Creating a Rural Broadband Strategy That Works: Three Steps to Success

A Vital Economy Alliance White Paper

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HIGH DEFINITION ECONOMIC DEVELOPMENT: A CRYSTAL CLEAR PATHWAY TO PROSPERITY

This white paper describes a proven approach to broadband deployment that can help carriers and rural leaders bridge the digital divide and find effective, wealth-generating solutions for their communities.

Rural America is uniquely positioned to regain the economic expansion and prosperity that it lost over the last five decades. However, many communities have tried and failed to implement effective broadband strategies to help them prosper in an increasingly global, digital world. The three-step approach outlined in this paper addresses the problems that have plagued past efforts to bridge the digital divide in rural areas. A combination of a collaborative process among community constituents and carriers, more sophisticated demand measurement and a better understanding of broadband options can and have achieved success in even the most remote areas. Such success is critical, because broadband is an essential ingredient to increasing their wealth and enhanced quality of life.

The Problem

Background on the Digital Divide

Effective delivery of broadband (BB) services to rural communities continues to be one of the top challenges facing leaders across the country. These leaders generally understand that BB network deployment must be available to change the way their communities live, work, learn, communicate, share resources and compete in a global 24/7 economy. However, they often can't find effective strategies to achieve these goals, with the result that their communities sink further into despair.

While the American Recovery Reform Act (ARRA) stimulus funding dramatically raised interest in rural BB, much of the stimulus money has been used to create mid-mile networks that extend the network but don't necessarily connect to the actual location (the last mile) where service is needed. Efforts to bring BB to a community must address this "last mile" issue, so that rural homes and businesses can truly take advantage of BB's economic potential.

A key challenge facing rural leaders is the ability to clearly identify an adequate return on investment (ROI) to support the deployment of "the last mile." Leaders must determine both what expanded BB access will be used for and how they can work with carriers to obtain it. Further, they face the challenge of translating their needs and wants into a message that carriers can understand and utilize.

Many community leaders have tried to resolve this issue with a "field of dreams" approach that assumes that if BB is built, it will be used. However, unless constituents are educated about how to use BB and how to work collaboratively to take advantage of it, this approach will usually fail and they conclude that BB is not feasible.

Let's look more in-depth at some of the barriers to successful rural BB implementation. These barriers can be found at all levels – within the community, BB providers, government agencies, businesses and even economic development professionals.

Community Barriers to Broadband Success: Silo Vision

Communities today tend to consist of separate entities with misaligned visions and strategies and little collaboration. Political and jurisdictional boundaries, as well as competing plans and initiatives, prevent funding solutions on a wider scale.

The result is what we call "Silo Vision." Silo Vision prevents aggregating the demand for BB in ways that would attract network investment. Many communities fail to properly define their requirements for and potential benefits from BB, which limits their ability to energize sufficient demand. They tend to focus on single rather than aggregate BB uses that are then rejected by users or network providers on the basis of insufficient ROI. Hence, no one BB application can stand-alone.

Additionally, communities often view carriers as adversaries rather than strategic partners. They may also have unrealistic expectations that if providers build a network for the community, jobs will automatically follow.

Community leaders that push for BB networks to be built when demand does not fully warrant may inadvertently create a fail-fail situation where actual usage does not justify the network provider's investment.

Broadband Provider Barriers to Success

BB carriers often have their own set of issues that limit their effectiveness in remote areas. They typically analyze potential service areas without seeking community input or considering economic and demographic factors. Further, carriers often receive information based on zip codes, county boundaries, or census blocks, which are not truly useable when designing networks. Defining demand using these broader geographic measures, while valuable in certain situations such as government grants, does not measure true BB demand.

Carriers also fail to collaborate with other service providers and the community at large. This severely limits the ability to leverage existing but separately owned network infrastructure. It also stymies opportunities for collaborative funding. And finally, carriers may miss potential market opportunities because they perceive that rural community inhabitants and leaders "just don't understand BB."

Businesses, Governments, Economic Development Professionals Also Contribute

The natural, competitive nature of most businesses typically hinders collaboration and limits the successful attraction of BB services. Businesses miss opportunities to gain affordable access to BB by focusing on their individual needs and independently pleading their own

requirements to carriers, rather than aggregating their BB needs in a collaborative effort such as a business center.

Government agencies also contribute to the problem by focusing on their own BB needs first. Typically funded publicly through grants, these agencies often create closed networks that aren't available to for-profit and other non-profit organizations.

Surprisingly, even economic development professionals tend not to foster collaboration among various constituents and entities. They may take a quasi-government approach by seeking grant money to fund projects, which in our experience is generally ineffective in rural situations. They also may lack sufficient knowledge about the telecommunication industry and technologies involved to implement a cost effective BB networks.

Educational institutions often stand alone in trying to address the "Digital Divide." Nonetheless, students often fail to understand that the access to BB that they had enjoyed in the classroom can and should be extended to the "real world." Additionally, educational institutions fail to understand that student demand for BB at home is an integral part of education's continuing role in driving BB access, capacity and penetration.

The Unfortunate Result

As a result of the barriers described above, most efforts to obtain funding for BB development remain disjointed and ineffectual, rather than collaborative and successful. The granting of stimulus money, while positive in intent, does not necessarily help leaders, communities, and/or governments understand:

- Why they want BB
- What BB will achieve
- What is the true benefit of access to BB
- What is the true demand for BB

The Solution:

A Three-Step, Collaborative Approach Creates a Win-Win-Win Scenario

To address the problems cited above, ViTAL Economy (VE) created a collaborative, structured and proven process that helps break down the traditional barriers to effective BB implementation, resulting in a greatly improved quality of life for residents of the rural area.

This approach has worked in rural communities from Southern Illinois to northwest Washington State to New England. On the Olympic Peninsula of Washington, for example, this process resulted in such a significant identification of demand for BB that carriers were willing to invest $70 million of their own funds within three years. The process is described below.

The First Step:

Create a Collaborative Relationship between Carriers and Communities

(VE calls this "Broadband With a Purpose™")

Broadband With a Purpose™ links business, education and community leaders in a collaborative process. These leaders define common goals and the ROI for each of them as well as for the community. These sessions result in a positive environment and increased awareness of BB issues, and create champions/stakeholders to support the effort to expand BB services. Through this effort, business, education & government entities uncover new BB applications, which can help them more effectively and efficiently improve quality of life and expand economic opportunity.

VE helps residents/businesses communicate with BB carriers or their own municipal government to translate their needs, replacing conflict with collaborative approaches. Competitors working together uncover and aggregate needs to help the various constituents identify constructive and mutually beneficial market opportunities. VE then takes these aggregated needs and develops unified requests for proposals (RFPs) that clearly identify business, government, and community requirements. The RFP and application requirements clearly define the market opportunity and business case for providing services to the area and create an open competitive environment with providers.

The Second Step:

Use Sophisticated Tools to Aggregate Broadband Demand and Map User Locations

(*VE calls this "I Want My Broadband™")*

I Want My Broadband™ facilitates carriers to create a Network Provider Community of Interest (NPCOI). The NPCOI provides a framework within which carriers can develop common goals and understand network build criteria. VE provides the group with BB demand aggregation tools that help define the market in a more meaningful way.

The VE approach to aggregation allows the potential customer to self-select and support mapping their specific location via web-based solutions. VE then provides an economic and demographic data overlay that better defines the market characteristics. Improved collaboration and relevant market information generates unified requirements that generate meaningful RFP's that will attract carriers with a technologically and cost effective solution.

With access to the VE approach and demand aggregation tools, economic development professionals gain valuable knowledge, tap proven resources and become lead facilitators for successful broadband deployment.

The Third Step

Understand Technology Options and Leverage Existing "Mid Mile" Infrastructure

In order to support enhanced BB service delivery in their area, leaders should have a working knowledge of the levels of technology that drive its application. An understanding of the advantages and disadvantages of each BB option is helpful when discussing BB with carriers. We discuss the most common options below.

Mid Mile Technology

Most carriers today, whether telecom or cable companies, have or are installing full IP/MPLS routed core networks that are supported by middle mile fiber networks that support Dense Wave Division Multiplexing (DWDM) at speeds from 10 to 100Gbps. This equates into what is dubbed a fiber deep architecture. Ethernet over Internet Protocol (IP) is the chosen method for delivery of services to these fiber deep hubs. Unfortunately, the ARRA stimulus dollars have largely been awarded for this type of middle mile network expansion, which does not deliver the "last mile" BB access that communities need and desire.

Last Mile Technology

Fortunately, there are many existing and budding future technologies to deliver BB services to the last mile end user. Usually, Ethernet over IP is converted to numerous protocols for transmission over copper lines, fiber optic cables, satellite, microwave radio or cellular/fixed wireless to the end users' home, business or mobile device. The myriad of protocols are converted back to Ethernet via a suitable customer premise device for consumption by end user equipment such as TVs, VoIP phones, computers, and portable devices connected via Wi-Fi wireless. Smart home and smart grid applications can also be supported.

To help leaders better understand the various BB technologies, descriptions of the most common of these last mile protocols follow:

1. **Services over existing copper lines:**
   - **Dial Up line** – these support 64 Kbps data speeds and were the initial method for delivering BB. Today, this speed is considered too slow for most applications.

   - **DSL (Digital Subscriber Line), A(Asymmetric)DSL, ADSL2, V(Very-High-Bit-Rate)DSL, VDSL-2** – a range of methods that use existing telephone lines to deliver digital data. The last mile copper is fed from a DSLAM (Digital Subscriber Line Access Multiplexer) device that is connected to the fiber deep mid-mile termination. These "over copper" methods can deliver BB speeds from 1 to 50 Mbps under ideal conditions over short distances. While telecoms use ADSL2 as the de facto standard in most networks today, this approach suffers from cross talk and external interference and is not acceptable for customers requesting high bandwidth applications.

- **CMTS (Cable Modem Termination System)** – providers use coax cable and CMTS to deliver up to 50Mbps of data to each customer under a service level agreement. Television and voice traffic is also included, hence the term "Triple Play Services."

2. **Services over fiber:**
- **Point to Point (p2p)** - provides fiber to business end users, supporting speeds up to 1 Gbps.

- **GePON (Gigabit Ethernet Passive Optical Network) & GPON (Gigabit Passive Optical Network) –** this increasingly popular technology splits the fiber from the fiber deep optical line termination (OLT) equipment to support up to 128 customers sharing 2.5 – 10 Gbps of bandwidth. Cable companies tend to use GePON while telecoms tend to use GPON. Generally, providers limit the split ratio to 1:16. GePON transports data via Ethernet in its native form while GPON transports data in a protocol defined by the International Telecommunication Union (ITU). GPON is the more efficient protocol.

- **FTTP (Fiber to the Premise)**– this is an expensive-to-implement delivery mechanism with an approximate last mile fiber installation cost of $1400 per site or more, depending on distance from the OLT and any obstacles on the installation path.

3. **Services over wireless:**
- **Wi-Fi** - this method supports fixed and portable computing devices in the home or business. The common wireless Wi-Fi router supports 50Mbps, has an in-home range and can be referred to as a "wireless hot spot" in an Internet café. It is an inexpensive solution for going wireless within the premises.

- **Satellite –** satellites deliver service downstream only to the end user with a telephone line providing the return path to the ISP (Internet Service Provider). With a normal downlink speed of 2 Mbps, this service is expensive and suffers from up to one-second-transmission delay. It is used largely in rural applications.

- **Microwave** - this p2p service to each end user requires line-of-sight coupling between provider and end user. It is expensive to implement and can suffer degradation due to rain etc.

4. **Cellular and fixed wireless access:**
- **4G LTE (4th Generation Long Term Evolution)** - Cellular-based wireless infrastructures have achieved enormous advances over the past few years. Technology has progressed from 2G to 3G and now to 4G LTE (Long Term Evolution) networks, with WiMax facing off against 3G and 4G implementations. The difference between 2/3G and 4G LTE is in the type of radio frequency modulation used to communicate between the base station (eNodeB) and the user equipment (9UE). 4G LTE uses IP/Ethernet as the backhaul protocol to connect

the eNodeB to the Central Office. 4G LTE has been selected by almost half of the mobile carriers in the world. By 2013, 4G LTE –Advanced is likely to emerge. When used as a fixed wireless access point, it delivers up to 1Gbps of bandwidth downstream and 50Mbps upstream.

- **Femtocells and Micro cells** - Femtocells are likely to replace analogue phone service by permitting cell phone services to be delivered without dropped calls due to loss of signal particularly within buildings where most cell calls are initiated. Micro cells, are mini eNodeB (refers to a point in the network called a base station that interfaces to the mobile handset) macro cells that can serve a small area, such as a neighborhood of 10 homes, with shared 1Gbps bandwidth. Micro cells will replace FTTH and, when used in conjunction with a Wireless Home Gateway (WHG), will eliminate the home wiring dilemma.

We've compared some of the above BB delivery methods on a cost-per-user basis in the following table. As the table shows, 4G LTE will prove to be the most cost effective delivery method based on available bandwidth per user. We expect that its costs will fall over time to approximate those of XDSL costs today.

Methods/ Technology	Description	Carrier Price per User	Bandwidth
DSL	Based on a 48 port OLT in Outside Plant Housing located within 4Kft from premise served. Existing copper pair used	$421.00	3-15 Mbps average
CABLE	Can be compared to a GPON system but costs are higher because of high cost of CMTS head-end and outside plant equipment	$2900.00	Up to 50Mbps
P2P Fiber	Based on a 48 port OLT in Outside Plant Housing located within 4Kft of the premise served. Fiber and ONT cost included	$2008.00	UP to 1Gbps under SLA
GPON	Based on Outside Plant housed OLT and optical splitter. 1:16 split ratio is assumed. Fiber and OLT cost assumed	$2572.00	2.5Mbps shared
4G LTE	Based on pole mounted micro cell shared amongst 10 houses. Wireless Home Gateway included	$922.00	100Mbps

NOTE: Costs stated in the table are average and will vary from provider to provider.

While VE supports all types of BB approaches, it does focus on those that make BB more possible and cost effective in rural areas. A fixed wireless approach to creating access has many advantages, including that it benefits both the provider of BB services and the customer by delivering a means to quickly design, build, and implement a network. Most critical in the selection of a provider and/or approach is knowledge of the technological skills that are needed to truly build and run an effective network.

The Final Requirements for Rural BB Success:

A Sense of Urgency, Sufficient Commitment, and Experienced Guidance

Beyond the three-step process we've described, a community must have a sense of urgency to begin expanding broadband services in their region. The journey is complex, requiring cross-organizational participation, expanded collaboration and expert facilitation.

Most communities do not have the technological expertise and experience to effectively engage network providers and build the strategic linkage to a community economic development strategy. Most need help in translating the message. For communities to evaluate their readiness, they should consider the following questions.

1. Are you fully prepared, with knowledgeable leadership in place to take action?
2. Do you know the region's current BB capacity and usage?
3. What design and deployment path will you take?
4. What is your level of cross-organizational cooperation?
5. Is there a unified and aligned community effort to support funding and development?
6. Could you use help in communicating with carriers to gain their support?
7. Is there a means to educate the community about the need for and use of BB?

ViTAL Economy is consortium of experienced companies that can help communities answer these questions and create the necessary framework to develop and implement a successful broadband delivery strategy. Essentially, the process can be distilled into a three-step approach for success:

- Create a collaborative relationship between carriers and communities
- Use sophisticated tools to aggregate broadband demand and map user locations
- Understand technology alternatives and leverage existing mid-mile infrastructure

Our experience has shown that, with the appropriate sense of urgency in the community, with the right guidance and use of the aforementioned ViTAL Economy processes, rural broadband efforts can succeed. With the proper combination of collaboration, education and measurement tools, broadband can successfully penetrate even the most remote areas to promote greater wealth and a better quality of life.

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About ViTAL Economy

ViTAL Economy: Your Partner on the Journey to Successful Community and Economic Development

Since 1992, members of the ViTAL Economy (VE) Alliance have guided regional economies in 43 states and three countries to a brighter future using our proven blueprint, the VE Journey. These communities have transformed themselves from declining to sustainable regional economies that are:

- Creating billions of dollars in new, sustainable economic growth
- Developing hundreds of high-performance businesses
- Creating thousands of high-wage jobs

We've also collaborated with hundreds of network providers who have helped their communities return to sustainable economic growth. We help you leverage broadband networks to change the way you live, work, learn, govern, compete, collaborate and share resources, to become winners rather than victims of our information-enabled economy.

We invite you to get to know us, to see what our clients have to say and to understand the depth of our commitment to a better future for struggling communities. We're confident that VE can help your community using practical business strategies, asset-based community economic development (CED) and proven processes, tools and a blueprint for success.

Learn more about our results or contact us to learn how VE can help your community grow and prosper, or to learn more about becoming a VE Journey sponsor.

Visit us at www.vitaleconomy.com