

# UVA Center for Telehealth Uses IoE Capabilities to Extend Quality Care to Medically Underserved Areas



## EXECUTIVE SUMMARY

### Objective

- Provide timely access to specialty medical services that are otherwise unavailable in communities throughout Virginia and around the world

### Strategy

- Locate strong advocates and leaders during program development
- Partner with a competitive variety of vendors to help address budget challenges
- Continue developing data analytics to identify ways to refine and streamline care delivery

### Solution

- Using video and remote medical equipment, UVA Center for Telehealth provides basic medical examinations and services in 40 specialties, including psychiatry, cardiology, pediatric specialties, child neurology, orthopedics, and genetic studies

### Impact

- Telemedical services stretch healthcare resources; save money, time, and travel; accelerate healthcare delivery; increase access to specialty services; and provide educational training opportunities that assist physicians both locally and internationally
- UVA Center for Telehealth is now approaching 40,000 clinical encounters in 40 different disease specialties over 125 sites in Virginia, saving citizens of the Commonwealth 8.9 million miles of travel

## Background

In January 2014, Cisco released the results of an in-depth analysis of the economic benefits of the Internet of Everything (IoE) for the public sector. Cisco's model revealed that some \$4.6 trillion in "Value at Stake" would result from the adoption of IoE capabilities across 40 key public sector use cases over the next 10 years, including smart water, smart buildings, smart energy, smart parking, and more (<http://bit.ly/1aSGIzn>).

As a next phase of its analysis, Cisco engaged Cicero Group, a leading data-driven strategy consulting and research firm, to undertake a global study of IoE capabilities across these 40 use cases – how the best public sector organizations are "connecting the unconnected," as Cisco terms it. To that end, Cicero Group conducted interviews with dozens of leading public sector jurisdictions – federal, state, and local governments; healthcare organizations; educational institutions; and non-governmental organizations (NGOs) – to explore how these global leaders are leveraging IoE today.

The research examined real-world projects that are operational today, are being delivered at scale (or through pilots with obvious potential to scale), and that represent the cutting edge of public sector IoE readiness and maturity. The aim of the research was to understand what has changed in terms of the jurisdictions' people, processes, data, and things, and how other public sector organizations can learn from (and replicate) the trail blazed by these global IoE leaders. In many cases, these jurisdictions are Cisco customers; in others, they are not. The focus of these jurisdictional profiles, therefore, is not to tout Cisco's role in these organizations' success, but rather to document IoE excellence, how public sector entities are putting IoE into practice today, and to inform a roadmap for change that will enable the public sector to address pressing challenges on multiple fronts by drawing on best practices from around the globe.

The president of the university, in his annual report, told the story of how we were connecting to Saudi Arabia, and it wasn't but a little time later that a legislator from Far Southwest Virginia picked up the phone and said, 'If you can go to Saudi Arabia, you can go to Pound [Virginia]. If you can take care of a Saudi princess, you can take care of a kid that lives in a coal-mining community in Southwest Virginia.'

David Gordon,  
Director,  
UVA Office of Telemedicine

## About UVA Telehealth

The University of Virginia is a pioneer and leader in regional, national, and international telehealth programs. As well as serving patients throughout Virginia, the UVA Center for Telehealth has expanded its programs to the medically underserved in Latin America, the Caribbean, Africa, and other international destinations.

Using video and remote monitoring equipment, the UVA Center for Telehealth has provided more than 40,000 encounters, offering basic medical examinations and services in 40 specialties, including psychiatry, telestroke cardiology, pediatric specialties, infectious disease, child neurology, orthopedics, and genetics. The UVA Center for Telehealth is headquartered within the UVA Medical Center and is a component of the University of Virginia Health System.

David Gordon is director of the UVA Office of Telemedicine, where he also serves as director of community engagement and rural network development. A native of Central Appalachia, Mr. Gordon was raised in the coalfields of Southeastern West Virginia. He is a community organizer by training, with advanced degrees in divinity and social work. He is co-director of the Healthy Appalachia Institute, and a member of the American Telemedicine Association, the National Association of Social Workers, and a board member of the Mid-Atlantic Telehealth Resource Center. Mr. Gordon is also an instructor in public health sciences and nursing at UVA.

Brian Gunnell is a video conference network engineer and analyst for the UVA Center for Telehealth. He previously worked for Albemarle County Public Schools as an audiovisual specialist, and is general manager of GCC Productions.

## Objectives

The UVA Center for Telehealth began in the mid-'90s following a medical procedure performed at the UVA Medical Center on a member of the Saudi royal family, and the ensuing press coverage of the event, including the long-distance care plan established by physicians. "The president of the university in his annual report told the story of how we were connecting to Saudi Arabia," Mr. Gordon remembered, "and it wasn't but a little time later that a legislator from Far Southwest Virginia picked up the phone and said, 'If you can go to Saudi Arabia, you can go to Pound [Virginia]. If you can take care of a Saudi princess, you can take care of a kid that lives in a coal-mining community in Southwest Virginia.'"

Mr. Gordon described what followed that initial phone call as a coordinated effort to ensure the commitment of physicians, obtain funding, install a telecommunications infrastructure, and provide telemedicine education to the community of providers in medically underserved regions of rural Virginia. "Initially, we were really founded with community-based clinics, small rural hospitals, health systems, health departments, community services boards. When they had an identified need, they'd reach out to us, and we'd reach out to them. We looked for grant dollars together, and we'd help them set up a telemedicine capability. We'd start testing, we'd put together a protocol and start seeing patients.

"It's about the network of technology," Mr. Gordon continued, "but it really is about the network of people: the physicians, scientists, researchers, community members,

patients. In that, we really feel like we've made gains. From the get-go in '95, we were really designed to be a program that first and foremost reached out to the community where services were otherwise unavailable. We've got the commitment of champions at UVA, we got the commitment of champions in the community, and so those two things became the foundation for what we've become."

## Strategy

Mr. Gordon sees telemedicine as an effective way to stretch medical resources due to its potential for influencing the way medicine is practiced at every level. "It's your connection to a referring physician," he said. "It's what you do in conference rooms, and what you do on the desktop. It's what you do on your mobile phone. It's what you do educationally, and it's how you share a Grand Round (an important teaching tool in the medical profession) and the intellectual property there. When you talk about what telehealth is now becoming in a system, it has to become integrated into all of those elements."

In order to provide telemedicine services to local rural areas, the UVA Center for Telehealth enters into detailed agreements that are compliant with CMS conditions of participation and JC standards with those hospitals and health clinics that want to partner. The agreements allow these clinics to connect with and draw upon the expertise of doctors and specialists at UVA. "We make the arrangements that are specific to the kind of clinical care that we would be providing to that hospital, such as a stroke agreement or an endocrine clinic or a neonatal agreement," Mr. Gordon explained. His office has formed agreements with 125 community partners that run "from the eastern shores of Virginia all the way to Lee County, which is farther west than Detroit, Michigan. It is a huge geography that we operate within," he stated.

The UVA Center for Telehealth also offers its services within the UVA Medical Center. Physicians can consult with one another and share documents to get immediate opinions and assistance, instead of having to physically move about the hospital, which is disruptive to their work and reduces productivity. From Spanish teleinterpretation services to video consultations and virtual meetings for executives, Mr. Gordon and his colleagues continue to explore ways to optimize patient care and contribute efficiency to the work of UVA's many professionals.

UVA Center for Telehealth is also expanding its services to international medical communities, providing mentoring and training in medically disadvantaged communities in Africa, Latin America, the Caribbean, and other areas that are resource-challenged.

As part of the UVA Health System, the UVA Center for Telehealth receives funding for its domestic and international programs from a variety of sources, including university funds and external grant funds, the Virginia Tobacco Settlement, and funds from institutions such as the Clinton Global Initiative. The organization also received a large amount of funding in 2010, when the Virginia General Assembly unanimously passed mandated coverage for telemedicine through state Medicaid. The center also receives funding from Medicare, Virginia Medicaid, healthcare grants from the USDA, and other state and federal government grants.

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UVA Center for Telehealth generates revenue through several significant clinical contracts, including one with the Department of Corrections.

Mr. Gordon explained the fiscal policy of the Center: “It’s been very important for us to bring in revenues because you need to show folks that this is a zero-sum game and beyond. We have certain charges with all of our partner sites. There’s a nominal but important contractual relationship that allows us to maintain that connection and support. Then, of course, because we can build for the physician encounters, we have a master agreement between the physician practice and telemedicine that has us receive a small piece of every clinical encounter.” He estimates the revenue from clinical encounters at approximately \$1 million per year.

Mr. Gordon emphasized that the office carries its expenses through its own revenue sources. The administrative costs of the UVA Center for Telehealth remain relatively modest – roughly \$700,000 per year, according to Mr. Gordon. “That’s just a day-to-day operational thing and doesn’t include all the expense of the network. That’s just our centralized service,” he said.

“We are very proud of our global program. Our technology team here developed a portal-testing process so that we could go into countries in Africa and Central America and the Caribbean, around the globe, and be able to test networks, check up-and-down speeds, look at various connectivity tools, and find ways to connect and then develop relationships and systems.”

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## Solution

The telemedicine services offered by the UVA Center for Telehealth provide increased opportunities for medical services throughout Virginia and in many underserved areas of the world. Services range from clinical consultations, medical education for providers and patients, and many local and international outreach projects.

Mr. Gordon described his office’s training program in these international partnerships. “Today I had a long conversation with a neurosurgeon here who is developing rounds in Rwanda, where we already do surgical rounds and anesthesiology rounds. He wants to do neurosurgical training,” said Mr. Gordon, emphasizing the need by adding that the country currently has two practicing neurosurgeons for the entire population.

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Physicians within the UVA Medical Center are also beginning to adopt telecare technology while treating patients within the UVA complex. In the past, doctors would scrub out of a surgery to provide an urgent consultation, leaving the surgery to an associate to finish. Now, they can receive a high-resolution image of the issue on their iPad using collaboration technology, and respond without having to leave their own work. “We’ve seen this remarkable change so that telemedicine is now an inside-outside expansion,” said Mr. Gordon. “We are growing as fast on the inside now as we are growing on the outside.”

Mr. Gordon is particularly impressed with the way patient services and administrative encounters have expanded with the proliferation and acceptance of the organi-

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Video Conference Network  
Engineer and Analyst,  
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zation’s unified communications system, which features voice, IM, presence, voicemail, and conferencing. According to Mr. Gunnell, “We started with about 20 users on that. We’re sitting at just under 200, and we’re anticipating over the next three to four months that is going to blossom up to about 600.” Mr. Gunnell expects this to swell to roughly 3,000 users in the next two to three years due to its ease of use and data security.

### Teleconferencing

Mr. Gunnell explained his objectives in choosing technology for the many sites he services: “We focus very hard on trying to make this as simple as can be for the doctors, and what I like to say is the technology needs to fall away and really become not part of the situation. It’s really about that interaction between the doctor and the patient or whoever’s on the screen. In doing that, you have to make the equipment very easy to use, but it’s a fine line between being easy and being secure, and obviously in a medical environment we have to really focus on the security in the encryption between these pieces of equipment.”

UVA Center for Telehealth uses telepresence bridges that can interface securely with a variety of equipment. “[Our equipment provider] has been very good about the open architecture,” Mr. Gunnell explained, “allowing us to interact with ... all the different flavors of equipment that are out there. It’s quite challenging. You have a clinic that’s holding on to, say, [a teleconference bridge] that they’ve been using for eight or nine years, and it still works, but the quality is not that great. So we have to make sure we can accept those types of older, legacy systems into our infrastructure, and that they communicate very easily with all of the current equipment that we have.”

According to Mr. Gunnell, minimum levels of data transfer are established by the regulating body, the American Telemedicine Association, per clinical specialty, but are sometimes limited by remote equipment. “Typically, we like to try to get up around 1 megabit [per second] now for the connections, but it really depends on what specialties we’re looking to do and what’s available,” he explained. The minimum for neurological encounters is 512 kilobytes or better, and for high-definition encounters, the minimum acceptable speed is 712 kilobytes for uploading and downloading.

### Peripherals

“We use a big variety of peripherals at this time,” Mr. Gunnell noted, including digital stethoscopes, otoscopes, patient cameras. “The stethoscope is a pretty important piece, as well as having a handheld camera that you can hook into the codecs,” Mr. Gunnell continued. “We have some doctors who are really just getting into telemedicine, so this is the first couple of times they’ve used the technology. With the stethoscope this morning, [one doctor] came out of the room and he actually said he thought he could hear it better over our system than he could in real life, face-to-face with the person.”

According to Mr. Gunnell, movable camera technology also figures prominently into patient encounters. “Most of the time, these fixed endpoints have cameras that are PTZ, or pan-tilt-zoom, but what we find is also having a handheld camera in



the clinical spaces makes it easier to get shots of different things. If you're doing wound care, it may be hard to zoom the camera in to get the right angle, so having a handheld camera there hooked into the endpoint makes it easier to identify wound care or burns," he said.

## Data Management

Mr. Gunnell explained that he has developed a "technical dashboard" for back-end data tracking and analytics. "There was a large amount of clinical data being collected, but what we started to do was look at numbers of connections. We started to look closer at how long connections would be made, [and] response time."

In addition, Mr. Gunnell has begun tracking data in an SQL database, including data from the call logs for the emergency response system, patient data, inventory, and equipment. "We've created a very robust database, so [for example] we can look for a particular clinic in Southwest Virginia and see what equipment they have, and get the specific information we need to troubleshoot that site," he said.

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Mr. Gunnell noted he is still in the process of analyzing the large amounts of data being collected. This is particularly useful for the telestroke program, which receives calls around the clock. "We [became] more interested in quality metrics on how the calls were going. We were very interested in how much usage any particular endpoints were getting for clinical usage," he said. Mr. Gunnell eventually chose a data management partner whose solution "pulls [backend data] into a pretty nice format. It's a tremendous amount of data, but it taps essentially every one of our systems and organizes it into a nice, clean space for us," he said. Mr. Gunnell explained that the program also alerts him when there is a large amount of packet loss across certain connections, a situation that might compromise the quality of a video conference.

## Technology Partners

Mr. Gunnell explained some of the forces affecting the preferred technology: "What we're finding is we're really having a lot of pressure pushing us toward the desktop and mobile solutions, because that's where everybody wants to go. They want to be on the move, they want to be able to make these connections from everywhere out in the wild. We still lean on fixed endpoints in our clinical spaces, but it's really starting to drive toward the more mobile technology, and getting people more flexibility on how they dial into the systems."

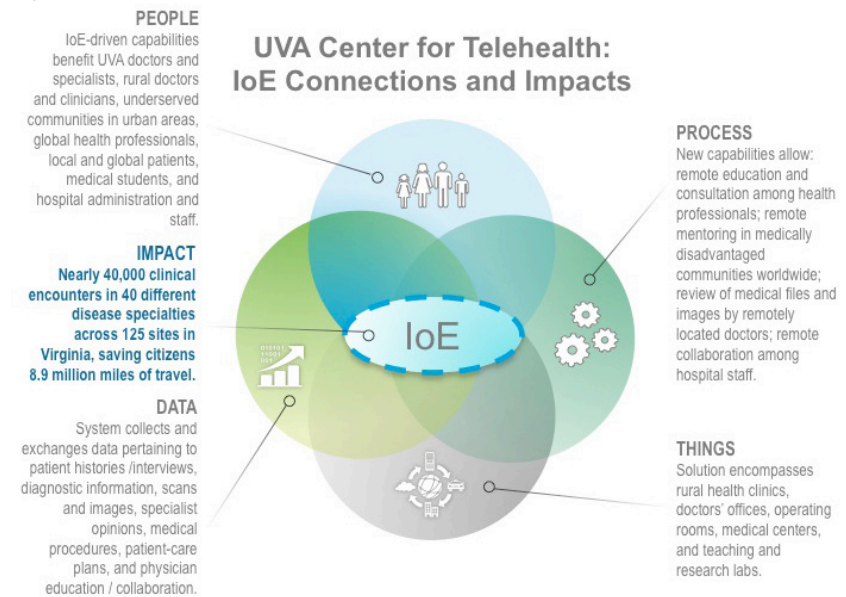
In addition to their main telemedicine infrastructure provider, Mr. Gunnell explained that his office routinely partners with a range of technology companies, and continues to research all available options to optimize patient encounters, reduce costs, and assist with administration. "We work closely with several different companies," he stated. "We've been looking closely recently at a couple of different services that are like a new bridging service but work like an MCU. They go down to mobile phones. We've been talking to a couple of partners that operate in that environment that really focus on the whole WebRTC," he said.

Mr. Gunnell and his two colleagues on the office's technical team continue to research and incorporate the most effective and cost-efficient technological options.

“As a tech team, we really pride ourselves in trying to stay on top of what’s out there, the new stuff that’s coming,” he said.

According to Mr. Gordon, since its founding in the mid-’90s, UVA Center for Telehealth is “now passing 40,000 clinical encounters in 40 different disease specialties in more than 125 sites in Virginia, saving citizens of the Commonwealth 8.9 million miles of travel.”

Figure 1. UVA Center for Telehealth: New and Better Connections.



Source: Cisco Consulting Services, 2014

## Impact

UVA Center for Telehealth is routinely cited in the press as a model for other telemedicine programs. According to Mr. Gordon, Virginia’s Center for Innovative Technologies routinely selects Virginia as the top provider of telemedicine in the nation. UVA Center for Telehealth recently agreed to become an academic partner of Specialists On Call, one of the largest telestroke care providers in the world. Mr. Gordon stated, “We are now their academic partner in terms of research, continuing education, as well as being a provider in Virginia. They have the relationship with the hospital, and it is our UVA doctors providing their clinical expertise through the Specialists On Call network.”

UVA’s telemedical services stretch healthcare resources and save money, time, and travel. According to Mr. Gordon, since its founding in the mid-’90s, UVA Center for Telehealth is “now passing 40,000 clinical encounters in 40 different disease specialties in more than 125 sites in Virginia, saving citizens of the Commonwealth 8.9 million miles of travel.”

Increased speed of delivery is another advantage. Mr. Gordon explained, “In our telestroke program, for example, we’ve been able to successfully put into place all the process protocols, clinical protocols, and technical protocols, with technical coverage and CT movement through the PACs system – getting the doctors on board, looking at the patient, a tech who’s standing ready in a system that we make sure that, in our opinion, is always operational. We’ve been able to get that down to under a 10-minute operation to have those things happen.”

“In this day and age of the Affordable Care Act, we need to reform to be more efficient. We’re going to change our relationship of where we go, so our connections are going to expand from clinics and hospitals to homes, to places of work, to schools.”

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Providing increased access to specialty services is another benefit of telemedicine. Mr. Gordon described UVA Center for Telehealth’s psychiatric services as an example. “We’ve become a resource for children and families throughout the state, as we do adult and child psychiatry through services to community services boards, hospitals, as well as emergency psychiatry. We’ll probably do 3,000 encounters this year alone in child psychiatry. We see it as a continuing, important place to grow not only externally to community hospitals, CSBs, but also internally to our family practice doctors. These are important directions in which we are heading.”

In addition, UVA Center for Telehealth’s educational training opportunities assist physicians both locally and internationally. They are involved in many programs, and their physicians provide medical mentoring in areas often badly in need of medical support. Mr. Gordon and Mr. Gunnell mentioned examples of training in neurosurgery to support the two practicing neurosurgeons in Rwanda, along with a training program in remote areas of Guatemala.

Mr. Gordon expressed his belief that the objectives of telemedicine fit well with the recent changes in healthcare coverage, providing convenient, safe, and cost-effective care options by bringing medicine to the patient and reducing the administrative load on the doctor’s office. “In this day and age of the Affordable Care Act, we need to reform to be more efficient. We’re going to change our relationship of where we go, so our connections are going to expand from clinics and hospitals to homes, to places of work, to schools.”

Mr. Gordon indicated there have been unique patient benefits as well. “We had a patient who came in with a neurological incident, and her only child was getting married the next day. She had been planning his wedding for a year,” he stated. “We were able to get the son to download our unified communications software onto his laptop, and we set up the cart in her room with the big screen. She was able to be on the receiving line and watch the wedding. That’s what it’s all about.”

Mr. Gordon offered his perspective on the broad potential of telemedicine: “I’m a community-based public health person, and I see within it the possibilities for community health and wellness. It pulls on my heart, not just my intellect or my pocketbook, to know how important this is when you’ve seen a patient recover function after a stroke, or you’ve seen a child who has an interrupted aortic arch get medicine and live as a result of what we can do with this.”

## Lessons Learned / Next Steps

Mr. Gordon said that dealing with significant growth remains his biggest challenge. “Since 2005, we’ve grown in encounters by some 465 percent. We’ve grown in size and operation only 13 percent. We have these human barriers. We also have financial barriers, the technology we need, and the funding for that technology. These are capital purchases, and we’re growing hand-over-fist with this. To do enterprise-wide incorporation of video conferencing is a major million-dollar project. It requires a lot of buy-in and a lot of commitment of capital dollars.”

Mr. Gunnell also described the initial infrastructure cost as the main challenge of telemedicine, particularly when convincing local providers to invest. “You go into a



small clinic, they have to spend \$6,000 to \$10,000 to get an endpoint, and then the annual maintenance is \$1,000 or \$1,500. Sometimes it's really hard for people to swallow those kinds of investments. To us, we see the value and ... see in the mileage saved and early intervention that it pays for itself, but really it's hard to get people to see that return on investment with some of the investments it takes to get into this."

UVA Center for Telehealth attempts to address the problem by partnering with a variety of vendors. "That's why we really have opened up looking at a lot of different technologies now, just trying to give options to people," Mr. Gunnell explained.

However, pursuing lower-cost technological options can present another set of difficulties. As an example, Mr. Gunnell discussed a seemingly interesting technological device that has so far been eliminated as an option due to overly complicated controls and limited data security. "One of the things they've managed to do is [create] an all-in-one computer monitor, smartboard, and endpoint at a price that's right around \$6,000. For all the functionality it gives you, it's a great price, but with a piece of technology that does all that, it becomes very complex. It's not easy to use that type of equipment."

"It's not really about the equipment for us. It's about finding the champions that are willing to go through this with you. If you have people that are not fully vested, the first time you have a technical problem, they derail and run away from the technology."

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Attempting to accommodate existing clinical resources creates another challenge, particularly in establishing sufficient bandwidth in remote locations. Mr. Gunnell stated, "A lot of places are ISDN lines, so basically it's asynchronous, it's not the same upload and download. It's pretty common for people to be able to get a 10-megabits-per-second download speed, but then only have 1.5 megabits up or something like that. Obviously, if you're doing very many clinical encounters and people are utilizing your system, 768 kilobytes doesn't go a very long way."

Educating end users introduces other problems, and Mr. Gunnell gives the example of a rural clinic where UVA Health might offer a significant number of specialties. "We urge a 5-megabit up and down pipe, in and out, so that we have the very best capability to have the very best images we can have. For a single clinic, a 5-megabit pipe would be plenty of bandwidth. The challenge becomes, a lot of these places will try to use that 5-megabit pipe for everything. If they have a couple on their desktops set up and they're watching YouTube videos and we're trying to do a clinical encounter, it can impact."

Aside from solving technological challenges, Mr. Gunnell emphasized the critical importance of locating strong advocates and leaders in the creation of any telemedicine program. "It's not really about the equipment for us," he said. "It's about finding the champions that are willing to go through this with you. If you have people that are not fully vested, the first time you have a technical problem, they derail and run away from the technology. So find partners that are very flexible and will work with you through the bumpy road of getting things started. It's really finding those internal champions that are going to help you grow it, and that are going to use it."

UVA Center for Telehealth plans to continue developing data analytics to identify ways to refine and streamline care delivery. "We've got to be able to make sure that those are quality-managed, and we need to know the data, and we have to

have capability for super analytics on top of this,” stated Mr. Gordon. Mr. Gunnell added, “We collect data on a ton of stuff – from mileage, to number of encounters, to number of particular kinds of encounters, to time to encounters, and we keep a performance notebook.”

Mr. Gordon emphasized that every telemedicine program will be as unique as the individuals in the organization. “I would urge a place just to try it. You become convinced very quickly that this is technology and service meeting [with] the highest qualities of human existence. I think it is something that every place ... needs to try,” he stated. “Everything is a pilot continually in this. As long as you’re willing to pilot it to experiment and learn, you become hooked that this is a real resource that can make a real difference to people and communities in need.”

## More Information

For more information, please visit <http://bit.ly/SYW2ca>



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