



VMware Cloud Foundation

Storage: Advanced Design & Deploy [V9.1]

Course Overview

This four-day advanced course provides you with the knowledge and skills to understand and operate storage and vSAN technologies in VMware Cloud Foundation 9.1 environments. You will explore storage design, vSAN and shared storage, and vSAN architecture, including storage policies, RAID, ESA and OSA, networking, capacity, and availability.

The course also covers vSAN data services, File Service, disaggregated storage, and stretched clusters, including encryption, key management, SMB and NFS, witness hosts, and workload availability. You will also learn vSAN troubleshooting and shared storage concepts, including performance monitoring, VMFS, multipathing, storage APIs, Datastore Clusters, Storage DRS, and Storage Policy Based Management.

Course Objectives

By the end of the course, you should be able to meet the following objectives:

- Describe the architecture, components, and key design considerations of storage technologies used in VMware Cloud Foundation 9.1 environments.
- Explain vSAN architecture, storage policies, data placement, networking, capacity, availability, and fault-domain considerations.
- Describe vSAN data services, including Global Deduplication, encryption, key management, and data-at-rest and data-in-transit protection.
- Explain the architecture and design considerations for vSAN File Service, disaggregated storage, and stretched clusters.
- Describe vSAN monitoring and troubleshooting methodologies, including common disk, network, performance, capacity, and hardware-related issues and the tools used to identify them.
- Explain shared storage technologies and the design considerations associated with VMFS, multipathing, storage APIs, Datastore Clusters, Storage DRS, and Storage Policy Based Management in VCF 9.1.

Target Audience

- Solution Architects, Cloud Administrators, VI Administrators, System Administrators, Consultants and Support Personnel

Prerequisites

This course has the following prerequisites:

- VMware Cloud Foundation: Solution Architecture & Design.
- VMware Cloud Foundation: Build, Manage & Secure.

Course Modules

Module 1: Course Introduction

- Describe the key concepts and scope of the VCF Storage Advanced Design and Deploy course.

Module 2: The Design Conversation

- Differentiate between vSAN and shared storage usage in VCF 9.1.
- Differentiate between principal and supplemental storage and describe the role of each.
- Describe the factors that influence the selection of a storage model based on customer requirements.
- Identify the key considerations when evaluating storage options for a VCF 9.1 environment.

Module 3: vSAN Architecture Review

- Describe vSAN objects, components, witnesses, and the voting mechanisms used to maintain object availability.
- Explain how storage policies determine vSAN component layouts, including RAID and Auto-RAID configurations.
- Describe the ESA and OSA architectures, including their device, write-path, and failure-domain models.
- Identify vSAN cluster types, minimum host requirements, fault-domain models, and the characteristics of stretched and two-node clusters.
- Describe the vSAN network architecture, traffic types, network design requirements, and bandwidth considerations.
- Explain how fault domains, component states, durability components, reserves, and capacity calculations affect vSAN availability and capacity.
- Identify key vSAN design considerations, changes introduced in VCF 9.1, and common design anti-patterns.

Module 4: vSAN Data Services

- Identify the data services available in vSAN 9.1 and distinguish between cluster-wide settings and per-object policy configurations.
- Compare OSA deduplication with ESA Global Deduplication and explain their relationship to the vSAN write path.
- Describe the vSAN encryption architecture, including data-at-rest encryption, data-in-transit encryption, and the KEK/DEK key hierarchy.
- Differentiate between Standard Key Providers and Native Key Provider and describe their respective configuration, availability, backup, and recovery considerations.
- Explain key rotation, rekey, key revocation, and key-provider migration concepts for encrypted vSAN environments.
- Describe the role of KMS infrastructure, certificate trust, compliance requirements, and connectivity in vSAN encryption.

Module 5: vSAN File Service

- Describe the vSAN File Service architecture, including vDFS, FSVMs, and per-share SPBM.
- Explain the FSVM deployment model, including IP pools, primary IP addresses, and behavior during host maintenance and failure.
- Identify the supported SMB and NFS protocols, security models, and scale considerations for vSAN File Service.
- Describe the Active Directory requirements and security options for SMB file shares.
- Compare NFSv3 and NFSv4.1, including their authentication, security, and access-control models.
- Explain how primary IP abstraction provides client access to SMB and NFS shares.
- Identify key design, deployment, migration, and health-monitoring considerations for vSAN File Service.

Module 6: vSAN Disaggregated Storage

- Differentiate between vSAN HCI clusters and vSAN storage clusters and identify common use cases for each.
- Describe the architecture and purpose of the vSAN storage client network.
- Explain how a vSAN Compute Cluster connects to and mounts a remote vSAN data store.

- Describe how virtual machine objects are located on a remote vSAN data store.
- Identify the vSAN health checks available for a vSAN Compute Cluster.
- Describe the considerations for mounting and unmounting remote vSAN data stores.

Module 7: vSAN Stretched Cluster

- Describe how vSAN stretched clusters protect objects across availability zones and the role of the witness host.
- Differentiate between availability zones and regions and between preferred and nonpreferred sites.
- Differentiate between a vSAN witness appliance and a physical vSAN witness host.
- Describe the roles of site disaster tolerance, FTT, data locality, and storage policies in stretched cluster architectures.
- Explain how vSAN and vSphere HA maintain workload availability during host, site, and witness failures.
- Describe the effects of maintenance mode, admission control, and Adaptive Quorum Control on workload availability in stretched clusters.

Module 8: vSAN Troubleshooting

- Describe the PNOMA troubleshooting framework and the general process for troubleshooting vSAN environments.
- Describe the symptoms, impacts, and troubleshooting considerations associated with vSAN disk and component failures.
- Explain how to troubleshoot and validate vSAN network connectivity and identify common networking issues.
- Describe vSAN performance troubleshooting methods, including performance charts, host performance, I/O Insight, and I/O Trip Analyzer.
- Identify vSAN monitoring, capacity, proactive testing, hardware compatibility, and data-migration precheck capabilities.
- Describe how to monitor vSAN objects, VM components, and the overall vSAN environment.
- Identify the ESXCLI, ESX shell, and PowerCLI capabilities used to troubleshoot and manage vSAN environments.

Module 9: Shared Storage

- Identify the key patterns and high-level considerations used when designing storage infrastructure for VCF 9.1.
- Describe the design considerations associated with different shared storage technologies and storage systems.
- Explain how NVMe storage systems, PSA, and HPP influence shared storage design decisions.
- Describe VMFS datastore design considerations and the role of iSER in shared storage designs.
- Identify the supported vSphere storage APIs, including VAAI, VASA, and VAIO, and their design implications.
- Describe multipathing policies and their associated shared storage design considerations.
- Explain Datastore Clusters, Storage DRS, and Storage Policy Based Management considerations and their support in VCF 9.1.