

# IoE-Driven Capabilities Help OTN Reduce Travel and Hospitalizations – and Improve Patient Care



## EXECUTIVE SUMMARY

### Objectives

- Help the medical community integrate telemedicine into everything they do
- Deliver better care and value

### Strategy

- Provide a technological and organizational structure that supports and maintains telemedicine capabilities throughout the province of Ontario, Canada

### Solution

- OTN provides tools that allow healthcare organizations to easily communicate with one another
- Physicians and other healthcare providers use the network for conferencing, clinical collaboration, and to gain access to education
- OTN's services fall into five areas: Health Care Office, E-Consult, Emergency Telemedicine, Learning, and Telehomecare

### Impact

- OTN facilitates more than 300,000 clinical encounters and more than 40,000 educational and administrative events annually
- Telemedicine helped Ontarians avoid more than 259 million kilometers (more than 161 million miles) of travel in the last year
- Telehomecare has drastically reduced hospitalizations among chronic care patients enrolled in the program – a 60 percent reduction in the pilot program and early results of 71 percent in the expansion program

## 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/1aSGlzn>).

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.

“We’re trying to support the medical community to really think about ways to leverage this technology. There are two reasons to do that. One is to provide better care for patients. The second is to provide better value for money. In a sense, we have become telemedicine consultants to help support organizations to do both.”

Dr. Edward Brown,  
Founder and Chief Executive Officer,  
Ontario Telemedicine Network

## About the Ontario Telemedicine Network

The Ontario Telemedicine Network (OTN) is one of the largest – if not the largest – telemedicine networks in the world. OTN focuses on delivering tools that incorporate telemedicine into mainstream practices.

With more than 1,300 collaborating organizations, including hospitals, clinics and research and academic institutions, OTN provides a technological and organizational structure that supports and maintains telemedicine capabilities throughout the province of Ontario, Canada. In terms of scale, OTN provides more than 300,000 clinical encounters and 40,000 educational and administrative events each year.

Dr. Edward Brown is a founder and chief executive officer of OTN. Dr. Brown has won numerous awards for his work, including a Queen Elizabeth II Diamond Jubilee Award for his contributions to healthcare in Canada. He serves on several boards and is the president of the American Telemedicine Association.

Frank van Heeswyk is chief technical officer and vice president of technical services for Ontario Telemedicine Network. An experienced systems and development engineer, he worked for a number of technology companies in Canada, including stints as vice president of product development for Taqua, and as vice president of engineering for SOMA Networks, prior to joining OTN in 2012.

## Objectives

Seeking a way to bridge the sometimes vast distances separating physicians, specialists, and patients in rural Canada, Dr. Brown founded the NORTH Network in the early 1990s.

“Basically, in those days, telemedicine was hardware-based video-conferencing platforms via dial-up or, subsequently, private networks that linked them all together around the province,” Dr. Brown said.

Services provided by the network have expanded since the original teleconferencing solution, powered by advances in technology, monitoring, and the development of new clinical approaches such as self-management coaching for at-home patients.

“We’ve gone through an Internet revolution, and it’s finally happening in healthcare. We still use hardware video-conferencing units, and they are still valuable things you can roll around in a hospital, for example, but we’ve added much lower-cost software video conferencing. Everybody understands IP video-conferencing software now. It’s standard on your iPhone or on your Android. We’ve added that and integrated it into the network,” Dr. Brown explained.

According to Dr. Brown, his primary goal is to assist the provider community in integrating telemedicine into everything they do.

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## Strategy

In 2006, Dr. Brown's NORTH network merged with two other telemedicine networks to create the Ontario Telemedicine Network.

"We spent a few years integrating and developing a set of key services to support providers," Dr. Brown said. The results can be found on OTN's one-stop website, which provides secure access to OTN's services. Among its many links, patients can learn more about Telehomecare, providers can consult with one another, healthcare organizations can schedule events, and teleconferences can be scheduled.

Thanks in part to an active marketing and communications campaign to create awareness in the healthcare sector, growth at OTN has been remarkable. More than 300,000 clinical events took place last year – a 33 percent increase compared to the previous year. An independent, not-for-profit organization, OTN is primarily funded by the Government of Ontario. Additional revenue comes from the membership fees of non-ministry of health providers and from additional fees for installations of telemedicine systems and various premium services offered.

OTN provides tools that allow healthcare providers to easily communicate with one another and with their patients.

## Solution

OTN provides tools that allow healthcare providers to easily communicate with one another and with their patients. Providers use the network to deliver care through video conferencing with patients. Providers also share data asynchronously among themselves to deliver clinical care for their patients. They also use multipoint video conferencing, web conferencing, and webcasting technologies to support educational events or meetings over a distance.

"The first and probably the most important service we provide is harmonized collaboration," Dr. Brown said. OTN's collaboration agreement with its members requires standardization across the various members' systems and processes to allow easy communication with one another, including one set of technical standards and a privacy and security overlay. OTN support staff is available to assist members with business process support, technical support, and training. "We provide that core governance structure and the core business process that everybody needs to work with each other," he said.

OTN maintains two large data centers within the provincial infrastructure that host centralized services and applications, as well as manage network data traffic. OTN members use OTN's virtual private network to communicate via video-conference appointments and sharing. OTN also provides software interfaces that deliver their various services, such as video-conference appointment scheduling and consulting and technology support services to keep members' systems up and running.

OTN's video-bridging system includes dynamic transcoding and speed matching to allow different video-conferencing systems to communicate with the highest possible video quality. The system also operates an IP gateway as well as a centralized pool of ISDN circuits that non-members can use to connect with the system using compatible video-conferencing systems.

Video content between physicians and their patients is private and secure; it is not stored, but “disappears into the ether” following the video conference, according to Chief Technical Officer Frank van Heeswyk. According to Dr. Brown, in the vast majority of cases, individual healthcare organizations own the technology that connects them to OTN’s network. This includes the computers, monitors, cameras, and even specialized monitoring equipment such as digital stethoscopes and otoscopes. OTN will assist in providing recommendations when organizations procure these items to help ensure they are compatible with the network, but OTN does not own the equipment itself.

### Healthcare Office

Dr. Brown describes Health Care Office as “traditional telemedicine.” For physician/patient encounters, OTN’s Health Care Office replaces traditional doctor’s examinations with the use of video conferencing and telediagnostic instruments like digital stethoscopes, handheld exam cameras, and digital otoscopes. The patient typically travels to a local rural health center or clinic for access to both the medical and conferencing equipment. “Basically, it’s like a visit in the office, except the patient and the doctor are a thousand miles away from each other,” said Dr. Brown. “Last year we facilitated about 300,000 events of this nature.” A telemedicine coordinator – in the same location as the patient – assists physicians in managing examinations and consultations.

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Mr. van Heeswyk emphasizes that during physician/patient interactions, measurements from biometric sensors such as stethoscopes and handheld cameras are reviewed by the physician in real time. OTN’s primary role in these encounters is facilitating the collection of patient data, much as data would be collected if the patient were examined in the physician’s office. “OTN is all about facilitating the patient/provider interaction through virtual means,” he said.

### E-Consult

E-Consult is an asynchronous service used in cases where a provider needs a specialist opinion but the diagnosis and management plan can likely be provided by the referring provider. There’s no direct interaction between the patient and the specialist. For example, digital images and the patient’s history, collected by a primary care physician, are sent to a specialist located hundreds or thousands of miles away. That specialist then diagnoses and provides treatment advice based on the digital information. The specialist typically does not see the patient directly, and all patient interaction is managed through a primary care physician.

“It’s pretty straightforward,” Dr. Brown said. “You have a funny-looking mole or a rash. Your primary care provider takes a picture, adds your history and sends it electronically to the dermatologist, who reviews it at a convenient time and sends back a management plan and advice.”

These various asynchronous technologies greatly extend reach of specialists to people living in areas without specialists. Examples of specialties where E-Consult has been highly utilized include dermatology and ophthalmology. The service is growing in wound management and even in psychiatry.

“In areas where there are not as many psychiatrists – in rural areas, for example – a health professional will video-record a standard interview and send it along to a psychiatrist to review and provide advice.”

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“In areas where there are not as many psychiatrists – in rural areas, for example – a health professional will video-record a standard interview and send it along to a psychiatrist to review and provide advice,” Dr. Brown explained. “E-consult will be soon be used in every specialty because it enables healthcare providers to collaborate more effectively and deliver better patient care.”

### Emergency Telemedicine

Emergency telemedicine provides rapid access to specialized resources whenever and wherever they are needed. This service includes emergency telestroke care, burn care, trauma care, mental health crisis support and tele-ICU care. In many of these cases, there is an urgent need for specialist knowledge and insight. By providing an emergency telemedicine service, OTN has greatly expanded the medical capabilities of rural clinics and small hospitals, linking them with larger trauma centers and other centers of expertise.

### Learning

Learning leverages OTN’s network to provide cost-effective professional education opportunities or administrative events such as group and/or one-to-one meetings. OTN offers fully integrated conferencing solutions, including video conferencing, webcasting, and webconferencing.

By enabling cost-effective dissemination of health education and best practices, OTN enhances access to the collective intelligence of healthcare providers across the province and reduces travel costs. More than a quarter-million people per year participate in OTN-facilitated education events.

### Telehomecare

Telehomecare is OTN’s newest program, delivering weekday monitoring and weekly self-management coaching to chronic disease patients in their own homes. Currently implemented for patients with Chronic Obstructive Pulmonary Disease (COPD) and Chronic Heart Failure (CHF), the program includes daily monitoring of biometric statistics, providing a live feed to a specially trained nurse or respiratory therapist. A pilot is currently studying the applicability of Telehomecare for persons with diabetes.

According to Dr. Brown, in the healthcare systems of most developed countries, about 5 percent of the population uses 60 to 80 percent of healthcare resources. Patients with chronic disease represent the largest part of the 5 percent. “Tele-homecare targets COPD and CHF because there’s a large behavior management component to controlling those diseases. If we can actually improve patients’ understanding of their disease, if we can help them manage it better, we can keep them healthier, keep them alive longer, and keep them out of the hospital. And that substantially reduces the pressure on healthcare resources,” Dr. Brown said.

Telehomecare requires weekday self-monitoring of biometrics by the patient. Nurses monitor the data and provide feedback, coaching the patient in healthy behaviors and intervening or alerting a physician when problems appear.

“These diseases require education and behavioral changes. These are process-oriented changes that we just haven’t been able to implement as a system because we haven’t been able to reach out to the patient in their home. We haven’t been able to give them what they need to be successful. This is really addressing what I believe is the core challenge that we have: how to keep these folks healthier and out of the hospital.”

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The medical devices used by the patient are either Bluetooth and connected to a mobile device or are plugged into a tablet’s USB connection. The data is normally transmitted directly without intervention by the patient. “Patients use a touchscreen tablet to answer questions about how they are feeling and a set of devices to measure their oxygen levels, sometimes their weight, and their blood pressure,” said Dr. Brown.

“It’s all automated,” Dr. Brown added. “We don’t like the idea of patients typing in data – they make mistakes. And, sometimes, they don’t like to tell you how much weight they gained. It’s all machine-to-machine. The connectivity depends on what they have in their home.” In most cases, patient-monitoring equipment connects to OTN servers via the patient’s in-home Internet connection.

Mr. van Heeswyk points out the importance of maintaining ease of use in designing digital medical peripherals for patient use. “They can be as simple as a scale where they measure their weight. It can be a pulse oximeter. It can be a blood pressure cuff. Almost any device can be hooked into the system.

“The nurse or respiratory therapist responds to numbers that are outside the norms for that patient,” he added. “They can connect with the patient’s doctor to make a change in medication or, in some cases, use the opportunity to coach the patient. It helps prevent the patient from getting sicker.”

As Dr. Brown explained, “One day, a patient will get a call from the nurse, who has noticed that they’re gaining weight and their oxygen level is dropping. The patient will pick up the phone and say, ‘I knew you’d call. I had a big fish and chips meal last night with a lot of salt.’ So patients begin to really understand that how their behavior changes their lives.

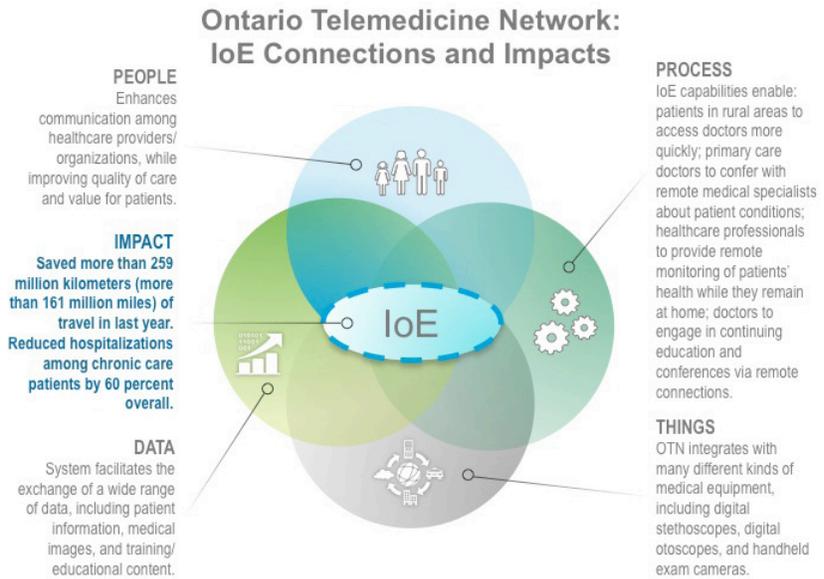
“It doesn’t sound like much, but if you’re a patient with heart failure and you start to collect fluid because of your diet, you gain a pound in weight and that fluid ends up in your lungs. You end up short of breath, you call 911. You’re in the intensive care unit with a breathing tube for two weeks before they can get you home, if they can get you home at all. When you’re able to help a patient avoid that behavior that causes fluid retention, you’re making a patient a lot healthier and you’re saving the health system money.

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“Telehomecare is extraordinarily powerful. In fact, it’s probably the most powerful thing I’ve seen to help patients understand their illness and change their behavior.”

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Figure 1. Ontario Telemedicine Network: New and Better Connections.



Source: Cisco Consulting Services, 2014

## Impact

According to Dr. Brown, the benefits of telemedicine and the OTN network are profound. The ability to provide services in rural areas and to improve access to specialists and other healthcare providers has changed healthcare. Last year, OTN provided access to nearly every medical and allied health specialty, and was used in more than 300,000 clinical encounters and more than 40,000 educational and administrative events.

Because care is delivered in or near the patient’s home, it avoids costly travel and results in quicker patient engagement. “Telemedicine saved more than 237 million kilometers of travel in the last year alone – that’s a greater distance than 300 trips to the moon and back,” Dr. Brown explained.

In addition, quicker access to specialty consultations results in faster diagnoses and more coordinated treatment plans, and access to immediate emergency consultations can even save lives in acute care situations.

Daily in-home monitoring in the Telehomecare pilot is translating to better patient self-management, leading to drastically reduced hospitalizations among chronic care patients – a 65 percent decrease in the pilot program, and early results of a 71 percent decrease in the expansion program.

Through self-monitoring and regular health coaching, patients become more aware of the significance of gained weight, higher blood pressure, or other changes in the numbers. They begin to understand how their behaviors drive their conditions. “Telehomecare is extraordinarily powerful,” said Dr. Brown. “In fact, it’s probably the

most powerful thing I've seen to help patients understand their illness and change their behavior."

## Lessons Learned / Next Steps

"Massive changes in technology have revolutionized telemedicine," Dr. Brown said. "We have much more ubiquitous connectivity – everybody is connected. We have exciting activity in the space to develop new applications that are software-based, new sensors, and, probably most important, we have a newfound understanding and awareness of the power of the connected Internet. Healthcare providers now understand and are excited by this new world."

OTN is about to launch a new platform to promote collaboration that will make access easier and enable new developments in E-Consult, Telehomecare, and direct-to-patient services. "We're going to give everybody one place to go for all of their collaborative and telemedicine services. Single sign-on, the ability to find each other and the resources they need, ability to organize it, and the ability to actually do it. And we're going to build it so that it's integrated with all the rest of the e-health infrastructure that we have in Ontario."

"Your physician is going to tell you to take two apps and call her in the morning."

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The Ontario Telemedicine Network is at the forefront of the rise of telemedicine as a mainstream channel for healthcare delivery and Dr. Brown is excited about the future, predicting that genomics and nanotechnologies will have a profound impact on the industry.

"There's a revolution underway in terms of devices and sensors that will live at the patient side of the equation," he explained. "There's amazing stuff out there that will read your blood sugar, transmit your heart rate, check your blood pressure, whatever it is. There's really incredible technology, and it's already out there and already approved. It's not science fiction – it's already being used." As technology becomes more widely available and more reasonably priced, Dr. Brown sees more change. "We are just beginning to see the next wave of innovation and entrepreneurship," he said.

Mr. van Heeswyk sees growth in the future as trending away from video conferencing on dedicated systems and moving toward personal devices, apps, and other technologies compatible with mobile devices. "I think the legacy [video conferencing] systems are not going to grow much. I think they will always be around, but I think the major growth in the future will be around access via personal devices over the Internet," he said.

Dr. Brown's vision of the future is one in which patients take an increasingly active role in their own health and are more comfortable with conducting their own biometric testing, becoming more personally vested in the results. "Your physician is going to tell you to take two apps and call her in the morning."

Dr. Brown adds that the savings and convenience of telemedicine are secondary priorities to increasing access to high-quality health care. “It’s about how you are going to use this technology, how you are going to create the processes and support that will make this meaningful for your patients, for your providers, for your organization. Technology is the enabler – it allows you to think about how you’re going to make things better.”

## More Information

For more information, visit <http://www.otn.ca>



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