
Healthcare: Inter-Data Center Applications

Many healthcare organizations are handicapped by aging IT infrastructures, some with applications and hardware dating back to the mainframe era. Recent HITECH legislation mandates that these organizations must deploy and use Electronic Health Record (EHR) systems. IT departments are leveraging this opportunity to consolidate, update, and virtualize IT resources. Existing processes are being enhanced with business continuity measures such as offsite data replication and backup. These business continuity measures are resulting in excessive stress on existing WAN links. Simply buying more bandwidth is prohibitively costly and a WAN optimization strategy is necessary.

Top IT Priorities of Healthcare CIOs

- Greater application availability to increase accessibility of patient information and improve the quality of patient care
- Fast transfer of high resolution diagnostic images between locations
- Decrease the overall cost of HIPAA compliance
- Alleviate stress placed on the WAN by mandated EHR systems

The sheer amount of traffic moving across the inter-data center WAN is growing at a dramatic pace due to increased usage of technologies such as storage replication and virtual machine migration. The need to separate data centers across hundreds of miles in order to prevent risks associated with natural and man-made disasters is also straining WAN resources. WAN latency increases with the length of the link and complicates disaster recovery programs. Supporting an increasing amount of traffic with lower latency requirements presents both performance and economic challenges.

The WAN is a strategic asset that links care providers, administrators, and patients. Organizations must also support mobile and multi-site, as well as off-site care providers that require access to patient information around the clock. At the same time, IT organizations are seeking both operational and cost efficiencies by consolidating clinical and business information processing infrastructures through virtualization. Today's healthcare organization must be able to deliver top quality health care and services quickly, and without regard to geographic location. Data must be replicated across expensive WAN links on a constant basis in order to provide clinicians with the most recent information, so that they can make the best decisions for their patients' care.

Although widely deployed, traditional WAN optimization controllers were not intended to respond to the challenges presented by inter-data center communications, and were instead optimized for branch office to data center communications. There are enormous differences between the two deployment scenarios: Branch office traffic is comprised of a large number of low-speed connections created by individual users, whereas inter-data center traffic is typically comprised of a small number of very high-speed connections provisioned between storage arrays, clusters, etc. This "machine" to "machine" communication is aggressive, bursty, and latency-sensitive, requiring high-bandwidth WANs.

These factors create a need for a next generation of WAN optimization devices that are purpose-built to support inter-data center traffic, not branch to data center traffic.

Common Healthcare Applications for Next Generation WAN Optimization Devices

Application: Providing Better Patient Care with EHR Systems

Many healthcare organizations are comprised of multiple physical locations such as outpatient and inpatient facilities. In order to provide care givers with the best and most timely medical files and information, these organizations share critical information over the WAN. As more and more data (especially large diagnostic images) are generated and shared between healthcare facilities, current WAN architectures are getting pushed to their limits. This is dangerous because saturated WAN links threaten to not only decrease end user experience and put the over system adoption at risk, they also put patients' lives at risk. Many healthcare organizations build valuable safety checks into EHR systems. For example, nurses dispensing medication must first consult the patient records in the system to verify that there are no negative interactions with other medications or treatments (contraindications) for a particular patient. As technology becomes a more integral part of medicine, if the EHR system is inaccessible for even a brief period of time, patient care will get impacted. WAN links that are used for service applications and for business continuity functions, such as replication and backup, run the risk of being saturated. Yet, healthcare organizations do not have the luxury of buying successively larger WAN links. A solution that increases WAN efficiency is needed to allow more geographically separate data centers to share and protect EHRs while controlling costs and driving operational efficiency.

The Health Information Technology for Economic and Clinical Health Act (HITECH), a component of 2009's American Recovery and Reinvestment Act, is making available 22 billion dollars for the delivery of quality healthcare information systems.

Much like other industries, healthcare is no exception to today's tight budgets, and IT managers are struggling to do more with less. While many existing processes are being migrated from paper to EHR systems, budgets are coming under closer scrutiny. Healthcare providers must have constant access to timely and accurate care and diagnostic information in order to best serve their patients. An efficient IT infrastructure that allows for flawless delivery of mission-critical applications is necessary to provide effective communication and collaboration within and between healthcare organizations, to improve the quality of care, and increase administrative efficiency.

Application: Backup for Business Continuity

Backups, whether disk to disk or disk to tape, are critical components of business continuity and disaster recovery strategies. These processes protect physical and virtual application servers, database servers, and file storage – the core systems provided by IT departments. Data is growing at an alarming rate as is the need to push more data between data centers for the purposes of business continuity and disaster recovery. Every organization wants to backup faster and minimize backup windows. There is increasing pressure on companies to either purchase additional bandwidth (to move all requisite data with backup windows), to move backup processes into the daytime, or even worse to back up a lot less data.

Application: Regulatory Compliance

Healthcare IT departments are faced with the daunting mission of maintaining HIPAA compliance. This tasks them with the burden of storing enormous amounts of patient data in order to demonstrate compliance in the event of an audit. A typical solution might involve storing records (for example patient intake and treatment records) in their original form (and preventing tampering) for many years. Many healthcare organizations archive from primary storage located at one data center to other storage (disk or tape) at another data center across a WAN link. Audits cost time and money. The faster compliance can be demonstrated the faster scarce IT resources can return to normal duties.

Similar to the challenges faced by backup and recovery operations, archiving across WAN links can be hindered by high latency, inefficient TCP networking, and the ever increasing volume of patient data to archive. Bandwidth must be saturated efficiently – the link between data centers should ideally be as fast as the links between servers and storage.

Criteria for Selecting Next Generation WAN Optimization

Next generation WAN optimization solutions should manage and accelerate critical applications requiring high performance and throughput between data centers. These solutions should be able to keep the WAN link fully utilized while applying reduction features to reduce the actual data footprint on the WAN.

Core Selection Criteria:

- **Acceleration:** The device must be able to accelerate up to 10Gbps of traffic.
- **Data Reduction:** The device must be able to sustain inline data reduction rates at levels of 80-90%.
- **High Throughput:** The device must support up to 1Gbps per connection and guarantee high throughput for critical workflows traversing long distance (100ms+ latency) WAN links.
- **Quality of Service:** The device must support granular QoS policies to ensure tight SLAs for critical application traffic.

Next generation WAN optimization devices need to be built to sustain multiple 10 Gbps links with extremely low latency. WAN traffic rates needs to be reduced, and network overhead needs to be dealt with more efficiently. This requires a very fast hardware-based reduction engine that enables the WAN optimization device to maintain the highest levels of data reduction at multi-gigabit speeds, while guaranteeing port to port latencies in the tens of microseconds.

TCP windows and inter-flow behavior needs to be managed very aggressively with dynamically adjusted window sizes in order to curtail the effects of WAN latency and packet loss. And finally, the WAN optimization controller must be built around a very high speed traffic management sub-system that can classify and prioritize traffic at multi-gigabit line rates, so that competing traffic can be managed as per business priorities.

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