SERVER AND STORAGE VIRTUALIZATION

Achieving EPA's Green IT goals and cost efficiencies through server and storage virtualization

A Vision Technologies Whitepaper providing an overview of the server and storage virtualization program.

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Server and Storage Virtualization

CONSOLIDATION, POWER REDUCTION, MANAGEMENT SERVICES

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT

Vision Technologies (Vision) provides support to the U.S. Environmental Protection Agency Office of Research and Development (EPA ORD) with Information Technology Infrastructure (ITI) management for over 4,000 end-users at 13 sites across the continental United States with three principal tasks: user support, network and server operations and management, and enterprise management and coordination. Vision staff provide required technical expertise to meet the needs of the management, research, and administrative staff for PC desktop systems (including laptops, and PCs used at laboratory instrument controllers) and software; access to local server resources, data, systems, and peripherals, telecommunications equipment, and access to the wide area network and Internet. Additionally, Vision provides services to procure, install, implement, manage provision, maintain, decommission, remove, and dispose of IT infrastructure, and complete SAN reorganization and server virtualization.

One of the central goals of this project was to achieve EPA's green IT goals and cost efficiencies through server and storage virtualization and to manage infrastructure from centralized consoles in RTP and LAS. In order to achieve this mission, Vision had to design a plan which included the following:

- ▶ Server and storage consolidation
- ▶ Power consumption reduction
- ▶ Increased redundancy and reliability
- ▶ Ease of management
- ▶ Cost savings—lower systems administration overhead and data center cooling costs

During the first year of support services for ORD, Vision was presented with the issue that multiple instances of asset databases and methodologies across the sites were resulting in the poor allocation of equipment to meet business requirements and failures to meet server and software license requirements. Vision met with the EPA Onsite Managers to perform a "needs analysis" to ensure the new Definitive Hardware and Definitive Media Library (DH/ML) would contain the information required by all stakeholders. The team prepared a detailed plan to update the DHL content by importing DML records from the ROAMS property database and to perform a Server Warranty analysis. We also used this opportunity to document the disposition of the servers as to their criticality. This allowed our DHL group to coordinate with our virtualization team and aid in evaluating for a warranty extension, server virtualization, or hardware refresh and submit the recommendation to the TOCOR. We also implemented enterprise or site specific reports in the DHL to enable easy access for site property, server and customer managers.

As part of Vision's Technology Roadmap Project at EPA ORD ITI, Vision recently conducted an Enterprise assessment of the Storage Area Network (SANs) analyzing existing storage platforms and evaluating best of breed storage platforms to enable upgrading, supporting, and maintaining these platforms to

meet current and future storage requirements. This included a technical review and product evaluation. It also included a full financial review with Total Cost of Ownership (TCO) and Return on Investment (ROI) factors. As part of this effort, Vision considered the sunk cost in Microsoft Operation Manager (MOM) by ORD, but the functionality of MOM 2005 does not allow for adequate control of the ORD environment at the enterprise level. In comparing Microsoft's latest tools, such as the Systems Center Operations Manager (SCOM) and Systems Center Configuration Manager (SCCM), with EMC Smarts, Vision concluded that the cost delta was negligible and the EMC solution is a more robust toolset for ORD's needs and is compatible with the current VMware environment. Our proposed solution uses the proven EMC Smarts to allow additional integration with other industry-standard tools and more reporting capabilities. The EMC Smarts package also automates the diagnosis of faults and identifies which customers and services are impacted, reducing the need for labor-intensive incident management teams (IMTs) and root cause analyses. In addition this combination of tools provides a link to an executive dashboard with service level agreements (SLAs), server performance, network health, application hosting, and VoIP performance that is available to key ORD stakeholders to support decision making. Our open source Extended Vision Dashboard provides ORD with management visibility.

GREEN IT PLANNING

Green IT Planning as Part of Virtualization of EPA Infrastructure. Vision is currently performing the analysis, planning, engineering, design, and implementation for virtualization and consolidation of current stand-alone server platforms. These efforts require careful planning and produce substantial environmental benefits such as reduced carbon dioxide emission, energy conservation, HVAC (water conservation) and reduced space requirements - with the additional benefit of lower operating costs.

Vision's Leadership in Energy and Engineering Design (LEED) Subject Matter Experts (SMEs) are GBCI LEED accredit professionals (AP) and have extensive experience in traditional LEED initiatives for the design, construction and operation of high performance green buildings. Holistically, LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings' performance. Team Vision Green LEED SMEs promote a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. For example, Vision is responsible for the virtualization and consolidation project currently underway at EPA ORD ITI. These efforts require careful planning and produce substantial environmental benefits such as reduced carbon dioxide emission, energy conservation, HVAC (water conservation) and reduced space requirements with the additional benefit of lower operating costs. It is estimated the current consolidation effort will save hundreds of thousands of dollars in operating expense while continuing to support EPA's Vision to provide government and citizens with timely, secure, relevant, and integrated information to protect human health and the environment. Team Vision currently supports over two million square feet of Data Center space and over a three year period has reduced environmental impacts directly related to IT servers and storage platforms via virtualization, consolidation, space planning and utilization, IT floor layout, hot and cold isles, and fire control reducing the operational costs by 35% and producing a ITIM high performance environment. In summary, Team Vision can provide the planning support required for IT Capacity Management, Green IT and ITIM planning activities centered on evaluating, analyzing, developing, maintaining, and supporting EPA ITIM strategies.

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RESULTS

As a result of Vision's analysis and design, ten ORD sites were converted to VMware ESX (RTP, Athens, Las Vegas, Cincinnati, Duluth, Gulf Breeze, Narragansett, WDC, Ada, and Chapel Hill). Currently as part of the VMware ESX project, Corvalis, Edison, Grosse, and RTF COOP are currently being converted. In addition, RTP, Athens, Las Vegas, and Cincinnati's storage was successfully migrated to DataCore SANmelody which provides for an option that increases ROI, decreases TCO, and enhances management of unlike systems across a streamlined platform.

Total EPA ORD Virtualization to Date:
- ▶ Virtual hosts   =   35 physical servers
- ▶ Virtual guests = 124 virtual server instances
- ▶ VMware View workstations = 15
- ▶ Virtualized storage = ~100TB
- ▶ Reduced physical Windows servers from 241 to 124 to date (124 servers virtualized – 35 new hosts added = 89 servers eliminated)
- ▶ Carbon footprint impact of 55.8 Metric Tons*
- ▶ Utility cost savings of $89K**

Benefits of Vision's Virtualization Approach:
- ▶ Zero-downtime hardware upgrades and maintenance; migrated live virtual machines between hosts with no downtime
- ▶ Automated power management - To conserve energy, hosts automatically power on and off based on load requirements
- ▶ Snapshots enable rapid recovery and rollback
- ▶ Corrupted upgrades or patch installations are easily repaired by reverting to a pre-upgrade snapshot
- ▶ Enhanced performance management and reporting
- ▶ Distributed Resource Scheduling (DRS) provides automatic load balancing; robust metrics and mapping features are available

Virtualized SANs optimize storage use via thin-provisioning. Virtual "Thin" storage creates a just-in-time model allowing for strategic oversubscription, eliminates waste due to "silos", and enables a pay-as-you-grow approach based on actual utilization. Storage is combined into large pools that can support many logical volumes. Presented volume sizes can exceed actual storage, so storage purchases can be delayed until additional capacity is actually required. In addition, adding storage to pools is transparent to the servers.

DataCore SANMelody HA/VMware ESX Configuration
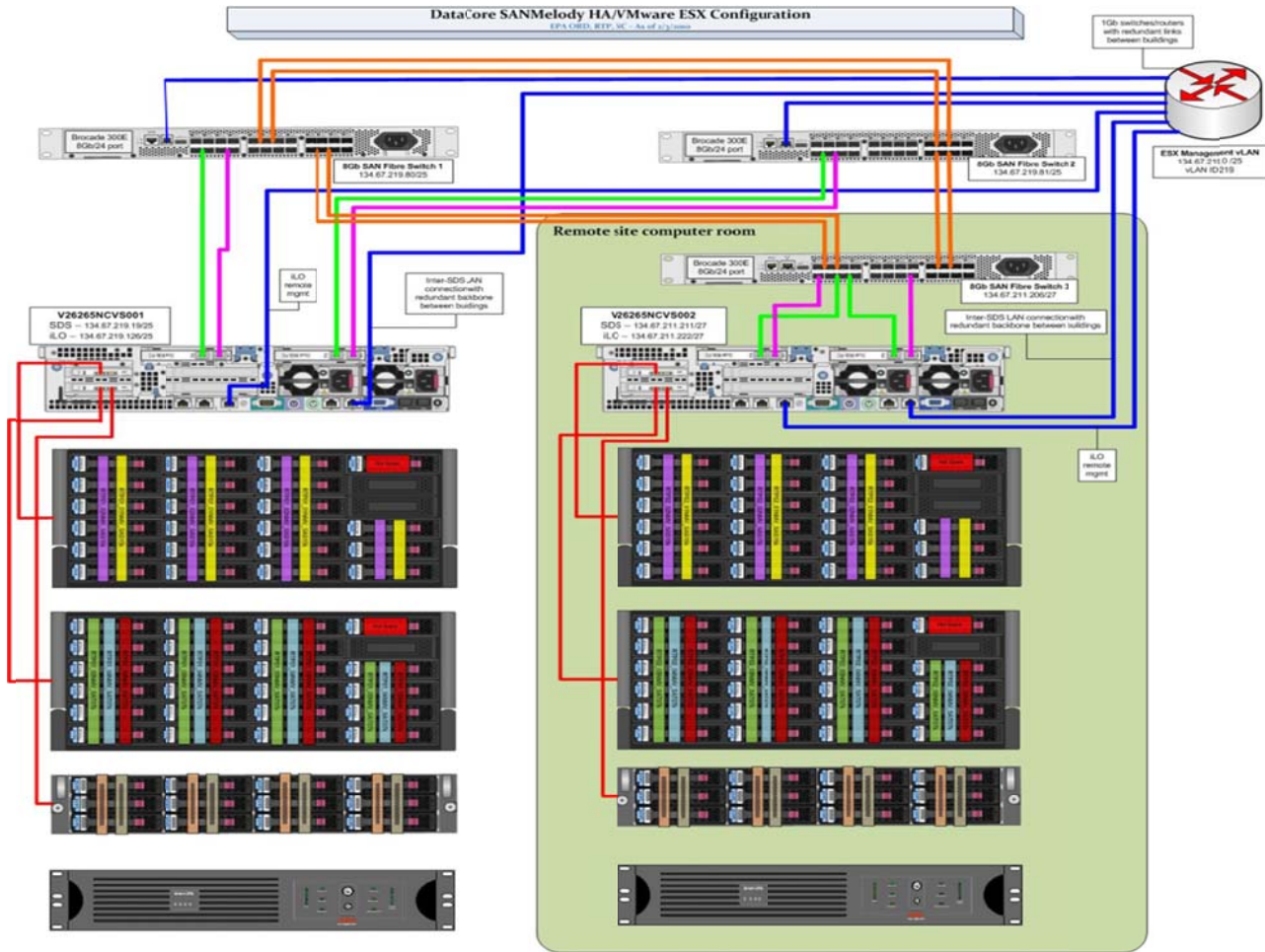
Virtualized storage enables true HA and seamless migration across storage platforms. At the EPA RTP site, the synchronous mirrors are placed at an offsite location for transparent failover to fully redundant storage (true high-availability). Additionally, physical storage units can be easily replaced without application downtime, manual data migration, or server reconfiguration. Vision's design for virtualization and consolidation was platform-agnostic, allowing for the use of practically any underlying storage platform (SSD, FC, DAS, iSCSI, inexpensive commodity JBOD/disks).

CONCLUSION

Vision has demonstrated excellent overall performance in almost all measurable categories for EPA ORD ITI as demonstrated by our incentive fee awards based on the performance based contract evaluation criteria. Vision has decreased the time and expense associated with network engineering, operations, and support. Vision has been a key collaborator in EPA ORD's IT support services and data centers in the 13 EPA ORD Sites supported by Vision. Vision has also assisted EPA ORD to smoothly integrate new technologies and methodologies, such as virtualization, consolidations, and ITIL. We continue to distinguish ourselves in our performance on the EPA contract through quality program management of services, flexibility, and the ability to handle highly diverse customer requirements.

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