

The Network as the IT Backbone within Healthcare



Executive Summary - The Growing Dependency on the IT Network

Healthcare providers, including hospitals, urgent care, outpatient centers, and satellite pop-up facilities, depend on their IT networks, day and night. Network attached smart care technologies are being introduced at a rapid pace, as innovations are improving the diagnostics, treatment, and patient outcomes. Whether it is a new drug, scanner, ventilator, analyzer, robot, real time surgery camera, asset tracking, and/or clean air HVAC system, all of these technologies are interconnected into a growing ecosystem of bedside care and operation room applications.

Most if not all of these healthcare devices have an intelligent data processing system behind them. These data processing systems are now borderless with adoption of cloud technologies as everything IT is being delivered as a cloud service. Many of these services are off sight in a 3rd party cloud infrastructure.

“The IT network is the backbone for all healthcare providers regardless of their size or sophistication.”

Healthcare's are moving away from their own customized server and platform applications as they lean towards commercially available EHRs applications including EPIC and Cerner. Attention within IT is shifting from application development to service delivery, where new patient care medical devices are on the top of the priority list. Delivery of these services via the network has to be secure, private and reliable. As a case in point, per patient personalized programs are being delivered on demand at the bedside as customized treatments can be downloaded by nurses for programming IV pumps. Again network enabled.

Healthcare centers now expected to provide communications to all within the building including doctors, nurses, patients, guests, and facilities management. All of these personas have highly diverse application requirements with different privacy, reliability, and data needs. As an example, while a patient is playing a video game, a nurse is downloading treatment programs, and a doctor is receiving a Wi-Fi call, all from the same Wi-Fi access point. The network manages this diversity with patient care first and patient entertainment second.

And the perimeter of these healthcare networks are changing, as more care devices become mobile, where critical care assets can be easily moved from one location to another for cost and life savings justifications. Crash carts, IV pumps, ventilators and even wheelchairs are shared on demand resources that are tracked from the network. Nurses and doctors now have smart applications on their phones, ipads, laptops, and specialty devices, where these personal devices are carried from room to room, in support of a highly mobile work environment. Again the network has to provide seamless communication, where no one thinks twice about their secure connections, as they move wirelessly around the edge of the network.

IoT devices are also changing the perimeter, as many of these unmanaged devices are being added to the network for controlling doors, air, temperature, humidity, lights, and power consumption. The location of these are in hallways, utility rooms, and on the rooftops where air handlers are commonly located. Security technologies are being integrated into many of these devices as they can lock a facility down, alert when there are problems, and with smart Lidar pattern recognition detect problems ahead of time. The network transports data back to the centralized security system.

The challenge for healthcares is deploying wired and wireless networks that can cost effectively accommodate all of these requirements into one tightly integrated infrastructure, with 7x24 reliability. Moreover, to be able to upgrade, update, and handle changes without any downtime or major disruptions. These changes could be as simple as a security patch, or as complex as new Wi-Fi infrastructure/upgrade across a 7x24 hospital floor. And while healthcares all have procedures in place, where they can function without the network by “going to paper”, realistically they are working in the dark without the network.

In summary the IT network is the backbone for all healthcare providers regardless of their size or sophistication. The network is serving a broad community with critical care being the number one priority. The network is a growing and highly mobile ecosystem of diverse users, applications, and sophisticated endpoints. This ecosystem is constantly changing and has to be open, flexible, redundant, secure, and have enough performance capacity to handle all of these communication needs.

The Impact the Network has on These Healthcare Innovations

While communication networks are critical across all healthcare providers, most healthcare deployments are lagging in their adoption of newer technologies that address their growing security, real time video delivery, congestion, and troubleshooting requirements. Given the importance of the network, and the benefits of smart devices, why are healthcare laggards? Are there budget, talent pool, regulatory, best practices, leadership, and/or there are too many competing requirements and agendas?

The one understandable laggard reason across all of these areas is that healthcare providers are risk averse, as an entire ecosystem of doctors, nurses, patients, researchers, and facilities teams cannot perform their work when the network is not functioning. This results in very conservative, vendor safe choices, where innovation is often placed in the waiting room. Healthcare providers rely on their peers for technology and vendor recommendations, which naturally are also conservative. As a result the adoption of networking technologies moves much slower than other industries, yet the influx of smart healthcare devices and applications is accelerating.

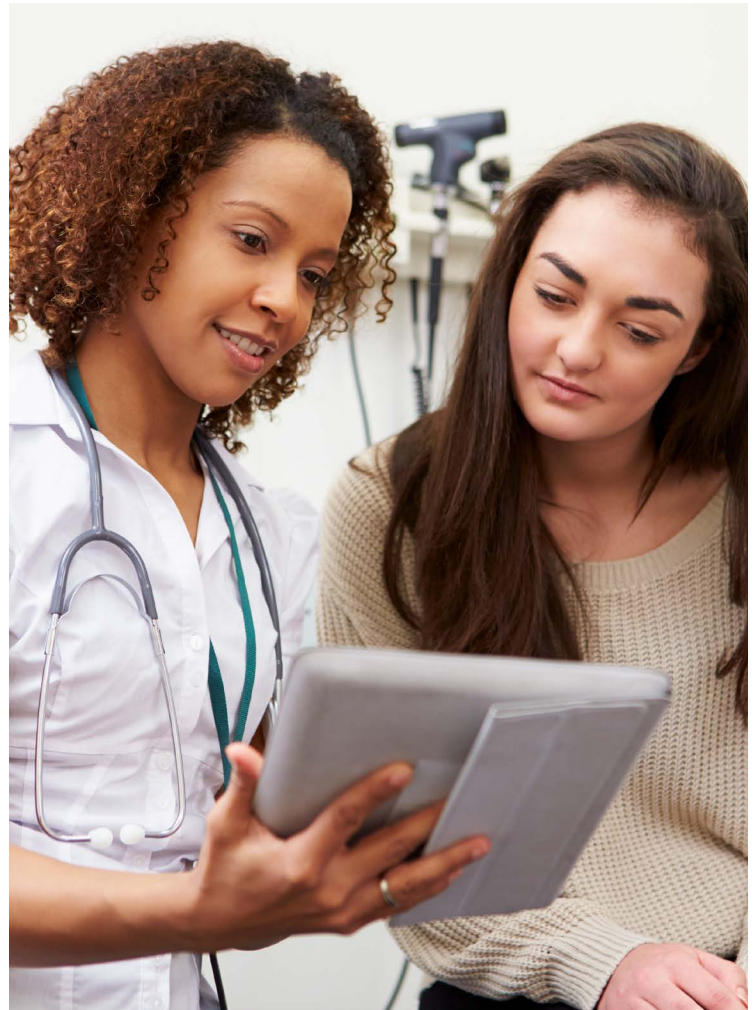


Healthcare providers must advance forward in addressing many of the aforementioned networking requirements such as data privacy, new imaging, scanning/sensor devices, wayfinding, smart building controllers, Lidar, and data intelligence as these offer improvements inpatient care. They need to pick up the pace as the world around them is moving fast. Aging network designs, legacy 100/1000 Mbps interface technologies, standalone Wi-Fi AC access points, a patchwork of security products, unacceptable change windows, secure cloud connections, and real time delivery of video (online surgeries, telehealth), must be addressed to move forward.

Cloud Networking for Addressing Healthcare IT Networking Needs

For all too long there has been a continuation of complex networking technologies that have been layered on top of each other. This is an artifact of the 1980's and 1990's as the OSI model defined independent technology layers, and packet standards for the open transfer of data between network devices, yet lacked an operating model for configuring, and managing each device commonly. This has ultimately slowed innovation down, as vendors within each layer have captured market share, and locked their customers in.

Much like the server industry, networking technologies including processing chips and open protocols are promoting new platforms and delivery models. This is driving more competitive hardware offerings with faster innovation times. However, the software layers remain complex, antiquated, and costly as every vendor supplies their own software stacks. The legacy vendors continue down the path of their legacy operating system and management tools. This obscures many of the time to market and commonality advantages at the hardware level. Yes customers may get more capable hardware yet they remain stuck with complex products, with very brittle interoperability matrixes. This prevents them from making true changes as needed for the influx of IT related patient care technologies.



The good news for healthcare providers is the fundamental shift taking place in how the networking software technologies are developed, delivered, deployed and operated. This shift is being led by cloud networking titans (Microsoft , AWS, Google Cloud) where at scale, there are repeatable, non disruptive, industry standards, grow as you go, software automation and operation advancements, based upon cloud principals. These titans have disrupted the status quo and are leading change within the market. These changes are finding their way into healthcare networks.

Now let's break this down. Essentially, complex multi OSI layer IT technologies are orchestrated behind a cloud abstraction layer, with underlying programming logic, real time network wide state models, and automated deployment/ configuration capabilities. This abstraction layer lowers the expertise required for making topology level changes, removes human errors including command line interface misconfigurations, represents the most current state of the topology as the single source of truth, and addresses version compatibility between platforms. Security, segmentation, endpoint policing, device tracking, and even topology wide upgrades can be made reliably in minutes (as opposed to days with a lot of error corrections).

The business benefits here are significant as new user communities (doctors, facilities mgmt etc), applications (Epic), specialized endpoints (Smart IV Pumps), Wi-Fi access points, data privacy (secure tunnels), and the prioritization of business critical applications can be enabled at the speed of the business, not the speed of IT. Healthcares can now customize their network in a reliable, repeatable, secure, and agile way based upon the needs of these smart care applications including any specific data delivery and/or data security requirements.

Cloud Networking is More than Just Outsourcing

While many IT executives are familiar with clouds there is a growing misnomer that clouds are today's word for outsourcing, where IT applications are shifted to 3rd party locations, including AWS, Azure, and Google. Cloud networking is far more than just outsourcing to a 3rd party infrastructure. While yes the cloud providers have driven a modernized way to deploy, configure and operate the network, and shown the world that this approach scales with 7x24 reliability.... cloud networking is also an enterprise technology that healthcare can benefit from mentioned above. Cloud is a methodology, and cultural shift, coupled with a number of software abstraction, automation, and operating technologies that better meet the IT needs within healthcare.

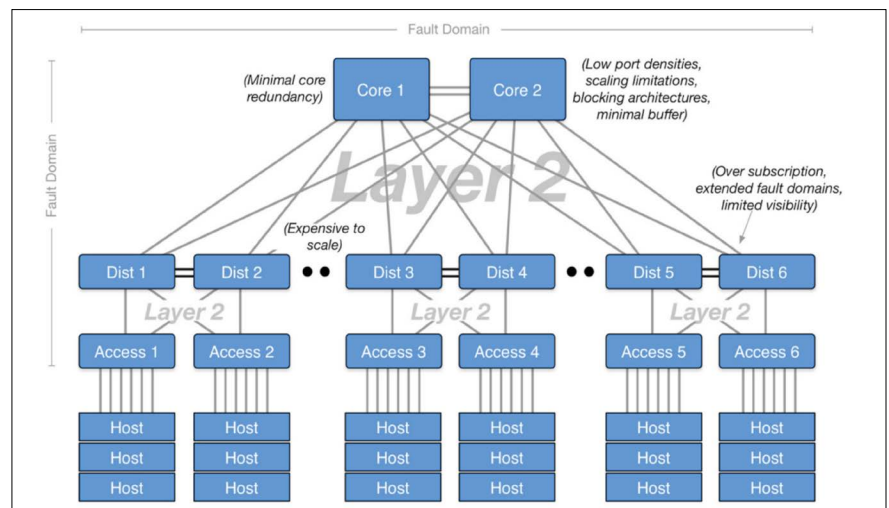
To summarize, cloud networking is an architectural and product shift, where networks are deployed and managed differently at the operations level. Yes data is still moved either through the air or the wire with all of the well known switching, routing, security and firewall features; but how the network is designed, configured, and managed is significantly different.

Legacy Technology Challenges

Deploying cloud networks in mixed topologies, where different operating systems, controllers and management appliances is challenging, as every platform required to deliver a network service must be configured manually. This can equate to 100's of platforms. Different operating system revision levels, CLI commands, automation scripts, and management protocols can be customized to work, however end up being very rigid as changing even one command within the networking operating system on one device could create interoperability nightmares.

Unfortunately, the above describes a majority of enterprise networks, where customers have different platform types, platform classes, and network operating systems versions, even within the same product families from the same vendor.. Yes, most vendors can claim that all of their network operating systems are developed on Linux, but can they say that the same version of Linux, with the same CLI syntax runs across all of the various platform types, sizes and form factors within their customer topologies. The answer here is no as these vendors never designed their products uniformly where a cloud abstraction layer was envisioned.

The fundamental cloud adoption issue with legacy network vendors is that they have too many disjointed hardware and software products that need to be re-developed, to be cloud native. Many attempts have been made in offering cloud middleware, i.e. orchestration, provisioning, and controllers by them. However their patchwork of disjointed operating systems, antiquated configuration interfaces, proprietary API's, outdated SNMP stacks, and the absence of real time change control have created fragile cloud abstraction layers that are stuck in time, as any change in one component will create interoperability issues with other components.



Legacy Network Architectures

As a case in point these legacy network vendors have had very little success in selling their products into the large cloud provider hosting centers (titans), as the cloud titans require a uniform operating system and abstraction layer. As these titans started with clean infrastructures, with an agile service enablement model they avoided the traps of the past.

Arista, as a cloud driven networking company has succeeded within the cloud titan market as many of the top cloud providers including Facebook, Microsoft, Google and eBay, are buying Arista products in volume based upon Arista's unified software infrastructure across all of their platforms.

Healthcares Must Embrace Cloud Networking Principles

Unfortunately, many enterprises, especially those within healthcare have legacy networks. To move forward they need to start carving out places within their buildings, sites and offices where they can upgrade their networks, inclusive of “cloud”. This goes beyond an upgrade from an older platform to a new one from the same vendor. These upgrades should specify cloud features within their RFP’s (request for proposals). Arista can help consult here.



Healthcares cannot easily move forward with their smart patient care technologies on older networking platforms and software stacks. For healthcares to keep up with the rapid innovations taking place, they must embrace these new cloud technologies, where they re-architect their buildings, data centers, and remote locations.

The Transition to Clouds:

Cloud computing is redefining information technologies as a coupling of technologies that deliver tangible business value. Businesses are demanding IT infrastructure services daily as they compete within an online, connected world.. Cloud has become analogous to agile as cloud infrastructures offer instantaneous time to market advantages, with repeatable, cost affordable service provisioning.

Networking is being redefined via these cloud transitions, as legacy networking is complex, proprietary, a patchwork of different platforms, custom designs, and requires manual configurations. Healthcares running their operations on legacy networks are at a disadvantage as it takes months to program these networks for any new patient care technologies that require secure, reliable, highly trackable communications.

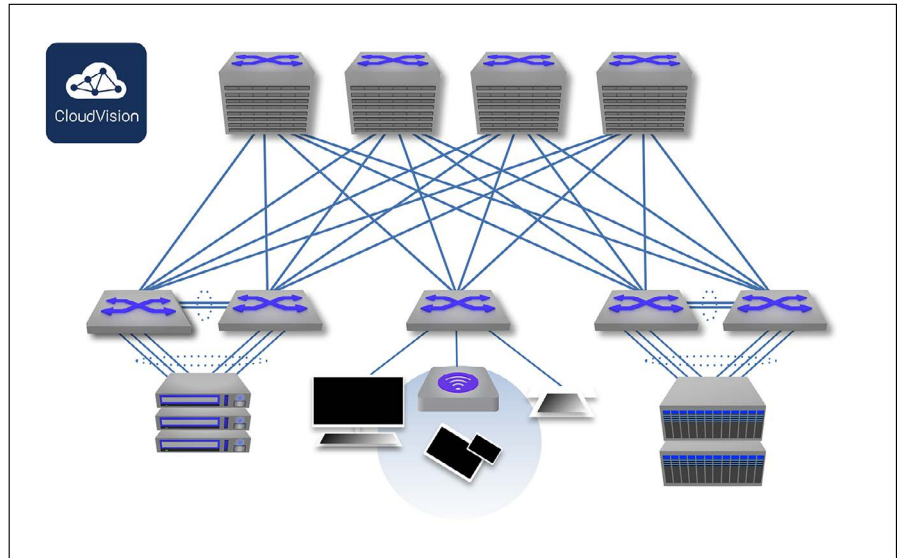
Clouds are easiest to implement when they are based upon open common platforms, automated service abstractions, centralized policies, simplified topologies, hitless upgrading, and no single points of failure. Well designed clouds have redundant hardware, modular software, open APIs, auto installation, real time telemetry, and proactive machine AI driven troubleshooting. Cloud networking is not your latest Wi-Fi, firewall, and/or wayfinding features. These features are embodied into the cloud infrastructure stack, where they are part of a 360 degree ecosystem, where the co-dependencies on the other parts of the network are well understood, leveraging real time telemetry, artificial intelligence, and natural speech engines.

As Arista networking products are all cloud defined; any customer familiar with legacy approaches, who installs an Arista network quickly becomes converted as majority of their deployment, upgrade, configuration headaches are resolved. For healthcare new topologies, products and features are deployed non disruptively.

Arista as the Cloud Networking Pioneer:

Arista was formed in 2005 just as cloud computing was beginning to take shape. Arista partnered early on with several of the largest cloud providers including Microsoft, Facebook, and EBay and developed Data Center switching products for these cloud titans. This laid the foundation on which all of Arista networking products are based upon. This includes hardware platforms with industry standard chip technologies, common/open operating system across all networking platforms, an abstraction layer for auto programming, self configuration based upon tenant and neighbor intelligence, one operations platform for troubleshooting and the lowest software defect rate in the industry.

As a company growing to \$5 billion in revenue in 2023, Arista is leading the market with their Unified Cloud Networking (UCN) architecture. This architecture is applicable across campus, data centers, and hybrid cloud networks. It offers simple two tier leaf spine scale out designs, with no single points of failure, and bandwidth optimization across all redundant links. Customers get the most for money with these optimizations. Further Arista leverages the same advanced network operating system, including a real time distributed data layer, and a multi-functional operations platform across all of their switching platforms. Yes, the same binary can run on all platforms.



Universal Cloud Networking

Many enterprises including healthcare providers are replacing their legacy wired and wireless networks with Arista products, as for the first time in 30 years Arista can address the technical challenges that have been holding them back. These customers end up with more reliable, secure networks, and with smaller staffs that do not require expert configuration training. And they can deploy features that secure, protect, and enhance productivity without outages or disruptions.

From a healthcare peer perspective, here is a recent article where Baptist Health is adopting Arista networking technologies across 6 sites in addressing many of their outage, innovation, and operation challenges.

[Baptist Health Adopts Arista](#)

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