broadband Census Act of 2007 provides for a detailed and comprehensive census of broadband availability across the nation. The bill also directs the National Telecommunications and Information Administration (NTIA) to establish a grant program to assist local communities in assessing their broadband capabilities.

The Broadband Census Act of 2007 will improve the quality and quantity of the data the Government collects concerning broadband deployment, as well as facilitate the construction of a nationwide inventory map of broadband facilities. The bill will direct the FCC to conduct periodic consumer surveys concerning broadband adoption and usage and assist local communities in increasing broadband usage and deployment in their areas.

There is a growing concern that the FCC inadequately collects data on broadband penetration. This legislation will allow the U.S. Government to better gather quality information on broadband services that are being provided, said Wilson. Local and rural com-

munities in New Mexico will benefit from this legislation by providing them with grants to increase broadband usage and deployment.

Federal Agencies and Programs

A number of federal agencies and departments are responsible for particular aspects of this nation's networked telecommunications future, through regulatory and statutory authority; grants, loans and other funding programs; and recommendations to Executive, Legislative and Judiciary bodies, as well as to States and municipalities.

FCC

The Federal Communications Commission (FCC) is an independent United States government agency, established by the Communications Act of 1934, and charged with regulating interstate and international communications by radio, television, wire, satellite and cable. The FCC's jurisdiction covers the 50 states, the District of Columbia, and U.S. possessions.

The FCC is directed by five Commissioners, appointed by the President and confirmed by the Senate for 5-year terms, except when filling an unexpired term. Only three Commissioners may be members of the same political party. None of them can have a financial interest in any Commission-related business.

The Commission staff is organized by function. There are seven operating Bureaus and ten Staff Offices. The Bureaus' responsibilities include: processing applications for licenses and other filings; analyzing complaints; conducting investigations; developing and implementing regulatory programs; and taking part in hearings. www.fcc.gov

FCC Report on Cable Regulation

(Excerpt) The Federal Communications Commission released a lengthy report on Thursday, September 4, which suggests that the FCC ought to regulate Internet access provided by cable operators….

The Congress, courts, and until recently, the FCC, have held to a distinction between "telecommunication services" and "information services" (also referred to as "basic" and "enhanced," respectively). The former are subject to FCC regulation -- the latter are not.

The Report argues … that with technological convergence "it will become increasingly difficult to maintain that particular facilities are 'cable' as opposed to 'telecommunications'." And because of this, existing "regulatory categories," claims the Report, "must necessarily collapse of their own weight in the digital communications world of tomorrow."

1984 Cable Act defined cable service as "the one-way transmission to subscribers of video programming or other programming service, and subscriber interaction, if any,

which is required for the selection of such video programming or other programming service."

The words "one-way transmission" have long been understood to mean that Internet access, which involves interactive two-way communication, is not covered by the 1984 Cable Act.

However, the 1996 Telecom Act modified the definition of "cable service" by inserting the words "or use," so that the definition now reads, "the one-way transmission to subscribers of video programming or other programming service, and subscriber interaction, if any, which is required for the selection or use of such video programming or other programming service."

The Report also contends that the changing nature of the Internet, particularly its assertion that it is becoming increasingly like TV, warrants regulating cable based Internet access like old fashioned cable TV monopolies.

FCC Telemedicine Pilot Program

Goal: To facilitate the creation of a nationwide broadband network dedicated to healthcare, connecting public and non-profit healthcare providers in rural and urban locations.

Provides funding for up to 85% of an applicants costs of deploying a dedicated broadband network connecting healthcare providers in rural and urban areas within a state or region.

Provides funding for up to 85% of an applicants costs of connecting the state or regional networks to Internet2 or National LambdaRail, which are both dedicated nationwide backbones. Applicants may also request connection to the public Internet.

All requests for funds allocated to each project must go out for competitive bid to approved service providers using USAC (Universal Services Administrative Company) form 465 with multiple RFPs posted for 28 days before a service provider can be selected. All funds go directly from USAC to the service provider, not to the institution managing the project.

USAC

The Universal Service Administrative Company (USAC) is an independent, not-for-profit corporation designated as the administrator of the federal Universal Service Fund by the Federal Communications Commission (FCC). USAC administers Universal Service Fund (USF) programs for high cost companies serving rural areas, low-income consumers, rural health care providers, and schools and libraries. The Universal Service Fund helps provide communities across the country with affordable telecommunications services.

The Universal Service Fund is one fund with four programs. The four programs are:

- High Cost - This support ensures that consumers in all regions of the nation have access to and pay rates for telecommunications services that are reasonably comparable to those in urban areas.
- Low Income - This support, commonly known as Lifeline and Link Up, provides discounts that make basic, local telephone service affordable for more than 7 million low-income consumers.
- Rural Health Care - This support provides reduced rates to rural health care providers for telecommunications and Internet services so they pay no more than their urban counterparts for the same or similar telecommunications services.
- Schools & Libraries - This support, commonly referred to as E-rate support, provides affordable telecommunications and Internet access services to connect schools and libraries to the Internet. This support goes to service providers that provide discounts on eligible services to eligible schools, school districts, libraries, and consortia of these entities.

E-Rate

When the Telecommunications Act of 1996 was signed into law, for the first time schools and libraries became eligible for Universal Service support. An explicit goal of the Act is to ensure that schools and libraries have affordable access to advanced telecommunications.

The E-Rate is the discount that schools and libraries will receive for the acquisition of telecommunication services. Eligible schools and libraries can receive discounts of 20-90 percent on telecommunication services, Internet access and internal connections necessary for deploying technology into the classroom.

DoC NTIA

A bureau of the U.S. Department of Commerce, the National Telecommunications and Information Administration (NTIA) is the President's principal adviser on telecommunications and information policy issues, and in this role frequently works with other Executive Branch agencies to develop and present the Administration's position on these issues. Since its creation in 1978, NTIA has been at the cutting edge of critical issues. In addition to representing the Executive Branch in both domestic and international telecommunications and information policy activities, NTIA also manages the Federal use of spectrum; performs cutting-edge telecommunications research and engineering, including resolving technical telecommunications issues for the Federal government and private sector; and administers infrastructure and public telecommunications facilities grants.

It is anticipated that the NTIA may, under the next Presidential administration, and with newly enacted legislation, be the agency that provides grants to states, for broadband infrastructure and services mapping and ‘digital-divide bridging’ initiatives.

NTIA - Public Safety Interoperable Communications (PSIC) Grant Awards

On September 30, 2007, the PSIC Grant Program awarded $968,385,000 to fund interoperable communications projects from the 56 States and Territories. These grants will provide public safety agencies with critical funding to contribute to meaningful and measurable improvements in public safety communications interoperability through the full and efficient use of all telecommunications resources. The program presents a unique opportunity for communities to leverage innovative technologies and solutions. The Department of Commerce is committed to improving communications interoperability among our nation's first responders.

In August, the States and Territories submitted applications for PSIC funds, which included a brief narrative on the process for choosing proposals for public safety organizations. By December 3, 2007, each State and Territory must identify projects to be funded under the award, and they must submit an Investment Justification (IJ) for those projects along with the Statewide Communications Interoperability Plan. Each IJ will include up to 10 Investments (projects) that strongly align with the goals. All public safety organization interested in PSIC funding will be able to seek funding through their State Administrative Agency.

Funding became available in early 2008, as NTIA approved each investment. All grant projects are to be completed by September 30, 2010. www.ntia.doc.gov/psic/awards.html

USDA RUS Programs

U.S. Department of Agriculture, Rural Utilities Service, Telecommunications Program, Broadband Division

Community Connect Broadband Grant Program

The Community-Oriented Connectivity Broadband Grant Program is designed to provide financial assistance to furnish broadband service in rural, economically challenged communities where such service does not currently exist. Grant funds may be utilized to deploy broadband transmission service to critical community facilities, rural residents, and rural businesses and to construct, acquire, or expand, equip, and operate a community center that provides free access to broadband services to community residents for at least two years. Grants are awarded, on a competitive basis, to entities serving communities of up to 20,000 inhabitants to ensure rural consumers enjoy the same quality and range of telecommunications service as are available in urban and suburban communities. http://www.usda.gov/rus/telecom/commconnect.htm.

Distance Learning and Telemedicine Grant Program

The Distance Learning and Telemedicine program continues its charge of bringing electronic educational resources to rural schools and improving health care delivery in rural

America, through use of advanced telecommunications technologies. http://www.usda.gov/rus/telecom/dlt/dlt.htm

Broadband Loan Program

The Rural Broadband Access Loan and Loan Guarantee Program is designed to provide loans for funding, on a technology neutral basis, the costs of construction, improvement and acquisition of facilities and equipment to provide broadband services to eligible rural communities. The Programs' goal is to ensure that rural consumers enjoy the same quality and range of telecommunications services that are available in urban and suburban communities. http://www.usda.gov/rus/telecom/broadband.htm .

New Mexico Needs Assessment

New Mexico Broadband Needs

What is Broadband?

There is much confusion about the "true" definition of broadband. From the perspective of economic development, there can be no upper limit on the definition of broadband. Saying that broadband (as an example) is 5 megabits/second of bandwidth or 10 megabits/second is to immediately tell businesses in the region that there will be infrastructure limits on their ability to do business in the future–it is dictating the size of truck that can be used to deliver goods and services. Here is the only appropriate definition of broadband:

> ***Broadband is whatever amount of bandwidth is needed to support a business' ability to compete in the global economy.***

Broadband is a community and economic development issue, not a technology issue. The essential question is not, "What system should we buy?" or "Is wireless better or cheaper than fiber?" Instead, the question is:

> ***"What do our businesses, residents, and state agencies need to be able deliver services and to compete globally over the next thirty years?"***

If New Mexico is to make investments in broadband and telecommunications infrastructure, it is absolutely critical that those investments are able to scale gracefully to meet business and economic development needs for decades. This drives the solution towards an integrated fiber and wireless system, rather than a wireless only service orientation. Wireless is able to provide basic Internet access needs, but is not able to support advanced video and multimedia services. Some off the shelf business videoconferencing systems in use today require a minimum of 50 megabits of bandwidth--far beyond the capabilities of any wireless system. Two key concepts that should drive community investments in telecom are:

> ***"Broadband" is not the Internet***
>
> ***Bandwidth is not a fixed number***

Broadband and "the Internet" are often used interchangeably, but this has led to much confusion. Broadband refers to a delivery system, while "the Internet" is just one of many services that can be carried on a broadband network. The challenge for communities is to ensure that businesses and homes have a broadband network with sufficient bandwidth to deliver all the services that will be needed and expected within the next three to four years, including but not limited to "the Internet."

Bandwidth needs for the past decade have been growing by 25% to 50% per year, and show no sign of slowing. As computers and associated hardware (e.g. video cameras, audio equipment, VoIP phones) become more powerful and less expensive, new applications and services are continually emerging that drive demand for more bandwidth. The table below indicates the likely growth in bandwidth, based on current uses, emerging high end equipment, and research lab/university/government networks already deployed and in use. Lightpaths refer to placing multiple wavelengths (paths) of light on a single fiber. High end commercial equipment already in production is routinely placing 20+ lightpaths on a single fiber, with each lightpath capable of carrying data at gigabit speeds. This technology will move down to ordinary business and residential network equipment over the next ten to fifteen years. Current fiber being installed will require only a relatively inexpensive equipment upgrade to increase carrying capacity over the same fibers.

	Next 2-4 years	Next decade	Twenty years
Small business needs (1-9 employees)	10-25 megabits of bandwidth	100 megabits of bandwidth	Gigabit+ bandwidth
Medium-sized business needs (10-100 employees)	50-100 megabits of bandwidth	Gigabit bandwidth	Multiple gigabit circuits and lightpaths
Large business needs (100-1000+ employees)	Gigabit+ bandwidth	Multiple gigabit connections	Multiple gigabit circuits and lightpaths
Residential needs	25-50 megabits of bandwidth	100 megabits of bandwidth	Multiple gigabit circuits and lightpaths

Time required to download a two-hour, DVD-quality movie	
56 K modem	13 days
5 megabit DSL	3 hours, 22 minutes
8 megabit cable modem	2 hours, 6 minutes
100 megabit fiber	10.4 minutes
Source: Utopia fiber-to-the-home Internet consortium (Utah)	

Service Needs Analysis

FCC Commissioner Deborah Tate spoke in April, 2008 at the Broadband Properties conference in Dallas, Texas. Commissioner Tate noted that:

- Demand for bandwidth has been doubling every two years for the last ten years.

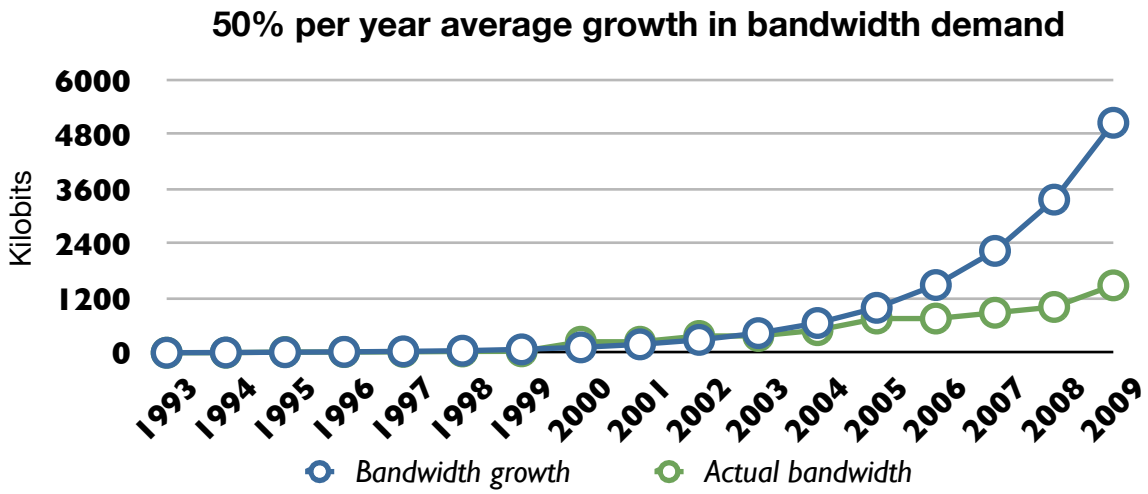
- By 2015 (just seven years from now), the FCC thinks bandwidth requirements will be fifty times (50x) what they are today.
- In Japan, where they have had 100 megabit connections to homes and businesses available for several years, they are already observing congestion--meaning 100 megabit pipes are already filling up.
- Americans are watching more than 10 billion videos per month over the Internet. The table and chart below illustrate the growth in average bandwidth to the home over the past fourteen years.

The FCC's prediction of a 50x increase in bandwidth needs in just seven years indicates that DSL and cable modem services will be adequate, especially for businesses, but also for home uses of telecom services.

At the same conference, a talk by a DirecTV offical provided additional insight into residential bandwidth needs. The DirecTV speaker noted that one of their biggest subscriber complaints is that the company does not have enough HD format programming. He went on to note that a single channel of "standard" HD content uses 10 megabits of bandwidth when delivered via IP-TV, and a live event like a race or sporting event (e.g. football) requires 15 megabits of bandwidth. The firm is already delivering video programming to end users using Internet-based IP-TV formats, and noted that many buildings and homes do not have the internal cabling to support the IP-TV bandwidth needs. He also indicated that their early IP-TV users cannot tell the difference between IP-TV delivery of video and traditional cable/satellite delivery.

In 1993, the year that the Web-based Internet became a commercial service, the average connection speed was 14,400 bits per second. At the end of 2007, the average bandwidth to the home was fifty times that for DSL service (768,000 bits per second), and over 70 times that for the typical cable modem connection (about 1,000,000 bits per second). DSL speeds have flattened out (the green line on the chart) because DSL capacity has flattened out, not because demand has diminished. The blue line (average bandwidth) has been increasing steadily year by year.

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Average bandwidth	14.4	19.1	25.3	33.5	44.4	58.8	88.2	132.3	198.5	297.7	446.6	669.9	1004.8	1507	2260.8	3391.2	5086.8
Actual bandwidth	14.4	14.4	28.8	28.8	33	42	45	256	256	384	384	512	768	768	896	1024	1500

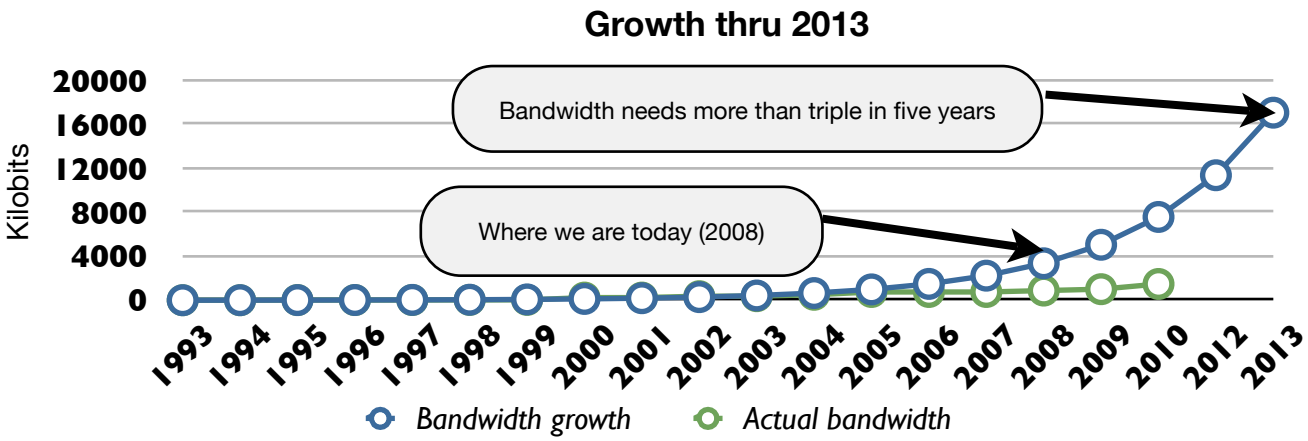


Service Bandwidth Needs for the Next Five Years

The table and chart below extends the average bandwidth trend out an additional five years. Using the same growth rate that has been documented for the past fourteen years, it is easy to see that DSL does not have the capacity to meet anticipated needs. In fact, in the next five years, bandwidth demand will triple if historical growth rates are maintained--and the average annual growth has been 32% per year since 1993. There is no reason to believe that this will change in the short term. The growth of video-oriented content like YouTube and many other video content services, including emerging movies on demand, will likely push bandwidth demands even higher than the historical growth rate.

As noted above, in the early nineties, average yearly growth was 32%, and in the late nineties accelerated to 50% a year or more.. The future projections for service needs later in this section are designed on an average annual growth of just 5%. ***The lower rate used for projections in this report provides a very conservative estimate of future need.*** The lower rate is also used because eventually, bandwidth needs to businesses and homes will flatten out as service demands mature and the infrastructure catches up. Skeptics who may suggest that no more bandwidth is needed than what is currently available may wish to study these charts carefully.

The business demand aggregation studies on the following pages illustrate why a wireless only strategy for broadband is likely not only to fail strictly from a capacity perspective, but could also be dangerous from an economic development perspective. The amount of bandwidth that will be needed in five years, just to support the business community, cannot be provided by wireless alone. A combined telecommunications infrastructure that is able to provide fiber connections to most businesses will be important to retain existing businesses and to help attract new businesses to communities.



Service and Gap Analysis

We are slowly making the first steps toward media-rich communities. In these communities, residents will have, literally, a world of information at their fingertips. Residents of media–rich communities will be able to access virtually any movie ever made with a few mouse clicks. They will be able to choose from a rich variety of music, search the Web, and access massive archives of multimedia video and audio programming. The characteristics of media-rich communities of the future includes:

- Abundant, inexpensive bandwidth locally
- Massive connection to the rest of the world
- Community information utility vested in the community
- A knowledgeable and engaged citizenry
- Rich local content from a multitude of sources
- A wide variety of information devices, including video monitors, distributed audio systems, converged media centers (computers), PDAs, wireless handheld phones, and tablet computing devices.

These media–rich communities will be attractive to an emerging new group of businesspeople and entrepreneurs that typically are well-educated, own their own businesses, and are making choices about where they lived based on family needs and interests, rather than business interests. This new breed of entrepreneurs place a high value on the kinds of amenities that contribute to a good quality of life–traditional neighborhoods, vibrant downtown areas, a wide range of cultural and recreation opportunities, walkable destinations for personal and business needs, good schools, and a sense of place.

These businesspeople and their families make relocation decisions based on quality of life only where there is abundant and affordable broadband, because broadband is the enabler of these new Knowledge Economy businesses. Many of these micro-enterprises are located in homes, and so neighborhoods are now business districts. Broadband is reshaping our communities in positive ways–less commuting, less need for high capacity transporta-

tion systems, more focus on community and civic life, and more emphasis on personal relationships.

The telecommunications business has already begun to move from a Manufacturing Economy model of dedicated, privately owned networks carrying one or just two or three services (e.g. voice, video, and Internet), to a Knowledge Economy model that is based on a single, shared infrastructure that can offer a wide variety of services from many different providers. These emerging services need much more bandwidth than is currently available on copper-based systems.

Residential Bandwidth Needs

The two tables below provide estimates of bandwidth needed for typical residential services which will be available in near future. In a next generation network all services will be delivered over a single network infrastructure which will require an access network that can support providing most services to most consumers simultaneously. Today's shared networks (cable and wireless in particular) rely on the "bursty" nature of traffic to provide services to end users. If all end users were consuming their "advertised" bandwidth today's cable and DSL networks would grind to a halt.

In fact, they already are; some cable providers have begun to receive heavy criticism for undocumented manipulation of data traffic. Existing cable modem network users are overwhelming the digital cable networks that were upgraded as little as three or four years ago, and the firms have had to artificially reduce the bandwidth available for certain kinds of high bandwidth services (e.g. peer to peer file sharing). Some cable providers have even run into capacity issues with the TV portion of their networks, and some consumers have observed that some HD TV channels have been so highly compressed that picture quality has been noticeably degraded when compared to the same channel delivered by satellite.

Services that are listed as "analog" or "out of band" refer to their delivery on a separate network (i.e. not via the "Internet"). Within five years, a single channel of HD television that is watched via a video on demand service (e.g. NetFlix, Blockbuster, iTunes, etc.) will use 5 to 10 megabits of bandwidth, with a total download file size of several gigabits. A dual layer Blu-Ray movie disc has a capacity of 50 gigabits. This format delivers high quality HD movies, and over time, home users will expect to be able to download movies in the high quality HD format.

Residential Services	Now	5 years	10 years
Telephone (single line)	analog	64 kbs	256 kbs
TV (standard definition)	analog/out-of-band	2.5 Mbs	5 Mbs
CD Quality Voice		256 kbs	512 kbs
HDTV (single channel)	out-of-band	12 Mbs	12 Mbs
Internet	768 kbs	3 Mbs	10 Mbs
Data Backup		1 Mbs	5 Mbs
Security Services		256 kbs	1 Mbs

Residential Services	Now	5 years	10 years
Telehealth		2 Mbs	12 Mbs
Video Phone		1 Mbs	8 Mbs
"Work at home"	768 kbs	3 Mbs	5 Mbs
Distance Learning	768 kbs	3 Mbs	5 Mbs

The next table shows the bandwidth needs for single household of two people. Network design requires a system than can meet peak demand across the entire network, meaning the network must be able to deliver peak bandwidth demand to a majority of households at the same time. Super Bowl Sunday is a typical example of a day when a majority of households may be watching a video at the same time. Political debates, season finales of popular shows, and even a typical Saturday afternoon during football season may see many households trying to access multiple channels of video simultaneously. This table shows the severe gap between current DSL, wireless, and cable modem options and projected future demand.

Residential Services	5 years			10 years		
	Instance of a Service	Concurrent Usage	Household Bandwidth Requirement (Mbs)	Instance of a Service	Concurrent Usage	Household Bandwidth Requirement
Telephone (single line)	64 kbs	2	0.128	256 kbs		0
TV (standard definition)	2.5 Mbs	2	5	5 Mbs		0
CD Quality Voice	256 kbs		0	512 kbs	1	0.512
HDTV (single channel)	12 Mbs	1	12	12 Mbs	3	36
Internet	3 Mbs	2	6	10 Mbs	2	2
Data Backup	1 Mbs		0	5 Mbs		0
Security Services	256 kbs		0	1 Mbs		0
Telehealth	2 Mbs		0	12 Mbs		0
Video Phone	1 Mbs		0	8 Mbs	1	8
"Work at home"	3 Mbs	1	3	5 Mbs	1	5
Distance Learning	3 Mbs	1	3	5 Mbs	1	5
Peak Usage of Average Residential Bandwidth (Megabits)			**29**			**57**

Business Bandwidth Needs

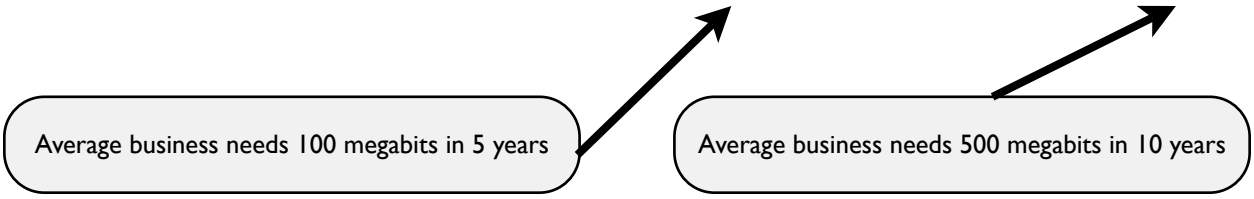
The tables below provide projections of business bandwidth needs. As noted above, "analog" and "out of band" denotes that these services are currently delivered via "old" dedicated networks. Over the next five to ten years, businesses will expect to purchase all of these services (e.g. video and telephone) on a single broadband network connection.

Business Services	Now	5 years	10 years
Telephone (10 lines)	analog	640 kbs	2.5 Mbs
TV (standard definition)	analog/out-of-band	8 Mbs	8 Mbs
CD Quality Voice (10 lines)		2.5 Mbs	5 Mbs
HDTV (single channel)	out-of-band	18 Mbs	18 Mbs
Internet	1.5 Mbs	5 Mbs	15 Mbs
Data Backup		5 Mbs	20 Mbs
Security Services	analog/out-of-band	1 Mbs	5 Mbs
Telehealth (provider)		45 Mbs	1 Gbs
Video Phone (10 lines)		10 Mbs	80 Mbs
Home Based Worker Access		50 Mbs	250 Mbs
Workforce Training		18 Mbs	150 Mbs
HD Video Conferencing		45 Mbs	250 Mbs

The cost of fuel is already impacting business travel decisions, and more and more businesses will invest in HD quality business videoconference systems to reduce the need for travel. These HD systems require substantial bandwidth; a two way HD video conference requires 20-25 megabits during the conference, and a three way conference requires 30-35 megabits during the conference. As more workers try to reduce the cost of driving to and from work by working part or full time from home, the business location must provide network access (Virtual Private Network, or VPN) to the employees working from home. These home-based workers will make extensive use of videoconferencing to attend routine office meetings remotely and to enhance communications with co-workers, including videoconferences with other home-based workers in the company. A VPN network providing remote access to just two or three home-based employees could require 50 megabits of bandwidth during normal work hours.

Business Services	5 years			10 years		
	Instance of a Service	Concurrent Usage	Business Bandwidth Requirement (Mbs)	Instance of a Service	Concurrent Usage	Business Bandwidth Requirement
Telephone (10 lines)	640 kbs	9	0.576	2.5 Mbs	3	0.75
TV (standard definition)	8 Mbs	1	8	8 Mbs	1	8
CD Quality Voice (10 lines)	2.5 Mbs		0	5 Mbs	3	1.5
HDTV (single channel)	18 Mbs	1	18	18 Mbs	3	54
Internet	5 Mbs	4	20	15 Mbs	4	60
Data Backup	5 Mbs	1	5	20 Mbs	1	20
Security Services	1 Mbs	1	1	5 Mbs	1	5
Telehealth (provider)	45 Mbs		0	1 Gbs		0
Video Phone (10 lines)	10 Mbs		0	80 Mbs	3	24
Home Based Worker Access	50 Mbs		0	250 Mbs		0
Workforce Training	18 Mbs		0	150 Mbs		0

Business Services	5 years			10 years		
HD Video Conferencing	45 Mbs	1	45	250 Mbs	1	250
Peak Usage of Average Business Bandwidth (megabits)			**98**			**423**



Organizational and Economic Development Needs

The table below identifies the organizational and economic development needs associated with community investments in broadband infrastructure. Selection of the right network equipment vendors and best practice in the construction of the network are necessary but not sufficient. A well-engineered network may not meet other needs and could ultimately fail if the wrong business model is chosen or the network costs too much to operate.

Needs	Description
Meet community and economic development needs	Community and economic development goals and objectives drive technology decisions, not vendor sales goals.
World class engineering	Invest in open access infrastructure that will last for decades, using best of class engineering designs and solutions
World class network systems	Invest in network systems designed specifically for shared public/private use. Systems should be easy to manage and maintain, and should be easy for service providers to use.
Financially sustainable business model	Use demand aggregation to create the right size marketplace for services. Operate the system as a shared public/private partnership, and ensure that government does not compete with business.
Low cost operations	Systems should be easy to operate, and should be highly automated to minimize need for expensive staff. Outsource most operations and maintenance to qualified private sector firms to create jobs and business opportunities.
Create opportunities for business	Aggregate demand to create new business opportunities for service providers. Keep prices low to encourage widespread use.
Create revenue opportunities for local government	Properly designed open access systems can create new opportunities for service providers, lower the cost of telecom services for all, and create new revenue streams for participating local governments. These revenue streams can be used for other community and economic development projects.

Demographic Analysis

Population of the region

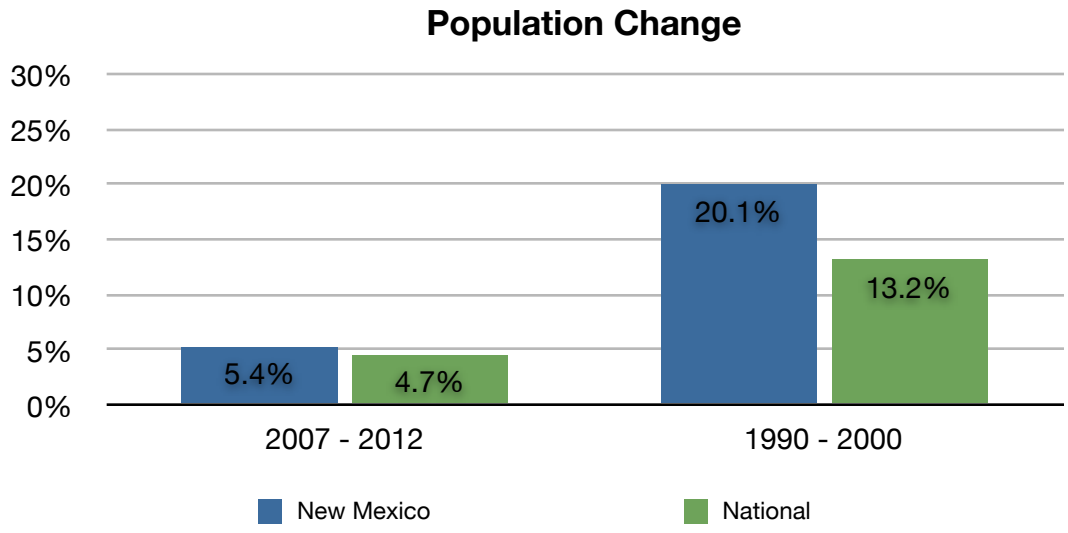
- New Mexico - population 1,971,127 (estimated change between 2000 and 2012: +5.4%)
- United States – population 301,825,750 (estimated change between 2000 and 2012: +4.7%)

Growth for New Mexico has been steadily increasing over the past two decades. Improved telecom services and more affordable telecom services would add to New Mexico's attractiveness as a state in which to live, and competitiveness as a place in which to conduct business.

Population of the State is approximately 2,000,000. With present, well intended community and economic development planning, New Mexico could substantially add to the quality of life of its current and future residents, families and working populations.

		New Mexico		National
	Population	% Change	Population	% Change
2012	2,077,985	5.4	316,054,480	4.7
2007	1,971,127		301,825,750	
2000	1,819,046	20.1	281,421,906	13.2
1990	1,515,074		248,710,012	

Source US Bureau of Census 1990 and 2000 Decennial Census SF1 DP-1
* US Census Bureau Population Estimates Program
* MediaMark Research

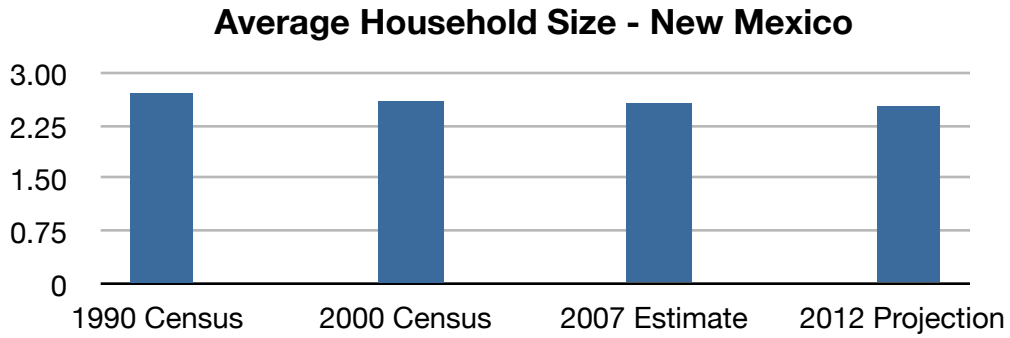


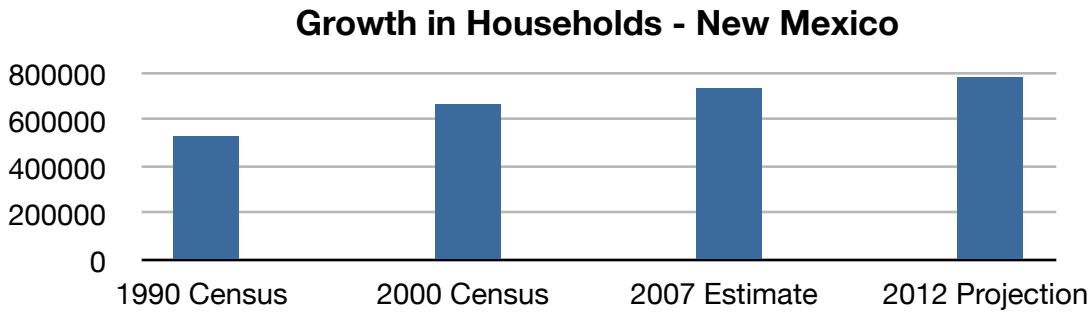
Household Size and Growth Trends

In the state, the number of persons living in the average household is declining slightly while the number of households is rising. This reflects a national trend of decreasing household size. The size of an average household and the number of households is an important set of data when predicting broadband take rates and modeling potential income. Most services are subscribed on a per household basis, rather than on a per person basis.

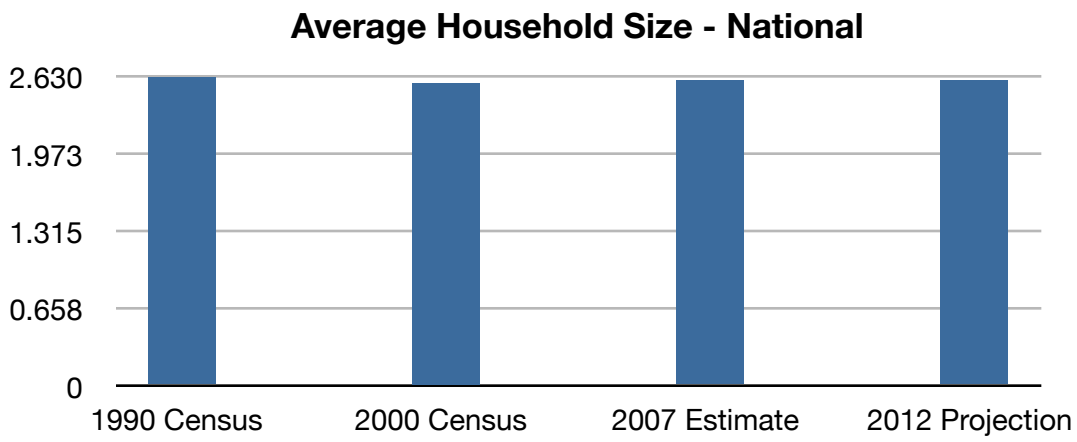
When calculating infrastructure investment costs, household statistics are also important because duct and fiber connections are made to the household (premise). The slow but steady growth in households suggests that the State will see steady demand for connections (as opposed to a situation where the number of households is shrinking).

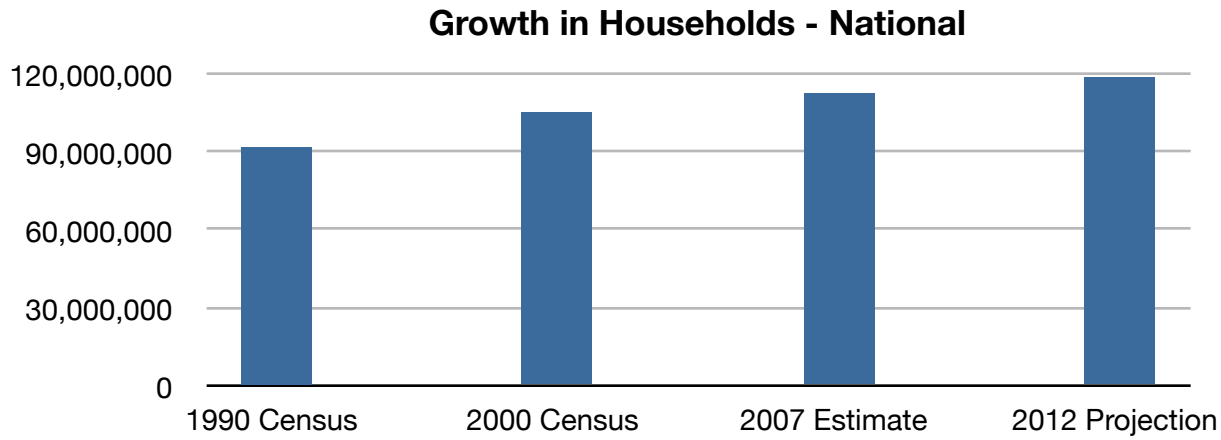
New Mexico	1990 Census		2000 Census		2007 Estimate		2012 Projection		Percent Change, 1990 to 2000	2007 to 2012
Total Households	542,71		677,971		746,810		794,285		24.9%	6.4%
Size of Household										
1 Person	124,88	23.0%	172,174	25.4%	206,815	27.7%	222,908	28.1%	37.9%	7.8%
2 Person	168,37	31.0%	219,499	32.4%	258,489	34.6%	278,732	35.1%	30.4%	7.8%
3 Person	93,259	17.2%	110,856	16.4%	116,617	15.6%	123,984	15.6%	18.8%	6.3%
4 Person	85,233	15.7%	95,692	14.1%	97,818	13.1%	100,092	12.6%	12.2%	2.3%
5 Person	42,077	7.8%	48,220	7.1%	43,830	5.9%	44,815	5.6%	13.3%	2.2%
6 Person	17,165	3.2%	18,716	2.8%	13,811	1.9%	14,143	1.8%	11.7%	2.4%
7 + Person	11,686	2.20%	12,814	1.90%	9,430	1.30%	9,611	1.20%	9.70%	1.90%
Ave Hhld Size	2.74		2.63		2.58		2.56		-4.0%	-1.0%





National	1990 Census		2000 Census		2007 Estimate		2012 Projection		Percent Change, 1990 to 2000	2007 to 2012
Total Households	91,947,641		105,480,101		113,136,906		118,488,62		14.7%	4.7%
Size of Household:										
1 Person	22,580,404	24.6%	27,227,982	25.8%	30,606,514	27.1%	32,008,728	27.0%	20.6%	4.6%
2 Person	29,453,694	32.0%	34,419,634	32.6%	37,692,004	33.3%	39,511,406	33.4%	16.9%	4.8%
3 Person	15,970,134	17.4%	17,452,353	16.6%	18,130,231	16.0%	18,985,796	16.0%	9.2%	4.7%
4 Person	13,859,937	15.1%	14,970,059	14.2%	15,605,023	13.8%	16,380,306	13.8%	8.0%	5.0%
5 Person	6,188,379	6.7%	7,047,432	6.7%	7,068,282	6.3%	7,434,149	6.3%	12.1%	5.2%
6 Person	2,300,175	2.5%	2,624,780	2.5%	2,500,160	2.2%	2,584,513	2.2%	14.6%	3.4%
7 + Person	1,593,222	1.70%	1,737,861	1.70%	1,534,689	1.40%	1,583,723	1.30%	9.10%	3.20%
Ave Hhld Size	2.63		2.59		2.6		2.60		-1.4%	0.0%


Average Household Size - National
2.630
1.973
1.315
0.658
0
1990 Census
2000 Census
2007 Estimate
2012 Projection


Growth in Households - National
120,000,000
90,000,000
60,000,000
30,000,000
0
1990 Census
2000 Census
2007 Estimate
2012 Projection

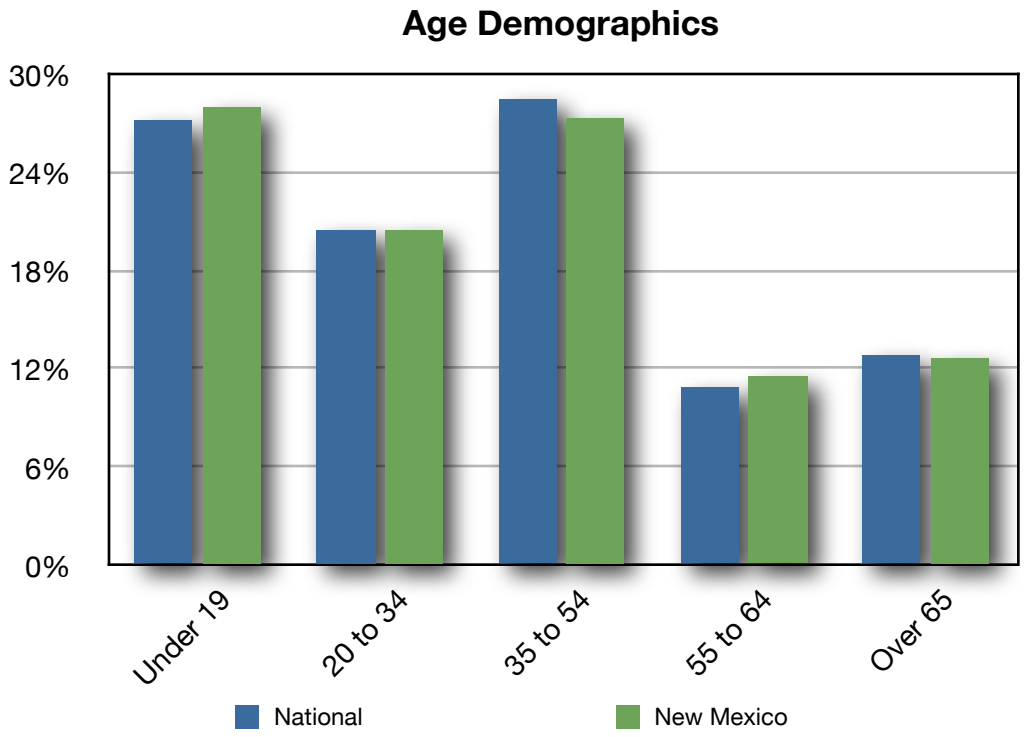
Age distribution

New Mexico compares closely with the rest of the nation in most age ranges. The distribution of younger people and middle-aged workers is close to the national average, indicating that the state is attracting younger people and families. Although the evidence is anecdotal, we are hearing regularly from real estate agents, businesses, and institutions that home buyers and workers are refusing to live in areas without broadband.

The percentage of senior citizens is also on a par with the rest of the nation. Seniors tend to be regular Internet users (to keep in touch with family and friends) who are also more likely to recognize the value of a moderately priced, high performance network.

Ongoing education is increasingly desired by older people, to make good use of technology.

	National	New Mexico
Under 19	27.2	28.0
20 to 34	20.5	20.5
35 to 54	28.7	27.4
55 to 64	10.9	11.6
Over 65	12.8	12.7



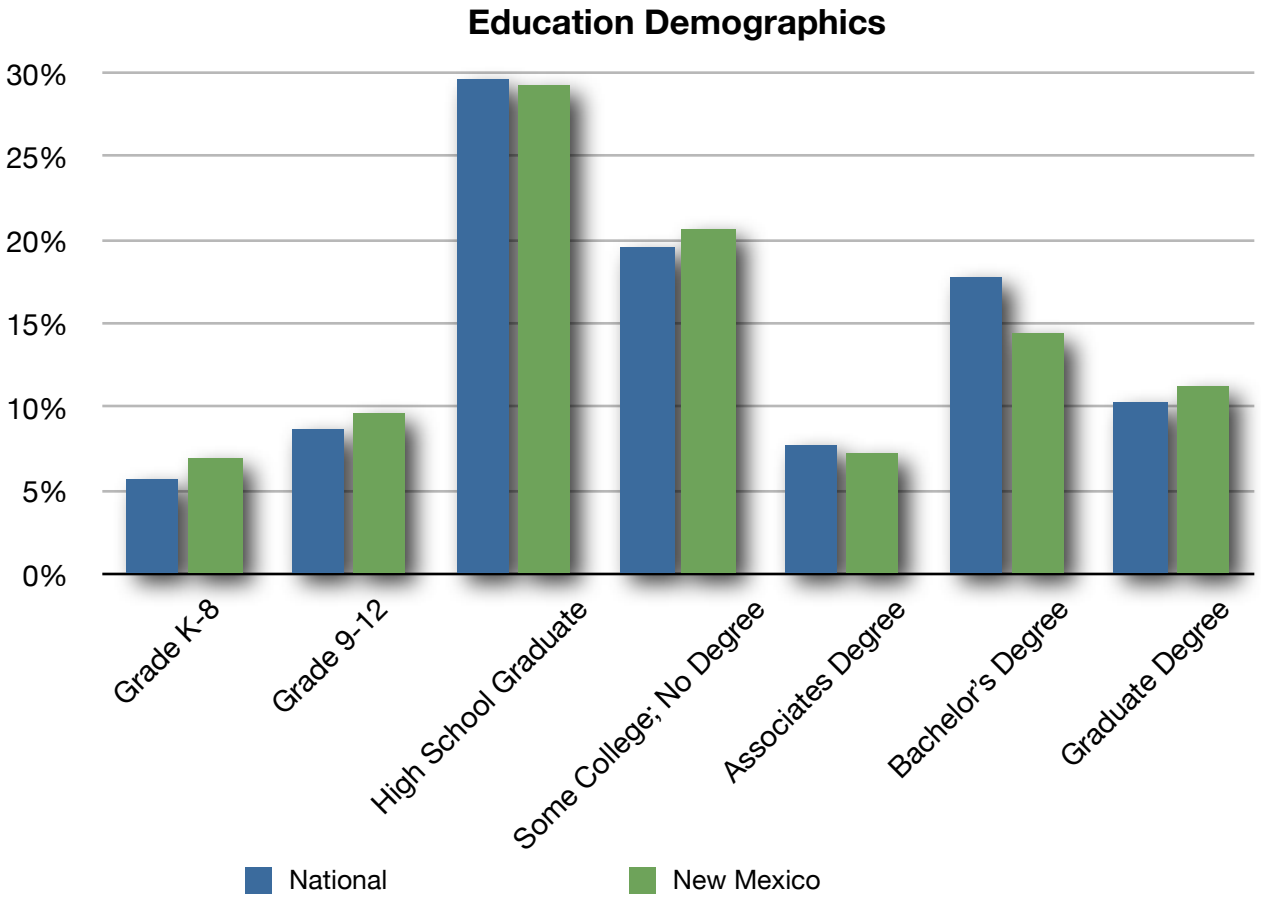
Education

New Mexico is slightly below the national average, with respect to high school graduation rates. The State lags slightly in the percentage of college graduates, but is above the national average in persons with graduate degrees, Increased availability of broadband is recognized as being of help in improve overall educational skills, job preparedness and graduation levels.

Distance learning using affordable broadband can also be used to lower the bar for residents to obtain college degrees which can lead to better paying jobs.

	National	New Mexico
Grade K-8	5.8	7.1
Grade 9-12	8.7	9.8
High School Graduate	29.9	29.3
Some College; No Degree	19.7	20.8
Associates Degree	7.8	7.3
Bachelor's Degree	17.8	14.5
Graduate Degree	10.4	11.3

Source US Bureau of Census 1990 and 2000 Decennial Census SF3 DP-2



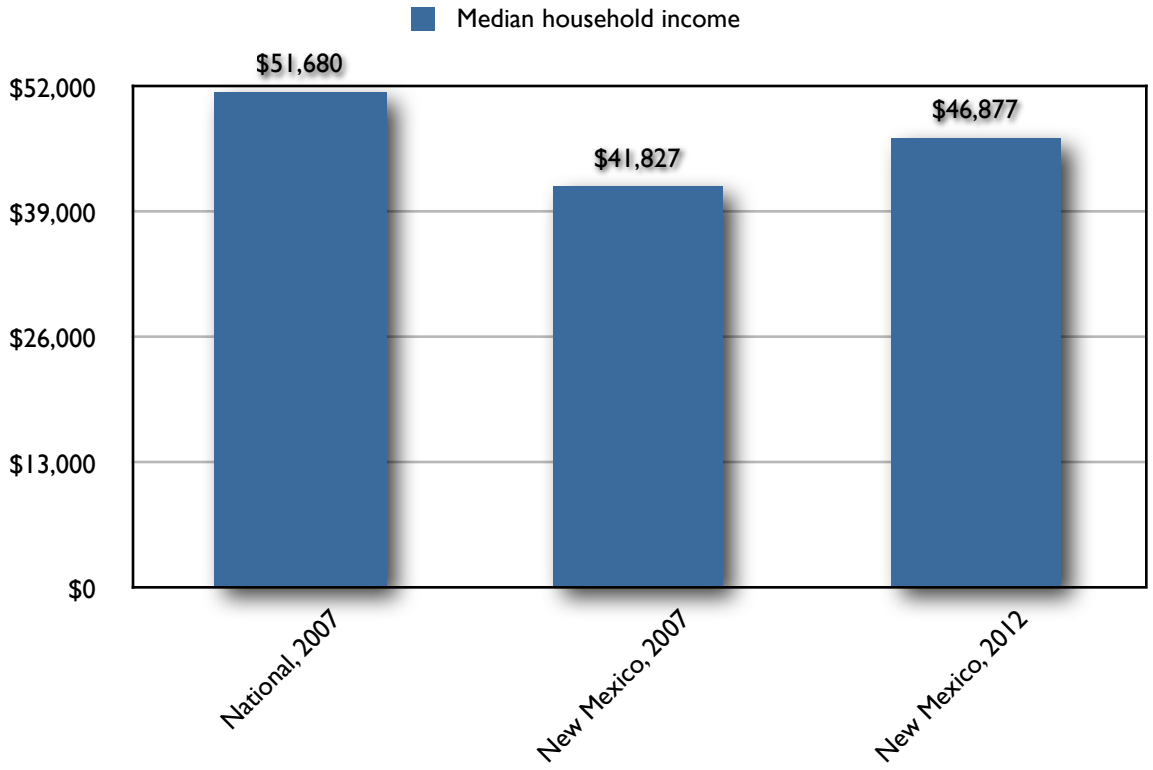
Median Household Income

Median income for the state is lower than the national average. The slow growth in better-paying Knowledge Economy jobs (which usually require different skills and more education) are keeping some household incomes low. The projected income growth is positive, probably due to growth in jobs in aerospace and the TV and film industry in the state.

There are new opportunities emerging for work from home employment. These work from home jobs require good reading skills, basic computer literacy, a late model computer in the home, a landline telephone, and a landline (not wireless) broadband connection. Work from homes jobs can start at $9-10 per hour and skilled workers can earn between $15 and $30 per hour. Adult workers in New Mexico may need assistance with computer literacy training and call center training before being able to qualify for such jobs. Work includes travel reservation agents, inbound technical support for major retail chains (e.g. Home Depot, Apple Computer), and more specialized work like medical transcription (which can pay wages in excess of $20 per hour).

	National, 2007	New Mexico, 2007	New Mexico, 2012
Median household income	$51,680	$41,827	$46,877

Source US Bureau of Census 1990 and 2000 Decennial Census SF3 DP-3

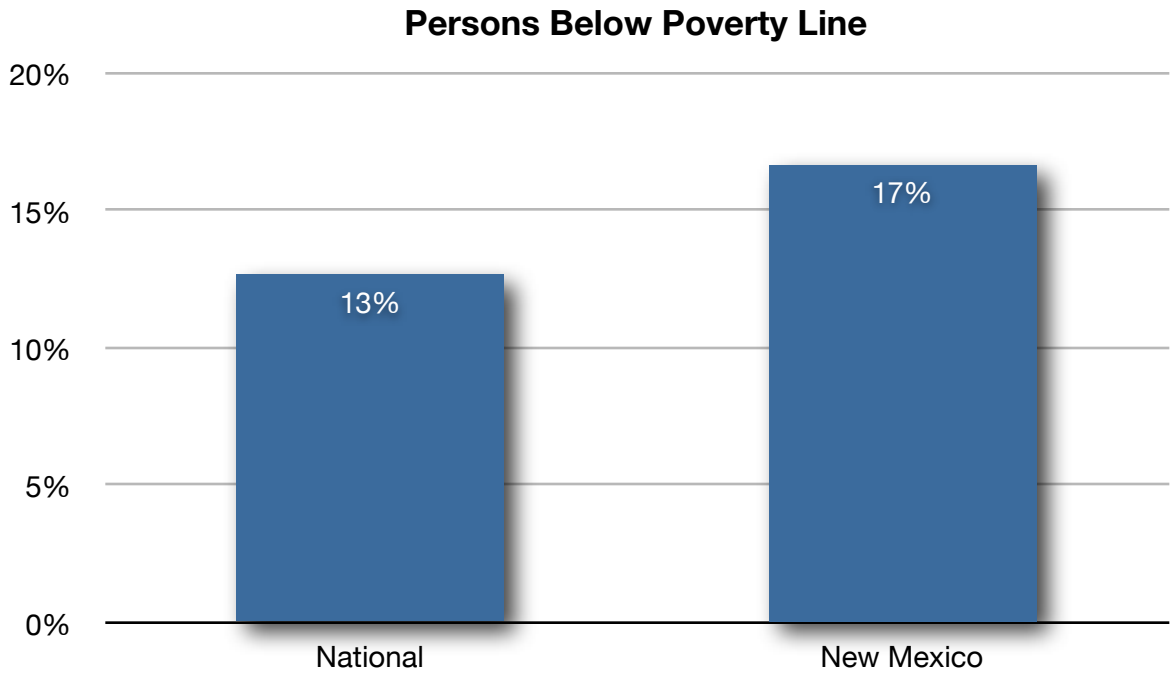


Families Below Poverty Level

The state has a level of poverty that is higher than the national average. The state continues to have a disparity in income levels between more urban centers in the state and smaller rural communities. Increased availability of affordable broadband in rural communities would increase educational opportunities (increased access to distance learning for both the GED and college courses), better access to remote diagnostic health care, and a wider variety of jobs, including newly emerging work from home jobs and business opportunities.

	National	New Mexico
Persons below poverty level	12.7	16.7

Source US Bureau of Census 1990 and 2000 Decennial Census SF3 DP-3

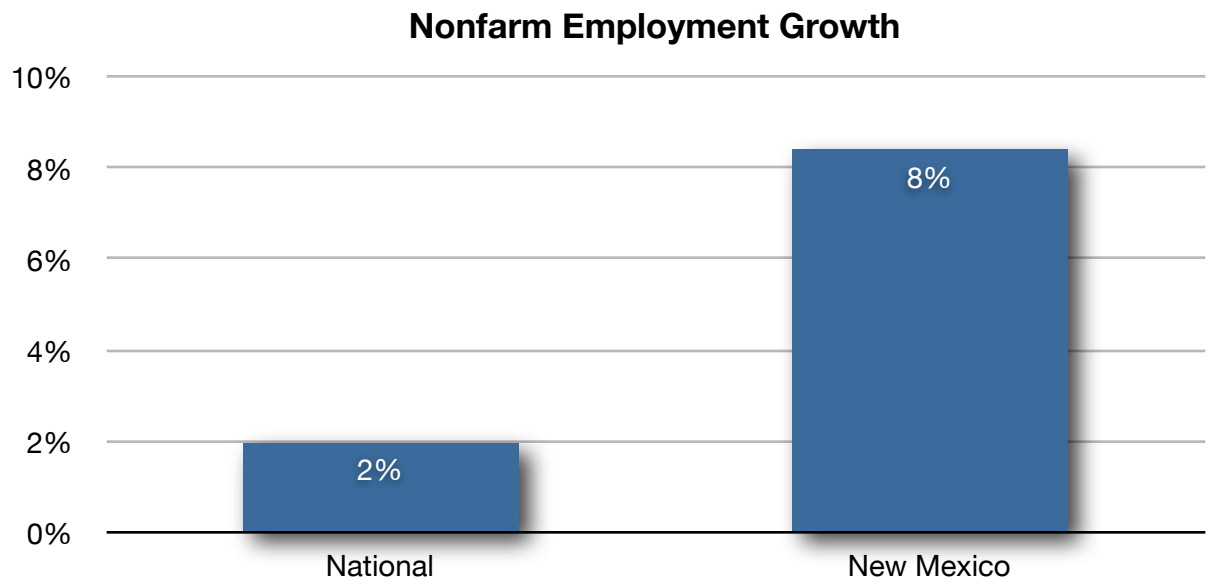


Non-farm employment growth

New Mexico's population growth trend is much higher than the national average. New investments in the state in aerospace and the film and TV industry are contributing to a healthy jobs climate. Widespread availability of broadband, especially in smaller communities, will help push jobs development to a wider portion of the state's population. A joint CMU/MIT study released in 2005 showed that regions with good distribution of broadband service enjoyed more economic growth than regions without good access to broadband services.

	National	New Mexico
Nonfarm employment growth	2	8.4

Source US Bureau of Census 2005 Business Patterns



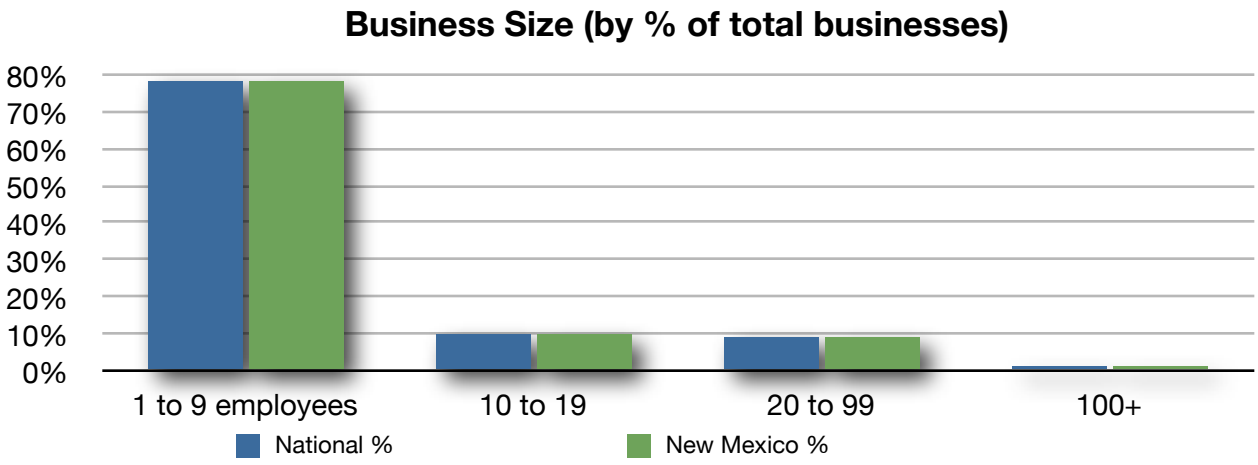
Business size distribution

The state has mostly small businesses, and enjoys a business size distribution similar to state and national averages, reflecting a reasonable balance. New Mexico has a lower than average concentration of manufacturing and a higher than average percentage of professional jobs.

The trend is toward smaller businesses, and most job creation is in the category of small business (25 employees or less). Increased broadband availability and increased competition among providers could lower costs for existing businesses, making it easier for them to fund business expansion. Improved affordability and availability of broadband in New Mexico may also help the state attract new small businesses, especially business owners looking for good quality of life.

Number of Businesses	National	New Mexico
1 to 9 employees	9,137,197	56,549
10 to 19	1,181,572	7,127
20 to 99	1,047,709	6,557
100+	205,260	1,042
Total businesses	11,571,738	71,275

Business Size Distribution	National %	New Mexico %
1 to 9 employees	79	79
10 to 19	10	10
20 to 99	9	9
100+	2	1
Total businesses	11,571,738	71,275

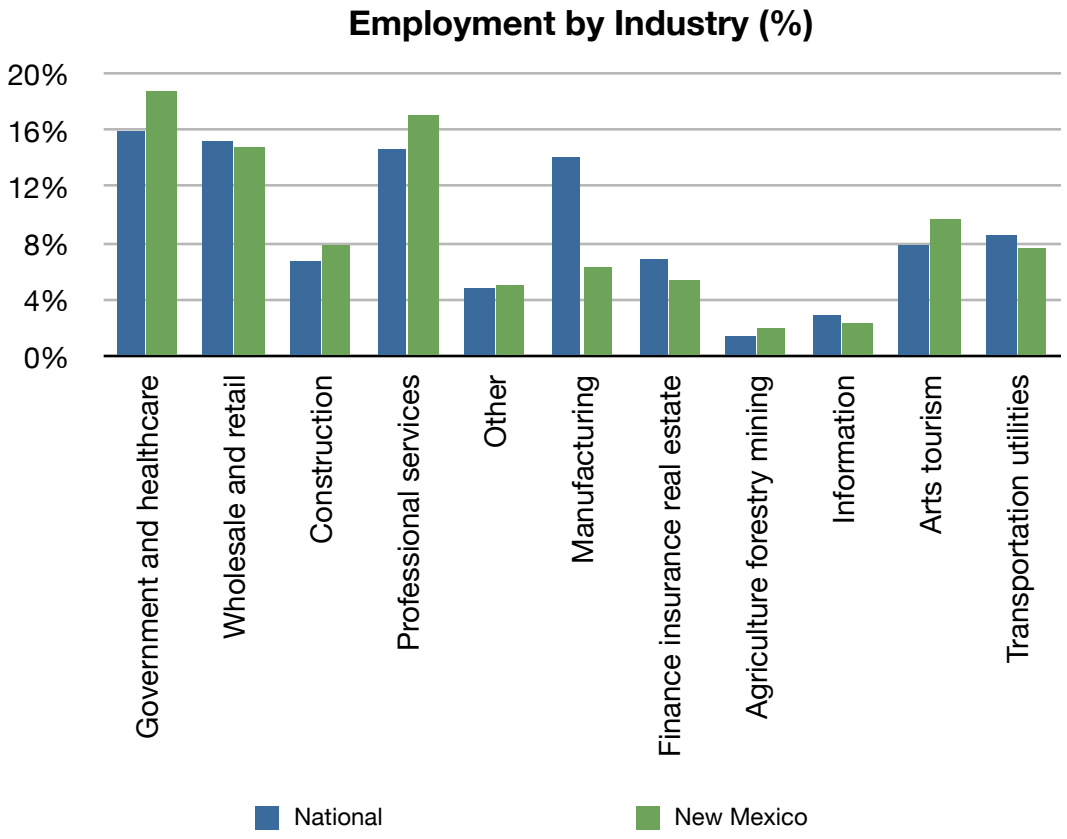


Business and Jobs Distribution

The state's largest employers are government/healthcare and professional services. Wholesale/retail is the next largest employer.

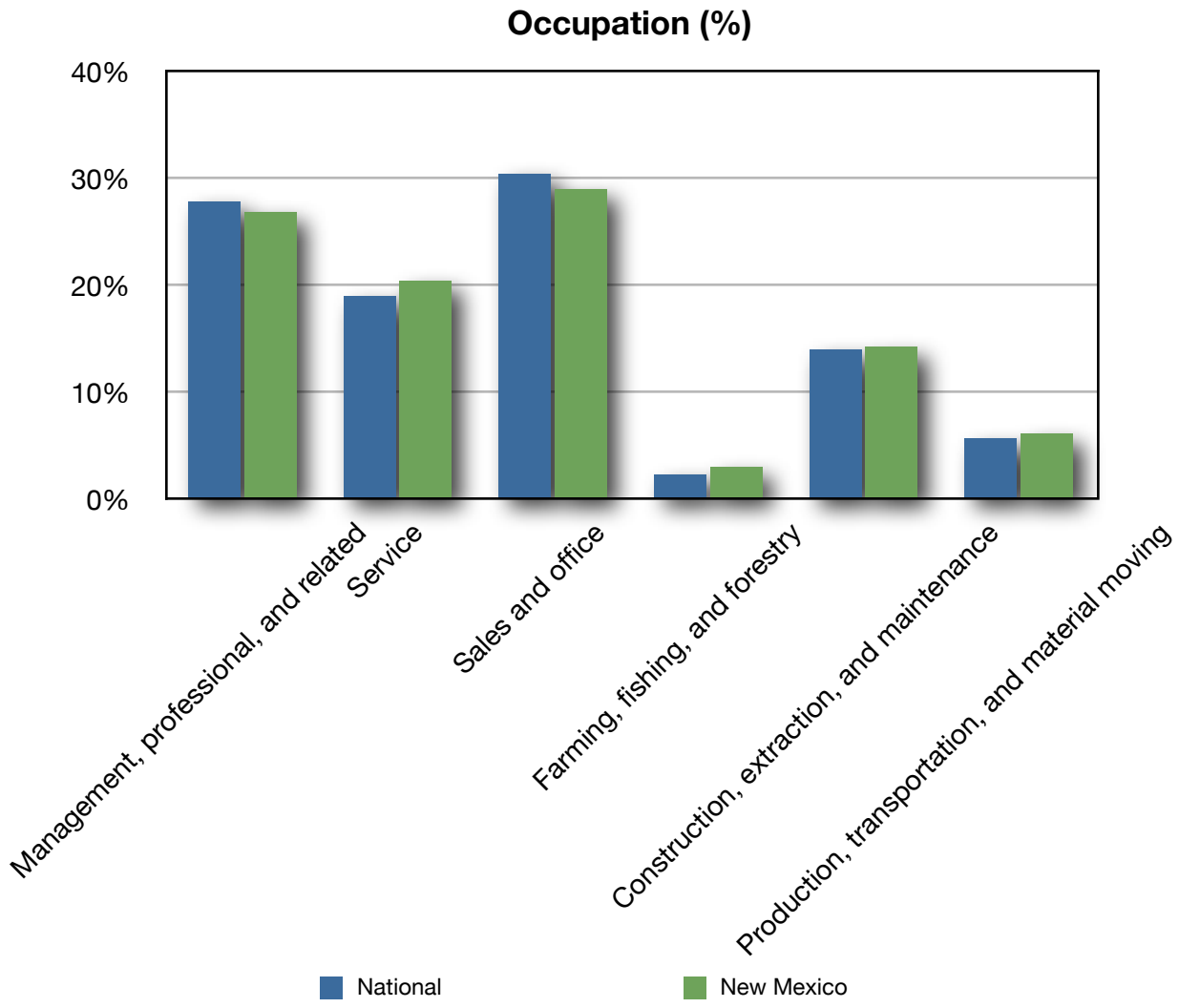
The Information (IT) sector is slightly lower, and Professional Services sector is slightly higher than the national average. Professional services are needed by Knowledge Economy businesses and entrepreneurs, and special attention should be paid to this sector to ensure that local businesses have access to the services they need to grow. Entrepreneurial businesses tend to outsource more kinds of services than small businesses did in the past. The county, by ensuring that high quality professional services are available (e.g. business focused accounting and bookkeeping services, business-oriented legal practices, receptionist services, copy and shipping services, temp worker services) may be able to attract related businesses. Continued improvements and upgrades along Main Streets to improve the general appearance of downtown areas will help attract more businesses. Incentives to landlords to rehab older retail and second floor spaces can help increase the inventory of good quality professional office space. Relocation decisions are now frequently made in 90 days or less, so county should strive to always have some good quality office space always available (with broadband cabling to the building and within the building). There is very limited Class A office space in the county, and this may hamper efforts to attract IT and professional businesses.

	National	New Mexico
Government and healthcare	16	18.8
Wholesale and retail	15.3	14.9
Construction	6.8	8
Professional services	14.7	17.2
Other	4.9	5.1
Manufacturing	14.1	6.5
Finance insurance real estate	6.9	5.5
Agriculture forestry mining	1.5	2.1
Information	3.1	2.4
Arts tourism	7.9	9.8
Transportation utilities	8.6	7.8



Distribution by Occupation (count)	National	New Mexico
Management, professional, and related	38,798,468	208,655
Service	26,573,501	158,050
Sales and office	42,846,623	225,512
Farming, fishing, and forestry	3,372,568	23,780
Construction, extraction, and maintenance	19,632,532	110,157
Production, transportation, and material moving	8,081,266	47,115
Totals	139,304,958	773,269

Distribution by Occupation (%)	National	New Mexico
Management, professional, and related	27.9	27.0
Service	19.1	20.4
Sales and office	30.8	29.2
Farming, fishing, and forestry	2.4	3.1
Construction, extraction, and maintenance	14.1	14.2
Production, transportation, and material moving	5.8	6.1



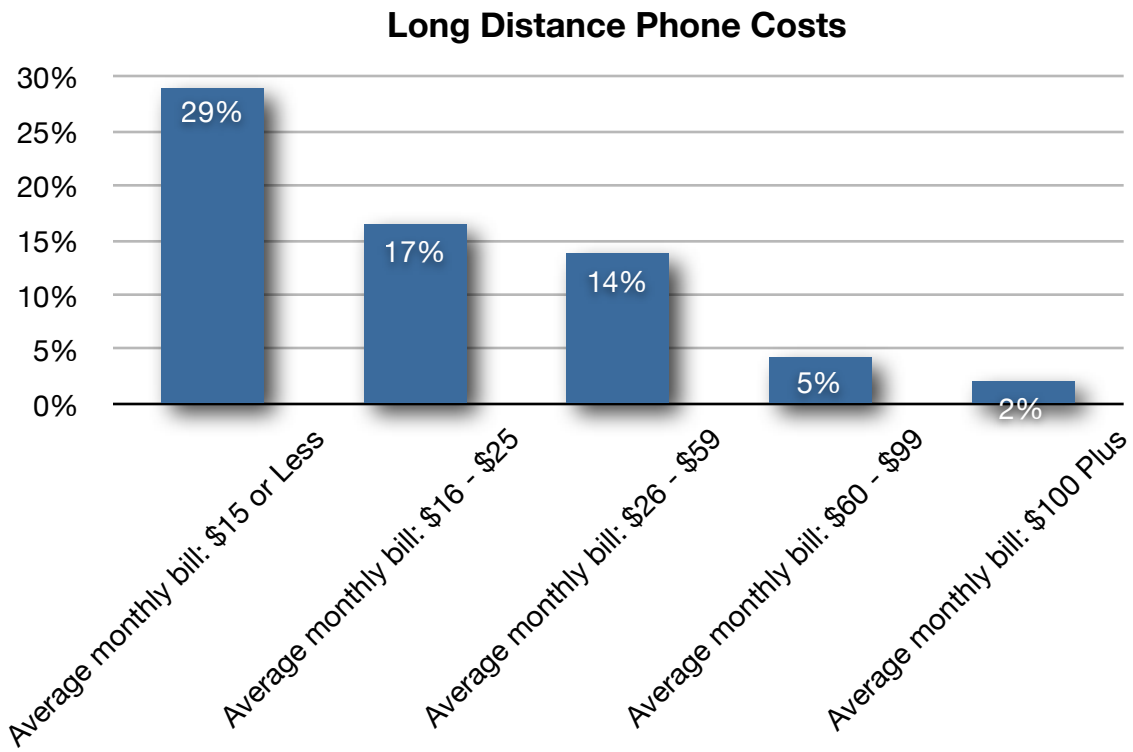
Demand Aggregation Analysis

Telephony Usage

Telephone usage in the state is average with every household having at least one landline telephone. State residents also pay as much or slightly more on phone bills, as those in other states. Given the level of activity of phone use, a less expensive VoIP-based telephone service (Voice over IP) is likely to be very popular, especially for those on fixed incomes (e.g. retirees and the elderly).

	Quantity	Percentage	Index (avg=100)
Telephone: Have a telephone	1,538,669	104.0%	101
Long Distance Costs			
Average monthly bill: $15 or Less	433,490	29.3	88
Average monthly bill: $16 - $25	244,116	16.5	101
Average monthly bill: $26 - $59	204,169	13.8	102
Average monthly bill: $60 - $99	66,577	4.5	101
Average monthly bill: $100 Plus	32,549	2.2	113

Source Mediamark Research, Inc.



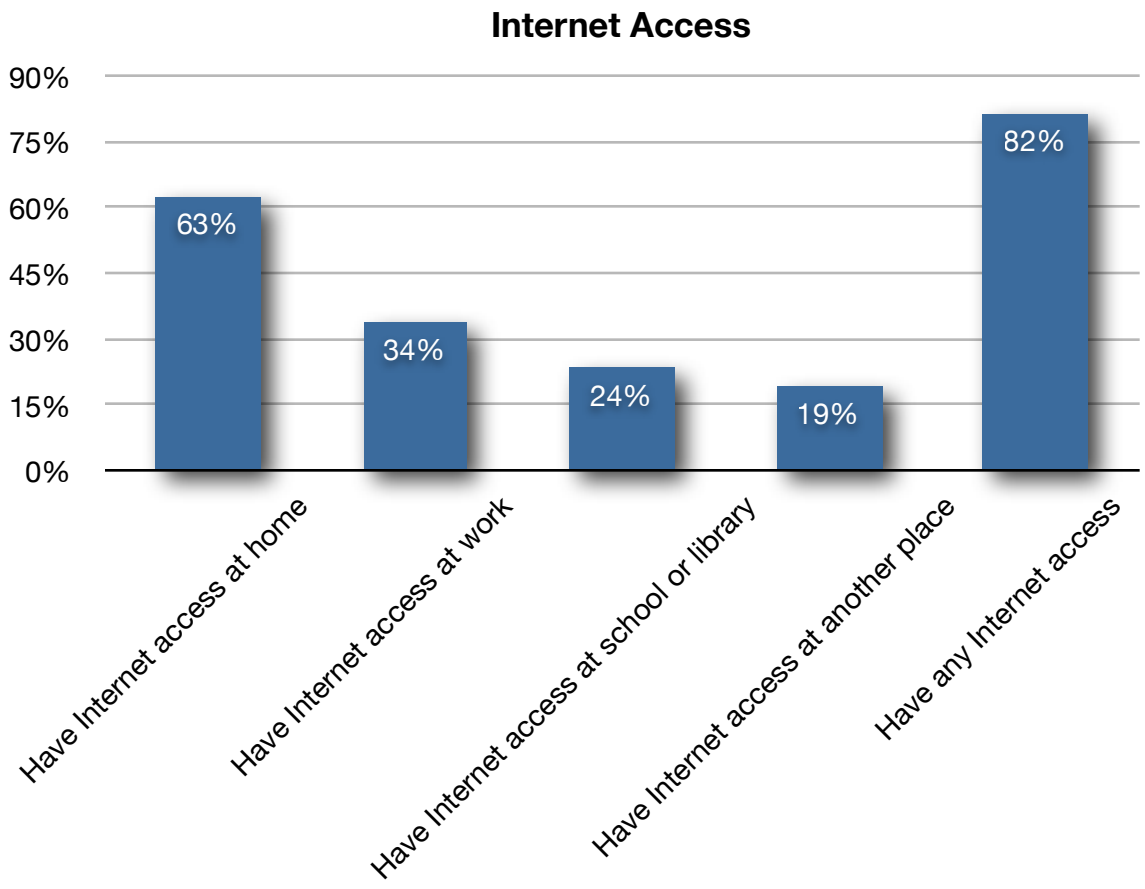
Internet Usage

While usage of the Internet is only one facet of a broadband project, this data highlights the importance of the Internet to the State. Residents have significantly less access as the rest of the country both from home and likewise when considering access at work. Nationally, close to 80% of residents tend to have some kind of Internet access from home (including dial up) while only 63% of residents in New Mexico have internet access at home.

The lower score for work access would tend to reflect the number of manufacturing and blue collar workers, many of whom would not have Internet access at their work area (compared to office workers).

Availability of Internet Access	Quantity	Percentage	Index
Have Internet access at home	926,160	62.6	90
Have Internet access at work	501,547	33.9	87
Have Internet access at school or library	347,680	23.5	86
Have Internet access at another place	287,021	19.4	96
Have any Internet access	1,207,263	81.6	92

Source Mediamark Research, Inc.



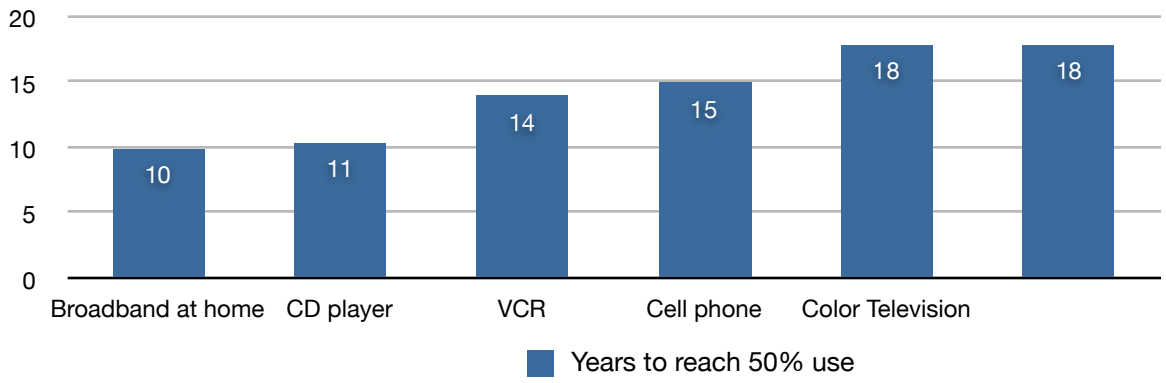
Broadband at Home Penetration Rate

The table and graph below illustrates the rapid pace of adoption of the Internet and the demand for broadband. While it took eighteen years to reach the point where half of American households had technology like a color TV or a personal computer, the time required to reach that point for broadband access to the Internet was almost half that, or about 80% less time.

Another way to think about broadband is that it has been more popular than color television.

Adoption Time	Years to reach 50% use
Broadband at home	10
CD player	10.5
VCR	14
Cell phone	15
Color Television	18
Personal computer	18

Source: Pew/Internet Measuring Broadband Report, 2007



Internet Activity Use in New Mexico

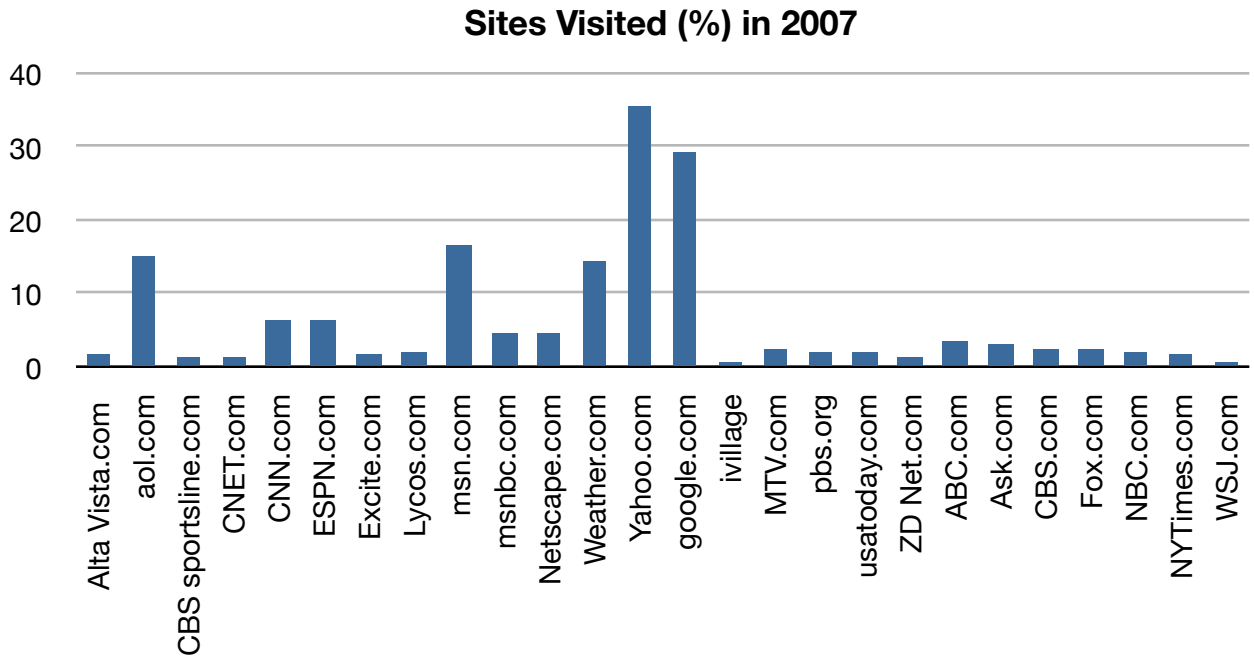
This table shows how Internet use in New Mexico compares to other areas of the country. An index score of 100 indicates a use pattern similar to users in other places; a higher score indicates higher than average use, and a lower score indicates fewer users engaged in that activity. Overall, business and personal use of the Internet in the state tends to be below the national average, underscoring the importance of bringing Internet access to residents. More than 57% of residents are using the Internet at least once or twice per week.

Internet activity use in Region	2006 Totals	2006 Percent	Index Aver-age=100
Looked at/used Internet in past 30 days	949,832	64.2%	90
Visited a chat room	87,290	5.9%	110
Used e-mail	788,568	53.3%	89
Used Instant Messenger	235,239	15.9%	85
Obtained financial information	261,870	17.7%	85
News and Current Events	443,847	30.0%	86
Sports news and information	270,746	18.3%	90
Obtained medical information	167,182	11.3%	82
Visited TV network or show website	137,592	9.3%	83
Other Activity	208,608	14.1%	91
Made a purchase for personal use	313,652	21.2%	84
Made a purchase for business use	94,687	6.4%	83
Made travel plans	192,334	13.0%	80
Played games online	251,513	17.0%	92
Tracked investments	137,592	9.3%	79
Traded stocks- bonds or mutual funds	35,508	2.4%	75
Obtained information for new/used car pur-chase	128,716	8.7%	93
Obtained information about real estate	118,359	8.0%	80
Looked for employment	140,551	9.5%	90
Listened to radio on the Internet	112,441	7.6%	89
Use Internet more than once a day	301,816	20.4%	87
Use Internet daily	279,623	18.9%	90
Use Internet 3-6x's/wk	153,867	10.4%	86
Use Internet 1-2x's/wk	108,003	7.3%	95
Use Internet less than 1x/wk	85,810	5.8%	106
Online Services looked at/used past 30 days: America Online	284,062	19.2%	93
Online Services looked at/used past 30 days: Microsoft Network	235,239	15.9%	91
Online Services looked at/used past 30 days: Any Service	843,309	57.0%	84
Online Services looked at/used past 30 days: Other	387,626	26.2%	91

Broadband Use by Site

This data from Mediamark Research indicates that New Mexico residents are making use of a wide variety of online information. An index score of 100 indicates a use pattern similar to users in other places; a higher score indicates higher than average use, and a lower score indicates fewer users accessing a data source.

Sites Accessed Recently	2007 Totals	2007 Percent	Index Average=100
Alta Vista.com	26,631	1.8	86
aol.com	224,882	15.2	88
CBS sportsline.com	19,233	1.3	76
CNET.com	23,672	1.6	96
CNN.com	97,646	6.6	84
ESPN.com	97,646	6.6	83
Excite.com	26,631	1.8	88
Lycos.com	29,590	2.0	88
msn.com	250,034	16.9	92
msnbc.com	68,056	4.6	80
Netscape.com	71,015	4.8	86
Weather.com	217,485	14.7	83
Yahoo.com	529,657	35.8	91
google.com	437,929	29.6	84
ivillage	10,356	0.7	71
MTV.com	35,508	2.4	89
pbs.org	34,028	2.3	76
usatoday.com	29,590	2.0	76
ZD Net.com	19,233	1.3	98
ABC.com	51,782	3.5	95
Ask.com	48,823	3.3	85
CBS.com	36,987	2.5	86
Fox.com	35,508	2.4	88
NBC.com	32,549	2.2	84
NYTimes.com	28,110	1.9	67
WSJ.com	10,356	0.7	84


Sites Visited (%) in 2007
40
30
20
10
0
Alta Vista.com
aol.com
CBS sportsline.com
CNET.com
CNN.com
ESPN.com
Excite.com
Lycos.com
msn.com
msnbc.com
Netscape.com
Weather.com
Yahoo.com
google.com
ivillage
MTV.com
pbs.org
usatoday.com
ZD Net.com
ABC.com
Ask.com
CBS.com
Fox.com
NBC.com
NYTimes.com
WSJ.com

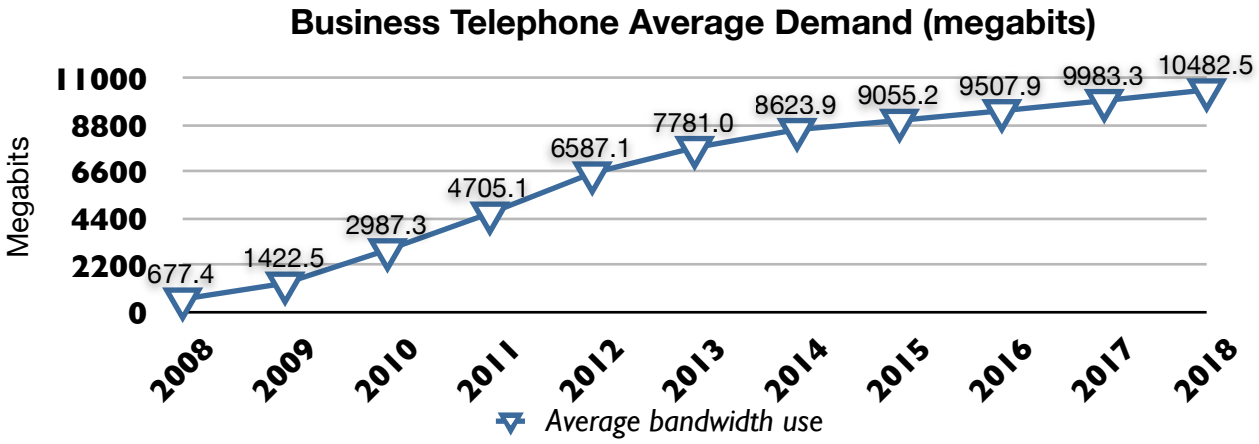
Business Telephone Demand

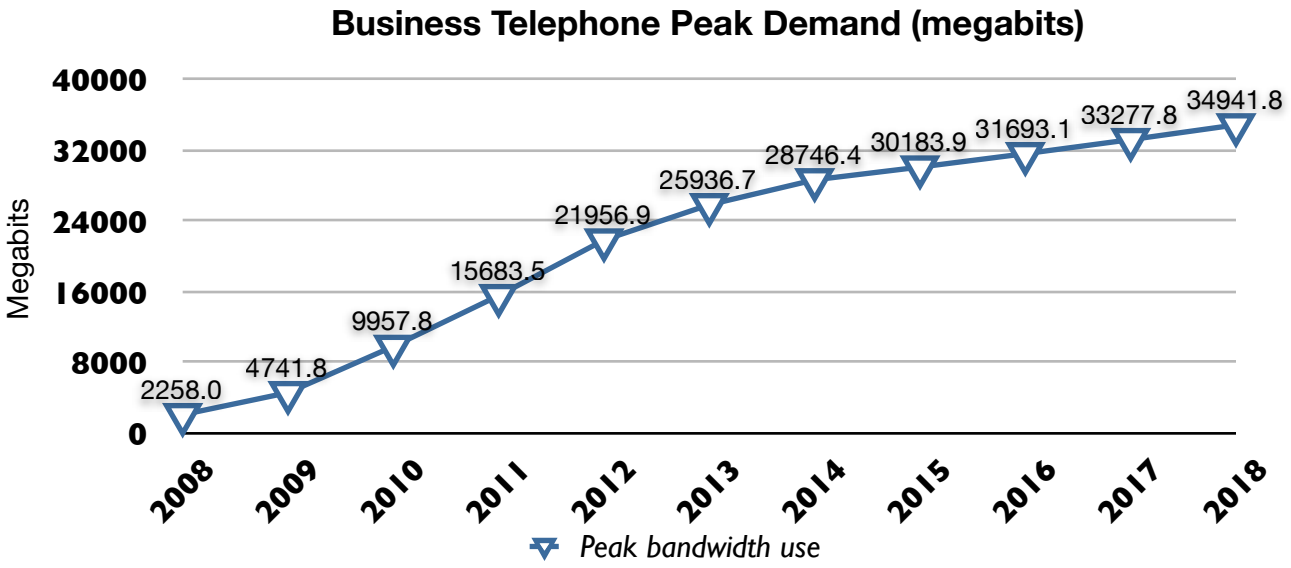
Business telephone demand is important because virtually all businesses require a telephone and most businesses require a landline. Very small start up businesses may use only a cellular phone but the quality of the call and the variability of the signal means that even small "mom and pop" businesses typically have at least one landline.

Over the past five years, there has been an increasing shift of business phone service away from the traditional analog phone line to Internet-based phone service (VoIP, or Voice over Internet Protocol). By some estimates, more than 4 million business telephone lines have been converted to VoIP over the past five years. Many business users switch to VoIP phone services because of the greatly expanded service options available, but most businesses also typically see savings of 25% to 40% savings on their overall phone bill. Businesses that must make make long distance calls and/or international calls may see as much as an 80% reduction on their monthly phone bill.

Telephone is the single most important business service, and the projections below assume that 95% of New Mexico businesses will switch to VoIP by 2014. Bandwidth for phone services is relatively modest (about 64 kilobits per phone line). VoIP is one of the easiest services to provide and can offer some of the biggest savings to businesses.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Businesses	71,275	74,839	78,581	82,510	86,636	90,968	95,516	100,292	105,307	110,572	116,101
Businesses with phone	64,148	67,355	70,723	74,259	77,972	81,871	85,964	90,263	94,776	99,515	104,491
Take rate	10%	20%	40%	60%	80%	90%	95%	95%	95%	95%	95%
Average bandwidth use	677.4	1,422.5	2,987.3	4,705.1	6,587.1	7,781	8,623.9	9,055.2	9,507.9	9,983.3	10,483
Peak bandwidth use	2258	4741.8	9957.8	15684	21957	25937	28746	30184	31693	33278	34942




Business Telephone Peak Demand (megabits)
Megabits
40000
32000
24000
16000
8000
0
2258.0
4741.8
9957.8
15683.5
21956.9
25936.7
28746.4
30183.9
31693.1
33277.8
34941.8
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Peak bandwidth use

Business Internet Demand

Internet demand is more difficult to project than telephone service because many different services (including VoIP telephone service) can be carried over a single broadband connection. The table and charts below provide three different sets of projections for the amount of bandwidth that New Mexico businesses will likely need over the next ten years, based on a mix of low, moderate, and peak use.

- Low use represents a typical mix of daily online business activities:
- Email access.
- Web access.
- Access to specialized business information and databases.
- Occasional high capacity services like computer backups.

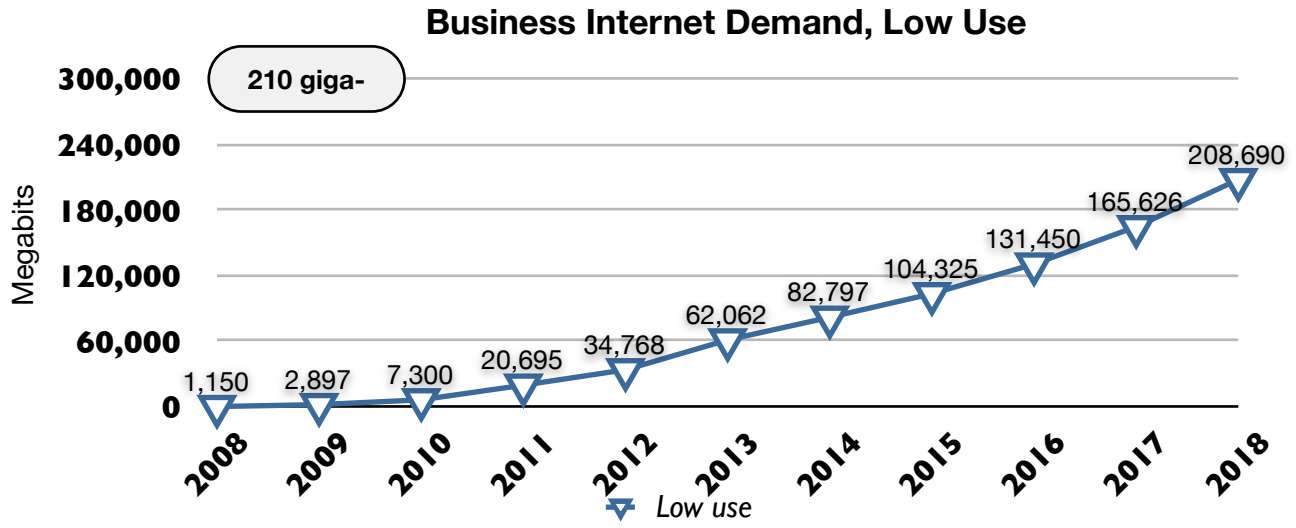
Moderate use includes the low use services but also adds additional business activities:

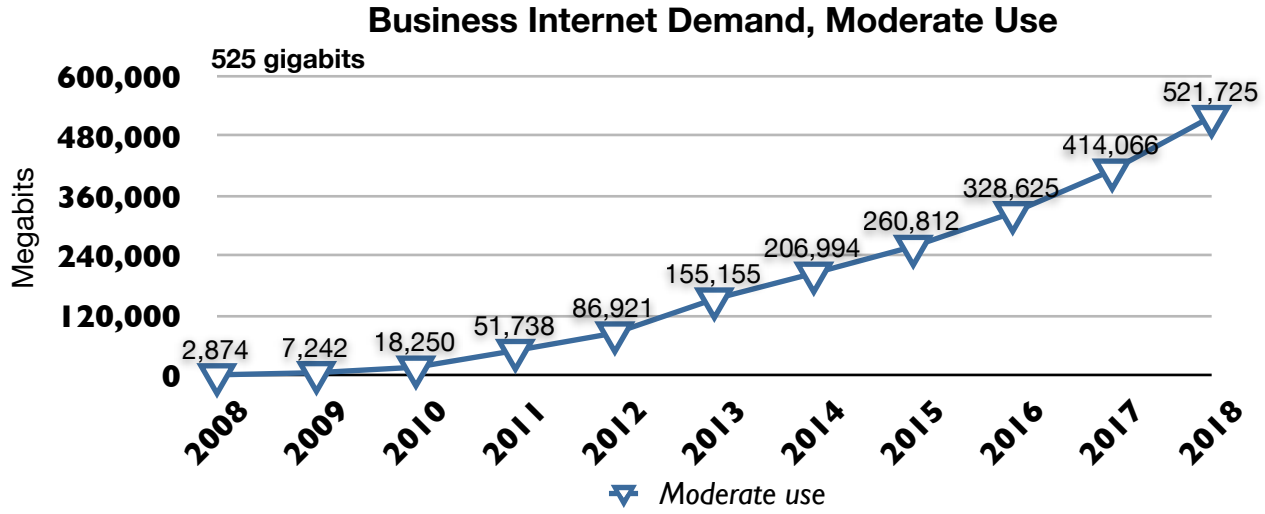
- Some streaming video (e.g. online business training).
- Hosting of e-commerce "shopping cart" Web site for online sales.
- Daily transfer of documents and files between multiple business locations (e.g. engineering drawings, medical files, etc.).
- Hosting of Web sites with multimedia heavy content like videos.

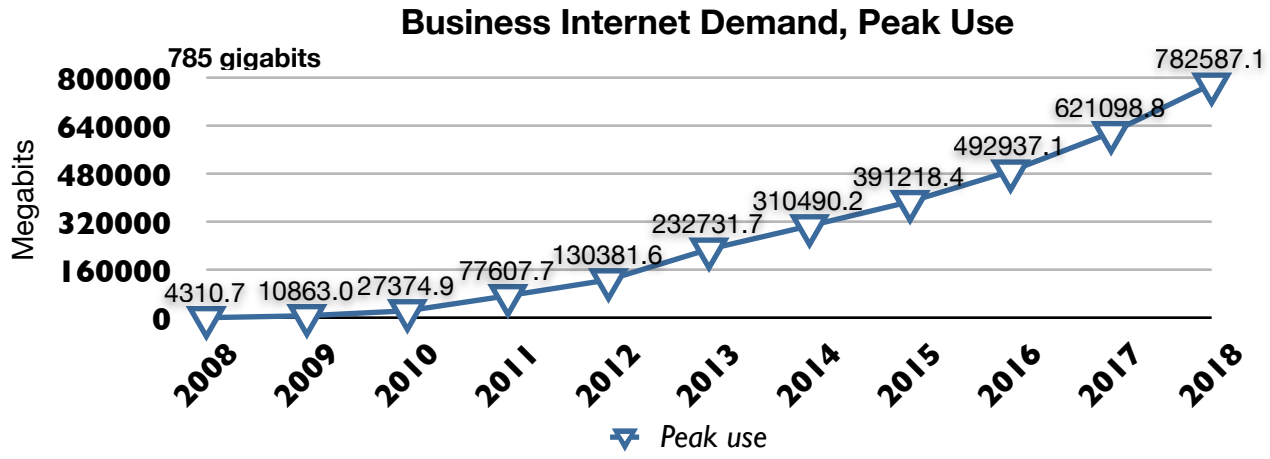
Peak use includes regular use of:

- Business videoconferencing in HD format.
- Multi-site business videoconferences (three or more sites connected at the same time).
- High demand Web sites with heavy traffic that requires multiple servers (e.g. popular e-commerce sites, popular news and information sites).
- Telemedicine and telehealth services, including regular transfer of radiology files, real time access to medical records, and video-enabled remote diagnostic services.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Businesses	71,275	74,839	78,581	82,510	86,636	90,968	95,516	100,292	105,307	110,572	116,101
Businesses with Internet (%)	65%	70%	80%	85%	90%	95%	95%	95%	95%	95%	95%
Businesses with Internet	64,148	67,355	70,723	74,259	77,972	81,871	85,964	90,263	94,776	99,515	104,491
Take rate	5%	10%	20%	45%	60%	85%	90%	90%	90%	90%	90%
Low use	1,150	2,897	7,300	20,695	34,768	62,062	82,797	104,325	131,450	165,626	208,690
Moderate use	2,874	7,242	18,250	51,738	86,921	155,155	206,994	260,812	328,625	414,066	521,725
Peak use	4,311	10,863	27,375	77,608	130,382	232,732	310,490	391,218	492,937	621,099	782,587


Business Internet Demand, Low Use
210 giga-
300,000
240,000
180,000
120,000
60,000
0
Megabits
1,150
2,897
7,300
20,695
34,768
62,062
82,797
104,325
131,450
165,626
208,690
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Low use

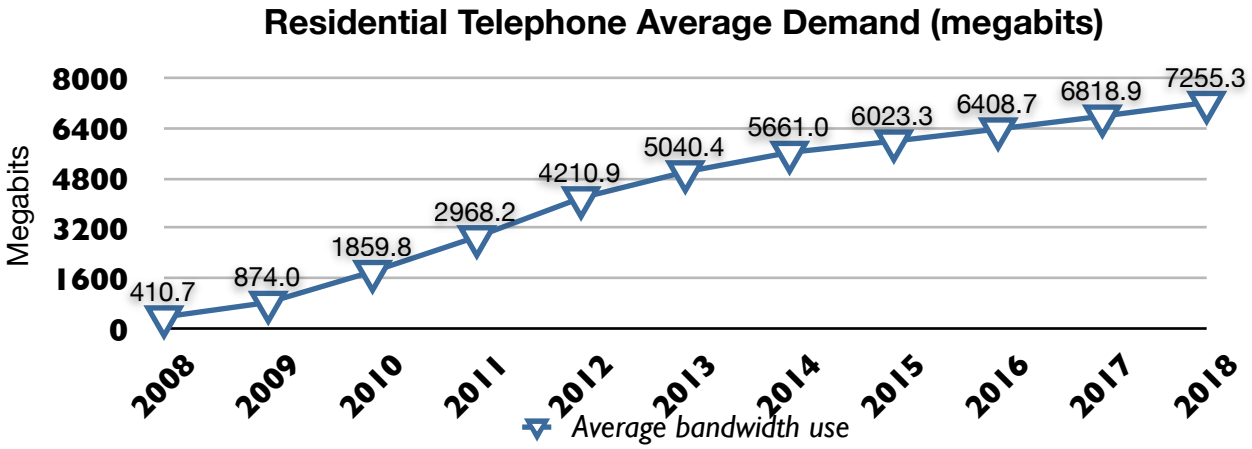

Business Internet Demand, Moderate Use
525 gigabits
600,000
480,000
360,000
240,000
120,000
0
Megabits
2,874
7,242
18,250
51,738
86,921
155,155
206,994
260,812
328,625
414,066
521,725
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Moderate use

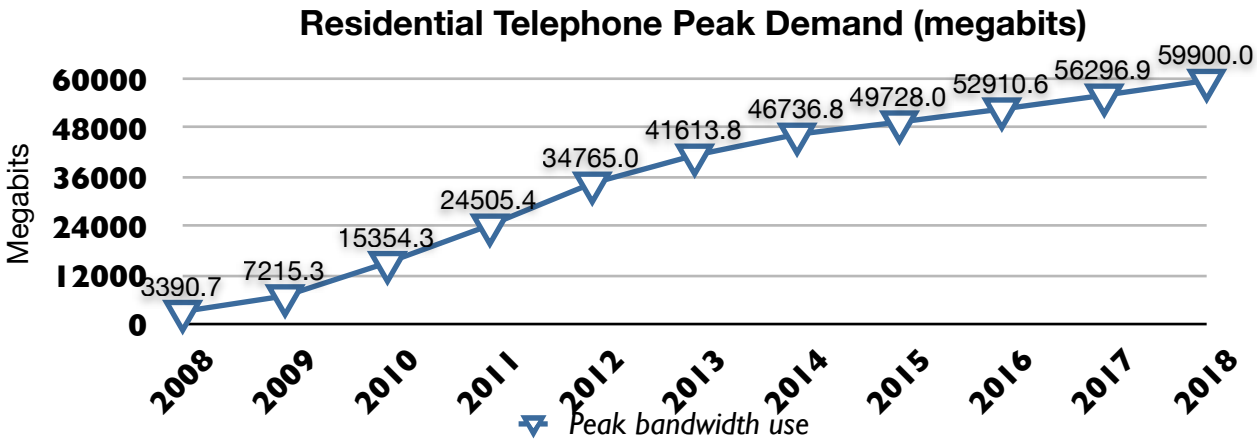

Business Internet Demand, Peak Use
785 gigabits
800000
640000
480000
320000
160000
0
Megabits
4310.7
10863.0
27374.9
77607.7
130381.6
232731.7
310490.2
391218.4
492937.1
621098.8
782587.1
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Peak use

Residential Telephone Demand

Most homes have a telephone, and despite a gradual shift among college age people to have only a cellphone, most homes will continue to have at least one landline, especially as VoIP phone service becomes more widely available: VoIP phone service will be less expensive than a cellphone (unlike the current situation, where many cellphone plans are less expensive than landlines).

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Households	246,810	262,606	279,413	297,295	316,322	336,567	358,107	381,026	405,412	431,358	458,965
Households with phone	256,682	273,110	290,590	309,187	328,975	350,030	372,431	396,267	421,628	448,612	477,324
Take rate	10%	20%	40%	60%	80%	90%	95%	95%	95%	95%	95%
Average bandwidth use	411	874	1,860	2,968	4,211	5,040	5,661	6,023	6,409	6,819	7,255
Peak band-width use	3,391	7,215	15,354	24,505	34,765	41,614	46,737	49,728	52,911	56,297	59,900



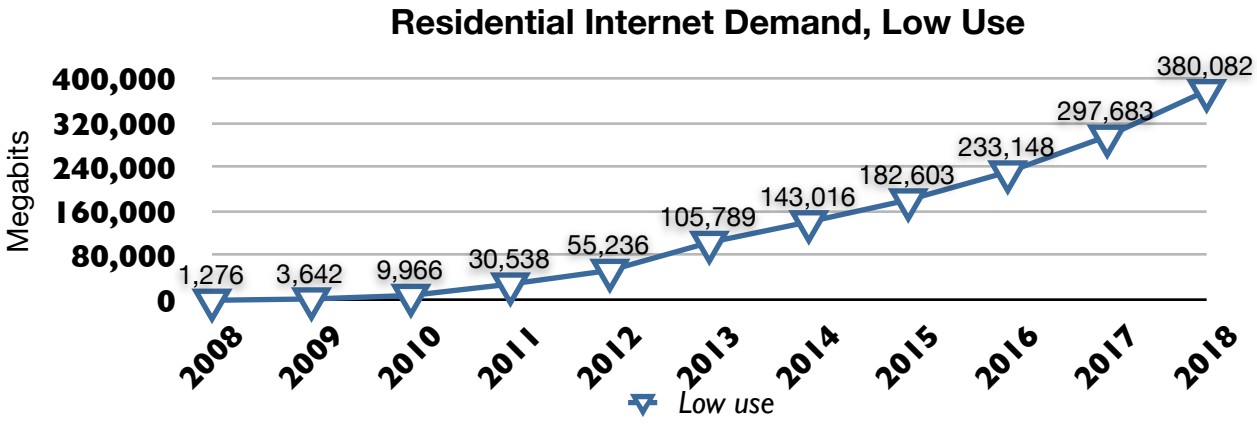


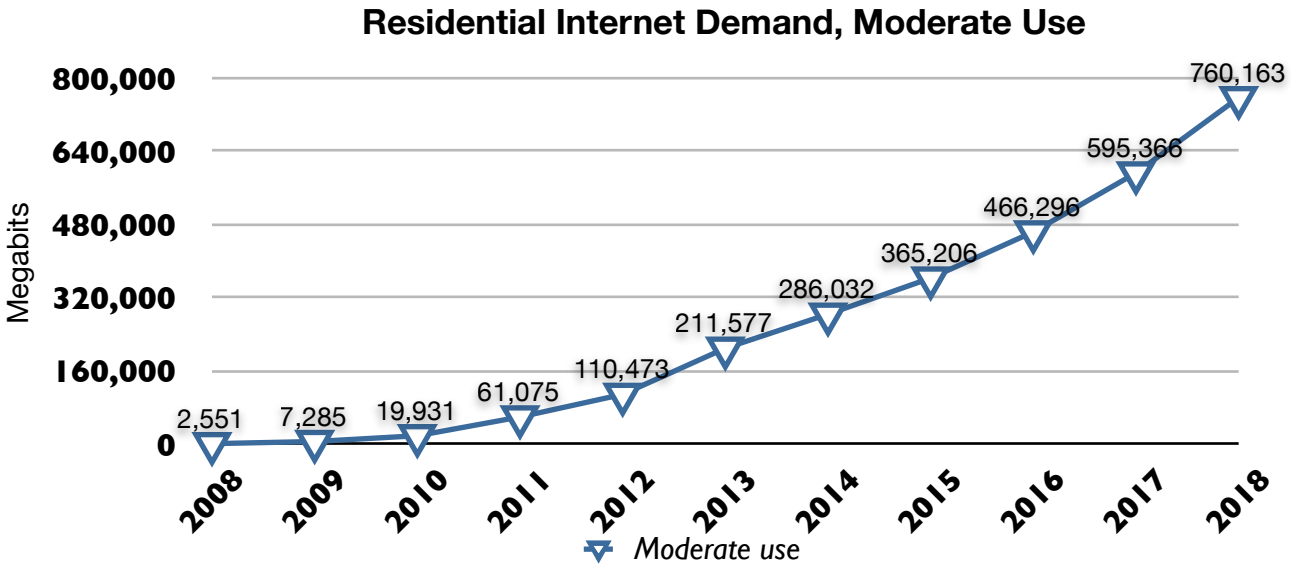
Residential Internet Demand

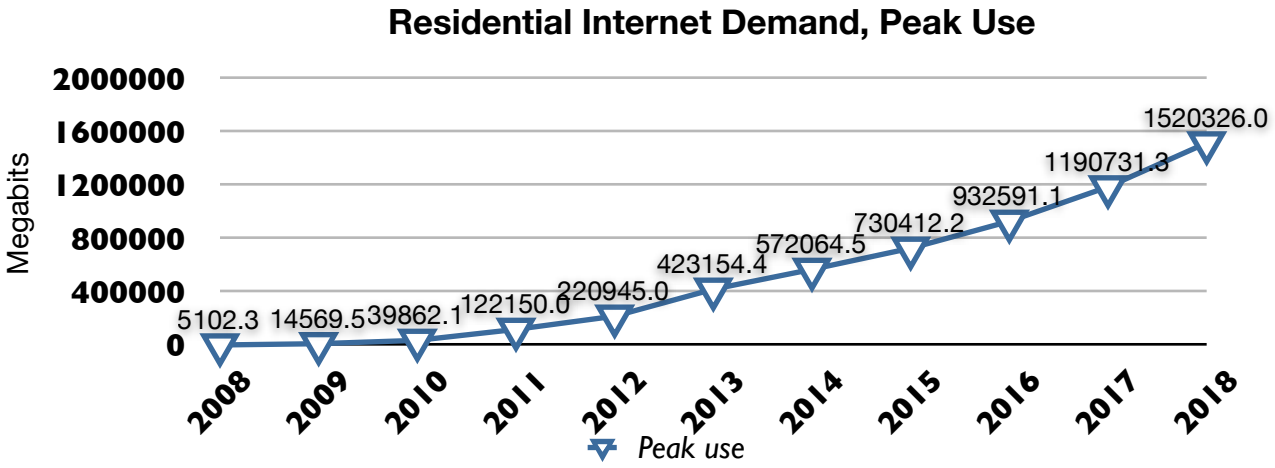
Residential Internet demand will be highly variable, based on time of day and type of service. New Mexico residents will make wide use of many kinds of services, including:

- Email
- Web surfing
- Shopping online
- Distance learning
- Work from home opportunities, both full time and part time
- Backup services (long term storage of photos, home movies, and music)
- Home security services
- Telemedicine and telehealth services
- Access to news and current events

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Households	246,810	262,606	279,413	297,295	316,322	336,567	358,107	381,026	405,412	431,358	458,965
Households with Internet (%)	63%	70%	75%	80%	85%	90%	90%	90%	90%	90%	90%
Households with Internet	154,503	183,824	209,560	237,836	268,874	302,910	322,296	342,923	364,871	388,222	413,069
Take rate	5%	10%	20%	45%	60%	85%	90%	90%	90%	90%	90%
Low use	1,276	3,642	9,966	30,538	55,236	105,789	143,016	182,603	233,148	297,683	380,082
Moderate use	2,551	7,285	19,931	61,075	110,473	211,577	286,032	365,206	466,296	595,366	760,163
Peak use	5,102	14,570	39,862	122,150	220,945	423,154	572,065	730,412	932,591	1,190,73	1,520,32




Residential Internet Demand, Moderate Use
Megabits
800,000
640,000
480,000
320,000
160,000
0
2,551
7,285
19,931
61,075
110,473
211,577
286,032
365,206
466,296
595,366
760,163
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Moderate use


Residential Internet Demand, Peak Use
Megabits
2000000
1600000
1200000
800000
400000
0
5102.3
14569.5
39862.1
122150.0
220945.0
423154.4
572064.5
730412.2
932591.1
1190731.3
1520326.0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Peak use

Residential TV and Video Demand

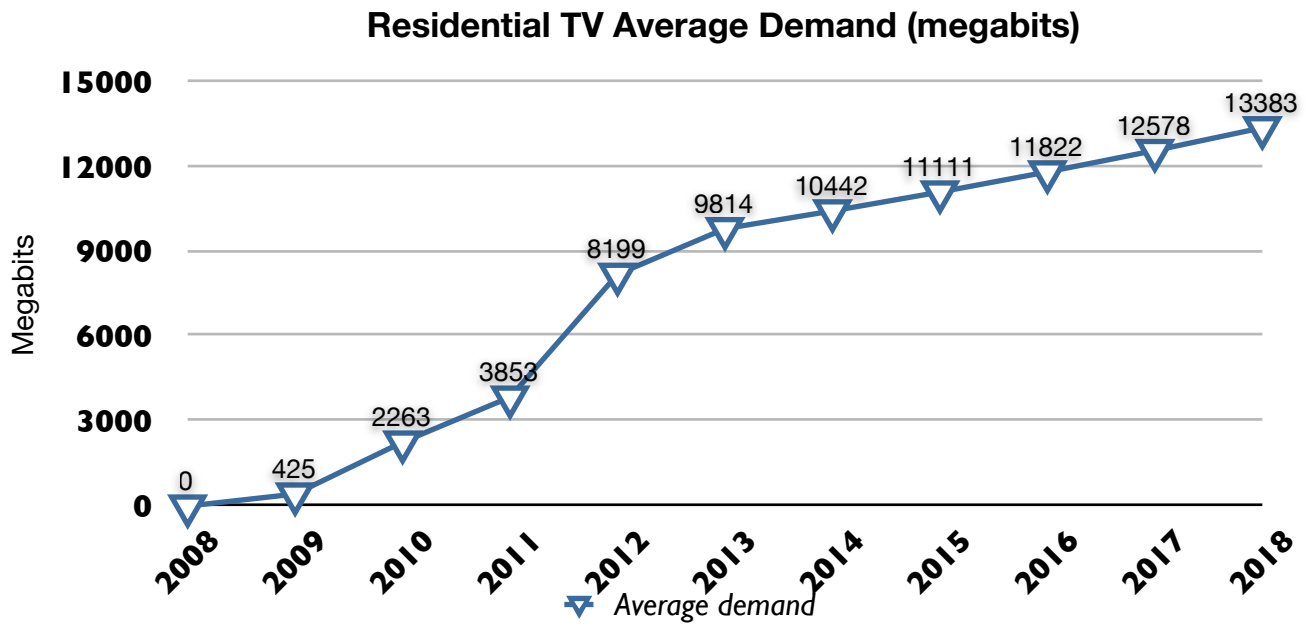
Distance learning from home with live video feeds will require high performance 2+ megabit connections in the near term (next 2-4 years), and over the next 4 to 7 years, there will be many distance learning courses that will incorporate live HD two way video feeds, enabling students to participate in classroom discussions at a much higher quality level. Distance learning could be an important home-based application for workforce training and retraining.

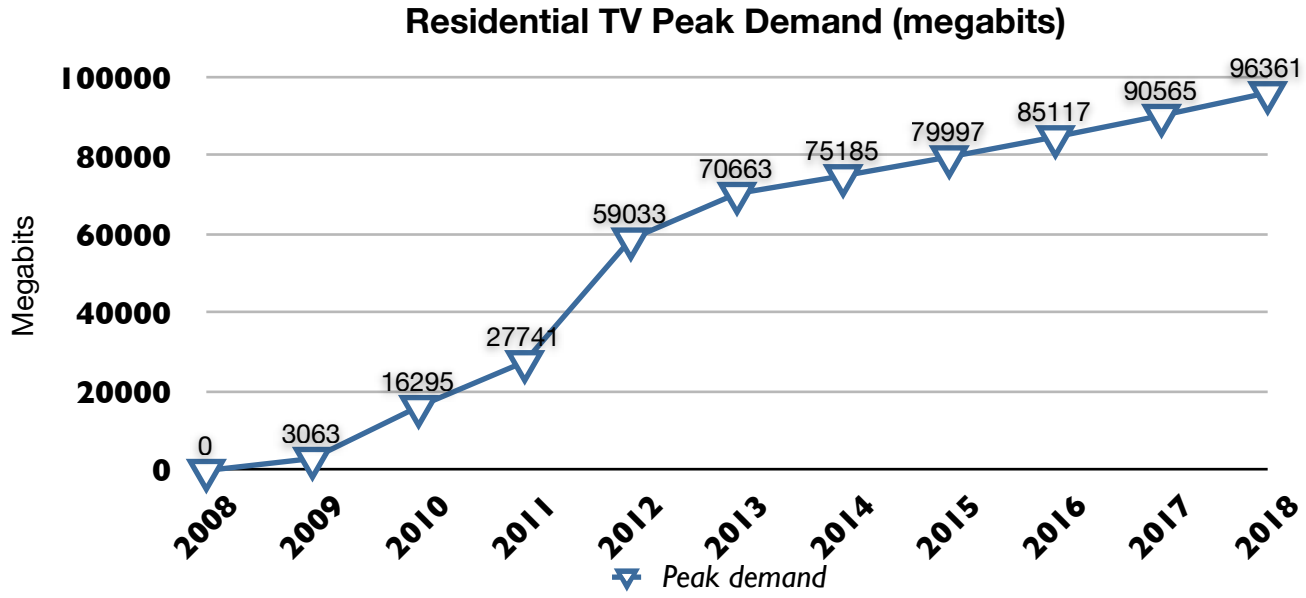
Entertainment will also drive bandwidth demand from the home, and the popularity of video sites like YouTube provide a good indication of the long term demand for video in many forms, including:

- Live feeds (e.g. live TV shows, live news reports).
- Video on demand (TV shows available for viewing at any time, rather than at scheduled times).
- Movies on demand (instead of going to the video store).
- Two way video conversations (family, friends).
- Video stored on home computers and distributed across the Internet (e.g. videos of grandchildren, family activities).
- Local video content streamed live or from a server (e.g. high school football games, other sporting events, town council meetings, other civic activities).

HD video will create the most demand for bandwidth. A single channel of HD video requires 12 to 18 megabits of bandwidth. Most homes in New Mexico have two televisions, meaning that a minimum of 25 megabits of bandwidth is required just to have both televisions on and tuned to two different channels. If a third person in the home is attending an evening distance learning course that uses HD video, the total bandwidth need would be more than 40 megabits.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Households	246,810	262,606	279,413	297,295	316,322	336,567	358,107	381,026	405,412	431,358	458,965
Households with TV	222,129	236,345	251,472	267,566	284,690	302,910	322,296	342,923	364,871	388,222	413,069
Take rate	0%	5%	25%	40%	80%	90%	90%	90%	90%	90%	90%
Average demand	0	425	2,263	3,853	8,199	9,814	10,442	11,111	11,822	12,578	13,383
Peak demand	0	3,063	16,295	27,741	59,033	70,663	75,185	79,997	85,117	90,565	96,361


Residential TV Average Demand (megabits)
Megabits
15000
12000
9000
6000
3000
0
0
425
2263
3853
8199
9814
10442
11111
11822
12578
13383
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Average demand


Residential TV Peak Demand (megabits)
Megabits
100000
80000
60000
40000
20000
0
0
3063
16295
27741
59033
70663
75185
79997
85117
90565
96361
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Peak demand

Economic Impact Analysis

Broadband is not a silver bullet for states or for their communities. Broadband investments need to be tied to a wider set of social and economic development strategies that help make states vital, engaging and interesting places to locate and run a business, and to make communities vibrant and safe places to live. States and their communities that have made broadband investments without taking the time to identify a broader set of goals and expected outcomes are beginning to experience harmful effects when broadband investments have not had much impact.

New Mexico should embark on a strategy to make regular investments in broadband infrastructure coupled with other key community and economic development projects (for example, building fiber alongside a proposed new rail line). Key goals of such an effort would have the following set of characteristics:

- ***A long range plan to extend duct and dark fiber*** to most communities, institutions, homes and businesses over a period of five to seven years.
- Install fiber and duct at industrial and business parks to increase the attractiveness, effectiveness and value of those facilities.
- Provide fiber and duct to all government facilities, educational and cultural institutions, healthcare facilities, libraries, and other public sector sites in urban and rural communities.
- Make fiber available to buildings on downtown Main Streets, especially buildings with office space, which could draw and support more small businesses and entrepreneurs.
- Fiber in residential and rural areas will enhance property values and will make communities more attractive as a live-work community.

Telecom Expenditures and Economic Impact

The financial analyses on the next several pages consider and compare the 30 year expenditures for routine and normal telecom services for businesses, residents, schools, and institutions for the state. Over the next three decades, almost $37 billion dollars will be spent on telecom services. This is a very conservative estimate that does not take into account wireless services or the ever expanding demand for new kinds of services. The model looks only at current demand. Public-private, State and local investments in a shared ownership and managed digital road systems, where all services are provided by the private sector, would have substantial benefits.

If New Mexico encourages public/private partnership investments in telecom infrastructure, we would expect that prices for telecom services would decline by 18% or more. The thirty year savings represents nearly $6.5 billion that can be used for other purposes, including commercial innovation investment, energy, water and resources management, education and jobs creation, or lower tax rates, among many other opportunities. How-

ever, the revenue from leasing of passive infrastructure is limited, compared to what would be possible with an active system approach.

If State and local governments partner with private sector providers to take a new role in the development of telecom. infrastructure, it will accelerate the availability of broadband options within regions, especially in the institutional, business and retail sector. It is important to note that government would not sell services to the public and would not compete with private sector firms. Instead, private sector firms, including existing telecom. providers, would use the new infrastructure to fairly compete with each other. Service providers using the network would pay or invest a small portion of revenue for the use of the infrastructure.

New Mexico Telecom Expenditure Estimates

New Mexico 30 Year Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Internet
Total households	746,810		
Total businesses	71,275		
Percentage of households	40%	30%	30%
Number of households	298,724	224,043	224,043
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/ household	$1,380	$1,800	$1,140
30 year telecom expenditure	$12,367,173,600	$12,098,322,000	$7,662,270,600
Total residential expenditures	$32,127,766,200		
Business and government expenditures [1]	$4,819,164,930		
Total telecom expenditures	**$36,946,931,130**		
Estimated savings from shared and open access networks [2]	$6,650,447,603		

[1] Business, schools, institutions, and government costs estimated conservatively at 15% of residential expenditures

[2] The sum of 18% savings on the cost of telecom services due to increased choice and competitive pricing

Albuquerque Telecom Expenditure Estimates

Albuquerque 30 Year Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Internet
Total households	496,949		
Total businesses	23,621		
Percentage of households	40%	30%	30%
Number of households	198,780	149,085	149,085
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/ household	$1,380	$1,800	$1,140
30 year telecom expenditure	$8,229,475,440	$8,050,573,800	$5,098,696,740
Total residential expenditures	$21,378,745,980		
Business and government expenditures [1]	$3,206,811,897		
Total telecom expenditures	**$24,585,557,877**		
Estimated savings from shared and open access networks [2]	$4,425,400,418		

[1] Business, schools, institutions, and government costs estimated conservatively at 15% of residential expenditures

[2] The sum of 18% savings on the cost of telecom services due to increased choice and competitive pricing

Santa Fe Telecom Expenditure Estimates

City of Santa Fe 30 Year Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Internet
Total households	66,922		
Total businesses	6,757		
Percentage of households	40%	30%	30%
Number of households	26,769	20,077	20,077
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/ household	$1,380	$1,800	$1,140
30 year telecom expenditure	$1,108,228,320	$1,084,136,400	$686,619,720
Total residential expenditures	$2,878,984,440		
Business and government expenditures [1]	$431,847,666		
Total telecom expenditures	**$3,310,832,106**		
Estimated savings from shared and open access networks [2]	$595,949,779		

[1] Business, schools, institutions, and government costs estimated conservatively at 15% of residential expenditures

[2] The sum of 18% savings on the cost of telecom services due to increased choice and competitive pricing

Las Cruces Telecom Expenditure Estimates

Las Cruces 30 Year Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Internet
Total households	81,306		
Total businesses	3,440		
Percentage of households	40%	30%	30%
Number of households	32,522	24,392	24,392
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/ household	$1,380	$1,800	$1,140
30 year telecom expenditure	$1,346,427,360	$1,317,157,200	$834,199,560
Total residential expenditures	$3,497,784,120		
Business and government expenditures [1]	$524,667,618		
Total telecom expenditures	**$4,022,451,738**		
Estimated savings from shared and open access networks [2]	$724,041,313		

[1] Business, schools, institutions, and government costs estimated conservatively at 15% of residential expenditures

[2] The sum of 18% savings on the cost of telecom services due to increased choice and competitive pricing

Rio Rancho Telecom Expenditure Estimates

Rio Rancho 30 Year Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Internet
Total households	64,378		
Total businesses	1,559		
Percentage of households	40%	30%	30%
Number of households	25,751	19,313	19,313
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/ household	$1,380	$1,800	$1,140
30 year telecom expenditure	$1,066,099,680	$1,042,923,600	$660,518,280
Total residential expenditures	$2,769,541,560		
Business and government expenditures [1]	$415,431,234		
Total telecom expenditures	**$3,184,972,794**		
Estimated savings from shared and open access networks [2]	$573,295,103		

[1] Business, schools, institutions, and government costs estimated conservatively at 15% of residential expenditures

[2] The sum of 18% savings on the cost of telecom services due to increased choice and competitive pricing

Los Alamos Telecom Expenditure Estimates

Los Alamos 30 Year Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Internet
Total households	12,493		
Total businesses	505		
Percentage of households	40%	30%	30%
Number of households	4,997	3,748	3,748
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/ household	$1,380	$1,800	$1,140
30 year telecom expenditure	$206,884,080	$202,386,600	$128,178,180
Total residential expenditures	$537,448,860		
Business and government expenditures [1]	$80,617,329		
Total telecom expenditures	**$618,066,189**		
Estimated savings from shared and open access networks [2]	$111,251,914		

[1] Business, schools, institutions, and government costs estimated conservatively at 15% of residential expenditures

[2] The sum of 18% savings on the cost of telecom services due to increased choice and competitive pricing

Shared Network Economic Impact Analysis

The following map and accompanying tables, tell part of a story. In considering just the 40+ Supercomputing Gateway sites, a comparable number of planned library network upgrades, and telehealth services sites' network needs in New Mexico, it becomes clear that many of these sites are in the very same communities, which may also have other institution and business connectivity, as well as their own economic development based broadband networking needs and plans.

Simply stated, the current telecommunications services model would have each of these many individual institutional users' needs for enhanced connectivity, paying varying high costs, for proprietary (not shared) point-to-point, asymmetrical networked access and services from the regional provider. In addition to some grants and federal discounts, many agencies compete for and are largely dependent upon annual appropriations from the State Legislature, which does not have the funds to support all requests.

Broadband Networking Costs, Sharing Options and Potential Savings

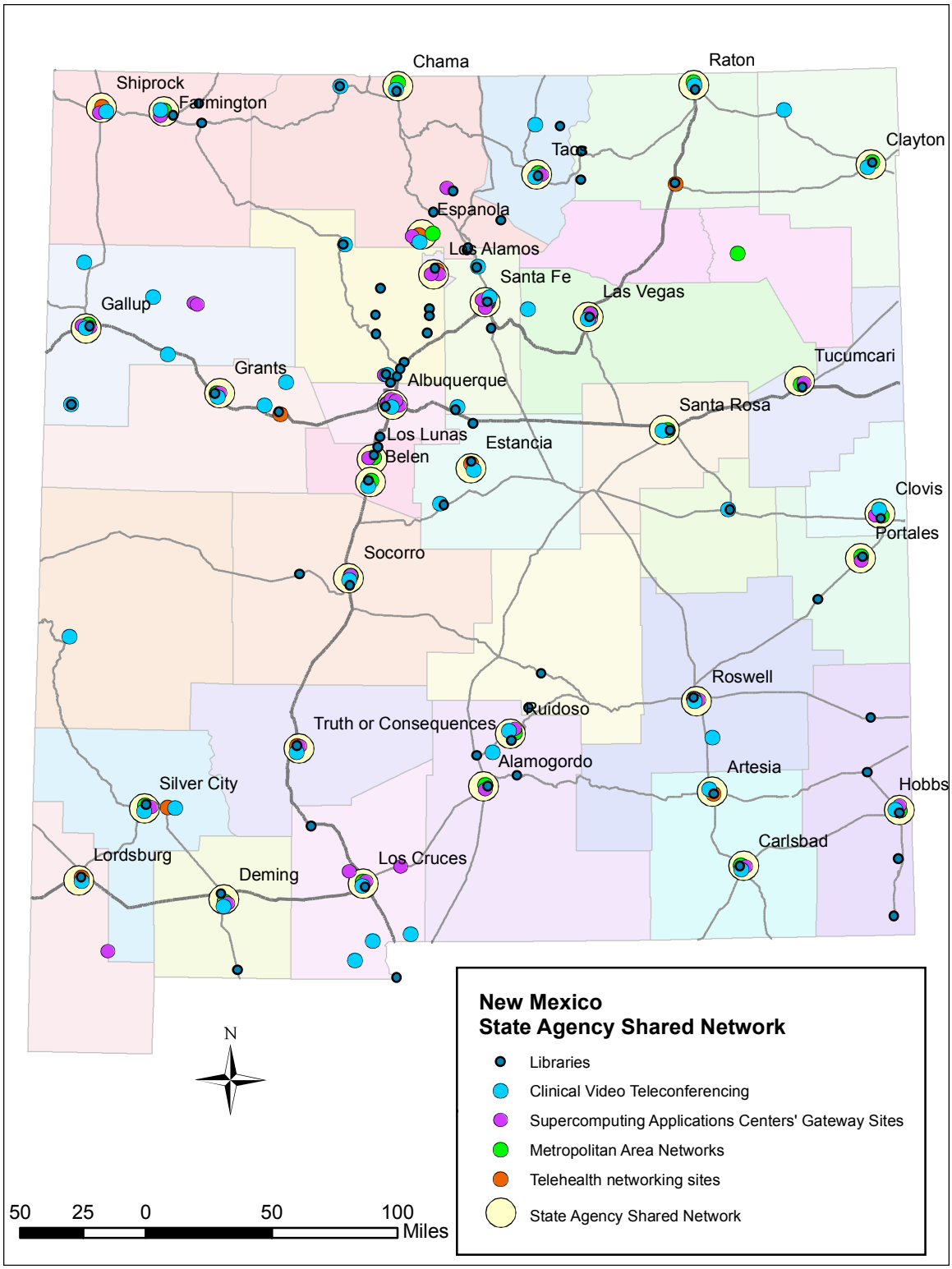
The following questions and related cost estimates are the basis for key decision-making needs which provoke a major reason for this Report. More detail is required, on actual bandwidth requirements and 'true costs', especially as it will impact telecommunication providers' 'quotes' and Legislative appropriation requests.

- What are current projected costs for connecting 40+ NM CAC Gateways ?
- What are current projected costs for connecting 200+ Telehealth facilities ?
- What are current projected costs for connecting 75+ Libraries ?
- What might cost savings be if these facilities shared an open fiber network ?
- What funding amounts might NM CAC, NM Telehealth Project, State Library, Public Education Department or other Departments be requesting of the State Legislature (LFC) in 2009, for broadband connectivity ?

If institutions and facilities, listed in the tables on following pages, were to pay current network backhaul and local rates for needed 1.5 or 3-10 Mbps network access, versus shared fiber connectivity at higher bandwidth, they would in aggregate, cost approximately:

- Approximated Total: $24,076,800 vs. $7,372,800.

Appendix B Page: 3


Chama
Raton
Shiprock
Farmington
Clayton
Taos
Espanola
Los Alamos
Santa Fe
Las Vegas
Gallup
Tucumcari
Grants
Albuquerque
Santa Rosa
Los Lunas
Estancia
Belen
Clovis
Portales
Socorro
Roswell
Ruidoso
Truth or Consequences
Alamogordo
Artesia
Silver City
Hobbs
Carlsbad
Lordsburg
Deming
Los Cruces
N
50 25 0 50 100
Miles
New Mexico
State Agency Shared Network
Libraries
Clinical Video Teleconferencing
Supercomputing Applications Centers' Gateway Sites
Metropolitan Area Networks
Telehealth networking sites
State Agency Shared Network

Location	CAC: Monthly estimated cost for 10 meg connection (DS3)	Libraries: Monthly estimated cost for 3 meg connection (2 x T1)	Telehealth: Monthly estimated cost for 3 meg connection (2 x T1)	Annual cost of three separate networks
Shiprock	$2,500	$700	$700	$46,800
Farmington	$2,500	$700	$700	$46,800
Chama	$2,500	$700	$700	$46,800
Taos	$2,500	$700	$700	$46,800
Raton	$2,500	$700	$700	$46,800
Clayton	$2,500	$3,400	$3,400	$111,600
Gallup	$2,500	$700	$700	$46,800
Espanola	$2,500	$700	$700	$46,800
Los Alamos	$2,500	$700	$700	$46,800
Santa Fe	$2,500	$700	$700	$46,800
Las Vegas	$2,500	$700	$700	$46,800
Grants	$2,500	$700	$700	$46,800
Albuquerque	$2,500	$700	$700	$46,800
Santa Rosa	$2,500	$3,200	$3,200	$106,800
Tucumcari	$2,500	$700	$700	$46,800
Los Lunas	$2,500	$700	$700	$46,800
Belen	$2,500	$700	$700	$46,800
Estancia	$2,500	$1,200	$1,200	$58,800
Socorro	$2,500	$700	$700	$46,800
Clovis	$2,500	$700	$700	$46,800
Portales	$2,500	$700	$700	$46,800
Lordsburg	$2,500	$4,400	$4,400	$135,600
Silver City	$2,500	$700	$700	$46,800
Truth or Cons.	$2,500	$3,500	$3,500	$114,000
Ruidoso	$2,500	$3,500	$3,500	$114,000
Alamogordo	$2,500	$700	$700	$46,800
Roswell	$2,500	$700	$700	$46,800
Artesia	$2,500	$700	$700	$46,800
Carlsbad	$2,500	$3,600	$3,600	$116,400
Hobbs	$2,500	$4,000	$4,000	$126,000
Deming	$2,500	$700	$700	$46,800
Las Cruces	$2,500	$700	$700	$46,800
			Total annual cost	$24,076,800

Shared open network model, using off the street pricing already available in other states ($40/meg point to point, no distance charges)				
Location	CAC: Monthly estimated cost for 20 meg	Libraries: Monthly estimated cost for 10 meg connection	Telehealth: Monthly estimated cost for 10 meg connection	Annual cost of three separate networks
Shiprock	$800	$400	$400	$19,200
Farmington	$800	$400	$400	$19,200
Chama	$800	$400	$400	$19,200
Taos	$800	$400	$400	$19,200
Raton	$800	$400	$400	$19,200
Clayton	$800	$400	$400	$19,200
Gallup	$800	$400	$400	$19,200
Espanola	$800	$400	$400	$19,200
Los Alamos	$800	$400	$400	$19,200
Santa Fe	$800	$400	$400	$19,200
Las Vegas	$800	$400	$400	$19,200
Grants	$800	$400	$400	$19,200
Albuquerque	$800	$400	$400	$19,200
Santa Rosa	$800	$400	$400	$19,200
Tucumcari	$800	$400	$400	$19,200
Los Lunas	$800	$400	$400	$19,200
Belen	$800	$400	$400	$19,200
Estancia	$800	$400	$400	$19,200
Socorro	$800	$400	$400	$19,200
Clovis	$800	$400	$400	$19,200
Portales	$800	$400	$400	$19,200
Lordsburg	$800	$400	$400	$19,200
Silver City	$800	$400	$400	$19,200
Truth or Cons.	$800	$400	$400	$19,200
Ruidoso	$800	$400	$400	$19,200
Alamogordo	$800	$400	$400	$19,200
Roswell	$800	$400	$400	$19,200
Artesia	$800	$400	$400	$19,200
Carlsbad	$800	$400	$400	$19,200
Hobbs	$800	$400	$400	$19,200
Deming	$800	$400	$400	$19,200
Las Cruces	$800	$400	$400	$19,200
			Total annual cost	$7,372,800

New Mexico Broadband Report

New Mexico Broadband Statistics

November 12, 2007 - Leichtman Research Group, Inc. (LRG)

www.leichtmanresearch.com/press/111207release.html

New Mexico is among the bottom five states in residential broadband penetration, along with Mississippi, West Virginia, Alabama, and Arkansas.

According to a report by the Kauffman Foundation and the Information Technology and Innovation Foundation, New Mexico ranks 46th in percentage of Internet users, 49th in e-government, and 36th in broadband telecommunications.

According to Federal Communications Commission statistics, only 78% of New Mexicans have access to digital subscriber line (DSL) service and only 77% have access to cable modem service – well below the national averages of 82% and 96%, respectively.

The quality of service received when broadband connectivity is available is 15% slower than the national average, according to Communications Workers of America's Speed Matters web site.

Appendix A Pages: 4, 5 and 6

New Mexico Documents

Following are a few excerpted sections of Executive Orders, Legislation, the State Constitution and political statements, of relevance to this Report.

NM Executive Order 2008-028

On Thursday, June 19th, 2008, Governor Richardson signed an Executive Order, establishing a Telework and Alternative Work Program for State workers. Such a program will require improved home-based broadband access and connectivity for many employees, as well as tele-conferencing systems and training on effective telework practices. Excerpts from the Press release and EO, follow:

For full text of EXECUTIVE ORDER 2008-028:

http://governor.state.nm.us/press.php?id=839

ESTABLISHING A STRONG TELEWORK AND FLEXIBLE WORK HOURS PROGRAM TO HELP REDUCE FUEL USE AND TAXPAYERS COSTS

Governor Bill Richardson has signed an executive order creating the State of New Mexico Telework and Alternative Work Schedule Program. The executive order creates the

framework for a new telework and alternative work schedule policy for state employees, with strict accountability to ensure that productivity remains high.

According to the executive order signed by the Governor, State Personnel Director Sandi Perez will report back to the Governor with policy guidelines for the New Mexico State Telework and Alternative Work Schedule Program by July 15th. State agencies will adopt a written policy that defines specific criteria and procedures for telework and alternative work schedules by September 1, 2008.

The executive order also calls for changes to state vehicle usage, more emphasis on public transit and for technology improvements to increase productivity and support teleworking in State government.

EO Item 3. The Department of Information Technology shall work with GSD's Lead by Example Coordinator to assess, improve, and promote State government's use of technology, such as telephone, video, and internet conferencing, to improve productivity and to support telework and reduce unnecessary employee travel.

HB - 75

(HB-75 currently restricts uses of State government networks, ie. Wire New Mexico.)

AN ACT RELATING TO ADMINISTRATION OF GOVERNMENT; PROVIDING FOR THE GENERAL SERVICES DEPARTMENT'S AUTHORITY TO PROVIDE TELECOMMUNICATIONS SERVICES.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF NEW MEXICO:

(Exerpted sections, passed in 2007)

In providing telecommunications services pursuant to Chapter 15 NMSA 1978, the telecommunications bureau of the communications division of the general services department shall not provide telecommunications services, including telephone, data and broadband services, to any entity other than those authorized pursuant to Section 15-5-1 NMSA 1978, except for telecommunications services that are necessary to facilitate state-mandated programs, such as distance education, telehealth or school-based health center programs.

"15-5-1. TELECOMMUNICATIONS BUREAU CREATED--DUTIES.

A. The "telecommunications bureau" is created within the communications division of the general services department.

B. The telecommunications bureau shall enter into necessary agreements to provide, where feasible, a central telephone system, including wide-area telephone service, and related facilities to all executive, legislative, judicial, institutional and other state governmental offices located in the state of New Mexico.

C. As used in this section, "executive, legislative, judicial, institutional and other state

governmental offices" means any of the branches, agencies, departments, institutions or boards of the state of New Mexico, but does not include a municipality, county, school district or two-year public post-secondary educational institution."

NM Constitution (Article IX, Section 14) – Anti-Donation Clause

The anti-donation clause of the NM Constitution says state or local government can't provide anything of value to a non-public entity for less than fair market value compensation.

Neither the state, nor any county, school district, or municipality ... shall directly or indirectly lend or pledge its credit, or make any donation to or in aid of any person, association, or public or private corporation ....

Governor Richardson on Broadband

The following are excerpts from Governor Richardson's presidential candidacy broadband policy statements, and citations on his on broadband positions:

"I would be a leader in promoting Internet broadband access, because I think it's technology that is needed...What I want to be sure of is that when we have broadband access and Internet access that it goes to the community, that it goes to schools, that it goes to the private sector, that it goes to businesses, that it not just go to government offices, county and city governments - that it be broadly based so that mainly schools can benefit from full Internet and broadband access."

Governor Richardson supports rural broadband efforts, demonstrated by his 2007 budget which included a section on expanding broadband infrastructure, noting the importance of providing state agencies with an efficient network to support public safety, schools and Telehealth.

An April 2006 White Paper on What Governor's Are Planning for Information Technology, pointed to Richardson's support of Telehealth initiatives via his March 2004 Healthcare Bill 581, which proposed expansion of rural broadband networks to make health services such as electronic prescription monitoring available to rural New Mexicans.

Gov. Richardson is invested in broadband as a tool to improve local schools, and in 2006 reached a settlement with Quest that lead Quest to invest $265 million in new technology [and] $15 million for computer literacy programs for disadvantaged schools.

In 2005, Richardson held three technology planning summits, including a Telecommunications Infrastructure Conference. The Governor commented: "Technology-based economic development has been, and continues to be, a priority for my administration, and these three events will showcase the potential for growing sustainable, high-wage jobs and business – building on New Mexico's unparalleled technology resources."

Past New Mexico Telecommunications Initiatives

There have been important steps taken in New Mexico over many years, especially as the Internet became a critical public resource and a major part of all state operations and livelihood. Though we have come far, there is much more that needs to be done, in order to fulfill the needs and goals for an intelligently responsible, healthy, educated, and globally competitive state.

Connect New Mexico

Connect New Mexico was an all-volunteer, unstaffed organization that included representatives of the state's telecommunications, broadcast, computer and Internet industries. Originally a consortium of public and private organizations co-sponsored by the state government and the Los Alamos National Lab, Connect New Mexico was restarted in June 1999 to encourage the state to develop communications networks that would improve education, health care, government and business. Its members included representatives of state government, industry and the education sector. In its 1999 legislative positions, Connect New Mexico called for programs to provide education and training in rural communities in telecommunications technology. It supported legislation to accelerate deployment and use of technology in education and health care. It backed capital spending to help New Mexico's public television stations convert to national digital transmission standards. It encouraged development of tax incentives for Internet-based and other telecommunications businesses. And it urged state legislators to provide support and funding to higher education institutions for information technology and related infrastructure upgrades.

START

The Strategic Telecommunications Alliance Resource Team (START) worked closely with the economic development community to provide essential services to relocating and expanding businesses by tracking and documenting the high-tech communications network of Metro New Mexico. With leadership from Senator Pete Domenici's Office, and some initial federal funding, START conducted statewide infrastructure mapping and services assessment.

During 2002-03 START was funded by the U.S. Department of Commerce Economic Development Administration (EDA) to assess the strengths and weaknesses of the state's telecommunications infrastructure. Finding that 'last mile' facilities were the weakest link in the state's network distribution system, START developed a set of tools, instructions and resources designed to assist communities meet their local networking needs, including ways to build business cases for local network investments. The START information and resources web site was taken off-line at the end of 2007.

NM TechNet

New Mexico TechNet, Inc. is a non-profit corporation whose mission is to encourage the use of technology and technology based applications in support of business, government and education.

Originally founded in 1984, TechNet was charged with linking the national laboratories, state government, the universities, and the private sector with a high capacity fiber optic network, and introducing applications that demonstrated the value of this technology. This created a communications and technology based environment to foster economic development, education, and research throughout the state.

In 1985 TechNet was selected by the National Science Foundation to be the Internet hub in New Mexico. Starting with a 56 Kilobits Per Second connection, TechNet has expanded capabilities reaching out to over 50 rural communities with local dial in access. TechNet served as the primary connection point to the Internet for other Internet Service Providers, businesses, government, education and private users in New Mexico.

In 1994, TechNet formed TFP, Inc., a wholly-owned for-profit subsidiary. On January 1, 2000, TFP became Oso Grande Technologies, Inc. and business activities that are similar to those of other for-profit companies were handed to Oso Grande. In 2001, TechNet in recognition of the commercial nature of the Internet market today, shifted its focus to support technology based applications and technology education. Commercial activity is handled through Oso Grande Technologies and there remains a strong tie between the two companies though each is a separate organization unto itself. TechNet continues to operate as a private, non-profit corporation serving the technology needs of New Mexico.

All revenues collected from services, grants and appropriations are used to pay for the operating and capital expenses of expanding and maintaining the company's services and to subsidize educational and economic development initiatives in the state.

MAGNet

The State of New Mexico's 'Multi Agency Network' arranged with Qwest for cost-saving, service contracted discounts for State networks, was initiated in 2002. The Agreement was ended in 2004-05, though the prior discounted pricing has continued in-effect, for the most part, with the State DoIT. MAGNet was a very important program, in its cost-cutting networking options for the State, which in all likelihood, resulted in added income for Qwest. The precedent established by this program should be considered and built upon within the proposed Broadband Initiative.

MAGNet did not include arrangements with the NMECG.

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Legislative Solutions for Telecommunications 2000

In 1999 and 2000 a number of proposals and white papers were prepared for the NM Economic Development Department, with recommendations for the State's telecommunications future, and resulted in Roberto Salazar, Director of EDD's Office of Science & Technology preparing a set of recommendations to the State Legislature. Some of these recommendations, proposed to be enacted as the "New Mexico Telecommunications Reform Act of 2000" were adopted over coming years, and some were not. Key recommendations were:

- Adopt contingency based regulation
- Separate the retail and wholesale telecommunications structure
- Increase the fining capabilities of the Public Regulatory Commission
- Establish a Telecommunications Infrastructure Fund
- Accelerate funding the digitalization of the State microwave system
- Mandate that all publicly funded entities pool their telecommunications requirements

Mapping of Infrastructure and Services

Mapping of our telecommunications networking infrastructure and services is key to more effective decision-making. It is not an easy task, though. Taking the task on properly, involves the participation of many public and private entities; wireline and wireless telecommunications companies, state and federal agencies, energy and transportation firms, Native American communities, counties and municipalities, and more. Some of the information is proprietary for competitive business reasons. Security concerns limit sharing of other information. Even if there are new agreements to share mapping data for greater benefit, determinations will be required as to what may be made public and what will need to be kept private, while entrusted to an authorized broker. Technical standards, metadata requirements, mapping system platform and information hosting, serving and maintenance issues will also need to be addressed.

Costs and support for a mapping project will have to be considered. Ultimately, the decisions that need to be made, will help to determine what gets mapped, by whom and how. Creation of a properly representative expert working group is recommended for this proposed Initiative.

Identification of Potential Pilot Projects

One of the objectives of this Report, is to help identify and possibly substantiate broadband 'pilot projects' in New Mexico. This may be premature. Defining and identifying 'pilots' must be based on their inherent self-identifying and self-determining abilities. 'Pilots' must be based on more than just needs; but also on their state of readiness. They may be individual urban or rural community broadband initiatives; or more appropriately and effectively, may be diverse, regional community partnership-based initiatives.

Ultimately, the determination of 'pilot projects' should be an outcome of the proposed New Mexico Integrated Strategic Broadband Initiative process, which would not only address the identification of such projects, but would also determine what the State, the private sector telecommunications infrastructure and services providers, and other entities can do to assist, support and substantiate 'pilot projects'.

Pilot Projects cannot be entirely dependent on State or other outside support, but must have resources and leadership, and be actively working to meet self-supporting objectives. The State can and should, however, provide strategically leveraged assistance to help move projects forward towards economic self-sufficiency, in ways that may not be otherwise available.

The rapid assessment broadband Survey undertaken for this Report may help to identify a few self-determining, potential Pilot Projects in New Mexico. They are emerging diversely, geographically, technically and socially upon the landscape.

New Mexico Broadband Survey

A Rapid Assessment

While there are many outstanding needs and problems here in New Mexico, there are also many individuals, communities, public institutions, public sector and private sector projects being planned and implemented, with important examples being set. These serve as the cornerstones for next phase actions and solutions to be embarked upon.

The following rapid assessment Survey of broadband networking projects in New Mexico, shows that there is a great deal of activity and achievement throughout the state. What these various efforts show also, is that there is a need for 'strategic integration' of these many networks. Many of the listed networking projects lack long-term economic sustainability structures, as they are currently supported by State legislative appropriations, or federal agency start-up funds, grants and subsidies.

This is a far from comprehensive listing and description of what has and is being accomplished in the networking of New Mexico. Its omissions should provoke the gathering of more comprehensive assessment. Maps and network diagrams illustrating some of the listed projects, along with Attachment documents, are located in the Report's Appendix.

State Departments, Agencies and Programs

An incomplete list of State Departments includes: Departments of Information Technology; Transportation; Economic Development; Homeland Security and Emergency Services; Finance and Administration; Health; Cultural Affairs; Higher Education and Public Education; Public Safety; Energy, Minerals and Natural Resources; Corrections; Environment; General Services; Human Services; Indian Affairs; Workforce Solutions; Taxation and Revenue; Tourism; Agriculture; and more.

All of the New Mexico State Government Departments have extensive information technology and telecommunications network operations and ongoing needs. They are now being integrated with the consolidated DoIT networking strategic plans, operations and services. State Government is the largest single user of telecommunications network infrastructure and services in New Mexico.

PRC: Telecommunications Bureau

The NM Public Regulations Commission's Telecommunications Bureau performs analysis and provides expert testimony on issues related to telecommunications, including rulemakings and cases before the Commission. The Bureau reviews applications for interconnection and certificates of public convenience and necessity for telecommunications carriers. The bureau is responsible for overseeing the Alternative Form of Regulation (AFOR) orders applicable to Qwest and Valor, including monitoring of quality of service reporting and infrastructure investment. The bureau also maintains the telecommunications carrier database which is used for collection of inspection and supervision fees. www.nmprc.state.nm.us/tb.htm

The NM PRC Telecom Bureau staff is currently proposing a Competition Study, which will help it to determine needed regulatory changes, to create a more 'level playing field'.

Appendix A Page: 11

The New Mexico Department of Information Technology (DoIT)

The New Mexico Department of Information Technology was created in 2007 to provide state government a strong technical foundation to better serve its citizens and to create more accountability and efficiency in the information technology arena. DoIT, by a 2008 Executive Order, has consolidated authority over the IT planning, services and solutions of all State Departments.

The department provides 'enterprise' IT services and support, including communication services such as e-mail, Internet access, telephone and radio service to state agencies. The department also manages the state's Data Center, which processes the necessary information to keep crucial government operations running. Its radio towers keep police patrols in touch with headquarters.

The Department of Information Technology also reviews all major technology projects and purchases in the executive branch. The department also participates in major technology efforts for the state, such as Wire New Mexico, an effort to expand high-speed digital communications. The department also oversees the Supercomputer project, and is assisting with the Telehealth Access Grid.

Primary bandwidth using applications on the State's network are SHARE, Enterprise Email and Personnel jobs applications. Major Departmental users are Tax and Revenue, Corrections, as well as Public Safety, Homeland Security and Emergency Management, Fish and Game, and Transportation. DoIT has 650-750 circuits throughout the state, for agencies' uses; few shared. DoIT has clearly expressed requirements for network redundancy via diverse routes, and more reliable power; both critical disaster management and recovery issues.

The department is headquartered in Santa Fe and has field offices in Las Cruces, Roswell, Las Vegas and Albuquerque.

Wire New Mexico

Wire NM consists of a statewide microwave and a fiber infrastructure networking project. The microwave network, with 99 radio sites, is currently being upgraded from analogue to digital, and is being integrated with the fiber backbone. The four phases of the fiber backbone are the the Rio Grande Corridor (a collaboration between UNM, NM Tech, NMSU and DoIT), the Southeast Ring, the Northwest Leg and the Northeast Leg. The integrated network will provide voice, video and data services; will provide for needed redundancy; and will service government and educational entities.

The Digital Microwave system will be able to deliver video conferencing, distance learning and high definition television. It will also provide enhanced two-way communications, with bandwidth equivalent to approximately 3 DS-3s, for the Department of Public Safety, local law enforcement, Border Patrol and the FBI.

The analogue to digital conversion of the Wire NM microwave system, currently in process, still requires funding, with $3.0 million in State funds being requested in FY-10. The Albuquerque and Santa Fe metropolitan Backbone networks will be interconnected with Wire NM, providing high capacity interconnectivity for State agencies.

Due in part to weather related outages and instabilities of the Santa Fe Metropolitan Network's wireless systems, Qwest QMOE services have been ordered and are near-operational. New, more reliable radio systems will be deployed to provide redundancy for all three primary Santa Fe network sites. Additional QMOE services will be added for additional high priority sites.

The Wire NM fiber backbone is intended to be integrated with other New Mexico broadband initiatives, including IDEAL-NM, NM LambdaRail Network, Telehealth networking, and CHECS-Net. The Southeast Optical Network (SEON) requires a $4.8 million

appropriation, while the the Northeast Optical Network (NEON) and the Northwest Optical Network (NWON) will seek future funding appropriations. The Albuquerque Metropolitan Area Network has no funding at present.

During 2008 the Rio Grande Optical Network is being interconnected to the UNM GigaPOP facility at 505 Marquette St., Albuquerque. This will facilitate interconnectivity with NM LambdaRail Network, the Supercomputing system at Intel and statewide Gateways, multiple carriers' networks, as well as providing backup and redundant paths for the Santa Fe MAN.

Appendix B Pages: 11, 12, 13, 14, 15, 16 and 17

Questions:

- What are DoIT's 5-12 year (to 2020) broadband networking needs and directions?
- How will current Wire NM networking initiatives strategically meet diverse, future State networking requirements?
- Will State Enterprise networks integrate with other statewide networks? How?

The New Mexico IT Commission

The Information Technology Commission (ITC) is an Executive Office Commission, under the Department of Information Technology (DoIT), which oversees and reviews State IT management, processes and outcomes. Its (17) voting members and (6) advisory members, usually meeting monthly, are widely representative of State, public and private sector interests and expertise.

The New Mexico Legislative ITTOC

The Legislative Information Technology and Telecommunications Committee (ITTOC) is in its 7th year, and usually meets once per month between Legislative sessions. Comprised of legislators, with interest in and familiarity with State ITT matters, the Committee oversees State departmental ITT activities, as well as statewide ITT needs and initiatives, with special interest in Legislative Finance Committee requests and appropriations.

NM Computing Applications Center (NM CAC)

The newly established nonprofit NM CAC, is a recent realization of New Mexico's new Science and Technology Plan, formed under the authority of the Research parks and Economic Development Act. Information Technology is a fundamental, overarching core component of the State's Plan, along with Energy (plus Environment and Water), Aerospace, Health and Biosciences and Nanotechnology. The three State Universities and two Laboratories are founding members of the NM CAC.

The NM CAC has $18.7 million in State appropriations for FY-08 + 09; $11 million for the Supercomputer, $4.8 million for gateway equipment, and $2.9 million for FY-09 operations. Funding requests over 5 years is: $36 million total from the State of NM, $59 million from other sources, plus in-kind contributions from members.

To be headquartered in Albuquerque, the NM CAC intends to initially connect (44) Gateway sites to the Encanto Supercomputer, for applications-based uses by NM businesses, schools and communities at no cost. "Out-of-state users will be charged, said Tom Bowles, former chief science officer at Los Alamos National Laboratory, on loan as Science Adviser to Governor Richardson.

Economic development objectives of this program are to provide R&D support needed for New Mexico businesses to grow, to attract large companies to the state, and to build national and international partnerships. Education and workforce development objectives include support of STEM education, university education and research, professional development for teachers, public education, and keeping young people in New Mexico. Community based objectives include problem-solving assistance about health, water, environment, climate, clean energy, traffic and more.

Gateway sites will include high-definition video conferencing suites with 3-dimensional Powerwall displays, to facilitate collaborative work. Major Gateway sites will be connected to NM LambdaRail (NMLR), with other college campuses connected via CHECS Net to NMLR. Bandwidth requirements for Gateway sites need at a minimum to be 10-15 Mbps., with 100 Mbps to 2 Gbps connections anticipated as being required for multiple users of high-definition motion graphics visualization and processing. The latter can only be achieved by connection to an optical fiber network.

"This is the largest non-federally funded, high-performance computing platform in the nation," said Stephen Wheat, director of High Performance Computing for Intel Corp., which houses the state's system at its Rio Rancho plant. The system is managed for the State by the NM DoIT.

The Encanto supercomputer is currently connected via Qwest 10 Gbps 'Private Line Transport GeoMax' fiber optic data transport service, from Intel Corp. to the NM GigaPoP facilities at 505 Marquette St., in Albuquerque.

Appendix B Page: 5

NM Computing Applications Centers' Proposed Gateway Sites

- Encanto Supercomputer, located at Intel Corp., Rio Rancho
- Air Force Research Laboratory (Kirtland), Albuquerque
- Central New Mexico Community College, Albuquerque
- Clovis Community College, Clovis
- College of Santa Fe, Santa Fe
- Dine College, Shiprock Campus

    - Crownpoint Campus
- Eastern New Mexico University
    - ENMU - Portales
    - ENMU - Roswell
    - ENMU - Ruidoso
- Institute of American Indian Arts, Santa Fe
- Los Alamos National Laboratory, Los Alamos
- Luna Community College, Las Vegas
- Navajo Technical College, Crownpoint
- Mesalands Community College, Tucumcari
- New Mexico Highlands University, Las Vegas
- New Mexico Junior College, Hobbs
- New Mexico Military Institute, Roswell
- New Mexico State University, Las Cruces
    - NMSU – Grants
    - NMSU – Dona Ana
    - NMSU – Alamagordo
    - NMSU – Carlsbad
- New Mexico Tech, Socorro
    - NMT – Playas
- Northern New Mexico Community College, Espanola
    - Northern – El Rito
- Sandia National Laboratories, Albuquerque
- San Juan College, Farmington
- Santa Fe Community College Santa Fe
- Santa Fe Institute, Santa Fe
- University of New Mexico, Albuquerque
    - UNM – Gallup
    - UNM – Las Lunas
    - UNM – Los Alamos
    - UNM - Taos
- Western New Mexico University, Silver City
    - WNMU – Truth or Consequences
    - WNMU – Deming
    - WNMU - Gallup
- Southwestern Indian Polytechnic Institute, Albuquerque
- White Sands Missile Range, White Sands

New Mexico Libraries

The New Mexico State Library system is planning to upgrade network connectivity to 75 libraries throughout the state in the coming year. It is most interested in exploring the possibilities for shared 'open' fiber networking with other State agencies and providers. Public libraries in New Mexico, like those in other states, provide critical services in the communities they serve, and increasingly these services are based on electronic resources stored on equipment that is non-local, accessed via the Internet.

- Fact: 1/3 of Americans do not own a computer.
- Fact: 73% of public libraries nationwide report they are the only source of free public access to computers and Internet in their communities.
- Types of On-line Services Provided by Libraries:
- Education resources for K-12 (67%)
- Services for job seekers – on-line job applications (44%)
- Computer and Internet skills training (29%)
- Education resources for adults/continuing ed. students (27%)
- Education resources for higher ed. (21%)

Benefits to Citizens: Local communities benefit when public libraries have the technology and connectivity to provide electronic resources to their citizens. These library services function as a lever for economic development in rural and developing communities. Access to online distance learning tools, learning technology skills that enhance the value of a person as an employee, and using the Internet for information and job search/application/medical information are a significant asset to the citizens of a town. Those without access to advanced telecommunications technologies and services are at an economic disadvantage.

Bandwidth needed: The American Library Association recommends that each small to medium sized library have a connection of at least 1.5 mbps. Libraries whose patrons use emerging technologies such as podcasting and social networking sites quickly realize the limitations of even this level of connectivity, however. In addition, public libraries around the county are forming resource sharing consortia that necessitate higher levels of bandwidth for internal library functions. By grouping together and sharing automated library management systems, libraries position themselves to take advantage of the economies of scale associated with such endeavors. One important component of any resource sharing consortium among libraries is appropriate bandwidth to carry the transactional data, especially when the participating libraries are sharing an automated system. Data must be able to traverse the network quickly and at the same transmission rates in both directions.

Appendix A Pages: 7, 8, 9 and 10 *Appendix B Page: 6*

NM Department of Cultural Affairs and New Mexico's Cultural Institutions

Statewide broadband improvements and expansion would provide our state's cultural institutions with the potential for extending the statewide and global benefit of their resources, including collections, information, and expertise. What follows is the framework that DCA is working on to ready itself for this opportunity.

The Center for Cultural Technology (CCT) is an outgrowth of the partnership between DCA (Office of Statewide Partnerships) and the Media Arts Program at New Mexico Highlands University.

CCT is envisioned as a national Center of Excellence in the domain of cultural technology—the rapidly emerging field at the intersection of cultural content and new digital media. When fully developed CCT will consist of leading academic, research & development, and clinical practice components.

NMHU is currently working on a $7.4 million capital outlay request for a new building on campus that would house CCT's academic program. Explorations are underway with the Santa Fe Innovation Park (SFIP) about the possibility of that Santa Fe location for the R&D component. DCA's Office of Statewide Partnerships, in the Office of the Secretary, administers the clinical practice component. The proposed R&D Lab will need the basic requirements for a non-profit corporation (or an alternative formal structure), including a Board of Directors and executive director.

CCT will provide the state's cultural institutions with a much-needed external partner outside of the bureaucratic structure of state government, which is not designed to support innovation and that is currently hampering efforts to promote the use of technology in cultural institutions through bureaucratic inertia and red tape. The combination of access to NMCAC and a statewide broadband infrastructure has vast potential for the future of cultural institutions in New Mexico.

NM DOT

The State Department of Transportation (DOT) has an extensive telecommunications network. It is also responsible for extensive 'right of ways' (RoWs) along transportation corridors, which are a critical asset for conduit and wireline (fiber) deployments. The DoT should be a more active participant in shared network planning, permitting process facilitation and deployments.

The New Mexico Department of Transportation's Intelligent Transportation System (ITS), being planned to meet federal requirements, will integrate traffic signal systems, maintenance and construction systems, emergency management systems, transit systems, and other statewide transportation communications, signaling, monitoring and electronic networked applications.

New Mexico Courts

There are 98 court facilities in NM.

- All sites connect to Santa Fe, via a star network of DSL and T-1 connections.
- A new open source Courts Management application is being set up.
- Approximately 30 sites have 56Kb dial-up connections, now being upgraded to DSL.
- Santa Fe is being connected to Albuquerque via Qwest QMOE Metro Ethernet.
- A peering link is being provided by IXNM.
- Service Level Agreement pricing is needed from the DoIT.
- Disaster recovery requirements are being determined.
- www.nmcourts.com

Department of Homeland Security and Emergency Management

The State of New Mexico has been awarded a $8,288,725 Public Safety Interoperable Communications (PSIC) Grant from the US Department of Commerce-NTIA, to be administered by the State Department of Homeland Security and Emergency Management. It will provide State and local public safety agencies with critical funding for needed improvements in public safety communications interoperability.

New Mexico Film & Media Initiative

New Mexico has taken a very aggressive and proactive position in becoming a state that is to be an international center for film and media production and post-production. As digital 'high definition' technologies permeate this industry, the use of highest-bandwidth networking has become a critical requirement for every aspect of the pre-to-post production and distribution process.

The NM Media Industries Strategy Project (NMMISP) is a cornerstone of the State's Film & Media Initiative www.altmedianm.org . One of the unmet parts of the original Project plans was the creation of a needed fiber networking initiative, titled: AcequiaNet.

In recent years, a number of large film and media education, production and post-production studios have been locating in the Albuquerque and Santa Fe area (Albuquerque Studios, Sony ImageWorks, Santa Fe Studios). They have made clear demands for 'as much bandwidth as they can get', in order to be here. Fiber infrastructure is being deployed to the studios in Albuquerque, and Santa Fe County is currently seeking proposals to meet the needs of the new Santa Fe Studios campus in the coming year.

The new Encanto supercomputer and the NM CAC Gateways will play an important role in the next generation of 'advanced imaging, visualization and simulation'. HD-3D imaging facilities are locating in Los Alamos, and almost all of the universities and colleges in the state now have growing media programs, to prepare the needed, skilled workforce

for this multi-sector industry. The State's cultural institutions (museums) are also becoming important developers and users of advanced digital media and networking technologies.

The advanced networking needs for film and media facilities, educational institutions, and new innovative businesses must be integrated into the technical planning, as well as the economic and policy-based considerations that will be inherent to the "NM Integrated Strategic Broadband Initiative"

Educational and Other Institutional Networks and Initiatives

IDEAL-NM

New Mexico is the first state in the nation to create a statewide eLearning system that from its inception encompasses all aspects of learning from traditional public and higher education environments to teacher professional development, continuing education and workforce education.

The IDEAL-NM (Innovative Digital Education and Learning in New Mexico) initiative was announced by Governor Bill Richardson on October 27, 2006, and followed by legislation in the 2007 session.

- Implementation of a statewide eLearning delivery system for P-12, higher education, and state agencies. This includes statewide software licensing for a Learning Management System (LMS).
- Creation of a state-led eLearning program in partnership with local schools, districts, and Regional Education Cooperatives. The intent of this program is to provide online courses that supplement the curricular offerings of New Mexico schools.
- Creation of a statewide eLearning Service Center for P-12, higher education, and state agencies to support the use of the shared eLearning delivery system via the LMS. This includes Help Desk support for the administration and use of the eLearning LMS software

IDEAL-NM provides eLearning services to New Mexico P-12 schools, higher education institutions, and government agencies. We reduce geographic and capacity barriers to educational opportunity while increasing the digital literacy skills students need to participate in a global economy. IDEAL_NM:

- Collaborates with New Mexico schools in providing online courses that expand educational opportunity for all students. The high-quality courses are taught by New Mexico teachers.
- Works with Regional Education Cooperatives in facilitating eLearning best-practices training for member schools.

- Implements a shared eLearning infrastructure using a single statewide Learning Management System, web conferencing system, and Help Desk (scheduled for Fall 2008 rollout).
- Provides professional development courses for P-20 teachers, and training courses for government agency employees (courses to be developed in 2008-09).
- Promotes statewide sharing of other educational resources, including subject matter expertise, instructional content and support services.
- Coordinates with other statewide technology initiatives.

IDEAL-NM will:

- Expand education opportunities, close achievement gaps, support college and career goals, and prepare students for global competition.
- Reduce the cost of technology access to P-12 schools, higher education institutions, and state agencies.
- Reduce the travel and personnel costs of state agency trainings and P-12 teacher professional development via online courses.
- Increase technology application skills of New Mexico youth and adult learners.
- Facilitate more cooperation between P-12 schools, higher education institutions and state agencies.

Broadband infrastructure and equitable access for all of New Mexico's 89 School Districts, as well as improved Internet access at home for students and families, is a requirement for the full implementation, applications and benefits of IDEAL-NM.

IDEAL-NM is sponsored by the New Mexico Public Education Department, Higher Education Department, and Department of Information Technology. www.ideal-nm.org

SchoolDude

The New Mexico Public School Facilities Association (PSFA) selected SchoolDude to provide a statewide facilities information management system to all 89 New Mexico school districts.

The NM Public Education Department's Telecommunications Bureau is currently considering providing SchoolDude with a $360,000+ contract to determine the connectivity status of all NM schools.

SchoolDude has been on contract with the Cooperative Educational Services – AEPA for six years and is a major contributor to their annual conference. In 2007, SchoolDude sponsored a computer lab with more than twenty computers and presented twelve sessions of in depth product training for the three state mandated SchoolDude modules. www.schooldude.com

Digital Pathways

Digital Pathways is a program of community-based distance learning for New Mexico's American Indian Nations, designed to further American Indian educational efforts by developing a recruiting and mentoring network and supporting students through this network as they earn academic degrees. It is funded by the Alfred P. Sloan Foundation and New Mexico State University; and is a partnership of the Sloan Foundation, NMSU, Southwest Indian Polytechnic Institute (SIPI) and New Mexico Tribal Higher Education Commission.

Tribal Partners include Acoma Pueblo, Cochiti Pueblo, Eight Northern Indian Pueblos, Laguna Pueblo, Santo Domingo Pueblo and Zia Pueblo. Institutional partners are Southwest Indian Polytechnic Institute and Dine College. Programs are managed by NMSU College of Extended Learning: Distance Education.

Enhanced networked connectivity and affordable access is a critical requirement of this statewide program. http://distance.nmsu.edu/externals/digital_pathways/index.html

CHECS-Net

The New Mexico Council for Higher Education Computing and Communication Services (CHECS) Network is a nonprofit, collaborative, self-funded educational intranet network for the State's higher education institutions. An extensive video conferencing infrastructure has been developed to share courses and reduce meeting expenses. In addition it provides high-speed connections to the Internet and Internet2. CHECS-Net was formed in 1994 in an effort to pool resources to provide the best connectivity possible to all institutions. It is a member-funded network, currently run by New Mexico State University with oversight and guidance from CHECS ETC.

Issues in rural areas include:

- No uniform, high quality inter-district bandwidth.
- Video connections are difficult.
- No 'economies of scale' from purchasing bandwidth in bulk for rural areas.
- No uniform technical support.
- Difficult to deploy statewide or multi-district programs.

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Internet2

A non-profit advanced networking consortium comprising more than 200 U.S. universities in cooperation with 70 leading corporations, 45 government agencies, laboratories and other institutions of higher learning, as well as over 50 international partner organizations. www.internet2.edu

New Mexico LambdaRail Network

The New Mexico Lambda Rail (NMLR) Initiative is a partnership formed by the University of New Mexico (UNM), New Mexico State University (NMSU), and the New Mexico Institute of Mining and Technology (NMMT) to provide direct high-speed access within Governor Richardson's Wire New Mexico Initiative — including National Lambda Rail (NLR) and Internet2 (I2).

NLR is a major initiative of U.S. universities and research oriented organizations to provide a national scale optical network infrastructure for research and experimentation in networking technologies and applications. In technical terms, NLR's network consists of leased optical fiber activated using Dense Wave Division Multiplexing (DWDM). This approach enables each fiber pair to support about 32 wavelengths or networks, which enable an ultra-high data transmission rate of 320 gigabits/second. NLR has connected more than 150 institutions within the United States with international peers to create a global optical-network cyber-infrastructure. www.nlr.net

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The creation of NMLR as the legal mechanism to provide access to the NLR network will enable New Mexico's research and educational institutions to more effectively communicate with each other and to better participate as players in the global research community. The ultra-high-speed connectivity provided by the NLR infrastructure will enhance the opportunities for research collaborations with other major universities in the U.S. and abroad, as well as improve the competitive position for federally funded initiatives in important expanding areas such as homeland security, microelectronics, nanotechnology, advanced material, ecology and telemedicine.

NMLR operates with an acceptable use policy that allows research-oriented organizations located in New Mexico, as well as governments and Educational Institutions to utilize the NLR infrastructure to accomplish activities requiring high-speed connectivity. Community colleges and secondary school systems, for example will have an opportunity to engage in next-generation teaching technologies, including state-of-the-art distance learning modalities. Use of advanced educational tools, such as virtual reality, visualization, and distributed multimedia, will become technically and economically feasible — even by entities in rural communities, allowing for the further economic growth of New Mexico.

Access to the NLR infrastructure in New Mexico will, in the future, have an impact on information transfer, and the emerging information economy, similar to the role of Interstates 25 and 40 in the transport of commercial goods produced by the industrial economy. NMLR costs are to be paid by affiliates' membership payments and bandwidth fees.

New Mexico LambdaRail Network currently connects member institutions and organizations: UNM (Albuquerque), NMSU (Las Cruces), NM Tech (Socorro), Navajo Technical College (Crownpoint), NM Computing Applications Center, NM Department of Information Technology (DoIT) and the Sandoval County Broadband Project (Bernalillo), via

peering connections at the Albuquerque GigaPOP facility. The CHECS Net and Mesa del Sol are in the cue for upcoming membership interconnection.
http://its.unm.edu/network/lambdarail.html

The Southwest Telehealth Access Grid (SW TAG) Project

In 2007, the Center for Telehealth and Cybermedicine Research at the University of New Mexico's Health Sciences Center was awarded $15,561,181 for The Southwest Telehealth Access Grid (SW TAG) Project. Funding came through the Federal Communications Commission. Dale Alverson, MD, Medical Director of CfTH is the Principal Investigator, Arthur B. Maccabe, UNM, CIO is the Co-Principal Investigator. The funding, over three years, will provide support for the costs of hardware and software, design, development, implementation, operations, maintenance, and evaluation of a telemedicine access grid. An additional $4,022,508 of matching funds will be provided by the SW TAG members, bringing the total funding for the project to $19,583,689.

While 85% of direct costs are provided by the FCC, the project intends to request the remaining 15% match ($2,000,000) from the New Mexico Legislature. Multiple RFP's for specified networked services are now being prepared by UNM and partner agencies, and are expected to be issued in early Fall 2008.

Lead by the University of New Mexico, the SW TAG is a partnership between New Mexico, the Arizona Telemedicine Network and the Southwest Indian Health Service Telehealth Consortium and associated tribes. The funds will support the build out of a telehealth access grid, providing the platform for the sharing, distribution and coordination of telemedicine clinical services, educational and training programs for 500 health related facilities across the rural southwest. The SW TAG network will also support UNM Clinical and Translational Science Center community-based research. In addition to the grids' support of day-to-day telemedicine transactions among participating agencies, it will also provide a system that can be quickly transitioned to support telehealth and other high priority traffic in the event of a natural or man-made disaster.

The telecommunications stakeholders in this proposal will play a critical role in bridging serious healthcare gaps through the development of adequate and affordable broadband infrastructure to communities in their territory. The project leverages, to a large extent, existing statewide and regional network infrastructure and investments already in place. The grid will also provide for the integration of the high-speed Internet backbones offered by Internet 2 and NM Lambda Rail.

Unique features of SW TAG are the network design studies and modeling components. These will allow iterative improvement through ongoing simulation, testing, evaluation, development and utilization throughout the project. Security, improved reliability, quality of service, and appropriate redundancy that can support disaster recovery are incorporated as part of the modeling and design.

The consortium of 12 stakeholders includes the Center for Disaster Medicine, Carrie Tingley Hospital, Center for High Performance Computing, Electrical & Computer Engineering, NM Institute of Mining & Technology, NM State University, NM Department of Health, Los Alamos National Laboratory, Southwest Indian Health Service including Albuquerque Area IHS, Navajo IHS, Phoenix Area IHS, Tucson Area IHS, Arizona Telemedicine Program, Holy Cross Hospital, Presbyterian Medical Services and Sangre de Cristo Community Health Partnership. http://hsc.unm.edu/som/telehealth

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UNM, NMSU and NM Tech

The University of New Mexico, New Mexico State University and New Mexico Institute of Mining and Technology (NM Tech) are the three primary state universities, which in addition to their Albuquerque, Las Cruces and Socorro main campuses, have satellite campuses and programs around the state. They operate and maintain complex telecommunications networks, which are central to and integrated with other statewide networks, supporting education, research and computing, health services, film and media production, and much more. They are also interconnected with national networking backbones and initiatives, which support extended applications and opportunities in this state.

Sandia Laboratories and Los Alamos National Laboratories

The two national laboratories based in New Mexico are major networking sites and users. They both are participants in numerous networked research, education, and other application-based projects throughout the state. They both, also, have need to upgrade their high-bandwidth network infrastructure and capabilities. They are both major technical and economic 'anchors' in a proposed State Broadband Initiative.

1st-Mile Institute

The 1st-Mile Institute has been established to provide broadband networked-society research, education and demonstration project services, with a dedicated focus on economic quality-of-life enhancing issues and initiatives of the state, the communities and the people of New Mexico.

The 1st-Mile Institute serve as 'think and do tank' and 'living laboratory' for research; consulting and contracted services; education; public policy; conferences and workshops; publishing, media and online content creation; tele-community assistance; creative economy demonstration projects; community networking; and 'open' networked society building.

The 1st-Mile Institute objectives include:

- Promoting local economy-generating 'open access' broadband systems and services.

- Being a trusted, politically neutral organization, advocating for effective public-private partnership opportunities and multi-sector benefits from networked society development.
- Integrating the state and local 'networked information economy' within whole-systems (water, energy, food, transportation, education, civic and community development) ecological understandings and practices.

The 1st-Mile Institute is currently being established. A New Mexico Board of Directors, and an international Advisory Board are being formed. While formalizing as a 501(c)(3) non-profit organization, the Institute is operating as a sponsored project of the nonprofit .org, Ars Publica. 1st-Mile Institute is supported in part by a 2008 grant from NM McCune Foundation.

The 1st-Mile Institute: Projects and Initiatives (current and proposed; 2007-2009)

- 1st-Mile New Mexico Initiative: web site and email list www.1st-mile.com
- List subscription and archive link are at: www2.dcn.org/mailman/listinfo/1st-mile-nm
- A "New Mexico Integrated Strategic Broadband Plan" (advocacy and stewardship)
- NM Broadband Forums, Workshops and Publications, 2008-09-onward
- Broadband Networking and Economic Assistance for NM Communities
- An 'Open Broadband Economic Study', being prepared with the UNM BBER.
- 1st-Mile NM - Broadband Economics Conference: "Info/Eco", 2009

Appendix A Pages: 2 and 3

Telecommunications Carriers, Providers and Infrastructure Companies

LATAs

NM is a single LATA state. Local access and transport area (LATA) is a term used in U.S. telecommunications regulation. It represents a geographical area of the United States under the terms of the Modification of Final Judgment (MFJ) that precipitated the breakup of the original AT&T into the "Baby Bells" or created since that time for wireline regulation.

Generally, a LATA represents an area within which a divested Regional Bell operating company (RBOC) is permitted to offer exchange telecommunications and exchange access services. Under the terms of the MFJ, the RBOCs are generally prohibited from providing services that originate in one LATA and terminate in another.

Since the term LATA may be difficult to simply understand, local carriers make up various terms for it, such as 'service areas'.

Tier One Carriers

There are (5) primary Tier One Carriers (backhaul fiber providers) in New Mexico, with high-bandwidth infrastructure connections to other states throughout the country. They are: Qwest, AT&T, Level 3, Global Crossing, Verizon and Time Warner.

Some of the issues that they have concerns about include: E-911 mandates; HIPA requirements; and Service Level Agreement problems.

Cable Companies

Multiple providers offer broadband Internet access to both businesses and residences within the state: Comcast Cable, Cable One, Cox Communications, Charter Communications, Time Warner and US Cable. Recent statistics indicate that cable modem service is available to 77% of subscribers in New Mexico's cable TV service areas.

Cable TV companies, like 'phone companies', are now convergent-services telecommunications companies, providing Internet, VoIP and other digital services, as well as tiered package TV channels.

Cable companies have also been required to have local/municipal franchise agreements, which often provide localities with franchise fees and public access TV channels and facilities, in exchange for use of right of ways.

Many communities are currently, or have recently renewed their franchise agreements, typically for periods of 10-15 years. In some cases, larger communities have been able to negotiate for deployment of fiber optic I-Nets (institutional networks), for use by local government, schools, and non-commercial, public access media.

Cable companies are not regulated by the FCC or state regulatory agencies, in the same way as the phone companies, however the regulatory environment is changing. A number of states have begun to enact state, rather than local, franchising authority. The FCC is beginning to consider changes in its regulatory oversight of cable companies, as well.

With the evolution of convergent-media telecommunications, we are likely to see major regulatory restructuring soon, leading to a more 'level playing field' among former phone and cable providers.

Cable companies will continue to be major players in the deployment and provision of high-bandwidth broadband infrastructure and services, especially within the local loop.

ILECs and CLECs

There are currently (16) Incumbent Local Exchange Carriers (ILECs) licensed by the PRC in New Mexico.

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There are currently (37) CLECs licensed by the PRC in New Mexico. Competitive Local Exchange Carriers (CLEC) offer wholesale digital services ranging from DS1 to OC12, as well as dial-up, DSL, and high-speed point-to-point and Internet access.

Qwest Communications, Inc.

Qwest is a large telecommunications carrier, providing local service in 14 western U.S. states: Arizona, Colorado, Idaho, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming.

Qwest provides voice, backbone data services, and digital television in some areas. It operates in three segments: Wireline Services, Wireless Services, and Other Services. The Wireline Services segment provides local voice, long distance voice, and data and Internet (DSL) services to consumers, businesses, and wholesale customers, as well as access services to wholesale customers. The Wireless Services segment, through an agreement with a subsidiary of The Sprint Nextel Corporation, resells Sprint wireless services, including access to Sprint's nationwide personal communications service wireless network, to consumer and business customers primarily within its local service area. Qwest also partners with DirecTV to provide digital television service to its customers.

Qwest Communications, the largest of the Incumbent Local Exchange Carriers (ILECs) in the state of New Mexico, connects customers in its service areas through (80,000+) miles of fiber optic cable.

Qwest: Fiber to the Node (FTTN)

Qwest plans to spend up to an additional $200 million on top of the $70 million to $100 million it had already earmarked in its 14 state service areas, for its fiber-to-the-node deployment, where the company runs fiber-optic cables to a neighborhood and uses copper loops to link homes to the node.

The project, which will cover about 1.5 million homes, will give customers speeds of up to 20 megabits per second. Qwest CEO, Mueller said some homes may hit 40 mbps through pair bonding, where the company will run two copper loops instead of one to double the speed.

Qwest's DSL high-speed Internet speeds currently range from 1.5 mbps to about 7 mbps.

The new FTTN service, advertised by Qwest as "fiber optic technology," is actually ADL2+ service that comes in asymmetric tiers of 12 Mbps/896 kilobits per second, or 20 Mbps/896 kilobits per second.

While Qwest is advertising its 12 Mbps tier for $46.99, that price requires that subscribers sign a two year contract and bundle $30 local voice service; otherwise the price for 12 Mbps/896 kilobits per second service will be closer to around $62 a month, plus fees.

Qwest's 20 Mbps/896 kilobits per second tier is almost $100, with the price tag closer to $120 without a long-term contract, and with added copper phone service.

The company is reviewing which markets it will target for the FTTN project. It recently identified only four cities in New Mexico for the service: Albuquerque, Rio Rancho, Santa Fe and Las Cruces.

Qwest AFOR Settlement Agreement

On February 1, 2007 the AFOR Settlement Agreement with Qwest Corporation, was signed by the New Mexico PRC, the Attorney Generals Office, the General Services Department, and the New Mexico IPA. The agreement calls for high speed internet (broadband) access project to be implemented over a period of 36 months, with an investment of over $81.3 million dollars.

- The broadband access project calls for coverage to 83% of the qualified working living units across the State and 50% coverage across all rural wire centers. Qwest plans to deploy 22 wire centers and approximately 250 RT locations within the 36 months.
- A second component of the project is the "Redundant and Diverse Routes Project". This requires approximately $26 million to provide redundant and diverse paths to those wire centers without IT today with some exclusions due to high cost or low density.
- The third component is called the "Cable Improvement Project". This requires a $30 million dollar investment to identify and replace defective aerial and buried facilities.
- The fourth component is called "Advanced Telecommunications Technologies Project". This requires a $50 million dollar investment ($10M on fiber feeder jobs) on technology advancements.
- The fifth component is called "Network Improvement and Capability Augment Project". This requires a $67.7 million dollar investment to utilize this category or to cover overruns in other categories.

The following High Speed Internet (broadband capabilities currently exist:

- Los Alamos Wire Center – 87% availability
- Whiterock Wire Center – 93% availability
- Eldorado Wire Center – 68% availability
- Santa Fe North Wire Center – 46% availability (redundant/diverse)
- Santa Fe Main Wire Center – 84% availability (redundant/diverse)
- Santa Fe Southwest Center – 74% availability (redundant/diverse)
- Taos Main Wire Center – 79% availability
- Taos North Wire Center – 46% availability

Qwest is approximately half way into the work specified in the 36 month Settlement Agreement.

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NMECG

The New Mexico Exchange Carrier Group was formed to improve communications within the industry as well as with legislators and the regulatory commission. Its main objective is to help small telecommunications companies in New Mexico provide excellent 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; eight companies have ASDL services. NMECG member companies' 2007 technical upgrades status, with some 2008 updates, follows:

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Baca Valley Telephone Co., Inc. (2007)

2006 – Added 80 miles of fiber cable to the existing 120 miles of fiber cable already in existence, and replaced Remote Serving Terminals to accommodate growth of broadband services. $2.5 million.

100% of customers can have broadband services via cooper/fiber + satellite connections.

Century Telephone Co., Inc. (2007)

Zuni Area

Replaced copper inter-exchange network cable from Zuni to Grants with fiber cable. Fiber access points were constructed for Pescado, Ramah, and El Morro. Project was in planning several years delayed due to planning permit on Native American lands.

Pecos Area

In the last two years an intra-exchange fiber distribution plan has been initiated, and fiber to the meet point with Qwest is in service.

Dell Telephone Cooperative, Inc. (2007)

Serves the Timberon Exchange via a fiber connection and has had for the last several years fiber network into El Paso, TX and Las Cruses, NM.

Replacing legacy switch network with Internet Protocol (IP) enabled switches.

Continue to increase DSL services to customers. Some of these customers are 20 to 30 miles from the main switching center.

ENMR Telephone Cooperative, Inc. (2008 Update)

ENMR Plateau Telecommunications, the largest telephone cooperative in New Mexico, with 13,000 access lines in eastern New Mexico and western Texas, was formed more than five decades ago by area farmers, ranchers and other citizens to provide telephone services to the rural citizens residing on the high plains of Eastern New Mexico. Today, ENMR Plateau customers enjoy a variety of modern telecommunications technologies including mobile phones, long distance service, business solutions, dial-up Internet, and high-speed Internet.

ENMR-Plateau will deploy its FiberPath platform to two residential subdivisions in the city of Clovis, N.M. The initial deployment of FiberPath in Clovis will serve as a trial for fiber-transmitted telephone and high-speed data services. Eventually, ENMR-Plateau will expand its offerings to other neighborhoods, and expand its service offerings. The future-proof FiberPath system gives ENMR-Plateau the capability of delivering a full suite of advanced voice, video and data services in the future, such as Internet access at unparalleled speeds, high-definition television, interactive video conferencing, online education, telemedicine and more.

In 2005 and 2006, 380 miles of distribution fiber (Network Modernization Phase 3) have been placed in the ground to current DLC (Digital Loop Carrier) locations. Completed.

Fourth Quarter 2007 project will begin to construct an additional 480 miles of distribution fiber to the remaining DLC's (Digital Loop Carriers).

This construction (Network Modernization Phase 4) is well under way with over 200 miles complete to date. The entire project is scheduled to complete in mid 2009.

OC-48 transport equipment is being upgraded to OC-192 equipment to prepare for additional bandwidth requirements and to provide Ethernet services to customers.

This project (Network Modernization Phase 5) was completed this year (2008), increasing backhaul capacity by four times. Expanding this OC-192 network by installing fiber rings in strategic locations, increasing reliability and survivability.

Project beginning now (Network Modernization Phase 6) to replace all DLC equipment with BLC (Broadband Loop Carrier) equipment which will upgrade the network from ADSL2 (~8 Mbps maximum) to ADSL2+ (~24 Mbps maximum).

Two exchanges have been converted, while the remaining 23 exchanges will be converted throughout 2008, 2009 and 2010.

La Jicarita RTC, Inc. (2008 Update)

In the last five years, La Jicarita RTC has been one of the leaders in providing DSL to rural New Mexico.

Over 95% of customer can subscribe to DSL if they want it. Current penetration rate is 30%.

Broadband Projects – remotes which are fiber fed:

- Cleveland
- Rio De La Casa
- Holman
- North Holman
- Chacon
- Xmas Tree Canyon
- Coyote
- Guadalupita
- Sierra Bonita
- Monte Aplanado
- Abuelo
- Ledoux
- South Carmen
- Las Auguitas
- Cebolla Springs
- Golondrinas
- Buena Vista
- La Cueva
- Rainsville
- Ojo Feliz
- Narangos
- Ocate

These remotes are placed within 15,000 ft of the subscriber, for the proliferation of DSL and Video Services.

Engineering for a loan design is in process, to provide fiber to the home/premises in Wagon Mound and Mora exchanges.

LEACO Telephone Cooperative Inc. (2008 Update)

Provides DSL to the communities of Dexter, Hagerman and Tatum.

Provides fiber connections for Internet access to schools in the service area, and provides Internet access to schools in the Lovington and Hobbs area.

Early discussions being conducted on projects that would provide fiber to the home for Tatum and Maljamar.

HasWiFi hot spots in Dexter and Hagerman.

Penasco Valley Telephone Co. Inc. (2007)

Penasco Valley Telecommunications (PVT), based in Artesia, NM, believes that wireless local loop technology is a great, low-cost, low-maintenance way to reach its out-of-region CLEC customers with VoIP and data services. PVT, which a few years ago in an FCC auction won enough 700MHz spectrum to cover about 40 miles, is using a broadband system from Vecima Networks Inc. The base station costs less than $100,000, and the CPE is less than $300. The company, which offers 1.5mbps service to subscribers in its wireless coverage area, is waiting for the next 700MHz spectrum.

In the past 18 months, Penasco Valley Telephone has installed 33.6 miles of fiber, and 3 new electronic sites to shorten the loop to the subscribers.

Roosevelt County Rural Telephone Co. (2008 Update)

Roosevelt County Rural Telephone Cooperative formed a subsidiary, Yucca Communications, in order to compete against Qwest to offer services in Portales, NM.

In June 2005, RCRTC and Yucca Communications introduced a new name – Yucca Telecom – which represents all services provided by, and customers served by both companies.

Yucca Telecom is a full service telecommunications provider that offers local telephone service, wireless 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.

Yucca Telecom is currently building a city-wide fiber optic network in Portales.

RCRTC completed engineering a fiber to the home (FTTH) project in Texico, NM and will start construction this year.

The Texico FTTH construction project has been bid and construction is scheduled to start October of 2008.

The existing Fiber Optic Terminals will be upgraded from OC-3 to OC-12 or OC-48 to handle the capacity needed.

FTTH in Texico, because the copper plant has deteriorated and is no longer feasible to maintain. Fiber to the home is the most cost effective long term solution.

RCRTC has supplied Fiber Optic Broadband service to the Texico Public School since 1997.

RCRTC has also been supplying DSL to the Post Office and residents in Texico, with speeds of 256k up & 1.5M down since 1999.

Engineering a 31 mile fiber route from Dora to Milnesand and Causey. This project will push broadband technology further into rural New Mexico and increase access to the Internet.

RCRTC has the fiber route engineered between Dora and Milnesand.

The fiber routes from Dora to Milnesand and Dora to Causey will replace old microwave systems. As the fiber is placed, Broadband Loop Carriers will strategically be placed along the routes, to continue pushing fiber closer to customers.

RCRTC has Broadband service (DSL for qualified loops; Wild Blue satellite service for anyone else, at 512Kilobits Per Second up &1.5Mbps down) available in all of its exchange areas.

Upgrading 25 Digital Loop Carrier Network systems to Broadband Loop Carrier equipment, which will increase speeds from 4Mbps to 24 Mbps.

Five of the 25 DLC systems have been upgraded to BLC's.

Upgrading fiber transport systems to be able to carry more bandwidth (LARGER PIPES) because of customer Broadband needs.

Long range plans are to provide not just Broadband to increase access to the Internet, but to also provide Video Services to as many customers as possible, when able.

All area schools are connected to RCRTC fiber.

Replacing 56k circuits for the United States Postal Service with DSL.

Sacred Wind Communications, Inc. (2008)

Overview of the current infrastructure.

- 700 miles of copper wire to the last mile.
- No DSL available due to lack of broadband cabinets and low capacity feeder.
- Building 700-mile RF tower network to ultimately reach 6,300 unserved Navajo homes.
    - 4 towers built or purchased in 2007.
    - 8 towers & 7 monopoles to be built in 2008.

- Designing a 320-mile fiber optic system to increase capacity to RF network.
- 1st phase, 17-mile segment, to be completed by Nov. 30, 2008.
- Remainder of fiber optic system to be installed by Dec. 2011.
- Converted 980 customers to Tribal Lifeline program (discount program for low income) since Jan. 2007.
- Installed 3 Mbps broadband by RF pathway to Huerfano Chapter house in Jan., 2007.
- Commenced broadband field trial for RUS-USDA, involving 70 customers, each receiving 512Kilobits Per Second download, but scalable to 1.5Mbps.
- 3 Mbps download to training center and Bureau of Indian Affairs (BIA) dormitory school;
- operates a computer training center on the Navajo Reservation; and
- Well over 1,500 attendees through its training center since February 2007.

Directions of infrastructure improvement over the next 5 years.

- Replace all (52) Digital Loop Cabinets with Broadband Loop Cabinets.
- Complete RF network, involving 12 major towers, 70-80 “aggregation” monopoles & towers, and 6,300 subscriber poles & RF antenna.
- Complete fiber optic routes along 3 highways to add capacity to RF backbone.
- Replace all defective copper wire.

Impediments to these directions include rights of way procedures imposed by Navajo Nation, BIA, state & local governments, which will add no less than 2 years to the timelines.

Tularosa Basin Telephone Co. Inc. (2008 Update)

Tularosa Basin Telephone Co., Inc. (TBTC) is currently replacing most of its old copper lines, by upgrading its outside plant facilities with fiber to the premises (FTTP) and fiber to the node (FTTN). The new active Ethernet fiber network will enable TBTC to provide all of its subscribers with a full range of triple-play services with up to 1 Gbit/sec of bandwidth, with a full range of advanced communications services today and the ability to meet future demands.

TBTC will bring the same advanced services typically found in large metropolitan areas to the people of New Mexico's smaller, rural communities. First-phase construction is currently underway. Once the final phase has been completed, more than 60 percent of TBTC's subscribers will have FTTP. The remaining 40 percent are served from short copper loops.

Founded in 1996, TBTC Inc. provides local, long distance, DSL, and Internet access services to customers from six exchanges: Cloudcroft, High Rolls, Mountain Park, Carrizozo, and Tularosa. TBTC provides wireline service to more than 5,100 customers and Inter-

net service to approximately 2,600 customers in an area that spans more than 1,200 square miles. Tularosa Basin Telephone has its headquarters in Tularosa, NM.

Fiber to the Home Project started in 2006 and due to be completed year-end 2008. When complete, customers will have options for video services as well as broadband and regular telephone service. This fiber network will be the first in the state that will provide an IP network protocol with 1 gigabyte ethernet connection. This multimillion dollar project will benefit customers in Cloudcroft, Carrizozo and Tularosa;

98% of TBTC customers can have broadband services today, though it currently has 29% penetration.

Fiber Projects Status:

Major construction activities associated with placement of new fiber-optic cable and state-of-the-art electronics within the High Rolls and Cloudcroft areas is now complete. All customers in Pierce Canyon, Silver Springs, Piney Woods, Karr Canyon, High Rolls, Ponderosa Pines, Russia Canyon, Waterfall, Chippewa Park and Silver Cloud have been connected to the new facilities.

Main line and service drop splicing is complete within the Village of Cloudcroft, and approximately twenty-five percent of customer have been turned-up to fiber. The remaining customers within the Village limits will be connected to fiber by year's end.

In the Tularosa area, 100% of main line construction and service drop placement is complete. Remote line cabinet locations at Bentwood, Riverfront, Three Rivers, Schoeller, Tulie Gate, Pecos, Riata, Papago, Rattlesnake and Sun Valley have been upgraded to new electronics. While all of these sites are connected to the network by fiber, feeds from the cabinet location to the customer location, in most cases, will remain on copper. Exceptions include Sun Valley, Tulie Gate and Riverfront sites, where 100%, 60% and 30% of customers, respectively, will be tuned-up to fiber in 2009.

Fiber turn-up within the Tularosa Village limits is estimated to begin in January 2009.

Engineering and planning are still in development for the Carrizozo area, at this time.

Valley Telephone Cooperative, Inc. - Cooper Valley Telephone, Inc. (2007)

Replacing "legacy" telephone switching equipment with state of the art Internet protocol (IP) soft switches in Animas, Playas, and Columbus.

Completed placement of fiber cable to all of its Digital Loop Carriers in New Mexico, in order to expand bandwidth and improve dependability.

The existing Digital Loop Carriers will be replaced to expand broadband services to include Internet Protocol Video Services.

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.

Double digit penetration rate has been achieved.

Western NM Telephone Co., Inc. (2007)

Western New Mexico Telephone Company's serving area encompasses 15,048 square miles of Southwestern New Mexico, from the desert of the Lordsurg area to rugged mountains covered with tall pines and aspens 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.

2006: 30 miles fiber expansion completed. 2007: Targeted approximately 100 miles of fiber expansion to be engineered, and 25 miles to be completed. 2008: scheduled to complete an additional 75 miles of fiber. Total estimated investment for fiber from 2006 through 2008 is $5.5 million.

The company started upgrading 'legacy' switch network with IP (Internet Protocol) enabled switches in 2005, and will complete projects by Sept. 1, 2007. These upgrades have and will improve the overall quality of service to rural customers, as well as provide a platform to meet future customer requirements.

Currently approximately 70% of the customer locations have DSL available, which includes Alamo, a part of the Navajo Nation. The company is targeting to increase this availability to 75% to 80% by the end of 2007.

Windstream Communications Inc. (WIN) (2007)

Over the last three years Valor Communications, now Windstream Communication, has aggressively expanded its fiber network and broadband services to their entire serving area.

Currently 100% of customers have access to broadband via DSL or satellite services

Construction of a fiber route into the Jal exchange been completed. Certain routes in the Jal area community are being upgraded to accommodate the economic growth that is occurring there.

Bill Garcia, Windstream NM V.P., Gov't Affairs offers the following observations on the company's accomplishments and some issues:

Windstream has made aggressive efforts in its deployment of fiber and broadband throughout the state and in northern New Mexico. 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).

The company has aggressively expanded its fiber network and broadband services in its entire serving area. WIN has engineered and is reinforcing network facilities in the Jal area to accommodate the economic growth that is occurring there. Constraints on a broadband service network; the ability for broadband services to work at an end-user's location; are based on two critical factors: distance and loop make-up:

- distance limitations are approximately 18,000 feet from the central office.
- if based beyond that distance, broadband equipment must be placed in the field (RT-based) to extend that reach.
- If RT-based, issues such as ROW, easements, power or DSL capacity could impact deployment.
- type of facility (copper vs. fiber) will affect manner in which broadband services are deployed.
- gauge changes and the physical condition of the outside plant facility have the greatest effect when deploying broadband.
- devices placed on the facility to enhance voice will impact the company's ability to provide broadband services.

While broadband is available to a vast majority of WIN's customers, there are impediments to customers securing this service, which may include social, economic and educational issues. These are the issues that must be addressed in a broader dialog, in order that the benefits of the Internet and broadband can be understood and expanded.

Further expansion of WIN's broadband footprint is subject to the development of a sound business case, particularly in more remote areas where the cost of expansions cannot generally be justified due to limited customer base.

There is an unfortunate misperception that arises everyday, that a telco like WIN has an obligation to provide broadband to every location despite cost. This is not the case. In today's competitive environment, with the dramatic loss in access lines, telco's like WIN must continue to make prudent financial decisions every day.

In addition, significant regulation of carriers such as WIN, creates a disincentive for investment, particularly where other competitors offering voice and data services are either unregulated or are subject to limited regulation, e.g., wireless, cable, government networks and CLECs.

Other issues, such the difficulty of obtaining rights-of-way and conducting business in a hostile business environment, also creates disincentive for investment. WIN is committed to participating in the dialog of addressing solutions, strategies and funding for the expansion and greater availability of broadband services in the state.

The PRC may be in a position to moderate the debate, although they do not have jurisdiction over broadband (and they should not). However, if parties and the PRC could get over these jurisdictional hurdles and just participate in the dialog, this would all work toward the betterment of the state. Without defined direction and commitment, we'll continue to debate these issues for years, with the net result being that the state will potentially fall further behind in meeting the needs of its citizens.

CLECs, ISPs and Other Service Providers

The following is a very incomplete list of companies. Additional information gathering is required.

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Oso Grande Technologies

Oso Grande Technologies, originally New Mexico TechNet, has been successfully providing state of the art networking in New Mexico since 1985, when TechNet was selected by the National Science Foundation to be the Internet hub in New Mexico, and to help companies and individuals find cost effective access to information while bringing connectivity and technology to rural areas, beginning with the Internetworking of New Mexico's Universities and national labs,

Oso Grande spun off as a private company a few years ago. It is based in Albuquerque. www.osogrande.com

Mescalero Apache Telecom Inc. (MATI)

MATI is a tribal-owned rural telco in New Mexico, also offering VoIP services out of region over a broadband wireless network, owned by a separate wireless ISP. The telco replaced its Siemens Class 5 switch with a softswitch in region and then used that softswitch — along with wireless local loop connections — to help it expand out of region.

MATI beliebes that these out-of-region strategies can have enormously positive impacts on rural telcos. A small telephone company with 5,000 to 10,000 subscribers, next to a big city that has 100,000 people, could very quickly look at doubling its effective subscriber base by just taking 10 percent of the adjacent market. Because rural providers often have great reputations for customer service, 10 percent penetration can be a very realistic expectation.

Godfrey Enjady is General Manager and founder of Mescalero Apache Telecom, Inc., and of Mescalero Gas Company.

Mescalero Apache Telecom, Inc. is based in Mescalero, NM. www.matisp.net

Darkstrand

Darkstrand, Inc. is a Chicago based company which is developing commercial services relationships through contractual agreements with the National LambdaRail Network. Darkstrand has initiated discussions with the NM LambdaRail Board and potential commercial network customers in NM, such as Sony ImageWorks, other film studios and large bandwidth users.

Transtelconet

Transtelconet is a new NM CLEC which is interested in building fiber networks that will be shared with the public sector. Their intent is to provide commercial backbone services, while providing free interconnection to government, schools, healthcare facilities and other public entities. Originally based in Mexico, they have been building a network in El Paso, that they currently hope to extend to Dona Ana County.

NMIPA

The New Mexico Internet Professionals Association is an important member-based industry group in this state, representing many ISPs, and web content and design firms and their interests, including on state regulatory matters.

Cellular and Wireless

An incomplete list of wireless (cellular) companies providing services in New Mexico:

- AllTel Communications
- AT&T Wireless
- Consumer Cellular, Cricket Communications
- GlobalStar, Leaco Wireless
- New Cingular PCS
- Nextel Communications
- Plateau Cellular Network
- PVT Wireless
- Qwest Wireless
- Smith Bagley
- SouthWestCo Wireless
- Sprint PCS
- T-Mobile
- Telecommunications Systems
- Verizon Wireless
- Ztar Mobile

Energy Companies

Public Service Company of New Mexico (PNM)

PNM has significant fiber optic assets (400+ miles) and facilities in New Mexico, mostly above ground, attached to its statewide network of transmission lines, now used primarily for energy monitoring/management needs. PNM's extensive RoWs and fiber networks extend through many rural broadband underserved areas of the state. The company has stated that it is interested in possibilities for public-private partnerships, and in combining assets with other utilities and entities, to use its fiber infrastructure for telecommunications services, and would favorably consider participation in a potential State Integrated Strategic Broadband Initiative. Current impediments and concerns focus on the regulatory environment, which would have to change for PNM or any of the other energy utilities to make their fiber networks available for telecommunications service.

FastTrack Communications

FastTrack Communications, a CLEC founded in 2002 It is a locally owned and operated, facilities-based telecommunications provider of fiber optic based network voice and data solutions, headquartered in Durango, CO. A subsidiary of La Plata Electric Association and Empire Electric Association, its primary purpose is to serve Colorado and New Mexico businesses and communications carriers.

FastTrack has fiber backbone extending from Grand Junction to Durango, Colorado, and on to Farmington to Aztec and Albuquerque, New Mexico. FastTrack is collocated with Qwest in Farmington and Albuquerque. It offers dedicated Internet access connections from DS-1 to OC-48 (Wavelength/Lambda channels at 2.5 or 10 Gbps), and Ethernet scalable and burstable Internet services connections (2 Mbps – 10 Gbps). It also owns and operates two tower/shelter locations, as well as collocation facilities, in Farmington.

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NM Rural Electric Cooperatives Association (NM RECA)

Throughout the U.S., rural electric coops are often at the forefront of providing advanced telecommunications services to their served communities. Only Kit Carson Electric Coop, one of the NM RECA members, currently provides telecom. services.

Energy Savings

Energy and communications infrastructure and services are inextricably inter-related. They are the two pillars of our emerging economy. They both now require demand-side economic understandings and development models, if we are to move towards more sustainable local-global societies.

The Tennessee Valley Authority recently published a study which indicated that one third of our home and commercial energy uses could be conserved by energy monitoring and management, via networked connection to the premises. In New Mexico, such energy savings could result in our not requiring at least one of the new power plants currently being proposed.

The resulting cost savings could be invested in a fund which could help support such energy saving network deployments in the most economically under-served rural parts of the state.

Regional and Community Broadband Projects

USDA RUS Grants in New Mexico

The U.S. Department of Agriculture's Rural Utilities Service has awarded 33 grants to New Mexico communities, institutions and network providers, from 1995 through 2008. Following is a brief encapsulation of the amounts awarded for wireless and wireline networking and services by the Community Connect and the Distance Learning and Telehealth programs, along with the substantial total awarded.

- USDA RUS Community Connect Grant awards in NM, from 2002-2008, approximate total: $8,723,400.
- USDA RUS Distance Learning and Telehealth Grant awards in NM, 1997-2007, approx. total: $5,766,900.
- USDA RUS Grant awards in NM, 1997-2008, approximate total: $14,490,300.

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Broadband Changed My Life! Contest

Sorraine Hot, the winner of APT's "Broadband Changed My Life! Contest," gave a deeply moving account of the impact broadband has made in her family and in her New Mexico community.

Hot was hired as the sole trainer in a community technology center that opened in February 2007. Sacred Wind Communications' Community Connect, a non-profit arm of Sacred Wind Communication, Inc., manages the training center with funding from the USDA-RUS Broadband Community Connect Program. In such an isolated community, where residents often lack electricity and there is only a single telephone, broadband has provided a critical connection to the outside world.

Since February over 3,000 Navajos have signed in to use the computers and 44 have completed a training course, despite having to travel long distances to reach the technology center. Upon completion of the program graduates receive a refurbished computer for their personal use. Hot powerfully described relatives being able to send digital photos and communicate with loved ones serving in Iraq because of broadband. "it is very re-

warding and emotional to see people use this type of communication for the first time." Navajos have used the technology center for job training and resume building as well. Hot misses seeing them, but she is pleased that they are now working.

Most importantly Hot saw her own four children, who lived for three years with no telephone or Internet connection, reconnect with their father's family in St. Louis. Her experience working in the technology center has also helped Hot grow, and as she explains "without this broadband I don't think I would have helped a lot of these people."

Navajo Nation

There are a number of networking initiatives in process throughout the Navajo Nation. Notes on these follow.

- The Navajo Education Technology Consortium, using E-Rate subsidies, is working to connect schools and libraries, as well as chapter houses, via fiber and microwave wireless networking.
- There are three primary employers on the Navajo Reservation: government, schools and hospitals.
- The satellite systems that have been used for communications access are not adequate.
- Spider Rock Networks: a Navajo telco, to provide towers, RoWs, co-location facilities)
- Spider Rock Technologies is planning a data center on the Reservation; working with PNM in Alb. (data center)
- Two RUS grants have been received in 2008.
- There is also preliminary work with energy companies (PNM, WAPA, etc.), to place fiber lines on transmission towers.
- Power for telecom. systems is an issue for the outlying areas, though photovoltaic solar systems are being utilized, with plans for hydrogen fuel cells as backup.
- There is cooperation with the Sandoval County Broadband Project, which has placed a tower on Pajarito Peak, with Homeland Security funding.
- In early 2008, The Navajo Nation discontinued its primary contracted Internet service provision from OnSat. Frontier Communications and Sacred Wind Communications continue to provide Internet and telecom. services to parts of the Nation in New Mexico.
- The Navajo Nation Telecommunications Regulatory Commission oversees services and issues in Arizona and New Mexico.
- The Navajo Nation, like all other native peoples' tribes and communities, is very concerned with maintaining its sovereignty, and inherent rights.

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The "Internet to the Hogan" and "Dine' Grid" Project

(Some of this text is excerpted from a paper by: M. Trebian, T. Davis, J. Ribble, J. Arviso)

Internet to the Hogan is an ambitious Navajo Nation networking and networked applications initiative. As proposed, the "Internet to the Hogan" initiative will provide IP network connectivity to all 110 Chapter Houses and to families in this 27,000 square mile, three-state nation, much of which is still not served by electricity or paved roads. With the roll-out of this network, Navajo Nation residents are to have improved, affordable access to numerous voice, video and data services.

The Internet To The Hogan and Dine' Grid is a project designed to fundamentally change the socio-economic realities for the Navajo Nation through the building of a cutting-edge cyber infrastructure connecting Navajo communities to the global scientific community.

The ultimate outcome is to end the digital divide, starting with communities surrounding Navajo Technical College, by building a high-speed wireless backbone with OC3 bandwidth that joins with communities such as the TeraGrid through Lambda Rail and Internet2 from Alburquerque, NM and the ABQ GigaPop. The OC3 backhaul will connect through communities in the Navajo Nation and the Pueblo Nation over a 120 mile path using Harris radio technologies. Collaborations and agreements between sovereign nations were negotiated and the resources of the global scientific community were brought to bear to make the backbone a reality.

After making the connection to Navajo Technical College the build out will continue to 52 chapter houses and community centers surrounding the college. Motorola Canopy technologies will be installed that will provide broadband wireless coverage at each chapter house and community center out to a radius of 30 miles. Another aspect of the cyber infrastructure implementation is the establishment of supercluster technologies on campus and distributed cluster technologies at the chapter houses and community centers through the LittleFe project.

The Dine' Grid will be more than just a distributed computing network where communities will have the opportunity for direct access to computing resources they would normally never have available. Teaching and learning will occur to provide communities the opportunity to be

contributors to the maintenance and expansion of the grid resources being made available to them in this project and to science occurring in and outside their communities. E-learning and telephony services will be made available through the application of open source products.

Collaborations and on-going relationships will be fostered through interactions with member communities of the TeraGrid to create research opportunities that have a direct impact on the communities touched by the project. Finally, a technology transfer model will be designed to create enterprises and entrepreneurships that can successfully compete in niche and national markets as intellectual human resources are built in the Navajo Na-

tion that can construct a new economic structure through well prepared human capital for the high value, high intellect jobs and tasks of the Twenty-first Century. Anticipated applications and benefits include:

- A Navajo Nation Web portal offering e-commerce and access to many government services.
- Distance learning teleconferencing, featuring classes from the major universities near the Nation, including Arizona State University, University of Arizona, University of New Mexico and the University of Utah.
- Telemedicine, allowing medical patients to receive superior health care via access to doctors in numerous large medical facilities in larger urban areas.
- Distance-learning opportunities, assuring school children who travel as much as four hours daily on a bus to attend school, will have after-hours access to the Internet for homework.
- Elderly populations, many of whom speak only the Navajo dialect, will have access to information on agriculture in their native language.
- Central government services such as housing, children's health insurance, e-government, job listings and voting will be as close as the nearest chapter House.
- Tourism enhancement by promoting Navajo crafts as well as vacation sites.
- Job creation by developing an IT work force and call centers for the Navajo Nation.
- Connections to a vast store of information about other tribes and Navajo peoples, thus preserving and promoting the culture, both within and outside the Nation.
- Disaster recovery capabilities, a significant improvement over the present method of dropping leaflets into remote sites.

Sandoval County Broadband Project

The goal of the Sandoval County Broadband Project (SCBP) is to offer affordable network and Internet access first to health, education, and government entities. The broadband project, which began almost three years ago, aims to provide cheap ultra high-speed wireless Internet access via multiple service providers, to the communities and residents of Sandoval County. It is now investigating the viability of allowing ISPs to offer services via its network infrastructure. Their goal is to allow for adequate bandwidth availability for collaboration and Internet access, along with the quality of service required to utilize real-time applications such as voice and video.

The Sandoval County Commission has selected a national wireless consulting firm to get the county's initially troubled broadband project back on track. The company, NetLogix, will take over as project manager. In addition to authorizing the project management contract, the Commission approved CH2M Hill to provide design, engineering and implementation services.

A fiber connection has been provided by CityLink Fiber Holdings, Inc., from the system's head end in Bernalillo to the GigaPOP at 505 Marquette St. in downtown Albuquerque, using Qwest QMOE Metro Ethernet.

Phase 1 of the project entails extending the network backbone from the County Judicial Complex (JC) at Idalia and 528, to the County fire station just off I-25 in the Placitas area, to Pajarito Peak, then into Cuba. The goal is to provide 100-200 Mbps (full-duplex) connectivity on the backbone, which uplinks to the Internet from the JC. End-user connectivity will be offered via this initial network backbone.

In order to deliver highly available, carrier-grade services for network users, to develop and test a functional business, equipment, and operational model, and to ensure users of the highest quality product, SCBP intends to undertake a one year testing period. This will be a limited test that will involve mainly the community of Cuba.

In conjunction with the deployment of the network backbone, SCBP is researching applications that will be facilitated by the use and reach of broadband. They see the development of Telehealth applications, educational applications, as well as public safety applications as highly promising. Once phase one has been completed and the network has been proven to satisfaction, the intent is to extend the network into other Sandoval County communities, to offer services similar to those expected to soon be available in Cuba.

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Rio Rancho

Azulstar was to have installed a city-wide wireless network in Rio Rancho, to allow residents and businesses to access high speed wireless Internet from anywhere in the city, along with mobile and stationary telephone services. Following many difficulties, the City of Rio Rancho, recently terminated its agreement with Azulstar, which will no longer provide services in that city.

Rio Rancho is growing rapidly. In addition to Intel and Hewlett Packard facilities, the City is also the site for Central New Mexico Community College, and a UNM campus. Major film studios are also planning to locate in Rio Rancho. The City's IT and Economic Development Departments are working closely with industry and educational partners to address networked needs and solutions.

Intel and Hewlett Packard

These two large companies have and are establishing facilities in Rio Rancho. They are important economic and educational partners, employers, and business and research incubators in the region. They require sophisticated, high-bandwidth networks.

Intel currently houses the Encanto supercomputer in partnership with the State and the NM CAC.

Albuquerque

The City of Albuquerque issued an RFP for a citywide wireless network, in Summer 2007. The RFP was quietly cancelled by the Fall. Albuquerque, the state's largest city and main networking hub, has a downtown fiber ring; has critical commercial fiber co-location and peering centers; and recently awarded an 'open access' fiber franchise to local company, CityLink, Inc.

Sandia Science and Technology Park

Sandia Science and Technology Park offers managed point-to-point Internet services and WAN connections. The Park has deployed its ORBIT Network, a fiber optic network, available to all tenants to have a choice of service providers. www.sstp.org/orbit.html

University of New Mexico

The University of New Mexico, and its ITS Department, is a major center and participant in numerous statewide networking initiatives. Some of these identified in this Report, include the New Mexico GigaPOP, with connections for the NM DoIT, NM CAC, LambdaRail Network, Internet2 and more.

NM GigaPOP

The NM GigaPOP, at 505 Marquette St, Albuquerque, is a peering and networking center for most of the State and institutional networks in New Mexico.

CityLink Fiber Holdings, Inc. / CityLink Telecommunications, Inc.

Albuquerque based CityLink Fiber Holdings, Inc. provides neutral, open access metropolitan dark fiber for a wide range of communications needs, and public and private sector users on a non-discriminatory basis. The company designs, engineers, installs and maintains the fiber network for all of its customers.

CityLink currently has two downtown Albuquerque fiber rings, totaling 12 miles, and connecting over 50 commercial and residential buildings. It recently 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 (Internet) services to residential and business users via its fiber optic network. The company is the first to bring Fiber to the Home (FTTH) to Albuquerque, supports open access networks and has a wholesale model that allows other service providers to make use of its fiber network.

CityLink's new service will start out providing home users with 50Mbs of service for an e stimated $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. CityLink has interest in extending its open fiber networking to other areas of New Mexico, including to and within Bernalillo, Santa Fe and beyond.

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IXNM

IXNM (Internet Exchange New Mexico) is the only statewide, neutral and open Internet peering/exchange point. IXNM has been operating since 2002. The mission of IXNM is to provide a common point for service providers and end user entities alike, to exchange Internet Routing data. Both IPv4 and IPv6 are supported. IXNM currently provides peering for various State agencies, county and city governments, higher education institutions and private sector entities. IXNM has its main hub located in downtown Albuquerque at the 'carrier hotel' building known as "505 Marquette". A remote hub is located in Sandoval County, with another hub planned in 2009 for Santa Fe. IXNM is also working to establish a peering connection at a major West Coast exchange point in 2009.

IXNM also provides a "co-op" like service for service providers. By aggregating the demands of providers from around the state, IXNM is able to purchase transit (global backbone) connectivity at a much lower prices. Transit services are only available to service providers and not to end-users, so that IXNM will not be a competitive threat to its service provider users.

Data Centers, Peering Points and Co-Location Facilities

- LightDart
- Big Byte
- 505 Marquette (GigaPOP)
- Qwest CyberCenter, 400 Tijeras (planned to be online by 9/09)

These facilities are highly energy consuming. Power management and Smart Grid networks, for energy savings, are important considerations for their strategic future.

Albuquerque Sunport

The Albuquerque Sunport airport is supported by high-bandwidth fiber infrastructure, with plans for pending upgrades. The Sunport offers free wireless access throughout the airport terminal.

Mesa del Sol

The Mesa del Sol developers (including Four City Land Development Co., Covington Capital, University of New Mexico and the NM State Land Office) are contracting with The Broadband Group and Connexion Technologies as consulting engineers and deployers of fiber (FTTH) networking the residential parts of the development. The commercial development portion of Mesa del Sol, which includes the new Sony Imageworks and Albuquerque Studios film/media production facilities, as well as the new UNM Film School, has an 'open trench' policy, allowing competitive providers to deploy fiber infrastructure and to offer services. www.mesadelsol.com

Mesa del Sol is one of the sites being considered for location of the New Mexico Computing Applications Center.

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North Central New Mexico Community Projects

Following are some of the four county, North Central New Mexico's many diverse, regional and locally active broadband efforts, now in process.

NCNMEDD-REDI

The North Central New Mexico Economic Development District's Regional Economic Development Initiative conducted a series of working meetings this past Spring and early Summer, and has issued a report, which ranked broadband telecommunications as the most important among all infrastructure investment requirements in the region. Many of the REDI participants met on August 18th, at the LANL Foundation offices in Espanola, to discuss their interest in being participants in a potential State "Pilot Project", as advocated for in this Report.

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SFRTC

The Santa Fe Regional Telecommunications Coalition is comprised of the City and County of Santa Fe and Santa Fe Community College. Santa Fe City and County are currently attempting to bring fiber optic and NM LambdaRail access and services to the planned Santa Fe Studios film/media production campus in the Community College District, with intentions to possibly extend the fiber network throughout the region.

The City of Santa Fe has long sought to implement its planned "LightTrail" fiber optic network for local government and institutions, with little success. It is currently deploying a 'controversial' WiFi network in certain government buildings, public libraries and other specified public sites. In 2007, the Santa Fe School District contracted with Qwest for a fiber network connecting all City schools.

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Los Alamos

The City and County of Los Alamos have repeatedly attempted to plan and deploy a local fiber optic network. Los Alamos County is currently reviewing proposals for wireless and fiber networking solutions to local needs.

The Los Alamos Research Park, adjoining the Los Alamos National Laboratories, in co-ordination with with Lab and County economic development initiatives, requires high bandwidth connectivity for many of the high-tech businesses planning to locate there.

Espanola

The City of Espanola, under the leadership of Mayor Joseph Maestas, has been proposing a City and regional infrastructure improvement project, which includes a shared 'open' fiber network.

Northern New Mexico Community College has been an achor site for an extended WiFi network being deployed in Espanola.

Taos

Kit Carson Electric Company is the only rural electric coop in New Mexico that also provides telecommunications services, via Kit Carson telecom, within its service region. The company is currently deploying a fiber network, using its right-of-ways and poles, from Taos, north to Arroyo Seco, and south to Penasco, with further extension planned.

Pueblos

Eight of the 19 pueblos in New Mexico are located in this four county region. All of them are variously involved in broadband deployments. Many have been recipients of USDA RUS broadband grants.

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San Ildefonso: Tewa Communications

In 2005, the Pueblo de San Ildefonso was awarded a Rural Utility Service (RUS) grant. RUS grants are offered through the United States Department of Agriculture (USDA) and the Federal Communications Commission (FCC) for the purpose of promoting Broadband connectivity in rural America. The Pueblo chose the San Ildefonso Enterprise Corporation (SIEC) to execute the grant. SIEC then created Tewa Communications @ San Ildefonso to offer services to the public under the name TewaCom Wireless
www.tewacom.com

TewaCom Wireless formed a partnership with Motorola Canopy to deploy its broadband network. By becoming a Motorola Canopy Reseller and Certified Service Provider, TewaCom Wireless utilizes the vast knowledge and expertise of the Motorola Canopy Team. As a result, the TewaCom Wireless network runs primarily on the 900 MHz platform that was created by Motorola Canopy to overcome the "line of site" issues that normally inhibit the deployment of wireless networks throughout rural America. The 900 MHz system allows for acquisition and transmission of Broadband services with the speed and reliability never before possible in the Upper Rio Grande Valley.

With the capability of bringing high-speed connectivity to areas that previously had no access to any broadband services at all, the future of TewaCom Wireless is both abundant and assured. Eventually the network will offer such services as Voice-over Internet Protocol (VoIP), Digital Television over Internet Protocol (DTVIP), Video Conferencing, and E-Commerce.

Tewa Communications at San Ildefonso is firmly committed to continuously upgrade its TewaCom Wireless service with the most recent advancements in broadband technology as they become available. This will allow TewaCom Wireless customers throughout the Valley to experience broadband connectivity as sophisticated as any in the world.

Fiber optic infrastructure has been identified as key to the regional expansion and future bandwidth requirements of the Tewa network. Networking relationships with Qwest, Widstream and PNM are part of possible integrated regional needs and solutions.

The network will initially cover the majority of the Pojoaque Valley along with portions of the Espanola Valley. Development plans call for expansion into White Rock, Los Alamos and the entire Espanola Valley, and to include the following communities:

- San Ildefonso Pueblo
- Santa Clara Pueblo
- Pojoaque Pueblo
- Nambe Pueblo
- Ohkay Owingeh
- Española
- White Rock

Ohkay Owingeh

Ohkay Owingeh Pueblo is deploying and operating a wireless network for its residents and institutional facilities. The Pueblo's IT staff have clearly determined their need for participatory use and investment in regional 'open' fiber infrastructure and services.

Tesuque

The Tesuque Pueblo and the Tribal Police Department have developed a Master Plan for wireless and fiber networking. They are already a 'pilot' site for rollout of the State's TRAX records management system. They are also CEGIS compliant. They are currently deploying an E-911 dispatch system via connection to the State of Nevada.

In addition to projects' seed funding and networking technology support, they recognize the need for wide-ranging and long-term training and education programs, which will be able to be conducted at the newly constructing Multi-Juristictional Facility, which will include networked computer learning labs.

The Pueblo did not receive a USDA RUS grant, as applied for this past year, and are awaiting response on other related funding, including a technology grant from the US Department of Justice. Like other native and rural communities, while understanding the need for regional and public-private partnerships, they have a strong inclination to be independent and self-determining, not simply dependent on State or other programs.

Though they have need of fiber backbone networking, they indicate difficulties in working with Qwest. To that end, they are actively pursuing working arrangements with alternative fiber providers.

Pojoaque

Qwest Communications was recently granted authority to continue to provide telecommunications services in the Pojoaque area, following a long, contentious period.

Pojoaque High School and Pojoaque Valley Schools have long-held licenses Instructional Television Fixed Service, which have value for newly allocated wireless spectrum services provision.

Nambe

Nambé Pueblo leases space on its towers to wireless-communications companies to extend cellular phone service into much of the Pojoaque Valley area. 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.

North Central New Mexico: Shared Fiber Networking Opportunity

The North Central New Mexico, four county region that is inclusive of Santa Fe, Taos, Espanola, Los Alamos and Pueblo communities has identified itself as a region of numerous broadband activities and intentions.

This region includes a number of proposed NM CAC Gateways, libraries intended for improved connectivity, and telehealth networked facilities, serving as potential anchor sites which will be prepared to pay for high-bandwidth connectivity. Given the overlapping needs for these institutional, applications-based connectivity needs in the same locales, the concept of shared fiber optic networking begins to make economic sense, as is noted in the Economic section of the Report. Regional CAC Gateways are planned for:

- Santa Fe Community College, Santa Fe
- Santa Fe Institute, Santa Fe
- College of Santa Fe, Santa Fe
- Institute of American Indian Arts, Santa Fe
- Northern New Mexico Community College, Espanola
- Los Alamos National Laboratory, Los Alamos
- University of New Mexico, UNM – Taos

Enhanced Library connectivity is planned in the following communities:

- Santa Fe, Los Alamos, Espanola, Taos, Pojoaque, Dixon

Networked Telehealth facilities are planned in the following communities:

- Santa Fe, Espanola, Taos, Pojoaque

South Central New Mexico

This region is home to Las Cruces, the third largest city in the state, and home to New Mexico State University, a major research and educational networking center. Las Cruces is directly north of El Paso, Texas, and along the primary north-south fiber corridor (Rio Grande Optical Network) that extends through New Mexico, from Texas to Colorado.

The greater region, which for purposes of this Report, 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.

Wire New Mexico, NM LambdaRail, CHECS-Net, library and telehealth network upgrades, and distance learning networks are already centered in and planned to be extended in this region. Rural telecos are also building local fiber networks throughout the area.

Las Cruces

The City of Las Cruces is currently considering ownership or partnerships to build fiber optic and wireless 'open service provider networks'.

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.

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New Mexico State University (NMSU), one of the state's three main universities, is a primary leader in the region's broadband networking expertise, education and jobs training, and technical infrastructure and applications development. It is a major hub for the Digital Pathways program, Internet 2, CHECS Net and the NM LambdaRail Network. It will also be a primary NM CAC Gateway site. NMSU will be a leading partner on any regional networking initiative.

The Las Cruces area also includes planned telehealth and library network facilities.

Spaceport America

Spaceport America located about 30 miles east of Truth or Consequences, and 45 miles north of Las Cruces, in Sierra County, will be a major user of high-bandwidth network connections and applications. The Spaceport Authority's primary infrastructure contractor, DMJM Aviation, has prepared preliminary networking plans, and is in discussion with the NM DoIT, NM LambdaRail, and Qwest, about its needs. Network deployment and provider decisions must be made by the second quarter of 2009.

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Tularosa

In the little town of Tularosa, the local rural telephone company is now connecting every home, institution and business with a fiber to the premises (FTTP) network, realizing that it would be a high-benefit investment, with little more cost than an existing copper DSL upgrade.

Western New Mexico

Western New Mexico is a sparsely populated region, which however, is home to some of the state's research and education facilities. It is also a 'gateway' west to Arizona.

New Mexico Tech.

New Mexico Mining and Technology Institute is one of the three primary universities in the state. It is a NM LambdaRail hub, as well as a major center for CHECS-Net development, and other state networking initiatives. It has research relationships with the neighboring Very Large Array, and the newer Small Array, to the west of Socorro.

Very Large Array - National Radio Astronomy Observatory

This national astronomical observatory has need of enhanced fiber networking, which has not been deployed, to date. Western NM Telephone Co. has offered available, overly high priced fiber to the VLA. Other options are needed.

Southeastern New Mexico

The state's Southeast quadrant is the highest cost area for broadband connectivity and services, and the area of greatest needs. Of note in this Report, is the fact that of all the high-need regions of the state, there have been no USDA RUS grants awarded here.

Hobbs Area

Hobbs, in far southeastern Lea County, is home to the College of the Southwest, and New Mexico Junior College, the latter being a designated NM CAC Gateway site. The Hobbs Public Library is also among the proposed library network upgrades. There are also a number of telehealth networked facilities to the immediate north and south of Hobbs.

Northwestern New Mexico

Farmington Area

The Farmington area is center for San Juan Economic Development Service attention, with broadband as an acknowledged key. FastTrack Communications has been deploying a fiber network in Farmington, and Navajo Community College, and Navajo Nation initiatives play an important role in the region's networked future.

Farmington, Aztec, Bloomfield and Shiprock have designated sites for NM CAC Gateways, Library and telehealth networked facilities, and distance learning network upgrades.

Community-level Broadband Project Considerations

Network Requirements

As local community and regional pilot projects are developed, these modern "future proof" networks in New Mexico should have certain characteristics to ensure that they will have the desired community and economic development impact.

Unlimited Bandwidth

Businesses within the state should have as much bandwidth as they need to do whatever it is they need to compete globally. Fiber to every premise is needed to support the business class services being requested by commercial and retail businesses in the area. Unlike roads, water, and sewer systems, fiber capacity can be increased incrementally as needed without incurring additional construction costs, making it a reliable and secure investment. Steady increases in work from home opportunities and home-based businesses require fiber in residential areas, not just commercial and retail areas of the city. Wireless access may be the primary method of access for some businesses and residents until the fiber deployment is well advanced. Long term, wireless will be used primarily for mobile access to the Internet and access to business information while away from the office.

Symmetric Bandwidth

Upstream and downstream data capacity of the broadband network should be equal. Most current broadband systems restrict upstream data capacity to a fraction of the downstream capacity--upstream capacity is often only 10% of downstream capacity. These limits restrict economic development, entrepreneurial activities, and work from home opportunities. Our meetings and interviews with large and small businesses across the United States indicate that symmetric bandwidth is now considered a business requirement. Companies as diverse as major corporations and small one person start ups are both citing symmetric bandwidth as essential to support business activities from the home, including casual nights and weekend access, full time work from home employee situations, and home-based businesses.

Widespread Availability

High performance network connections should be available at every business and residential premise in the city. Work from home programs and the diversity of other business access from the home indicates that if a desired outcome of the broadband investments is economic development, then universal access is extremely important, since it will not be possible to predict with any certainty in what parts of the region new business activity will take place. Retail areas, office buildings, and residential areas of the two cities and the rural areas of the county will all eventually need the same kind access to bandwidth and services.

Affordability

Discussions with management teams indicate that the high cost of existing business class services is a deterrent to growth and to business innovation. It is more efficient from both network and financial perspectives to build a single, shared, very high performance network than to have several competing legacy, copper-based networks that are each maintained at significant cost. Regional investments in basic infrastructure will allow service providers to offer services at lower cost because their capital expenses have been reduced substantially while increasing their access to a much larger, aggregated market.

Support for a Wide Range of Services Beyond "Triple Play"

Telecommunications services has undergone a massive transformation in the past fifteen years, and that change will continue for at least an additional ten years as all services formerly delivered over narrow bandwidth analog networks (i.e. the traditional "triple play" of Internet, TV and telephone) are delivered over wide band digital networks. Many new services (e.g. YouTube, iTunes Music Store, VoIP phone services) were not anticipated or predicted by most industry pundits just ten years ago. Newly emerging high bandwidth services include a wide range of telemedicine and telehealth services, new kinds of online entertainment options, and many more kinds of business and ecommerce services. Any telecom infrastructure investments undertaken by the authority must be capable of supporting a wide range of future services that are going to emerge but cannot be predicted precisely.

Competitive Marketplace

A world class broadband infrastructure will lower costs for service providers offering services on the network and will increase competition among providers. This will increase the kind and type of service offerings while keeping prices lower than those in communities without a competitive marketplace for telecom and broadband services. This will make the region more competitive from an economic development perspective and help to retain existing businesses and jobs and also help to attract new jobs and businesses to the region.

Limited Government Involvement

Local governments should limit their involvement to providing appropriate support to a broadband authority. The authority will provide the basic infrastructure; services provided to businesses and residents should be offered by private sector service providers. Incumbent providers as well as other interested firms should all be invited to use this "open access" authority infrastructure to sell current services and new, innovative services both to existing customers and to new customers. This approach will keep elected and appointed officials out of the business of providing telecom services directly to the public. Communities where the local government has chosen a "municipal retail" approach, where residents and businesses buy telecom services (e.g. telephone, Internet,

TV) directly from local government have often been sued by incumbent providers on the grounds that public funds should not be used to compete directly with the private sector.

While these communities have often won in court, such cases often take years to resolve at great legal expense. Financially, these network projects then face difficulties because the local government then must market the new network directly against the incumbent providers, who usually cut prices and engage in a price war with the local government. The open access approach avoids these difficulties by creating a market environment where service providers compete against each other instead of competing against local government.

Network Business Model Options

Private Sector Only

The "leave it to the private sector" model has obvious shortcomings, which is why so many communities are now beginning to consider telecom as essential public infrastructure. Private sector firms have a primary responsibility to preserve and enhance shareholder value. They do not make operational and service area deployment decisions based on community and economic development needs. For many communities, this has meant that broadband services have lagged well behind the rest of the world and places those communities at a competitive disadvantage when trying to attract or retain businesses.

The private sector model requires overbuilding, which means that each service provider must build its own network end to end to serve customers. This leads to completely duplicated networks, which increases costs and makes it more difficult for these firms to make a business case for enhanced services in many area. This business model is a fundamental weakness, because these private networks are not only expensive, but typically underutilized. Residential networks are only used heavily in late afternoon and evenings, and are virtually unused overnight and during the work day. Business networks that are only used heavily during work hours typically have very low utilization for the other two-thirds of the day. School and education networks are used only 8 to 12 hours per day, and are empty the rest of the time.

Community broadband projects overcome this fundamental weakness and substantially reduce the operating cost of networks by using a shared model, rather than a private model.

Municipal Retail

Also known as Muni (Municipal) Triple Play. Local government builds the network and sells services in direct competition with the private sector, offering only traditional "triple play" voice, video, and broadband. Muni triple play systems are usually closed systems that offer little choice to customers. Muni triple play systems compete directly with the private sector, and tend to have very low take rates. Opponents of community broadband

often cite the low take rates of muni triple play projects to "prove" that community broadband is a poor investment. But the low take rates only show that muni triple play business models are not financially viable over the long term.

The two key issues with this model are:

- It requires local government officials and leaders to sign long term contracts (typically 5 to nine years) with the providers whose services will be resold over the network. This means that those local leaders must have a high degree of confidence that they can accurately predict, seven to nine years out, what level and quality of services the businesses and residents of the community will require. While contracts can be renegotiated as needs change, prices are likely to rise during that renegotiation.
- This model does place the local government in direct competition with incumbent providers. This not only tends to keep take rates low, which threatens financial viability, but adoption of this model also encourages lawsuits from the incumbents (Bristol, Virginia, Lafayette, Louisiana, Geneva, Illinois, and Monticello, Minnesota are examples of communities that were sued after selecting the muni retail model).

Municipal Wholesale

Local government builds the network and provides access to service providers, who must use Layer 2 Virtual Private Networks (VPNs). Services must be provisioned individually for each subscriber. Not a true open access model because of system complexity. Muni wholesale is also confusingly called "open access" by some parties. Muni wholesale systems may have some competition for some service categories, but the technical complexity of these systems limit the ability of smaller providers to take full advantage of the system. Technically, most "open access" systems are managed at what is called Layer 2; the limitations of Layer 2 open access tend to keep the cost of providing services high, compared to a true open services network that provides fully automated, end to end provisioning of services.

Problems with the wholesale approach include:

- Each service provider must have their own service provisioning system, which raises the cost of market entry and increases the cost of all services (because the service provisioning and support software must be duplicated by every provider). This can limit the number of providers to a few bigger ones that already have such systems or can afford to build or purchase them.
- The Layer 2 provisioning by each provider increases the technical complexity of debugging network issues and resolving customer service problems.

The Utopia network in Utah, the country's biggest community fiber effort, had difficulty with its initial Layer 2 network architecture and is converting to an open services model that will use a Layer 3 open services model.

Open Infrastructure

In this model, local government limits investments primarily to passive infrastructure, which can include duct, dark fiber, handholes, splice cabinets, colocation facilities, and wireless towers. Each service provider that wishes to use the fiber infrastructure must provision their own electronics end to end. Some of the issues that must be considered with this model:

- The requirement to provide electronics raises the cost of market entry for service providers. It can also limit competition, as the first service provider who spends the money to install electronics in a business area or residential area may "capture" a large portion of the available market, making it more difficult for the next service provider to justify the expense of trying to compete. However, the availability of the fiber can still give some customers options, especially business customers in retail areas and business parks, where there is more incentive for providers to compete aggressively.
- The fiber design for the network must be done carefully to avoid both running out of fiber and to ensure that there is enough fiber to support competition. Fiber capacity must be overbuilt in the last mile (first mile) portion of the network to ensure there is enough fiber cable to support multiple providers. Fiber cable cost has decreased substantially, so this is not as much of an issue as it once was.
- Splice cabinets and locations for equipment cabinets and colocation facilities must also be considered carefully to make it easy for providers to install equipment. If the authority provisions cabinets, it makes it much easier for service providers to compete, because finding locations for equipment cabinets is a major time and cost factor when entering a new market area.

Open Network

Customer aggregation is a key advantage to a shared, community-owned telecommunications infrastructure. By building an integrated fiber and wireless system to every home and business, the community maximizes the market potential for private providers who want to sell services. The community investment allows these businesses to reach more customers than any single company could reach on its own. Some of the outcomes are:

- More customers -- When a community builds the transport layer of a digital road system (the roadway), each provider has a much lower cost of infrastructure needed to enter a market. In smaller towns and regions, this is a critical difference. Community investments allow more companies to profitably offer services in smaller markets than a firm could do on its own.
- Lower costs -- When a firm can reach more customers via a community broadband system, lower costs of service usually results. Typical reductions in cost in open access systems are usually on the order of 15%, and are frequently much more than that. It is not unusual to see the cost of telephone service decline by 40% or more.

Services aggregation occurs when communities build open networks, meaning that any qualified service provider can offer services using the community digital roadway. In this business model, there are usually several service providers competing for customers in each category of services (e.g. voice telephone service, TV, Internet access).

- More choice-- A natural outcome of more services is more choice for purchasers of services. Instead of a single monopoly provider of telephone or television, customers can pick and choose among a variety of service plans at various price points.
- More competition -- When more services are available, there is more competition for customers, which requires that service providers sell services for the lowest possible price, and also creates incentives to provide excellent service to customers. Compare this to a monopoly environment where there is no competition and hence little pressure for a company to provide good service--customers have no other service options.
- More services -- When there is a wider choice of services on the community system, there is more opportunity to use more services. This is, in part, what makes open service provider networks financially sound investments for communities: Open systems create a bigger market for telecom services, and thereby creates more revenue flowing through a community revenue sharing plan.

Organizational Options

Government Ownership

Many communities in the United States have municipal entities that offer services to the general public. The most common services are water and sewer, and are administered operationally either as a department of the government or as an authority. Typical water and sewer authorities are quasi-public entities that operate independently of direct local government oversight but operate as a nonprofit.

Also common are municipal electric service operations. Several hundred communities in the U.S. have municipal electric power, and some have moved into the telecommunications arena, largely because it is convenient to do so--the organization already has utility pole access, experienced staff, and equipment like bucket trucks. However, the direct municipal approach is not likely to work for the effort because local governments have already indicated that they are not interested in owning or administering systems directly.

Government operated networks using the muni retail model attract legislation forbidding localities from offering telecommunications services. Several states, including Pennsylvania, Nebraska, South Carolina, and Virginia, have enacted legislation making municipal telecom services illegal within the state shortly after a municipality or public service company started a data service. The Virginia bill was overturned by the Federal Circuit court in a remarkably brief decision that seems crystal clear:

I find that the broad and unambiguous language of § 253(a) [the Federal Telecom Deregulation Act] makes it clear that Congress did intend for cities to be "entities" within the meaning of the Telecommunications Act. Therefore, § 15.2-1500(B) [the Virginia legislation in question] is in direct conflict with federal law, and is void under the Supremacy Clause. Section 253(a) is a concise mandate that no state "may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecommunications service." 47 U.S.C.A. § 253(a) (emphasis added).....Simply put, it strains logic to interpret the term "any entity" in § 253(a) to mean "any entity except for municipalities and other political subdivisions of states." While it is true that such an interpretation is possible, the Supreme Court has cautioned that "[a] statute can be unambiguous without addressing every interpretive theory offered by a party." .....The federal statute, therefore, not only mandates that no state statute "may prohibit" telecommunications competition, but also that no state statute "may have the effect of prohibiting" telecommunications competition. 47 U.S.C.A. § 253(a).

While most communities that have been challenged by lawsuits have eventually won in court, the legal battles usually add years and significant expense to such efforts.

Regional Authority

Regional authorities are widely used for regional projects that require long term oversight and involve participation from more than one local government entity. Some states, including Virginia, have created enabling legislation specifically for broadband authorities.

Coop

Cooperative business enterprises as formal entities date from the mid-1800s. The first cooperative was set up in England to serve customers unhappy with local merchants. In the United States, the Grange movement began setting up cooperatives in rural areas to sell needed items to members and to help sell produce and other agricultural products that were produced by members. Today, credit unions are the most common form of coop business in the United States, with more than 65 million people obtaining services from over 12,000 credit unions.

Telephone and electric coops continue to be very common in rural parts of the U.S., and in fact, the majority of telephone companies in the United States are coops, but most have very small numbers of customers--often less than a thousand subscribers. Telephone coops serve more than a million subscribes in thirty-one states. The True Value and Ace Hardware chains are actually buying coops that help keep independent hardware stores competitive with the large chain stores.

The U.S. Department of Agriculture provides extensive support for existing coops, and also helps communities start coops. One of their publications lists coop principles:

- User-Benefits Principle -- Some purposes of a coop are to help members get services that might otherwise not be available, to get access to markets, or for other "mutually beneficial" reasons.
- User-Owner Principle -- The users of the cooperative own it.
- User-Control Principle -- The owners of the coop (i.e. members) control the coop through voting (annual meetings, etc), and indirectly by electing a board of directors to manage the enterprise. Large users who make high volume purchases of goods or services may receive additional votes.

Because cooperatives are user-managed, control of the enterprise is vested in the community or region where the users reside. Cooperatives also return excess earnings to members; these refunds, called patronage refunds, are typically computed at the end of the fiscal year. Coop expenses and income are calculated for the year, and any excess is returned to members, based on the percentage paid in by each member (e.g. a member that paid in 1% of total earnings would get a refund of 1% of any excess earnings).

Most cooperatives do not pay dividends on capital. This helps keep outsiders from taking control of the company, which would result in the community losing control over the quality of services and direction of the enterprise.

Coops are organized in part based on the territory they serve, and there are several classifications that may be relevant for community broadband efforts. A local coop serves a relatively small area that may be a single county and/or a radius of ten to thirty miles. A super local coop serves two or more counties. A regional coop may have a service area of several counties up to an entire state (or multiple states). For projects that involve several local government entities that are already trading services like local public safety dispatch, a super local coop may be the most appropriate designation.

Most local and super local coops use the centralized governance structure, which means that individuals and businesses represent the bulk of members.

Cooperatives offer one or more of three kinds of services:

- Marketing coops help sell products or services produced by members.
- Purchasing coops buy products and services on behalf of members.
- Service cooperatives provide services to members, and service coops include the credit unions, the electric coops, and the telephone coops.

Equity is typically raised for coops by direct investment from members. In return for an investment, members receive a membership certificate. The member may also receive shares of stock if the cooperative issues stock (some do, and some do not). Once a member has invested, they gain the right to vote in elections. As an example, if the local governments made a large initial investment in the cooperative, they could gain substantial influence in the organization's affairs, by gaining multiple shares and increased voting rights. Property owners (residential and business property owners) who paid an initial connection or pass-by fee would also gain shares in the business, so every property

owner that pays the connection fee gains ownership in the enterprise--an important selling point when encouraging property owners to, quite literally, invest in the project.

Although cooperatives are typically constrained by both Federal and state laws to do a majority of business with members, in most cases, cooperatives are able to do business with nonmembers up to some percentage of business income that can be as high as 49 percent. Note that this may be affected by the underlying legal incorporation of the cooperative--if incorporated as a 501(c)(12), the IRS requires that 85% of income must come from members for the purpose of meeting ordinary expenses.

Non-profit

There are various kinds of nonprofit businesses. The most common is the 501(c)(3), which is limited to strictly charitable efforts--a 501(c)(3) cannot, according to IRS rules, operate as a nonprofit business providing services to the general public. However, one or more nonprofit businesses may be useful as part of the overall effort.

A 501c3 may be desirable as a mechanism to accept charitable donations, and more importantly, to apply for certain kinds of grants. Once the funds have been received by the 501c3, and the donors have received the tax credit, the nonprofit can, in turn, give or loan those funds to another organization (e.g. an authority or coop chartered specifically to provide services).

For profit businesses

There are various types of for profit business organizations: individually owned businesses, partnerships, general business corporations, and limited liability companies. None of these are appropriate for the broadband project because:

- Public funds are involved in the development of the system.
- Local control vested in the participating communities is required to protect investments in the project (private, for profit enterprises are not vested in the community). A for-profit enterprise could operate an open, multi-service network, but the community would have little or no control over the venture.

Ad Hoc and Informal Partnerships

Some local governments have deployed duct and/or dark fiber and have made ad hoc arrangements to provide capacity to other institutions like K12 school systems or adjacent local governments. In some cases, they have a policy for leasing duct or fiber to the private sector (the city of Sacramento, California has leased duct for over a decade) but have not developed a comprehensive plan for management and expansion.

Conclusion

The next phase of the networked broadband society will be focused on what has been called *the last mile*; the community, the home, businesses and institutions, and the personal; which, to be effectively addressed, should be referred to as *the first mile*, because in economic terms, value is local.

It is also being shaped by new opportunities for openness and innovation as exemplified by the proliferation of open source software and applications, open wireless and fiber networking standards and deployments, and an already rich and broad array of new information sources and distribution methods (e.g. blogs, MySpace, FaceBook, BitTorrent) that very broadly are described as "social networking."

Fulfilling the promise and opportunities inherent in our increasingly networked society will require the collaboration and cooperation of the private sector, tech savvy citizens and community groups, and government at all levels (local, state, and Federal).

Closely linked with the global knowledge economy are two related trends: the emerging energy economy and the space economy. Leveraging energy conservation and new sources of renewable energy will require robust, reliable, and redundant broadband networks. Managing energy will require highly reliable broadband connections to every home, every business, and every institution, so that both demand for energy and sources of energy can be managed in real time. As just one example, Sandia Labs is funding research to explore the feasibility of using the electric power stored in electric vehicle batteries as as source of peak demand electric power (Vehicle To Grid, or V2G). V2G only works if the electric utilities can communicate with homes and vehicles over a broadband network.

In the near future, there will be no area of human involvement that will not require support from and access to the network. Governance and civic activities, economic development and jobs creation, distance learning and K12 education, healthcare, commerce, culture, recreation and entertainment, work and home life will all require and expect affordable access to broadband services.

In order to meet and fulfill the needs of New Mexico businesses, citizens, and institutions a statewide Integrated Strategic Broadband Initiative will give New Mexico the opportunity to emerge as a technology leader and innovator--first among all the other states. Doing nothing is a greater risk than the challenge of finding ways to create new and innovative public/private partnerships. Small, incremental and achievable steps will provide opportunities to experiment and to quickly identify successful strategies and approaches.

The State of New Mexico has an exciting opportunity if it takes actions to enhance and develop broadband networks and services as essential infrastructure.

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