Aledo ISD VMware View Design Reference Implementation

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Introduction

This paper outlines the successful design and implementation of VMware View at Aledo Independent School District by Sigma Solutions.

Overview Design Approach

At Aledo ISD, Sigma Solutions leveraged a VMware View reference architecture specifically designed with the complete solution in mind- including Servers, Networking, Storage, and related software components. Several templates, questionnaires and sizing tools were also developed and leveraged to ensure the overall solution was scalable, manageable, predictable and re-producible. This was essential to ensure that the deployment not only met, but additionally exceeded the customers' expectations and quickly allowed them to realize the benefits of desktop virtualization.

The basis of the solution used at Aledo ISD (and one which Sigma uses with all of its customers) is a "Block and Pod" approach to virtualization. This Block includes all of the management virtualization servers and applications required to support desktop virtualization pods. The Management Block, called VMware View Management Block (VVMB), supports up to ten (10) VMware View VDI Pods (VVVP). Each VVVP, supports on average up to 1500 Virtual Desktops (depending on user profiles, OS, memory, CPU, etc...), thus scaling to 15,000 virtual desktops.

Sigma's desktop virtualization reference architecture details are not included in this document. This paper focuses on the actual implementation of the reference architecture developed by Sigma Solutions at Aledo ISD. Figures 1 and 2 illustrate a typical virtual desktop deployment by Sigma which leverages Cisco UCS networking and servers, EMC Storage and VMware View virtual desktop software.

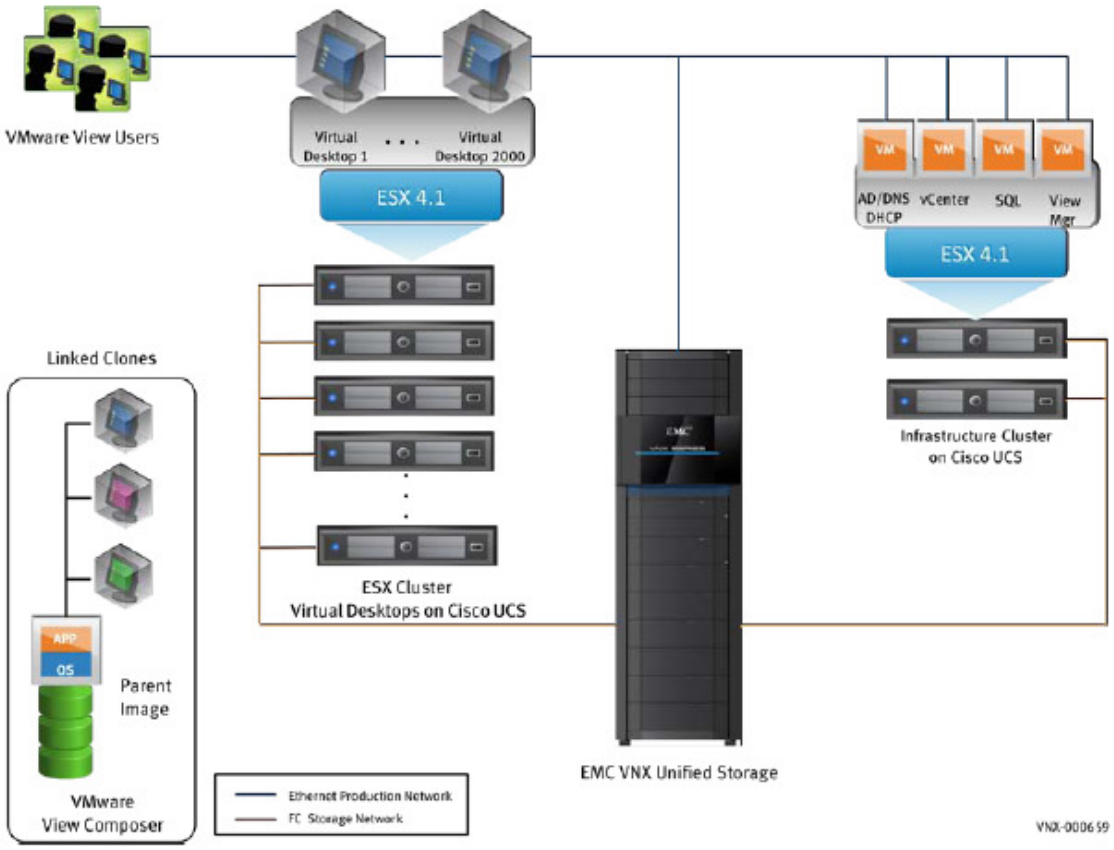

Figure 1. EMC and Cisco UCS Solution Overview

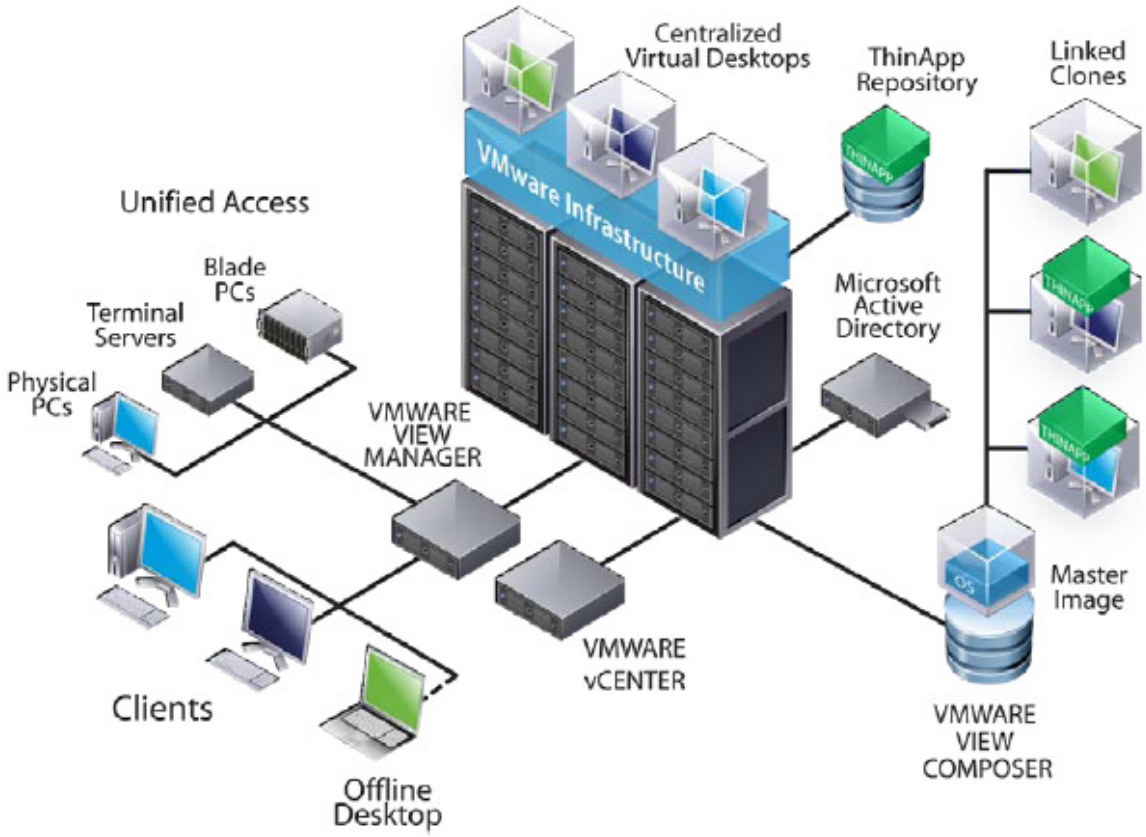

Figure 2. VMware View Components described in the following sections

Technical Highlights of Sigma's Desktop Virtualization Reference Architecture

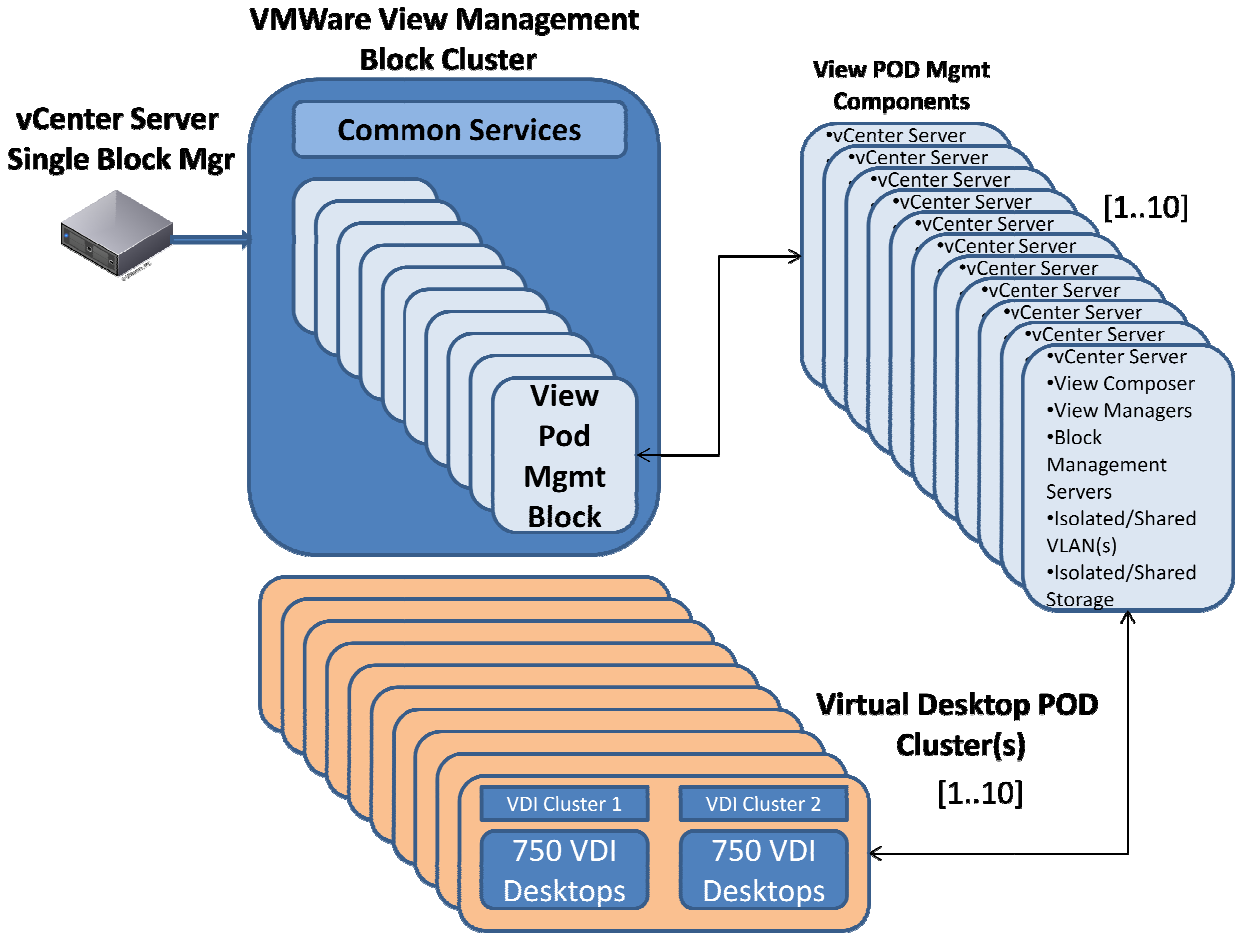

Figure 3 Sigma Block and POD Diagram

- VMware View Management Block (VVMB) and VMware View VDI Pod (VVVP) approach
    - VMware View Management Block (VVMB)
        - The VMware View Block in the reference architecture is defined as a group of management servers that support between 1 to 10 VMware View Pods. Each block contains management servers-such as vCenter Servers, View Connection Management Servers and File Shares for Data Repositories (ThinApp, Transfer Servers. User profiles, etc.), Domain Controllers and other Utility Servers to support VMware View Virtual Desktop Pods.
        - Each VMware View Management Block has its own unique storage, networking and virtual servers that can provide support, security and controllers for each VMware View Pod.
        - The View Management Block consists of a vSphere-based HA/DRS/FT cluster that supports up to 8 physical servers managed by a single vCenter server.

- The VVMD can support up to 10 VVVP, with 1500 VDI Sessions per VVVP and is scalable to support up to 15,000 VDI Desktops.

- VMware View VDI POD (VVVP)
  - The VVVP is a set of VMware vSphere servers designed to support, host and deploy VMware View virtual desktops.
  - Each VVVP has its own vCenter server and set of Connection Manager Servers hosts in the VVMD.
  - Most VVMDs have their own Networking requirements that allow them to be isolated (if needed) and communicate over the networking interfaces back into the VVMB.
  - Each VVMD has its own storage to support the virtual desktop environments.
  - Each VVMD can have up to two (2) eight (8) server clusters that can support up to 750 instances per cluster or 1500 Virtual desktops in total per Pod.

- A reference architecture needs to be scalable, manageable, reproducible and predictable. For our complete solution, we utilize solid and proven technologies with VVMB and VVVP components. There are several steps involved in building the reference architecture and adjustments are made accordingly based on up-front assessments, technology changes, service-level agreements, user profiles and long-term objectives. There are several factors that go into the planning, architecting and development of virtual desktop solutions, but the high level architectural design remains consistent. This architecture is flexible enough to adjust to various types of server, storage and networking technologies, but uses the same underlying premise for CPUs, Memory, Storage allocation, networking requirements and security.
- A key attribute of our reference architecture is the upfront virtual desktop assessment which builds user profiles and feeds this information into Sigma's sizing utilities so that we can engineer the best overall solution to meet a customer's objectives. This assessment contains 18 sections and covers everything from user profiles, user data, the business case, security, data integrity, helpdesk etc. that are used to provide a solid understanding of how the architecture will be designed and supported long-term.
- Below are some key high-level hardware engineering specifications:
    - Servers
        - Dual Intel Nehalem X5640 (Quad-Core 2.66 GHz or higher) CPUs
        - 96 GB RAM
        - Recommend Cisco UCS Blade systems with B200 blade servers
        - Fiber Channel or NAS base interconnects
    - Storage
        - 3 Tiers of storage are used
            - Tier 1 – Solid state drives for base replica disks for linked clones
            - Tier 2 – SAS Based 15K Minimum for active desktops
            - Tier 3 – SATA based storage for backups, user profiles, ThinApp repository, base images in Transfer servers, etc…
        - EMC VNX Storage is the storage of choice for our solution, but customers can additionally leverage other storage vendors such as NetApp, Toshiba, etc...

- Networking
    - 802.1 VLAN Tagged Virtual Switching is a key component to support multi-site and multi-tenet environments and provides the following benefits:
        - Pure layer-2 security
        - Virtual Port group based bandwidth control
        - Limit Physical NICs per server
        - Isolation between Servers, Desktops and NAS storage
    - The majority of our solutions are based on Cisco hardware and software solutions.
- Thin Clients
    - Although our solution is not tethered to any specific end device, there are some thin client solutions that can provide several benefits to our customers, such as reducing their power costs:
        - An average PC draws ~100 kWh per month; thin clients draw ~12 kWh per month
        - Replacing 500 PCs with thin clients can save on average $120K per year on utility costs alone (very low estimate)
    - Ease of end device maintenance
    - Solid state devices have 5+ years life-cycle
- Hardware recommended:
    - Wyse P20 Zero Client
    - Samsung NC190 Zero Client

Aledo ISD VMware View Implementation

Overview

Aledo Independent School District was on a quest to provide advanced end user experience for their students, faculty, administration and IT support staff on a fixed budget. The district could no longer afford the constant capital outlays for new PCs and turned to virtual desktops to not only provide a solid platform for end user computing, but one which could save the district dollars down the road-thus potentially allowing them hold on to valuable teacher and staff positions.

Solution

As a trusted solutions partner, Sigma was tasked to develop a virtual desktop environment that would initially support the 9TH grade computing environment (which was due for a complete computer refresh cycle). Aledo's IT leadership team selected VMware View and leveraged Sigma's experience to roll out virtual desktops successfully in this environment. Initial funding was used to build out Sigma's Desktop Virtualization "Block and Pod" architecture to support over 2000 students with approximately 500 concurrent users at the 9th grade high school.

The success of the implementation was quickly noted by the leaders within the school district as well as many surrounding school districts. As a result, Aledo ISD transitioned their 10-12th grade high schools to VMware View and the budget was quickly approved. This implementation provides another 2000+ students advanced computing with desktop virtualization, replacing 600 old PCs with Wyse P20 thin clients and a software utility called ThinLaunch to repurpose older computers.

An initial success story was published by VMware (http://www.VMware.com/files/pdf/customers/11Q1_Aledo_ISD_Case_Study.pdf) that describes the overall success of the initial deployment of Sigma's Virtual Desktop architecture within Aledo ISD.

Technology Specifics for Aledo ISD Deployment

The virtual desktop deployment at Aledo ISD consists of a single VMware View Management Block and two (2) VMware View VDI Pods. This infrastructure supports the 9-12th grade students or roughly ~1000 concurrent desktops to over 3000 students. This architecture can scale up with no added resources to support 1500 concurrent virtual desktops.

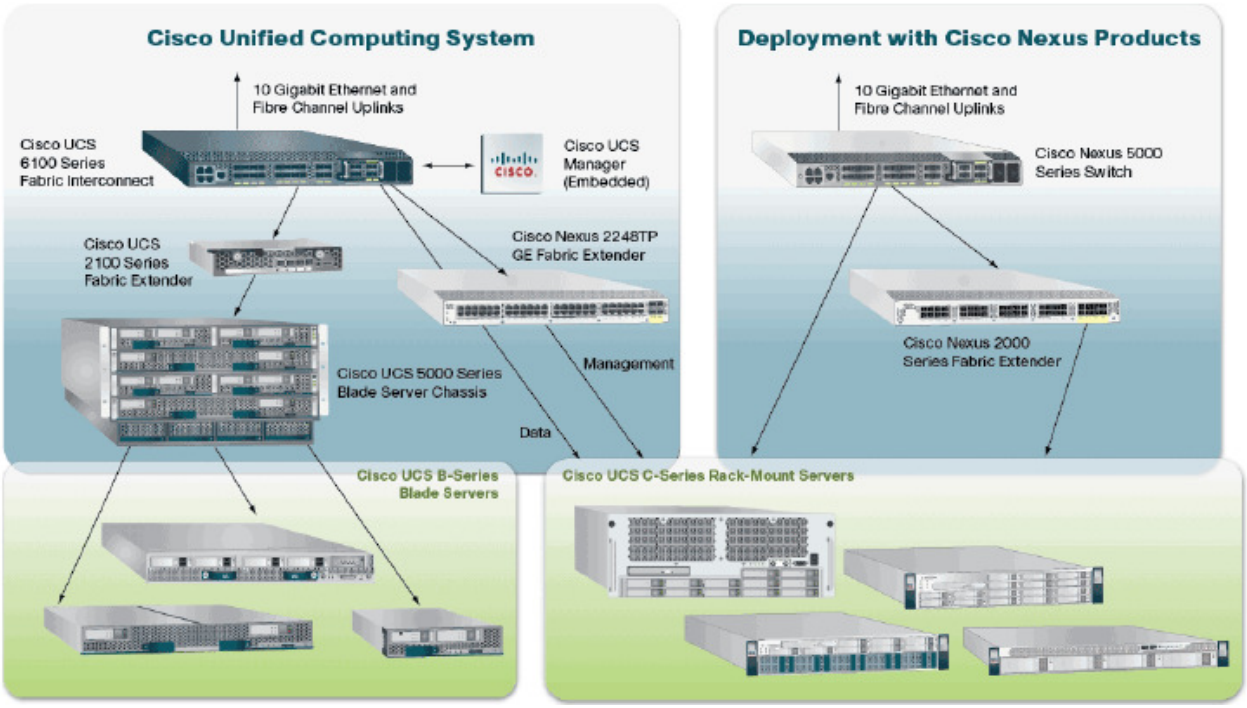

Figure 4. Aledo ISD Cisco UCS Solution Diagram

Several factors were considered in engineering the overall solution at Aledo ISD-including;

- Data gathering concerning user profiles
- Desktop workflows
- Security
- Operating system requirements
- Applications needed per user groups
- End user device access
- Expected end-to-end service level agreements

Using Sigma's technology partnerships with Cisco UCS, EMC, Wyse, Samsung, ThinLaunch, Solarwinds and VMware, Sigma provided an end-to-end solution and that met customer objectives and overall requirements. This solution included the following components:

- Cisco UCS Networking and Blade Servers
- EMC VNX Storage with all 3 tiers of storage
- VMware View Premier 4.5 and 4.6
- Wyse P20 Zero Clients with Teradici Manager
- Samsung NC190 Zero Clients with Teradici Manager
- ThinLaunch software to lockdown and re-purpose existing PCs
- Solarwinds Orion Suite of environment monitoring and performance utilities

The following tables represent the overall hardware and software deployment components used in the Aledo ISD virtual desktop deployment. The following figures show the actual implementation as well as the pod and block layout.

TABLE 1 SOLUTION HARDWARE

Hardware	Quantity	Configuration	Notes
Cisco UCS Rack Mount c210 Servers	6	Dual Quad Intel 5550 @2.67 GHz 8 CPUs 96 G Ram Dual FC HBA's 4G 8 -1Gbe NICs	4 Servers used for 9th Grade VDI Pod cluster and 2 For Management Block cluster
Cisco Rack Mound c250 Servers	2	Dual Quad Intel 5540 @2.53 GHz 8 CPUs 192 G Ram Dual FC HBA's 4G 8 -1Gbe NICs	Added to VDI Pod Cluster to support up to 700 VDI Desktops
Cisco Blade Servers B200	10	Dual Six-Way Intel 5650 @2.67 GHz 12 CPUs 96 G Ram Integrated converged network adaptor	8 Servers are for High Scholl VDI Pod cluster and 2 are added to the Management Block Cluster
Cisco Blade Chassis	2	UCS 5108 2 UCS 2104XP-I/O module	
Cisco Nexus 4510	2	Intel Xeon 4 G Ram	Infrastructure switching
EMC Storage - NS-4G15-300HS	2	300GB 15K 4GB FC 520BPS HS	All EMC Includes Fast Cache Architecture
EMC Storage - NS-4G15-300	23	300GB 15K 4GB FC 520BPS	Tier 1
EMC Storage - NS-SA07-010	6	ASSY DISK 1000GB 7.2K 512BPS SATA 3GB 32MB - R	Tier 3
EMC Storage - NS-SA07-010-HS	1	ASSY DISK 1000GB 7.2K 512BPS SATA 3GB 32MB - R HS	Tier 3
EMC Storage - NS-SA07-010U	12	ASSY DISK 1000GB 7.2K 512BPS SATA 3GB 32MB - R UPG	Tier 3
EMC Storage - NS-4G15-600U	12	600GB 15K 4G FC NAS DISK DRIVE UPGRADE	Tier 1
EMC Storage - FLNSAF04-100U	3	100GB FLASH DRIVE FOR NS FAST CACHE UPGRADES	Tier 1
EMC Storage - NS-AF04-200U	11	200GB 3.5IN 520BPS FLASH DRIVE 4GB FC UPGRADE	Tier 1
Wyse P20 Zero Clients – PCoIP Teradici	600	High School and Special Education	Re-purposed existing monitors. Replacing older equipment.
Samsung NC190 With Integrated monitor Zero Clients – PCoIP Teradici	500	9th Grade end user devices	Replacing older equipment.
Intel Server	1	Two quad Intel family 5400 CPUs 8 G Ram	Single vCenter server for Management Block. All other vCenter servers are virtualized.

TABLE 2 SOLUTION SOFTWARE

Software	Configuration	Notes
EMC OE	Operational Environment Management software for Virtual Environments	
EMC Power Path	Operational Environment Management software for Virtual Environments	
VMWare vSphere ESX	4.1.0 Build 260247	used on 9th Grade Cluster
VMWare vSphere ESXi	4.1 U1 Build 381591	used on High School Cluster
VMWare vCenter Server	4.1 Build 258902	used on 9th Grade Cluster
VMWare vCenter Server	4.1 U1 Build 345043	used on High School Cluster
VMWare View Manager	4.5 Build 277453	used on 9th Grade Cluster
VMWare View Manager	4.6 Build 366101	used on High School Cluster
VMWare View Composer	2.5	used on 9th Grade Cluster
VMWare View Composer	2.6	used on High School Cluster
Microsoft SQL Server	2008	Database server that hosts vCenter server, View Composer and View events databases
Microsoft Windows 2008	R2 STD	Operating systems for all virtual servers, 64bit
EMC Unisphere	1.0	Management software for EMC
Windows XP 32 bit	SP3	Virtual Desktop base image OS
UCS	1.4 (m)	Firmware and management software
ThinLaunch	2.6.5	Software used to re-purpose 250 Laptops to lockdown and connect to View broker(s)
Teradici PCoverIP	3.3	Firmware and management software
Solarwinds Orion Network Performance Monitor	8.0	Network and Performance Monitoring software

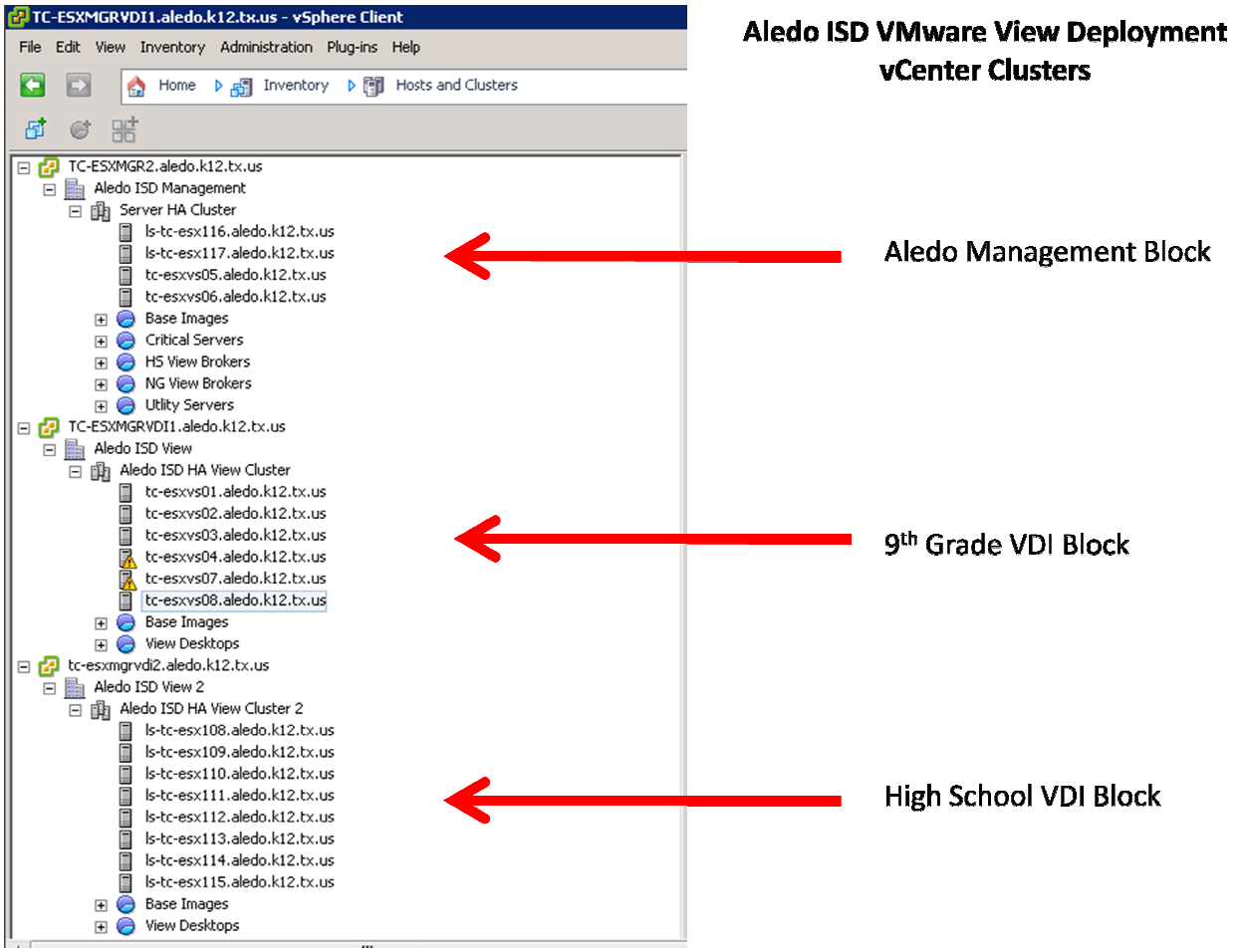

Figure 5. Aledo ISD VMware Block and Pod "Single Pane of Glass" View

Figure 5 shows the "single pane of glass" view of vCenter in linked mode configuration. The virtual desktop management block contains all of the management and control servers that support the two (2) VDI blocks noted. Additionally, the VDI Pod networking is separated by two (2) separate VLANs, VLAN74 for the 9th grade and VLAN76 for the high school.

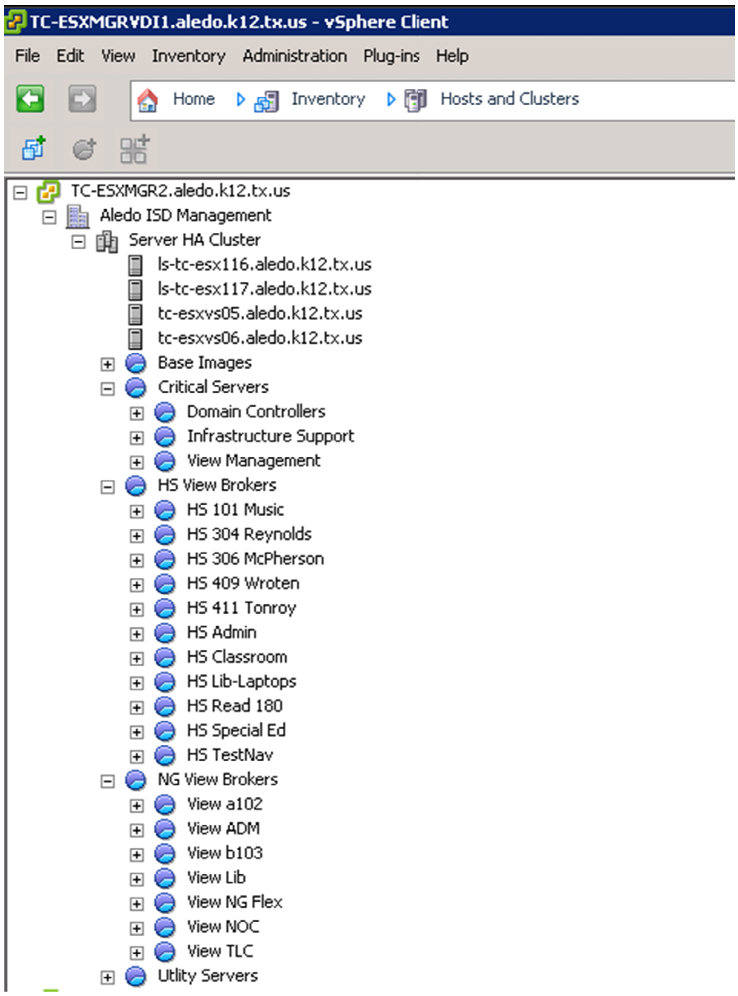

Figure 6. Management Block VMware Layout

Figure 6 shows the VMware design and all the management and control servers to support the two (2) VDI Pods.

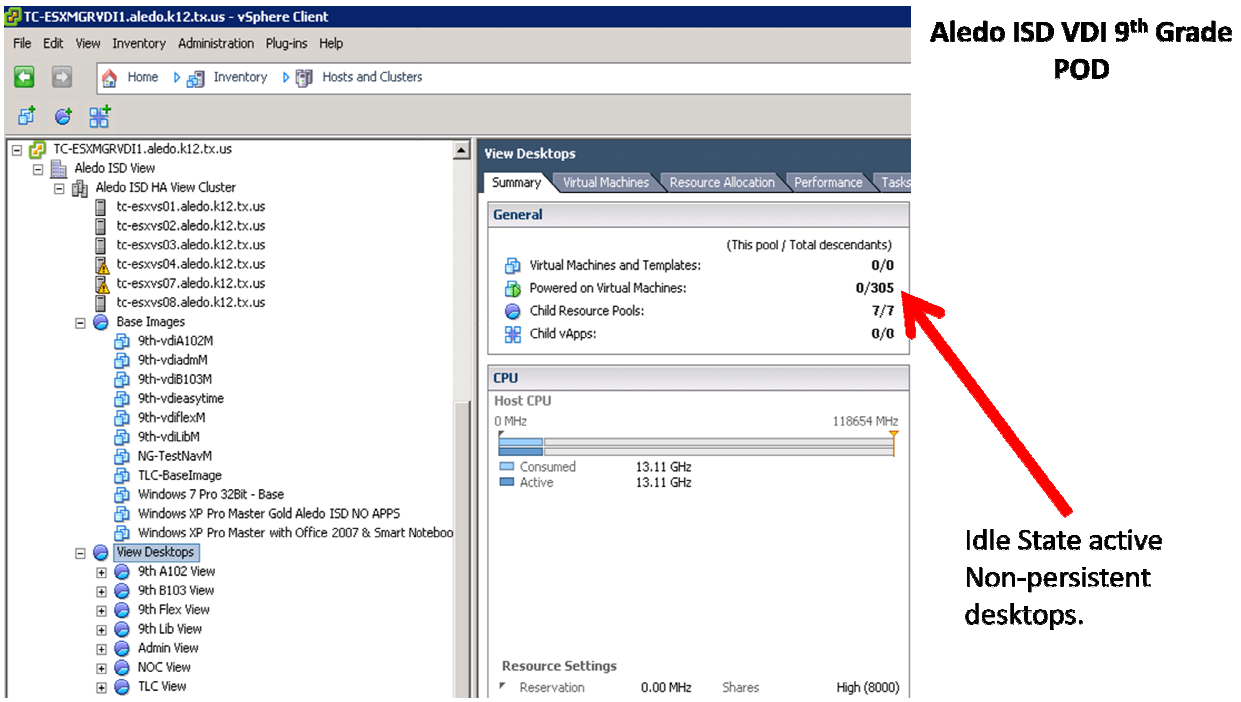

Figure 7. Aledo ISD 9th Grade VMware View POD

Figure 7 shows the Aledo ISD 9th grade VMware View virtual desktop pod. The unique characteristic of this VDI solution is that the non-persistent "floating" desktop pools expand and shrink throughout the day. The idle state of the cluster is around ~300 virtual desktops. During peak usage, the virtual desktop environment expands to over 500 active virtual desktops. This solution truly takes advantage of the concurrent usage licensing from VMware View and saves on overall licensing costs for software.

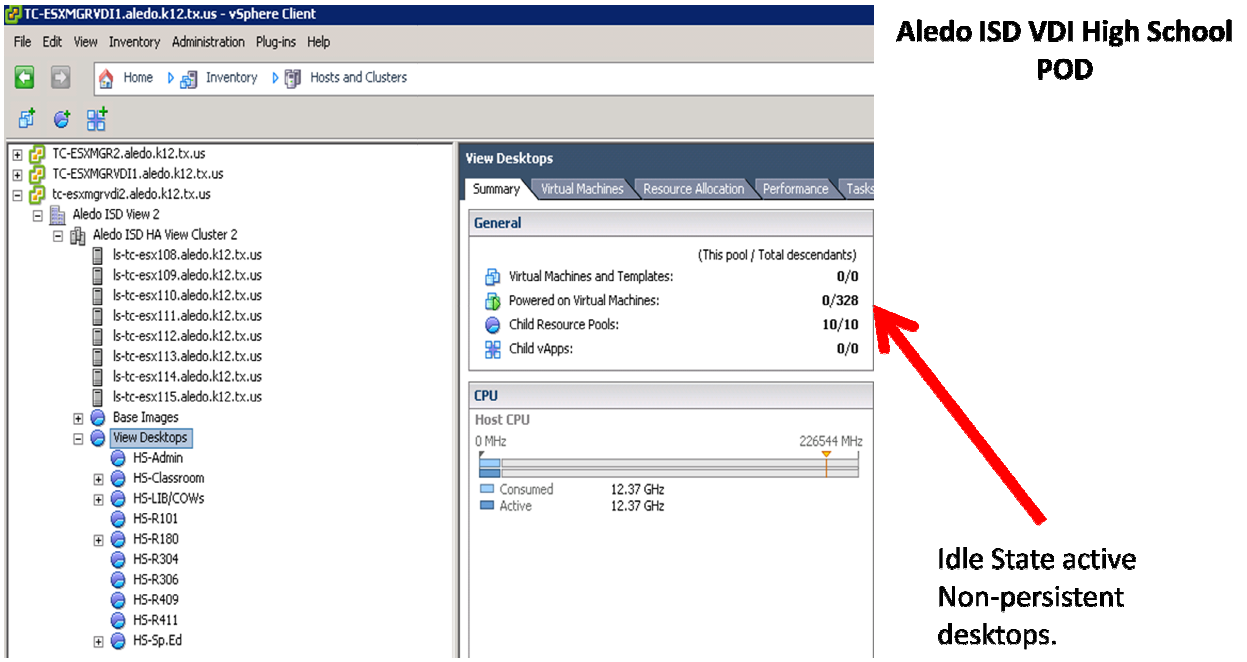

Figure 8. Aledo ISD High School VMware View POD

Figure 8 represents the Aledo ISD High School VMware View virtual desktop Pod. This Pod was built and deployed to over 1000 students in a single weekend. And this included the provisioning of new virtual desktops and the replacement of 300 PCs with Wyse P20 devices. Two hundred and fifty notebooks were also repurposed using ThinLaunch software to lock down these devices and only allow them to connect to View brokers for windows desktop access. An additional 300 devices are scheduled to be deployed over the summer of 2011 which will make the school 100% virtualized on the desktop side for students, faculty and staff.

Conclusion

Overall, the Aledo ISD virtual desktop deployment has been a highly successful yet very challenging deployment for Sigma Solutions. Sigma continues to monitor, evaluate and optimize Aledo's desktop environment in conjunction with the Aledo ISD IT management team and support staff. With this platform and the overall ingenuity of the Aledo ISD staff, this technology implementation is being taken to new levels and Sigma is proud to be part of this effort.

References

http://www.vmware.com/files/pdf/customers/11Q1_Aledo_ISD_Case_Study.pdf

http://www.vmware.com/files/pdf/VMware-Ref-Architecture-for-CISCO-EMC-CLARIION-RAB-EN-VCE.pdf

http://www.emc.com/collateral/hardware/technical-documentation/h8196-virtual-desktop-vnx-cisco-ucs-reference-arch.pdf

http://www.thinlaunch.com/pdf/whitepapers/Business_Case_PC_into_Thin_Client.pdf

http://www.wyse.com/products/hardware/zeroclients/p20/index.asp

http://www.samsung.com/us/business/monitors/LF19PPBCBNA/ZA

http://www.teradici.com/pcoip/pcoip-technology/pcoip-management-console.php

http://www.solarwinds.com/products/orion/

http://dharmgolf.blogspot.com/2011/02/vmware-view-45-success-story-texas.html