EMC® ScaleIO®

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Using ScaleIO with VVols Technical Notes

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EMC²

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Preface

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Bold	Used for names of interface elements, such as names of windows, dialog boxes, buttons, fields, tab names, key names, and menu paths (what the user specifically selects or clicks)
Italic	Used for full titles of publications referenced in text
`Monospace`	Used for: • System code • System output, such as an error message or script • Pathnames, filenames, prompts, and syntax • Commands and options
Monospace italic	Used for variables
`Monospace bold`	Used for user input
[ ]	Square brackets enclose optional values

|	Vertical bar indicates alternate selections - the bar means “or”
{ }	Braces enclose content that the user must specify, such as x or y or z
...	Ellipses indicate nonessential information omitted from the example

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CHAPTER 1

ScaleIO VASA and Virtual Volumes

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ScaleIO VASA architecture

ScaleIO has implemented VMware's vSphere API for Storage Awareness (VASA). ScaleIO's VASA enables control of ScaleIO storage to be handled by the vCenter administrator. ScaleIO's VASA uses Virtual Volumes (VVols) to enable VMs hosted on ESXs in the vCenter to have their storage mapped directly to storage in ScaleIO.

The following are the different components of ScaleIO's VASA:

- Virtual Volumes (VVols): A VMware object type that allows the vSphere Admin to provision VMs without depending on the Storage Admin.
- VVol datastores: A type of VMware datastore, in addition to VMFS and NFS datastores, which allow VVols to map directly to the storage system. VVol datastores are more granular than VMFS and NFS datastores, enabling VMs or virtual disks to be managed independently. You can create VVol datastores based on one or more underlying storage pools and then allocate the pool to be used for the VVol datastore and its associated VVols.
- Storage containers: A logical abstraction on to which VVols are mapped and stored. In ScaleIO's VASA, the storage container is mapped to a ScaleIO Storage Pool. vSphere maps storage containers to VVol datastores and provides applicable datastore level functionality.
- Storage policies: Storage policies are used to ensure that VMs are placed on storage that guarantees a specific level of performance.
- VASA ScaleIO Virtual Machine (SVM): The virtual machine that runs the VASA.
- VASA-database: A database created to store the VVols metadata.
- Protocol Endpoint (PE): PEs are used to establish an I/O data path between the ESX hosts and the ScaleIO system. For every VASA implemented, the SDC exposes a single PE on the ESX for that VASA to use.

VASA allows for automatic mapping of storage. When a new VM is created, a request for storage passes through the VASA. The VASA sends the request to the MDM to create the volume. The MDM creates the volume and passes the volume ID back through the VASA to the ESX server. Mapping volume requests also pass through the VASA as the MDM maps the volume the VM runs on to the ESX. For every VM that is created, a minimum of two VVols are created. One is for the VM metadata and one is for the VM disk. When the VM is powered on, another VVol, called the swap VVol, is created. The swap VVol is removed when the VM is powered off. The VASA is used only for storage management; no I/Os are sent through the VASA.

Using storage policies

Use keywords in Storage Pool names to assign VMware storage policies.

ScaleIO's VASA automatically assigns VMware storage policies based on keywords that appear in the ScaleIO Storage Pool names. When you create a Storage Pool, indicate what type of disk is used by adding the appropriate keyword to the Storage Pool name.

The following are the storage policies and the keywords that are associated with them:

Storage policy	Keyword	Used for storage type
Gold	SSD	Only SSD disks

Storage policy	Keyword	Used for storage type
Silver	Cached	HDD disks with IO caching
Bronze	anything other than "SSD" or "Cached"	Only HDD disks

ScaleIO VASA's limitations

Limitations and restrictions

- All VASA-related configuration changes must be performed using the vSphere Web Client. Using the vSphere Client may corrupt the VASA.
- Cloning and Storage vMotion of powered on VMs are not supported. You can perform cloning and storage vMotion of VMs that are powered off.
- The maximum number of volumes is 200K (4,096 mapped volumes per ESX).
- The VASA can be mapped to a single ScaleIO system.
- The VASA should be registered with a single vCenter.

Deploying ScaleIO VASA overview

Before you begin

Ensure that:

- The DNS server is configured and all ESXs and vCenters are registered on it.
- Both forward and reverse names for the VASA ScaleIO Virtual Machine (SVM) are added to the DNS server.
- All components of your environment, including ESXs and vCenters, have their time synchronized.
- A ScaleIO Data Client (SDC) is installed on the ESX on which you want to deploy VASA.
- A ScaleIO storage system is deployed and registered in the vCenter.

Procedure

1. Create storage pools for VASA use and assign SDS devices to each of the Storage Pools, according to your needs.

   If you wish to use VMware's storage policies, see Using storage policies on page 8.

2. Create one of the following types of datastore for the VASA SVM:
   - Local datastore, which does not offer high-availability protection.
   - NFS datastore.
   - ScaleIO shared datastore, which is recommended.
3. Use VMware High Availability or Fault Tolerance to protect the SVM.
4. Deploy the ScaleIO VASA on the designated datastore using the ScaleIO vSphere Web plug-in.
5. (Optional) Configure NTP service on the VASA SVM to synchronize time with the vCenter and ESX hosts.

6. Register the ScaleIO VASA as a Storage Provider in vCenter.
7. Create Virtual Volume (VVol) datastores.

CHAPTER 2

Deploying the ScaleIO VASA

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ScaleIO's VASA in a 2-layer environment

You can deploy ScaleIO's VASA in a 2-layer environment.

In a 2-layer ScaleIO environment, the ScaleIO MDM and SDS reside on bare metal servers, while the SDCs are installed on ESXi servers. In order to deploy the VASA in a 2-layer environment, you must first register the ScaleIO system. For more information, see the *EMC ScaleIO User Guide*.

Configure ScaleIO's VASA for high availability

Configuring the ScaleIO VASA to use VMware's HA shortens downtime in case of VMware ESX host failure. In order for the VASA to be available when the ESX host fails, the VASA SVM must be hosted on an VMware ESX HA cluster and must use shared storage. It is recommended to use ScaleIO shared storage for the VASA SVM.

In case of an ESX failure, the VASA SVM reboots on an available ESX host in the HA cluster. During the time that the SVM is rebooting and unavailable, any VMs that are powered off become briefly unavailable. Any VMs that are powered on at the time of the failure remain available, but cannot be managed (host vMotion, virtual hardware editing, etc).

In order to ensure 100% SVM availability, you should enable VMware's Fault Tolerance and ensure that the secondary VASA SVM is not on the same datastore as the primary SVM.

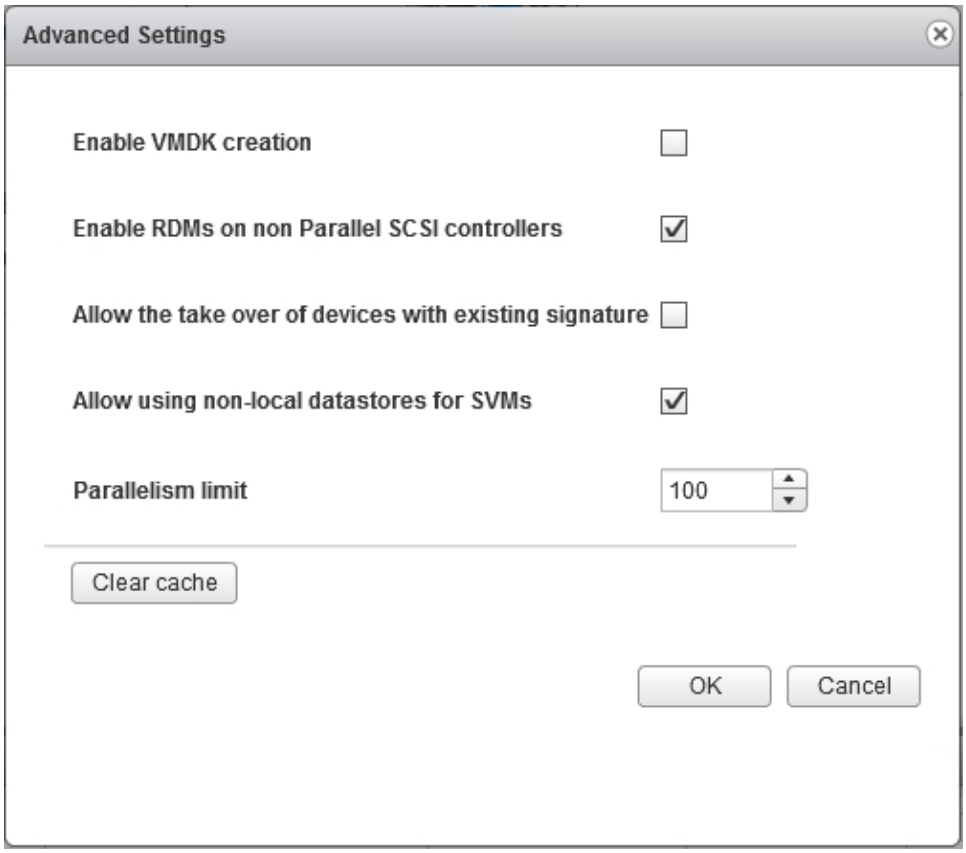
Configure VASA SVM to use shared storage

Change the default setting to configure the VASA SVM to use shared storage.

To configure the VASA SVM on shared storage (such as ScaleIO or NFS), you must change the default setting before VASA SVM deployment. It is recommended to use shared storage for the VASA SVM so that it supports VMware High Availability (HA) and allows for host migration when necessary.

Procedure

1. In the **vSphere Web Client home** tab, click the **ScaleIO** icon.
2. Click **Advanced Settings.**
3. In the **Advanced Settings** dialog, select **Allow using non-local datastores for SVMs**.



Results

During deployment of the VASA SVM, the option to use shared storage will be available.

Deploying VASA

Use the vSphere plug-in to deploy ScaleIO's VASA.

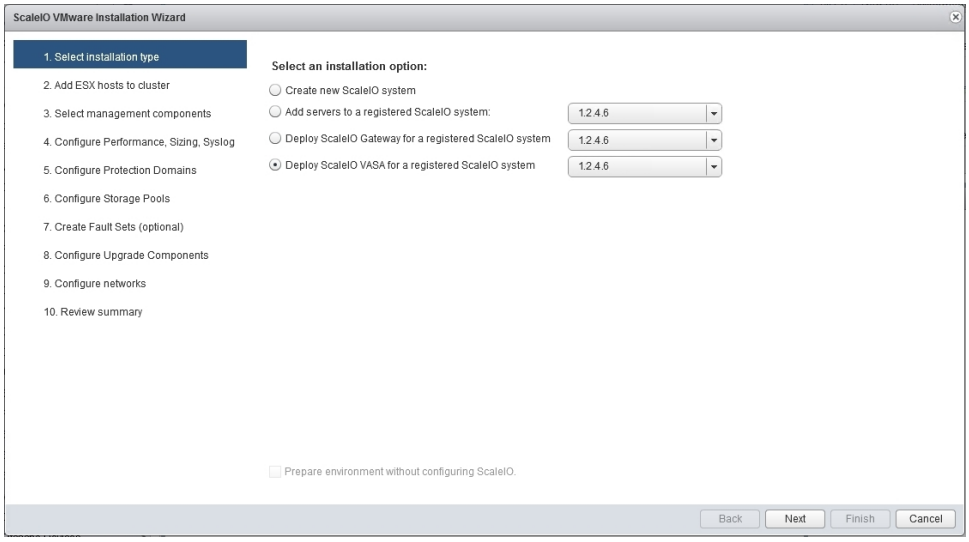
Before you begin

Ensure your system meets the requirements detailed in Deploying ScaleIO VASA overview on page 9.

Procedure

1. In the **vSphere Web Client home** tab, click the **ScaleIO** icon.
2. From the **Basic tasks** section of the **EMC ScaleIO** screen, click **Deploy ScaleIO environment**.

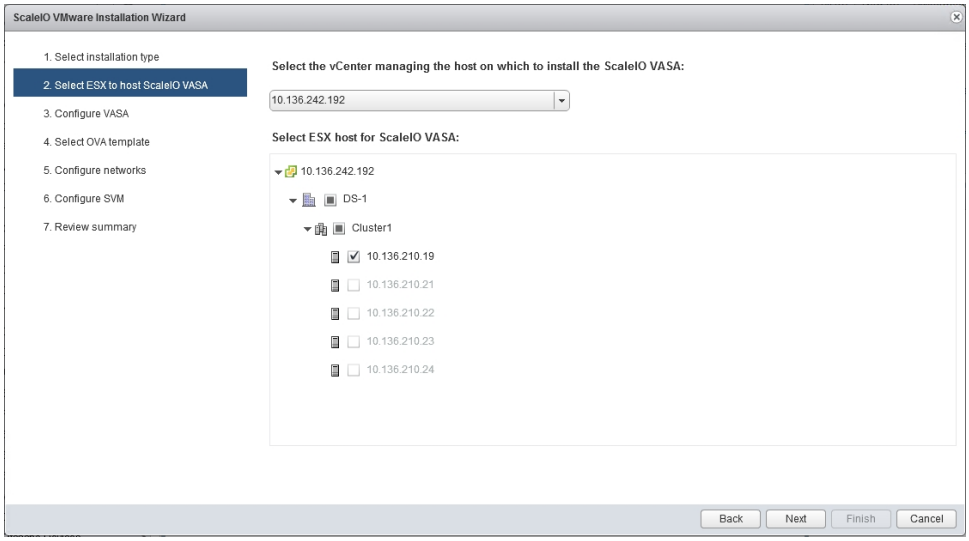
   The **ScaleIO VMware Installation Wizard** begins.
3. In the **Select Installation type** screen, select **Deploy ScaleIO VASA for a registered ScaleIO system**. Select the appropriate ScaleIO system.



Only ScaleIO systems of version 2.0.1 or later are displayed.

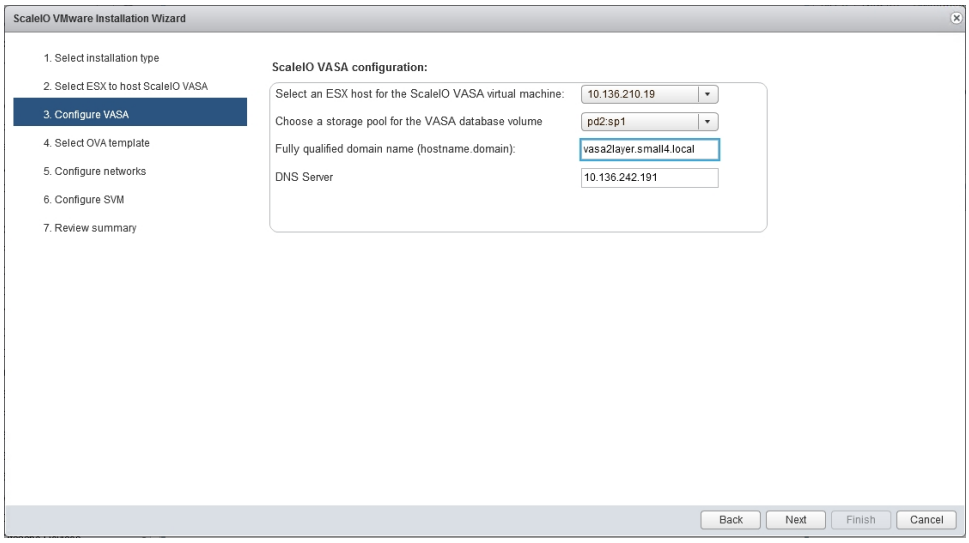
4. In the **Select ESX to host ScaleIO VASA** screen, select the vCenter and the ESX host for the VASA SVM.

   To use VMware's High Availability, select an ESX from a cluster with shared storage.



   ESXs that do not have SDC installed on them appear dimmed and are unavailable.

5. In the **Configure VASA** screen, define the VASA configuration:



a. Select an ESX to host the VASA SVM.

b. Select a storage pool for the VASA database volume.

The volume will be named "database-volume."

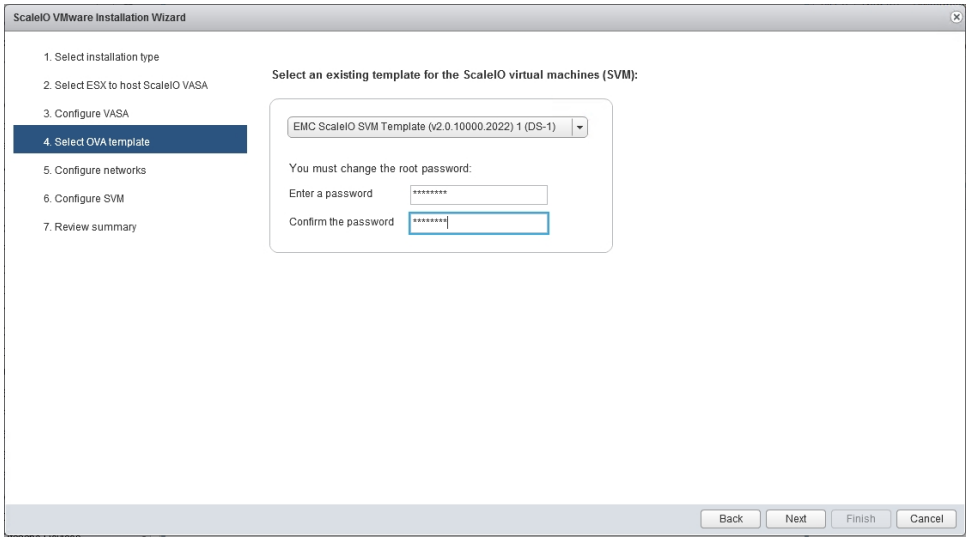
c. Enter the fully qualified domain name (FQDN), as registered in the DNS.

Note

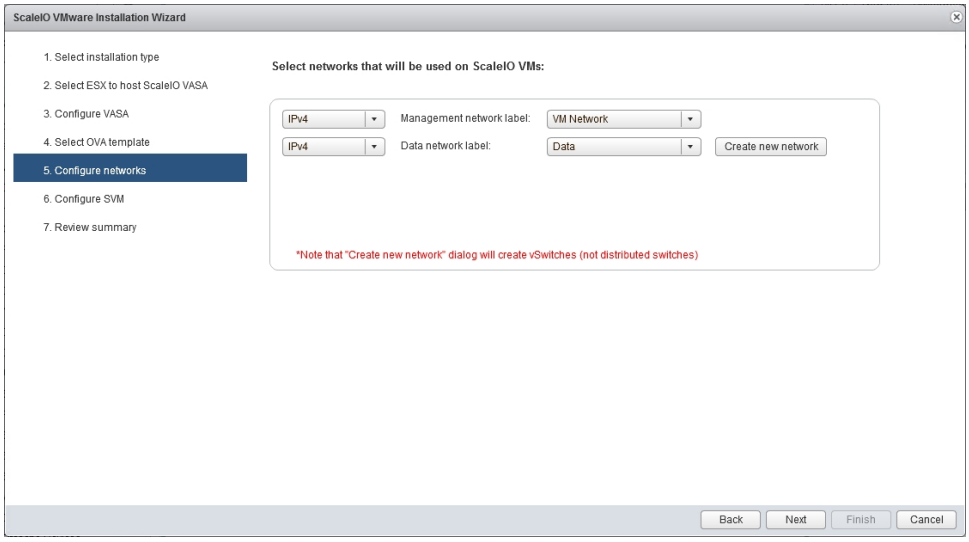
If you do not enter a FQDN, the VASA may not work properly.

d. Enter the DNS server IP address.

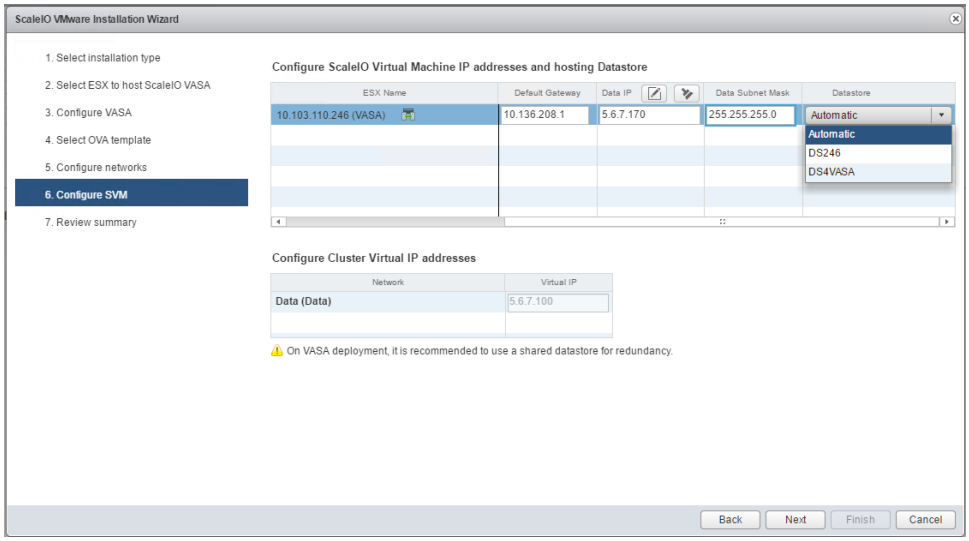
6. In the **Select OVA template** screen, select the SVM OVA template. Change the default root password.



7. In the **Configure networks** screen, select the networks that will be used for the SVM.



8. In the **Configure SVM** screen, define the VASA SVM configuration:



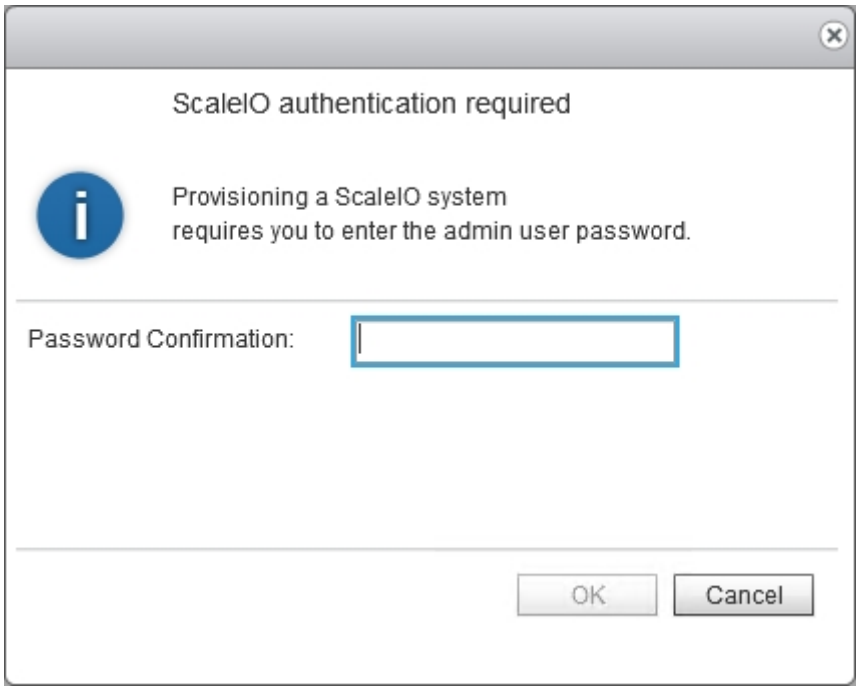
   a. Enter IP addresses for the management, management subnet mask, default gateway, data, and data subnet mask networks.

   b. Select the datastore for the VASA SVM.

      If you created a shared datastore, select it. If you select **Automatic**, a local datastore will be used.

9. In the **Review summary** screen, click **Finish** to begin deployment or **Back** to make changes.

10. Enter the ScaleIO system password.



If requested, enter the vCenter password.

Results

ScaleIO's VASA is deployed.

Configuring NTP on the VASA SVM

Configure NTP on the VASA SVM for time synchronization.

Configure NTP service on the VASA SVM to synchronize time with the vCenter and ESX hosts.

Procedure

1. SSH to the VASA SVM.
2. Open the NTP configuration file for editing:

   ```
   vi /etc/ntpd.conf
   ```

3. Add the following entry to the NTP configuration file: **`server`** ***`<NTP_IP_ADDRESS>`***

   Where *<NTP_IP_ADDRESS>* is the IP address or the FQDN of the NTP server.
4. Save and close the NTP configuration file.
5. Run the following command:

   ```
   chkconfig ntp on
   ```

6. To start the NTP service, run:

   ```
   service ntp start
   ```

7. Run the following to verify that the VASA SVM is connected to the NTP server:

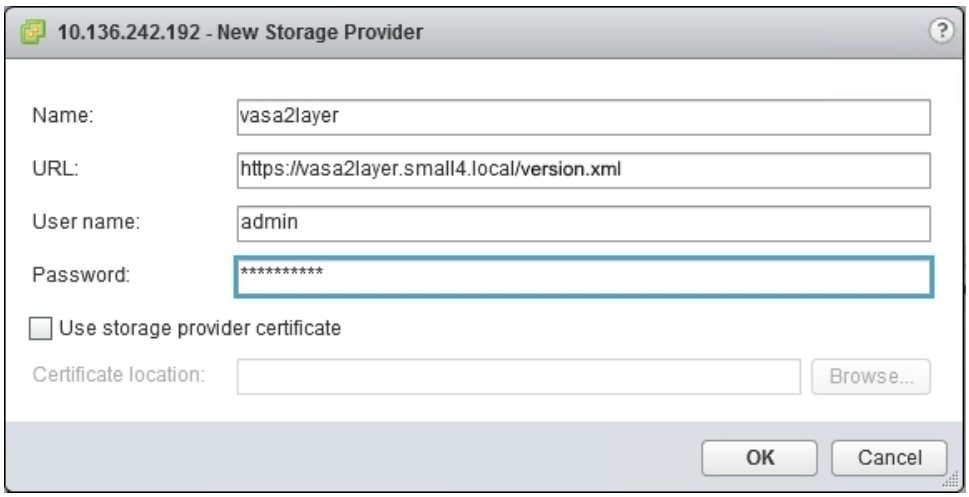
```
ntpq -c peers
```

Registering ScaleIO's VASA in the vCenter

Register the ScaleIO VASA as a Storage Provider in the vCenter.

Procedure

1. Browse to the vCenter Server in the vSphere Web Client navigator.
2. Click the **Manage** tab, and click **Storage Providers**.
3. Click the **Register a Storage Provider** icon.
4. In the **New Storage Provider** dialog, define the connection information for the storage provider:
   a. Enter a name.
   b. Enter the VASA URL: `https://<VASA_FQDN>/version.xml` where *<VASA_FQDN>* is the fully-qualified domain name of the VASA, as registered in the DNS server.
   c. Enter the MDM admin username and password.



5. Click **OK** to complete the registration.
6. Click **Yes** to confirm the VASA certificate.

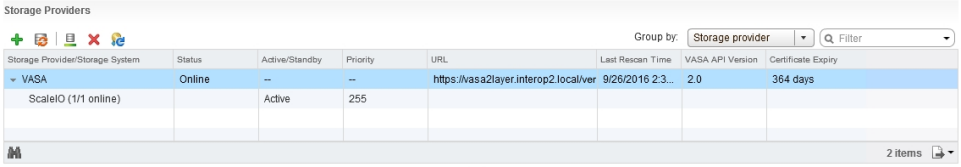
Results

The vCenter Server has registered the ScaleIO VASA as a storage provider.

After you finish

Verify that the status of the VASA Storage Provider in the Storage Provider table is online. If the status is offline, it most likely indicates an issue with the DNS or a communication issue with the ESXs. For more information, see Checking name

resolution on page 28



CHAPTER 3

Managing and Monitoring VASA and VVols

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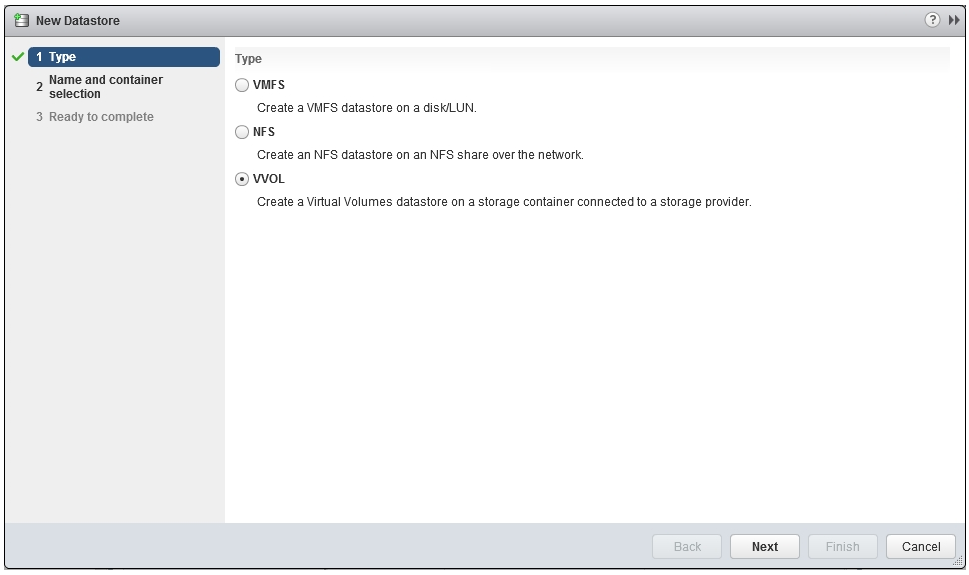
Creating Virtual Volume datastores

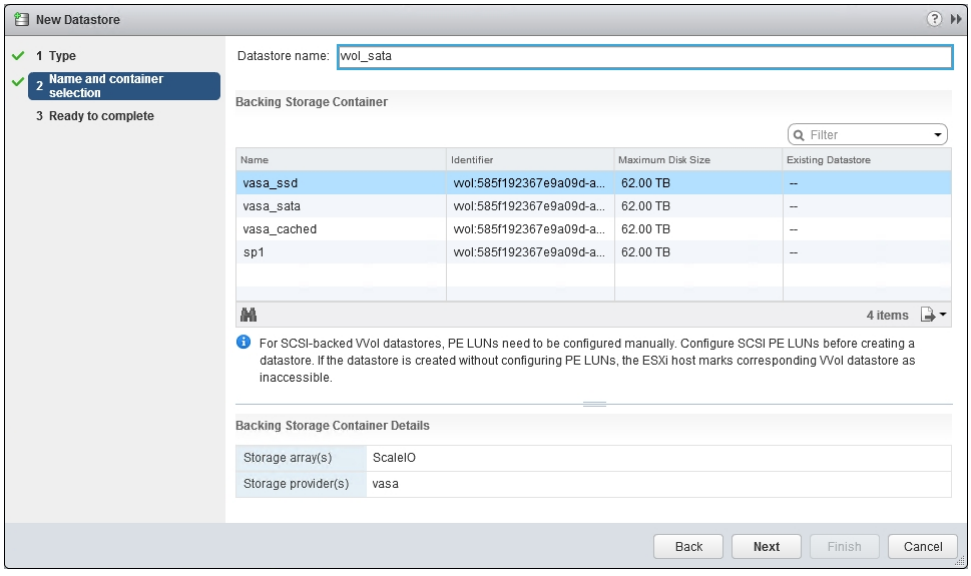
Create Virtual Volume (VVol) datastores in the designated Storage Pools.

Procedure

1. In the **vSphere Web Client navigator**, navigate to the datacenter for which you want to create the VVol.
2. Right-click the datacenter and select **All vCenter Actions** > **Storage** > **New Datastore**.
3. In the **Type** screen, select **VVOL** as the datastore type.



4. In the **Name and container selection** screen, fill in the datastore details as follows:



   a. Enter the datastore name. Make sure to use a name that does not duplicate another datastore name in your data center environment.

b. In the **Backing Storage Container** table, select the designated Storage Pool.

5. Review the configuration details and click **Finish**.
6. If you want to make the datastore available to other hosts:
   a. In the vSphere Web Client, select **Storage**.
   b. Right-click the VVol datastore and select **Mount Datastore to Additional Hosts**.
   c. Select the ESX hosts you want the VVol datastore to be available to and select **OK**.

Results

A VVol datastore has been created and assigned to the selected ESX hosts.

The VASA SVM configuration file

The VASA SVM has an editable configuration file that defines various SVM settings.

The VASA SVM configuration file is automatically created with default settings during deployment of the SVM. You may manually change some of these settings. After changes are made to the configuration file, the ScaleIO VASA service must be restarted. The configuration file is located on the VASA SVM: `/opt/emc/scaleio/vasa/webapps/ROOT/WEB-INF/classes/vasa-provider.properties`

Changing the VASA SVM configuration

Update the VASA SVM configuration file to change default settings.

Procedure

1. SSH to the VASA SVM.
2. Open the configuration file for editing:

```
vi /opt/emc/scaleio/vasa/webapps/ROOT/WEB-INF/classes/vasa-provider.properties
```

3. Update the setting value to the desired configuration.

   For detailed explanations of each setting that you may manually update, see VASA SVM configuration file settings on page 23.
4. Save and close the configuration file.
5. Restart the ScaleIO VASA service:

```
/etc/init.d/scaleio-vasa restart
```

VASA SVM configuration file settings

Configuration settings

The following are configuration settings in the VASA SVM configuration file that you may manually update:

Setting	Definition	Notes	Example
mdm.addresses	A comma-separated list of IP addresses of the MDMs.	Add new MDM IP addresses when extending from a 3-node to a 5-node cluster.	mdm.addresses=10.136.220.101,10.136.220.104,10.136.220.102
mdm.port	The MDM port.	If you are using a different port for the MDM, update the property value.	mdm.port=6700
mdm.dbvolume.name	The name of the VASA database volume that is automatically created during deployment.	To change the name volume that is automatically created, update the value.	mdm.dbvolume.name=VASA-database-1

Removing VASA

Remove the VVols and the VASA SVM from the system.

Procedure

1. Use Storage vMotion to migrate all of the VMs using the VVol datastores to other datastores, or delete the virtual disks that use this datastore.
2. Unmount the VVol datastores:
   a. In the vSphere Web Client, click the **Storage** tab.
   b. Right-click on the VVol datastore and select **Unmount datastore**.
   c. In the **Unmount datastores** dialog, select the ESX hosts that are listed and click **OK**.
   d. Repeat for any remaining VVol datastores.
3. Click the **Manage** tab and select the **Storage Providers** subtab.
4. In the Storage Providers table, select the VASA that you want to remove and click **Unregister the selected storage provider**.
5. Remove the VASA SVM:
   a. In the vSphere Web Client, right-click the VASA SVM and select **Power off**.
   b. Right-click the VASA SVM and select **Delete from disk**.
6. Open the ScaleIO GUI.
7. In the ScaleIO GUI, select **Frontend** > **Storage Pools**.
8. Identify the VASA database volume. From the **Command** menu or context-sensitive menu, select **Unmap Volumes** to unmap the volume from the SDC.
9. Right-click the VASA database volume and select **Remove.**
10. Identify the VASA database snapshot volumes, right-click each one and select **Remove**.
11. In the ScaleIO GUI, select **Frontend** > **SDC**.
12. Identify the IP adddress of the VASA SVM. Right-click on it and select **Remove**.

Results

The VVols and the VASA SVM are removed from the system.

CHAPTER 4

Troubleshooting

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Checking name resolution

When the ScaleIO VASA does not register successfully, first check the name resolution.

If the ScaleIO VASA fails to register in the vCenter as a Storage Provider, the most likely cause is a problem with the domain name resolution. If the fully-qualified domain name (FQDN) has not been setup properly, the VASA will not register.

Procedure

1. Log in to the vCenter host using either SSH or RDP.
2. Ping the FQDN of the VASA and check the IP address used in the ping.
   - If the IP address is not the IP address of the VASA SVM, check the VASA DNS record and modify it to the correct IP address.
   - If the IP address is the IP address of the VASA SVM, and you get no ping replies, check for network connectivity errors.
   - If the ping cannot resolve the VASA IP address from the provided FQDN, check that the DNS record for the VASA is setup correctly. If it is setup correctly, check the DNS setting of the vCenter.
3. Log in to an ESX host in your system using SSH and run the ping test. Repeat the test on each ESX host in the system.
4. Log in to the VASA SVM using SSH.
5. Ping the FQDN of the vCenter and check the IP address used in the ping.
   - If the IP address is not the IP address of the vCenter, check the vCenter's DNS record and modify it to the correct IP address.
   - If the IP address is the IP address of the vCenter, and you get no ping replies, check for network connectivity errors.
   - If the ping cannot resolve the vCenter IP address from the provided FQDN, check that the DNS record for the vCenter is setup correctly. If it is setup correctly, check the following configuration file on the SVM to see if correct DNS settings are defined in the file: `/etc/resolv.conf`. For more information, see Updating the DNS setting on the SVM on page 28.

Results

When pinging the vCenter and all of the ESXs returns the correct IP address, the FQDN and DNS settings are setup correctly.

Updating the DNS setting on the SVM

Update DNS server information on the VASA SVM.

You can add, remove, or change the DNS server information on the VASA SVM.

Procedure

1. SSH to the VASA SVM.
2. Edit the following file: `/etc/resolv.conf`
3. Update the entry for the `nameserver` property.

   You can change the IP address of the existing entry. By adding additional `nameserver` entries, you can allow for DNS redundancy. A maximum of three

`nameserver` entries is supported. You should avoid changing the value of the `search` property as doing so may cause the VASA to not work.

Troubleshooting inaccessible VVols

Troubleshoot when a VVol becomes unavailable to the ESX host.

Before you begin

Procedure

1. Perform DNS and networking tests, as described in Checking name resolution on page 28.
2. In the vSpehere Web Client, select the ESX host with the inaccessible VVOL datastore.
3. Select the **Manage** tab.
4. Select **Storage** > **Protocol Endpoints**.
   - If no protocol endpoints are displayed, migrate all VMs off of the current ESX host and reboot the ESX.

Results

After rebooting, the VVol datastores are available on the ESX host.

Reverting to a VASA database snapshot

When the VASA database is corrupted, revert to a snapshot of the database volume to restore.

When the VASA SVM resides on ScaleIO storage, ScaleIO takes automatic snapshots of the database. If the VASA database becomes corrupted, revert back to a snapshot from before the database failure.

Procedure

1. SSH to the VASA SVM.
2. Stop the VASA service:

```
/etc/init.d/scaleio-vasa stop
```

3. Unmount the VASA database file system:

```
umount /opt/emc/scaleio/vasa/mnt_vasa_db
```

4. Open the ScaleIO GUI and select **Frontend** > **Volumes**.
5. Locate the VASA-database volume, right-click and select **Unmap**.
6. Identify the VASA database snapshot that you wish to revert to.
7. Right-click the snapshot volume and select **Map Volumes**.
8. Map the snapshot volume to the IP address of the VASA SVM.
9. SSH to the VASA SVM.

10. Run the following command to verify that the "/dev/scinia" device exists:

    ```
    fdisk -l
    ```

    Check the output to make sure that "/dev/scinia" appears.

11. Mount the device:

    ```
    mount /dev/scinia /opt/emc/scaleio/vasa/mnt_vasa_db
    ```

12. Run the following command to ensure the device is mounted:

    ```
    df -h
    ```

13. Start the VASA service:

    ```
    /etc/init.d/scaleio-vasa start
    ```

Results

The VASA database is restored from the snapshot.

Updating the FQDN in the VASA SVM

Update the FQDN in the VASA SVM.

When the VASA SVM is deployed and the FQDN is incorrect, you can update the FQDN, as long as it is done before registering the VASA as a Storage Provider in the vCenter:

Procedure

1. SSH to the VASA SVM.
2. Edit the hostname configuration file:

   ```
   vi /etc/HOSTNAME
   ```

   Enter the correct FQDN hostname.

3. Edit the hosts configuration file:

   ```
   vi /etc/hosts
   ```

   Wherever scaleio-vasa property is listed, update it with the correct host.

4. Reboot the SVM.

Redeploying the VASA SVM

Redeploy the VASA SVM after it has been deleted

To redeploy a VASA SVM after it has been deleted, you must first unregister the ScaleIO system:

Procedure

1. In the vSphere Web Client, select **ScaleIO Systems**.
2. Identify your ScaleIO system, right-click it, and select **Unregister ScaleIO System**.
3. Right-click the same ScaleIO system and select **Register ScaleIO System**.
4. Enter the primary MDM IP address, username, and password.
5. In the **vSphere Web Client home** tab, click the **ScaleIo** icon.
6. In the **Select Installation type** screen, select **Deploy ScaleIO VASA for a registered ScaleIO system**.
7. Proceed through the deployment wizard.

   For more details, see Deploying VASA on page 13.