

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

Volume I: Executive Summary



Prepared for the  
Roanoke Valley Region



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# The **Star City** has always been **a connector** and *connected*



In 1720, it was the Roanoke waterways that were the connectors . . . connecting eastern Virginia with western Virginia . . .

In 1880 the railroad connected Roanoke with the rest of the eastern USA . . .



In 1930, Roanoke's Woodrum Field connected Roanoke with the whole country . . .

In 1970, Interstate 81 connected Roanoke to the national economy . .



And today, how is Roanoke going to join the connected world?

*It would take over 5 years to watch the amount of video that will cross global IP networks every second in 2015.*

Every second, 1 million minutes of video content will cross the network in 2015.

Cisco System Visual Networking Index, 2011

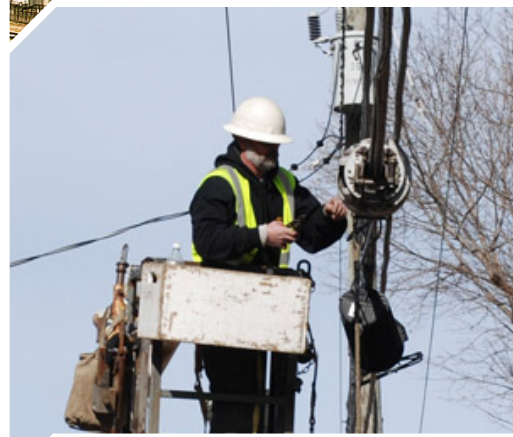
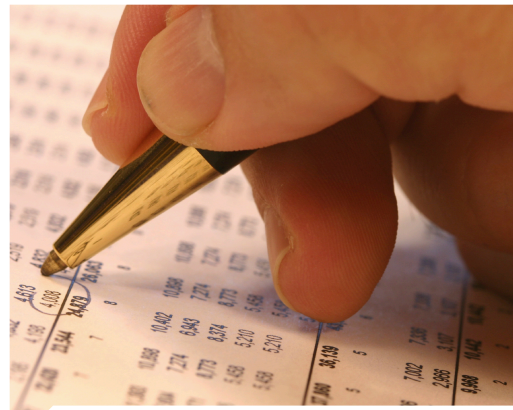


This **Executive Summary** is Part One of four documents that comprise a broadband study commissioned by the Roanoke Valley Alleghany Regional Commission, local governments, and business leaders in the region.

Part Two of the study contains a **Needs Assessment** and the **Business and Residential Survey** results. That document reviews the essential background information: what we have learned about the region and its businesses and residents and how this relates to other communities from around the country with similar characteristics.

Part Three of the study is our **Findings and Recommendations**. That document provides key findings and the broader context that led to the recommendations summarized in this report (the Executive Summary). The Findings report also contains a series of **Appendices** that step through the main topics presented in the Findings, in an order that parallels portions of the Findings, but are presented in significant detail.

Part Four contains **Maps and Detailed Cost Estimates** and financial information on various “next step” options and alternatives. Due to the large size of the complete set of maps, all maps developed are available online at : <http://roanoke.designnine.com/>



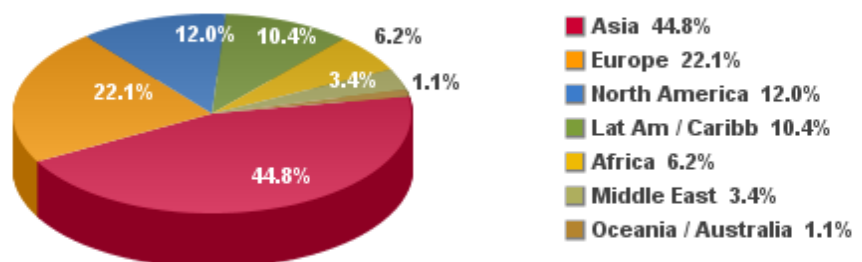
# 21st Century Telecom from 10,000 Feet

## The World is Increasingly Online

A good place to begin is with the sheer magnitude of the Internet today. Even if you think you know how big the Internet has become, these numbers will floor you.

- In 2000 there were an estimated 361 million users worldwide. As 2011 came to a close that number had grown to **2.2 billion Internet users**. This represents a 528.1% increase, or *1.8 billion new users in less than 12 years*. 30.3% of the population worldwide is now online. (InternetWorldStats.com data)

### Worldwide Internet Use by Regions - 2011



Source: Internet World Stats      Basis: Internet Users December 31, 2011  
C 2012 : Miniwatts Marketing Group

## Staggering Growth Still to Come

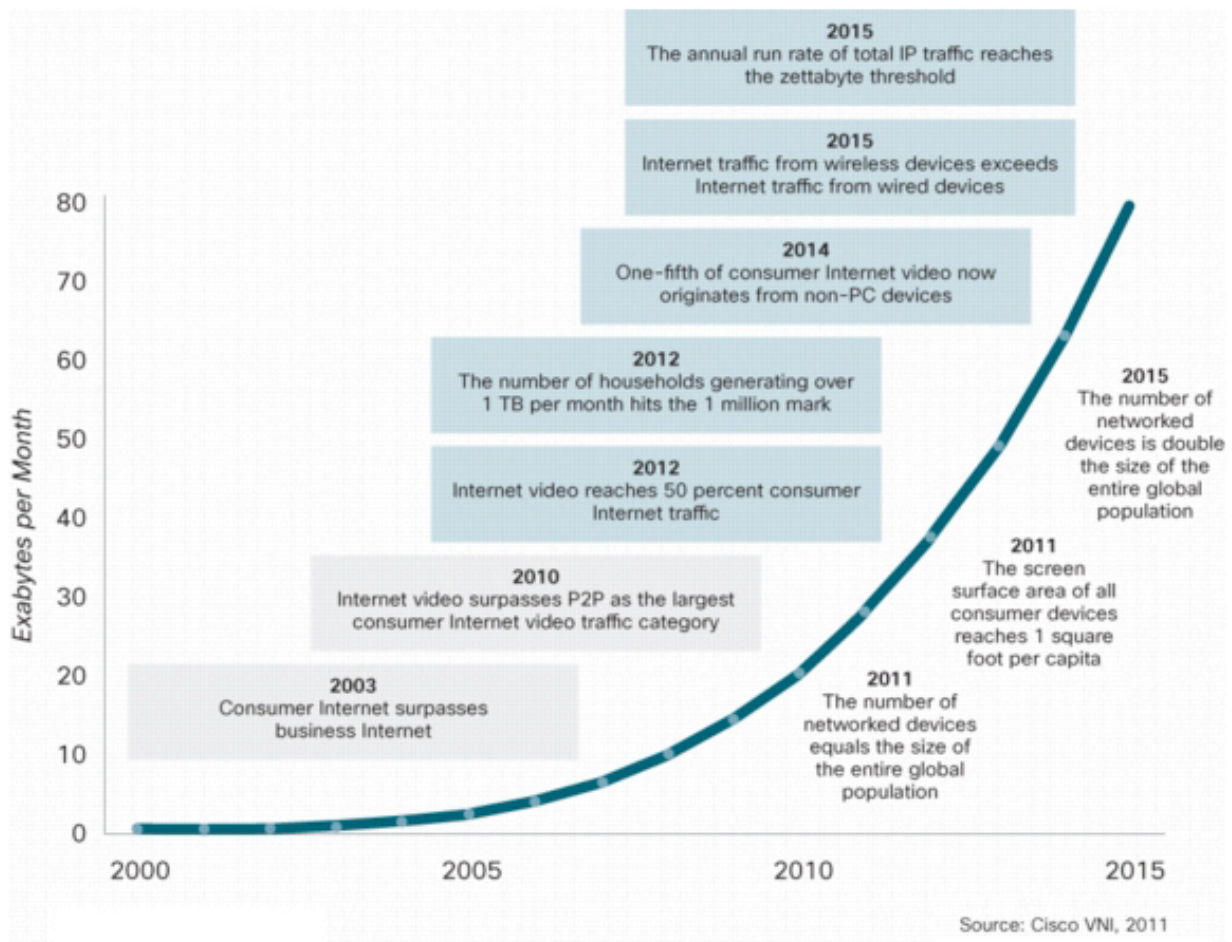
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These numbers, as enormous as they are, almost pale in comparison the growth projections for just the next three years made by Cisco Systems Visual Networking Index (VNI). Together with a few dozen top consulting, analysis, and strategy firms, Cisco projected broadband connections, video subscribers, mobile connections, and Internet application adoption for the year 2015 using data from service providers, current technology trends, and knowledge of evolving hardware dictating enabling factors such as broadband and computing speeds.

- **Annual global IP traffic will reach the zettabyte threshold** (966 exabytes or nearly 1 zettabyte) by the end of 2015. *(A zettabyte is a measure of storage capacity. 1 zettabyte is approximately equal to a thousand exabytes or a billion terabytes.)*
- **The "terabyte club" will reach 6 million by 2015.** In 2015, there will be 6 million Internet households worldwide generating over a terabyte per month in Internet traffic, up from just a few hundred thousand in 2010. There will be over 20 million households generating half a terabyte per month in 2015.
- **Global IP traffic has increased eightfold over the past 5 years, and will increase fourfold over the next 5 years.** Overall, IP traffic will grow at a compound annual growth rate (CAGR) of 32 percent from 2010 to 2015.
- **A growing amount of Internet traffic is originating with non-PC devices.** In 2010, only 3 percent of Internet traffic originated with non-PC devices, but *by 2015 the non-PC share of Internet traffic will grow to 15 percent.* PC-originated traffic will grow at a CAGR of 33 percent, while TVs, tablets, smartphones, and machine-to-machine (M2M) modules will have growth rates of 101 percent, 216 percent, 144 percent, and 258 percent, respectively.



## Visual Indexing Forecast (VNI) for 2015



- **Traffic from wireless devices will exceed traffic from wired devices by 2015.** In 2015, wired devices will account for 46 percent of IP traffic, while Wi-Fi and mobile devices will account for 54 percent of IP traffic. In 2010, wired devices accounted for the majority of IP traffic at 63 percent.
- **Busy-hour traffic is growing more rapidly than average traffic.** Busy-hour traffic will increase fivefold by 2015, while average traffic will increase fourfold. During an average hour in 2015, the traffic will be equivalent to 200 million people streaming high-definition video continuously. *During the busy hour in 2015, the traffic will be equivalent to 500 million people streaming high-definition video continuously.*



- **Internet video is now 40 percent of consumer Internet traffic, and will reach 62 percent by the end of 2015**, not including the amount of video exchanged through P2P file sharing. *The sum of all forms of video (TV, video on demand [VoD], Internet, and P2P) will continue to be approximately 90 percent of global consumer traffic by 2015.*
- **Globally, mobile data traffic will increase 26 times between 2010 and 2015.** Mobile data traffic will grow at a CAGR of 92 percent between 2010 and 2015, reaching 6.3 exabytes per month by 2015.
- **Business IP traffic will grow at a CAGR of 24 percent from 2010 to 2015.** Increased adoption of advanced video communications in the enterprise segment will cause business IP traffic to grow by a factor of 2.7 between 2010 and 2015.
- **Business video conferencing will grow sixfold over the forecast period.** Business videoconferencing traffic is growing significantly faster than overall business IP traffic, at a CAGR of 41 percent from 2010-2015.
- **Global mobile data traffic will grow three times faster than fixed IP traffic from 2010 to 2015.** Global mobile data traffic was 1 percent of total IP traffic in 2010, and will be 8 percent of total IP traffic in 2015.

## Not All Broadband is Created Equal

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**What is broadband?** This widely used term means different things to different people. Why? Because this same label is attached to a variety of technologies with vastly different attributes and performance characteristics that have only two things in common: first, broadband technologies connect to the Internet at speeds faster than “dial-up” service; and second, broadband connections are “always on.”

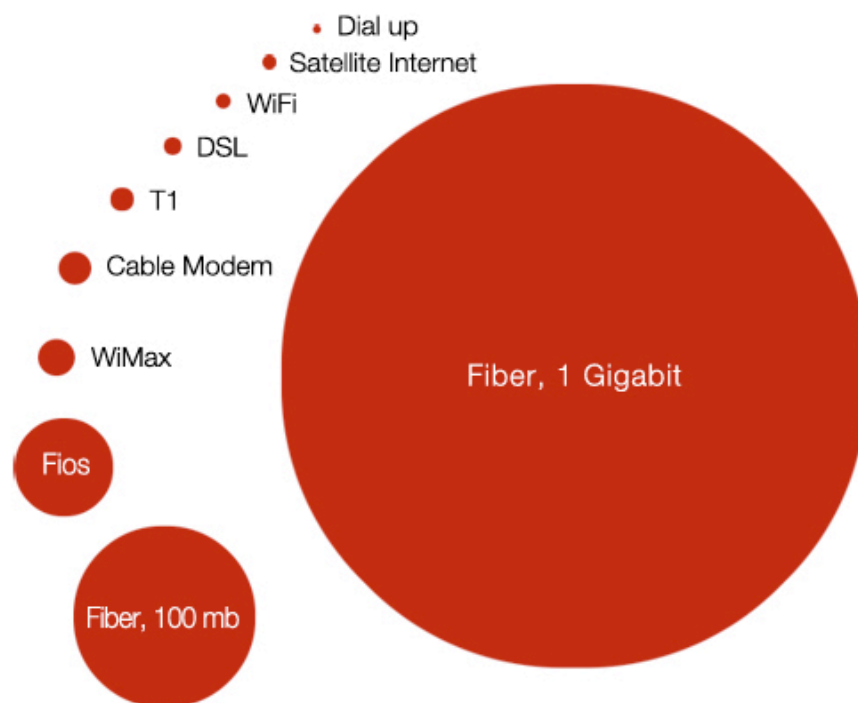
The **Internet** and the **Web** are not the same. And **broadband** is more than one thing.

- **The Internet is a global system of interconnected computer networks**—a vast network of networks—consisting of millions of separate government, business, academic and private networks that are linked together by a complex of wired and wireless technologies. The Internet is where we go when we login to our computer to download a report, ask our Android phone for a nearby restaurant, watch a movie on our iPad.



To add further fuzziness, *broadband* and *high speed Internet* are used interchangeably –with neither term saying very much about capabilities. In 2012, saying *better than dial-up* is not saying much. At the end of the day, broadband is really a marketing slogan much more than a useful technical definition.

### Bandwidth/Connectivity Comparisons Dial-up Modem to Gigabit Ethernet



The term **Broadband** is used to describe various Internet connectivity technologies, beginning with a satellite Internet connection, providing only slightly better service than dial-up at relatively high cost, and advancing with improving connectivity speed to Fiber-to-the-Premises (FTTH) at the top of the list.

A good analogy can be made between the volume of data an Internet connection is able to manage and the carrying capacity of a water pipe. The diagram above illustrates the relative capacity of each of the so-called broadband technologies.

Fixed wireless, satellite and cable are thought to have very little additional future capacity through advances in engineering. Cable is believed capable of achieving somewhat greater bandwidth capacity in the future.

Optical fibers themselves transmit at the speed of light so the speed limitation on a fiber network is a function of the electronics that power the lasers. Today, there are real-world networks offering Gigabit-per-second Internet connections and one of them Chattanooga, Tennessee. Lab experiments are underway at even faster speeds.

## Why Big Bandwidth is Critical for Our Future

Speaking at the Consumer Electronics Show in Las Vegas in January of this year. FCC Chair, Julius Genachowski connected the importance of bandwidth to the unmistakable trends in consumer electronics and beyond to the economic health of the nation.

- Virtually every new product on the CES floor is fueled by broadband Internet – by connectivity and bandwidth, wired and wireless. If you shut off the Internet, virtually nothing on the CES floor would work.
- The value of almost every technology innovation at this show goes up as bandwidth goes up.
- As Netscape founder Marc Andreessen has noted, increased bandwidth dramatically enhances the increasing power of software, which lowers the cost to start and run businesses and vastly expands the market for online services.
- As the quality of network-connected apps, services and devices goes up, they generate increasing consumer demand, which drives increased investment in networks – creating a virtuous cycle with a growing broadband economy and ongoing job creation.
- We need universal broadband adoption, so that every American is taking advantage of our 21st century communications platform – for finding and landing jobs, for connecting to education in and out of the classroom, for obtaining health care information, diagnosis and even treatment, and for participating in your community.

**By the end of 2012, South Korea intends to connect every home in the country to the Internet at one Gigabit per second.** “That would be a tenfold increase from the already blazing national standard, and more than 200 times as fast as the average household setup in the United States,” The Times reported last February.

# Last Mile is the First Mile

It is indeed unfortunate that the telecom industry has dubbed the most important part of the network “the last mile.” The so-called “last mile” is the way customers of broadband services get access to the network; the correct term should be “the first mile.” Indeed, the overwhelming problem with broadband assets in the Valley is the lack of “first mile” connectivity to existing fiber assets—there is very little.

Some providers in the region do make the legally truthful claim that they can provide fiber anywhere it is needed, but what is typically left out is the cost of doing so. A business or school that wants a fiber connection but is not directly on an existing fiber route (most places in the Valley) will typically be charged the full cost of constructing new fiber to that location, even if the provider now has the opportunity to offer fiber services to other customers now passed by the new fiber. These charges can often be hundreds of thousands of dollars for even just a mile or two of construction.

## About Fiber Networks

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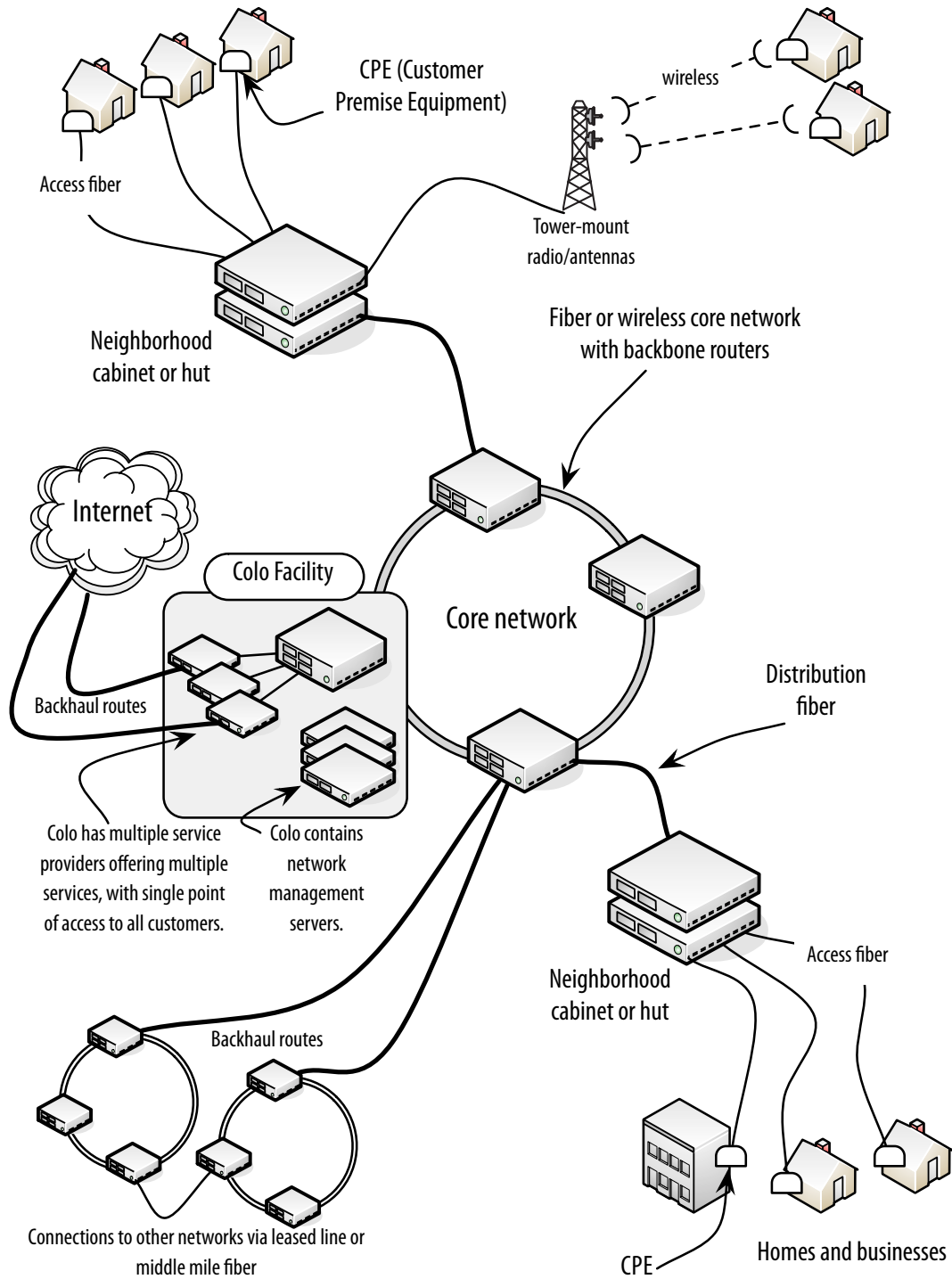
Fiber network designs have five primary components that must be considered when developing a strategy for fiber investments.

- **Backhaul** – Backhaul fiber constitutes the routes in and out of the region. In the Roanoke Valley, most of the backhaul fiber entering and leaving the region traverse the I-81 corridor, which reduces path diversity and redundancy. The MBC connection at Bonsack provides a new route out of the region to the east, greatly improving the resiliency of fiber networks within the Valley.
- **Core Network** – The most desirable core network design is at least one “ring” of fiber around the community, so that if the fiber cable is cut at any point, data traffic can be automatically re-routed in the opposite direction without creating a failure. In an area the size of the Roanoke Valley, a redundant regional ring would ideally connect a series of smaller redundant rings to provide a higher level of protection against fiber cuts. We know of a business in the mid-west that has calculated the loss of Internet access at one million dollars per minute--the firm processes a very large number of online

transactions. Relocating businesses are typically keenly interested in the design of a regional core network, and want to see both redundant rings and path diversity in and out of the region.

- **Distribution** – Distribution fiber constitutes the fiber cables that go up and down the streets of the community, passing homes, businesses and institutions. The Roanoke area has a limited amount of privately owned distribution fiber. Distribution fiber can be the most expensive portion of a community-wide network design. Private providers typically cannot make a business case to build large amounts of distribution fiber; instead, they build distribution fiber only to the largest customers (e.g. schools, large businesses, etc.). Homes and most smaller businesses and retail stores are left out.
- **Access** – Access fiber is the connection from the street to the premises. Once a business, school, or home has been passed by distribution fiber, the crucial “first mile” fiber is needed to connect the premises to the network.
- **Colocation/Data Center** – A colocation or data center is needed to provide a meet point for various public and private fiber cables and network to inter-connect. In the past, the telephone company switch office (Central Office, or CO) has provided that function. Today, many communities have either a community-owned data center or a privately owned data center that offers an affordable range of options for customers of broadband services. The rise of Software as a Service (SaaS) and cloud-based computing and data services has increased the need for affordable data centers. Many companies now backup company data in multiple, geographically diverse data centers to reduce the likelihood of any data loss. We know of one company that uses multiple data centers for storage of corporate data and enforces a rule that any two data centers must be a minimum of twenty miles apart to reduce the likelihood of a natural disaster (e.g. flood, wind storm, earthquake, etc.) would affect both data centers at the same time. The Rockbridge Area Network Authority is building a \$3 million dollar data center in Lexington that will be largest facility of its kind in western Virginia.

The illustration below shows how the parts of a broadband network fit together.



## Regional Challenges

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Despite the region's long list of advantages, the Roanoke valley has some challenges to overcome.

- Virtually **no distribution or access fiber** – Despite the presence of some competitive fiber providers, very little access or distribution fiber exists. The competitive providers can only afford to build distribution and access fiber to the larger customers in the area, leaving wide portions of the Valley limited options for broadband services and virtually no competition.
- The competitive fiber that does exist does not provide the region with a **coherent, fully redundant core fiber ring**, which is essential for many businesses that might want to relocate to the region. The lack of an open access core network ring also keeps prices for broadband services higher than they would be if it existed. This is a particular burden for local governments and higher education facilities, which depend wholly or partly on tax dollars to fund telecom needs.
- **Lack of path diversity** is also an issue, with too much reliance by existing providers on fiber cable exiting the region on Interstate 81. This situation is improving (.e.g. MBC presence at Bonsack, future Allied Fiber route), but these two new routes out of the area cannot be fully utilized without a fully redundant core fiber ring within the valley.
- The network does not recognize **political boundaries**, and improved access to affordable broadband will only be solved by a strategy of aggregating customers across political boundaries. Collaborating with other regional efforts such as the New River Regional Open Access Network helps create efficiencies that can't be achieved by one or two local governments.

# Next Steps

## Long Term Goals

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Long Term Goals	Description
<b>Encourage Public/Private Partnerships</b>	Partnerships among local governments, service providers, schools, public safety agencies, water authorities, major businesses and health care institutions will assist with business attraction and lower telecom costs for all partners.
<b>Create New Business Opportunities for Existing Service Providers</b>	Local government should provide only basic infrastructure and transport, and should not compete with existing providers by selling services to businesses and residents. This is best done by the private sector.
<b>Fiber Should Support Economic Development</b>	Investments in broadband should be targeted to promote business growth and jobs creation.
<b>Reduce Cost, Improve Quality of Government Services</b>	A shared regional network will reduce the cost of telecom services for local governments while simultaneously improving service delivery.
<b>Reduce Costs for Small and Large Businesses</b>	A shared regional network will reduce the cost services for entrepreneurs, business start ups, and existing businesses.
<b>Wireless Everywhere</b>	Fiber and wireless infrastructure are complementary. The cost and performance of cellular wireless can be improved with affordable fiber access, and WiFi in retail areas and downtowns can enhance tourism.
<b>Don't Wait</b>	Many other communities have already made investments and aggressively promoting their infrastructure as part of their economic development strategies.

### ***Encourage Public/Private Partnerships***

The size of the region and the diversity of public and private interests in the region will require a commitment to regional collaboration if this effort is to be successful. The network does not stop at political boundaries. From a network perspective, the entire region is a single, large (and attractive) market. While it is entirely



possible for the individual governments to each pursue an independent course, this is a situation where the whole is much greater than the sum.

Important and critical partners include:

- Local governments
- Higher education institutions, including all two year and four year colleges and universities.
- Large institutional users of broadband services, especially health care and medical facilities in the region.
- K12 school systems are essential partners because they are among the largest users of broadband connections.
- Major public and private providers of other critical infrastructure, including gas, water, sewer, and roads (traffic control),
- Existing incumbent and competitive telecom service providers.

By taking the time to develop the partnerships needed for a regional approach:

- Costs are spread across a larger market area, making the long term financial sustainability much more likely.
- The larger market base will attract more providers and services, leading to even lower prices and a greater diversity of service offerings.
- The larger market base will also encourage more private investment, especially in building new and diverse fiber routes in and out of the region.
- It will be possible to raise more funds more quickly and thereby build to more businesses, residents, and institutions more quickly.

### ***Create New Business Opportunities for Existing Service Providers***

Any local government investment in telecom and broadband infrastructure should be at the physical layer and the transport layer of the network. Local government should avoid selling services to businesses and residents. Providing basic infrastructure and transport will allow them to reach new customers at much lower cost and allow them to offer improved services to their existing customers. An important goal of any local government investment should be to create new business opportunities for existing incumbent and competitive providers,

### ***Build Fiber in Support of Economic Development Goals***

The region needs more distribution and access fiber, which is essential for meeting future demand for broadband services. The Valley needs a carefully designed redundant core fiber network with a ring design that gives public and private broadband users maximum access to competitive services from a wide variety of providers, including Lumos, Level(3), Zayo, Citizen's, Cox, Comcast, Verizon, 1Point, and any other interested provider. The core network should also extend north into Botetourt county to support identified economic and residential development growth zones.

To the maximum extent possible, this core network should avoid over-building existing privately owned fiber assets, and any construction should be preceded by an effort to obtain long term leases of fiber where it is available. The core network should include a connection to the MBC network Point Of Presence (POP) at Bonsack. This would also provide a route into the New River Valley via the MBC/VT fiber route through Craig and Giles counties.

- Fiber to the home is needed to support work from home opportunities.
- Fiber to the home is needed to support business from home ventures, especially small business start-ups and entrepreneurial ventures.
- Fiber is needed to every economic development area and corridor in the region, and open fiber is needed within every business park to reduce the cost of broadband services for businesses located in those parks.
- Fiber is needed in downtown areas (Main Street) to support economic revitalization efforts and to meet business needs in those core areas.
- Open fiber is needed to every school to help drive down the cost of K12 and higher ed telecom costs and to improve the delivery of learning resources and online classes.
- Fiber is needed to both improve the delivery of government services and to reduce the cost of those services.
- Fiber is needed to provide improved efficiencies in the management of regional water and sewer facilities and to support automated meter reading.

### ***Reduce Cost, Improve Quality of Government Services***

A shared regional network will help reduce the cost of telecommunications and broadband services for local governments through increased competition and the cost advantage of shared infrastructure. Critical services like public safety, water, and sewer will benefit from a long range plan to make fiber available to most local government locations (e.g. fire and rescue, police stations and sheriff's departments, pumping stations, parks, intersections (for improved traffic control),

### ***Reduce Costs for Small and Large Businesses***

A single, shared, high performance network will reduce the cost of telephone, Internet, data back up, videoconferencing, and other business services through reduced cost of infrastructure and increased competition. The region is competing for jobs and businesses with other communities in Virginia and communities in other states that already have this kind of infrastructure in place--and most of those communities are aggressively promoting it as part of their economic development business attraction and retention strategies.

### ***Wireless Everywhere***

For the foreseeable future, the primary means of mobility access to the network will be via the existing private sector cellular network. But that system will require additional expansion and investment to meeting the drastically increasing demand.

- Open fiber to cell towers will simultaneously reduce carrier backhaul costs while improving service from those towers.
- Local governments can adopt uniform tower permitting and design requirements to simplify the process of adding more towers.
- Tourist areas of the valley, downtown areas, and recreational locations will benefit from “visitor WiFi” access. Visitor WiFi would be free but would have limits on bandwidth and hours of use per day. Visitor WiFi would encourage longer tourist stays in shopping and dining areas while simultaneously reducing the load on the local cellular networks. In some areas, the visitor WiFi might also include access to other networks (e.g. in downtown Salem, Roanoke College faculty, staff, and students might be able to access the private Roanoke College network with a userid and password).

### ***Don't Wait***

As we have described in more detail in Findings report, many other regions, some very close by, are well ahead of the Roanoke Valley in their plans to acquire 21st century broadband infrastructure.

- Kansas City, Kansas and Kansas City, Missouri have construction underway in their Google partnership, which will connect hundreds of government locations, thousands of businesses, and tens of thousands of homes.
- The Utopia project in Utah is investing more than \$60 million to expand its community-based fiber network from 9,000 homes and businesses to a planned 25,000 homes and businesses.
- The Rockbridge area's \$3 million data center opens in June, and fiber customers will begin receiving service on the \$7 million fiber backbone before the end of the summer.

- The Wired Road will have completed more than \$3 million in fiber and high performance wireless to that network by the end of the year.
- Danville's nDanville network will have completed a 1500 home multi-million dollar fiber to the home expansion by the end of 2012.
- More than 200 other communities in the United States have operating networks or have substantial network construction underway.

How will Roanoke's businesses, schools, health care facilities, and government agencies be connected? And what will bring businesses to Roanoke?

## Short Term Goals

A variety of short term goals should be considered as next steps in this effort.

Short Term Goals	Description
<b>Continue the Current Broadband Exploratory Committee Initiative</b>	The current group of public and private stakeholders and interested parties should continue development of this initiative.
<b>Select a Governance and Ownership Model</b>	Answering the question, "What entity will own and manage the infrastructure?" is an essential first step.
<b>Commitment from Local Governments to Support the Effort</b>	Regardless of the type of governance structure selected, support of the local governments is essential to success.
<b>Consistent Message and Coordinated Public Awareness</b>	If a decision to move forward is made by local governments, stakeholders, and interested parties, a consistent message about the benefits and advantages will be critical to gain public support.
<b>Develop a Strategy for Attracting a Regional Data Center/Colocation Facility</b>	A regional colocation/data center is an important component that makes the fiber network more valuable, and the fiber network will make the data center more valuable.
<b>Explore Public/Private Partnership Options First</b>	Prior to making a decision on community investments, consider issuing an RFI that asks private sector telecom providers to submit a proposal for a public/private partnership to meet the region's broadband goals and objectives.

Short Term Goals	Description
<b>Explore Possible Smart Grid and Utilities Partnerships</b>	Automated meter reading (e.g. electric, water) and energy conservation (e.g. Smart Grid initiatives) can save power and reduce costs to the partner utilities. Such partnerships can also assist with paying for both capital and operating costs of the network.
<b>Develop a Common Fiber Overlay Plan and Open Ditch Policy Across the Region</b>	Duct and handholes should be included where appropriate in all new public and private construction. Opportunities for shared trenching should be vigorously pursued.
<b>Reach Go/No Go Decision on a Phase One Fiber Project</b>	The localities must agree on the size and scope of a modest “Phase One” build out that provides immediate economic development benefits.
<b>Coordinate Broadband Infrastructure Improvements with Public Safety Spending</b>	Coordinate upgrades to public safety communications systems with planned fiber and wireless improvements to reduce the cost and improve the quality of public safety voice/data traffic.

### ***Continue the Current Broadband Exploratory Committee Initiative***

The current group of local government officials, private sector business people, and institutional stakeholders should continue to meet regularly, identify key decision points, recommend an overall strategy, and advise local governments on next steps.

### ***Select a Governance and Ownership Model***

The advantages and disadvantages of three different governance/ownership models are discussed in detail in the Findings report. These three options are:

- Form a regional broadband authority.
- Issue an RFI to solicit proposals for a public/private partnership.
- Form a broadband coop.

Without consensus on what form of enterprise will own and manage the proposed infrastructure, raising the funds needed for a Phase One effort will be extremely difficult. If there is agreement that shared infrastructure for the valley is desirable, then choosing and creating the ownership/governance entity becomes the essential next step.

### ***Commitment from Local Governments to Support the Effort***

Local government support may consist of assistance with financing, commitments to buy services once the network is constructed, and commitments to provide expedited right of way and construction permit processing. The commitment to buy services for local government facilities and agencies is particularly important for early financial sustainability and stability. Over time, as more private sector businesses and residents are connected, government purchases of services have less financial impact on the enterprise, but early commitments from local governments to be anchor tenant customers can ease financing (both for public and private ownership) and can help attract service providers.

K12 school commitments to buy services on the network are particularly important, as K12 schools are often the single largest public or private purchaser of broadband services in a locality. Regrettably, K12 schools often choose not to support community broadband initiatives, so early commitments of support from K12 schools have an outsized impact on the project.

During the planning stages of an early phase build out, it is also important that local government IT managers and directors not purchase or renew long term broadband and telecom service contracts with providers (and in fact, this is true for large business and institutional customers as well). Large “anchor tenant” customers for the new network can use their purchasing power to encourage local incumbent and competitive service providers to amend their contracts to allow a graceful transition to the new open network.

The community broadband projects that have succeeded have all had consistent long term support from local governments--even across local elections. Candidates for local offices should be asked about their commitment to current and future community broadband plans prior to the election to prevent erosion of political support over time.

### ***Consistent Message and Coordinated Public Awareness***

Public support for the project will be important to the long term success of the effort. All parties involved in the effort must be able to address key talking points clearly, succinctly, and consistently to avoid confusion and negative rumors. Incumbents often embark on extremely negative and mis-leading public relations campaigns that seem to suggest a wide range of poor outcomes to such an effort. Citizens often assume that taxes will be increased to support the effort. A well-managed public awareness campaign that includes helping elected and appointed officials both understand and discuss key parts of the project will be very important.

### ***Develop a Strategy for Attracting a Regional Data Center/Colocation Facility***

The region needs a state of the art, modern data center that can be certified, at a minimum, to meet the Tier III data center standards. The facility should be located to maximize the number of carriers that can affordably

bring private fiber into the facility at minimum cost (i.e. locations on or near existing fiber routes are most desirable).

- Option One – Develop an incentives package to attract private investment for a modest facility designed primarily to meet carrier needs, with a modest amount of additional floor space for local government, institutional, and business needs (e.g. 10,000 to 20,000 square feet of space).
- Option Two - Develop an incentives package to attract private investment for a larger data center designed to meet the needs of a larger portion of southwest Virginia, including the New River Valley. This facility would offer 50,000 to 100,000 square feet of space. This option would only succeed if the region had already developed an open fiber strategy that would provide affordable local access to the data center.

Regardless of whether Option One or Option Two is chosen (and the two are not mutually exclusive), the facility must have convenient 24 hour/7 day/week access for service providers, and it must be of sufficient size to meet early demand for growth.

### ***Explore Public/Private Partnership Options First***

Prior to making a decision on community investments in broadband infrastructure, consider issuing an RFI that asks private sector telecom providers to submit a proposal for a public/private partnership to meet the region's broadband goals and objectives. The RFI should ask for innovative proposals from qualified private sector companies. The RFI should outline the goals and objectives that must be met. For example:

- Affordable, high performance “big broadband” fiber connections to most homes and businesses in the region.
- Network build out in a reasonable period of time.
- What kind of support is needed from local governments to form the partnership.
- A network that will offer a wide range of both traditional “triple play” services along side a wide offering of new and innovative services from many small and large service providers.

Such an RFI could be issued in early summer 2012, and responses could be evaluated quickly so that the overall effort keeps moving forward without a long delay.

### ***Explore Possible Smart Grid and Utilities Partnerships***

Automated meter reading (e.g. electric, water) and energy conservation (e.g. Smart Grid initiatives) can save power and reduce costs to the partner utilities. The regional water authority and the local electric utility

providers (e.g. City of Salem, AEP) are potential partners. These partnerships could take a number of forms, including an up front payment in return for long term use of the network for meter reading and utility management at no charge, or a long term contract to pay a monthly per subscriber fee in exchange for use of the network. These partnerships can play a major role in developing a robust financial plan to cover both capital and operating costs of the network.

### ***Develop a Common Fiber Overlay Plan and Open Ditch Policy Across the Region***

A fiber overlay plan is an essential part of any next steps. The four localities should agree to develop a shared GIS layer that identifies desired fiber routes and connected facilities, and any road reconstruction or repairs, water or sewer expansion, and any other civic construction or utility work should be compared to the overlay plan to determine if the new work is on a desired fiber route. If it is, funds should be budgeted during the planning phase of the effort to include adding duct and fiber along that route.

Planning departments in the Valley should update new project guidelines and checklists to encourage both public and private development projects to include conduit, duct, and handholes where appropriate, just as private developers routinely provide shared infrastructure like roads, sidewalks, water and sewer.

Public works departments should be trained to install duct so that incremental build opportunities can be pursued at least cost.

### ***Coordinate Broadband Infrastructure Improvements with Public Safety Spending***

Public safety can benefit substantially from cost sharing with a regional open access network. Fiber can be reserved specifically for public safety use so that those agencies have secure data transmission with no information co-mingled with commercial and residential data. Public safety radio networks can be enhanced by running fiber to all repeater towers, improving the quality of voice transmission and potentially reducing the overall number of towers and repeaters needed.

### ***Reach Go/No Go Decision on a Phase One Fiber Project***

The question of where to start is an important one. Business, commercial, and government uses (e.g. schools, critical public infrastructure) should have a high priority. The map below is a potential “Phase One” effort.

The initial routes identified in the map below have the following characteristics:

- The extremely important connection to the MBC fiber in Bonsack.
- A route from Bonsack into the downtown area, where there are many large, medium, and small businesses.



- An approximately six to eight square block area of downtown that could take fiber to virtually any customer in any building in that area.
- The fiber continues down Jefferson past many Carilion facilities and would connect the medical school.
- Two routes west that connect with existing City of Salem fiber and would also form a redundant loop.
- A route to the northwest into Botetourt County that would connect some important development areas in Botetourt.
- Fiber should be extended to the western part of Roanoke County to provide open access connectivity to the County's Center for Research and Technology.

