CHANUTE'S GIG

One Rural Kansas Community's Tradition of Innovation Led to a Gigabit and Ubiquitous Wireless Coverage

KANSAS

Chanute

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Executive Summary

Chanute is the “Hub of Southeast Kansas” and with over 9,000 residents, the largest town in Neosho County. It also has an impressive broadband network that has helped businesses create new jobs, improved public safety, and led to increased educational opportunities. Without borrowing, the City has incrementally built a telecommunications network with both wired and wireless components to serve the City and local businesses.

Back in 1984, the City’s Utility Department installed four miles of fiber optic cable to monitor and control its electric grid. The utility also handles natural gas, water, and sewer operations.

After 26 years and $2 million, the fiber network connects community anchor institutions including local government offices, a local community college, the school district, a hospital, and the public library. Thirteen local businesses depend on the network for their high capacity connectivity needs after poor experiences with, or lack of service from, existing providers.

In addition to a 10 Gbps fiber ring in Chanute, the City developed a wireless network. Wi-fi hotspots are available to the public through the City. Chanute also has a 4G WiMAX network used primarily for public safety purposes, which spans a distance of 35 miles in and around the City.

Neosho Community College is saving at least $19,200 each year due to the network and has gigabit connectivity between its facilities. The school district also decreased its costs by connecting to the publicly owned network and is now paying $3,300 per month for a gigabit network connecting all its sites and a connection of at least 12Mbps to the Internet. Chanute’s network guarantees a floor speed – in this case 12Mbps – but allows subscribers to burst to whatever additional capacity is available at any given time, the opposite of the big cable/DSL corporate model that advertises “up to” speeds that are rarely achieved.

Local businesses are strong supporters of the network. From Ash Grove Cement to Magna-Tech, business clients have remained satisfied subscribers. The network continues to encourage economic development and provides connectivity options that attract high bandwidth employers. The network generates $600,000 per year for Chanute’s Electric Utility, 5 percent of which goes to the general fund as a franchising fee each year.

In addition to monitoring critical infrastructure and serving both business clients and educational institutions, city leaders plan to deploy a comprehensive smart grid for all utilities. The City routinely includes smart grid and smart metering compatible utility connections on all new residential and commercial construction. Little by little, existing structures are also outfitted. Chanute Utilities has future plans to expand the network to every premise, enabling further smart-grid investments and a universal open access broadband network.

Introduction

In one corner of Kansas lies the "Hub of Southeast Kansas," the city of Chanute. The town sits within two hours of Kansas City, Tulsa, Wichita, Joplin and Topeka and is the largest town in Neosho County. Chanute's population is 9,100; during weekdays approximately 1,800 commuters come into the city.

Chanute began as one of many railroad towns in the Midwest and is now home to a variety of manufacturing companies, including Ash Grove Cement, Chanute Manufacturing, and Consolidated Oil Well Services. Neosho County Community College (NCCC) and the Neosho Memorial Regional Medical Center are other large employers. Estimated median income is just under $33,000, lower than the state median of $48,000. Chanute's municipal budgets in 2011 and 2012 were $42.5 million and $48.2 million respectively.[1]

AT&T provides local telephone service and the cable company is Cable One, the tenth largest cable company in the United States. Neither one has been particularly aggressive at offering fast, affordable, or reliable access in the community.

Chanute Municipal Electric Utility began providing power to the community in 1903 after several private companies failed. The first power plant was purchased with retained earnings from the Chanute Municipal Gas Utility, which began serving the public in 1899. The City also provides wastewater and drinking water services

Chanute's Power Plant #1

and handles refuse. Like many other Midwestern towns its size, Chanute has a quaint main street, prairie farmland, several schools, and an easy charm. However, this town has something most similar communities do not – an impressive next-generation municipal network.

Small Steps Start the Network

Chanute Utilities took advantage of numerous opportunities over 26 years to incrementally build a municipal fiber network connecting key community anchor institutions and local businesses. The journey began in 1984 when the electric utility installed four miles of fiber optic cable to monitor substations and the power plant in real time.

That year, the utility also connected Ash Grove Cement to the fiber network. As the largest electricity consumer in town, it could significantly impact distribution of electricity to the rest of the City with little or no warning. By constantly monitoring Ash Grove's use, the Utility Department could make adjustments when power fluctuated and keep the grid properly balanced.

For eleven years, the first few miles of fiber served only to assist the electrical functions of the utility. But in 1995, an informal group of technical experts from Neosho County Community College (NCCC), Unified School District 413, representatives from the library, and city government began meeting to discuss ways to expand Internet access throughout the

community. They recognized the early link between broadband, education, government services, and economic development. The small fiber network was not a part of the discussions at the time, but they did discuss the possibility of building a larger municipal network. These discussions did not result in new broadband investments but did set the tone for later discussions.

The group commissioned a Communications Feasibility Study to explore a community network in 2001. Residents responded favorably to the idea of a City administered, high-speed fiber optic network that could provide Internet access.

As in many other rural communities, incumbent providers had neglected to invest sufficiently in local broadband infrastructure, leaving residents and businesses with few choices. For much of the community, unreliable satellite or dial-up was the only option. In contrast to their opinions of existing telephone and cable providers, residents and businesses held a high opinion of Chanute's municipally owned utilities.

Early Network Expansion

The Feasibility Study emphasized the community's enthusiasm for a city network, but other factors prompted its next expansion. In 2001, the City upgraded its fiber infrastructure to connect a new gas turbine electric generator in a separate facility. At the time, regulatory changes following 9/11 imposed new mandates on the City. The 2001 Patriot Act and the resulting Homeland Security Act of 2002 required tightening the City's utility security policy.[2] Under the new mandates, if the Homeland Security Risk Level Assessment elevated to "red," municipalities would have to continually monitor utility facilities with personnel or video surveillance.

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Additionally, the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 amended the Safe Drinking Water Act to require monitoring of drinking water facilities.[3] Municipalities with populations similar to Chanute had until June 30, 2004, to complete a vulnerability assessment. Following their assessments, communities were required to complete an emergency response plan by December 31, 2004.

The City hired Kansas City engineering and technical services firm, Sega, Inc., to complete their assessment in 2004. Sega determined that Chanute did not have the necessary personnel to monitor all the facilities. Engineers at Sega found video surveillance of the facilities would be possible, but would require a high-speed communications system. To contain costs, Sega recommended combining a wireless network with Chanute's existing fiber network and extending the fiber as necessary.

The results of the security analysis and the 2001 Feasibility Study inspired the City to develop a business plan for the extension of the City's network. Final recommendations from the City's consultants included incrementally connecting the facility that houses city offices, known as the Memorial Building, and to link both the schools and NCCC to a community network.

Connecting the Schools

While the initial purpose of the fiber build out was security, it became clear to local leaders that additional opportunities would come with a larger network. The City's consultants did not recommend borrowing or bonding. Instead, the utility would cover the upfront capital costs to

connect anchor institutions, such as NCCC and the School District. Both entities would reimburse Chanute Utilities over time.

The capital cost of connecting NCCC would cost $37,000. Fiber and wireless connections at three elementary schools would cost $23,000 and a fiber installation at Chanute High, the Middle School and the remaining elementary school would cost $90,000.

The School District is repaying the capital cost of the new connections with a 7-10 year installment plan. The school's costs are partially subsidized by the federal E-Rate program, reducing the amount they are directly covering.

The 2004 Security Analysis and Business Plan and the 2001 Communications Feasibility Study indicated a need, a solution, and community support for a network. The City Commission adopted the recommendation unanimously. The Chanute Municipal Electric Utility immediately began connecting the schools and NCCC to the network.

The search for an optimal location for siting an antenna for the wireless network led the utility straight to Ash Grove Cement. The Ash Grove facility is the tallest structure in Neosho County at 406 feet and private carriers had repeatedly sought to rent space on the top of the tower, only to have the company turn them away year after year. But in an example of public-private collaboration, Ash Grove decided to allow the City's wireless broadband equipment on its tower. This agreement allowed Chanute to pursue the wireless component of the original business plan. As part of the agreement, use was limited to public institutions and public purposes; there would be no charge to the city for the space. In 2005, the City installed the wireless network point-to-point equipment needed to connect the remaining schools to the municipal network. The City also installed the same type of wireless network equipment on the town's south water tower. This was the start of what would become Chanute's extensive wireless network.

Chanute, NCCC, and the School District hoped to become an aggregation point for the Kan-ed

Connecting With Kan-ed

The Kan-ed program was a statewide consortium of schools, higher education institutions, libraries, and hospitals that connected to each other through the Kan-ed network. Kan-ed 2.0 followed after the original program sunset. The Kansas Universal Service Fund provided $10 million in annual grants for a broad range of technology-focused initiatives administered by Kan-ed and Kan-ed 2.0. The Kan-ed program ended in July, 2012.

> "Kan-ed provides an authenticated, single-sign on portal that provides students, teachers, and library patrons a place to store documents (electronic backpack), access databases, develop practice tests to meet the State standards established by KSDE (Kansas State Department of Education), online tutoring … and more. In partnership with the State Library of Kansas, Kan-ed also provides educational and research databases that every citizen in the State of Kansas can access. Other services include EMResource, a web-based program that provides real-time information on hospital emergency department status, hospital patient capacity, the availability of staffed beds, and available specialized treatment capabilities for hospitals across Kansas, and an E-Rate consultant service that ensures that Kan-ed and its members are able to maximize the acquisition of federal E-Rate funds in Kansas. Kan-ed also provides scheduled videoconferencing, worldwide access through a video bridge, and provides grant funding and support to our CONNECTED members for video equipment and services." - Kan-ed 2.0 website "FAQs"

program (see box) to obtain grant funding they could apply to their network expansion. The City linked Kan-ed and AT&T via the Chanute network. AT&T paid to install interconnecting fiber and Kan-ed provided equipment to establish Chanute as a Kan-ed aggregation point. Local Kan-ed members would be able to link to each other and to the main Kan-ed network.[4] Midwest Connections, a Kansas wireless ISP, began taking Kan-ed service via the Chanute connection and backhauled this service to other schools and libraries in the area outside of Chanute.

After AT&T paid for the Kan-ed fiber installation in 2005, a partnership between the City and the telco seemed promising. Rather than continue partnering with Chanute however, AT&T ended negotiations for future joint investments. City officials later described AT&T's announcement to move on in its application to the Google Fiber initiative, writing "AT&T announces to the City of Chanute that it will pursue development of its own project, Lite Speed, to other, more financially lucrative markets." The City of Chanute pressed on, determined to expand the network with or without a business partner.

Additional Connections Complete the Ring

Kustom Signals, a local designer and manufacturer of public safety equipment became the first business customer to connect to Chanute's network in 2005. Kustom designs and manufactures public safety devices, including radar, lidar, and speed calming devices. The company had been using a wireless provider but had experienced brief disruptions in network service, followed by an unacceptable loss of service over a five-day period. The company IT Director contacted the City, pleading to be connected to Chanute's municipal network. Within 24 hours, Kustom Signal was the first commercial customer on the fiber network and still remains a loyal subscriber.

While public safety inspired the beginning of the network, the police and fire departments had not yet been connected. Even though Chanute is the largest town in Neosho County, it was not connected to the county public safety dispatch center until 2005. A $40,000 federal grant funded a wireless broadband link to the Neosho County Central Dispatch and 911 Call Center in Erie, 19 miles away. The City used part of the grant to purchase network equipment for a future Emergency Operations Center (EOC) in Chanute, which became a backup facility to the County Central Dispatch Center.

In 2005, the cloud infrastructure and managed services company, Savvis, also connected to the Chanute network. The connection to Savvis provided a second Internet source so Chanute could be dual-homed, which allowed the city to apply for a set of IPV4 and 6 addresses.[5] This move allowed the City to offer a more secure network to potential business clients.

Chanute continued to add community anchor institutions in 2006 with the Neosho Regional Medical Center.[6] But the downtown fiber ring was only completed when all local state government offices connected to the network. Twenty-two years after the first fiber installation, Chanute's downtown finally had a fiber ring.

The City returned to the fiber-to-the-home idea in 2006, hiring Uptown Services to complete a feasibility study on the prospect of a fiber-to-the-home installation. The market survey again indicated strong support for expanding the municipal network to homes but again the City chose to pursue low-cost, incremental growth and connecting local businesses.

A major commercial customer joined the network in 2006: Community National Bank. The bank needed a secure way to connect all its branches, spread out over 18 communities. Chanute used its fiber and wireless systems to provide local connections where it could and used its expertise to manage the rest of the network, composed primarily of leased lines. On that

Rings and Reliability

A complete fiber ring allows data to circle in the ring until it is picked up by the computer to which it is originally directed. A single ring is less reliable than a network with overlapping rings because if the ring is compromised, other computers on the network are cut off, similar to an older style strand of holiday lights. When another overlapping ring is added, the network becomes redundant. In other words, if one of the rings is compromised, data is redirected to the other ring and will continue to travel to its destination.

private network, employees began using VoIP and video conferencing to be more productive by reducing the need to travel. Since 2006, branches in 8 more communities added to the network, now spanning over one third of the state.

Chanute Utilities also extended the fiber network to include an industrial park and the future home of a new elementary school. By the end of 2006, the fiber network stretched 13 miles throughout the city. Chanute established wireless network access points at parks and green spaces, which provided Internet access to the public. Police, fire, and municipal utility departments also began using the network for mobile data access. By 2010, every park in the City and much of downtown began offering free Wi-fi.

When Kan-ed required increased capacity in 2007, the City used the new revenue to extend the network. This allowed Chanute to close its first redundant ring.

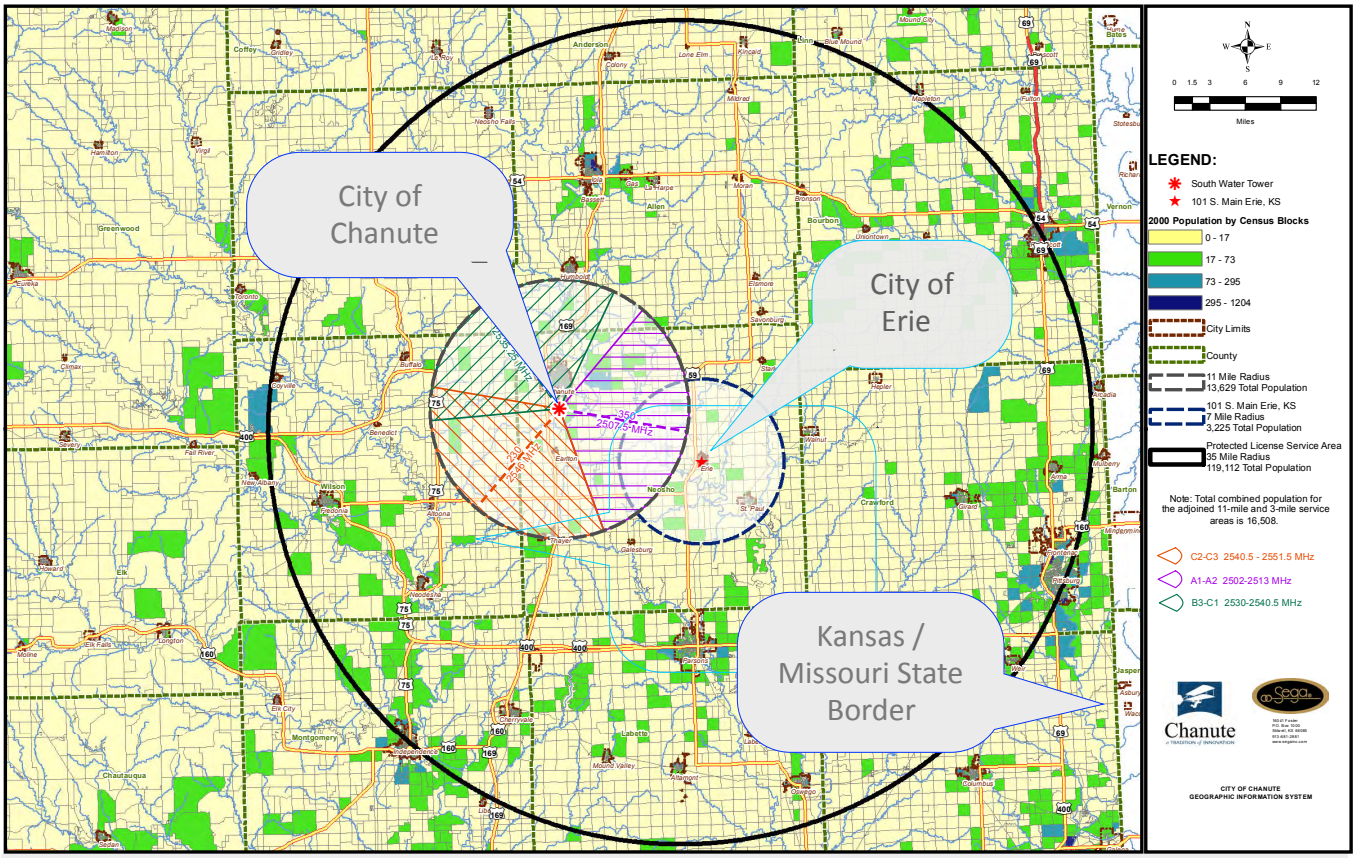
The City struck a unique partnership with the Fire Escape Coffee House in 2008. Fire Escape is a non-profit providing social and volunteer opportunities for high school and college students. It also runs an onsite radio station, over which it began providing local public service announcements in exchange for Internet service.

In anticipation of an eventual FTTH deployment, the City Utilities Department laid conduit for fiber during construction of the new Osa Martin Heights Housing Subdivision in 2009. The utility is not yet rolling out a FTTH network but it seems increasingly likely. Installing conduit before roads are built and sidewalks formed is much more cost effective than after the fact.

The Modern Network

In 2010, the City began leasing 2.5 MHz of spectrum from four local educational institutions for a wireless network that stretches outside city limits. This spectrum was available because the FCC previously issued spectrum licenses to educational institutions around the nation. Several area schools leased out the rights to private ISPs, but they did not take advantage of it. In 2010, the FCC planned to recapture licenses where the spectrum was going unused. Around that time, Chanute began to plan its future 4G WiMax system. The system now covers 35 miles in and around Chanute and provides a maximum transfer rate of 25 Gbps, more than enough capacity for the 100 Mbps radios that use the network.

The City is developing an advanced metering network that uses the fiber infrastructure. Electric, natural gas, drinking water and wastewater facilities are already connected to the fiber network, allowing video surveillance for security. The utility plans to use smart grid technology to monitor usage and billing for each service, allowing the utility to immediately see exact locations of power outages and maintenance problems. Precise diagnosis provides the opportunity to reroute power over the network, limit the expanse of the outage, and fix maintenance issues before they become widespread problems. Every Chanute resident and business will eventually have a smart meter.
In 2010, Chanute ran an intense public relations campaign with their “We Are Ready” drive, competing in Google’s search for a community in which to deploy a FTTH gigabit network. Though Kansas City came out the winner, Chanute



Chanute's WiMax protected license coverage area spans a 35 mile radius, to the border of Missouri. Over 119,000 residents live within the area.

ranked at the top for community support. The same year saw Chanute's fiber network establish a 1 Gbps fiber interface to the Level 3 network and the City began purchasing Internet access services from Reallinx.

Since 2011, the City has distributed its core network routers and now operates a 10 Gigabit Metro Ethernet Loop between core facilities. Chanute's fiber now connects to a Cox Communications fiber route east of the City, establishing a redundant connection to complement the Level 3 circuit.

Larry Gates, Chanute's Director of Utilities, and J.D. Lester, City Manager, are proud that the municipal broadband network created zero debt for the City. Using only retained income from electric utility receipts, a few small grants, and an incremental "pay as you go" expansion, the City limited its risk. Gates estimates the entire cost of the network thus far to be about $2 million. Without its own network, Chanute would have been situated like many other local communities all over the United States - paying a private provider higher prices than the cost to develop its own, superior network.[7] In this case, the resulting asset is approximately 30 miles of fiber optic cable and a wireless network that extends well beyond the City limits.

Benefits to the community include increased public safety, more economic development, enhanced quality of life, and educational opportunities for youth and college students. Some of the cost savings are detailed below but are composed primarily of lower telecom budgets from the schools, community college, public safety, and municipal facilities.

Networked Education

In 2004, when Chanute began implementing the community network business plan, the School District enthusiastically embraced the possibilities. The schools' connections had been relatively slow and unreliable, point-to-point T1 lines providing 1.5 Mbps each building. The School District now pays $3,300 a month for 12 Mbps of Internet connectivity on its gigabit wide area network (WAN) connecting six separate locations in Chanute.

The cost is broken down into two charges. Each of the six locations pay a $250 connectivity fee, making up nearly half of the $3,300 monthly bill. This $1,500 allows the schools to transfer data between themselves at 1 Gbps, an incredible deal when compared to what most schools have to pay. Having an affordable gigabit connection between the schools allows the school district's IT Department to save maintenance and labor by sharing one large server rather than operating several smaller ones.

The balance of the fee provides a minimum of 12 Mbps Internet access to the schools, though the network often allows them to burst at higher speeds. So while the schools can transfer files between themselves at a gigabit, they access the Internet at a minimum of 12 Mbps – all for $3,300/month.

The school district also qualifies for an E-Rate subsidy, reducing the amount coming from local taxpayers from $3,300 per month to $990 for the six facilities. The final cost is $13.75 per Mbps per month for each location.

There is another advantage from Chanute's network – rather than limiting the connections to a maximum of the contracted capacity, Chanute allows the school district and NCCC to use whatever spare capacity is available in the network at any given time. In other words, the network guarantees a minimum of 12 Mbps when connecting to external networks but the connection is regularly faster. This approach flips the standard model, which generally promises an "up to" connection speed that may not be achieved in practice. Mikel Kline from Sega, Inc. says, "While private providers offer a ceiling when describing their capability, Chanute offers a floor."

> "During my forty years as an educator I witnessed technology grow from something new and scary, to something which only the rich districts could afford and where it was considered an 'extra,' to something which all districts strived to include in their programs, to an essential part of what is learned and how we teach. Today we even do the state assessment tests online which requires a tremendous amount of bandwidth. The fiber optic network has been a major factor in being able to keep ahead of the technology demands relating to Pre-K through Grade 12 education in Chanute." – Steve Parsons, Retired Superintendent of USD413.

Steve Parsons retired from his position as Superintendent of the school district in July 2011. As an educator, Parson saw firsthand how technology and the ability to use it became basic curriculum. Educational online games are part of daily kindergarten school work. As children move into higher grades, they use the Internet for research in class and for homework. Assignments, syllabi, and standardized testing are online. With these classroom advances come increasing bandwidth demands. In fact, a 2012 report from the State Educational Technology Directors Association recommends 1 Gbps connections between school district facilities by 2014-15 and 10 Gbps by 2017-18.[8]

Parsons also recalls that the School District, NCCC, and the City grappled with the costs of building the network and were able to make the

project work by collaborating. For instance, the City provided common space in its retired power plant no. 1 to NCCC and the School District. The hardened facility made an ideal colocation for both institutions' servers. At the "server farm," the School District and College shared network administrators and staff, as well as email servers and other hardware. All three partners purchased shared appliances, took advantage of backup servers, and shared the investment in network electronics. Estimates on savings to the taxpayers from reductions in personnel, equipment, and the cost of space were $100,000 combined. [9]

Students at NCCC are connected in every classroom on campus.

Chanute's fiber network connects twelve buildings on the NCCC main campus, including two residence halls. Like the School District, NCCC has a 1 Gbps WAN network, allowing the residence halls to connect to other buildings on campus at 1 Gbps. NCCC pays the City $5,400 per month for a minimum connection of 45 Mbps to the Internet. Brian Inbody, President of NCCC, found that AT&T's rate for a similar service is $7,000 per month, and calculates the savings due to the network at $19,200 per year.[10] The college also knows the network will be able to handle its ever-increasing bandwidth needs as the college grows.

Benefits of Colocation

Colocation allows a customer to place its servers in the service provider's facilities. Often, these facilities are designed with redundant power feeds, data feeds, and a detailed plan to remain operating in the face of the worst disasters.

The network has allowed the college to offer more courses and increase its distance learning program, which is essential for many in the rural areas around Chanute. NCCC could not offer broadband to students in residence halls before the community network. Now, ubiquitous broadband access, virtual classrooms, video conferencing, and online classroom materials are the norm at NCCC.

Supporting Local Businesses

Prior to becoming the first commercial customer on Chanute's network, local business Kustom Signals had purchased wireless service from a private provider because they had no other option. Though they experienced periodic outages from time to time, a five-day loss of service in 2005 was unacceptable. Mike Kline, from Sega, recalls following up via email with Kustom after the switch, asking how things were going on the new fiber network. The response from the IT Director was immediate: "Weeeeeeeeeeeee!"[11]

Chanute Manufacturing, Post Rock Energy, Tri-Valley Developmental Services, MagnaTech and Consolidated Oil Well Services are among the fourteen local businesses that use the network and are some of the largest employers in town. They say the reliability and capacity of Chanute's network create efficiency and make them more credible to their clients. The network continues to attract new businesses to Chanute and retain companies that increasingly rely on broadband.

David Orr, owner of MagnaTech, was born and raised in Chanute. He credits the network for keeping him in his hometown, running a company that designs and manufactures equipment for installing conduit and cable, tow trucks, RV accessories, and related heavy duty machinery. He sends and receives large blueprints and CAD documents with clients on a daily basis. These documents used to be

physically shipped via mail or courier. Now, clients expect immediate digital transfer of large documents, video conferencing, and other high bandwidth applications.

Magna Tech employs 10 people in Chanute and another 38 at the original plant in Victor, Iowa. Orr moved back to Chanute in 1996 after purchasing a bankrupt firm in Chanute to expand his business. He was excited to move back to Chanute but was quickly disappointed by the lack of connectivity options at the new facility. His needs had been met in Victor by the Cooperative Telephone Company but the best he could do in Chanute was an unreliable wireless connection. Hoping for a better experience, Orr signed on to HughesNet Satellite Internet service, but the data transfer caps were too low for his business. Regularly, Magna Tech would surpass its HughesNet cap and be cut off in the middle of uploading large data documents to clients. Clients would become frustrated, which meant Orr had to find a better solution.

Orr contacted AT&T, but the telco refused to expand DSL to the industrial park. He received a similar answer to his request for CableOne to bring broadband to the location. Three months later, CableOne offered to connect his facility for $3,900 if Orr paid all labor costs. Service, still with data caps, would have cost $125.00 per month - more than he could afford. Magna Tech continued to muddle through with HughesNet until 2010.

"It was like living in a nice new home with no sewer," he says. He had contemplated leaving to find a location with modern connections but remained in town until the City began to experiment with WiMax in 2010. He quickly signed up as a beta customer, calling it a lifesaver and crediting it with keeping his business in town. Now he has access to faster, more reliable transfer for large amounts of data. He recounts instances when the network "made him a hero" because he responded to clients so quickly.[12] Gone are the days of fear and frustration from inadequate connectivity.

In April of 2012, Spirit AeroSystems, the largest designer and manufacturer of aero structures for commercial aircraft, opened a new manufacturing facility in Chanute and will eventually employ 150 people. Since Spirit is a global company with facilities all over the world, reliable broadband is a must. When Spirit was evaluating Chanute for its investment, the network allowed Chanute to ensure it could meet any of Spirit's possible telecommunications needs. Chanute could offer a local fiber loop to make sure the new facility was directly connected to the Wichita headquarters.

Lester recalls the discussions with Spirit about Chanute's network capacity. Spirit's IT Director was accustomed to the usual process of negotiating with private providers to increase network capacity. Each time Spirit upped the requirements in discussions with Chanute Utilities, however, Lester replied with a quick, "Yep." Lester

Satellite Ain't Broadband

While satellite Internet service is often cited as a viable alternative for rural areas, it is used as a last resort. In fact, we have not found anyone who uses satellite when they have a reliable DSL or cable option. Because the signal has to travel from a computer to the satellite and back down to earth, satellite connections suffer from "lag," or a very slow response time. VoIP, video chatting, multiplayer gaming, and other modern applications are all but impossible over satellite connections. Further, customers are often given a ration of data they are allowed to send or receive during each month, referred to as a "cap." When a customer meets that limit, service is cut off. Given that most Internet users have no idea how much data they send or receive, monitoring or controlling that amount is difficult. See Satellite Internet Connection for Rural Broadband: Is it a viable alternative to wired and wireless connectivity for America's rural communities? by Steven Cobb, 2011.

described Spirit's IT Director as being more amazed with each upping of the ante.

Unlike private providers, negotiations with the City start at what a local business needs, not what the provider is willing to supply. Gates distinguishes the City network as an "all-you-can-eat" service and they have yet to be challenged by a customer's data needs. The network is simply there to serve the community, just like the roads and bridges.

City Manager J.D. Lester refers to municipal broadband as "the great equalizer for Rural America," saying: "You don't have to live in Kansas City to work there."

Quality of Life and Unanticipated Benefits

Chanute's network has provided benefits beyond school savings and economic development. The network provides free connections to the local library system. In addition to patrons' access to high speed broadband at the library, the administration now takes advantage of the network with a VoIP system.

The network also generates $600,000 in revenue annually for the City's Electric Utility. All utilities in Chanute pay a 5% franchise fee based on gross receipts to the general fund. The result is an additional $30,000 each year into the general fund, reducing pressure on other taxpayers. Operation and maintenance costs are funded from the network revenue. Future network additions and expansions, as with those in the past, will be funded with net earnings from previous years. The municipal network is a division of the electrical utility presently, but Lester and Gates expect it to eventually become a separate utility just like water, gas, or electricity.

As the network expands, Gates plans to open the network to independent service providers. He emphatically advocates the municipal open access model, where Chanute will build the infrastructure and allow independent service providers to operate on the network. This approach will allow anyone to choose among multiple providers, creating a true market for next-generation services.

The open access approach has struggled in communities that borrowed vast sums to build a citywide network because sharing revenues with the third party providers has resulted in insufficient funds for debt repayment. But communities that are expanding incrementally, as in Virginia's Danville, are seeing more success. Chanute's plan is to balance the cost of connecting homes with efficiency savings from electric, gas, and water smart meters as well as a slice of revenues from telecommunications services.

Gates describes Chanute's publicly-owned infrastructure investment as "the future of the Internet in the United States." This model allows a single network to support many competing service providers. However, it has been difficult for other communities to finance it solely with revenues from the network. Chanute's incremental approach may solve that problem.

Conclusion

Chanute's local leaders have long appreciated the importance of ensuring community anchor institutions, residents, and local businesses were connected to a modern telecommunications network. They took full advantage of opportunities to expand the network to benefit schools, the community college, and local businesses.

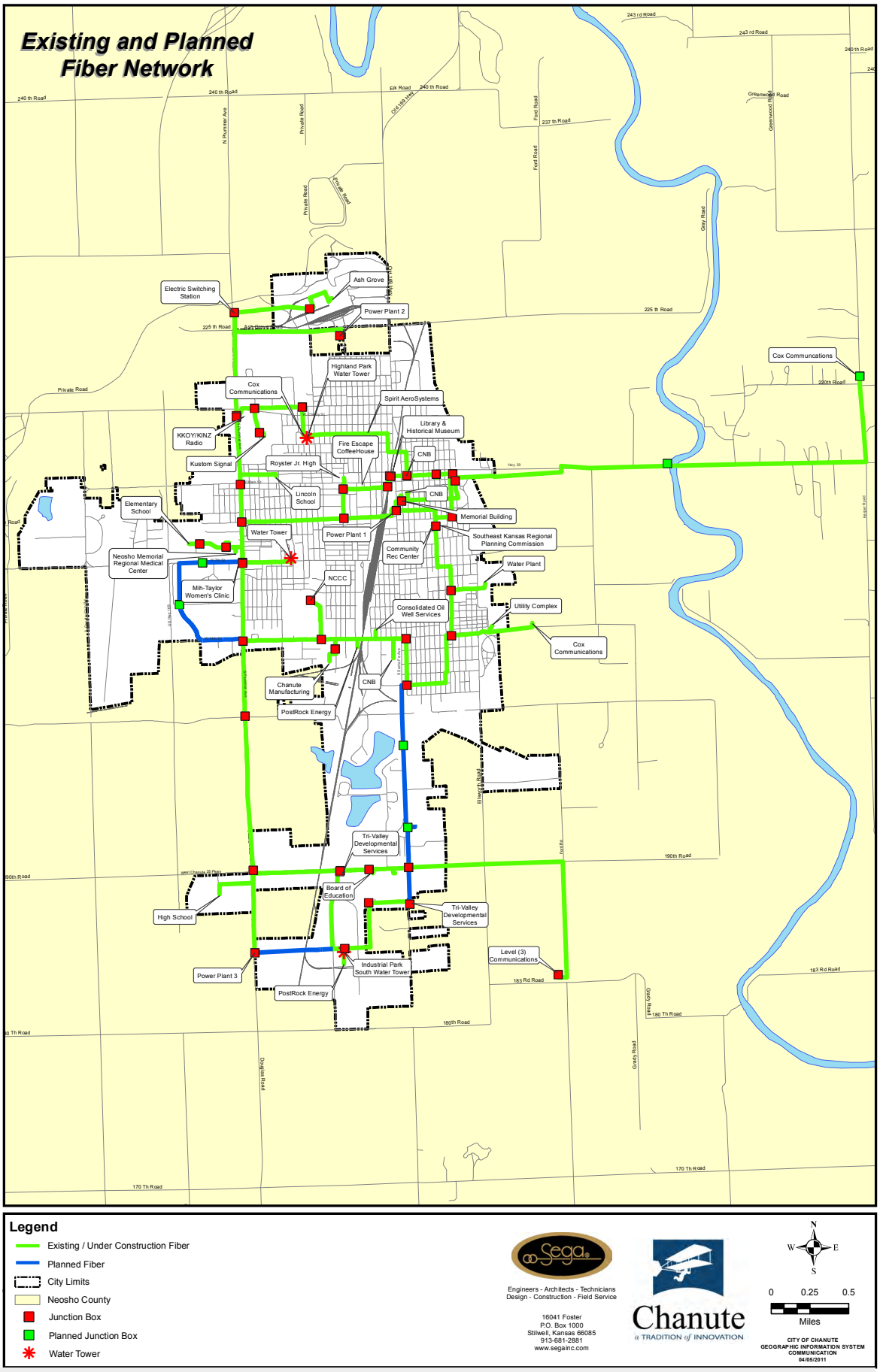
City Manager J.D. Lester calls municipal broadband "the great equalizer for Rural America," saying: "You don't have to live in Kansas City to work there."[13]

The cost of the network has been approximately $2 million thus far. Though many pieces of it were required per Homeland Security regulations or to implement SCADA systems for the electric utility, the network has created a lot of value for the community. The schools have a gigabit WAN for the modest fee of $250 per site. The community college also has a gigabit WAN for its twelve buildings and is saving almost $20,000 each year in Internet connectivity compared to AT&T's rate. The schools, City, and NCCC pooled resources to colocate their servers, saving an estimated $100,000. And as the network continues to expand, it will create even more local benefits.

From the beginning, Chanute had the advantage of its own Utilities Department. The 1984 fiber installation started the physical infrastructure build out and administrative expertise within the agency keeps the expansion moving. Knowledge of current technologies and best practices overlap between broadband, electricity, and similar critical public services. Perhaps more importantly, the Utility has the trust of the community on matters of building and operating essential infrastructure.

When considering a community-owned network, some communities have become mired in a "public vs. private" debate over whether it is appropriate for local governments to provide telecommunications services. But in Chanute, public investments in its network have tremendously benefited private companies, showing that the "public vs. private" debate misses a key point. When a community is stuck with slow, unreliable, or high priced service from one or two monopolistic firms, both public and private suffer. When everyone has access to fast, affordable, and reliable broadband, the whole community thrives.

For 26 years, community leaders patiently took advantage of opportunities to finance the expansion. Chanute shows that a proactive plan and vision can result in a community broadband network that spurs economic development and community cost savings.



Chanute's existing and planned fiber network, 2012.

References

[1] The City refinanced bonds during the 2012 fiscal year. The increase reflects the original bond satisfaction.

[2] http://www.dhs.gov/xabout/laws/gc_1214597989952.shtm

[3] http://www.fda.gov/regulatoryinformation/legislation/ucm148797.htm

[4] While Chanute was an aggregation point in 2005, the town later became an Authorized Provider. The Kan-ed Network partners with local providers to create a statewide network connecting schools, libraries, hospitals, and higher-ed institutions. Each Authorized Provider must meet minimum equipment standards and be able to provide at least 1.5 Mbps connections to each member of the network. The applicant provider must also prove tax clearance from the state of Kansas, provide references in the three different institutional sectors, and adhere to stringent guidelines and peer review. In 2011, the State Legislature voted to end Kan-ed and turn to private sector providers and KanREN, the university network, to provide Internet access to Kan-ed member entities.

[5] "A dual-homed host (or dual-homed gateway) is a system fitted with two network interfaces (NICs) that sits between an untrusted network (like the Internet) and trusted network (such as a corporate network) to provide secure access." http://en.wikipedia.org/wiki/Dual-homed

[6] Community anchor institutions (CAI) are defined by the NTIA as: "Schools, libraries, medical and healthcare providers, community colleges and other institutions of higher education, and other community support organizations and entities to facilitate greater use of broadband service by or through those organizations." http://broadband.uwex.edu/resources/anchor-institutions/

[7] For example, Martin County, Florida built their own network when faced with the prospect of Comcast raising its prices over 800% for a simple dark fiber lease. Managed services, which would have been the eventual arrangement, are even more expensive. See http://www.ilsr.org/florida-fiber-gigabit/

[8] See The Broadband Imperative, available at http://www.setda.org/web/guest/broadbandimperative

[9] See Chanute Tribune, "Senator Umbarger visits to discuss ICAN with Chanute officials," Shanna Foster-Guiot, January 17, 2006, available at http://chanute.org/Business/Utilities/PDF/TribuneJan2006.pdf

[10] Email from Brian Inbody, June 1, 2012.

[11] Phone conversation with Mikel Kline, April 20, 2012.

[12] Phone call with David Orr May 21, 2012.

[13] Phone call with Larry Gates and JD Lester, May 10, 2012.

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