

# Supporting today's data-intensive clinical environments



Technology is transforming all aspects of today's healthcare, from care delivery to administration. Create a network that keeps pace with rapid change.

Here's step-by-step guidance for planning a network infrastructure that will help you advance your digital health initiatives and improve efficiency and patient outcomes

## An era of rising expectations

When patients engage with your healthcare facility — whether in person, by phone or video link — they expect at least two things: a positive experience and confidence they are receiving the highest quality care.

Along with advanced equipment and knowledge, data has emerged as an essential tool for delivering quality healthcare and improving patient outcomes. Electronic health record (EHR) systems, digital imaging, telehealth, patient portals, remote monitoring, the Internet of Things (IoT) and big data initiatives have made secure, reliable, high-speed and low-latency connectivity a must in today's complex and bandwidth-intensive clinical environments.

The ability to share vast amounts of business and clinical information is key to ensuring patients receive individualized care while the health system continues to operate efficiently. This access to vital information also presents a challenge, placing new expectations and demands on your network and digital health infrastructure.

This guide will help you prepare to meet the network infrastructure requirements of the digital healthcare environment for today and tomorrow.

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Step 1

# Identify your needs



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Identify  
your needs

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right partner



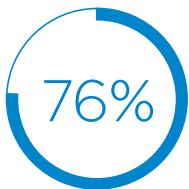


## Step 1: Identify your needs

In healthcare, having fast, reliable and continuous access to data literally saves lives. It also serves as the foundation for achieving the Quadruple Aim of healthcare: (1) Improving population health in a (2) cost-effective manner, while improving the (3) patient experience and (4) clinician experience across the continuum of care.

Making smart network decisions today can deliver:

- Improved population health outcomes through coordination of care, prevention and personalized medicine
- Lower costs through smarter use of resources and greater efficiency
- Better patient experiences through seamless and thereby less stressful interactions with providers and hospitals
- Better clinician experiences through reliable, streamlined systems that help them focus on patients



76% of U.S. hospitals connect patients with practitioners at a distance through video and other technology.<sup>1</sup>

Of course, the key to all of these benefits is ensuring that your healthcare facility has reliable, high-speed connectivity that can scale to support evolving data, networking, voice and security needs.

To assess your overall connectivity needs, ask what you will require from your network over the next 3 to 5 years. Aspects to consider include the amount of bandwidth you'll need, your wide area network (WAN) infrastructure, your WiFi coverage and protection to keep your network secure.



## Bandwidth: The lifeblood of all healthcare connectivity

To understand how much Internet bandwidth you need, start with the broadband recommendations from the Federal Communications Commission (FCC)<sup>2</sup>. The latest FCC report, Healthcare Broadband in America issued in 2010, suggests the following minimum bandwidth goals for healthcare providers:

Delivery setting	Use profile/support provided	Key assumptions	Recommended bandwidth
<b>Nursing home</b>	<ul style="list-style-type: none"> <li>Facility management functions, email and Web browsing</li> <li>Remote monitoring of resident population</li> <li>Simultaneous use of EHR and high-quality SD video consultations</li> <li>Non real-time image downloads</li> <li>HD video consultations</li> </ul>	<ul style="list-style-type: none"> <li>Five simultaneous users of general facility management and Web-based activities</li> <li>Two simultaneous high-quality SD video consultations</li> <li>Image files (~10 MB) should download in less than 30 seconds</li> </ul>	≥ 10 Mbps
<b>Rural health clinic (-5 practitioners)</b>	<ul style="list-style-type: none"> <li>Clinic management functions (billing, scheduling, etc.), email and Web browsing</li> <li>Simultaneous use of EHR and high-quality SD video consultations</li> <li>Non real-time image downloads</li> <li>Remote monitoring</li> <li>HD video consultations</li> </ul>	<ul style="list-style-type: none"> <li>Three total users per practitioner for EHR and other general Web-based activities</li> <li>Two simultaneous high-quality SD video consultations</li> <li>Image files (~10 MB) should download in less than 30 seconds</li> </ul>	≥ 10 Mbps
<b>Clinic/large physician practice (5-25 physicians)</b>	<ul style="list-style-type: none"> <li>Clinic management functions (billing, scheduling, etc.), email and Web browsing</li> <li>Real-time image transfer</li> <li>Simultaneous use of EHR and high-quality SD video consultations</li> <li>Remote monitoring</li> <li>HD video consultations</li> </ul>	<ul style="list-style-type: none"> <li>Specialty services (e.g., radiology, orthopedics, dermatology) provided</li> <li>Three total users per practitioner for EHR and other general Web-based activities</li> <li>Large image files (~20 MB) should transfer in less than 10 seconds</li> <li>Five simultaneous high-quality SD video consultations</li> </ul>	≥ 25 Mbps
<b>Hospital</b>	<ul style="list-style-type: none"> <li>Hospital management functions (billing, scheduling, etc.), email and Web browsing</li> <li>Real-time image transfer</li> <li>Simultaneous use of EHR and high-quality SD video consultations</li> <li>Continuous remote monitoring</li> <li>HD video consultations</li> </ul>	<ul style="list-style-type: none"> <li>Picture archiving and communication systems (PACS) in place for real-time diagnostic imaging</li> <li>Very large image files (~50 MB) should transfer in less than 5 seconds</li> <li>Multiple simultaneous high-quality SD video consultations</li> </ul>	≥ 100 Mbps
<b>Academic/large medical center</b>	<ul style="list-style-type: none"> <li>Same as hospital</li> </ul>	<ul style="list-style-type: none"> <li>Same as hospital, but scale of demands on largest medical centers drives exponential bandwidth needs</li> </ul>	≥ 1 Gbps



While the FCC recommendations offer a good baseline, technology and user expectations have changed dramatically since the report was issued. Here are some factors to consider when determining your bandwidth needs:

**User base:** *How many simultaneous users will you have?*

With potentially hundreds of users needing high-speed Internet connectivity, determining your specific needs — and allowing for growth — is essential because each additional user will directly impact bandwidth requirements. Also consider how many cloud-based applications you use and how your staff interacts with the Web. Remember that Web users today consume far more bandwidth-intensive media than in 2010.

**Capacity:** *What's the volume of imaging files you need to transfer?*

With improved imaging technology and the extensive use of PACS, transferring large diagnostic image files has become common. Clinicians who need immediate access to files containing hundreds of megabytes of data can't afford to wait minutes for a download. Think about your own facility's use of imaging files to ensure you have sufficient bandwidth to increase staff productivity and provide positive patient experiences.

**Streaming video:** *Do you currently offer or plan to offer telehealth video consultations?*

HD video allows for better communication, giving providers more detailed patient images. Keep in mind that HD video may require up to three times more bandwidth than SD-quality video,<sup>3</sup> the format quoted in the FCC bandwidth recommendations.





**New devices and applications:** *How will you leverage IoT devices, patient portals and emerging network-based applications?*

The explosive growth of sensor-based devices and connected applications has increased the demand for digital connectivity. Along with this, more and more facilities are providing patients with convenient, 24/7/365 access to personal health information and care management via patient portals.

**Take action**

**Know your bandwidth usage**

Use a network monitoring tool to understand how much of your capacity is being used at various locations throughout the day. Usage report data will help you understand key trends, such as peak usage times, sources of bottlenecks and how much bandwidth individual applications use. This tool can help you determine how much more bandwidth you'll need to achieve your goals.

**WAN: Seamlessly connect all your locations**

The WAN of the future is highly agile, scalable and adaptable, capable of expanding to meet your organization's ever-changing needs. It should be customizable, with features to optimize performance and the intelligence to identify problems. As you evaluate your WAN's readiness for the future, here are some key questions to guide you.

**Capacity:** *Does your network have the capacity to meet users' needs now and into the future?*

Consider how many users you'll have (including providers, staff, patients and visitors), applications they use, clinician mobility devices and how many IoT devices will be connected to your network over the next several years. Will your bandwidth meet expected demand? What latency is appropriate between network sites? You need a network that won't become congested during peak usage times.

**Resiliency:** *Is your WAN designed with failover protections to withstand a cut line or other outage to a critical network connection?*

Loss of a network connection can be extremely disruptive to a digital-dependent care environment without sufficient backup capabilities. Building a resilient, reliable network involves planning for the worst with alternate routes available for your network traffic.

**Flexibility:** *Can your network easily accommodate changing needs?*

Does your network infrastructure give you the flexibility to easily make adjustments, such as adding new locations? An agile network gives you more control, allowing you to respond quickly to changing needs.

**Visibility:** *Can you see data traffic patterns and application usage across your network?*

To make smart policy decisions based on network performance, you need to see what's going on with your network at any given time. Having both real-time and historical insight into your network operations allows you to monitor performance and set or adjust policies as needed.

**Efficiency:** *Does your network include features designed to maximize the efficiency of data flow?*

Features such as traffic shaping allow you to prioritize certain types of network traffic (like communication and clinical applications) over other types (such as video streaming), resulting in faster and more reliable network performance.

#### Take action

##### Consider the advantages of SD-WAN

Healthcare providers seeking greater network utilization and simplified network management over distributed locations should consider the advantages of a managed, software-defined WAN (SD-WAN). A managed SD-WAN service allows for application-aware routing while reducing network complexity and bandwidth cost. In addition to offering centralized network monitoring, visibility and control, as a managed service, it comes with the support of a skilled partner to design, deploy, implement, manage and monitor the solution.

## WiFi: Continuous access enhances clinician mobility and patient experience

Fast and reliable WiFi coverage throughout a medical campus is essential to enable patients, clinicians, staff and visitors to use technology effectively. Consider these items as you determine your wireless needs:

**Multi-tenancy:** *Does your WiFi infrastructure allow you to create separate, secure wireless networks from shared access points?*

A key challenge in creating wireless environments is establishing separate networks for clinicians, patients, visitors and IoT devices using the same WiFi access points. The latest WiFi technology lets hospitals and health systems enjoy better network security and efficiency while also lowering the cost of WiFi deployment with less RF signal interference.

Having real-time and historical insight into your network performance lets you make smart policy decisions.

**Room to grow:** *How can you invest in scalable technology?*

By investing in a modular solution, you can easily add more capacity to your wireless network as your needs grow — such as adding more access points at the current location or adding other locations as needs change — without having to overhaul or build an entirely new network.

**Total network demand:** *How many people will use your WiFi network?*

The number of network users you anticipate should include clinicians, patients and administrative staff, as well as visitors. Consider how on-site community events or clinical seminars may affect your network. Are you able to accommodate temporary bandwidth spikes?

**IoT:** *Have you factored in IoT devices?*

Organizations are gathering real-time information from an increasing array of devices, sensors and applications. IoT devices now connect everything from security cameras and smart thermostats to advanced medical devices, and are expected to account for half of the global connected devices and connections by 2022.<sup>5</sup>

**Self-optimization:** *Does your WiFi infrastructure contain built-in intelligence that continuously looks for ways to optimize performance so users receive the best experience possible?*

Innovative WiFi technology can improve network performance in congested, high-density environments (such as common areas) by dynamically changing the channel selection, channel width and transmission power of radio frequency (RF) antennas to match user needs. Automating this process reduces signal interference and results in a better wireless experience for clinicians, staff, patients and visitors.





**Load balancing:** *Does your WiFi infrastructure automatically distribute users evenly to prevent network congestion?*

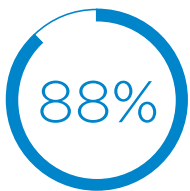
Dynamically transferring users between network access points, in real time, as they roam the medical campus results in better signal performance for each user, even in large crowds.

**Seamless failover:** *Does your wireless network have the ability to switch users over to another access point seamlessly (and automatically) in the event of a failure, so service continues uninterrupted?*

Today when an access point fails, it's possible for another to automatically pick up the user session with no drop in service. If access points are configured in clusters, then standby paths are created in real time to alternate devices within the same cluster. During high-priority sessions (such as voice or video use), these sessions are synchronized so if a network device fails, switching the user to another network device is seamless. Users don't experience service disruption and IT staff aren't burdened with complaints or help requests.

**Reporting:** *Will you use WiFi management tools?*

Wireless network management tools can help you track and report your WiFi coverage, find dead network spots, identify and block rogue access points and boost signal output where needed.



of health system leaders say prioritizing patient/visitor WiFi solutions is extremely or very important.<sup>4</sup>

#### Take action

##### Conduct a site survey

Designing a wireless environment can be complex. Healthcare leaders have to account for possible signal interference, as well as how walls and building materials affect the range of wireless signals. This can be especially challenging in hospitals. A site survey done by an experienced provider can help you plan for adequate coverage.

## Network security: Protect patient information and your reputation

Cybersecurity and privacy are vital concerns in healthcare. Providers must not only ensure that they are protected against malicious hackers, but also that all networks, processes and IT systems meet stringent federal regulations and HIPAA requirements. Having a powerful, high-speed and highly scalable network does no good if the network is paralyzed in an attack. As you assess your security needs, here are some key considerations:

**A firewall with unified threat management (UTM):** *Can you administer and manage multiple security functions from a single console?*

A firewall solution that combines intrusion detection and prevention features, antivirus software, deep packet inspection, application layer control and advanced security reporting within a single product can simplify network security while saving time and money. With fewer devices to configure and maintain, network administrators can have protection while also achieving a single, holistic view of network threats.

**DDoS protection:** *Can you protect your network from a Distributed Denial of Service (DDoS) attack?*

In a DDoS attack, multiple computers target a single server, overwhelming the server's network with traffic so it cannot respond. DDoS attacks are fairly easy to carry out and can be very disruptive to health systems, which have become increasingly popular targets. The best defense is to deploy a cloud-based security solution to intercept malicious traffic before it reaches your network.

**Vulnerability testing:** *Are you regularly scanning your network for potential weak spots that can be exploited by hackers?*

As a general rule, you should test your network on a quarterly basis to find and correct possible weaknesses in your security defenses. Ideally, this testing should be performed by a certified third party.

**HIPAA-compatible:** *When planning a network upgrade, make sure that the configuration of your network solution facilitates your ability to meet the HIPAA requirements for system availability, disaster recovery and redundancy.*

For security, think about designing your network so that your network data doesn't touch third-party networks, and backhauling all Internet access through a central site with filters. If any of your networks failover onto the public Internet, ensure that data remains encrypted through AES256 VPN tunnels.

## 2022

The year that WiFi will carry more than half of all IP traffic, surpassing both wired and mobile/cellular connections.<sup>5</sup>





of U.S. healthcare security professionals have experienced a breach — a higher percentage than any other U.S. vertical.<sup>7</sup>

**Other best practices:** *Have you adopted other industry-recognized best practices for keeping your network secure, such as network segmentation?* Segmenting your network involves separating groups of systems or applications from each other either physically or virtually. This limits communication between various systems, which limits how much damage a hacker can do on your network.

#### Take action

##### Perform a security audit

A network security audit can help you understand where your network might be vulnerable to possible security breaches. A security audit identifies all of the assets on your network and whether their operating systems are up to date. It also reviews the configuration of your firewall and assesses the biggest risks to your network security, so you know which threats are the most important to address.

### Reliability and latency: Ensure rock-solid performance

Network reliability and latency — key measures of network performance — have critical significance in a healthcare environment. Today's connected healthcare networks support numerous applications, processes and devices that deliver essential services to patients and providers. Real-time and interactive health applications (such as patient monitoring and video consultations) demand low latency.

Achieving a reliable, low-latency network involves intelligent selection of multiple components — including carrier transport services, protocols, switches, routers and firewalls — working together to deliver optimal, assured performance. As you plan the evolution of your network, here are some questions to bear in mind.







**Connectivity:** *What is the right transport media?*

Selecting the right transport media will have a significant impact on your network reliability and latency. Fiber offers higher bandwidth, lower latency over long distances and resistance to many of the problems that can affect other transport types. For example, fiber is not affected by interference from nearby power lines or high voltage electrical equipment, it can withstand wide temperature fluctuations, and it can be submerged in water. These are key features to think about when considering connectivity that is used to support business continuity and disaster recovery.

**Direct connectivity:** *Should you deploy a private network?*

For improved reliability and predictable latency between sites on your WAN, private and directly-connected networks are preferred. Fiber-based Ethernet eliminates performance concerns that can occur with other technologies. Likewise, consider establishing a private cloud connection if you're using a cloud service provider (e.g., AWS or Microsoft Azure) for your enterprise applications.

2.5x

increase in the use of medical devices over five years.<sup>8</sup>

**Take action**

**Identify and eliminate single points of failure**

As you examine your network, look for vital devices or pathways that lack failover protection. One way to ensure that your network isn't exposed to issues or failures is to build diversity into your network. Network diversity ensures that alternative paths are available for network traffic in the event of a failure. That way, a disruption in the primary line won't impact your overall business continuity.

Step 2

# Evaluate owned vs. managed services



1

Identify your needs

2

Evaluate owned vs. managed services

3

Choose the right partner



## Step 2: Evaluate owned vs. managed services

Network solution options available to healthcare providers have evolved rapidly over the last decade to provide greater efficiency and cost-savings. Hospitals, health systems and their affiliates no longer have to own and manage their own routers, firewalls, wireless access points and other network technology; instead, they can choose a solution that is fully owned, installed and managed by a service provider.

Although purchasing and managing network equipment yourself might appear to be cheaper, there are hidden costs and risks you need to be aware of. Here are key factors to consider when weighing this decision.

### **Reliability.** *Have you budgeted for maintenance and repairs?*

Keeping things running smoothly might require constant tweaking and firmware updates. When you own your network equipment, you're responsible for all maintenance and repairs. How might this affect the reliability of your network? With a managed solution, you have the peace of mind that comes from having a service level agreement (SLA) in place guaranteeing network uptime and issue resolution response times.

### **Staff expertise.** *Do you have skilled network technicians who can maintain and troubleshoot your network?*

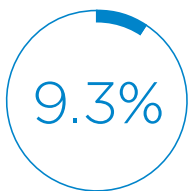
If so, then it might make sense to own your own infrastructure. If not — or if you'd rather have your in-house experts focus on more strategic projects — then a fully managed solution may make more sense, where support teams are available to monitor equipment, troubleshoot problems and deploy technicians 24/7/365 if problems arise.

### **Flexibility.** *Does it make sense to invest in a specific network infrastructure with a fixed capacity?*

If your needs change faster than you anticipate, or if you underestimate the demands on your network, you'll need additional capital to make changes. If flexibility is a priority, a managed solution lets you add capacity as needed and offers you access to the latest equipment as technology evolves.

### **Budget model.** *Would you rather incur a large upfront expense or have monthly recurring charges?*

Some healthcare providers opt for a single capital outlay to buy and install their own network equipment. Others find that a fixed monthly fee for a managed service makes budgeting easier. Keep in mind that owning your own equipment means you'll need to set aside funding for maintenance and upkeep, which can add up quickly.



Projected compound annual growth rate (CAGR) for managed services market from 2018 to 2023, with healthcare and life sciences expected to grow at the fastest rate.<sup>9</sup>



Step 3

# Choose the right partner

1

Identify your needs

2

Evaluate owned vs. managed services

3

Choose the right partner



## Step 3: Choose the right partner

Your choice of service providers matters. You want a company that is not just a technology vendor, but a partner who understands healthcare organizations and is fully invested in your success. The right partner can help you at every step in your project, ensuring you make the right network decisions to advance your digital health initiatives.

Here are four important qualities to look for in a network service provider:

**Advanced technology.** Does the provider employ the latest standards and technologies? Do the company's products reflect the latest industry developments?

**Industry leadership.** Does the provider have the size, capacity and expertise to serve your needs effectively? Is the company stable and reliable, with a strong reputation in the industry?

**Experience in the healthcare market.** Does the provider understand the unique needs and goals of healthcare professionals? Does it have a proven track record of success in serving the needs of clinicians, administrators and patients?

**High-quality service.** Does the provider value you as a customer? Does it have U.S.-based call centers backed by local support experts to provide prompt answers to your questions? Is someone available at all hours in the event of an emergency?

### Spectrum Enterprise — your partner in transforming healthcare

The selection of your service provider matters. Spectrum Enterprise is more than a technology vendor; we are an experienced and engaged partner that is fully invested in your success.

Spectrum Enterprise offers a complete array of connectivity solutions — from FIA and WAN services to managed WiFi and security — to simplify healthcare IT management and eliminate the need for a patchwork of providers. Our dedicated IT healthcare experts, exceptional network performance, end-to-end accountability, responsiveness and support has made Spectrum Enterprise the partner of choice for over 119,000 healthcare organizations nationwide.

Spectrum Enterprise is committed to meeting your connectivity and communication needs to help ensure quality patient care and efficient facility operations. We give you the agility to stay ahead of fast-changing healthcare trends through a comprehensive range of services that include:

Spectrum Enterprise serves more than 119,000 healthcare organizations nationwide.

560+  
active MEF-Certified experts at Spectrum Enterprise



**Ethernet Services** — Increase the performance of your network with a reliable, private WAN delivered on the Spectrum Enterprise fiber network. Expand your network quickly with flat-rate pricing and scalable bandwidth from 10 Mbps to over 10 Gbps.



**Fiber Internet Access (FIA)** — Get symmetrical, dedicated connectivity — up to 10 Gbps — backed by an industry-leading SLA and proactive, 24/7/365 monitoring to ensure network performance and uptime.



**DDoS Protection** — Guard against malicious volumetric attacks designed to overload your network and prevent access to applications, systems and information with world-class DDoS threat identification and mitigation.



**Cloud Connect** — Extend your network with fast, secure and dependable private cloud connections to cloud service providers.



**Managed SD-WAN** — Achieve greater visibility and control with a complete, virtualized WAN service that allows for application-aware routing while reducing network complexity and cost.



**Managed Router Service** — Make sure your network is running at top performance with always-current equipment that automatically identifies and corrects bottlenecks and provides failover service to a second router, efficiently managing traffic flow and bandwidth use with a fully outsourced solution that won't burden IT staff.



**Managed WiFi** — Improve your wireless coverage with a complete, turnkey WiFi solution that includes design, installation, management and operation of wireless infrastructure, ensuring high-quality connectivity with no equipment to buy.



**Managed Security Service** — Protect your network and users with a fully managed solution that includes a unified threat management (UTM) firewall, intrusion detection and prevention, web content filtering, vulnerability testing, event log management, and more.

### Making critical technology more affordable for rural healthcare providers

If you're a rural hospital network or healthcare provider, dedicated Spectrum Enterprise experts can help you take advantage of federal funding programs that can reduce the cost of network technology investments to enhance patient care.

The Rural Health Care (RHC) Program, established by the FCC in 1997, helps public and non-profit rural healthcare systems improve the quality of health through enhanced connectivity through two sub-programs.

Through the Healthcare Connect Fund, eligible providers can receive up to a 65-percent discount on an array of communications services. The Telecommunications Program funds the difference between the rural and urban rates for telecommunications services.

For additional details and information on the RHC Program and how Spectrum Enterprise can help, see [our Rural Healthcare Guide](#).



## Preparing you for the connected future of healthcare

Today, as a healthcare provider you face evolving demands: the growth of digital health requirements, data management, EHR optimization challenges and cybersecurity. With the reality of limited budgets, it's important to understand how to effectively evaluate, plan and implement network improvements. Let the healthcare IT solutions experts at Spectrum Enterprise help.

To learn more, visit [enterprise.spectrum.com/healthcare](https://enterprise.spectrum.com/healthcare).

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### About Spectrum Enterprise

Spectrum Enterprise, a part of Charter Communications, Inc., is a national provider of scalable, fiber technology solutions serving America's largest businesses and communications service providers. The broad Spectrum Enterprise portfolio includes networking and managed services solutions: Internet access, Ethernet access and networks, Voice and TV solutions. Spectrum Enterprise's industry-leading team of experts works closely with clients to achieve greater business success by providing solutions designed to meet their evolving needs. More information about Spectrum Enterprise can be found at [enterprise.spectrum.com/healthcare](https://enterprise.spectrum.com/healthcare).