

Moving Forward at the Speed of Light: Fiber Infrastructure for the 21st Century

Volume II:
Needs Assessment
Business Survey
Residential Survey



Prepared for the
Roanoke Valley Region

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Overview

Introduction

Over the next thirty years, the businesses, residents, and institutions of the Roanoke Valley will spend about \$6.3 billion 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 reach twelve billion. Currently, there exists a substantial opportunity to capture more of these funds and direct them towards greater job creation and business opportunities for the region.

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 three years) will exceed 50 megabits.

A random telephone survey of 400 residents and businesses in the City of Roanoke and Roanoke County was conducted by Osborne Associates to determine market demand for broadband.

- *64% of residents have at least one computer in their home with Internet access, slightly lower than the national average (68%).*
- *70% of residents indicated that they are interested in more features for their phones, Internet, and television services.*
- *26% of residents answered that they have a slower type of Internet (Less than 3Mbps).*
- *85% of business respondents have Internet access.*
- *49% of business respondents have access to broadband Internet.*
- *100% of business respondents indicated that they would want additional services for phone, Internet, and television.*

The Roanoke Valley's community livelihood 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 town 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 areas of the Roanoke Valley 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.

The four localities in the Roanoke Valley covered in this report can take advantage of the emerging business and residential growth in the counties, while also taking steps to improve the competitive advantages of the cities. This can only be accomplished if the region has the right telecommunications infrastructure that will support the needs of existing businesses and also attract new businesses.

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 means ***providers make 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 most other businesses. 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.

Recent analysis indicates that rural areas are five times more likely to have slower connection speeds compared to urban areas, three times more likely compared to small cities, and twice as likely when compared to towns. Usage figures show that the top 1 percent of broadband connections are responsible for 20 percent of the internet traffic and the top 10 percent consume 60 percent of the bandwidth. This disparity in usage is indicative of an infrastructure model that has failed to create a fair playing field.

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 of an impact. However, it is clear that broadband investments are critical for economic viability.

- In 2008, U.S. industries invested over \$455 billion dollars in ICT investment, including over \$60 billion in broadband.
- A 2011 report from the McKinsey Global Institute studied the Internet's growing impact on the economy. The report found that the Internet accounted for 21% of GDP growth in the last five years for mature countries, and this number is only expected to climb higher.
- \$8 trillion dollars is exchanged through *e-commerce* annually.

The financial analysis below demonstrates 30 year expenditures for routine and normal telecom services for businesses, residents, schools, and institutions for the Roanoke Valley region. These numbers are based on the combined data for Botetourt, Roanoke Co, the City of Roanoke, and the City of Salem. Over the next three decades, about \$6.3 billion 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.

Roanoke Valley 30 Year Telecom Expenditure Analysis			
	Households still on dial-up	Households with "little" broadband cable modem/DSL/wireless	Households with no Internet
Total households	104,387		
Total businesses	11,389		
Percentage of households	6%	80%	14%
Number of households	6,263	83,510	14,614
Average monthly telecom expenditures	Local phone: \$25 Long distance: \$25 Cable/satellite TV: \$55 Dial up Internet: \$20	Local phone: \$25 Long distance: \$25 Cable/satellite TV: \$65 Broadband Internet: \$40	Local phone: \$25 Long distance: \$25 Cable/satellite TV: \$55
Annual telecom cost/household	\$1,500	\$1,860	\$1,260
30 year telecom expenditure	\$281,844,900	\$4,659,835,680	\$552,416,004
Total residential expenditures	\$5,494,096,584		

Roanoke Valley 30 Year Telecom Expenditure Analysis	
Total telecom expenditures ¹	\$6,318,211,072

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

Source: Mediamark Research, Inc. *Includes figures for Botetourt County.

Community investments in infrastructure will accelerate the availability of broadband options within the community, especially in the business and retail sector. It is important to note that the government entities 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 network for the use of the infrastructure.

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 the Roanoke Valley 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 light path 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.

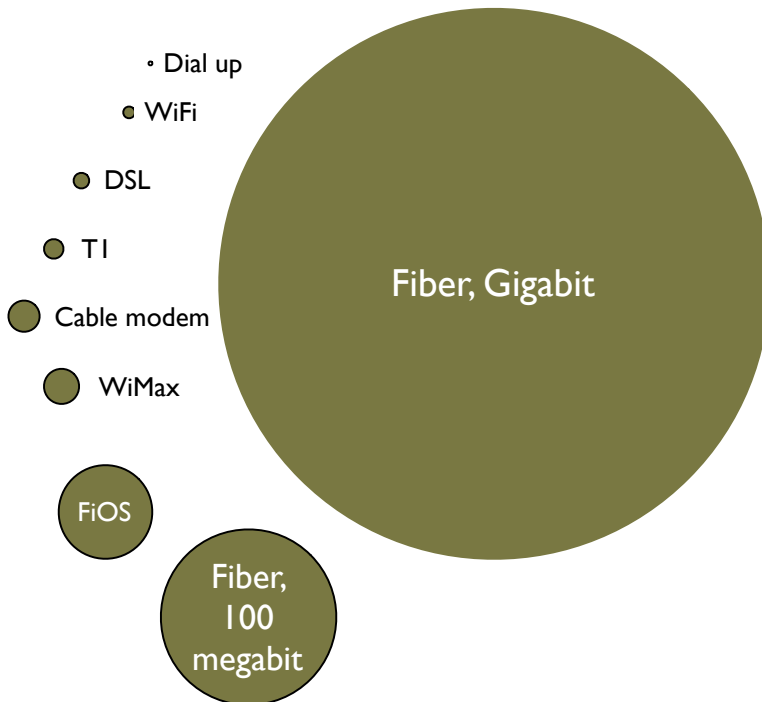
From a report by the Information Technology and Innovation Foundation (March, 2009), listed below are the bandwidth requirements for services already commonly in use and for emerging services like telepresence business videoconferencing.

Application/Service	Upstream Bandwidth Requirement	Downstream Bandwidth Requirement
Medium resolution videoconferencing	1.2 megabits	1.2 megabits
Streaming video (720p)		1.2 megabits
Standard definition TV		4 megabits
Basic HD videoconferencing (720p)	1.2 to 4 megabits	1.2 to 4 megabits
Telepresence high resolution HD videoconferencing	5 megabits	5 megabits
Video home security service	10 megabits	
HD digital television (1080p)		15 megabits
Telepresence very high resolution HD videoconferencing (1080p)	15 megabits	15 megabits

Note that the business videoconferencing services all require symmetric bandwidth. This is a critically important issue, as current incumbent “little broadband” services like DSL and cable modem systems do not offer symmetric bandwidth (where the upstream and downstream bandwidth is equal). Using this information we can project what Roanoke Valley homes and businesses will need in the coming years.

	Next 2-4 years	Next decade	Twenty years
Small business needs (1-9 employees)	10-25 megabits of symmetric bandwidth and 5-10 megabits of Internet access	100 megabits of symmetric bandwidth and 20-40 megabits of Internet access	Gigabit+ symmetric bandwidth and 50 to 100 megabits of Internet access

	Next 2-4 years	Next decade	Twenty years
Medium-sized business needs (10-100 employees)	50-100 megabits of symmetric bandwidth and 10-20 megabits of Internet access	Gigabit symmetric bandwidth and 50 to 100 megabits of Internet access	Multiple gigabit symmetric circuits and lightpaths and 100+ megabits of Internet access
Large business needs (100-1000+ employees)	Gigabit+ symmetric bandwidth and 100+ megabits of Internet access	Multiple gigabit symmetric connections and 250 to 500 megabits of Internet access	Multiple gigabit symmetric circuits and lightpaths and 1 Gigabit+ of Internet access
Residential needs	25-50 megabits of symmetric bandwidth and 4-8 megabits of Internet access	100 megabits of symmetric bandwidth and 20-30 megabits of Internet access	A Gigabit symmetric circuit and/or lightpaths, with 50 to 100 megabits of Internet access



Use Trends and Service Needs Analysis

Mark Peterson, a Professor of Community and Economic Development at the University of Arkansas who studies the impact of broadband access and affordability on rural communities, wrote recently, “Broadband connectivity is not the infrastructure of the future, it is the infrastructure of the present.” The Roanoke Valley faces a challenge in economic development infrastructure with primarily “little broadband” (i.e. DSL, wireless, and cable services) when many communities, regions, and countries have already made the decision to focus resources on the development of “big broadband,” which is typically fiber with a minimum capacity of 100 megabits or gigabit to the premises.

- A third of IBM employees work from home at least part time, and the company has reported annual savings of \$110 million.

- Australia’s government is converting the entire telecommunications infrastructure for the country to an open access system by buying a major portion of Telstra assets. Telstra, which is currently the country’s primary incumbent telecom provider, will become a service provider on the new open network.
- South Korea will provide almost universal coverage through a network offering speeds of 1 gigabit/second
- As of 2010, there were 57 municipal-owned networks that served 3.4 percent of fiber to the home subscribers in the U.S.
- Nearby community networks in Galax, Danville, and Bristol are offering 100 megabit and Gigabit services already.
- The Rockbridge Area Network Authority expects to offer Gigabit to the home in the stimulus-funded network that is underway. The first connections to businesses, schools, and local government will be active in the third quarter of 2012.
- Recently, a large school district was able to increase its network connection speeds from 1.5 megabits/second to 35 megabits/second, while simultaneously reducing operating and service costs by over 50%.
- Broadband networks also allow for smart metering and efficient utility provisioning. A community in Appalachia saved \$2 million in reduced water and sewer overflow fines by using their broadband network to make use of real-time sensors and asset monitors.
- Fiber to the premise attracts home buyers, who are willing to pay \$2000 to \$4600 more for a house with fiber service.
- Homes connected to broadband fiber have an 8.6 percent higher asking price and a 4.5 percent higher appraisal value than comparable homes without a fiber connection.
- More than 13% of homes in the U.S. had been passed by fiber by mid 2009.
- Nationally, less than 10% of homes have no access to any kind of broadband service, but in the region, more than 16% of homes still have no broadband access, or 50% higher than the national average.
- Fiber to the home users say they are able to work from home more often, averaging 7.3 workdays per month, reducing their carbon footprint and decreasing wear and tear (and maintenance) on roads.
- Converting 14% of regular jobs into telecommuting jobs would eliminate an estimated 136 billion vehicle travel miles and reduce CO₂ emissions by 55 million tons.

In its March, 2009 report, the ITIF (Information Technology & Innovation Foundation) listed some of the next generation services and applications enabled by high performance, affordable broadband. The table below lists these and other services that all represent broadband-enabled applications and services that must be available in the Roanoke Valley if the region is to remain economically viable.

Residential and Business	Videoconferencing
	IP TV (Internet Protocol TV)
	HD streaming video
	Ultra hi-def (BluRay) video streaming
	Video on demand (e.g. Netflix)
	Place-shifted video
	Cloud computing services
	Online and cloud-based gaming
	Smart homes, buildings, and appliances, including smart electric meters, AMR (automated meter reading), and AMI (advanced metering infrastructure)
	Remote computer aided design (CAD)
	Work from home jobs
	Business from home

	3D graphic rendering and CGI server farms
	Remote network management and managed services
	Virtual collaboration spaces (e.g. enhanced GoToMeeting, Webex style services)
Public Safety	Intelligent transportation applications (smart road systems)
	Public safety and first responder networks
	Emergency dispatch and coordination
	Webcast agency meetings (e.g. virtual meetings)
	Online training for first responders, fire, and rescue
Society	Broadcast of local sports events
	Videoconferencing of community and town hall meetings for wider participation
	Wider availability of nonprofit and community organization services
Health Care	Teleconsultations
	Telepathology
	Telesurgery
	Remote patient monitoring
	Remote diagnosis
	Remote medical imaging
	Grid computing for medical research
Education and Research	Distance education
	Virtual classrooms
	Remote instrumentation
	Multi-campus collaboration
	Digital content repositories and distribution (digital libraries)
	Data visualization
	Virtual laboratories
	Grid computing for academic research

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

- Demand for bandwidth has been doubling every two years for the last ten years.
- By 2015 (just three 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. This has been a huge driver of bandwidth demand
- The size and resolution of digital device screens is another reason for bandwidth demand increases. The surface area of all digital screens increased 43 percent from 2000 to 2008 and will increase 64 percent more by 2013.

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

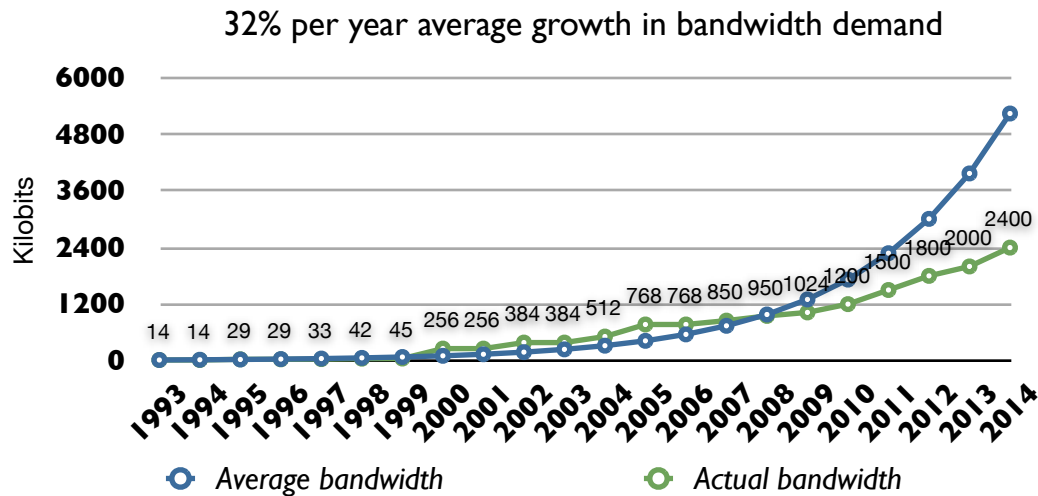
- This means that current DSL, wireless, and cable modem services are completely inadequate for future needs. Current DSL offerings are in the range of 384 kilobits to 768 kilobits for most residential users, 768 kilobits to 1.5 megabits for business DSL users, and there are severe distance limitations 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.
- Verizon recently upgraded their coverage in some parts of the Roanoke Valley to the new 4G LTE technology. Customers with 4G phones will experience significant decreases in their connection speeds over the next year as more and more people switch to 4G phones and begin sharing the network.
- A smartphone demands as much bandwidth as 30 regular cell phones, and one laptop or tablet device can use as much bandwidth as 450 regular cell phones.
- 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 leaders in the Roanoke Valley is to ensure that the region 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 for-

mats, 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.

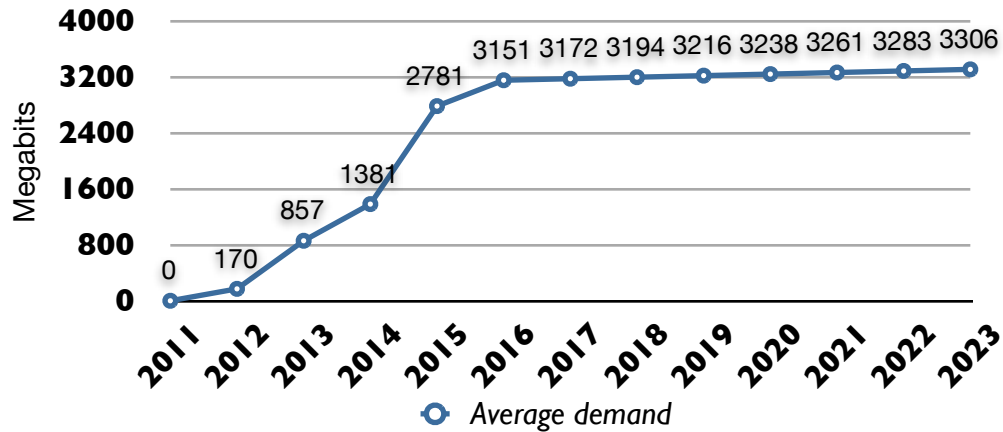


The table below presents the estimated Internet connection type for residents in the Roanoke Valley. Roanoke’s demand is above average because it has a higher share than normal of residents that have some form of high-speed connection.

Internet Connection Type	Total	Percentage	Index
Any Broadband or High speed Connection	125,099	65.12%	100
Cable Modem	57,395	29.88%	101
DSL Connection	46,587	24.25%	100
Dial-up modem	10,907	5.68%	105
Not sure/Don't know	4,258	2.22%	89
Wireless Connection from a computer or laptop (e.g. Wi-Fi, wireless router, etc.)	29,725	15.47%	96

As has been mentioned earlier, the increase in TV and Video usage is one of the largest drivers of bandwidth usage. The demand for video will continue to increase, and by 2013, it is expected to account for over 60% of all internet traffic. This increase in bandwidth is reflected in the graph below, which estimates the growth in average residential demand in the Roanoke Valley for the next 20 years.

Residential TV Average Demand (megabits)



Distance learning, entertainment, and video conferencing are three major applications of internet video. Distance learning from home with live video feeds will require high performance 2+ megabit connections in the near term (next 2-4 years), and over the next 4 to 7 years, there will be many distance learning courses that will incorporate live HD two-way video feeds, enabling students to participate in classroom discussions at a much higher quality level. Distance learning could be an important home-based application for workforce training and retraining. Some Virginia community colleges offer “hybrid courses” where a student attends several class sessions at the college and the remaining sessions online from their home, the library, or another location.

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

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

Most homes in the Roanoke Valley have multiple channels, 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.

Another source of increased demand, alluded to above, is multi-tasking. Surfing the Web while watching TV is becoming commonplace. With the proliferation of smart-phones, tablets, and laptop computers, the amount of potential users is also increasing. The chart below presents the Internet use frequency for residents in the Roanoke Valley. More than 75 percent of residents access the internet at least once a day and more than a third access the Internet at least five times a day.

Internet Use Frequency	Total	Percentage
Internet - Times looked at/used: 1-2 times a week	11,850	8.68%
Internet - Times looked at/used: 3-6 times a week	18,733	13.72%
Internet - Times looked at/used: Once a day	24,075	17.63%
Internet - Times looked at/used: 2-4 times per day	35,798	26.21%
Internet - Times looked at/used: 5 or more times per day	46,100	33.76%

While bandwidth demands have steadily increased, the supply of adequate bandwidth has struggled to keep up. The result of this has been a mixed record of service and performance. The copper cable and wireless technologies are having a difficult time meeting current demand, and it will likely be technically impossible for them to meet future demand in the not-so-distant future. As a result:

- Most consumers receive well below the advertised speeds they are purchasing. Providers are forced to limit speeds or compress data during periods of high demand.
- Bandwidth during the evening may only be 30 percent of advertised peak speeds.
- Content providers have resorted to compressing the signal as a way to reduce data size. This results in a lower quality video signal that may appear distorted or blurry, if it comes through at all.

Service Bandwidth Needs for the Next 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 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.

Broadband at Home Penetration Rate

The table 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

Adoption Time	Years to reach 50% use
VCR	14
Cell phone	15
Color Television	18
Personal computer	18

Source: Pew/Internet Measuring Broadband Report, 2007

Service and Gap Analysis

Business Bandwidth Needs

The next table shows bandwidth consumption for several types of businesses and a projection of the bandwidth needed 5 and 10 years out. The cost of fuel is already affecting 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.

Description	Large Business		Small Business		Home Based Worker		Business From Home	
	Concurrent Use	Mbps	Concurrent Use	Mbps	Concurrent Use	Mbps	Concurrent Use	Mbps
Telephone	20	1.28	5	0.32	1	0.064	1	0.064
TV		0		0		0		0
HDTV		0		0		0		0
Credit Card Validation	4	4	1	1		0		0
Security System	1	0.25	1	0.25	1	0.25	1	0.25
Internet	20	30	7	10.5	1	1.5	1	1.5
VPN Connection	5	25		0	1	5		0
Data Backup	5	7.5	1	1.5	1	1.5	1	1.5
Web Hosting	1	2		0		0		0
Telehealth (provider)		0		0		0		0
Workforce Training (online classes)	2	20	1	10		0	1	10
HD Videoconferencing	10	140	2	28	1	14		0
Totals		230.0		51.6		22.3		13.3
5 years from now (megabits)	690		155		67		40	
10 years from now (megabits)	2070		464		201		120	

Residential Bandwidth Needs

The table below depicts the bandwidth needed for typical residential services which are available now or 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.

The table below is designed to show bandwidth consumption in several scenarios. Network design requires a system that 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 the Roanoke Valley and projected future demand.

Description	Residential Day-time		Early Evening		Evening and Late Night		Snow Day	
	Concurrent Use	Mbps	Concurrent Use	Mbps	Concurrent Use	Mbps	Concurrent Use	Mbps
Telephone	1	0.064	1	0.064	1	0.064	1	0.064
TV	1	2.5	1	2.5	1	2.5	1	2.5
HDTV		0		0	1	8		0
Security System	1	0.25	1	0.25	1	0.25	1	0.25
Internet	1	1.5	1	1.5	2	3	3	4.5
Online Gaming		0		0		0		0
VPN Connection		0		0		0	1	5
Data Backup		0	1	1.5		0	1	1.5
Telehealth (subscriber)		0		0		0		0
Distance Learning / Workforce Training		0	1	10	1	10	2	20
HD Videoconferencing		0		0		0	1	14
Totals		4.3		15.8		23.8		47.8
5 years from now (megabits)	13		47		71		143	
10 years from now (megabits)	39		142		214		430	

Demographic Analysis

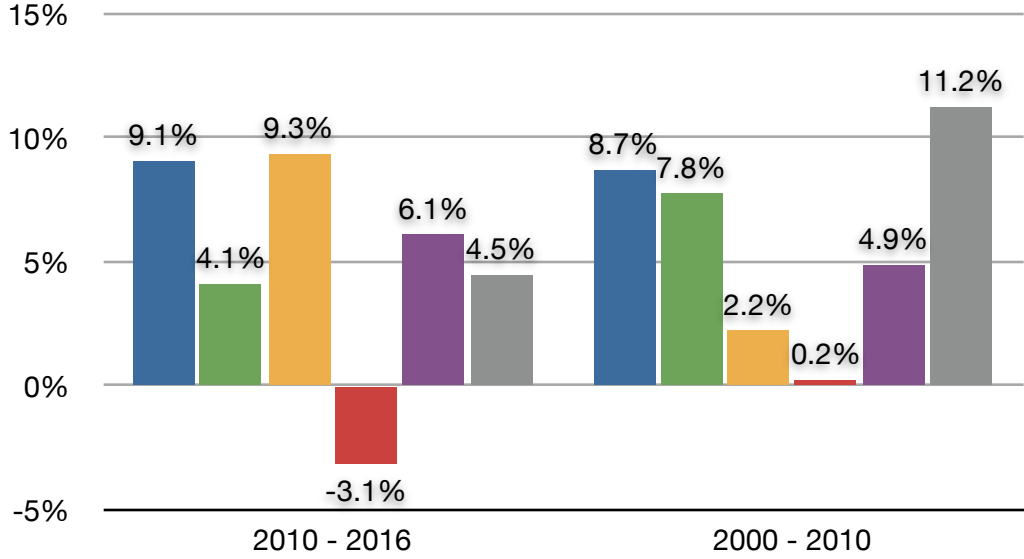
Population of the region

In the last decade, the region experienced modest growth compared to the state average. Considering that much of the state’s growth has taken place in northern Virginia, the growth rate for this area is an indication of regional strength. However, the pace of growth between the two counties and cities was very different. Growth in the counties has been strong while the cities have struggled to add residents. Over the next several years, the region is expected to grow at a faster pace. Strong growth in the counties and increased growth in the City of Roanoke is expected to offset the population loss in Salem. For Salem to counter this negative trend, and for the region as a whole to increase its attractiveness, improved and more affordable broadband services will play a key role in supporting work-from-home jobs and new business and entrepreneurial activities.

Year	Botetourt County		Roanoke County		City of Roanoke		City of Salem		Region		Virginia	
	Pop.	% Change	Pop.	% Change	Pop.	% Change	Pop.	% Change	Pop.	% Change	Pop.	% Change
2016	36,153	9.1%	96,182	4.1%	106,093	9.3%	24,026	-3.1%	262,454	6.1%	8,226,501	4.5%
2010	33,148	8.7%	92,376	7.8%	97,032	2.2%	24,802	0.2%	247,358	4.9%	7,874,646	11.2%
2000	30,496	22%	85,726	8.1%	94,911	-1.6%	24,747	4.2%	235,880	5.1%	7,078,515	14.4%
1990	24,992		79,337		96,406		23,760		224,495		6,187,391	

Source US Bureau of Census 1990, 2000 and 2010 Decennial Census SFI DP-1
 * US Census Bureau Population Estimates Program
 * Weldon Cooper Center for Public Service, UVA

Population Change



■ Botetourt, Co
 ■ Roanoke, Co
 ■ City of Roanoke
 ■ City of Salem
 ■ Region
■ Virginia

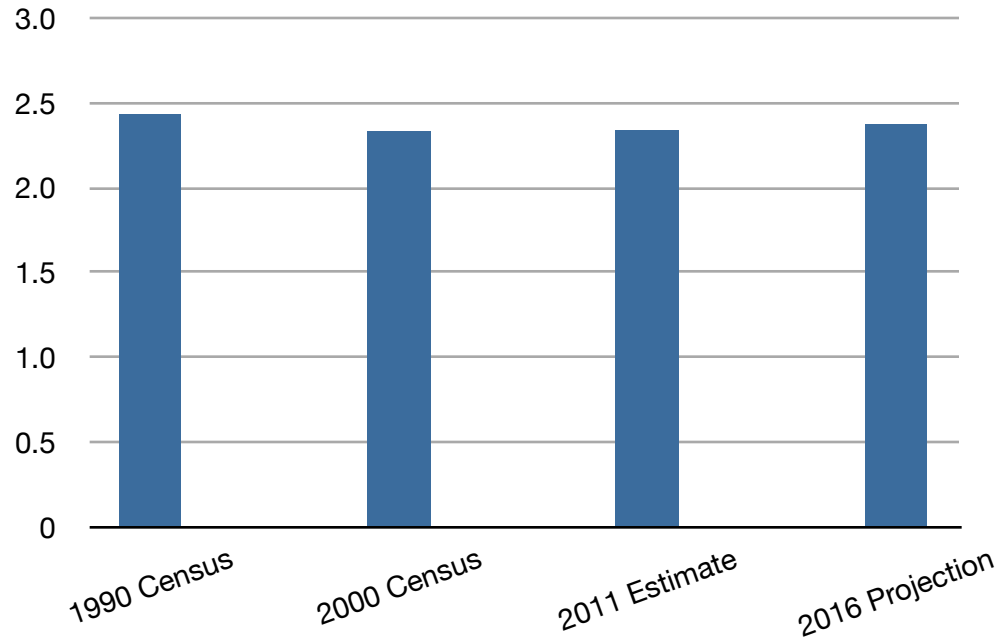
Household Size and Growth Trends

The number of households in the Roanoke Valley is expected to rise in the next five years, while the number of persons living in the average household will remain close to the same. The size of an average household and the number of households are important data indicators 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.

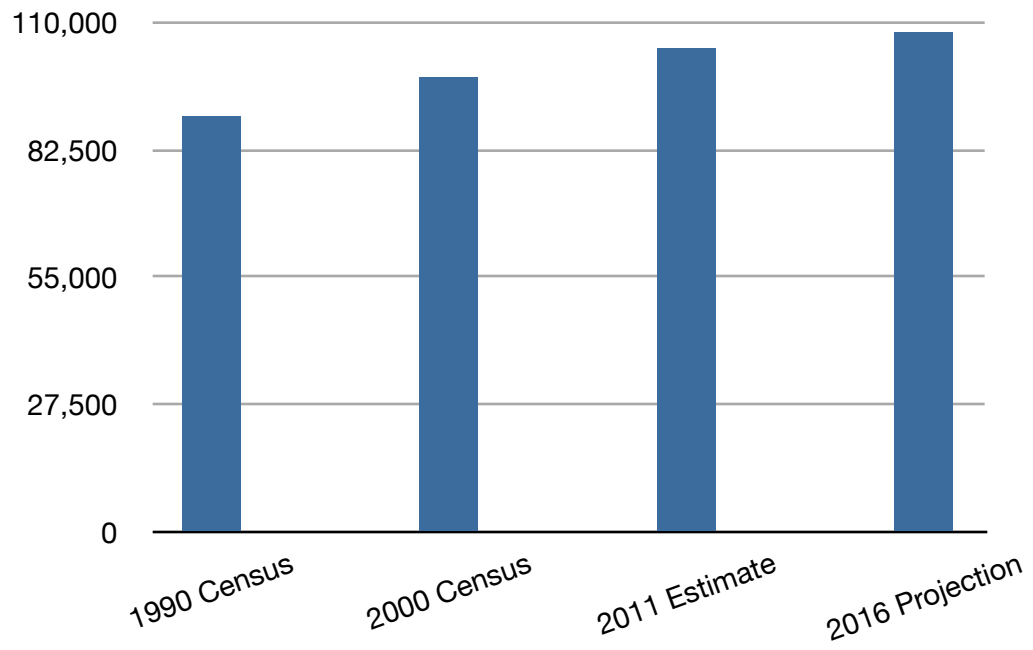
When calculating infrastructure investment costs, household statistics are also important because duct and fiber connections are made to the household (premise). Projected steady growth in households suggests that the region will see steady demand for connections (as opposed to a situation where the number of households is shrinking). The table below shows housing projections using census data.

	1990 Census		2000 Census		2011 Estimate		2016 Projection		2000 to 2011	2011 to 2016
Total Households	89,699		98,322		104,387		108,037		9.6%	3.5%
Size of Household:										
1 Person	23,758	26.5%	28,934	29.4%	34,362	32.9%	37,357	34.6%	21.7%	8.7%
2 Person	31,089	34.7%	35,152	35.8%	33,170	31.8%	31,356	29.0%	13.1%	-5.5%
3 Person	16,520	18.4%	16,246	16.5%	15,295	14.7%	14,595	13.5%	-1.8%	-4.6%
4 Person	12,295	13.7%	11,943	12.2%	14,350	13.8%	16,474	15.3%	-2.7%	14.8%
5 Person	4,180	4.7%	4,275	4.4%	4,999	4.8%	5,728	5.3%	0.5%	14.6%
6 Person	1,260	1.4%	1,221	1.2%	1,492	1.4%	1,701	1.6%	-1.0%	14.0%
7 + Person	597	0.7%	552	0.6%	722	0.7%	832	0.8%	-7.5%	15.2%
Average Household Size	2.4		2.3		2.3		2.4		-4.1%	1.4%

Average Household Size



Growth in Households



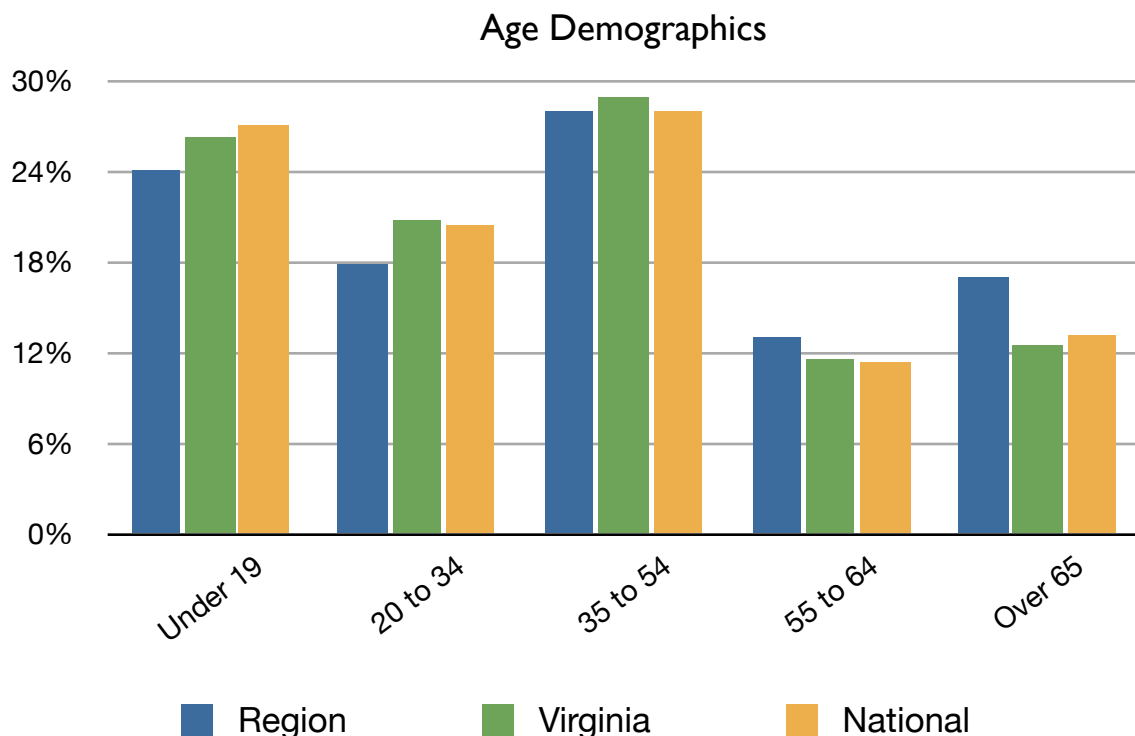
Age Distribution

The Roanoke Valley’s population is older than the the state and national averages. Different age groups use the Internet differently, and only high speed broadband can cater to the needs of each. Younger generations are often avid consumers of online video and most working-aged people will benefit greatly from a high speed connection to their home. At the same time, an ongoing awareness and education effort is often needed to help older people make good use of technology.

During our work in other areas, local real estate agents consistently report that many home buyers will NOT look at homes that do not have broadband connections, especially younger, first time home buyers. So broadband availability (or the lack of it) is changing where people choose to live.

Population	Region	Virginia	National
Under 19	24.1%	26.3%	27.1%
20 to 34	17.8%	20.7%	20.4%
35 to 54	28.0%	28.9%	28.0%
55 to 64	13.0%	11.6%	11.3%
Over 65	17.0%	12.5%	13.2%

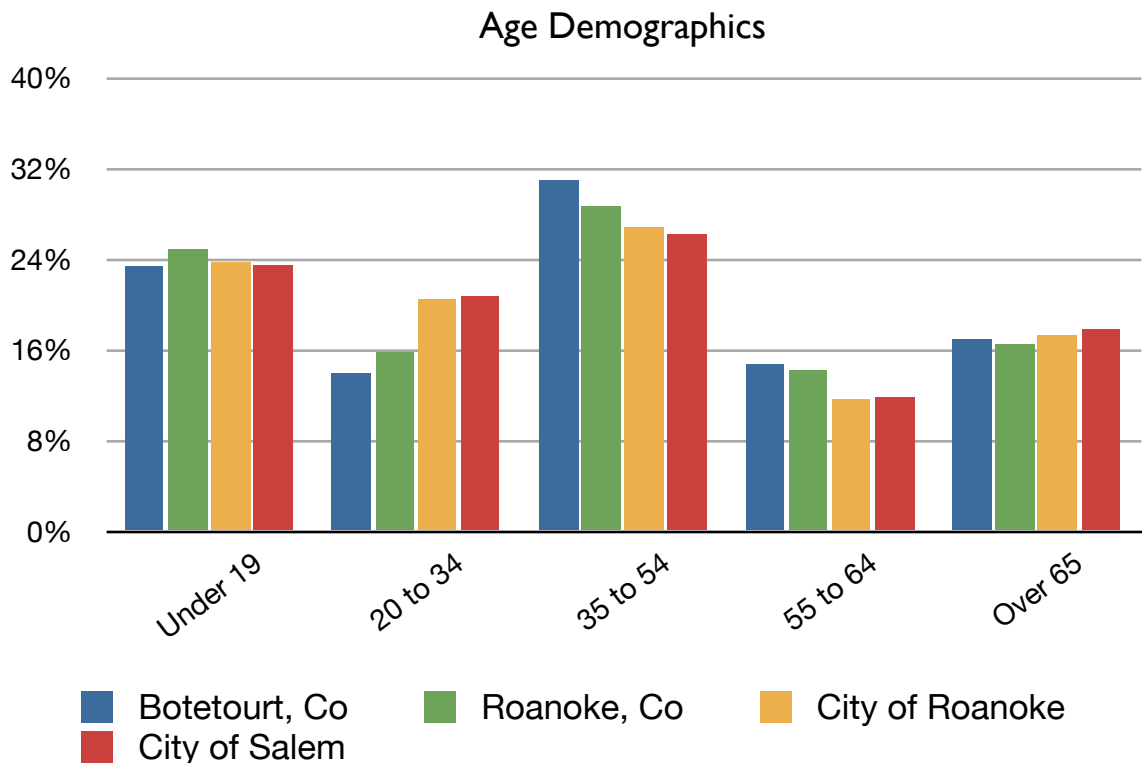
Source US Bureau of Census 2010 Decennial Census SF3 DP-2



The table and chart below provide the age distribution of residents between the four localities. The proportional share of children and seniors is very similar across the region. Salem and the City of Roanoke have a higher share of young adults compared to the counties. This should be viewed as an opportunity for investment. While the cities have experienced slower growth than Botetourt and Roanoke County, the higher share of young adults indicates a larger share of customers that will demand improved broadband services. For a number of reasons, the area is attractive to young professionals. Improving broadband connectivity and service availability represents a good opportunity to retain and attract younger residents.

Population	Botetourt County	Roanoke County	City of Roanoke	City of Salem
Under 19	23.4%	24.8%	23.8%	23.5%
20 to 34	13.9%	15.8%	20.4%	20.7%
35 to 54	30.9%	28.7%	26.8%	26.2%
55 to 64	14.8%	14.2%	11.7%	11.8%
Over 65	16.9%	16.5%	17.3%	17.8%

Source US Bureau of Census 2010 Decennial Census SF3 DP-2

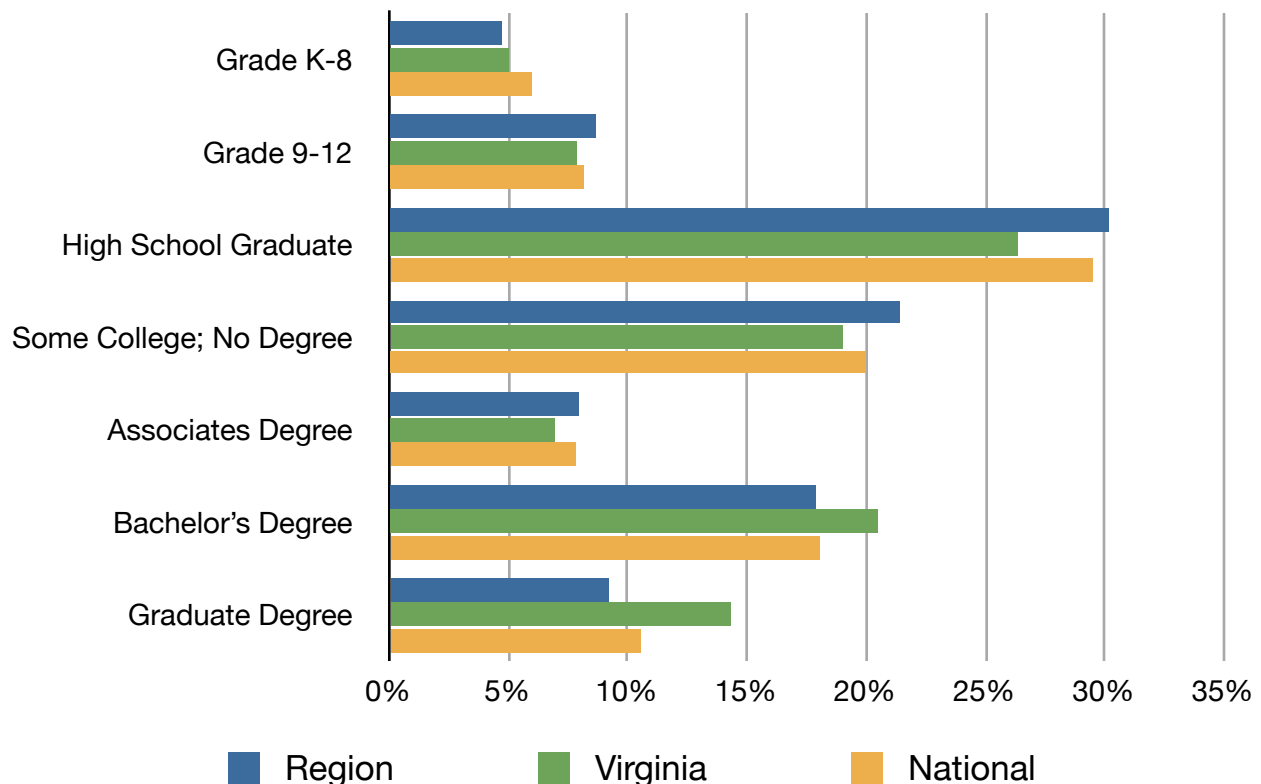


Education

The level of educational attainment in the region equals or exceeds the national averages, but trails the state averages in advanced degrees. The region has higher rates of high school, and associates degree attainment. It has lower rates of bachelor and graduate degrees compared to the state average. Increased availability of broadband could help to further improve this over time, as increased awareness and connectivity would allow residents to complete or improve their education and skill set by attending online classes. Increased connectivity could also attract a different mix of residents (e.g., business people and entrepreneurs who can work from home).

	Region	Virginia	National
Grade K - 8	4.7%	5.0%	6.0%
Grade 9 - 12	8.7%	7.9%	8.2%
High School Graduate	30.2%	26.4%	29.5%
Some College, No Degree	21.4%	19.0%	20.0%
Associates Degree	8.0%	7.0%	7.8%
Bachelor's Degree	17.9%	20.5%	18.0%
Graduate Degree	9.2%	14.3%	10.5%

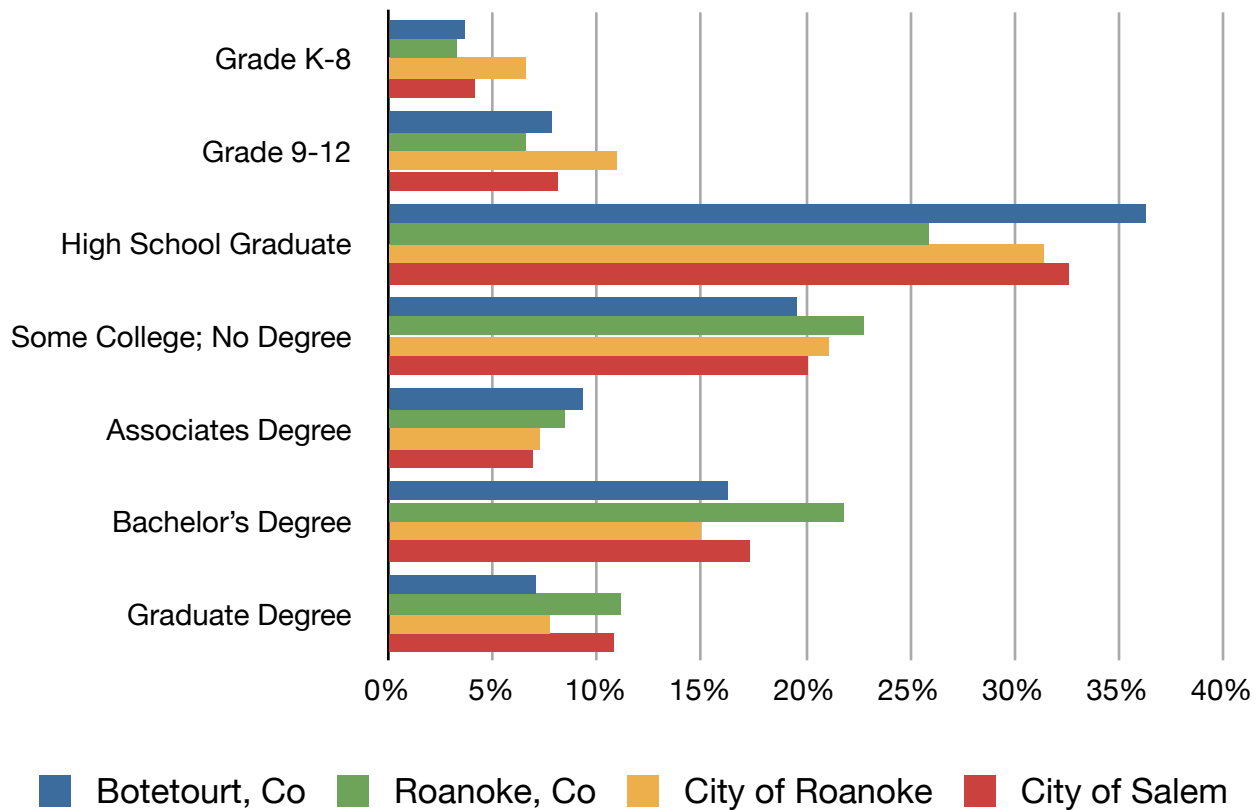
Source US Bureau of Census 2010 Decennial Census SF3 DP-2



This table and graph below provide the distribution of educational attainment for the four individual localities. It's interesting to note that each of the localities has a high share of residents with some college education but no degree. This indicates that there may be above average demand for online degree programs within the region.

	Botetourt County	Roanoke County	City of Roanoke	City of Salem
Grade K - 8	3.7%	3.3%	6.6%	4.1%
Grade 9 - 12	7.9%	6.6%	11.0%	8.1%
High School Graduate	36.3%	25.9%	31.4%	32.6%
Some College, No Degree	19.6%	22.8%	21.1%	20.1%
Associates Degree	9.3%	8.5%	7.3%	6.9%
Bachelor's Degree	16.3%	21.8%	15.0%	17.3%
Graduate Degree	7.1%	11.2%	7.7%	10.8%

Source US Bureau of Census 2010 Decennial Census SF3 DP-2



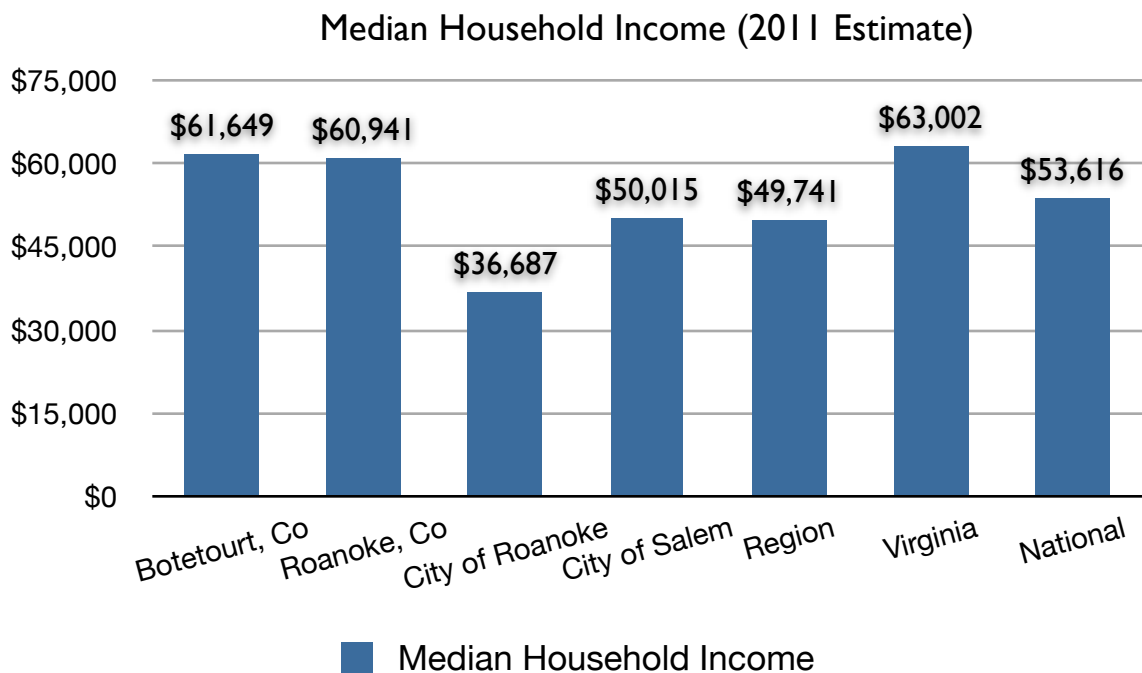
Median Household Income

The Median Household Income of the Roanoke Valley is lower than the national average and state average. This is a reflection of the low incomes and concentrated areas of poverty in some areas of the City of Roanoke, and to a lesser degree, Salem. Both Botetourt and Roanoke County have median income levels that are very close to the state average. This income disparity should be an important consideration for broadband provisioning. Regional investments in broadband infrastructure could spur increased competition and lower prices for residents and businesses, thus making access more affordable.

Improved Internet access in the region would continue to shift some employment and job opportunities towards office and professional employees. Home-based businesses and working from home jobs, either part time or full time, could contribute more to the local economy, and broadband at home is already considered a requirement among white collar professionals.

	Botetourt County	Roanoke County	City of Roanoke	City of Salem	Region	Virginia	National
Median Household Income	\$61,649	\$60,941	\$36,687	\$50,015	\$49,741	\$63,002	\$53,616

Source US Bureau of Census 2010 Decennial Census SF3 DP-3

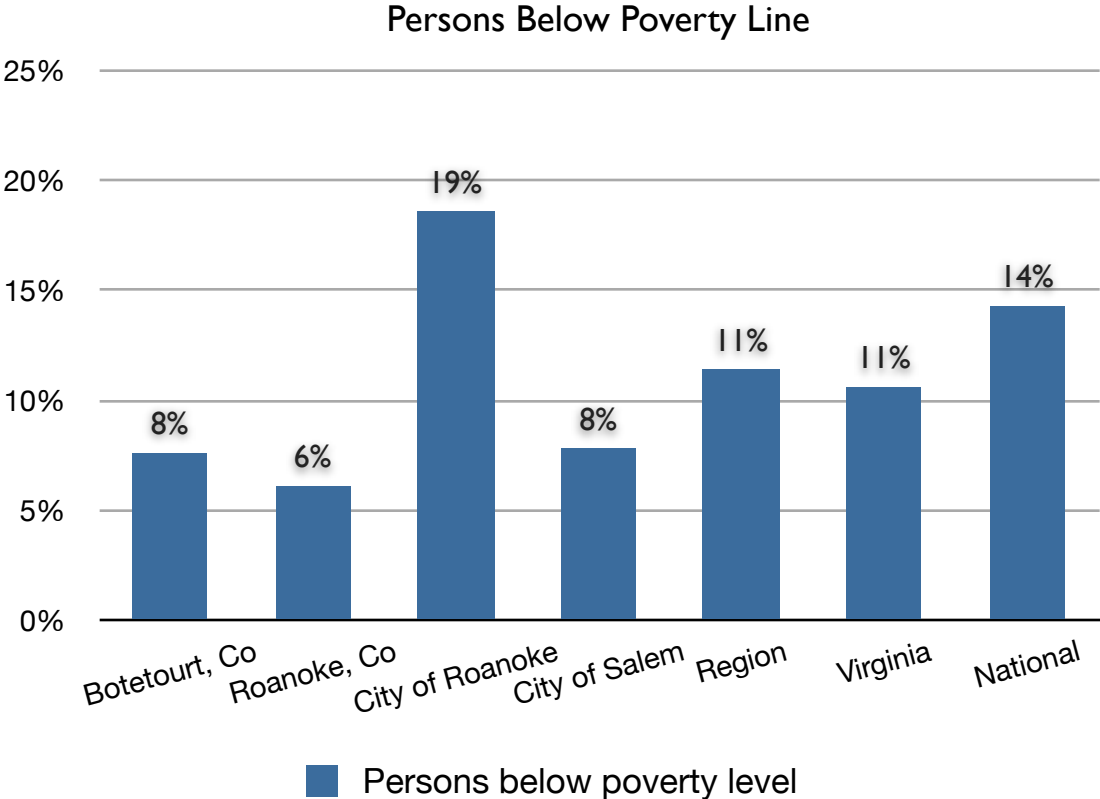


Families Below Poverty Level

The following table compares the poverty level for the four jurisdiction to the regional, state, and national averages. As a region, the area is very similar to the statewide poverty rate and lower than the national average. When viewed individually, the poverty rates for Botetourt, Roanoke County, and Salem are all well below the statewide levels. However, there is a substantial amount of poverty in the City of Roanoke. Almost 1/5 of the residents are living below the poverty line. For the region as a whole, and Salem in particular, increased broadband access and affordability is an essential service to reducing poverty in a community. Broadband access can facilitate work-from-home businesses, provide access to online degree programs, and attract more business investment and job opportunities to the area.

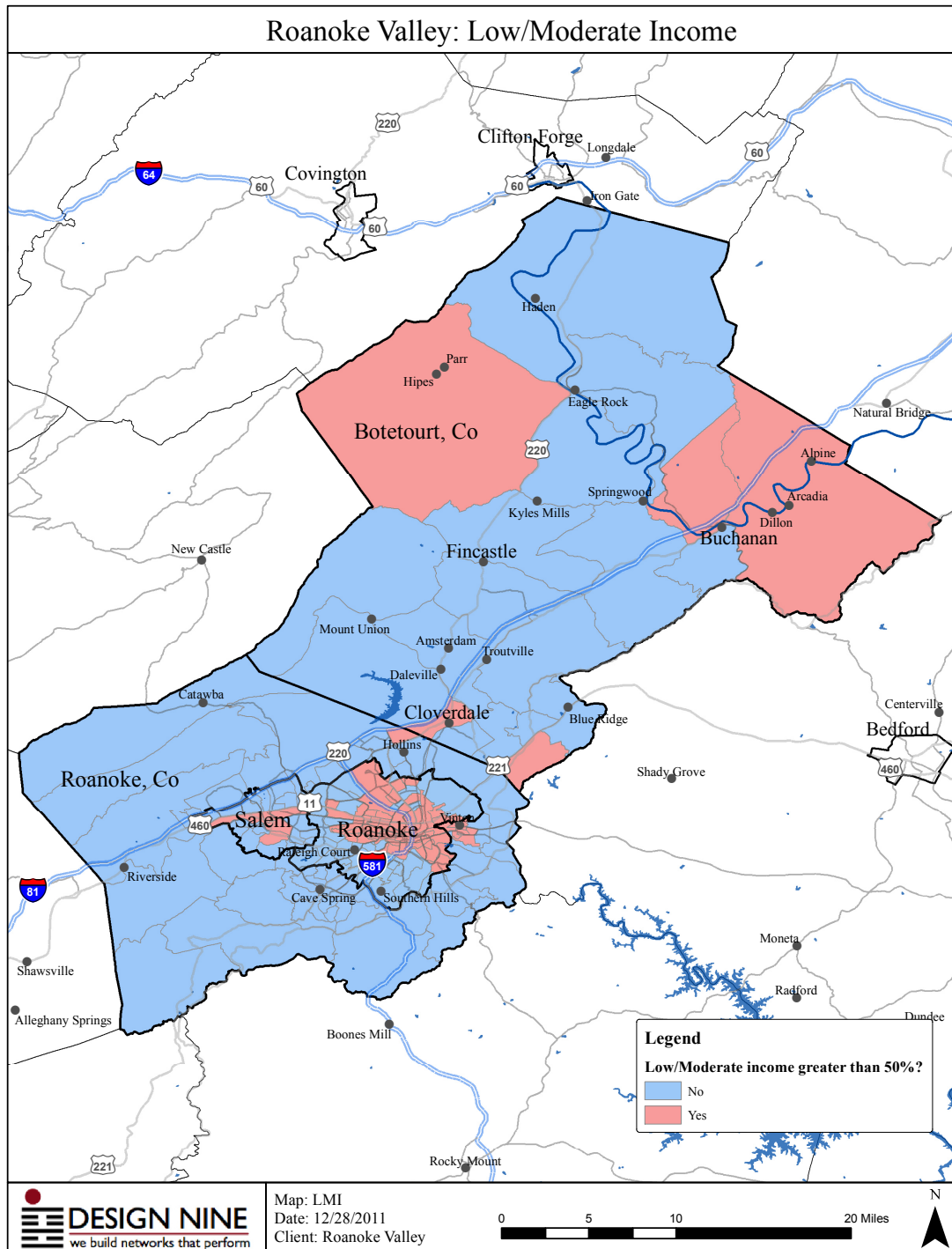
	Botetourt County	Roanoke County	City of Roanoke	City of Salem	Region	Virginia	National
Persons below poverty level	7.6%	6.1%	18.6%	7.8%	11.4%	10.6%	14.3%

Source US Bureau of Census, State and County Quickfacts
 Accessed 2011, Data from 2009



Low and Moderate Income

The map below shows the concentration of low and moderate income (LMI) households in the Roanoke Valley. LMI areas are eligible for certain kinds of broadband funding opportunities, including some from the Virginia Department of Housing and Community Development.



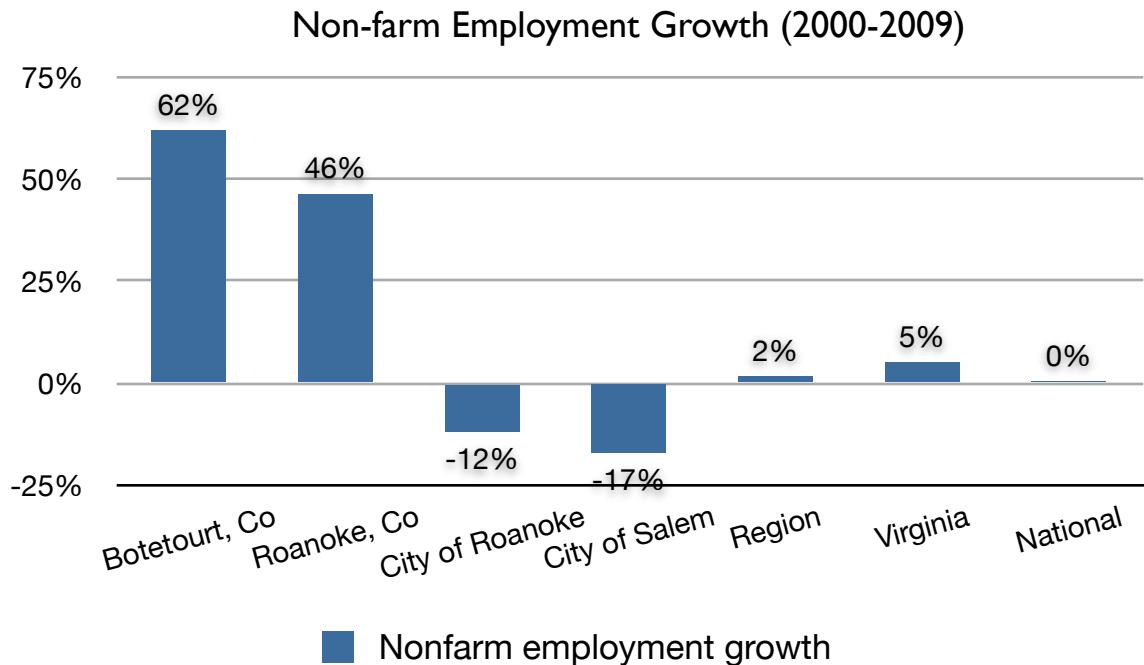
Non-farm employment growth

Both the City of Roanoke and Salem are experiencing a sharp decrease in the number of jobs, underscoring the need for corrective action through economic development focus and broadband infrastructure investments. A joint CMU/MIT study released in 2005 showed that regions with good distribution of broadband service enjoyed more economic growth than regions without quality access to broadband services.

A study by the Phoenix Center showed that broadband was also an important tool for job-seekers; those looking for jobs were more likely to find work than those on dial-up or those without any Internet access.

	Botetourt County	Roanoke County	City of Roanoke	City of Salem	Region	Virginia	National
Non-farm employment growth	61.9%	46.4%	-11.8%	-17.0%	1.6%	5.0%	0.4%

Source US Bureau of Census 2000-2009 State and County Quickfacts



Business size distribution

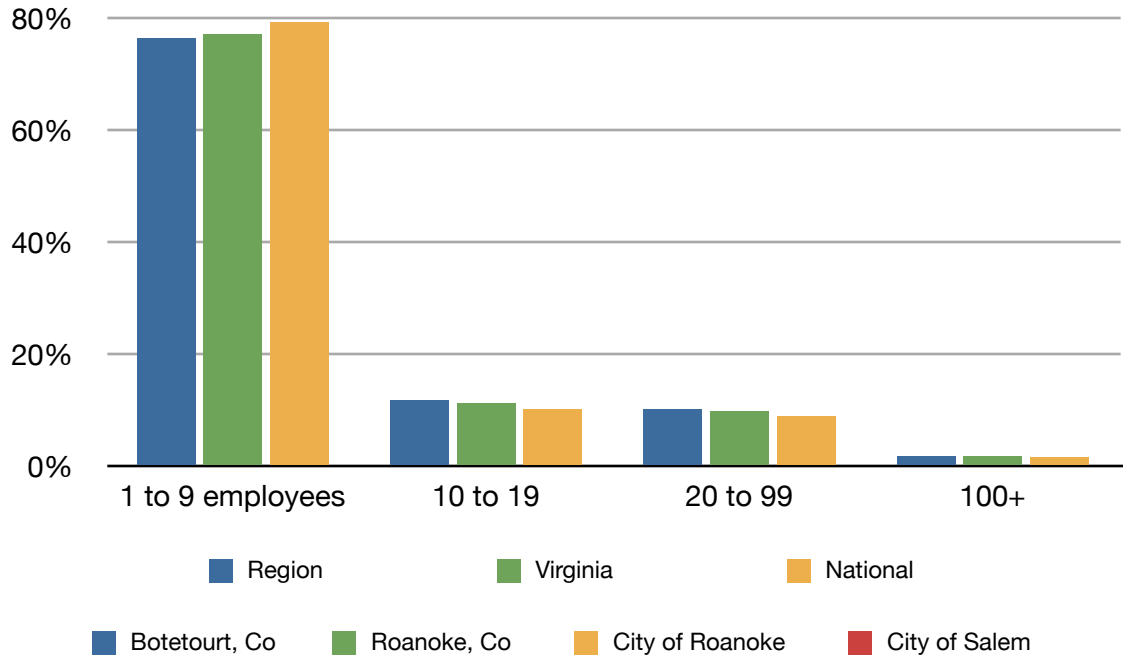
The Roanoke Valley has mostly small businesses, and enjoys a business size distribution similar to state and national averages, reflecting a reasonable balance.

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

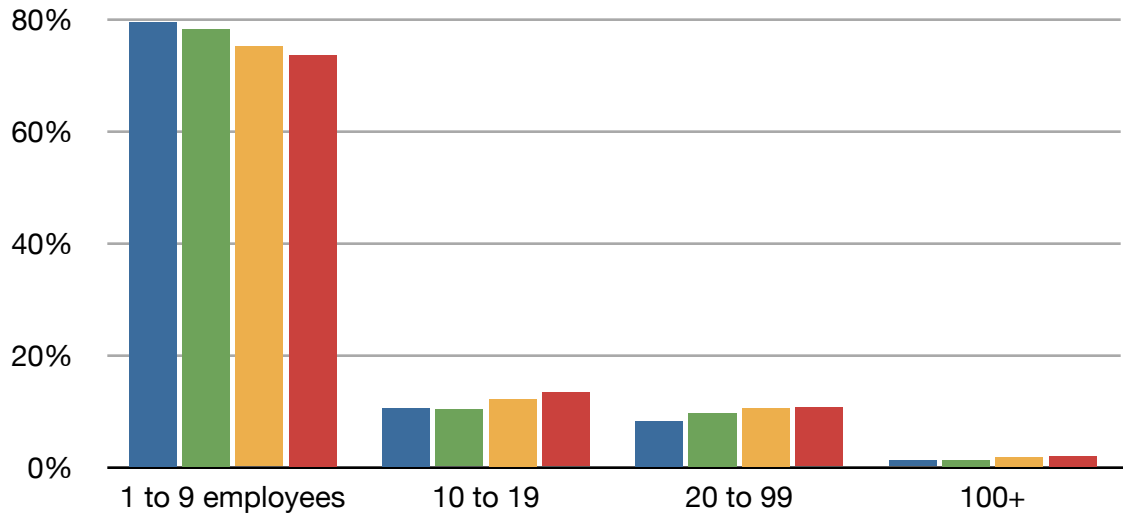
Number of Businesses	Botetourt County	Roanoke County	City of Roanoke	City of Salem	Region	Virginia	National
1 to 9 employees	798	2,643	4,059	1,192	8,692	214,329	9,329,502
10 to 19	107	351	661	217	1,336	31,370	1,196,220
20 to 99	84	330	577	174	1,165	27,206	1,039,532
100+	13	48	101	34	196	5,110	195,101

Business Size Distribution	Botetourt County	Roanoke County	City of Roanoke	City of Salem	Region	Virginia	National
1 to 9 employees	79.6%	78.4%	75.2%	73.7%	76.3%	77.1%	79.3%
10 to 19	10.7%	10.4%	12.2%	13.4%	11.7%	11.3%	10.2%
20 to 99	8.4%	9.8%	10.7%	10.8%	10.2%	9.8%	8.8%
100+	1.3%	1.4%	1.9%	2.1%	1.7%	1.8%	1.7%
Total businesses	1,002	3,372	5,398	1,617	11,389	278,015	11,760,355

Business Size (by % of total businesses)



Business Size (by % of total businesses)



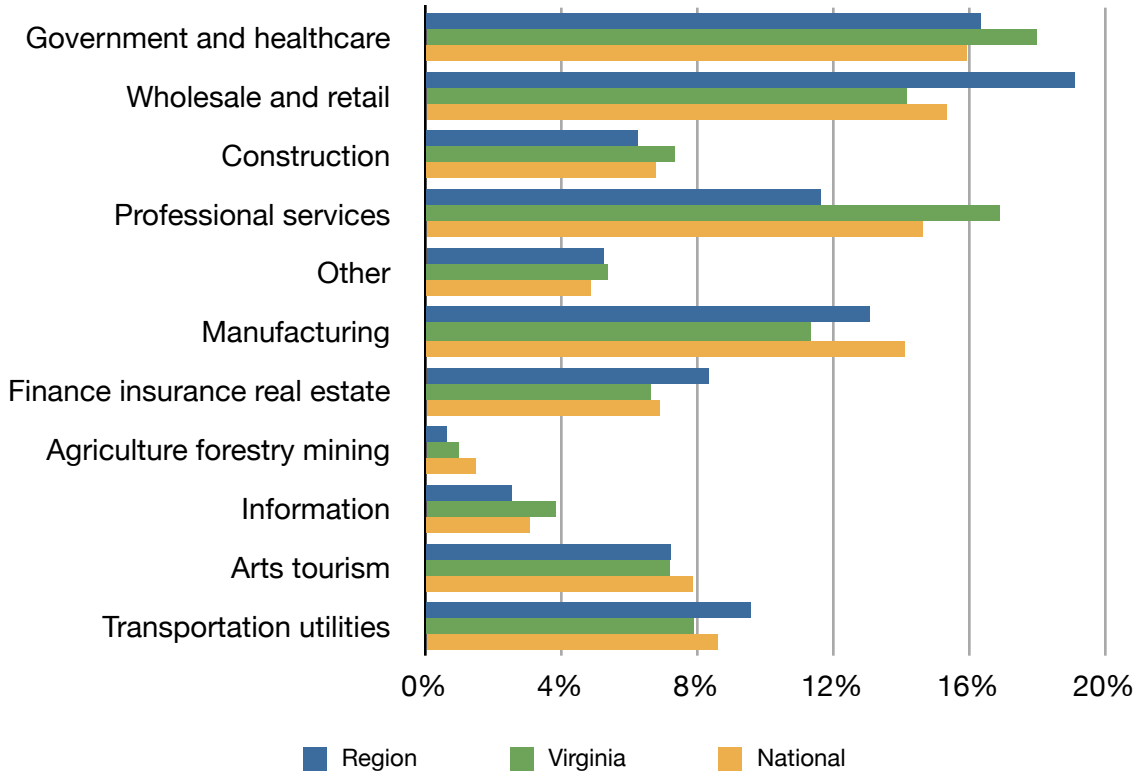
Business and Employment Distribution

The region’s largest employer is the retail sector. Government/healthcare, manufacturing, and professional services are the next largest employers. 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 that small businesses did in the past. The Roanoke Valley, by ensuring that high quality professional services remain 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 better attract Knowledge Economy businesses.

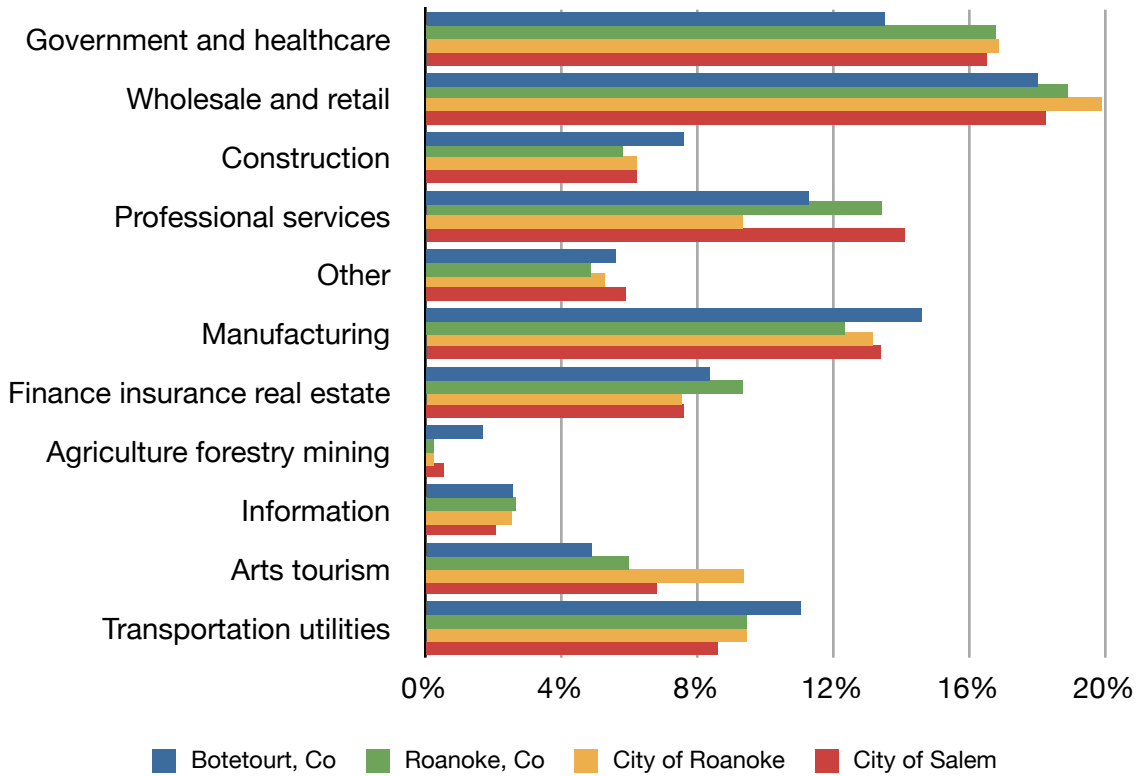
Improvements and upgrades in the urban and town centers of the region to improve the general appearance of the downtown area will help attract more businesses. Incentives for landlords to rehab older retail and second floor spaces can help increase the inventory of good quality professional office space. Relocation decisions are now frequently made in 90 days or less, so the region should strive to always have some good quality office space always available (with broadband cabling to the building and within the building). Class A office space is an asset that should be a priority when planning fiber or other facilities.

	Bote-tourt County	Roanoke County	City of Roanoke	City of Salem	Region	Virginia	National
Government and healthcare	13.5%	16.8%	16.9%	16.5%	16.4%	18.0%	15.9%
Wholesale and retail	18.0%	18.9%	19.9%	18.3%	19.1%	14.2%	15.3%
Construction	7.6%	5.8%	6.2%	6.2%	6.3%	7.3%	6.8%
Professional services	11.3%	13.4%	9.4%	14.1%	11.6%	16.9%	14.6%
Other	5.6%	4.9%	5.3%	5.9%	5.2%	5.4%	4.9%
Manufacturing	14.6%	12.4%	13.2%	13.4%	13.1%	11.4%	14.1%
Finance insurance real estate	8.4%	9.4%	7.5%	7.6%	8.3%	6.6%	6.9%
Agriculture forestry mining	1.7%	0.25%	0.25%	0.54%	0.6%	1.0%	1.5%
Information	2.6%	2.7%	2.5%	2.1%	2.5%	3.8%	3.1%
Arts tourism	4.9%	6.0%	9.4%	6.8%	7.2%	7.2%	7.9%
Transportation utilities	11.0%	9.5%	9.5%	8.6%	9.6%	7.9%	8.6%

Employment by Industry (%)

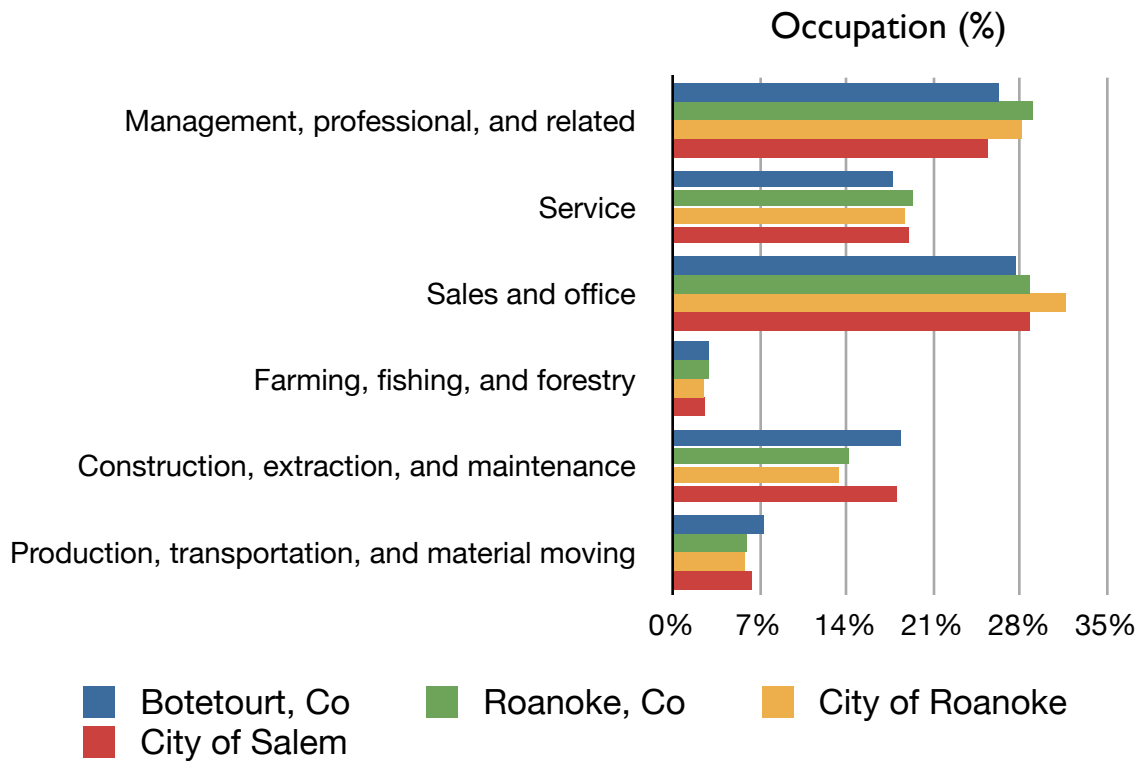
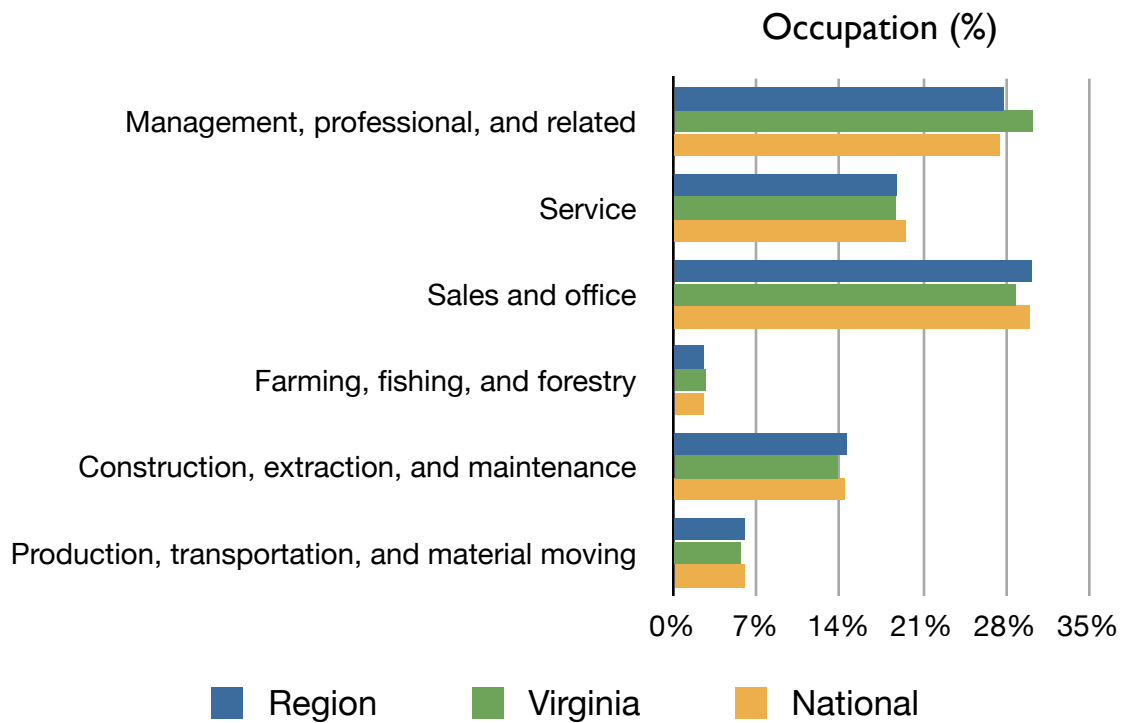


Employment by Industry (%)



Distribution by Occupation (count)	Botetourt County	Roanoke County	City of Roanoke	City of Salem	Region	Virginia	National
Management, professional, and related	2,502	10,539	20,369	5,494	38,904	1,056,458	37,763,616
Service	1,685	7,030	13,558	4,108	26,381	655,337	26,873,658
Sales and office	2,630	10,436	22,933	6,231	42,230	1,006,991	41,167,530
Farming, fishing, and forestry	273	1,036	1,784	556	3,649	94,407	3,480,270
Construction, extraction, and maintenance	1,748	5,142	9,695	3,905	20,490	482,893	19,802,394
Production, transportation, and material moving	696	2,162	4,216	1,384	8,458	198,552	8,213,335
Totals	9,534	36,345	72,555	21,678	140,112	3,494,638	137,300,800

Distribution by Occupation (%)	Botetourt County	Roanoke County	City of Roanoke	City of Salem	Region	Virginia	National
Management, professional, and related	26.24%	29.00%	28.07%	25.34%	27.77%	30.23%	27.50%
Service	17.67%	19.34%	18.69%	18.95%	18.83%	18.75%	19.57%
Sales and office	27.59%	28.71%	31.61%	28.74%	30.14%	28.82%	29.98%
Farming, fishing, and forestry	2.86%	2.85%	2.46%	2.56%	2.60%	2.70%	2.53%
Construction, extraction, and maintenance	18.33%	14.15%	13.36%	18.01%	14.62%	13.82%	14.42%
Production, transportation, and material moving	7.30%	5.95%	5.81%	6.38%	6.04%	5.68%	5.98%



Business Survey Results

A market research study was conducted to determine the market for a new broadband Internet provider. The study was a telephone survey of businesses in the City of Roanoke, the City of Salem, and Roanoke County.

The study was done to determine the following:

- Ownership of computers and current Internet usage
- Existing provider price and speed
- Satisfaction with current provider
- Services desired
- Incentive and introductory pricing
- Interest in switching
- Demographic information
- Under-served and un-served statistics for the application

The market research was conducted because it is critical in determining the interest and demands of the targeted communities for the services offered. This research will provide the applicant with knowledge of market potential, an understanding of competition, and knowledge of the needs and demands of the potential customer base. But most important, market research informs feasibility studies and strategic planning goals, as well as fulfilling the requirements of many state and Federal funding and grant opportunities.

Methodology

A 10-minute telephone survey of 400 businesses in the City of Roanoke, the City of Salem, and Roanoke County that had a +/- 5% margin of error was conducted. Additionally, there was a 95% level of confidence. Surveyors asked respondents a series of questions relating to their computer ownership, Internet usage, service providers, need for additional services, and demographics.

The survey was developed by Osborne Associates using information supplied by Design Nine and feedback from the broadband task force about the proposed network and the services anticipated to be delivered.

Osborne Associates conducted pre-testing and validation of the questions. A small number of surveys were conducted and completed, and the data was reviewed by Osborne Associates to de-

termine whether there were any problems with the wording or organization of the content. The survey was conducted over a one-week period, and 400 surveys were completed.

Our survey interviewers participated in a training session that covered the survey project protocols and survey instrument test runs. All interviewers were monitored periodically by a call center supervisor. New interviewers are monitored at least once per shift and experienced interviewers are monitored at least once a week. The monitoring system operates without the interviewer being aware that he or she is being monitored. Any problems with an interviewer are addressed either through additional training or reassignment to other projects.

Our survey interviewers are located in Illinois, Indiana, Ohio, and Pennsylvania.

Survey Methods—The surveying was conducted by telephone, utilizing a random-digit-dial (RDD) calling format for the target group specified above. Households were screened on eligibility for the survey based on the stated criteria (e.g., region, adult respondent).

A portion of the sample was made up of cell phone numbers, because it was important to specifically target and collect data that accurately reflected the potentially different attitudes and needs of residents living in cell phone-only households.

Quality Control—It is vitally important to ensure that the collected data meets the expectations and deliverables of the contract, while also conforming to national standards and best practices. The data is collected following strict protocols and established business controls. Quality control measures cover many facets of the interview process, ranging from the type of interviewer training to the type of edit checks that are used on the data. We apply a number of different techniques at various steps of the project to ensure that the collected data is the best possible.

Summary of Results

Some of the key data points that resulted in the survey include:

51% of respondents have 1-3 computers in their business.

85% of respondents have Internet access with 65% of respondents having a Web site.

92% of respondents answered that they use the Internet primarily for work.

71% of respondents indicated they are satisfied with their current provider for phone, Internet, and television service.

100% of respondents indicated that they would want additional services for phone, Internet, and television service.

42% of respondents answered that price would be a major factor in switching phone, Internet, and television service providers.

70% of businesses have annual sales of less than \$1 Million with 67% having 10 or fewer employees.

49% of respondents have access to broadband Internet while 36% only have access to slower Internet and 15% have no connection to the Internet.

80% of businesses indicated that cost was important in choosing phone, Internet, and television service bundles.

81% of businesses indicated that customer service was important in choosing phone, Internet, and television service bundles.

81% of respondents answered that quality and reliability was important in choosing phone, Internet, and television service bundles.

56% of respondents showed interest in a new phone company providing service.

52% of respondents showed interest in a new Internet company providing service.

39% of respondents showed interest in a new television company providing service.

69% of businesses indicated that it did not matter whether the new company was locally owned or not.

Ownership of computers and current Internet usage

Overall, the respondents used the Internet on a regular basis and were computer savvy. 51.0% had 1–3 computers in their business, 84.9% had Internet access, and 64.8% of the businesses had a website. This data indicates that the businesses overall are moderate computer users and have a moderate level of Internet sophistication.

91.5% of the respondents indicated they use the Internet primarily for “work,” and 71.9% indicated they also use the Internet for “e-mailing and texting.”

Existing provider price and speed

Phone: Verizon provided phone service to 38.5% of the respondents. Respondents paid an average of \$153.18 for their monthly phone service. 76.9% used phone services other than PBX or Centrex phone lines. 50.0% of the businesses had 1–2 phone lines, and 67.0% had 1–5 phones.

Internet: Cox provided Internet access to 46.8% of the respondents with Internet. The average monthly cost for Internet access was \$150.57. When asked about their Internet speed, 88.3% of those who had an Internet connection did not know their speed. 47.7% knew their speed was symmetrical, and 47.7% did not know if the upload and download speeds were the same.

Television: Cox provided service to 53.1% of those with television service. They had an average monthly cost of \$140.79.

Satisfaction with current provider

Phone: 72.2% of respondents had been with their current provider for more than five years. 72.2% of respondents rated their phone service “best.”

Internet: 68.4% of the respondents had been with their current provider for more than five years. Overall, 66.1% of the respondents who had Internet access rated their provider as “best.” When asked about areas of potential improvement, 14.6% mentioned “price” and 40.6% said they “did not know.”

Television: 78.8% of the respondents had been with their provider for more than five years. In addition, 75.0% ranked their service as “best.”

Services desired

Phone: Respondents stated clearly that they wanted all the additional services. Specifically, respondents mentioned call waiting (48.9%) and voicemail (43.2%).

Internet: As with the phones, respondents clearly wanted additional services. Specifically, the respondents mentioned: faster speed (48.0%) and greater reliability (40.4%). 52.1% of the respondents were willing to pay \$30–\$80 for these services.

Television: As with the phones and Internet, respondents stated clearly that they wanted premium services. Respondents with television services identified “price” as the factor that would be most likely to cause them to switch providers (44.4%).

Incentive and introductory pricing

Phone: 41.4% of the respondents said “pricing” would be a factor in switching providers. 12.4% identified “reliability” as another factor. When asked about another company offering the same services, 72.4% indicated they would be “very unlikely” or “unlikely” to change.

Internet: 39.5% of the respondents said that “price” would be a factor in switching providers, and 28.7% indicated that they did not know. When asked about another company with same services, 70.4% indicated they would be “very unlikely” or “unlikely” to change.

Television: 44.1% of the respondents said that “price” would be a factor in switching providers, and 28.1% indicated they “did not know.” When asked about another company offering the same services, 77.5% indicated they would be “very unlikely” or “unlikely” to change.

Demographic information

All the respondents were businesses in Roanoke, VA; Salem, VA; or Roanoke County. We spoke with people who made the expenditure decisions in their business. 85.1% of the respondents had been in business for more than five years. 70.1% of the businesses had annual sales of less than \$1 million. 66.8% of the businesses had 10 or fewer employees.

Under-served and un-served statistics

Broadband Internet Connection: 49.4% of the respondents had access to broadband Internet through their connection to Cox (39.7%) or Comcast (9.7%), the latter of which is the sole pro-

vider of broadband speed, that is, it has a minimum rate of data transmission of 3 megabits per second (download plus upload speed). However, it is important to note that we are basing the broadband speed assumption on Comcast's published speeds. These speeds can vary by time of day, time of year, and level of usage. At any time, Comcast's actual broadband speed could in fact be less than the 3 megabits per second required to be called "broadband."

Other Internet Connections: 35.5% of the respondents connected to the Internet through other means: DSL, fixed wireless, cell phone data cards, etc. None of these meet the acceptable broadband speed criteria.

No Internet Access: 15.1% of the respondents had no connection to the Internet in their business.

Reasons for choosing phone, television, and Internet bundle

Cost: 79.9% said cost was "very important," "important," or "somewhat important."

Customer Service: 81.1% said customer service was "very important," "important," or "somewhat important."

Quality and Reliability: 81.1% said quality and reliability were "very important," "important," or "somewhat important."

Potential for a new utility company

Phone: 55.6% of the respondents said they would be "very interested," "interested," or "somewhat interested" in a new utility company providing service.

Internet: 52.1% of the respondents said they would be "very interested," "interested," or "somewhat interested" in a new utility company providing service.

Television: 39.0% of the respondents said they would be "very interested," "interested," or "somewhat interested" in a new utility company providing service.

Local Utility: 74.2% of the respondents said it being a local utility does not matter.

Locally Owned Company: 69.2% said it did not matter if the company was locally owned.

Detailed Results

A total of 403 responses were collected. Not all responders answered every question.

403 Businesses responded to this question.

Are you a business in Roanoke County, the City of Salem, or the City of Roanoke?

Yes	No
403	0
100%	0%

Are you the person who approves expenditures?

Yes	No
403	0
100%	0%

How long have you been in business?

Less than a year	1 to 5 years	More than 5 years
3	57	343
1%	14%	85%

What company provides your local phone service?

Verizon	Comcast	Cox	Verizon Wireless	AT&T Wireless	Sprint Wireless	VOIP	Other
155	40	149	15	5	4	2	33
38%	10%	37%	4%	1%	1%	0%	8%

Those responses classified as “Other” above are broken out in the table below:

nTelos	AT&T	Mitel	Cisco	B2x	Regal	Better Deal	Internal	RCI	Lum-mos	Level3	Caril-ion	US Cellular	Don't Know
10	2	2	1	1	1	1	1	1	1	1	1	1	9
30%	6%	6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	27%

How much were your monthly bills in August, September, and October for the entire business for all phone services combined?

Phone Bill for August	Phone Bill for September	Phone Bill for October
194	197	219
The Mean: \$158.77	The Mean: \$153.38	The Mean: \$147.39

The average monthly phone bill for all respondents over the three month period was \$153.18.

How many phone lines does your business have?

5 or less	6 to 20	More than 20
324	65	13
81%	16%	3%

How many phones does your business have?

5 or less	6 to 20	More than 20
299	92	12
74%	23%	3%

What types of phone does your business have?

In this question, “other” would typically indicate one or more direct dial lines.

PBX	Centrex	Other
44	49	310
11%	12%	77%

How long have you been a customer of your current local phone company?

Less than a year	1 to 5 years	More than 5	Don't Know
12	78	291	22
3%	19%	72%	5%

How would you rate your current telephone provider?

Worst	Not Bad	Neutral	OK	Best
6	8	16	82	291
1%	2%	4%	20%	72%

List of factors that might cause you to switch phone companies.

Price	Service	Reliability	Features	Local	Satisfied	None	Don't Know
167	30	50	20	5	5	6	120
41%	7%	12%	5%	1%	1%	1%	30%

If you had a chance to buy local phone service from a company other than your current provider for the same price and with the same services, how likely would you be to do so?

Very Likely	Likely	Somewhat	Unlikely	Very Unlikely	Don't Know
13	23	72	115	177	3
3%	6%	18%	29%	44%	1%

What phone services might you be interested in if a new provider offered them?

Call Waiting	Call	Voicemail	Caller ID	Long Distance	Other
197	132	174	159	163	131
21%	14%	18%	17%	17%	14%

List of price ranges for phone services if a new company offered those services.

\$30 to \$55	\$55 to \$80	\$80 to \$95	\$95 to \$110	Bundle It	Don't Know
134	76	26	14	125	28
33%	19%	6%	3%	31%	7%

How many computers are there in your business?

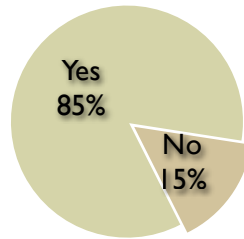
5 or less	6 to 20	More than 20
317	72	13
79%	18%	3%

Do you have Internet access at your business?

Nearly all businesses have Internet access, indicating that the Internet is an essential business service in Roanoke County, the City of Salem, and the City of Roanoke.

Yes	No
342	61
85%	15%

Do you have Internet access at your business?



Does your business have a Web site?

Only the 342 businesses with Internet access answered this question.

Yes	No
261	81
76%	24%

How likely is it that you will be using the Internet for your business in the next three years?

Only the 61 business that do not have Internet access answered this question.

Very Likely	Likely	Somewhat	Unlikely	Very Unlikely
2	5	5	9	40
3%	8%	8%	15%	66%

What do you use the Internet for?

Work	Research	E-mail and Texting	Selling	Credit Card	Other
313	226	246	125	111	8
30%	22%	24%	12%	11%	1%

What kind of service do you use to access the Internet, and what company provides the service?

Only the 342 businesses with Internet access answered this question.

DirecTV	Dish TV	Verizon	Verizon DSL	Cox	Verizon Wireless	AT&T	T-Mobile	Comcast	Other
6	7	27	60	160	9	3	1	39	30
2%	2%	8%	18%	47%	3%	1%	0%	11%	9%

Do you know your Internet speed?

Only the 342 businesses with Internet access answered this question.

Fast	2 Mbps	Differs	Slow	3 Mbps	56 Kbps	Don't Know	Other
7	3	1	3	2	3	316	14
2%	1%	0%	1%	1%	1%	92%	4%

Is the speed symmetrical?

Only the 342 businesses with Internet access answered this question.

Yes	No	Don't Know
153	36	153
45%	11%	45%

How much did you pay for Internet service for the entire company in August, September, and October?

Internet Service for August	Internet Service for September	Internet Service for October
154	160	178
The Mean: \$155.51	The Mean: \$151.10	The Mean: \$145.10

Internet Service for August	Internet Service for September	Internet Service for October
154	160	178
The Median: \$100.00	The Median: \$100.00	The Median: \$99.00

The average monthly bill paid for Internet service for all respondents over the three month period was \$150.57. The median monthly bill for Internet service was just about \$100.

How long have you been a customer of your current Internet access provider?

Only the 342 businesses with Internet access answered this question.

Less than a year	1 to 5 years	More than 5	Don't Know
12	78	234	18
4%	23%	68%	5%

How would you rate your current Internet access provider?

Only the 342 businesses with Internet access answered this question.

If you could change or improve one thing about the Internet access service you currently use, what would it be?

Only the 342 businesses with Internet access answered this question.

Reliability	Price	Speed	Choice of Providers/Will Switch	None	Other
30	51	43	2	60	17
9%	15%	13%	1%	18%	5%

If you had a chance to buy local Internet service from a company other than your current provider for the same price and with the same services, how likely would you be to do so?

Only the 342 businesses with Internet access answered this question.

Very Likely	Likely	Somewhat	Unlikely	Very Likely
10	20	68	108	136
3%	6%	20%	32%	40%

List of factors that might cause you to switch Internet companies.

Only the 342 businesses with Internet access answered this question.

Reliability	Price	Speed/Symmetrical Speeds	Service	Features	Other/Don't Know
34	135	31	29	9	104
10%	39%	9%	8%	3%	30%

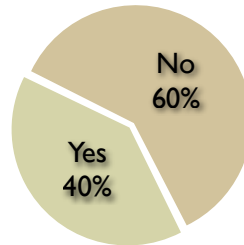
What Internet services might you be interested in if a new provider offered them?

Faster Speeds	Greater Reliability	Spam/Virus Blockers	Home Security	Steaming Video	Remote Control of Utilities	Telephone	Other
164	138	215	41	36	32	48	88
22%	18%	28%	5%	5%	4%	6%	12%

Does your business purchase television service, either cable or satellite?

Yes	No
160	243
40%	60%

Does your business purchase television service, either cable or satellite?



If you purchase television service, what is your current cable or satellite television provider?

Dish TV	DirecTV	Comcast	Cox	Other
20	20	30	85	5
13%	13%	19%	53%	3%

How much did your business pay for television service in August, September, and October?

Television Service for August	Television Service for September	Television Service for October
87	86	90
The Mean: \$141.32	The Mean: \$142.34	The Mean: \$138.70

The average monthly bill paid for television service for all respondents over the three month period was \$140.79.

How long have you been a customer of your current television service provider?

Less than a year	1 to 5 years	More than 5	Don't Know
7	23	126	4
4%	14%	79%	3%

If you have television service, how would you rate your current television service provider?

Worst	Not Bad	Neutral	OK	Best
2	1	8	29	120
1%	1%	5%	18%	75%

If you had a chance to buy television service from a local company other than your current provider for the same price and with the same services, how likely would you be to do so?

Only the 160 businesses that have television service answered this question.

Very Likely	Likely	Somewhat	Unlikely	Very Unlikely
2	9	25	54	70
1%	6%	16%	34%	44%

List of factors that might cause your business to switch television providers.

Only the 160 businesses that have television service answered this question.

Price	Service/Reliability	Features	Greater channel selection/ Movie Library	None	Don't Know
71	23	6	14	1	45
44%	14%	4%	9%	1%	28%

How important is cost when choosing your business phone, Internet, and television services?

Very Important	Important	Somewhat Important	Not Very Important	Not Important At All	Don't Know
218	104	62	16	2	1
54%	26%	15%	4%	0%	0%

How important is customer service when choosing your business phone, Internet, and cable television services?

Very Important	Important	Somewhat Important	Not Very Important	Not Important At All	Don't Know
200	127	55	16	4	1
50%	32%	14%	4%	1%	0%

How important are quality and reliability when choosing your business phone, Internet, and television services?

Very Important	Important	Somewhat Important	Not Very Important	Not Important At All	Don't Know
246	88	49	17	2	1
61%	22%	12%	4%	0%	0%

How important are service features when choosing your business phone, Internet, and television services?

Very Important	Important	Somewhat Important	Not Very Important	Not Important At All	Don't Know
174	134	59	29	6	1
43%	33%	15%	7%	1%	0%

If a new utility company were to provide phone service, at a lower cost and with more features, would you be...?

Very Interested	Interested	Somewhat Interested	Not Very Interested	Not Interested At All	Don't Know
51	71	102	97	81	1
13%	18%	25%	24%	20%	0%

If a new utility company were to provide Internet service, at a lower cost and with more features, would you be...?

Very Interested	Interested	Somewhat Interested	Not Very Interested	Not Interested At All	Don't Know
52	58	100	95	97	1
13%	14%	25%	24%	24%	0%

If a new utility company were to provide television services, at a lower cost and with more features, would you be...?

Very Interested	Interested	Somewhat Interested	Not Very Interested	Not Interested At All	Don't Know
34	42	81	100	145	1
8%	10%	20%	25%	36%	0%

Everything else being equal, would the fact that a company was locally based make you more or less likely to buy services from it?

Much More Likely	More Likely	Doesn't Matter	Less Likely	Much Less Likely	Don't Know
12	66	279	24	20	2
3%	16%	69%	6%	5%	0%

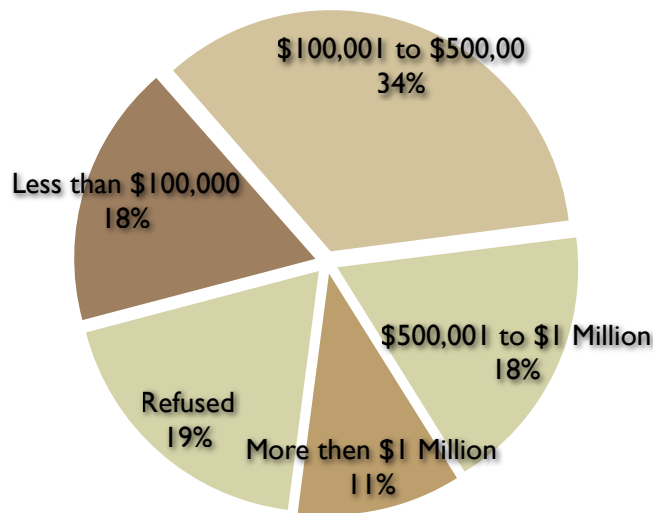
Everything else being equal, would the fact that the network was owned by a public utility make you more or less likely to buy services from it?

Much More Likely	More Likely	Doesn't Matter	Less Likely	Much Less Likely	Don't Know
7	53	300	23	19	1
2%	13%	74%	6%	5%	0%

What is the total annual sales figures for your businesses?

Less than \$100,000	\$100,001 to \$500,000	\$500,001 to \$1 Million	More than \$1 Million	Refused
71	139	73	44	76
18%	34%	18%	11%	19%

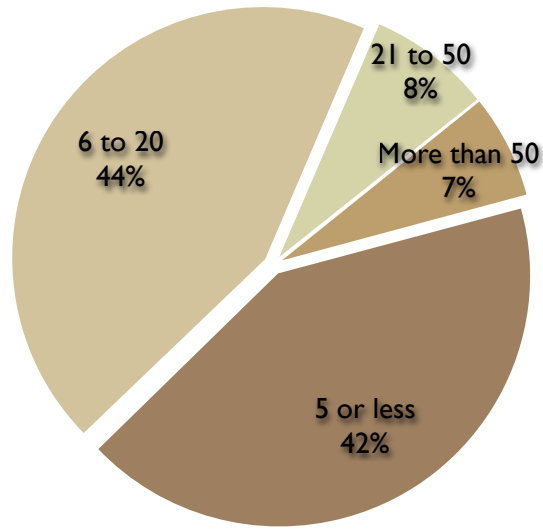
What is your businesses annual sales figures?



How many people currently work in your business besides you?

5 or less	6 to 20	21 to 50	More than 50
168	175	31	26
42%	44%	8%	7%

How many people currently work in your business besides you?



What is the one thing that would make you switch from your current phone, Internet or television services to another?

Reliability/Service	Price	Speed	Satisfied/Will Not Switch/None	Rebate/Discounts/Better Deal	Local	Don't Know	Other
41	155	11	112	7	4	61	12
10%	38%	3%	28%	2%	1%	15%	3%

Residential Survey Results

A market research study was conducted to determine the market for a new broadband Internet provider. The study was a telephone survey of residents of the City of Roanoke and Roanoke County.

The study was done to determine the following:

- Ownership of computers and current Internet usage
- Existing provider price and speed
- Satisfaction with current provider
- Services desired
- Incentive and introductory pricing
- Interest in switching
- Demographic information
- Under-served and un-served statistics for the application

In addition, this information was cross-tabulated by income level, computer ownership, and Internet usage. The market research was conducted because it is critical in determining the interest and demands of the targeted communities for the services offered. This research will provide the applicant with knowledge of market potential, an understanding of competition, and knowledge of the needs and demands of the potential customer base. But most important, market research informs feasibility studies and strategic planning goals, as well as fulfilling the requirements of many state and Federal funding and grant opportunities..

Methodology

A 10-minute telephone survey of 400 residents in the City of Roanoke and Roanoke County that had a +/- 5% margin of error was conducted. Additionally, there was a 95% level of confidence. Surveyors asked respondents a series of questions relating to their computer ownership, Internet usage, service providers, need for additional services, and demographics.

The survey was developed by Osborne Associates using information supplied by Design Nine and feedback from the broadband task force about the proposed network and the services anticipated to be delivered.

Osborne Associates conducted pre-testing and validation of the questions. A small number of surveys were conducted and completed, and the data was reviewed by Osborne Associates to determine whether there were any problems with the wording or organization of the content. The survey was conducted over a one-week period, and 400 surveys were completed.

Our survey interviewers participated in a training session that covered the survey project protocols and survey instrument test runs. All interviewers were monitored periodically by a call center supervisor. New interviewers are monitored at least once per shift and experienced interviewers are monitored at least once a week. The monitoring system operates without the interviewer being aware that he or she is being monitored. Any problems with an interviewer are addressed either through additional training or reassignment to other projects.

Our survey interviewers are located in Illinois, Indiana, Ohio, and Pennsylvania.

Survey Methods—The surveying was conducted by telephone, utilizing a random-digit-dial (RDD) calling format for the target group specified above. Households were screened on eligibility for the survey based on the stated criteria (e.g., region, adult respondent).

A portion of the sample was made up of cell phone numbers, because it was important to specifically target and collect data that accurately reflected the potentially different attitudes and needs of residents living in cell phone-only households.

Quality Control—It is vitally important to ensure that the collected data meets the expectations and deliverables of the contract, while also conforming to national standards and best practices. The data is collected following strict protocols and established business controls. Quality control measures cover many facets of the interview process, ranging from the type of interviewer training to the type of edit checks that are used on the data. We apply a number of different techniques at various steps of the project to ensure that the collected data is the best possible.

Summary of Results

Some of the key data points that resulted in the survey include:

64% of residents have at least one computer in their home with Internet access with 56% spending more than one hour a day on the Internet.

70% of residents indicated they use the Internet primarily for e-mail while 61% also use the Internet for research.

90% of residents who have an Internet connection identified the speed as 2 Mbps.

85% of residents answered that they are satisfied with their current provider.

70% of residents indicated that they are interested in more features for their phones, Internet, and television services.

58% of residents indicated that price would be a factor in switching phone, Internet, and television service providers.

50% of residents answered that they would be interested in switching phone, Internet, and television service providers if they offer an introductory incentive package.

38% of residents indicated that they would be likely to purchase all of their telecommunications services (phone, Internet, and television) at one price.

84% of respondents own their homes 85% of homeowners having lived in their homes for more than five years.

38% of residents answered they have some form of broadband Internet (3Mbps or more).

26% of residents answered that they have a slower type of Internet (Less than 3Mbps).

36% of residents answered that they have no Internet connection in their homes.

Ownership of computers and current Internet usage

Overall, the respondents used the Internet on a regular basis and were computer savvy. 63.8% had at least one computer in their home, 63.8% had Internet access, and 56.3% spent more than one hour a day on the Internet. This data indicates they are computer competent and have a moderate level of Internet sophistication.

70.0% of the respondents indicated they use the Internet primarily for “e-mail and texting,” and 61.1% indicated they also use the Internet for “research.”

85.2% do not use the computer to work from home. 93.4% did not know or their employers did not provide a VPN for remote access.

Existing provider price and speed

Phone: Verizon provided phone service to 46.2% of the respondents, and Cox provided 23.6%. 11.7% said that their cell phone was their primary phone. 39.7% identified both their landline and cell phone as their primary line. Respondents paid an average of \$70.88 for their monthly phone service.

Internet: Cox provided Internet access to 43.6% of the respondents, and Verizon DSL was the next-largest provider at 16.7%. The average monthly cost for Internet access through these two providers was \$77.67. When asked about their Internet speed, 89.7% of those who had an Internet connection identified the speed as 2 Mbps. 51.4% did not know if the upload and download speeds were the same.

Television: Cox provides 40.2% and DirecTV provides an additional 18.4% of the television services to the respondents, at an average monthly cost of \$70.70.

Satisfaction with current provider

Phone: 72.7% of respondents had been with their current provider for more than five years. 85.4% of respondents were “very satisfied” or “satisfied” with their phone service.

Internet: 60.7% of the respondents had been with their current provider for more than five years. Overall, 86.0% of the respondents said they were “very satisfied” or “satisfied.”

Television: 68.5% of the respondents had been with their provider for more than five years. In addition, 84.4% of the respondents said they were “very satisfied” or “satisfied.”

Services desired

Phone: Respondents stated clearly that they wanted all the additional services. When the “very interested,” “interested,” and “somewhat interested” rankings are combined in questions regarding “basic service” vs. “phones with additional services like call waiting, etc.,” they chose the latter over the former by 70.0% vs. 42.2%.

Internet: As with the phones, respondents clearly wanted additional services. When the “very interested,” “interested,” and “somewhat interested” rankings are combined in questions regarding “basic Internet” vs. “Internet with speed, virus protection, etc.,” they chose the latter over the former by 66.2% vs. 49.1%.

Television: As with the phones and Internet, respondents stated clearly that they wanted premium services. When the “very interested,” “interested,” and “somewhat interested” rankings are combined in questions regarding “basic television” vs. “television with premium services,” they chose the latter over the former by 73.2% vs. 58.1%.

Incentive and introductory pricing

Phone: 61.5% of the respondents said “pricing” would be a factor in switching providers. 21.6% identified “better service” as another factor.

Internet: 57.6% of the respondents said that “price” would be a factor in switching providers, and 23.3% indicated “speed” as a factor. 28.0% said they would pay between \$36 and \$50 for their Internet service; and 50.2% would like their Internet service pricing bundled with their phone and television service.

Television: 53.3% of the respondents said that “price” would be a factor in switching providers, and 21.1% indicated “service” as another factor. 39.4% said they would pay between \$36 and \$60 for their television services; and 39.2% would like their television service pricing bundled with their phone and Internet.

Incentive: 37.5% of respondents indicated they would like an introductory incentive package to include 20% off the entire package of three bundled services. 51.8% said they would be “very interested,” “somewhat interested,” or “interested” in purchasing a contract for two services if they received an iPad. 59.3% were interested in three services if they were incentivized with a flat-screen TV.

Bundling: 38.0% of the respondents said they would be “very likely,” “somewhat likely,” or “likely” to purchase all their telecommunications services (phone, Internet, and television) at one price.

Demographic information

All the respondents were residents of Roanoke, VA , or Roanoke County. 84.1% of all respondents owned their own home, and 85.4% had lived in their home for more than five years. 69.7% of the respondents had no children living in their home. 60.0% of the respondents had incomes of less than \$100,000.

Under-served and un-served statistics

Broadband Internet Connection: 37.7% had access to broadband Internet through their connection to Cox (27.8%) and Comcast (9.9%), the latter of which is the sole provider of broadband speed, that is, a minimum rate of data transmission of 3 megabits per second (download plus upload speed). However, it is important to note that we are basing the broadband speed assumption on Comcast’s published speeds. These speeds can vary by time of day, time of year, and level of usage. At any time, Comcast’s actual broadband speed could in fact be less than the required 3 megabits per second required to be called “broadband.”

Other Internet Connections: 26.1% of the respondents connected to the Internet through other means: DSL, fixed wireless, cell phone data cards, etc. None of these meet the acceptable broadband speed criteria.

No Internet Access: 36.2% of the respondents had no connection to the Internet in their home.

Detailed Results

A total of 403 responses were collected. Not all responders answered every question.

Are you a resident of Roanoke County or the City of Roanoke?

Yes	No
403	0
100%	0%

What is your zip code?

24001	24012	24013	24014	24015	24016	24017	24018
11	81	15	45	32	7	32	101
3%	20%	4%	11%	8%	2%	8%	25%

24019	24059	24070	24105	24121	24153	24179	Refused
49	2	4	3	1	3	12	5
12%	0%	1%	1%	0%	1%	3%	1%

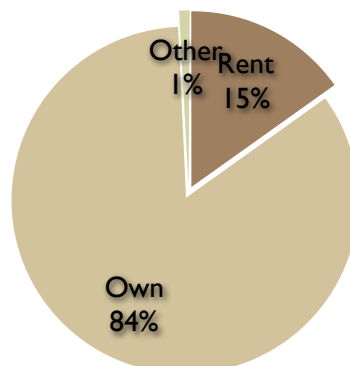
What year were you born?

1920 to 1934	1935 to 1949	1950 to 1964	1965 to 1974	1975 to 1989	Refused
42	106	113	68	32	42
10%	26%	28%	17%	8%	10%

Do you rent or own?

Rent	Own	Other
61	339	3
15%	84%	1%

Do you rent or own?



How long have you lived at your place of residence?

Less than a year	1 to 5 years	More than 5 years	Other
9	49	344	1
2%	12%	85%	0%

How many people over the age of 17 live in your household in addition to you?

0	1	2	3	4	5	6	7
56	112	178	41	11	2	2	1
14%	28%	44%	10%	3%	0%	0%	0%

How many children under the age of 18 live in your household?

0	1	2	3	4	7
281	50	48	19	4	1
70%	12%	12%	5%	1%	0%

How do you make phone calls from your home?

Verizon Landline	Comcast	Verizon Wireless	AT&T Wireless	Sprint Wireless	Cox	Other
186	57	24	27	2	95	12
46%	14%	6%	7%	0%	24%	3%

Is your cell phone your primary phone?

Yes	No	Both	Don't Know
47	192	160	4
12%	48%	40%	1%

What have you paid for phone service in August, September, and October?

Phone Bill for August	Phone Bill for September	Phone Bill for October	Bundled with Internet and TV
174	173	192	56
The Mean: \$70.79	The Mean: \$71.21	The Mean: \$70.66	The Mean: \$123.59

The average monthly phone bill for all respondents over the three month period was \$70.88.

How long have you been a customer of your current phone company?

Less than a year	1 to 5 years	More than 5 years	Don't Know
12	81	293	17
3%	20%	73%	4%

Rate your level of satisfaction with your current phone company?

Very Satisfied	Satisfied	Somewhat Satisfied	Somewhat Unsatisfied	Very Unsatisfied	Don't Know
181	163	34	11	10	4
45%	40%	8%	3%	2%	1%

What factor might cause you to switch?

Price	Better Service/Reliability	Features	Local Ownership	Other	Don't Know
248	143	69	24	22	70
43%	25%	12%	4%	4%	12%

How many computers are there in the house?

0	1	2	3	4	5	6
129	165	65	16	21	6	1
32%	41%	16%	4%	5%	1%	0%

Do you plan to purchase a computer in the next...?

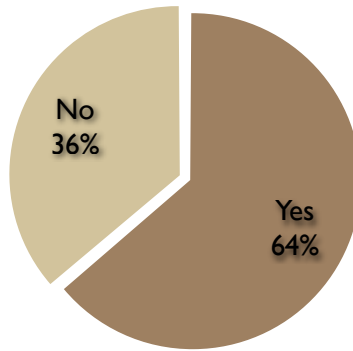
Only the 129 residents without a computer answered this question.

Year	2 years	5 years	Never
6	5	3	115
5%	4%	2%	89%

Can you currently access the Internet in your home?

Yes	No
257	146
64%	36%

Can you currently access the Internet in your home?



Is Internet access available in your community?

146 residents responded to this question.

Yes	No	Don't Know
86	10	50
59%	7%	34%

Possible reasons your home doesn't have Internet access.

146 residents responded to this question.

Costs too much	Can't get wire to my house	Do not use, no need for it	Do not want family to use	Other
19	3	92	13	19
13%	2%	63%	9%	13%

How do you currently access the Internet from home?

257 residents responded to this question.

HughesNet	Verizon	Verizon DSL	Cox Cable	Verizon Wireless	AT&T	Comcast	Other
8	18	43	112	17	9	40	10
3%	7%	17%	44%	7%	4%	16%	4%

Cross tabulation of Age and Access

		Age Range						Total
		21-30	31-40	41-50	51-60	60 plus	No age	
How do you currently access the Internet from home?	HughesNet		2	1	2	2	1	8
	Verizon		2	3	7	5	1	18
	Verizon DSL	2	6	16	13	5	1	43
	Cox Cable	5	7	23	26	34	17	112
	Verizon Wireless		1	4	5	5	2	17
	AT&T	1	2	3	1	2		9
	Comcast	1	6	9	8	14	2	40
	Other		1	2	1	4	2	10
Total		9	27	61	63	71	26	257

What did you pay for Internet service in August, September, and October?

Internet Service for August	Internet Service for September	Internet Service for October	Bundled w/Phone and Television
93	95	101	48
The Mean: \$77.77	The Mean: \$77.52	The Mean: \$77.74	The Mean: \$127.29

What is your Internet speed?

257 residents responded to this question.

2Mbps to 4Mbps	5Mbps to 12Mbps	13Mbps to 56Mbps	100Mbps or Faster	Don't Know
145	3	6	1	102
56%	1%	2%	0%	40%

Are your upload and download speeds the same?

257 residents responded to this question. Because most residential Internet services are not symmetric, it is possible that some people that answered “yes” actually don’t know.

Yes	No	Don't Know
100	25	132
39%	10%	51%

If you have Internet service, how long have you been a customer of your current Internet access provider?

Less than a year	1 to 5 years	More than 5 years	Don't Know
11	81	156	9
4%	32%	61%	4%

Rate your level of satisfaction with your current Internet provider.

Very Satisfied	Satisfied	Somewhat Satisfied	Somewhat Unsatisfied	Very Unsatisfied	Don't Know
118	103	17	10	6	3
46%	40%	7%	4%	2%	1%

What do you use the Internet for?

Work	Research	E-mail, Texting	Shopping	Security	Games/ Entertainment	Online Learning	Other
68	157	180	115	35	339	67	10
7%	16%	18%	12%	4%	35%	7%	1%

Do you ever work from home?

257 residents responded to this question.

Part-time for my Employer	Full-time for my Employer	Need Night and Weekend Access	Self-employed & Work Part-time	Self-employed & Work Full-time	I never work from home
12	9	4	7	6	219
5%	4%	2%	3%	2%	85%

Does your employer use a VPN to allow access to the corporate network?

257 residents responded to this question.

Yes	No	Don't Know
17	105	135
7%	41%	53%

How likely would you be to switch from your current Internet provider?

Very Likely	Likely	Somewhat Likely	Somewhat Unlikely	Very Unlikely	Don't Know
14	14	28	75	124	2
5%	5%	11%	29%	48%	1%

What factors might cause you to switch?

Price	Service/Reliability	Speed/Symmetrical Speed	VoIP	Features	Other	Don't Know
148	91	64	3	37	12	42
37%	23%	16%	1%	9%	3%	11%

Interest in potential services offered by new provider.

Faster Speeds	Greater Reliability	Spam/Virus Blockers	Home Security	Streaming Video	Remote Control of Utilities	Telephone	Other
133	116	219	67	61	36	49	56
18%	16%	30%	9%	8%	5%	7%	8%

Price ranges for your indicated services if a new provider offered Internet services.

\$30 to \$35	\$36 to \$40	\$41 to \$45	\$46 to \$50	Bundle w/ Phone and TV	Don't Know
48	21	18	33	129	8
19%	8%	7%	13%	50%	3%

How do you get your television signal?

Dish TV	DirecTV	Comcast	Cox	Roof Antenna	Set-top	Other	Don't have a TV
67	74	60	162	11	13	6	10
17%	18%	15%	40%	3%	3%	1%	2%

What did you pay for television service in August, September, and October?

Television Service for August	Television Service for September	Television Service for October	Bundled Internet and Phone
161	165	177	55
The Mean: \$69.43	The Mean: \$71.10	The Mean: \$71.58	The Mean: \$127.80

How long have you been a customer of your current television service provider?

Less than a year	1 to 5 years	More than 5 years	Don't Know
12	90	276	25
3%	22%	68%	6%

How would you rate your level of satisfaction with your current television provider?

Very Satisfied	Satisfied	Somewhat Satisfied	Somewhat Unsatisfied	Very Unsatisfied	Don't Know
183	157	28	18	11	6
45%	39%	7%	4%	3%	1%

How likely would you be to switch providers?

Very Likely	Likely	Somewhat Likely	Somewhat Unlikely	Very Unlikely	Don't Know
26	29	49	96	198	5
6%	7%	12%	24%	49%	1%

What factors might cause you to switch?

Price	Service/Reliability	Features	Movie Library	Greater Channel Selection	Other	Don't Know
215	145	75	10	34	11	99
37%	25%	13%	2%	6%	2%	17%

Interest in potential services offered by new provider.

Premium Channels	On-demand Service	DVR	High Definition	Blu-Ray	3D TV	Phone Capabilities	Other
231	113	236	103	56	48	49	105
24%	12%	25%	11%	6%	5%	5%	11%

Price ranges for your indicated television service if a new provider offered television services.

\$12 to \$35	\$36 to \$40	\$41 to \$45	\$46 to \$60	Bundle w/Phone and Internet	Don't Know
80	54	39	66	150	14
20%	13%	10%	16%	37%	3%

Proposed services from a new service provider - basic phone.

Not Interested	Maybe	Somewhat Interested	Interested	Very Interested	Don't Know
114	38	22	48	96	85
28%	9%	5%	12%	24%	21%

Would you be interested in a new service provider providing you with a phone with additional services (call waiting, call forwarding, voice mail, etc.)?

Not Interested	Maybe	Somewhat Interested	Interested	Very Interested	Don't Know
76	28	131	32	119	17
19%	7%	33%	8%	30%	4%

Would you be interested in a new service provider providing you with basic Internet?

Not Interested	Maybe	Somewhat Interested	Interested	Very Interested	Don't Know
157	28	125	19	54	20
39%	7%	31%	5%	13%	5%

Would you be interested in a new service provider providing you with Internet with more speed, virus blocker, and spam blockers?

Not Interested	Maybe	Somewhat Interested	Interested	Very Interested	Don't Know
97	19	130	31	108	18
24%	5%	32%	8%	27%	4%

Would you be interested in a new service provider providing you with basic television services?

Not Interested	Maybe	Somewhat Interested	Interested	Very Interested	Don't Know
108	42	130	21	83	19
27%	10%	32%	5%	21%	5%

Would you be interested in a new service provider providing you with premium television services?

Not Interested	Maybe	Somewhat Interested	Interested	Very Inter-ested	Don't Know
74	16	148	31	116	18
18%	4%	37%	8%	29%	4%

Would you be interested in a new service provider providing you with a flat-screen television with a two-year contract?

Not Interested	Maybe	Somewhat In-terested	Interested	Very Inter-ested	Don't Know
125	21	146	30	63	18
31%	5%	36%	7%	16%	4%

Would you be interested in a new service provider providing you with an iPad with a one-year contract?

Not Interested	Maybe	Somewhat In-terested	Interested	Very Inter-ested	Don't Know
153	23	135	25	49	18
38%	6%	33%	6%	12%	4%

How likely would you be to purchase all your telecommunications services at one price?

Very Likely	Likely	Somewhat Likely	Somewhat Un-likely	Very Unlikely	Don't Know
95	58	51	42	75	82
24%	14%	13%	10%	19%	20%

Interest in incentives for purchasing telecommunications services.

10% off 3 or more services	20% off 3 or more services	Low cost for 6 months for 3 services	Flat-screen TV with 2 year contract	iPad with 1 year contract	Other
14	151	53	52	15	118
3%	37%	13%	13%	4%	29%

In total, including work and home, how much time do you spend online each day?

Less than 1 hour	1 to 2 hours	3 to 5 hours	6 to 10 hours	More than 10 hours	Don't Know
85	111	86	20	10	91
21%	28%	21%	5%	2%	23%

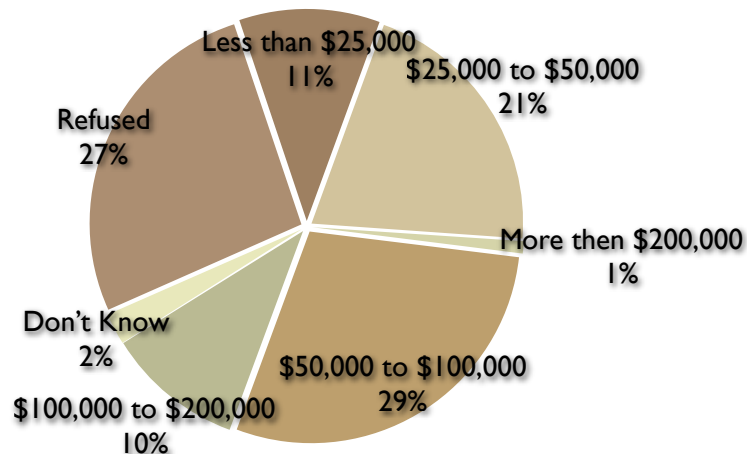
Cross tabulation of time spent online and age.

		Age Range						Total
		21-30	31-40	41-50	51-60	60 plus	No age	
In total, including work and home, how much time do you spend online each day?	Less than one hour	1	8	10	11	47	8	85
	one to two hours	3	10	34	26	32	6	111
	three to five hours	4	12	20	23	18	9	86
	six to ten hours	1	3	3	8	3	2	20
	More than ten hours			2	2	3	3	10
	Do not know		3	3	15	56	14	91
Total		9	36	72	85	159	42	403

What is your total household income?

Less than \$25,000	\$25,000 to \$50,000	\$50,000 to \$100,000	\$100,000 to \$200,000	More than \$200,000	Don't Know	Refused
43	83	116	42	3	9	107
11%	21%	29%	10%	1%	2%	27%

What is your total household income?



Cross tabulation of household income and service provider

		Service Provider								
		Hughes Net	Verizon	Verizon DSL	Cox Cable	Verizon Wire-less	AT&T	Com-cast	Other	Total
Household income	Less than \$25,000	1		1	5	5	1	2	1	11
	\$25,000-\$50,000		4	4	23	3	1	8		43
	\$50,000-\$100,000	4	10	17	30	9	3	19	2	93
	\$100,000-\$200,000	1		14	8	3	2	9	2	39
	More than \$200,000				1				2	3
	Do not know	1	2		3					6
	Refused	1	3	7	42	2	2	2	3	62
Total		8	18	43	112	17	9	40	10	257

Cross tabulation of household income and time spent online

		Time spent online each day						Total
		Less than one hour	One to two hours	Three to five hours	Six to ten hours	More than ten hours	Do not know	
Household income	Less than \$25,000	15	8	1	1	2	16	43
	\$25,000- \$50,000	24	19	17	1		22	83
	\$50,000-\$100,000	18	45	31	5	1	16	116
	\$100,000-\$200,000	5	23	9	2	2	1	42
	More than \$200,000	1			2			3
	Do not know	3	2	3			1	9
	Refused	19	14	25	9	5	35	107
Total		85	111	86	20	10	91	403