

BROADBAND
LOCAL PLANNING
ASSISTANCE TO
ARIZONA COMMUNITIES

PROVIDED BY

Digital Arizona Program For Northern Arizona Council Of Governments
(NACOG)

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Digital Arizona

{ Expanding Innovation
} Through Connectivity

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NACOG Region / Counties



Executive Summary

NACOG is a nonprofit membership corporation representing local governments to provide a wide variety of services within the four rural Arizona counties of Apache, Coconino, Navajo, and Yavapai. From these four counties - three regions and their respective communities were identified for this business case. Region 1 represents Prescott and Chino Valley. Region 2 represents Cottonwood and Clarkdale. Region 3 represents Pinetop-Lakeside and Flagstaff, Arizona.

This Business Case Analysis focuses on digital capacity for the Northern Arizona Council of Governments (NACOG). It is funded by a federal grant awarded to the state of Arizona. Launched in 2009, NTIA's State Broadband Initiative (SBI) implements the joint purposes of the Recovery Act and the Broadband Data Improvement Act, which envisioned a comprehensive program, led by state entities or non-profit organizations working at their direction, to facilitate the integration of broadband and information technology into state and local economies. Economic development, energy efficiency, and advances in education and health care rely not only on broadband infrastructure, but also on the knowledge and tools to leverage that infrastructure.

Work with the three regions consisted of developing Community Data Sets, integrating these data sets with the Arizona Broadband Map and identifying broadband providers and their respective services. Broadband speeds by county/zip codes were obtained for the three regions from *speedmatters.org*. The Service Provider and Services were generated from the Arizona Digital broadband Map. Current infrastructure including providers and services, utilities, roads and rail are identified in the Community Data Sets. The results confirm rural Arizona requires more hi-speed Internet capacity.

Arizona ranks 45th in the nation with a 4.8 Mbps average speed experienced by broadband subscribers, according to the Akami speed reporting for the second quarter 2012. Forty six percent of Arizona households have internet speeds that are below the minimum National Standards, that are 4 Mbps download and 1 Mbps upload.

Minimum Sufficient Speed thresholds were identified for the four major application areas and the consisted of 10Mbps Download and 5Mbps Upload to support Economic Development, Education, Telemedicine and Public Safety. The Business Case Analysis identifies NACOG regions with limited broadband capacity. This is a critical issue that must be resolved for continuous economic development to continue. In all cases - no community reviewed in these three NACOG regions could be identified to meet the threshold standards for all four applications.

Studies show the connection between economic development and high bandwidth. A 2011 Chalmers University study concluded that every doubling of broadband speed increased GDP by 0.3%. (Rohman, 2012) If this Chalmers University calculation is applied to rural Arizona's economy it potentially has the following impact:

Arizona Annual GDP - \$277 billion

X 15% (rural portion of Arizona GDP)

X 0.6% (4 x increases in rural digital capacity - 1 Mbps to 4Mbps) or equal to \$249 million potential Arizona Rural Increase/Year from digital capacity expansion.

The next generation of Internet will utilize real time video which requires much higher demand for broadband capacity to do a multitude of different types of work. For example, businesses that are in any community are going to need to have access to real time video for collaboration, and telework that drives the need for more broadband. Modern Internet is video intensive, and increases by ten times the demand for video. Future uses of broadband will require even more capacity.

Conclusion and Recommendations:

NACOG must now put in place action plans, as identified in the Systems Requirements to move forward and advance broadband capacity requirements for the major four major applications within each of three regions and communities. These action plans will require group leaders for each of the applications, defined community requirements, identification of local infrastructure assets, service provider/service(s) and availability, including the formulation of a ROI and an implementation schedule.

The transformation from community planning to technical assistance has begun. Clarkdale is a target for cell tower planning/zoning and permitting, broadband redundancy is currently under review with providers and communities including Prescott and Flagstaff. Pinetop-Lakeside and Clarkdale are focused on improving Public Safety as their number one project. North Country Healthcare in Flagstaff is seeking help in expanding its broadband capacity to support additional physicians and patients. Community planning (by the Sub-Committee is the process of evaluating action plans as defined in the Systems Requirements. Technical assistance has begun working with Clarkdale (cell tower locations) and Prescott Valley for fiber connections to facilities.

Action is already occurring in Clarkdale, Arizona. Clarkdale is currently underway working with the service providers (AT&T and Verizon), the community stakeholder, and NACOG's Technical Assistance team. All are working on planning/zoning and permits for cell towers to increase capacity to support the applications and sustain community progress.

Communities will continue to focus on the benefits of broadband and how it can further sustain a region and community's vital sustainability. One of many factors that lead to broadband projects include the knowledge of knowing the current capacity and realizing what is required to support the demand of future applications (speed tests are essential factors).

Identifying the need for rural broadband capacity

Below is a table of recommended speeds relative to specific applications. The recommended speeds for digital applications from the California Broadband Task Force for various applications involving business and jobs, education, telemedicine and public safety are identified in the table. A recommended speed standard of 10 Mbps download and 5 Mbps upload is seen in the graph below. These speeds support necessary requirements for the major applications.

Upstream and Downstream Speed Range

Applications

500 kbps – 1 Mbps	Voice over Internet Protocol telephony , Basic email, Web browsing - (simple sites), Streaming music, Low quality video (highly compressed)
1 Mbps – 5 Mbps	Web browsing (complex sites), Email (larger size attachments), Remote surveillance, IPTV-Standard Definition (SD) (1-3 channels), File sharing- (small/medium), Digital broadcast video)1 channel), Streaming music.
5 Mbps – 10 Mbps	File sharing (large), IPTV-Standard Definition (multiple channels), Broadcast Standard Definition video, Video streaming (2-3 channels) High Definition video downloading.
5 Mbps – 10 Mbps	Medical file sharing (basic), Remote diagnosis (basic), Remote education, Building control and management.
10 Mbps – 100 Mbps	Telemedicine, Educational Services, Broadcast video SD and some High-Definition, High quality tele-presence, High Definition surveillance, Smart-Intelligent building control.
100 Mbps – 1 gbps	High Definition telemedicine, Multiple Educational Services, Full High – Definition Broadcast video, Full IPTV channel support, High Definition – Video on Demand. Gaming (immersion).

Source: California Broadband Task Force, the State of Connectivity; Building Innovation through Broadband, Jan 2008.

Comparison of standard application speeds compared to NACOG's average county speeds.

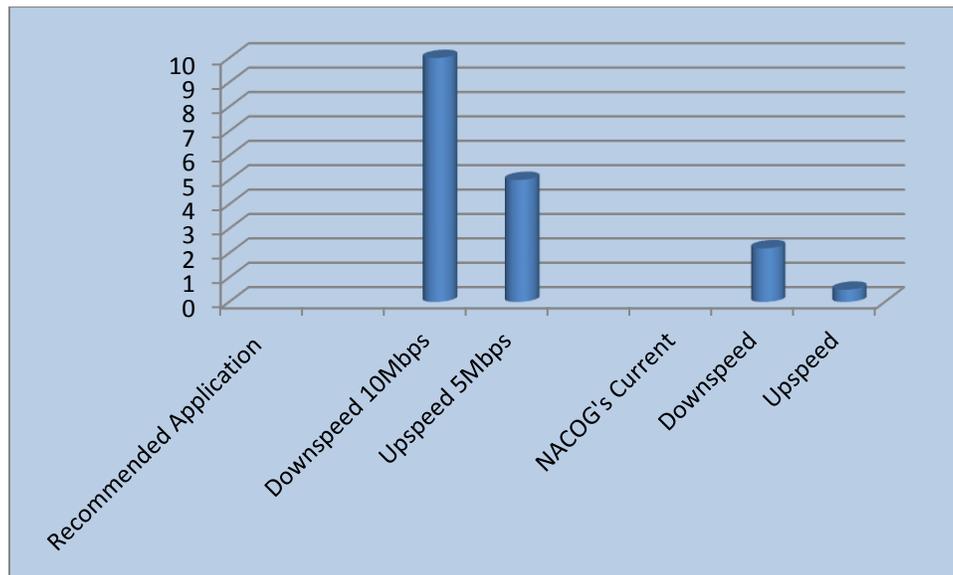


Figure 1

Figure 1: Shows the recommended speeds necessary to support Economic Development, Education, Telemedicine and Public Safety. **NACOG's speeds are not sufficient to support the recommended application speeds.** A letter released from Superintendent of Public Instruction, John Huppenthal recommends a speed standard of 6Mbps Down and Up for students at school and at home. Huppenthal's letter is on page 43.

The NACOG region seeks to enable the availability of sufficient digital capacity for each of the four applications and an effective redundant system to protect and secure all entities from outages, either natural or manmade.

Arizona also lacks wide area interconnected fiber-optic rings to create robust statewide digital connections. Many communities are essentially stranded islands of digital capacity lacking fail-safe redundancy and inadequate backup in emergencies. There have been numerous Arizona communities that have experienced prolonged broadband Internet and 9-1-1 outages resulting in millions of dollars in economic damage. Ideal digital infrastructure is constructed in rings or interconnects so if there is a cut in the line, the system can route traffic in other directions. (Data Site Consortium and International Research Center, 2009, p. 50).

All three NACOG regions in this analysis do not have the redundancy to support their networks in the event of a line disruption.

Each NACOG region along with its community has identified the general requirements for additional broadband capacity.

REGION 1

REGIONAL OBJECTIVES

- **Prescott:** Broadband redundancy, entrepreneur and home-based businesses. Distance Learning with Northern Arizona University.
- **Prescott Valley:** Business Attraction, with more broadband coverage and capacity in support of call centers, data centers and light manufacturing.
- **Chino Valley:** Better public safety communications. Recent growth in construction jobs, services, suppliers and agriculture businesses.

REGION 2

- **Clarkdale:** Additional wireless mobile broadband capacity with minimal resident intrusions, such as cell tower locations.
- **Cottonwood:** Better broadband will retain and attract new businesses. Light manufacturing, viticulture and tourism with Internet connectivity driving the economy.

REGION 3

- **Pinetop-Lakeside:** Better public safety communications.
- **Flagstaff:** Business Retention and Expansion for medium sized companies and expansion of entrepreneurial businesses. North Country Medical requires additional digital capacity for new-hire physicians and patients.

Local leadership is essential in accurately defining broadband requirements. The community action plans for satisfying the identified requirements will lead to model projects for the communities.

The driving force for each of these communities will be to obtain the high-speed Internet technology and infrastructure in place to support the following four applications:

1. Foster local Economic Development by:

- a. retaining and expanding the current businesses
- b. attracting new businesses,
- c. providing local Jobs and developing new skill-sets necessary to increase employment and community sustainability.
- d. Supporting local entrepreneurs who engage with the global economy using high-speed Internet

2. Improve educational success within local communities by:

- a. Increasing the effective use of interactive digital learning solutions such as:
 - i. khanacademy.org,
 - ii. distance learning and collaboration in classrooms, homes and businesses for students of all ages,
 - iii. real-time accountability for student and staff performance.

3. **Improve health care availability**, quality while lowering costs by:
 - a. Using high-speed Internet for local doctors and providers to collaborate with remote specialists
 - b. Improving local triage to reduce unnecessary transportation of patients to remote facilities.
 - c. Providing remote well-being check-ups from local facilities such as schools, libraries, etc.
 - d. Providing enhanced in-home care with video check-ups by remote health care providers
4. **Improve public safety and save lives** by delivering accurate real-time data to all first-responders as needed and across jurisdictional boundaries.

Building the Business Case Analysis

The work performed within the three regions to assess the inventory of currently available broadband services can be summarized as creation of speed tests, Community Data Sets and integration with the Digital Arizona broadband map. Results of this work are:

1. the reporting on speed tests performed speedmatters.org as organized by county/zip code including the identification of service providers and their offered services,
2. the identification of potential grants that that could be applied for to support increased availability and/or more effective use of high-speed Internet in local communities,
3. the creation of a Broadband Development sub-committee within NACOG's Economic Development and Planning Committee,
4. the ranking of the importance to different communities of different Internet applications based on a particular regions' priorities
5. the creation of web page updates about broadband activities within each region.

By determining not only the current availability of digital services within the three regions, and creation of a composite picture of the community's demographic and socio-economic makeup, the Broadband Development Committee will be able to generate the rationale for why and where additional digital capacity and services are most needed within the various regions. This information can provide fundamental guidance in the process of planning for how to get capacity and services enhanced more effectively and efficiently.

To recognize where NACOG needed to place emphasis on broadband capacity, it was necessary to first determine what is currently available within NACOG's territory. NACOG is comprised of four large counties covering north-central and north-eastern Arizona. It consists of 47,899 square miles. Investigative research toward demands on economic development, education, telemedicine and public safety within each region/community, discovered that the NACOG region requires enhanced broadband services to attract and sustain economic development programs (jobs, education/skill-sets, regional educational, medical, and public safety services). Several current data resources were utilized to determine the existing digital capabilities for targeted regions. The four county demographics and average broadband speed tests are identified on the following pages.

Speed tests by speedmatters.org and County demographics

Apache County	Tests	Download	Upload
	37	1.7Mbps	.4Mbps

Area:	11,220 sq. miles
County Seat:	St. Johns
Population:	72,401 (2011)
Unemployment:	18.7% (12/2012)
Age Groups:	Under 18 years – 31.5% 65 years and over – 12.0%
High School Graduate or higher:	73.1%
Homeownership:	76.2%
Per capita income:	\$12,628 (2007 – 2011)
Median household income:	\$31,011 (2007 – 2011)

Navajo County	Tests	Download	Upload
	32	2.7Mbps	.4Mbps

Area:	9,959 sq. miles
County Seat:	Holbrook
Population:	107,094 (2012)
Unemployment:	14.8% (12/2012)
Age Groups:	Under 18 years – 29.2% 65 years and over – 13.8%
High School Graduate or higher:	80.4%
Homeownership:	72.8%
Per capita income:	\$17,004 (2007 – 2011)
Median household income:	\$38,975 (2007 – 2011)

Coconino County	Tests	Download	Upload
	181	2.2Mbps	.5Mbps

Area:	18,660 sq. miles
County Seat:	Flagstaff
Population:	136,011 (2012)
Unemployment:	8.4% (12/2012)
Age Groups:	Under 18 years – 23.1%
	65 years and over – 9.3%
High School Graduate or higher:	86.8%
Homeownership:	61.3%
Per capita income:	\$22,607 (2007 – 2011)
Median household income:	\$ 49,615 (2007 – 2011)

Yavapai County	Tests	Download	Upload
	153	2.5Mbps	.6Mbps

Area:	8,128 sq. miles
County Seat:	Prescott
Population:	212,637 (2012)
Unemployment:	8.6% (12/2012)
Age Groups:	Under 18 years – 18.5%
	65 years and over – 25.2%
High School Graduate or higher:	89.8%
Homeownership:	71.8%
Per capita income:	\$26,028 (2007 – 2011)
Median household income:	\$44,084 (2007 – 2011)

These speed results by counties indicate each of the four counties is below the FCC benchmark, (4Mbps Down and 1Mbps Up) and below the 10Mbps Download and 5Mbps Upload to adequately support the four applications (economic development –Jobs, education, telemedicine and public service).

Although the quantity of speed-tests performed to date does not rise to the level of statistical significance, the early results point to the fact that all the four counties are below the minimum FCC benchmark, (4Mbps Down and 1Mbps Up) and nowhere near the Educationally Sufficient benchmark of 6 Mbps (up and down) established by the State Superintendent of Education. In the near future statistically significant speed test measurements will be created for NACOG to use in its planning as broadband users throughout the State report speed-test measurements using the Digital Arizona Speed Test. <http://digitalarizona.gov/>

Coconino and Yavapai counties currently both experience high unemployment rates as seen in the above tables. Flagstaff located in Coconino County, attracts businesses, and has recognized

health-care programs. Flagstaff is home to one of Arizona's three major public universities, Northern Arizona University (NAU). Yet, its high unemployment rate (8.4%) makes employment difficult. Flagstaff is developing more skill-set training programs with the high-schools and community colleges to help reduce the unemployment. Interactive video curricula and distant learning capabilities for specialized training would significantly accelerate this process. Prescott in Yavapai County, also attracts businesses, and currently has distance learning programs, in collaboration between Yavapai Community College and NAU. The Prescott, Prescott Valley, Chino Valley region includes a high number of entrepreneurs and home-based business operators where high-speed digital connections are a necessity to run their small businesses.

High capacity broadband service providers and their respective services bring opportunities to these rural areas. The economic development trend for rural Arizona is dependent on small service businesses, designed to complement larger (often global) organizations. Without broadband, these small businesses will not be sustainable. The data analysis details the speeds and services by zip codes for the four NACOG counties. Speedmatters.org is the source for the average speeds reported for each of the four counties and zip codes. The service providers and their services were obtained from the Arizona Broadband Map. The additional small sample of regional and community speed tests for specific anchor institutions were (and will continue to be) conducted via the Arizona broadband Speed Test:

<http://www.digitalarizona.gov/Survey/StandardInArizonaQuestion.html>

The Community Planning tasks contributed to the Business Case by providing research (speed tests, provider services in the counties), along with a variety of research methods including surveys, site visits, and focus group updates (multiple presentations during the NACOG Economic Development Council meetings) on the Arizona Digital Program (DAP).

From the research activity, (service providers and services, speed results in the four NACOG counties and Community Data Sets) root causes of problematic systems were identified. Current available infrastructure in the regions/communities is in the form of utilities, providers, roads/rails, and is identified in the Arizona Broadband Map with its Community Data Sets. The results can be seen in the Appendix D and E, pages 25 - 27.

There is an overwhelming desire by NACOG to enhance the current broadband network throughout its regions. In order to adequately address the problems and promote workable, cost effective solutions a Systems Requirement outline was generated. The format identifies the Project, the User Requirements, a description of the tasks required tasks including Environmental Requirements, Constraints, Functional Requirements and Major Milestones. It concludes with an Action Plan. A proposal of what is required to meet the requirements for standard and above broadband capacity has been prepared to support the four major applications and can be reviewed in the Systems Requirements document.

The use of real-time video streaming and collaboration is emerging as the major driver of the need for increased digital capacity. Although consumers are largely seeking this capability to enjoy Internet based video entertainment. (Netflix, etc); the important and live transforming uses are for enhanced educational, health-care, and public safety outcomes, as well as keeping local companies connected and competitive to the global economy. New infrastructure and expanded services offered by providers should be designed to deliver at least 6 Mbps up and down per simultaneous video streaming user on any given Internet connection to make such uses work reliably.

Systems Requirements – A business case to achieve enhanced broadband

1. Project Description - Goals/Objective(s) – “Provide Better Internet Service to rural Arizona citizens, businesses and government”.

2. User Requirements - these requirements are focused on the Four Major Applications and accountability:

- A. Economic Development (Jobs)** and economic sustainability
- B. Education** – expansion of distance learning
- C. Telemedicine** – use technology to enhance quality-of-life for rural residents
- D. Public Safety** – delivery of real-time information to all first responders

3. Identifying the costs of expanding broadband capacity

Right-of-way and environmental requirements

Utility clearances as well as completion of environmental / cultural impact studies.

Regions and local communities can have significant positive impact on the return-on-investment (ROI) calculation to facilitate and encourage such investments by providers.

4. Project Planning Requirements:

- Develop specific action plans, including assignments and schedules (milestones), to meet the goals/objectives of identified projects.
- Communicate with potential investors in desired projects to discover in detail the barriers that might prevent them in investing in an identified project.
- Explore ways to mitigate possible barriers through cooperative arrangements. Communities and stakeholders must distinguish the “Must Haves” from the “Like to Haves” in proposed projects in order to control costs and resources. and to encourage investment.

5. Identify and agree upon major milestones and expected accomplishments and how success will be measured.

- Leadership and Planning are essential for the success of any project.
- Identify the leaders and advocates in each community for each project
- Communicate with all leaders in the community and leaders in other communities frequently to learn about best practices and keep the project momentum high.
- Track progress and corrective actions that may need to be taken

6. Desired Outcomes:

Initially Targeted NACOG Communities:

Clarkdale is the nucleus for creating a Planning/Zoning “best practices” template for determining the location of cell towers and creating community “buy-in”. This template will expedite the permitting process and provide guidelines for both rural communities and service providers.

Regional Demand

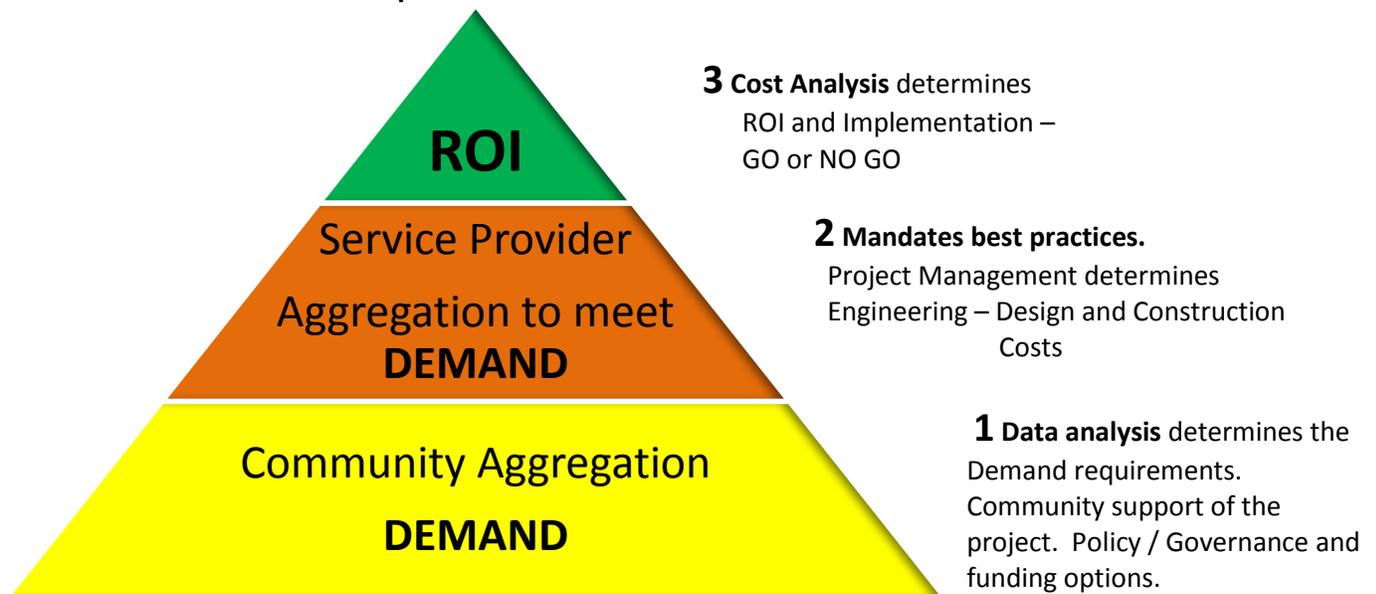
Pinetop-Lakeside - will be creating a plan for effective Public Safety communications.
Chino Valley will be creating a plan for effective Public Safety communications.
Prescott Valley – is a hub for data centers and call centers. Current facilities will be assessed for digital infrastructure improvement requirements.

Prescott – seeks redundancy in the event of outages. New road and power-line construction will be evaluated as a potential for new conduit/fiber middle-mile routes by working with NACOG’s Transportation Committee.

Flagstaff – is the largest community in the region and requires expanded broadband capacity for their current, as well as future, employers. The North Country Medical facilities require more broadband capacity to support additional physicians and patients. The committee and Flagstaff planners will explore with existing and potentially new providers the possibilities for expanding this capacity.

An analysis for potential demand aggregation and incentive values for the private sector, including estimates of broadband investment was conducted. The results indicate the necessity for service aggregation as an incentive for provider investment.

DEMAND AGGREGATION – explain these in more detail....



Community aggregation means the inclusion of stakeholders (business, government, residents) to quantify a greater demand for broadband services. Communities may look for funding streams to offset a portion of the costs to private investors.

Service provider aggregation means sharing capacity between providers and offsetting costs. Design and construction costs can be lowered with funding streams (revolving loans,

Community Reinvestment Act (CRA), USDA Broadband projects and/or making community physical assets and ROW available at or near cost).

A Return on Investment for the provider(s) and community will insure success and sustainability. There are two possible locations for provider aggregation. One location is Flagstaff where redundancy is one of the major requirements.

- Provider aggregation could consist of AT&T and NPG Cable partnering with other local providers along Interstate 40 and demarking in Flagstaff.
- The second location could include a backhaul up Yarnell Hill (from Wickenburg to Prescott) into the backside of Prescott. A combination of community planning and technical assistance working with the providers (COX and Cable One) will assess the costs and ROI along with the provider and the community.

The research approach included a purposeful sampling of broadband capacity in NACOG's four counties, which is representative of 42% of Arizona's square miles, 9% of the total population of the state and about 50% of Arizona's rural population. Arizona is in strong competition with California, Texas, Utah, and Nevada for business. After site selectors find a location and after inquiring about utilities they ask if there is high-capacity service in the area. The stakes are too high to continue "business as usual". Rural Arizona must look forward to providing improved infrastructure to support businesses, provide education and protect its residents and properties with reliable and cost effective systems. Support North Country Medical in obtaining additional digital capacity to support physicians and patients with telemedicine collaborations between Flagstaff, Phoenix, and Tucson specialists. Expand capacity to support the hiring of new physicians and additional patient capacity.

Investments must be made in the NACOG region by the private sector and communities to improve broadband functions and features. Communities should explore various funding opportunities available only to governments and non-profit organizations to augment private sector investment. Internet accessibility is critical for businesses, schools, telemedicine and public safety. Businesses must be able to reduce operating costs by deploying efficient systems through exploiting the power of the internet including shipping/receiving logistics, purchasing power and customer service. Flagstaff, Arizona has become a distribution center with Purina, Walgreens and SCA serving as warehousing tenants. These companies rely upon high capacity broadband to service their customers and efficiently run their businesses. Prescott is the home to Embry Riddle Engineering, the number one rated school for aviation and aerospace college education, and requires broadband capacity for their students engineering education.

Without connectivity to Yavapai Community College and NAU's Distance Learning programs the employees in these communities will not have the opportunity to advance their skill-sets and education while continuing to reside in the region. The Verde Valley region (Cottonwood, Sedona, Clarkdale and Jerome) are dependent on tourism and as of late, the viticulture

business. Without the Internet, these communities would not be able to brand and market their assets to the rest of the world. Pinetop-Lakeside in the White Mountain region of northeastern Arizona is home to skiing, fishing and hunting. Like the Verde Valley region, they are very dependent on the Internet to brand and market their region to year-round tourists.

Rural Arizona needs to vigorously prepare for increasing broadband infrastructure, whether it includes the middle-mile and/or local distribution in regions/communities.

Arizona's Councils of Governments Map



Figure 2. There are four rural Council of Governments (COGs) in Arizona, (NACOG, CAG, WACOG and SEAGO).

Arizona is 113,000 square miles of geographical contrasts. The Northern Arizona Council of Governments (NACOG) region consists of four counties, Apache, Coconino, Navajo and Yavapai; and covers 47,901 square miles, or 42% of the state. The estimated total population in 2012 for the NACOG region is 476,197.

The other three rural COGs are Central Association of Governments (CAG) covering Pinal and Gila counties, Western Arizona Council of Governments (WACOG) covering Yuma La Paz and Mohave counties, and the Southeastern Arizona Council of Governments (SEAGO) covering Santa Cruz, Cochise, Graham and Greenlee counties. The two primarily urban COGs are the Maricopa Association of Governments (MAG) and the Pima Association of Governments (PAG). Neither of these two COGs is rural.

Appendix A

1. Preparation of the Business Case Analysis

I. Work with the three identified regions to assess inventory of broadband services and infrastructure currently available.

The first step was to engage NACOG's Executive Team. This was accomplished by meeting with the NACOG team and obtaining their endorsement. The next step involved presentations to the NACOG Economic Development Council and getting their buy-in. Once there was commitment the inventory of available broadband providers and services and infrastructure was documented.

- Broadband Services and speeds per each of the four Counties identified.
- Broadband Providers and Services per designated community (identified within the three regions) were identified.
- Periodic updates provided to NACOG.
- Broadband maps and NACOG's Transportation Department identified routes and locations where infrastructure assets are currently available and where there are opportunities to increase digital capacity.

II. The inventory of broadband services and infrastructure has been obtained through a variety of resources including data sets linked to the Digital Arizona Broadband Community Planning Map, www.digitalarizona.gov. A total of twenty communities within the four counties were analyzed, including available broadband providers and their reported service speeds based on data from the map. The inventory of such data resources included:

- Extraction of Broadband Providers and Services from the Arizona Broadband Community Planning Map. There are at least 17 service providers in the NACOG region.
- Demographic data is extracted from city-data.com, census data, Department of Economic Security (DES), ReferenceUSA, Arizona Department of Transportation and the Arizona Commerce Authority. References can be seen on page 27.

III. A Systems Requirement document has been prepared. The foundation of the document uses the above inventory of current broadband services to identify digital limitations. It presents what is required by the stakeholders and regional/community leaders to enhance and upgrade competitive infrastructure to support Economic Development/Jobs, Education, Telemedicine and Public Safety. The general Systems Requirement document can be viewed on page 24. Key ingredients for the Systems Requirement document include:

- Project Description with Goals and Objectives

- User Requirements: Response to the four major applications and how additional broadband capacity can better serve the region/communities.
- Environmental Requirements, including Right-of-Way and clearances.
- Constraints include commitment and aggregation of community leaders and providers, infrastructure costs, and Return-On-Investment.
- Functional Requirements include an action plan to:
 - Separate the “Must Have” from the “Like to Have” projects
 - Support the four applications with 10Mbps Download and 5Mbps Upload speeds.
- Identify major milestones and Expected Achievements.

IV. Analysis of potential demand aggregation and its incentive values for private sector broadband investment in each region is identified in the speed and provider tables located in Appendix H, pages 30 – 34. The analysis also includes:

- Identification of Service Providers and Services by regions and communities. Currently, there are 17 providers covering the four counties and communities identified in NACOG’s three regions.
- Provider and community aggregation has begun in the Town of Clarkdale with cell tower planning/zoning and permitting processes with AT&T and the community.

V. A survey to gather data to be utilized in generating a report on current adoption of broadband services by educational and healthcare entities, businesses and private citizens includes expectations and desired levels of broadband capacity and services. Conducted surveys with the NACOG Sub-Committee and community representatives identified:

- The ranking of the applications and desired levels of broadband capacity and services include:

Region 1

Prescott requires digital broadband redundancy

Prescott Valley requires more broadband to attract call centers and data centers.

Chino Valley requests better Public Safety spectrum and capacity.

Region 2

Cottonwood seeks broadband capacity to support their local retail business, that currently runs a 98% retail occupancy rate in Old Town and where the merchants are highly dependent on internet coverage to support their sales.

Clarkdale is looking for additional broadband capacity, by utilizing cell towers and current facilities, with minimal intrusive impact to residents.

Region 3

Pinetop-Lakeside requires better Public Safety spectrum and capacity. Local tests reveal broadband speeds are seriously below standards. Where 1Mbps download and .6Mbps represent the recently conducted speed tests.

Flagstaff, the largest community in the NACOG region will require redundant reliability as the businesses and population continues to grow in and around the city. Currently, there is demand for more capacity to support telemedicine and upcoming Business Assistance Centers.

Pending the review of technical assistance gap analyses there may be opportunities for grants with USDA RUS annual telemedicine and distance learning grant (DLT), ROW Clearance analysis for a rural town that could serve as a template for other jurisdictions, and technical analysis for broadband development projects in specific areas.

2. Grant opportunity Identification

The Arizona Broadband Community Planning Map, the Community Data Sets and the benchmark speed tests become the ingredients for potential broadband demand aggregation. A survey distributed to the NACOG Sub-Committee also serves as Key Performance Indicators. Broadband infrastructure deployment will be based upon demand and sometimes urgencies. A generous list of grants that have potential broadband leverage can be found in Appendix I, pages 35 – 38.

3. Broadband Committees

The NACOG Broadband Subcommittee was organized during November and December of 2012. The committee has held two official meetings, one in person and one by conference call. There have also been a number of email communications. This subcommittee is organized under the Economic Development Committee of NACOG.

Interviews have been conducted with key stakeholders. Flaws and limitations have been recognized relative to the current broadband availability. Key areas of concern have been identified from the stakeholders. Objectives have been determined and listed below that respond to this survey and feedback regarding the need for improved broadband in the three regions of NACOG. Key stakeholders and their motivation for better broadband are listed below:

- Terri Drew – NACOG Program Director and member of the Digital Arizona Council who is concerned foremost with the lack of broadband redundancy in the NACOG region.

- Gary Marks – Economic Development Director for Prescott Valley was concerned with the need for broadband infrastructure for business attraction including call centers and data centers.
- Linda Hatch – Councilwoman for the Town of Chino Valley – concerned with need for broadband for public safety.
- Jodie Filardo – Economic Development Director for Clarkdale - wants better cell tower for wider coverage for businesses and residents in the area. Desires advice regarding cell tower best practices for tower location approval processes.
- Casey Rooney – Economic Development Director for the Town of Cottonwood – his concern is broadband supporting businesses and viticulture in his region which includes the Verde Valley area.
- Rod Stevens – IT Manager and Director for the town of Pinetop-Lakeside. His concern is broadband for public safety.
- Greg Hale – Telehealth Program Manager for North Country Healthcare. Needs more bandwidth for additional patients and physicians using his network.
- Carl Taylor – former Supervisor Coconino County. Has consistently supported more broadband capacity and redundancy for Coconino County.

The input received from the above stakeholders provided the key objectives for each of the three regions.

Key Objectives: The Sub-Committee will indicate the priority levels of the four applications. They will provide direct interface with anchor institutions and operators. They will contribute to providing financing partnerships among the service providers and the communities, relative to broadband infrastructure.

4. Broadband focused Webpage(s)

Publications of pages occurred during the initial planning stages. Periodic updates have been provided and NACOG has included in their website. These pages include community involvement and items of interest (SB1402 and SB1353), relating to the Digital Arizona Program and activities the Sub-Committee are conducting. These updates can be seen in Appendix K, pages 40 – 42.

Appendix B

Survey Results from the NACOG Sub-Committee

Applications (Priority) as defined by NACOG's Sub-Committee

1. Economic Development
2. Education
3. Telemedicine
4. Public Safety

Survey results as of 2/8/2013

A woman with blonde hair holding a cardboard sign that says "FIRED HIRED!".	A hand holding a glowing blue sphere with a graduation cap on top. The word "EDUCATION" is written in white at the bottom.	A diagram titled "TELEMEDICINE CONCEPT" showing a network of connections between a "District Hospital", a "Specialty Hospital", and a "Patient". It also includes icons for "Video Conferencing", "Remote Monitoring", and "Remote Diagnostics".	Four figurines representing different public safety roles: a firefighter in yellow gear, a police officer in a blue uniform, a sheriff in a dark uniform with a hat, and a cowboy in a red shirt and blue jeans.
Jobs Business	Education Schools	Tele-Med Health Facilities	Public Safety Fire, Police, Hwy, Sherriff

Appendix C

Systems Requirements

1. Project Description - Provide Better Internet Service to rural Arizona citizens, businesses and government.

2. User Requirements - Ranking of the four major applications identifies community/regional requirements. Speed tests conducted on the four counties including the zip codes for the three regions indicate that the counties/regions data speeds are below the FCC benchmarks. User requirements indicate a demand for more broadband capacity.

3. Developmental Requirements:

- Property ownership and clearances where required
- Right-of-Way clearances
- Environmental & Cultural clearances
- Property Ownership
- Community-wide Demand Aggregation
- Service Provider infrastructure sharing (aggregation)
- Interfaces with current infrastructure
- Safety requirements
- Redundancy requirements

4. Constraints:

- Stakeholder commitment
- Service Provider commitment
- Processing capabilities compared to projected costs
- Return-On-Investment
- Infrastructure
- Hardware and Software integration
- Project Budget
- Terrain

5. Functional Requirements:

- Action Plan with Task Assignments and Schedule
- The anticipated speeds to support the four applications consist of:
 - 10Mbps Download Speed : 5Mbps Upload Speed
 - As can be seen on page 6, California Speed Tests
- Resources: communities, service providers, technical assistance
- Determine: the “Must Have” vs “Like to Have” program(s)

6. Major Milestones and Expected Achievements:

- Leadership and Planning is essential for the success of the project.
- Funding: grants, foundation, Community Reinvestment Act (banks).

Appendix D

Digital Arizona Broadband Map

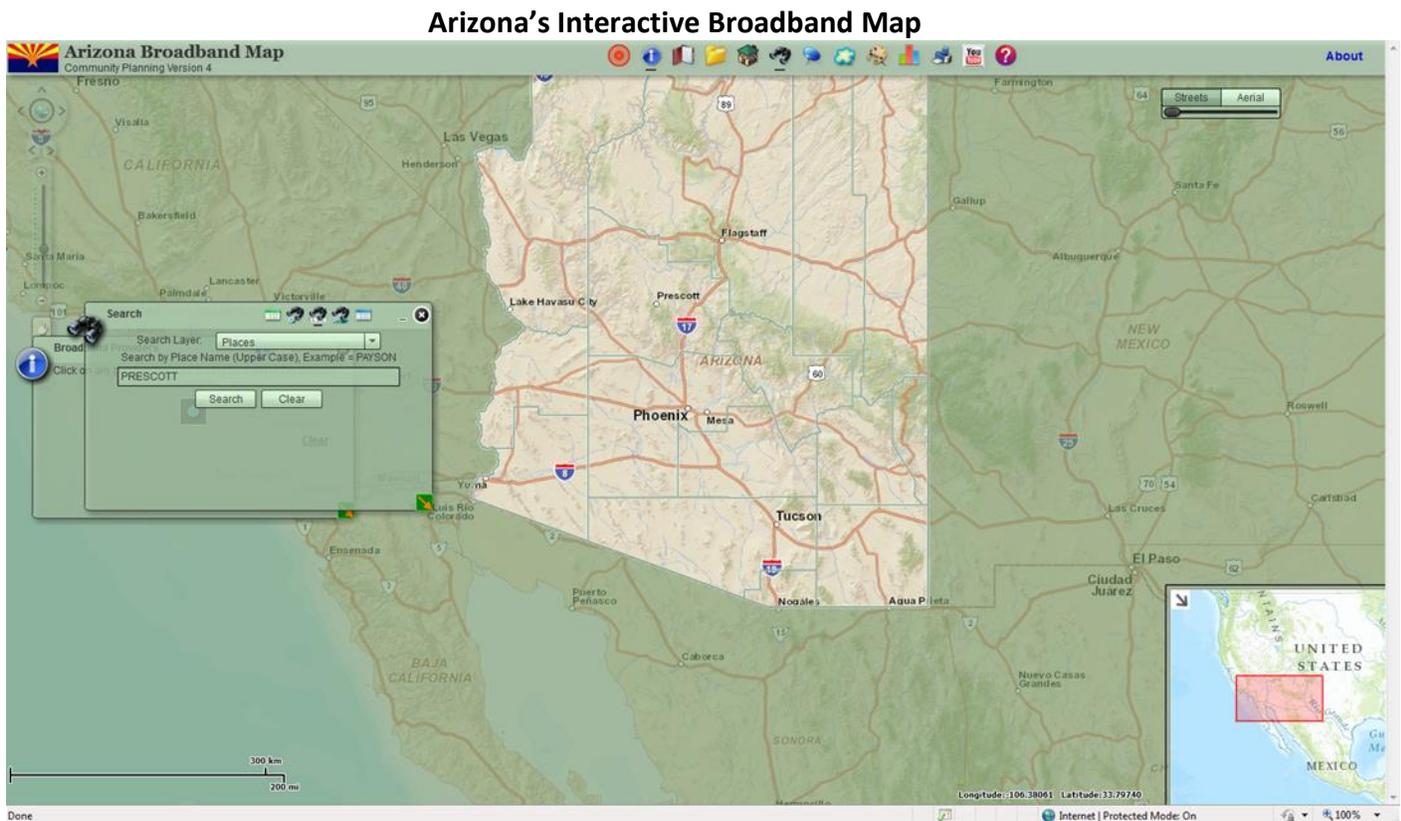
The link <http://broadbandmap.az.gov/CommunityPlanningMap/> contains the state broadband map funded by a federal grant along with the associated data sets.

This broadband map is updated twice a year over the five year period of the federal grant funding which ends in December of 2014.

Overlays of economic, employers, jobs, population and other demographics have been added to enhance the use of the map as a tool for broadband planning and technical analysis. Arizona's map has received attention on the national scene for these innovations.

This broadband map is interactive and available to any individual or organization free of charge through the web link above.

The following pages illustrate the Arizona Broadband Map, followed by the integration of the Community Data Sets.



Arizona Broadband Map Community Planning Functions and Features

- Multiple search capabilities
 - County, Community, Provider and Services, Routes, Schools, Libraries, Congressional Districts, Land Ownership (State, Federal, Tribal), etc.
- Display of Community Anchor Institutions (CAIs)
- Interstate highways
- Providers and Providers' Services
- Counties, Communities
- Links to Socio-Eco data
- Links to Community Data Sets

Appendix E

Screenshot example of Community Data Sets profile information:

Prescott, Arizona




Prescott, Arizona

Population in 2010: 39,843. Population change since 2000: +17.4%

Males: 19,583	(49.2%)
Females: 20,260	(50.8%)

Median resident age: 54.1 years
Arizona median age: 37.1 years

Zip codes: 86301, 86302, 86303, 86304, 86305, 86313.

Prescott Zip Code Map

Estimated median household income in 2009: \$41,010 (it was \$35,446 in 2000)

Prescott:	\$41,010
Arizona:	\$48,745

Estimated per capita income in 2009: \$29,191

Prescott city income, earnings, and wages data

Estimated median house or condo value in 2009: \$285,562 (it was \$148,600 in 2000)

Prescott:	\$285,562
Arizona:	\$187,700

Mean prices in 2009: All housing units: \$347,336; Detached houses: \$395,834; Townhouses or other attached units: \$217,964; In 2-unit structures: \$241,624; Mean travel time to work (commute): 18.4 minutes

Median gross rent in 2009: \$783.

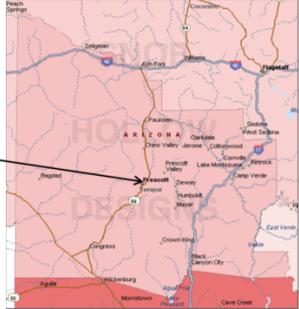
For population 25 years and over in Prescott:

High school or higher:	89.6%
Bachelor's degree or higher:	30.6%
Graduate or professional degree:	12.3%

Planning/Community: 928-777-1317

Police Chief: 928-777-1900
Fire Chief: 928-445-5555
Public Works: 928-777-1607
Library Director: 928-777-1500

[To see more about Prescott, Arizona](#)
[Prescott Utility Companies](#)
[Arizona State Highway Map](#)
[Arizona Rail Roads](#)
[Broadband Data Rate Table](#)
[Broadband Providers in the Region](#)
[Arizona Prospector - Prescott's facilities 10,000s.f. minimal](#)
[Prescott School District](#)
[Prescott Hospitals](#)
[Prescott Clinics](#)



Unemployment in August 2012:

Here:	9.30%
Arizona:	8.50%

For population 25 years and over in Prescott:

High school or higher:	89.6%
Bachelor's degree or higher:	30.6%
Graduate or professional degree:	12.3%

Read more: <http://www.city-data.com/city/Prescott-Arizona.html#ixzz2EwoQYXec>

Other management occupations except farmers and farm managers (7%)
Other sales and related workers including supervisors
Retail sales workers except cashiers
Construction trades workers except carpenters, electricians, painters, plumbers, and construction laborers (4%)

Prescott | Prescott Valley | Chino Valley | Mileage Calculator | Yavapai

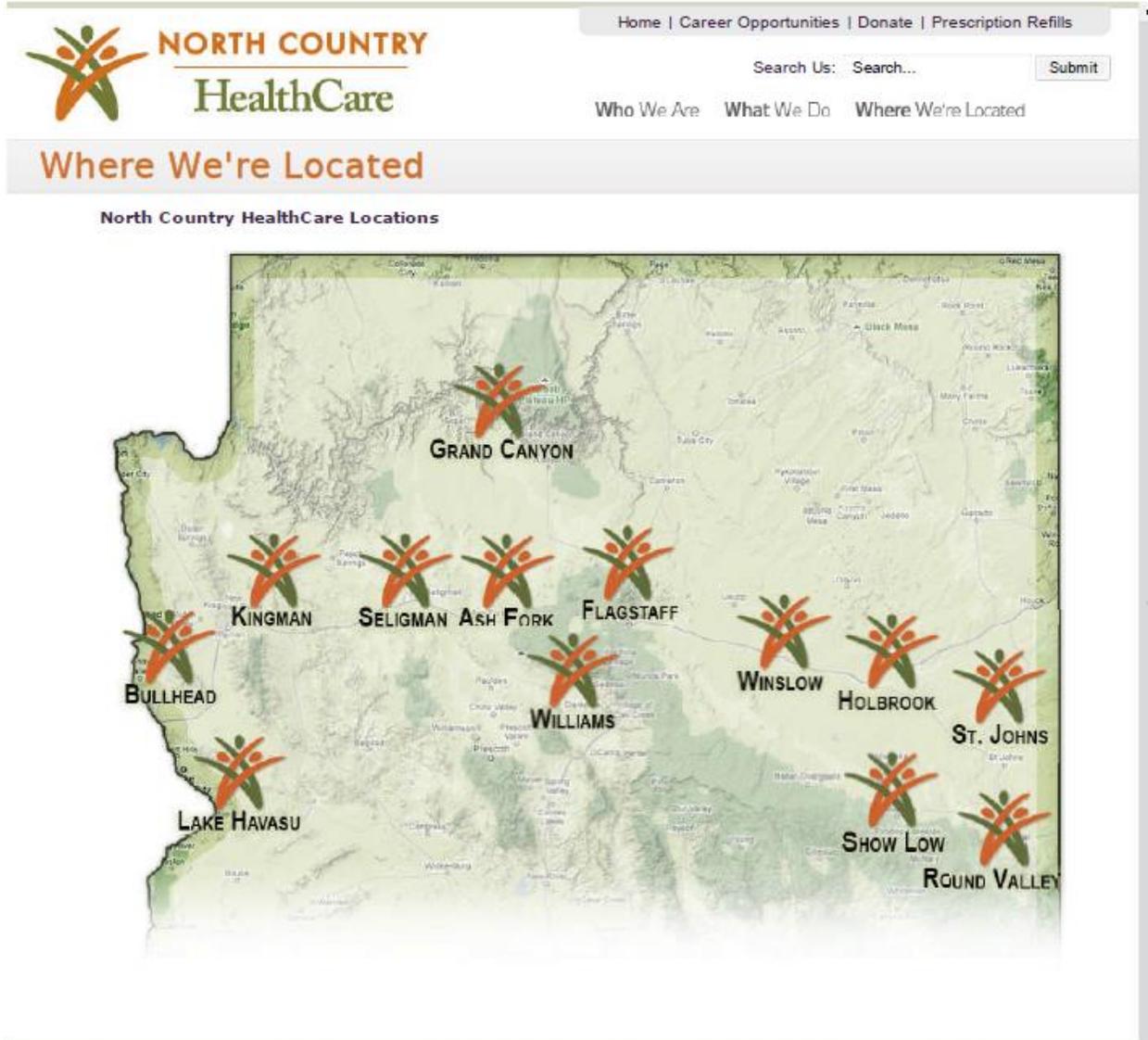
Internet | Protected Mode: On | 100%

The Community Data Sets offer detail information about a community. This data is essential for developing broadband plans and system implementation. Data sets consists of:

- Details about the community include population, gender population, median resident age, Arizona’s median age, zip codes, map with SR Highways, unemployment rate, estimate median household income, median cost of home, population 25 years and over with educational levels, major employers and occupations.
- Additional pages include the County to Arizona statistics, mileage chart for configuring miles between CO’s and Last mile demarks, Arizona Highway Map, Arizona Rail Road Map for potentially running fiber along short line and two Class One rail lines, utility companies for towers and underground power, school districts, and healthcare clinics for locations (addresses, broadband service and contact information).
- Links to local Service Providers including Down Load, Up Load speeds, services and speeds relative to the communities: Employers (jobs), Education (schools), Healthcare (telemedicine) and Police/Sheriff (public safety).
- Specific data comparisons are in the next section on Community Data Sets.

Appendix F

Below is a map of the North Country Health Care locations.



Appendix G

Sources of Reference Material

Sources*:

- U.S. Census Bureau:
www.censusrecords.com
- State and County QuickFacts
<http://quickfacts.census.gov/qfd/states/00000.html>
- Data derived from Population Estimates
<http://quickfacts.census.gov/qfd/states/00000.html>
- American Community Survey
<http://www.census.gov/acs/www/>
- Census of Population and Housing
<http://quickfacts.census.gov/qfd/states/04000.html>
- State and County Housing Unit Estimates
<http://www.census.gov/popest/data/housing/totals/2011/HU-EST2011-3.html>
- County Business Patterns
<http://www.census.gov/wholesale/index.html>
- Non-employer Statistics
<http://www.census.gov/econ/nonemployer/index.html>
- Economic Census
http://www.census.gov/econ/census/new_for_2012.html
- Survey of Business Owners
<http://www.census.gov/econ/sbo/>
- Building Permits
http://www.nacog.org/index.cfm?fuseaction=dep_intro&dept_id=6

Appendix H

Explanation of broadband speed tests:

Upstream speeds of 5 Mbps and Downstream speeds of 10 Mbps as seen in the chart on page 6 will meet the following applications recommended desirable broadband speeds: Medical file sharing (basic), Remote diagnosis (basic), Remote education, Building control and management. These broadband uses impact the four application areas of focus for this report: ***Economic Development, Education, Telemedicine, and Public Safety use.***



Current and Future Broadband Speed Standards:

The minimum current FCC broadband speed standard is 4 megabits per second (Mbps) download, and 1 Mbps upload.

Arizona State School Superintendent John Huppenthal in a March 7, 2012 letter released to the public stated: “The minimum speed that is educationally sufficient to support ADE’s transformational plans is 6 Megabits per second per student. This speed enables uninterrupted video streaming and rapid downloads of education content whether a student is at home or at school.” **It turns out that telemedicine, enhanced public safety and most modern business applications require equivalent levels of performance.**

An FCC National Broadband Plan milestone, by 2015 is, “100 million U.S. homes should have affordable access to actual download speeds of 50 Mbps and actual upload speeds of 20 Mbps.”

The National Broadband Plan further states: “The United States must lead the world in the number of homes and people with access to affordable, world-class broadband connections. As such, 100 million U.S. homes should have affordable access to actual download speeds of at least 100 Mbps and actual upload speeds of at least 50 Mbps by 2020.”

For Community Anchor Institutions the National Broadband Plan states: “Every American community should have affordable access to at least 1 gigabit per second broadband service to anchor institutions such as schools, hospitals and government buildings.”

<http://www.broadband.gov/plan/2-goals-for-a-high-performance-america/>

Using the FCC minimum speed definition for broadband – in many cases, rural Arizona communities cannot meet this minimum definition.

Speed tests by counties/zip codes with Service Providers by speedmatters.org:

Apache County 37 tests, 1.7Mbps Download and .4Mbps Upload speeds

Zip Code	Download Speed (Mbps)	Upload Speed (Mbps)
85925	.8	.1
85936	1.1	.1
86512	4.4	.7
86033	1.4	1.3
86538	1.1	.1
86503	.6	.1
86505	.042	.3
86512	4.9	.7
85966	1.1	.1

Apache County

General - Regional Service Providers				Download	Upload Speed Tier	
Provider	Service Type	Advertised Download Speed	Advertised Upload Speed	Speed	Speed	St. Johns
Frontier Communications of the White Mountains	DSL (Asymmetric)	1.5 - 3 Mbps	768 Kbps - 1.5 Mbps	4	3	X
Frontier Communications of the White Mountains	DSL (Asymmetric)	3 - 6 Mbps	200 - 768 Kbps	5	2	X
Frontier Communications of the White Mountains	DSL (Asymmetric)	3 - 6 Mbps	200 - 768 Kbps	5	2	X
Transworld Network	Fixed Wireless	3 - 6 Mbps	1.5 - 3 Mbps	5	4	X
Verizon Communications	Mobile Wireless	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2	X
StarBand Communications	Satellite	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2	X
HNS (Hughes, Echostar)	Satellite	3 - 6 Mbps	200 - 768 Kbps	5	2	X
ViaSat	Satellite	3 - 6 Mbps	768 Kbps - 1.5 Mbps	5	3	X
Skycasters (VSAT Systems)	Satellite	6 - 10 Mbps	1.5 - 3 Mbps	6	4	X

Navajo County 32 tests, 2.7Mbps Download and .4Mbps Upload speeds

Zip Code	Download Speed (Mbps)	Upload Speed (Mbps)
85901	3.5	.4
85933	1.1	.1
85935	3.4	.4
85937	.6	.3
85941	.8	.1
86033	5.4	1.3
86505	.042	.3
86025	6.3	.7
85929	3.4	.4

Navajo County				Download	Upload Speed Tier		Pinetop
General Service Providers	Service Type	Advertised Download Speed	Advertised Upload Speed	Speed	Speed	Show Low	Lakeside
Frontier Communications of the White Mountains	DSL (Asymmetric)	1.5 - 3 Mbps	768 Kbps - 1.5 Mbps	4	3	X	X
Frontier Communications of the White Mountains	DSL (Asymmetric)	3 - 6 Mbps	200 - 768 Kbps	5	2	X	X
Frontier Communications of the White Mountains	DSL (Asymmetric)	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2	X	X
Frontier Communications of the White Mountains	DSL (Asymmetric)	3 - 6 Mbps	200 - 768 Kbps	5	2	X	X
Cable One	Cable	50 - 100 Mbps	1.5 - 3 Mbps	9	4	X	X
Cable One	Cable	50 - 100 Mbps	1.5 - 3 Mbps	9	4	X	X
Transworld Network	Fixed Wireless	3 - 6 Mbps	1.5 - 3 Mbps	5	4	X	X
Verizon Communications	Mobile Wireless	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2	X	X
StarBand Communications	Satellite	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2	X	X
HNS (Hughes, Echostar)	Satellite	3 - 6 Mbps	200 - 768 Kbps	5	2	X	X
ViaSat	Satellite	3 - 6 Mbps	768 Kbps - 1.5 Mbps	5	3	X	X
Skycasters (VSAT Systems)	Satellite	6 - 10 Mbps	1.5 - 3 Mbps	6	4	X	
Century Link	DSL (Asymmetric)	1.5 - 3 Mbps	768 Kbps - 1.5 Mbps	4	3		
Century Link	DSL (Asymmetric)	3 - 6 Mbps	200 Kbps - 768 Kbps	5	2		
Century Link	DSL (Asymmetric)	3 - 6 Mbps	768 Kbps - 1.5 Mbps	5	3		
Century Link	DSL (Asymmetric)	6 - 10 Mbps	768 Kbps - 1.5 Mbps	6	3		
Century Link	DSL (Asymmetric)	10 - 25 Mbps	768 Kbps - 1.5 Mbps	7	3		
Sprint Communications	Mobile Wireless	768 Kbps - 1.5 Mbps	200 Kbps - 768 Kbps	3	2		

Speed Tests by County Communities by Zip Code- NACOG Region

Coconino County 181 tests, 2.2Mbps Download and .5Mbps Upload

Zip Code	Download Speed (Mbps)	Upload Speed (MBps)
86001	5.1	.9
86004	1.9	.6
86018	.1	.091
86022	3.4	1.3
86023	.6	.050
86024	.7	.3
86035	4.4	.7
86040	3.2	.7
86045	.8	.1
86046	2.3	.4

Coconino County				Download	Upload Speed Tier
General Service Providers	Service Type	Advertised Download Speed	Advertised Upload Speed	Speed	Speed
Century Link	DSL (Asymmetric)	1.5 - 3 Mbps	768 Kbps - 1.5 Mbps	4	3
Century Link	DSL (Asymmetric)	3 - 6 Mbps	200 - 768 Kbps	5	2
Century Link	DSL (Asymmetric)	3 - 6 Mbps	768 Kbps - 1.5 Mbps	5	3
Century Link	DSL (Asymmetric)	6 - 10 Mbps	768 Kbps - 1.5 Mbps	6	3
Century Link	DSL (Asymmetric)	10 - 25 Mbps	768 Kbps - 1.5 Mbps	7	3
Century Link	DSL (Asymmetric)	25 - 50 Mbps	3 - 6 Mbps	8	5
Century Link	DSL (Asymmetric)	25 - 50 Mbps	10 - 25 Mbps	8	7
Century Link	DSL (Asymmetric)	1.5 - 3 Mbps	768 Kbps - 1.5 Mbps	4	3
Century Link	DSL (Asymmetric)	3 - 6 Mbps	200 - 768 Kbps	5	2
Century Link	DSL (Asymmetric)	3 - 6 Mbps	768 Kbps - 1.5 Mbps	5	3
Century Link	DSL (Asymmetric)	6 - 10 Mbps	768 Kbps - 1.5 Mbps	6	3
Century Link	DSL (Asymmetric)	10 - 25 Mbps	768 Kbps - 1.5 Mbps	7	3
Century Link	DSL (Asymmetric)	25 - 50 Mbps	3 - 6 Mbps	8	5
Century Link	DSL (Asymmetric)	25 - 50 Mbps	10 - 25 Mbps	8	7
XO Communications	T1/Tn	1.5 - 3 Mbps	1.5 - 3 Mbps	4	4
NPG Cable (Suddenlink)	Cable	10 - 25 Mbps	1.5 - 3 Mbps	7	4
NPG Cable (Suddenlink)	Cable	10 - 25 Mbps	1.5 - 3 Mbps	7	4
CommSpeed	Fixed Wireless	768 Kbps - 1.5 Mbps	768 Kbps - 1.5 Mbps	3	3
Sprint Communications	Mobile Wireless	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2
Verizon Communications	Mobile Wireless	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2
T-Mobile (Deutsche Telecom)	Mobile Wireless	1.5 - 3 Mbps	200 - 768 Kbps	4	2
AT&T Mobility	Mobile Wireless	3 - 6 Mbps	3 - 6 Mbps	5	5
T-Mobile (Deutsche Telecom)	Mobile Wireless	10 - 25 Mbps	1.5 - 3 Mbps	7	4
StarBand Communications	Satellite	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2
HNS (Hughes, Echostar)	Satellite	3 - 6 Mbps	200 - 768 Kbps	5	2
ViaSat	Satellite	3 - 6 Mbps	768 Kbps - 1.5 Mbps	5	3
Skycasters (VSAT Systems)	Satellite	6 - 10 Mbps	1.5 - 3 Mbps	6	4

Speed Tests by County Communities by Zip Code- NACOG Region

Yavapai County 163 tests, 2.5Mbps Download and .6Mbps Upload

Zip Code	Download Speed (Mbps)	Upload Speed (Mbps)
86301	5.3	1.3
96303	4.8	.6
86321	.2	.095
86322	1.9	.4
86327	.2	.2
86332	.6	.4
86333	1.0	.3
86334	1.2	.7
86335	8.3	1.8
86336	2.0	.6
86338	.1	.024
86351	4.2	.5
86390	.8	.7
86325	4.2	.5

Yavapai County				Download	Upload Speed Tier		Prescott	Chino
Provider	Service Type	Advertised Download Speed	Advertised Upload Speed	Speed	Speed	Prescott	Valley	Valley
Century Link	DSL (Asymmetric)	1.5 - 3 Mbps	768 Kbps - 1.5 Mbps	4	3	X	X	X
Century Link	DSL (Asymmetric)	3 - 6 Mbps	200 - 768 Kbps	5	2	X	X	X
Century Link	DSL (Asymmetric)	3 - 6 Mbps	768 Kbps - 1.5 Mbps	5	3	X	X	X
Century Link	DSL (Asymmetric)	6 - 10 Mbps	768 Kbps - 1.5 Mbps	6	3	X	X	X
Century Link	DSL (Asymmetric)	10 - 25 Mbps	768 Kbps - 1.5 Mbps	7	3	X	X	X
Century Link	DSL (Asymmetric)	25 - 50 Mbps	3 - 6 Mbps	8	5	X	X	
Century Link	DSL (Asymmetric)	25 - 50 Mbps	10 - 25 Mbps	8	7	X	X	
Century Link	DSL (Asymmetric)	1.5 - 3 Mbps	768 Kbps - 1.5 Mbps	4	3	X	X	X
Century Link	DSL (Asymmetric)	3 - 6 Mbps	768 Kbps - 1.5 Mbps	5	3	X	X	
Century Link	DSL (Asymmetric)	6 - 10 Mbps	768 Kbps - 1.5 Mbps	6	3			X
Century Link	DSL (Asymmetric)	10 - 25 Mbps	768 Kbps - 1.5 Mbps	7	3	X	X	
Century Link	DSL (Asymmetric)	25 - 50 Mbps	10 - 25 Mbps	8	7			
Cable One	Cable	50 - 100 Mbps	1.5 - 3 Mbps	9	4	X	X	X
NPG Cable (Suddenlink)	Cable	10 - 25 Mbps	1.5 - 3 Mbps	7	4	X	X	
Cable One	Cable	50 - 100 Mbps	1.5 - 3 Mbps	9	4	X	X	X
NPG Cable (Suddenlink)	Cable	10 - 25 Mbps	1.5 - 3 Mbps	7	4		X	
Swift Wireless Internet	Fixed Wireless	768 Kbps - 1.5 Mbps	768 Kbps - 1.5 Mbps	3	3	X	X	X
Bolt Internet	Fixed Wireless	3 - 6 Mbps	768 Kbps - 1.5 Mbps	5	3	X	X	X
eSedona	Fixed Wireless	6 - 10 Mbps	1.5 - 3 Mbps	6	4			
AireBeam	Fixed Wireless	10 - 25 Mbps	768 Kbps - 1.5 Mbps	7	3			
CommSpeed	Fixed Wireless	768 Kbps - 1.5 Mbps	768 Kbps - 1.5 Mbps	3	3	X	X	X
Sprint Communications	Mobile Wireless	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2	X	X	X
Verizon Communications	Mobile Wireless	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2	X	X	X
AT&T Mobility	Mobile Wireless	3 - 6 Mbps	3 - 6 Mbps	5	5	X	X	X
StarBand Communications	Satellite	768 Kbps - 1.5 Mbps	200 - 768 Kbps	3	2	X	X	X
HNS (Hughes, Echostar)	Satellite	3 - 6 Mbps	200 - 768 Kbps	5	2	X	X	X
ViaSat	Satellite	3 - 6 Mbps	768 Kbps - 1.5 Mbps	5	3	X	X	
Skycasters (VSAT Systems)	Satellite	6 - 10 Mbps	1.5 - 3 Mbps	6	4			
ViaSat	Satellite	10 - 25 Mbps	3 - 6 Mbps	7	5			X

Appendix I

Grant opportunity Identification

The Arizona Broadband Community Planning Map, the Community Data Sets and the benchmark speed tests become the ingredients for potential broadband demand aggregation. A survey distributed to the NACOG Sub-Committee also serves as Key Performance Indicators. Broadband infrastructure deployment will be based upon demand and sometimes urgencies.

The AZ Broadband Community Planning Map identifies the service providers and their capacities, while the Community Data Sets serve as indicators to the:

- Economic Development (Jobs) – Employers, occupations
- Education - School Districts
- Telemedicine - Health Care Facilities
- Public Safety – police, sheriff, Fire, EMT, Forest departments

Collaboration with funding agencies is essential in developing potential incentive programs. The Arizona Commerce Authority (ACA) has grants and funds to:

Economic Development (Jobs). Public/Private Partnership eligibility.

- Arizona STEP Grant – Cash assistance to help develop international exports. <http://www.azcommerce.com/az-step-grant/>
- Job Training Program – 75% eligible training expenses for net new employees, 50% for incumbent job training. <http://www.azcommerce.com/job-training/>
- Quality Jobs Program – tax credit up to \$ 9,000 per new qualified employee over 3 year period. <http://www.azcommerce.com/quality-jobs/>
- Research & Development – tax credit up to 24% new R&D, \$ 600,000 plus 15% of expenses in excess of \$ 2.5M, 34% of expenses if in conjunction with AZ public university and 75% of excess tax credit can be refunded to small businesses. <http://www.azcommerce.com/research-development/>
- Small Business Capital Investment Tax Credit (Angel Investment) – tax credit up to 35% of investment over 3 years. Elimination of capital gains tax on income from investment in certified companies. <http://es.azcommerce.com/angelinvestment.aspx>

State & Federal incentives for Education, enhancements.

- Arizona Tax Incentive program - This tax incentive provides a State of Arizona income tax deduction for contributions made to any state's 529 plan. The incentive adds to the

ongoing tax benefits of a 529 plan where assets grow tax-deferred and withdrawals are tax-free when funds are used for qualified higher education expenses.

- Married couples can subtract up to **\$1500** when filing jointly
 - Single individuals or heads of household may subtract up to **\$750**
 - Families should consider their own state's 529 plan before investing in another state's plan. By considering in-state incentives, families may find that they more closely meet college saving goals. Families are urged to consult their tax advisor when making a college savings decision. Contact the Arizona Department of Revenue Taxpayer Information and Assistance Section at (602) 255-3381 with questions.
-

Additional Opportunity:

- The Partnership for Assessment of Readiness for College and Careers (PARCC) is a consortium of states working together to develop a common set of K-12 assessments in English and math anchored in what it takes to be ready for college.

PARCC Technology Guidelines

[Version 2.0/December 21, 2012](#)

The document provides minimum and recommended specifications for computer hardware, input devices, and security requirements; and suggests recommended levels of bandwidth that will support schools instructional and assessment needs. It does not yet set minimum bandwidth specifications. Schools, districts, and states can use these guidelines to determine the eligibility of existing computers as test-taking devices for the 2014-15 PARCC assessments.

The information in this document is intended to answer questions about whether computer inventories and new instructional hardware schools may purchase as they implement the Common Core States Standards, will also meet PARCC's 2014-15 requirements for the online test. Smaller tablets (screen size less than 9.5"), e-readers, and smart phones will not be supported and will not be compatible with PARCC assessments for 2014-2015.

BANDWIDTH RECOMMENDATIONS

Minimum bandwidth requirements will be determined based on the final selection of the PARCC assessment delivery platform and the level of multimedia and technology enhanced items in the final assessment design. PARCC will provide minimum specifications by October 2013.

Arizona Ready-for-Rigor Project (TIF- Grant)

The Arizona Ready-for-Rigor Project is a \$43.8 million Teacher Incentive Fund (TIF) grant from the U. S. Department of Education awarded to ASU and its partners for 2010-2015.

This project aims to develop, implement and assess a performance-based compensation system in historically struggling schools for the purpose of increasing student achievement, retaining highly effective educators, and fostering exemplary school culture in the highest-need communities across Arizona. The Arizona Ready-for-Rigor Project is led by Arizona State University's Mary Lou Fulton Teachers College, School Partnership Grant Programs and its Executive Director, [Dr. Virginia McElyea](#).

To view an audio presentation about this project, please click [here](#).

- Arizona Department of Education (ADE) <http://www.azed.gov/>
- National Institute for Excellence in Teaching (NIET) <http://niet.org/>

Telemedicine incentive programs - ACA and USDA are resources for Telemedicine

- ACA's Angel Investment: <http://www.azcommerce.com/angel-investment/>
- ACA's R&D program: <http://www.azcommerce.com/research-development/>
- USDA's Telemedicine and Distance Learning grant – administered in D.C.
- USDA' Rural Utility Service grant: http://www.rurdev.usda.gov/Utilities_Assistance.html
- USDA's Rural Business Opportunity Grant (RBOG):
http://www.rurdev.usda.gov/BCP_RBOG.html
- USDA's Rural Business Enterprise Grant (RBE):
http://www.usda.gov/wps/portal/usda/usdahome?contentid=kyf_grants_rd6_content.html
- USDA's Rural Economic Development Grant (REDG) – requires a community- oriented utility coop willing to apply on the project's behalf. Revolving loan that could be used to offset broadband infrastructure costs.
http://www.usda.gov/wps/portal/usda/usdahome?navtype=SU&navid=RURAL_DEVELOPMENT

Public Safety

- Assistance to Firefighters Grants (AFG): <http://www.firegrants.info/>
- Coordinated Tribal Assistance Solicitations (CTAS):
<http://ncfy.acf.hhs.gov/funding/2013-tribal-justice-safety>
- Edward Byrne Memorial Justice Assistance Grant (JAG):
<http://www.grants.gov/search/search.do?mode=VIEW&oppId=98213>
- AZ Department of Homeland Security: <http://www.azdohs.gov/>
- FEMA: <http://m.fema.gov/>

Grant opportunity identification continued...

Program / Description	Web Site Links
1. Twenty-six (26) grant making agencies	www.grants.gov
2. 2,000 government foundations And corporate funders	www.fundsnetsservices.com
3. Overview of federal & foundation grant makers	www.ecivis.com (annual cost)
4. Private grant makers	www.grantstation.com (annual cost)
5. U.S. foundations and corporate donors – 35,000 foundations, corporate donors, matching gift programs, in-kind donation and government grant makers.	www.foundationcenter.org and www.bigdatabase.com
6. Arizona grant seekers – online searchable data- Base.	www.azgrants.com (annual cost)
7. Center for Rural Affairs – entrepreneurs, energy Efficiency, hiking trails, broadband, etc. Contact:	www.cfra.org/node/1880 briand@cfra.org
8. SBA programs	www.sba.gov
9. Small Business Innovation Research (SBIR)	www.azcommerce.com
10. Economic Development Administration (EDA)	www.eda.gov
11. New Market Tax Credits	http://cdfifund.gov/programs
12. Advanced Technology Program (ATP)	www.atp.nist.gov
13. Dual Use Science & Technology Program	www.acq.osd.mil/ott/dust
14. Department of Energy	www.eere.energy.gov
15. National Science Foundation (NSF)	www.nsf.gov
16. Arizona’s Angel Investment Tax Credit	www.azcommerce.com
17. Arizona’s Research & Development Income Tax Credit.	www.azdor.gov
18. Arizona’s FAST grant	www.azcommerce.com
19. Rural Business Enterprise Grants	www.rurdev.usda.gov
20. Community Development Block Grants (CDBG)	http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs

Appendix J

Broadband Committees

The NACOG Broadband Subcommittee was organized during November and December of 2012. The committee has held two official meetings, one in person and one by conference call. There have also been a number of email communications. This subcommittee is organized under the Economic Development Committee of NACOG.

The Goals of the NACOG Broadband Subcommittee and members include:

Goals: The Sub-Committee will indicate the priority levels of the four applications. They will provide direct interface with anchor institutions and operators. They will contribute to providing financing partnerships relative to broadband infrastructure.

Individuals and their Titles/Positions that are members of the NACOG Sub-Committee:

- Rod Stevens – Chairperson. IT Manager/Director for the Town of Pinetop/Lakeside
- Mike Ward - Sedona City Council Member
- Kris Estes - IT Director for Coconino County
- Tom Hansen - private sector rep. for Utility Solar Engineering, St. Johns Apache County
- Mike Makowski - private sector representative for Innovative Consulting Systems, Page, Arizona
- John Smith - IT Manager/Director for City of Sedona
- Jodie Filardo - Economic Development Director for Clarkdale
- Linda Hatch - Town of Chino Valley Councilwoman
- Casey Rooney - Economic Development Director for Cottonwood
- Sean Clendaniel - Telehealth Program Manager for North Country Health Care, Flagstaff
- Greg Hales - Telehealth Program Manager for North Country Health Care, Flagstaff

Administrative participants:

- Teri Drew - NACOG Program Director, Member Digital Arizona Council (DAC), president of the Arizona Association of Economic Development (AAEC)
- Bill Bolin - Vice President of Operations, STS – Digital Broadband Community Planning Consultant

Appendix K

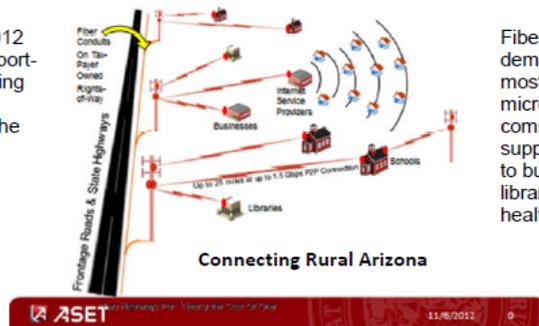
Broadband focused Web pages

NACOG and several of its communities provided links to the below page:

Digital Arizona Program

DIGITAL ARIZONA TACTICAL MODEL

With the passing of SB1402 in 2012 the Arizona Department of Transportation can allow for conduit trenching along state highways/roads. The private service providers will lay the conduit and pull the fiber.



Fiber along state highways/roads will demark at key locations where it is most economical to utilize existing micro-wave and/or other communications infrastructure to supply additional broadband capability to businesses, homes, governments, libraries, public safety, schools and health facilities.

The Rural Arizona Broadband Project has many parts, all integrated to accomplish a better economy with stronger educational purposes. The Digital Arizona Council was formed with private and public officials and representatives to develop top-tier applications that best serve rural Arizona. The applications consist of:

1. Economic Development – Jobs, with base industry retention and new business attraction.
2. Education – K-12, with connectivity to community colleges and universities to provide competitive educational programs to offer the same competitive programs worldwide.
3. Tele-Health – where a rural resident and patient can be treated without having to drive many miles and spend many hours waiting for treatment and diagnosis.
4. Public Safety – where police, fire, EMT, and forestry can all communicate on multiple devices using common frequencies.

Each one of the program applications helps level the playing field for rural regions and communities to become more competitive. Together they offer continuous opportunities to retain populations, businesses and enhance the quality of life.

The Digital Arizona Program (DAP) is currently developing Regional/Community data sets that identify the assets and infrastructures. These data sets will create a Business Case Analysis that will identify locations to where the best return on investment can be obtained.

This is the last update to NACOG's web page.

NORTHERN ARIZONA COUNCIL OF GOVERNMENTS RURAL BROADBAND UPDATE

The Digital Arizona Program (DAP) is funded by the National Telecommunications and Information Administration (NTIA) State Broadband Development Initiative (SBDI), a federal grant to the State of Arizona. DAP is managed by Arizona Strategic Enterprise Technology (ASET) and its planning partner, the Arizona Telecommunications and Information Institute (ATI Institute).

NACOG's broadband focused on three regions.

- Region One: included Prescott, Prescott Valley and Chino Valley.
- Region Two: included Cottonwood, Verde Valley.
- Region Three: included Pinetop-Lakeside.

Community Data Sets were created from November 2012 to January 2013, to show the assets including socio-eco data, broadband providers, utilities, school districts health-care facilities, State Highways, Rail Roads, employers and major occupations. This data was integrated with the Arizona Broadband Community Planning Map, located at:

<http://broadbandmap.az.gov/CommunityPlanningMap/>.

NACOG's Economic Development Council created a Digital broadband Sub-Committee.

Digital broadband Sub-Committee members are from the local communities within NACOG's four county region. The members have ranked the importance of applications to enhance the quality of life in rural Arizona. The applications ranking includes: 1) Economic Development- Jobs, 2) Education, 3) Tele-Health and 4) Public Safety.

Community Commitment:

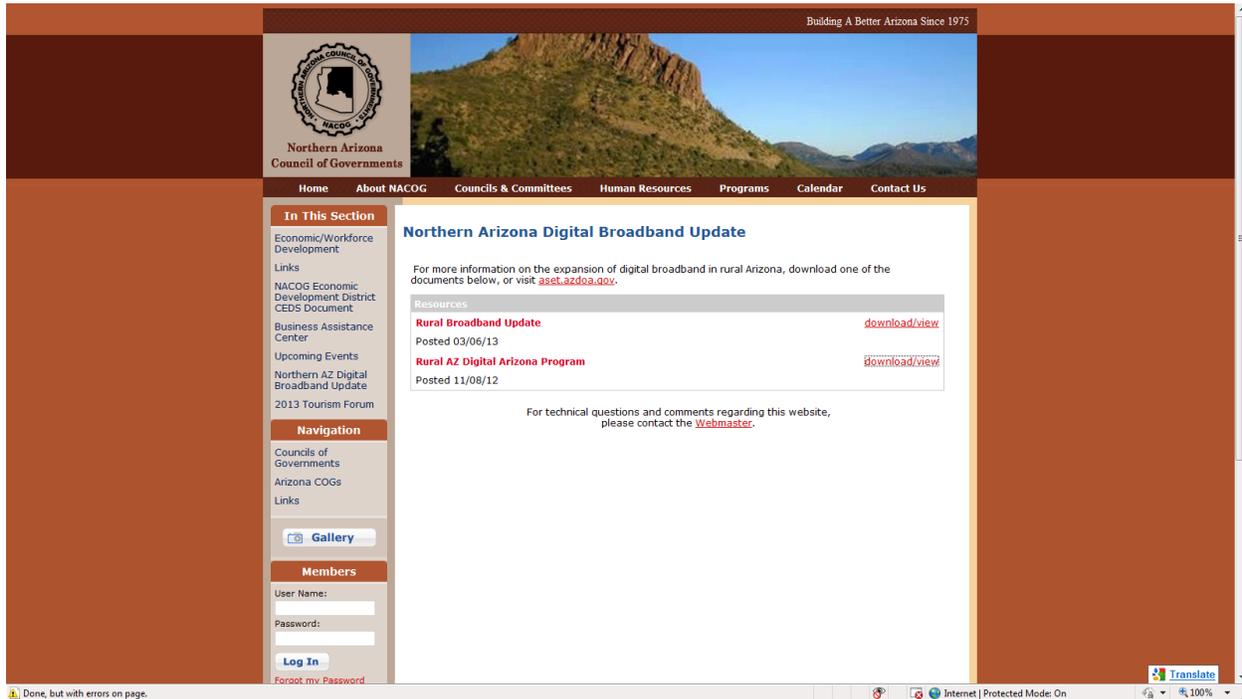
Members of the Digital broadband Sub-Committee are currently obtaining data speeds from providers that service the anchor institutes that host the applications. You are invited to conduct your own speed test from your home and/or work. The Arizona Digital broadband Speed Test site is:

<http://digitalarizona.gov/Survey/inArizonaQuestion.html>.

DOWNLOAD SPEED UPLOAD SPEED

NACOG is concluding the Community Planning Project and moving towards Technical Assistance, where service providers, communities and businesses will work together to formulate plans to increase broadband capacity in NACOG's regions. The Arizona broadband website is: <http://digitalarizona.gov> for additional information!

NACOG webpage update:



How do you get to this page:

1. Type www.nacog.org in the Address line.
2. Point and Click Programs, then point and click Economic Workforce Development.
3. Note in the left hand box titled "In this Section", point and click Northern AZ Digital Broadband Update.
4. Chose either one of the updates to view items of interest and community/sub-committee activities.

Appendix L



State of Arizona
Department of Education
Office of John Huppenthal
Superintendent of Public Instruction

March 7, 2012

Dear Legislator:

I would like to call your attention to two bills now working their way through the legislature, SB 1402: broadband conduit installation; right of way; ADOT and SB1403: digital Arizona infrastructure office. These bills are critically important to our mission in providing access to education technology throughout the state. SB1402 and SB1403 provide a cost effective way of providing this access by allowing Arizona's Department of Transportation to lay the fiber conduit for digital access either concurrently or independently of highway construction projects, thereby saving the state and our rural schools and communities significant funds.

SB1402 and SB1403 will help the Department of Education address two very significant problems. Our rural education communities across the state do not have adequate access to technology infrastructure that will enable quality digital learning. It is particularly critical these communities have this infrastructure because many of these communities have significant challenges in attracting and retaining highly effective teachers. This infrastructure will allow their students to access quality instruction online that would not otherwise be available to them.

As a second benefit, communication throughout the education community is critical as we attempt to cut travel costs associated with professional development and the roll out of programs that will move education forward. As we continue to expand the power of digital learning, without SB1402 and SB1403 many education communities throughout the state will be left behind and be tied to an archaic and ineffective education model that has thwarted the advancement of student achievement. The minimum speed that is educationally sufficient to support ADE's transformational plans is 6 Megabits per second (up and down) per student. This speed enables uninterrupted video streaming and rapid downloads of education content whether a student is at home or at school.

We view SB1402 and SB1403 as critical to our ability to transform education in Arizona. We hope you agree and will support these significant bills.

A handwritten signature in black ink that reads "John Huppenthal".

John Huppenthal
Superintendent of Public Instruction



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