Managing NAS and Performance on Clustered Data ONTAP

Course Objectives

By the end of this course, you should be able to:

- Describe CIFS and NFS protocols
- Describe configuration in the clustered Data ONTAP operating system
- Use the Data ONTAP PowerShell Toolkit to write PowerShell scripts
- Use Data ONTAP operating system to configure home directories
- Review performance management for CIFS and NFS environments
- Explain troubleshooting techniques for NetApp storage systems and for clients who use the CIFS and NFS protocols
- Describe how data flows through the network and protocol layers of clustered Data ONTAP
- Define performance-related terms and describe basic methodologies
- Identify the methods that can be used to monitor and analyze storage system performance
- Explain how methods and tools can be used to collect performance data
- Use command output to analyze system performance
- Use command output from case studies to identify performance bottlenecks
- Implement configuration for recommended practices for resiliency and performance
- Locate resources and information that help you maximize system performance

Audience

Professionals who manage NetApp storage systems and need a deeper understanding of protocols and performance in a clustered Data ONTAP environment.

Prior knowledge

The following course is recommended before attending the Manage NAS and Performance on clustered Data ONTAP class.

- Clustered Data ONTAP 8.3 Administration and Data Protection (CDOTDP)

Course Content

This course combines CIFS, NFS, and performance analysis topics into a single, in-depth one-week course. It provides the knowledge and skills that you need to administer CIFS version 1.x to 2.x and NFS versions 3, 4, and 4.1 in a clustered Data ONTAP® operating system. You also learn the skills you need to collect and analyze performance data from NetApp® storage systems.

Detailed Course Outline

Module 1 How a NetApp Storage System Works

- Describe the layers within the Data ONTAP architecture
- List the advantages that are provided by the ability of WAFL to optimize writes
- Explain the purpose of NVRAM
- Diagram the flow of read and write requests through the network and protocol layers of Data ONTAP
- Describe the benefits that RAID provides

Module 2 Performance Overview

- Define performance-related terms, such as “baseline,” “bottleneck,” “Little’s law,” and “latency”
- Describe baseline performance guidelines and methodologies as they relate to NetApp storage systems

Module 3 Clustered Storage System Workloads and Bottlenecks

- Gather information about the workload of an existing storage system
- Identify the storage system components that can affect performance—become bottlenecks

Module 4 Cluster Performance Monitoring and Analysis

- Describe the performance analysis tools and commands that are commonly used for cluster health checks
- Identify the key performance commands and describe the command output that they produce
- Explain how to use NetApp tools for performance measurement
- Describe the benefits of using the AutoSupport support tool for performance analysis

Module 5 OnCommand Management Tools

- Use command output to analyze system performance
- Use command output from case studies to identify performance bottlenecks
- Implement configuration for recommended practices for resiliency and performance
- Locate resources and information that help you maximize system performance
- List the three categories of performance tools
- Explain the features and functions of Insight Perform
- Explain the features and functions of OnCommand Balance
- Use OnCommand management tools to view performance data

Module 6 Storage QoS
- Discuss how the Storage Quality of Service (QoS) feature works in a clustered Data ONTAP environment
- Identify the commands that are used to manage policy groups
- Monitor workload performance

Module 7 NFS Overview
- Define NFS List use cases for NFS
- Differentiate between NFS protocol versions
- Discuss the two implementations of Data ONTAP

Module 8 NFS Version 3
- Discuss NFS version 3 (NFSv3) features
- Describe Data ONTAP support for NFSv3
- Explain use cases for NFSv3
- Configure Data ONTAP operating in 7-Mode to use the NFSv3 protocol
- Configure clustered Data ONTAP to use the NFSv3 protocol
- Describe NFSv3 security

Module 9 NFS Version 4
- Discuss NFS version 4 (NFSv4) features
- Describe Data ONTAP support for NFSv4
- Explain use cases for NFSv4
- Configure Data ONTAP operating in 7-Mode to use the NFSv4 protocol
- Configure clustered Data ONTAP to use the NFSv4 protocol
- Describe NFSv4 security

Module 10 NFS Version 4.1
- Discuss NFS version 4.1 (NFSv4.1) and parallel NFS (pNFS) features
- Describe Data ONTAP support for NFSv4.1 and pNFS
- Explain use cases for NFSv4.1 and pNFS
- Configure clustered Data ONTAP to use the NFSv4.1 protocol
- Configure a Linux host to use the NFSv4.1 protocol

Module 11 Performance and Basic Troubleshooting
- Discuss the factors that influence NFS performance
- List the tools that are used to capture NFS performance statistics
- Recognize areas in which issues might arise
- Explain the interactions between CIFS and NFS name mapping
- Describe basic NFS troubleshooting between storage systems, the Linux client, and the network
- Discuss troubleshooting NFS locks and leases

Module 12 CIFS Overview
- Differentiate between CIFS protocol versions
- List the CIFS supported environments
- Explain how CIFS authenticates resources in a workgroup environment and a domain environment
- Discuss the two implementations of Data ONTAP

Module 13 SMB Setup
- Configure workgroup authentication for a storage system with Data ONTAP operating in 7-Mode
- Set up a storage system with clustered Data ONTAP for Windows domain authentication
- Configure Windows domain authentication for a storage system with Data ONTAP operating in 7-Mode

Module 14 Shares and Sessions
- List the default shares
- Display all shares that are available on the storage system
- Configure a client machine to access any share
- Define sparse files and set their attributes
- Identify the CIFS sessions that are established by accessing a share on the storage system
- Add, modify, and delete share

Module 15 Access Control
Use the CLI, OnCommand System Manager, or Microsoft tools to add, delete, and modify the access permissions of shares.
Use Microsoft tools to add, delete, and modify the access permissions of files and folders.
Use access-based enumeration.
Create local users.
Create local groups.
Determine and verify user mappings for CIFS users that access NTFS and UNIX volumes or qtrees.
Configure file policies.

Module 16: Advanced Topics

- Discuss opportunistic locks (oplocks) implementation within the Data ONTAP operating system.
- Describe metacache support for Clustered Data ONTAP.
- Explain support for BranchCache.
- Configure auditing.
- Set up home directory shares.
- Describe group policy object implementation within the Data ONTAP operating system.
- Configure CIFS security settings.
- Implement symbolic links and widelinks.

Module 17: PowerShell and the Data ONTAP PowerShell Toolkit

- Describe Microsoft PowerShell.
- Configure a Microsoft Windows host to work with the Data ONTAP Software Development Kit (SDK).
- Explain how the Data ONTAP SDK can be used to script storage features.
- List the methods of using PowerShell.
- Explain how to create simple scripts.
- Redirect output results to log files.
- Use PowerShell to make Windows Management Instrumentation (WMI) calls.

Module 18: Performance and Basic Troubleshooting

- Discuss the factors that influence CIFS performance.
- List the tools that are used to capture CIFS performance statistics.
- Recognize areas in which issues might arise.
- Describe basic CIFS troubleshooting between storage systems, a Windows client, the authentication mechanism, and the network.
- Discuss troubleshooting SMB 3.0 locks.

Lab Exercises

Lab 2-1: Identify the exercise environment.
Lab 2-2: Log in to the exercise environment.
Lab 2-3: Add a cluster to OnCommand System Manager.
Lab 2-4: Configure SNMP public community name.
Lab 2-5: Identify clustered Data ONTAP components.
Lab 2-6: Set the clustered Data ONTAP command line system timeout value (optional).
Lab 3-1: Examine the statistics catalog commands.
Lab 3-2: Examine the statistics start and statistics show commands.
Lab 3-3: Defining workload characteristics.
Lab 4-1: Perform initial health checks on the cluster.
Lab 4-2: Baseline performance monitoring from the cluster shell.
Lab 4-3: Performance monitoring from the cluster shell.
Lab 4-4: Unlock diag userid.
Lab 4-5: Using the performance and statistics collector (Perfstat).
Lab 6-1: Reactively limit throughput to a workload by associating the workload with QoS policy group.
Lab 6-2: Proactively monitor workload performance by associating a workload with a QoS policy group.
Lab 6-3: Isolate a tenant workload by associating the workload with a QoS policy group.
Lab 7-1: Identify the exercise environment.
Lab 7-2: Log in to the exercise environment.
Lab 7-3: Install OnCommand System Manager in the exercise environment.
Lab 7-4: Add a cluster to OnCommand System Manager.
Lab 7-5: Configure SNMP public community name.
Lab 8-1: Create a data aggregate.
Lab 8-2: Add the NFS license to a cluster.
Lab 8-3: Create a Vserver.
Lab 8-4: Create a UNIX group and user.
Lab 8-5: Define a new export policy and rule.
Lab 8-6: Allocate an aggregate as a resource for a Vserver.
Lab 8-7: Create the Vserver’s namespace.
Lab 8-8: Mount the Vserver’s namespace.
Lab 8-9: Explore file permissions.
Lab 9-1: Configure a Vserver with a new storage and LIF.
Lab 9-2 Enable NFSv4 features on a Vserver and client
Lab 9-3 Explore an NFSv4 export on a client
Lab 9-4 Explore NFSv4 ACLs
Lab 10-1 Configure a Vserver for NFSv4.1
Lab 10-2 Explore an NFSv4.1 export on a client
Lab 10-3 Analyze the effects of a volume move operation on pNFS
Lab 12-1 Identify the exercise environment
Lab 12-2 Log in to the exercise environment
Lab 12-3 Install NetApp OnCommand System Manager in the exercise environment
Lab 12-4 Add a cluster to OnCommand System Manager
Lab 12-5 Configure SNMP public community name
Lab 13-1 Create an aggregate
Lab 13-2 Configure the prerequisites for the CIFS services
Lab 13-3 Add the CIFS license to a cluster
Lab 13-4 Create a Vserver for CIFS
Lab 13-5 Verify the CIFS server configuration
Lab 13-6 Configure DNS for a data LIF
Lab 14-1 Allocate an aggregate as a resource for a Vserver
Lab 14-2 Create the Vserver’s namespace
Lab 14-3 Create CIFS shares for the Vserver’s volumes
Lab 14-4 Mount the Vserver’s shares
Lab 14-5 Verify an SMB session using Computer Management
Lab 14-6 Verify an SMB session using Data ONTAP CLI and PowerShell
Lab 14-7 Explore the copy-offload feature
Lab 14-8 Investigate the auto location feature
Lab 15-1 Create a domain group
Lab 15-2 Create a domain user
Lab 15-3 Explore share-level permissions with domain user authentication
Lab 15-4 Configure local users authentication
Lab 15-5 Implement a native file blocking policy
Lab 15-6 Set up a multiprotocol configuration
Lab 15-7 Create an export policy rule
Lab 15-8 Configure a Vserver for NFS access
Lab 15-9 Use multiple protocols to access a volume
Lab 16-1 Configure BranchCache in Data ONTAP
Lab 16-2 Configure BranchCache in Windows
Lab 16-3 Configure home directories
Lab 16-4 Test the home directories with different users
Lab 16-5 Implement event auditing
Lab 16-6 Use symbolic links
Lab 16-7 Implement a widelink on the Vserver
Lab 17-1 Set up the Data ONTAP PowerShell Toolkit
Lab 17-2 Explore the toolkit help
Lab 17-3 Use PowerShell to connect to the cluster
Lab 17-4 Use PowerShell to create a Vserver
Lab 17-5 Use PowerShell to configure a CIFS server
Lab 17-6 Use PowerShell to create a share
Lab 17-7 Work with PowerShell ISE