Customer Success Story

ADARA Advanced Solution Set for Healthcare

Executive Summary

Industry: Healthcare

Challenge

National healthcare clinic with multiple locations needed to expand capacity, improve performance, manage complexity and deliver continuously available, critical services.

Solution

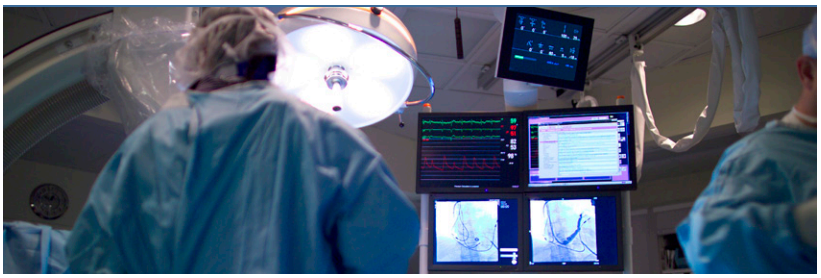
- Provided real time, failure-proofed redundancy
- Added dynamic capacity
- Created end-to-end virtualization of all resources

Results

- Dramatically increased performance, productivity and ROI
- Enabled all services available 24/7 to all users, remote or local
- Provided protection from service and other interruptions

Key Products

- The ADARA Networks Virtual Overlay Network (VON)
- ADARA SIRIUS, ALPHA, GOLD and WILD Routers
- ADARA WDNS



Major Healthcare Clinic Increased Performance and Capacity while Reducing Costs

Business Challenge

One of the largest clinics in the US, serving both large urban and multiple remote areas, needed to expand capacity and improve performance of its networking and computing infrastructure. In order to support the demands of the expanding community, and care for a patient population with services of growing complexity and bandwidth intensiveness, the infrastructure needed to deliver mission critical services with higher performance than ever before. These services had to be always available and dynamically scalable.

The clinics operated multiple data centers in an active (hot) standby manner, but needed them to operate in a fully active-active configuration. However, conventional products did not achieve true data center “virtualization” from the end user to the data center.

Investigation of Disaster Recovery Management (DRM) Schemes

Many possible solutions were investigated, including an outsourced, hosted DRM. The options being considered would have been point solutions, not comprehensive solutions that would not have solved the following:

- Stale DNS mapping issues
- Dynamic capacity data center or connectivity issues
- Recovery from routing anomalies
- Load balanced network elements or resources

- Preemptive prevention of dynamic spikes which would cause critical levels and failures
- Other numerous predictable and unpredictable anomalies

It was clear that highly-available servers were not highly-available services, and that QoS alone was not the solution because the infrastructure was not capacity-constrained, but performance-constrained. Most importantly, all of the conventional schemes were focused upon failure and recovery.

They were attempting to raise the bar from disaster-then-recovery, trying to "virtualize" the entire end-to-end infrastructure so that no single element or group of elements could disrupt service delivery. The correct solution had to accomplish all of these goals, and be comprehensive and transparent, leveraging infrastructure in place, requiring no changes at all.

Investigation of Infrastructure Issues

The clinic realized that the exposure to a single service provider had to be addressed as a single point-of-service congestion and/or failure.

Having a single data center configured as active while others were in hot standby, was sub-optimal at best, and at worst, prevented the clinic from achieving its mission. They knew that such a data center was:

- Incapable of assisting in stateful service availability
- Unable to generate financial justifications for the time in use
- Incapable of providing service scalability

Most importantly, a sub-optimal data center would not prevent a fatal interruption in service delivery. The ability to re-configure both data centers to be active-active and to determine performance in real time, as well as availability, was crucial.

The entire operation had already become fully paperless and electronic. Therefore, it required IT delivered services to always be available. Service had to be maintained despite numerous potential anomalies, some not within the control of the clinic to troubleshoot or repair. ADARA categorized potential anomalies into two groups:

- **Horizontal issues:** issues in the end-to-end infrastructure from client-to network-to-data center
- **Vertical issues:** issues in the stack, from Layer 1 to Layer 7

Horizontal Issues: End-to-End

The clinic needed to ensure against service unavailability which could occur at any point in the end-to-end infrastructure. A myriad of potential anomalies existed, such as:

- Local and remote routers and switches could malfunction, fail, or become overloaded
- Firewalls could be improperly configured or experience anomalies in running through rules
- Servers and applications could suffer from misconfigurations, hardware or software failure
- DNS could have stale or incorrect mappings
- Client browsers could cache incorrect or stale mappings
- Routing could be misconfigured or experience anomalies

- Connectivity could degrade or fail in the Verizon network, into which the clinic did not have visibility and could not troubleshoot
- Power loss could cripple network providers or data centers for periods longer than what Uninterruptible Power Supplies (UPSs) could provide

In addition, there was also no way to preconfigure the infrastructure to dynamically respond to unforeseeable real-world situations. The clinic therefore needed to do the following:

- Eliminate reliance upon a single service provider
- Remove exposure to multiple single points of failures
- Balance every segment of the end-to-end infrastructure

Vertical Issues: Physical to Application Layer

The clinic needed a solution which would span all of the layers in the stack of the OSI model. Conventional technologies did not coordinate actions between the layers, and these functionalities were not coordinated or integrated.

It was critical to ensure granularity in services delivery by coordinating application, user and services dynamics to the network and physical layers.

The solution needed to manage service flows based on port and service type. Dynamically integrating all layers simultaneously would enable the paperless clinic to achieve fine grained control, and to ensure services delivery was uninterrupted.

Every individual service and application would be coordinated and optimized. This fully integrated capability enabled the clinic to make an optimal decision with regard to transport, network, and application data simultaneously.

The desired result was a solution that would dynamically know the availability and optimality of all resources as well as all sites servers, routers, switches, applications, services, files, and content at runtime.

Comprehensive Solution Requirements

The following necessary requirements were considerable:

- Guarantee services to remote sites even if any part of the infrastructure were not functional
- Guarantee services and service levels to continue regardless of degradations or failures at any point in the infrastructure
- Ensure service even if the anomalies were not understood or beyond the reach of the IT staff to troubleshoot
- Guarantee services even if computing and especially networking infrastructure were degraded, but had not yet failed
- Deliver a fully transparent solution that does not require any changes to infrastructure
- Increase capacity by multiples, while lowering costs in terms of dollars per Mbps delivered

Performance

The clinic required that end-to-end performance be improved through any solution deployed. It was insufficient to simply improve “PING” response time. Also, bandwidth availability, while a contributor to better performance, did not ensure or predict performance, even with a single domain.

Scalability

Infrastructure must be dynamically scalable to meet spikes in demand and usage for access to Electronic Medical Records (EMRs), PACS and all services. Previous static over provisioning did not address scalability, and:

- Was neither a true solution nor financially practical
- Would not address the issue of dynamic demand spikes
- Would not enable additional concurrent connectivity
- Would not be dynamic or solve the issues of multiple points of failure that could arise in the event of a medical emergency

Scalability was also defined as increasing the normal operating capacity of the entire system, and that could only be achieved by coordinating and subsequently increasing the efficiencies of all resources in the infrastructure.

Solution and Results

ADARA's Advanced Solution Set for Healthcare provided a comprehensive solution: an end-to-end virtualization of all resources, while simultaneously and dynamically balancing and scaling the infrastructure with policy in a fully-transparent manner.

ADARA's solution provided real time, failure-proofed redundancy, and added dynamic capacity as needed. This enabled preemptive management of resources to eliminate failure-recovery situations, and as a result provided always-available service in its place.

The ADARA Networks Virtual Overlay Network (VON) - a dynamic overlay of tunnels which enables optimized performance and always-available services was implemented.

Link Virtualization

ADARA Sirius Routers enabled the creation of the ADARA VON. Sirius Routers using ADARA dynamic multipath routing virtualized all public and private links simultaneously.

ADARA enabled the optimization of all network links and paths in order to aggregate and use their individual bandwidth capacities to prevent overload, service degradation and failures. The number of network paths available to concurrently route traffic have thus increased significantly.

The total concurrent transmission capacity of the network has been significantly increased:
a 300% increase on the MPLS WAN PVC links, and an approximately 1000% increase on the Internet links.

Sirius Routers, working with ADARA Alpha Routers demonstrated the power of ADARA's full stack integration:

- Alpha Routers operate at the application layer, seeing all users, requests, sites, servers, and services
- Sirius Routers create the ADARA Tunneled VON that concurrently uses Internet and WAN links

ADARA does not compete with MPLS. The ADARA Solution makes MPLS dynamic, and extends functionality from the MPLS domain by adding knowledge of the execution environment.

Host/Site Virtualization

ADARA Alpha Routers with ADARA WDNS, and ADARA Wild Routers virtualized all hosts of a service simultaneously, whether co-located or distributed (site virtualization). Aggregation of all servers allowed them to:

- Optimally share load
- Aggregate processing power and storage capacity
- Prevent overload and critical failures
- Increase processing and storage capacities
- Extend end-of-life (EOL)

Most importantly, ADARA enabled all services to be available to all users, remote or local, at all times.

The ADARA Advanced Solution Set for Healthcare enabled the multiplexing of all resources. ADARA multi-path was shown to be more efficient than all other multi-path and single-path mechanisms.

By enabling a fully virtualized infrastructure, ADARA provided protection from:

- Service interruptions resulting from misconfigurations
- Hardware or software failures
- Local power outage and connectivity degradations and failures
- Denial-of-Service (DOS) attacks and other malicious activities

In each of these levels of virtualization, capacities and performance were increased.

Previously unused/underutilized resources were able to deliver increased production and Return on Investment (ROI) of existing infrastructure.

In addition, by enabling the extension of virtualized services, ADARA showed that additional investment in conventional infrastructure could be leveraged to deliver greater production.

Availability

ADARA Alpha Series Routers featuring ADARA WDNS, ADARA Wild Host Routers, and ADARA Gold Object Routers, enabled the clinic to achieve its objective for stateful service for all users. The health status and load of all sites, servers, applications, content files and services at all sites are known in real time. This prevents mapping clients to a malfunctioning or disabled site or resource, and proactively prevents the creation of hot spots.

Scalability

Active-active configurations for the data centers more than doubled the processing capacity of the clinics' infrastructure. The increase in processing capacity resulted from:

- Aggregation of both computing and networking resources
- Efficiencies gained through cross layer integration and coordination

The ADARA Solution enabled the clinic to endure any usage spikes. Prior to implementation, these sudden surges in demand would have been catastrophic to operations.

Summary Of Significant Results

The ADARA Advanced Solution Set for Healthcare more than doubled the processing capacity of the clinics' data center infrastructure.

The number of network paths available to concurrently route traffic have increased significantly. Every remote site has increased the number of available and concurrently utilized paths from one (1) path to eight (8) symmetrical, and sixteen (16) asymmetrical paths per remote site.

The total concurrent transmission capacity of the network has been significantly increased:

- 300% increase on the MPLS WAN PVC links
- Approximately 1000% increase on the Internet links

ADARA does not compete with MPLS. ADARA enables resource reservation schemes like MPLS to be fully leveraged.

ADARA eliminates Post Deployment Catastrophe Averted

After implementation the clinic experienced two (2) episodes where failures were averted - without ADARA's Advanced Solution Set for Healthcare these occurrences would have resulted in service loss.

The clinic experienced a complete loss of service on the MPLS circuits in the Verizon PVC which lasted 3 hours. ADARA Sirius Routers continued to network service around the MPLS network outage.

The clinic experienced what would have been data center loss at the primary data center. ADARA Alpha Routers moved service for the entire clinic to alternate data centers. No service interruption occurred, no patients were jeopardized, and no health care provider was even aware that the data center was unavailable.

For more information, www.adaranetworks.com.

