EVOLUTION

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this issue

IPv6 and Modern Healthcare

To many, the task to implement IPv6 is just another technology burden that is added to the already overloaded list of technical projects that need to be done. Many times, it takes a back seat to other, more urgent projects. To others who do not understand the technology, it is just another mandate where the need or benefit is unclear, undefined, and even unnecessary. The question that always seems to percolate to the top is "Why IPv6 when IPv4 is working so well for us?"

The implementation of IPv6 is not only an important technological implementation for VA, but it is also a necessity. As more veterans return to their homes in the coming years, the attention is on VA to provide necessary services to these veterans in a manner that is faster, cheaper, and better. One key area where VA can realize the benefits of the implementation of IPv6 is in the area of veterans' healthcare.

More than half of the veterans live in areas defined as being rural. VA is leaning more on technology innovations of telehealth to provide key health services to these veterans. Telehealth capabilities save money both for VA and the veteran. The veteran can receive higher level services closer to home in a more timely fashion. They can be under "real-time

Continued on page 2...

The Healthcare Focus

This issue of Evolution is focused on healthcare technologies and IPv6. A substantial part of VA's support of the Veteran is in the medical arena. IPv6, as a technology, provides VA with the opportunity to provide next generation technology medical support to the veteran.

What is IPv6

IPv6 is the next generation Internet protocol developed by the Internet community to replace the current IPv4 protocol. IPv6 provides an almost unlimited amount of address space and has been developed to meet the requirements and performance of today's businesses, governments, and consumers. While IPv4 and IPv6 can operate on the same network, they are not directly interoperable.

IPv6 and Modern Healthcare

Serving the Veteran with Advanced Technology

Continued from Page 1

monitoring" right in their home. High-Definition video teleconferencing can put them in direct contact with specialists where travel is costly.

The implementation of IPv6 can improve these services in the following ways:

Performance: IPv6 eliminates the need for Network Address Translation (NAT). By eliminating that need, high definition video, remote monitoring, and remote diagnostics can achieve better performance in real time eliminating stuttering or other delays that may skew diagnostic results. Lost or delayed data can influence a particularly difficult diagnosis.

Security: The IPv6 session is encrypted and secured by the nature of the protocol. This is important when we consider the security of patient data and privacy. The ability to hijack the session or capture patient data becomes more difficult, especially over networks outside of VA such as ISP or other public networks.

Scope: Because of the virtually limitless address space, the number of devices involved in the care of VA patients can also increase. Network attached diagnostic equipment can allow patients to be monitored by a variety of pieces of equipment individually. This increases capability and flexibility.

Service: With the exhaustion of IPv4 addresses, in coming years, there may be veterans getting Internet service purely on IPv6 networks. The ability to service those veterans hinges on VA's ability to provide all services over the IPv6 protocol.

The implementation of IPv6 is more than just another project; it is a communication protocol that can allow VA to securely serve the medical needs of veterans faster, cheaper and better while leveraging the benefits of advanced medical technologies.

IPv6 in a Hospital Near You

It is logical for hospitals to embrace the concept of IPv6 transition and the adoption of equipment that implements the protocol as a core capability. One possible implementation might be for hospitals to put RFID tags (electronic tags attached to objects for the purpose of identifying and tracking) on wheelchairs. Wheelchairs are expensive to buy, and it is costly to have nurses spend time trying to find them throughout a large hospital. Case studies have shown that tagging them would be more cost effective.

Taking the concept a step further, under IPv6, hospitals could track every surgical instrument, even individual cotton swabs, to make sure that nothing got left inside a patient during an operation. From a technical perspective, it's feasible. There would be an incredible business value in having that type of tracking and inventory capability. Hospital CIOs need to get with their business colleagues and say, "Given that I can bring you this technical ability, let's have a conversation about what new services it would allow us to offer our patients."

Another possible application would be outfitting a patient with an RFID chip that can provide the primary care provider the ability to locate the patient anywhere in the hospital. The information can be used to track the patient through diagnostic procedures, as well as locate ambulatory patients when they are needed for procedures.

Location capabilities alone help save time, minimize waste, and reduce the potential for mistakes.

IPv6 Enabled Medical Devices

As the world continues to march toward universal deployment of IPv6, the availability of devices that leverage the protocol will increase. Many foresee that medical devices can leverage the protocol in unique and very beneficial ways. In a perfect world, each medical device could be individually attached directly to a database, allowing a healthcare provider to view a complete picture of a patient at a glance, with all the critical information they need literally at their fingertips.

This reality can be realized with the increase in development of medical biosensors. We have seen the potential of this capability running over the existing IPv4 networks. It is not hard to see the limitations of the current technology. We are limited by speed, security, and address space. IPv4, even when on high-speed networks is not optimized for the speed or the data load requirements.

Information technology tools in the medical domain have resulted in increased usage of biosensors to monitor the critical vital signs in real time. For example, medical biosensors can allow healthcare professionals to maintain continuous monitoring of the vital parameters of a patient within a geographical area that may span from a hospital room to an entire city or even the entire globe. This capability requires a robust network infrastructure that allows the sensory information to reach the destination on a continuous basis in real time thereby alerting the healthcare professionals to any medical condition requiring attention. It also allows the healthcare professionals to take proactive measures rather than following a reactionary approach in extending critical healthcare facilities.

New applications may include remote diagnostics and telemedicine that allow the healthcare professionals to monitor their patients round the clock, run diagnostic checks on them, and allow consultation through the use of various interactive communication technologies. IPv6 biosensors will be increasingly used in the medical services to cater to a number of information needs. Biosensors allow doctors to remotely check the vital signs of a patient. It also helps them monitor any noticeable changes on a 24x7 basis providing the capability to take preemptive steps in responding to the patient needs.

The most important benefit that IPv6 enabled medical devices can provide is the ability to securely communicate with the necessary medical facilities while being mobile. The patient could leave their home and possibly go to the local coffee shop or even on a cross-country trip without losing the ability to communicate with their medical team. The ability to remain connected or even reconnect when out of a service area is seamless. The technological support for the patient is minimized and the data available to the healthcare team is maximized.

The IPv6 Code

The challenge to effective IPv6 transition lies in the ability to write programming to support the devices in use. There are several levels of computer code that need to be considered when a networked medical device is to support IPv6 protocol.

The first computer code to be analyzed is the firmware. This is the code that is embedded in the computer chips on the device. The computer chips need to be able to support the new code that implements the IPv6 protocol.

The second implementation, in many devices, is the embedded code. This is the "operating system" that the medical professional interacts with on the device. It may be simply text or some sort of graphical interface.

The third implementation is more controllable. This is the operating system that we commonly think of as Windows, Unix, Linux, or Apple iOS. Guidance from the vendors for compatibility is publically available just by searching their company web sites.

The fourth area of code that needs attention are the Back-End Services. These are often the database, e-mail, or web services that we do not see directly, however, we do notice they are missing when connection is lost.

The IPv6 Q&A Corner

Q: Is my facility capable of supporting IPv6 medical devices?

VA is in the early stages of IPv6 transition. Even at that, VA is leading the way among other Federal Agencies in their implementation projects. The VA IPv6 Transition Program Office is working diligently to meet the OMB milestone directives. By 2012, all of the perimeter systems will be able to communicate using IPv6. After that, it is a progression to implement the capability to communicate using IPv6 throughout the network. There are many components of the network to consider including local network segments and the applications that run on them. So, your facility, most probably, is not capable of supporting IPv6 medical devices at this time. There are, however, several pilot projects in the planning stages. If you are interested in a pilot project, or want to sponsor one, please contact the IPv6 Transition Office.

VA IPv6 Steering Committee

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Upcoming IPv6 Related Events

Network World: The Critical Path to IPv6
December 13, 2011 New York, NY

NTIA IPv6 Conference
December 20, 2011 Washington, DC

V6 World Congress 2012
February 7-10, 2012 Paris, France

2012 North American IPv6 Summit
April 9-11, 2012 Denver, CO

VA Interagency IPv6 Meeting
April, 2012 TBD

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Get more information on VA's IPv6 efforts at:
http://vaww.netops.oit.va.gov/IPv6.asp