



Test Specification

# ONTAP with Ansible

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## Abstract

This document provides guidance and examples on common tests executed to verify proper storage feature setup and functionality. Most of these tests can be automated and are therefore described with CLI command sequences as well as Ansible playbooks.

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# Introduction

## Scope

This document provides general guidance and instructions on how to perform and document a procedure for setting up and testing or simply demonstrating functionality of NetApp's data management software ONTAP.

It can be fully or partially applied depending on test requirements and deployment platform:

- Engineered appliances (AFF)
- Virtualized appliances (ONTAP Select)
- Cloud appliances (Cloud Volumes ONTAP in Azure, AWS, or GCP)

## Audience

The contents of this document are primarily targeted to anyone involved in designing or performing test procedures with or without detailed ONTAP knowledge:

- Infrastructure Architects
- Site Reliability Engineers
- Storage Administrators
- Professional Services Engineers/Consultants
- Solution Engineers

## Ansible

This test specification is closely aligned with common configuration management practices based on Ansible. Most of the procedures described in this document can be executed with prebuilt Ansible playbooks.

Ansible playbooks and configuration files are hosted on GitHub:

<https://github.com/AdrianBronder/NetApp-ONTAP-Testplan>

# Test Plan

**Table 1) Full Test Plan**

ID	Description	Comments & Test Notes	Success?
<b>ONTAP-00 – Initial Cluster Setup</b>			
<i>Prerequisites for execution:</i>			
<ul style="list-style-type: none"> <li>- Physical installation of storage components</li> <li>- Working network setup and connectivity</li> </ul>			
<i>Additional notes:</i> -			
ONTAP-00-01	<b>Node Setup</b> – Complete Node setup on all cluster nodes.	<placeholder> Click or tap here to enter text.	select...
ONTAP-00-02	<b>Cluster Setup</b> – Complete cluster setup for storage cluster.	<placeholder> Click or tap here to enter text.	select...
ONTAP-00-03	<b>Firmware Upgrade</b> – Upgrade firmware including mainboard, disks, shelves, and BMC/SP	<placeholder> Click or tap here to enter text.	select...
ONTAP-00-04	<b>ONTAP Upgrade</b> – Upgrade ONTAP to the desired major, minor, and patch release.	<placeholder> Click or tap here to enter text.	select...
<b>ONTAP-01 - Cluster Basic Connection Checks</b>			
<i>Prerequisites for execution:</i>			
<ul style="list-style-type: none"> <li>- ONTAP-00</li> </ul>			
<i>Additional notes:</i> -			
<a href="#">ONTAP-01-01</a>	<b>CLI</b> – Connect via SSH to the storage cluster's management interface.	Click or tap here to enter text.	select...
<a href="#">ONTAP-01-02</a>	<b>GUI</b> – Connect via HTTP/HTTPS to the cluster's management interface (System Manager).	Click or tap here to enter text.	select...
ONTAP-01-03	<b>REST API</b> – Query ONTAP's REST API and retrieve basic cluster information.	<work in progress> Click or tap here to enter text.	select...
ONTAP-01-04	<b>Ansible</b> – Execute na_ontap_rest_info module and retrieve basic cluster information.	<work in progress> Click or tap here to enter text.	select...
ONTAP-01-05	<b>Python Client Library</b> -	<placeholder> Click or tap here to enter text.	select...
ONTAP-01-06	<b>PowerShell Toolkit</b> -	<placeholder> Click or tap here to enter text.	select...
<b>ONTAP-10 - Basic Cluster Configuration</b>			
<i>Prerequisites for execution:</i>			
<ul style="list-style-type: none"> <li>- ONTAP-00</li> </ul>			
<i>Additional notes:</i> -			
<a href="#">ONTAP-10-01</a>	<b>Licenses</b> – Install licenses on storage cluster nodes and verify successful enablement of features.	Click or tap here to enter text.	select...
<a href="#">ONTAP-10-02</a>	<b>Physical Network</b> – Configure physical network ports on cluster nodes including interface groups, VLANs, broadcast domains, and cluster default gateway.	Click or tap here to enter text.	select...
<a href="#">ONTAP-10-03</a>	<b>Network Services</b> – Configure additional network services including DNS for name resolving and NTP for time synchronization.	Click or tap here to enter text.	select...
<a href="#">ONTAP-10-04</a>	<b>Storage Aggregates</b> – Create storage aggregates on cluster nodes.	Click or tap here to enter text.	select...
<a href="#">ONTAP-10-05</a>	<b>AutoSupport</b> – Enable and test AutoSupports being sent from cluster nodes.	Click or tap here to enter text.	select...
<b>ONTAP-11 - Advanced Cluster Configuration</b>			

ID	Description	Comments & Test Notes	Success?
<i>Prerequisites for execution:</i>			
- ONTAP-10			
<i>Additional notes:</i> -			
<a href="#">ONTAP-11-01</a>	<b>Cluster/Node Parameters</b> – Configure additional parameters including time zone, login banner and message of the day (MOTD).	Click or tap here to enter text.	select...
<a href="#">ONTAP-11-02</a>	<b>Administrative Domain Authentication</b> – Create proxy SVM for Active Directory domain authentication to the storage cluster.	Click or tap here to enter text.	select...
<a href="#">ONTAP-11-03</a>	<b>Key Manager</b> – Configure key manager for data at rest encryption and enable encryption on all aggregates.	Click or tap here to enter text.	select...
<a href="#">ONTAP-11-04</a>	<b>Event Notification</b> – Configure events to be sent to a webhook server.	Click or tap here to enter text.	select...

#### **ONTAP-12 - Cluster User Management**

<a href="#">ONTAP-12-01</a>	<b>Read-only Local User</b> – Create a local user with read-only privileges.	Click or tap here to enter text.	select...
<a href="#">ONTAP-12-02</a>	<b>Administrative Local User</b> – Create a local user with admin privileges.	Click or tap here to enter text.	select...
<a href="#">ONTAP-12-03</a>	<b>Local User Access</b> – Verify local users' access and privileges.	Click or tap here to enter text.	select...
<a href="#">ONTAP-12-04</a>	<b>Read-only Domain Group</b> – Grant read-only privileges to a domain group.	Click or tap here to enter text.	select...
<a href="#">ONTAP-12-05</a>	<b>Administrative Domain Group</b> – Grant admin privileges to a domain group.	Click or tap here to enter text.	select...
<a href="#">ONTAP-12-06</a>	<b>Domain User Access</b> – Verify domain users' access and privileges.	Click or tap here to enter text.	select...
<a href="#">ONTAP-12-10</a>	<b>Admin Multifactor Authentication (MFA)</b> – Enable multifactor authentication for SSH access with built-in admin account.	< work in progress > Click or tap here to enter text.	select...

#### **ONTAP-15 - Cluster Peering**

<a href="#">ONTAP-15-01</a>	<b>Cluster Peering</b> – Peer cluster with other storage clusters for backup, disaster recovery, or data caching.	Click or tap here to enter text.	select...
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#### **ONTAP-16 – MetroCluster Setup**

<a href="#">ONTAP-16-01</a>	<b>MetroCluster</b> – Peer cluster with other storage clusters for backup, disaster recovery, or data caching.	< placeholder > Click or tap here to enter text.	select...
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#### **ONTAP-20 - Basic SVM Setup**

<a href="#">ONTAP-20-01</a>	<b>Storage Virtual Machines (SVMs)</b> – Create SVMs to serve data to clients and hosts. Activate SAN services, if applicable.	Click or tap here to enter text.	select...
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ID	Description	Comments & Test Notes	Success? Yes   No   n/a
<a href="#">ONTAP-20-02</a>	<b>SVM Logical Network</b> – Create logical interfaces (LIFs) and default gateway to allow network access to SVMs.	Click or tap here to enter text.	select...
<a href="#">ONTAP-20-03</a>	<b>SVM Network Services</b> – Configure DNS on SVMs.	Click or tap here to enter text.	select...
<a href="#">ONTAP-20-04</a>	<b>SVM Data Protocol Setup</b> – Setup data protocols on SVMs (CIFS, NFS, iSCSI...)	Click or tap here to enter text.	select...

#### **ONTAP-25 - SVM Peering**

*Prerequisites for execution:*

- ONTAP-15
- ONTAP-20

*Additional notes:* -

ONTAP-25-01	<b>SVM Peering</b> – Peer cluster with other storage clusters for backup, disaster recovery, or data caching.	< work in progress > Click or tap here to enter text.	select...
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#### **ONTAP-31 - NFS**

*Prerequisites for execution:*

- ONTAP-20

*Additional notes:* -

<a href="#">ONTAP-31-01</a>	<b>Export Policies &amp; Rules</b> – Create export policies & rules to control host access to provisioned storage resources.	Click or tap here to enter text.	select...
<a href="#">ONTAP-31-02</a>	<b>Volumes &amp; Qtrees</b> – Create volumes and qtrees for storing host/client data.	Click or tap here to enter text.	select...
<a href="#">ONTAP-31-03</a>	<b>Mount &amp; Write (Volumes)</b> – Access provisioned resources from a UNIX host via NFS.	Click or tap here to enter text.	select...
<a href="#">ONTAP-31-04</a>	<b>FlexGroups &amp; Qtrees</b> – Create FlexGroups (large scale volumes) and qtrees.	Click or tap here to enter text.	select...
<a href="#">ONTAP-31-05</a>	<b>Mount &amp; Write (FlexGroups)</b> – Access provisioned resources from a UNIX host via NFS.	Click or tap here to enter text.	select...

#### **ONTAP-32 - CIFS**

*Prerequisites for execution:*

- ONTAP-12
- ONTAP-20

*Additional notes:* -

<a href="#">ONTAP-32-01</a>	<b>Volumes &amp; Qtrees</b> – Create volumes and qtrees for storing host/client data.	Click or tap here to enter text.	select...
<a href="#">ONTAP-32-02</a>	<b>Shares &amp; ACLs (Volume)</b> – Create shares & ACLs to control client access to provisioned storage resources.	Click or tap here to enter text.	select...
<a href="#">ONTAP-32-03</a>	<b>Mount &amp; Write (Volume)</b> – Access provisioned resources from a Windows client via CIFS.	Click or tap here to enter text.	select...
<a href="#">ONTAP-32-04</a>	<b>FlexGroups &amp; Qtrees</b> – Create FlexGroups (large scale volumes) and qtrees.	Click or tap here to enter text.	select...
<a href="#">ONTAP-32-05</a>	<b>Shares &amp; ACLs (FlexGroup)</b> – Create shares & ACLs to control client access to provisioned storage resources.	Click or tap here to enter text.	select...
<a href="#">ONTAP-32-06</a>	<b>Mount &amp; Write (FlexGroup)</b> – Access provisioned resources from a Windows client via CIFS.	Click or tap here to enter text.	select...

#### **ONTAP-33 – Object**

*Prerequisites for execution:*

- ONTAP-20

ID	Description	Comments & Test Notes	Success? Yes   No   n/a
<i>Additional notes:</i> -			
ONTAP-33-01	Work in progress	Click or tap here to enter text.	select...

#### **ONTAP-35 – iSCSI**

*Prerequisites for execution:*

- ONTAP-20

*Additional notes:* -

<a href="#">ONTAP-35-01</a>	<b>iGroups</b> – Create iGroups according to test hosts' operating system and add host IQNs.	Click or tap here to enter text.	select...
<a href="#">ONTAP-35-02</a>	<b>Volumes</b> – Create volumes for storing host/client data.	Click or tap here to enter text.	select...
<a href="#">ONTAP-35-03</a>	<b>LUNs &amp; Mappings</b> – Create LUNs for storing host/client data and map them to the previously created iGroups.	Click or tap here to enter text.	select...
<a href="#">ONTAP-35-04</a>	<b>Mount &amp; Write (Linux)</b> – Discover iSCSI portals from Linux host(s). Map LUNs and write test data to them.	Click or tap here to enter text.	select...
<a href="#">ONTAP-35-05</a>	<b>Mount &amp; Write (Windows)</b> – Discover iSCSI portals from Windows host(s). Map LUNs and write test data to them.	Click or tap here to enter text.	select...

#### **ONTAP-36 – Fibre Channel**

*Prerequisites for execution:*

- ONTAP-20

*Additional notes:* -

- *Cannot be executed on virtualized storage clusters (e.g. ONTAP Select or ONTAP simulators)*

ONTAP-36-01	Fibre Channel	<placeholder> Click or tap here to enter text.	select...
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#### **ONTAP-37 – NVMe/TCP**

*Prerequisites for execution:*

- ONTAP-20

*Additional notes:* -

<a href="#">ONTAP-37-01</a>	<b>Volumes</b> - Create volumes for storing host/client data.	Click or tap here to enter text.	select...
<a href="#">ONTAP-37-02</a>	<b>Namespaces</b> - Create Namespaces for storing host/client data.	Click or tap here to enter text.	select...
<a href="#">ONTAP-37-03</a>	<b>Subsystem</b> – Create subsystem, add host(s) and map namespaces.	Click or tap here to enter text.	select...
<a href="#">ONTAP-37-04</a>	<b>Mount &amp; Write (Linux)</b> - Discover NVMe subsystem portals from Linux host(s). Connect namespaces and write test data to them.	Click or tap here to enter text.	select...

#### **ONTAP-41 – Cloning (NFS)**

*Prerequisites for execution:*

- ONTAP-20

*Additional notes:* -

<a href="#">ONTAP-41-01</a>	<b>Export Policies &amp; Rules</b> – Create export policies & rules to control host access to provisioned storage resources.	Click or tap here to enter text.	select...
<a href="#">ONTAP-41-02</a>	<b>Origin Volume</b> – Create volume for storing host/client data.	Click or tap here to enter text.	select...
<a href="#">ONTAP-41-03</a>	<b>Mount &amp; Write (Origin Volume)</b> – Access provisioned volume from a UNIX host via NFS and write data to it.	Click or tap here to enter text.	select...
<a href="#">ONTAP-41-04</a>	<b>Client Write (Origin Volume)</b> – Create an additional file in the provisioned volume from the UNIX host.	Click or tap here to enter text.	select...
<a href="#">ONTAP-41-05</a>	<b>Clone Volume</b> – Create a FlexClone of the origin volume	Click or tap here to enter text.	select...

ID	Description	Comments & Test Notes	Success? Yes   No   n/a
<a href="#">ONTAP-41-06</a>	<b>Mount &amp; Write (Clone)</b> - Access cloned volume from a UNIX host via NFS and write data to it.	Click or tap here to enter text.	select...
<a href="#">ONTAP-41-07</a>	<b>Client Write (Clone)</b> – Create an additional file in the cloned volume from the UNIX host.	Click or tap here to enter text.	select...
<a href="#">ONTAP-41-08</a>	<b>Clone &amp; Write (Loop)</b> – Repeat step 5 & 6 multiple times	Click or tap here to enter text.	select...

#### **ONTAP-42 – Quality of Service**

*Prerequisites for execution:*

- ONTAP-20

*Additional notes:* -

<a href="#">ONTAP-42-01</a>	<b>QoS Policy</b> – Create a Quality of Service policy to specify minimum and maximum throughput and IOPS on an object.	Click or tap here to enter text.	select...
<a href="#">ONTAP-42-02</a>	<b>Volumes</b> – Create volumes with and without QoS policy.	Click or tap here to enter text.	select...
<a href="#">ONTAP-42-03</a>	<b>Prepare Filesystem</b> – Create qtrees, export policies, rules, and shares on volumes for test host access.	Click or tap here to enter text.	select...
<a href="#">ONTAP-42-04</a>	<b>Client Write</b> – Write test data to qtrees on each volume to compare write speed.	Click or tap here to enter text.	select...

#### **ONTAP-51 – Local Versioning (Snapshots)**

*Prerequisites for execution:*

- ONTAP-12
- ONTAP-20

*Additional notes:* -

<a href="#">ONTAP-51-01</a>	<b>Custom Policy</b> – Create a custom snapshot policy for creating scheduled snapshots on a volume.	Click or tap here to enter text.	select...
<a href="#">ONTAP-51-02</a>	<b>Prepare Filesystem</b> – Prepare test storage and clients for snapshot testing: <ul style="list-style-type: none"> <li>- Volume</li> <li>- Qtrees</li> <li>- Client Access</li> <li>- Test Files</li> </ul>	Click or tap here to enter text.	select...
<a href="#">ONTAP-51-03</a>	<b>Snapshot</b> – Create a point in time snapshot to protect current state of filesystem.	Click or tap here to enter text.	select...
<a href="#">ONTAP-51-04</a>	<b>Delete Files</b> – Delete some of the previously created files and confirm they still exist in previously created snapshot.	Click or tap here to enter text.	select...
<a href="#">ONTAP-51-05</a>	<b>Access Snapshot</b> – Access snapshot to view a previous version of the file system.	Click or tap here to enter text.	select...
<a href="#">ONTAP-51-06</a>	<b>Restore Snapshot</b> – Restore entire volume from snapshot to recover all deleted files.	Click or tap here to enter text.	select...

#### **ONTAP-52 – Backup (SnapMirror)**

*Prerequisites for execution:*

- ONTAP-12
- ONTAP-15
- ONTAP-3\* (optional for ONTAP-52-11)

*Additional notes:* -

<a href="#">ONTAP-52-01</a>	<b>SVM Peering</b> – Establish peering relationships between source and target SVMs	Click or tap here to enter text.	select...
<a href="#">ONTAP-52-02</a>	<b>Custom Policies</b> – Create custom snapshot and SnapMirror policies to	Click or tap here to enter text.	select...

ID	Description	Comments & Test Notes	Success? Yes   No   n/a
	replicate scheduled as well as adhoc snapshots in later steps.		
<a href="#">ONTAP-52-03</a>	<b>Prepare Filesystem (Source)</b> - Prepare test storage and clients for backup testing: - Volume - Qtrees - Client Access - Test Files	Click or tap here to enter text.	select...
<a href="#">ONTAP-52-04</a>	<b>Protect Volume</b> – Create and initialize backup relationship.	Click or tap here to enter text.	select...
<a href="#">ONTAP-52-05</a>	<b>Access Backup (read-only)</b> – Access replicated data at destination.	Click or tap here to enter text.	select...
<a href="#">ONTAP-52-06</a>	<b>Additional Files</b> – Add files to be backed up adhoc.	Click or tap here to enter text.	select...
<a href="#">ONTAP-52-07</a>	<b>Incremental Backup</b> – Create snapshot and replicate it to the backup destination.	Click or tap here to enter text.	select...
<a href="#">ONTAP-52-08</a>	<b>Delete Files</b> – Delete some of the previously created files on the source and confirm they still exist on the backup destination.	Click or tap here to enter text.	select...
<a href="#">ONTAP-52-09</a>	<b>Restore Backup</b> – Restore entire volume from backup to recover all deleted files.	Click or tap here to enter text.	select...
<a href="#">ONTAP-52-11</a>	<b>Bulk Protect Volumes</b> – Build backup relationships and protect all volumes and data from primary NAS and SAN SVM (e.g. created in ONTAP-3*).	Click or tap here to enter text.	select...

#### **ONTAP-53 – Disaster Recovery (SVM DR)**

*Prerequisites for execution:*

- ONTAP-25

*Additional notes:* -

ONTAP-53	Disaster Recovery (SVM DR)	< planned > Click or tap here to enter text.	select...
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#### **ONTAP-55 – Data Mobility**

*Prerequisites for execution:*

- ONTAP-25

*Additional notes:* -

ONTAP-55-01	SVM Migrate	< planned > Click or tap here to enter text.	select...
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#### **ONTAP-61 – Basic Failure Scenarios**

*Prerequisites for execution:*

- ONTAP-20

*Additional notes:* -

ONTAP-61	Basic Failure Scenarios	< planned > Click or tap here to enter text.	select...
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#### **ONTAP-62 – Advanced Failure Scenarios**

*Prerequisites for execution:*

- ONTAP-20

*Additional notes:* -

ONTAP-62	Advanced Failure Scenarios	< placeholder > Click or tap here to enter text.	select...
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# Test Inventory

High-level overview of the test environment and components.

## Storage – cluster1

**Table 2) cluster1 – Cluster & Nodes**

Cluster	Raw Capacity (TiB)	Usable Capacity (TiB)	Nodes	SN#	Controller	OS Version
cluster1	0.66	0.55	cluster1-01		SIMBOX	ONTAP 9.13.1
			cluster1-02		SIMBOX	ONTAP 9.13.1

**Table 3) cluster1 – Network**

Description	Interface Name	Home Port	IP Address
Cluster management interface	cluster1_mgmt1	cluster1-01:e0c	192.168.0.101/24
1st node's management interface	cluster1-01_mgmt1	cluster1-01:e0c	192.168.0.111/24
2nd node's management interface	cluster1-02_mgmt1	cluster1-02:e0c	192.168.0.112/24
1st node's service processor	n/a	n/a	
2nd node's service processor	n/a	n/a	

**Table 4) cluster1 – Storage Virtual Machines**

SVM	Protocols	Description
ntap-svm01-nas	NFS, CIFS	
ntap-svm02-san	CIFS, iSCSI	

## Storage – cluster2

**Table 5) cluster2 – Cluster & Nodes**

Cluster	Raw Capacity (TiB)	Usable Capacity (TiB)	Nodes	SN#	Controller	OS Version
cluster2	0.66	0.55	cluster2-01		SIMBOX	ONTAP 9.13.1
			cluster2-02		SIMBOX	ONTAP 9.13.1

**Table 6) cluster2 – Network**

SVM	Interface Name	Home Port	IP Address
Cluster management interface	cluster1-01_mgmt1	cluster1-01:e0c	192.168.0.101/24
1st node's management interface	cluster1-01_mgmt1	cluster1-01:e0c	192.168.0.111/24
2nd node's management interface	cluster1-02_mgmt1	cluster1-02:e0c	192.168.0.112/24
1st node's service processor	n/a	n/a	
2nd node's service processor	n/a	n/a	
1st node's interconnect	cluster1-01_ic01	cluster1-01:e0c	
2nd node's interconnect	cluster1-02_ic01	cluster1-02:e0c	

**Table 7) cluster2 – Storage Virtual Machines**

SVM	Protocols	Description
ntap-svm03-backup	NFS, CIFS, iSCSI	

## Test Hosts

**Table 8) Test Hosts**

Host	IP	OS	Description
centos1.demo.netapp.com	192.168.0.61	CentOS 7.9.2009	
jumphost.demo.netapp.com	192.168.0.5	Windows Server 2019 (DC)	

## Ansible Inventory

This is the representation of the test environment as inventory file in Ansible:

*Ansible: "<inventory\_source>/hosts"*

```
[ontap]
cluster1 ansible_host=cluster1.demo.netapp.com
cluster2 ansible_host=cluster2.demo.netapp.com

[linux]
centos1 ansible_host=centos1.demo.netapp.com

[win_hosts]
jumphost win_hostname=jumphost.demo.netapp.com

[win_domain_controllers]
dc1 win_hostname=dc1.demo.netapp.com

[windows:children]
win_hosts
win_domain_controllers
```

Ansible built-in inventory check:

```
[root@centos1 NetApp-ONTAP-Testplan]# ansible-inventory -i inventories/labondemand/ --graph
@all:
  |--@ungrouped:
  |--@ontap:
    |   |--cluster1
    |   |--cluster2
  |--@linux:
    |   |--centos1
  |--@windows:
    |   |--@win_hosts:
    |   |   |--jumphost
    |   |--@win_domain_controllers:
    |   |   |--dc1
```

# Test Variables

Variables are defined at various levels. There are generally two categories of variables for this test:

- **Environment**, or: Desired state of a system or a group of systems
- **Runtime**, or: Configuration, that is created or changed as part of the test plan

## Environment

### All

*Ansible: "<inventory\_source>/group\_vars/all"*

**Table 9) Environment Variables – All**

Parameter Name	Description	Value (Lab on Demand)
all_default_gateway	Default gateway IP traffic should be routed to	"192.168.0.1"
all_default_dns_domain	Default DNS domain to be used	"demo.netapp.com"
all_ad_domain	Default Active Directory domain for adding CIFS servers	"demo.netapp.com"
all_storage_ad_ou_path	Full distinguished name for Active Directory organizational unit to register new computer accounts	"OU=Storage,DC=DEMO,DC=NETAPP,DC=COM"
all_dns_domains	List of DNS search domains	- "demo.netapp.com"
all_dns_nameservers	Default servers for DNS lookups	- "192.168.0.253"
all_ntp_serveres	Default servers for time synchronization	- "0.us.pool.ntp.org" - "2.us.pool.ntp.org"
all_timezone	Timezone, the environment is located in	"America/New_York"
all_ad_join_user	Account used for creating accounts in the Active Directory domain (e.g. joining SVMs)	"Administrator@DEMO.NETAPP.COM"
all_ad_join_password	Password for account used for creating accounts in the Active Directory domain	<hidden>

## ONTAP

Ansible: "<inventory\_source>/group\_vars/ontap/\*"

**Table 10) Environment Variables – ONTAP**

Parameter Name	Description	Value (Lab on Demand)
ontap_admin_user	Default account for administrative access to ONTAP	"admin"
ontap_admin_password	Password for default administrative account	<hidden>
<b>security_login_messages</b>	List of login message configurations on the cluster.	
- banner	The login banner text. This message is displayed during SSH and console device login just before the password prompt displays.	##### TEST BANNER ##### # This system is currently in testing state # ##### #####
scope	SVM or cluster level	"cluster"
message	The message of the day (MOTD). This message appears just before the clustershell prompt after a successful login.	Welcome! Please note: This system is not ready for production yet!
<b>network_ethernet_broadcast_domains</b>	List of broadcast domains to be created.	
- name	Name of the broadcast domain, scoped to its IPspace.	"bc_data"
mtu	Maximum transmission unit, largest packet size on this network	9000
ipspace		
name	IPspace name	"Default"
<b>security_key_managers</b>		
onboard		
passphrase		<hidden>
<b>security_accounts</b>		
- name		"na_local_admin"
scope		"cluster"
role		
name		"admin"
applications		
- application		"ssh"
authentication_methods		- "password"
second_authentication_method		"none"
- application		"ontapi"
authentication_methods		- "password"
second_authentication_method		"none"
- application		"http"
authentication_methods		- "password"
second_authentication_method		"none"
- name		"na_local_ro "
scope		"cluster"
role		
name		"readonly"
applications		
- application		"ssh"

Parameter Name	Description	Value (Lab on Demand)
	authentication_methods	- "password"
	second_authentication_method	"none"
-	application	"ontapi"
	authentication_methods	- "password"
	second_authentication_method	"none"
-	application	"http"
	authentication_methods	- "password"
	second_authentication_method	"none"
-	name	"DEMO\\na_ad_admin_group"
	scope	"cluster"
role		
	name	"admin"
applications		
-	application	"ssh"
	authentication_methods	- "password"
	second_authentication_method	"none"
-	application	"ontapi"
	authentication_methods	- "password"
	second_authentication_method	"none"
-	application	"http"
	authentication_methods	- "password"
	second_authentication_method	"none"
-	name	"DEMO\\na_ad_ro_group"
	scope	"cluster"
role		
	name	"readonly"
applications		
-	application	"ssh"
	authentication_methods	- "password"
	second_authentication_method	"none"
-	application	"ontapi"
	authentication_methods	- "password"
	second_authentication_method	"none"
-	application	"http"
	authentication_methods	- "password"
	second_authentication_method	"none"

## Hosts

Ansible: "<inventory\_source>/host\_vars/<(host|cluster)\_name>/\*"

### centos1

**Table 11) Environment Variables – centos1**

Parameter Name	Description	Value (Lab on Demand)
<b>iscsi</b>		
initiator_name		" iqn.1994-05.com.redhat:centos1.demo.netapp.com"

### jumphost

**Table 12) Environment Variables – jumphost**

Parameter Name	Description	Value (Lab on Demand)
<b>iscsi</b>		
initiator_name		" iqn.1991-05.com.microsoft:jumphost.demo.netapp.com"

### cluster1

**Table 13) Environment Variables – cluster1**

Parameter Name	Description	Value (Lab on Demand)
<b>cluster</b>		
name		"cluster1"
<b>cluster_nodes</b>		
name		"cluster1-01"
location		"Virtual DC01   Virtual Rack 01"
name		"cluster1-02"
location		"Virtual DC01   Virtual Rack 02"
<b>cluster_licensing_licenses</b>		[ ]
<b>security_authentication_cluster_a_d_proxy</b>		
svm		
name		"cluster1_ad"
<b>network_ethernet_ports</b>		
- name		"a0a"
node		
name		"cluster1-01"
type		"lag"
lag		
- member_ports		
- name		"e0f"
- name		"e0g"
distribution_policy		"port"
mode		"singlemode"

Parameter Name	Description	Value (Lab on Demand)
broadcast_domain		
name		"bc_data"
ipspace		
name		"Default"
- name		"a0a"
node		
name		"cluster1-02"
type		"lag"
lag		
member_ports		
- name		"e0f"
- name		"e0g"
distribution_policy		"port"
mode		"singlemode"
broadcast_domain		
name		"bc_data"
ipspace		
name		"Default"
- name		"a0b"
node		
name		"cluster1-01"
type		"lag"
lag		
member_ports		
- name		"e0d"
- name		"e0e"
distribution_policy		"port"
mode		"singlemode"
broadcast_domain		
name		"bc_peering"
ipspace		
name		"ip_peering"
- name		"a0b"
node		
name		"cluster1-02"
type		"lag"
lag		
member_ports		
- name		"e0d"
- name		"e0e"
distribution_policy		"port"
mode		"singlemode"
broadcast_domain		
name		"bc_peering"
ipspace		
name		"Default"
storage_aggregates		
- name		"cluster_01_aggr01"

Parameter Name	Description	Value (Lab on Demand)
node		
name		"cluster1-01"
block_storage		
primary		
disk_count		13
snaplock_type		"non_snaplock"
- name		"cluster_02_aggr01"
node		
name		"cluster1-02"
block_storage		
primary		
disk_count		13
snaplock_type		"non_snaplock"
<b>svm_svms</b>		
- name		"cluster1_ad"
dns		
domains		<s. all_dns_domains>
servers		<s. all_dns_nameservers>
ipspace		
name		"Default"
nfs		
allowed		false
cifs		
allowed		true
iscsi		
allowed		false
fcp		
allowed		false
ndmp		
allowed		false
nvme		
allowed		false
language		"utf8mb4"
comment		"This is the tunnel SVM for cluster AD authentication"
- name		"ntap-svm01-nas"
dns		
domains		<s. all_dns_domains>
servers		<s. all_dns_nameservers>
auto_enable_analytics		true
auto_enable_activity_tracking		true
ipspace		
name		"Default"
nfs		
allowed		true
cifs		
allowed		true
iscsi		
allowed		false

Parameter Name	Description	Value (Lab on Demand)
fcp		
allowed		false
ndmp		
allowed		false
nvme		
allowed		false
language		"utf8mb4"
comment		"This is the first SVM for NAS testing"
- name		"ntap-svm02-san"
dns		
domains		<s. all_dns_domains>
servers		<s. all_dns_nameservers>
auto_enable_analytics		true
auto_enable_activity_tracking		true
ipspace		
name		"Default"
nfs		
allowed		false
cifs		
allowed		false
iscsi		
allowed		true
fcp		
allowed		false
ndmp		
allowed		false
nvme		
allowed		false
language		"utf8mb4"
comment		"This is the second SVM for SAN testing"
protocols_nfs_services		
- svm		
name		"ntap-svm01-nas"
enabled		true
protocol		
v3_enabled		true
v40_enabled		true
v41_enabled		false
v3_64bit_identifiers_enabled		true
v4_64bit_identifiers_enabled		true
showmount_enabled		true
protocols_active_directory		
cluster1_ad		
preferred-domain-controllers		
- fqdn		"demo.netapp.com"
ip		"192.168.0.253"
ntap-svm01-nas		

Parameter Name		Description	Value (Lab on Demand)
		preferred-domain-controllers	
-	fqdn		"demo.netapp.com"
	ip		"192.168.0.253"
<b>protocols_cifs_services</b>			
-	name		"cluster1_ad"
	svm		
	name		"cluster1_ad"
		ad_domain	
	fqdn		<s. all_ad_domain>
		organizational_unit	<s. all_storage_ad_ou_path>
	comment		"This CIFS Server is for cluster AD authentication"
	enabled		true
	name		"svm01-nas"
	svm		
-	name		"ntap-svm01-nas"
		ad_domain	
	fqdn		<s. all_ad_domain>
		organizational_unit	<s. all_storage_ad_ou_path>
	comment		"This CIFS Server is created for the primary NAS SVM"
	enabled		true
	name		"svm02-nas"
	svm		
	name		"ntap-svm02-san"
		ad_domain	
-	fqdn		<s. all_ad_domain>
		organizational_unit	<s. all_storage_ad_ou_path>
	comment		"This CIFS Server is created for the primary SAN SVM"
	enabled		True
	<b>protocols_san_iscsi_services</b>		
	svm		
		name	"ntap-svm02-san"
			True
<b>protocols_nvme_services</b>			
-	svm		
		name	"ntap-svm02-san"
			true
<b>network_ip_interfaces</b>			
-	name		"cluster1_ad"
		scope	"svm"
	svm		
		name	"cluster1_ad"
	ip		
		netmask	"24"
		address	"192.168.0.210"
		family	"ipv4"

Parameter Name	Description	Value (Lab on Demand)
location		
home_node		
name		"cluster1-01"
home_port		
name		"e0c"
auto_revert		true
service_policy		
name		"default-management"
- name		"ntap-svm01-nas"
scope		"svm"
svm		
name		"ntap-svm01-nas"
ip		
netmask		"24"
address		"192.168.0.211"
family		"ipv4"
location		
home_node		
name		"cluster1-01"
home_port		
name		"e0c"
auto_revert		true
service_policy		
name		"default-data-files"
- name		"ntap-svm02-san"
scope		"svm"
svm		
name		"ntap-svm02-san"
ip		
netmask		"24"
address		"192.168.0.212"
family		"ipv4"
location		
home_node		
name		"cluster1-01"
home_port		
name		"e0c"
auto_revert		true
service_policy		
name		"default-data-files"
- name		"ntap-svm02-san_iscsi01"
scope		"svm"
svm		
name		"ntap-svm02-san"
ip		
netmask		"24"
address		"192.168.0.215"
family		"ipv4"

Parameter Name	Description	Value (Lab on Demand)
location		
home_node		
name		"cluster1-01"
home_port		
name		"e0c"
auto_revert		false
service_policy		
name		"default-data-blocks"
- name		"ntap-svm02-san_iscsi02"
scope		"svm"
svm		
name		"ntap-svm02-san"
ip		
netmask		"24"
address		"192.168.0.216"
family		"ipv4"
location		
home_node		
name		"cluster1-02"
home_port		
name		"e0c"
auto_revert		false
service_policy		
name		"default-data-blocks"
- name		"ntap-svm02-san_nvme01"
scope		"svm"
svm		
name		"ntap-svm02-san"
ip		
netmask		"24"
address		"192.168.0.217"
family		"ipv4"
location		
home_node		
name		"cluster1-01"
home_port		
name		"e0c"
auto_revert		false
service_policy		
name		"default-data-nvme-tcp"
- name		"ntap-svm02-san_nvme02"
scope		"svm"
svm		
name		"ntap-svm02-san"
ip		
netmask		"24"
address		"192.168.0.218"
family		"ipv4"

Parameter Name	Description	Value (Lab on Demand)
location		
home_node		
name		"cluster1-02"
home_port		
name		"e0c"
auto_revert		false
service_policy		
name		"default-data-nvme-tcp"
- name		"cluster1-01_ic01"
scope		"cluster"
ip		
netmask		"24"
address		"192.168.0.121"
family		"ipv4"
location		
home_node		
name		"cluster1-01"
home_port		
name		"e0c"
auto_revert		true
service_policy		
name		"default-intercluster"
- name		"cluster1-02_ic01"
scope		"svm"
ip		
netmask		"24"
address		"192.168.0.122"
family		"ipv4"
location		
home_node		
name		"cluster1-02"
home_port		
name		"e0c"
auto_revert		true
service_policy		
name		"default-intercluster"
cluster_peers		
- name		"cluster2"
authentication		
generate_passphrase		False
passphrase		<hidden>
encryption		
proposed		"tls_psk"
ipspace		
name		"Default"
local_network		
interfaces		
ip_address		"192.168.0.121"

Parameter Name	Description	Value (Lab on Demand)
- ip_address		"192.168.0.122"
remote		
ip_addresses		- "192.168.0.123" - "192.168.0.124"

## cluster2

Table 14) Environment Variables – cluster2

Parameter Name	Description	Value (Lab on Demand)
cluster		
name		"cluster2"
cluster_nodes		
name		"cluster2-01"
location		"Virtual DC02   Virtual Rack 01"
name		"cluster2-02"
location		"Virtual DC02   Virtual Rack 02"
cluster_licensing_licenses		[]
security_authentication_cluster_ad_proxy		
svm		
name		"cluster2_ad"
network_ethernet_ports		
- name		"a0a"
node		
name		"cluster2-01"
type		"lag"
lag		
member_ports		
- name		"e0f"
- name		"e0g"
distribution_policy		"port"
mode		"singlemode"
broadcast_domain		
name		"bc_data"
ipspace		
name		"Default"
- name		"a0a"
node		
name		"cluster2-02"
type		"lag"
lag		
member_ports		
- name		"e0f"
- name		"e0g"
distribution_policy		"port"
mode		"singlemode"
broadcast_domain		

Parameter Name	Description	Value (Lab on Demand)
name		"bc_data"
ipspace		
name		"Default"
- name		"a0b"
node		
name		"cluster2-01"
type		"lag"
lag		
member_ports		
-	name	"e0d"
-	name	"e0e"
distribution_policy		"port"
mode		"singlemode"
broadcast_domain		
name		"bc_peering"
ipspace		
name		"ip_peering"
- name		"a0b"
node		
name		"cluster2-02"
type		"lag"
lag		
member_ports		
-	name	"e0d"
-	name	"e0e"
distribution_policy		"port"
mode		"singlemode"
broadcast_domain		
name		"bc_peering"
ipspace		
name		"Default"
<b>storage_aggregates</b>		
- name		"cluster_02_aggr01"
node		
name		"cluster2-01"
block_storage		
primary		
disk_count		13
snaplock_type		"non_snaplock"
- name		"cluster_02_aggr01"
node		
name		"cluster2-02"
block_storage		
primary		
disk_count		13
snaplock_type		"non_snaplock"
<b>svm_svms</b>		
- name		"cluster2_ad"

Parameter Name	Description	Value (Lab on Demand)
dns		
domains		<s. all_dns_domains>
servers		<s. all_dns_nameservers>
ipspace		
name		"Default"
nfs		
allowed		false
cifs		
allowed		true
iscsi		
allowed		false
fcp		
allowed		false
ndmp		
allowed		false
nvme		
allowed		false
language		"utf8mb4"
comment		"This is the tunnel SVM for cluster AD authentication"
- name		"ntap-svm03-backup"
dns		
domains		<s. all_dns_domains>
servers		<s. all_dns_nameservers>
auto_enable_analytics		true
auto_enable_activity_tracking		true
ipspace		
name		"Default"
nfs		
allowed		true
enabled		true
cifs		
allowed		true
iscsi		
allowed		true
fcp		
allowed		false
ndmp		
allowed		false
nvme		
allowed		false
language		"utf8mb4"
comment		"This is the primary backup SVM for testing"
protocols_nfs_services		
- svm		
name		"ntap-svm03-backup"
enabled		true
protocol		

Parameter Name	Description	Value (Lab on Demand)
v3_enabled v40_enabled v41_enabled v3_64bit_identifiers_enabled v4_64bit_identifiers_enabled showmount_enabled	v3_enabled	true
	v40_enabled	true
	v41_enabled	false
	v3_64bit_identifiers_enabled	true
	v4_64bit_identifiers_enabled	true
	showmount_enabled	true
protocols_active_directory		
cluster2_ad preferred-domain-controllers - fqdn ip	cluster2_ad	
	preferred-domain-controllers	
	- fqdn	"demo.netapp.com"
	ip	"192.168.0.253"
ntap-svm03-backup preferred-domain-controllers - fqdn ip	ntap-svm03-backup	
	preferred-domain-controllers	
	- fqdn	"demo.netapp.com"
	ip	"192.168.0.253"
protocols_cifs_services		
- name svm name ad_domain fqdn organizational_unit comment enabled - name svm name ad_domain fqdn organizational_unit comment enabled	name	"cluster2_ad"
	svm	
	name	"cluster2_ad"
	ad_domain	
	fqdn	<s. all_ad_domain>
	organizational_unit	<s. all_storage_ad_ou_path>
	comment	"This CIFS Server is for cluster AD authentication"
	enabled	true
	name	"svm03-backup"
	svm	
- name svm name ad_domain fqdn organizational_unit comment enabled	name	"ntap-svm03-backup"
	svm	
	name	"ntap-svm03-backup"
	ad_domain	
	fqdn	<s. all_ad_domain>
	organizational_unit	<s. all_storage_ad_ou_path>
	comment	" This CIFS Server is the default NAS backup location"
	enabled	true
protocols_san_iscsi_services		
- svm name enabled	svm	
	name	"ntap-svm03-backup"
	enabled	True
protocols_nvme_services		
- svm name enabled	svm	
	name	"ntap-svm03-backup"
	enabled	true
network_ip_interfaces		
- name scope svm name ip netmask	name	"cluster2_ad"
	scope	"svm"
	svm	
	name	"cluster2_ad"
	ip	
	netmask	"24"

Parameter Name	Description	Value (Lab on Demand)
address		"192.168.0.220"
family		"ipv4"
location		
home_node		
name		"cluster2-01"
home_port		
name		"e0c"
auto_revert		true
service_policy		
name		"default-management"
-		
name		"ntap-svm03-backup"
scope		"svm"
svm		
name		"ntap-svm03-backup"
ip		
netmask		"24"
address		"192.168.0.221"
family		"ipv4"
location		
home_node		
name		"cluster2-01"
home_port		
name		"e0c"
auto_revert		true
service_policy		
name		"default-data-files"
-		
name		"cluster2-01_ic01"
scope		"cluster"
ip		
netmask		"24"
address		"192.168.0.123"
family		"ipv4"
location		
home_node		
name		"cluster2-01"
home_port		
name		"e0c"
auto_revert		true
service_policy		
name		"default-intercluster"
-		
name		"cluster2-02_ic01"
scope		"svm"
ip		
netmask		"24"
address		"192.168.0.124"
family		"ipv4"
location		
home_node		

Parameter Name	Description	Value (Lab on Demand)
name		"cluster2-02"
home_port		
name		"e0c"
auto_revert		true
service_policy		
name		"default-intercluster"
cluster_peers		
- name		"cluster1"
authentication		
generate_passphrase		false
passphrase		<hidden>
encryption		
proposed		"tls_psk"
ipspace		
name		"Default"
local_network		
interfaces		
- ip_address		"192.168.0.123"
- ip_address		"192.168.0.124"
remote		
ip_addresses		- "192.168.0.121" - "192.168.0.122"

## Ansible Environment Variables

There is a simple command to check all variables assigned to a particular host or group in Ansible:

```
[root@centos1 NetApp-ONTAP-Testplan]# ansible-inventory -i inventories/labondemand/ --list --yaml
all:
  children:
    linux:
      hosts:
        centos1:
          all_ad_domain: '{{ all_default_dns_domain }}'
          all_ad_join_password: '{{ vault_all_ad_join_password }}'
          all_ad_join_user: '{{ vault_all_ad_join_user }}'
          all_default_dns_domain: demo.netapp.com
          all_default_gateway: 192.168.0.1
          all_dns_domains: &id001
          - '{{ all_default_dns_domain }}'
          all_dns_nameservers: &id002
          - 192.168.0.253
          all_ntp_serveres: &id003
          - 0.us.pool.ntp.org
          - 1.us.pool.ntp.org
          all_storage_ad_ou_path: OU=Storage,DC=DEMO,DC=NETAPP,DC=COM
          all_timezone: America/New_York
          ansible_host: centos1.demo.netapp.com
          iscsi:
            initiator_name: iqn.1994-05.com.redhat:centos1.demo.netapp.com
            vault_all_ad_join_password: <hidden>
            vault_all_ad_join_user: Administrator@DEMO.NETAPP.COM
        ontap:
          hosts:
            cluster1:
              all_ad_domain: '{{ all_default_dns_domain }}'
              all_ad_join_password: '{{ vault_all_ad_join_password }}'
              all_ad_join_user: '{{ vault_all_ad_join_user }}'
              all_default_dns_domain: demo.netapp.com
              all_default_gateway: 192.168.0.1
              all_dns_domains: *id001
              all_dns_nameservers: *id002
              all_ntp_serveres: *id003
              all_storage_ad_ou_path: OU=Storage,DC=DEMO,DC=NETAPP,DC=COM
              all_timezone: America/New_York
              ansible_connection: local
              ansible_host: cluster1.demo.netapp.com
              ansible_python_interpreter: '{{ansible_playbook_python}}'
            cluster:
              name: cluster1
              cluster_licensing_licenses: []
              cluster_nodes:
                - location: Virtual DC01 | Virtual Rack 01
                  name: cluster1-01
                - location: Virtual DC01 | Virtual Rack 02
                  name: cluster1-02
              cluster_peers:
                - authentication:
                    generate_passphrase: false
                    passphrase: '{{ vault_cluster_peers.passphrase }}'
                  encryption:
                    proposed: tls_psk:
                      [.....]
                      [... output truncated ...]
                      [.....]
```

## Runtime

*Ansible: "<vars\_source>/<environment name>"*

**Table 15) Runtime Variables**

Parameter Name	Description	Value (Lab on Demand)
<b>General Defaults</b>		
global_primary_test_cluster	Name of the primary storage cluster used for testing	"cluster1"
global_secondary_test_cluster		"cluster2"
global_primary_nas_svm		"ntap-svm01-nas"
global_primary_san_svm		"ntap-svm02-san"
global_primary_backup_svm		"ntap-svm03-backup"
global_primary_linux_host		"centos1"
global_primary_windows_host		"jumphost"
ontap_default_vol_size_gb		10
ontap_default_vol_size_increment_gb		2
ontap_default_fg_size_gb		102400
ontap_default_fg_size_increment_gb		1024
ontap_default_fg_multiplier		8
ontap_default_lun_size_gb		5
ontap_default_ns_size_gb		5
ontap_iscsi_vendor_id		"3600a0980"
linux_default_mount_dir		"/mnt/ontap_test"
windows_default_mount_dir		"C:\\Users\\Administrator.DEMO\\Desktop\\ontap_test"
<b>ONTAP-12 – Cluster User Management</b>		
ontap_12_local_ro		"na_local_ro"
ontap_12_local_admin		"na_local_admin"
ontap_12_test_svm01		"svm_ontap_12_01"
ontap_12_ad_ro_group		"DEMO\\na_ad_ro_group"
ontap_12_ad_ro_user		"DEMO\\na_ad_ro_user"
ontap_12_ad_ro_user_pw		<hidden>
ontap_12_ad_admin_group		"DEMO\\na_ad_admin_group"
ontap_12_ad_admin_user		"DEMO\\na_ad_admin_user"
ontap_12_ad_admin_user_pw		<hidden>
ontap_12_test_svm02		"svm_ontap_12_02"
<b>ONTAP-31 – NFS</b>		
ontap_31_policy_name		"ontap_31_policy"
ontap_31_vol_name		"ontap_31_nfs_volo1"
ontap_31_vol_qtree_names		- "ontap_31_vol_qt01" - "ontap_31_vol_qt02" - "ontap_31_vol_qt03" - "ontap_31_vol_qt04" - "ontap_31_vol_qt05"
ontap_31_fg_name		"ontap_31_nfs_fg01"
ontap_31_fg_qtree_names		- "ontap_31_fg_qt01" - "ontap_31_fg_qt02" - "ontap_31_fg_qt03" - "ontap_31_fg_qt04" - "ontap_31_fg_qt05"

Parameter Name	Description	Value (Lab on Demand)
linux_31_mount_dir		"<linux_default_mount_dir>/31"
<b>ONTAP-32 – CIFS</b>		
ontap_32_vol_name		"ontap_32_cifs_vo101"
ontap_32_vol_qtree_names		<ul style="list-style-type: none"> <li>- "ontap_32_vol_qt01"</li> <li>- "ontap_32_vol_qt02"</li> <li>- "ontap_32_vol_qt03"</li> <li>- "ontap_32_vol_qt04"</li> <li>- "ontap_32_vol_qt05"</li> </ul>
ontap_32_fg_name		"ontap_32_cifs_fg01"
ontap_32_fg_qtree_names		<ul style="list-style-type: none"> <li>- "ontap_32_fg_qt01"</li> <li>- "ontap_32_fg_qt02"</li> <li>- "ontap_32_fg_qt03"</li> <li>- "ontap_32_fg_qt04"</li> <li>- "ontap_32_fg_qt05"</li> </ul>
ontap_32_ad_ro_group		<s. ontap_12_ad_ro_group>
ontap_32_ad_admin_group		<s. ontap_12_ad_admin_group>
windows_32_mount_dir		"<windows_default_mount_dir>\\32"
ontap_32_ad_admin_user		<s. ontap_12_ad_admin_user>
ontap_32_ad_admin_user_pw		<s. ontap_12_ad_admin_user_pw>
<b>ONTAP-35 – iSCSI</b>		
ontap_35_lin_igroup_name		"ontap_35_lin_ig"
ontap_35_lin_igroup_iqns		<ul style="list-style-type: none"> <li>- "iqn.1994-05.com.redhat:centos1.demo.netapp.com"</li> </ul>
ontap_35_win_igroup_name		"ontap_35_win_ig"
ontap_35_win_igroup_iqns		<ul style="list-style-type: none"> <li>- "iqn.1991-05.com.microsoft:jumphost.demo.netapp.com"</li> </ul>
ontap_35_lin_luns		<ul style="list-style-type: none"> <li>- "/vol/ontap_35_lin_vo101/ontap_35_lin_lun01"</li> <li>- "/vol/ontap_35_lin_vo102/ontap_35_lin_lun02"</li> <li>- "/vol/ontap_35_lin_vo103/ontap_35_lin_lun03"</li> </ul>
ontap_35_win_luns		<ul style="list-style-type: none"> <li>- "/vol/ontap_35_win_vo101/ontap_35_win_lun01"</li> <li>- "/vol/ontap_35_win_vo102/ontap_35_win_lun02"</li> <li>- "/vol/ontap_35_win_vo103/ontap_35_win_lun03"</li> </ul>
linux_35_mount_dir		"<linux_default_mount_dir>/35"
windows_35_mount_dir		"<windows_default_mount_dir>\\35"
<b>ONTAP-37 – NVMe/TCP</b>		
ontap_37_lin_subsystem_name		"ontap_37_lin_subs01"
ontap_37_lin_namespaces		<ul style="list-style-type: none"> <li>- "/vol/ontap_37_lin_vo101/ontap_37_lin_ns01"</li> <li>- "/vol/ontap_37_lin_vo102/ontap_37_lin_ns02"</li> <li>- "/vol/ontap_37_lin_vo103/ontap_37_lin_ns03"</li> </ul>

Parameter Name	Description	Value (Lab on Demand)
linux_37_mount_dir		"<linux_default_mount_dir>/37"
<b>ONTAP-41 – Cloning (NFS)</b>		
ontap_41_policy_name		"ontap_41_policy"
ontap_41_vol_name		"ontap_41_nfs_vo101"
ontap_41_snapshot_name		"software_source"
ontap_41_clone_dir_name		"clonedir"
ontap_41_clone_vol_name		"software_source"
linux_41_mount_dir		"<linux_default_mount_dir>/41"
<b>ONTAP-42 – Quality of Service</b>		
ontap_42_policy_name		"ontap_42_policy"
ontap_42_qos_policy_name		"ontap_42_qos_policy"
ontap_42_vol_name		"ontap_42_noqos_vo101"
ontap_42_qos_vol_name		"ontap_42_qos_vo101"
ontap_42_nfs_suffix		"_nfs_qt01"
ontap_42_cifs_suffix		"_cifs_qt0"
linux_42_mount_dir		"<linux_default_mount_dir>/42"
windows_42_mount_dir		"<windows_default_mount_dir>\42"
ontap_42_ad_ro_group		<s. ontap_12_ad_ro_group>
ontap_42_ad_admin_group		<s. ontap_12_ad_admin_group>
ontap_42_ad_admin_user		<s. ontap_12_ad_admin_user>
ontap_42_ad_admin_user_pw		<s. ontap_12_ad_admin_user_pw>
<b>ONTAP-51 – Local Versioning (Snapshots)</b>		
ontap_51_policy_name		"ontap_51_policy"
ontap_51_vol_name		"ontap_51_vo101"
ontap_51_win_qtree_name		"ontap_51_win_qt01"
ontap_51_lin_qtree_name		"ontap_51_lin_qt01"
ontap_51_snapshot_name		"ontap_51_snapshot"
ontap_51_snap_policy_name		"ontap_51_snap_policy"
linux_51_mount_dir		"<linux_default_mount_dir>/51"
windows_51_mount_dir		"<windows_default_mount_dir>\51"
ontap_51_ad_ro_group		<s. ontap_12_ad_ro_group>
ontap_51_ad_admin_group		<s. ontap_12_ad_admin_group>
ontap_51_ad_admin_user		<s. ontap_12_ad_admin_user>
ontap_51_ad_admin_user_pw		<s. ontap_12_ad_admin_user_pw>
<b>ONTAP-52 – Backup (SnapMirror)</b>		
ontap_52_policy_name		"ontap_52_policy"
ontap_52_vol_name		"ontap_52_vo101"
ontap_52_win_qtree_name		"ontap_52_win_qt01"
ontap_52_lin_qtree_name		"ontap_52_lin_qt01"
ontap_52_snapshot_name		"ontap_52_snapshot"
ontap_52_snapm_sched_label		"ontap_52_snapm_sched"
ontap_52_snapm_adhoc_label		"ontap_52_snapm_adhoc"
ontap_52_snap_policy_name		"ontap_52_snap_policy"
ontap_52_snapm_policy_name		"ontap_52_snapm_policy"
linux_52_mount_dir		"<linux_default_mount_dir>/52"
windows_52_mount_dir		"<windows_default_mount_dir>\52"
ontap_52_ad_ro_group		<s. ontap_12_ad_ro_group>
ontap_52_ad_admin_group		<s. ontap_12_ad_admin_group>

<b>Parameter Name</b>	<b>Description</b>	<b>Value (Lab on Demand)</b>
ontap_52_ad_admin_user		<s. ontap_12_ad_admin_user>
ontap_52_ad_admin_user_pw		<s. ontap_12_ad_admin_user_pw>

# Test Procedures

## ONTAP-01 – Cluster Basic Connection Checks

### ONTAP-01-01 – CLI

#### Description

Connect via SSH to the storage cluster's management interface.

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
ssh admin@<global_primary_test_cluster>
```

#### Execution Example

```
ssh admin@cluster1.demo.netapp.com
Password:

Last login time: 9/6/2023 08:11:30
cluster1::>
```

#### Verification Example

```
n/a
```

## ONTAP-01-02 – GUI

### Description

Connect via HTTP/HTTPS to the cluster's management interface (System Manager).

### Expected Result

<placeholder>

### Additional Information

<placeholder>

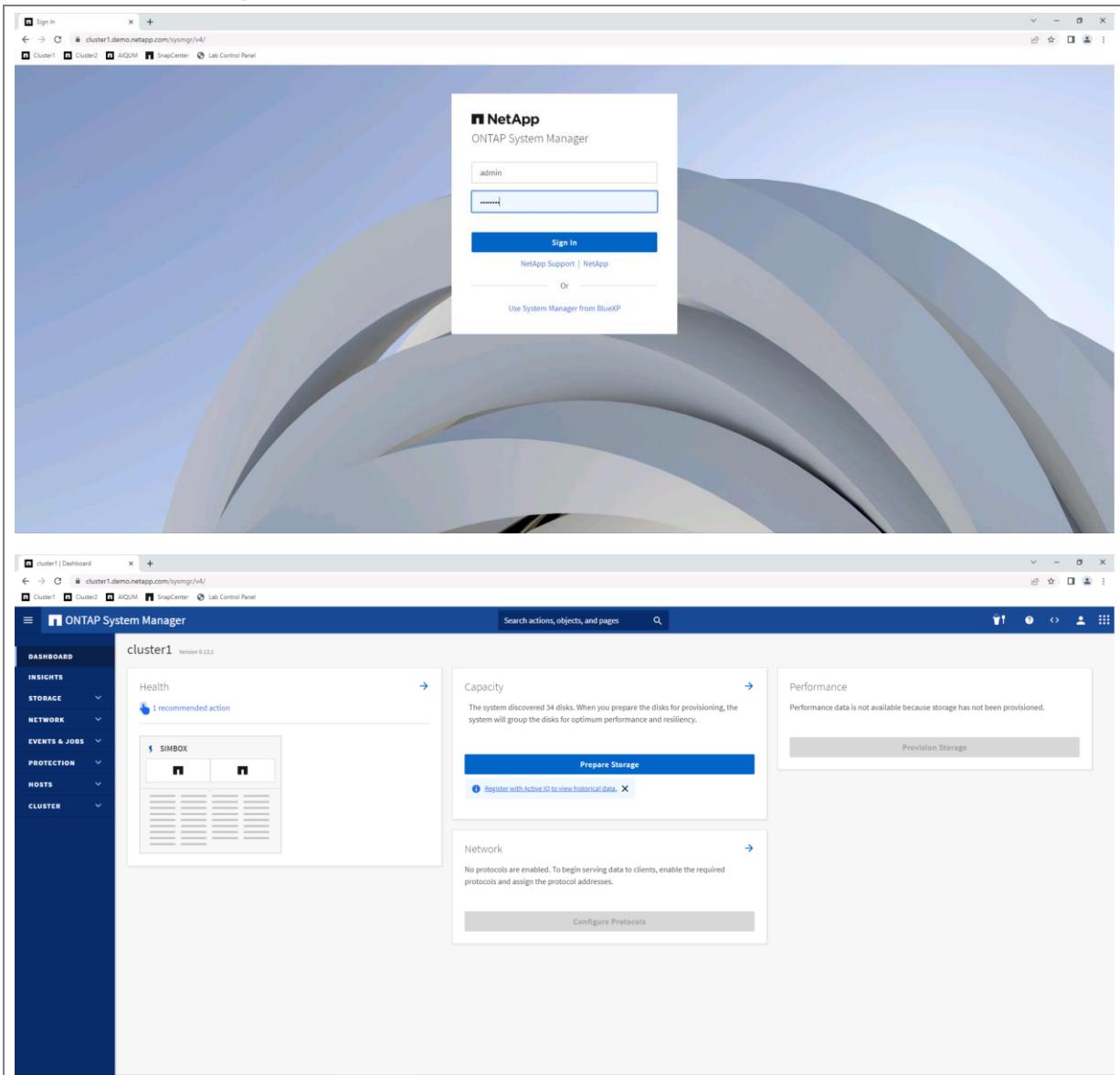
### Instructions

```
https://<global_primary_test_cluster>.<all_default_dns_domain>/sysmgr/v4/
```

### Execution Example

```
https://cluster1.demo.netapp.com/sysmgr/v4/
```

### Verification Example



## ONTAP-10 – Basic Cluster Configuration

### ONTAP-10-01 – Licenses

#### Description

Activate features on storage cluster by adding licenses.

#### Expected Result

<placeholder>

#### Additional Information

Licenses must be installed on all nodes in a cluster for each feature.

#### Instructions

```
system license add -license-code <cluster_licensing_licenses>
License for package "CIFS" and serial number "1-81-00000000000004082368507" in
stalled.
```

#### Execution Example

```
cluster1::> system license add -license-code <hidden_licensekey>
License for package "CIFS" and serial number "1-81-00000000<hidden_id>" in
stalled.
```

#### Verification Example

```
cluster1::> system license status show
Package      Licensed Method  Expiration      Status Details
-----  -----
Base          site           -              -
NFS           enabled        -              -
CIFS          enabled        -              -
iSCSI         enabled        -              -
FCP           enabled        -              -
[...]
[... output truncated ...]
[...]
```

## ONTAP-10-02 – Physical Network

### Description

Configure physical cluster network including broadcast domains, interface groups and default gateway.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
network port broadcast-domain create -broadcast-domain <network_ethernet_broadcast_domains.name> -mtu <network_ethernet_broadcast_domains.mtu> -ipspace <network_ethernet_broadcast_domains.ipspace.name>

network port ifgrp create -node <network_ethernet_ports[item].node.name> -ifgrp <network_ethernet_ports[item].name> -distr-func <network_ethernet_ports[item].lag.distribution_policy> -mode <network_ethernet_ports[item].lag.mode>

network port broadcast-domain remove-ports -broadcast-domain Default -ports <network_ethernet_ports[item].node.name>:<network_ethernet_ports[item].name> -ipspace Default

network port ifgrp add-port -node <network_ethernet_ports[item].node.name> -ifgrp <network_ethernet_ports[item].name> -port <network_ethernet_ports[item].member_ports[item].name>

network port broadcast-domain remove-ports -broadcast-domain Default -ports <network_ethernet_ports[item].node.name>:<network_ethernet_ports[item].name> -ipspace Defaults

network route add -vserver <cluster.name> -destination 0.0.0.0/0 -gateway <all_default_gateway>
```

### Execution Example

```
cluster1::> network port broadcast-domain create -broadcast-domain bc_data -mtu 9000 -ipspace Default

cluster1::> network port ifgrp create -node cluster1-01 -ifgrp a0a -distr-func port -mode singlemode
cluster1::> network port ifgrp create -node cluster1-02 -ifgrp a0a -distr-func port -mode singlemode

cluster1::> network port ifgrp add-port -node cluster1-01 -ifgrp a0a -port e0f
cluster1::> network port ifgrp add-port -node cluster1-01 -ifgrp a0a -port e0g
cluster1::> network port ifgrp add-port -node cluster1-02 -ifgrp a0a -port e0f
cluster1::> network port ifgrp add-port -node cluster1-02 -ifgrp a0a -port e0g

cluster1::> network port broadcast-domain remove-ports -broadcast-domain Default -ports cluster1-01:a0a,cluster1-02:a0a -ipspace Default

cluster1::> network port broadcast-domain add-ports -broadcast-domain bc_data -ports cluster1-01:a0a,cluster1-02:a0a -ipspace Default

cluster1::> network route add -vserver cluster1 -destination 0.0.0.0/0 -gateway 192.168.0.253
```

### Verification Example

IPspace Broadcast				Update
Name	Domain Name	MTU	Port List	Status Details
Cluster	Cluster	9000	cluster1-01:e0a cluster1-01:e0b cluster1-02:e0a	complete complete complete

Default	Default	1500	cluster1-02:e0b	complete
			cluster1-01:e0c	complete
			cluster1-01:e0d	complete
			cluster1-01:e0e	complete
			cluster1-02:e0c	complete
			cluster1-02:e0d	complete
			cluster1-02:e0e	complete
bc_data	9000		cluster1-01:a0a	complete
			cluster1-02:a0a	complete

3 entries were displayed.

**cluster1::>** network port ifgrp show

Node	Port	Distribution Function	MAC Address	Active Ports	Active Ports
<hr/>					
cluster1-01	a0a	port	02:50:56:81:b0:1f	partial	e0f, e0g
cluster1-02	a0a	port	02:50:56:81:c0:18	partial	e0f, e0g

2 entries were displayed.

**cluster1::>** network port show

Node: cluster1-01

Port	IPspace	Broadcast Domain	Link MTU	Speed (Mbps)	Admin/Oper	Health Status
<hr/>						
a0a	Default	bc_data	up 9000	-/-	healthy	
e0a	Cluster	Cluster	up 9000	auto/1000	healthy	
e0b	Cluster	Cluster	up 9000	auto/1000	healthy	
e0c	Default	Default	up 1500	auto/1000	healthy	
e0d	Default	Default	up 1500	auto/1000	healthy	
e0e	Default	Default	up 1500	auto/1000	healthy	
e0f	Default	-	up 9000	auto/1000	healthy	
e0g	Default	-	up 9000	auto/1000	healthy	

Node: cluster1-02

Port	IPspace	Broadcast Domain	Link MTU	Speed (Mbps)	Admin/Oper	Health Status
<hr/>						
a0a	Default	bc_data	up 9000	-/-	healthy	
e0a	Cluster	Cluster	up 9000	auto/1000	healthy	
e0b	Cluster	Cluster	up 9000	auto/1000	healthy	
e0c	Default	Default	up 1500	auto/1000	healthy	
e0d	Default	Default	up 1500	auto/1000	healthy	
e0e	Default	Default	up 1500	auto/1000	healthy	
e0f	Default	-	up 9000	auto/1000	healthy	
e0g	Default	-	up 9000	auto/1000	healthy	

16 entries were displayed.

**cluster1::>** network route show

Vserver	Destination	Gateway	Metric
<hr/>			
cluster1	0.0.0.0/0	192.168.0.1	20

## ONTAP-10-03 – Network Services

### Description

Configure basic network services on cluster (DNS and NTP)

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
vserver services dns create -domains <all_dns_domains> -name-servers <all_dns_nameservers>
cluster time-service ntp server create -server <all_ntp_serveres[item]>
```

### Execution Example

```
cluster1::> vserver services dns create -domains demo.netapp.com -name-servers 192.168.0.253
Warning: Only one DNS server is configured. Configure more than one DNS server to avoid a
single-point-of-failure.

cluster1::> cluster time-service ntp server create -server 0.us.pool.ntp.org
cluster1::> cluster time-service ntp server create -server 1.us.pool.ntp.org
```

### Verification Example

```
cluster1::> vserver services dns show -vserver cluster1
          Vserver: cluster1
          Domains: demo.netapp.com
          Name Servers: 192.168.0.253
          Timeout (secs): 2
          Maximum Attempts: 1

cluster1::> cluster time-service ntp server show
          Is
          Authentication
          Server      Version  Enabled   Key ID
          -----
          0.us.pool.ntp.org    auto    false     -
          1.us.pool.ntp.org    auto    false     -
2 entries were displayed.
```

## ONTAP-10-04 – Storage Aggregates

### Description

Create storage aggregates on storage nodes.

### Expected Result

<placeholder>

### Additional Information

Aggregates are physical storage pools composed of one or multiple RAID groups. Logical volumes will be placed into aggregates in later test steps.

### Instructions

```
storage aggregate create -aggregate <storage_aggregates[item].name> -node
<storage_aggregates[item].node.name> -diskcount
<storage_aggregates[item].block_storage.primary.disk_count> -snaplock-type
<storage_aggregates[item].snaplock_type>
```

### Execution Example

```
cluster1::> storage aggregate create -aggregate cluster1_01_aggr01 -diskcount 13 -snaplock-
type non-snaplock

Info: The layout for aggregate "cluster1_01_aggr01" on node "cluster1-01" would be:

First Plex

RAID Group rg0, 13 disks (block checksum, raid_dp)
Position Disk Type Usable Size Physical Size
----- ----- -----
dparity VMw-1.7 SSD -
parity VMw-1.8 SSD -
data VMw-1.9 SSD 28.42GB 28.44GB
data VMw-1.10 SSD 28.42GB 28.44GB
data VMw-1.11 SSD 28.42GB 28.44GB
data VMw-1.12 SSD 28.42GB 28.44GB
data VMw-1.13 SSD 28.42GB 28.44GB
data VMw-1.14 SSD 28.42GB 28.44GB
data VMw-1.15 SSD 28.42GB 28.44GB
data VMw-1.16 SSD 28.42GB 28.44GB
data VMw-1.17 SSD 28.42GB 28.44GB
data VMw-1.18 SSD 28.42GB 28.44GB
data VMw-1.19 SSD 28.42GB 28.44GB

Aggregate capacity available for volume use would be 281.3GB.

Do you want to continue? {y|n}: y
[Job 210] Job succeeded: DONE

cluster1::> storage aggregate create -aggregate cluster1_02_aggr01 -node cluster1-02 -
diskcount 13 -snaplock-type non-snaplock

[...]
[... output truncated ...]
[...]
[Job 211] Job succeeded: DONE
```

### Verification Example

```
cluster1::> storage aggregate show

Aggregate      Size Available Used% State    #Vols  Nodes          RAID Status
-----      ----- ----- ----- -----   -----  -----          -----
aggr0_cluster1_01        24.30GB    1.17GB  95% online       1 cluster1-01      raid_dp,
                                                               normal
```

aggr0_cluster1_02	24.30GB	1.18GB	95% online	1 cluster1-02	raid_dp, normal
cluster1_01_aggr01	281.3GB	281.3GB	0% online	0 cluster1-01	raid_dp, normal
cluster1_02_aggr01	281.3GB	281.3GB	0% online	0 cluster1-02	raid_dp, normal

4 entries were displayed.

## ONTAP-10-05 – AutoSupport

### Description

Enable and test AutoSupports being sent from cluster nodes.

### Expected Result

<placeholder>

### Additional Information

If executed on simulated ONTAP systems, no messages will be sent out to NetApp.

### Instructions

```
system node autosupport modify -node <cluster_nodes[item].name> -state enable  
system node autosupport invoke -node <cluster_nodes[item].name> -type test -message "Invoked test autosupport as part of standard test plan"
```

### Execution Example

```
cluster1::> system node autosupport modify -node cluster1-0* -state enable  
Notice: AutoSupport configuration will be modified for all nodes in the cluster.  
2 entries were modified.  
  
cluster1::> system node autosupport invoke -node cluster1-0* -type test -message "Invoked test autosupport as part of standard test plan"  
The AutoSupport was successfully invoked on node "cluster1-01" (sequence number: 34).  
The AutoSupport was successfully invoked on node "cluster1-02" (sequence number: 32).  
2 entries were acted on.
```

### Verification Example

```
cluster1::> system node autosupport show  
Node State From To Mail Hosts  
----- ----- ----- -----  
cluster1-01 enable Postmaster - mailhost  
cluster1-02 enable Postmaster - mailhost  
2 entries were displayed.  
  
cluster1::> autosupport history show -node cluster1-0* -seq-num 32,34  
Seq Attempt Percent Last  
Node Num Destination Status Count Complete Update  
----- ----- ----- -----  
cluster1-01 34  
          smtp ignore 1 - 9/5/2023 14:43:50  
          http ignore 1 - 9/5/2023 14:43:50  
          noteto ignore 1 - 9/5/2023 14:43:50  
          32  
          smtp ignore 1 - 9/5/2023 00:32:33  
          http ignore 1 - 9/5/2023 00:32:33  
          noteto ignore 1 - 9/5/2023 00:32:33  
cluster1-02 32  
          smtp ignore 1 - 9/5/2023 14:43:50  
          http ignore 1 - 9/5/2023 14:43:50  
          noteto ignore 1 - 9/5/2023 14:43:50  
9 entries were displayed.
```

## ONTAP-11 – Advanced Cluster Configuration

### ONTAP-11-01 – Cluster/Node Parameters

#### Description

Configure additional parameters including time zone, login banner and message of the day (MOTD).

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
timezone -timezone <all_timezone>

security login banner modify -vserver <cluster.name>
<security_login_messages[item].banner>
<empty line>

security login motd modify -vserver <cluster.name>
<security_login_messages[item].message>
<empty line>
```

#### Execution Example

```
cluster1::> timezone -timezone America/New_York
1 entry modified

cluster1::> security login banner modify -vserver cluster1
Enter the login banner for Vserver "cluster1".
Max size: 2048. Enter a blank line to terminate input. Press Ctrl-C to abort.
0      1      2      3      4      5      6      7      8
1234567890123456789012345678901234567890123456789012345678901234567890
##### TEST BANNER #####
# This system is currently in testing state #
#####

cluster1::> security login motd modify -vserver cluster1
Enter the message of the day for Vserver "cluster1".
Max size: 2048. Enter a blank line to terminate input. Press Ctrl-C to abort.
0      1      2      3      4      5      6      7      8
1234567890123456789012345678901234567890123456789012345678901234567890
Welcome! Please note:
This system is not ready for production yet!
```

#### Verification Example

```
cluster1::> timezone
Timezone: America/New_York

cluster1::> security login banner show
Vserver: cluster1
Message
-----
#####
##### TEST BANNER #####
# This system is currently in testing state #
#####

cluster1::> security login motd show
Vserver: cluster1
Is the Cluster MOTD Displayed?: false
Message
```

-----  
Welcome! Please note:  
This system is not ready for production yet!

## ONTAP-11-02 – Administrative Domain Authentication

### Description

Create proxy SVM for Active Directory domain authentication to the storage cluster.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
vserver create -vserver <ontap_svms[item].name> -data-services data-cifs

network interface create -vserver <network_ip_interfaces[item].svm.name> -lif
<network_ip_interfaces[item].name> -service-policy
<network_ip_interfaces[item].service_policy> -address <network_ip_interfaces[item].ip.address>
-netmask <network_ip_interfaces[item].ip.netmask> -home-node
<network_ip_interfaces[item].location.home_node.name> -home-port
<network_ip_interfaces[item].location.home_port.name> -auto-revert
<network_ip_interfaces[item].location.aut_revert>

network route add -vserver <ontap_svms[item].name> -destination 0.0.0.0/0 -gateway
<all_default_gateway>

vserver services dns create -vserver <ontap_svms[item].name> -domains
<ontap_svms[item].dns.domains> -name-servers <ontap_svms[item].dns.servers>

vserver cifs create -cifs-server <protocols_cifs_services[item].name> -domain <all_ad_domain>
-ou <all_storage_ad_ou_path> -status-admin up -vserver
<protocols_cifs_services[item].svm.name>
Enter the user name: <all_ad_join_user>
Enter the password: <all_ad_join_password>

security login domain-tunnel create -vserver <protocols_cifs_services[item].svm.name>
```

### Execution Example

```
cluster1::> vserver create -vserver cluster1_ad -data-services data-cifs
[Job 224] Job succeeded:
Vserver creation completed.

cluster1::> network interface create -vserver cluster1_ad -lif cluster1_ad -service-policy
default-management -address 192.168.0.110 -netmask 255.255.255.0 -home-node cluster1-01 -home-
port e0c -auto-revert true

cluster1::> network route add -vserver cluster1_ad -destination 0.0.0.0/0 -gateway 192.168.0.1

cluster1::> vserver services dns create -vserver cluster1_ad -domains demo.netapp.com -name-
servers 192.168.0.253

Warning: Only one DNS server is configured. Configure more than one DNS server to avoid a
single-point-of-failure.

cluster1::> vserver cifs create -cifs-server cluster1_ad -domain demo.netapp.com -ou
OU=Storage,DC=DEMO,DC=NETAPP,DC=COM -status-admin up -vserver cluster1_ad

In order to create an Active Directory machine account for the CIFS server, you must supply
the name and password of a Windows
account with sufficient privileges to add computers to the
"OU=Storage,DC=DEMO,DC=NETAPP,DC=COM" container within the
"DEMO.NETAPP.COM" domain.

Enter the user name: Administrator@demo.netapp.com

Enter the password:

Notice: SMB1 protocol version is obsolete and considered insecure. Therefore it is deprecated
and disabled on this CIFS server.
```

```
Support for SMB1 might be removed in a future release. If required, use the (privilege: advanced) "vserver cifs options modify -vserver cluster1_ad -smb1-enabled true" to enable it.
```

```
cluster1::> security login domain-tunnel create -vserver cluster1_ad
```

## Verification Example

```
cluster1::> vserver cifs show -vserver cluster1_ad

          Vserver: cluster1_ad
          CIFS Server NetBIOS Name: CLUSTER1_AD
          NetBIOS Domain/Workgroup Name: DEMO
          Fully Qualified Domain Name: DEMO.NETAPP.COM
          Organizational Unit: OU=Storage,DC=DEMO,DC=NETAPP,DC=COM
Default Site Used by LIFs Without Site Membership:
          Workgroup Name: -
          Authentication Style: domain
          CIFS Server Administrative Status: up
          CIFS Server Description:
          List of NetBIOS Aliases: -

cluster1::> security login domain-tunnel show
Tunnel Vserver: cluster1_ad
```

## ONTAP-11-03 – Key Manager

### Description

Configure key manager for data at rest encryption and enable encryption on all aggregates.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
security key-manager onboard enable
Enter the cluster-wide passphrase for the Onboard Key Manager:
<security_key_managers.onboard.passphrase>
Re-enter the cluster-wide passphrase: <security_key_managers.onboard.passphrase>

storage aggregate modify -aggregate <storage_aggregates[item].name> -encrypt-with-aggr-key
true
```

### Execution Example

```
cluster1::> security key-manager onboard enable

Enter the cluster-wide passphrase for the Onboard Key Manager:

Re-enter the cluster-wide passphrase:

After setting up the Onboard Key Manager, save the encrypted backup data, displayed below,
along with the cluster passphrase in a safe location so that you can use it if you need to
perform a manual recovery operation. To view the encrypted backup data again, use the
"security key-manager onboard show-backup" command.

-----BEGIN BACKUP-----
TmV0QXBwIEtleSBCbG9iAAEAAAAcAEAAAAAAA8Y6eOAAAAACEAAAAAAA
[.....]
[... output truncated ...]
[.....]
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
-----END BACKUP-----

cluster1::> storage aggregate modify -aggregate cluster1_0* -encrypt-with-aggr-key true
2 entries were modified.
```

### Verification Example

```
cluster1::> security key-manager show-key-store

Vserver          Key Store Key Store Type
-----  -----
cluster1        onboard    OKM

cluster1::> storage aggregate show -fields encrypt-with-aggr-key
aggregate      encrypt-with-aggr-key
-----
aggr0_cluster1_01 false
aggr0_cluster1_02 false
cluster1_01_aggr01
true
cluster1_02_aggr01
true
4 entries were displayed.
```

## ONTAP-11-04 – Event Notification

### Description

Configure events to be sent to a webhook server.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
event notification destination create -name <support.ems.destinations[0].name> -rest-api-url  
<support.ems.destinations[0].destination>  
  
event notification create -filter-name <support.ems.destinations[0].filters> -destinations  
<support.ems.destinations[0].name>
```

### Execution Example

```
cluster1::> event notification destination create -name restapi-ems -rest-api-url  
http://192.168.0.61:5000/ontap\_webhook  
  
cluster1::> event notification create -filter-name no-info-debug-events -destinations restapi-  
ems
```

### Verification Example

```
cluster1::> event notification destination show  
Name          Type      Destination  
-----  
restapi-ems   rest-api   http://192.168.0.61:5000/ontap\_webhook  
snmp-traphost snmp      - (from "system snmp traphost")  
2 entries were displayed.  
  
cluster1::> event notification show  
ID  Filter Name           Destinations  
----  
1   default-trap-events  snmp-traphost  
2   no-info-debug-events  restapi-ems  
2 entries were displayed.
```

## ONTAP-12 – Cluster User Management

### ONTAP-12-01 – Read-only Local User

#### Description

Create a local user with read-only privileges.

#### Expected Result

<placeholder>

#### Additional Information

User access in ONTAP is configured based on access type (“application”). In order to allow user access via different protocols or methods, it has to be configured explicitly for each of the corresponding “applications”. A password for a local user is set with the first application it is configured for.

#### Instructions

```
security login create -vserver <cluster.name> -user-or-group-name
<security_accounts[item].name> -application
<security_accounts[item].applications[item].application> -authentication-method
<security_accounts[item].applications[item].authentication_methods> -role
<security_accounts[item].role.name>

Please enter a password for user '<security_accounts[item].name>':
<vault_security_accounts[item].password>
Please enter it again: <vault_security_accounts[item].password>
```

#### Execution Example

```
cluster1::> security login create -vserver cluster1 -user-or-group-name na_local_ro -
application ssh -authentication-method password -role readonly

Please enter a password for user 'na_local_ro':
Please enter it again:

cluster1::> security login create -vserver cluster1 -user-or-group-name na_local_ro -
application ontapi -authentication-method password -role readonly

cluster1::> security login create -vserver cluster1 -user-or-group-name na_local_ro -
application http -authentication-method password -role readonly
```

#### Verification Example

```
cluster1::> security login show -vserver cluster1
Vserver: cluster1

User/Group          Authentication                         Second
Name    Application Method   Role Name   Acct Locked Authentication Method
-----  -----  -----  -----  -----  -----
admin      amqp     password   admin      no    none
admin      console  password   admin      no    none
admin      http     cert      admin      -     none
admin      http     password  admin      no    none
admin      ontapi   cert      admin      -     none
admin      ontapi   password  admin      no    none
admin      service-processor
                           password   admin      no    none
admin      ssh      password  admin      no    none
autosupport  console  password  autosupport  no    none
na_local_ro  http     password  readonly  no    none
na_local_ro  ontapi   password  readonly  no    none
na_local_ro  ssh      password  readonly  no    none

12 entries were displayed.
```

## ONTAP-12-02 – Administrative Local User

### Description

Create a local user with admin privileges.

### Expected Result

<placeholder>

### Additional Information

User access in ONTAP is configured based on access type (“application”). In order to allow user access via different protocols or methods, it has to be configured explicitly for each of the corresponding “applications”. A password for a local user is set with the first application it is configured for.

### Instructions

```
security login create -vserver <cluster.name> -user-or-group-name
<security_accounts[item].name> -application
<security_accounts[item].applications[item].application> -authentication-method
<security_accounts[item].applications[item].authentication_methods> -role
<security_accounts[item].role.name>

Please enter a password for user '<security_accounts[item].name>':
<vault_security_accounts[item].password>
Please enter it again: <vault_security_accounts[item].password>
```

### Execution Example

```
cluster1::> security login create -vserver cluster1 -user-or-group-name na_local_admin -
application ssh -authentication-method password -role admin

Please enter a password for user 'na_local_admin':
Please enter it again:

cluster1::> security login create -vserver cluster1 -user-or-group-name na_local_admin -
application ontapi -authentication-method password -role admin

cluster1::> security login create -vserver cluster1 -user-or-group-name na_local_admin -
application http -authentication-method password -role admin
```

### Verification Example

```
cluster1::> security login show -vserver cluster1
Vserver: cluster1

User/Group          Authentication           Second
Name    Application Method   Role Name   Acct Locked Authentication Method
-----  -----
admin      amqp      password   admin      no    none
admin      console   password   admin      no    none
admin      http      cert      admin      -     none
admin      http      password  admin      no    none
admin      ontapi   cert      admin      -     none
admin      ontapi   password  admin      no    none
admin      service-processor
                        password   admin      no    none
admin      ssh       password  admin      no    none
autosupport  console   password  autosupport  no    none
na_local_admin  http      password  admin      no    none
na_local_admin  ontapi   password  admin      no    none
na_local_admin  ssh       password  admin      no    none
na_local_ro    http      password  readonly  no    none
na_local_ro    ontapi   password  readonly  no    none
na_local_ro    ssh       password  readonly  no    none
15 entries were displayed.
```

## ONTAP-12-03 – Local User Access

### Description

Verify local users access and privileges.

### Expected Result

Attempting creation of an SVM with both previously created local users.

- Expected result with read-only user: Failure – Insufficient privileges
- Expected result with admin user: Success

### Additional Information

<placeholder>

### Instructions

```
vserver create -vserver <ontap_12_test_svm01>
vserver delete -vserver <ontap_12_test_svm01>
```

### Execution Example

```
# login with read-only user
cluster1::> security login whoami

User: na_local_rd
Role: readonly

cluster1::> vserver create -vserver svm_ontap_12_01
Error: "create" is not a recognized command

# login with admin user
cluster1::> security login whoami

User: na_local_admin
Role: admin

cluster1::> vserver create -vserver svm_ontap_12_01
[Job 231] Job succeeded:
Vserver creation completed.

cluster1::> vserver delete -vserver svm_ontap_12_01
[Job 233]
```

### Verification Example

```
<n/a>
```

## ONTAP-12-04 – Read-only Domain Group

### Description

Grant read-only privileges to a domain group.

### Expected Result

<placeholder>

### Additional Information

User access in ONTAP is configured based on access type (“application”). In order to allow user access via different protocols or methods, it has to be configured explicitly for each of the corresponding “applications”.

### Instructions

```
security login create -vserver <cluster.name> -user-or-group-name
<security_accounts[item].name> -application
<security_accounts[item].applications[item].application> -authentication-method
<security_accounts[item].applications[item].authentication_methods> -role
<security_accounts[item].role.name>
```

### Execution Example

```
cluster1::> security login create -vserver cluster1 -user-or-group-name DEMO\na_ad_ro_group -
application ssh -authentication-method domain -role readonly
cluster1::> security login create -vserver cluster1 -user-or-group-name DEMO\na_ad_ro_group -
application ontapi -authentication-method domain -role readonly
cluster1::> security login create -vserver cluster1 -user-or-group-name DEMO\na_ad_ro_group -
application http -authentication-method domain -role readonly
```

### Verification Example

```
cluster1::> security login show -vserver cluster1

Vserver: cluster1

User/Group          Authentication           Second
Name      Application Method   Role Name   Acct  Authentication
-----  -----  -----  -----  -----
DEMO\na_ad_ro_group        http    domain    readonly   -    none
DEMO\na_ad_ro_group        ontapi   domain    readonly   -    none
DEMO\na_ad_ro_group        ssh     domain    readonly   -    none
admin       amqp      password   admin      no    none
[...]
[... output truncated ...]
[...]
18 entries were displayed.
```

## ONTAP-12-05 – Administrative Domain Group

### Description

Grant admin privileges to a domain group.

### Expected Result

<placeholder>

### Additional Information

User access in ONTAP is configured based on access type (“application”). In order to allow user access via different protocols or methods, it has to be configured explicitly for each of the corresponding “applications”.

### Instructions

```
security login create -vserver <cluster.name> -user-or-group-name  
<security_accounts[item].name> -application  
<security_accounts[item].applications[item].application> -authentication-method  
<security_accounts[item].applications[item].authentication_methods> -role  
<security_accounts[item].role.name>
```

### Execution Example

```
cluster1::> security login create -vserver cluster1 -user-or-group-name DEMO\na_ad_admin_group  
-application ssh -authentication-method domain -role admin  
cluster1::> security login create -vserver cluster1 -user-or-group-name DEMO\na_ad_admin_group  
-application ontapi -authentication-method domain -role admin  
cluster1::> security login create -vserver cluster1 -user-or-group-name DEMO\na_ad_admin_group  
-application http -authentication-method domain -role admin
```

### Verification Example

```
cluster1::> security login show  
  
Vserver: cluster1  


| User/Group Name            | Application                | Authentication Method | Role Name | Acct Locked | Second Authentication Method |
|----------------------------|----------------------------|-----------------------|-----------|-------------|------------------------------|
| DEMO\na_ad_admin_group     | http                       | domain                | admin     | -           | none                         |
| DEMO\na_ad_admin_group     | ontapi                     | domain                | admin     | -           | none                         |
| DEMO\na_ad_admin_group     | ssh                        | domain                | admin     | -           | none                         |
| DEMO\na_ad_ro_group        | http                       | domain                | readonly  | -           | none                         |
| DEMO\na_ad_ro_group        | ontapi                     | domain                | readonly  | -           | none                         |
| DEMO\na_ad_ro_group        | ssh                        | domain                | readonly  | -           | none                         |
| [.....]                    | [... output truncated ...] | [.....]               |           |             |                              |
| 21 entries were displayed. |                            |                       |           |             |                              |


```

## ONTAP-12-06 – Domain User Access

### Description

Verify domain users' access and privileges.

### Expected Result

Attempting creation of an SVM with users of both previously referenced domain groups.

- Expected result with read-only group user: Failure – Insufficient privileges
- Expected result with admin group user: Success

### Additional Information

<placeholder>

### Instructions

```
vserver create -vserver <ontap_12_test_svm02>
vserver delete -vserver <ontap_12_test_svm02>
```

### Execution Example

```
# login with read-only user
cluster1::> security login whoami

User: DEMO\na_ad_ro_user
Role: readonly

cluster1::> vserver create -vserver svm_ontap_12_02
Error: "create" is not a recognized command

# login with admin user
cluster1::> security login whoami

User: DEMO\na_ad_admin_user
Role: admin

cluster1::> vserver create -vserver svm_ontap_12_02
[Job 250] Job succeeded:
Vserver creation completed.

cluster1::> vserver delete -vserver svm_ontap_12_02
[Job 251]
```

### Verification Example

<n/a>

## **ONTAP-12-10 – Admin Multifactor Authentication (MFA)**

### **Description**

Enable multifactor authentication for SSH access with built-in admin account.

### **Expected Result**

<placeholder>

### **Additional Information**

<placeholder>

### **Instructions**

### **Execution Example**

### **Verification Example**

## ONTAP-20 – Basic SVM Setup

### ONTAP-20-01 - Storage Virtual Machines (SVMs)

#### Description

Create SVMs to serve data to clients and hosts.

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
vserver create -vserver <svm_svms[item].name> -auto-enable-analytics  
<svm_svms[item].auto_enable_activity_tracking> -auto-enable-activity-tracking  
<svm_svms[item].auto_enable_activity_tracking>

vserver add-protocols -vserver <svm_svms[item].name> -protocols <svm_svms[item]>  
[service_name].allowed=true>

vserver remove-protocols -vserver <svm_svms[item].name> -protocols <svm_svms[item]>  
[service_name].allowed=false>

vserver iscsi create -vserver <svm_svms[item].name>

vserver nvme create -vserver <svm_svms[item].name>
```

#### Execution Example

```
### NAS Example
cluster1::> vserver create -vserver ntap-svm01-nas -auto-enable-analytics true -auto-enable-
activity-tracking true
[Job 278] Job succeeded:
Vserver creation completed.
cluster1::> vserver add-protocols -vserver ntap-svm01-nas -protocols nfs,cifs,s3
cluster1::> vserver remove-protocols -vserver ntap-svm01-nas -protocols fcp,iscsi,nvme,ndmp

### SAN Example
cluster1::> vserver create -vserver ntap-svm02-san -auto-enable-analytics true -auto-enable-
activity-tracking true
[Job 139] Job succeeded:
Vserver creation completed.

cluster1::> vserver add-protocols -vserver ntap-svm02-san -protocols cifs,iscsi,nvme
cluster1::> vserver remove-protocols -vserver ntap-svm02-san -protocols nfs,fcp,s3,ndmp

cluster1::> vserver iscsi create -vserver ntap-svm02-san
cluster1::> vserver nvme create -vserver ntap-svm02-san
```

#### Verification Example

```
cluster1::> vserver show -fields allowed-protocols,disallowed-protocols
vserver allowed-protocols disallowed-protocols
-----
cluster1 - -
cluster1-01 - -
cluster1-02 - -
cluster1_ad
    cifs,s3      nfs,fcp,iscsi,ndmp,nvme
ntap-svm01-nas
    nfs,cifs,s3      fcp,iscsi,ndmp,nvme
ntap-svm02-san
    iscsi,nvme      nfs,cifs,fcp,ndmp,s3
6 entries were displayed.
```



## ONTAP-20-02 - SVM Logical Network

### Description

Create logical interfaces (LIFs) and default gateway to allow network access to SVMs.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
network interface create -vserver <network_ip_interfaces[item].svm.name> -lif
<network_ip_interfaces[item].name> -service-policy
<network_ip_interfaces[item].service_policy.name> -address
<network_ip_interfaces[item].ip.address> -netmask <network_ip_interfaces[item].ip.netmask> -
-home-node <network_ip_interfaces[item].location.home_node.name> -home-port
<network_ip_interfaces[item].location.home_port.name>

route add -vserver <network_ip_interfaces[item].svm.name> -destination 0.0.0.0/0 -gateway
<all_default_gateway>
```

### Execution Example

```
cluster1::> network interface create -vserver ntap-svm01-nas -lif ntap-svm01-nas -service-
policy default-data-files -address 192.168.0.211 -netmask 255.255.255.0 -home-node cluster1-01
-home-port e0c

cluster1::> route add -vserver ntap-svm01-nas -destination 0.0.0.0/0 -gateway 192.168.0.1
```

### Verification Example

```
cluster1::> network interface show -vserver ntap-svm01-nas
Logical      Status       Network          Current      Current Is
Vserver      Interface   Admin/Oper Address/Mask    Node        Port     Home
-----  -----
ntap-svm01-nas
          ntap-svm01-nas
                  up/up    192.168.0.211/24  cluster1-01  e0c    true

cluster1::> route show -vserver ntap-svm01-nas
Vserver      Destination   Gateway       Metric
-----  -----
ntap-svm01-nas  0.0.0.0/0    192.168.0.1      20
```

## ONTAP-20-03 - SVM Network Services

### Description

Configure DNS on SVMs.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
vserver services dns create -vserver <svm_svms[item].name> -domains  
<svm_svms[item].dns.domains> -name-servers <svm_svms[item].dns.servers>
```

### Execution Example

```
cluster1::> vserver services dns create -vserver ntap-svm01-nas -domains demo.netapp.com -  
name-servers 192.168.0.253
```

Warning: Only one DNS server is configured. Configure more than one DNS server  
to avoid a single-point-of-failure.

### Verification Example

```
cluster1::> vserver services dns show -vserver ntap-svm01-nas  
  
          Vserver: ntap-svm01-nas  
          Domains: demo.netapp.com  
          Name Servers: 192.168.0.253  
          Timeout (secs): 2  
          Maximum Attempts: 1
```

## ONTAP-20-04 – SVM Data Protocol Setup

### Description

Setup data protocols on SVMs (CIFS, NFS, iSCSI...).

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
vserver nfs create -vserver <protocols_nfs_services[item].svm.name> -v3  
<protocols_nfs_services[item].protocol.v3_enabled> -v4.0  
<protocols_nfs_services[item].protocol.v40_enabled> -v4.1  
<protocols_nfs_services[item].protocol.v41_enabled> -showmount  
<protocols_nfs_services[item].showmount_enabled>  
  
set advanced -confirmations off  
vserver nfs modify -vserver ntap-svm01-nas -v3-64bit-identifiers  
<protocols_nfs_services[item].protocol.v3_64bit_identifiers_enabled> -v4-64bit-identifiers  
<protocols_nfs_services[item].protocol.v4_64bit_identifiers_enabled>  
  
vserver export-policy create -vserver <global_primary_nas_svm> -policyname  
ro_<global_primary_nas_svm>  
  
vserver export-policy rule create -vserver <global_primary_nas_svm>  
ro_<global_primary_nas_svm> -protocol nfs -clientmatch <hosts[linux]> -rorule any -rwrule none  
-superuser none -allow-suid false  
  
volume modify -vserver <global_primary_nas_svm> -volume <global_primary_nas_svm>_root -policy  
ro_<global_primary_nas_svm>  
  
vserver cifs domain preferred-dc add -vserver <protocols_active_directory[item].key> -domain  
<protocols_active_directory[key][item].preferred-domain-controllers[item].fqdn> -preferred-dc  
<protocols_active_directory[key][item].preferred-domain-controllers[item].ip>  
  
vserver cifs create -vserver <protocols_cifs_services[item].svm.name> -cifs-server  
<protocols_cifs_services[item].name> -domain <protocols_cifs_services[item].ad_domain.fqdn> -  
ou <protocols_cifs_services[item].ad_domain.organizational_unit> -comment  
<protocols_cifs_services[item].comment>  
Enter the user name: <all_ad_join_user>  
Enter the password: <all_ad_join_password>
```

### Execution Example

```
cluster1::> vserver nfs create -vserver ntap-svm01-nas -v3 enabled -v4.0 enabled -v4.1  
disabled -showmount enabled  
  
cluster1::> set advanced -confirmations off  
cluster1::*> vserver nfs modify -vserver ntap-svm01-nas -v3-64bit-identifiers enabled -v4-  
64bit-identifiers enabled  
cluster1::*> set admin  
  
cluster1::> vserver export-policy create -vserver ntap-svm01-nas -policyname ro_ntap-svm01-nas  
cluster1::> vserver export-policy rule create -vserver ntap-svm01-nas -policyname ro_ntap-  
svm01-nas -protocol nfs -clientmatch centos1.demo.netapp.com -rorule any -rwrule none -  
superuser none -allow-suid false  
cluster1::> volume modify -vserver ntap-svm01-nas -volume ntap_svm01_nas_root -policy ro_ntap-  
svm01-nas  
Volume modify successful on volume ntap_svm01_nas_root of Vserver ntap-svm01-nas.  
  
cluster1::> vserver cifs domain preferred-dc add -vserver ntap-svm01-nas -domain  
demo.netapp.com -preferred-dc 192.168.0.253  
  
cluster1::> vserver cifs create -vserver ntap-svm01-nas -cifs-server svm01-nas -domain  
demo.netapp.com -ou OU=Storage,DC=DEMO,DC=NETAPP,DC=COM -comment "This CIFS Server is created  
for the primary NAS SVM"
```

In order to create an Active Directory machine account for the CIFS server, you must supply the name and password of a Windows account with sufficient privileges to add computers to the "OU=Storage,DC=DEMO,DC=NETAPP,DC=COM" container within the "DEMO.NETAPP.COM" domain.

Enter the user name: Administrator@demo.netapp.com

Enter the password:

Notice: SMB1 protocol version is obsolete and considered insecure. Therefore it is deprecated and disabled on this CIFS server.

Support for SMB1 might be removed in a future release. If required, use the (privilege: advanced) "vserver cifs options modify -vserver ntap-svm01-nas -smb1-enabled true" to enable it.

## Verification Example

```
cluster1::> set advanced -confirmations off

cluster1::*> vserver nfs show -vserver ntap-svm01-nas -fields v3,v4.0,v4.1,v3-64bit-identifiers,v4-64bit-identifiers,showmount
vserver      v3      v4.0      v4.1      showmount v3-64bit-identifiers v4-64bit-identifiers
----- -----
ntap-svm01-nas enabled enabled disabled enabled           enabled

cluster1::> vserver export-policy rule show
          Policy      Rule      Access      Client          RO
Vserver    Name      Index      Protocol Match      Rule
----- -----
ntap-svm01-nas
      ro_ntap-svm01-nas
          1          nfs      centos1.demo.netapp. any
                           com

cluster1::*> set admin

cluster1::*> vserver cifs domain preferred-dc show -vserver ntap-svm01-nas
Vserver      Domain Name          Preferred Domain Controllers
----- -----
ntap-svm01-nas demo.netapp.com      192.168.0.253

cluster1::*> vserver cifs show
          Server      Status      Domain/Workgroup Authentication
Vserver    Name      Admin      Name      Style
----- -----
cluster1_ad CLUSTER1_AD      up        DEMO      domain
      Comment: This CIFS Server is for cluster AD authentication
ntap-svm01-nas
      SVM01-NAS      up        DEMO      domain
      Comment: This CIFS Server is created for the primary NAS SVM
2 entries were displayed.
```

## ONTAP-31 – NFS

### ONTAP-31-01 – Export Policies & Rules

#### Description

Create export policies & rules to control host access to provisioned storage resources.

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
# on the primary storage system
vserver export-policy create -vserver <global_primary_nas_svm> -policyname
<ontap_31_policy_name>

vserver export-policy rule create -vserver <global_primary_nas_svm> -policyname
<ontap_31_policy_name> -protocol nfs -clientmatch <hosts[linux]> -rorule any -rwrule any -
superuser any -allow-suid true
```

#### Execution Example

```
# on the primary storage system
cluster1::> vserver export-policy create -vserver ntap-svm01-nas -policyname ontap_31_policy
cluster1::> vserver export-policy rule create -vserver ntap-svm01-nas -policyname
ontap_31_policy -protocol nfs -clientmatch centos1.demo.netapp.com -rorule any -rwrule any -
superuser any -allow-suid true
```

#### Verification Example

```
# on the primary storage system
cluster1::> vserver export-policy rule show -vserver ntap-svm01-nas
      Policy      Rule   Access   Client          RO
Vserver    Name       Index   Protocol Match      Rule
-----
ntap-svm01-nas
      ontap_31_policy 1      nfs     centos1.demo.netapp. any
                           com
ntap-svm01-nas
      ro_ntap-svm01-nas
                           1      nfs     centos1.demo.netapp. any
                           com
2 entries were displayed.

cluster1::> volume show -vserver ntap-svm01-nas -fields policy
vserver      volume      policy
-----
ntap-svm01-nas ntap_svm01_nas_root ro_ntap-svm01-nas
```

## ONTAP-31-02 – Volumes & Qtrees

### Description

Create volumes and qtrees for storing host/client data.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
volume create -volume <ontap_31_vol_name> -vserver <global_primary_nas_svm> -size
<ontap_default_vol_size_gb>GB -aggregate <storage_aggregates[item].name> -junction-path
/<ontap_31_vol_name> -policy ro_<global_primary_nas_svm> -security-style unix

volume qtree create -vserver <global_primary_nas_svm> -volume <ontap_31_vol_name> -qtree
<ontap_31_vol_qtree_name[item]> -security-style unix -export-policy <ontap_31_policy_name>
```

### Execution Example

```
# on the primary storage system
cluster1::> volume create -volume ontap_31_nfs_vol01 -vserver ntap-svm01-nas -size 10GB -
aggregate cluster1_01_aggr01 -junction-path /ontap_31_nfs_vol01 -policy ro_ntap-svm01-nas -
security-style unix
[Job 332] Job succeeded: Successful

cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_31_nfs_vol01 -qtree
ontap_31_vol_qt01 -security-style unix -export-policy ontap_31_policy
Info: the newly configured qtree export policies may not be enforced on existing NFS mount
points.
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_31_nfs_vol01 -qtree
ontap_31_vol_qt02 -security-style unix -export-policy ontap_31_policy -unix-permissions 0777
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_31_nfs_vol01 -qtree
ontap_31_vol_qt03 -security-style unix -export-policy ontap_31_policy -unix-permissions 0777
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_31_nfs_vol01 -qtree
ontap_31_vol_qt04 -security-style unix -export-policy ontap_31_policy -unix-permissions 0777
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_31_nfs_vol01 -qtree
ontap_31_vol_qt05 -security-style unix -export-policy ontap_31_policy -unix-permissions 0777
```

### Verification Example

```
# on the primary storage system
cluster1::> volume show -vserver ntap-svm01-nas
Vserver      Volume      Aggregate      State      Type      Size      Available Used%
-----      -----      -----      -----      -----      -----      -----      -----
ntap-svm01-nas
          ntap_svm01_nas_root
                      cluster1_02_aggr01
                                      online      RW      20MB      18.58MB      2%
ntap-svm01-nas
          ontap_31_nfs_vol01
                      cluster1_01_aggr01
                                      online      RW      10GB      9.50GB      0%

cluster1::> volume qtree show -vserver ntap-svm01-nas
Vserver      Volume      Qtree      Style      sssOlocks      Status
-----      -----      -----      -----      -----      -----
ntap-svm01-nas
          ntap_svm01_nas_root
                      ""
                                      unix      enable      normal
ntap-svm01-nas
          ontap_31_nfs_vol01
                      ""
                                      unix      enable      normal
ntap-svm01-nas
          ontap_31_nfs_vol01
                      ontap_31_vol_qt01
```

```
        unix [REDACTED] enable    normal
ntap-svm01-nas
    ontap_31_nfs_vo101
        ontap_31_vol_gt02
            unix [REDACTED] enable    normal
ntap-svm01-nas
    ontap_31_nfs_vo101
        ontap_31_vol_gt03
            unix [REDACTED] enable    normal
ntap-svm01-nas
    ontap_31_nfs_vo101
        ontap_31_vol_gt04
            unix [REDACTED] enable    normal
ntap-svm01-nas
    ontap_31_nfs_vo101
        ontap_31_vol_gt05
            unix [REDACTED] enable    normal
7 entries were displayed.
```

## ONTAP-31-03 – Mount & Write (Volumes)

### Description

Access provisioned resources from a UNIX host via NFS.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the Linux test host(s)
mkdir -p <linux_31_mount_dir>/<ontap_31_vol_qtree_names[item]>

mount -t nfs <global_primary_nas_svm>:<ontap_31_vol_name>/<ontap_31_vol_qtree_names[item]>
/mnt/ontap_test/<ontap_31_vol_qtree_names[item]>

dd if=/dev/urandom of=/mnt/ontap_test/<ontap_31_vol_qtree_names[item]>/
<ontap_31_vol_qtree_names[item]>_testfile bs=1024KB count=50
```

### Execution Example

```
# on the Linux test host(s)
[root@centos1 ~]# mkdir -p /mnt/ontap_test/31/ontap_31_vol_qt0{1..5}

[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_vo101/ontap_31_vol_qt01 /mnt/ontap_test/31/ontap_31_vol_qt01
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_vo101/ontap_31_vol_qt02 /mnt/ontap_test/31/ontap_31_vol_qt02
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_vo101/ontap_31_vol_qt03 /mnt/ontap_test/31/ontap_31_vol_qt03
[root@centos1 ~]# mount -t nfs ntap-ssvm01-
nas.demo.netapp.com:/ontap_31_nfs_vo101/ontap_31_vol_qt04 /mnt/ontap_test/31/ontap_31_vol_qt04
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_vo101/ontap_31_vol_qt05 /mnt/ontap_test/31/ontap_31_vol_qt05

[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/31/ontap_31_vol_qt01/ontap_31_vol_qt01_testfile bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.844488 s, 60.6 MB/s
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/31/ontap_31_vol_qt02/ontap_31_vol_qt02_testfile bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.997076 s, 51.4 MB/s
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/31/ontap_31_vol_qt03/ontap_31_vol_qt03_testfile bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.864504 s, 59.2 MB/s
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/31/ontap_31_vol_qt04/ontap_31_vol_qt04_testfile bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.732951 s, 69.9 MB/s
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/31/ontap_31_vol_qt05/ontap_31_vol_qt05_testfile bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.904567 s, 56.6 MB/s
```

### Verification Example

```
# on the Linux test host(s)
[root@centos1 ~]# mount | grep ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_vo101/
```

```

ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_vo101/ontap_31_vol_qt01 on
/mnt/ontap_test/31/ontap_31_vol_qt01 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_vo101/ontap_31_vol_qt02 on
/mnt/ontap_test/31/ontap_31_vol_qt02 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_vo101/ontap_31_vol_qt03 on
/mnt/ontap_test/31/ontap_31_vol_qt03 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_vo101/ontap_31_vol_qt04 on
/mnt/ontap_test/31/ontap_31_vol_qt04 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_vo101/ontap_31_vol_qt05 on
/mnt/ontap_test/31/ontap_31_vol_qt05 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)

[root@centos1 ~]# [root@centos1 ~]# ls -lar /mnt/ontap_test/31/ontap_31_vol_qt0*
/mnt/ontap_test/31/ontap_31_vol_qt05:
total 50208
-rw-r--r-- 1 nobody nobody 51200000 Sep  7 16:30 ontap_31_vol_qt05_testfile
drwxr-xr-x. 12 root    root      251 Sep  7 16:18 ..
drwxr-xr-x  2 nobody nobody   4096 Sep  7 16:30 .

/mnt/ontap_test/31/ontap_31_vol_qt04:
total 50208
-rw-r--r-- 1 nobody nobody 51200000 Sep  7 16:30 ontap_31_vol_qt04_testfile
drwxr-xr-x. 12 root    root      251 Sep  7 16:18 ..
drwxr-xr-x  2 nobody nobody   4096 Sep  7 16:30 .

/mnt/ontap_test/31/ontap_31_vol_qt03:
total 50208
-rw-r--r-- 1 nobody nobody 51200000 Sep  7 16:30 ontap_31_vol_qt03_testfile
drwxr-xr-x. 12 root    root      251 Sep  7 16:18 ..
drwxr-xr-x  2 nobody nobody   4096 Sep  7 16:30 .

/mnt/ontap_test/31/ontap_31_vol_qt02:
total 50208
-rw-r--r-- 1 nobody nobody 51200000 Sep  7 16:30 ontap_31_vol_qt02_testfile
drwxr-xr-x. 12 root    root      251 Sep  7 16:18 ..
drwxr-xr-x  2 nobody nobody   4096 Sep  7 16:30 .

/mnt/ontap_test/31/ontap_31_vol_qt01:
total 50208
-rw-r--r-- 1 nobody nobody 51200000 Sep  7 16:30 ontap_31_vol_qt01_testfile
drwxr-xr-x. 12 root    root      251 Sep  7 16:18 ..
drwxr-xr-x  2 nobody nobody   4096 Sep  7 16:30 .

```

## ONTAP-31-04 – FlexGroups & Qtrees

### Description

Create FlexGroups (large scale volumes) and qtrees.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
volume create -vserver <global_primary_nas_svm> -volume <ontap_31_fg_name> -size
<ontap_default_fg_size_gb>GB -junction-path /<ontap_31_fg_name> -aggr-list
<storage_aggregates[items].name> -aggr-list-multiplier <ontap_default_fg_multiplier> -policy
<ontap_31_policy_name> -security-style unix

volume qtree create -vserver <global_primary_nas_svm> -volume <ontap_31_fg_name> -qtree
<ontap_31_fg_qtree_name[item]> -security-style unix -export-policy <ontap_31_policy_name>
```

### Execution Example

```
# on the primary storage system
cluster1::> volume create -vserver ntap-svm01-nas -volume ontap_31_nfs_fg01 -size 102400GB -
aggr-list cluster1_01_aggr01,cluster1_02_aggr01 -aggr-list-multiplier 16 -junction-path /
ontap_31_nfs_fg01 -security-style unix
[Job 129] Job succeeded: Successful

cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_31_nfs_fg01 -qtree
ontap_31_fg_qt01 -security-style unix -export-policy ontap_31_policy
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_31_nfs_fg01 -qtree
ontap_31_fg_qt02 -security-style unix -export-policy ontap_31_policy
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_31_nfs_fg01 -qtree
ontap_31_fg_qt03 -security-style unix -export-policy ontap_31_policy
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_31_nfs_fg01 -qtree
ontap_31_fg_qt04 -security-style unix -export-policy ontap_31_policy
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_31_nfs_fg01 -qtree
ontap_31_fg_qt05 -security-style unix -export-policy ontap_31_policy
```

### Verification Example

```
# on the primary storage system
cluster1::> volume show -vserver ntap-svm01-nas
Vserver      Volume      Aggregate      State      Type      Size      Available      Used%
-----      -----
ntap-svm01-nas
          ntap_svm01_nas_root
                      cluster1_02_aggr01
                                      online      RW      20MB      18.58MB      2%
ntap-svm01-nas
          ontap_31_nfs_fg01
                      -
                                      online      RW      100TB      554.1GB      0%
ntap-svm01-nas
          ontap_31_nfs_v0101
                      cluster1_01_aggr01
                                      online      RW      10GB      9.25GB      2%
3 entries were displayed.

cluster1::> volume qtree show -vserver ntap-svm01-nas -volume ontap_31_nfs_fg01
Vserver      Volume      Qtree      Style      Oblocks      Status
-----      -----
ntap-svm01-nas
          ontap_31_nfs_fg01
                      ""
                                      unix      enable      normal
ntap-svm01-nas
          ontap_31_nfs_fg01
                      ontap_31_fg_qt01
```

```
       unix      enable    normal
ntap-svm01-nas
    ontap_31_nfs_fg01
        ontap_31_fg_qt02
            unix      enable    normal
ntap-svm01-nas
    ontap_31_nfs_fg01
        ontap_31_fg_qt03
            unix      enable    normal
ntap-svm01-nas
    ontap_31_nfs_fg01
        ontap_31_fg_qt04
            unix      enable    normal
ntap-svm01-nas
    ontap_31_nfs_fg01
        ontap_31_fg_qt05
            unix      enable    normal
6 entries were displayed.
```

## ONTAP-31-05 – Mount & Write (FlexGroups)

### Description

Access provisioned resources from a UNIX host via NFS.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the Linux test host(s)
mkdir -p <linux_31_mount_dir>/<ontap_31_fg_qtree_names[item]>

mount -t nfs <global_primary_nas_svm>:<ontap_31_fg_name>/<ontap_31_fg_qtree_names[item]>
/mnt/ontap_test/<ontap_31_vol_qtree_names[item]>

dd if=/dev/urandom of<linux_31_mount_dir>/<ontap_31_fg_qtree_names[item]>/
<ontap_31_fg_qtree_names[item]>_testfile bs=1024KB count=50
```

### Execution Example

```
# on the Linux test host(s)
[root@centos1 ~]# mkdir -p /mnt/ontap_test/31/ontap_31_fg_qt0{1..5}

[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt01 /mnt/ontap_test/31/ontap_31_fg_qt01
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt02 /mnt/ontap_test/31/ontap_31_fg_qt02
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt03 /mnt/ontap_test/31/ontap_31_fg_qt03
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt04 /mnt/ontap_test/31/ontap_31_fg_qt04
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt05 /mnt/ontap_test/31/ontap_31_fg_qt05

[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/31/ontap_31_fg_qt01/ontap_31_fg_qt01_testfile bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.844488 s, 60.6 MB/s
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/31/ontap_31_fg_qt02/ontap_31_fg_qt02_testfile bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.997076 s, 51.4 MB/s
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/31/ontap_31_fg_qt03/ontap_31_fg_qt03_testfile bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.864504 s, 59.2 MB/s
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/31/ontap_31_fg_qt04/ontap_31_fg_qt04_testfile bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.732951 s, 69.9 MB/s
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/31/ontap_31_fg_qt05/ontap_31_fg_qt05_testfile bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.904567 s, 56.6 MB/s
```

### Verification Example

```
# on the Linux test host(s)
[root@centos1 ~]# mount | grep ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_fg01/
```

```

ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt01 on
/mnt/ontap_test/31/ontap_31_fg_qt01 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt02 on
/mnt/ontap_test/31/ontap_31_fg_qt02 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt03 on
/mnt/ontap_test/31/ontap_31_fg_qt03 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt04 on
/mnt/ontap_test/31/ontap_31_fg_qt04 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt05 on
/mnt/ontap_test/31/ontap_31_fg_qt05 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)

[root@centos1 ~]# ls -lar /mnt/ontap_test/31/ontap_31_fg_qt0*
/mnt/ontap_test/31/ontap_31_fg_qt05:
total 50208
-rw-r--r-- 1 nobody nobody 51200000 Sep  7 16:30 ontap_31_fg_qt05_testfile
drwxr-xr-x. 12 root    root      251 Sep  7 16:18 ..
drwxr-xr-x  2 nobody nobody   4096 Sep  7 16:30 .

/mnt/ontap_test/31/ontap_31_fg_qt04:
total 50208
-rw-r--r-- 1 nobody nobody 51200000 Sep  7 16:30 ontap_31_fg_qt04_testfile
drwxr-xr-x. 12 root    root      251 Sep  7 16:18 ..
drwxr-xr-x  2 nobody nobody   4096 Sep  7 16:30 .

/mnt/ontap_test/31/ontap_31_fg_qt03:
total 50208
-rw-r--r-- 1 nobody nobody 51200000 Sep  7 16:30 ontap_31_fg_qt03_testfile
drwxr-xr-x. 12 root    root      251 Sep  7 16:18 ..
drwxr-xr-x  2 nobody nobody   4096 Sep  7 16:30 .

/mnt/ontap_test/31/ontap_31_fg_qt02:
total 50208
-rw-r--r-- 1 nobody nobody 51200000 Sep  7 16:30 ontap_31_fg_qt02_testfile
drwxr-xr-x. 12 root    root      251 Sep  7 16:18 ..
drwxr-xr-x  2 nobody nobody   4096 Sep  7 16:30 .

/mnt/ontap_test/31/ontap_31_fg_qt01:
total 50208
-rw-r--r-- 1 nobody nobody 51200000 Sep  7 16:30 ontap_31_fg_qt01_testfile
drwxr-xr-x. 12 root    root      251 Sep  7 16:18 ..
drwxr-xr-x  2 nobody nobody   4096 Sep  7 16:30 .

```

## ONTAP-32 – CIFS

### ONTAP-32-01 – Volumes & Qtrees

#### Description

Create volumes and qtrees for storing host/client data.

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
# on the primary storage system
volume create -volume <ontap_32_vol_name> -vserver <global_primary_nas_svm> -size
<ontap_default_vol_size_gb>GB -aggregate <storage_aggregates[item].name> -junction-path
/<ontap_32_vol_name> -security-style ntfs

volume qtree create -vserver <global_primary_nas_svm> -volume <ontap_32_vol_name> -qtree
<ontap_32_vol_qtree_name[item]> -security-style ntfs
```

#### Execution Example

```
# on the primary storage system
cluster1::> volume create -volume ontap_32_cifs_vol01 -vserver ntap-svm01-nas -size 10GB -
aggregate cluster1_01_aggr01 -junction-path /ontap_32_cifs_vol01 -security-style ntfs

Warning: The export-policy "default" has no rules in it. The volume will
therefore be inaccessible over NFS and CIFS protocol.
Do you want to continue? {y|n}: y
[Job 180] Job succeeded: Successful

cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_32_cifs_vol01 -qtree
ontap_32_vol_qt01 -security-style ntfs
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_32_cifs_vol01 -qtree
ontap_32_vol_qt02 -security-style ntfs
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_32_cifs_vol01 -qtree
ontap_32_vol_qt03 -security-style ntfs
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_32_cifs_vol01 -qtree
ontap_32_vol_qt04 -security-style ntfs
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_32_cifs_vol01 -qtree
ontap_32_vol_qt05 -security-style ntfs
```

#### Verification Example

```
# on the primary storage system
cluster1::> volume show -vserver ntap-svm01-nas
Vserver      Volume      Aggregate     State      Type      Size   Available Used%
-----      -----
ntap-svm01-nas
    ntap_svm01_nas_root
        cluster1_02_aggr01
            online      RW       20MB    18.64MB   1%
ntap-svm01-nas
    ontap_31_nfs_fg01
        -          online      RW       100TB   554.4GB   0%
ntap-svm01-nas
    ontap_31_nfs_vol01
        cluster1_01_aggr01
            online      RW       10GB    9.50GB    0%
ntap-svm01-nas
    ontap_32_cifs_vol01
        cluster1_01_aggr01
            online      RW       10GB    9.50GB    0%
```

```
4 entries were displayed.
```

```
cluster1::> volume qtree show -vserver ntap-svm01-nas -volume ontap_32_cifs_vol01
Vserver      Volume       Qtree       Style      Olocks      Status
-----      -----       ---       ---      ---      ---
ntap-svm01-nas
    ontap_32_cifs_vol01
        ""           ntfs       enable     normal
ntap-svm01-nas
    ontap_32_cifs_vol01
        ontap_32_vol_gt01
            ontap_32_vol_gt01
                ntfs       enable     normal
ntap-svm01-nas
    ontap_32_cifs_vol01
        ontap_32_vol_gt02
            ontap_32_vol_gt02
                ntfs       enable     normal
ntap-svm01-nas
    ontap_32_cifs_vol01
        ontap_32_vol_gt03
            ontap_32_vol_gt03
                ntfs       enable     normal
ntap-svm01-nas
    ontap_32_cifs_vol01
        ontap_32_vol_gt04
            ontap_32_vol_gt04
                ntfs       enable     normal
ntap-svm01-nas
    ontap_32_cifs_vol01
        ontap_32_vol_gt05
            ontap_32_vol_gt05
                ntfs       enable     normal
```

```
6 entries were displayed.
```

## ONTAP-32-02 – Shares & ACLs (Volume)

### Description

Create shares & ACLs to control client access to provisioned storage resources.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
vserver cifs share create -vserver <global_primary_nas_svm> -share-name
<ontap_32_vol_qtree_names[item]> -path /<ontap_32_vol_name>/<ontap_32_vol_qtree_names[item]> -
share-properties browsable,changetrigger,oplocks,show-previous-versions,showsnapshot

vserver cifs share access-control delete -vserver <global_primary_nas_svm> -share
<ontap_32_vol_qtree_names[item]> -user-or-group Everyone

vserver cifs share access-control create -vserver <global_primary_nas_svm> -share
<ontap_32_vol_qtree_names[item]> -user-or-group <ontap_32_ad_admin_group> -user-group-type
windows -permission Full_Control

vserver cifs share access-control create -vserver <global_primary_nas_svm> -share
<ontap_32_vol_qtree_names[item]> -user-or-group <ontap_32_ad_ro_group> -user-group-type
windows -permission Read
```

### Execution Example

```
# on the primary storage system
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_vol_qt01 -
path /ontap_32_cifs_vo1/ontap_32_vol_qt01 -share-properties
browsable,changetrigger,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_vol_qt02 -
path /ontap_32_cifs_vo1/ontap_32_vol_qt02 -share-properties
browsable,changetrigger,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_vol_qt03 -
path /ontap_32_cifs_vo1/ontap_32_vol_qt03 -share-properties
browsable,changetrigger,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_vol_qt04 -
path /ontap_32_cifs_vo1/ontap_32_vol_qt04 -share-properties
browsable,changetrigger,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_vol_qt05 -
path /ontap_32_cifs_vo1/ontap_32_vol_qt05 -share-properties
browsable,changetrigger,oplocks,show-previous-versions,showsnapshot

cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_32_vol_qt01 -user-or-group Everyone
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_32_vol_qt02 -user-or-group Everyone
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_32_vol_qt03 -user-or-group Everyone
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_32_vol_qt04 -user-or-group Everyone
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_32_vol_qt05 -user-or-group Everyone

cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_vol_qt01 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_vol_qt02 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_vol_qt03 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_vol_qt04 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
```

```

full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_vol_gt05 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
full_Control

cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_vol_gt01 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_vol_gt02 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_vol_gt03 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_vol_gt04 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_vol_gt05 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read

```

## Verification Example

```

# on the primary storage system
cluster1::> vserver cifs share show -vserver ntap-svm01-nas -fields share-name,acl
vserver      share-name acl
-----
ntap-svm01-nas c$          "BUILTIN\Administrators / Full Control"
ntap-svm01-nas ipc$        -
ntap-svm01-nas ontap_32_vol_gt01
                           "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group / Read"
ntap-svm01-nas ontap_32_vol_gt02
                           "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group / Read"
ntap-svm01-nas ontap_32_vol_gt03
                           "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group / Read"
ntap-svm01-nas ontap_32_vol_gt04
                           "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group / Read"
ntap-svm01-nas ontap_32_vol_gt05
                           "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group / Read"
7 entries were displayed.

```

## ONTAP-32-03 – Mount & Write (Volume)

### Description

Access provisioned resources from a Windows client via CIFS.

### Expected Result

<placeholder>

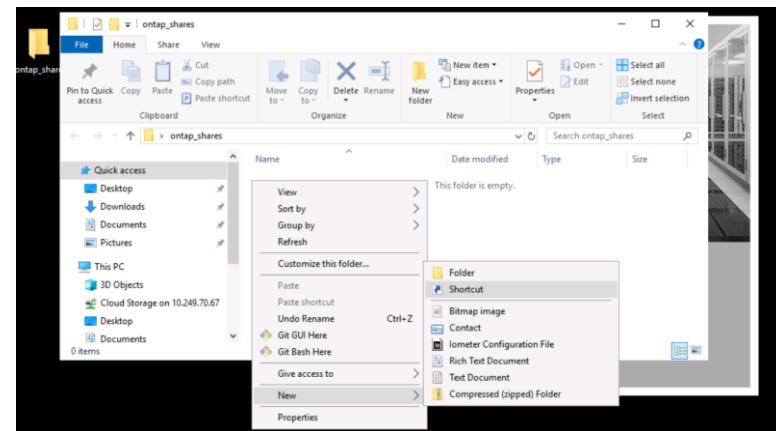
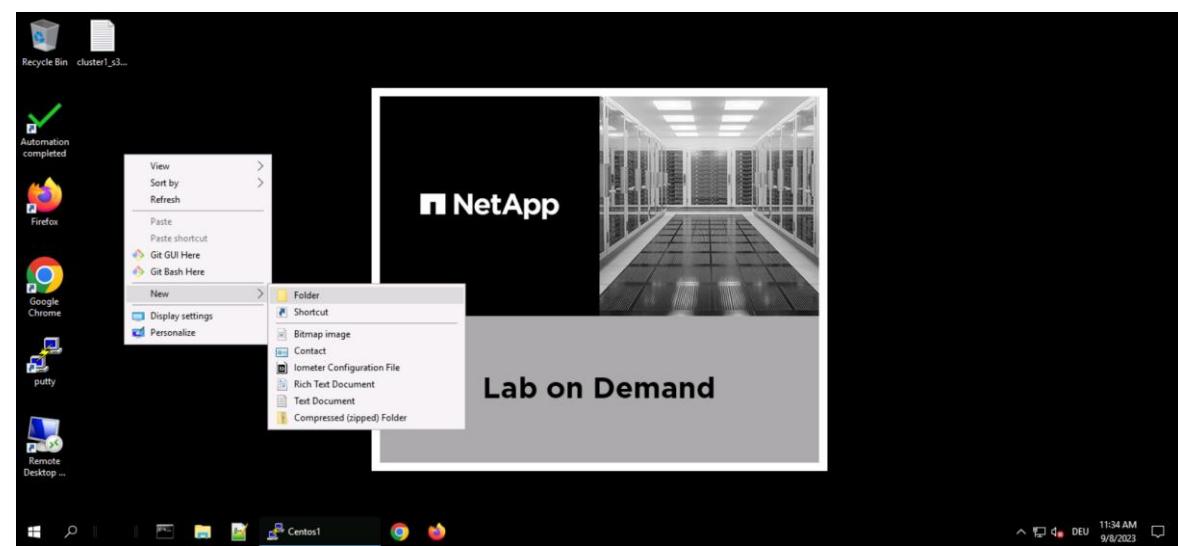
### Additional Information

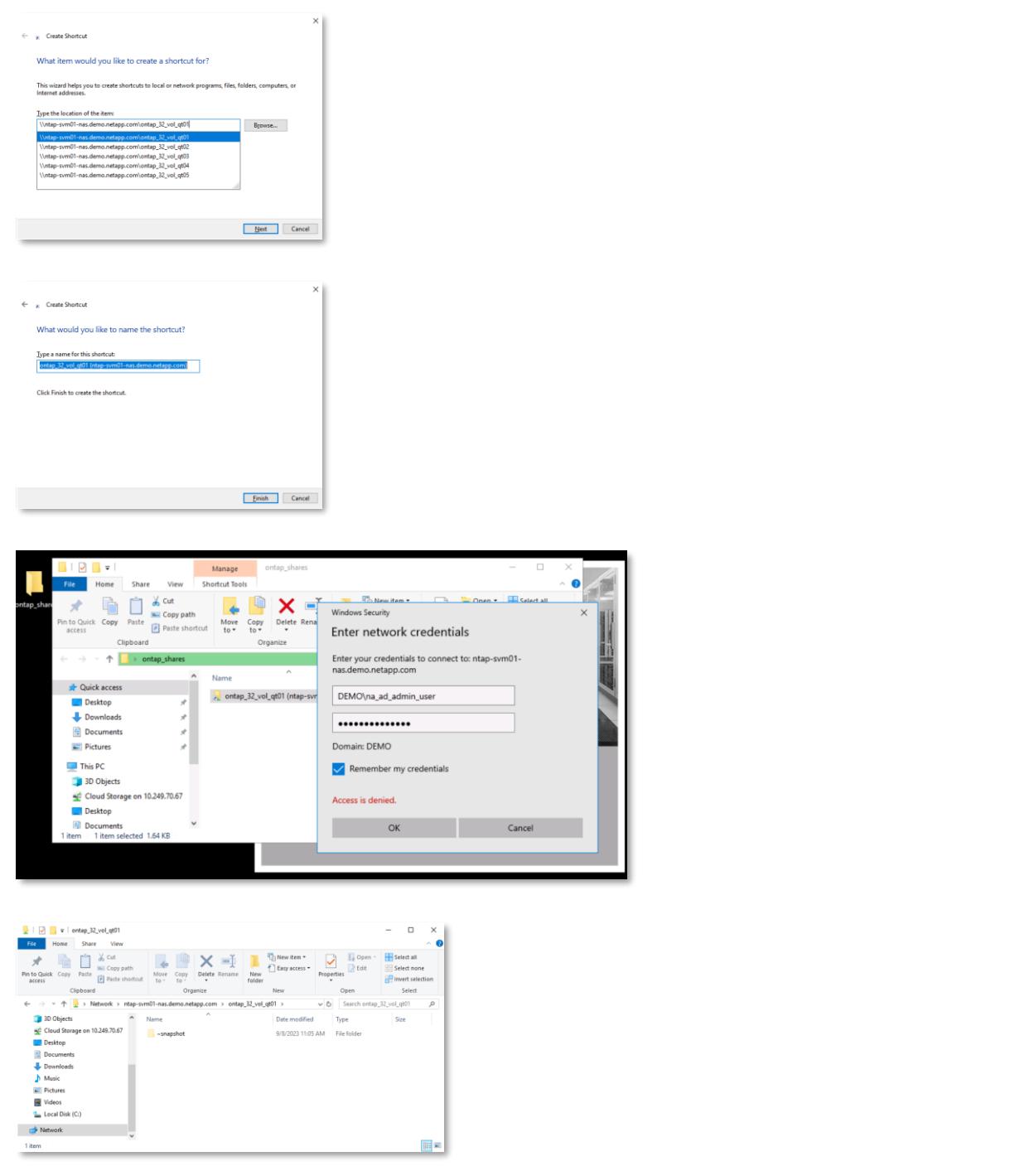
<placeholder>

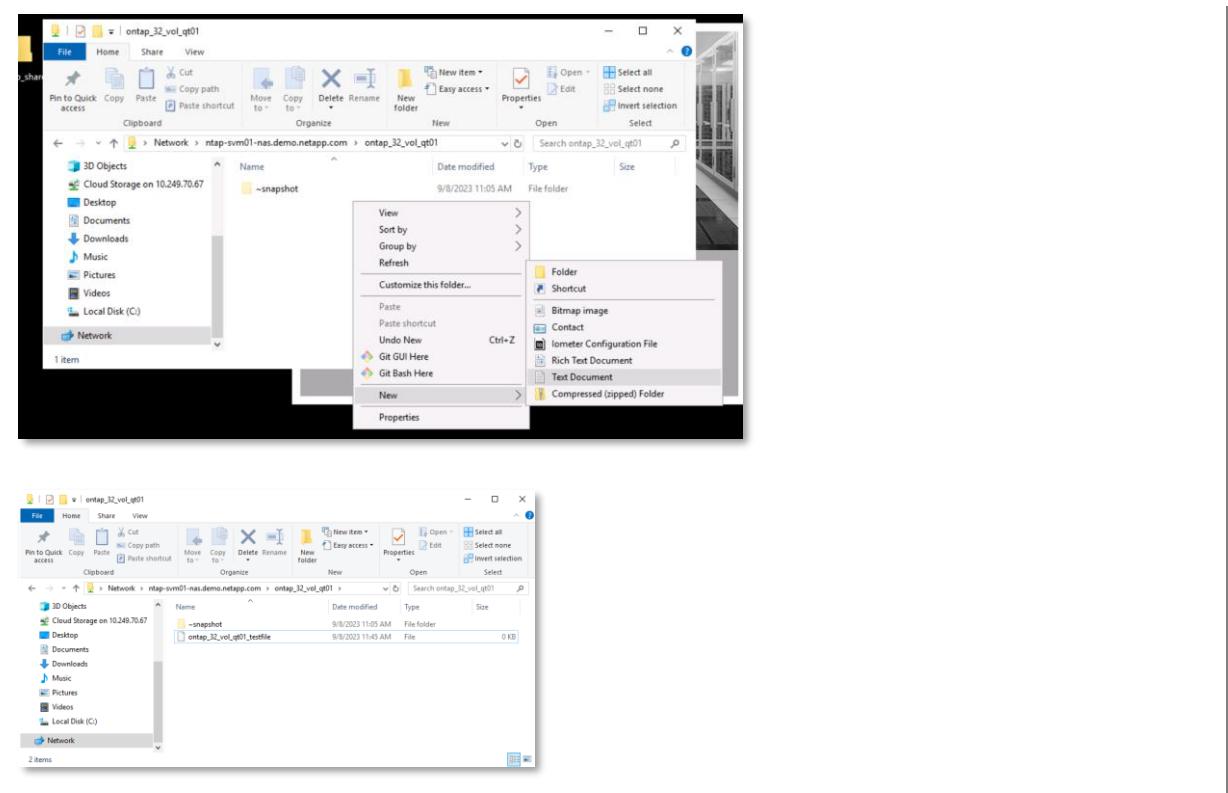
### Instructions

```
# on the Windows test host(s)
# Create directory test
# Connect/link network shares
# Provide login credentials
# Acces shares and write test data
```

### Execution Example







## Verification Example

```
C:\> Command Prompt
C:\Users\Administrator.DEMO>net use
New connections will be remembered.

Status      Local      Remote          Network
-----      ----      -----          -----
OK           \\ntap-svm01-nas.demo.netapp.com\ontap_32_v01_qt01
                           Microsoft Windows Network
                           \\tsclient\Cloud Storage  Microsoft Terminal Services
The command completed successfully.

C:\Users\Administrator.DEMO>
```

## ONTAP-32-04 – FlexGroups & Qtrees

### Description

Create volumes and qtrees for storing host/client data.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
volume create -vserver <global_primary_nas_svm> -volume <ontap_32_fg_name> -size
<ontap_default_fg_size_gb>GB -junction-path /<ontap_32_fg_name> -aggr-list
<storage_aggregates[items].name> -aggr-list-multiplier <ontap_default_fg_multiplier> -
security-style ntfs

volume qtree create -vserver <global_primary_nas_svm> -volume <ontap_32_fg_name> -qtree
<ontap_32_fg_qtree_name[item]> -security-style ntfs
```

### Execution Example

```
# on the primary storage system
cluster1::> volume create -vserver ntap-svm01-nas -volume ontap_32_cifs_fg01 -size 102400GB -
aggr-list cluster1_01_aggr01,cluster1_02_aggr01 -aggr-list-multiplier 16 -junction-path
/ontap_32_cifs_fg01 -security-style ntfs

Notice: The FlexGroup volume "ontap_32_cifs_fg01" will be created with the following number of
constituents of size 6.25TB: 16.
Do you want to continue? {y|n}: y

Warning: The export-policy "default" has no rules in it. The volume will therefore be
inaccessible over NFS and CIFS protocol.
Do you want to continue? {y|n}: y
[Job 266] Job succeeded: Successful

cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_32_cifs_fg01 -qtree
ontap_32_fg_qt01 -security-style ntfs
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_32_cifs_fg01 -qtree
ontap_32_fg_qt02 -security-style ntfs
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_32_cifs_fg01 -qtree
ontap_32_fg_qt03 -security-style ntfs
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_32_cifs_fg01 -qtree
ontap_32_fg_qt04 -security-style ntfs
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_32_cifs_fg01 -qtree
ontap_32_fg_qt05 -security-style ntfs
```

### Verification Example

```
# on the primary storage system
cluster1::> cluster1::> volume show -vserver ntap-svm01-nas
Vserver      Volume      Aggregate      State      Type      Size      Available Used%
-----  -----  -----  -----  -----  -----  -----  -----
ntap-svm01-nas
    ntap_svm01_nas_root
        cluster1_02_aggr01
            online      RW      20MB     18.64MB     1%
ntap-svm01-nas
    ontap_31_nfs_fg01
        -          online      RW      100TB     549.8GB     0%
ntap-svm01-nas
    ontap_31_nfs_vol01
        cluster1_01_aggr01
            online      RW      10GB      9.50GB     0%
ntap-svm01-nas
    ontap_32_cifs_fg01
        -          online      RW      100TB    545.5GB     0%
```

```

ntap-svm01-nas
    ontap_32_cifs_vol01
        cluster1_01_aggr01
            online      RW       10GB     9.50GB   0%
5 entries were displayed.

cluster1::> cluster1::> volume qtree show -vserver ntap-svm01-nas -volume ontap_32_cifs_fg01
Vserver      Volume      Qtree      Style      Oplocks      Status
-----      -----      -----      -----      -----      -----
ntap-svm01-nas
    ontap_32_cifs_fg01
        ""          ntfs      enable      normal
ntap-svm01-nas
    ontap_32_cifs_fg01
        ontap_32_fg_qt01
            ntfs      enable      normal
ntap-svm01-nas
    ontap_32_cifs_fg01
        ontap_32_fg_qt02
            ntfs      enable      normal
ntap-svm01-nas
    ontap_32_cifs_fg01
        ontap_32_fg_qt03
            ntfs      enable      normal
ntap-svm01-nas
    ontap_32_cifs_fg01
        ontap_32_fg_qt04
            ntfs      enable      normal
ntap-svm01-nas
    ontap_32_cifs_fg01
        ontap_32_fg_qt05
            ntfs      enable      normal
6 entries were displayed.

```

## ONTAP-32-05 – Shares & ACLs (FlexGroup)

### Description

Create shares & ACLs to control client access to provisioned storage resources.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
vserver cifs share create -vserver <global_primary_nas_svm> -share-name
<ontap_32_fg_qtree_names[item]> -path /<ontap_32_fg_name>/<ontap_32_fg_qtree_names[item]> -
share-properties browsable,changetracker,oplocks,show-previous-versions,showsnapshot

vserver cifs share access-control delete -vserver <global_primary_nas_svm> -share
<ontap_32_fg_qtree_names[item]> -user-or-group Everyone

vserver cifs share access-control create -vserver <global_primary_nas_svm> -share
<ontap_32_fg_qtree_names[item]> -user-or-group <ontap_32_ad_admin_group> -user-group-type
windows -permission Full_Control

vserver cifs share access-control create -vserver <global_primary_nas_svm> -share
<ontap_32_fg_qtree_names[item]> -user-or-group <ontap_32_ad_ro_group> -user-group-type windows
-permission Read
```

### Execution Example

```
# on the primary storage system
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_fg_qt01 -
path /ontap_32_cifs_fg01/ontap_32_fg_qt01 -share-properties
browsable,changetracker,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_fg_qt02 -
path /ontap_32_cifs_fg01/ontap_32_fg_qt02 -share-properties
browsable,changetracker,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_fg_qt03 -
path /ontap_32_cifs_fg01/ontap_32_fg_qt03 -share-properties
browsable,changetracker,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_fg_qt04 -
path /ontap_32_cifs_fg01/ontap_32_fg_qt04 -share-properties
browsable,changetracker,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_fg_qt05 -
path /ontap_32_cifs_fg01/ontap_32_fg_qt05 -share-properties
browsable,changetracker,oplocks,show-previous-versions,showsnapshot

cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_32_fg_qt01 -user-or-group Everyone
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_32_fg_qt02 -user-or-group Everyone
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_32_fg_qt03 -user-or-group Everyone
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_32_fg_qt04 -user-or-group Everyone
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_32_fg_qt05 -user-or-group Everyone

cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_fg_qt01 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_fg_qt02 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_fg_qt03 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_fg_qt04 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
```

```

full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_fg_qt05 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
full_Control

cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_fg_qt01 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_fg_qt02 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_fg_qt03 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_fg_qt04 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_32_fg_qt05 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read

```

## Verification Example

```

# on the primary storage system
cluster1::> cluster1::> vserver cifs share show -vserver ntap-svm01-nas -fields share-name,acl
-share-name *fg*
vserver      share-name      acl
-----
-----
ntap-svm01-nas ontap_32_fg_qt01 "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group /
Read"
ntap-svm01-nas ontap_32_fg_qt02 "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group /
Read"
ntap-svm01-nas ontap_32_fg_qt03 "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group /
Read"
ntap-svm01-nas ontap_32_fg_qt04 "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group /
Read"
ntap-svm01-nas ontap_32_fg_qt05 "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group /
Read"
5 entries were displayed.

```

## ONTAP-32-06 – Mount & Write (Volume)

### Description

Access provisioned resources from a Windows client via CIFS.

### Expected Result

<placeholder>

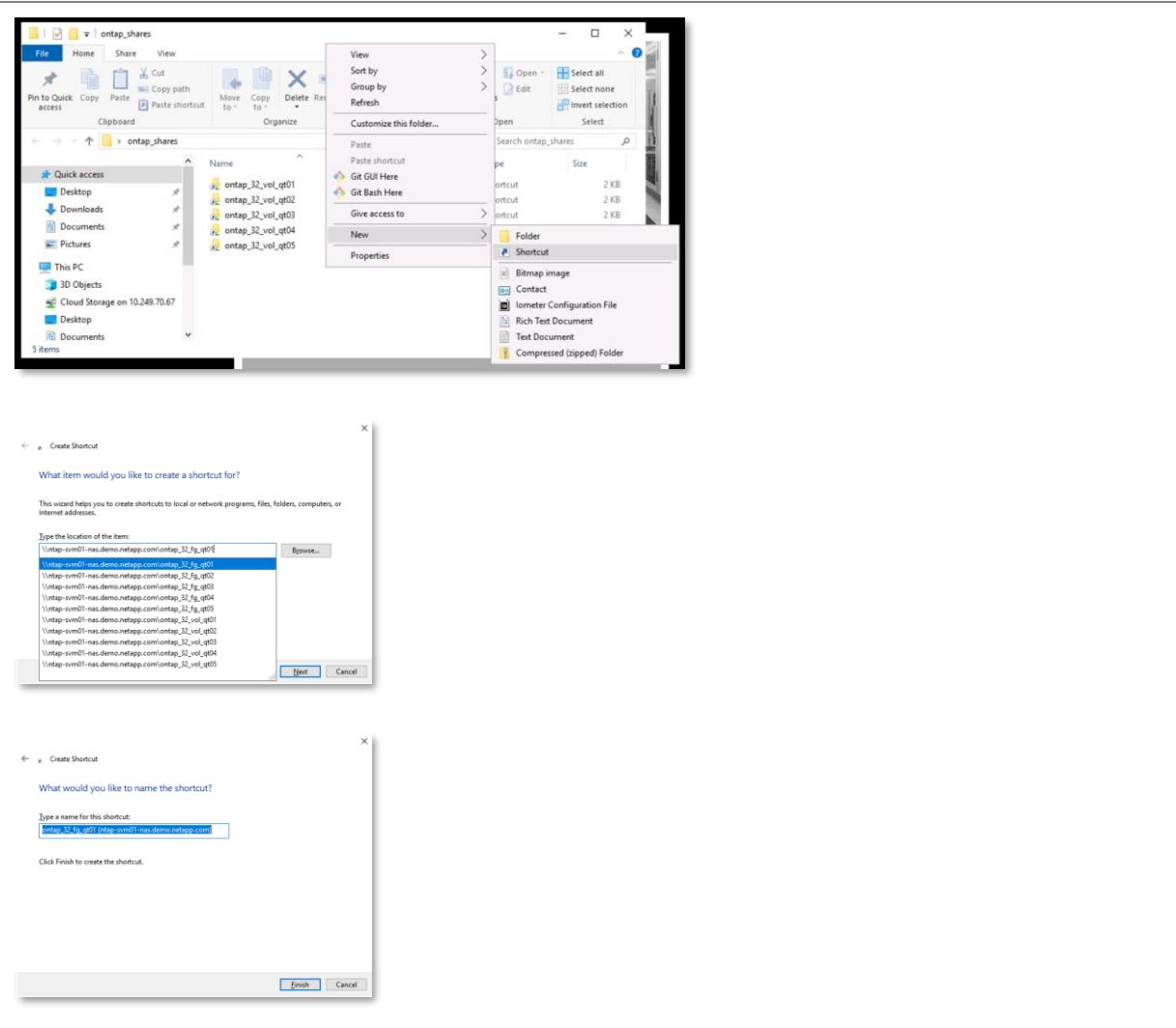
### Additional Information

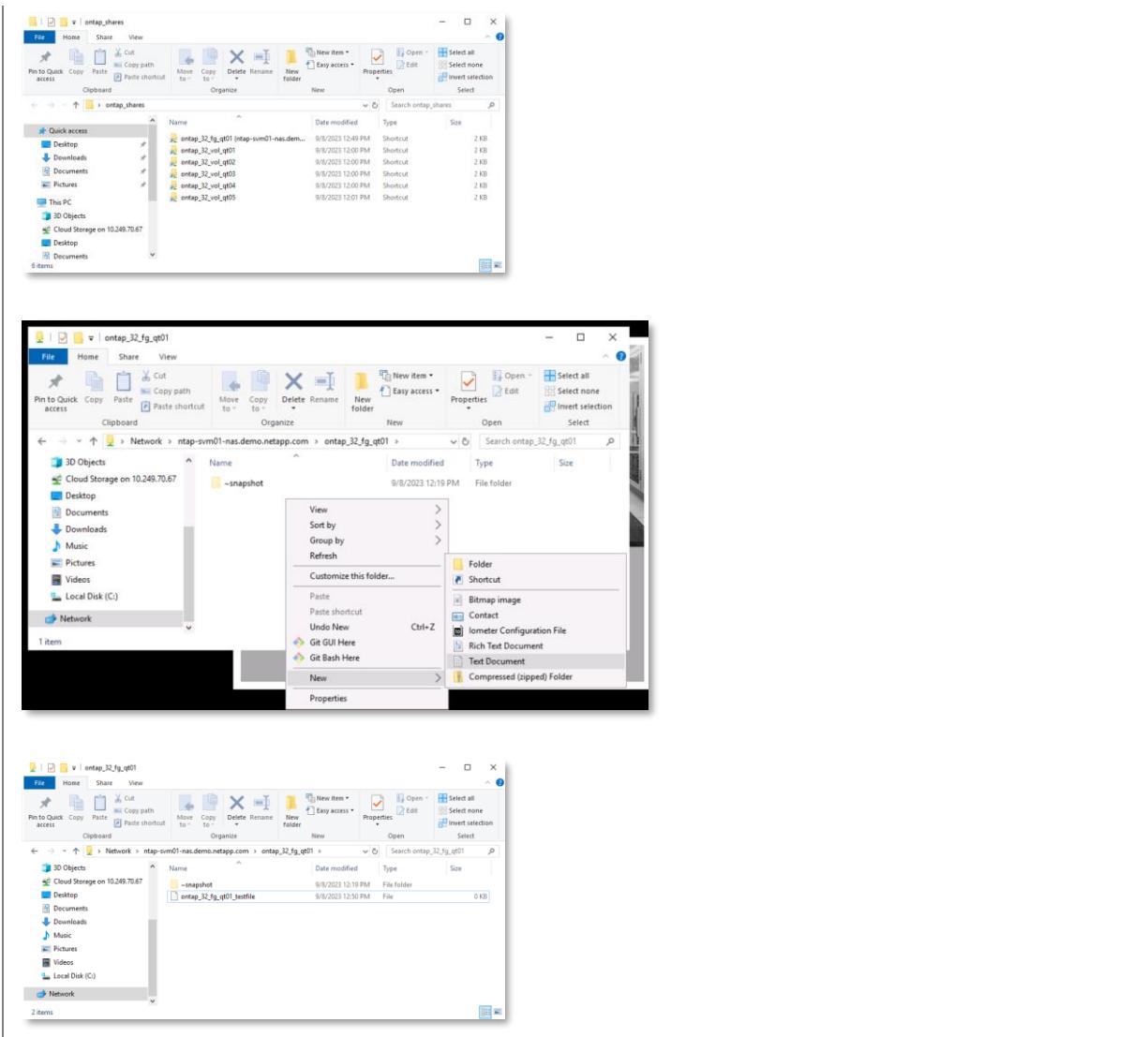
<placeholder>

### Instructions

```
# on the Windows test host(s)
# Create directory test
# Connect/link network shares
# Provide login credentials
# Acces shares and write test data
```

### Execution Example





## Verification Example

<n/a>

## ONTAP-35 – iSCSI

### ONTAP-35-01 – iGroups

#### Description

Create iGroups according to test hosts' operating system and add host IQNs.

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
# on the primary storage system
igroup create -vserver <global_primary_san_svm> -igroup <ontap_35_lin_igroup_name>
<ontap_35_win_igroup_name> -protocol iscsi -ostype linux -initiator <ontap_35_lin_igroup_iqns>
<ontap_35_win_igroup_iqns>
```

#### Execution Example

```
# on primary storage system
### Linux Example
cluster1::> igrup create -vserver ntap-svm02-san -igroup ontap_35_lin_ig01 -protocol iscsi -
ostype linux -initiator iqn.1994-05.com.redhat:centos1.demo.netapp.com

### Windows Example
cluster1::> igrup create -vserver ntap-svm02-san -igroup ontap_35_win_ig01 -protocol iscsi -
ostype windows -initiator iqn.1991-05.com.microsoft:jumphost.demo.netapp.com
```

#### Verification Example

```
# on primary storage system
cluster1::> igrup show -vserver ntap-svm02-san
Vserver      Igroup      Protocol OS Type   Initiators
-----
ntap-svm02-san
    ontap_35_lin_ig      iscsi     linux    iqn.1994-05.com.redhat:centos1.demo.netapp.com
ntap-svm02-san
    ontap_35_win_ig      iscsi     windows   iqn.1991-05.com.microsoft:jumphost.demo.netapp.com
2 entries were displayed.
```

## ONTAP-35-02 – Volumes

### Description

Create volumes for storing host/client data.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
volume create -volume <ontap_35_lin_vol_name|ontap_35_win_vol_name> -vserver
<global_primary_san_svm> -size <ontap_default_vol_size_gb>GB -aggregate
<storage_aggregates[item].name>
```

### Execution Example

```
# on primary storage system
cluster1::> volume create -volume ontap_35_lin_vol01 -vserver ntap-svm02-san -size 10GB -
aggregate cluster1_02_aggr01
[Job 201] Job succeeded: Successful

cluster1::> volume create -volume ontap_35_win_vol01 -vserver ntap-svm02-san -size 10GB -
aggregate cluster1_02_aggr01
[Job 202] Job succeeded: Successful
```

### Verification Example

```
# on primary storage system
cluster1::> volume show -vserver ntap-svm02-san
Vserver      Volume      Aggregate      State      Type      Size      Available Used%
-----      -----      -----      -----      -----      -----      -----      -----
ntap-svm02-san
          ntap_svm02_san_root
                      cluster1_01_aggr01
                                      online      RW      20MB      18.71MB      1%
ntap-svm02-san
          ontap_35_lin_vol01
                      cluster1_02_aggr01
                                      online      RW      10GB      9.50GB      0%
ntap-svm02-san
          ontap_35_win_vol01
                      cluster1_02_aggr01
                                      online      RW      10GB      9.50GB      0%
3 entries were displayed.
```

## ONTAP-35-03 – LUNs & Mappings

### Description

Create LUNs for storing host/client data and map them to the previously created iGroups.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
lun create -vserver <global_primary_san_svm> -volume
<ontap_35_lin_vol_name|ontap_35_win_vol_name> -lun
<ontap_35_lin_lun_name|ontap_35_win_lun_name> -size 5gb -ostype <linux|windows> -space-reserve
enabled -space-allocation enabled

lun map -vserver <global_primary_san_svm> -path
/vol/<ontap_35_lin_vol_name|ontap_35_win_vol_name>/<ontap_35_lin_lun_name|ontap_35_win_lun_name>
-igroup <|>
```

### Execution Example

```
# on primary storage system
cluster1::> lun create -vserver ntap-svm02-san -volume ontap_35_lin_vol01 -lun
ontap_35_lin_lun01 -size 5gb -ostype linux -space-reserve enabled -space-allocation enabled
Created a LUN of size 5g (5368709120)
cluster1::> lun create -vserver ntap-svm02-san -volume ontap_35_win_vol01 -lun
ontap_35_win_lun01 -size 5gb -ostype windows -space-reserve enabled -space-allocation enabled
Created a LUN of size 5g (5368709120)

cluster1::> lun map -vserver ntap-svm02-san -path /vol/ontap_35_lin_vol01/ontap_35_lin_lun01 -
igroup ontap_35_lin_ig01
cluster1::> lun map -vserver ntap-svm02-san -path /vol/ontap_35_win_vol01/ontap_35_win_lun01 -
igroup ontap_35_win_ig01
```

### Verification Example

```
# on primary storage system
cluster1::> lun mapping show -vserver ntap-svm02-san
Vserver      Path                      Igroup      LUN ID  Protocol
-----      -----
ntap-svm02-san   /vol/ontap_35_lin_vol01/ontap_35_lin_lun01    ontap_35_lin_ig01        0  iscsi
                                         /vol/ontap_35_win_vol01/ontap_35_win_lun01    ontap_35_win_ig01        0  iscsi
ntap-svm02-san
2 entries were displayed.
```

## ONTAP-35-04 – Mount & Write (Linux)

### Description

Discover iSCSI portals from Linux host(s). Map LUNs and write test data to them.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the Linux test host(s)
iscsiadm -m discovery -t sendtargets -p
<hostvars[global_primary_test_cluster].network_ip_interfaces[<iscsi_interface_name>].ip.addresses>

iscsiadm -m node --login

mkfs.ext4 <device path to LUN>

mkdir -p <linux_35_mount_dir>/<ontap_35_lin_lun_name>

mount -o discard <device path to LUN> <linux_35_mount_dir>/<ontap_35_lin_lun_name>

dd if=/dev/urandom of=<linux_35_mount_dir>/<ontap_35_lin_lun_name>/testfile bs=1024KB count=50
```

### Execution Example

```
# on the Linux test host(s)
[root@centos1 ~]# iscsiadm -m discovery -t sendtargets -p 192.168.0.215,192.168.0.216
192.168.0.215:3260,1029 iqn.1992-08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22
192.168.0.216:3260,1030 iqn.1992-08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22

[root@centos1 ~]# iscsiadm -m node --login
Logging in to [iface: default, target: iqn.1992-
08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22, portal: 192.168.0.215,3260]
(multiple)
Logging in to [iface: default, target: iqn.1992-
08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22, portal: 192.168.0.216,3260]
(multiple)
Login to [iface: default, target: iqn.1992-
08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22, portal: 192.168.0.215,3260]
successful.
Login to [iface: default, target: iqn.1992-
08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22, portal: 192.168.0.216,3260]
successful.

[root@centos1 ~]# mkfs.ext4 /dev/dm-2
mke2fs 1.42.9 (28-Dec-2013)
Discarding device blocks: done
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=16 blocks
327680 inodes, 1310720 blocks
65536 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=1342177280
40 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
```

```

Writing superblocks and filesystem accounting information: done

[root@centos1 ~]# mkdir -p /mnt/ontap_test/35/ontap_35_lin_lun01
[root@centos1 ~]# mount -o discard /dev/dm-2 /mnt/ontap_test/35/ontap_35_lin_lun01
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/35/ontap_35_lin_lun01/testfile
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.216513 s, 236 MB/s

```

## Verification Example

```

# on the Linux test host(s)
[root@centos1 ~]# iscsiadm -m node
192.168.0.215:3260,1029 iqn.1992-08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22
192.168.0.216:3260,1030 iqn.1992-08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22

[root@centos1 ~]# iscsiadm -m session
tcp: [13] 192.168.0.215:3260,1029 iqn.1992-
08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22 (non-flash)
tcp: [14] 192.168.0.216:3260,1030 iqn.1992-
08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22 (non-flash)

[root@centos1 ~]# iscsiadm --mode session --sid=13 -P 3
ISCSI Transport Class version 2.0-870
version 6.2.0.874-22
Target: iqn.1992-08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22 (non-flash)
    Current Portal: 192.168.0.215:3260,1029
    Persistent Portal: 192.168.0.215:3260,1029
    ****
    Interface:
    ****
        Iface Name: default
        Iface Transport: tcp
        Iface Initiatorname: iqn.1994-05.com.redhat:centos1.demo.netapp.com
        Iface IPAddress: 192.168.0.61
        Iface HWAddress: <empty>
        Iface Netdev: <empty>
        SID: 13
        iSCSI Connection State: LOGGED IN
        iSCSI Session State: LOGGED IN
        Internal iscsid Session State: NO CHANGE
    ****
    Timeouts:
    ****
        Recovery Timeout: 5
        Target Reset Timeout: 30
        LUN Reset Timeout: 30
        Abort Timeout: 15
    ****
    CHAP:
    ****
        username: <empty>
        password: *****
        username_in: <empty>
        password_in: *****
    ****
    Negotiated iSCSI params:
    ****
        HeaderDigest: None
        DataDigest: None
        MaxRecvDataSegmentLength: 262144
        MaxXmitDataSegmentLength: 65536
        FirstBurstLength: 65536
        MaxBurstLength: 1048576
        ImmediateData: Yes
        InitialR2T: Yes
        MaxOutstandingR2T: 1
    ****
    Attached SCSI devices:
    ****
        Host Number: 33 State: running
        scsi33 Channel 00 Id 0 Lun: 0

```

```

Attached scsi disk sdb           State: running
[root@centos1 NetApp-ONTAP-Testplan]# iscsiadm --mode session --sid=14 -P 3
iSCSI Transport Class version 2.0-870
version 6.2.0.874-22
Target: iqn.1992-08.com.netapp:sn.04f8e1e6772911eea2b5005056b76a95:vs.22 (non-flash)
Current Portal: 192.168.0.216:3260,1030
Persistent Portal: 192.168.0.216:3260,1030
*****
Interface:
*****
Iface Name: default
Iface Transport: tcp
Iface Initiatorname: iqn.1994-05.com.redhat:centos1.demo.netapp.com
Iface IPaddress: 192.168.0.61
Iface HWaddress: <empty>
Iface Netdev: <empty>
SID: 14
iSCSI Connection State: LOGGED IN
iSCSI Session State: LOGGED IN
Internal iscsid Session State: NO CHANGE
*****
Timeouts:
*****
Recovery Timeout: 5
Target Reset Timeout: 30
LUN Reset Timeout: 30
Abort Timeout: 15
*****
CHAP:
*****
username: <empty>
password: *****
username_in: <empty>
password_in: *****
*****
Negotiated iSCSI params:
*****
HeaderDigest: None
DataDigest: None
MaxRecvDataSegmentLength: 262144
MaxXmitDataSegmentLength: 65536
FirstBurstLength: 65536
MaxBurstLength: 1048576
ImmediateData: Yes
InitialR2T: Yes
MaxOutstandingR2T: 1
*****
Attached SCSI devices:
*****
Host Number: 34 State: running
scsi34 Channel 00 Id 0 Lun: 0
Attached scsi disk sdc           State: running

[root@centos1 ~]# lsscsi
[2:0:0:0]    disk    VMware   Virtual disk    2.0   /dev/sda
[3:0:0:0]    cd/dvd  NECVMWar VMware SATA CD00 1.00   /dev/sr0
[33:0:0:0]   disk    NETAPP   LUN C-Mode     9131   /dev/sdb
[34:0:0:0]   disk    NETAPP   LUN C-Mode     9131   /dev/sdc

[root@centos1 ~]# mount | grep "/mnt/ontap_test/35/ontap_35_lin_lun01"
/dev/mapper/3600a0980774f6a3458245659692d6244 on /mnt/ontap_test/35/ontap_35_lin_lun01 type
ext4 (rw,relatime,discard,stripe=16)

```

## ONTAP-35-05 – Mount & Write (Windows)

### Description

Discover iSCSI portals from Windows host(s). Map LUNs and write test data to them.

### Expected Result

<placeholder>

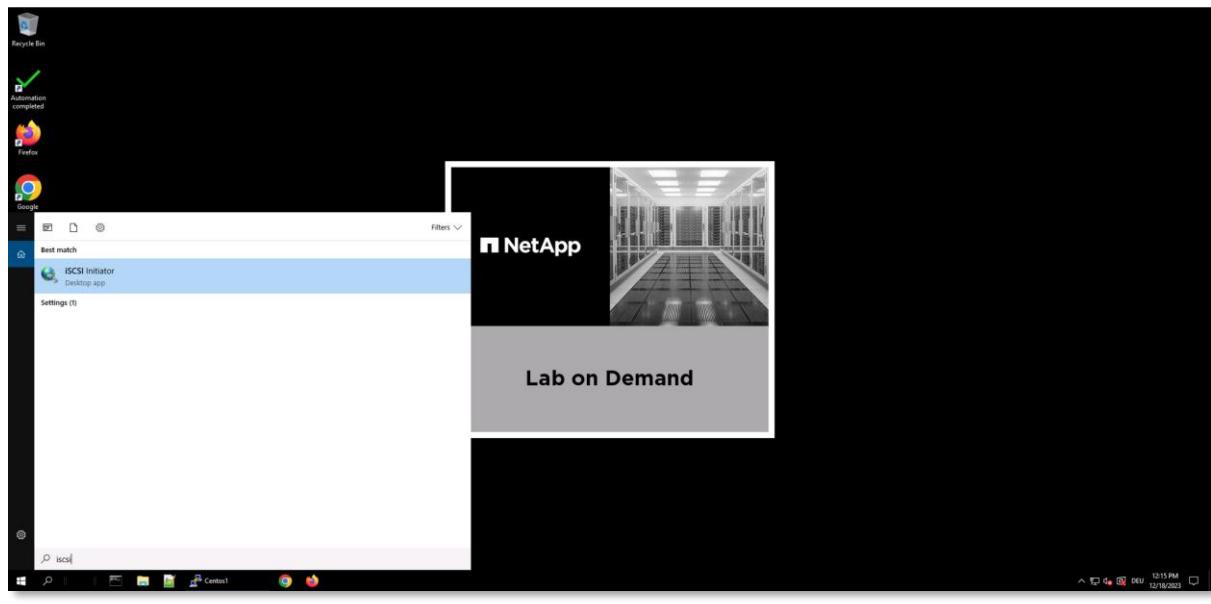
### Additional Information

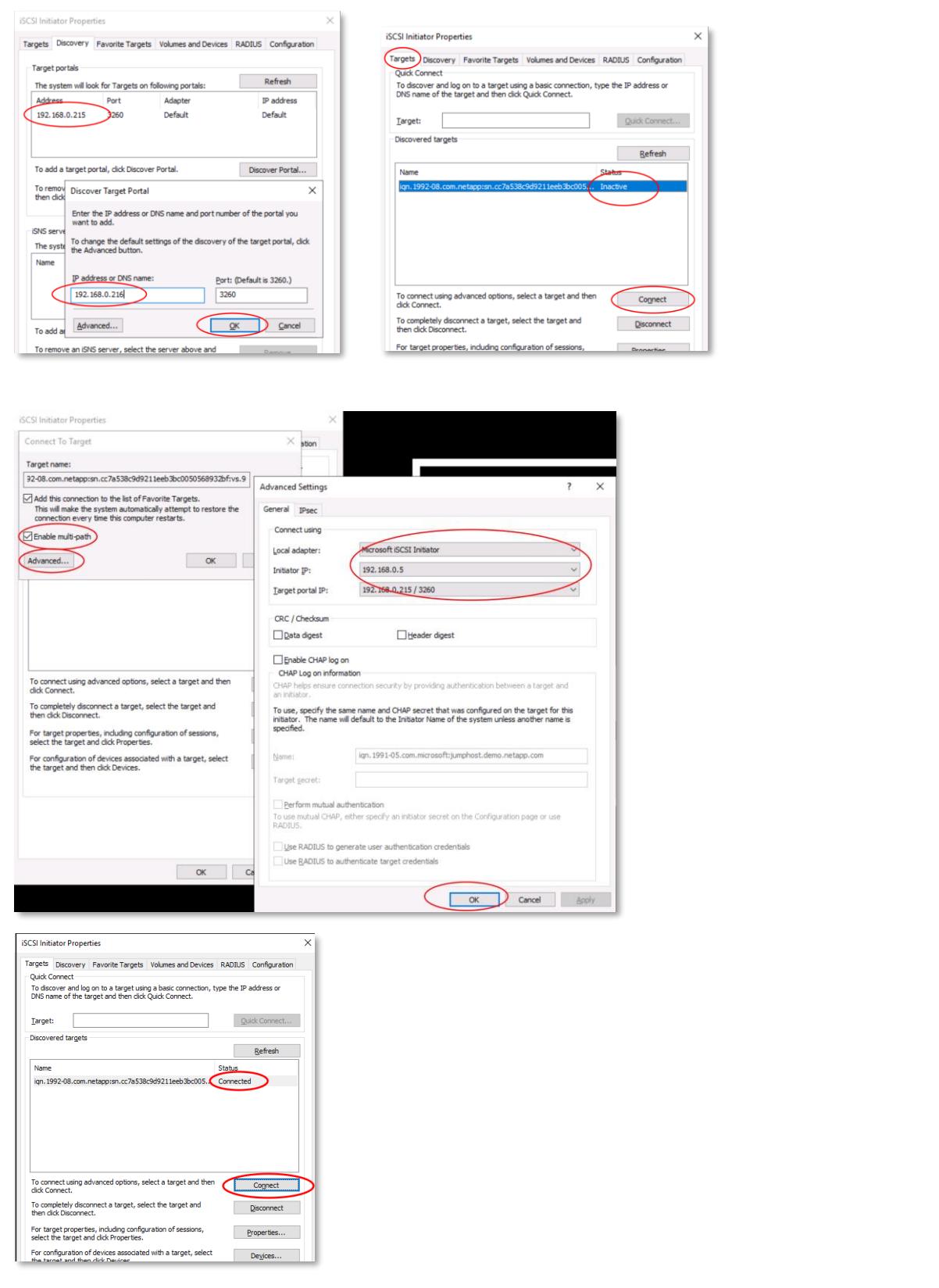
<placeholder>

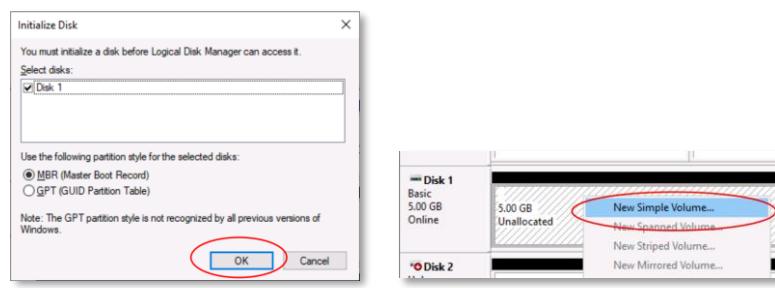
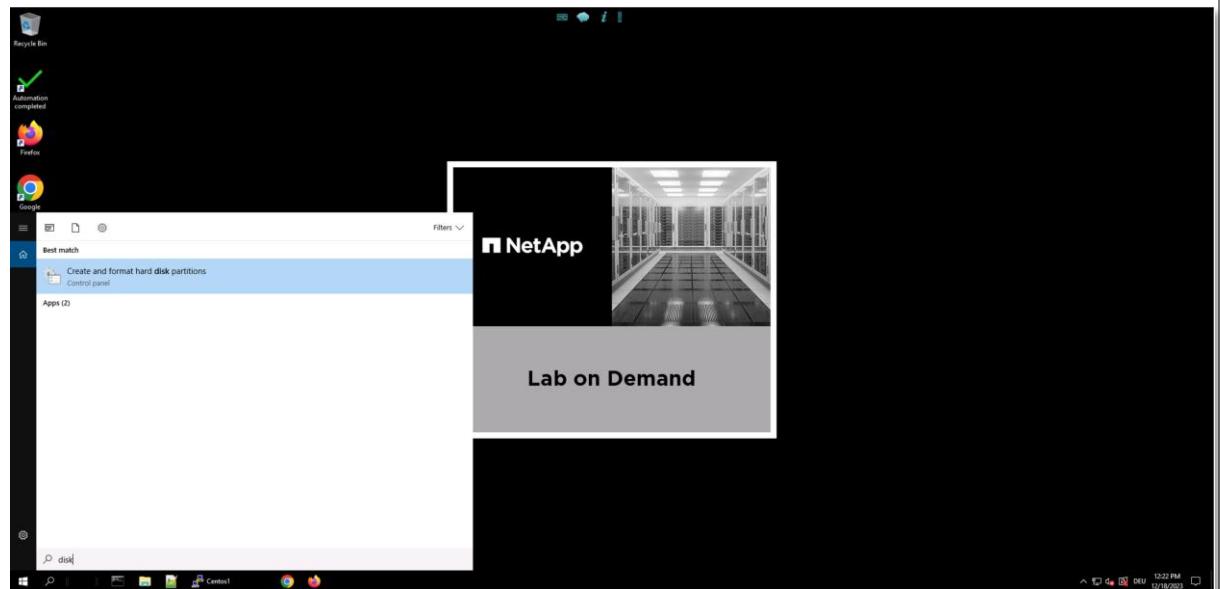
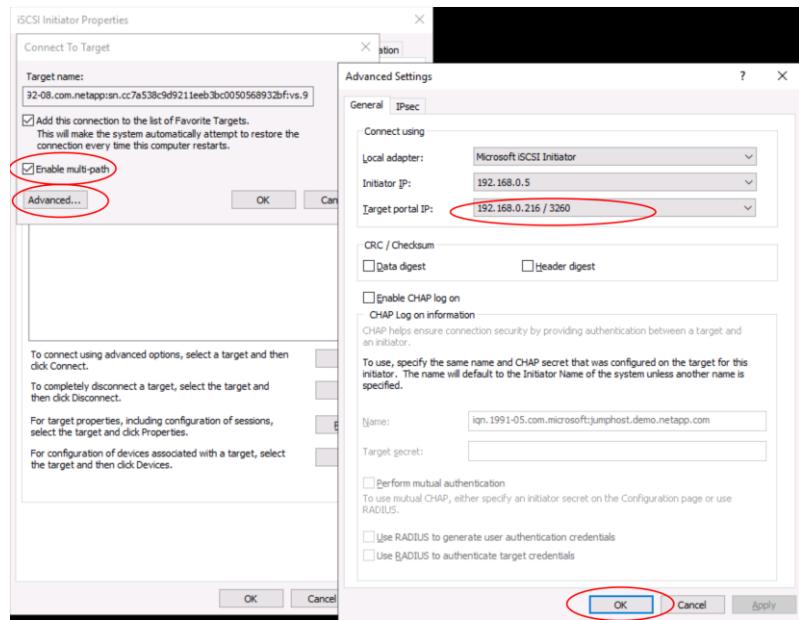
### Instructions

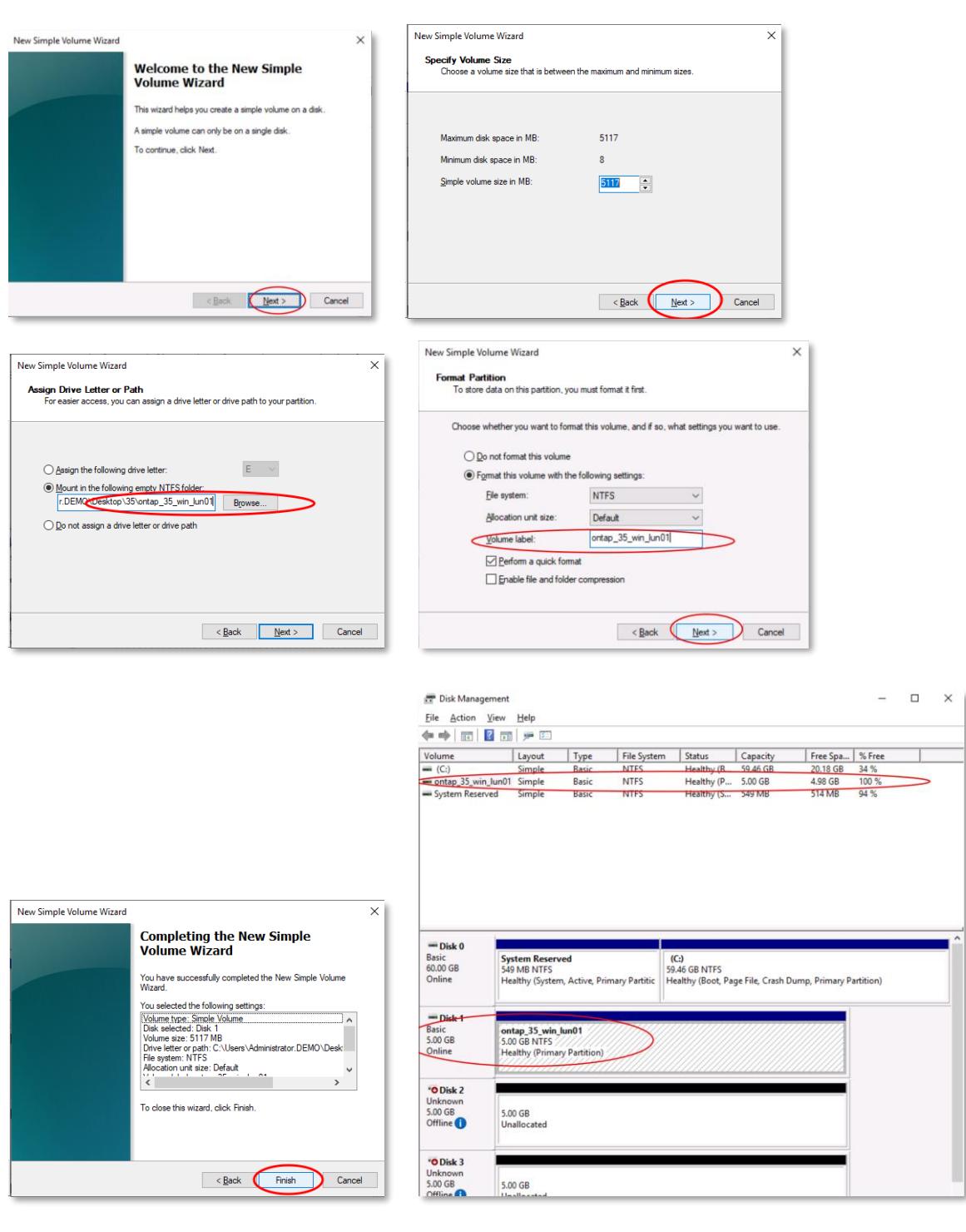
```
# on the Windows test host(s)
# Add iSCSI portals for target discovery
# Get iSCSI targets
# Connect iSCSI targets with multipathing enabled
# Initialize disks
# Create mount directories
# Format & mount disks
# Add ACLs to access disks
# Write test data
```

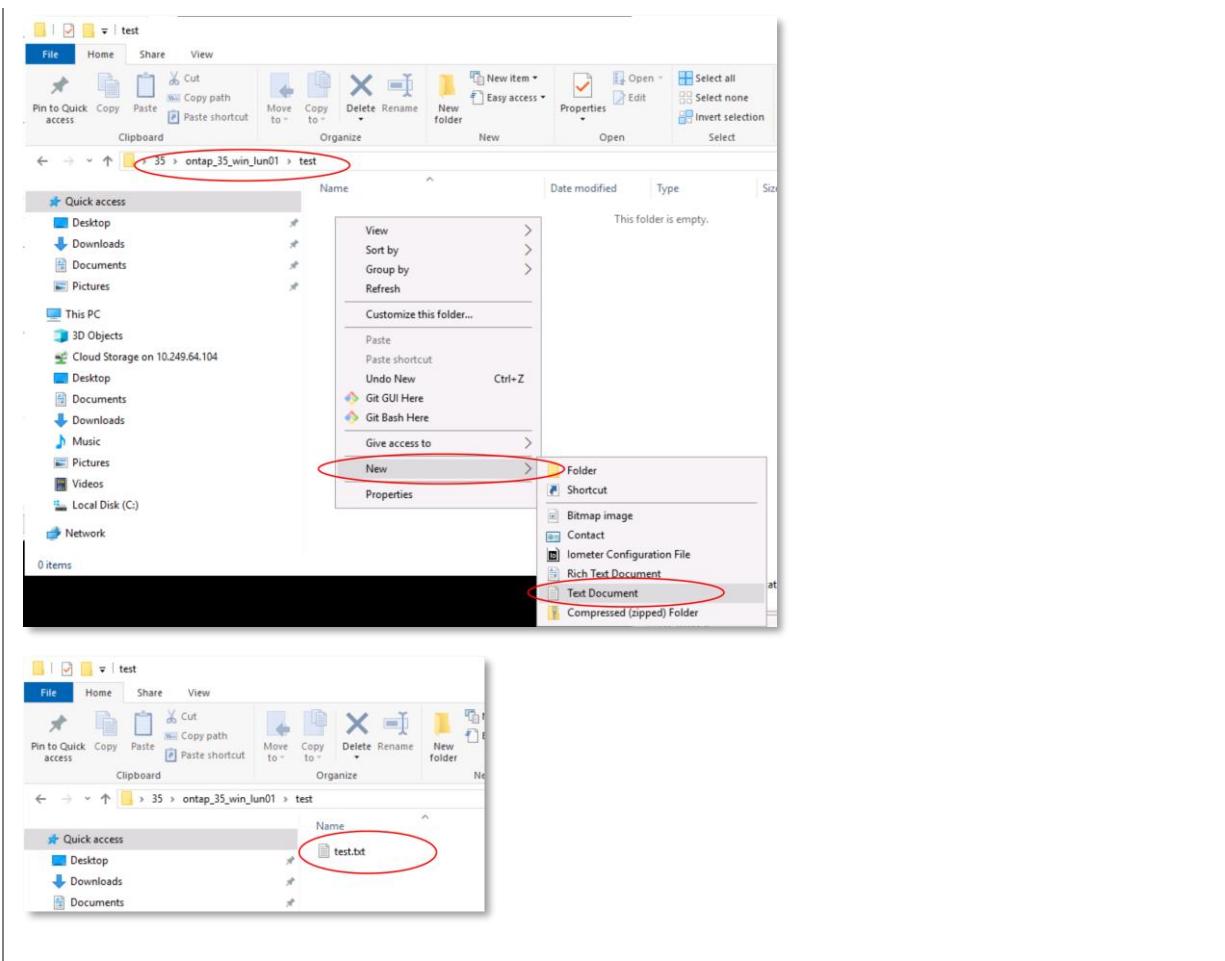
### Execution Example











## Verification Example

**iSCSI Initiator Properties**

- Targets
- Discovery
- Favorite Targets
- Volumes and Devices
- RADIUS
- Configuration

Quick Connect  
To discover and log on to a target using a basic connection, type the IP address or DNS name of the target and then click Quick Connect.

Target:  Quick Connect...

Discovered targets

Name	Status
ign.1992-08.com.netapp:sn:cz7a538c9d9211eeb3bc005...	Connected

To connect using advanced options, select a target and then click Connect.  
To completely disconnect a target, select the target and then click Disconnect.  
For target properties, including configuration of sessions, select the target and click Properties...  
For configuration of devices associated with a target, select the target and then click Devices...

**iSCSI Initiator Properties**

- Targets
- Discovery
- Favorite Targets
- Volumes and Devices
- RADIUS
- Configuration

Properties

Sessions

Identifier

- ffffbe0ee3143010-40000 1370000006
- ffffbe0ee3143010-40000 1370000007

Add session

Disconnect

Devices...

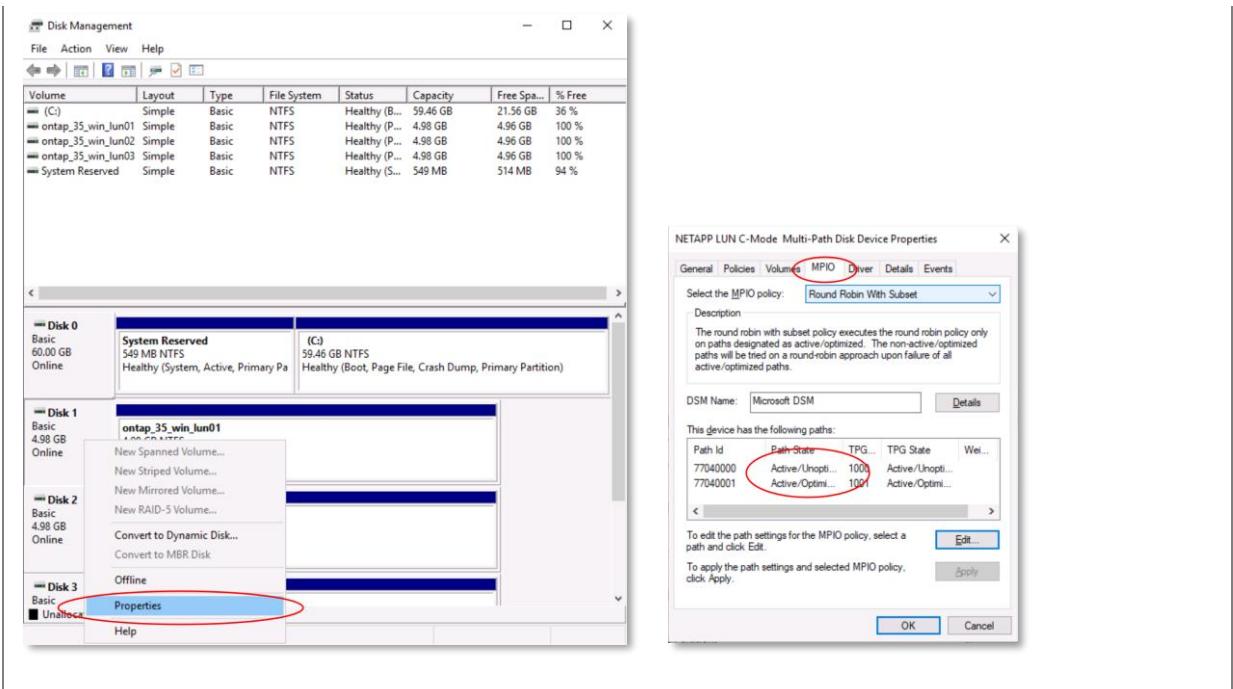
Session Information

Target portal group tag: 1029  
Status: Connected  
Connection count: 1  
Magnum Allowed Connections: 1  
Authentication: None Specified  
Header Digest: None Specified  
Data Digest: None Specified

Configure Multiple Connected Session (MCS)  
Target portal group tag: 1029  
Status: Connected  
Connection count: 1  
Magnum Allowed Connections: 1  
Authentication: None Specified  
Header Digest: None Specified  
Data Digest: None Specified

MCS...

OK Cancel



## ONTAP-37 – NVMe/TCP

### ONTAP-37-01 – Volumes

#### Description

Create volumes for storing host/client data.

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
# on the primary storage system
volume create -volume <volume item from ontap_37_lin_namespaces[item]> -vserver
<global_primary_san_svm> -size <ontap_default_vol_size_gb>GB -aggregate
<storage_aggregates[item].name>
```

#### Execution Example

```
# on the primary storage system
cluster1::> volume create -volume ontap_37_lin_vol01 -vserver ntap-svm02-san -size 10GB -
aggregate cluster1_02_aggr01
[Job 176] Job succeeded: Successful
cluster1::> volume create -volume ontap_37_lin_vol02 -vserver ntap-svm02-san -size 10GB -
aggregate cluster1_02_aggr01
[Job 177] Job succeeded: Successful
cluster1::> volume create -volume ontap_37_lin_vol03 -vserver ntap-svm02-san -size 10GB -
aggregate cluster1_02_aggr01
[Job 178] Job succeeded: Successful
```

#### Verification Example

```
# on the primary storage system
cluster1::> volume show -vserver ntap-svm02-san
Vserver      Volume       Aggregate     State      Type      Size   Available Used%
-----  -----
ntap-svm02-san
    ntap_svm02_san_root
        cluster1_01_aggr01
            online      RW      20MB    18.60MB    2%
ntap-svm02-san
    ontapss_37_lin_vol01
        cluster1_02_aggr01
            online      RW      10GB    9.50GB    0%
ntap-svm02-san
    ontap_37_lin_vol02
        cluster1_02_aggr01
            online      RW      10GB    9.50GB    0%
ntap-svm02-sanss
    ontap_37_lin_vol03
        cluster1_02_aggr01
            online      RW      10GB    9.50GB    0%
4 entries were displayed.
```

## ONTAP-37-02 – Namespaces

### Description

Create Namespaces for storing host/client data.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
nvme namespace create -vserver <global_primary_san_svm> -path <ontap_37_lin_namespaces[item]>
-size <ontap_default_ns_size_gb>GB -ostype linux
```

### Execution Example

```
# on the primary storage system
cluster1::> vservesr nvme namespace create -vserver ntap-svm02-san -path
/vol/ontap_37_lin_vol01/ontap_37_lin_ns01 -size 5GB -ostype linux
Created a namespace of size 5GB (5368709120).

cluster1::> vservesr nvme namespace create -vserver ntap-svm02-san -path
/vol/ontap_37_lin_vol02/ontap_37_lin_ns02 -size 5GB -ostype linux
Created a namespace of size 5GB (5368709120).

cluster1::> vservesr nvme namespace create -vserver ntap-svm02-san -path
/vol/ontap_37_lin_vol03/ontap_37_lin_ns03 -size 5GB -ostype linux
Created a namespace of size 5GB (5368709120).
```

### Verification Example

```
# on the primary storage system
cluster1::> nvme namespace show -vserver ntap-svm02-san
(vserver nvme namespace show)
Vserver Path State Size Subsystem NSID
-----
ntap-svm02-san
    /vol/ontap_37_lin_vol01/ontap_37_lin_ns01      online 5GB -
    /vol/ontap_37_lin_vol02/ontap_37_lin_ns02      online 5GB -
    /vol/ontap_37_lin_vol03/ontap_37_lin_ns03      online 5GB -
3 entries were displayed.ss
```

## ONTAP-37-03 – Subsystem

### Description

Create subsystem, add host(s) and map namespaces.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
vserver nvme subsystem create -vserver <global_primary_san_svm> -subsystem
<ontap_37_lin_subsystem_name> -ostype linux

vservesr nvme subsystem map add -vserver <global_primary_san_svm> -subsystem
<ontap_37_lin_subsystem_name> -path <ontap_37_lin_namespaces[item]>

vservesr nvme subsystem host add -vserver <global_primary_san_svm> -subsystem
<ontap_37_lin_subsystem_name> -host-nqn <nqn from /etc/nvme/hostnqn>
```

### Execution Example

```
# on the primary storage system
cluster1::> vserver nvme subsystem create -vserver ntap-svm02-san -subsystem
ontap_37_lin_subsys01 -ostype linux

cluster1::> vservesr nvme subsystem map add -vserver ntap-svm02-san -subsystem
ontap_37_lin_subsys01 -path /vol/ontap_37_lin_vol01/ontap_37_lin_ns01
cluster1::> vservesr nvme subsystem map add -vserver ntap-svm02-san -subsystem
ontap_37_lin_subsys01 -path /vol/ontap_37_lin_vol02/ontap_37_lin_ns02
cluster1::> vserver nvme subsystem map add -vserver ntap-svm02-san -subsystem
ontap_37_lin_subsys01 -path /vol/ontap_37_lin_vol03/ontap_37_lin_ns03

cluster1::> vserver nvme subsystem host add -vserver ntap-svm02-san -subsystem
ontap_37_lin_subsys01 -host-nqn nqn.2014-08.org.nvmeexpress:uuid:36ealc7d-e1c0-4fe9-baf1-
6e989df2d51b
```

### Verification Example

```
# on the primary storage system
cluster1::> vserver nvme subsystem show
Vserver Subsystem      Target NQN
-----
ntap-svm02-san
    ontap_37_lin_subsys01
        nqn.1992-
08.com.netapp:sn.cc7a538c9d9211eeb3bc0050568932bf:subsystem.ontap_37_lin_subsys01

cluster1::> nvme subsystem map show
  (vserver nvme subsystem map show)
Vserver      Subsystem      NSID Namespace Path
-----
ntap-svm02-san
    ontap_37_lin_subsys01
        00000001h /vol/ontap_37_lin_vol01/ontap_37_lin_ns01
        00000002h /vol/ontap_37_lin_vol02/ontap_37_lin_ns02
        00000003h /vol/ontap_37_lin_vol03/ontap_37_lin_ns03
3 entries were displayed.

cluster1::> nvme subsystem host show
  (vserver nvme subsystem host show)
Vserver Subsystem Host NQN
-----
ntap-svm02-san
    ontap_37_lin_subsys01
        nqn.2014-08.org.nvmeexpress:uuid:36ealc7d-e1c0-4fe9-baf1-6e989df2d51b
```

## ONTAP-37-04 – Mount & Write (Linux)

### Description

Discover NVMe subsystem portals from Linux host(s). Connect namespaces and write test data to them.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the Linux test host(s)
nvme discover -t tcp -a
<hostvars[global_primary_test_cluster].network_ip_interfaces[<nvme_interface_name>].ip.address
>

nvme connect-all -t tcp -a
<hostvars[global_primary_test_cluster].network_ip_interfaces[<nvme_interface_name>].ip.address
>

mkfs.ext4 <device path to namespace>

mkdir <linux_37_mount_dir>/<ontap_37_lin_ns_name>

mount -o discard <device path to LUN> <linux_35_mount_dir>/<ontap_35_lun_name>

dd if=/dev/urandom of=<linux_37_mount_dir>/<ontap_37_lin_ns_name>/testfile bs=1024KB count=50
```

### Execution Example

```
# on the Linux test host(s)
[root@centos1 ~]# nvme discover -t tcp -a 192.168.0.217

Discovery Log Number of Records 4, Generation counter 6
=====Discovery Log Entry 0=====
trtype: tcp
adrfam: ipv4
subtype: unrecognized
treq: not specified
portid: 0
trsvcid: 8009
subnqn: nqn.1992-08.com.netapp:sn.cc7a538c9d9211eeb3bc0050568932bf:discovery
traddr: 192.168.0.218
sectype: none
=====Discovery Log Entry 1=====
trtype: tcp
adrfam: ipv4
subtype: unrecognized
treq: not specified
portid: 1
trsvcid: 8009
subnqn: nqn.1992-08.com.netapp:sn.cc7a538c9d9211eeb3bc0050568932bf:discovery
traddr: 192.168.0.217
sectype: none
=====Discovery Log Entry 2=====
trtype: tcp
adrfam: ipv4
subtype: nvme subsystem
treq: not specified
portid: 0
trsvcid: 4420
subnqn: nqn.1992-
08.com.netapp:sn.cc7a538c9d9211eeb3bc0050568932bf:subsystem.ontap_37_lin_subs01
traddr: 192.168.0.218
sectype: none
=====Discovery Log Entry 3=====
trtype: tcp
```

```

adrfam: ipv4
subtype: nvme subsystem
treq: not specified
portid: 1
trsvcid: 4420
subnqn: nqn.1992-
08.com.netapp:sn.cc7a538c9d9211eeb3bc0050568932bf:subsystem.ontap_37_lin_subs01
traddr: 192.168.0.217
sectype: none

[root@centos1 ~]# nvme connect-all -t tcp -a 192.168.0.217
skipping unsupported subtype 3
skipping unsupported subtype 3

[root@centos1 ~]# mkfs.ext4 /dev/nvme0n1
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
[...]
Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
[root@centos1 ~]# mkfs.ext4 /dev/nvme0n2
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
[...]
Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
[root@centos1 ~]# mkfs.ext4 /dev/nvme0n3
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
[...]
Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done

[root@centos1 ~]# mkdir /mnt/ontap_test/37
[root@centos1 ~]# mkdir /mnt/ontap_test/37/ontap_37_lin_ns01
[root@centos1 ~]# mkdir /mnt/ontap_test/37/ontap_37_lin_ns02
[root@centos1 ~]# mkdir /mnt/ontap_test/37/ontap_37_lin_ns03

[root@centos1 ~]# mount -o discard /dev/nvme0n1 /mnt/ontap_test/37/ontap_37_lin_ns01
[root@centos1 ~]# mount -o discard /dev/nvme0n2 /mnt/ontap_test/37/ontap_37_lin_ns02
[root@centos1 ~]# mount -o discard /dev/nvme0n3 /mnt/ontap_test/37/ontap_37_lin_ns03

[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/37/ontap_37_lin_ns01/testfile
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.203579 s, 251 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/37/ontap_37_lin_ns02/testfile
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.183974 s, 278 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/37/ontap_37_lin_ns03/testfile
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.207503 s, 247 MB/s

```

## Verification Example

# on the Linux test host(s)			
[root@centos1 ~]# nvme list			
Node	SN	Model	Namespace Usage
Format	FW Rev		

```

----- ----- -----
/dev/nvme0n1    wOj4WNUh4EZCAAAAAAAC NetApp ONTAP Controller      1
5.37 GB / 5.37 GB   4 KiB + 0 B   FFFFFFFF
/dev/nvme0n2    wOj4WNUh4EZCAAAAAAAC NetApp ONTAP Controller      2
5.37 GB / 5.37 GB   4 KiB + 0 B   FFFFFFFF
/dev/nvme0n3    wOj4WNUh4EZCAAAAAAAC NetApp ONTAP Controller      3
5.37 GB / 5.37 GB   4 KiB + 0 B   FFFFFFFF

[root@centos1 ~]# nvme netapp ontapdevices
/dev/nvme0n1, Vserver ntap-svm02-san, Namespace Path
/vol/ontap_37_lin_vo101/ontap_37_lin_ns01, NSID 1, UUID c353aaa9-0e44-4e52-b7f4-57e091689643,
5.37GB
/dev/nvme0n2, Vserver ntap-svm02-san, Namespace Path
/vol/ontap_37_lin_vo102/ontap_37_lin_ns02, NSID 2, UUID 3b146160-4845-4171-a65f-56199f90a384,
5.37GB
/dev/nvme0n3, Vserver ntap-svm02-san, Namespace Path
/vol/ontap_37_lin_vo103/ontap_37_lin_ns03, NSID 3, UUID 4fe46a9f-07a0-46ed-a540-7af0b8ccf92f,
5.37GB

[root@centos1 ~]# nvme list-subsys /dev/nvme0n1
nvme-subsy0 - NQN=nqn.1992-
08.com.netapp:sn.cc7a538c9d9211eeb3bc0050568932bf:subsystem.ontap_37_lin_subs01
 \
 +- nvme0 tcp traddr=192.168.0.218 trsvcid=4420 live optimized
 +- nvme1 tcp traddr=192.168.0.217 trsvcid=4420 live non-optimized

[root@centos1 ~]# ls -laR /mnt/ontap_test/37/
/mnt/ontap_test/37/:
total 12
drwxr-xr-x 5 root root 81 Dec 18 16:48 .
drwxr-xr-x. 3 root root 16 Dec 18 16:48 ..
drwxr-xr-x 3 root root 4096 Dec 18 16:52 ontap_37_lin_ns01
drwxr-xr-x 3 root root 4096 Dec 18 16:52 ontap_37_lin_ns02
drwxr-xr-x 3 root root 4096 Dec 18 16:53 ontap_37_lin_ns03

/mnt/ontap_test/37/ontap_37_lin_ns01:
total 50020
drwxr-xr-x 3 root root 4096 Dec 18 16:52 .
drwxr-xr-x 5 root root 81 Dec 18 16:48 ..
drwx----- 2 root root 16384 Dec 18 16:46 lost+found
-rw-r--r-- 1 root root 51200000 Dec 18 16:52 testfile

/mnt/ontap_test/37/ontap_37_lin_ns01/lost+found:
total 20
drwx----- 2 root root 16384 Dec 18 16:46 .
drwxr-xr-x 3 root root 4096 Dec 18 16:52 ..

/mnt/ontap_test/37/ontap_37_lin_ns02:
total 50020
drwxr-xr-x 3 root root 4096 Dec 18 16:52 .
drwxr-xr-x 5 root root 81 Dec 18 16:48 ..
drwx----- 2 root root 16384 Dec 18 16:46 lost+found
-rw-r--r-- 1 root root 51200000 Dec 18 16:52 testfile

/mnt/ontap_test/37/ontap_37_lin_ns02/lost+found:
total 20
drwx----- 2 root root 16384 Dec 18 16:46 .
drwxr-xr-x 3 root root 4096 Dec 18 16:52 ..

/mnt/ontap_test/37/ontap_37_lin_ns03:
total 50020
drwxr-xr-x 3 root root 4096 Dec 18 16:53 .
drwxr-xr-x 5 root root 81 Dec 18 16:48 ..
drwx----- 2 root root 16384 Dec 18 16:46 lost+found
-rw-r--r-- 1 root root 51200000 Dec 18 16:53 testfile

/mnt/ontap_test/37/ontap_37_lin_ns03/lost+found:
total 20
drwx----- 2 root root 16384 Dec 18 16:46 .
drwxr-xr-x 3 root root 4096 Dec 18 16:53 ..

```

## ONTAP-41 – Cloning (NFS)

### ONTAP-41-01 – Export Policies & Rules

#### Description

Create export policies & rules to control host access to provisioned storage resources.

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
vserver export-policy create -vserver <global_primary_nas_svm> -policyname  
ro_<global_primary_nas_svm>  
  
vserver export-policy rule create -vserver <global_primary_nas_svm>  
ro_<global_primary_nas_svm> -protocol nfs -clientmatch <hosts[linux]> -rorule any -rwrule none  
-superuser none -allow-suid false  
  
volume modify -vserver <global_primary_nas_svm> -volume <global_primary_nas_svm>_root -policy  
ro_<global_primary_nas_svm>  
  
vserver export-policy create -vserver <global_primary_nas_svm> -policyname  
<ontap_41_policy_name>  
  
vserver export-policy rule create -vserver <global_primary_nas_svm> -policyname  
<ontap_41_policy_name> -protocol nfs -clientmatch <hosts[linux]> -rorule any -rwrule any -  
superuser any -allow-suid true
```

#### Execution Example

```
cluster1::> vserver export-policy create -vserver ntap-svm01-nas -policyname ro_ntap-svm01-nas  
cluster1::> vserver export-policy rule create -vserver ntap-svm01-nas -policyname ro_ntap-  
svm01-nas -protocol nfs -clientmatch centos1.demo.netapp.com -rorule any -rwrule none -  
superuser none -allow-suid false  
cluster1::> volume modify -vserver ntap-svm01-nas -volume ntap_svm01_nas_root -policy ro_ntap-  
svm01-nas  
Volume modify successful on volume ntap_svm01_nas_root of Vserver ntap-svm01-nas.  
  
cluster1::> vserver export-policy create -vserver ntap-svm01-nas -policyname ontap_41_policy  
cluster1::> vserver export-policy rule create -vserver ntap-svm01-nas -policyname  
ontap_41_policy -protocol nfs -clientmatch centos1.demo.netapp.com -rorule any -rwrule any -  
superuser any -allow-suid true
```

#### Verification Example

```
cluster1::> vserver export-policy rule show -vserver ntap-svm01-nas  
Policy          Rule     Access   Client           RO  
Vserver        Name      Index    Protocol Match     Rule  
-----  
ntap-svm01-nas  
          ontap_41_policy 1      nfs      centos1.demo.netapp.  any  
                           com  
ntap-svm01-nas  
          ro_ntap-svm01-nas 1      nfs      centos1.demo.netapp.  any  
                           com  
2 entries were displayed.  
  
cluster1::> volume show -vserver ntap-svm01-nas -fields policy  
vserver      volume      policy  
-----  
ntap-svm01-nas  ntap_svm01_nas_root  ro_ntap-svm01-nas
```

## ONTAP-41-02 – Origin Volume

### Description

Create volume for storing host/client data.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
volume create -volume <ontap_41_vol_name> -vserver <global_primary_nas_svm> -size  
<ontap_default_vol_size_gb>GB -aggregate <storage_aggregates[item].name> -junction-path  
</ontap_41_vol_name> -policy ro_<global_primary_nas_svm> -security-style unix
```

### Execution Example

```
cluster1::> volume create -volume ontap_41_nfs_vol01 -vserver ntap-svm01-nas -size 10GB -  
aggregate cluster1_01_aggr01 -junction-path /ontap_41_nfs_vol01 -policy ontap_41_policy -  
security-style unix  
[Job 224] Job succeeded: Successful
```

### Verification Example

```
cluster1::> volume show -vserver ntap-svm01-nas  
Vserver      Volume      Aggregate      State      Type      Size      Available Used%  
-----  
ntap-svm01-nas  
          ntap_svm01_nas_root  
                      cluster1_02_aggr01  
                                online      RW      20MB      18.17MB      4%  
ntap-svm01-nas  
          ontap_41_nfs_vol01  
                      cluster1_01_aggr01  
                                online      RW      10GB      9.50GB      0%  
2 entries were displayed.
```

## ONTAP-41-03 – Mount & Write (Origin Volume)

### Description

Access provisioned volume from a UNIX host via NFS and write data to it.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the Linux test host(s)
mkdir -p <linux_41_mount_dir>/<ontap_41_vol_name>

mount -t nfs <global_primary_nas_svm>:/<ontap_41_vol_name>
<linux_41_mount_dir>/<ontap_41_vol_name>

dd if=/dev/urandom
of=<linux_41_mount_dir>/<ontap_41_vol_name>/<ontap_41_snapshot_name>_original_<timestamp>
bs=1024KB count=50
```

### Execution Example

```
[root@centos1 ~]# mkdir -p /mnt/ontap_test/41/ontap_41_vol01

[root@centos1 ~]# mount -t nfs ntap-svm01-nas.demo.netapp.com:/ontap_41_nfs_vol01
/mnt/ontap_test/41/ontap_41_vol01

[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/41/ontap_41_vol01/software_source_original_$(date +%Y%m%d_%H%M%S) bs=1024KB
count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.526544 s, 97.2 MB/s
```

### Verification Example

```
[root@centos1 ~]# mount | grep ntap-svm01-nas.demo.netapp.com
ntap-svm01-nas.demo.netapp.com:/ontap_41_nfs_vol01 on /mnt/ontap_test/41/ontap_41_vol01 type
nfs4
(rw,relatime,vers=4.0,rsize=65536,wszie=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)

[root@centos1 ~]# ls -la /mnt/ontap_test/41/ontap_41_vol01/
total 50208
drwxr-xr-x 2 nobody nobody 4096 Dec 19 14:05 .
drwxr-xr-x 3 root root 28 Dec 19 14:01 ..
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:01 software_source_original_20231219_140133
```

## ONTAP-41-04 – Mount & Write (Origin Volume)

### Description

Create an additional file in the provisioned volume from the UNIX host.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the Linux test host(s)
dd if=/dev/urandom
of=<linux_41_mount_dir>/<ontap_41_vol_name>/<ontap_41_snapshot_name>_extraop_<timestamp>
bs=1024KB count=50
```

### Execution Example

```
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/41/ontap_41_vol01/software_source_extraop_$(date +%Y%m%d_%H%M%S) bs=1024KB
count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.684099 s, 74.8 MB/s
```

### Verification Example

```
[root@centos1 ~]# ls -la /mnt/ontap_test/41/ontap_41_vol01/
total 100412
drwxr-xr-x 2 nobody nobody 4096 Dec 19 14:07 .
drwxr-xr-x 3 root root 28 Dec 19 14:01 ..
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:01 software_source_original_20231219_140133
```

## ONTAP-41-05 – Clone Volume

### Description

Create a FlexClone of the origin volume.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
volume snapshot create -vserver <global_primary_nas_svm> -volume <ontap_41_vol_name> -snapshot <ontap_41_snapshot_name>

volume create -vserver <global_primary_nas_svm> -volume <ontap_41_clone_dir_name> -aggregate <storage_aggregates[item].name> -policy ro_<global_primary_nas_svm> -junction-path /<ontap_41_clone_dir_name>

volume clone create -vserver <global_primary_nas_svm> -flexclone <ontap_41_clone_vol_name> -parent-volume <ontap_41_vol_name> -parent-snapshot <ontap_41_snapshot_name> -junction-path /<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>
```

### Execution Example

```
cluster1::> volume snapshot create -vserver ntap-svm01-nas -volume ontap_41_nfs_vol01 -snapshot software_source

cluster1::> volume create -vserver ntap-svm01-nas -volume clonedir -aggregate cluster1_01_aggr01 -policy ro_ntap-svm01-nas -parent-snapshot software_source -junction-path /clonedir
[Job 289] Job succeeded: Successful

cluster1::> volume clone create -vserver ntap-svm01-nas -flexclone software_source -parent-volume ontap_41_nfs_vol01 -junction-path /clonedir/software_source
[Job 299] Job succeeded: Successful
```

### Verification Example

```
cluster1::> volume snapshot show -vserver ntap-svm01-nas -volume ontap_41_nfs_vol01
                                         ---Blocks---
Vserver   Volume   Snapshot                               Size Total% Used%
-----  -----
ntap-svm01-nas
    ontap_41_nfs_vol01
        hourly.2023-12-19_0905
        software_source
2 entries were displayed.

cluster1::> volume show -vserver ntap-svm01-nas -fields clone-parent-name,junction-path
vserver      volume   junction-path clone-parent-name
-----  -----
ntap-svm01-nas clonedir /clonedir      -
ntap-svm01-nas ntap_svm01_nas_root      /
ntap-svm01-nas ontap_41_nfs_vol01      /ontap_41_nfs_vol01
                                         -
ntap-svm01-nas software_source
                                         /clonedir/software_source
                                         ontap_41_nfs_vol01
4 entries were displayed.
```

## ONTAP-41-06 – Mount & Write (Clone)

### Description

Access cloned volume from a UNIX host via NFS and write data to it.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the Linux test host(s)
mkdir -p <linux_41_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>

mount -t nfs <global_primary_nas_svm>:<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>
<linux_41_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>

dd if=/dev/urandom
of=<linux_41_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>/newop_<timestamp>
bs=1024KB count=50
```

### Execution Example

```
[root@centos1 ~]# mkdir -p /mnt/ontap_test/41/clonedir/software_source

[root@centos1 ~]# mount -t nfs ntap-svm01-nas.demo.netapp.com:/clonedir/software_source
/mnt/ontap_test/41/clonedir/software_source

[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/41/clonedir/software_source/newop_$(date +%Y%m%d_%H%M%S) bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.653956 s, 78.3 MB/s
```

### Verification Example

```
[root@centos1 ~]# mount | grep ntap-svm01-nas.demo.netapp.com
ntap-svm01-nas.demo.netapp.com:/ontap_41_nfs_vo101 on /mnt/ontap_test/41/ontap_41_vo101 type
nfs4
(rw,relatime,vers=4.0,rsize=65536,wszie=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source on
/mnt/ontap_test/41/clonedir/software_source type nfs4
(rw,relatime,vers=4.0,rsize=65536,wszie=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)

[root@centos1 ~]# ls -laR /mnt/ontap_test/41/
/mnt/ontap_test/41/:
total 4
drwxr-xr-x 4 root root 44 Dec 19 16:15 .
drwxr-xr-x 4 root root 32 Dec 19 13:51 ..
drwxr-xr-x 3 root root 29 Dec 19 16:15 clonedir
drwxr-xr-x 2 nobody nobody 4096 Dec 19 14:07 ontap_41_vo101

/mnt/ontap_test/41/clonedir:
total 4
drwxr-xr-x 3 root root 29 Dec 19 16:15 .
drwxr-xr-x 4 root root 44 Dec 19 16:15 ..
drwxr-xr-x 2 nobody nobody 4096 Dec 19 16:16 software_source

/mnt/ontap_test/41/clonedir/software_source:
total 150616
drwxr-xr-x 2 nobody nobody 4096 Dec 19 16:16 .
drwxr-xr-x 3 root root 29 Dec 19 16:15 ..
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 16:16 newop_20231219_161623
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:01 software_source_original_20231219_140133
```

```
/mnt/ontap_test/41/ontap_41_vol01:  
total 100412  
drwxr-xr-x 2 nobody nobody 4096 Dec 19 14:07 .  
drwxr-xr-x 4 root root 44 Dec 19 16:15 ..  
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:07 software_source_extraop_20231219_140736  
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:01 software_source_original_20231219_140133
```

## ONTAP-41-07 – Client Write (Clone)

### Description

Create an additional file in the cloned volume from the UNIX host.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the Linux test host(s)
dd if=/dev/urandom
of=<linux_41_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>/extraop_<timestamp>
> bs=1024KB count=50
```

### Execution Example

```
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/41/clonedir/software_source/extraop_$(date +%Y%m%d_%H%M%S) bs=1024KB
count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.735212 s, 69.6 MB/s
```

### Verification Example

```
[root@centos1 ~]# ls -laR /mnt/ontap_test/41
/mnt/ontap_test/41:
total 4
drwxr-xr-x 4 root root 44 Dec 19 16:15 .
drwxr-xr-x. 4 root root 32 Dec 19 13:51 ..
drwxr-xr-x 3 root root 29 Dec 19 16:15 clonedir
drwxr-xr-x 2 nobody nobody 4096 Dec 19 14:07 ontap_41_vo101

/mnt/ontap_test/41/clonedir:
total 4
drwxr-xr-x 3 root root 29 Dec 19 16:15 .
drwxr-xr-x 4 root root 44 Dec 19 16:15 ..
drwxr-xr-x 2 nobody nobody 4096 Dec 19 16:26 software_source

/mnt/ontap_test/41/clonedir/software_source:
total 200820
drwxr-xr-x 2 nobody nobody 4096 Dec 19 16:26 .
drwxr-xr-x 3 root root 29 Dec 19 16:15 ..
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 16:26 extraop_20231219_162610
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 16:16 newop_20231219_161623
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/ontap_41_vo101:
total 100412
drwxr-xr-x 2 nobody nobody 4096 Dec 19 14:07 .
drwxr-xr-x 4 root root 44 Dec 19 16:15 ..
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r-- 1 nobody nobody 51200000 Dec 19 14:01 software_source_original_20231219_140133
```

## ONTAP-41-08 – Clone & Write (Loop)

### Description

Repeat step 5 & 6 multiple times.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
volume clone create -vserver <global_primary_nas_svm> -flexclone  
<ontap_41_clone_vol_name>_<##> -parent-volume <ontap_41_vol_name> -junction-path  
/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>_<##>  
  
# on the Linux test host(s)  
mkdir -p <linux_41_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>_<##>  
  
mount -t nfs  
<global_primary_nas_svm>:<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>_<##>  
<linux_41_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>_<##>  
  
dd if=/dev/urandom  
of=<linux_41_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>_<##>/moreops_<time  
stamp> bs=1024KB count=50
```

### Execution Example

```
[cluster1::> volume clone create -vserver ntap-svm01-nas -flexclone software_source_01 -parent-  
volume ontap_41_nfs_vol01 -parent-snapshot software_source -junction-path  
/clonedir/software_source_01  
[Job 303] Job succeeded: Successful  
  
[root@centos1 ~]# mkdir -p /mnt/ontap_test/41/clonedir/software_source_01  
  
[root@centos1 ~]# mount -t nfs ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_01  
/mnt/ontap_test/41/clonedir/software_source_01  
  
[root@centos1 ~]# dd if=/dev/urandom  
of=/mnt/ontap_test/41/clonedir/software_source_01/newop_$(date +%Y%m%d_%H%M%S) bs=1024KB  
count=50  
50+0 records in  
50+0 records out  
51200000 bytes (51 MB) copied, 0.592058 s, 86.5 MB/s
```

### Verification Example

```
[root@centos1 ~]# mount | grep ntap-svm01-nas.demo.netapp.com  
ntap-svm01-nas.demo.netapp.com:/ontap_41_nfs_vol01 on /mnt/ontap_test/41/ontap_41_vol01 type  
nfs4  
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se  
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)  
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source on  
/mnt/ontap_test/41/clonedir/software_source type nfs4  
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se  
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)  
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_01 on  
/mnt/ontap_test/41/clonedir/software_source_01 type nfs4  
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se  
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)  
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_02 on  
/mnt/ontap_test/41/clonedir/software_source_02 type nfs4  
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se  
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)  
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_03 on  
/mnt/ontap_test/41/clonedir/software_source_03 type nfs4
```

```

(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_04 on
/mnt/ontap_test/41/clonedir/software_source_04 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_05 on
/mnt/ontap_test/41/clonedir/software_source_05 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_06 on
/mnt/ontap_test/41/clonedir/software_source_06 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_07 on
/mnt/ontap_test/41/clonedir/software_source_07 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_08 on
/mnt/ontap_test/41/clonedir/software_source_08 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_09 on
/mnt/ontap_test/41/clonedir/software_source_09 type nfs4
(rw,relatime,vers=4.0,rsize=65536,wsize=65536,namlen=255,hard,proto=tcp,timeo=600,retrans=2,se
c=sys,clientaddr=192.168.0.61,local_lock=none,addr=192.168.0.211)
[root@centos1 ~]# ls -laR /mnt/ontap_test/41/
/mnt/ontap_test/41/:
total 4
drwxr-xr-x  4 root    root     44 Dec 19 16:15 .
drwxr-xr-x  . 4 root    root     32 Dec 19 13:51 ..
drwxr-xr-x 12 root    root    263 Dec 19 17:23 clonedir
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 14:07 ontap_41_volo1

/mnt/ontap_test/41/clonedir:
total 40
drwxr-xr-x 12 root    root     263 Dec 19 17:23 .
drwxr-xr-x  4 root    root     44 Dec 19 16:15 ..
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 16:26 software_source
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:21 software_source_01
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:24 software_source_02
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:24 software_source_03
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:24 software_source_04
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:25 software_source_05
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:25 software_source_06
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:25 software_source_07
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:25 software_source_08
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:25 software_source_09

/mnt/ontap_test/41/clonedir/software_source:
total 200820
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 16:26 .
drwxr-xr-x 12 root    root    263 Dec 19 17:23 ..
-rw-r----  1 nobody  nobody  51200000 Dec 19 16:26 extraop_20231219_162610
-rw-r----  1 nobody  nobody  51200000 Dec 19 16:16 newop_20231219_161623
-rw-r----  1 nobody  nobody  51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r----  1 nobody  nobody  51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/clonedir/software_source_01:
total 150616
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:21 .
drwxr-xr-x 12 root    root    263 Dec 19 17:23 ..
-rw-r----  1 nobody  nobody  51200000 Dec 19 17:21 newop_20231219_172101
-rw-r----  1 nobody  nobody  51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r----  1 nobody  nobody  51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/clonedir/software_source_02:
total 150616
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:24 .
drwxr-xr-x 12 root    root    263 Dec 19 17:23 ..
-rw-r----  1 nobody  nobody  51200000 Dec 19 17:24 newop_20231219_172447
-rw-r----  1 nobody  nobody  51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r----  1 nobody  nobody  51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/clonedir/software_source_03:
total 150616
drwxr-xr-x  2 nobody  nobody  4096 Dec 19 17:24 .

```

```

drwxr-xr-x 12 root      root          263 Dec 19 17:23 ..
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 17:24 newop_20231219_172452
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/clonedir/software_source_04:
total 150616
drwxr-xr-x  2 nobody    nobody   4096 Dec 19 17:24 .
drwxr-xr-x 12 root      root          263 Dec 19 17:23 ..
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 17:24 newop_20231219_172457
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/clonedir/software_source_05:
total 150616
drwxr-xr-x  2 nobody    nobody   4096 Dec 19 17:25 .
drwxr-xr-x 12 root      root          263 Dec 19 17:23 ..
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 17:25 newop_20231219_172502
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/clonedir/software_source_06:
total 150616
drwxr-xr-x  2 nobody    nobody   4096 Dec 19 17:25 .
drwxr-xr-x 12 root      root          263 Dec 19 17:23 ..
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 17:25 newop_20231219_172508
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/clonedir/software_source_07:
total 150616
drwxr-xr-x  2 nobody    nobody   4096 Dec 19 17:25 .
drwxr-xr-x 12 root      root          263 Dec 19 17:23 ..
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 17:25 newop_20231219_172513
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/clonedir/software_source_08:
total 150616
drwxr-xr-x  2 nobody    nobody   4096 Dec 19 17:25 .
drwxr-xr-x 12 root      root          263 Dec 19 17:23 ..
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 17:25 newop_20231219_172519
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/clonedir/software_source_09:
total 150616
drwxr-xr-x  2 nobody    nobody   4096 Dec 19 17:25 .
drwxr-xr-x 12 root      root          263 Dec 19 17:23 ..
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 17:25 newop_20231219_172524
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:01 software_source_original_20231219_140133

/mnt/ontap_test/41/ontap_41_vol01:
total 100412
drwxr-xr-x  2 nobody    nobody   4096 Dec 19 14:07 .
drwxr-xr-x  4 root      root          44 Dec 19 16:15 ..
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:07 software_source_extraop_20231219_140736
-rw-r--r--  1 nobody    nobody   51200000 Dec 19 14:01 software_source_original_20231219_140133

```

## ONTAP-42 – Quality of Service

### ONTAP-42-01 – QoS Policy

#### Description

Create a Quality of Service policy to specify minimum and maximum throughput and IOPS on an object.

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
# on the primary storage system
qos policy-group create -vserver <global_primary_nas_svm> -policy-group
<ontap_42_qos_policy_name> -min-throughput 100iops,1MB/s -max-throughput 1000iops,10MB/s
```

#### Execution Example

```
# on the primary storage system
cluster1::> qos policy-group create -vserver ntap-svm01-nas -policy-group ontap_42_qos_policy
-min-throughput 100iops,1MB/s -max-throughput 1000iops,10MB/s
```

#### Verification Example

```
# on the primary storage system
cluster1::> qos policy-group show -vserver ntap-svm01-nas
Name          Vserver      Class        Wklds Throughput   Is Shared
-----
ontap_42_qos_policy
          ntap-svm01-nas      user-defined 0    100IOPS,1MB/s-1000IOPS,10MB/s
                                         true
```

## ONTAP-42-02 – Volumes

### Description

Create volumes with and without QoS policy.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
volume create -volume <ontap_42_vol_name> -vserver <global_primary_nas_svm> -size
<ontap_default_vol_size_gb>GB -aggregate <storage_aggregates[item].name> -junction-path
/<ontap_42_vol_name> -policy ro_<global_primary_nas_svm> -security-style unix

volume create -volume <ontap_42_qos_vol_name> -vserver <global_primary_nas_svm> -size
<ontap_default_vol_size_gb>GB -aggregate <storage_aggregates[item].name> -junction-path
/<ontap_42_qos_vol_name> -policy ro_<global_primary_nas_svm> -security-style unix
```

### Execution Example

```
# on the primary storage system
cluster1::> volume create -volume ontap_42_noqos_vol01 -vserver ntap-svm01-nas -size 10GB -
aggregate cluster1_01_aggr01 -junction-path /ontap_42_noqos_vol01 -policy ro_ntap-svm01-nas -
security-style unix
[Job 894] Job succeeded: Successful

cluster1::> volume create -volume ontap_42_qos_vol01 -vserver ntap-svm01-nas -size 10GB -
aggregate cluster1_01_aggr01 -junction-path /ontap_42_qos_vol01 -policy ro_ntap-svm01-nas -
security-style unix -qos-policy-group ontap_42_qos_policy
[Job 899] Job succeeded: Successful
```

### Verification Example

```
# on the primary storage system
cluster1::> volume show -vserver ntap-svm01-nas -fields qos-policy-group
vserver          volume           qos-policy-group
----- -----
ntap-svm01-nas  ntap_svm01_nas_root  -
ntap-svm01-nas  ontap_42_noqos_vol01  -
                           -
ntap-svm01-nas  ontap_42_qos_vol01  ontap_42_qos_policy
3 entries were displayed.
```

## ONTAP-42-03 – Prepare Filesystem

### Description

Create qtrees, export policies, rules, and shares on volumes for test host access.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
vserver export-policy create -vserver <global_primary_nas_svm> -policyname
<ontap_42_policy_name>

vserver export-policy rule create -vserver <global_primary_nas_svm> -policyname
<ontap_42_policy_name> -protocol nfs -clientmatch <hosts[linux]> -rorule any -rwrule any -
superuser any -allow-suid true

volume qtree create -vserver <global_primary_nas_svm> -volume
<ontap_42_vol_name|ontap_42_qos_vol_name> -qtree
<ontap_42_vol_name|ontap_42_qos_vol_name><ontap_42_nfs_suffix> -security-style unix -export-
policy <ontap_42_policy_name>

volume qtree create -vserver <global_primary_nas_svm> -volume
<ontap_42_vol_name|ontap_42_qos_vol_name> -qtree
<ontap_42_vol_name|ontap_42_qos_vol_name><ontap_42_cifs_suffix> -security-style ntfs

vserver cifs share create -vserver <global_primary_nas_svm> -share-name
<ontap_42_vol_name|ontap_42_qos_vol_name><ontap_42_cifs_suffix> -path
/<ontap_42_vol_name|ontap_42_qos_vol_name>/<ontap_42_vol_name|ontap_42_qos_vol_name><ontap_42-
cifs_suffix> -share-properties browsable,changenotify,oplocks,show-previous-
versions,showsnapshot

vserver cifs share access-control delete -vserver <global_primary_nas_svm> -share
<ontap_42_vol_name|ontap_42_qos_vol_name><ontap_42_cifs_suffix> -user-or-group Everyone

vserver cifs share access-control create -vserver <global_primary_nas_svm> -share
<ontap_42_vol_name|ontap_42_qos_vol_name><ontap_42_cifs_suffix> user-or-group
<ontap_42_ad_admin_group> -user-group-type windows -permission Full_Control

vserver cifs share access-control create -vserver <global_primary_nas_svm> -share
<ontap_42_vol_name|ontap_42_qos_vol_name><ontap_42_cifs_suffix> -user-or-group
<ontap_42_ad_ro_group> -user-group-type windows -permission Read

# on the Linux test host(s)
mkdir -p <linux_42_mount_dir>/<ontap_42_vol_name|ontap_42_qos_vol_name><ontap_42_nfs_suffix>

mount -t nfs
<global_primary_nas_svm>:<linux_42_mount_dir>/<ontap_42_vol_name|ontap_42_qos_vol_name><ontap-
_42_nfs_suffix>
<linux_42_mount_dir>/<ontap_42_vol_name|ontap_42_qos_vol_name><ontap_42_nfs_suffix>
```

### Execution Example

```
# on the primary storage system
cluster1::> vserver export-policy create -vserver ntap-svm01-nas -policyname ontap_42_policy
cluster1::> vserver export-policy rule create -vserver ntap-svm01-nas -policyname
ontap_42_policy -protocol nfs -clientmatch centos1.demo.netapp.com -rorule any -rwrule any -
superuser any -allow-suid true

cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_42_noqos_vol01 -qtree
ontap_42_noqos_vol01_nfs_qt01 -security-style unix -export-policy ontap_42_policy
Info: the newly configured qtree export policies may not be enforced on existing NFS mount
points.

cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_42_qos_vol01 -qtree
ontap_42_qos_vol01_nfs_qt01 -security-style unix -export-policy ontap_42_policy
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_42_noqos_vol01 -qtree
```

```

ontap_42_noqos_vol01_cifs_qt01 -security-style ntfs
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_42_qos_vol01 -qtree
ontap_42_qos_vol01_cifs_qt01 -security-style ntfs

cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name
ontap_42_noqos_vol01_cifs_qt01 -path /ontap_42_noqos_vol01/ontap_42_noqos_vol01_cifs_qt01 -
share-properties browsable,changednotify,oplocks,show-previous-versions,showssnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name
ontap_42_qos_vol01_cifs_qt01 -path /ontap_42_qos_vol01/ontap_42_qos_vol01_cifs_qt01 -share-
properties browsable,changednotify,oplocks,show-previous-versions,showssnapshot
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_42_noqos_vol01_cifs_qt01 -user-or-group Everyone
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_42_qos_vol01_cifs_qt01 -user-or-group Everyone
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_42_noqos_vol01_cifs_qt01 -user-or-group DEMO\na_ad_admin_group -user-group-type windows
-permission full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_42_qos_vol01_cifs_qt01 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -
permission full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_42_noqos_vol01_cifs_qt01 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -
permission Read
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_42_qos_vol01_cifs_qt01 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -
permission Read

# on the Linux test host(s)
[root@centos1 ~]# mkdir -p /mnt/ontap_test/42/ontap_42_noqos_vol01_nfs_qt01
[root@centos1 ~]# mkdir -p /mnt/ontap_test/42/ontap_42_qos_vol01_nfs_qt01

[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_42_noqos_vol01/ontap_42_noqos_vol01_nfs_qt01
/mnt/ontap_test/42/ontap_42_noqos_vol01_nfs_qt01
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_42_qos_vol01/ontap_42_qos_vol01_nfs_qt01
/mnt/ontap_test/42/ontap_42_qos_vol01_nfs_qt01

```

## Verification Example

n/a

## ONTAP-42-04 – Client Write

### Description

Write test data to qtrees on each volume to compare write speed.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the Linux test host(s)
dd if=/dev/urandom
of=<linux_42_mount_dir>/<ontap_42_vol_name|ontap_42_qos_vol_name><ontap_42_nfs_suffix>/testfil
e bs=1024KB count=100
```

### Execution Example

```
# on the Linux test host(s)
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/42/ontap_42_noqos_vol01_nfs_qt01/testfile bs=1024KB count=100
100+0 records in
100+0 records out
102400000 bytes (102 MB) copied, 1.33327 s, 76.8 MB/s
[root@centos1 ~]# dd if=/dev/urandom
of=/mnt/ontap_test/42/ontap_42_qos_vol01_nfs_qt01/testfile bs=1024KB count=100
100+0 records in
100+0 records out
102400000 bytes (102 MB) copied, 9.74573 s, 10.5 MB/s
```

### Verification Example

n/a

## ONTAP-51 – Local Versioning (Snapshots)

### ONTAP-51-01 – Custom Policy

#### Description

Create a custom snapshot policy for creating scheduled snapshots on a volume.

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
volume snapshot policy create -policy <ontap_51_snap_policy_name> -vserver  
<global_primary_nas_svm> -enabled true -schedule1 10min -count1 6 -prefix1 10min_
```

#### Execution Example

```
cluster1::> volume snapshot policy create -policy ontap_51_snap_policy -vserver ntap-svm01-nas  
-enabled true -schedule1 10min -count1 6 -prefix1 10min_
```

#### Verification Example

```
cluster1::> volume snapshot policy show -vserver ntap-svm01-nas  
Vserver: ntap-svm01-nas  
Policy Name Number of Is  
Schedules Enabled Comment  
-----  
ontap_51_snap_policy 1 true -  
Schedule Count Prefix SnapMirror Label Retention Period  
-----  
10min 6 10min_- - 0 seconds
```

## ONTAP-51-02 – Prepare Filesystem

### Description

Prepare test storage and clients for snapshot testing:

- Volume
- Qtrees
- Client Access
- Test Files

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
vserver export-policy create -vserver <global_primary_nas_svm> -policyname
<ontap_51_policy_name>

vserver export-policy rule create -vserver <global_primary_nas_svm> -policyname
<ontap_51_policy_name> -protocol nfs -clientmatch <hosts[linux]> -rорule any -rwrule any -
superuser any -allow-suid true

volume create -volume <ontap_51_vol_name> -vserver <global_primary_nas_svm> -size
<ontap_default_vol_size_gb>GB -aggregate <storage_aggregates[item].name> -junction-path
/<ontap_51_vol_name> -policy ro <global_primary_nas_svm> -security-style unix

volume qtree create -vserver <global_primary_nas_svm> -volume <ontap_51_vol_name> -qtree
<ontap_51_lin_qtree_name> -security-style unix -export-policy <ontap_51_policy_name>

volume qtree create -vserver <global_primary_nas_svm> -volume <ontap_51_vol_name> -qtree
<ontap_51_win_qtree_name> -security-style ntfs

vserver cifs share create -vserver <global_primary_nas_svm> -share-name
<ontap_51_win_qtree_name> -path /<ontap_51_vol_name>/<ontap_51_win_qtree_name> -share-
properties browsable,changedontifsys,oplocks,show-previous-versions,showsnapshot

vserver cifs share access-control delete -vserver <global_primary_nas_svm> -share
<ontap_51_win_qtree_name> -user-or-group Everyone

vserver cifs share access-control create -vserver <global_primary_nas_svm> -share
<ontap_51_win_qtree_name> -user-or-group <ontap_51_ad_admin_group> -user-group-type windows -
permission Full_Control

vserver cifs share access-control create -vserver <global_primary_nas_svm> -share
<ontap_51_win_qtree_name> -user-or-group <ontap_51_ad_ro_group> -user-group-type windows -
permission Read

# on the Linux test host(s)
mkdir -p <linux_51_mount_dir>/<ontap_51_lin_qtree_name>

mount -t nfs <global_primary_nas_svm>:<linux_51_mount_dir>/<ontap_51_lin_qtree_name>
<linux_51_mount_dir>/<ontap_51_lin_qtree_name>

dd if=/dev/urandom of=<linux_51_mount_dir>/<ontap_51_lin_qtree_name>/testfile01 bs=1024KB
count=50

# on the Windows test host(s)

# Create mount directory

# Connect/link network shares

# Provide login credentials
```

```
# Acces shares and write test data
```

## Execution Example

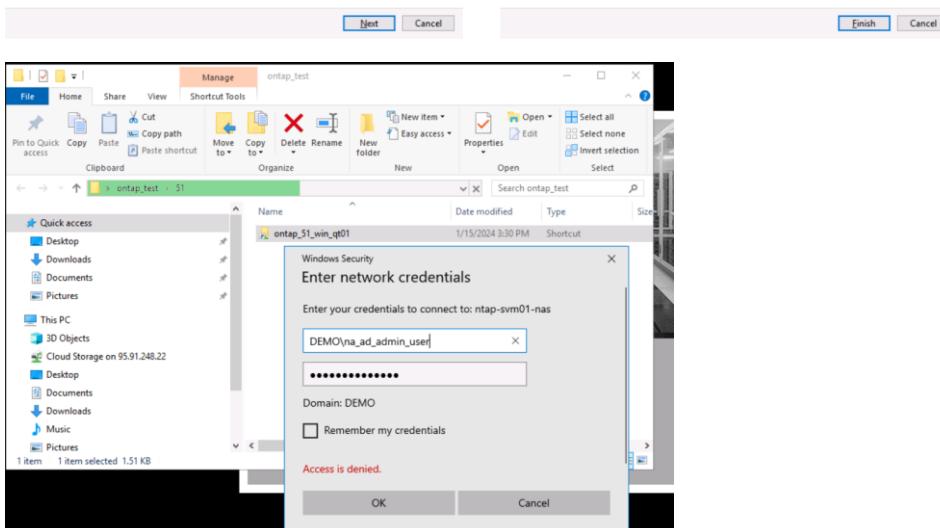
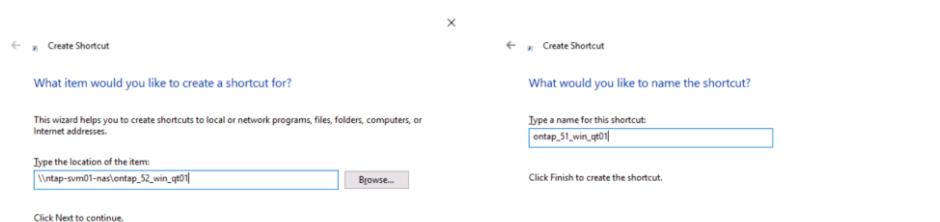
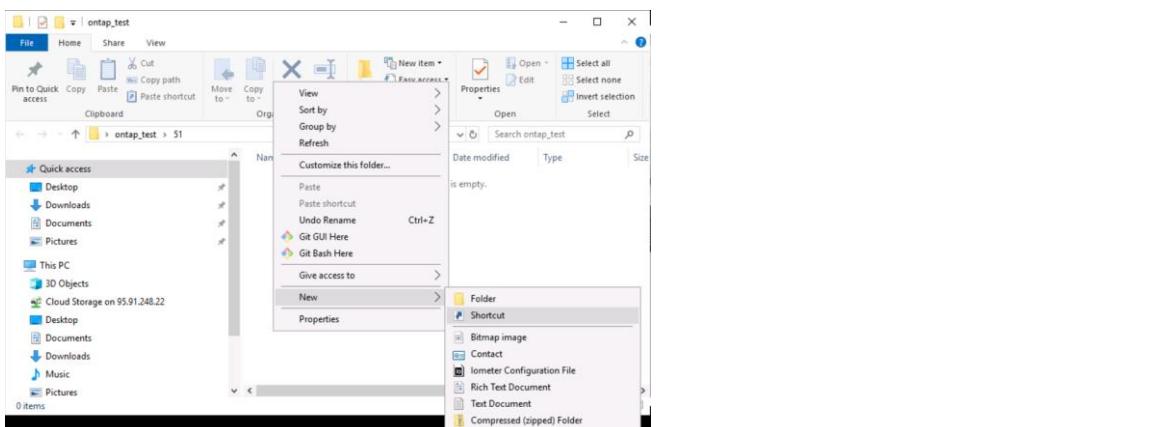
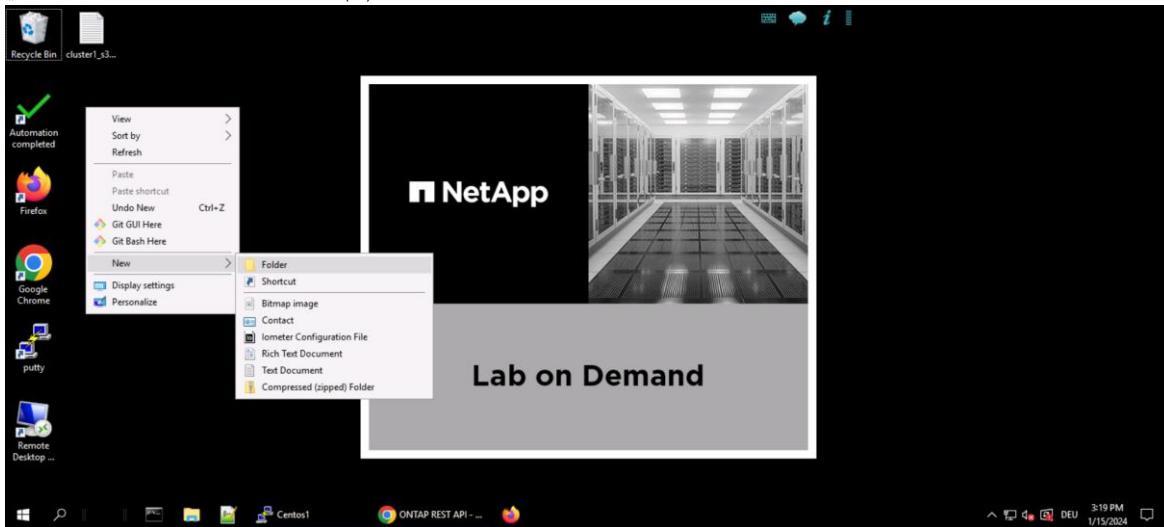
```
# on the primary storage system
cluster1::> vserver export-policy create -vserver ntap-svm01-nas -policyname ontap_51_policy
cluster1::> vserver export-policy rule create -vserver ntap-svm01-nas -policyname
ontap_51_policy -protocol nfs -clientmatch centos1.demo.netapp.com -rorule any -rwrule any -
superuser any -allow-suid true

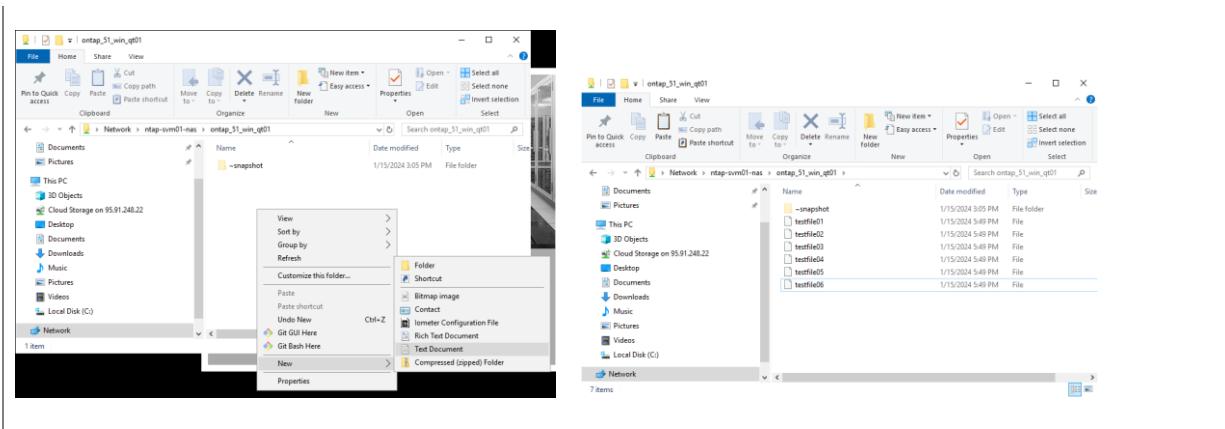
cluster1::> volume create -volume ontap_51_vo101 -vserver ntap-svm01-nas -size 10GB -aggregate
cluster1_01_aggr01 -junction-path /ontap_51_vo101 -policy ro_ntap-svm01-nas -security-style
unix
[Job 579] Job succeeded: Successful
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_51_vo101 -qtree
ontap_51_lin_qt01 -security-style unix -export-policy ontap_51_policy
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_51_vo101 -qtree
ontap_51_win_qt01 -security-style ntfs

cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_51_win_qt01 -
path /ontap_51_vo101/ontap_51_win_qt01 -share-properties browsable,changednotify,oplocks,show-
previous-versions,showsnapshot
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_51_win_qt01 -user-or-group Everyone
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_51_win_qt01 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_51_win_qt01 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read

# on the Linux test host(s)
[root@centos1 ~]# mkdir -p /mnt/ontap_test/51/ontap_51_lin_qt01
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_51_vo101/ontap_51_lin_qt01 /mnt/ontap_test/51/ontap_51_lin_qt01
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/51/ontap_51_lin_qt01/testfile01
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.350125 s, 146 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/51/ontap_51_lin_qt01/testfile02
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.681591 s, 75.1 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/51/ontap_51_lin_qt01/testfile03
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.755003 s, 67.8 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/51/ontap_51_lin_qt01/testfile04
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.348313 s, 147 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/51/ontap_51_lin_qt01/testfile05
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.636386 s, 80.5 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/51/ontap_51_lin_qt01/testfile06
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.844409 s, 60.6 MB/s
```

```
# on the Windows test host(s)
```





## Verification Example

n/a

## ONTAP-51-03 – Snapshot

### Description

Create a point in time snapshot to protect current state of filesystem.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
volume snapshot create -vserver <global_primary_nas_svm> -volume <ontap_51_vol_name> -snapshot  
<ontap_51_snapshot_name>
```

### Execution Example

```
cluster1::> volume snapshot create -vserver ntap-svm01-nas -volume ontap_51_vol01 -snapshot  
ontap_51_snapshot
```

### Verification Example

```
cluster1::> volume snapshot list -vserver ntap-svm01-nas -volume ontap_51_vol01  
-----  
Vserver   Volume   Snapshot           ---Blocks---  
-----  
ntap-svm01-nas  
    ontap_51_vol01  
        hourly.2024-01-15_0805      180KB    0%    0%  
        hourly.2024-01-15_0905      200KB    0%    0%  
        hourly.2024-01-15_1005      276KB    0%    0%  
        hourly.2024-01-15_1105      140KB    0%    0%  
        hourly.2024-01-15_1205      184KB    0%    0%  
        hourly.2024-01-15_1305      152KB    0%    0%  
        ontap_51_snapshot          136KB    0%    0%  
7 entries were displayed.
```

## ONTAP-51-04 – Delete Files

### Description

Delete some of the previously created files and confirm they still exist in previously created snapshot.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the Linux test host(s)
rm <linux_51_mount_dir>/<ontap_51_lin_qtree_name>/testfile0{1-3}

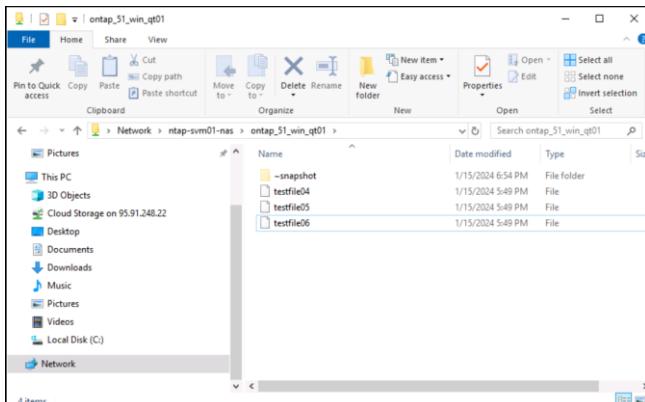
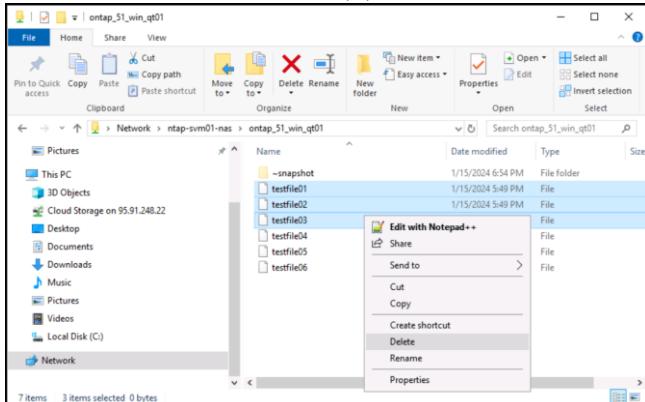
# on the Windows test host(s)

# Delete some of the previously created files
```

### Execution Example

```
# on the Linux test host(s)
[root@centos1 ~]# rm /mnt/ontap_test/51/ontap_51_lin_qt01/testfile0{1..3}
rm: remove regular file '/mnt/ontap_test/51/ontap_51_lin_qt01/testfile01'? y
rm: remove regular file '/mnt/ontap_test/51/ontap_51_lin_qt01/testfile02'? y
rm: remove regular file '/mnt/ontap_test/51/ontap_51_lin_qt01/testfile03'? y
```

# on the Windows test host(s)



### Verification Example

```
[root@centos1 ~]# ls -la /mnt/ontap_test/51/ontap_51_lin_qt01/
total 150616
```

```
drwxr-xr-x 2 nobody nobody      4096 Jan 15 18:58 .
drwxr-xr-x 3 root    root       31 Jan 15 15:15 ..
-rw-r--r-- 1 nobody nobody 51200000 Jan 15 15:39 testfile04
-rw-r--r-- 1 nobody nobody 51200000 Jan 15 15:39 testfile05
-rw-r--r-- 1 nobody nobody 51200000 Jan 15 15:39 testfile06
```

## ONTAP-51-05 – Access Snapshot

### Description

Access snapshot to view a previous version of the file system.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
volume show -vserver <global_primary_nas_svm> -fields snapdir-access

# on the Linux test host(s)
ls -laR <linux_51_mount_dir>/<ontap_51_lin_qtree_name>/.snapshot/ontap_51_snapshot

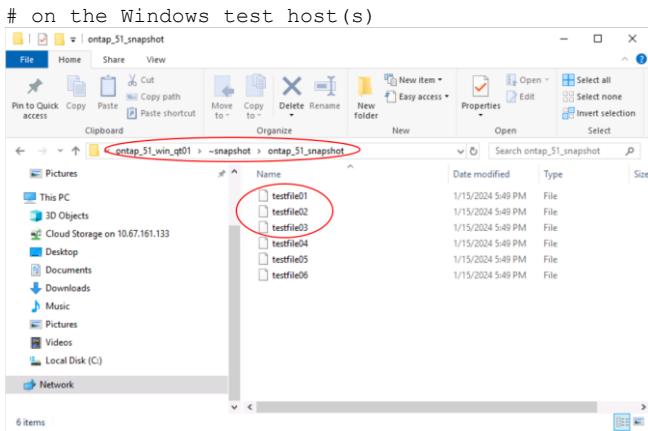
# on the Windows test host(s)
# List content of the Snapshot directory
# Show previous versions of top level folder
```

### Execution Example

```
# on the primary storage system
cluster1::> volume show -vserver ntap-svm01-nas -fields snapdir-access
vserver          volume           snapdir-access
-----
ntap-svm01-nas  ntap_svm01_nas_root  true
ntap-svm01-nas  ontap_51_vol01     true
2 entries were displayed.

# on the Linux test host(s)
[root@centos1 ~]# ls -laR /mnt/ontap_test/51/ontap_51_lin_qt01/.snapshot/ontap_51_snapshot
/mnt/ontap_test/51/ontap_51_lin_qt01/.snapshot/ontap_51_snapshot:
total 301232
drwxr-xr-x  2 nobody nobody    4096 Jan 15 15:39 .
drwxrwxrwx 10 nobody nobody    4096 Jan 16 07:05 ..
-rw-r--r--  1 nobody nobody 51200000 Jan 15 15:39 testfile01
-rw-r--r--  1 nobody nobody 51200000 Jan 15 15:39 testfile02
-rw-r--r--  1 nobody nobody 51200000 Jan 15 15:39 testfile03
-rw-r--r--  1 nobody nobody 51200000 Jan 15 15:39 testfile04
-rw-r--r--  1 nobody nobody 51200000 Jan 15 15:39 testfile05
-rw-r--r--  1 nobody nobody 51200000 Jan 15 15:39 testfile06

# on the Windows test host(s)
```



### Verification Example

n/a

## ONTAP-51-06 – Restore Snapshot

### Description

Restore entire volume from snapshot to recover all deleted files.

### Expected Result

<placeholder>

### Additional Information

Analytics have to be re-enabled after restoring a volume from a snapshot.

### Instructions

```
volume snapshot restore -vserver <global_primary_nas_svm> -volume <ontap_51_vol_name> -  
snapshot <ontap_51_snapshot_name>  
  
volume analytics on -vserver <global_primary_nas_svm> -volume <ontap_51_vol_name>  
  
# on primary Linux test host(s)  
ls -laR <linux_51_mount_dir>/<ontap_51_lin_qtree_name>  
  
# on primary Windows test host(s)  
# Review files in previously created share
```

### Execution Example

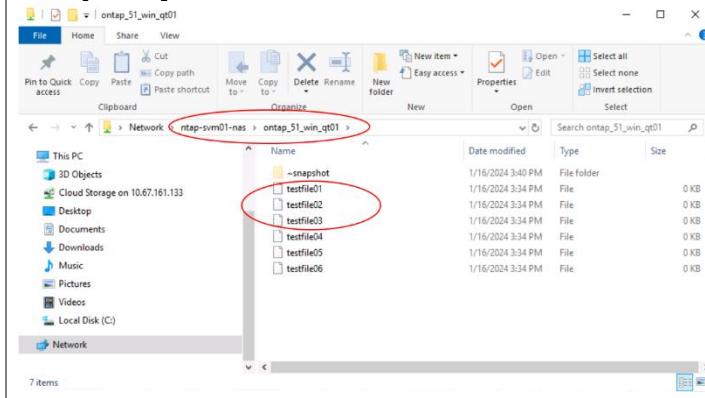
```
cluster1::> volume snapshot restore -vserver ntap-svm01-nas -volume ontap_51_vol01 -snapshot  
ontap_51_snapshot  
  
Warning: Quota rules currently enforced on volume "ontap_51_vol01" might change  
during this operation. If the currently enforced quota rules are  
different from those in Snapshot copy "ontap_51_snapshot", you might  
have to resize or reinitialize quotas on this volume after this  
operation.  
Do you want to continue? {y|n}: y  
  
Warning: Export policies currently enforced on the qtrees of volume  
"ontap_51_vol01" will not change during this operation. If the  
currently enforced export policies are different from those in  
Snapshot copy "ontap_51_snapshot", reassign the export policies of the  
qtrees on this volume after this operation.  
Do you want to continue? {y|n}: y  
  
Warning: File system analytics is currently turned on for volume  
"ontap_51_vol01". It will be turned off for the volume during this  
operation. Use the "volume analytics on -vserver ntap-svm01-nas  
-volume ontap_51_vol01" command to turn file system analytics back on  
for the volume after the operation is complete.  
Do you want to continue? {y|n}: y  
  
cluster1::> volume analytics on -vserver ntap-svm01-nas -volume ontap_51_vol01  
  
Info: File system analytics has been enabled on volume "ontap_51_vol01" in Vserver "ntap-  
svm01-nas". It will take time to initialize  
file system analytics data for this volume. The more files that are on the volume, the  
longer it will take. Use the "volume  
analytics show -vserver ntap-svm01-nas -volume ontap_51_vol01" command to check that the  
analytics "-state" is "on".
```

### Verification Example

```
cluster1::> volume show -vserver ntap-svm01-nas -volume ontap_51_vol01 -fields analytics-  
state,activity-tracking-state  
vserver      volume      analytics-state activity-tracking-state  
-----  -----  
ntap-svm01-nas  ontap_51_vol01  on          on
```

```
# on primary Linux test host(s)
[root@centos1 ~]# ls -laR /mnt/ontap_test/51/ontap_51_lin_qt01
/mnt/ontap_test/51/ontap_51_lin_qt01:
total 294172
dr-x---x-- 2 nobody nobody 4096 Jan 16 15:34 .
drwxr-xr-x 3 root root 31 Jan 16 15:33 ..
-rw-r--r-- 1 nobody nobody 50000000 Jan 16 15:34 testfile01
-rw-r--r-- 1 nobody nobody 50000000 Jan 16 15:34 testfile02
-rw-r--r-- 1 nobody nobody 50000000 Jan 16 15:34 testfile03
-rw-r--r-- 1 nobody nobody 50000000 Jan 16 15:34 testfile04
-rw-r--r-- 1 nobody nobody 50000000 Jan 16 15:34 testfile05
-rw-r--r-- 1 nobody nobody 50000000 Jan 16 15:34 testfile06
```

# on primary Windows test host(s)



## ONTAP-52 – Backup (SnapMirror)

### ONTAP-52-01 – SVM Peering

#### Description

Establish peering relationships between source and target SVMs.

#### Expected Result

<placeholder>

#### Additional Information

<placeholder>

#### Instructions

```
# on the primary storage system
vserver peer create -vserver <global_primary_nas_svm|global_primary_san_svm> -peer-vserver
<global_primary_backup_svm> -applications snapmirror -peer-cluster
<global_secondary_test_cluster>

# on the secondary storage system
vserver peer accept -vserver <global_primary_backup_svm> -peer-vserver
<global_primary_nas_svm|global_primary_san_svm>
```

#### Execution Example

```
# on the primary storage system
cluster1::> vserver peer create -vserver ntap-svm01-nas -peer-vserver ntap-svm03-backup -
applications snapmirror -peer-cluster cluster2

Info: [Job 826] 'vserver peer create' job queued

cluster1::> vserver peer create -vserver ntap-svm02-san -peer-vserver ntap-svm03-backup -
applications snapmirror -peer-cluster cluster2

Info: [Job 827] 'vserver peer create' job queued

# on the secondary storage system
cluster2::> vserver peer accept -vserver ntap-svm03-backup -peer-vserver ntap-svm01-nas

Info: [Job 598] 'vserver peer accept' job queued

cluster2::> vserver peer accept -vserver ntap-svm03-backup -peer-vserver ntap-svm02-san

Info: [Job 599] 'vserver peer accept' job queued
```

#### Verification Example

```
# on the primary storage system
cluster1::> vserver peer show
      Peer          Peer          Peering          Remote
Vserver    Vserver    State     Peer Cluster   Applications   Vserver
-----
ntap-svm01-nas
      ntap-svm03-backup
          peered
      cluster2           snapmirror       ntap-svm03-backup
ntap-svm02-san
      ntap-svm03-backup
          peered
      cluster2           snapmirror       ntap-svm03-backup
2 entries were displayed.

# on the secondary storage system
cluster2::> vserver peer show
      Peer          Peer          Peering          Remote
Vserver    Vserver    State     Peer Cluster   Applications   Vserver
-----
ntap-svm03-backup
      ntap-svm01-nas
```

ntap-svm03-backup	peered	cluster1	snapmirror	ntap-svm01-nas
ntap-svm02-san	peered	cluster1	snapmirror	ntap-svm02-san
2 entries were displayed.				

## ONTAP-52-02 – Custom Policies

### Description

Create custom snapshot and SnapMirror policies to replicate scheduled as well as adhoc snapshots in later steps.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
volume snapshot policy create -vserver <global_primary_nas_svm> -policy
<ontap_52_snap_policy_name> -enabled true -schedule1 5min -count1 6 -prefix1 5min_ -
snapmirror-label1 <ontap_52_snapm_sched_label>

# on the secondary storage system
snapmirror policy create -vserver <global_primary_backup_svm> -policy
<ontap_52_snapm_policy_name> -type mirror-vault

snapmirror policy add-rule -vserver <global_primary_backup_svm> -policy
<ontap_52_snapm_policy_name> -snapmirror-label <ontap_52_snapm_adhoc_label> -keep 5

snapmirror policy add-rule -vserver <global_primary_backup_svm> -policy
<ontap_52_snapm_policy_name> -snapmirror-label <ontap_52_snapm_sched_label> -keep 36
```

### Execution Example

```
# on the primary storage system
cluster1::> volume snapshot policy create -vserver ntap-svm01-nas -policy ontap_52_snap_policy
-enabled true -schedule1 5min -count1 6 -prefix1 5min_ -snapmirror-label1 ontap_52_snapm_sched

# on the secondary storage system
cluster2::> snapmirror policy create -vserver ntap-svm03-backup -policy ontap_52_snapm_policy
-type mirror-vault
cluster2::> snapmirror policy add-rule -vserver ntap-svm03-backup -policy
ontap_52_snapm_policy -snapmirror-label ontap_52_snapm_adhoc -keep 5
cluster2::> snapmirror policy add-rule -vserver ntap-svm03-backup -policy
ontap_52_snapm_policy -snapmirror-label ontap_52_snapm_sched -keep 36
```

### Verification Example

```
# on the primary storage system
cluster1::> volume snapshot policy show -vserver ntap-svm01-nas
Vserver: ntap-svm01-nas
                                         Number of Is
                                         Schedules Enabled Comment
Policy Name
-----
ontap_52_snap_policy           1 true   -
                                         Schedule   Count   Prefix   SnapMirror Label   Retention Period
----- -----
5min                         6 5min_          ontap_52_snapm_sched   0 seconds

# on the secondary storage system
cluster2::> snapmirror policy show -vserver ntap-svm03-backup
Vserver Policy          Policy Number      Transfer
Name     Name            Type    Of Rules Tries Priority Comment
-----
ntap-svm03-backup        ontap_52_snapm_policy
                                         mirror-vault 3     8 normal  -
                                         SnapMirror Label: sm_created               Keep: 1
                                         ontap_52_snapm_adhoc                   5
                                         ontap_52_snapm_sched                  36
```



## ONTAP-52-03 – Prepare Filesystem (Source)

### Description

Prepare test storage and clients for backup testing:

- Volume
- Qtrees
- Client Access
- Test Files

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
vserver export-policy create -vserver <global_primary_nas_svm> -policyname
<ontap_52_policy_name>

vserver export-policy rule create -vserver <global_primary_nas_svm> -policyname
<ontap_52_policy_name> -protocol nfs -clientmatch <hosts[linux]> -rорule any -rwrule any -
superuser any -allow-suid true

volume create -volume <ontap_52_vol_name> -vserver <global_primary_nas_svm> -size
<ontap_default_vol_size_gb>GB -aggregate <storage_aggregates[item].name> -junction-path
/<ontap_52_vol_name> -policy ro-<global_primary_nas_svm> -security-style unix -snapshot-policy
<ontap_52_snap_policy_name>

volume qtree create -vserver <global_primary_nas_svm> -volume <ontap_52_vol_name> -qtree
<ontap_52_lin_qtree_name> -security-style unix -export-policy <ontap_52_policy_name>

volume qtree create -vserver <global_primary_nas_svm> -volume <ontap_52_vol_name> -qtree
<ontap_52_win_qtree_name> -security-style ntfs

vserver cifs share create -vserver <global_primary_nas_svm> -share-name
<ontap_52_win_qtree_name> -path /<ontap_52_vol_name>/<ontap_52_win_qtree_name> -share-
properties browsable,changedontifsy,oplocks,show-previous-versions,showsnapshot

vserver cifs share access-control delete -vserver <global_primary_nas_svm> -share
<ontap_52_win_qtree_name> -user-or-group Everyone

vserver cifs share access-control create -vserver <global_primary_nas_svm> -share
<ontap_52_win_qtree_name> -user-or-group <ontap_52_ad_admin_group> -user-group-type windows -
permission Full_Control

vserver cifs share access-control create -vserver <global_primary_nas_svm> -share
<ontap_52_win_qtree_name> -user-or-group <ontap_52_ad_ro_group> -user-group-type windows -
permission Read

# on the Linux test host(s)
mkdir -p <linux_52_mount_dir>/<ontap_52_lin_qtree_name>

mount -t nfs <global_primary_nas_svm>:<ontap_52_vol_name>/<ontap_52_lin_qtree_name>
<linux_52_mount_dir>/<ontap_52_lin_qtree_name>

dd if=/dev/urandom of=<linux_52_mount_dir>/<ontap_52_lin_qtree_name>/testfile01 bs=1024KB
count=50

# on the Windows test host(s)

# Create mount directory
# Connect/link network share on source
# Provide login credentials
```

```
# Acces shares and write test data
```

## Execution Example

```
# on the primary storage system
cluster1::> vserver export-policy create -vserver ntap-svm01-nas -policyname ontap_52_policy
cluster1::> vserver export-policy rule create -vserver ntap-svm01-nas -policyname
ontap_52_policy -protocol nfs -clientmatch centos1.demo.netapp.com -rorule any -rwrule any -
superuser any -allow-suid true

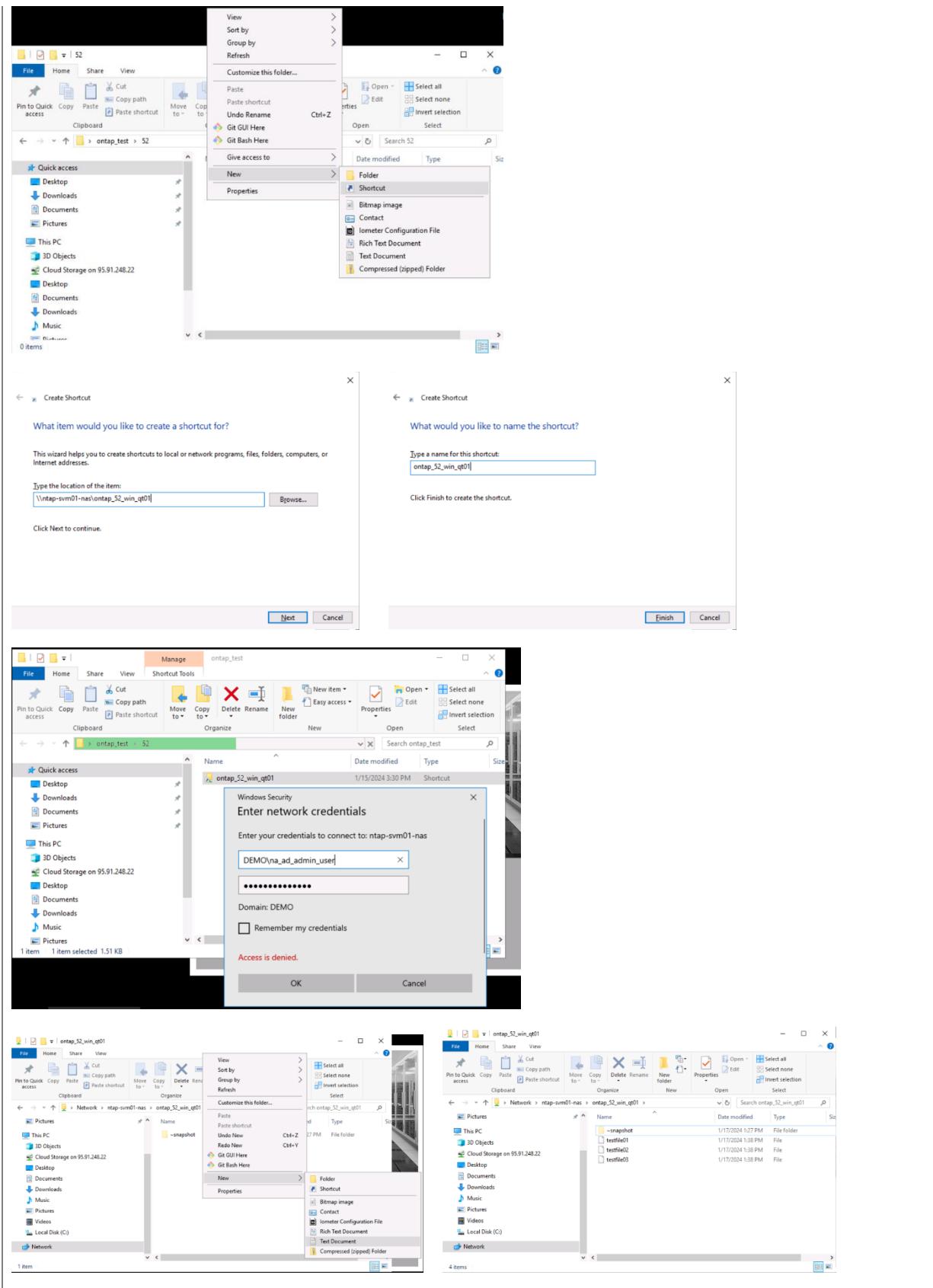
cluster1::> volume create -volume ontap_52_vo101 -vserver ntap-svm01-nas -size 10GB -aggregate
cluster1_01_aggr01 -junction-path /ontap_52_vo101 -policy ro_ntap-svm01-nas -security-style
unix -snapshot-policy ontap_52_snap_policy
[Job 828] Job succeeded: Successful
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_52_vo101 -qtree
ontap_52_lin_qt01 -security-style unix -export-policy ontap_52_policy
cluster1::> volume qtree create -vserver ntap-svm01-nas -volume ontap_52_vo101 -qtree
ontap_52_win_qt01 -security-style ntfs

cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_52_win_qt01 -
path /ontap_52_vo101/ontap_52_win_qt01 -share-properties browsable,changednotify,oplocks,show-
previous-versions,showsnapshot
cluster1::> vserver cifs share access-control delete -vserver ntap-svm01-nas -share
ontap_52_win_qt01 -user-or-group Everyone
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_52_win_qt01 -user-or-group DEMO\na_ad_admin_group -user-group-type windows -permission
full_Control
cluster1::> vserver cifs share access-control create -vserver ntap-svm01-nas -share
ontap_52_win_qt01 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read

# on the Linux test host(s)
[root@centos1 ~]# mkdir -p /mnt/ontap_test/52/ontap_52_lin_qt01
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_52_vo101/ontap_52_lin_qt01 /mnt/ontap_test/52/ontap_52_lin_qt01
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/52/ontap_52_lin_qt01/testfile01
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.546989 s, 93.6 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/52/ontap_52_lin_qt01/testfile02
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.437265 s, 117 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/52/ontap_52_lin_qt01/testfile03
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.675442 s, 75.8 MB/s
```

```
# on the Windows test host(s)
```





## Verification Example

n/a

## ONTAP-52-04 – Protect Volume

### Description

Create and initialize backup relationship.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the secondary storage system
volume create -vserver <global_primary_backup_svm> -volume <ontap_52_vol_name>_dst -aggregate
<storage_aggregates[item].name> -type DP -size <ontap_default_vol_size_gb>GB

snapmirror create -vserver <global_primary_backup_svm> -source-path
<global_primary_nas_svm>:<ontap_52_vol_name> -destination-path
<global_primary_backup_svm>:<ontap_52_vol_name>_dst -policy <ontap_52_snapm_policy_name> -
schedule 5min

snapmirror initialize -destination-path <global_primary_backup_svm>:<ontap_52_vol_name>_dst
```

### Execution Example

```
# on the secondary storage system
cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_52_vol01_dst -aggregate
cluster2_01_aggr01 -type DP -size 10GB
[Job 113] Job succeeded: Successful
cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm01-
nas:ontap_52_vol01 -destination-path ntap-svm03-backup:ontap_52_vol01_dst -policy
ontap_52_snapm_policy -schedule 5min
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-
backup:ontap_52_vol01_dst".
cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_52_vol01_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_52_vol01_dst".
```

### Verification Example

```
# on the secondary storage system
cluster2::> snapmirror show -vserver ntap-svm03-backup
                                         Progress
                                         Last
Source          Destination Mirror Relationship Total
Path            Type    Path      State   Status   Progress Healthy Updated
-----  -----
ntap-svm01-nas:ontap_52_vol01
              XDP    ntap-svm03-backup:ontap_52_vol01_dst
                           Snapmirrored
                           Idle
                                         -       true   -
```

## ONTAP-52-05 – Access Backup (read-only)

### Description

Access replicated data at destination.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the secondary storage system
volume modify -vserver <global_primary_backup_svm> -volume <ontap_52_vol_name>_dst -policy
ro_<global_primary_backup_svm>

volume mount -vserver <global_primary_backup_svm> -volume <ontap_52_vol_name>_dst -junction-
path /<ontap_52_vol_name>_dst

vserver export-policy create -vserver <global_primary_backup_svm> -policyname ontap_52_policy

vserver export-policy rule create -vserver <global_primary_backup_svm> -policyname
ontap_52_policy -protocol nfs -clientmatch centos1.demo.netapp.com -rорule any -rwrule none -
superuser any -allow-suid false

vserver cifs share create -vserver <global_primary_backup_svm> -share-name
<ontap_52_win_qtree_name>_dst -path /<ontap_52_vol_name>_dst/<ontap_52_win_qtree_name> -
share-properties browsable,changeNotify,oplocks,show-previous-versions,showsnapshot

vserver cifs share access-control delete -vserver <global_primary_backup_svm> -share
<ontap_52_vol_name>_dst -user-or-group Everyone

vserver cifs share access-control create -vserver <global_primary_backup_svm> -share
<ontap_52_win_qtree_name>_dst -user-or-group <ontap_52_ad_admin_group> -user-group-type
windows -permission Read

# on the Linux test host(s)
mkdir -p <linux_52_mount_dir>/<ontap_52_lin_qtree_name>_dst

mount -t nfs -o ro <global_primary_backup_svm>:<linux_52_mount_dir>/<ontap_52_lin_qtree_name>
<linux_52_mount_dir>/<ontap_52_lin_qtree_name>_dst

# on the Windows test host(s)

# Create mount directory
# Connect/link network share on destination
# Provide login credentials
# Acces shares
```

### Execution Example

```
# on the secondary storage system
cluster2::> volume modify -vserver ntap-svm03-backup -volume ontap_52_vol01_dst -policy
ro_ntap-svm03-backup
Volume modify successful on volume ontap_52_vol01_dst of Vserver ntap-svm03-backup.
cluster2::> volume mount -vserver ntap-svm03-backup -volume ontap_52_vol01_dst -junction-path
/ontap_52_vol01_dst

cluster2::> vserver export-policy create -vserver ntap-svm03-backup -policyname
ontap_52_policy
cluster2::> vserver export-policy rule create -vserver ntap-svm03-backup -policyname
ontap_52_policy -protocol nfs -clientmatch centos1.demo.netapp.com -rорule any -rwrule none -
superuser any -allow-suid false

cluster2::> vserver cifs share create -vserver ntap-svm03-backup -share-name
ontap_52_win_qt01_dst -path /ontap_52_vol01_dst/ontap_52_win_qt01 -share-properties
```

```

browsable,changedir,oplocks,show-previous-versions,showsnapshot
cluster2::> vserver cifs share access-control delete -vserver ntap-svm03-backup -share
ontap_52_win_qt01_dst -user-or-group Everyone
cluster2::> vserver cifs share access-control create -vserver ntap-svm03-backup -share
ontap_52_win_qt01_dst -user-or-group DEMO\na_ad_admin_group -user-group-type windows -
permission Read

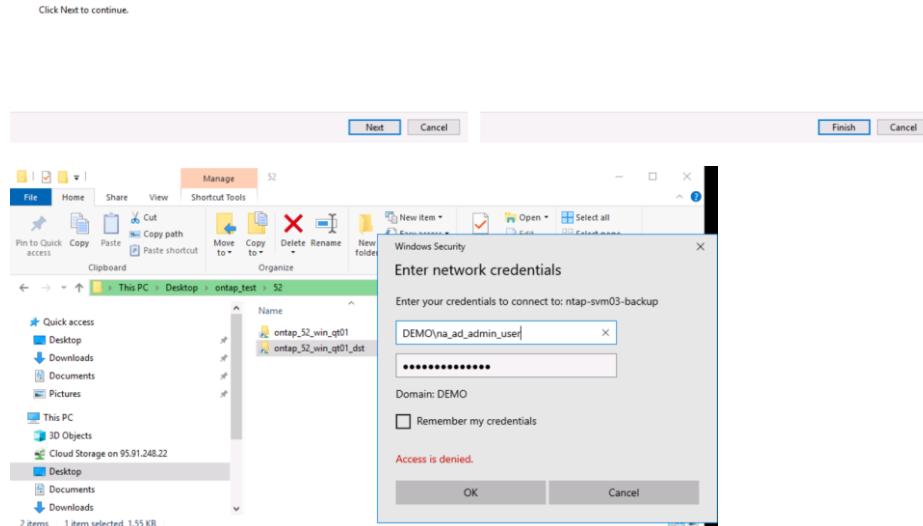
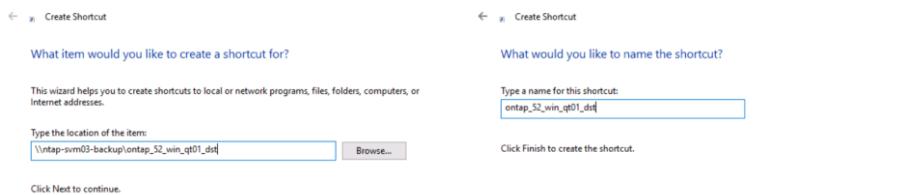
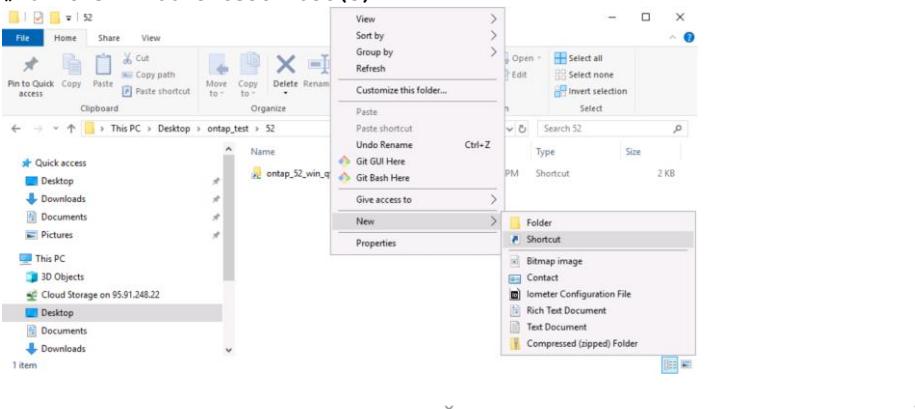
```

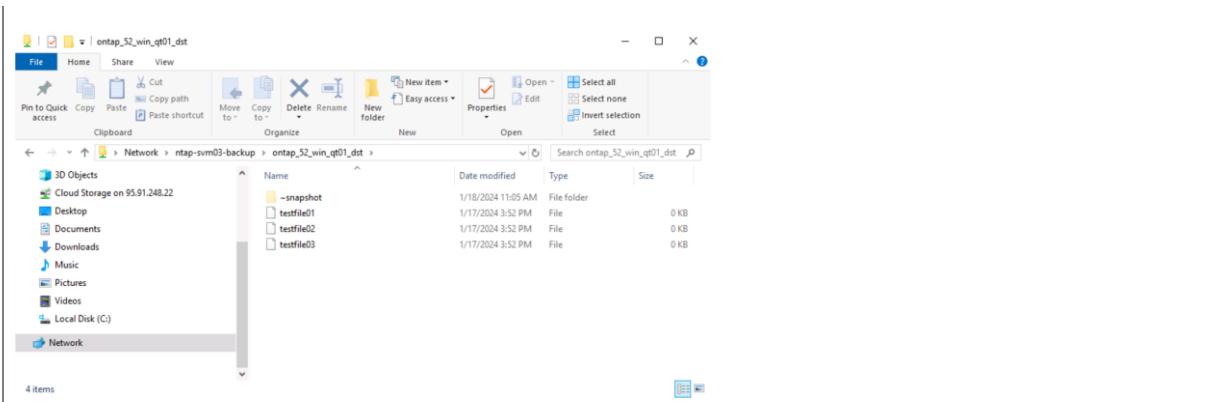
```

# on the Linux test host(s)
[root@centos1 ~]# mkdir -p /mnt/ontap_test/52/ontap_52_lin_qt01_dst
[root@centos1 ~]# mount -t nfs -o ro ntap-svm03-
backup.demo.netapp.com:/ontap_52_vo101_dst/ontap_52_lin_qt01
/mnt/ontap_test/52/ontap_52_lin_qt01_dst

```

#### # on the Windows test host(s)





## Verification Example

n/a

ONTAP-52-06 – Additional Files

## Description

Add files to be backed up adhoc.

## Expected Result

<placeholder>

#### **Additional Information**

<placeholder>

## Instructions

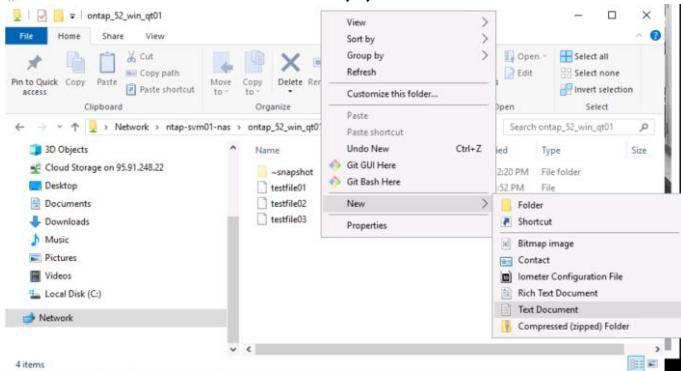
```
# on the Linux test host(s)
dd if=/dev/urandom of=<linux_52_mount_dir>/<ontap_52_lin_qtree_name>/testfile11 bs=1024KB
count=50

# on the Windows test host(s)
# Create additional files on source share
```

## Execution Example

```
# on the Linux test host(s)
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/52/ontap_52_lin_qt01/testfile11
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.636626 s, 80.4 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/52/ontap_52_lin_qt01/testfile12
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.77561 s, 66.0 MB/s
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/ontap_test/52/ontap_52_lin_qt01/testfile13
bs=1024KB count=50
50+0 records in
50+0 records out
51200000 bytes (51 MB) copied, 0.872057 s, 58.7 MB/s
```

```
# on the Windows test host(s)
```

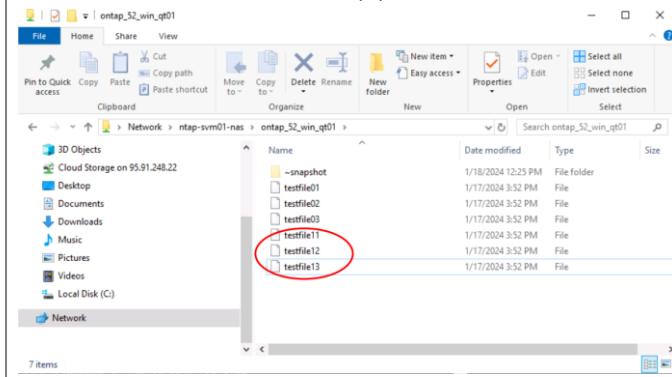


## Verification Example

```
# on the Linux test host(s)
[root@centos1 ~]# ls -la /mnt/ontap_test/52/ontap_52_lin_qt01/
total 301228
drwxr-xr-x 2 nobody nobody 4096 Jan 18 11:56 .
drwxr-xr-x 4 root root 60 Jan 18 10:55 ..
-rw-r--r-- 1 nobody nobody 51200000 Jan 17 15:50 testfile01
-rw-r--r-- 1 nobody nobody 51200000 Jan 17 15:50 testfile02
-rw-r--r-- 1 nobody nobody 51200000 Jan 17 15:50 testfile03
-rw-r--r-- 1 nobody nobody 51200000 Jan 18 11:55 testfile11
-rw-r--r-- 1 nobody nobody 51200000 Jan 18 11:56 testfile12
```

```
-rw-r--r-- 1 nobody nobody 51200000 Jan 18 11:56 testfile13
```

# on the Windows test host(s)



## ONTAP-52-07 – Incremental Backup

### Description

Create snapshot and replicate it to the backup destination.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
volume snapshot create -vserver <global_primary_nas_svm> -volume <ontap_52_vol_name> -snapshot
<ontap_52_snapshot_name> -snapmirror-label <ontap_52_snapm_adhoc_label>

# on the secondary storage system
snapmirror update -destination-path <global_primary_backup_svm>:<ontap_52_vol_name>_dst
```

### Execution Example

```
# on the primary storage system
cluster1::> volume snapshot create -vserver ntap-svm01-nas -volume ontap_52_vol01 -snapshot
ontap_52_snapshot -snapmirror-label ontap_52_snapm_adhoc

# on the secondary storage system
cluster2::> snapmirror update -destination-path ntap-svm03-backup:ontap_52_vol01_dst
Operation is queued: snapmirror update of destination "ntap-svm03-backup:ontap_52_vol01_dst".
```

### Verification Example

```
# on the primary storage system
cluster1::> volume snapshot show -vserver ntap-svm01-nas -volume ontap_52_vol01
                                         ---Blocks---
Vserver   Volume   Snapshot                               Size Total% Used%
-----  -----
ntap-svm01-nas
    ontap_52_vol01
        5min_.2024-01-18_1025           236KB     0%     0%
        5min_.2024-01-18_1030           188KB     0%     0%
        ontap_52_snapshot             148KB     0%     0%
        snapmirror.49f33c7e-b54d-11ee-9a74-0050569c83fc_2154890294.2024-01-18_103311
                                         148KB     0%     0%
4 entries were displayed.

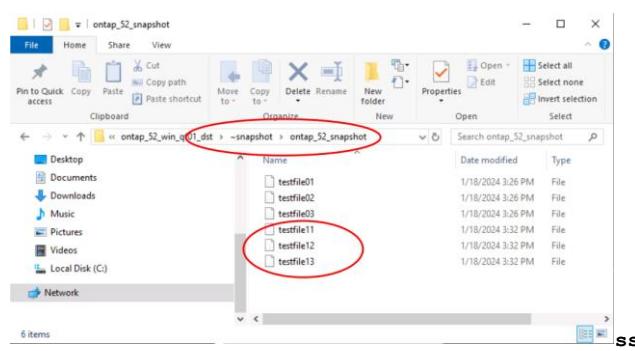
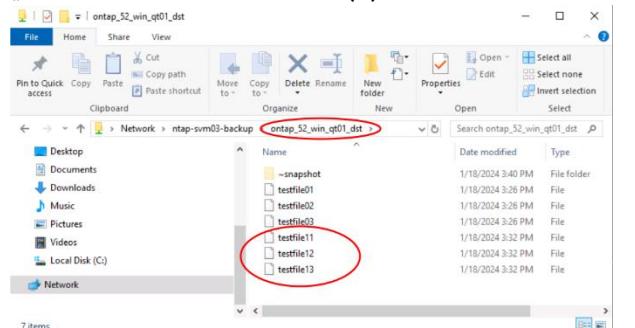
# on the secondary storage system
cluster2::> snapmirror show -destination-path ntap-svm03-backup:ontap_52_vol01_dst -fields
last-transfer-end-timestamp
source-path          destination-path          last-transfer-end-timestamp
-----  -----
ntap-svm01-nas:ontap_52_vol01 ntap-svm03-backup:ontap_52_vol01_dst 01/18 10:33:25

cluster2::> volume snapshot show -vserver ntap-svm03-backup -volume ontap_52_vol01_dst
                                         ---Blocks---
Vserver   Volume   Snapshot                               Size Total% Used%
-----  -----
ntap-svm03-backup
    ontap_52_vol01_dst
        5min_.2024-01-18_1030           188KB     0%     0%
        snapmirror.49f33c7e-b54d-11ee-9a74-0050569c83fc_2154890294.2024-01-18_103000
                                         248KB     0%     0%
        ontap_52_snapshot             188KB     0%     0%
        snapmirror.49f33c7e-b54d-11ee-9a74-0050569c83fc_2154890294.2024-01-18_103311
                                         140KB     0%     0%
4 entries were displayed.
```

```
# on the Linux test host(s)
[root@centos1 ~]# ls -laR /mnt/ontap_test/52/ontap_52_lin_qt01_dst/
/mnt/ontap_test/52/ontap_52_lin_qt01_dst/:
total 294172
drwxr-xr-x 2 nobody nobody 4096 Jan 18 15:32 .
drwxr-xr-x 4 root root 60 Jan 18 15:29 ..
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile01
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile02
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile03
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile11
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile12
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile13
```

```
[root@centos1 ~]# ls -laR
/mnt/ontap_test/52/ontap_52_lin_qt01_dst/.snapshot/ontap_52_snapshot/
/mnt/ontap_test/52/ontap_52_lin_qt01_dst/.snapshot/ontap_52_snapshot/:
total 294176
drwxr-xr-x 2 nobody nobody 4096 Jan 18 15:32 .
drwxrwxrwx 7 nobody nobody 4096 Jan 18 15:35 ..
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile01
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile02
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile03
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile11
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile12
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile13
```

#### # on the Windows test host(s)



## ONTAP-52-08 – Delete Files

### Description

Delete some of the previously created files on the source and confirm they still exist on the backup destination.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

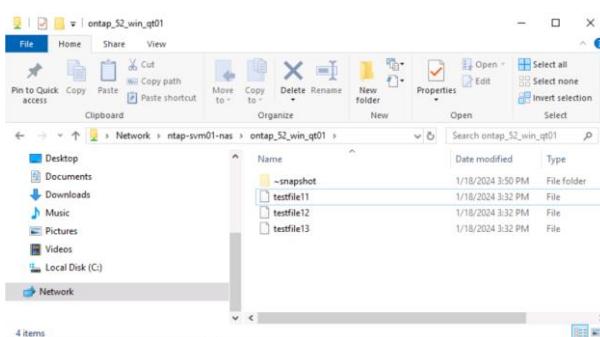
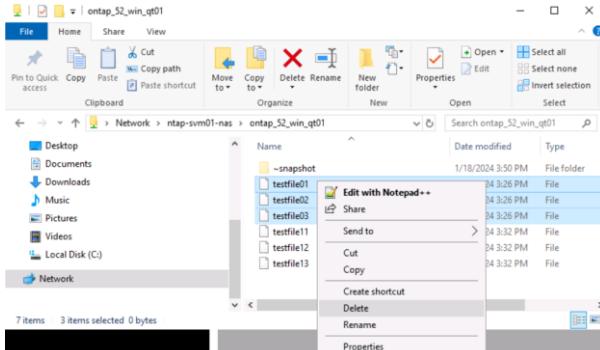
```
# on the Linux test host(s)
rm <linux_52_mount_dir>/<ontap_52_lin_qtree_name>/testfile0{1..3}

# on the Windows test host(s)
# Delete some of the previously created files
```

### Execution Example

```
# on the Linux test host(s)
[root@centos1 ~]# rm /mnt/ontap_test/52/ontap_52_lin_qt01/testfile0{1..3}
rm: remove regular file '/mnt/ontap_test/52/ontap_52_lin_qt01/testfile01'? y
rm: remove regular file '/mnt/ontap_test/52/ontap_52_lin_qt01/testfile02'? y
rm: remove regular file '/mnt/ontap_test/52/ontap_52_lin_qt01/testfile03'? y
```

#### # on the Windows test host(s)

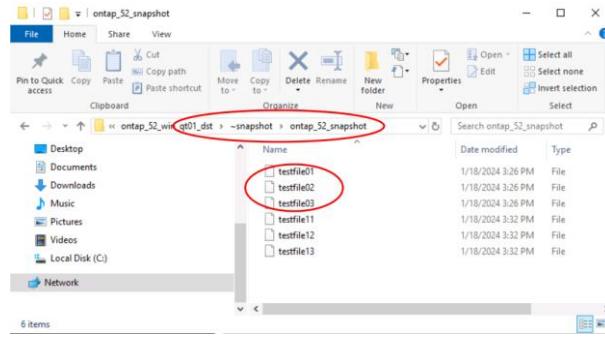


### Verification Example

```
# on the Linux test host(s)
[root@centos1 ~]# ls -laR
/mnt/ontap_test/52/ontap_52_lin_qt01_dst/.snapshot/ontap_52_snapshot/
/mnt/ontap_test/52/ontap_52_lin_qt01_dst/.snapshot/ontap_52_snapshot/:
total 294176
drwxr-xr-x  2 nobody nobody     4096 Jan 18 15:32 .
```

```
drwxrwxrwx 11 nobody nobody 4096 Jan 18 15:55 ..
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile01
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile02
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile03
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile11
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile12
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile13
```

# on the Windows test host(s)



## ONTAP-52-09 – Restore Backup

### Description

Restore entire volume from snapshot to recover all deleted files.

### Expected Result

<placeholder>

### Additional Information

<placeholder>

### Instructions

```
# on the primary storage system
snapmirror restore -destination-path <global_primary_nas_svm>:<ontap_52_vol_name> -source-path
<global_primary_backup_svm>:<ontap_52_vol_name>_dst -source-snapshot <ontap_52_snapshot_name>s
```

### Execution Example

```
cluster1::> snapmirror restore -destination-path ntap-svm01-nas:ontap_52_vol01 -source-path
ntap-svm03-backup:ontap_52_vol01_dst -source-snapshot ontap_52_snapshot
Warning: All data newer than Snapshot copy snapmirror.49f33c7e-b54d-11ee-9a74-
0050569c83fc_2154890294.2024-01-18_111500 on volume
      ntap-svm01-nas:ontap_52_vol01 will be deleted.
      Export policies currently enforced on the qtrees of volume "ntap-svm01-
nas:ontap_52_vol01" will not change during this
      operation. If the currently enforced export policies are different from those in
Snapshot copy
      "snapmirror.49f33c7e-b54d-11ee-9a74-0050569c83fc_2154890294.2024-01-18_111500",
reassign the export policies of the qtrees
      on this volume after this operation.
Do you want to continue? {y|n}: y
[Job 191] Job is queued: snapmirror restore from source "ntap-svm03-backup:ontap_52_vol01_dst"
for the snapshot ontap_52_snapshot.
```

### Verification Example

```
# on the primary storage system
cluster1::> snapmirror show
Source          Destination Mirror Relationship Total Progress
Path           Type     Path       State   Status    Progress Last
----- -----
ntap-svm03-backup:ontap_52_vol01_dst
      RST  ntap-svm01-nas:ontap_52_vol01
          Snapmirrored
                  Idle      -      true   -
cluster1::> snapmirror show
Source          Destination Mirror Relationship Total Progress
Path           Type     Path       State   Status    Progress Last
----- -----
ntap-svm03-backup:ontap_52_vol01_dst
      RST  ntap-svm01-nas:ontap_52_vol01
          Broken-off
                  Idle      -      true   -
cluster1::> snapmirror show
This table is currently empty.

cluster1::> volume snapshot show -vserver ntap-svm01-nas -volume ontap_52_vol01
                                         ---Blocks---
Vserver  Volume  Snapshot
----- -----
ntap-svm01-nas
          ontap_52_vol01
          Size Total% Used%
```

```

ontap_52_snapshot                                1.21MB    0%    1%
5min_.2024-01-18_1055                          148KB     0%    0%
5min_.2024-01-18_1100                          148KB     0%    0%
5min_.2024-01-18_1105                          148KB     0%    0%
5min_.2024-01-18_1110                          148KB     0%    0%
5min_.2024-01-18_1115                          208KB     0%    0%
restored.49f8443b-b54d-11ee-8354-
0050569c9312_2151486063.ontap_52_snapshot.2024-01-18_111930
                                                172KB     0%    0%
5min_.2024-01-18_1120                          140KB     0%    0%
snapmirror.49f33c7e-b54d-11ee-9a74-0050569c83fc_2154890294.2024-01-18_112000
                                                144KB     0%    0%
9 entries were displayed.

```

```

# on the primary storage system
cluster2::> volume snapshot show -vserver ntap-svm03-backup -volume ontap_52_vvol01_dst
                                         ---Blocks---
Vserver      Volume   Snapshot                               Size Total% Used%
-----  -----
ntap-svm03-backup      ontap_52_vvol01_dst
5min_.2024-01-18_1030          248KB    0%    0%
ontap_52_snapshot           188KB    0%    0%
5min_.2024-01-18_1035          192KB    0%    0%
5min_.2024-01-18_1040          204KB    0%    0%
5min_.2024-01-18_1045          192KB    0%    0%
5min_.2024-01-18_1050          1.65MB   0%    1%
5min_.2024-01-18_1055          188KB    0%    0%
5min_.2024-01-18_1100          188KB    0%    0%
5min_.2024-01-18_1105          188KB    0%    0%
5min_.2024-01-18_1110          188KB    0%    0%
5min_.2024-01-18_1115          184KB    0%    0%
snapmirror.49f33c7e-b54d-11ee-9a74-0050569c83fc_2154890294.2024-01-18_111500
                                         920KB    0%    1%
5min_.2024-01-18_1120            0B      0%    0%
snapmirror.49f33c7e-b54d-11ee-9a74-0050569c83fc_2154890294.2024-01-18_112000
                                         0B      0%    0%
14 entries were displayed.

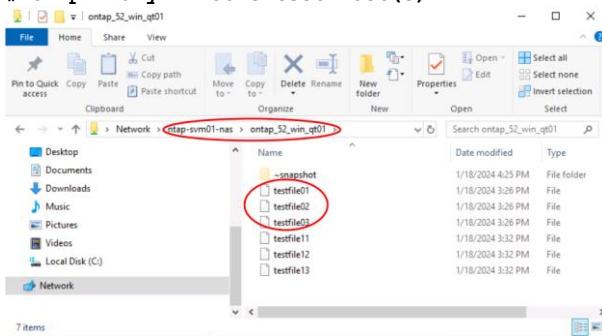
```

```

# on primary Linux test host(s)
[root@centos1 ~]# ls -laR /mnt/ontap_test/52/ontap_52_lin_qt01_dst/
/mnt/ontap_test/52/ontap_52_lin_qt01_dst/:
total 294172
drwxr-xr-x 2 nobody nobody    4096 Jan 18 15:32 .
drwxr-xr-x 4 root   root      60 Jan 18 15:29 ..
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile01
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile02
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:25 testfile03
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile11
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile12
-rw-r--r-- 1 nobody nobody 50000000 Jan 18 15:32 testfile13

```

```
# on primary Windows test host(s)
```



## ONTAP-52-11 – Bulk Protect Volumes

### Description

Build backup relationships and protect all volumes and data from primary NAS and SAN SVM (e.g. created in ONTAP-3\*).

### Expected Result

<placeholder>

### Additional Information

Protection is set up without policy and schedule. No scheduled incremental backups will be performed after the initial full transfer.

### Instructions

```
# on the secondary storage system
volume create -vserver <global_primary_backup_svm> -volume <source_volumes[item]>_dst -aggregate <storage_aggregates[item].name> -type DP -size <ontap_default_vol_size_gb>GB
volume create -vserver <global_primary_nas_svm> -volume <ontap_31_fg_name> -size <ontap_default_fg_size_gb>GB -junction-path /<ontap_31_fg_name> -aggr-list <storage_aggregates[items].name> -aggr-list-multiplier <ontap_default_fg_multiplier> -policy <ontap_31_policy_name> -security-style unix
ssnapmirror create -vserver <global_primary_backup_svm> -source-path <global_primary_nas_svm|global_primary_san_svm>:<source_volumes[item]> -destination-path <global_primary_backup_svm>:<source_volumes[item]>_dst
snapmirror initialize -destination-path <global_primary_backup_svm>:<source_volumes[item]>_dst
```

### Execution Example

```
# on the secondary storage system
cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_31_nfs_vol01_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 220] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_31_nfs_fg01_dst -aggr-list cluster2_01_aggr01,cluster2_02_aggr01 -aggr-list-multiplier 8 -type DP -size 102400GB
Notice: The FlexGroup volume "ontap_31_nfs_fg01_dst" will be created with the following number of constituents of size 6.25TB: 16.
Do you want to continue? {y|n}: y
[Job 222] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_32_cifs_vol01_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 224] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_32_cifs_fg01_dst -aggr-list cluster2_01_aggr01,cluster2_02_aggr01 -aggr-list-multiplier 8 -type DP -size 102400GB
Notice: The FlexGroup volume "ontap_32_cifs_fg01_dst" will be created with the following number of constituents of size 6.25TB: 16.
Do you want to continue? {y|n}: y
[Job 226] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_35_win_vol01_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 228] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_35_win_vol02_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 230] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_35_win_vol03_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 232] Job succeeded: Successful
```

```

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_35_lin_vol01_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 233] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_35_lin_vol02_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 235] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_35_lin_vol03_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 237] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_37_lin_vol01_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 238] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_37_lin_vol02_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 240] Job succeeded: Successful

cluster2::> volume create -vserver ntap-svm03-backup -volume ontap_37_lin_vol03_dst -aggregate cluster2_01_aggr01 -type DP -size 10GB
[Job 241] Job succeeded: Successful

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm01-nas:ontap_31_nfs_vol01 -destination-path ntap-svm03-backup:ontap_31_nfs_vol01_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-backup:ontap_31_nfs_vol01_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm01-nas:ontap_31_nfs_fg01 -destination-path ntap-svm03-backup:ontap_31_nfs_fg01_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-backup:ontap_31_nfs_fg01_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm01-nas:ontap_32_cifs_vol01 -destination-path ntap-svm03-backup:ontap_32_cifs_vol01_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-backup:ontap_32_cifs_vol01_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm01-nas:ontap_32_cifs_fg01 -destination-path ntap-svm03-backup:ontap_32_cifs_fg01_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-backup:ontap_32_cifs_fg01_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm02-san:ontap_35_win_vol01 -destination-path ntap-svm03-backup:ontap_35_win_vol01_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-backup:ontap_35_win_vol01_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm02-san:ontap_35_win_vol02 -destination-path ntap-svm03-backup:ontap_35_win_vol02_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-backup:ontap_35_win_vol02_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm02-san:ontap_35_win_vol03 -destination-path ntap-svm03-backup:ontap_35_win_vol03_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-backup:ontap_35_win_vol03_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm02-san:ontap_35_lin_vol01 -destination-path ntap-svm03-backup:ontap_35_lin_vol01_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-backup:ontap_35_lin_vol01_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm02-san:ontap_35_lin_vol02 -destination-path ntap-svm03-backup:ontap_35_lin_vol02_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-backup:ontap_35_lin_vol02_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm02-san:ontap_35_lin_vol03 -destination-path ntap-svm03-backup:ontap_35_lin_vol03_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-backup:ontap_35_lin_vol03_dst".

```

```

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm02-
san:ontap_37_lin_vol01 -destination-path ntap-svm03-backup:ontap_37_lin_vol01_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-
backup:ontap_37_lin_vol01_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm02-
san:ontap_37_lin_vol02 -destination-path ntap-svm03-backup:ontap_37_lin_vol02_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-
backup:ontap_37_lin_vol02_dst".

cluster2::> snapmirror create -vserver ntap-svm03-backup -source-path ntap-svm02-
san:ontap_37_lin_vol03 -destination-path ntap-svm03-backup:ontap_37_lin_vol03_dst
Operation succeeded: snapmirror create for the relationship with destination "ntap-svm03-
backup:ontap_37_lin_vol03_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_31_nfs_vol01_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_31_nfs_vol01_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_31_nfs_fg01_dst
Error: command failed: Geometry of the source FlexGroup does not match that of the
destination FlexGroup. Delete the SnapMirror relationship and delete and recreate the
destination FlexGroup with a geometry that matches the source FlexGroup. Create the
SnapMirror relationship again before retrying the operation.

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_32_cifs_vol01_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_32_cifs_vol01_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_32_cifs_fg01_dst
Error: command failed: Geometry of the source FlexGroup does not match that of the
destination FlexGroup. Delete the SnapMirror relationship and delete and recreate the
destination FlexGroup with a geometry that matches the source FlexGroup. Create the
SnapMirror relationship again before retrying the operation.

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_35_win_vol01_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_35_win_vol01_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_35_win_vol02_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_35_win_vol02_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_35_win_vol03_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_35_win_vol03_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_35_lin_vol01_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_35_lin_vol01_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_35_lin_vol02_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_35_lin_vol02_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_35_lin_vol03_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_35_lin_vol03_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_37_lin_vol01_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_37_lin_vol01_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_37_lin_vol02_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_37_lin_vol02_dst".

cluster2::> snapmirror initialize -destination-path ntap-svm03-backup:ontap_37_lin_vol03_dst
Operation is queued: snapmirror initialize of destination "ntap-svm03-
backup:ontap_37_lin_vol03_dst".

```

## Verification Example

```
# on the secondary storage system
cluster2::> snapmirror show -vserver ntap-svm03-backup
Source          Destination Mirror  Relationship   Total           Progress
Path            Type    Path       State    Status      Progress  Healthy Updated
-----  -----
ntap-svm01-nas:ontap_31_nfs_fg01
    XDP  ntap-svm03-backup:ontap_31_nfs_fg01_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm01-nas:ontap_31_nfs_vo101
    XDP  ntap-svm03-backup:ontap_31_nfs_vo101_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm01-nas:ontap_32_cifs_fg01
    XDP  ntap-svm03-backup:ontap_32_cifs_fg01_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm01-nas:ontap_32_cifs_vo101
    XDP  ntap-svm03-backup:ontap_32_cifs_vo101_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm01-nas:ontap_52_vo101
    XDP  ntap-svm03-backup:ontap_52_vo101_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm02-san:ontap_35_lin_vo101
    XDP  ntap-svm03-backup:ontap_35_lin_vo101_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm02-san:ontap_35_lin_vo102
    XDP  ntap-svm03-backup:ontap_35_lin_vo102_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm02-san:ontap_35_lin_vo103
    XDP  ntap-svm03-backup:ontap_35_lin_vo103_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm02-san:ontap_35_win_vo101
    XDP  ntap-svm03-backup:ontap_35_win_vo101_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm02-san:ontap_35_win_vo102
    XDP  ntap-svm03-backup:ontap_35_win_vo102_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm02-san:ontap_35_win_vo103
    XDP  ntap-svm03-backup:ontap_35_win_vo103_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm02-san:ontap_37_lin_vo101
    XDP  ntap-svm03-backup:ontap_37_lin_vo101_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm02-san:ontap_37_lin_vo102
    XDP  ntap-svm03-backup:ontap_37_lin_vo102_dst
        Snapmirrored
        Idle      -      true     -
ntap-svm02-san:ontap_37_lin_vo103
    XDP  ntap-svm03-backup:ontap_37_lin_vo103_dst
        Snapmirrored
        Idle      -      true     -
14 entries were displayed.
```

## Additional References

- ONTAP 9 Documentation and Command references
  - <https://docs.netapp.com/us-en/ontap/index.html>
- ONTAP 9 REST API References
  - <https://devnet.netapp.com/restapi.php>
- NetApp ONTAP Ansible Modules on Ansible Galaxy
  - <https://galaxy.ansible.com/netapp/ontap#>
- Public documentation – NetApp ONTAP Ansible Modules
  - <https://docs.ansible.com/ansible/latest/collections/netapp/ontap/>
- NFS in NetApp ONTAP - Best practice and implementation guide
  - <https://www.netapp.com/media/10720-tr-4067.pdf>
- Best practices for modern SAN – ONTAP 9
  - <https://www.netapp.com/media/10680-tr4080.pdf>
- NetApp ONTAP FlexGroup volumes - Best practices and implementation guide
  - <https://www.netapp.com/pdf.html?item=/media/12385-tr4571.pdf>

## Additional Support

- Community Support on Discord
  - <https://discord.gg/netapp>
- Open a support case (e.g. for ONTAP)
  - <https://mysupport.netapp.com/>
- Open an issue on GitHub (e.g. for ONTAP Ansible modules)
  - <https://github.com/ansible-collections/netapp.ontap/issues>

## Version History

Version	Date	Details	Contributors
1.0	December 20 <sup>th</sup> , 2023	<ul style="list-style-type: none"><li>Initial Release</li></ul>	<ul style="list-style-type: none"><li>Adrian Bronder</li><li>Ken Hillier</li></ul>
1.1	January 19 <sup>th</sup> , 2024	<ul style="list-style-type: none"><li>Adding “Quality of Service”</li><li>Adding “Local Versioning (Snapshots)”</li><li>Adding “Backup (SnapMirror)”</li><li>Moving RO policy creation for NFS to “ONTAP-20 – Basic SVM Setup” (previously in “ONTAP-31 – NFS”)</li></ul>	<ul style="list-style-type: none"><li>Adrian Bronder</li></ul>
1.2	May 13 <sup>th</sup> , 2024	<ul style="list-style-type: none"><li>Adding “Event Notification”</li><li>Validating test plan against ONTAP 9.14.1</li><li>Minor fixes (typos, vars...)</li></ul>	<ul style="list-style-type: none"><li>Adrian Bronder</li></ul>

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