![Ciena logo — Experience. Outcomes.]

Applying Ethernet Services to Enable Advanced Healthcare Applications

Healthcare providers of all sizes, from hospital systems to medical centers and provider consortiums, are under pressure to improve quality of and access to care while reducing costs. The challenge is ambitious but necessary, given the push toward a value-based payment model and demand for a better patient experience.

New, disruptive technologies such as artificial intelligence, augmented and virtual reality, 3D imaging, and whole-genome sequencing are revolutionizing patient treatment. Connected-health solutions, including telemedicine and telehealth, enable providers to deliver virtual medical consultations and preventive and educational services to remote patients. Image-enabled Electronic Health Records (EHRs) and enterprise imaging architectures streamline information sharing to help providers expedite care and improve treatment accuracy while creating business process efficiencies that reduce operational costs. For many medical centers and provider consortiums, however, digital services require modernizing the IT network to support more data traffic and the transmission of high-bandwidth, latency-sensitive applications. IT modernization can be especially challenging for organizations that prefer to focus on delivering high-quality patient care rather than managing a complex communication network.

Ethernet services from a reliable communication service provider can support healthcare's most demanding digital networking requirements to ensure the bandwidth capacity and performance required to support advanced medical applications. This paper summarizes the healthcare challenges requiring network modernization and describes how organizations can deploy Carrier Ethernet solutions to support clinical and non-clinical IT needs across their ecosystems.

Keeping people healthy efficiently has impacts on IT

Medical centers and provider consortiums are applying digital technologies throughout their ecosystems of partners to improve quality of care, expand access to patients, and reduce costs.

Feature and Benefits

- Shares digital patient data quickly across the spectrum of providers involved in the treatment plan
- Provides flexible bandwidth capacity to support digital healthcare applications
- Supports a comprehensive Business Continuity/Disaster Recover (BC/DR) strategy through cost-effective high-speed connectivity between data centers

Improving quality of care and patient outcomes

Providers are using networked medical technologies to increase the accuracy of diagnoses and improve the quality of clinical and non-clinical care. Healthcare AI platforms, genome sequencing, cognitive computing[1], and other resources are enabling medical centers and consortiums to analyze patient data, improve the accuracy of diagnoses, and craft life-saving treatments for patients with precision, personalized medicine. New 3D medical imaging technologies, used in conjunction with virtual-reality tools, can expedite preparation for outpatient surgical procedures to increase accuracy and improve outcomes.[2] Remote-assisted robotic surgery makes it possible for specialists to perform procedures regardless of a patient's location. In-home telehealth solutions can actively monitor patients 24/7 to improve care for the elderly, as well as the burgeoning population of patients with chronic diseases.

Organizations using these technologies must ensure the IT system provides the required capacity, bandwidth, and performance characteristics. For digital medical applications that use real-time, high- definition video, for example, the network must ensure seamless connectivity, high bandwidth, ultra-low latency, and minimal jitter. The network must be also able to transmit data to and from medical centers, consortium locations, labs, and surgical centers and support the transmission of advanced EHRs, which can now include massive radiology imaging files, genome data, and high-definition video. The network must be able to prioritize traffic and scale bandwidth in real time to accommodate the volumes and varying types of traffic.

> Disruptive healthcare technologies
> and their impact
> Learn more   →

Improving access to affiliated specialists and providers to bolster population health and wellness

A healthy population costs less to serve, but patients must have ready access to providers, facilities, and services to remain in good health.

Medical centers are expanding partnerships with outpatient consortiums and establishing free-standing emergency care centers closer to where patients work and live. They are using telemedicine technologies to extend care to rural clinics and schools, helping overcome physician shortages.[3] They are also using telemedicine to offer virtual ICUs, virtual doctor visits, and other innovative services[4] that make care more convenient for patients. Telehealth applications, accessible via mobile devices, enable patients to manage health and wellness, facilitate patient engagement with providers, and strengthen patient/provider relationships.

Expanding access via these approaches does increase digital networking needs. In addition to support for telemedicine networking requirements, organizations must share EHRs between more facilities and providers. IT networks must also accommodate the data explosion and traffic growth created by telehealth applications.

Reducing costs by improving business efficiencies

Many medical centers and consortiums are streamlining clinical operations and creating new service offerings that improve revenue and financial stability. Eliminating outdated IT systems and inadequate network technology can significantly reduce costs while improving clinical operation flows. Replacing legacy network connectivity with Ethernet services extends connectivity to affiliated locations and meets the bandwidth-intensive demands for modern health IT. Most importantly, Ethernet services minimize network management and maintenance requirements. This means more time treating patients, and less time worrying about the network.

Consolidation of medical imaging systems offers another strategy for cost reduction. Many medical centers and consortiums are evolving beyond their internal Picture Archiving and Communication Systems (PACS) and adopting public or private cloud-based enterprise imaging architectures[5] that facilitate exchange of medical images over a converged network for internal and external stakeholders. The approach not only reduces costs, it reduces error and enables diagnosticians and physicians to view images simultaneously to collaboratively craft treatment plans for the best possible patient outcomes. To facilitate timely retrieval, distribution, and sharing of massive medical imaging data sets among more constituents, organizations must have high-capacity, high-speed networks that always run at peak performance.

1 HIT Infrastructure; "How IBM Universal Quantum Computing Impacts HIT Infrastructure" by Elizabeth O'Dowd; March 6, 2017
2 The Wall Street Journal; "Virtual Reality Is Coming to Medical Imaging" by Amy Westervelt; February 15, 2016
3 Becker's Hospital Review; "New Data Shows Potential 100k+ Shortfall of Physicians by 2030: 8 Things to Know" by Emily Rappleye; March 15, 2017
4 The Wall Street Journal; "How Telemedicine Is Transforming Health Care" by Melinda Beck; June 26, 2016
5 TechTarget; "Enterprise Imaging Is becoming Mainstream in Healthcare" by Shaun Sutner

Ethernet: A practical foundation for healthcare IT

Ethernet services can provide the networking foundation healthcare providers of all sizes need for their advanced digital medical applications. Ethernet services are very practical for healthcare; their versatility enables medical centers and consortiums to seamlessly integrate clinical and administrative services on a single network while ensuring scalability for future growth.

With Ethernet Services, healthcare providers can support:

- Dedicated, secure, high-capacity, high-performance services between primary locations, affiliated providers, specialists, radiology centers, urgent care facilities, and lab services
- Telesurgery applications that require ultra-high-quality video transport with ultra-low latency, minimal jitter, and five-9s reliability
- Telehealth services for long-distance clinical care, networked information and educational applications for patients and professionals, and 24/7 real-time patient/doctor communications
- Rapid transmission of next-generation EHRs, massive genome files, or medical images from PACs or enterprise imaging systems
- Point-to-point connections between data centers and cloud services
- Video traffic and data flows from Internet-based telehealth services and mobile medical apps
- VoIP, videoconferencing, and data communications for the business

Ethernet services include provisioning conveniences that medical centers and consortiums can use to tailor their implementations to meet their specific needs. The network can allocate bandwidth for specific classes of service and prioritize traffic for latency-sensitive applications. Depending on the solution deployed, bandwidth can be scaled as required and in real time, on demand, from 100 Mb/s to higher than 100 Gb/s. Carrier-class performance, including self-healing capabilities that reroute traffic in case of a failure, ensures 100 percent uptime for critical systems.

Carrier Ethernet Essentials
Get the infographic

Considerations for deployment

Because no two healthcare systems are alike, Ethernet service deployments will vary depending on the number and type of facilities connected, the types and volumes of traffic transmitted over the network, and the performance requirements for the various services.

To establish a facility's network needs and develop a deployment strategy, consider:

- The ability to predict and manage bandwidth and networking costs with the current technology
- How much bandwidth each digital application consumes
- If the current network has enough bandwidth to support PACs or access an enterprise imaging system
- If network capacity can support increasing use of an EHR application
- Whether the organization is currently offering or planning to offer telemedicine and robotic surgeries that require extremely low latency
- The number of patients expected to use remote device monitoring, and how much traffic and bandwidth these services will require
- How the facility connects users to its data centers and cloud service providers
- The organization's ability to scale its network bandwidth and performance for specific facilities or connections, depending on clinical needs and schedules

To get started modernizing IT capabilities, contact Ciena to learn how its Ethernet services are helping improve quality of and access to care and reduce costs for healthcare systems.

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