



# FIVE REQUIREMENTS OF A HEALTHCARE NETWORK

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*Delivering Performance, Flexibility, Security,  
Simplicity, and Economy in an Era of Disruption,  
Competition, and Cost Pressure*

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# EXECUTIVE SUMMARY

The healthcare industry's current struggles to reduce costs, improve patient outcomes, and increase access to information are fundamentally transforming the delivery of health services. Many providers are expanding or building entirely new facilities to deliver updated care models, and one of the many benefits resulting from this effort is an opportunity to take a fresh look at how to build a modern health IT system.

Many healthcare providers are leveraging the latest IT trends such as virtualization, cloud, mobility, and big data analytics to provide a foundation for next-generation facilities. The most savvy providers are carefully considering how data communications—specifically the network—can enable caregiver mobility; connect the ecosystem of clinicians, patients, and medical devices; provide a scalable platform for new care models; and ultimately safeguard patient data.

When faced with a new build, expansion, or network refresh, healthcare providers should consider five essential requirements to deliver on the promise of continuous care delivery. This white paper addresses these requirements and provides examples of how one health system leveraged these requirements to build a next-generation network that aligned with its growth strategy.

## Introduction

Several key IT trends emerging in the modern healthcare provider environment are largely driven by the notion that IT can be better leveraged to reduce costs, improve outcomes, and increase access. Mobility, cloud strategies, collaboration tools, and real-time location systems (RTLS) all help to improve clinical and administrative services. At the same time, security and compliance requirements are forcing IT teams to reconsider how to deliver these new services quickly and efficiently. Failure to protect patient data is not only a regulatory and trust issue; it is also a revenue issue. Consumers will likely change doctors and hospitals if their medical information is stolen. Among the considerations must be a flexible yet solid foundation provided by the hospital's data communications network.

The related trends of clinical mobility and BYOD place difficult demands on the overall IT system and the staff members who support it. As patient records become fully digitized, clinicians realize the benefits of enhanced data exchange through mobile platforms, and they demand access to dozens or even hundreds of applications anytime, anywhere, from any device.

Medical equipment manufacturers are also realizing the benefits of delivering new, wireless-capable devices like monitors and pumps. While wireless—and eventually remote access—will supersede onsite wired access as the connectivity method of choice, both wireless and wired access to network and communication resources remains a major consideration in architecting the provider IT system. More endpoints—whether user or IoT—can create more opportunities for attackers to breach an organization's network.

## The Critical Importance of the Network

When it comes to healthcare IT, the network is often overlooked—mainly because it's invisible until it goes down. The network is expected to be available at least 99.999 percent of the time while delivering data quickly and efficiently between clinical devices and caregivers.

Additionally, the provisioning, management, and security of personal and hospital-owned mobile devices are a significant consideration. Smart, connected devices are an increasingly important part of patient care, with everything from smart beds and infusion pumps, to diagnostic imaging, to monitoring patients at home. Developing and adopting both comprehensive mobility, IoT, and security policies ensures that provider IT teams have addressed the availability, performance, and security requirements to deliver next-generation mobility and patient services.

## Business Intelligence and Data Analytics

To take advantage of the continuous stream of data pouring in from many sources, providers must also consider the impact that big data analytics, visualization, and data warehousing have on their internal IT environment. Data from external data feeds, such as cancer or mortality data registries, must also be factored in. Fast access to massive data sets around the world is essential for clinical research. These logical and physical collections of data are used repeatedly to achieve greater understanding and make more informed decisions.

Since these data warehouses can be extremely large, they will drive the movement of sizeable amounts of data, typically between end users and data center storage and server environments. Research may require access to—and the ability to manipulate—the genome and other massive databases. Patient monitoring systems continuously collect data, and gleaning insights from that steady stream is vital to help clinicians deliver more personalized, real-time care.

Analyzing not only the data but the network itself is of paramount importance in this new era. The network is getting smarter, instrumented with telemetry and able to identify and fix pending issues automatically. Real-time visibility and actionable intelligence can help organizations conduct solid root-cause analysis, traffic engineering, and network optimization, drastically improving efficiency in overall operations.

## Managing Multicloud Complexity

Multicloud is more than using multiple clouds. Cloud is increasingly commonplace in healthcare, as providers rely on multiple cloud services for clinical and administrative, data hosting, and business continuity. The cloud makes it easy to provide caregivers with anywhere, anytime access to their applications and resources while maintaining HIPAA compliance. As a heavily regulated industry, however, healthcare leaders must secure and deploy their applications in the correct cloud environment to provide the right level of protection.

Multicloud environments enable healthcare providers to separate applications with different security requirements, but the reality is that a multicloud strategy is complex and must be carefully planned. Multicloud means connecting and securing applications end to end—from the data center to the point of care, across many clouds—as simply as if they were in one cloud. Any workload can be launched on any cloud across a multivendor environment. IT can manage resources as a single, cohesive infrastructure with consistent security and operations across all places of the network. The move to multicloud requires an operational transformation that's just beginning.

## Data Transit and Delivery

The network architecture has a significant impact on data transit and delivery. Clinical research, medical imaging, and analytics create huge amounts of data. How the network is designed plays a critical role in a hospital's ability to serve data to applications and clinicians where and when they need it. The network not only has to be flexible and scalable enough to grow as data communication demands grow, it must also be cost-effective and provide a return on investment over time. A conscientious approach to network architecture enables IT teams to build a network today that can evolve over time, delivering on the total cost of ownership and making the investment worthwhile.

## The Challenge and Opportunity of Disruption

Healthcare providers would agree that universally desirable network attributes such as performance, availability, flexibility, and low cost of ownership are difficult to implement in practical terms. In an existing hospital environment, IT teams are plagued by tremendous complexity within legacy systems, often supporting multiple disparate networks that have their own requirements, devices, and applications.

Additionally, making any changes requires downtime, and provider IT teams have extremely limited, if any, maintenance windows. While the ultimate goal is to become proactive and visionary, many IT teams remain in reactive mode, mired in operational inefficiencies. Therefore, operational simplicity must be a key consideration when designing and building a mission-critical communications infrastructure.

What network infrastructure requirements need to be considered during a new facility, expansion, or refresh project? How can IT design a network to provide the performance, flexibility, and simplicity required to support the next wave of health IT innovations while offering a return on investment?

## Case Study: Mapping Out the Requirements

A not-for-profit community health system that provides comprehensive healthcare services to nearly one million people built a highly resilient network to support round-the-clock operations. The organization operates three hospitals as well as medical offices, urgent care centers, rehabilitation centers, long-term care centers, and a mental health and substance abuse treatment center in the Southeast region of the United States. It needed to ensure that it had a proper foundation to connect its community partners now and in the near future. At a high level, the organization had three main objectives:

- Enhance patient care by shifting IT from a transactional platform to a core enabler
- Provide the most robust infrastructure to support the rollout of the Epic software suite, which requires nonstop services
- Implement a business continuity plan and network design that makes it easier to securely connect a growing number of community providers and partners to Epic

The health system opted for a network based on solutions from Juniper Networks that helps them realize their objectives by delivering carrier-class performance, flexibility and scalability, end-to-end security, operational simplicity, and lower total cost of ownership.

## 1. Carrier-Class Performance

As more patient and clinical services are enabled by technology, system outages and network downtime that can result in serious risk to patient safety cannot be tolerated. The growth of clinical applications and medical images, coupled with an explosion of biomedical data, was causing a substantially higher network load across the organization. The health system in this case study achieved its IT goal of a highly available network with nearly 100 percent uptime to support life-critical medical applications, high-definition video, and voice—all in a cost-efficient manner. It opted for a virtualized data center core to support more than 200 different applications and services, each with its own performance and security requirements, on a single network infrastructure.

The result is a flatter, less hierarchical, more point-to-point network framework from the patient and clinician to the data center and back. The design has improved the speed at which patient and application data can move across the system, resulting in better access to clinical data at the point of care when it is needed.

The organization's primary and secondary data centers must continually be in sync to meet business continuity requirements. Before the network upgrade, replicating data to the secondary site could easily overload the 1 Gbps link, which would make data recovery challenging during an unplanned event. Now, data is replicated in near real time, with less than one minute of delay.

"The higher capacity 40 Gbps network backbone and a fully meshed design help with our application uptime and capacity needs," the network architect says.

## 2. Flexibility and Scalability

While modernizing the variety of system platforms was a main priority for the IT leadership team, the health system had to build an IT staff capable of sustaining the network and keeping pace with a rapidly changing environment that includes many technologies and manufacturers. The IT team was tasked with planning ahead to build an environment that could support any and all new services, both clinical and administrative. Understanding that the data network was the foundation for supporting such growth, the IT team chose an open, standards-based architecture that served the current needs, but also allowed for evolution in the years to come.

Over the past two years, the health system has acquired a hospital and a clinic, and is preparing to host community-accessible electronic medical records for other healthcare providers in the region. Therefore, the need for flexibility and growth was essential. "Given our growth pattern, we need to be flexible and easily integrate with other technologies," the chief technology officer says. "We stick to standards-based solutions."

## 3. End-to-End Security

Given the state of cybersecurity today, it was imperative that security be fully integrated into the network architecture. Integrated security helps providers maintain compliance and minimize risk. The health system uses Juniper's Data Center Interconnect (DCI) capabilities for a fast, reliable, secure connection between its primary data center and disaster recovery site. It uses Ethernet VPN (EVPN) to connect its data centers using a Layer 2 bridge, enabling active/active replication and the ability to move virtual workloads as needed. As the network architect explains, "With EVPN, we can have the data center and disaster recovery site in the same address space, which allows for faster failover."

Virtual Extensible LAN (VXLAN) enables network segmentation on a far greater scale than traditional VLANs, and is essential to meeting healthcare providers' stringent privacy and security requirements. Using VXLAN makes it easier for the organization to securely connect a growing number of community providers and partners to Epic.

## 4. Operational Simplicity

The modern health system is a highly complex, coordinated system, particularly when leveraging a flat, consolidated communications network platform for all services and applications. One of the most critical requirements during this build was to invest in operational simplicity, which ultimately allowed the IT team to be more proactive and engineering focused.

The health system needed a high-performance, highly resilient network to support its growing organization. As the director of technical services explains, "The new network design allows us to perform concurrent maintenance without downtime, have higher bandwidth between application servers, and provide higher uptime for mission-critical applications."

The health system vastly simplified network operations by taking advantage of the single Juniper Networks® Junos® operating system for switching, routing, and security. The entire environment is now much simpler to manage, with fewer organizational challenges and dramatically streamlined network operations.

## 5. Total Cost of Ownership

With Juniper Networks, the health system has engineered simplicity into its network and created a foundation for delivering top-quality healthcare, so that patients can stay close to home when they need complex medical care. The new network is faster, more easily maintained, enables continuous operations—and is lower cost.

The health system expects to reduce the number of switches in its data center by 50 percent, delivering a sizable operational savings. Operations have been simplified for the network staff of eight, who, along with the IT department, support 8000 users and 1000 medical staff across the three hospital campuses and 80 remote sites. There are tremendous cost savings involved in flattening the network layers and managing the network with one operating system and automated tools. With an efficient infrastructure design and architecture, health systems can maximize their budget spend effectively and get the best value for their long-term investment.

## Conclusion

When the IT team had a vision to build a next-generation infrastructure that could support the modernization of many IT systems and platforms, they knew the underlying network would play a critical role. When it came to architecting how all of these systems interconnected, the IT team designed a comprehensive solution that ensured uninterrupted operations. "If you have a patient in the ICU, you can't lose access to the information about that patient and the treatment," the Chief Information Officer says.

The end result is a resilient and simplified Juniper-based network that transports all of the provider's clinical and administrative data, interconnects a multitude of medical and nonmedical devices, and ultimately delivers carrier-class performance, flexibility, and scalability to provide the organization with end-to-end security, operational simplicity, and a lower total cost of ownership.

Whether a greenfield opportunity comes along, expansion within an existing campus, or a looming refresh of technology, IT often only has one shot to meet the organization's goals while avoiding disruption. An open, standards-based network not only supports growing health systems looking to transform information technology systems, but also provides a transformational level of patient care. Consider the five benefits of selecting a single, high-performance network outlined in this white paper to make sure you build a highly resilient, scalable, secure, and manageable network—not only for now but also for the future of your healthcare organization.

*"The new network design allows us to perform concurrent maintenance without downtime, have higher bandwidth between application servers, and provide higher uptime for mission-critical applications."*

— Director of Technical Services, Not-for-Profit Community Health System, Southeastern U.S.

## About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at [www.juniper.net](http://www.juniper.net).

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