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Commonwealth of Kentucky Commonwealth Office of Technology Converged Data Center Optimization

Project Initiation: May 2018
Project Completion: October 2018

Project Sponsors:

Rick Woodruff, Executive Director, Office of IT Services and Delivery,
Commonwealth Office of Technology

Dr. Charles Grindle, Chief Information Officer,
Commonwealth of Kentucky

Executive Summary

The Commonwealth Office of Technology created the Converged Data Center Optimization Project to transition Kentucky to a homogeneous data center by migrating to Dell's converged hardware platform, the VxBlock. The VxBlock replaced the existing x86 server, block and file storage, and backup solutions with a single offering. To continue our commitment to disaster recovery, we procured a Dell EMC VxBlock 740 at both our primary and alternate data centers.

Exemplar

The Commonwealth Office of Technology teams moved more than 12,000 user folders, 3,480 virtual servers and 1,200 physical servers, and more than 4 petabytes of data from legacy hardware to a new Dell converged hardware platform (VxBlock) solution in the past year.

COT worked with 13 Cabinets and multiple state boards and commissions to get the required downtime for the migrations.

Concept

Decreasing environmental complexities in the Commonwealth Data Center and Alternate Data Center by moving from a heterogeneous legacy environment to a homogenous data center grounded in Dell's converged hardware platform – the VxBlock. Emphasize the use of virtual machines and position. After installation of initial operation capabilities and conduct of migration testing, complete migration of VM environments, followed by NAS and physical server migrations.

Significance

- 13 major Cabinets
- Several backup products: Tivoli Storage Manager (TSM), VEEAM Backup and Replication, and Microsoft Data Protection Manager (DPM)
- 3,480 virtual servers and 1,200 physical servers (including Domain Controllers)
- 4 Petabytes of file and block storage
- Disaster recovery for Commonwealth applications from several products, to the VMAX's integrated solution.

Impact

The Converged Data Center Optimization Project produced a host of real benefits including:

- Improved IT Staff Efficiency
- Equipment Consolidation
 - Virtual servers reduced from 68 to 65 (4% reduction)
 - Physical servers reduced from 159 to 120 (24% reduction)
- Reduce Software Licensing
- Reduce Power Consumption by 26%
- Condense Floor Space Requirements by 52%

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The Converged Data Center Optimization Project addressed the primary issues of a heterogeneous data center- there were several points of contact for support, knowledge silos provided a single point of failure across multiple hardware offerings and management tools, and dissimilar hardware often caused compatibility issues.

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The Commonwealth Data Center and the Alternate Data Center were both moved to Converged configurations. The ADC is not a duplicate of the CDC so migration and testing were different for both sites.

CDC Site Summary

- VxBlock 740
- VMAX3
- Physical Servers (120)
- Isilon
- Avamar & Data Domain
- VMAX SRDF Replication
- Isilon Replication
- Data Domain Replication
- Elastic Cloud Storage (ECS)

ADC Site Summary

- VxBlock 740
- VMAX3
- Isilon
- Avamar & Data Domain
- VMAX SRDF Replication
- Isilon Replication
- Data Domain Replication
- Elastic Cloud Storage (ECS)

The VxBlock Infrastructure Summary (VM and Physical) is provided (for CDC only) to provide some indication of the size and complexity of the project.

VCE™ Data Protection			
Avamar	# Nodes	Licensed Capacity	Total Capacity
Avamar M2400	5		
Data Domain	# of Shelves	Licensed Capacity	Total Capacity
DD9800	5 x DS60 (60x4TB) 1 x DS60 (15x4TB)	1260TB	1260TB
DD9300	2 x DS60 (60x3TB) 1 x DS60 (15x3TB)	405TB	405TB

Isilon Storage Technology Extension				
Isilon Node	QTY	RAM	RAW SSD Capacity	RAW SATA Capacity
X410	6	256GB	6.4TB	128TB

Cluster Raw Size: 768 TB
Cluster Usable Capacity: 577.09 TIB @ 100 % utilization

VxBlock Infrastructure Summary	
Compute (Blades)	10 x UCS 5108 Blade Server Chassis w/2204 FEX 51 x UCS B200M4 blades, 2.2GHz (20 Core) 768GB, 1340 21 x UCS B200M4 blades, 2.0GHz (12 Core) 768GB, 1340 8 x UCS B200M4 blades, 2.2GHz (22 Core) 384GB, 1340 2 x UCS 6296 Fabric Interconnects
Storage	EMC VMAX3 950FX (1508 TIB usable)
Network	2 x Cisco 93180YC-EX 10/25/40/100G Switches • 16 x 10GbE SR SFPs (Customer Uplinks) 2 x Cisco MDS 9706 16Gb Fabric Switches • 96 physical ports each / 96 ports licensed each
Management	VCE Advanced Management Pod (Three Servers) VCE Vision Intelligent Operations EMC Secure Remote Support
Compute Technology	
Compute	2 x 6296 Fabric Interconnects 4 x Pairs UCS 2232 FEX (4 uplinks per 2232) 10 x C220 M4 servers, 2.2 GHz (18 Core) 128GB, 2x300GB HDD, 1227 110 x C220 M4 servers, 2.2GHz (18 Core) 64GB, 2x300GB HDD, 1227

The project was completed in approximately 18 months and tracked closely to the initial project plan. The challenge in execution was coordinating migration testing with Cabinets, Boards and Commissions while maintaining normal operations

Milestone	Date
Initial Operating Capability CDC & ADC (IOC)	May 18, 2018
Migration Testing	May 31, 2018
VM Development Environment	June 30, 2018
VM Test Environment	July 31, 2018
VM Training Environment	August 31, 2018
VM UAT Environment	September 30, 2018
VM Production Environment	Oct – Nov, 2018
NAS Migration	Jun – Nov, 2018
Physical Server Migration	Jun – Nov, 2018

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- Several backups products: Tivoli Storage Manager (TSM), VEEAM Backup and Replication, and Microsoft Data Protection Manager (DPM)
- 3,480 virtual servers and 1,200 physical servers (including Domain Controllers)
- 4 Petabytes of file and block storage
- Disaster recovery for Commonwealth applications from several products, to the VMAX’s integrated solution.

It should not be difficult to understand the significance of this project to the delivery of business and IT services in the Commonwealth of Kentucky. This project modernized the heart of Kentucky’s infrastructure and touched all of its agencies. The project positioned the Commonwealth to operate more efficiently and transition to new technologies. The capabilities establish a basis for new IT services and business models.

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The Converged Data Center Optimization Project increased data center speed, and responsiveness while remaining generally consistent with our legacy environment. The new infrastructure, supports rapid diagnosis (or elimination) of hardware issues when troubleshooting. Harmonized storage, network and compute (and supporting diagnostic reports) improve our ability to proactively resolve issues and at times prevent problems before an issue occurs.

We capture the inherent advantages of virtual machines. Application developers, business owners, and our other IT partners can now request a server or additional resources without impacting other workloads hosted on our virtual machine platform.

Transitioning to a converged data center has provided the Commonwealth the following benefits:

- Decreases the time to resolution for vendor issues.
- Pricing discounts by leveraging economies of scale.
- Staff reductions through simplification of the environment and the tools that support it.
- Many legacy servers chose virtualization over new bare-metal hardware.
- Consolidation of Vendor Equipment
 - Virtual servers reduced from 68 to 65 (4% reduction)
 - Physical servers reduced from 159 to 120 (24% reduction)
 - Storage Vendors reduced from 3 to 1
- Increase Hardware Performance (Upgrades in technology)
 - Flash Drives (VMAX)
 - Scale-out Architecture
 - Lower Latency
- Reduce Software Licensing
- Reduce Power Consumption by 26%
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The project resulted in improved operational efficiency, a more stable environment with fewer unscheduled outages, and quicker response times. For issues that require vendor assistance, we now have a single point of contact for support. With array-based replication between data centers and by simplifying the backup process, we improved disaster recovery, business continuity, and the security of the Commonwealth's data.