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Community Broadband Snapshot Report™

Fiber & Wireless – Stronger Together for Community Broadband



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January 2017

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Introduction

Google in June stunned some in the broadband world by acquiring wireless provider Webpass and “momentarily” exiting the fiber stage. Hybrid wired/wireless networks became the Next Big Thing – for a month. But what if hybrid infrastructure is the key that unlocks the doors to the next level of community broadband success?

This report makes a business case for hybrid infrastructure by assessing community broadband in a historical context, as well as the capabilities of today’s fiber and wireless. Past and current projects can teach us how to get more value from broadband technologies that communities use.

Wireless in broadband has been deified, vilified, misunderstood, hyped to holy heaven, and in some circles, just plain ignored. To many, fiber can do no wrong, only become faster. Then came gig fiber. No, wait, now there’s gig wireless. We need a reality check!! We’re too fixated on speeds and feeds, bits and bytes.

Interviews and case stories in this report steer readers toward new positions on needs analysis, RFPs, and public private partnerships. They question why we get distracted with speed issues rather than focusing on the value of unlimited data. It’s important to ask how we can reconcile hype with the realities of infrastructure, and why we should never let technology become the tail that wags the dog.

Sure, Philadelphia’s declaration to build a citywide Wi-Fi network made headline news in 2004. But community broadband was almost derailed by the dozens of cities using an “RFPs-by-rote” tactic in which their RFPs heavily cut-and-pasted from the first cities that asked for free networks. Today, RFPs don’t ask providers for freebies, yet a lot impose conditions that can negatively impact providers’ financials. So don’t be surprised if fewer providers respond than expected.

In Virginia, for example, the Center for Innovative Technology (CIT) has turned the shopping-for-broadband process on its ear. Questions that lead to RFPs driven by conventional wisdom are replaced by 1) what are the various constituencies’ needs, 2) what are the communities willing to bring to the table and 3) what solutions are providers offering that they are willing to build?

Need determines technology, not the reverse. Some iteration of fiber or wireless can meet most of our broadband needs if you have enough talent with planning, skills, creativity, and insight. Money is the wild card, but talented community stakeholders can lead you to money more often than not.

It’s time to talk about hybrids because the technologies are stronger together when tackling the opportunities and challenges of community broadband.

I. Technology follows needs, not vice versa

Communities risk hardships when they issue RFPs for feasibility studies, infrastructure, partnerships, etc. based on assumption, conventional wisdom, or the comfort of job security before they do an extensive needs assessment. Furthermore, decision-making based solely on network architectures and biases from 10 or 15 years ago, invites frustration and failure.

Even before a cursory examination of a community's needs, we can find minds already made up. "We need a gig." "Fiber is the only way to go." "Google has jumped ship. Now it's wireless or nothing."

When communities put the cart before the horse, they likely will spend more money than they need to accomplish less than they want and usually take longer than they expect. Don't let the shiny technology cause you to lose focus. Understand that the average customer does not really care how their data arrives as long as it is affordable, fast enough, secure, and reliable.

Of course, various factors determine how well wireless and wired meet these four factors. Some factors are related to facts while others are related to emotions.

The needs assessment – don't leave home without one!

The needs assessment moves a community from informal discussions to a collection of questions and statements from various parts of the community expressing specific needs and presumed benefits for a high-speed network. Ask questions that allow you to develop the initial sketch on the state of broadband in your community that you later fill in with the primary portrait of the town and how it will be transformed by meeting its needs for broadband. Some of those questions are:

- do the broadband resources adequately meet the current needs of various constituent stakeholder groups;
- are there things that constituents would like to do but the current broadband options hold them back;
- what are the potential financial or economic impacts for respective constituents and organizations if their broadband was able to meet the needs identified; and

In addition to the feedback you gathered from the key stakeholders, you want to gather as much useful data from as many constituents as possible. As you discuss your needs with the different community members, many of them should

be able to give you names of some particular entities you should target for fundraising efforts.

Knowing how much people are willing to spend for broadband is also important. There can be a significant gap between how much people say they are willing to pay versus how much they will actually pay when the network is actually launched. How much revenue you might make affects your overall financial picture, as does the costs of the network buildout, operations, and management. What percentage of your hybrid network is wired or wireless is a major financial consideration?

Tech inventory just as important as needs assessments

Conduct an extensive technology inventory to determine government-owned technology, as well as wireless, fiber and other resources owned by businesses, public libraries, schools, and other stakeholders. Catalog vertical assets owned by local governments and constituents including rights of way, utility poles, water towers and access to rooftops.

B2x, a wireless ISP (WISP) in Franklin County, Virginia, negotiated rights to place an access point in the bell tower of an old abbey. Are there unused conduits and fiber cables? Almost half of Brentwood, California had existing conduits they were able to swap for fiber from Sonic, an ISP.

There are likely to be some resources to facilitate broadband deployments, but it may not be obvious what those resources are or why they are needed. “Many cities already have Geographic information system (GIS) and other software tools enable broadband teams to visualize, question, and analyze data to assess relationships, patterns, and trends that affect broadband deployments,” says Richard Frank, CEO of Madcom, a broadband engineering design and logistics planning firm.

Frank continues, “Conversely, a community might lack certain resources such as access to private utility company poles. Different types of spectrum may be needed to facilitate fixed wireless services, and you need to know who might be stockpiling that spectrum. Access to rooftops is actually an ongoing need even after completing the engineering design. Negotiated deals with building owners might change, requiring you too find other rooftops.”

But the problem finding and/or securing broadband-related resources is that a lot of planners don’t ask or don’t know whom to ask. Ideally, a needs assessment should include questions that uncover who has resources that might not seem to be broadband related – but are. Remember the Abbey.

II. The basics of wired and wireless technology

Before communities can determine which best infrastructure is best, it's helpful to have a basic knowledge of wired and wireless technologies. Here are some tech terms and terminology that are helpful, especially for non-technical readers. Technology changes frequently, some vendors' and ISPs' marketing blurs the line between reality and hype, and literally the lay of the land impacts what technologies to use.

Pay close attention to wireless licensed spectrum, cellular (one form of licensed spectrum), and unlicensed spectrum. A lot of people use the term wireless willy-nilly without realizing 1) all wireless is NOT the same, 2) you pick particular types of wireless based on the need, and 3) wireless does not work in real life the same as it works in testing labs.

Be clear on the difference between **Speed vs capacity**. They're not interchangeable. Speed refers to how fast your Internet connection is (1.5 Megabits per second, 100 Mbps, gig speed). Internet capacity means how effectively you move all of the data for all of the network's users simultaneously. Your 5 Mbps of speed doesn't matter when the network's capacity can't handle all of the neighborhood kids simultaneously streaming gig homework files, collaborating online and reviewing classroom videos.

As you assess respective constituencies' need for speed, you also have to foresee the capacity needs of the entire network. As engineers design the network, make your infrastructure choices based on cost, reliability, distance to reach users with Internet access and speed. "Just understand that you can only optimize three of the four," says Mark Rewers, Senior Consultant for ECC Technologies. "For example, if cost is even a minimal concern, then sacrifices will have to be made in terms of either distance, speed, or reliability." Or if users want 99.99% reliability, it's going to cost a lot more money.

Wired infrastructure

DSL is offered by the telephone LECs (Local Exchange Carriers) and is a copper-based solution that delivers Internet to the home. The service can be Asynchronous (up and download have different rates) or Synchronous (up and download have the same speed). Many folks use the word symmetrical instead of synchronous. DSL circuits are dedicated to each subscriber and not shared.

Cable is provided by cable TV operators and combines fiber and coaxial cable. The infrastructure is shared among all subscribers, so data rates are never guaranteed or absolute, as the number of simultaneous users, their place in line and the amount of capacity they are drawing effects everyone afterwards.

This is why incumbents can advertise “speed up to [x]” and not care when customers become angry that they never reach advertised speeds. Be aware that incumbents might brag about the speed of their fiber, but when the data reaches the coax that is where the decreased capacity becomes the problem.

FTTN is Fiber to the Node. FTTN is fiber lines that run to customers over existing copper infrastructure. Though only an incremental improvement, incumbents like to brag about moving the node closer to peoples’ residences, thus increasing the amount of fiber over which the data will travel. Ultimately, though, any amount copper slows data speeds to the home significantly.

FTTC is Fiber to the Curb. FTTC is where fiber is run all the way to existing copper demarcation points on a street (max 64 users) and then split to individual homes using existing copper. Depending on the capacity of the fiber lines before the demarcation point, customers may or may not get the speeds they desire.

Since the Google announcement earlier this year, talk increased within the industry, as well as within communities, about using fixed (licensed spectrum) wireless between the curb and the home. Wireless is considered cheaper and faster than copper, depending on the speed of the wireless connection.

FTTH is Fiber to the Home (or Premise). In this network, fiber is run from a central office directly to a home or business and then converted to a copper handoff inside the building via a transceiver (converter). In the last few years, many broadband networks using wired infrastructure have employed FTTH. Before 2010 there was a more equitable distribution between copper and FTTH.

IRU is Indefeasible Rights of Use. An IRU is a permanent contractual agreement that between owners of a communications system and a customer (organization or company) of that system, and cannot be undone. The customer purchases the right to use a certain amount of the system’s capacity for a specified time. In community broadband scenarios, this term is frequently heard in reference to open access fiber models where one company or organization is leasing dark (or lit) fiber strands from the fiber owner, through an IRU agreement.

Wireless infrastructure

Spectrum (the total range of wireless frequencies) is generally divided into 2 categories: Licensed – the frequencies that are bought or set aside for carriers, TV/radio, the military, and private use; Unlicensed – the frequencies made available to the general public and are shared by many individuals, products, and uses. There is no regulation or real rules of engagement as to how products or individuals may use unlicensed frequencies or how to remedy conflicts.

Mesh networks became all the rage between 2004-2008. A municipality would mount multiple access points (APs) within the jurisdiction, and program them to communicate with each other. End users connected their computers, laptops and other computing devices wirelessly to the network. There would be multiple ingress/egress points where the network communicated with the Internet.

After 2008, the dream of city or countywide mesh connectivity died in most places, but municipalities saw value in building these networks to enable public Internet access in airports, parks and random open outdoor spaces. Libraries, hospitals, schools and a plethora of business establishments find value in enabling public Wi-Fi access (often through a small mesh of APs) as an amenity.

Around 2005, before there was an Internet of Things (IoT), municipalities, public utilities, public safety entities and others saw mesh Wi-Fi as a way to enable various software apps, databases and electronic gear to communicate with each other. For example, an app could alert a city's parking staff when specific meters were expired, or when metered parking spaces were occupied. Or an app can transfer public utility meter readings from homes to the utility's data servers.

Wired Wi-Fi is a network in which all the APs are wired back to a central server via copper or fiber. Users then connect to the APs wirelessly. These networks gained popularity as a way to enable mobile workers with certain applications needing greater capacity and speed. Cities such as Corpus Christi have been linking up their EMT personnel wirelessly with the hospital emergency rooms for years. As equipment becomes more sophisticated both in ambulances and hospitals, access points could benefit from the boost of a fiber link.

Fixed wireless networks, either through point-to-point or point-to-multi-point connections, have been connecting muni wireless networks for a decade or more. They have been a mainstay infrastructure for wireless ISPs (WISPs), mostly in rural and small towns. In the smaller communities that can have sparse populations, fixed is significantly more effective than mesh or cellular networks.

Fixed wireless involves a transmitter on a tower (or other vertical asset) and a receiver (AP) at the home or business, or a more powerful transmitter that communicates with multiple APs. These networks have been transmitting data at 15-25 Mbps for years, and within the last two years vendors have been showing off technology that clocks in at hundreds of megabits per second.

A caveat – buyer beware when assessing fixed wireless equipment. A number of factors can restrict wireless equipment from reaching advertised speeds. At a recent broadband conference in Oregon, an equipment vendor confirmed that there could be a difference between speed performance in the laboratory and performance in a real-world setting.

Cellular became common place in the early 1990s. The second-generation (2G) devices arrived in 1991 and only for voice communications. 3G devices came along 10 years later and offered voice with limited data. 4G are the current devices that are data only though they are designed to access 3G to get voice capabilities. And for now, 5G is scheduled to be rolled out by 2020.

Carrying a 4G smartphone is a relatively new thing for Americans, coming into full bloom at the beginning of this decade. Smartphones are the lens through which many view mobile broadband, for better or worse. However, even though we equate owning a smartphone with broadband adoption, are these citizens fully connected, especially for those whose smartphones are their only connection to the Internet?

TV white space (TVWS) is still not talked about as a major topic in many U.S. broadband circles, aside from pioneers that steadfastly argue its value, such as a sizeable number of public library systems. “This free radio spectrum has been made available that nobody owns but everybody uses and shares it,” stated Don Means, Coordinator of the Gigabit Library Network. “This unlicensed spectrum is similar to Wi-Fi, and in fact, some refer to this as Super Wi-Fi.

TVWS is theoretically capable of transmitting data a mile or two away. This makes it great for wireless backhaul that libraries can use to connect TVWS routers at their facilities and remote receivers in public places such as parks, shelters, playgrounds and community centers. Libraries are starting to adapt this technology and [several organizations are helping](#) their pioneering efforts.

Harold Feld, Senior VP at [Public Knowledge](#) and telecom policy expert, offers a key caveat. “TV white space is a proven technology, but availability of equipment such as routers that can harness its use, takes time. Similar to the early days of Wi-Fi, it takes time for market demand to grow so vendors can experience economies of scale. But once this happens you should expect a surge of applications.”

Hybrid infrastructure

“Hybrid networks provide the needed underlying fiber capacity, while embracing the flexibility of multiple technologies enabled by the fiber – fixed wireless, cellular, fiber to the home, whatever is needed,” says Joe Starks, President of ECC Technologies. “The cellular industry, and small cell in particular, is growing exponentially. A hybrid network allows for this growth by facilitating these last-mile solutions as they evolve.”

In essence, the hybrid infrastructure can be anything the community wants or needs an infrastructure to be. The creative power often attributed to broadband networks becomes a reality, as you will see in the upcoming pages.

III. The historical context of hybrid infrastructure

“Wireless in broadband means one wire less,” jokes Deb Sasha, Executive Director for Next Century Cities. “I don’t think you can find any wireless solution that doesn’t include fiber. On the other hand, some communities are using wireless to reach citizens that otherwise can’t be reached with fiber.

Reviewing community broadband projects over the last 10 or 15 years could teach us a lot of valuable lessons about hybrid infrastructure. Communities have had successes that were not well publicized or replicated in a significant way. But just because a particular technology or business model did not become the “Flavor of the Month” at the time does not preclude it from being replicated now.

Cities and counties have been using public-owned hybrid infrastructure for over 20 years, initially for local government and K-12 public school use. When a few small municipalities built networks to sell services to the public in the 90s, they were either copper or fiber. In 1999, for example, city staff in Thomasville, Georgia built a fiber network after being ignored by incumbents.

Thomasville residents had little more than dial up, and the business community fared only slightly better. From humble beginnings, the network went on to become a success story. Mayor Max Beverly reports that their network [now generates \\$2 million a year for city coffers](#). This enabled them in 2012 to eliminate taxes. Thomasville’s story is important because it demonstrate the potential 17 years later for to have successful community broadband networks.

Between 2000 and 2004, several cities elected to build Wi-Fi mesh networks, which cost less than fiber infrastructure and were quicker to build. Scottsburg, Indiana’s public utility built a mesh network for \$385,000 to sell services to its 6,000 residents and its businesses. Public utilities today tend to favor fiber networks that they build out themselves, often as an extension to their business operations. Wireless can still be less expensive for a lot of situations.

Chaska, Minnesota formed a public private partnership that delivered fiber initially, then added wireless to serve businesses that have smaller budgets. Other small towns had their municipal IT departments build and run the networks, including Sandy, Oregon and Wilson, North Carolina. Some of the bigger cities and the counties are building out and selling fiber services themselves, but retain WISPs or other providers to sell wireless services to the public.

When no incumbent provider stepped up to serve the city of Sandy, Oregon (population 9,500), the city blazed its own broadband trail that went from wired to wireless and back to wired. In 2001 the city’s SandyNet network delivered DSL services to City Hall and residents. From 2007 to 2013, the city sold Wi-Fi

services and grew the network from 160 to 1600 customers. The city switched to fiber, shifted into overdrive, and generated over 10,000 customers in two years.

Greene County – the value of focus

Greene County, North Carolina offers an important lesson on why communities need to focus on the needs analysis before the technology.

Misty Chase was a main driver of the county's broadband project. She facilitated a needs assessment, "and this produced the most effective tool in our toolkit – a very detailed plan," she stated in a 2007 interview. "That way you got everyone on the same page and everyone knew where we wanted to go."

The plan established benchmarks to measure the network's success. One goal was to improve academic performance by providing access at students' homes. Chase said, "Access to the network led to high school SAT composite scores increasing 41 points, and proficiency scores increased from 53% to 78.4%. Over 70% of students apply to college compared to less than 30% before the network."

Inadequate broadband prompted companies to move to other counties with better access. Greene County stemmed the tide and the network helped attract more than a dozen new businesses. Most of them did a lot of electronic commerce. The training programs accessed through the network educating adults who didn't have computer skills, help them get diplomas and actively participate in the digital economy.

Greene County teaches us two important lessons. First, they achieved a lot using wireless that wasn't nearly as advanced as it is today. Imagine a network today powered by fiber and wireless. Second, Greene County did not have staff that knew how to build or market broadband, but they solved this particular problem by building the infrastructure and then leasing it to a private provider to manage.

This particular public private partnership addressed affordability while the county maintained control over the process of "[owning the business of broadband](#)," meaning, using the network as an asset that produces short- and long-term community ROI.

What is the value of "free"?

Community broadband advocates today can learn several important lessons. First and foremost, do thorough due diligence on all potential partners and vendors. Regardless of a network's cost, publicly financed broadband always comes with political risks.

While cities were pursuing free private Wi-Fi in 2006, there also were plenty of local governments building wireless infrastructure for city and county use, such as outdoor Wi-Fi in parks, malls, airports and other public spaces. Many government applications used licensed spectrum since it was more secure and reliable, but there are some Wi-Fi believers as well, since unlicensed spectrum is, well, free.

Portland, Rhode Island built a licensed 2.4 GHz wireless network with a heavy focus on public safety and serving police officers. Building inspectors also use the network, saving about two and a half hours per inspector per day because they could complete the paperwork in the field.

Oklahoma City built a 515-square mile Wi-Fi network that allowed them to create 42 research-quality weather stations to collect all kinds of weather data. Inspectors give instant licensing approvals, which save several days of construction time for projects. Wireless probably won't supplant fiber in the city, but the Oklahoma City CIO believed Wi-Fi allowed them to do things not otherwise possible. Licensed and unlicensed wireless today still gives you options you otherwise won't have.

Smart apps before cities realized they were smart

I hate to burst anyone's bubble, but many "smart" apps are old news with new marketing and powered by faster wired and wireless infrastructure. Houston in 2004 used wireless to drive a parking meter app that saved and earned extra thousands of dollars a month. Corpus Christi's Wi-Fi network in 2006 was nationally famous for its automatic meter reading capability.

A true rock star in the muni Wi-Fi world at the time was the 1000-square mile network the Morrow County [OR] Emergency Management Center (MCEMC) built to manage a myriad of monitoring and emergency response resources. Unsure about the practical value of the Internet of Things (IoT), or the relative security of Wi-Fi? This is a story for you.

The Umatilla Chemical Depot held (but eventually destroyed) about one-third of the U.S.'s remaining stockpile of warfare materials within the county. This county was home to the Hanford Nuclear Reservation as well as a nuclear power station. One of the major east-west rail lines in the western U.S. cut through here. Several major natural gas and energy production and distribution facilities operate here.

Cameras linked to the network streamed real-time, full-speed color video to monitor all of these facilities, and they can be remotely controlled to turn and zoom in on specific areas. Cameras monitor the highways since, in the event of a chemical disaster, the staff has about 10 minutes in which to respond. If they need to quickly evacuate residents, MCEMC relies on those cameras and the

network to remotely re-direct traffic by controlling traffic lights, drop arm barriers and billboard-sized message signs that can post new text as needed.

MCEMC deployed Wi-Fi access points mounted on buoys on the rivers and waterways to provide warnings to watercraft as well as back up to land-based Wi-Fi points. This same system can operate un-manned fire boats to fight hazardous materials fires on or near shores. The main PBX phone lines all have VoIP capability that also provides backups to the cell phones.

Emergency response vehicles are equipped with mobile Wi-Fi access points so they can stay connected to the network while driving up to 100 mph. The network is HIPAA-certified safe so that patient data can be wirelessly transmitted while en route to hospitals. On top of that, the network is also Fed Info Protection Standard (FIPS 140-2) compliant. MCEMC didn't worry much about security being breached, or network failure at a critical time.

This story's main take-away should be, hybrid wireless and wired infrastructure is very smart for your community. The hype that surrounds the phrase "smart city," however, can hinder its progress. The key to make technology work best is to downplay hype, focus on the needs assessment, and do everything you can to collapse silos of technology and data within local government, as well as within the community.

IV. Before we can maximize hybrids, fix the RFP process

Before I started this report, I skimmed through [Fighting the Good Fight for Municipal Wireless](#), my first book on community broadband. It's a little interesting that 11 years later, some of the same dynamics are plaguing these networks' effectiveness:

- hype is a double-edged sword that threatens success;
- fixation with the technology dilutes communities' focus
- some communities do not appreciate what determines providers' profits; and
- some don't realize it takes more than broadband to make projects work.

Marketing hype has released a tidal wave of municipal interest. Unfortunately, a lot of the RFPs look similar to each other, both in content and intent. There is a heavy, almost exclusionary, focus on fiber. Often there is an emphasis on one business model. Industry hype promoting fiber, Google, a gig, smart cities, etc., etc. threatens to afflict cities in a "one-size-fits-all" mentality.

Whatever technology decisions are made for public, co-op and public private partnership-owned networks, you have to address the shortcomings that hinder how community broadband is implemented. This section addresses how to minimize the effects of these challenges while maximizing the value that hybrid infrastructure brings to broadband projects.

Maybe it's time to think differently

"They were taking advice that was dispensed in 2005, changing the name of the city at the top of the document and then handing it to another city today. Much of what they told the city was erroneous in this day and age." Technology Director Bruce Patterson of the City of Ammon, Idaho was recalling a city he knew of that recently hired a consultant to do a feasibility study.

In recent years between 30 and 40 Virginia cities or counties have completed feasibility studies. However, only a small fraction of these communities has moved forward, many of the rest had difficulty enticing wireline or wireless providers to participate in community broadband projects. Both large incumbents and small ISPs often feel that these projects fail to offer viable business cases.

In 2016, cities mercifully don't ask for free networks, as many did in 2006. But analyzing cities' RFPs released in the last year, we see them asking vendors to execute feasibility studies but may or may require an extensive needs analysis. A significant number of these RFPs lock everyone into the middle-mile, open access model and specifically limit the network infrastructure to fiber.

Cities seem to have a “build it and they will come” philosophy. “Communities are being advised to build ‘x’ number of towers, and lay ‘so many miles’ of fiber, or give anchor institutions to providers and they will somehow magically generate residential customers,” says Sandie Terry, Vice President, Broadband Programs, at the Center for Innovative Technology (CIT) in Virginia. Her team strongly felt that communities need a new path, so the team asked everyone to take a timeout on broadband development while they rethought the entire process.

Virginia blazes a different path

Meetings with Virginia communities, telecom companies, WISPs and co-ops revealed communities face two challenges: 1) they often put the cart before the horse, and 2) they need to better understand how providers make money.

CIT helped several communities do extensive needs analysis and technology inventories similar to activities described in Section I. Also, they examined adoption rates by demographics in areas that already have broadband (e.g. seniors, low income, small businesses) as well as the barriers to adoption.

Terry’s team assessed telcos, cable companies and ISPs that provide broadband, and those that avoid RFPs requesting services. WISPs often find RFPs specify fiber-only. Wireline providers find some RFPs favor fiber when wireless might be advisable. And for quite a few providers, the economics of the RFP is not penciled out.

“Communities cannot go into a project expecting to spend no money, having providers carry the full freight, and wanting little do with broadband once the project starts,” says Terry. “People won’t be happy with the results. Local government has to make it quick, easy, and cheap for providers to get involved.”

First and foremost, the city or county has to have realistic financial goals. Pent-up demand? It looks good on paper, but what happens after the initial excitement is over and/or competitors arrive? Also, how much money is a town willing to spend to build a fiber ring, or to guarantee rooftop access for a WISP’s routers?

Amelia County, Virginia has an agricultural economy and only 5,400 homes. When the first RFI went out, some providers said they could not financially support bringing broadband to such a small number of homes. When the county re-did the package based on Terry’s guidance, they offered a package that included schools, libraries, and the county government as anchors. They offered middle-mile fiber built with BTOP funding, fee waivers, dedicated logistics support, digital literacy training and a PC refurbishing program. Now they have several broadband suitors.

Consider some constituents as a broadband adoption puzzle – find creative ways to remove barriers. For instance, if your senior population has an expected take rate of only 30%, tell providers you'll do a mobile Wi-Fi hotspot rental program with the public libraries to increase seniors' take rates. Or to increase take rates among low-income constituents, join with a city agency to create a job-hunting service that includes a refurbished computer and Internet access.

Re-thinking the community broadband RFPs

Starting in 2017, how many communities have a feasibility study on the shelf somewhere in City Hall after private sector companies and even some city staff rejected the recommended solutions? Some cities have two or three. But the problem isn't the feasibility study. The problem is community leaders' and stakeholders' mindset that values technology over constituents' needs!

With the prevalence of industry hype and municipal leaders wanting to keep up with the Joneses (or Chattanooga), it's easy for reason to give way to emotion. As wireless capabilities increase, the business case for hybrid networks increases because wireless use you additional flexibility.

As much as communities want to have ironclad formulas for speed, infrastructure, business models or other aspects of broadband, it ain't gonna happen! Every city is different and broadband plans require some amount of customization. Everything rides on the needs analysis, and expect that your game plan may be unique. Do not be distracted or discouraged by a lack of standards, but rather, build a better RFP.

Communities have to get away from formula RFPs that ask for pre-determined infrastructure, business model, etc., and start designing RFPs that ask, "what can we create with hybrid broadband infrastructure?" This reflects a new mindset.

RFPs should contain extra incentives for organizations or providers that provide extra cost value and reliability. Lon Whelchel, CEO of AcelaNet, LLC believes "too many communities get focused on fiber because they get grant money, but then find they can cover everyone unless they get more money. In some cases, if they had used wireless, everyone would have gotten Internet access."

Once a community has the right game plan, decisions on infrastructure, business models, partnerships, and other elements of broadband deployments are easier and more likely to be successful.

V. WISPs – the unsung heroes of Internet access

You can't talk about hybrid wired/wireless infrastructure without talking about WISPs. They started in 1992, mostly in rural areas in response to a philosophy deeply rooted in the America' Old West: there's no need waiting for someone else, we'll just do it ourselves. And they did. Not only in rural areas, urban WISPs are starting to make a difference in midsize and metropolitan areas.

As muni Wi-Fi increased the bright spotlight on wireless technology, WISPs became more popular, especially since they actually delivered real services. There are over 3,000 WISPs, each comprised usually of a handful of people who do everything: engineering design, hanging routers, marketing, customer service and tech support. Recently fiber technology is making inroads with WISPs.

WISPs should have a prominent role in community broadband. Unfortunately, marketers for many of the vendors and ISPs in the industry have successfully made speed the standard by which we evaluate the progress and value of broadband. "But research tells us that even for a family of four, the biggest use of their home connection is for video, specifically Amazon and Netflix," observes CEO Jimmy Carr of All Points Broadband, a WISP. "Speed tests show Netflix takes at most 4 or 5 Mbps of bandwidth per person."

Midwest Electric Cooperative in Michigan says that most of their fiber customers use about 20 Mbps of speed. One Christmas, the co-op doubled their speed for a month. Afterwards most customers were content to return to their old speed. An ISP in Minnesota, Hiawatha Broadband Communications, has been selling the residents in 10 towns 25 Mbps symmetrical wireless since 2015. Customers are overjoyed because before this there was mostly dial up. A hybrid infrastructure can address a median need for speed.

"Rather than focus on speed, the policy makers, funding agencies, and others should focus on unlimited data because if you listen to consumers, that's what they want," says Carr. "Fixed wireless with no data caps is the sweet spot where WISPs play. This bias against wireless is no longer grounded in reality."

A WISP in Franklin County, Virginia, B2X, formed a public private partnership that's credited for its success. In 2005, the county seat had some DSL but the rest of the 721 square-mile county mostly had dial-up or satellite. The county government issued an RFP for broadband to cover its needs and their constituents'. Given the terrain and sparse population, B2X determined that fiber was not the best option.

The County embraced a tiny start-up WISP in a full-on partnership. The County provided space on towers, water tanks and poles in exchange for reduced-cost

services for County offices, fire and rescue stations and the government WAN. This arrangement lowered deployment costs for the B2X and it expedited growth.

B2X's customer base went from 98 in early 2005 to over 1000 residential customers and 143 businesses in just three years. Since then, the WISP formed another partnership with a nearby county and has expanded to the status of regional provider servicing cities and towns in 15 counties. B2X kept pace as wireless technologies with greater speed and capacity have come on the market.

At the same time fiber's role in WISPs' hybrid deployments is increasing. B2X, for example, is testing fiber to create stronger connections between all of the WISP's networks. Wireless equipment vendors are announcing products that facilitate fiber deployment. Expect to see WISPs building hybrid networks on their own and in public private partnerships.

WISPs serve urban areas too!

Ron Deus, CEO of regional WISP NetX, located in Cleveland, Ohio (population 400,000), has been providing homes and businesses with gig wireless connections, and is preparing to extend services to New York City. Deus says, "You see lot of consolidation has happened in the telecom industry that produced monopolistic situations in big cities. They are very slow to upgrade, and they raise prices that are not in line with actual expenses. WISPs tend to design more efficient ways to communicate data so we are more profitable."

Some state and federal agencies (as well as the media) are not focusing on the severe broadband need in urban areas. Deus feels, "What happens in the suburban and urban areas amounts to redlining as incumbents' buildouts, upgrades and adoption efforts happen in the most profitable areas first. Areas just a mile or two away become broadband deserts. A lot of incumbents are shareholder driven, so their first concerns are their profits and cherry-picking."

Communities see an aging broadband infrastructure that incumbents will not improve, and an urban core that is frustrated by the impasse. In Cleveland and other urban centers there are economic considerations that point to wireless infrastructure as a practical and fiscally responsible way to improve broadband. However, that being said, cellular service may not be a wise wireless choice.

Deus feels that, "Because of this flexibility we are experimenting with different business models, different pricing, maybe even different service levels, to figure out which variables works. We can look at online funding options, public partnerships, potentially free access for some, pay-as-you-go type of service for others." WISPs such as NetX and others have provided wireless services to individuals and companies in urban areas for several years.

VI. Moving forward with hybrids

In the first part of this 21st Century, pioneering communities did lots of innovative thinking because they had to make up the game plan as they went along. Unfortunately, some of the innovation didn't receive a lot of media coverage. The following mix of past and current accomplishments provides some building blocks to future decisions regarding hybrid infrastructure.

Regional development organizations light fires under broadband

It is widely assumed that ideal broadband strategy is to build middle-mile networks, entice middle-mile builders by giving them anchor institutions as direct customers, and wait for private and public providers to flock in build last mile networks. For years, some providers refused take the bait.

Several counties in New York State executed their open access model quite effectively, bringing fiber and wireless together to solve broadband needs. In 2005, a group in western New York launched a not-for-profit 501(c)(3) corporation called Axxess Ontario. However, they didn't hire employees. They created a board of directors, raised money, and retained firms with the talents needed to run a telecom business that sells dark fiber.

Similar to Terry in Virginia, Axxess Ontario believed the key to get providers to bring broadband into un-served areas was to make it quick, easy and cost-effective for them. Furthermore, Axxess Ontario conducted extensive needs analysis of both constituents and providers.

The board retains legal, accounting, and construction firms, and ECC Technologies, Inc. to handle network design, oversee construction, and manage marketing, sales, and customer service. Axxess Ontario formed a public private partnership between Ontario County, the Ontario County Industrial Development Agency and local businesses and carriers.

The county contributed funds in exchange for an IRU that provides fiber optic cable throughout the backbone. The county also used a pilot project to offset loan costs. County officials join representatives from local businesses in leadership positions on the board.

Axxess Ontario facilitates wireless and wired deployments throughout the county through dark fiber sales to carriers and businesses. There are carriers that sell services directly to businesses and individuals. "Empire Access, for example, brought fiber to the home in Naples, NY, a rural village of 2500, after no carriers were willing to serve them," says ECC's Director of Broadband Services, Andy

Lukasiewicz. Cellular carrier towers use Access Ontario fiber or get lit fiber from other carriers, and other providers rely on the group just for backhaul transport.

Businesses and other organizations buying Access Ontario's dark fiber might use any type of infrastructure for the customers' private networks. "Finger Lakes Community College uses the dark fiber to enable links to their remote facilities, hotspot access to several locations on campus, and a small cell connection with a cellular provider to cover an outdoor performance venue," states Lukasiewicz.

Let's do that again

In 2012, a similar partnership was formed, this time with a coalition of three counties that expanded to eight. The Southern Tier Network (STN) is the not-for-profit corporation and it operates similarly to Access Ontario. Steuben, Chemung, and Schuyler Counties were the initial jurisdictions.

STN formed a board of directors and a public private partnership to sell dark fiber to providers and businesses. ECC had a bigger role with needs assessments given the multiple counties. As additional counties' networks go live in 2017, the jurisdictions will present new deployments, tactics, and other programs directly to the board to review and determine how money should be spent.

Marcia Weber, the Chair of STN, expects to have the same success with recruiting providers as Access Ontario. "I find that many providers are local or regional that understand the needs and challenges of the communities. We expect an increase in wireless providers as the technology improves in speed and quality. However, we haven't seen enough of the new stuff to understand how real gigabit wireless is."

"Cellular is good, but fixed wireless has room in the market to grow," concurs Steve Manning, CEO of STN. "The cell carriers now buy additional fiber from us that pushes wireless deeper into rural areas. WISPs understand they either have to partner with traditional ISPs to integrate fiber in their networks, or they need to start building hybrid networks." WISPs are helping by alerting STN to areas where they can expand the fiber ring so WISPs can sign up more customers.

Three things to take away from the story are 1) "RFPs-by-rote" needs to stop, 2) be willing to tweak the conventional wisdom, and 3) everyone has a role to play.

By changing the rules, these New York PPPs are displaying the desired outcome: plenty of providers, competition, and creativity. Learn from them. Equally as important, community stakeholders don't wash their hands of broadband after the provider steps in – they stay engaged. For example, libraries in counties applied for grants so to turn their libraries into more potent fiber outposts that in turn rely on fixed wireless to reach sparsely populated areas.

In Chattanooga, before there was a gig...

Between 2006 and 2007 automated meter reading (AMR) and advanced meter infrastructure (AMI) were two applications that justified public utilities' interest in municipal Wi-Fi. With AMR, staff in vehicles or on foot with mobile devices went block-by-block capturing how much water, gas and electricity customers used since the last reading. AMI not only does this without human intervention but also can do it as frequently as needed, enabling utilities to analyze data as granularly as they wish, and enables communication between the office and the meters.

These applications help drive broadband deployment today, as well as the smart city movement. Over the years, Chattanooga's public utility, EPB, has tested various technologies and deployment assumptions as they have built out their 600 square miles of infrastructure. Their footprint covers the urban city proper (143 square miles) and a fair amount of sparsely populated rural areas.

EPB evaluated Wi-Fi as an AMR/AMI infrastructure but found it to be cost prohibitive in the rural and urban areas. Colman Keane, Director of Fiber Technology at EPB, says, "the problem with a Wi-Fi network covering a city the size of Chattanooga is that it would require so much fiber to backhaul the data, you would lose any cost benefits that Wi-Fi might give you.

EPB found fixed wireless integrated with fiber to be much better. "Initially, when we upgraded the infrastructure to facilitate selling broadband services to our customers, we ran wireless to every two utility meters for every fiber line to a meter," says Keane. "As we grew beyond a specific take rate, we replaced wireless connections with fiber." At the same time, EPB optionally sells and support Wi-Fi routers that distribute their broadband within the premises.

Some in the industry feel the term "smart cities" is partly a facelift to too old technology. Keane feels the same. Many of the applications such as smart grids, traffic management, and public safety have been around for years. "What's being added today are apps that aggregate data, make sense of data, track it as it moves to other parts of the city, and ultimately, distribute it to mobile and other computing devices so constituents can do something useful with the data."

NC Co-op considers the financial implications of hybrids

There are over 800 utility co-ops in America that started as a way to bring electricity and telephone services into rural areas when corporate utility providers would not. Because of the data communication needs of a utility, a lot of them have or plan to install fiber. In addition, the business and logistical operations make co-ops well suited to add highspeed Internet services for members.

After several high-profile co-ops launched successful pilot programs to test out the viability of offering broadband services, there's been a lot of interest from other co-ops as their members also demand Internet services. Expect this trend to surge in community broadband networks.

Roanoke Electric Cooperative covers five counties in rural North Carolina, and serves as few as six or seven homes per square mile. They currently have a \$4 million fiber ring project known as Roanoke Connect. Their primary goal is to enhance the co-op's electricity operations. Their substations will be able to communicate better with each other, predict and manage outages, protect equipment from vandalism or theft, and proactively communicate with members.

Roanoke started a pilot project to determine the potential success in providing broadband to individual and business members. "We are assessing if a hybrid wireless/wired infrastructure will improve the financials of our operations over the next few years," says Curtis Wynn, the co-op's CEO and also Secretary-Treasurer of the National Rural Electric Cooperative Association (NRECA).

It may not make economic sense to provide fiber to sparsely populated areas. "As we learn more about wireless technologies that potentially can deliver half a gig or more, this interests us because deploying fixed wireless is faster," remarks Wynn. High definition (HD) video is taking off and providers of all sizes are racing to keep up with the resulting customer demand for more speed.

He feels that wireless infrastructure gives them more flexibility. The fiber ring is necessary, but the new wireless speeds give co-op members fast Internet access now and for some interim period if the co-op decides to add fiber later.

Roanoke is comfortable building out fiber infrastructure. However, it is likely that they will partner with a provider to deliver wireless. "As we do the pilot, we are looking at WISPs, traditional carriers and some broadband technology companies that some might not think of as capable of delivering wireless services," says Wynn.

Hybrids solve the cash and cash flow dilemma

10 Minnesota towns in Renville and Sibley Counties, ranging in populations from 2305 down to 504, created a joint powers board to bring broadband to constituents. The board created the RS Fiber co-op to represent communities' communications interests, and sign up members. The board and co-op retained an ISP, Hiawatha Broadband Communications (HBC), to oversee network operations and marketing.

The original plan called for a fiber backbone to link the 10 towns together and build fiber laterals to the premises. It was estimated to take three years to complete and in 2018, RS Fiber would ask the board to pass another bond to finance the remaining buildout to take in surrounding farmlands. In total, the entire network will cover over 600 miles and 2500 farm sites and cost \$70 million.

Broadband projects present two major financial challenges for communities: raising cash for buildout costs and generating sustainable cash flow. They can't start billing customers until the network is built, plus there is a lag between the buildout and the time when revenue can cover operating costs. HBC came up with a solution that resolved both concerns.

HBC split the project into two phases and focused on the towns first. Starting in mid-2015, they used multiple crews to 1) build out the fiber ring, 2) simultaneously ran fiber to towers that held fixed wireless equipment, 3) then built fiber to the premises. 90% of the residents got 25 Megabit symmetrical wireless service by the end of 2015. 70% had fiber by the end of 2016.

Wireless was the key because it allowed RS Fiber to collect \$50,000-\$100,000 in monthly revenue and start retiring the debt because residents received service soon after the project started. It helped significantly that RS Fiber gave the go-ahead immediately while cities expedited permitting processes and access to vertical assets. HBC retained appropriate staff to do simultaneous buildouts.

"It helped we could use our own fiber ring for five of the towns, our own video head-end and several towns let us use vertical assets such as water towers," says Dan Pecarina, HBC CEO. "We installed point-to-point fixed wireless with 1-gig capacity to ensure every customer gets 25 Mbps symmetrical."

Wireless for those hard to reach places

Eau Claire County, Wisconsin has been part of a mostly fiber community network infrastructure since about 1999 that connected anchor institutions such as schools, libraries and hospitals, various cities in the county and the neighboring county. In 2012 the County was part of the group that received a BTOP (U.S. Department of Commerce) grant as part of the broadband stimulus program.

Various jurisdictions' employees and properties as well as anchors share applications and interconnections on the network. County public areas such as parks and campgrounds have Wi-Fi access. Through a state broadband extension grant, Eau County and a private ISP called Packerland share fiber and wireless infrastructure that serve County employees and Packerland customers.

When the stimulus program started, public and private entities considered WiMAX (licensed spectrum) go-to technology, especially when covering

expansive suburban and rural areas with wireless. Around June the County began transitioning to LTE wireless by upgrading a tower with LTE equipment.

Dave Hayden, Information Systems Director at Eau Claire County, says, “As you move into most remote areas, some type of hybrid network likely will become more prevalent. We find many of our County workers as well as those served by our private provider in those remote areas are using both WiMAX and LTE wireless, which delivers up to 60 Mbps symmetrical. Movable wireless equipment also gives us better flexibility providing Internet access to agencies we work with whose employees might work in a building only 6 to 12 months.”

For cities to be smart, hybrid infrastructure is a must

To make “smart cities” more than the next over-hyped Flavor of the Month, smart stakeholders understand they must 1) illuminate silos of technology within muni government, and 2) commit to hybrid infrastructure. Actual and promised smart city apps rely on blazing speed and incredible broadband capacity.

One of San Leandro, California’s leading employers, OSISOFT, teamed with the city government and the Bay Area Rapid Transit (BART) to transform this small manufacturing city into a test bed of technology and other innovations. The city is layering on technology and smart city apps to help the city meet its goals.

OSISOFT CEO Dr. Patrick Kennedy created a new company called Lit San Leandro, which pulled 288 strands of fiber through the conduit and gave the city 28. The San Leandro had available conduit and BART has extra dark fiber that it made available.

ISPs running on Lit San Leandro provide wired and wireless services to businesses. Various city agencies are connected to a 10-gigabit port. The San Leandro School District connected all schools to the port, and modernized its IT infrastructure including the WiFi. Another public private partnership installed a microgrid on the network that will power an ecosystem of small businesses to help Bay Area cities meet the demand for advanced renewable energy systems.

Thanks to a \$5.2 million contract with Climatec, an energy services company, the city is launching an array of new projects and improvements including a new smart LED lighting system. A wireless mesh network will be installed on street lights. The deal is structured to achieve guaranteed energy savings and no need for upfront capital expenditures from the city’s general fund.

“Having a gig network by itself does not make government more effective,” says Tony Batalla, City of San Leandro IT Director. It’s just a building block, but with it more is possible. Cloud computing now becomes the real option. We can reach out to the public and have them interact with us more. Mobile apps work better.”

VII. Analysis

With the latest developments in wireless speeds and capacity, we have a stronger set of tools in our broadband toolkit. Subsequently, we need to rethink our use of hybrid infrastructure as we increase community broadband buildouts. Even though the media treats Google's transition into hybrid networks as "the next big thing," hybrid networks have been a reality throughout the history of community buildouts.

"I have long preached that the hybrid approach makes sense," says Rick Harnish, Director of WISP Markets for BaiCells Technologies and former WISPA Executive Director. "Lower costs, faster deployment time, standards based equipment and network flexibility make fixed wireless the hybrid partner to fiber now and into the future." Communities need creative minds to leverage hybrids to their full potential.

Reviewing RFPs and media articles, there seems to be a lot of people within local governments and national and state policymaking circles who believe building open-access middle-mile networks is the key to broadband success. Specifically, these should be all or mostly fiber, and include anchor institutions in the buildup. Then we'll see providers flocking to the middle mile.

But what happens if those hoped-for networks don't get built because the process by which a community entices fiber and wireless providers actually repels them? 30 years in the high-tech business has taught me you need more than "cool technology" to make a product, service, or network successful.

"I don't know anything about the Internet" is never ok

Some local policy makers, decision-makers, and others involved with making broadband real for the community have very little understanding of how things work with broadband. Often it is in generational divide affecting those who haven't grown up using the Internet. However, you can't make smart decisions from a knowledge vacuum. Get educated. Quickly!

Problem solving or creation orientation?

When constituents interact with local government officials to fix a problem – a pothole, school crowding, poor broadband, etc. – everything becomes narrowly focused on the problem. Things could get contentious. The problem might not even get fixed. And if the problem does get resolved, everyone goes on their way until the next problem.

When communities treat broadband only as a problem because their constituents are complaining, they likely shortchange the technologies' value. Some leaders do the minimum with the technology. The feasibility study becomes a CYA project. Leaders can't wait to hand off the project to a private provider with no regards to how successful – or not – that provider is.

Conversely, a creation orientation leads to more successful buildouts in Chattanooga, Lafayette, and hundreds more communities. With this orientation, you engage and motivate constituents. You create more opportunities to use hybrid infrastructure to facilitate innovation that makes a difference. The network fuels start-ups and leading-edge technologies. Bottom line: use the creation orientation when you want a better return on your broadband investment.

Whose tail, whose dog?

It seems some communities waste time and money on an RFP process that relies too much on Cut & Paste from prior RFPs, conventional wisdom, venter marketing hype, and a tendency to confuse customer speed with infrastructure capacity. Others are executing a “build it and they will come” broadband strategy that likely we'll not draw enough customers or providers.

“Too many cities waste time with a feasibility study to determine whether they need broadband (yes, they do), or if fiber is good (not necessarily),” says Richard Frank. “They would do better by understanding their needs more thoroughly, do better job demand aggregation, and using software such as GIS automate the technology design process.”

A well-designed pilot project guided by an extensive needs analysis is an ideal way to give most communities the knowledge they need make good broadband decisions. ServiceHub CEO Hans Wynholds, “What you're buying with these pilot projects are not your first steps of automation, but useful information to make better decisions. So run multiple projects. Don't be afraid to pay your tuition for your education.” That's how you prevent the tail from wagging the dog.

Don't be suckered by the chimera of 5G

I often take issue with large incumbents and those in the industry that create these mythical broadband speeds and capabilities in order to sell consumers and businesses a chimera of hoped-for innovation. It is often marketing hype perpetrated to enhance the illusion that incumbents are the captains of innovation while in reality they're trying to clear away true competition.

In 2011, I [wrote this about how the values and virtues](#) of 4G greatly exaggerated through chicanery. “We see the problem deepen with the 4G con perpetrated by

effective incumbent pushback. The standards-setting body ITU (International Telecommunications Union) originally defined 4G as speeds equaling 100 Mbps, a speed closer to meeting businesses' and organizations' needs both currently and for a couple of years down the road. But alas, that benchmark went by the boards to become speeds friendlier to big wireless providers, I'm guessing in the face of subtle and less-than-subtle influence wielding."

5G one day will be real, though I doubt the reality that the industry is selling you today will define 5G in 2018. Doug Dawson is the owner and president of CCG Consulting, and a long-time Editor of [POTs and PANs](#). He and I share a disdain for the marketing-manufactured expectations game.

As Dawson recently wrote, "Most of the world sees the term '5G' and assumes it means the next generation of cellular technology. And that means that most people reading about the AT&T press release think that we are just a few years away from having gigabit cell phones. And we are not.

"This kind of confusion has real life negative consequences. Politicians and decision makers read these articles and assume that there is a fast cellular alternative coming in a few years – and this allows them to take the issue of faster landline broadband off the plate. It's not a hard mistake to make and I've even seen this same confusion from smaller telco and cable company owners who see the headlines but don't dig deeper. I assume one reason this confusion is being promoted is that both AT&T and Verizon benefit if fewer companies are investing in fiber last-mile networks to compete with them."

All fiber and all wireless infrastructures aren't the same

To make things easier for non-tech people understand, both tech and non-tech folks wrap complex technology into simple terms, often out of necessity or convenience. However, just describing a network as being wired and wireless is convenient, but it can lead to problems given the different categories of wired (i.e. fiber, cable) and wireless (i.e. fixed wireless, Wi-Fi).

As communities do their needs assessments, they need to understand that various broadband needs, population and building densities, terrains, etc. require different categories of wired or wireless. Even how advanced a particular category is can determine what needs it can meet.

To reiterate, need determines what technology communities use, not the reverse. Furthermore, understand that how well a technology can resolve needs depends on whether the technology is ready for primetime. Just because it works in the lab doesn't mean it works in the field.

Allen Higgins, owner of Immersive Technologies, LLC, says, "the technology is

moving way too fast to become stable, yet cities want the best the fastest, or whatever and they want it right now. First there was 802.11 WiFi. Then 802.11b and g evolved into 802.11n, which had not been really proven out before 802.11ac arrived to become the next buzzword. People and municipalities will not take their time and let the technology prove itself.”

The era of HTTH - Hybrid-to-the-Home

Stop treating wireless like the left-handed, redheaded stepchild! “A sizable number of cities are starting to find that hybrid infrastructure makes more sense than just fiber to the home,” says Starks of ECC. “Several studies have shown that 35 Mbps is tops in what the average family needs. It’s good to have gigabit capacity in a network, but communities that are working with limited resources will find hybrid networks are more cost efficient the needed speed to customers.”

Chris Stewart, Network Engineer at Lightspeed Technology reports that their WISP business “runs 1 Gig fiber to our NOC in downtown Canton, OH. We have a wireless radio on the roof that pushes gig capacity to towers as far away as 11 miles in one hop. Even when there are two or three hops to the customer, we can deliver 200 meg speed to remote farms. In our more populated service areas, we deliver 10-40 megs symmetrical and with no data caps.”

The average person doesn’t care much how they get their data just as long as it is reliable, affordable, secure, and fast. With the improvements that wireless technologies are making, it is easy to deliver 25-35 Mbps. Businesses, universities, hospitals and various other large organizations need more speed and probably fiber. Bottom line, hybrid networks are the way to go.

Understand how private providers make money

The potential is high for disconnect between private providers and communities. WISPs and ISPs often complain the biggest shortcoming of middle-mile networks is the underlying assumption that these networks lead to profitable customers for providers. For providers, the difference between boondoggle and booming business isn’t much. When both community leaders and the providers get on the same page, even the most reticent providers will come to the table.

Communities that thoroughly analyze needs by constituency, neighborhood, type of business, etc. have better odds for success, because the more needs you identify the more paying customers you entice to the network. Whatever cash and/or resources a community brings to the table increases providers’ odds of success. Before and after the buildout keep searching for needs to meet.

Hints for state and federal broadband policymakers

Politics and industry lobbyists can impede the nurturing of good broadband policies. At the local level, bipartisanship tends to be the norm when it comes to community broadband. At the state and federal level, not so much. Sequentially, broadband policies can be detrimental to communities they are designed to help.

For stepping to the breach, WISPs should be recognized and funded by state and federal agencies that support broadband. WISPs as well as regional and local telecom companies often are best suited to meet their communities' broadband needs. Consult with them and co-ops vigorously on policy issues.

Lon Whelchel feels that people – and by extension, policymakers – should stop judging wireless by older or immature technology or bad implementation. “Policymakers need to realize there is more to wireless than previous experiences. Google’s actions seem to indicate they realize fiber is not the only way to get Internet access to people.”

State and federal policymakers and legislators should fight spectrum hoarding. Andreas Wiatowski, CEO at Silo Wireless Inc. says, “Most spectrum goes to the highest bidder and gets stockpiled rather than distributed to those willing to deploy now. Make more spectrum available to organizations that invest in rural communities or areas where broadband is unavailable. Claw back spectrum that incumbents do not deploy. Support standards like LTE that make spectrum sharing/deployment a reality and create a usable ubiquitous wireless ecosystem.”

When muni wireless really is free

WiFi is an unlicensed (free) spectrum. It has its limits, but are you ready to push those limits? Not as an amenity but as a working tool to help city and county governments, businesses multiple locations, other organizations, and consumers. Spend time talking to your library administrators. They have been pushing the Wi-Fi envelope for years.

Columbus, Ohio is one of the more aggressive Wi-Fi users. Department of transportation grants enabled the city to deploy fiber lines to all of the traffic lights and added Wi-Fi radios. Fiber enhances Wi-Fi's speeds. The city uses wired and wireless in equal measure. The city's mobile workforce accesses Wi-Fi. Police and public safety workers access top-grade video transmissions that save time and money while increasing efficiency. There are several public Wi-Fi zones, and all of the city's rec centers have Wi-Fi access that enables after-school programs, application development training, and job-hunting support for older youth.

While there's no such thing as a free lunch, creative use of Wi-Fi opens new applications and services for your hybrid networks.

Commuting sucks! Can hybrid networks resolve the issue?

Is it better to take a creative orientation approach to broadband rather than a problem solving tact, especially when we are dealing with complex issues? The implementations of hybrid infrastructure describes in this report are just a tiny tip of the potential iceberg when it come giving your community greater flexibility.

Here is an opportunity for you to test out the creation orientation versus the problem-solving approach. One of the biggest problems in the country is traffic congestion, especially around the bigger metropolitan areas. How would you use hybrid networks as a key element to address this issue?

Michael Shear, through his company Pockets, is driving the [Broadband Planning Initiative](#) to use technology and communication tools to resolve traffic gridlock. “We have a rapid migration of people moving into metropolitan areas,” Shear says. “We see a continuing increase in the number of jobs moving from manufacturing to knowledge- or service-sector jobs. And technology changes so quickly we don’t have time to build ways to harness and manage it.”

Shear believes that cities often are reactive rather than proactive, so they miss opportunities to use technology to alleviate congestion. Telecommuting and home offices take hold for some of the workforce, but “there we see push back because the US. Has an ingrained method of employment, compensation, and human resource management based on the legacy of manufacturing,” he says. Broadband can help but you need greater adoption and better quality.

For each of these questions, how would your community employ hybrid broadband infrastructure in ways that find answers and solutions?

We need a lot of data to address this issue: demographics, traffic, employers. What would hybrid broadband and smart apps contribute to data collection?

How can broadband engage various stakeholders to contribute AND own potential solutions, processes, and applications, or maybe a new definition for “work,” “employee” or “office?”

Shear envisions communities building “pods” of workers and managers that are connected to large companies and organizations, but geographically distributed says that employees’ commute time is significantly reduced. Do you need broadband to initiate a new world order in the workplace?

Start discussion among your community stakeholders, initially treat all ideas equally, include conventional and out-of-the-box thinkers, and have discussions take place in small and large groups. Email ([craig @ cjspeaks. com](mailto:craig@cjspeaks.com)) and tell me what your constituents and stakeholders learn. This may seem like an intractable problem, but how good is your community at creating visionary initiative?

About the author

Craig Settles can assist your community [develop their broadband business plan](#), identify network customers, and help you raise money for the project. My work helps you get more value for your feasibility study, and you can put my fee on your credit card.

Besides a service that's based on 30 years of experience, Mr. Settles website is overflowing with broadband knowledge: over 200 hours of interviews, a couple of hundred blog posts, in-depth reports on hot broadband topics, a link to my book, Building the Gigabit City and other resources. Check out the [complete list on his Website](#) today.

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ECC a certified women and veteran owned business, has been a recognized national leader in the development of community fiber and middle mile Open Access models for nearly 20 years. ECC's middle mile networks play major roles in the transformation to successful collaborative fiber and wireless last mile solutions. ECC does not subscribe to the "build it and they will come model." By creating demand models, ECC demonstrates to communities and providers specifically where to invest and when, which removes risks associated with more subjective models. ECC develops business plans around these demand models, to secure funding, prioritize deployment, and form collaborative arrangements needed to implement and operate both metro and rural broadband programs.

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