



Children's
of Alabama

Accelerating IT Delivery to Improve Patient Care with V3 Appliances

CHALLENGES

- Quickly accessing the required data to ensure quality healthcare for patients
- A platform that was accessible to the 1500 nurses and doctors in the Children's Hospital

SOLUTION

Even after leveraging a super-fast network and an optimized infrastructure, the performance was not up to par. In order to achieve the required performance goals, the V3 appliance was introduced and produced extraordinary results. All of the above decisions were made to improve the hospital's IT delivery with the goal of enhancing the patient care and experience.

This Case Study represents a production VMware View Virtual Desktop infrastructure for use by 1500 nurses and doctors, which was deployed in a period of 5 weeks for an expansion facility. After extensive testing, the V3 appliance solution was introduced to achieve performance requirements.

In the Healthcare industry, the most important metric is the quality of care provided to patients. This is influenced by how quickly care providers can access the data needed to provide the best and most responsive care possible. The team at Children's Hospital of Alabama tackled this challenge by leveraging some of the newest technology on the market today while they deployed their VMware View Virtual Desktop Infrastructure (VDI) platform.

Like many healthcare providers, Children's of Alabama performed their due diligence to make a sound investment in technology. They had purchased the most competitive and fastest blade technology on the market, and the fastest SAN with tiered storage (Solid State Drive pool, 15K and 10K drives). They had designed a state-of-the-art network infrastructure and topology that was based on a 40 Gigabit pipe. In addition, they chose VMware View, AppSense, and Active Directory for their VDI and User Virtualization Layer technologies.

The Business Need

The IT group at Children's of Alabama thoroughly and carefully worked with hospital staff to fully understand their requirements and then diligently translated these requirements into a scalable architecture that could replicate the existing desktop experience. This resulted in the following key mandates:

- **Bed side unit access:** Nurses and Doctors are able to gain access to the patient data at the bedside, accessing their virtual desktops from devices positioned next to each patient bed.
- **Follow Me Desktop (critical functionality):** Nurses and Doctors are able to login to their virtual desktops securely, and see current patient data from any device in the hospital. This allows them to have the most up-to-date patient information at all times. Staff members can use one of two options when disconnecting from a device:
 - Suspend desktop: Staff members can suspend their sessions at one device and pick up where they left off by logging in at another device without losing the state of their virtual desktop.
 - Log off: When a user logs off, the virtual desktop will refresh, wiping all information related to that user.
- **Localized information and resource mapping:** Nurses are able to log off their desktops and log back in to their desktops having all localized information mapped (such as local printing).

- **Nursing round support:** The system follows nurses as they go floor to floor. They use their credentials to access their desktop in the exact state that they left it when they disconnected. For example, if a Nurse opens Microsoft Word and is typing a summarization and gets called to another floor, he or she can disconnect the virtual desktop from the device in front of them, rush to the emergency call and login to the device at the new location and get their virtual desktop in the exact state it was left.
- **Personalized application access:** Doctors and Nurses access a personalized image provisioned with applications that are unique to each nurse and doctor.
- **Automated desktop refresh:** All desktops are automatically refreshed after 60 minutes of being in a disconnected state. In addition, desktops must automatically move to a disconnect state in the event that a practitioner does not log off.
- **Floating pool deployment:** Nurses and Doctors are provided with non-persistent virtual desktops. These are virtual desktops where data cannot be saved and the virtual desktop is wiped and regenerated each time a nurse or doctor logs off.
- **Shared drive mapping:** Shared folders that Doctors and Nurses could access prior to the VDI implementation are mapped to their virtual desktops. The virtual desktops give the Nurses and Doctors the same access to information as before.

The Existing Infrastructure

The existing infrastructure at Children’s of Alabama included three Cisco UCS Blade Servers B440 M2 with 256GB RAM, an EMC VNX SAN with 2.2TB of EMC superfast SSD drives (not yet configured), and approximately 20TB of 10K drives in a pool. The Cisco Network Infrastructure was an ultrafast 40Gb backbone. The following activities were also conducted to attempt to optimize the performance:

- Upgraded the VMware software in the existing ecosystem: View 4.6 View infrastructure to View 5.1. This included View Connection Servers, View Security Server and the View Composer Server. In line with best practices, they also built a second vCenter Server 5.0 U1 and dedicated it only for VDI. On this vCenter Server they also installed Composer 3.0, to handle Linked Clones.
- Upgraded vSphere 4.1, ESXi 4.1 and vCenter 4.1 to vSphere 5, ESXi 5.0 U1. A new vCenter Server 5.0 was built and dedicated to VDI.
- Configured the SSD drives in the VNX as a separate pool dedicated to VDI. With this configuration, the initial boot times tested between 1 minute 12 seconds and 1 minute 20 seconds.
- Created a Desktop Image with relevant applications.
- Deployed a Test Pool.

- View 5.1 Security Servers and Connection Server clusters were created.
- The User Layer (including the Master Image, Registry Edits, Group Policy Objects (GPOs)), was extensively analyzed, and corrupt GPOs and a bad application install on the master image were found. After fixing these issues and performing optimizations based on live analysis, the boot time was consistently reduced from 1 minute and 12-20 seconds, to 45-55 seconds. Although not optimal, these times are relatively fast for a production system with decentralized storage.

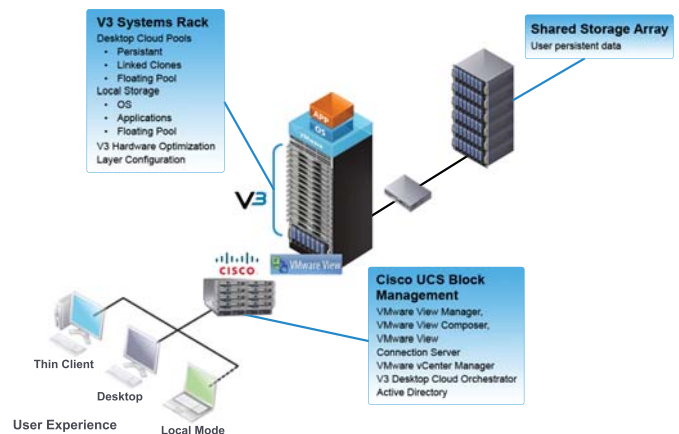
Even after their current infrastructure was fully optimized, Children’s of Alabama still needed faster performance. The mandate from the CIO was simple, to make the staff experience even faster and more reliable.

V3 Systems Proof-of-Concept

A VMware architect/consultant pointed out that the hospital was currently deploying Cisco B440 M2 Servers in the Server Layer (Server Virtualization) and how this is inefficient for desktop virtualization. At that point, and upon the architect’s recommendation, the hospital chose to deploy a V3 demonstration appliance to determine whether performance could be improved to a satisfactory level.

The V3 appliance arrived and was installed in the datacenter. A separate cluster dedicated to the V3 appliance was created in vCenter. A production pool (identical pool, from the same Master Image used for the existing infrastructure) was created on the appliance.

Cisco/VMware/V3 Systems Reference Architecture



It is important to note that the V3 appliance was deployed to augment and support the existing UCS and VNX infrastructure. It did not replace UCS or VNX but instead provided an incremental high performance cluster or resources. The V3 appliance solution isolated critical components of the virtual desktop (in this case the Replica Disk and the OS disks) that are vulnerable to traditional server design latencies and IOPS contention. The results included:

- **Reduced login times:** Login times were reduced from 50 to 22 seconds (>50% Improvement).
- **Decreased application load times:** Application load times were decreased approximately 50%.
- **Better end user experience:** The user experience was faster than their existing client desktop experience.
- **Purpose allocated hardware:** Critical performing VDI components were managed by the V3 appliance, optimized for desktop virtualization.
- **Increased performance:** Every bottleneck that slowed performance was minimized. For example, the V3 appliance combines CPU, memory, and OS drive space directly on the appliance. The operating system and applications remain instantly available to the CPU using industry standard solid state (flash) memory, preventing delays associated with spinning disk drives, decreasing context switching latency, and increasing access speed for working data. By optimizing the use of local storage, and leveraging shared storage (SANs and NAS) only for persistent user data, access latency is decreased by an order of magnitude.

Results and V3 Benefits

By adding V3 appliance as their computing and local storage component to their VMware View, Cisco UCS, and EMC UCS infrastructure, Children's of Alabama gained a 100% performance increase for the end user desktop experience.

What did the V3 appliance do?

- **Removed latency:** Eliminated the bottlenecks of latency and IOPS contention.
- **Eliminated the VDI science experiment:** The V3 appliance is a purpose built, patent-pending solution that combines specifically designed and configured appliance technology with customized software that has been exhaustively lab and field tested. It eliminated the need to purchase and experiment with off the shelf hardware and accelerated the actual use of the technology by care practitioners.
- **Delivered industry leading technology:** The V3 appliance has been engineered and tuned to get the maximum performance and customized software and firmware configurations that guarantee end user experience of 2 to 8 times faster than a traditional desktop.
- **Condensed VD per core:** The V3 appliance tested in this Case Study was generating 11 Virtual Desktops per Core, versus 5 Virtual Desktops per Core with previous implementations.
- **Reduced total cost of operations:** The hospital reduced TCO by an estimated \$100K (after the cost of 3 appliances with redundancy) by not having to upgrade their expensive SSD to accommodate production scalability.
- **Exceeded end user expectations:** End users expect VDI to be faster, easier to use, and provide a better desktop experience than a traditional desktop provides. The V3 solution was key to meeting these expectations and to supporting the Children's of Alabama mission to be a world-class healthcare provider. At the end of the project the talk around the office was, "The doctors, of course, do not get to use the zero clients because the nurses like them so much!"
- **Improved technology adoptability:** End User acceptance of VDI with V3 appliances has paved the way for Children's to adopt new virtualization technologies, leverage existing virtualization technologies, integrate better with existing monitoring solutions, and provide a pro-active approach to managing their existing virtual infrastructure.