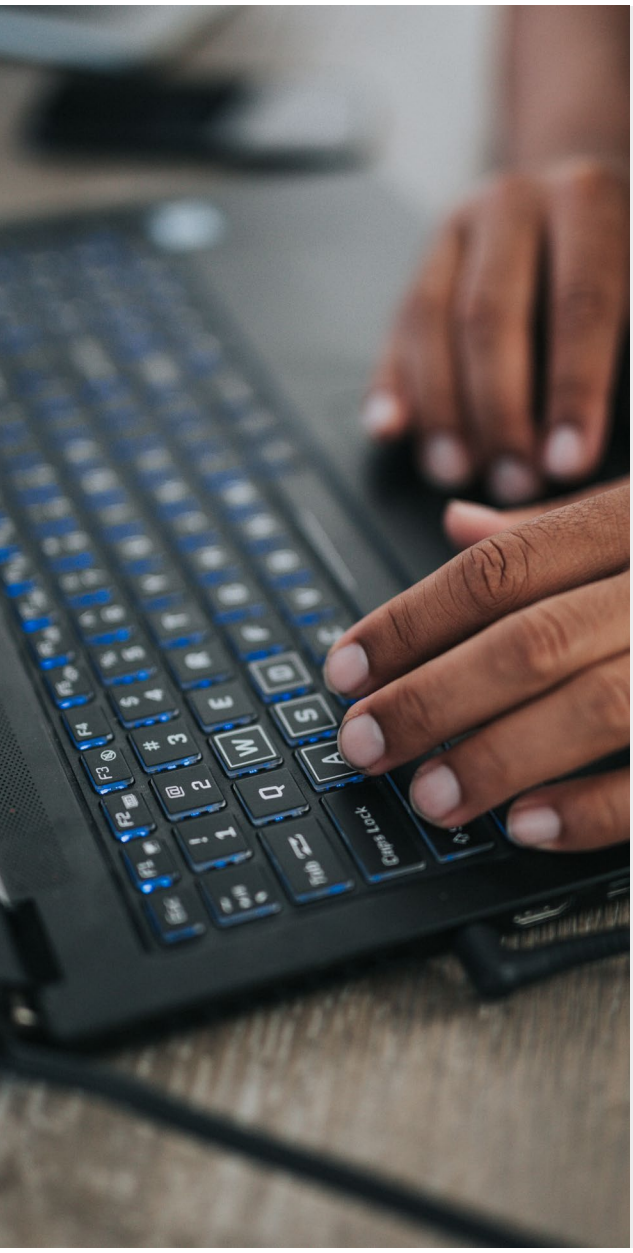
2020
Cable Companies and Municipalities

NATURAL SMART COMMUNITY PARTNERS

TABLE OF CONTENTS



3 Executive Summary

4 Key Takeaways

5 Introduction

7 SECTION ONE
"Smart Community" Overview

11 SECTION TWO
What Cable Providers Bring to Smart Community Partnerships & Projects

14 SECTION THREE
The Expanding Ecosystem of the Smart Community Sector

21 Conclusion & Recommendations

Cover Photo by Alina Grubnyak on Unsplash

Laptop Photo by Nathan Dumlao on Unsplash

EXECUTIVE SUMMARY

In recent years, a growing ecosystem of organizations are acting as the catalysts for Smart Community projects. The Smart Community market has expanded beyond local governments to include:

Hospitals

Universities

Utilities

Real Estate Developers

Like municipalities, these new actors in the Smart Community marketplace require solutions that can meet their evolving needs and value partners that can work collaboratively to deploy, leverage and support networks of connected devices.

Research conducted by Connected Communities LLC supports a conclusion that cable companies are uniquely well-positioned to help a growing ecosystem of Smart Community partners advance their objectives. Cable companies possess both dense network infrastructure across large service areas and valuable experience deploying and managing wired and wireless networks designed to solve complex connectivity challenges.

Smart Community projects involving cable companies, municipalities and other Smart Community partners are on-going in urban, suburban and rural areas across the county. From the lessons learned drawn from these projects, the following recommendations emerge for cable companies and the growing ecosystem of Smart Community partners:

Recommendations for Organizations Pursuing Smart Community Projects:

— Do not lose sight of the fact that effective Smart Community projects require robust, reliable and secure connectivity.

— Consider carefully whether long range, low power wireless solutions (LoRAWan) can enable and support today the end-to-end smart applications promised by the forthcoming deployment of 5G networks.

— Since Smart Community projects are collaborative and can evolve over time, it is wise to recognize that the strongest projects benefit from project participants that possess a vested interest in the project's success.

Recommendations for Cable Companies:

— When designing a project with partner, keep in mind that a demonstrable and rapid return-on-investment (ROI) is a critical success factor for Smart Community projects.

— Recognize that Smart Community projects, particularly those including a municipal partner, are most effective if they directly address pain points and require minimal upfront hardware investment.

— Continue to invest in expanding your networks in recognition of the fact that small towns and cities, like their larger counterparts, benefit greatly from investments in high capacity, high speed networks.

KEY TAKEAWAYS

1 Cable networks have the capability to support Smart Community applications both now and in the future.

There is no need for communities to wait for "5G" or other wireless networks to be deployed before pursuing Smart & Connected Community initiatives. Cable providers possess wired and wireless facilities to deliver Smart Community solutions and decades of experience deploying and supporting network-enabled applications and services. DOCSIS 3.1 and the additional fiber that cable companies are deploying in order to expand capacity means that **cable networks have the capability to support Smart Community applications both now and in the future.** In addition, wireless solutions, including low power, long range solutions (e.g., LoRaWAN) supported by Spectrum, Comcast's machineQ and Cox Communications' Cox2M, offer organizations and municipalities access to wireless IoT platforms that make possible rapid deployment of cost-effective projects.

2 A rapid expansion of the number of homes where gigabit service is available means that the smart home will be an increasingly viable platform capable of advancing Smart & Connected Community objectives.

The percentage of **households where cable providers offer gigabit service has increased to 80%** as of December 2019 and some operators are far beyond that threshold (for example, Cox Communications reports that 99% of households in its service area have access to gigabit service). As consumers continue to take advantage of increased connectivity being offered, they create a large base of end-users with access to a platform through which end-to-end services and innovative applications will be provided. The success of applications, including the remote delivery of social services, support of residents choosing to 'age at home' and distance education initiatives, depends on reaching a critical mass of end-users who have access to a *smart home* where data collection and dissemination occurs seamlessly. For this reason, current efforts by cable providers to expand the availability of gigabit services will be an important driver of the Smart Community efforts and will be incorporated into effective Smart and Connected Community planning. The cable industry's progress toward the delivery of **10 gigabit per second service ("10G")** is evidence that cable providers are committed to providing the most advanced networks.

3 The catalysts for Smart Community projects have expanded to include hospitals, universities, utilities, real estate companies in addition to local governments. This has created a new Smart Community market for cable providers who will serve this new market segment most effectively by working across existing business lines.

Rather than approach partners with a one-size fits all approach to Smart Community deployments, **cable providers are working with organizations to co-create approaches that best achieve common goals.** The partnerships and projects outlined in this paper reflect an approach to working collaboratively. The most effective Smart and Connected Community partnerships between communities and cable providers **build upon decades of experience working together** and a shared commitment to the success of the communities they serve.

INTRODUCTION

Between 2017 and 2020, the market for "Smart Community" solutions continued to grow at a rapid pace.[1] According to the research firm IDC, municipalities across the globe will spend a projected $124 Billion in 2020 on Smart and Connected Community projects.[2] IDC's forecast represents a 19% increase over 2019 spending levels. Evidence from several sources, including IDC (which examined 207 cities to create its 2020 Smart Community Spending Guide), shows that communities are investing in smart technology to improve services for residents.[3]

$124 BILLION **is projected to be spent by municipalities in 2020 on Smart and Connected Community projects.[2]**

Municipal leaders are making these investments because of the impact of technology-centered projects on the livability, security and inclusivity of the communities they serve. A 2018 study from McKinsey illustrates that Smart Community applications, especially when delivered over dependable technology infrastructure, can make our built environment more energy efficient, reduce commute times and improve emergency response times. In so doing, Smart Community initiatives advance some important quality of life measures.[4]

While Smart and Connected Community initiatives present opportunities for municipalities, the initiatives also present challenges. Many Smart and Connected Community projects are technical in nature, involve multiple municipal departments and touch the lives of many different community stakeholders. Traditional workflows within a municipality may not be well-suited to advance projects that present new approaches to long-standing issues.

Deploying new technologies and applications can also involve risk. Municipal leaders seek to be innovative while at the same time being good stewards of taxpayer funds. The most innovative projects—those with the greatest potential to transform a community—may require pilot deployments to validate the project's return-on-investment (ROI). Due to these and other related challenges, the municipal leaders that are most successful in achieving their communities' smart and connected objectives do so by leveraging effective partnerships. Partners help municipalities explore and examine innovative technologies and applications, develop approaches that balance risk

Municipal leaders who are most successful in achieving their communities' smart and connected objectives do so by leveraging effective partnerships.

1 In 2018, I authored a white paper with title "Cable Companies and Municipalities—Natural Smart Community Partners." The white paper documents several under appreciated affinities between municipalities and cable companies and makes the case that cable providers are uniquely well-suited to act as effective partners to municipalities pursuing Smart and Connected Community initiatives. At the invitation of the NCTA, I have revisited the 2018 white paper, its findings and its recommendations. In this white paper, I present an updated picture of Smart Community partnerships.

2 See https://business.financialpost.com/pmn/press-releases-pmn/business-wire-news-releases-pmn/new-idc-spending-guide-forecasts-124-billion-will-be-spent-on-smart-cities-initiatives-in-2020

3 See https://www.techrepublic.com/article/66-of-us-cities-are-investing-in-smart-city-technology/

4 See https://www.mckinsey.com/~/media/mckinsey/industries/capital%20projects%20and%20infrastructure/our%20insights/smart%20cities%20digital%20solutions%20for%20a%20more%20livable%20future/mgi-smart-cities-full-report.ashx

and reward and deliver positive impacts for community residents. Through effective partnerships, local governments can work across City Hall silos and develop projects that more fully realize the value of Smart Community investment by bundling applications and services designed to advance the goals of several different municipal departments.

Cable companies have an interest in the Smart and Connected Community sector and are well-suited for Smart Community partnerships with municipalities. For initial deployments and pilot projects, cable companies can use existing wired and wireless networks to actualize evaluative pilot projects rapidly. To facilitate large-scale deployments of connected IoT devices, cable companies have critical facilities including dense networks of fiber and coax, Wi-Fi networks (inside and outside of a consumer's home or business) and customer support resources. The connectivity that cable companies provide to Smart Community partners can enable applications including traffic management, environmental monitoring and sanitation management and remote monitoring and management of municipal or campus-wide assets. Finally, cable companies have a long-standing commitment to the success and livability of the communities they serve.

UNIQUE CONTRIBUTIONS OF CABLE COMPANIES TO SMART COMMUNITY PARTNERSHIPS

1

Existing wired & wireless networks to rapidly deploy and evaluate pilot projects.

2

Expansive wired and Wi-Fi networks for large-scale deployment of IoT connected devices.

3

Connectivity and scale to enable large applications like:

- Traffic management
- Environmental monitoring
- Sanitation management
- Remote monitoring and management of assets

4

Deep roots, partnerships and a proven commitment to the communities they serve.

As the title of this White Paper suggests, cable companies have capabilities and resources that position them as natural Smart Community partners to municipalities. This paper explores the roles that cable companies can, do and will play as partners to municipalities pursuing Smart and Connected Community initiatives.

Drawing-on the author's experience working with municipal leaders on Smart Community projects, the paper initially identifies the common elements in Smart and Connected Community deployments and the growing ecosystem of organizations working to use smart technologies to advance the livability, sustainability and equity of our communities. The paper's second section examines a geographically diverse array of Smart Community partnerships involving cable providers. The final section outlines a series of recommendations for cable companies and local governments to build-upon their partnerships.

"SMART COMMUNITY" OVERVIEW

'Smarter planet,' 'cyber-physical systems,' the 'industrial internet' are just a few of the buzzwords in the so-called "Smart City" space.[5] The explosion of "smart" everything, can make challenging the development of a serviceable and understandable definition of "Smart City." Behind the buzzwords, however, there is something very real occurring. Namely, a convergence of 1) **ubiquitous communications networks**, 2) **wide-spread availability of low cost sensors** and 3) **increased utilization of analytics software.** This convergence has technologists and municipal leaders alike confident that innovative and cost-effective technical solutions can be developed and deployed to address long-standing challenges and make our communities more livable.

→ **For the purposes of this paper, the phrase "Smart Community" shall refer to** a segment of the marketplace for Internet of Things ("IoT") solutions designed to help local government leaders and community anchor institutions meet challenges and realize opportunities to advance the livability, sustainability and equity in their communities.

The section below describes in detail three primary components of the Smart Community definition for this paper: 1) Internet of Things, 2) high quality and ubiquitous communications networks and 3) the multiple municipal objectives and responsibilities that influence the deployment of Smart Community solutions.

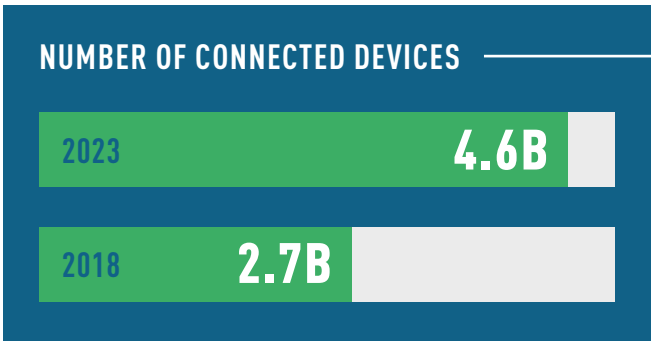
The Internet of Things

The Internet of Things is a rapidly growing marketplace for connected devices. Popular IoT devices include thermostats, measurement and motion sensors of all kinds, security cameras and—of course—smart phones. Wired and wireless connectivity creates networks of connected devices and software applications help transform sensors and actuators into smart devices around which new products and services are developed.

→ **The "Internet of Things"—a techie term describing a happening that is occurring all around us.** The security services provided by many cable companies are a widely-adopted example of services/solutions that have been developed for—and delivered by—the Internet of Things. Motion sensors, sound sensors and cameras, often connected by a residential subscriber's home Wi-Fi network, are connected to a subscriber's phone or to a remote security monitoring service via the Internet. The Wi-Fi enabled home security systems in our homes provide an illustration of a co-mingling of tangible things present in the physical world, computers, software, networks and the bits and bytes that travel across networks.

5 To be inclusive of the fact that rural and suburban areas—in addition to urban areas—are pursuing Smart and Connected Community objectives, this paper will use the term "Smart Community" instead of the more commonly used "Smart City."

According to Cisco's annual Internet Report, there were 2.7B networked devices in 2018.[6] The average American possessed 8.4 networked devices in 2018. Cisco forecasts that the average American will possess 13.6 networked devices in 2023, totaling 4.6B devices in the U.S. alone. The Cisco report affirms that connected IoT devices are both a current reality and will become increasingly ubiquitous in coming years.



The IoT Technology *Stack* Common to Most Smart Community Projects

Across many use cases and market verticals (e.g., consumer, healthcare, utilities), IoT solutions share similar technological elements; elements technologists often refer to as a "stack." Networking experts refer to the elements in a technology stack as "layers." Depending on the specific IoT solution, distinctions between key elements of the stack can blur, but it is nonetheless helpful to identify and describe the four primary layers of the IoT technology stack.

— **Communications:** At the foundation of the IoT technical stack is the communications layer. The communications layer establishes connections between devices ("things") and/or between devices and a central hub that connects the things to the Internet and/or a private network. Depending on the requirements of the application, connections between things can be wired, wireless (Wi-Fi, LTE, 5G) or a hybrid combination of both wired and wireless.

— **Devices:** The device layer is the most tangible, physical element of an IoT deployment. Devices, including sensors and cameras, collect data and have the capability to store the data, transmit the collected data or both. In some cases, an IoT solution's device layer may also include a computer that enables processing power required for data analysis that occurs on-site or physically close to the location where the data was collected. This is often described as computing at the edge of the network or "edge computing" as opposed to "cloud" computing, where data analysis occurs a remote server.

— **Data Processing/Analytics:**[7] Once the data is collected, data processing and analytics can occur at a data center or, if the device includes storage and compute functionality, it can occur at the edge of the network. Data analytics software filters, processes and/or aggregates data to support decisions and recommendations that can have an impact in the physical world. Algorithms at the core of the analytics layer provide the smarts of an IoT solution.

6 See https://www.cisco.com/c/en/us/solutions/executive-perspectives/annual-internet-report/air-highlights.html

7 Deployment of solutions and technologies that enable data processing/analytics raises issues including privacy, data ownership, data stewardship and data security. While not addressed in this functional description of the IoT stack, it is important to note that the most effective and enduring deployments of IoT solutions take place in accordance with well-developed and transparent data management and privacy policies.

— **Applications/Services:** The application layer refers to the software that receives and visualizes the collected and analyzed data as an input. Applications use and combine available data to generate an action, recommendation, optimization and/or service that has an impact in the physical world.

Reliable connectivity between computers and devices is a critical component of Smart Community projects. Current IoT-enabled projects related to vehicle and commuter route optimization, air quality notifications for asthmatics and HVAC energy efficiency strategies in the built environment, to name just a few, all require dependable and real-time connectivity to be most effective. Projects such as these analyze data from multiple sources and combine them with trend data (e.g., previously collected traffic data, weather forecast data) and depend on wired and/or wireless connectivity to move data seamlessly to/from sensors, servers and computers. While sensors, computers and algorithms constitute the brain of IoT deployments, communications networks constitute a Smart Community project's nervous system. As the CEO SCTE-ISBE has observed about Smart Communities, "everything is connected and connectivity is everything."[8]

The widespread availability of high-speed connectivity and connected devices in residences means that the "smart home" can provide a new platform through which to deliver applications and services. For the first time, local governments, schools, healthcare providers and other organizations can connect with residents, students and patients in their homes via real-time medical monitoring, classroom-quality distance learning and artificial-intelligence driven home assistants. Building on effective pilots and rapid adoption of telehealth services,[9] application developers and providers of virtual services will leverage the smart home to make in-home chronic disease management and job training a realistic possibility for millions.

The Multiple Roles of the Municipality in Smart Community Projects

The potential of Smart and Connected Community projects to transform a community has caught the attention of mayors, city council members, city managers and local government leaders. Forward-looking municipal leaders are developing and ratifying "Smart City" plans to prioritize the specific opportunities they will pursue to guide their community's efforts.[10] A review of "Smart City" plans ratified illustrates that municipal leaders most often do not perceive Smart and Connected Community initiatives in terms of IT or Telecommunications projects alone, but as a larger effort to improve fundamentally the standard of living in their communities.

8 See https://hitconsultant.net/2020/04/10/telehealth-lessons-learned-from-covid-19-pandemic/#.XpSgwS-ZM1J

9 See https://www.baltimoresun.com/opinion/op-ed/bs-ed-op-0919-smart-homes-20190918-z3eaz3zcgze5zhao7f7xfd4ozq-story.html

10 For illustrative "Smart City" plans developed by the cities of Albuquerque, Atlanta, Pittsburgh and San Jose see http://smartatl-wp-e2.azurewebsites.net/#strategy, http://smartpittsburgh.org, http://www.sanjoseca.gov/DocumentCenter/View/5502, http://smart.cabq.gov

Smart Home Photo by Jonas Leupe on Unsplash

This point is worth emphasizing because there has been an evolution in the way communities perceive and react to Smart Community projects in recent years. During the years immediately following the emergence of the "smart city" nomenclature, small scale projects were often received favorability by communities as innovative "pilots" or "experiments." As smaller projects are giving way to at-scale deployments. the projects are receiving more scrutiny. As an example, a network of 3,000+ smart cameras throughout the City of San Diego that was widely cheered when it was deployed, is now the subject of notable controversy.[11] When developing a Smart Community project, municipalities are wise to consider the cybersecurity, equity and the privacy implications of the project and engage with key stakeholders on each of these topics.

It is important to recognize the many different avenues through which local governments can participate in Smart Community projects, including, as an:

1 **Entity controlling valuable real estate or other property,** municipalities are responsible for issuing franchises to communications network providers and make it possible for IoT devices and appliances to be deployed in or on municipally-controlled buildings, on municipally controlled property including light poles, buses and etc., and in municipally-controlled Right-of-Way.

2 **End-user of technology solutions** designed to advance municipal goals in areas including public safety, resilience, and transportation, municipalities purchase telecommunications services and equipment, engage in public private partnerships and procure the IoT solutions necessary to advance municipal objectives.

3 **Entity working to advance economic development** and job growth in its community, municipalities seek opportunities to facilitate and spur economic activity.

4 **Entity that contributes to and—in many cases—leads efforts to plan** for their community's future direction, municipalities engage key stakeholder and build support for short and long-term strategic plans.

5 **Regulatory body** with responsibility for public safety, community aesthetics and appropriate use of community assets, municipalities enforce laws and regulations that govern Smart Community deployments.

Municipalities intersect and interact with Smart Community projects in many ways—as regulators, property-owners, providers of municipal services, and agents of public safety and economic activity. For this reason, it is important for partners to government to keep in mind that there are often many important stakeholders within local government. It is the rare circumstance where one champion—or one detractor—is enough to approve or disapprove a potential project. While engaging with several different stakeholders can be laborious, within a local government there may be different potential champions for a Smart Community project.

11 See https://fox5sandiego.com/news/activists-call-for-end-to-smart-streetlights-in-san-diego/ and https://www.nbcsandiego.com/news/local/city-attorney-defends-smart-streetlight-camera-programs-success/2252009/

WHAT CABLE PROVIDERS BRING TO SMART COMMUNITY PARTNERSHIPS & PROJECTS

To appreciate the central role that cable companies can and do play in Smart Community deployments, it is helpful to return to the IoT technical stack. At the device and analytics layers, cable networks provide elements that are central to cost-effective and sustainable deployments of connected devices. These key project elements include:

Access to Right of Way (ROW): Cable companies can help provide locations for connected devices and the equipment required for data storage and edge computing. As discussed in Section 1, municipalities or state governments issue franchises to communications providers to access the ROW. In many cases, cable operators have already received these franchises to install a cable system, which allows for cost-effective, efficient deployment of Smart Community solutions.

Access to power: Network nodes that cable companies have deployed throughout their service areas include access to AV power. If a Smart Community application requires computing at the edge, cable providers can help ensure that the required computing equipment has access to a power source.

Experience working with both connected device partners and end-users: The millions of connected IoT devices that forecasters expect will be deployed throughout the U.S. will require service and maintenance. Moreover, organizations that rely on applications and services that are enabled by these connected devices will require support. Cable companies have resources to both deploy and service the connected devices and provide support for the end-user.

Expertise deploying, administering and supporting secure networks and devices: As more and more sensors and equipment are connected to the smart community networks, the need for effective and reliable cybersecurity has become pronounced. A single breached device can become a gateway to the entire smart community's network. On behalf of millions of residential, business and enterprise customers, cable providers are committed to cybersecurity and to finding new, innovative ways to prevent cybercrime as it continues to evolve.

At the application layer, cable companies have deployed advanced applications including home security, temperature and lighting control in millions of homes and businesses. Cable providers bring to Smart Community partnerships their long-standing presence in a local community, their local knowledge of how to expeditiously execute connectivity projects in a specific market and their proven ecosystem of suppliers.

Most importantly of all, cable companies bring to Smart Community partnerships what some have referred to as the *power of the network*.[12] Cable companies own dense fiber and coax networks and robust Wi-Fi networks. They operate communications networks that provide reliable and resilient connectivity to residential, business and wireless subscribers. Comcast, for example, operates a network of 170,000 fiber miles and manages 19 million WiFi hotspots, making it the largest Internet

12 See https://enterprise.spectrum.com/resource-center/blog/spectrum-smart-city-solutions.html

Service Provider in the United States. At the foundation of Smart Community projects is connectivity. Cable providers are uniquely well positioned to enable and support the connectivity that enables Smart Community partnerships.

Due to an industry-wide commitment to network upgrades that have resulted in greater and greater throughput to consumers, cable providers possess networks that can enable and support bandwidth-thirsty connected device projects at a tremendous scale. Based on the upgraded networks, cable providers are bringing the power and speed of Gigabit networks to more homes, business and cities. Since 2016, the percentage of U.S. households where gigabit speed broadband access is available increased from 5% to 80%.[13]

As local government leaders develop and implement their Smart and Connected Community efforts they may receive recommendations from Smart Community experts that they need to install network infrastructure. Municipal leaders are wise to examine carefully recommendations to invest in broadband infrastructure for at least two reasons.

1 **Utilization of current data is key.** Between 2016 and 2020, thousands of communities and millions of households have new-found access to ultra-high speed broadband service. This rapid deployment of infrastructure and services often renders obsolete data that may only be 12-24 months old. Community leaders would be advised to consult local broadband network providers regarding their most recent offerings and service coverage area to avoid the installation of duplicative infrastructure.

2 **Infrastructure, devices and technology solutions are capital intensive.** Purchasing and deploying devices and technology solutions that enable Smart Community projects (e.g., smart streetlights, Intelligent traffic controls) can be expensive and often require municipal investment of resources. Since robust connectivity, deployed smart devices and innovative applications must all be in place for Smart Community goals to be advanced, it does not make sense to invest in unnecessary and difficult to support network infrastructure. A clear majority of communities and households across the country have access to the broadband networks required to enable and support Smart Community projects. In 2020, in most municipalities, available resources for Smart Community initiatives are best used purchasing the services and solutions required to address their community's specific objectives and challenges.

13 See https://www.ncta.com/industry-data/80-of-us-homes-have-access-cables-gigabit-internet-speeds

The 'Next Great Leap for Broadband' From 1G Service to 10G Service

In January 2019, the cable industry shared its vision for delivering 10 gigabit networks, or "10G™"—a technology platform that will ramp up from the 1 gigabit offerings of today to speeds of 10 gigabits per second and beyond. With 10G, the cable industry is promising faster speeds, more capacity, lower latency and greater security. The ultra-fast speeds will apply to both uploads and downloads, making the service "gig symmetric." The 10G networks will support and enable new applications related to smart communities, telehealth, distance learning and low latency virtual and augmented reality.
It is significant to note that cable providers will achieve 10G™ not from a wholesale deployment of new infrastructure but instead by extracting enhanced performance from their existing infrastructure. By leveraging their existing physical plant, cable companies will deliver the next generation technology efficiently and cost effectively. On the path to delivering 10G™, cable providers will continue to upgrade their networks with a combination of technologies that currently exist alongside ongoing advancements in new hardware, software and techniques that are being developed and tested by CableLabs and the ecosystem of vendors to the cable industry. For example, to support the rollout, Intel has committed to deliver 10 gigabit ready technology from the network infrastructure to home gateways.[14]

Since the initial 10G™ announcement, the cable industry has reported important progress in the development and implementation of technologies needed to deliver the 10G™ platform. The most exciting developments of 2019 include[15]:

- The rapid development of the DOCSIS 4.0 specification, the first major update to the DOCSIS specification in six years.
- The release of a new 200 Gbps Point-to-Point Coherent Optics specification, a critical component for enabling our interconnected future, designed to leverage the next generation of silicon and resulting networking equipment.
- The introduction of Low Latency DOCSIS into the DOCSIS specification.
- The release of Dual Channel Wi-Fi, which eases network congestion, enabling a 10G™ reliable Wi-Fi connection.

10G™ field trials are slated to begin in 2020.

14 https://itpeernetwork.intel.com/building-10-gigabit-connected-future/#gs.zyazkb

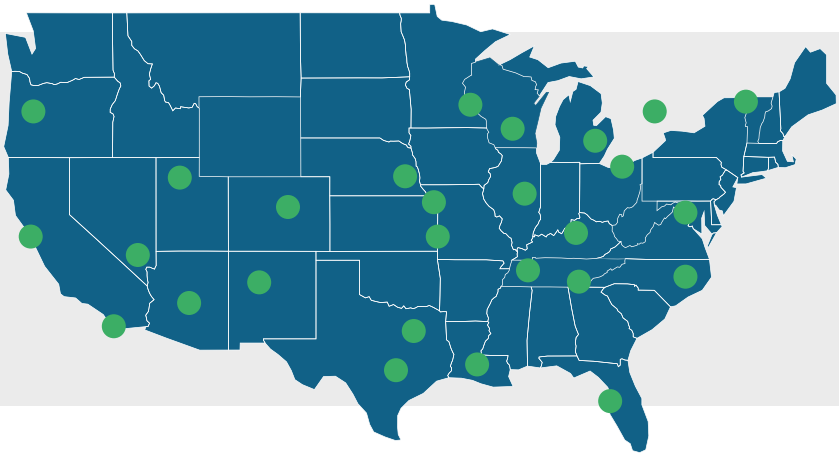
15 For a complete overview of progress towards 10G in 2019, please see https://www.cablelabs.com/path-10g-2020-update

THE EXPANDING ECOSYSTEM OF THE SMART COMMUNITY SECTOR

In recent years, a growing ecosystem of organizations are acting as the catalysts for Smart Community projects. The Smart Community market has expanded beyond local governments to include hospitals, universities, utilities and real estate developers. These new actors in the Smart Community marketplace seek more than connectivity and more than access to a menu of existing products. Indeed, most often, these organizations require solutions that can meet their evolving needs and a partner that can work collaboratively to deploy, leverage and support networks of connected devices.

U.S. Ignite Smart Gigabit Communities

US Ignite, a non-profit organization established to accelerate the smart city movement, launched the Smart Gigabit Communities ("SGC") program in 2015 with the National Science Foundation. As of 2020, SGC projects are present in more than 28 communities, and leading cable providers are U.S. Ignite sponsors and partners. Cox Communications supports Smart Gigabit Community partnerships in three communities: Las Vegas, Phoenix and San Diego. Charter Communications supports an SGC program in St. Petersburg, Florida. Comcast supports an SGC program in Philadelphia.



Each community participating in the SGC program secures access to a low-latency, ultra-fast network with local cloud computing and storage capabilities. Leveraging these resources, SGC communities have developed a catalog of more than 150 applications and services. Experts, including the municipal leaders that make-up the City Innovators Forum at Harvard University, agree that expanding the ecosystem of municipal applications is a critical component of the most effective Smart Community projects.[16] A stumbling block associated with the development of enduring Smart Community apps is the fact that the applications must be meaningful to a municipality but sustained by a business model that will most often be developed by 3rd party application developers. To help address this stumbling block, the SGC program forges partnerships and collaboration between municipal leaders, application developers and connectivity partners.

16 See https://cityinnovatorsforum.com/iot-what-works-what-doesnt-and-what-we-care-about/

Through the SGC partnerships, in addition to providing connectivity, cable companies provide support for stakeholder engagement efforts, hackathons and create opportunities for application developers to deploy their apps on a network that serves a large, addressable market. Existing partnerships between cable companies—some of which are examined in detail below—illustrate the valuable contributions of cable providers to Smart and Connected Community projects. The projects summarized below also serve to highlight the common objectives that municipalities and cable companies share with respect to the successful deployment of Smart Community projects.

A Living Lab for Smart City Applications in Phoenix AZ: In 2016, Cox Communications partnered with U.S. Ignite to establish an SGC program in the City of Phoenix. With the support of Cox, Phoenix hosted hackathons to explore which app ideas would be best to fund and develop. Via the SGC program, Phoenix has spurred the development of apps that help the city alert and remind its residents on days when the trash bins should be taken out, what can or can't be thrown into the trash bins, and when recycling day happens in the city. Through the SGC, Phoenix has also brought together a consortium of leaders from inside and outside of local government to explore solutions to regional challenges, including approaches to improve traffic management.

SmartCityPHL: In early 2020, Comcast began a 3-year partnership with US Ignite to work together with the City of Philadelphia to address difficult public challenges using smart technology. Comcast has a long history partnering with the City to address city challenges, but this is the first such partnership for the company. In light of Covid, Comcast and Philadelphia are currently in discussions to assist with safe, gradual opening of public spaces using optical sensors, smart lighting, and A.I. technology. In the future, this combination of technology has potential to assist with other challenges including illegal dumping, intelligent curb management, and more.

St. Petersburg Innovation District: In March of 2019, the city of St. Petersburg, US Ignite and Spectrum, the brand name for Charter Communications, announced a 3-year partnership to develop advanced applications and services designed to address local needs such as infrastructure, workforce development, public safety, education and community health. The initiative is particularly focused on two main areas: Smart Lighting, Traffic, and Pedestrian Safety and Marine Science STEM. The programs leverage technologies implemented by Spectrum such as wireless point to point connectivity, WiFi, a wireless sensor network, and underwater equipment such as HD cameras and drones. These technologies, supported by Spectrum's network, enable Smart Lighting, Pedestrian and Traffic safety and provide the local Boys & Girls Club a real-time broadcast of marine life activity to enhance learning opportunities.

Smart Buildings and Arenas

When the term "smart city" was originated, a widely-accepted vision imagined that municipalities would play a central role in all Smart Community projects.[17] We now know that non-governmental entities including application developers, technology companies, hospitals, universities and utilities (to name a few) are, alongside local governments, driving forces behind the use of technology to transform our communities. In recent years, real estate developers have joined this list of non-governmental entities that are, nonetheless, critical contributors to the realization of Smart Community goals.

As illustrated below, real estate developers are emerging as an important new Smart Community partner to cable company providers. The reason for this is straightforward. There exists market demand for "smart" amenities. Real estate developers recognize that deploying home automation technologies and ubiquitous wireless access in their new developments reduce electricity and maintenance costs and can help differentiate their properties.[18] As a result, apartment buildings, mixed use developments and arenas can have the traits of—and seem like a microcosm of—a smart connected community.

According to IDC's 2020 Smart Cities Spending Guide, cities worldwide will spend $124B in 2020. This significant spending power notwithstanding, it simply pales in comparison to construction spending in the United States, which in January 2019 totaled $1.28 trillion according to U.S. Census data.[19] Effective partnerships that leverage construction expenditures in their communities have the potential to rapidly accelerate a community's Smart Community goals. As active participants in the Smart Community ecosystem, real estate developers stand to bring tremendous scale to the sector.

The Battery Atlanta: For the Atlanta Braves' Truist Park and 1.5 million square feet of mixed use development known as the Battery, Comcast installed and operates an all-fiber network providing video, voice and high speed internet connectivity. The network is driven by 100 Gigabit per second (Gbps) Ethernet lines, 250 miles of fiber optic cable and more than 1000 WiFi access points in and outside of Truist park. The network supports the development's LED lighting, sprinklers and HVAC systems, the ballpark's security system, interactive kiosks, over 1,000 screens and WiFi for thousands of fans' smart devices. The Atlanta Braves Organization is also using the network for smart solutions to parking and traffic management through a customized app.

17 See, for instance, this 2012 Cisco blog post outlining the vision for one of the earliest "smart" cities, Barcelona. https://newsroom.cisco.com/feature-content?type=webcontent&articleId=1024698

18 See https://www.gru.com/Portals/0/Xfinity-Communities-Survey-Report_041817.pdf

19 See https://www.housingwire.com/articles/48416-this-is-how-much-the-us-spent-on-housing-construction-in-january/

Smart Thermostat Photo by Dan LeFebvre on Unsplash

Woodrow Apartments in Fargo, ND: Midco, a cable provider in 342 communities KS, MN, ND, SD, KS, has partnered with the Kilbourne Group to provide a managed Wi-Fi solution for Kilbourne's newly developed Woodrow Apartment complex in Fargo, ND. For Kilbourne, the partnership with Midco, enables them to offer tenants a very attractive amenity: turnkey access to seamless, steadfast wireless internet connectivity. Tenants in the Woodrow apartments contact Midco directly for support, so the Kilbourne team is confident that any issues are being handled by technical support experts. The feedback from residents has been overwhelmingly positive. Tenants like being able to move about the property while remaining connected and appreciate being connected to complex's Wi-Fi as soon as they move-in.

Wyatt Apartment Complex in Fort Collins, CO: Comcast's Xfinity Smart Communities is partnered with the Wyatt Apartment Complex in Fort Collins, CO. In each of the 368 units, tenants can control their door locks, lights and thermostats via the Xfinity Smart Communities app. The property managers also use the Smart Communities app to transfer control of apartments to new tenants and to simplify daily management tasks including checking temperature set-points in common areas and vacant units and monitoring for water leaks. Via the Smart Communities application, these tasks can now be accomplished more simply and remotely.

Xtream Arena Powered by Mediacom in Coralville, IA: In January 2019, Mediacom Communications, the country's 5th largest cable company serving 1.4 million customers in Midwest and Southeast, announced its involvement in a new arena that will be a centerpiece of a complex in the City of Coralville's Iowa River Landing district. In partnership with the City of Coralville, Mediacom is an advertising sponsor of the arena and is also providing media assets and state of the art broadband and WiFi technology for the entire facility. The partnership with Mediacom ensures that the new arena will offer visitors state of the art connectivity and an outstanding in-venue experience. When construction is completed in 2020, the Xtream Arena will attract even more visitors and further enhance a cultural and entertainment district that has helped revitalized Johnson County and become an asset for the cities and residents of Eastern Iowa.

Smart Community Projects Leveraging LoRaWAN Wireless Networks

U.S. cable operators, including Charter Communications, Comcast and Cox, are deploying Low Power Wide Area networks (LoRAWAN or "LoRa") that support a range of smart city, smart building, smart agriculture and other IoT applications. Described as 'Wi-Fi for IoT" by LoRa Alliance members, LoRa networks use unlicensed spectrum to support low-bandwidth applications. Compared to the cost of connecting sensors and other networked devices via a cellular network, connectivity via LoRaWAN can be very cost effective and enable and support a broad array of specific applications. Because LoRa technologies are designed to require very low levels of power consumption, battery lifetimes of connected devices can extend to 10+ years.

City of College Park's Smart City Platform: In January 2020, Comcast and the City of College Park announced the first application that will run on the College Park's wireless Smart City Platform. Comcast has installed its MachineQ Gateway (which uses LoRaWan technology) to connect sensors to city's trash receptacles and alert the municipality when they are nearing full capacity. The project reflects the City of College Park's commitment to using technology to support the city's daily operations. The decision to install a MachineQ wireless platform indicates that the smart trash application is unlikely to be College Park's only smart city application. The wireless Gateway enables the city to rapidly and cost effectively deploy and test application/initiatives designed to address of city residents and visitors.

Cox Connected Environments Collaboratory at ASU: Cox Communications partnered with Arizona State University (ASU) to create the Cox Connected Environments Collaboratory at ASU. As an incubation center and convening space, the Collaboratory will engage ASU students, staff, and faculty and support the design of the next wave of Internet of Things (IoT) solutions. Solutions that could, for example, optimize buildings for sustainability, provide new learning experiences in virtual and augmented reality, overhaul transportation infrastructure and more. Through Cox's IoT business unit, Cox2M, the Collaboratory will make available the tools and capabilities to develop innovative end-to-end solutions, which will enrich the educational experience at ASU and will enhance the quality of life for citizens and businesses throughout the Greater Phoenix Smart Region Consortium.

Water Street District, Henderson, NV: In December 2019, the City of Henderson partnered with Cox Communication's Cox2M business unit to pilot an "innovation exploration environment." As part of the pilot, Cox2M will deploy its Smart Communities Platform and work with the city to trial new water systems controls, lighting controls and parking management solutions. The Cox2M Smart Communities Platform aims to make it easier for communities to deploy smart community solutions at scale.

Five Lessons Learned from Effective Projects Between Cable Providers & Smart Community Partners

1 **At the core of an effective Smart Community project is robust and reliable connectivity.** The Battery Atlanta project, like so many Smart Community projects, is technically complex because the expectations of the project are evolving. Because Comcast has deployed and is operating a state of the art communications networks, the Atlanta Braves are free to imagine new ways to leverage the connected device network to exceed Braves' fans' high expectations for engagement, awareness and access.

> "More than ever, we need a communications infrastructure across multiple sites that would give us, fast reliable communications and more than enough capacity to accommodate a host of emerging technology applications."
> *—Atlanta Braves President of Development Mike Plant*

2 **A demonstrable and rapid return-on-investment (ROI) is a critical success factor for Smart Community projects.** The Wyatt Apartments in Fort Collins offers residents a limited menu of high-value functionality via the Xfinity Smart Communities App. Comcast plans to connect even more smart home devices to the Smart Communities app in the future, but the ability to control locks, lighting and thermostats has had the desired effect. Residents recognize and value the amenity and the property owner can assess the value.

> "When I selected The Wyatt FOCO for my residence, it was the unique amenity package that set it apart from other communities in the area. The ability to remotely control my unit from an app offers a greater sense of comfort and knowing that the Internet can handle both my work-from-home and study needs, as well as stream content without a glitch was an added benefit."
> *—Jack Waldon, resident at the Wyatt FOCO*

3 **Long range, low power wireless solutions** (LoRAWan) can make a reality today the end-to-end smart applications promised by the forthcoming deployment of 5G networks.

> "Cox is a trusted partner, and we are eager to see the Cox Connected Environments Collaboratory at ASU drive smart region applications that combine people, connected devices, data and processes to improve community operations and the citizen experience,"
> *—Lev Gonick, Chief Information Officer, Arizona State University*

4 **Small towns and cities, like their larger counterparts, benefit greatly** from investments in high capacity, high speed networks.

> The growing popularity of gigabit internet in our markets is proof positive that our fiber-rich network has become a true economic and social engine for the small cities and towns we serve across America,"
> *—John Pascarelli, Executive Vice President of Operations, Mediacom Communications*

5 **Because Smart Community projects are collaborative and can evolve over time, the strongest projects benefit from partners that have a vested interest in the project's success.** Most cable providers have employees who live in the communities we serve. Because cable providers know and live in the community, they can contribute not just to the technical aspects of a Smart Community project, but also to community engagement activities that are a critical input into a successful Smart Community project.

> It's not difficult to find a vendor—but it is difficult to find a partner. Our partnership with MachineQ has deployed solutions quickly at a scale to have efficacy to change the lives of citizens for the future,"
> *—Michael Barnett, Smart City Coordinator, City of Wichita*

CONCLUSION & RECOMMENDATIONS

A growing number of entities recognize the promise of Smart Community projects to expand economic opportunity and improve the standard of living for residents in their communities. Because of the complexity, cost and risk of at-scale Smart Community deployments, the strongest Smart Community projects are built on partnerships. This whitepaper makes the case that cable companies are uniquely well-positioned to help a growing ecosystem of Smart Community partners advance their objectives; arguing that cable companies possess both dense network infrastructure across large service areas and valuable experience deploying and managing wired and wireless networks designed to solve complex connectivity challenges.

From the lessons learned drawn from current Smart Community initiatives involving cable companies, municipalities and other Smart Community partners, the following recommendations for cable providers and the growing ecosystem of Smart Community partners emerge:

Smart Community partners should not lose sight of the fact that effective projects require **robust, reliable and secure connectivity**.

Cable providers must recognize that Smart Community projects, particularly those including a municipal partner, are most effective if they **directly address pain points** and **require minimal upfront hardware investment**.

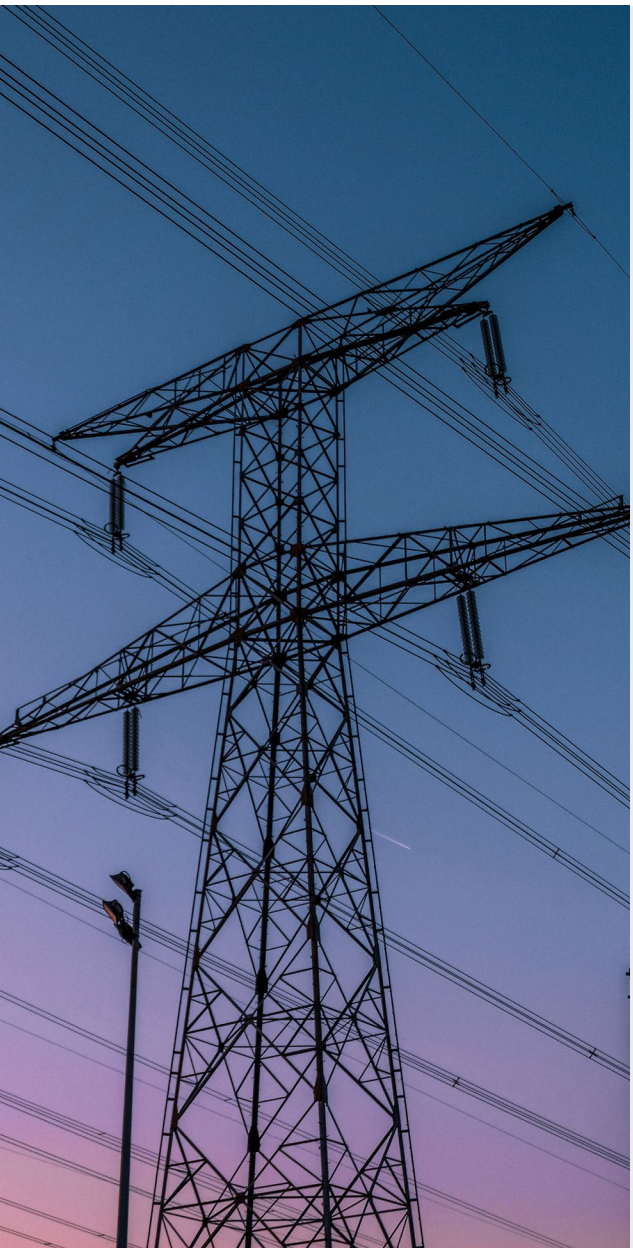
When designing a project with partner, cable providers should keep in mind that **a demonstrable and rapid return-on-investment** (ROI) is a critical success factor for Smart Community projects.

Since Smart Community projects are collaborative and can evolve over time, organizations pursing Smart Community partnerships are wise to recognize that the strongest projects benefit from project **participants that possess a vested interest** in the project's success.

Organizations pursing Smart Community projects should carefully consider whether long range, low power wireless solutions (LoRAWan) can enable and support today the end-to-end smart applications promised by the **forthcoming deployment of 5G networks**.

Cable providers should continue to invest in expanding their networks in recognition of the fact that **small towns and cities**, like their larger counterparts, **benefit greatly from investments** in high capacity, high speed networks.

ABOUT THE AUTHOR



Bill Maguire is the founder of Connected Communities LLC and an advisor and consultant to local governments, non-profit organizations and technology companies. Prior to his consulting work, Bill served as Chief of Staff for the Broadband Technology Opportunities Program (BTOP) at the National Telecommunications and Information Administration (NTIA). Bill is a graduate of Reed College and of Union Theological Seminary in New York.

Electric Transmission Tower Photo by Saad Sharif on Unsplash