TECHNICAL WHITE PAPER:
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VMware Cloud Foundation Cloud Maturity Model - Storage

Adoption Path for VCF 5.2

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Maturity Stage 1: Virtualized Storage

Virtualized Storage using VMFS

VMFS is a clustered file system used on traditional, block-based shared storage solutions – most commonly in the form of storage arrays. It has historically been the dominant way to provide centralized shared storage for vSphere clusters.

- Core Storage Best Practices
- Verify Storage is Supported
- VMware vSphere VMFS Overview
- VAAI FAQs
- Using Clustered VMDKs instead of RDMs

Virtualized Storage using NFS

NFS is an alternate option to provide centralized shared storage for vSphere clusters. This is available for storage arrays who use the NFS protocol.

- NFS Best Practices
- Supported Storage Types for VMware Cloud Foundation

Virtualized Storage using vSAN: Overview

vSAN is a distributed shared storage solution integrated into the hypervisor. It aggregates storage devices in the hosts that comprise a vSAN cluster into a single shared datastore, and can be used by the VMs residing on the vSAN cluster, or by other clusters.

- vSAN Technology Overview (link not available yet)
- What is vSAN?
- vSAN 100 Quick Questions
- vSAN FAQs
- An Introduction to the vSAN Express Storage Architecture
- Key Benefits of the vSAN Express Storage Architecture (ESA)
- vSAN ESA Lightboards
- vSAN Hands on Lab (HoL)
- vSAN Objects and Components Revisited

Virtualized Storage using vSAN: Design, Networking and Topologies

Make better design decisions and undertand he requirement for vSAN.

- vSAN Design Guide (link may be updated)
- vSAN Stretched Cluster Guide
- 5 Things you Need to Know about vSAN Networking

Virtualized Storage using vSAN: Performance

Monitor your vSAN performance.

- Troubleshooting vSAN Performance
- Performance Recommendations for vSAN ESA
- Migrating to the Express Storage Architecture in vSAN 8

Virtualized Storage using vVols

vSphere Virtual Volumes (vVols) is framework that allows storage arrays to shared storage to vSphere clusters. Rather than use a clustered file system like VMFS, virtual machines are comprised of individual objects, which avoids some of the scalability and operational challenges of clustered file systems.

- What is vVols
- Migrating your VMs to vVols
- Migrate WSFC using RDMs to vVols
- Unique Replication Features of SRM and vVols
- vVols FAQs
- vVols Getting Started Guide

Maturity Stage 2: Policy-Based Management

Storage Policy-Based Management (SPBM): Storage Policy Settings

Storage policy-based management (SPBM) is a management framework that allows administrators to define one or more outcomes, and the system will prescribe the changes to achieve that desired state. SPBM exists in both vSAN, and vVols.

- RAID-5/6 with the Performance of RAID-1 using the vSAN ESA
- Auto-Policy Management Capabilities with the ESA in vSAN 8 U1
- Auto-Policy Remediation Enhancements for vSAN ESA in vSAN 8 U2
- Adaptive RAID-5 Erasure Coding with the Express Storage Architecture in vSAN 8
- Stripe Width Storage Policy Rule in the vSAN ESA
- vSAN Operations Guide (link not available yet)
- vSAN Interactive Infographic
- vSAN FAQs

Storage Policy-Based Management (SPBM): Fault Domains

Fault Domains can be a powerful feature to use storage policies in a way that can protect against rack or room failure.

- Design and Operation Considerations when using vSAN Fault Domains
- Using Fault Domains in vSAN ESA

Storage Policy-Based Management (SPBM): Resilience

Storage policies help define the desire level of data resilience for your VMs. Learn how policy settings impact how and where data is placed across a vSAN cluster.

- vSAN's Approach to Resilient Data Storage, and How it Compares to Traditional Storage
- Understanding Failures to Tolerate (FTT) in vSAN
- Data Placement and Resilience in vSAN ESA
- The Impact of a Storage Device Failure in vSAN ESA versus OSA
- vSAN Cluster Design - Large Clusters versus Small Clusters
- vSAN Interactive Infographic
- vSAN FAQs

Storage Policy-Based Management (SPBM): vSAN Capacity Concepts

Storage policy settings can impact the amount of capacity that VMs consume in a vSAN datastore. Learn how these settings may impact the effective amount of capacity you have in your cluster. .

- Understanding Reserve Capacity Concepts in vSAN
- Demystifying Capacity Reporting in vSAN
- Revisiting vSAN's Free Capacity Recommendations
- Calculating Capacity Needs when Refreshing Existing vSAN Clusters
- Observing Capacity Changes in vSAN
- The Importance of Space Reclamation for Data Usage Reporting in vSAN
- Capacity Overheads for the ESA in vSAN 8
- Improved Capacity Reporting in VMware Cloud Foundation 5.1 and vSAN 8 U2

Deduplication and Compression

Deduplication and compression are two opportunistic space-efficiency techniques used to store more data on a given amount of physical capacity. It exists as a cluster-based setting in the vSAN Original Storage Architecture (OSA). The vSAN Express Storage Architecture (ESA) includes compression as a storage policy rule.

- vSAN Space Efficiency Technologies
- Compression in vSAN ESA
- vSAN (OSA) Design Considerations - Deduplication and Compression
- Space Efficiency using the "Compression Only" option in vSAN OSA
- vSAN OSA - Write Buffer Sizing using the Very Latest Hardware
- vSAN OSA - Increased Write Buffer Capacity for vSAN 8 OSA
- vSAN FAQs

Maturity Stage 3: Flexible Scaling (Independent Compute and Storage)

Flexible Scaling using vSAN Max: Introduction

vSAN Max (vSAN storage clusters) a fully distributed, centralized shared storage solution for vSphere clusters. It is built using vSAN ESA, and provides disaggregated centralized storage while maintaining the same management and operations as a traditional aggregated vSAN HCI cluster.

- Introducing vSAN Max
- What is vSAN Max?
- vSAN Max and the Advantage of Scalability
- Starting Small with vSAN Max
- vSAN FAQs

Flexible Scaling using vSAN Max: Design, Deploy, and Optimize

A vSAN Max cluster can be designed to provide storage services for your VCF environment that can grow in an easy and incremental way.

- Design and Operational Guidance for vSAN Storage Clusters
- vSAN HCI or vSAN Max - Which Deployment is Right for You?
- Troubleshooting vSAN Performance

Flexible Scaling using Fault Domains: Fault Domains with Stretched Clusters

vSAN Fault Domains are a construct that is used when configuring a vSAN stretched cluster: A cluster spanning across two geographical sites. Learn how vSAN uses fault domains to provide site-level resilience for your VMs and data.

- Understanding vSAN Stretched Clusters
- vSAN Stretched Cluster Guide
- vSAN Stretched Cluster Bandwidth Sizing
- Using the vSAN ESA in a Stretched Cluster Topology
- Performance with vSAN Stretched Clusters (OSA)
- vSAN Interactive Infographic

Flexible Scaling using Fault Domains: Fault Domains using 2-Node Clusters

Much like stretched clusters, a vSAN 2-Node configuration is a topology option that also uses the Fault Domains feature. Learn how fault domains play a part in the resilience of a special vSAN cluster consisting of just two data hosts.

- vSAN 2-Node Cluster Guide (old link for data not migrated yet)
- Design and Operation Considerations for vSAN 2-Node Topologies

Flexible Scaling using Fault Domains: Basic Features

The fault domains feature in vSAN is an optional configuration option to improve the resilience of a cluster based on your topology. It ensures that data in the cluster remains available in the event of a single host, or a group of hosts, such as a rack or a data closet are unavailable.

- Design and Operation Considerations when using vSAN Fault Domains
- Using Fault Domains in vSAN ESA

Maturity Stage 4: Data-at-Rest Encryption

Data-at-Rest Encryption: Overview

vSAN Data-at-Rest encryption is a cluster-based service that securely encrypts all vSAN data as it lands on persistent storage devices in the hosts. The data is non decrypted until the process of a read operation requires the data to be read.

- vSAN Encryption Services
- Cluster-Level Encryption with the vSAN Express Storage Architecture
- Key Rotation Options for vSAN ESA in VMware Cloud Foundation 5.1 and vSAN 8 U2
- Performance when using Encryption Services (vSAN OSA)
- vSAN FAQs

File Services: Overview

vSAN File Services is a cluster-based service that allows a vSAN cluster to serve file shares. These file shares can used with NFS clients (Linux VMs and containers) and SMB clients (Windows VMs) and are commonly used for the storage of unstructured data such as user data.

- vSAN File Services (old link for data not migrated yet)
- An overview of vSAN File Services
- vSAN FAQs

Maturity Stage 5: Workload Encryption

Workload Encryption: Data-in-Transit Encryption

vSAN Data-in-Transit Encryption security encrypts all vSAN traffic “in flight” across the hosts that comprise the vSAN cluster. All encryption and decryption activities occur transparently to the administrator.

- vSAN Encryption Services
- Performance when using Encryption Services (vSAN OSA)
- vSAN FAQs

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