

## Rural & Underserved Populations have VARIOUS Broadband Communications Needs

The clear message from a February 16<sup>th</sup> roundtable discussion of municipal networks was that each community is different – with different objectives, applications, challenges, and business models among various sized cities and towns – so regulations governing broadband deployment should be flexible enough to serve a variety of needs, especially for Rural & Underserved Populations where there's no service at all or little competitive choice.

These observations were captured during a breakfast event hosted in Austin by Cisco, Intel and MuniWireless.org, which attracted both municipal IT and government officials, including:

- Mayors, councilmen and other elected officials in charge of setting overall vision, direction and policies;
- Heads of local government operations, such as police, fire, emergency services, building inspections, public works, and others;
- Local IT executives, from Chief Information Officers and IT directors to network managers and project managers; and
- Local VARs, integrators, and IT consultants working directly with local governments on their municipal broadband rollouts.

### OBJECTIVES & EXPECTED BENEFITS

This list was collected during one 2-hour breakfast discussion with only about a dozen municipalities in Texas, focused primarily on wireless networks. When thinking about the large variety of cities, towns, and communities of all sizes, it should be clear that this short list only begins to represent that variety.

- Manage Public Infrastructure
- Ensure Operational Efficiency
- Improve Public Safety
- Encourage Economic Development
- Bridge the Digital Divide
- Attract Tourism
- Improve Quality of Life
- Enable Innovation

**Infrastructure Management** – Broadband communications helps municipalities provide, safeguard and maintain the basic facilities and equipment used by individuals and public, private or government entities, such as streets, sidewalks, street lights, parks, storm drains, schools, hospitals, police & fire stations, airports, water treatment plants, electric power systems, railway systems, public transportation, etc. And increasingly, the broadband networks themselves are becoming critical infrastructure.

**Ensure Operational Efficiency** – Local officials have a fiduciary responsibility to maximize the public benefit of these various assets, sometimes contracting with private

entities to install and maintain them, doing that in-house, or in some public/private combination. While municipalities prefer private entities to provide critical services in a competitive environment, they sometimes have to step in and provide these themselves. The latest example is broadband communications infrastructure and services.

**Improve Public Safety** – Provide for and continually improve the protection and safety of citizens with necessary Police, Fire, Animal Control, and Utility services. Mobile and broadband communications is an increasingly important component of the modern systems that support these services.

**Encourage Economic Development** – Create and nurture an environment that promotes the continued viability of the community, its commerce, and its lifestyle. Broadband communications has become so critical to commerce and lifestyle in this Digital Age that companies and people move away if they can get better connectivity elsewhere, and that puts the viability of many rural and underserved communities at risk. So, if competitive broadband services are not provided by the private sector, they must be provided by the public sector.

**Bridge the Digital Divide** – Private broadband network operators with profit motive naturally serve the most profitable markets first and ignore those with less profit potential, including customers in homes and neighborhoods disadvantaged by location or socio-economic status, so municipalities feel compelled to step in and fill the gap. Ensuring that these people have affordable high-speed Internet access gives them a better chance of competing for jobs, education, and a say in the political process. It also lessens demands on welfare, healthcare, law enforcement, and other social programs.

**Attract Tourism** – Free wireless broadband can be an important amenity for visitors and tourists as a way of competing with other municipalities. While large cities may provide free wireless Internet access in their convention center and downtown areas to promote local activities, nearby businesses, and the city itself; smaller towns along interstate highways can provide free wireless services to encourage travelers to stop and visit. Either way, it's a proactive way of encouraging economic development.

**Improve Quality of Life** – Elected officials are also expected to balance public investments (taxes, bonds, etc.) against services and amenities that improve quality of life, including libraries, parks, and theaters. Providing for broad and easy access to community Web portals and e-government ensures that citizens are best able to benefit from these amenities and services. Examples may include offering free Wi-Fi access in parks and government or public venues, like city hall, courtrooms, schools, and libraries.

**Enable Innovation** – When looking at the variety of innovative applications already in place or planned for the near future, it prompts this question: *“Is it market demand for specific services that justify network deployment, or is it the available of networks with excess capacity that enable the development of innovative new applications?”* While a profit-driven private company looking for quick payback may invest only what is required for services with near-term revenue, a public entity may view such investment as a way of enabling innovation, with different benefits expected over a longer term.

## **APPLICATIONS**

Innovation in application development is driven more by need than by profit motive, as we observed when questioning cities and towns about how they used their municipal networks. The identified apps address the specific objectives described above and are

often used to initially justify deployment of municipal networks, although it's clear that once these networks are in place that other apps get implemented that may not have been feasible otherwise.

- Automated Meter Reading
- Parking Meters
- Electronic Ticket Writing
- Other Sensor Applications
- Smart Dispatching
- Remote Surveillance
- Next Bus
- Public Service Announcements
- Traffic Light Coordination
- Voice over IP
- Public Wi-Fi Hot Spots
- Public Wi-Fi Access
- Public Fiber Infrastructure

**Automated Meter Reading** – Early implementation of wireless technologies improved the efficiencies of public utilities by allowing electric, gas and water meters to be “read” from a distance, such as while driving down the street instead of entering a customers’ property and risking attack from their dogs. With municipal networks, the meters can be electronically read automatically and as often as desired from a single location, giving electric power companies, for example, more insight into usage patterns that improve their decision making when buying power across the grid or determining whether to bring additional generators online. Operational cost savings from this simple application can run into the millions, fully paying for the wireless infrastructure that can also be used for other apps.

**Parking Meters** – A new class of parking meters that don’t require coins add convenience for consumers who rely on public parking spaces, while also monitoring the time in each space, noticing when allowed times have expired, and billing accordingly.

**Electronic Ticket Writing** – The use of sensors, cameras, and municipal networks also has been applied to noticing traffic violations and responding with electronic ticket writing, which is more efficient for law enforcement and less embarrassing for violators.

**Other Sensor Applications** – A long list of other sensor applications was discussed, including the ability to identify problems at railroad crossings and, with RFID tags, monitor the movement of shipping containers in Corpus Christi’s seaport to help improve national security or high-value or sensitive assets.

**Smart Dispatching** – Public safety officials, as well as utility managers, use wireless mesh networks and GPS vehicle locator applications to identify which remote units are closest and most easily dispatched to trouble calls. GIS and GPS navigation systems can remotely controlled to then show street maps, provide real time driving directions, and include satellite images. Wireless networks can then provide building floor plans, mug shots, records of hazardous materials or disabled persons, and other information, as well as allow remote data capture and reporting to keep units in the field and avoid return trips to the central office.

**Remote Surveillance** – The ability to monitor surveillance cameras in buildings, on utility poles, and in police cruisers, is allowing dispatchers to recognize trouble spots quickly and respond proactively. And consumer access to Internet-connected traffic cams from Web browsers helps them avoid congested areas and balance traffic flows. Adoption of new surveillance applications will continue to grow with the popularity of municipal networks and the availability of inexpensive CMOS image sensors and embedded processors.

**Next Bus** – Some cities are experimenting with a new application of wireless networks to encourage greater use of mass transit, such as tracking the location of each bus and displaying estimated arrival times at each bus stop. With more convenience for riders, more people will ride instead of drive.

**Public Service Announcements** – Electronic street signs connected to wireless networks are used for a variety of announcements, such as Amber Alerts, traffic and weather warnings, etc.

**Traffic Light Coordination** – The timing of traffic lights to improve traffic flow and safety is improved with connecting networks, sensors, and cameras, thus helping to justify deployment of municipal networks.

**Voice over IP** – Once citywide wireless networks are in place, the addition of VoIP capabilities helps officials control the cost of cellular services from private firms.

**Public Wi-Fi Hot Spots** – There are many reasons why municipalities may endorse, support, fund, or install and manage public hot spots. Access in courtrooms lets attorneys communicate with their offices, eliminating delays that may lengthen trials and crowd dockets. Wireless access in schools, libraries, museums, and other public buildings enhances the value of these assets and is consistent with objectives to serve the citizens.

**Public Wi-Fi Access** – Extending wireless throughout the community is interesting for many reasons, as discussed above, including bridging the digital divide and driving economic development. Making sure that everyone has high-speed Internet access can also improve the education system with greater parental involvement in school and classroom activities. Telemedicine apps can improve and lower the cost of healthcare by connecting patients in their homes with doctors, specialists, and other healthcare professionals. Distance Learning can address the need for constant retooling of skills as old jobs disappear and workers change careers.

**Public Fiber Infrastructure** – The social benefits of universal adoption of broadband are great and varied, and although we only discussed wireless, even more applications are enabled by fiber optics. With asymmetrical bandwidth in both directions, for example, every school classroom, church, Boy Scout troop, civic organization, or individual with a web cam or \$250 video camera can produce video programming and stream live video content. Fiber networks enable more and innovation, but the added deployment cost can make them more difficult to justify than the quick payback of wireless.

## **EXPECTED DIFFICULTIES**

Obstacles to deploying municipal networks extend beyond just an inconsistent, obsolete, and often confusing regulatory environment but also include:

- Politics, Awareness & Education
- Cost/Benefit Analysis, Funding & Business Models
- Best Practices Awareness
- Obsolescence and the Pace of Technology
- Complexity and Growth
- Ongoing Support
- Lack of Fiber and Availability of Bandwidth in Backhaul
- Compatibility and Interoperability of Networks (standards)
- ROW Management
- Dead Spots

**Politics, Awareness & Education** – The telecommunications regulatory environment has not kept up with changes in technology, business models, and application needs, largely because of politics and the influence of incumbent lobbyists. Key to addressing this problem is increased awareness and education among all parties – policy makers, network operators, other stakeholders, and citizens.

**Cost/Benefit Analysis, Funding & Business Models** – Municipalities know they need high-speed Internet access for continued viability and other reasons, and when they are unable to get private company competition for broadband services, they often struggle to develop the business case and funding models to justify other alternatives.

**Best Practices Awareness** – Because of the differences among community networks, no single business or management model will work for them all, so municipalities need ways to discover what has worked best for those others with similar objectives, expected benefits, applications, and challenges. [MuniWireless.com](http://MuniWireless.com), [CAZITech Consulting](http://CAZITech Consulting) and [MetroNetIQ](http://MetroNetIQ), sponsors or attendees at the roundtable, list several online resources for community networks, but awareness of the best practices remains limited.

**Obsolescence and the Pace of Technology** – Especially with wireless technologies, the pace of innovation and new product introductions makes obsolescence a concern for both private service providers and local communities that operate their own networks. Fiber optics faces less obsolescence but is more expensive to install and requires a longer payback period.

**Complexity and Growth** – Managing the complexity and scalability of networks as they grow to support more users and additional apps is a top concern requiring flexible plans with contingencies and expansion in mind.

**Ongoing Support** – Keeping up with the pace of technology and demands for growth can be difficult, requiring new equipment and updated skills.

**Lack of Fiber and Availability of Bandwidth in Backhaul** – Installing a wireless mesh is one thing; but gaining access to a broadband backhaul with enough bandwidth for the expected number of users and apps is another. This sometimes requires multiple fixed wireless hops and the regional integration of networks, sometimes across different media and protocols.

**Compatibility and Interoperability of Networks** – Networking standards help ensure compatibility among multi-vendor products and can enable interoperability across heterogeneous networks, but the standards are evolving at such a rapid pace that keeping up can be difficult.

**ROW Management** – Municipalities face increasing demand for access to public facilities, so they manage that with zoning requirements, ROW fees, and other means to avoid the number of street cuts and construction projects required to lay similar and duplicate communications infrastructure. One way to minimize such disruption is with publicly owned infrastructure in an open access model that lets any service provider connect by paying an access fee.

**Dead Spots** – Attachment of wireless equipment to public buildings and structures, often by private firms paying right-of-way fees, can serve entire communities, but irregularities in terrain, foliage, building density, and construction materials can result in places where radio signals are weak or nonexistent. Providing coverage in these dead spots, once they are discovered, can usually be done but at added expense.

## **BUSINESS MODELS**

How is broadband infrastructure funded, installed, and maintained, and should it be privately owned and operated, belong to the citizens like the roads and other infrastructure, or should it be some sort of public-private partnership? How can it best be deployed, rapidly, universally, at low cost, and with the most bandwidth? And how do you encourage open competition for the services and applications using broadband? And finally, who benefits versus who pays? Yes, the subscribers benefit, but so do the schools (parents more involved online), entrepreneurs (e-commerce), employers (telework), commuters (less traffic from teleworkers), public services (fire, police), and healthcare providers (telemedicine). In fact, the whole community benefits in many ways. That's why so many communities are considering municipal networks.

Selecting an appropriate business model, however, can be a daunting task influenced by the competitive environment, local regulations, politics, and many other factors. We discussed some of the various models, including:

- Franchise Model
- Publicly Funded and Operated
- Public-Private Partnership
- Wholesale Transport with Open Access
- Grass Roots Support with Venue Funding
- Stakeholder Funding – Anchor tenants
- Subscription Model – Fees supplement low income
- Advertising Model – Free low speed & specific sites

**Franchise Model** – A community may get broadband quickly by granting exclusive access (or non-exclusive like an oligopoly), but that prevents or limits competition. Cable Television is the best example of a franchised monopoly, where cities wanting cable gave one operator exclusive access in exchange for (1) a franchise fee, (2) commitment to serve the entire community, (3) free service to schools and hospitals, and (4) an agreement to carry PEG (public/education/government) programming. The overall result of this model has been the rising cable rates.

**Publicly Funded and Operated** – One way to fund publicly owned municipal networks is to tax revenues or sell bonds that are often backed by taxpayers, but this has been challenged by private network operators who complain that they'd then have to compete with government entities unfairly.

**Public-Private Partnership** – Similar to the franchise model is a public-private partnership where both entities share in the risk and reward. The private entity may be an independent WISP or a large network operator like AT&T. Earthlink in Philadelphia

**Wholesale Transport with Open Access**– State laws in Utah prevented municipalities from offering retail communication services and content, but there was nothing to prevent them from offering wholesale transport as long as any service provider can connect. So, the UTOPIA project was setup in an open access model that operates like an airport, where cities raise bonds to fund the airport that are paid off from gate access fees from competing airlines and rent from restraints and retail shops. The cities don't build and operate the airports but instead outsource that to contractors. The same model can work for public broadband networks.

**Grass Roots Support with Venue Funding** – The [Austin Wireless City Project](#) was one of the first initiatives by citizen activists to bring free Wi-Fi to the masses in public hotspots supported by a team of volunteers. Each venue provides its own premise equipment and a broadband connection that is usually there already for business purposes. No public funds are used, except to add similar equipment in public libraries, the state capitol building, in city hall, and to cover city parks. Broadband network operators generally support the concept as more people use the network.

**Stakeholder Funding** – Another way of funding municipal networks without public funds is with support from anchor tenants, such as restaurants in the Dallas Convention District, which wanted free Wi-Fi for convention goers that covers the downtown area and promotes local activities and businesses.

**Subscription Model** – Subscription fees from those with means can subsidize Internet access by those without. Mayor Bill White and leaders from Rice University, the Houston Public Library and nonprofit TechnologyForAll established a project to provide free or reduced-rate wireless Internet access in Houston's low-income neighborhoods. Residents with a public library card who attend an orientation class can receive these services with fees subsidized by revenue from other subscribers.

**Advertising Model** – Just as advertising funds broadcast television and radio; it can also fund free Internet access. To guard against abuse, municipalities might restrict free access by time (15 minutes free), speed (250 Kbps free), or content (sites that promote local activities or advertisers), with the option of paying for unrestricted access.

## **POLITICAL LANDSCAPE**

Because telecom reform is underway with a rewrite of the 1996 Telecom Act, we briefly discussed the political landscape, including difference between local, state and federal regulations, the need for long-term vision, and the role of various influencers.

**Local / State / Federal** – While local officials know more about their communities' objectives and need for broadband than state legislators or the feds, wireless is one technology that needs broad regulations to address technical issues such as RF interference – since radio signals can cross state borders. But these local officials object when state or federal legislation limits growth and opportunities locally.

**Long-term Vision versus Short-term Tactics** – Compared to fiber optics, decisions to deploy municipal networks based on wireless are relatively short-term due to bandwidth limits and the volatile nature of the wireless industry, but that doesn't mean these are

bad decisions. Wireless is a more tactical decision that complements fiber. In any case, regulators should not pick winning technologies, companies, or business models.

**Influencers** – With so much at stake in pending telecom reform, it's not surprising that incumbents spend so much on lawyers and lobbyists to protect their old and threatened businesses. But with the Jack Abramoff scandal, it seems that political influence may have gone too far, with large campaign contributions, expensive gifts and trips, donations to favorite charities, and the funding of Astroturf & Sock-puppet organizations that pretend to act on behalf of citizens but instead represent their telecom sponsors. This stresses the important balancing role of the FCC Consumer Advisory Committee, consumer advocacy organizations, watchdog groups, electronic tools that help the collective voice of citizens be heard, and policy makers with a mind open enough to seek and consider the views of all stakeholders equally with an objective of doing what's best for the entire country and not just its special interests. So far, this has not become a debate drawn on strict party lines, and we see signs that it won't come to that.