Telecommunications Needs Assessment and Demand Aggregation

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DESIGN NINE
broadband architecture + engineering

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Overview

Introduction

Over the next thirty years, the businesses, residents, and institutions of Madison County will spend $282 million for telecommunications services--in today's dollars, unadjusted for inflation and unadjusted for price increases. Some analysts believe that the average household bill for services delivered via broadband may double in the next ten years, which would make the thirty year projection easily exceed $560 million. Currently, virtually all of these funds leave the county without producing any jobs or business opportunities. Very modest community investments in telecommunications infrastructure have the potential for keeping as much as $25 million in Madison County for business expansion and providing up to an additional $3 million per year to the county general funds.

Based upon a business survey conducted in Madison County between November and March of 2009 100% of the business that responded are using the Internet today. Over 50% of the respondents were only somewhat satisfied or not at all satisfied with their current connection (33% not at all satisfied, 25% somewhat satisfied) and only 8% were very satisfied with their current service. Of all the businesses that responded over 90% believe that the Internet is very important or somewhat important for the success of their business over the next five years (58% somewhat, 33% very).

In a talk at a broadband conference in April (2008), FCC Commissioner Deborah Tate indicated that demand for bandwidth is doubling every two years, and that the FCC expects that the typical bandwidth needed by businesses and residents in 2015 (just seven years) will exceed 50 megabits. Many areas of Madison County have no options for broadband service and many residences are still using dial-up due to the lack of availability. In areas that do have broadband the service connections average about 1.5 megabit. Wireless internet is available in limited areas of Madison County. However, current DSL and Wireless networks will not be able to be upgraded to support the broadband requirement based upon the FCC's definition.

Based on commercially available data sources, only 66% of area residents have Internet access at home, which is 14% lower than the national average. The residential survey indicated a higher percentage of Internet access at home (90%) (the data is likely skewed due to the survey being performed over the Internet) of which 52% of the survey respondents indicated they used dial-up. Of the respondents with dial-up service 62% did not have a higher speed connection due to the lack of availability while 38% lacked higher speed Internet service due to the price.

Madison County community and economic future is dependent upon the availability of affordable high speed broadband services--at the bandwidths that will be needed to conduct business in the future ("big" broadband), not at today's "little" broadband speeds. Businesses large and

small are already heavy users of the Internet, and their bandwidth needs will increase dramatically as two business trends accelerate:

- Business travel costs are increasing rapidly as the cost of fossil fuel increases. Both the cost of ordinary commuting to the workplace is increasing as well as the cost of out of County business travel by air. Businesses are already investing heavily in HD quality business videoconferencing systems, and will make more use of them to reduce travel costs. These HD quality business videoconferencing systems require dramatic increases in bandwidth that are not affordable or in most cases even available in Madison County today.

- More and more workers and business people are working from home, either on a part time or a full time basis. New work from home job opportunities are growing rapidly, but most of those jobs require a wired Internet and a wired phone connection to qualify. Many corporate and business employees will be seeking permission to work more from home (e.g. one or two days per week) to reduce travel costs. Some major businesses in other parts of the U.S. are already actively planning to have 20% of their workforce work full time from home to reduce employee travel costs and office energy costs. Corporate employees working from home require high bandwidth services to be connected to the office network and to use corporate videoconferencing systems. These corporate network services will require 35-50 megabit connections within five years.

Madison County, located with it's proximity to both a major city (DC and Suburban DC) and a major university, is ideally located to take advantage of recently emerging business and residential growth in Virginia, but only if it has the right telecommunications infrastructure to support the needs of existing businesses and to attract new businesses. Today home buyers are evaluating living locations based upon the availability of broadband. Real estate professionals understand this and it is now included in the listing information if DSL or Cable is offered. For years, it has been understood that the value of a business location increases if there is fiber optic cable available but we are now seeing the same for residential properties and even the available current broadband has an impact on property values.

A vision for Madison County telecommunications infrastructure would include the goals below.

Vision for the Project

By 2012, every business in Madison County should have affordable access to a service oriented broadband infrastructure with as much bandwidth as needed to successfully compete with any other business located anywhere in global economy.

By 2012, every residence in Madison County should have affordable access to a service oriented broadband infrastructure with as much bandwidth as they need to manage their personal affairs, obtain access to world class tele-health and tele-medicine services, keep their homes safe, and have the same level and quality of access online goods and services as any other community anywhere in the world.

By 2013, Madison County is attracting new businesses to the region and creating new jobs because a high performance, affordable broadband infrastructure lowers the cost of doing business.

By 2013, Madison County has a workforce that has the skills needed by high tech businesses. Workers are able to study and train from home using the advanced broadband infrastructure to attend classes, and many workers in the region work full time from home, using the regional broadband infrastructure to be connected to their corporate business systems.

By 2011, Madison County has access to a wireless and fiber network that enables effective and efficient delivery government services to citizens and businesses, to support the data and communications needs of first responder, public safety, fire, and rescue needs, and to help communities monitor and manage threats to community safety.

Over the next thirty years, the businesses, residents, and institutions of Madison County will spend, very conservatively, more than $282 million on telecommunications services (voice, video, and data). This estimate (see the section on Economic Impact) is based on current average expenditures, and does not consider what is expected to be rapid growth in new kinds of services (e.g. tele-medicine, tele-health, IP-based security applications, video on demand, online games, and many other emerging business applications and services. If these future services were included as part of the projection, the total spent on telecommunications in Madison County would probably exceed $300 million (over 30 years).

The very conservative estimates of expenditures included in this report indicate that there are substantial funds available for community owned and managed broadband systems in the region: It would take just 7% of those expenditures to make integrated, future-proof fiber and wireless broadband infrastructure available to every home and business in Madison County.

By adopting an open access model focused on passive infrastructure, County investments remain modest and can be managed without overly burdensome maintenance requirements. By using this approach, the service providers interested in offering services to businesses and residents will have a lower cost of doing business in the community. The county government will not and should not sell services. Instead, the county will build a digital road system and make that digital road available to the private sector, just as governments today build roads and let the private sector use those roads to sell goods and services. There will be NO competition between government and the private sector, because local governments will not sell any services to the public.

The current broadband business model is broken

The current business model for selling broadband is an anachronism that evolved in the early nineties with the introduction of dial up Internet access. At that time, there was little more than email and a few text-based Web pages available on the Internet, and selling bandwidth "by the bucket" worked fine. For something like $20/month, subscribers got a "bucket of bandwidth"

that was defined by some upper limit on that bandwidth, like 14,400 bits/second or 56,000 bits/second.

As the Web evolved to include video and audio, and as new services like telephone over the Internet (Voice over IP, or VoIP) became available, more bandwidth was needed to support these uses. Broadband was and still is sold by the "bucket," but the bucket is now larger, with the DSL bucket typically advertised as something like 1/2 megabit/second, and cable modem service typically promoted as 1-3 megabits/second. We are still buying bandwidth by the bucket.

This business model is fundamentally broken. There is no way to fix it. The broadband business model of selling bandwidth by the bucket is the only business in the 400 year history of modern mercantilism where ***a company makes the most money if their customers do not use the service at all***. They make the least amount of money if customers like the service and use a lot of it. This approach is upside down from every other business in the world. It leads to odd behavior by the service providers that causes them to punish or even disconnect customers that use too much of the service.

From an economic development perspective, this is disastrous. Local businesses should not be punished for using too much of an essential business service. An apt analogy would be if the Department of Transportation told a businesses that the tractor trailers they were using were "too big" and henceforth all deliveries had to be made by pick up truck. We know intuitively that this would make the business uncompetitive with businesses in other regions that had roads that supported tractor trailers.

The least desirable course of action is to make direct or indirect investments to support privately owned copper-based or low performance telecom infrastructure. As one example of what not to do, in other states, regional authorities and state governments have made direct cash payments to incumbent telecom providers to extend copper-based and wireless broadband services. This has two negative effects:

1. By doing this, elected officials are picking winners and losers in the marketplace. The private firm that gets the cash payment "wins," and all other companies "lose." It is poor policy for government officials to make such selections, and presumes that a handful of government officials can accurately predict that a single firm is likely to be able to provide all the business and residential telecom needs over a period of several years. The past twenty years of telecom deregulation and divestiture provide numerous examples of how difficult this is to do.

2. Investing in the continued use of copper-based broadband infrastructure or only low performance wireless puts Madison County businesses at a competitive disadvantage in the world economy. Copper infrastructure is slow, and many low cost wireless systems lack appropriate security and bandwidth for business use. Competitors in many other countries already have low cost access to high capacity fiber systems ($40-$50/month for 100 megabit fiber is common).

Investment Characteristics

Just as communities had to take on the task of building and maintaining roads in the early twentieth century, communities must now provide digital road systems as a matter of community and business survival. These digital road systems must be designed with certain characteristics:

Future oriented

Current usage patterns are not a good predictor of future broadband needs. Community-wide networks must be designed to scale gracefully to support future uses over the next thirty years.

Invest in systems that will meet future needs, not current demand.

Fiscally conservative

Vendor and system selection should be deferred until a community or region has conducted a thorough financial engineering exercise that predicts as accurately as possible system design and construction costs, sources and cost of funding, operational expenses, prices of services, and income and cash flow.

Identify a financially sustainable business model and an appropriate legal entity before picking systems or selecting vendors.

Integrated fiber and wireless system

Both fiber and wireless infrastructure are needed to meet all business and residential needs. Wireless alone is an incomplete solution that will leave communities and their businesses at a competitive disadvantage. Wireless can be an appropriate early step as part of a well-designed, comprehensive integrated fiber and wireless system.

Plan for integrated fiber and wireless solutions.

Open access multi-services model

Community digital road systems should be managed in the same way physical road systems are managed. Use highly automated, service-oriented network systems and software so that qualified private sector service provider, including incumbent providers, can use the community system to deliver goods and services to customers. Companies that use the community system will pay a portion of gross revenue to the network owner/operator (the community) in return for access to a high performance system connected to every household and business.

Invest in open services-oriented networks to keep operational costs low and to maximize competition and choice.

Economic development focus

While technology design issues obviously have to be addressed appropriately, it is business needs that have to drive the design of these systems. Both the needs of businesses that will offer services and the businesses that will use those services to sell into the global market place have to be calculated carefully.

Investments should support long term economic development goals and objectives.

Economic Impact Analysis

Broadband is not a silver bullet for communities. Broadband investments need to be tied to a wider set of community and economic development strategies that help make communities engaging and interesting places to locate and run a business, and to make communities a vibrant and safe place to live. Communities that have made broadband investments without taking the time to identify a broader set of goals and expected outcomes have usually been disappointed when broadband investments have not had much impact.

Madison County should embark on a strategy to make regular investments in broadband infrastructure coupled with other key community and economic development projects. 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 homes and businesses over a period of seven to ten years.
- Plan to install duct in road, sidewalk, water, and sewer projects.
- Expand access to Wireless broadband be building and leasing towers to private service providers.
- Make fiber available to buildings on Main Street, especially buildings with office space, which could draw more small businesses and entrepreneurs.
- Fiber in residential areas will enhance property values and should make Madison County more attractive as a bedroom community.

Telecom Expenditures and Economic Impact

The financial analyses on the next two pages consider and compare the 30 year expenditures for routine and normal telecom services for businesses, residents, schools, and institutions for the County. Over the next three decades, more than $282 million dollars will be spent on telecom services. This is a very conservative estimate that does not take into account the ever expanding demand for new kinds of services. The model looks only at current demand. A community investment in a community-owned and managed digital road system, where all services are provided by the private sector, would have substantial benefits.

If Madison County makes modest investments in passive telecom infrastructure only, we would expect that prices for telecom services would decline by 10% or more. The thirty year savings represents more than $25 million that can be used for other purposes, including business expansion, consumer goods and services, and lower tax rates, among other opportunities. However, the revenue from leasing of passive infrastructure is limited compared to what is possible with the active system approach.

While the investment for a fully operational (active) system is higher, projected savings to the community is also higher (about $42 million) and the potential revenue is higher (as much as $13 million per year to the county after capital costs, operating costs, and interest on debt).

If the county government takes a lead role in the development of telecom infrastructure, it will accelerate the availability of broadband options within the community, especially in the business and retail sector. It is important to note that the County 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 compete with each other. Service providers using the network would pay a small portion of revenue to the County for the use of the passive infrastructure.

Madison County 30 Year Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Internet
Total households	5,453		
Total businesses	317		
Percentage of households	40%	40%	20%
Number of households	2,181	2,181	1,091
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	$90,301,680	$117,784,800	$37,298,520
Total residential expenditures	$245,385,000		
Total telecom expenditures [1]	**$282,192,750**		

Open, Multi-Service (active) Network Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$282,192,750
Savings on telecom fees from using a multi-service open network (conservatively 15%) that goes back into the local economy immediately	$42,328,913
What the community will spend on telecom with an open services network	$194,289,708
Average 25% revenue share paid by service providers to the network	$48,572,427
Build cost [2]: 100% of homes, businesses, institutions requesting service	$15,579,000
Cost of financing (50% of build cost at 5% for 12 years)	$6,051,397
Total cost to build integrated fiber/wireless system to all premises	$21,630,397
Thirty year revenue after initial system is paid for	$26,942,030
Net 30 year revenue[3] after expenses, maintenance, repairs (about 50% of gross revenue)	$13,471,015
Total monies available[4] for economic development, business expansion	**$55,799,928**

[1] Business, schools, institutions, and government costs estimated conservatively at 15% of residential expenditures
[2] Conservatively estimated at an average cost of $2,500 per premise connected.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue

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30 year telecom expenditure	$90,301,680	$117,784,800	$37,298,520
Total residential expenditures	$245,385,000		
Total telecom expenditures [1]	**$282,192,750**		

Passive Network Infrastructure Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$282,192,750
Savings on telecom fees from using community infrastructure (conservatively 10%) that goes back into the local economy immediately	$25,397,348
What the community will spend on telecom with using the community infrastructure	$194,289,708
Average 7% revenue share paid by service providers to the network	$13,600,280
Build cost [2]: 100% of homes, businesses, institutions requesting service	$6,231,600
Cost of financing (50% of build cost at 5% for 12 years)	$2,420,559
Total cost to build fiber/duct/wireless system to all premises requesting service	$8,652,159
Thirty year revenue after initial system is paid for	$4,948,121
Net 30 year revenue[3] after expenses, maintenance, repairs (about 75% of gross revenue)	**$3,711,091**
Total funds available[4] for economic development, business expansion	**$29,108,438**

[1] Business, schools, institutions, and government costs estimated conservatively at 15% of residential expenditures
[2] Conservatively estimated at an average cost of $1,200 per premise connected for duct, dark fiber, pedestals, etc.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue

Case Studies

Danville, Virginia

The City of Danville, Virginia is operating an open access, open services network (www.ndanville.net) focused on creating the right kind of economic development incentives and accompanying infrastructure that will help retain existing businesses and help attract new ones. Danville has a City-owned electric utility, and the growing fiber network is being managed as part of the electric utility operations. Using a multi-phase approach, the City first hooked up government offices and local schools in 2004, and in 2006 began planning for extending the high performance all fiber network to local businesses and residents throughout the electric service area, which includes a large part of very rural Pittsylvania county. The first businesses began to get hooked up in late 2007, and Danville expects to have fiber to every parcel in its business parks before the end of 2008. The city-county business incubator was one of the first locations to receive the fiber services. The City has begun doing advanced planning for taking fiber to some of its residential neighborhoods. The City is not selling any services to businesses or residents; all services are offered by private sector service providers that use the network and pay the City for the use of the network via a revenue sharing agreement.

The Wired Road

The Wired Road is an open access, open service network jointly owned and managed by Carroll and Grayson counties and the City of Galax (Virginia). The three localities formed a regional broadband authority and began construction in September of 2007. The first institutional customers were added to the network (Carroll County Public Schools, Carroll County, Crossroads Institute) in March of 2008. Residential and business customers will be offered services in summer, 2008. The Wired Road is not selling any services to businesses or residents; all services are offered by private sector service providers that use the network and pay the Authority for the use of the network via a revenue sharing agreement. The three governments see the network investments as a way of differentiating the region and providing a valuable economic development marketing tool. The Wired Road is being designed as an integrated fiber and wireless network, with fiber in the three major Countys and all business parks, and wireless services as the initial offering in under-served rural areas where many residents are still on dial up. The long term vision is to provide fiber to every home and business that requests it.

Vint Hill Economic Development Authority

Vint Hill is a 695 acre mixed use office park in Fauquier County that has begun deploying fiber and telecom duct for tenant use. The EDA's first fiber investments were made in the spring of 2008 to help a tenant win a major contract with the Federal government that ***required*** fiber connectivity across the park and to the tenant building. At the same time, fiber was installed to help a local wireless service provider purchase lower cost Internet service to improve availability of wireless Internet access both in the park and in the surrounding area. The EDA has made improvements and upgrades to a tower located in the business park and made the tower available to private sector wireless providers.

Accomack/Northampton Broadband

Accomack and Northampton counties, on the Eastern Shore of Virginia, have formed a broadband authority and are about to begin construction of a 60 mile high performance fiber backbone that will reach from the northern border of Maryland and will extend across the 17 mile Chesapeake Bay-Bridge Tunnel to meet other regional fiber networks in the Norfolk area. The authority was formed in the spring of 2008, and construction on the fiber backbone will begin later in early fall, 2008. The region made the commitment to form the authority to provide fiber services to private sector firms that were demanding better connectivity to both the NASA Spaceport and Navy facilities in Chincoteague, Virginia and to provide higher performance and less expensive fiber routes off the the Shore. The Authority is currently beginning planning for deployment of both wireless and fiber services throughout the region.

Ripton Broadband Coop

Coops are a great ownership and governance model because they firmly vest the enterprise in the community–every subscriber is also a shareholder in the enterprise, and shareholder/members are able to vote and select board members. The Ripton Broadband Coop serves customers in rural Vermont via wireless, using an open access, open service model. Two service providers are selling services on the network. Coops have some unique advantages because membership fees can be used to help fund the initial development of the network. The Ripton Coop assesses a $200 membership fee and collects an additional $150 for customer premise equipment. For more information, visit www.ripton-coop.net.

Oklahoma City Government Network

The government of Oklahoma City, Oklahoma has installed a WiFi wireless network for public safety use. The wide area network covers 555 square miles and was funded from a public safety sales tax and city capital improvement funds. The city installed 1,200 wireless access points on utility poles, street lights, and other structures around the city. The network gives first responders, police, fire, and rescue personnel wide area access to city databases and the Internet. Local police have found the access extremely useful, as they can get access from patrol cars almost anywhere in the city. Public safety uses include getting detailed maps for use in search and rescue operations, photographs of suspects or victims, and information on hazardous materials to assist during a haz-mat clean up operation. On a per access point basis, the system cost about $5,000 per node.

Needs Assessment

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 structural 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 and residents need to be able to compete globally over the next thirty years?"***

If Madison County 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

Service Needs Analysis

When analyzing future service needs, it is important to take into account ALL services that may be delivered over a broadband connection. As we noted in the previous section, "broadband" is not a service--it is a delivery medium. If we think about broadband using a roads analogy, broadband is the road, not the trucks that use the road. Internet access is a service delivered by a broadband road system, and that Internet service is just one of many services that are in demand. Today, congestion on broadband networks is not due just to increased use of email and Web surfing, but many other services.

FCC Commissioner Deborah Tate spoke in April 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 (current average bandwidth to homes and businesses is 1-2 megabits). 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.

- This means that current DSL, wireless, and cable modem services are completely inadequate for future needs. Current DSL offerings are in the range of 384 kilobits to 768 kilobits for most residential users, 768 kilobits to 1.5 megabits for business DSL users, and there are severe distance limitations on DSL. Higher bandwidth (2-5 megabits) is possible, but as the DSL bandwidth goes up, the distance it can be delivered goes down.

- Current wireless offerings are in the range of 1/2 megabit to 1 megabit, and future WiMax services will only be able to deliver 2-4 megabits. Some wireless providers are rolling out 10-15 megabit services, but wireless does not scale up well with respect to cost. As bandwidth increases, the cost of the equipment also increases, and even a 15 megabit service is well short of the FCC projections of the need for 50 megabits of bandwidth in the near term. Wireless performance and capacity is heavily dependent upon backhaul (the local connection to the provider's core network); if this connection is also wireless, the bandwidth available at the access point is shared among all users, even if the rated capacity of an individual connection is 15 megabits. In other words, if the backhaul capacity is 100 megabits, and twenty local users are sharing that capacity, actual bandwidth available to any single user may be much lower than 15 megabits. If all the users are trying to watch video at the same time (not uncommon in early evening), performance can suffer drastically.

- Current average bandwidth for cable modem services is typically 1 to 2 megabits. It is important to note that cable providers make heavy use of the phrase "up to" in their advertising, and it is not unusual to see ads promoting cable modem speeds of "up to 6 megabits." However, that amount of bandwidth is shared among many users (often 200 or more) in a neighborhood, which results in much lower average speeds, and during peak use times in residential areas, the actual bandwidth available to a single household may be less than one megabit.

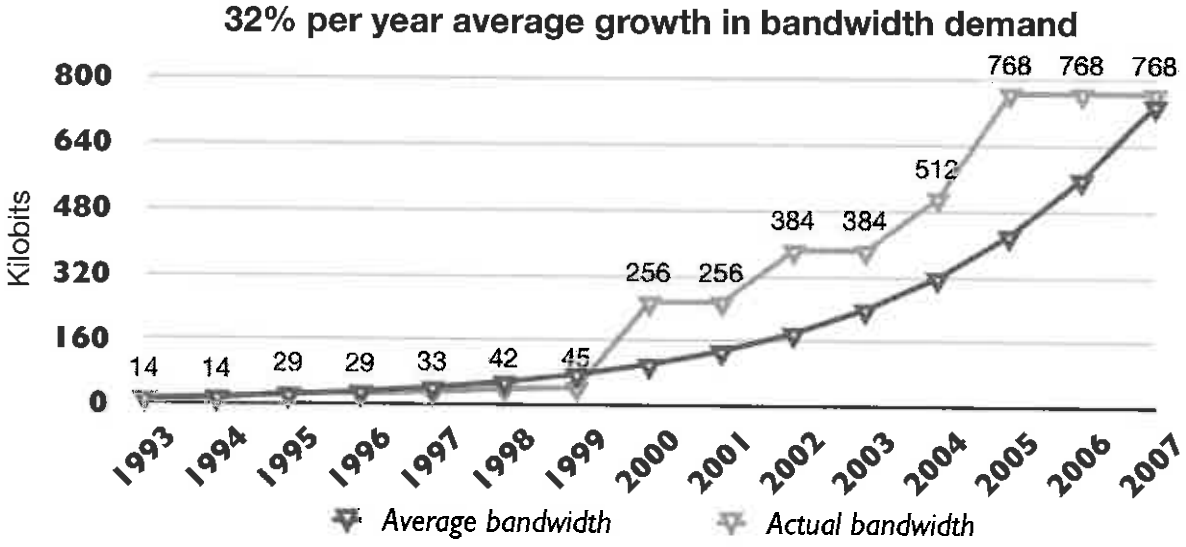
The challenge for Madison County leaders is to ensure that the County has a telecommunications infrastructure in place that will be able to handle the 50x bandwidth increase projected by the FCC (which is based on many years of real world data).

At the same conference, a talk by a DirecTV official provided additional insight into residential bandwidth needs. The DirecTV speaker noted that one of their biggest 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 Blacksburg Electronic Village began offering the first residential Internet access in the world, the average connection speed was 14,400 bits per second. At the end of 2007, the average bandwidth to the home is 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
Average bandwidth	14.4	19.1	25.3	33.5	44.4	58.8	77.9	103.2	136.8	181.3	240.2	318.2	421.7	558.7	740.3
Actual bandwidth	14.4	14.4	28.8	28.8	33	42	45	256	256	384	384	512	768	768	768



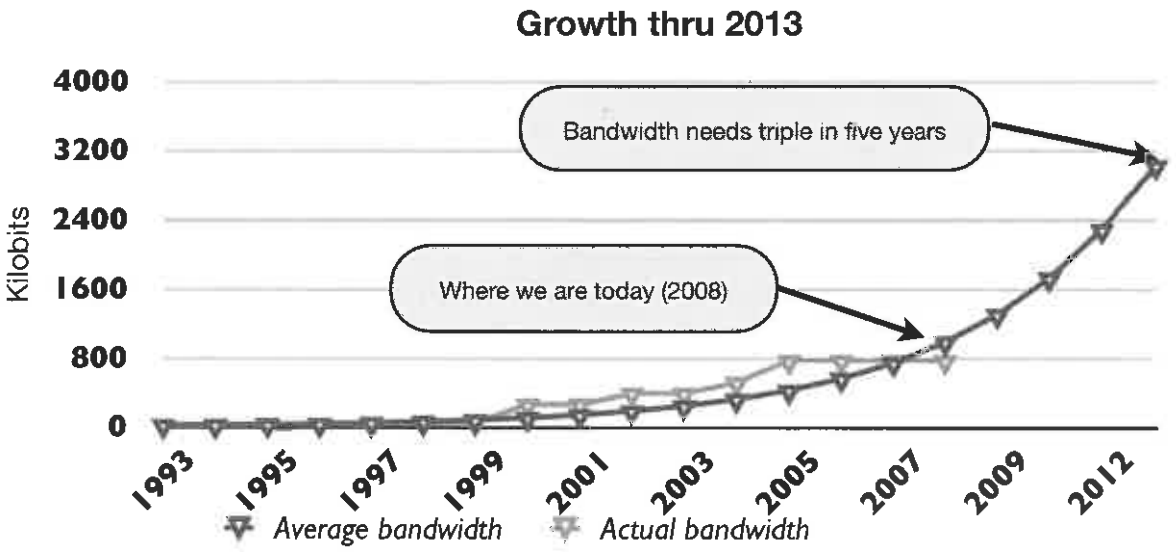
Service Bandwidth Needs for the Next Five Years

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, over the past fourteen years, average yearly growth has been 32%. 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 Madison County 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 the community.

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2012	2013
Average bandwidth	14.4	19.1	25.3	33.5	44.4	58.8	77.9	103.2	136.8	181.3	240.2	318.2	421.7	558.7	740.3	980.8	1299.	1722.	2281.	3023.
Actual bandwidth	14.4	14.4	28.8	28.8	33	42	45	256	256	384	384	512	768	768	768	768				



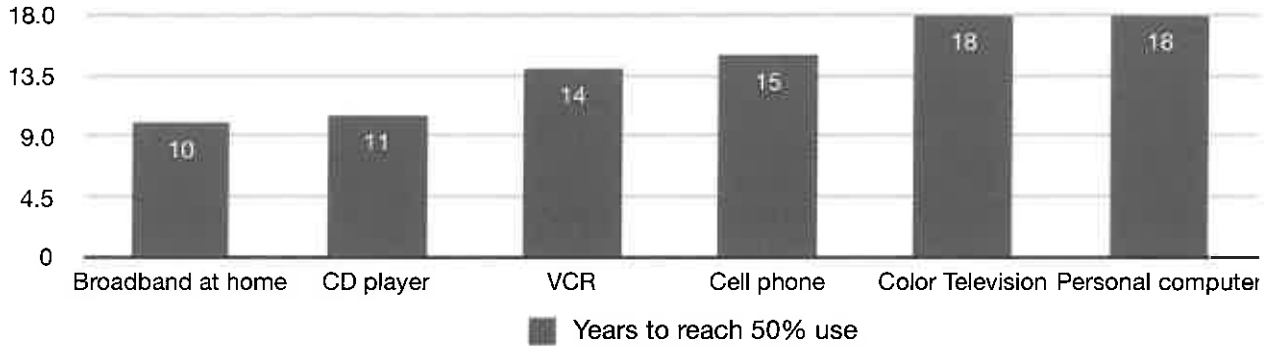
Broadband at Home Penetration Rate

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



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 transportation 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.

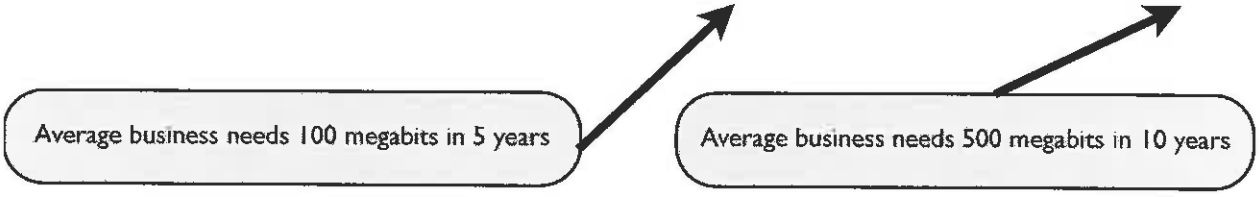
Business Bandwidth Needs

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	Con-current Usage	Business Bandwidth Requirement (Mbs)	Instance of a Service	Con-current 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
HD Video Conferencing	45 Mbs	1	45	250 Mbs	1	250
Peak Usage of Average Business Bandwidth (megabits)			**98**			**423**



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
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 in Madison County and projected future demand.

Residential Services	5 years			10 years		
	Instance of a Service	Con-current Usage	Household Bandwidth Requirement (Mbs)	Instance of a Service	Con-current 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**

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.

Needs	Description
Financially sustainable business model	Use demand aggregation to create the right size market-place 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. Out-source most operations and maintenance to qualified private sector firms to create jobs and business opportu-nities.
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

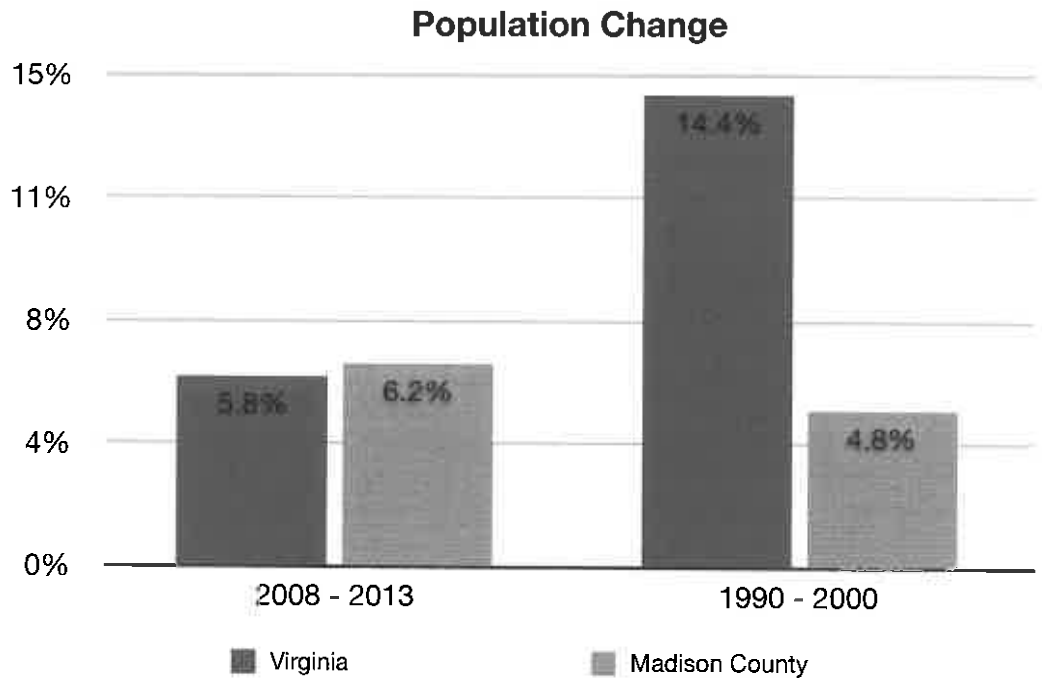
Population of the region
(2006 Census estimates)

- Madison County - population 13,945 (estimated change between 2000 and 2013: 6.2%)
- Virginia – population 7,833,684 (estimated change between 2000 and 2012: +5.8%)

Growth for Madison County is improving over the previous decade. Overall, growth for Madison County is slightly greater than the rest of the state. Improved telecom services and more affordable telecom services could make the county more attractive as a bedroom community and to small and medium-sized businesses.

	Virginia		Madison County	
	Population	% Change	Population	% Change
2013	8,289,116	5.80%	14,804	6.20%
2008	7,833,684		13,945	
2000	7,078,515	14.40%	12,520	4.80%
1990	6,187,393		11,949	

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

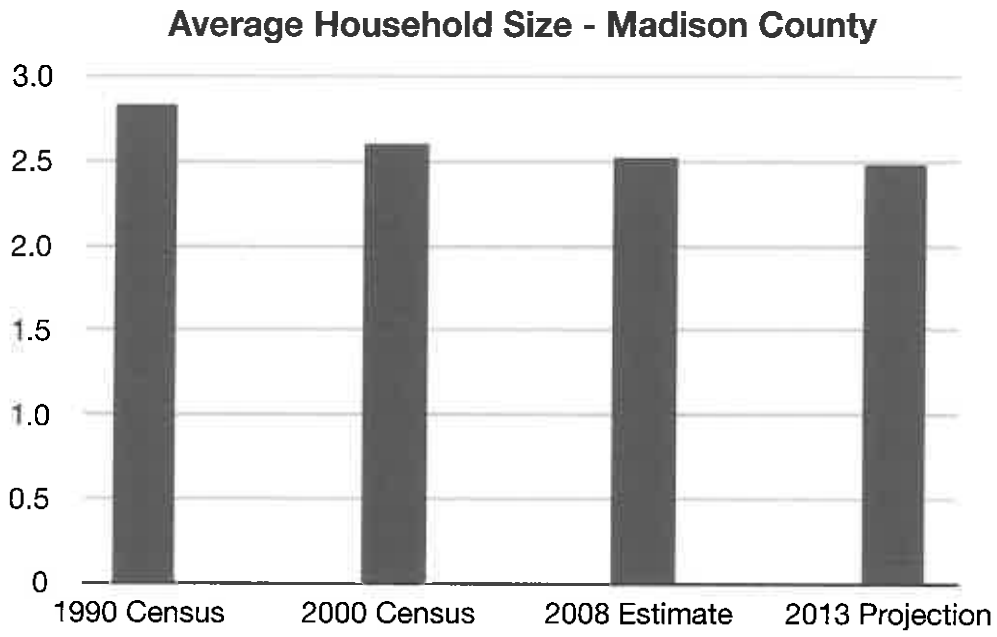


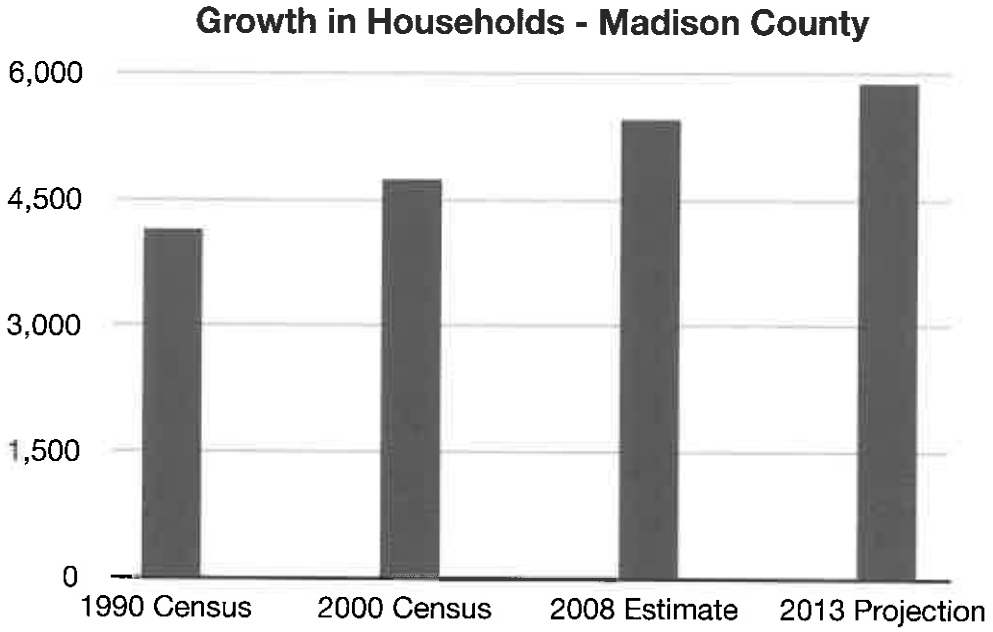
Household Size and Growth Trends

In the county, the number of persons living in the average household is expected to lower slightly, but the number of households is expected to rise in the next five years. 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). Thesteady growth in households suggests that the county will see steady demand for connections (as opposed to a situation where the number of households is shrinking).

Madison County	1990 Census		2000 Census		2008 Estimate		2013 Projection		Percent Change, 1990 to 2000	2008 to 2013
Total Households	4,144		4,739		5,453		5,883		14.4%	7.9%
Size of Household:										
1 Person	795	19.2%	1,030	21.7%	1,229	22.5%	1,363	23.2%	29.8%	10.9%
2 Person	1,345	32.5%	1,733	36.6%	2,069	37.9%	2,148	36.5%	28.6%	3.8%
3 Person	788	19.0%	836	17.6%	1,008	18.5%	1,039	17.7%	7.7%	3.1%
4 Person	656	15.8%	676	14.3%	681	12.5%	794	13.5%	1.4%	16.6%
5 Person	313	7.6%	330	7.0%	299	5.5%	348	5.9%	-5.4%	16.4%
6 Person	137	3.3%	95	2.0%	108	2.0%	124	2.1%	-21.2%	14.8%
7 + Person	110	2.70%	39	0.80%	59	1.10%	67	1.10%	-64.50%	13.60%
Ave Hhld Size	2.83		2.60		2.52		2.48		-8.2%	-1.5%


Average Household Size - Madison County
3.0
2.5
2.0
1.5
1.0
0.5
0
1990 Census
2000 Census
2008 Estimate
2013 Projection


Growth in Households - Madison County
6,000
4,500
3,000
1,500
0
1990 Census
2000 Census
2008 Estimate
2013 Projection

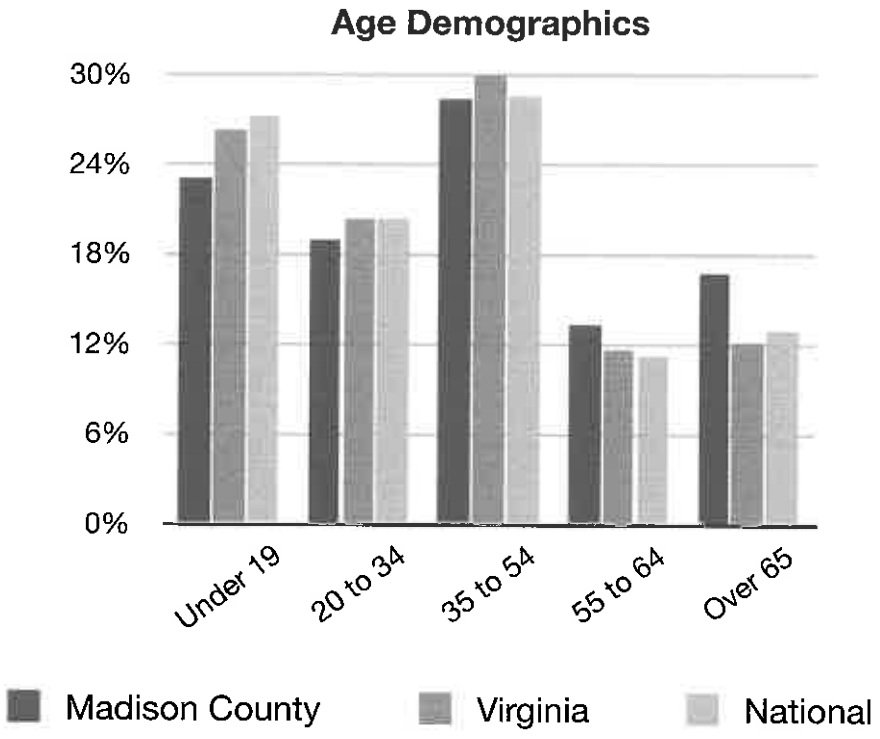
Age distribution

Madison County has an older population than the state and the nation in most age ranges. There is a significantly higher percentage of senior citizens, which reflects the county's attractiveness as a retirement destination. Retirees 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.

At the same time, an ongoing education effort is often needed to help older people make good use of technology.

	Madison County	Virginia	National
Under 19	23.0%	26.2%	27.1%
20 to 34	18.9%	20.3%	20.3%
35 to 54	28.3%	29.9%	28.5%
55 to 64	13.3%	11.6%	11.2%
Over 65	16.7%	12.1%	12.9%

Source US Bureau of Census 1990 and 2000 Decennial Census SF1 DP-1

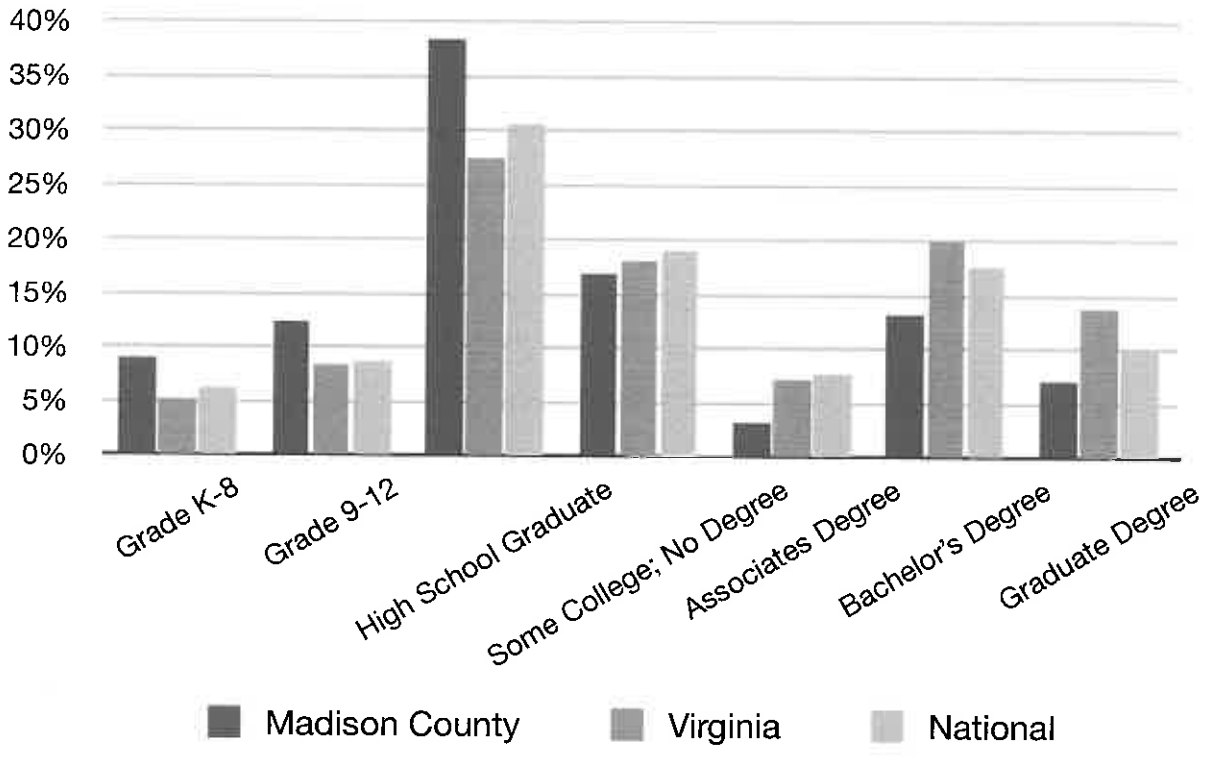


Education

Madison County is above average with respect to high school graduation rates. The area lags both college categories, with a somewhat lower percentage of college graduates (including advanced degrees), which is probably related to the relatively high number of manufacturing jobs in the County. Increased availability of broadband could help change this over time as it could attract a different mix of residents (e.g. business people and entrepreneurs who can work from home).

	Madison County	Virginia	National
Grade K-8	9.0%	5.2%	6.2%
Grade 9-12	12.4%	8.4%	8.7%
High School Graduate	38.4%	27.5%	30.6%
Some College; No Degree	16.9%	18.1%	19.0%
Associates Degree	3.2%	7.2%	7.7%
Bachelor's Degree	13.2%	20.0%	17.6%
Graduate Degree	7.1%	13.8%	10.2%

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



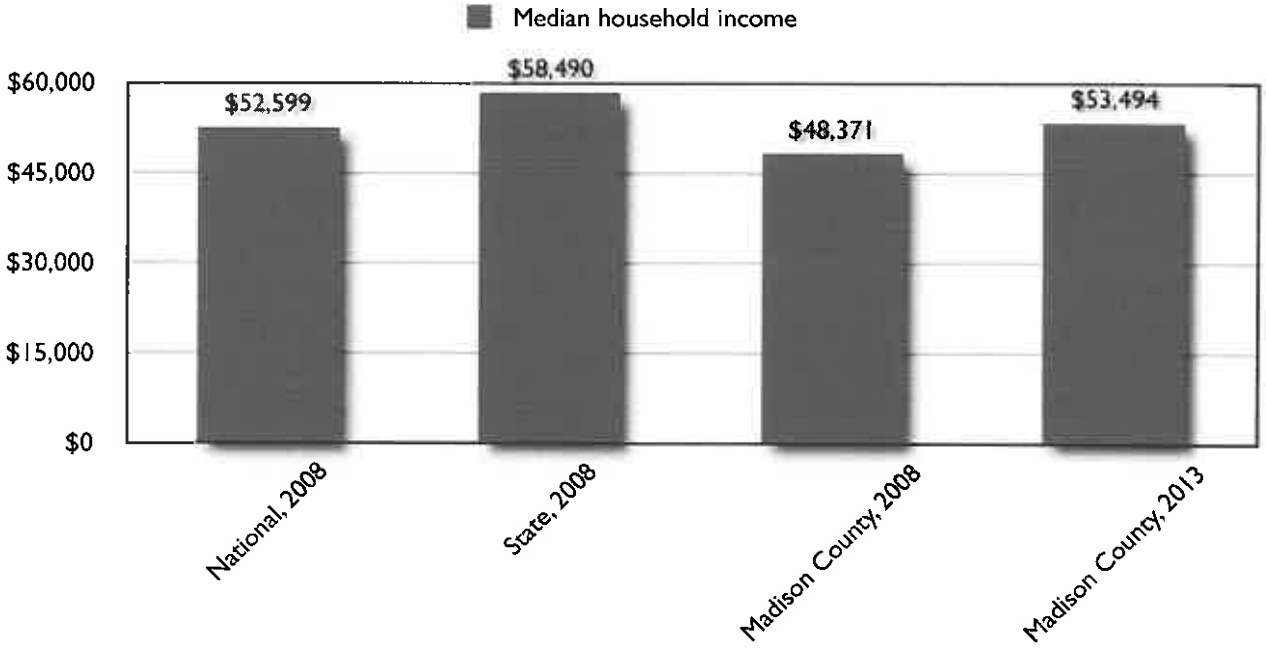
Median Household Income

Median income for the county is lower than both the national and state averages. Household income is projected to rise substantially over the next five years, and this is probably due to the trend of Madison County becoming more popular as a bedroom community for workers commuting to good paying jobs in the DC and Charlottesburg areas. Madison County may also be benefitting from some retirees who view the community as a good place to live.

The trend of having more affluent households in Madison County suggests that affordable choices among broadband providers and the availability of high performance broadband services in both residential neighborhoods and business/commercial areas of the County will be important. As the kind of worker living in Madison County shifts away from manufacturing and towards office and professional employees, working from home, either part time or full time, will become more important, and broadband at home is already considered a requirement among white collar professionals.

	National, 2008	State, 2008	Madison County, 2008	Madison County, 2013
Median household income	$52,599	$58,490	$48,371	$53,494

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

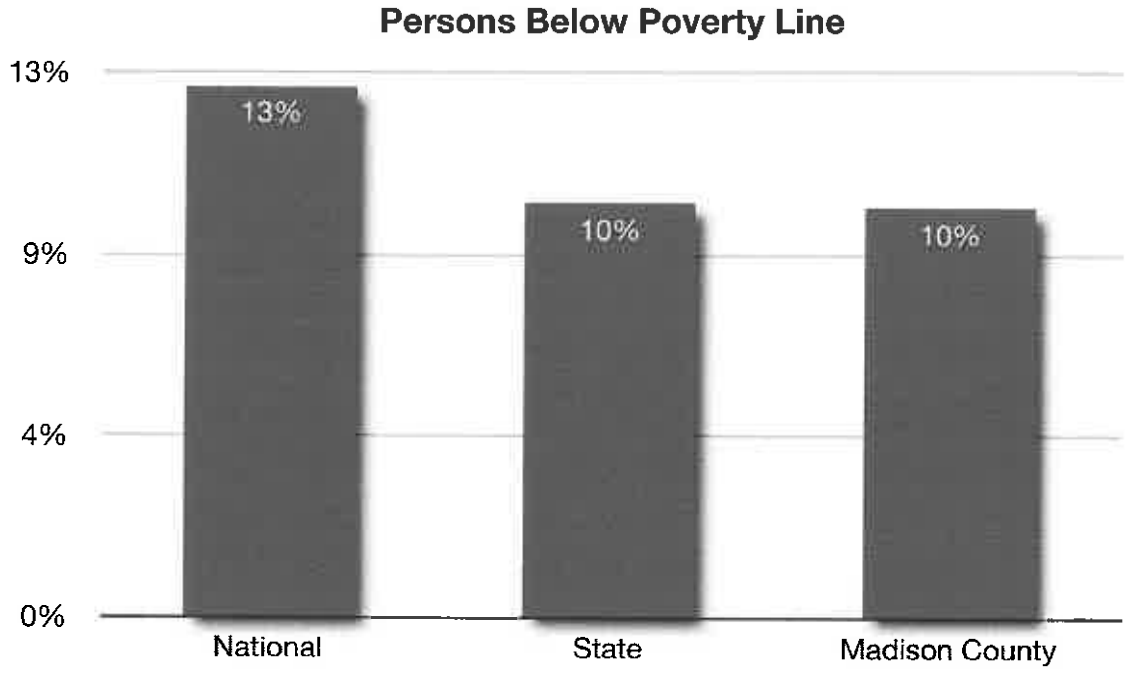


Families Below Poverty Level

The county's level of poverty is below the state and national average. Madison County has a major employer that offers a range of good paying jobs, and the higher than average level of relatively prosperous retirees also helps.

	National	State	Madison County
Persons below poverty level	12.7%	9.9%	9.8%

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



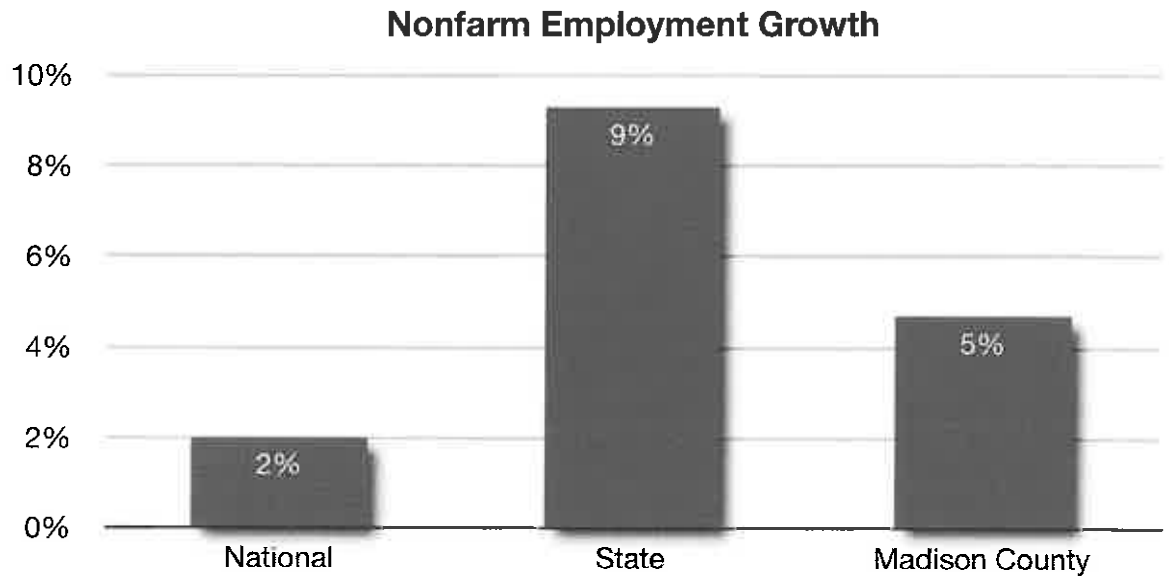
Non-farm employment growth

Madison County has had positive growth in the first half of this decade greater than the national average, but less than the state average.

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	State	Madison County
Nonfarm employment growth	2.0%	9.3%	4.7%

Source US Bureau of Census 2005 Business Patterns



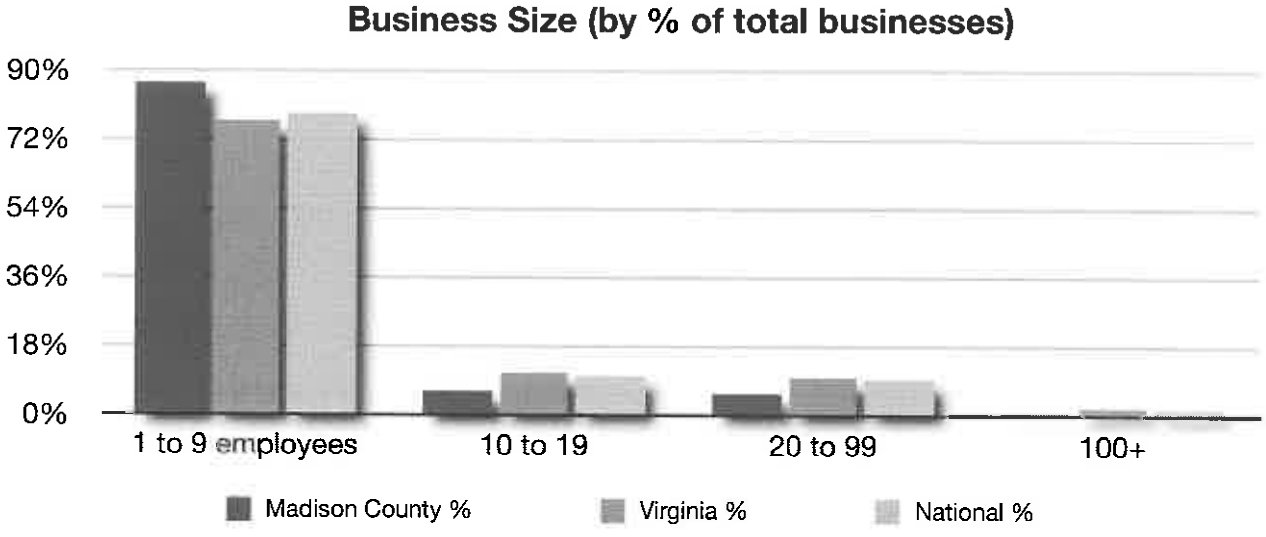
Business size distribution

The county has mostly small businesses, and enjoys a business size distribution similar to state and national averages, reflecting a reasonable balance.

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 Madison County may also help the County attract new small businesses, especially business owners looking for good quality of life.

Number of Businesses	Madison County	Virginia	National
1 to 9 employees	277	214,024	9,366,851
10 to 19	20	30,897	1,210,650
20 to 99	18	27,467	1,082,676
100+	2	5,709	215,492
Total businesses	317	278,097	11,875,669

Business Size Distribution	Madison County %	Virginia %	National %
1 to 9 employees	87.38%	76.96%	78.87%
10 to 19	6.31%	11.11%	10.19%
20 to 99	5.68%	9.88%	9.12%
100+	0.63%	2.05%	1.81%
Total businesses	317	278,097	11,875,669

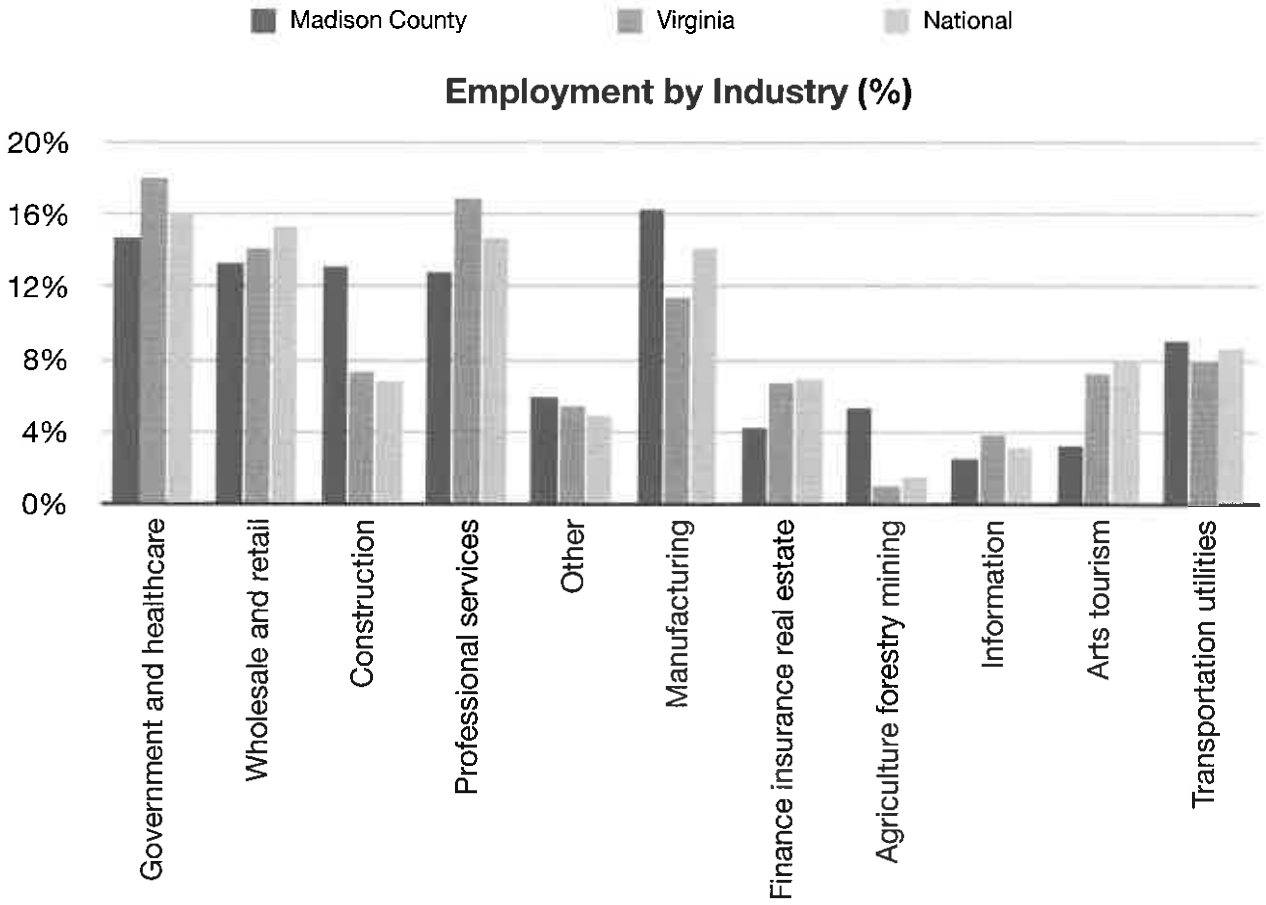


Business and Jobs Distribution

The county's largest employer is manufacturing. Wholesale/retail and government/healthcare are the next largest employers.

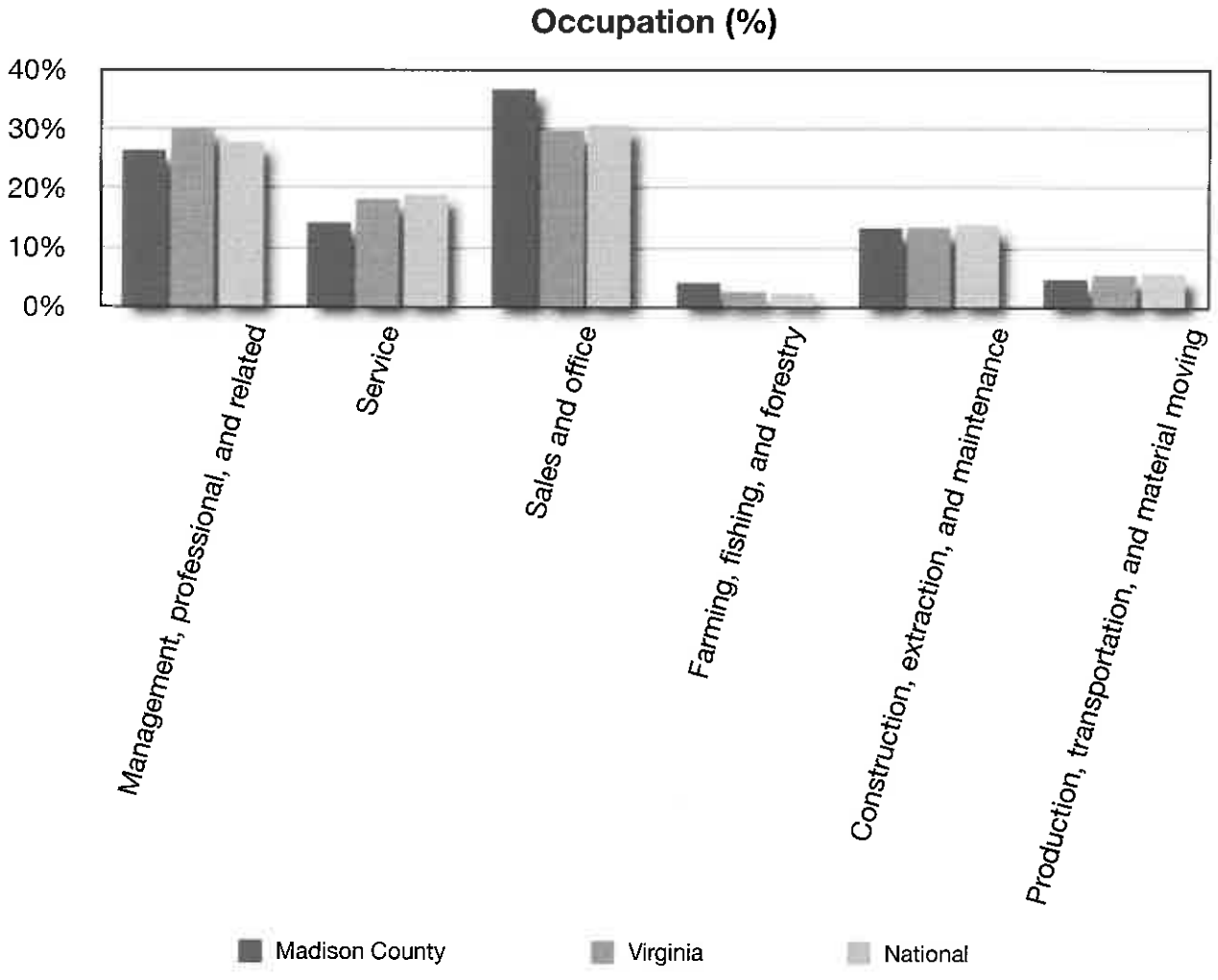
The Information (IT) sector and Professional Services sector are significantly lower than the national and state average. Professional services are needed by Knowledge Economy businesses and entrepreneurs, and special attention should be paid to this sector to ensure that local businesses have access 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 Street to improve the general appearance of the County area 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 the county should strive to always have some good quality office space always available (with broadband cabling to the building and within the building). There appears to be little or no Class A office space in the county, and this may hamper efforts to attract IT and professional businesses.

	Madison County	Virginia	National
Government and healthcare	14.7%	18%	16%
Wholesale and retail	13.3%	14.1%	15.3%
Construction	13.1%	7.3%	6.8%
Professional services	12.8%	16.9%	14.7%
Other	5.9%	5.4%	4.9%
Manufacturing	16.3%	11.4%	14.1%
Finance insurance real estate	4.2%	6.7%	6.9%
Agriculture forestry mining	5.3%	1%	1.5%
Information	2.5%	3.8%	3.1%
Arts tourism	3.2%	7.2%	7.9%
Transportation utilities	9%	7.9%	8.6%


Madison County
Virginia
National
Employment by Industry (%)
20%
16%
12%
8%
4%
0%
Government and healthcare
Wholesale and retail
Construction
Professional services
Other
Manufacturing
Finance insurance real estate
Agriculture forestry mining
Information
Arts tourism
Transportation utilities

Distribution by Occupation (count)	Madison County	Virginia	National
Management, professional, and related	669	1,083,154	40,216,610
Service	362	656,571	27,516,293
Sales and office	929	1,065,701	44,355,767
Farming, fishing, and forestry	106	94,244	3,511,525
Construction, extraction, and maintenance	339	484,707	20,230,201
Production, transportation, and material moving	121	197,739	8,360,524
Totals	2,526	3,582,116	144,190,920

Distribution by Occupation (%)	Madison County	Virginia	National
Management, professional, and related	26.48%	30.24%	27.89%
Service	14.33%	18.33%	19.08%
Sales and office	36.78%	29.75%	30.76%
Farming, fishing, and forestry	4.20%	2.63%	2.44%
Construction, extraction, and maintenance	13.42%	13.53%	14.03%
Production, transportation, and material moving	4.79%	5.52%	5.80%



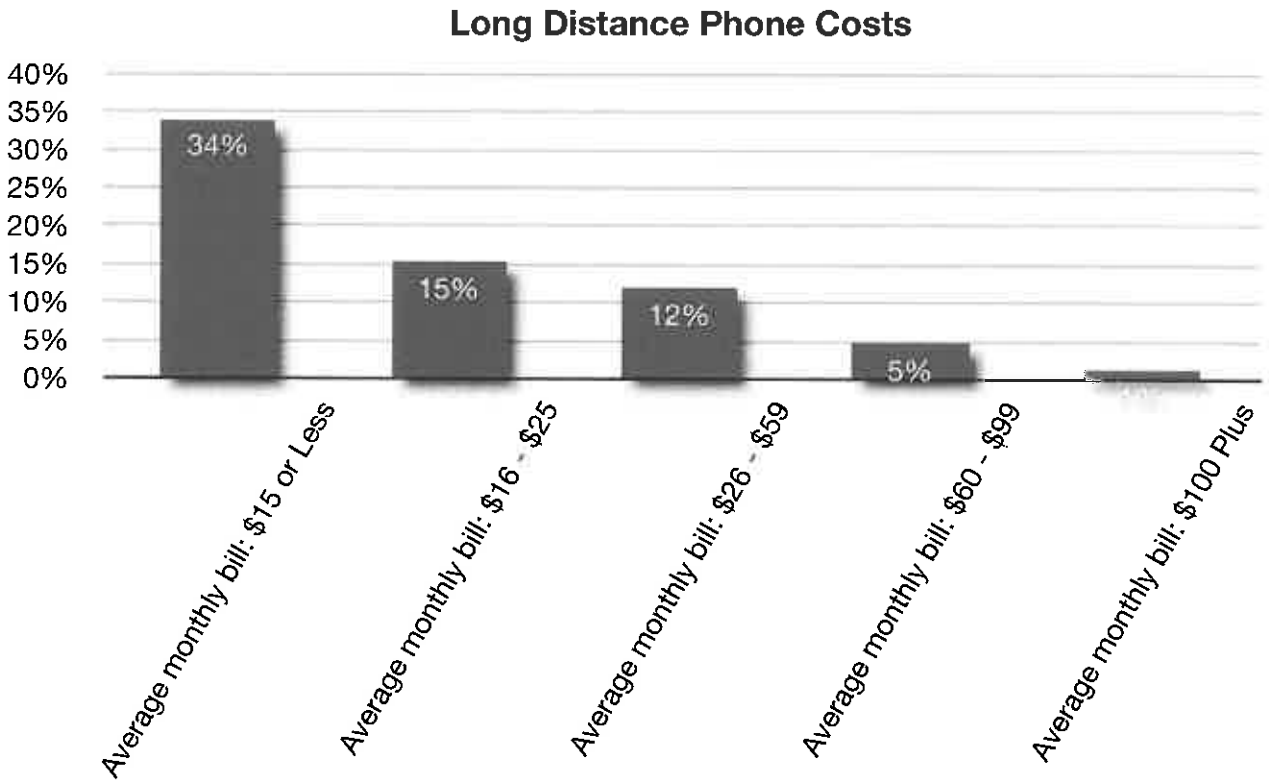
Demand Aggregation Analysis

Telephony Usage for Madison County

Telephone usage in the county is average with almost every household having at least one landline telephone. County residents also pay as much or slightly more on phone bills than the national average. 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	10,793	97.1%	95
Long Distance Costs			
Average monthly bill: $15 or Less	3,801	34.2%	104
Average monthly bill: $16 - $25	1,712	15.4%	95
Average monthly bill: $26 - $59	1,334	12.0%	91
Average monthly bill: $60 - $99	534	4.8%	111
Average monthly bill: $100 Plus	144	1.3%	70

Source Mediamark Research, Inc.



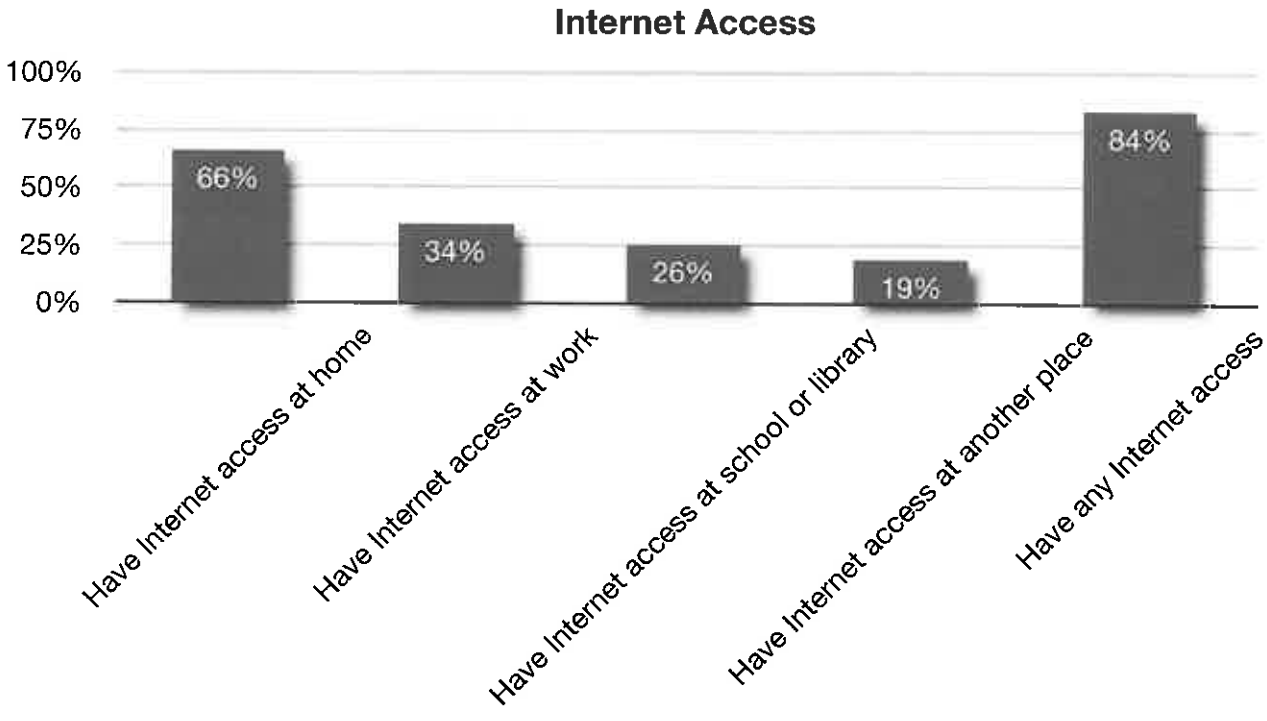
Internet Usage for Madison County

While usage of the Internet is only one facet of a community broadband project, this data highlights the importance of the Internet to the area. Residents tend to lag slightly behind the rest of the country both in terms of access from home and access at work. Nationally, close to 80% of residents tend to have some kind of Internet access from home (including dial up).

The lower score for work access would tend to reflect the number of manufacturing 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	7,325	66%	95
Have Internet access at work	3,824	34%	89
Have Internet access at school or library	2,857	26%	95
Have Internet access at another place	2,134	19%	96
Have any Internet access	9,303	84%	96

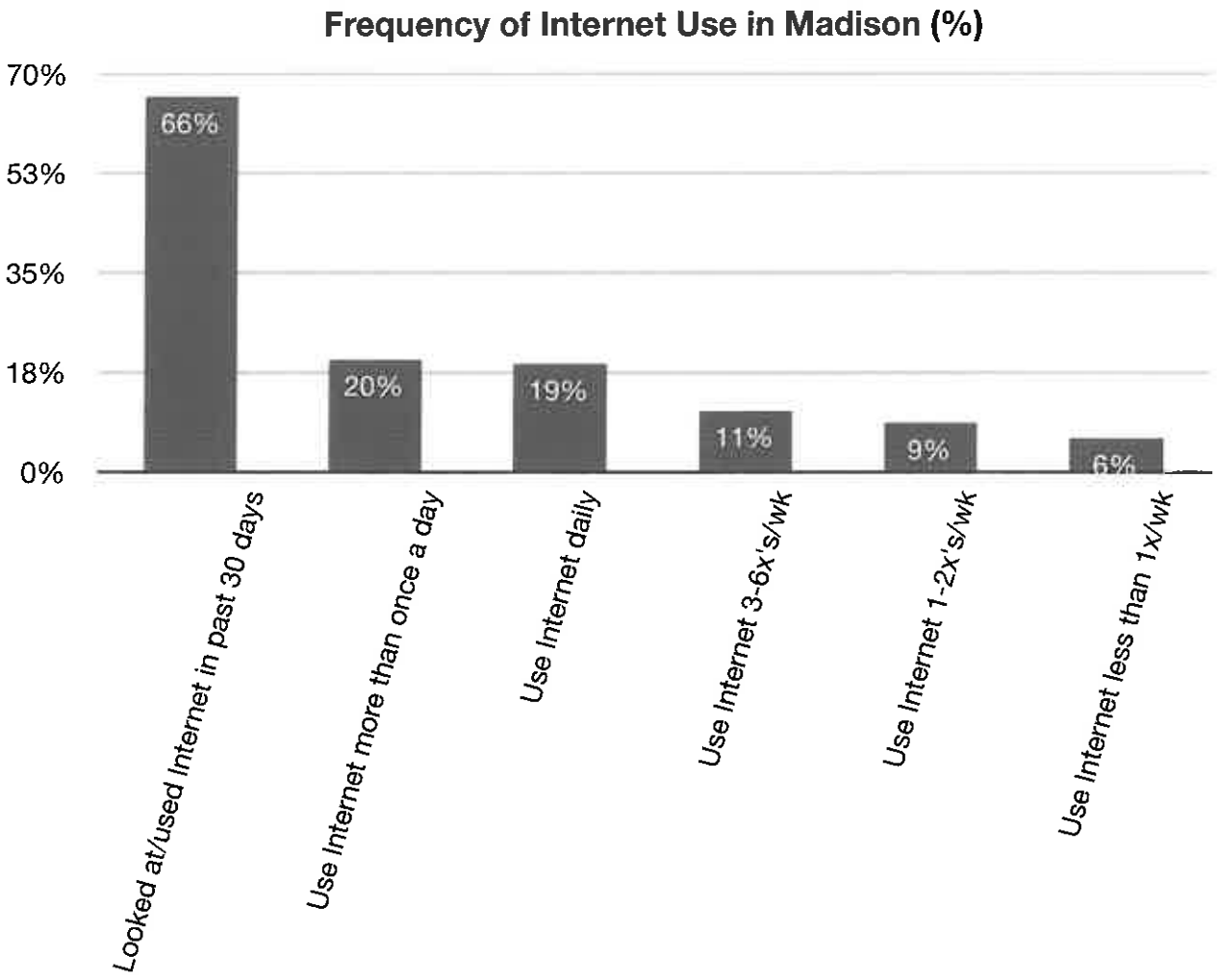
Source Mediamark Research, Inc.



Internet Activity Use in Madison County

This table shows how Internet use in the area 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 area tends to be lower than in other places, reflecting perhaps the lower levels of Internet access and use from homes in Madison County.

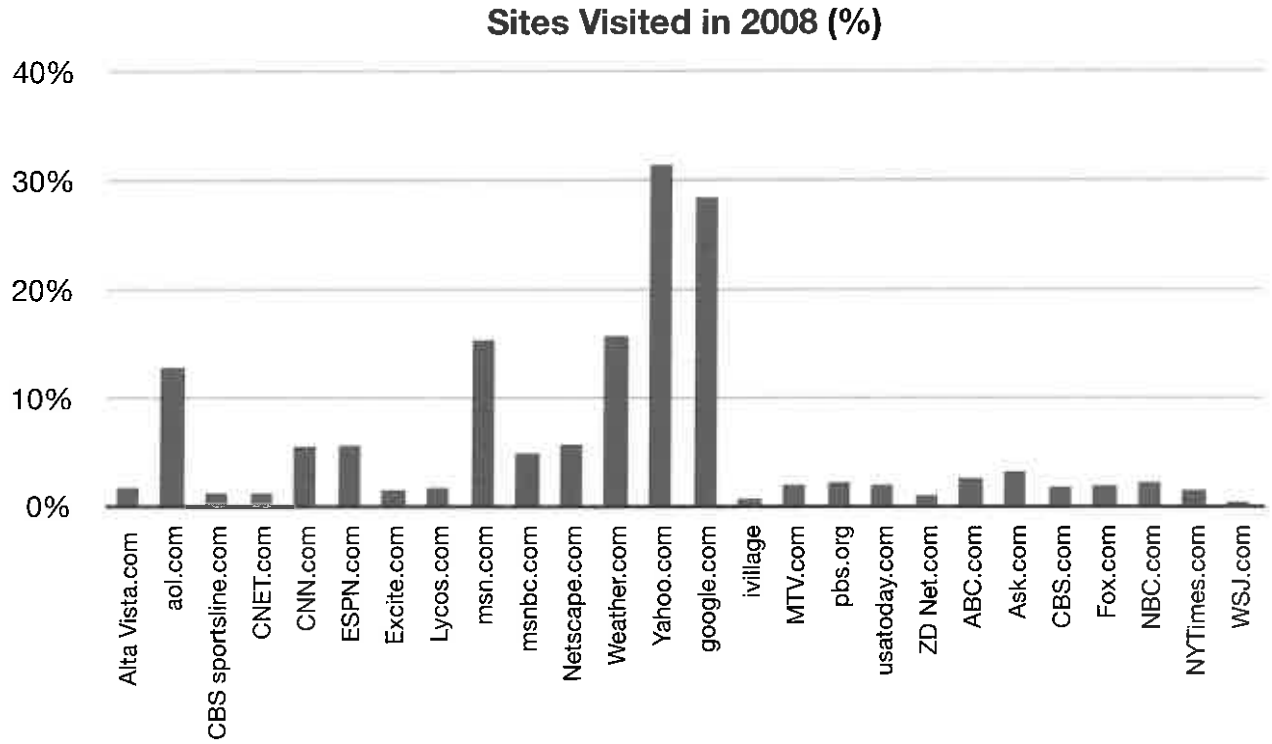
Internet activity use in Region	2008 Totals	2008 Percent	Index Average=100
Looked at/used Internet in past 30 days	7,336	66.0%	94
Visited a chat room	456	4.1%	78
Used e-mail	5,969	53.7%	91
Used Instant Messenger	1,667	15.0%	81
Obtained financial information	1,923	17.3%	84
News and Current Events	3,335	30.0%	87
Sports news and information	1,890	17.0%	84
Obtained medical information	1,145	10.3%	76
Visited TV network or show website	967	8.7%	79
Other Activity	1,556	14.0%	91
Made a purchase for personal use	2,512	22.6%	91
Made a purchase for business use	900	8.1%	105
Made travel plans	1,667	15.0%	93
Played games online	1,645	14.8%	82
Tracked investments	1,045	9.4%	81
Traded stocks- bonds or mutual funds	300	2.7%	85
Obtained information for new/used car purchase	900	8.1%	88
Obtained information about real estate	1,000	9.0%	90
Looked for employment	878	7.9%	75
Listened to radio on the Internet	656	5.9%	71
Use Internet more than once a day	2,190	19.7%	85
Use Internet daily	2,112	19.0%	92
Use Internet 3-6x's/wk	1,189	10.7%	90
Use Internet 1-2x's/wk	956	8.6%	113
Use Internet less than 1x/wk	656	5.9%	108
Online Services looked at/used past 30 days: America Online	1,978	17.8%	96
Online Services looked at/used past 30 days: Microsoft Network	1,790	16.1%	94
Online Services looked at/used past 30 days: Any Service	6,513	58.6%	79
Online Services looked at/used past 30 days: Other	3,023	27.2%	96


Frequency of Internet Use in Madison (%)
70%
53%
35%
18%
0%
66%
20%
19%
11%
9%
6%
Looked at/used Internet in past 30 days
Use Internet more than once a day
Use Internet daily
Use Internet 3-6x's/wk
Use Internet 1-2x's/wk
Use Internet less than 1x/wk

Broadband Use by Site within Madison County

This data from Mediamark Research indicates that Madison County 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. News and weather sites are very popular, with Web sites like USA Today, MSNBC among the most used. MTV is extraordinarily popular, suggesting that young people are heavy Internet users in Madison County.

Sites Accessed Recently	2008 Totals	2008 Percent	Index Average=100
Alta Vista.com	189	1.7%	83
aol.com	1,423	12.8%	75
CBS sportsline.com	133	1.2%	67
CNET.com	133	1.2%	74
CNN.com	611	5.5%	71
ESPN.com	622	5.6%	72
Excite.com	167	1.5%	73
Lycos.com	189	1.7%	74
msn.com	1,701	15.3%	84
msnbc.com	545	4.9%	86
Netscape.com	634	5.7%	104
Weather.com	1,745	15.7%	90
Yahoo.com	3,490	31.4%	81
google.com	3,157	28.4%	81
ivillage	78	0.7%	76
MTV.com	222	2.0%	75
pbs.org	245	2.2%	76
usatoday.com	222	2.0%	79
ZD Net.com	111	1.0%	76
ABC.com	289	2.6%	72
Ask.com	356	3.2%	84
CBS.com	200	1.8%	64
Fox.com	211	1.9%	69
NBC.com	245	2.2%	83
NYTimes.com	167	1.5%	55
WSJ.com	44	0.4%	51


Sites Visited in 2008 (%)
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

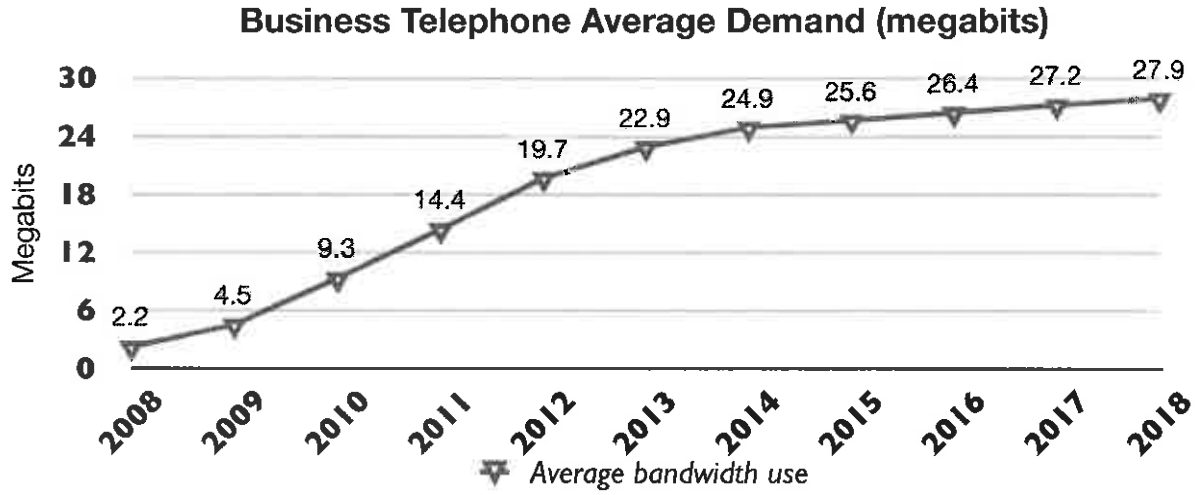
Madison County Business Telephone Demand

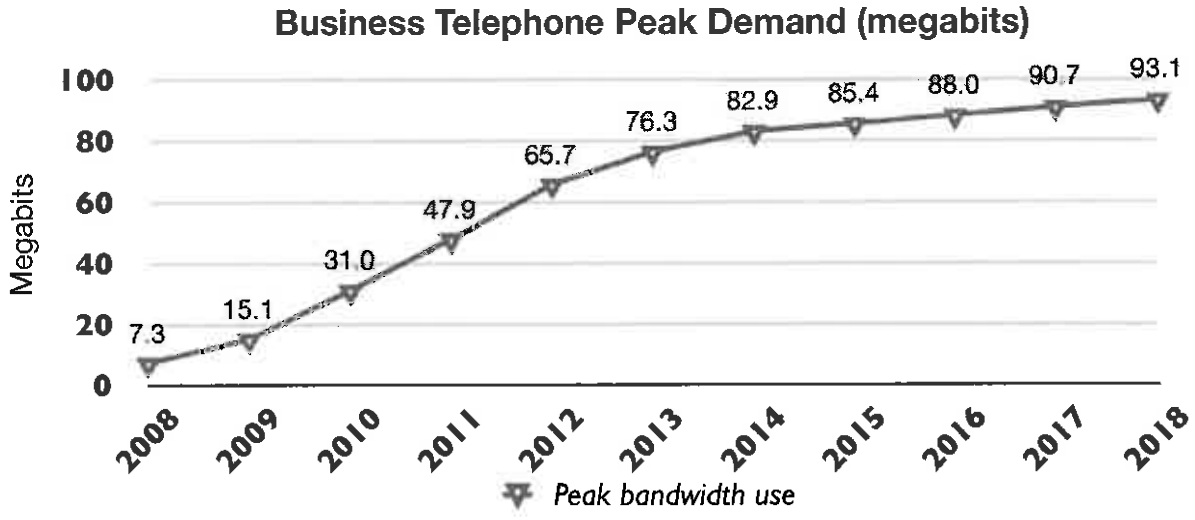
Business telephone demand is important because virtually all businesses require a telephone and most businesses require a landline. Very small start up businesses may use only a cellular phone but the quality of the call and the variability of the signal means that even small "mom and pop" businesses 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 Madison County businesses will switch to VoIP by 2014. Bandwidth for phone services is relatively modest (about 128 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	317	327	337	347	357	368	379	390	402	414	426
Businesses with phone	285	294	303	312	321	331	341	351	362	373	383
Take rate	10%	20%	40%	60%	80%	90%	95%	95%	95%	95%	95%
Average bandwidth use	2.2	4.5	9.3	14.4	19.7	22.9	24.9	25.6	26.4	27.2	27.9
Peak bandwidth use	7.3	15.1	31	47.9	65.7	76.3	82.9	85.4	88	90.7	93.1




Business Telephone Peak Demand (megabits)
Megabits
100
80
60
40
20
0
7.3
15.1
31.0
47.9
65.7
76.3
82.9
85.4
88.0
90.7
93.1
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Peak bandwidth use

Madison County 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 Madison County 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:

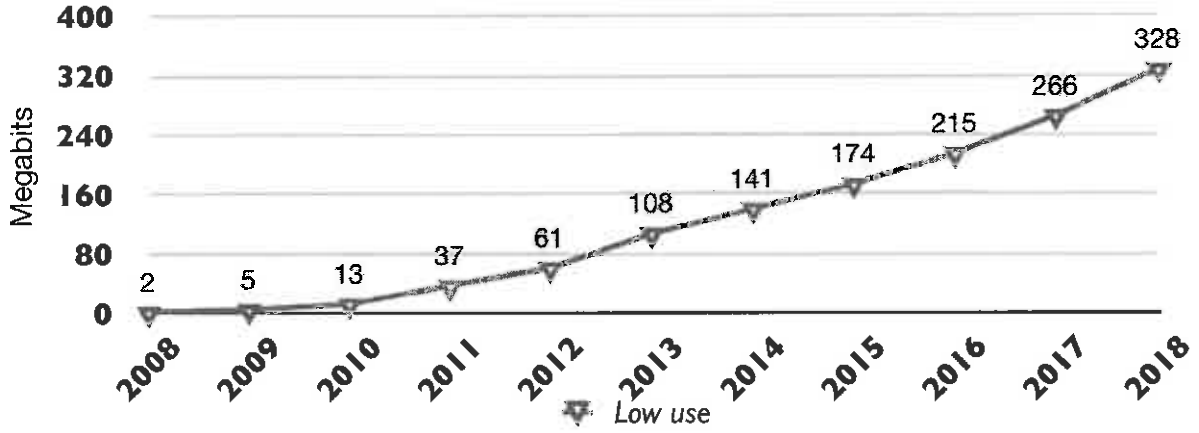
- Some streaming video (e.g. online business training).
- Hosting of ecommerce "shopping cart" Web site for online sales.
- Daily transfer of documents and files between multiple business locations (e.g. engineering drawings, medical files, etc.).
- Hosting of Web sites with multimedia heavy content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

Peak use includes regular use of:

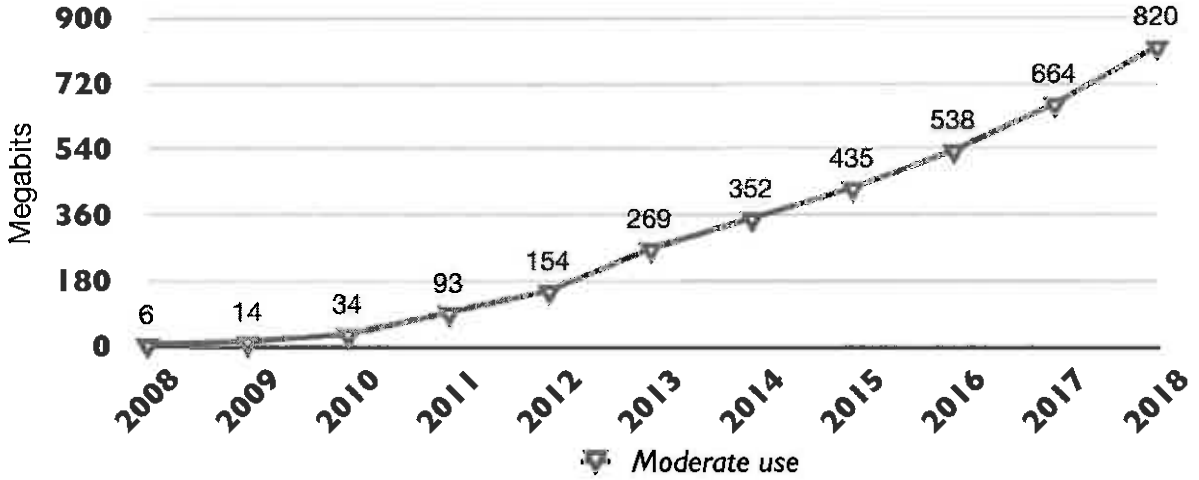
- Business videoconferencing in HD format.
- Multi-site business videoconferences (three or more sites connected at the same time).
- High demand Web sites with heavy traffic that requires multiple servers (e.g. popular ecommerce sites, popular news and information sites).
- Telemedicine and telehealth 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	317	327	337	347	357	368	379	390	402	414	426
Businesses with Internet (%)	65%	70%	80%	85%	90%	95%	95%	95%	95%	95%	95%
Businesses with Internet	285	294	303	312	321	331	341	351	362	373	383
Take rate	5%	10%	20%	45%	60%	85%	90%	90%	90%	90%	90%
Low use	2.2	5.4	13.4	37.3	61.4	107.6	140.8	173.9	215.1	265.8	328.2
Moderate use	5.5	14	33.5	93.3	153.5	269.0	352.0	434.7	537.6	664.4	820.4
Peak use	8.2	20.3	50.3	139.9	230.3	403.5	528.0	652.0	806.5	996.6	1,230.6

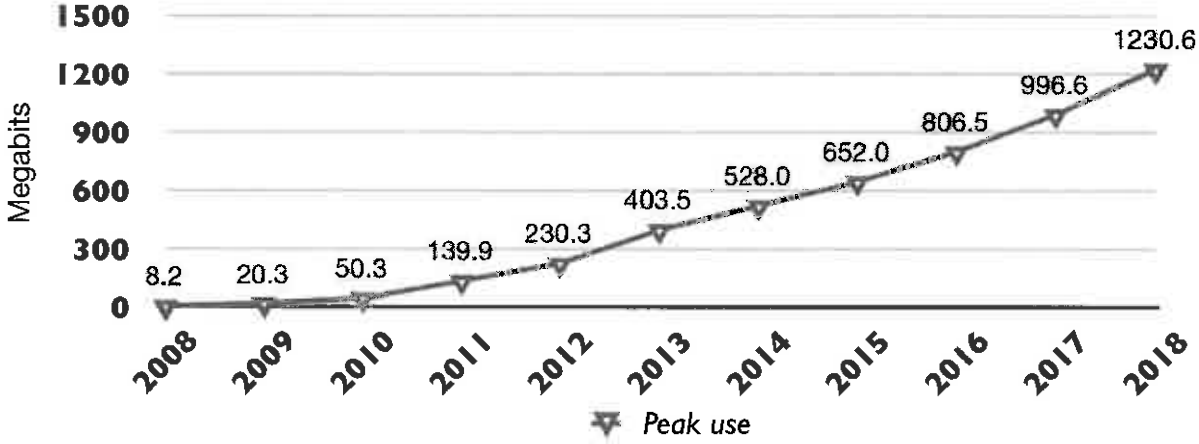
Business Internet Demand, Low Use



Business Internet Demand, Moderate Use



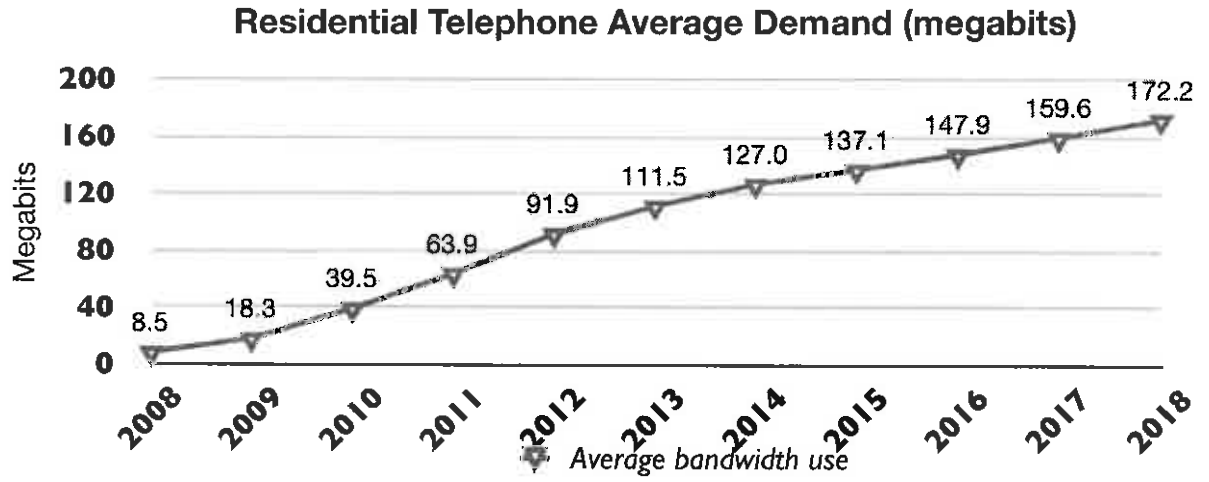
Business Internet Demand, Peak Use

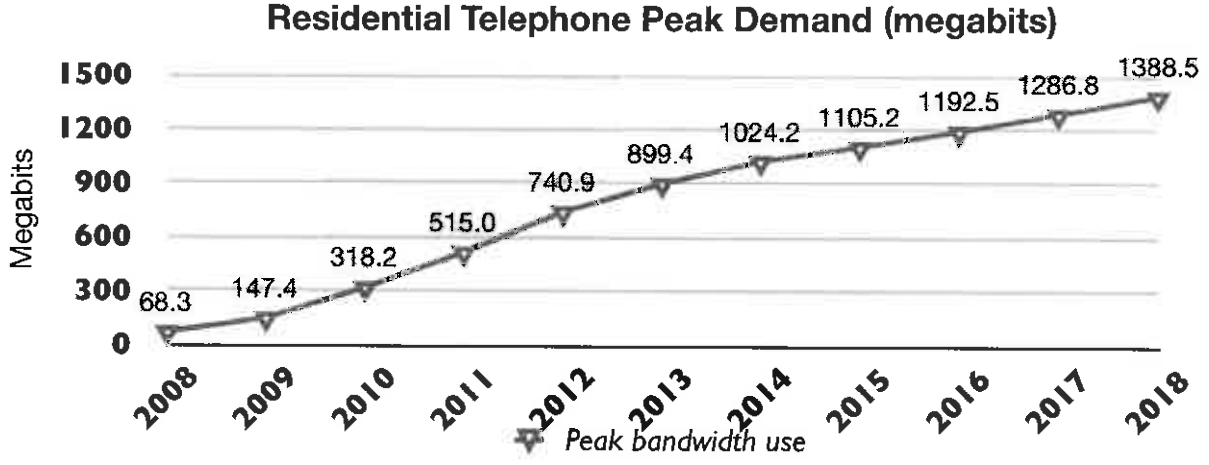


Madison County Residential Telephone Demand

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	5,453	5,884	6,349	6,851	7,392	7,976	8,606	9,286	10,020	10,812	11,666
Households with phone	5,295	5,713	6,165	6,652	7,178	7,745	8,356	9,017	9,729	10,498	11,328
Take rate	10%	20%	40%	60%	80%	90%	95%	95%	95%	95%	95%
Average bandwidth use	8.5	18.3	39.5	63.9	91.9	111.5	127.0	137.1	148	159.6	172.2
Peak bandwidth use	68.3	147.4	318.2	515.0	740.9	899.4	1,024.2	1,105.2	1,192.5	1,286.8	1,388.5



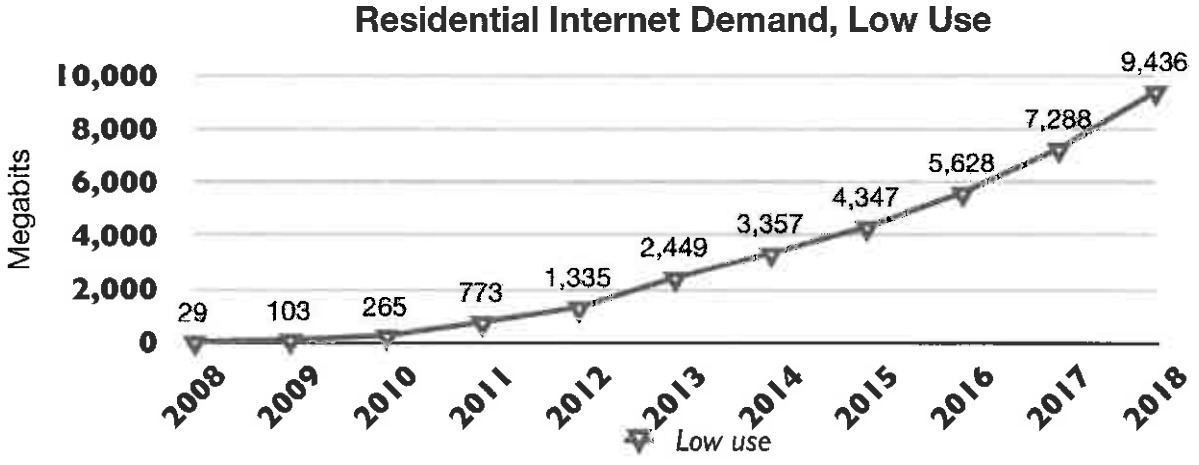


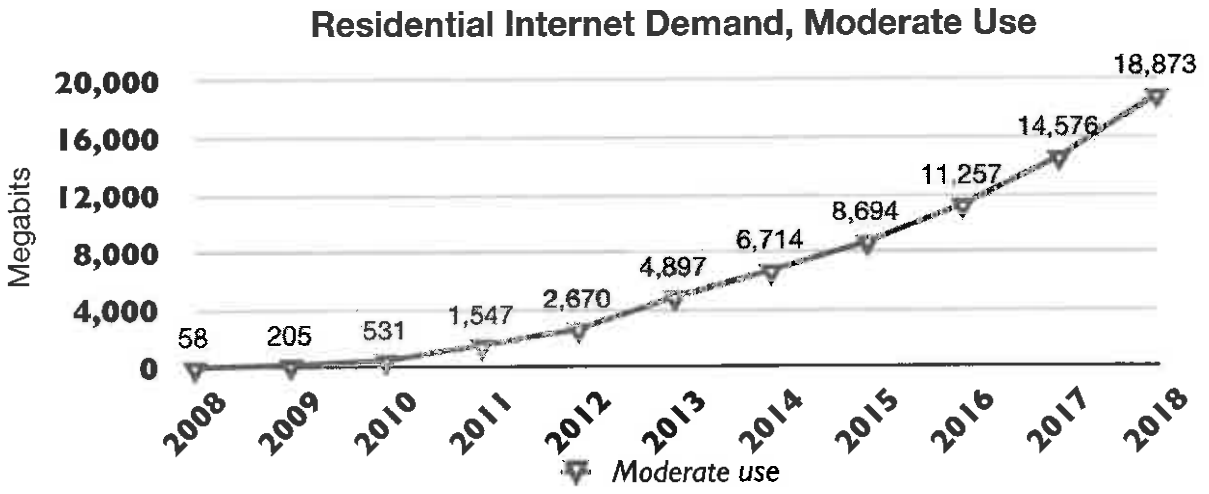
Madison County Residential Internet Demand

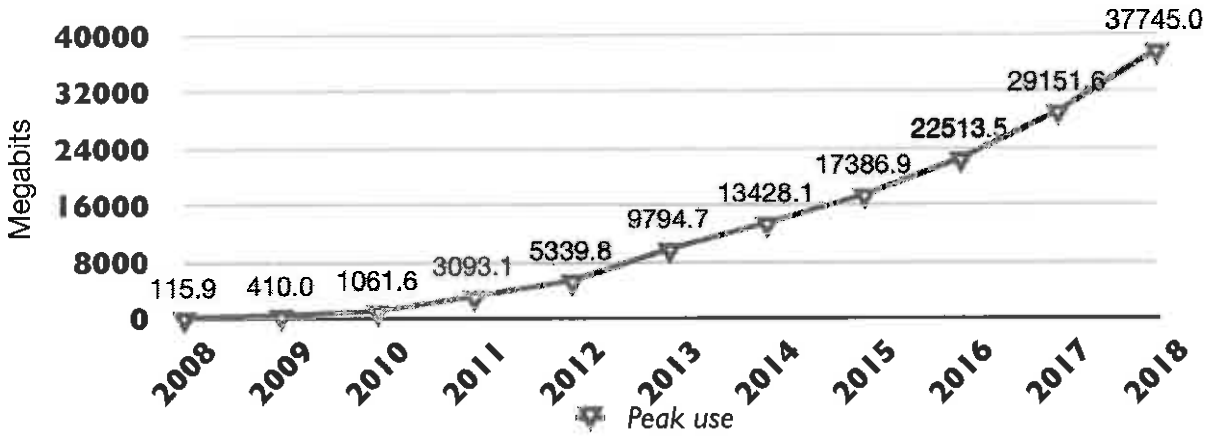
Residential Internet demand will be highly variable, based on time of day and type of service. Madison County residents will make wide use of many kinds of services, including:

- 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	5,453	5,884	6,349	6,851	7,392	7,976	8,606	9,286	10,020	10,812	11,666
Households with Internet (%)	66%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Households with Internet	3,594	5,296	5,714	6,166	6,653	7,178	7,745	8,357	9,018	9,731	10,499
Take rate	5%	10%	20%	45%	60%	85%	90%	90%	90%	90%	90%
Low use	29	103	265	773	1,335	2,449	3,357	4,347	5,628	7,288	9,436
Moderate use	58	205	531	1,547	2,670	4,897	6,714	8,694	11,257	14,576	18,873
Peak use	116	410	1,062	3,093	5,340	9,795	13,428	17,387	22,514	29,152	37,745




Residential Internet Demand, Moderate Use
Megabits
20,000
16,000
12,000
8,000
4,000
0
58
205
531
1,547
2,670
4,897
6,714
8,694
11,257
14,576
18,873
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Moderate use


Residential Internet Demand, Peak Use
Megabits
40000
32000
24000
16000
8000
0
115.9
410.0
1061.6
3093.1
5339.8
9794.7
13428.1
17386.9
22513.5
29151.6
37745.0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Peak use

Madison County Residential TV and Video Demand

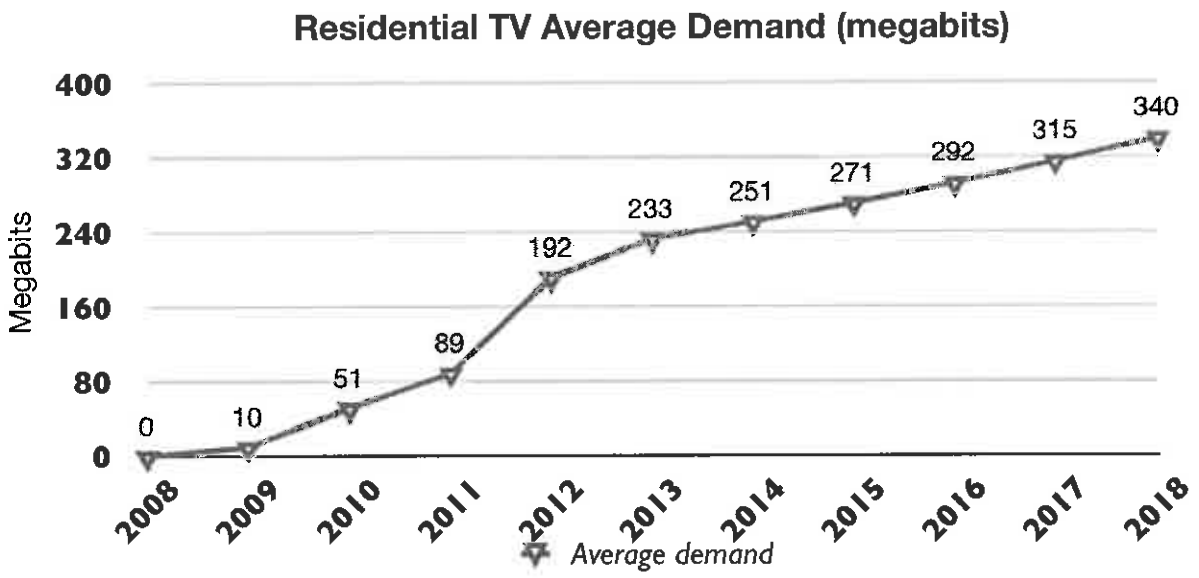
Distance learning from home with live video feeds will require high performance 2+ megabit connections in the near term (next 2-4 years), and over the next 4 to 7 years, there will be many distance learning courses that will incorporate live HD two way video feeds, enabling students to participate in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

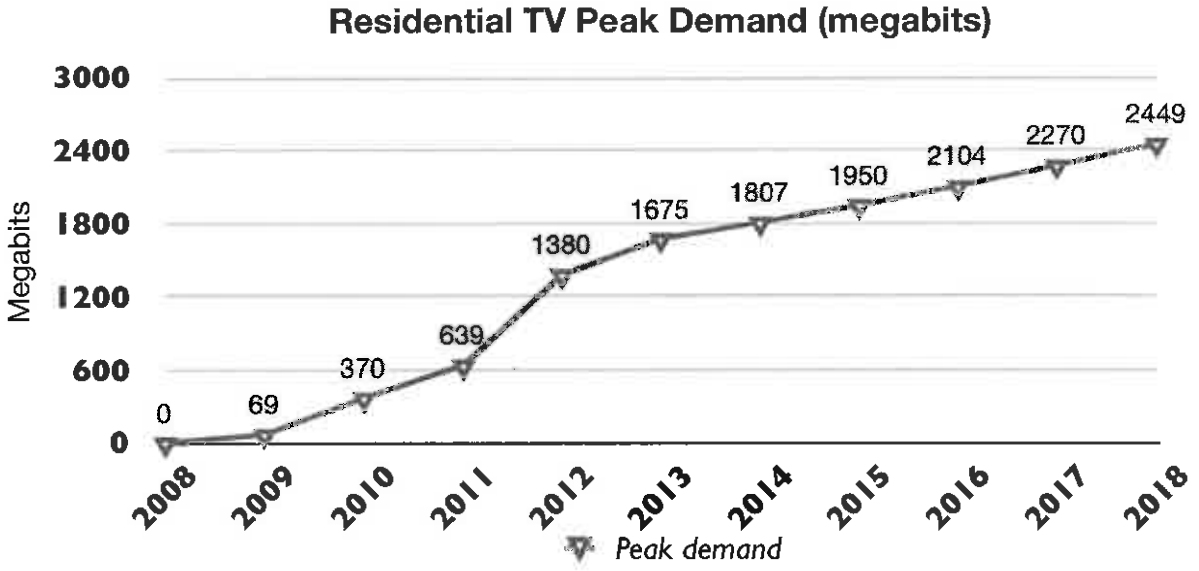
Entertainment will also drive bandwidth demand from the home, and the popularity of video sites like YouTube provide a good indication of the long term demand for video in many forms, including:

- 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 grand-children, family activities).
- Local video content streamed live or from a server (e.g. high school football games, other sporting events, County 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 Madison County 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	5,453	5,884	6,349	6,851	7,392	7,976	8,606	9,286	10,020	10,812	11,666
Households with TV	4,908	5,296	5,714	6,166	6,653	7,178	7,745	8,357	9,018	9,731	10,499
Take rate	0%	5%	25%	40%	80%	90%	90%	90%	90%	90%	90%
Average demand	0	10	51	89	192	233	251	271	292	315	340
Peak demand	0	69	370	639	1,380	1,675	1,807	1,950	2,104	2,270	2,449


Residential TV Average Demand (megabits)
Megabits
400
320
240
160
80
0
0
10
51
89
192
233
251
271
292
315
340
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Average demand


Residential TV Peak Demand (megabits)
Megabits
3000
2400
1800
1200
600
0
0
69
370
639
1380
1675
1807
1950
2104
2270
2449
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Peak demand

Madison County Business Survey

A total of 12 valid responses were received as of 3/12/2009. Not all responders answered every question.

Total # of employees

1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1000+
6	3	1	1	0	0	1	0	0

Total # of computer users

1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1000+
9	2	0	0	0	0	0	0	1

Type of organizational activities conducted at this facility

Govern-ment	Education (Primary & Secon-dary)	Business and Eco-nomic	Devel-opment	Non-profit	Medical (health care)	Higher Education	Internet Access Service Providers	Other
0	2	9	0	1	0	0	0	1

Does your organization have an Internet Connection?

100% of respondents have an Internet connection, which indicates that the Internet is an essential business service.

Yes	No
12	0
100%	0%

What type of connection does your organization have?

Dial-up	ISDN Line	DSL Line	Fiber	Cable Modem	T1 Line	Satellite	Don't Know	Other (Please Specify)
4	0	3	0	1	0	2	0	2

If your business does have a connection what is the cost?

$0-$20	$21 to $40	$41 to $60	$61 to $100	$101 to $150	$151 to $300	$301 to $500	$501 to $1000	$1001 to $5000	Greater than $5000
2	4	4	1	0	0	0	0	1	0

Internet Access Speed

Less than 56K	56K to 256 K	256 K to 512 K	512K to 765K	765K to 1 Mb	1 Mb to 1.5 Mb	1.5 to 3 Mb	3 to 5 Mb	5 to 10 Mb	10 to 25 Mb	25 to 50 Mb	50 to 100 Mb	100+Mb
3	1	1	1	1	0	1	0	1	0	1	1	0

How satisfied are you with the speed of your current service?

Not at all Satisfied	Somewhat Satisfied	Satisfied	Very Satisfied
4	3	4	1
33%	25%	33%	8%

Check all applicable uses of the Internet needed for your business now

12% of respondents are already using videoconferencing services, and 12% are using video streaming services--today. 42% are transferring large files, and 42% are teleworking from home at least some of the time.

Application	Response	Percentage
e-Mail	12	100%
Browsing/research	12	100%
Voice over IP	2	17%
Teleworking at home	5	42%
Banking	6	50%
Web site for marketing/advertising/information	10	83%
Placing orders	10	83%
Making payments	9	75%
Receiving orders/payments	5	42%
Customer/employee services	5	42%
Education/Training	7	58%
Audio streaming/audio on demand	4	33%
Video streaming/video on demand	3	25%
Videoconferencing	3	25%
Transfer large files	5	42%
Network storage/backup	2	17%
Communications between home office site and remote sites	7	58%
Monitor & control for security, alarms, health, processes, etc.	1	8%
Disaster Recovery/Avoidance	1	8%
Other	0	0%

12 of 12 people reponded to this question.

Check all applicable uses of the Internet needed for your business in the future

Videoconference services and video streaming services will see increases based on these responses. Video services require high capacity networks to provide adequate quality of service.

Application	Response	Percentage
e-Mail	11	92%
Browsing/research	11	92%
Voice over IP	7	58%
Teleworking at home	7	58%
Banking	9	75%
Web site for marketing/advertising/ information	10	83%
Placing orders	10	83%
Making payments	10	83%
Receiving orders/payments	9	75%
Customer/employee services	9	75%
Education/Training	10	83%
Audio streaming/audio on demand	6	50%
Video streaming/video on demand	7	58%
Videoconferencing	6	50%
Transfer large files	6	50%
Network storage/backup	5	42%
Communications between home office site and remote sites	9	75%
Monitor & control for security, alarms, health, processes, etc.	4	33%
Disaster Recovery/Avoidance	3	25%
Other	0	0%

12 of 12 people responded to this question.

Would you be willing to pay more for faster, higher quality Internet access?

83% of respondents indicated some willingness to pay more for faster Internet access, indicating that current services are viewed as inadequate (if the services were available, they would already be paying more).

Not at all willing	Somewhat willing	Very willing	Not sure
0	10	1	1
0%	83%	8%	8%

How important do you think Internet technology will be for the the success of your company over the next 5 years?

58% of respondents said that the Internet is "very important" to the success of their business over the next five years.

Not Important	Somewhat Important	Very Important
1	4	7
8%	33%	58%

How difficult is it to find personnel with the needed computer, software, and Internet skills from the local area?

68% of respondents indicated having some difficulty finding employees with the right technology skills. This indicates an urgent need for more technology-focused training at both the high school and community college level.

Very Difficult	Somewhat Difficult	Not Difficult
5	2	5
42%	17%	42%

How difficult is it to find and provide the appropriate training for employees in computer, software and Internet applications?

Very Difficult	Somewhat Difficult	Not Difficult
3	3	6
25%	25%	50%

If you need better, more affordable, services at your location, please indicate below

Telephone	Internet/data	TV
6	9	3
50%	75%	25%

Do you believe you organization would benefit from an affordable broadband connection?

Yes	No
10	2
83%	17%

Responses to 'What is affordable and at what speed?':

- Schools can always benefit from more affordable options.
- $30-$40 per month. 50MB
- $30-$40 per month. 50MB
- $100 a month, and speeds faster than 750k
- Main issues is bandwidth/speed. At present the available DSL or Satellite are asynchronous and top speed is about 756 down and 1500 up. Really wish we could have fiber optic service. Our needs for data could be satisfied in every respect, we could view video, and stream live audio while doing other work if this were available.

- Affordable? Less than Hughes Net and Wild Blue. Speed? I have never had faster than 52k. How can I judge?
- My budget is around $60.00 per month. Due to the economic situation, I am not willing to go higher than that. Would love to find something cheaper if available. We also use the internet to process our company credit card transactions.
- Don't know at this point.
- Don't know at this time.

Who is your dial-tone provider?

Verizon	VoIP	Other
12	0	0
100%	0%	0%

Who is your long-distance telephone service provider?

Verizon	AT&T	MCI	Sprint	Cell-phone Only	VOIP (Vonage, etc.)	Other
9	1	0	0	0	0	2
75%	8%	0%	0%	0%	0%	17%

Who is your Internet Service provider?

Verizon	Comcast	Virginia Broadband	Satellite	Other
3	2	0	1	6
25%	17%	0%	8%	50%

Who is your cable/satellite TV provider?

Comcast	Cox	DirecTV	Echostar	Other
4	0	2	0	3
44%	0%	22%	0%	33%

9 of 12 people responded to this question.

Responses to 'What other telecommunication needs do you have that were not covered in this survey?':

- None as of today.
- The ability to purchase Broadband,Phone and TV packages bundled together.
- Just speed. And availability in remote, mountainous locations.

If more affordable broadband allowed your business to add new jobs, will the jobs to be filled require no more than a HS degree and no special skills required for employment? (unless training will be available from the company/business):

Yes	No
6	5
55%	45%

Do you work from home?

____% of respondents are working full time from home, and a total of ____% of respondents do some work from home, indicating the need for business class services to residences on the shore.

I have a full-time home-based business	I work full-time from home for another company	I work only part time from home	I need nights and weekends access to my place of work	I never work from home.
6	1	1	4	0
50%	8%	8%	33%	0%

Madison County Residential Survey

A total of 95 responses from the following zip codes were received as of 3/10/2009.

Zip Code	# of Responses
22727	53
22715	7
22960	7
22709	6
22731	4
22735	4
22743	2
22738	2
22719	2
22723	2
22711	2
22701	1
22722	1
22730	1
22948	1

Total # of people in the household

1	2	3	4	5	6	7+
7	35	17	32	2	2	0

Total # of computer users

1	2	3	4	5	6	7+
13	43	16	19	2	1	1

Does your home have an Internet Connection?

95% of respondents indicated they have an Internet connection.

Yes	No
90	5
95%	5%

What type of connection does your home have?

53% of respondents are still on dial up, and the rest have some form of "little" broadband service.

Dial-up	DSL Line	Fiber	Cable Modem	Wireless	Satellite	Don't Know	Other
46	10	0	10	7	10	0	4
53%	11%	0%	11%	8%	11%	0%	5%

87 of 95 people responded to this question.

How much do you pay for Internet access each month?

No Internet	$10 to $20	$21 to $40	$41 to $60	$61 to $80	More than $80 per month
4	32	29	13	9	4
4%	35%	32%	14%	10%	4%

How important is Internet access to your or your household?

73% of respondents indicate that the Internet is very important. Only 1% indicated that it is un-important or have no opinion.

Very Important	Somewhat Important	Not Important	No Opinion
69	25	1	0
73%	26%	1%	0%

How satisfied are you with the speed of your current landline telephone service?

Not at all Satisfied	Somewhat Satisfied	Satisfied	Very Satisfied
32	28	22	12
34%	30%	23%	13%

How satisfied are you with the speed of your TV service (cable or satellite)?

Not at all Satisfied	Somewhat Satisfied	Satisfied	Very Satisfied
7	29	44	13
8%	31%	47%	14%

How satisfied are you with the speed of your Internet service?

71% of respondents are "somewhat" or "not at all" satisfied with their current service, indicating there is a market for alternative service providers.

Not at all Satisfied	Somewhat Satisfied	Satisfied	Very Satisfied
48	16	16	10
53%	18%	18%	11%

If you are still on dial up, (no broadband connection), why are you?

76% of dial up users are still on dial up, not by their choice, but because they can't get any other service option.

No broadband options in my area	Too expensive	Not interested	Lack of help/ support
39	12	0	0
76%	24%	0%	0%

Would you be willing to pay more for faster, higher quality Internet access?

76% of respondents would pay more for better broadband services.

Not at all willing	Somewhat willing	Very willing	Not sure
6	36	22	12
8%	47%	29%	16%

76 of 95 people responded to this question.

Check all items you use the Internet for now

Note that 35% of respondents are already using the Internet to view video, and 6% are using the Internet for videoconferencing.

Application	Response	Percentage
E-mail	92	99%
Teleworking at home	31	33%
Homework	42	45%
News and current events	74	80%
Video streaming/video on demand	29	31%
Backup files, pictures, music	47	51%
Browsing / Research	86	92%
Banking	60	65%
Downloading music	40	43%
Podcasts	9	10%
Videoconferencing with family, friends in other places	6	6%
Connect to office or business network	38	41%
Voice over IP telephone (VoIP)	1	1%
Watching video (like YouTube)	33	35%
Downloading movies	5	5%
Audio streaming/audio on demand	14	15%
Other	0	0%

Check all items you use in the future

Application	Response	Percentage
E-mail	79	90%
Teleworking at home	39	44%
Homework	36	41%
News and current events	68	77%
Video streaming/video on demand	41	47%
Backup files, pictures, music	62	70%
Browsing / Research	73	83%
Banking	62	70%
Downloading music	54	61%
Podcasts	24	27%
Videoconferencing with family, friends in other places	34	39%
Connect to office or business network	48	55%
Voice over IP telephone (VoIP)	19	22%
Watching video (like YouTube)	48	55%
Downloading movies	39	44%
Audio streaming/audio on demand	27	31%
Other	0	0%

Does anyone in your household use the Internet to complete school assignments or job training course work?

42% of respondents are using the Internet weekly for school or job training, and a total of 62% are using at least once a month--more than two-thirds of all survey respondents. This is a very high percentage, and suggests that broadband access is important to workforce development and training.

Yes, several times a week	Yes, at least once a week	Yes, at least once a month	No
25	15	19	36
26%	16%	20%	38%

How difficult is it to find help and training for things you would like to do on the computer or on the Internet?

Very Difficult	Somewhat Difficult	Not Difficult
6	38	51
6%	40%	54%

If you need better, more affordable, services at your location, please indicate below

More than 87% of respondents want more choice in Internet services.

Telephone	Internet/data	TV
38	69	47
48%	87%	59%

For your household, how much do you spend each month for local and long distance telephone, TV, and Internet?

63% of respondents are spending more than $100 per month on telecommunications services (not including cellphone services).

$50 or less	$50 to $75	$75 to $100	$100 to $150	$150 to $200	More than $200 per month
3	4	19	35	24	9
3%	4%	20%	37%	26%	10%

Who is your Internet Service provider?

Verizon	Comcast	Virginia Broadband	Satellite	Other
15	15	6	9	45
17%	17%	7%	10%	50%

Who is your cable/satellite TV provider?

Comcast	Cox	DirecTV	EchoStar	Other
26	0	32	2	29
29%	0%	36%	2%	33%

Who is your local dial-tone provider?

Verizon	VoIP	Other
88	0	3
97%	0%	3%

Who is your long-distance telephone service provider?

Verizon	AT&T	MCI	Sprint	Cellphone only	VoIP	Other
56	12	1	0	12	0	11
61%	13%	1%	0%	13%	0%	12%

Responses to 'What other telecommunication needs do you have that were not covered in this survey?':

- My life-style is fairly simiple, and I can think of none at this time.
- I want a "work at home" job and can't even be considered because we only have dial up. Also our local dish network company is absolutely horrible. We have had them out at least 5 times to correct the installation problems. I am about to be a first time grandma and my son and his wife live in California. I want to see my grandbaby live so please hurry. Their due date is 1-7-09!
- tv,broadband and phone under one bill
- Main issue is internet connectivity. We are deep in the mountains, so VABB which is a viable alternative, is not possible. We may be a tough case, but if fiber optic were available where ever phone lines are, then all would be well.
- Ability to have cell phone coverage at home in Criglersville.....
- Dish Network
- Virginia broadband has been promising me service for over two years now. They still don't meet the needs of our community. I live less than a half mile from a major road and am not in a valley at all. I hope that the frequencies opened up by digitalizing tv broadcast will mean I'll get service at some point. Hughes net does not meet my requirements as the uploads speed to not work for gaming online. I also fall between the cracks as my cell phone provider does not offer a signal at my house. Hope you all get it right soon. I'm less than five miles from the Town of Orange. Not exactly a rural address.
- Cell phone service
- There is no cable TV available here..... have an antennae, limited reception. Land line is unreliable..... Earthlink dial up is much too slow.....
- Just to clarify - we do not have internet at home, REALLY...I have a Blackberry and I can use it at home for internet if needed. I also have (in summer months, when I'm off work) paid the extra fee to Alltel to use my phone as an uplink to satellite internet. My alltel bill is $30 more a month when I enable that feature, so I suppose that means we can get high speed satellite for that much a month.
- None
- I would love for all services (cable, phone, internet to be under one bill.
- CELL PHONE

- None-We do not have cable or satellite TV because we do not watch or own a TV. We would very much like high speed internet via VABB or cable/DSL.
- none!!
- none
- We need Broadband internet access -- not available here without satellite and it would be seperate from our Dish Network Satellite service. We would use TV (local and national) and broadband internet plus local and long distance telephone as well as CapTel and emergency Cell Phone service for two people.
- Local Channels provided on Directv
- BROADND, BROADBAND, BROADBAND!!!! Reliable broadband internet connectivity would enable me to work more effectively at home - in particular video and other conferencing (netmeeting) and instant messaging. I would very likely discontinue my land-line phone service in favor or VOIP. I would be able to listen to streaming audio and watch streaming video - such as YouTube. Broadband would be a tremendous boon for research into sites such as WebMD. It would make access to online services from government (i.e. on-line tax preparation) or other sources, such as banks. It is the single most significant improvement in infrastructure that can be made in the county today.
- Cell Phone Service. My cell phone gets no bars at my house.
- Virginia Broadband has services in my area, my next door neighbor has excellent service, however at our house the connection is not sufficient to support Broadband. My neighbor directly across the street and around the corner from my house has COMCAST, however they will not run the service to my house since I'm at the end of the line on both Beautiful Run Road and Good Hope Church Road. There is no cable commission in madision County to require cable companies to provide service to all residents. I have spent hours on the phone requesting site surveys, offered to pay for the line to be run to my house with no success. Va Broadband at least truly attempted to provide the service, even though in the end the signal was not strong enough to support the service. I have the opportunity to work at home full time, but due to poor internet service I have to go to my office several times a week. Fortunately my neighbor allows me to use their Va Broadband connection as necessary, but I prefer service at my home. We have direct TV, but their high speed does not work with my VPN connection and will not interface with my network. A recent cell tower has been constructed down the street from on on Beautiful Run Road and I hope that VA Broadband can have service on the tower and hopefully will be able to get VA Broadband service. Thanks for the opportunity to respond. I actually had to wait until I was in my office to respond to this survey, dail up, timed out at home. Annette Willis 540 672-2004. I will be happy to do anything I can to support improved services throughout the county.

Does your employer use a VPN (Virtual Private Network) to allow remote access to the corporate network?

30% of respondents already work for companies using VPNs for remote access to company networks. VPN connections typically need higher bandwidth to support access to company data and services. Another way of looking at this figure is that 30% of homes may already need work from home broadband services.

Yes	No	Don't know
27	20	44
30%	22%	48%

Do you work from home?

33% of respondents work from home part time or full time, and 8% of respondents are already working from home full time, indicating the changing nature of neighborhoods and the importance of residential broadband to support businesses and jobs.

I have a full-time home-based business	I work full-time from home for another company	I work only part time from home	I need nights and weekends access to my place of work	I never work from home.
5	3	23	31	29
5%	3%	25%	34%	32%