Traditional Block Storage Provisioning

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vSphere traditional block storage provisioning with ONTAP

VMware vSphere supports the following VMFS datastore options with ONTAP SAN protocol support indicated.

VMFS datastore options	ONTAP SAN protocol support
Fibre Channel (FC)	yes
Fibre Channel over Ethernet (FCoE)	yes
iSCSI	yes
iSCSI Extensions for RDMA (iSER)	no
NVMe over Fabric with FC (NVMe/FC)	yes
NVMe over Fabric with RDMA over Converged Ethernet (NVMe/RoCE)	no

If iSER or NVMe/RoCE VMFS is required, check SANtricity-based storage systems.

vSphere VMFS datastore - Fibre Channel storage backend with ONTAP

About this task

This section covers the creation of a VMFS datastore with ONTAP Fibre Channel (FC) storage.

For automated provisioning, use one of these scripts: [PowerShell], Ansible Playbook, or [Terraform].

What you need

- The basic skills necessary to manage a vSphere environment and ONTAP
- An ONTAP storage system (FAS/AFF/CVO/ONTAP Select/ASA) running ONTAP 9.8 or later
- ONTAP credentials (SVM name, userID, and password)
- ONTAP WWPN of host, target, and SVM and LUN information
- The completed FC configuration worksheet
- vCenter Server credentials
- vSphere host(s) information
  - vSphere 7.0 or later
- Fabric switch(es)
  - With connected ONTAP FC data ports and vSphere hosts
  - With the N_port ID virtualization (NPIV) feature enabled
  - Create a single initiator single target zone.
    - Create one zone for each initiator (single initiator zone).

    - For each zone, include a target that is the ONTAP FC logical interface (WWPN) for the SVMs. There should be at least two logical interfaces per node per SVM. Do not use the WWPN of the physical ports.
- An ONTAP Tool for VMware vSphere deployed, configured, and ready to consume.

Provisioning a VMFS datastore

To provision a VMFS datastore, complete the following steps:

1. Check compatability with the Interoperability Matrix Tool (IMT)
2. Verify that the FCP Configuration is supported.

ONTAP tasks

1. Verify that you have an ONTAP license for FCP.
    a. Use the `system license show` command to check that FCP is listed.
    b. Use `licen se add -license-code <license code>` to add the license.
2. Make sure that the FCP protocol is enabled on the SVM.
    a. Verify the FCP on an existing SVM.
    b. Configure the FCP on an existing SVM.
    c. Create s new SVM with the FCP.
3. Make sure that FCP logical interfaces are available on an SVM.
    a. Use `Network Interface show` to verify the FCP adapter.
    b. When an SVM is created with the GUI, logical interfaces are a part of that process.
    c. To rename network interfaces, use `Network Interface modify`.
4. Create and Map a LUN. Skip this step if you are using ONTAP tools for VMware vSphere.

VMware vSphere tasks

1. Verfiy that HBA drivers are installed. VMware supported HBAs have drivers deployed out of the box and should be visible in the Storage Adapter Information.
2. Provision a VMFS datastore with ONTAP Tools.

vSphere VMFS Datastore - Fibre Channel over Ethernet storage protocol with ONTAP

About this task

This section covers the creation of a VMFS datastore with the Fibre Channel over Ethernet (FCoE) transport protocol to ONTAP storage.

For automated provisioning, use one of these scripts: [PowerShell], Ansible Playbook, or [Terraform].

What you need

- The basic skills necessary to manage a vSphere environment and ONTAP
- An ONTAP storage system (FAS/AFF/CVO/ONTAP Select) running ONTAP 9.8 or later
- ONTAP credentials (SVM name, userID, and password)
- A supported FCoE combination
- A completed configuration worksheet
- vCenter Server credentials
- vSphere host(s) information
  - vSphere 7.0 or later
- Fabric switch(es)
  - With either ONTAP FC data ports or vSphere hosts connected
  - With the N_port ID virtualization (NPIV) feature enabled
  - Create a single initiator single target zone.
  - FC/FCoE zoning configured
- Network switch(es)
  - FCoE support
  - DCB support
  - Jumbo frames for FCoE
- ONTAP Tool for VMware vSphere deployed, configured, and ready to consume

Provision a VMFS datastore

- Check compatibility with the Interoperability Matrix Tool (IMT).
- Verify that the FCoE configuration is supported.

ONTAP tasks

1. Verify the ONTAP license for FCP.
   a. Use the `system license show` command to verify that the FCP is listed.
   b. Use `license add -license-code <license code>` to add a license.
2. Verify that the FCP protocol is enabled on the SVM.
   a. Verify the FCP on an existing SVM.
   b. Configure the FCP on an existing SVM.
   c. Create a new SVM with the FCP.
3. Verify that FCP logical interfaces are available on the SVM.
   a. Use `Network Interface show` to verify the FCP adapter.
   b. When the SVM is created with the GUI, logical interfaces are a part of that process.
   c. To rename the network interface, use `Network Interface modify`.
4. Create and map a LUN; skip this step if you are using ONTAP tools for VMware vSphere.

VMware vSphere tasks

1. Verify that HBA drivers are installed. VMware-supported HBAs have drivers deployed out of the box and should be visible in the storage adapter information.
2. Provision a VMFS datastore with ONTAP Tools.

vSphere VMFS Datastore - iSCSI Storage backend with ONTAP

About this task

This section covers the creation of a VMFS datastore with ONTAP iSCSI storage.

For automated provisioning, use one of these scripts: [PowerShell], Ansible Playbook, or [Terraform].

What you need

- The basic skills necessary to manage a vSphere environment and ONTAP.
- An ONTAP storage system (FAS/AFF/CVO/ONTAP Select/ASA) running ONTAP 9.8 or later
- ONTAP credentials (SVM name, userID, and password)
- ONTAP network port, SVM, and LUN information for iSCSI
- A completed iSCSI configuration worksheet
- vCenter Server credentials
- vSphere host(s) information
  - vSphere 7.0 or later
- iSCSI VMKernel adapter IP informattion
- Network switch(es)
  - With ONTAP system network data ports and connected vSphere hosts
  - VLAN(s) configured for iSCSI
  - (Optional) link aggregation configured for ONTAP network data ports
- ONTAP Tool for VMware vSphere deployed, configured, and ready to consume

Steps

1. Check compatibility with the Interoperability Matrix Tool (IMT).
2. Verify that the iSCSI configuration is supported.
3. Complete the following ONTAP and vSphere tasks.

ONTAP tasks

1. Verify the ONTAP license for iSCSI.
   a. Use the `system license show` command to check if iSCSI is listed.
   b. Use `license add -license-code <license code>` to add the license.

2. Verify that the iSCSI protocol is enabled on the SVM.
3. Verify that iSCSI network logical interfaces are available on the SVM.

   When an SVM is created using the GUI, iSCSI network interfaces are also created.

4. Use the `Network interface` command to view or make changes to the network interface.

   Two iSCSI network interfaces per node are recommended.

5. Create an iSCSI network interface. You can use the default-data-blocks service policy.
6. Verify that the data-iscsi service is included in the service policy. You can use `network interface service-policy show` to verify.
7. Verify that jumbo frames are enabled.
8. Create and map the LUN. Skip this step if you are using ONTAP tools for VMware vSphere. Repeat this step for each LUN.

VMware vSphere tasks

1. Verify that at least one NIC is available for the iSCSI VLAN. Two NICs are preferred for better performance and fault tolerance.
2. Identify the number of physical NICs available on the vSphere host.
3. Configure the iSCSI initiator. A typical use case is a software iSCSI initiator.
4. Verify that the TCPIP stack for iSCSI is available.
5. Verify that iSCSI portgroups are available.
   - We typically use a single virtual switch with multiple uplink ports.
   - Use 1:1 adapter mapping.
6. Verify that iSCSI VMKernel adapters are enabled to match the number of NICs and that IPs are assigned.
7. Bind the iSCSI software adapter to the iSCSI VMKernel adapter(s).
8. Provision the VMFS datastore with ONTAP Tools. Repeat this step for all datastores.
9. Verify hardware acceleration support.

What's next?

After these the tasks are completed, the VMFS datastore is ready to consume for provisioning virtual machines.

Ansible Playbook

```
## Disclaimer: Sample script for reference purpose only.

- hosts: '{{ vsphere_host }}'
  name: Play for vSphere iSCSI Configuration
  connection: local
  gather_facts: false
  tasks:
```

```
    # Generate Session ID for vCenter
    - name: Generate a Session ID for vCenter
      uri:
        url: "https://{{ vcenter_hostname }}/rest/com/vmware/cis/session"
        validate_certs: false
        method: POST
        user: "{{ vcenter_username }}"
       password: "{{ vcenter_password }}"
        force_basic_auth: yes
        return_content: yes
      register: vclogin

    # Generate Session ID for ONTAP tools with vCenter
    - name: Generate a Session ID for ONTAP tools with vCenter
      uri:
        url: "https://{{ ontap_tools_ip
}}:8143/api/rest/2.0/security/user/login"
        validate_certs: false
        method: POST
        return_content: yes
        body_format: json
        body:
          vcenterUserName: "{{ vcenter_username }}"
          vcenterPassword: "{{ vcenter_password }}"
      register: login

    # Get existing registered ONTAP Cluster info with ONTAP tools
    - name: Get ONTAP Cluster info from ONTAP tools
      uri:
        url: "https://{{ ontap_tools_ip
}}:8143/api/rest/2.0/storage/clusters"
        validate_certs: false
        method: Get
        return_content: yes
        headers:
          vmware-api-session-id: "{{ login.json.vmwareApiSessionId }}"
      register: clusterinfo

    - name: Get ONTAP Cluster ID
      set_fact:
        ontap_cluster_id: "{{ clusterinfo.json |
json_query(clusteridquery) }}"
      vars:
        clusteridquery: "records[?ipAddress == '{{ netapp_hostname }}' &&
type=='Cluster'].id | [0]"
```

```
    - name: Get ONTAP SVM ID
      set_fact:
        ontap_svm_id: "{{ clusterinfo.json | json_query(svmidquery) }}"
      vars:
        svmidquery: "records[?ipAddress == '{{ netapp_hostname }}' &&
type=='SVM' && name == '{{ svm_name }}'].id | [0]"

    - name: Get Aggregate detail
      uri:
        url: "https://{{ ontap_tools_ip
}}:8143/api/rest/2.0/storage/clusters/{{ ontap_svm_id }}/aggregates"
        validate_certs: false
        method: GET
        return_content: yes
        headers:
          vmware-api-session-id: "{{ login.json.vmwareApiSessionId }}"
          cluster-id: "{{ ontap_svm_id }}"
      when: ontap_svm_id != ''
      register: aggrinfo

    - name: Select Aggregate with max free capacity
      set_fact:
        aggr_name: "{{ aggrinfo.json | json_query(aggrquery) }}"
      vars:
        aggrquery: "max_by(records, &freeCapacity).name"

    - name: Convert datastore size in MB
      set_fact:
        datastoreSizeInMB: "{{ iscsi_datastore_size |
human_to_bytes/1024/1024 | int }}"

    - name: Get vSphere Cluster Info
      uri:
        url: "https://{{ vcenter_hostname }}/api/vcenter/cluster?names={{
vsphere_cluster }}"
        validate_certs: false
        method: GET
        return_content: yes
        body_format: json
        headers:
          vmware-api-session-id: "{{ vclogin.json.value }}"
      when: vsphere_cluster != ''
      register: vcenterclusterid

    - name: Create iSCSI VMFS-6 Datastore with ONTAP tools
      uri:
```

```
        url: "https://{{ ontap_tools_ip
}}:8143/api/rest/3.0/admin/datastore"
        validate_certs: false
        method: POST
        return_content: yes
        status_code: [200]
        body_format: json
        body:
          traditionalDatastoreRequest:
            name: "{{ iscsi_datastore_name }}"
            datastoreType: VMFS
            protocol: ISCSI
            spaceReserve: Thin
            clusterID:  "{{ ontap_cluster_id }}"
            svmID: "{{ ontap_svm_id }}"
            targetMoref: ClusterComputeResource:{{
vcenterclusterid.json[0].cluster }}
            datastoreSizeInMB: "{{ datastoreSizeInMB | int }}"
            vmfsFileSystem: VMFS6
            aggrName: "{{ aggr_name }}"
            existingFlexVolName: ""
            volumeStyle: FLEXVOL
            datastoreClusterMoref: ""
        headers:
          vmware-api-session-id: "{{ login.json.vmwareApiSessionId }}"
      when: ontap_cluster_id != '' and ontap_svm_id != '' and aggr_name !=
''
      register: result
      changed_when: result.status == 200
```

vSphere VMFS Datastore - NVMe/FC with ONTAP

About this task

This section covers the creation of a VMFS datastore with ONTAP storage using NVMe/FC.

For automated provisioning, use one of these scripts: [PowerShell], Ansible Playbook, or [Terraform].

What you need

- Basic skills needed to manage a vSphere environment and ONTAP.
- Basic understanding of NVMe/FC.
- An ONTAP Storage System (FAS/AFF/CVO/ONTAP Select/ASA) running ONTAP 9.8 or later
- ONTAP credentials (SVM name, userID, and password)
- ONTAP WWPN for host, target, and SVMs and LUN information

- A completed FC configuration worksheet
- vCenter Server
- vSphere host(s) information (vSphere 7.0 or later)
- Fabric switch(es)
  - With ONTAP FC data ports and vSphere hosts connected.
  - With the N_port ID virtualization (NPIV) feature enabled.
  - Create a single initiator target zone.
  - Create one zone for each initiator (single initiator zone).
  - For each zone, include a target that is the ONTAP FC logical interface (WWPN) for the SVMs. There should be at least two logical interfaces per node per SVM. DO not use the WWPN of physical ports.

Provision VMFS datastore

1. Check compatibility with the Interoperability Matrix Tool (IMT).
2. Verify that the NVMe/FC configuration is supported.

ONTAP tasks

1. Verify the ONTAP license for FCP.
   Use the `system license show` command and check if NVMe_oF is listed.
   Use `license add -license-code <license code>` to add a license.
2. Verify that NVMe protocol is enabled on the SVM.
   a. Configure SVMs for NVMe.
3. Verify that NVMe/FC Logical Interfaces are available on the SVMs.
   a. Use `Network Interface show` to verify the FCP adapter.
   b. When an SVM is created with the GUI, logical interfaces are as part of that process.
   c. To rename the network interface, use the command `Network Interface modify`.
4. Create NVMe namespace and subsystem

VMware vSphere Tasks

1. Verify that HBA drivers are installed. VMware supported HBAs have the drivers deployed out of the box and should be visible at Storage Adapter Information
2. Perform vSphere Host NVMe driver installatioln and validation tasks
3. Create VMFS Datastore

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