NetApp

Test Specification

ONTAP
with Ansible

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December 2023 | Version 1.0

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? Yes | No | n/a
	ONTAP-00 – Initial Cluster Setup		
Prerequisites for execution: - *Physical installation of storage components* - *Working network setup and connectivity* *Additional notes: -*			
ONTAP-00-01	**Node Setup** – Complete Node setup on all cluster nodes.	< *placeholder* > Click or tap here to enter text.	select...
ONTAP-00-02	**Cluster Setup** – Complete cluster setup for storage cluster.	< *placeholder* > Click or tap here to enter text.	select...
ONTAP-00-03	**Firmware Upgrade** – Upgrade firmware including mainboard, disks, shelves, and BMC/SP	< *placeholder* > Click or tap here to enter text.	select...
ONTAP-00-04	**ONTAP Upgrade** – Upgrade ONTAP to the desired major, minor, and patch release.	< *placeholder* > Click or tap here to enter text.	select...
	ONTAP-01 - Cluster Basic Connection Checks		
Prerequisites for execution: - *ONTAP-00* *Additional notes: -*			
ONTAP-01-01	**CLI** – Connect via SSH to the storage cluster's management interface.	Click or tap here to enter text.	select...
ONTAP-01-02	**GUI** – Connect via HTTP/HTTPS to the cluster's management interface (System Manager).	Click or tap here to enter text.	select...
ONTAP-01-03	**REST API** – Query ONTAP's REST API and retrieve basic cluster information.	< *work in progress* > Click or tap here to enter text.	select...
ONTAP-01-04	**Ansible** – 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	**Python Client Library** -	< *placeholder* > Click or tap here to enter text.	select...
ONTAP-01-06	**PowerShell Toolkit** -	< *placeholder* > Click or tap here to enter text.	select...
	ONTAP-10 - Basic Cluster Configuration		
Prerequisites for execution: - *ONTAP-00* *Additional notes: -*			
ONTAP-10-01	**Licenses** – Install licenses on storage cluster nodes and verify successful enablement of features.	Click or tap here to enter text.	select...
ONTAP-10-02	**Physical Network** – 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...
ONTAP-10-03	**Network Services** – Configure additional network services including DNS for name resolving and NTP for time synchronization.	Click or tap here to enter text.	select...
ONTAP-10-04	**Storage Aggregates** – Create storage aggregates on cluster nodes.	Click or tap here to enter text.	select...
ONTAP-10-05	**AutoSupport** – Enable and test AutoSupports being sent from cluster nodes.	Click or tap here to enter text.	select...
	ONTAP-11 - Advanced Cluster Configuration		

ID	Description	Comments & Test Notes	Success? Yes | No | n/a
Prerequisites for execution: - *ONTAP-10* *Additional notes: -*			
ONTAP-11-01	**Cluster/Node Parameters** – Configure additional parameters including time zone, login banner and message of the day (MOTD).	Click or tap here to enter text.	select...
ONTAP-11-02	**Administrative Domain Authentication** – Create proxy SVM for Active Directory domain authentication to the storage cluster.	Click or tap here to enter text.	select...
ONTAP-11-03	**Key Manager** – Configure key manager for data at rest encryption and enable encryption on all aggregates.	Click or tap here to enter text.	select...
ONTAP-12 - Cluster User Management			
Prerequisites for execution: - *ONTAP-11* *Additional notes: -*			
ONTAP-12-01	**Read-only Local User** – Create a local user with read-only privileges.	Click or tap here to enter text.	select...
ONTAP-12-02	**Administrative Local User** – Create a local user with admin privileges.	Click or tap here to enter text.	select...
ONTAP-12-03	**Local User Access** – Verify local users' access and privileges.	Click or tap here to enter text.	select...
ONTAP-12-04	**Read-only Domain Group** – Grant read-only privileges to a domain group.	Click or tap here to enter text.	select...
ONTAP-12-05	**Administrative Domain Group** – Grant admin privileges to a domain group.	Click or tap here to enter text.	select...
ONTAP-12-06	**Domain User Access** – Verify domain users' access and privileges.	Click or tap here to enter text.	select...
ONTAP-12-10	**Admin Multifactor Authentication (MFA)** – 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			
Prerequisites for execution: - *ONTAP-10* *Additional notes: -*			
ONTAP-15-01	**Cluster Peering** – Peer cluster with other storage clusters for backup, disaster recovery, or data caching.	< *work in progress* > Click or tap here to enter text.	select...
ONTAP-16 – MetroCluster Setup			
Prerequisites for execution: - *ONTAP-15* *Additional notes:* - *Basic setup and peering tasks have been executed on partner/remote cluster*			
ONTAP-16-01	**MetroCluster** – Peer cluster with other storage clusters for backup, disaster recovery, or data caching.	< *placeholder* > Click or tap here to enter text.	select...
ONTAP-20 - Basic SVM Setup			
Prerequisites for execution: - *ONTAP-10* *Additional notes: -*			
ONTAP-20-01	**Storage Virtual Machines (SVMs)** – Create SVMs to serve data to clients and hosts. Activate SAN services, if applicable.	Click or tap here to enter text.	select...
ONTAP-20-02	**SVM Logical Network** – Create logical interfaces (LIFs) and default gateway to allow network access to SVMs.	Click or tap here to enter text.	select...

ID	Description	Comments & Test Notes	Success? Yes | No | n/a
ONTAP-20-03	**SVM Network Services** – Configure DNS on SVMs.	Click or tap here to enter text.	select...
ONTAP-20-04	**SVM Data Protocol Setup** – 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	**SVM Peering** – Peer cluster with other storage clusters for backup, disaster recovery, or data caching.	< *work in progress* > Click or tap here to enter text.	select...

ONTAP-31 - NFS

Prerequisites for execution:

- *ONTAP-20*

Additional notes: -

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

ONTAP-32 - CIFS

Prerequisites for execution:

- *ONTAP-20*

Additional notes: -

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

ONTAP-33 – Mixed File Access

Prerequisites for execution:

- *ONTAP-20*

Additional notes: -

ONTAP-33-01	Mixed File Access	< *work in progress* > Click or tap here to enter text.	select...

ID	Description	Comments & Test Notes	Success? Yes | No | n/a
	ONTAP-35 – iSCSI		
Prerequisites for execution: - *ONTAP-20* *Additional notes: -*			
ONTAP-35-01	**iGroups** – Create iGroups according to test hosts' operating system and add host IQNs.	Click or tap here to enter text.	select...
ONTAP-35-02	**Volumes** – Create volumes for storing host/client data.	Click or tap here to enter text.	select...
ONTAP-35-03	**LUNs & Mappings** – Create LUNs for storing host/client data and map them to the previously created iGroups.	Click or tap here to enter text.	select...
ONTAP-35-04	**Mount & Write (Linux)** – Discover iSCSI portals from Linux host(s). Map LUNs and write test data to them.	Click or tap here to enter text.	select...
ONTAP-35-05	**Mount & Write (Windows)** – 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...
	ONTAP-37 – NVMe/TCP		
Prerequisites for execution: - *ONTAP-20* *Additional notes:*			
ONTAP-37-01	**Volumes** - Create volumes for storing host/client data.	Click or tap here to enter text.	select...
ONTAP-37-02	**Namespaces** - Create Namespaces for storing host/client data.	Click or tap here to enter text.	select...
ONTAP-37-03	**Subsystem** – Create subsystem, add host(s) and map namespaces.	Click or tap here to enter text.	select...
ONTAP-37-04	**Mount & Write (Linux)** - 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: -*			
ONTAP-41-01	**Export Policies & Rules** – Create export policies & rules to control host access to provisioned storage resources.	Click or tap here to enter text.	select...
ONTAP-41-02	**Origin Volume** – Create volume for storing host/client data.	Click or tap here to enter text.	select...
ONTAP-41-03	**Mount & Write (Origin Volume)** – Access provisioned volume from a UNIX host via NFS and write data to it.	Click or tap here to enter text.	select...
ONTAP-41-04	**Client Write (Origin Volume)** – Create an additional file in the provisioned volume from the UNIX host.	Click or tap here to enter text.	select...
ONTAP-41-05	**Clone Volume** – Create a FlexClone of the origin volume	Click or tap here to enter text.	select...
ONTAP-41-06	**Mount & Write (Clone)** - Access cloned volume from a UNIX host via NFS and write data to it.	Click or tap here to enter text.	select...

ID	Description	Comments & Test Notes	Success? Yes | No | n/a
ONTAP-41-07	**Client Write (Clone)** – Create an additional file in the cloned volume from the UNIX host.	Click or tap here to enter text.	select...
ONTAP-41-08	**Clone & Write (Loop)** – Repeat step 5-7 multiple times	Click or tap here to enter text.	select...
	ONTAP-42 – Cold Data Tiering		
	Prerequisites for execution: - *ONTAP-20* *Additional notes: -*		
ONTAP-42-01	Cold Data Tiering	< *work in progress* > Click or tap here to enter text.	select...
	ONTAP-51 – Local Versioning (Snapshots)		
	Prerequisites for execution: - *ONTAP-20* *Additional notes: -*		
ONTAP-51-01	Local Versioning (Snapshots)	< *planned* > Click or tap here to enter text.	select...
	ONTAP-52 – Backup (SnapMirror)		
	Prerequisites for execution: - *ONTAP-25* *Additional notes: -*		
ONTAP-52-01	Backup (SnapMirror)	< *planned* > Click or tap here to enter text.	select...
			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...
	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...
	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...
	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...

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/ --grap
@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>*
security_login_messages		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!`
network_ethernet_broadcast_domains		List of broadcast domains to be created.	

Parameter Name			Description	Value (Lab on Demand)
-	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"
security_key_managers				
	onboard			
		passphrase		<hidden>
security_accounts				
-	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"
		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"

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

jumphost

Table 12) Environment Variables – jumphost

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

cluster1

Table 13) Environment Variables – cluster1

Parameter Name		Description	Value (Lab on Demand)
cluster			
	name		"cluster1"
cluster_nodes			
	name		"cluster1-01"

Parameter Name	Description	Value (Lab on Demand)
location		"Virtual DC01 | Virtual Rack 01"
name		"cluster1-02"
location		"Virtual DC01 | Virtual Rack 02"
cluster_licensing_licenses		[]
security_authentication_cluster_ad_proxy		
svm		
name		"cluster1_ad"
network_ethernet_ports		
- name		"a0a"
node		
name		"cluster1-01"
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		"cluster1-02"
type		"lag"
lag		
member_ports		
- name		"e0f"
- name		"e0g"
distribution_policy		"port"
mode		"singlemode"
broadcast_domain		
name		"bc_data"
ipspace		
name		"Default"
storage_aggregates		
- name		"cluster_01_aggr01"
node		
name		"cluster1-01"
block_storage		
primary		
disk_count		13
snaplock_type		"non_snaplock"
- name		"cluster_02_aggr01"
node		

Parameter Name	Description	Value (Lab on Demand)
name		"cluster1-02"
block_storage		
primary		
disk_count		13
snaplock_type		"non_snaplock"
svm_svms		
- 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
fcp		
allowed		false
ndmp		
allowed		false
nvme		
allowed		false
language		"utf8mb4"

Parameter Name	Description	Value (Lab on Demand)
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_cifs_services		
- 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"

Parameter Name	Description	Value (Lab on Demand)
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
protocols_san_iscsi_services		
- svm		
name		"ntap-svm02-san"
enabled		True
protocols_nvme_services		
- svm		
name		"ntap-svm02-san"
enabled		true
network_ip_interfaces		
- name		"cluster1_ad"
scope		"svm"
svm		
name		"cluster1_ad"
ip		
netmask		"24"
address		"192.168.0.210"
family		"ipv4"
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"

Parameter Name	Description	Value (Lab on Demand)
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"
location		
home_node		
name		"cluster1-01"
home_port		
name		"e0c"
auto_revert		false
service_policy		
name		"default-data-blocks"

Parameter Name	Description	Value (Lab on Demand)
- 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"

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		

Parameter Name	Description	Value (Lab on Demand)
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		
name		"bc_data"
ipspace		
name		"Default"
storage_aggregates		
- 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"
svm_svms		
- name		"cluster2_ad"
dns		

Parameter Name	Description	Value (Lab on Demand)
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		
v3_enabled		true

Parameter Name	Description	Value (Lab on Demand)
v40_enabled		true
v41_enabled		false
v3_64bit_identifiers_enabled		true
v4_64bit_identifiers_enabled		true
showmount_enabled		true
protocols_cifs_services		
- 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		"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
network_ip_interfaces		
- name		"cluster2_ad"
scope		"svm"
svm		
name		"cluster2_ad"
ip		
netmask		"24"
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"

Parameter Name	Description	Value (Lab on Demand)
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		
name		"cluster2-02"
home_port		
name		"e0c"
auto_revert		true
service_policy		
name		"default-intercluster"

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
        - 2.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
        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
                                  [.......................]
                                  [... output truncated ...]
                                  [.......................]
```

Runtime

Ansible: "<vars_source>/<environment name>"

Table 15) Runtime Variables

Parameter Name	Description	Value (Lab on Demand)
General Defaults		
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-12 – Cluster User Management		
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"
ONTAP-31 – NFS		
ontap_31_policy_name		"ontap_31_policy"
ontap_31_vol_name		"ontap_31_nfs_vol01"
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"
linux_31_default_mount_dir		"/mnt/31"
ONTAP-32 – CIFS		
ontap_32_vol_name		"ontap_32_cifs_vol01"
ontap_32_vol_qtree_names		- "ontap_32_vol_qt01" - "ontap_32_vol_qt02"

Parameter Name	Description	Value (Lab on Demand)
		- "ontap_32_vol_qt03" - "ontap_32_vol_qt04" - "ontap_32_vol_qt05"
ontap_32_fg_name		"ontap_32_cifs_fg01"
ontap_32_fg_qtree_names		- "ontap_32_fg_qt01" - "ontap_32_fg_qt02" - "ontap_32_fg_qt03" - "ontap_32_fg_qt04" - "ontap_32_fg_qt05"
ontap_32_ad_ro_group		<s. ontap_12_ad_ro_group>
ontap_32_ad_admin_group		<s. ontap_12_ad_admin_group>
windows_32_default_mount_dir		"C:\\Users\\Administrator.DEMO\\Desktop\\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>
ONTAP-35 – iSCSI		
ontap_35_lin_igroup_name		"ontap_35_lin_ig"
ontap_35_lin_igroup_iqns		- "iqn.1994-05.com.redhat:centos1.demo.netapp.com"
ontap_35_win_igroup_name		"ontap_35_win_ig"
ontap_35_win_igroup_iqns		- "iqn.1991-05.com.microsoft:jumphost.demo.netapp.com"
ontap_35_lin_luns		- "/vol/ontap_35_lin_vol01/ontap_35_lin_lun01" - "/vol/ontap_35_lin_vol02/ontap_35_lin_lun02" - "/vol/ontap_35_lin_vol03/ontap_35_lin_lun03"
ontap_35_win_luns		- "/vol/ontap_35_win_vol01/ontap_35_win_lun01" - "/vol/ontap_35_win_vol02/ontap_35_win_lun02" - "/vol/ontap_35_win_vol03/ontap_35_win_lun03"
linux_35_default_mount_dir		"/mnt/35"
windows_35_default_mount_dir		"C:\\Users\\Administrator.DEMO\\Desktop\\35"
ONTAP-37 – NVMe/TCP		
ontap_37_lin_subsystem_name		"ontap_37_lin_subs01"
ontap_37_lin_namespaces		- "/vol/ontap_37_lin_vol01/ontap_37_lin_ns01" - "/vol/ontap_37_lin_vol02/ontap_37_lin_ns02" - "/vol/ontap_37_lin_vol03/ontap_37_lin_ns03"
linux_37_default_mount_dir		"/mnt/37"
ONTAP-41 – NFS FlexClone		
ontap_41_policy_name		"ontap_41_policy"
ontap_41_vol_name		"ontap_41_nfs_vol01"

Parameter Name	Description	Value (Lab on Demand)
ontap_41_snapshot_name		"software_source"
ontap_41_clone_dir_name		"clonedir"
ontap_41_clone_vol_name		"software_source"
linux_41_default_mount_dir		"/mnt/41"

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>

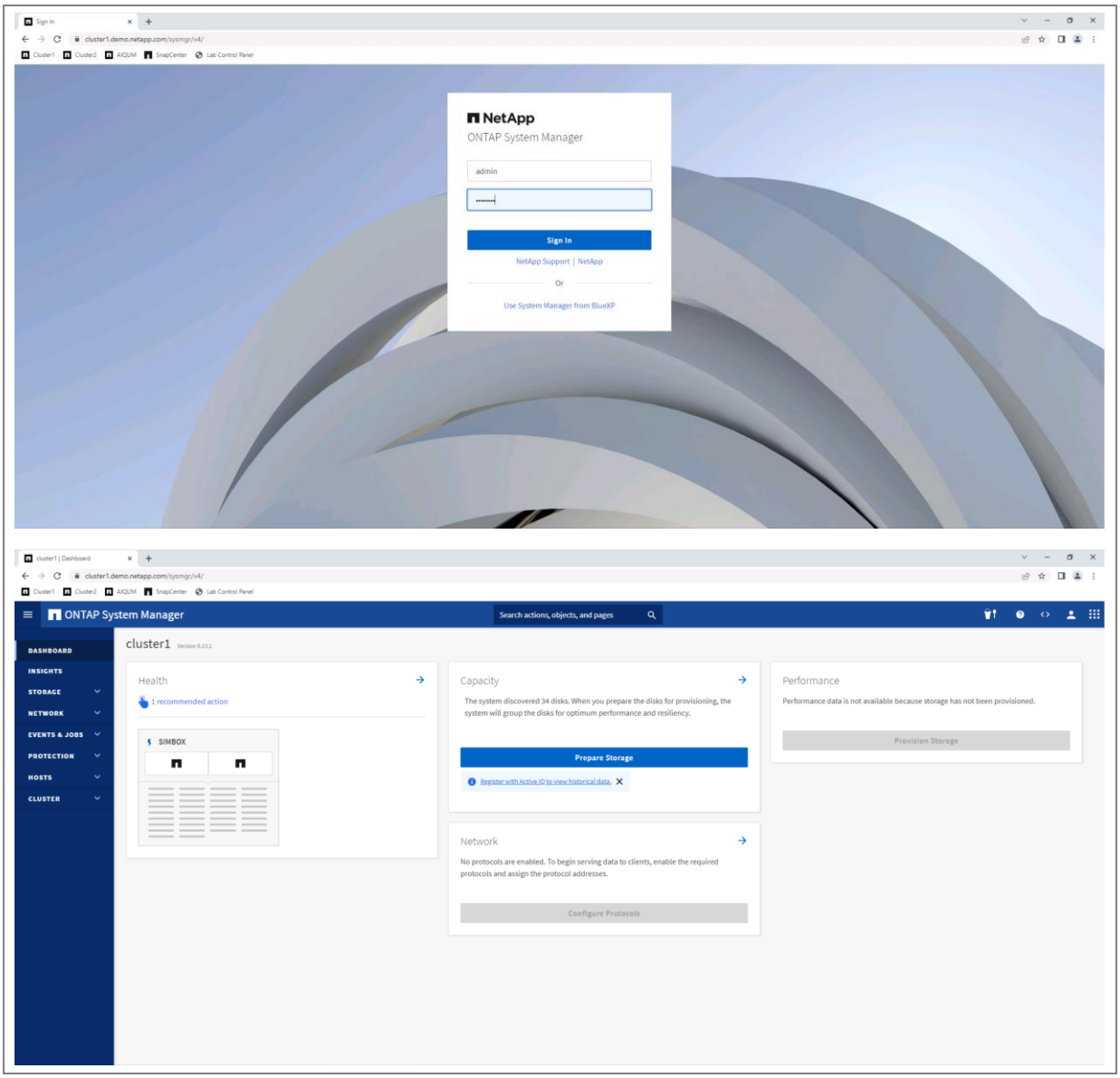
Instructions

```
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 "1-81-0000000000000004082368507" 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

```
cluster1::> network port broadcast-domain show
IPspace Broadcast                                       Update
Name    Domain Name    MTU  Port List                   Status Details
------- ----------- ------  ---------------------------- --------------
Cluster Cluster       9000
                            cluster1-01:e0a              complete
                            cluster1-01:e0b              complete
                            cluster1-02:e0a              complete
```

```
                              cluster1-02:e0b               complete
Default Default       1500
                              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
         Port       Distribution                    Active
Node     IfGrp      Function     MAC Address        Ports   Ports
-------- ---------- ------------ ------------------ ------- -------------------
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
                                                            Speed(Mbps) Health
Port      IPspace      Broadcast Domain Link MTU  Admin/Oper  Status
--------- ------------ ----------------- ---- ---- ----------- --------
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
                                                            Speed(Mbps) Health
Port      IPspace      Broadcast Domain Link MTU  Admin/Oper  Status
--------- ------------ ----------------- ---- ---- ----------- --------
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
------------------- --------------- --------------- ------
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)
                                                            Usable Physical
          Position   Disk                      Type           Size     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
12345678901234567890123456789012345678901234567890123456789012345678901234567890
################ 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
12345678901234567890123456789012345678901234567890123456789012345678901234567890
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-------------------------
TmV0QXBwIEtleSBCbG9iAAEBAAAEAAAAcAEAAAAAAAA8Y6eOAAAAACEAAAAAAAAA
[.......................]
[... output truncated ...]
[.......................]
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
-------------------------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-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
                                                                 Second
User/Group                 Authentication                 Acct   Authentication
Name           Application Method        Role Name        Locked 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
                                                                 Second
User/Group                 Authentication                 Acct   Authentication
Name           Application Method        Role Name        Locked 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_ro
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
                                                                  Second
User/Group                  Authentication                 Acct   Authentication
Name           Application  Method        Role Name        Locked Method
-------------- -----------  ------------- ---------------- ------ --------------
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
                                                                 Second
User/Group                 Authentication                 Acct   Authentication
Name           Application Method        Role Name        Locked 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 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 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               enabled

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

```
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_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

```
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_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

```
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

```
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

```
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

```
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        sssOplocks   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         enable     normal
ntap-svm01-nas
           ontap_31_nfs_vol01
```

```
                           ontap_31_vol_qt02
                                          unix          enable    normal
ntap-svm01-nas
           ontap_31_nfs_vol01
                           ontap_31_vol_qt03
                                          unix          enable    normal
ntap-svm01-nas
           ontap_31_nfs_vol01
                           ontap_31_vol_qt04
                                          unix          enable    normal
ntap-svm01-nas
           ontap_31_nfs_vol01
                           ontap_31_vol_qt05
                                          unix          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 <linux_31_default_mount_dir>
mkdir <linux_31_default_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_31_vol_qtree_names[item]>

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

Execution Example

```
[root@centos1 ~]# mkdir /mnt/ontap_31_vol_qt0{1..5}

[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_vol01/ontap_31_vol_qt01 /mnt/ontap_31_vol_qt01
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_vol01/ontap_31_vol_qt02 /mnt/ontap_31_vol_qt02
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_vol01/ontap_31_vol_qt03 /mnt/ontap_31_vol_qt03
[root@centos1 ~]# mount -t nfs ntap-ssvm01-
nas.demo.netapp.com:/ontap_31_nfs_vol01/ontap_31_vol_qt04 /mnt/ontap_31_vol_qt04
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_vol01/ontap_31_vol_qt05 /mnt/ontap_31_vol_qt05

[root@centos1 ~]# dd if=/dev/urandom of=/mnt/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_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_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_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_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

```
[root@centos1 ~]# mount | grep ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_vol01/
ntap-svm01-nas.demo.netapp.com:/ontap_31_nfs_vol01/ontap_31_vol_qt01 on /mnt/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_vol01/ontap_31_vol_qt02 on /mnt/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_vol01/ontap_31_vol_qt03 on /mnt/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_vol01/ontap_31_vol_qt04 on /mnt/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_vol01/ontap_31_vol_qt05 on /mnt/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_31_vol_qt0*
/mnt/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_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_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_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_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

```
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

```
cluster1::> volume create -vserver ntap-svm01-nas -volume ontap_31_nfs_vol01 -size 10GB -
junction-path /ontap_31_nfs_vol01 -policy ontap_31_policy
[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

```
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_vol01
                       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        Oplocks    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 <linux_31_default_mount_dir>
mkdir <linux_31_default_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_31_vol_qtree_names[item]>

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

Execution Example

```
[root@centos1 ~]# mkdir /mnt/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_31_fg_qt01
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt02 /mnt/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_31_fg_qt03
[root@centos1 ~]# mount -t nfs ntap-svm01-
nas.demo.netapp.com:/ontap_31_nfs_fg01/ontap_31_fg_qt04 /mnt/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_31_fg_qt05

[root@centos1 ~]# dd if=/dev/urandom of=/mnt/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_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_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_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_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

```
[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_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_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_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_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_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 ~]# [root@centos1 ~]# ls -lar /mnt/ontap_31_fg_qt0*
/mnt/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_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_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_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_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

```
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

```
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

```
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        Oplocks   Status
---------- ------------- ------------ ------------ --------- --------
```

```
ntap-svm01-nas
           ontap_32_cifs_vol01
                          ""            ntfs          enable    normal
ntap-svm01-nas
           ontap_32_cifs_vol01
                          ontap_32_vol_qt01
                                        ntfs          enable    normal
ntap-svm01-nas
           ontap_32_cifs_vol01
                          ontap_32_vol_qt02
                                        ntfs          enable    normal
ntap-svm01-nas
           ontap_32_cifs_vol01
                          ontap_32_vol_qt03
                                        ntfs          enable    normal
ntap-svm01-nas
           ontap_32_cifs_vol01
                          ontap_32_vol_qt04
                                        ntfs          enable    normal
ntap-svm01-nas
           ontap_32_cifs_vol01
                          ontap_32_vol_qt05
                                        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

```
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,changenotify,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

```
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_vol_qt01 -
path /ontap_32_cifs_vol01/ontap_32_vol_qt01 -share-properties
browsable,changenotify,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_vol_qt02 -
path /ontap_32_cifs_vol01/ontap_32_vol_qt02 -share-properties
browsable,changenotify,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_vol_qt03 -
path /ontap_32_cifs_vol01/ontap_32_vol_qt03 -share-properties
browsable,changenotify,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_vol_qt04 -
path /ontap_32_cifs_vol01/ontap_32_vol_qt04 -share-properties
browsable,changenotify,oplocks,show-previous-versions,showsnapshot
cluster1::> vserver cifs share create -vserver ntap-svm01-nas -share-name ontap_32_vol_qt05 -
path /ontap_32_cifs_vol01/ontap_32_vol_qt05 -share-properties
browsable,changenotify,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_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_vol_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_vol_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_vol_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_vol_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_vol_qt05 -user-or-group DEMO\na_ad_ro_group -user-group-type windows -permission Read
```

Verification Example

```
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_qt01
                          "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group / Read"
ntap-svm01-nas ontap_32_vol_qt02
                          "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group / Read"
ntap-svm01-nas ontap_32_vol_qt03
                          "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group / Read"
ntap-svm01-nas ontap_32_vol_qt04
                          "DEMO\na_ad_admin_group / Full Control","DEMO\na_ad_ro_group / Read"
ntap-svm01-nas ontap_32_vol_qt05
                          "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>

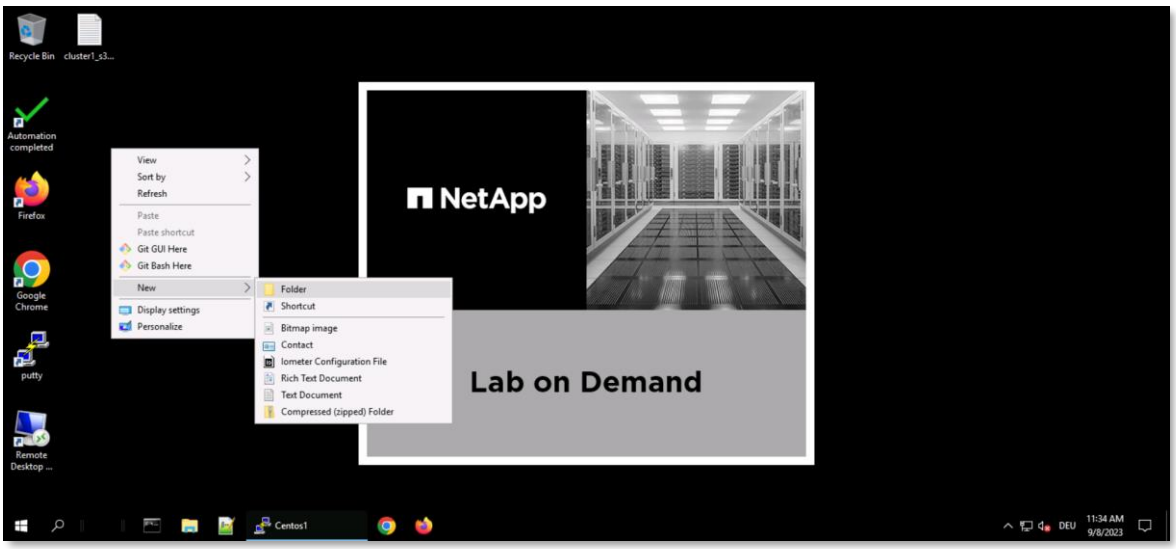
Additional Information

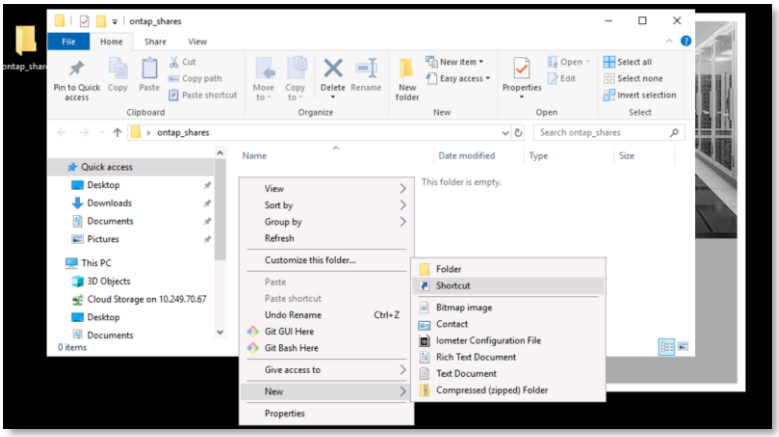
<placeholder>

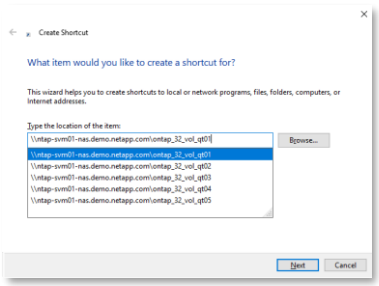
Instructions

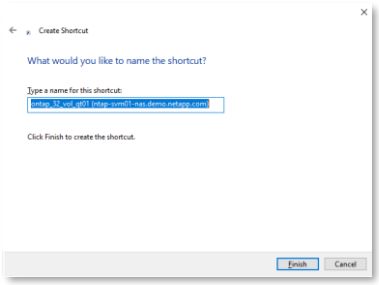
```
# Create directory for all mount points

# Connect/link network shares

# Provide login credentials

# Acces shaers and write test data
```

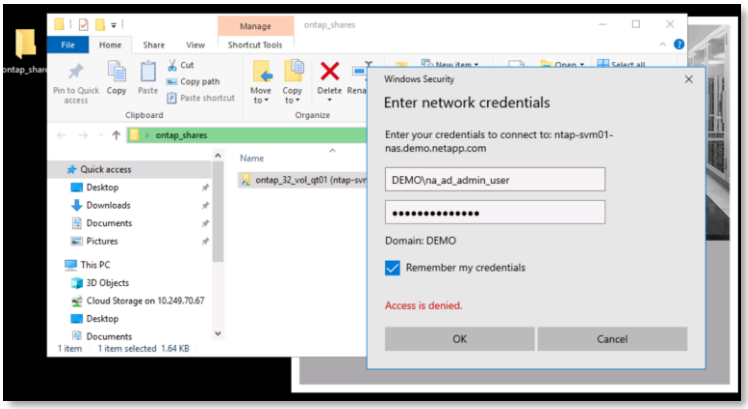
Execution Example

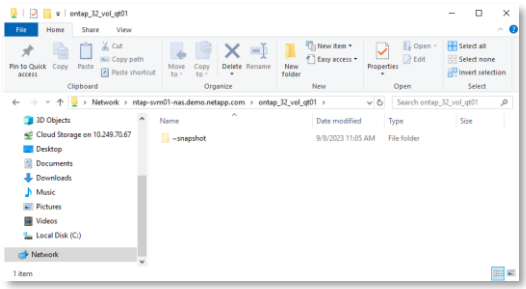


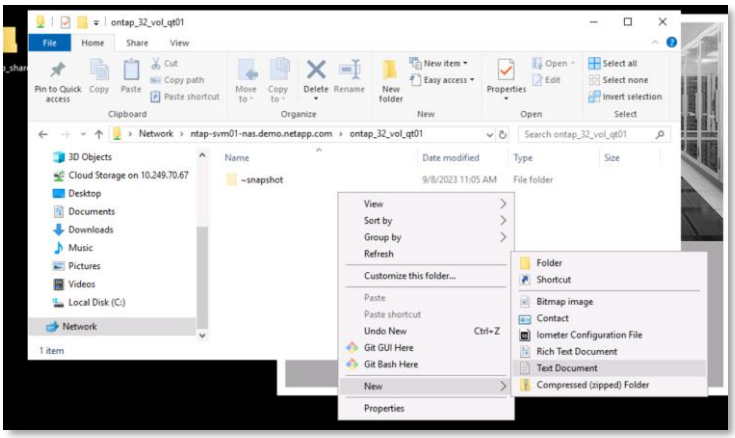


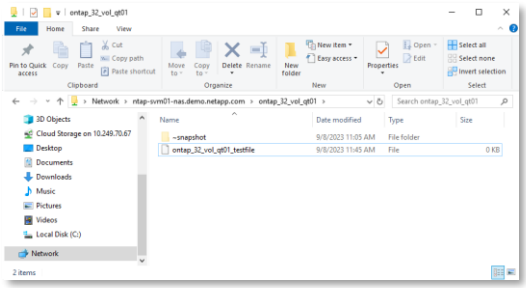




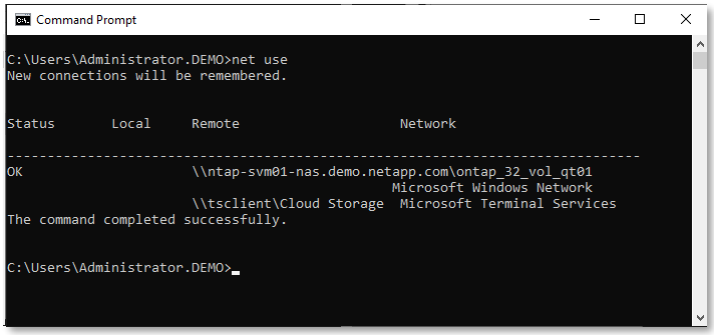








Verification Example



ONTAP-32-04 – FlexGroups & Qtrees

Description

Create volumes and qtrees for storing host/client data.

Expected Result

<placeholder>

Additional Information

<placeholder>

Instructions

```
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

```
cluster1::> 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 8 -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

```
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

```
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,changenotify,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

```
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,changenotify,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,changenotify,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,changenotify,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,changenotify,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,changenotify,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

```
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>

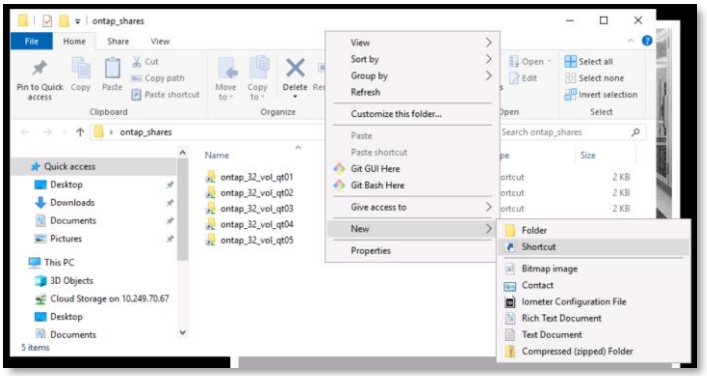
Additional Information

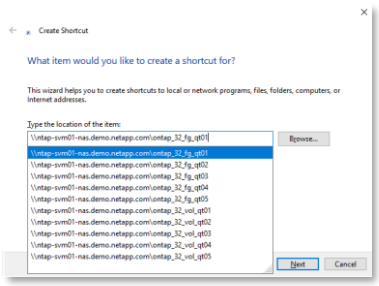
<placeholder>

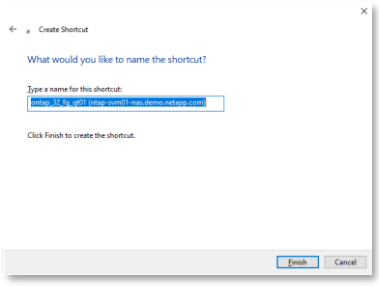
Instructions

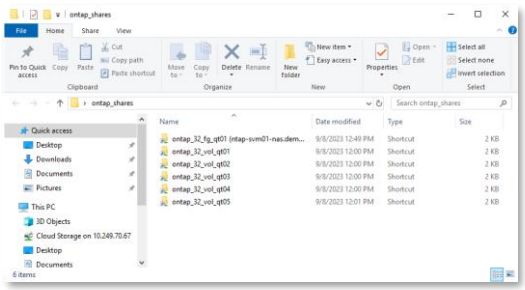
```
<n/a>
```

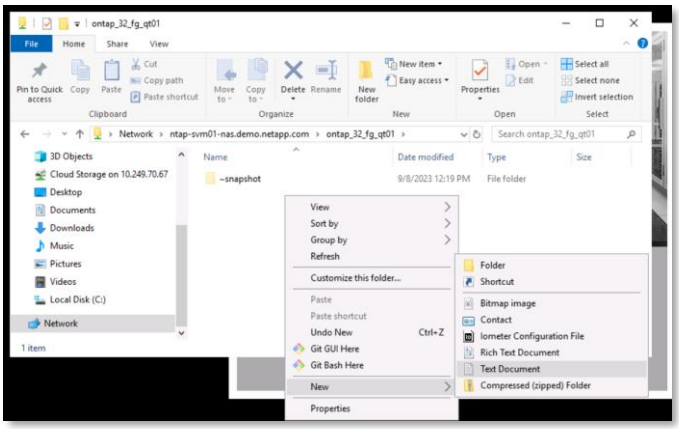
Execution Example

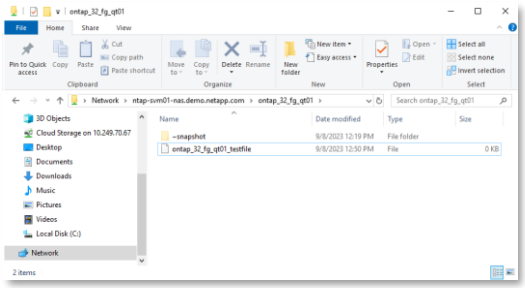












Verification Example

<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

```
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

```
### Linux Example
cluster1::> igroup 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::> igroup 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

```
cluster1::> igroup 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.cosm
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

```
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

```
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

```
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

```
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_nam
e> -igroup <|>
```

Execution Example

```
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

```
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
ntap-svm02-san
           /vol/ontap_35_win_vol01/ontap_35_win_lun01
                                                     ontap_35_win_ig01
                                                              0  iscsi
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.addres
s>

iscsiadm -m node –login

mkfs.ext4 <device path to LUN>

mkdir <linux_35_default_mount_dir>/<ontap_35_lin_lun_name>

mount -o discard <device path to LUN> <linux_35_default_mount_dir>/<ontap_35_lin_lun_name>

dd if=/dev/urandom of=/mnt/<linux_35_default_mount_dir>/<ontap_35_lin_lun_name>/testfile
bs=1024KB count=50
```

Execution Example

```
[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/35/ontap_35_lin_lun01

[root@centos1 ~]# mount -o discard /dev/dm-2 /mnt/35/ontap_35_lin_lun01

[root@centos1 ~]# dd if=/dev/urandom of=/mnt/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

```
[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/35/ontap_35_lin_lun01"
/dev/mapper/3600a0980774f6a3458245659692d6244 on /mnt/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>

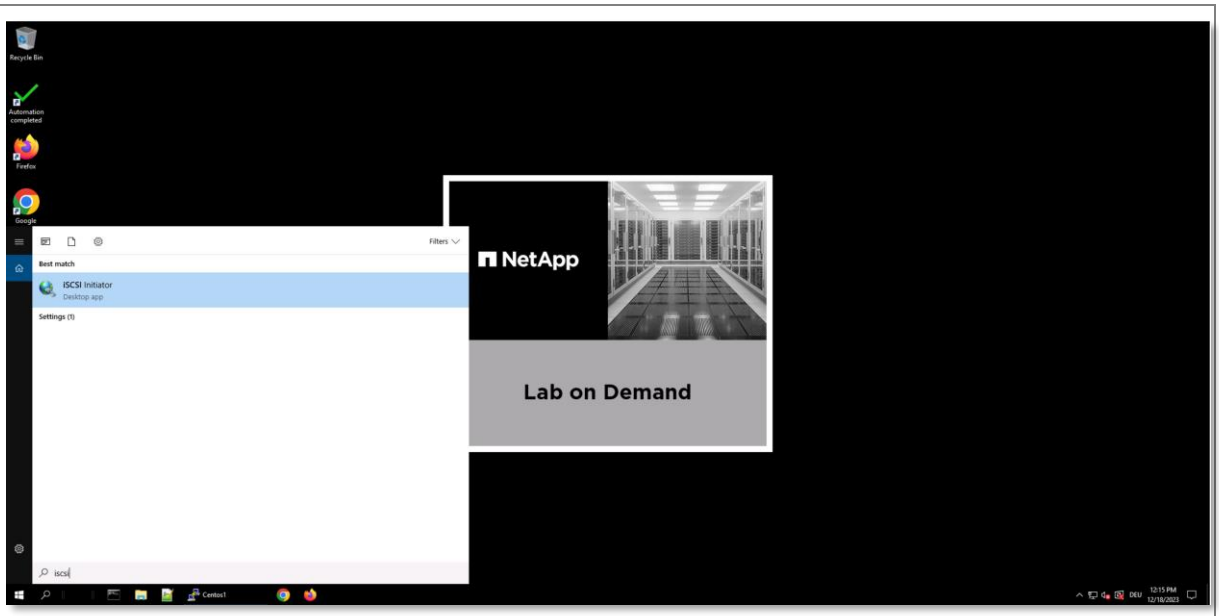
Additional Information

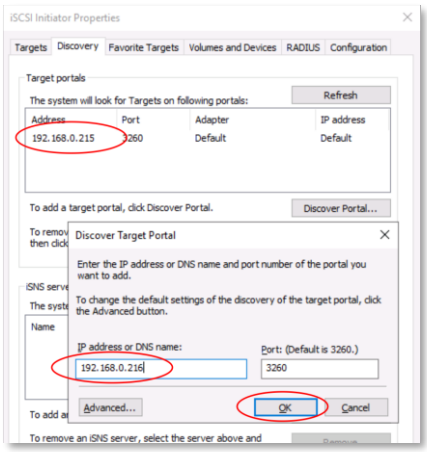
<placeholder>

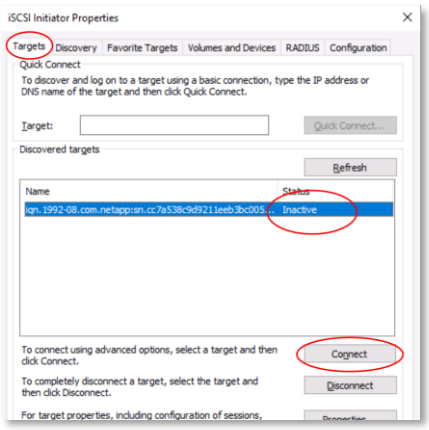
Instructions

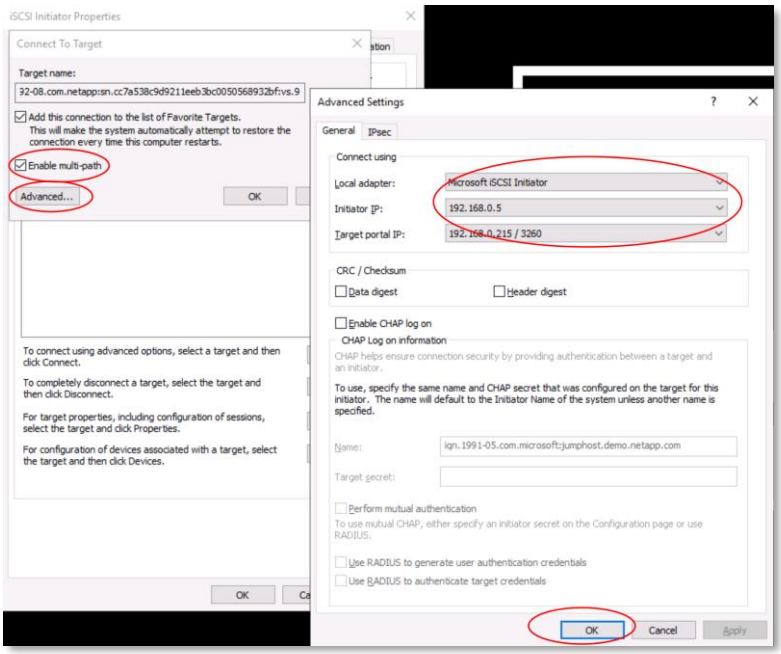
```
# Add iSCSI portals for target discovery

# 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
```

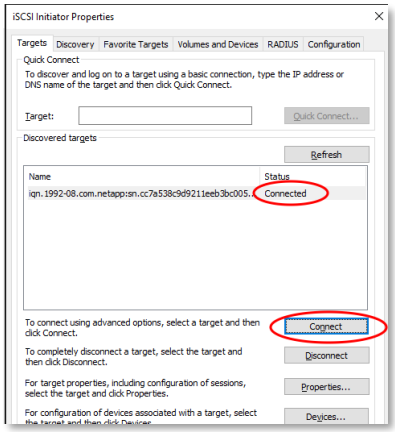
Execution Example

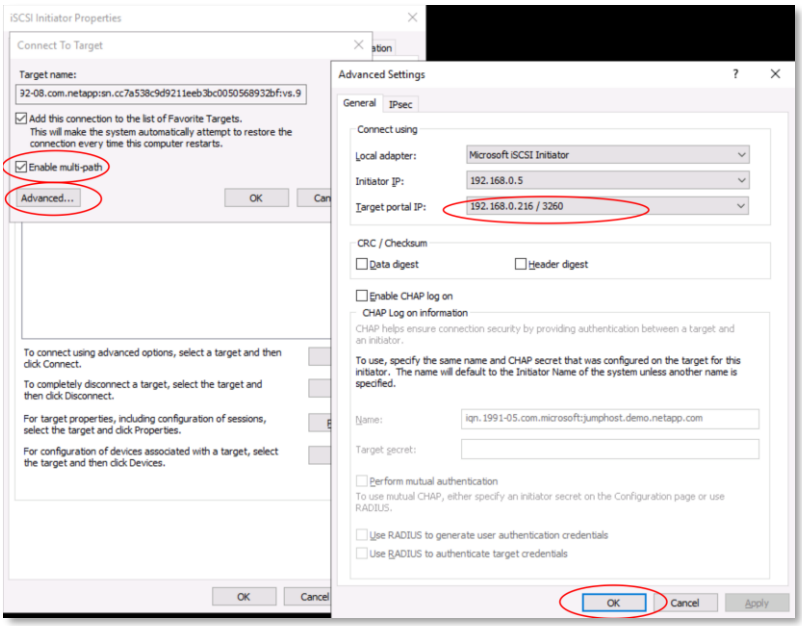


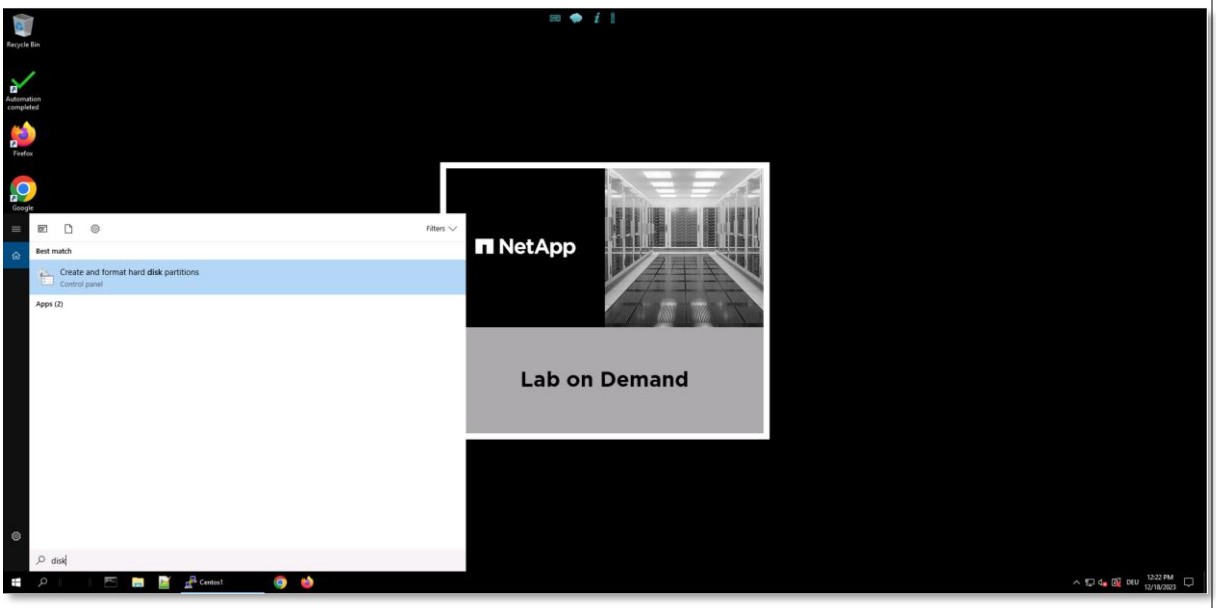


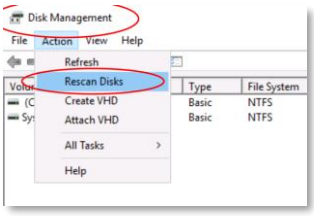


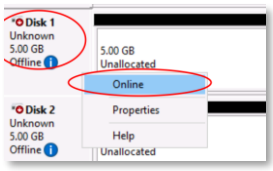


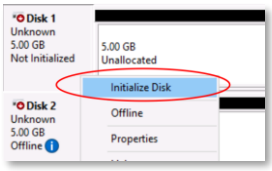


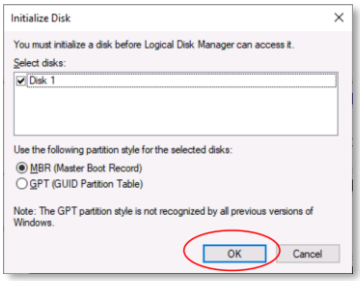


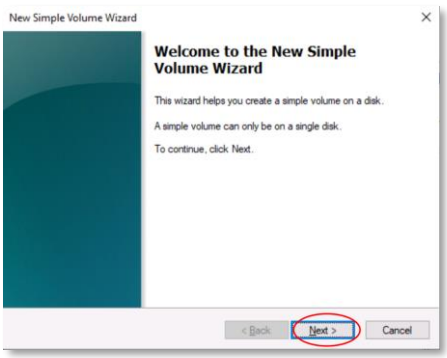


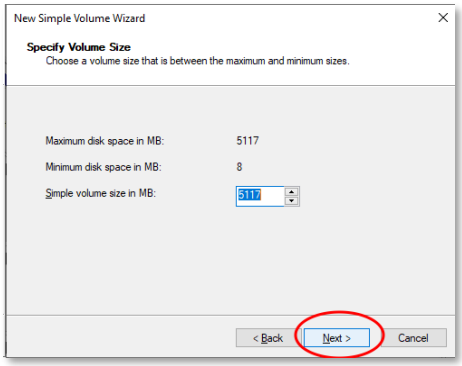


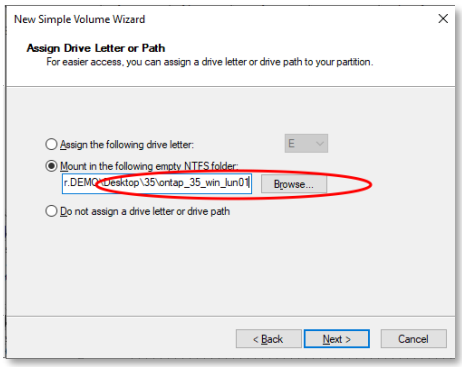


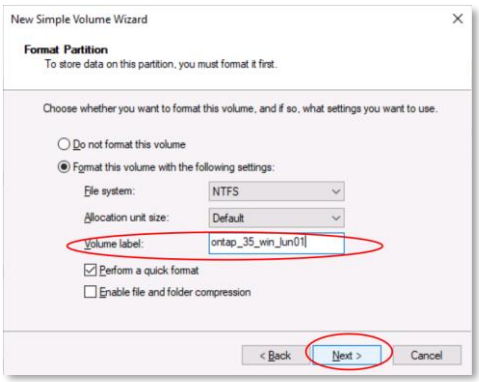


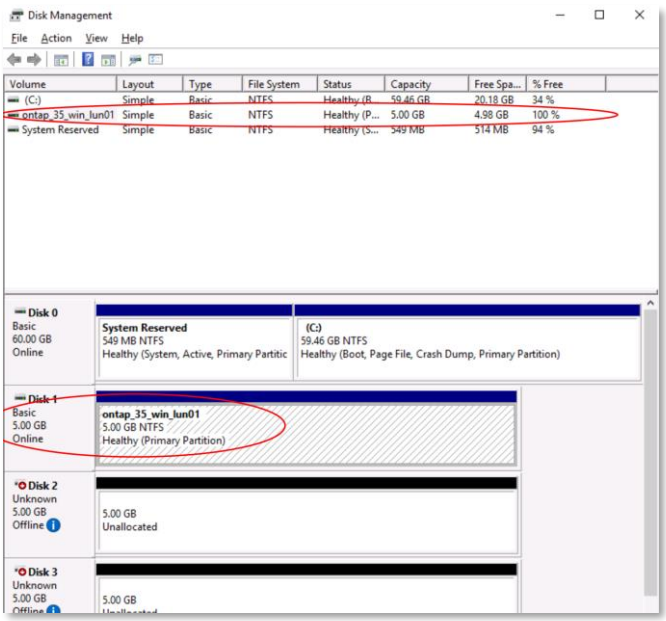


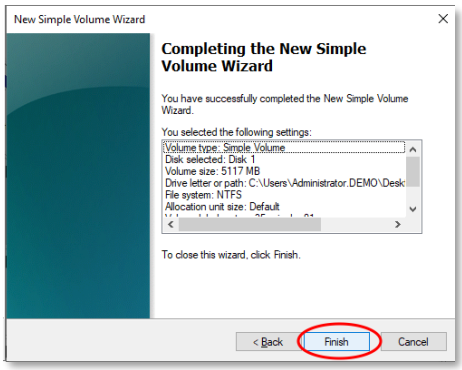


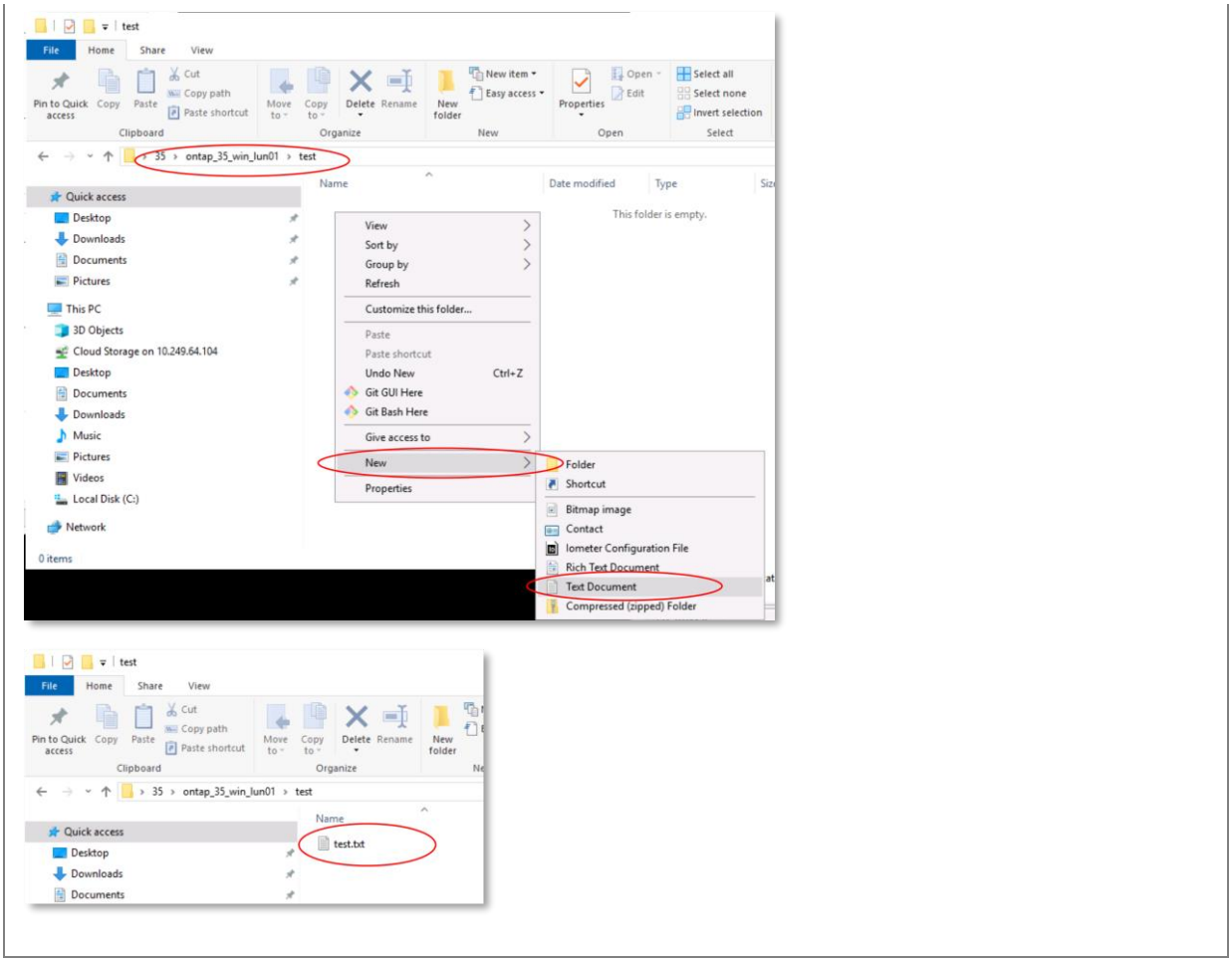




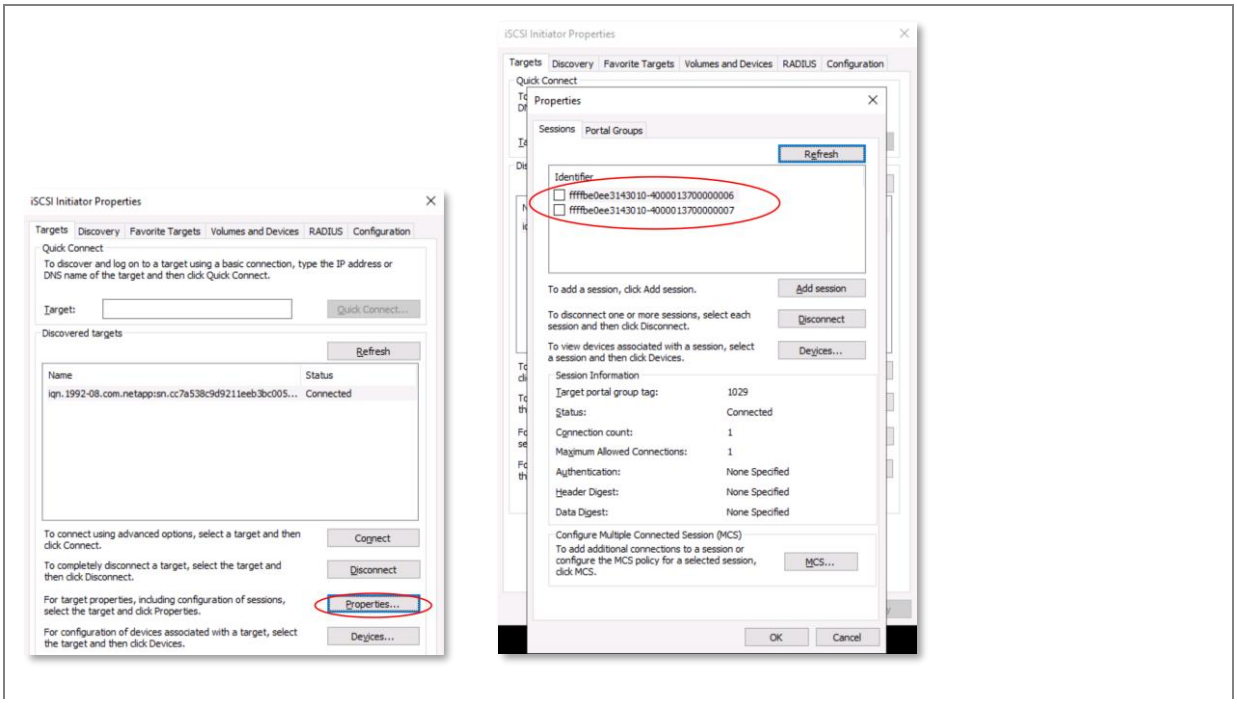


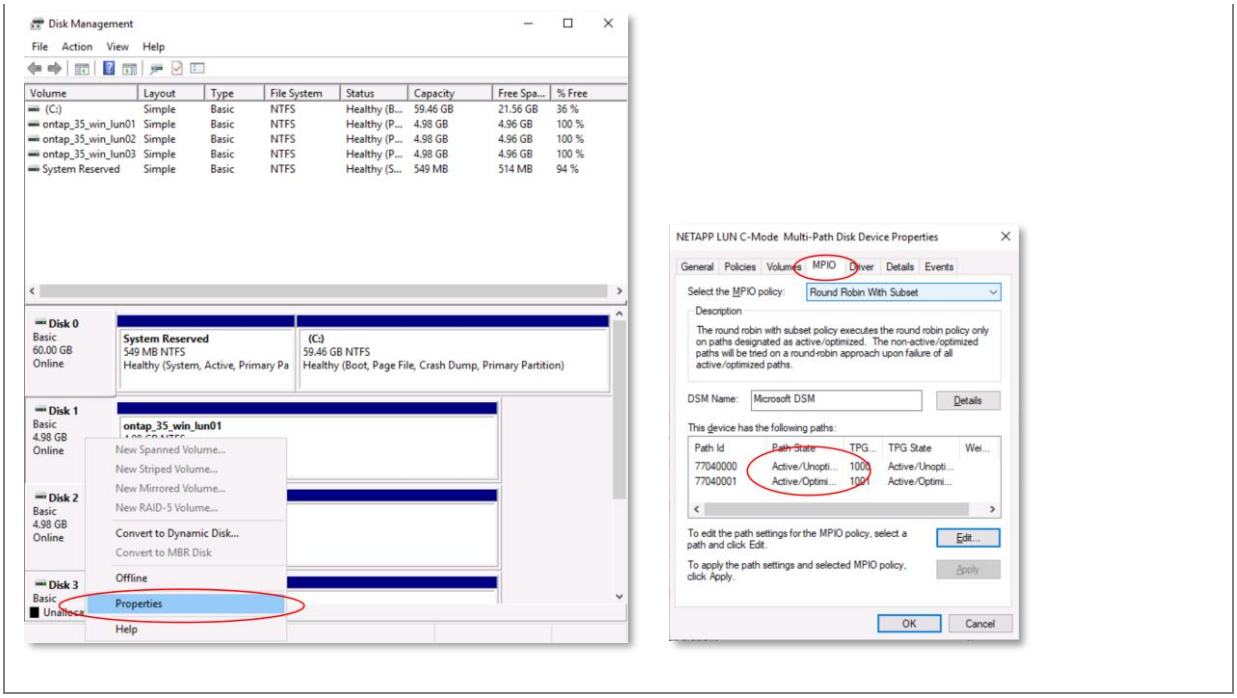






Verification Example





ONTAP-37 – NVMe/TCP

ONTAP-37-01 – Volumes

Description

Create volumes for storing host/client data.

Expected Result

<placeholder>

Additional Information

<placeholder>

Instructions

```
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

```
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

```
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

```
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

```
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

```
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

```
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

```
cluster1::> vserver nvme subsystem create -vserver ntap-svm02-san -subsystem
ontap_37_lin_subs01 -ostype linux

cluster1::> vservesr nvme subsystem map add -vserver ntap-svm02-san -subsystem
ontap_37_lin_subs01 -path /vol/ontap_37_lin_vol01/ontap_37_lin_ns01
cluster1::> vservesr nvme subsystem map add -vserver ntap-svm02-san -subsystem
ontap_37_lin_subs01 -path /vol/ontap_37_lin_vol02/ontap_37_lin_ns02
cluster1::> vserver nvme subsystem map add -vserver ntap-svm02-san -subsystem
ontap_37_lin_subs01 -path /vol/ontap_37_lin_vol03/ontap_37_lin_ns03

cluster1::> vserver nvme subsystem host add -vserver ntap-svm02-san -subsystem
ontap_37_lin_subs01 -host-nqn nqn.2014-08.org.nvmexpress:uuid:36ea1c7d-e1c0-4fe9-baf1-
6e989df2d51b
```

Verification Example

```
cluster1::> vserver nvme subsystem show
Vserver Subsystem    Target NQN
------- ------------ ----------------------------------------------------------
ntap-svm02-san
        ontap_37_lin_subs01sss
                     nqn.1992-
08.com.netapp:sn.cc7a538c9d9211eeb3bc0050568932bf:subsystem.ontap_37_lin_subs01

cluster1::> nvme subsystem map show
  (vserver nvme subsystem map show)
Vserver       Subsystem      NSID Namespace Path
------------- --------- --------- ----------------------------------------
ntap-svm02-san
              ontap_37_lin_subs01
                        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_subs01
                  nqn.2014-08.org.nvmexpress:uuid:36ea1c7d-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_default_mount_dir>/<ontap_37_lin_ns_name>

mount -o discard <device path to LUN> <linux_35_default_mount_dir>/<ontap_35_lin_lun_name>

dd if=/dev/urandom of=/mnt/<linux_37_default_mount_dir>/<ontap_37_lin_ns_name>/testfile
bs=1024KB count=50
```

Execution Example

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

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

[root@centos1 ~]# dd if=/dev/urandom of=/mnt/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/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/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

```
[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_vol01/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_vol02/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_vol03/ontap_37_lin_ns03, NSID 3, UUID 4fe46a9f-07a0-46ed-a540-7af0b8ccf92f,
5.37GB

[root@centos1 ~]# nvme list-subsys /dev/nvme0n1
nvme-subsys0 - 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/37/
/mnt/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/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/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/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/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/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/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_default_mount_dir>/<ontap_41_vol_name>

mount -t nfs <global_primary_nas_svm>:/<ontap_41_vol_name>
<linux_41_default_mount_dir>/<ontap_41_vol_name>

dd if=/dev/urandom
of=<linux_41_default_mount_dir>/<ontap_41_vol_name>/<ontap_41_snapshot_name>_original_<timesta
mp> bs=1024KB count=50
```

Execution Example

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

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

[root@centos1 ~]# dd if=/dev/urandom of=/mnt/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/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)

[root@centos1 ~]# ls -la /mnt/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_default_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/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/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                49.22MB     0%   33%
                  software_source                         140KB     0%    0%
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_default_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_default_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>

dd if=/dev/urandom
of=<linux_41_default_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>/newop_<tim
estamp> bs=1024KB count=50
```

Execution Example

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

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

[root@centos1 ~]# dd if=/dev/urandom of=/mnt/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_vol01 on /mnt/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/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)

[root@centos1 ~]# ls -laR /mnt/41/
/mnt/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_vol01

/mnt/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/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/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_default_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>/extraop_<t
imestamp> bs=1024KB count=50
```

Execution Example

```
[root@centos1 ~]# dd if=/dev/urandom of=/mnt/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/41
/mnt/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_vol01

/mnt/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/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/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-41-08 – 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_default_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_default_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>_<##>

dd if=/dev/urandom
of=<linux_41_default_mount_dir>/<ontap_41_clone_dir_name>/<ontap_41_clone_vol_name>_<##>/moreo
ps_<timestamp> 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/41/clonedir/software_source_01

[root@centos1 ~]# mount -t nfs ntap-svm01-nas.demo.netapp.com:/clonedir/software_source_01
/mnt/41/clonedir/software_source_01

[root@centos1 ~]# dd if=/dev/urandom of=/mnt/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/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/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/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/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/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/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/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/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/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/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/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/41/
/mnt/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_vol01

/mnt/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/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--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/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--r--  1 nobody nobody 51200000 Dec 19 17:21 newop_20231219_172101
-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/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--r--  1 nobody nobody 51200000 Dec 19 17:24 newop_20231219_172447
-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/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/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/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/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/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/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/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/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
```

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	November 1st, 2023	• Initial Release	• Adrian Bronder • Ken Hillier

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