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Deciding whether to use this ONTAP Select guide

This guide includes everything you need to plan, deploy, and support an ONTAP Select cluster on KVM with a NetApp purchased license. To deploy an ONTAP Select cluster with an evaluation license, see the applicable Quick Start Guide.

You should also review the ONTAP Select on KVM Product Architecture and Best Practices Technical Report for a more detailed description of the product.

**Attention:** The KVM hypervisor platform is a complex and challenging environment to work in. Before attempting to install the ONTAP Select administration utility and deploy an ONTAP Select cluster on KVM, you must be certain that you have the necessary knowledge and skills.

**Related references**

*Required Linux knowledge and skills* on page 14

**Related information**

*ONTAP Select 9.2 Release Notes*
*ONTAP Select 9 Quick Start Guide: Deploying an Evaluation Cluster on VMware*
*ONTAP Select 9 Quick Start Guide: Deploying an Evaluation Cluster on KVM*
ONTAP Select installation and deployment workflow

Before you can deploy an ONTAP Select cluster, you must plan the deployment and prepare the hypervisor hosts where ONTAP Select will run. After you have prepared the deployment environment, you can install the ONTAP Select Deploy administration utility and then use the Deploy utility to deploy an ONTAP Select cluster. After the cluster has been deployed, you can administer the cluster using the standard NetApp management tools and interfaces.

1. Plan the deployment and prepare the environment.
2. Install the ONTAP Select Deploy administration utility.
3. Deploy an ONTAP Select cluster using the ONTAP Select Deploy administration utility (web UI or CLI).
4. Administer the ONTAP Select cluster using the standard NetApp management tools and interfaces.
Getting started with ONTAP Select

ONTAP Select is a software-only version of ONTAP running in a virtual machine on a hypervisor host. ONTAP Select complements the suite of mainstream hardware-based ONTAP offerings as well as other software-only options, including ONTAP Cloud. Before deploying ONTAP Select, you should understand its key characteristics, operational components, and features.

Key concepts and terminology

As you begin to explore ONTAP Select and plan a deployment, it is helpful to first become familiar with the key concepts at a high level. Based on this, you are better able to understand and deploy the product.

ONTAP Select Deploy

ONTAP Select Deploy is the administration utility that you must use to deploy ONTAP Select clusters. The Deploy utility runs in a dedicated Linux virtual machine. You can access the Deploy utility in one of several different ways, including through the web GUI and CLI management shell.

Kernel-based Virtual Machine

Kernel-based Virtual Machine (KVM) is a virtualization feature of the Linux kernel enabling it to act as a hypervisor platform. A wide range of guest operating systems is supported.

Hypervisor host versus ONTAP Select node

A hypervisor host is the core hardware platform, including the Linux-based KVM virtualization software, that hosts an ONTAP Select virtual machine. When an ONTAP Select virtual machine is deployed and active on a hypervisor host, it is considered to be an ONTAP Select node.

ONTAP Select cluster

You can create an ONTAP Select cluster on KVM composed of one or four nodes. A four-node cluster consists of two HA pairs. The single-node cluster does not provide an HA capability.

Preparation of the hypervisor host environment

Before using the Deploy administration utility to deploy an ONTAP Select cluster, you must prepare the hypervisor hosts where ONTAP Select will run, including the storage and networking environments. You must perform this host pre-configuration outside of the ONTAP Select product based on the current requirements and limitations.

Evaluation versus purchased licenses

Each ONTAP Select node runs with either an evaluation license or a purchased license.

An evaluation license allows you to evaluate ONTAP Select prior to deploying it in a production environment. If you deploy a cluster in evaluation mode, the evaluation license is automatically generated and applied by the ONTAP Select Deploy administration utility.

Attention: After you select the license type for a node, it cannot be changed. For example, you cannot upgrade an evaluation license to a purchased license. For more information about evaluation deployments, see the appropriate Quick Start Guide.

Purchased license with storage capacity

You cannot use an evaluation license in a production environment; instead, you must purchase a license for each ONTAP Select node. One of the attributes you need to select
when purchasing a license is the storage capacity for the node. After purchasing a license with storage capacity, NetApp assigns a unique serial number to the node. You must use this serial number to download a separate license file which you then apply to the node using the Deploy administration utility.

**Note:** The ONTAP Select storage capacity corresponds to the total allowable size of the virtual data and root disks attached to the ONTAP Select virtual machine.

**Purchased license offerings and hypervisor configuration type**

There are two offerings or platform levels available when you purchase a license for an ONTAP Select node:

- Standard
- Premium

The premium offering enhances the standard offering by providing support for SSD drives in addition to the HDD drives, as well as a larger virtual machine configuration.

When configuring a host using the ONTAP Select Deploy utility, there are two hypervisor instance types available: small and medium. These instance types correspond to the standard and premium offerings, respectively. For additional details, review the planning information related to the KVM environment.

**Storage pools**

An ONTAP Select storage pool is a logical, hypervisor-independent data container designed to abstract and hide the underlying physical storage.

**Storage efficiency**

The storage efficiency feature consists of two ONTAP functions: inline compression and deduplication. The feature can only be enabled when SSD drives are used for all of the storage pools in an HA pair or node. The storage efficiency feature is available in the following configurations:

- HA pair
  All the storage pools used by both nodes in the HA pair must reside on SSD drives (four-node clusters).
- Single node
  All the storage pools used by a single node must reside on SSD drives (single-node cluster).

**Note:** When storage efficiency is enabled, only storage pools on SSD drives can be used by the HA pair or single node.

**Open vSwitch**

Open vSwitch (OVS) is a software implementation of a distributed virtual switch supporting multiple networking protocols. OVS is open source and available according to the Apache License 2.0.

**Administering an ONTAP Select cluster after it is deployed**

After you deploy an ONTAP Select cluster, you must configure the cluster as you would any hardware-based ONTAP cluster. For example, you can configure the cluster using System Manager or the standard ONTAP command line interface.

**Related concepts**

*Appendix A: Understanding the ONTAP Select storage environment* on page 63
*Appendix B: Understanding the ONTAP Select networking environment* on page 66
Business needs and possible usage scenarios

ONTAP Select is suitable for several different types of applications based on the inherent flexibility provided through the hypervisor virtualization.

Private cloud

ONTAP Select is ideally suited to supporting one or more private clouds within your organization. Like the public cloud, a private cloud provides flexibility as well as rapid setup and teardown. In addition, a private cloud offers improved security and control.

Disaster recovery and secondary storage

You can use ONTAP Select to implement additional storage that augments your primary storage capabilities. The additional storage can be used to support your organization’s disaster recovery efforts and data backup plans.

Development and testing

As you deploy various applications within your organization, you can use ONTAP Select as an integral part of the overall application development and testing process. For example, you may need temporary storage to hold test input or output data. The length of these types of deployments can vary based on the application characteristics and requirements.

Primary storage

In certain cases, you may choose to deploy ONTAP Select as your primary storage platform. These types of implementations vary and depend on the workload characteristics of the applications as well as your business objectives.

Remote office/Branch office

You can deploy ONTAP Select in remote office/branch office (ROBO) situations to support smaller offices while maintaining centralized administration and control.

Dedicated versus collocated

From a high level, you can deploy ONTAP Select in two different ways regarding the workload on the hypervisor host servers.

- Dedicated deployment
  With the dedicated deployment model, a single instance of ONTAP Select runs on the host server. No other significant processing runs on the same hypervisor host.

- Collocated deployment
  With the collocated deployment model, ONTAP Select shares the host with other workloads. Specifically, there are additional virtual machines, each typically running computational applications. These compute workloads are therefore local to the ONTAP Select cluster. This model supports specialized application and deployment requirements. As with the dedicated deployment model, each ONTAP Select virtual machine must run on a separate and dedicated hypervisor host.
Illustration of a typical deployment environment

The following figure illustrates the ONTAP Select Deploy administration utility being used to deploy and support a four-node ONTAP Select cluster. The Deploy utility and ONTAP Select nodes run as separate virtual machines on dedicated hypervisor hosts.

Comparing ONTAP Select and ONTAP 9

Both hardware-based ONTAP and ONTAP Select provide enterprise class storage solutions. However, because they are designed and implemented differently, each can address different business requirements and usage scenarios. You should become familiar with the major differences between the platforms before planning an ONTAP Select deployment.

Different HA architecture

Depending on the number of nodes you define in a cluster, ONTAP Select provides an HA capability. For example, a four-node cluster consists of two HA pairs. The HA architecture used with ONTAP Select is based on a non-shared storage model. That is, one node in an HA pair cannot directly access the storage owned by the other node. This design can affect certain ONTAP Select operational characteristics.

Capacity licensing

ONTAP Select introduces a new consumption-based licensing model. You must purchase a license with storage capacity for each node when deploying an ONTAP Select cluster in a production mode (that is, non-evaluation licensing). Using the Deploy utility, you must apply a license file which establishes the storage capacity for the node.

ONTAP feature licensing

Each node in an ONTAP Select cluster is automatically licensed to use several ONTAP features. You do not need to manually install or apply these feature licenses.
ONTAP Select features not supported

Several ONTAP features are not supported with ONTAP Select. In most cases, these features require special hardware that is not available in the virtualized ONTAP Select environment.

**Fibre Channel**
Fibre Channel and Fibre Channel over Ethernet are not supported.

**Interface groups**
Interface groups (IFGRPs) are not supported.

**Health monitors**
The traditional health monitoring used with a hardware-based ONTAP deployment is specific to the underlying hardware components. Due to the virtualized environment used with ONTAP Select, health monitors are not active.

**NIC offload support**
Due to the virtualized environment used with ONTAP Select, the NIC offload facility is not supported.

**Cluster IPspace**
Any modification to Cluster IPspace, including adding or removing ports, is not supported.

**ONTAP port properties**
Modifying the properties of the ONTAP ports, including speed, duplex, and flow-control, is not supported.

**SnapLock**
This compliance solution based on WORM storage for file retention is not supported.

ONTAP Select Deploy utility

ONTAP Select Deploy is the administration utility that you must use to deploy and manage the ONTAP Select clusters. The Deploy administration utility is implemented as a Linux virtual machine and contains all the functionality you need to deploy and administer ONTAP Select clusters.

The Deploy utility performs the following core functions:

- Record the details of each hypervisor host where ONTAP Select is deployed
- Configure the hosts and install the required licenses
- Deploy and manage the ONTAP Select clusters
- Maintain an inventory of ONTAP Select clusters and hosts
- Collect and send AutoSupport data to NetApp
- Maintain an internal set of ONTAP Select node images
- Support the hypervisor command formats and protocols

Ways you can access the Deploy utility

There are several options available when accessing the Deploy administration utility. All the external interfaces are functionally equivalent. You should select the access option that best matches your
specific deployment goals and requirements. In all cases, you must sign in using the administrator account with a valid password.

**Web graphical user interface**

You can access the Deploy utility through a modern web browser. The web GUI provides an intuitive and easy-to-use interface, and in most cases will be your primary interface when using the utility.

**Command line interface**

A text-based command line interface is available through the management shell. You can access the CLI management shell in the following ways:

- Secure shell (SSH)
- Virtual machine console

You typically use the virtual machine console as part of the installation and initial configuration process. However, in most situations SSH provides a more flexible and convenient option.

**RESTful web services API**

The RESTful web services API exposed to external clients provides another option when connecting to the Deploy utility. You can access the API using any mainstream programming language or tool that supports RESTful web services. Popular choices include:

- Python
- Java
- cURL

Using a programming or scripting language provides an opportunity to automate the deployment and management of the ONTAP Select clusters.

**Swagger web page**

Displaying the Swagger web page at the Deploy utility is an alternative way to access the RESTful web services API. However, instead of using a programming language, you access the management API through the Swagger web page using a browser. The Swagger page provides the following features:

- A detailed description of every call in the RESTful web services API
- The ability to manually issue any of the API calls

You can access the Swagger page using the IP or domain name of the Deploy virtual machine. To display the page, enter a URL with the following format in your browser (substituting the appropriate IP address or domain name for your Deploy VM instance):

http://<ip_address>/api/v2/ui
Planning to deploy ONTAP Select

Before deploying ONTAP Select, you should prepare for the deployment to assure success. As part of completing the planning and preparation, you should also consider creating a formal deployment plan.

Related concepts

- Planning to install the ONTAP Select Deploy utility on page 21
- Appendix A: Understanding the ONTAP Select storage environment on page 63
- Appendix B: Understanding the ONTAP Select networking environment on page 66

General requirements and planning considerations

There are several general requirements and best practices that you should consider as part of planning an ONTAP Select deployment.

Required Linux knowledge and skills

Linux with the KVM hypervisor is a complex environment to work in. Before deploying ONTAP Select on KVM, you must have the necessary knowledge and skills.

Linux server distribution

You should have experience with the specific Linux distribution to be used for your ONTAP Select Deployment. Specifically, you should be able to perform the following tasks:

- Install the Linux distribution
- Configure the system using the command line interface
- Add software packages as well as any dependencies

For more information on preparing your Linux server, including the required configuration and software packages, see the host configuration checklist. Refer to the hypervisor requirements for the currently supported Linux distributions.

KVM deployment and administration

You should be familiar with general virtualization concepts. In addition, there are several Linux CLI commands that you must use as part of installing and administering ONTAP Select in a KVM environment:

- virt-install
- virsh
- lsblk
- lvs
- vgs
- pvs
Networking and Open vSwitch configuration

You should be familiar with networking concepts and the configuration of network switches. In addition, you should have experience with Open vSwitch. You must use the following network commands as a part of configuring the ONTAP Select network in a KVM environment:

- ovs-vsctl
- ip
- ifup
- ifdown
- systemctl

Related concepts

Host configuration and preparation checklist on page 27

Related references

Hypervisor requirements on page 17

Cluster size and related considerations

There are several planning issues related to the cluster size that you should consider.

Number of nodes in the cluster

An ONTAP Select cluster is composed of one or four nodes. You should determine the size of the cluster based on the application requirements. For example, if HA capability is needed for an enterprise deployment, then a four-node cluster should be used.

Dedicated versus collocated

Based on the application type, you should determine if the deployment follows the dedicated or collocated model. Note that the collocated model can be more complex due to the workload diversity and tighter integration.

Hypervisor host considerations

There are several planning issues related to the hypervisor host that you should consider.

Hypervisor independent

Both ONTAP Select and the ONTAP Select Deploy administration utility are hypervisor-independent. The following hypervisors are supported for both:

- VMware ESXi
- Kernel-based Virtual Machine (KVM)

Note: Refer to the hypervisor-specific planning information and release notes for additional details regarding the supported platforms.

Hypervisor for ONTAP Select nodes and administration utility

Both the Deploy administration utility and ONTAP Select nodes run as virtual machines. The hypervisor you choose for the Deploy utility is independent of the hypervisor you choose for the ONTAP Select nodes. You have complete flexibility when pairing the two:
• Deploy utility running on VMware ESXi can create and manage ONTAP Select clusters on either VMware ESXi or KVM
• Deploy utility running on KVM can create and manage ONTAP Select clusters on either VMware ESXi or KVM

One instance of ONTAP Select per host
Each ONTAP Select node runs as a dedicated virtual machine. You can deploy only one instance of an ONTAP Select virtual machine on a specific hypervisor host.

Hypervisor consistency for the nodes within an HA pair
The two hosts within an HA pair must run on the same version and release of the hypervisor software.

Number of physical ports on each host
Each host must be configured to use either two or four physical ports. The following requirements apply:
• The host in a single-node cluster must have two physical ports.
• It is recommended that each host in a four-node cluster be configured with four ports, although two can be used instead if needed.

Integrating ONTAP Select with an ONTAP hardware-based cluster
You cannot add an ONTAP Select node directly to an ONTAP hardware-based cluster. However, you can optionally establish an intercluster link between an ONTAP Select cluster and a hardware-based ONTAP cluster.

Storage considerations
There are several planning issues related to host storage that you should consider.

Number of RAID groups and LUNs
Depending on your storage requirements, you must decide the following:
• Whether to use one or more RAID groups
• Whether to use one or more LUNs

Estimate for the storage needed
You should determine how much storage is required for the ONTAP Select nodes. This information is required as part of acquiring the purchased licenses with storage capacity.

Note: Each node in an HA pair must have the same storage capacity.

Requirements related to the KVM environment
There are several requirements and planning issues you should consider when deploying ONTAP Select in a KVM environment.

Note: Some of the hardware-related requirements vary based on whether you choose the standard or premium platform capacity when licensing ONTAP Select.
Hypervisor requirements

There are several requirements related to the hypervisor where ONTAP Select runs.

Software compatibility

ONTAP Select can be deployed using KVM on the following Linux distributions:

• RedHat Enterprise Linux 7.2

Storage pool characteristics

With a multi-node cluster, each host within an HA pair must have a storage pool that is at least 2 TB (for user data) plus an additional 266 GB. With a single-node cluster, the host must have a storage pool that is at least 1 TB (for user data) plus 266 GB. In both cases, the extra 266 GB is used by various ONTAP Select internal processes and so is required overhead.

Core hardware requirements

The physical hypervisor host where you deploy ONTAP Select must meet several minimum hardware requirements. You can choose any platform for the hypervisor host, as long as it meets the minimum hardware requirements. The following vendors provide supported hardware platforms: Cisco, Dell, HP, Fujitsu, Lenovo, and Supermicro. Refer to the NetApp Interoperability Matrix Tool for more information.

Basic hardware requirements

There are several common hardware requirements that apply to both the standard and premium licensing options, including:

• Processor
  Intel CPU 25xx v3 (Haswell) or higher

• Ethernet network ports
  ◦ 4 x 10GbE (recommended)
  ◦ 2 x 10GbE (minimum)
  ◦ 2 x 1GbE (only for a single-node cluster)

Additional requirements for the standard and premium capacity offerings

There are several additional requirements based on the platform capacity option you choose when licensing ONTAP Select.

Note: The disk drive requirements apply when using a local RAID controller and drives. These requirements do not apply to external storage accessed through the ONTAP Select vNAS solution.

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU cores</td>
<td>Six physical cores or greater, with four reserved for ONTAP Select</td>
<td>Ten physical cores or greater, with eight reserved for ONTAP Select</td>
</tr>
<tr>
<td>Memory</td>
<td>24GB or greater with 16GB reserved for ONTAP Select</td>
<td>72GB or greater with 64GB reserved for ONTAP Select</td>
</tr>
</tbody>
</table>
### Standard

<table>
<thead>
<tr>
<th>Disk drives</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 to 24 internal HDD (NL-SAS, SATA, 10K SAS)</td>
<td>• 4 to 24 internal SSD</td>
</tr>
<tr>
<td>• 8 to 24 internal HDD (NL-SAS, SATA, 10K SAS)</td>
<td>• 8 to 24 internal HDD (NL-SAS, SATA, 10K SAS)</td>
</tr>
</tbody>
</table>

### ONTAP Select Deploy

<table>
<thead>
<tr>
<th>instance type</th>
<th>Standard</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td></td>
<td>Small or medium</td>
</tr>
</tbody>
</table>

### Best practices

You should consider the following recommendations regarding the hypervisor core hardware:

- All of the drives in a single ONTAP Select aggregate should be the same type. For example, you should not mix HDD and SSD drives in the same aggregate.

### Related information

*NetApp Interoperability Matrix Tool*

### RAID controller requirements

The RAID controller on the hypervisor host where you deploy ONTAP Select must meet several requirements.

The minimum requirements for the RAID controller include:

- 12 Gbps throughput
- 512 MB internal battery-backed or flash (SuperCAP) cache
- Configured in write back mode
  - Enable failback mode to “write through” (if supported)
  - Enable “always read ahead” policy (if supported)
- All local disks behind the RAID controller must be configured as a single RAID group
  - Disable the local drive cache for RAID group, which is fundamental to preserving data integrity.
- LUN configuration must be performed based on the following guidelines:
  - If the RAID group size exceeds the maximum supported LUN size, you should configure multiple equal-sized LUNs consuming all the available storage within the RAID group.
  - If the RAID group size is smaller than the maximum LUN size, you should configure one LUN consuming all available storage within the RAID group.

### Related concepts

*Appendix A: Understanding the ONTAP Select storage environment* on page 63
Network configuration

You must configure the hypervisor network correctly before deploying ONTAP Select.

Virtual switch options

You must configure a virtual switch on each of the ONTAP Select hosts to support the external network and internal network (multi-node clusters only). As part of deploying a multi-node cluster, you should test the network connectivity on the internal cluster network.

To learn more about how to configure a vSwitch on a hypervisor host, see the ONTAP Select on KVM Product Architecture and Best Practices Technical Report.

Related concepts

Appendix B: Understanding the ONTAP Select networking environment on page 66
Host configuration and preparation checklist on page 27

Related information


Required information for a KVM deployment

As part of preparing to deploy an ONTAP Select cluster in a KVM environment, you must collect information required when using the ONTAP Select Deploy administration utility to deploy and configure the cluster.

Some of the information you collect applies to the cluster itself, while other information applies to the individual nodes in the cluster.

Cluster-level information

You must collect information related to the ONTAP Select cluster.

Name of the cluster

Unique name of the cluster

Licensing mode

Evaluation or purchased licensing

IP configuration for the cluster

IP configuration for the clusters and nodes, including:

- Management IP address of the cluster
- Subnet mask
- Default gateway

Host-level information

You must collect information related to each of the nodes in the ONTAP Select cluster.

Name of the host

Unique name of the host.

Domain name of the host

Fully qualified domain name of the host
**IP configuration for the nodes**

Management IP address of each node in the cluster

**Mirror node**

Name of the associated node in the HA pair (multi-node clusters only)

**Storage pool**

Name of the storage pool that is used

**Serial number**

If you are deploying with a purchased license, the unique nine-digit serial number provided by NetApp
Planning to install the ONTAP Select Deploy utility

Before installing the ONTAP Select Deploy administration utility, you should first plan and prepare for the installation to assure success.

Related concepts

Planning to deploy ONTAP Select on page 14

Pairing the Deploy utility with the ONTAP Select clusters

You have several options when pairing an instance of the Deploy utility with the ONTAP Select clusters.

Restriction: In all deployment scenarios, a single ONTAP Select cluster and the nodes in the cluster can be managed by only one instance of the Deploy administration utility. A cluster cannot be managed by two or more different instances of the Deploy utility.

One instance of the utility for each ONTAP Select cluster

You can deploy and manage each ONTAP Select cluster using a dedicated instance of the Deploy utility. With this one-to-one configuration, there is a clear separation between each of the utility-to-cluster pairings. This configuration provides a high level of isolation with more flexibility and tolerance in the case of a system failure.

One instance of the utility for multiple ONTAP Select clusters

You can deploy and manage multiple ONTAP Select clusters in your organization using a single instance of the Deploy utility. With this one-to-many configuration, all processing and configuration data is managed by the same instance of the Deploy utility.

Requirements related to the KVM environment

Before installing the Deploy administration utility in a KVM hypervisor environment, you should review the basic requirements and prepare for the deployment to assure success.

Requirements and restrictions for a deployment

There are several requirements and restrictions that you should consider when installing the ONTAP Select Deploy utility in a KVM environment.

Linux KVM host server hardware requirements

There are several minimum resource requirements that your Linux KVM hypervisor host must meet. You should make sure that the hosts where ONTAP Select is deployed meet the following basic requirements:

- Linux server:
  - Hardware and software must be 64-bit
  - Must adhere to the same supported versions as defined for an ONTAP Select node
- Virtual CPUs (2)
• Virtual memory (4 GB)
• Storage (40 GB)
• DHCP enabled (can also assign a static IP address)

Networking and connectivity

You must make sure that the Deploy virtual machine network interface is configured and has a single management IP address. By default, the IP address is assigned to the VM using DHCP. However, you can manually configure the interface and assign a static IP instead. Also, the Deploy VM must be able to connect to the ONTAP Select hosts it will manage.

Required configuration information

As part of your deployment planning, you should determine the required configuration information before installing the ONTAP Select Deploy administration utility.

Name of the Deploy virtual machine
Name to use for the virtual machine

Name of the Linux KVM host
Linux KVM host where the Deploy utility is installed

Name of the storage pool
Storage pool holding the virtual machine files (approximately 40 GB is required)

Network for the virtual machine
Network where the Deploy virtual machine is connected

Optional network configuration information

The Deploy virtual machine is configured using DHCP by default. However, if needed, you can manually configure the network interface for the virtual machine.

Host name
Name of the host

Host IP address
Static IPv4 address

Subnet mask
Subnetwork mask, based on the network the virtual machine is a part of

Gateway
Default gateway or router

Primary DNS server
Primary Domain Name Server

Secondary DNS server
Secondary Domain Name Server

Search domains
Search domains to use
Licensing ONTAP Select

ONTAP Select provides two types of node licenses or entitlement models that provide flexibility when evaluating and deploying the product. You should understand these licensing options before deploying an ONTAP Select cluster.

Selecting the licensing model for a deployment

One license is required for each ONTAP Select virtual machine and the license is associated with the Select VM through a unique serial number.

Evaluation license

You can use an evaluation license if you want to evaluate ONTAP Select before making the decision to purchase. The evaluation license is included with the ONTAP Select Deploy administration utility and is automatically applied to each ONTAP Select node during an evaluation deployment.

The evaluation license has the following characteristics:

- A purchased license with storage capacity is not required
- The node serial number is twenty digits and is automatically generated by ONTAP Select (that is, you do not acquire it directly from NetApp)
- Two TB of storage for user data is available
- The evaluation period lasts up to 90 days
- An ONTAP Select node that is initially deployed with an evaluation license cannot be converted to a purchased license

Purchased license

After you determine that ONTAP Select is suitable for your organization, you can purchase a license for each node to support your production deployment. As part of purchasing a license, you must select the storage capacity and acquire a license file for the node. You must apply the node license files using the Deploy utility.

The purchased license has the following characteristics:

- Each ONTAP Select virtual machine must be licensed by NetApp.
- You should contact your NetApp account team or partner for assistance when acquiring the licenses and associated serial numbers needed for each node.
- The serial number identifying each node is nine digits and assigned by NetApp.
- You must also acquire and apply a license file based on the node serial number. You can apply the license file during deployment or within 30 days after deploying the cluster.
- Storage is allocated in 1 TB increments and you can purchase up 100 TB for a node.
- The storage capacity identifies the raw (not usable) capacity and corresponds to the total allowable size of the virtual data and root disks attached to the ONTAP Select virtual machine.
- After initially applying a license file to a node, you can add additional capacity as needed by contacting your NetApp account team or partner to procure an updated, larger capacity license.
Both nodes in an HA pair must have the same capacity.

An ONTAP Select node that is initially deployed with a purchased license cannot be converted to an evaluation license.

**Comparing the evaluation and purchased licenses**

The following table compares the two types of licenses for ONTAP Select nodes.

<table>
<thead>
<tr>
<th>Evaluation license</th>
<th>Purchased license</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node serial number</td>
<td>Automatically generated by ONTAP Select Deploy (20 digits).</td>
</tr>
<tr>
<td>License file with storage capacity needed?</td>
<td>No</td>
</tr>
<tr>
<td>Maximum storage for user data</td>
<td>2 TB</td>
</tr>
<tr>
<td>License duration</td>
<td>90 days</td>
</tr>
<tr>
<td>Possible to convert the license?</td>
<td>No</td>
</tr>
</tbody>
</table>

**Premium and standard capacity offerings for a purchased license**

You can acquire a purchased license for an ONTAP Select node in one of two platform capacity tiers: standard or premium.

The premium offering enhances the standard offering by providing support for both SSD and HDD drives as well as a larger virtual machine platform.

When configuring an ONTAP Select host, you must choose the appropriate hypervisor instance type based on the capacity offering. The following hypervisor instance types can be selected during host configuration using the ONTAP Select Deploy utility:

- **Small**
  - Standard or premium capacity license can be used

- **Medium**
  - Premium license must be used

For more information, refer to the planning information related to the appropriate hypervisor environment.

**Related references**

*Requirements related to the KVM environment* on page 16

**Purchasing ONTAP Select licenses**

Before deploying an ONTAP Select cluster in a production environment, you must purchase and apply a license for each node in the cluster. As part of purchasing the licenses, you must select the storage capacity.
**Purchased license workflow**

The following workflow illustrates the process of purchasing and applying a license for your ONTAP Select nodes. When initially purchasing a license, you must select the storage capacity for the node. Based on the assigned serial number, you can acquire and apply a license file to the node.

1. **Purchase a license for each ONTAP Select node through NetApp or a NetApp partner.**

2. **Extract the node serial numbers from received NetApp email or at the NetApp Support site.**

3. **Enter the serial number at the ONTAP Select licensing site for a single node.**

4. **Either download the license file or extract it from an email received from NetApp.**

   - **More nodes?**
     - **Yes**
     - **No**

5. **Apply the license files to the nodes using the Deploy utility to establish storage capacity.**

**Acquiring a license file with storage capacity**

You must acquire a license file for each ONTAP Select node running with a purchased license. The license file defines the storage capacity for the node and is associated with the node through the unique serial number assigned by NetApp.

**Before you begin**

You must have the nine-digit serial number assigned to the node by NetApp.

**About this task**

You must perform this task for each ONTAP Select node requiring a purchased license.

**Steps**

1. Access the ONTAP Select license site using a web browser:
https://register.netapp.com/register/getlicensefile

2. Sign in using your NetApp account credentials.

3. On the License Generator page, select the desired license offering from the dropdown box.

4. Fill in the remaining fields on the same page, including the Product Serial #, which is the serial number for the ONTAP Select node.

5. Click Submit.

6. After the request has been validated, select the delivery method for the license.
   
   You can click either Download License or Email License.

7. Confirm that you received the license file based on your selected delivery method.
Host configuration and preparation checklist

You must prepare each of the hypervisor hosts where an ONTAP Select node is deployed. As part of preparing the hosts, you should carefully assess the deployment environment to make sure that the hosts are properly configured and ready to support the deployment of an ONTAP Select cluster.

Attention: The ONTAP Select Deploy administration utility does not perform the required network and storage configuration of the hypervisor hosts. You must manually prepare each host prior to deploying an ONTAP Select cluster. For more information about the ONTAP Select hypervisor environment, see Understanding the ONTAP Select storage environment and Understanding the ONTAP Select networking environment. You should also review the ONTAP Select on KVM Product Architecture and Best Practices Technical Report for more information.

Related concepts

Appendix A: Understanding the ONTAP Select storage environment on page 63
Appendix B: Understanding the ONTAP Select networking environment on page 66
Planning to deploy ONTAP Select on page 14
Planning to install the ONTAP Select Deploy utility on page 21

Related information


Preparation of the Linux server

You must prepare each of the Linux KVM servers where an ONTAP Select node is deployed. You must also prepare the server where the ONTAP Select Deploy administration utility is deployed.

Installing RedHat Enterprise Linux

You must install the RedHat Enterprise Linux operating system using the ISO image. During installation, you should configure the system as follows:

• Select Default as the security policy
• Choose the Virtualized Host software selection
• The destination should be the local boot disk and not a RAID LUN used by ONTAP Select
• Make sure the host management interface is up after booting up

Note: You can edit the correct network configuration file under /etc/sysconfig/network-scripts and then bring up the interface using the ifup command.

Installing additional packages required for ONTAP Select

There are several software packages that ONTAP Select requires. As a first step, make sure that the yum repository is available on your server. If it is not available, you can retrieve it using the following command:

wget your_repository_location.

Ensure that the following packages and dependencies are installed:

• qemu-kvm (qemu-kvm-1.5.3-126.el7_3.3.x86_64)
• libvirt (libvirt-2.0.0-10.el7_3.5.x86_64)
• openvswitch (openvswitch-2.5.0-14)
• lswh (lshw-B.02.17-12)
• lsscsi (lsscsi.x86_64-0.27-3)

Note: Some of the required packages might already be installed if you chose Virtualized Host for the software selection during installation of the Linux server.

Installing additional packages required for the ONTAP Select Deploy utility
The host running ONTAP Select Deploy requires the same software packages as an ONTAP Select node. In addition, you must install the following packages:

• virt-install (virt-install-1.4.0-2)

Configuration of the storage pools
An ONTAP Select storage pool is a logical data container that abstracts the underlying physical storage. You must manage the storage pools on the KVM hosts where ONTAP Select is deployed.

Creating a storage pool
You must create at least one storage pool at each ONTAP Select node.

Before you begin
You must be able to sign in to the Linux command line interface on the host where ONTAP Select is deployed.

About this task
The ONTAP Select Deploy administration utility expects the target location for the storage pool to be specified as: /dev/<pool_name> where <pool_name> is a unique pool name on the host.

Note: The entire capacity of the LUN is allocated when a storage pool created.

Steps
1. Display the local devices on the Linux host and choose the LUN that will contain the storage pool:
   ```
   lsblk
   ```
   The appropriate LUN is likely the device with the largest storage capacity.

2. Define the storage pool on the device:
   ```
   virsh pool-define-as <pool_name> logical --source-dev <device_name> --target=/dev/<pool_name>
   ```
   For example:
   ```
   virsh pool-define-as select_pool logical --source-dev /dev/sdb --target=/dev/select_pool
   ```

3. Build the storage pool:
   ```
   virsh pool-build <pool_name>
   ```

4. Start the storage pool:
   ```
   virsh pool-start <pool_name>
5. Configure the storage pool to automatically start at system boot up:
   ```
   virsh pool-autostart <pool_name>
   ```

6. Verify that the storage pool has been created:
   ```
   virsh pool-list
   ```

**Deleting a storage pool**

You can delete a storage pool when it is no longer needed.

**Before you begin**

You must be able to sign in to the Linux command line interface where ONTAP Select is deployed.

**About this task**

The ONTAP Select Deploy administration utility expects the target location for the storage pool to be specified as: `/dev/<pool_name>` where `<pool_name>` is a unique pool name on the host.

**Steps**

1. Verify that the storage pool is defined:
   ```
   virsh pool-list
   ```

2. Destroy the storage pool:
   ```
   virsh pool-destroy <pool_name>
   ```

3. Undefine the configuration for the inactive storage pool:
   ```
   virsh pool-undefine <pool_name>
   ```

4. Verify that the storage pool has been removed from the host:
   ```
   virsh pool-list
   ```

5. Verify that all logical volumes for the storage pool volume group have been deleted:
   a. Display the logical volumes:
      ```
      lvs
      ```
   b. If any logical volumes exist for the pool, delete them:
      ```
      lvremove <logical_volume_name>
      ```

6. Verify that the volume group has been deleted:
   a. Display the volume groups:
      ```
      vgs
      ```
   b. If a volume group exists for the pool, delete it:
      ```
      vgremove <volume_group_name>
      ```

7. Verify that the physical volume has been deleted:
   a. Display the physical volumes:
      ```
      pvs
      ```
   b. If a physical volume exists for the pool, delete it:
      ```
      pvremove <physical_volume_name>
      ```
Preparation of the ONTAP Select cluster network

You can deploy ONTAP Select on KVM as either a four-node cluster or a single-node cluster. In many cases, a four-node cluster is preferable because of the additional storage capacity and HA capability.

Illustration of the ONTAP Select networks and nodes

The figures below illustrate the networks used with a single-node cluster and four-node cluster.

**Single-node cluster showing one network**

The following figure illustrates a single-node cluster. The external network carries client, management, and cross-cluster replication traffic (SnapMirror/SnapVault).

![Single-node cluster showing one network](image)

**Four-node cluster showing two networks**

The following figure illustrates a four-node cluster. The internal network enables communication among the nodes in support of the ONTAP cluster network services. The external network carries client, management, and cross-cluster replication traffic (SnapMirror/SnapVault).
Single node within a four-node cluster

The following figure illustrates the typical network configuration for a single ONTAP Select virtual machine within a four-node cluster. There are two separate networks: ONTAP-internal and ONTAP-external.

VLAN 10 = 169.254.0.x
VLAN 20 = 192.168.1.x
Configuring Open vSwitch on a KVM host

You must configure a software-defined switch on each ONTAP Select using Open vSwitch.

Before you begin
The network manager must be disabled and the native Linux network service must be enabled.

About this task
ONTAP Select requires two separate networks, both of which utilize port bonding to provide HA capability for the networks.

Steps
1. Make sure that Open vSwitch is active on the host:
   a. Determine if Open vSwitch is running:
      ```bash
      systemctl status openvswitch
      ```
   b. If Open vSwitch is not running, start it:
      ```bash
      systemctl start openvswitch
      ```
2. Display the Open vSwitch configuration:
   ```bash
   ovs-vsctl show
   ```
   The configuration should be empty.
3. Add a new vSwitch instance:
   ```bash
   ovs-vsctl add-br <bridge_name>
   ```
   For example:
   ```bash
   ovs-vsctl add-br ontap-br
   ```
4. Bring the network interfaces down:
   ```bash
   ifdown <interface_1>
   ifdown <interface_2>
   ```
5. Combine the links using LACP:
   ```bash
   ovs-vsctl add-bind <internal_network> bond-br <interface_1> <interface_2> bond_mode=balance-slb lACP=active other_config:lACP-time=fast
   ```
   For example:
   ```bash
   ovs-vsctl add-bind ontap-internal bond-br enp18s0 enp19s0 bond_mode=balance-slb lACP=active other_config:lACP-time=fast
   ```
6. Bring the network interfaces up:
   ```bash
   ifup <interface_1>
   ifup <interface_2>
   ```
Setting the transmit queue length for virtual NICs

You should set the transmit queue length for the ONTAP Select virtual NICs by adding a udev rule. You can create the rule using one of two different styles.

Before you begin

You must have root access to the Linux server where the ONTAP Select virtual machine is deployed.

About this task

You must create and confirm a single udev rule in the /etc/udev/rules.d directory to set the transmit queue length to 5000.

- Create the rule
  You can create the rule in a number of ways; for example:

  `echo "<rule>" > /etc/udev/rules.d/<rule_name>.rules`

- Display the rule
  You can display the rule in a number of ways; for example:

  `cat /etc/udev/rules.d/<rule_name>.rules`

Steps

1. Sign in to the Linux server with root access.
2. Create one rule.
   - Use the 99 ontapnic rules style

     `echo "SUBSYSTEM=="net", ACTION=="add", KERNEL=="ontapn*", ATTR{tx_queue_len}="5000"" > /etc/udev/rules.d/99-ontap- txqueuelen.rules`

     - Use the 98 ontapnic rules style

       `echo "KERNEL=="ontapnic*", RUN+="/sbin/ip link set %k txqueuelen 5000"" > /etc/udev/rules.d/98-ontapnic.rules`

3. Display the rule to confirm it has been added correctly:

   `cat /etc/udev/rules.d/<rule_name>.rules`
Installing and configuring the ONTAP Select Deploy utility

The ONTAP Select Deploy administration utility virtual machine is packaged in the raw file format. You must download the single compressed file and then deploy and configure the virtual machine on a Linux server using KVM.

Before you begin

You must prepare the Linux server where ONTAP Select Deploy runs. Refer to the applicable host configuration and planning information.

Steps

1. Downloading the virtual machine image on page 34
2. Uploading the virtual machine image to the Linux server on page 35
3. Installing the virtual machine on page 35
4. Signing in to the Deploy utility using SSH on page 36

Related concepts

- Host configuration and preparation checklist on page 27
- Planning to install the ONTAP Select Deploy utility on page 21

Related references

- Requirements related to the KVM environment on page 21

Downloading the virtual machine image

To begin the installation process, you must download the appropriate virtual machine image from the NetApp Support Site. The ONTAP Select Deploy virtual machine is formatted according to the raw file format and packaged as a single compressed file with the .tgz suffix.

Steps

1. Access the NetApp Support Site using a web browser and click the Downloads tab at the top of the page.
2. Click Software and sign in to the site.
3. Scroll to the line displaying ONTAP Select and select Deploy Install on the right and click GO!.
4. Click View & Download for the desired software level.
5. Click CONTINUE and accept the End User License Agreement (EULA).
6. Select and download the appropriate installation file, responding to all prompts as needed for your environment

Related information

- NetApp Support
Uploading the virtual machine image to the Linux server

You must upload the ONTAP Select Deploy virtual machine image to the Linux server before installing it.

Before you begin
You must have the compressed virtual machine image on your local workstation.

Steps
1. Sign in to the command shell at your local workstation.
2. Upload the virtual machine image to the Linux server where Deploy will run; for example you can use the SCP utility:
   
   ```
   scp <file_name> root@<ip_address>:/root
   ```

Installing the virtual machine

You must install and start the ONTAP Select Deploy virtual machine on your Linux server. As part of the installation process, you must configure the network interface to use DHCP or a static IP configuration.

Before you begin
The compressed virtual machine image is assumed to be in the `/root` directory at the Linux server based on a previous upload operation. You must have the configuration information to be used when creating the virtual machine, including the name of the virtual machine, external network, and host name.

When defining a static network configuration, you need the following additional information:

- IP address of the Deploy virtual machine
- netmask
- IP address of the gateway (router)
- IP address of the primary DNS server
- IP address of the second DNS server
- DNS search domains

Steps
1. Sign in to the command line interface at the Linux server:
   
   ```
   ssh root@<ip_address>
   ```
2. Create a new directory and extract the raw virtual machine image:
   
   ```
   mkdir /home/select_deploy25
   cd /home/select_deploy25
   mv /root/<file_name> .
   tar -xzvf <file_name>
   ```
3. Create and start the KVM virtual machine running the Deploy administration utility:
virt-install --name=<vm_name> --vcpus=2 --ram=4096 --os-type=linux --controller=scsi,model=virtio-scsi --disk path=<full_path_to_raw_file>,device=disk,bus=scsi,format=raw --network "type=bridge,source=<name_of_external_network> model=virtio,virtualport_type=openvswitch" --console=pty --import --wait 0

For example:

virt-install --name=deploy-kvm --vcpus=2 --ram=4096 --os-type=linux --controller=scsi,model=virtio-scsi --disk path=/home/select_deploy25,device=disk,bus=scsi,format=raw --network "type=bridge,source=ontap_externalnetwork model=virtio,virtualport_type=openvswitch" --console=pty --import --wait 0

4. Connect to the virtual machine console:

```
virsh console <vm_name>
```

5. Wait for the following prompt:

```
Host name :
```

6. Type the host name and press Enter.

7. Wait for the following prompt:

```
Use DHCP to set networking information? [n]:
```

8. Type n to define a static IP configuration or y to use DHCP, and press Enter.

9. If you choose a static configuration, provide all network configuration information as required.

**After you finish**

After the virtual machine boots up, you are automatically signed in to the Deploy utility shell using the admin user account. You must provide the current account password. If this is the first time signing in to Deploy, you must use the default password (admin123) and then change the password when prompted.

### Signing in to the Deploy utility using SSH

After the Deploy virtual machine is installed and started, you can use SSH to access the management shell. This allows you to confirm that the Deploy utility is operational and to prepare to perform administrative procedures using the CLI.

**Steps**

1. Sign in using the administrator account and management IP address of the Deploy virtual machine:

```
ssh admin@<ip_address>
```

2. Provide the current password for the account.

   If this is the first time signing in to Deploy, you must use the default password (admin123) and then change the password when prompted.

3. Type ? to display a list of Deploy shell commands.

**Related tasks**

*Signing in to the Deploy utility web interface* on page 38
Changing the Deploy administrator password on page 49
Deploying an ONTAP Select cluster

You can use the web user interface provided with the ONTAP Select Deploy administration utility to deploy a multi-node or single-node ONTAP Select cluster.

Tip: You can also deploy ONTAP Select clusters using the Deploy utility CLI.

Related concepts

- Planning to deploy ONTAP Select on page 14
- Deploying an ONTAP Select cluster using the CLI on page 58

Signing in to the Deploy utility web interface

You must sign in to the Deploy utility web user interface before creating or administering an ONTAP Select cluster.

Before you begin

You must have the current password for the administrator user account. The password for the account is defined when the Deploy utility virtual machine is installed.

Steps

1. Point your browser to the Deploy utility using the IP address or domain name:

   http://<ip_address>/

2. Provide the account information and sign in.

Preparing to create your first ONTAP Select cluster

You should prepare to use the ONTAP Select Deploy utility before deploying your first cluster to assure success.

Understanding the GUI workflow options and characteristics

When you use the Deploy utility web user interface, the pages displayed and workflow options presented can vary based on several factors.

The Deploy utility web interface is affected by the following:

- Current task being performed
- Previous tasks completed and the state of the system
- Characteristics of the cluster being created

Initial page displayed after signing in

When you sign in to the web user interface, the page initially displayed depends on whether any hosts have been added yet or not.

- No hosts have been added

  When you sign in but no hypervisor hosts have yet been added, the Getting Started page is displayed with the Welcome to ONTAP Select popup window superimposed over the page. The
popup window describes the prerequisites that must be in place before you proceed. After clicking OK in the popup, the Getting Started page is enabled, allowing you to add your first hypervisor host.

- At least one host has been added
  When you sign in and at least one hypervisor host has already been added, the Clusters page is displayed. To display the ONTAP Select Prerequisites popup window with the prerequisite information, click the ? icon at the top of the page and select Prerequisites.

Ways to add a hypervisor host
There are several ways you can add a hypervisor host to the pool of available hosts prior to creating a cluster. You can add a host in the following ways:

- Getting Started page
  After signing in, this page is displayed when no hosts have been added yet. You can add one or more hypervisor hosts on this page.

- Hypervisor Hosts page
  When at least one host has already been added, you can add additional hosts by clicking the Hypervisor Hosts tab at the top of the page and then Add.

- Create Cluster page
  As part of the cluster create workflow, you must set up two HA pairs (four-node cluster) or one host (for a single-node cluster). In both cases, when selecting the host or hosts for the cluster, you can add a new host by clicking Add Hypervisor on the Select hosts popup window.

Storage pool capacity
As part of the workflow used to create a cluster, you must select the instance type and the minimum storage pool capacity on the Select hosts popup window. The Storage pool capacity value you select on the window is used in the following ways:

- Filter the list of hosts in the window by showing only the hosts that have at least one storage pool with the minimum capacity
- Limit the amount of storage used by ONTAP Select in the storage pool, even if the available capacity is larger

Note: If you select zero or leave the value blank, no filtering is applied to the list. Also, the entire capacity of the storage pool is used.

Understanding the typical workflow when deploying your first cluster
After installing the ONTAP Select Deploy utility, you can create your first cluster. When creating the cluster, you are guided through a series of steps and choices.

1. Prepare the hypervisor hosts and acquire the capacity license files
   You must install and prepare the hypervisor servers that will host the ONTAP Select nodes. You should also purchase licenses and acquire the capacity license files for each node. You can perform these tasks before using the Deploy utility.

2. Sign in to the Deploy web user interface
   You must sign in to the Deploy utility using the administrator user account. Because it is assumed that the Deploy utility is newly installed and no hosts have yet been added, the Welcome to ONTAP Select popup window is displayed over the Getting Started page. The popup window lists the required prerequisites.

3. Confirm that you have configured the hypervisor hosts
You must acknowledge that all the prerequisites in the **Welcome to ONTAP Select** popup window have been met. Click **OK** to acknowledge that all prerequisites and requirements have been met.

4. **Add your first host**
   You must add your first host on the **Getting Started** page. You can also add additional hosts on the same page as needed, based on your deployment plans. All the hosts you add are listed on the right side of the page. Each host has a type value which is initially **unknown** and then becomes **KVM** when the host is ready to be used in a cluster.

5. **Define the configuration of the cluster**
   After you have added your hosts, you must click **Create Cluster** to begin creating the cluster. The process flows through the following steps:
   a. Provide the basic cluster details
   b. Select and configure the hosts that are part of the cluster
   c. Configure the cluster network

6. **Confirm the network connectivity on the internal cluster network**
   Before creating a multi-node cluster, you should run the network connectivity checker available through the Deploy web user interface. This tool tests the connectivity among the hypervisor hosts on the internal cluster network.

7. **Initiate the cluster creation process**
   After reviewing the cluster summary, you can initiate the cluster creation request. On the **Clusters** page, the request advances through four states as follows:
   a. Configuring host
   b. Deploying nodes
   c. Creating data disks
   d. Post deploy setup
   The state displayed on the page automatically refreshed at a regular interval.

---

### Creating your first ONTAP Select cluster

When you create an ONTAP Select cluster using the Deploy utility web interface, you are guided through a specific sequence of steps. The exact process varies depending on whether you deploy a multi-node cluster or a single-node cluster.

**Best practice:** After creating a cluster, you should back up the ONTAP Select Deploy configuration data.

**Related concepts**

*Preparing to create your first ONTAP Select cluster* on page 38

**Related tasks**

*Signing in to the Deploy utility web interface* on page 38

*Configuring AutoSupport* on page 50
Creating a multi-node cluster

You can use the ONTAP Select Deploy web user interface to deploy a four-node ONTAP Select cluster.

Before you begin

You must prepare the hypervisor hosts where ONTAP Select runs and have a capacity license file for each node in the cluster. You should be familiar with the network connectivity checker.

About this task

An ONTAP Select four-cluster is created with the following characteristics and assumptions:

- No hosts have yet been added using the Deploy utility
- A purchased license is used
- Capacity license files will be applied to each node

Steps

1. Sign in to the Deploy utility through the web interface using the administrator account.
   
   If this is the first time you are signing in to Deploy, provide the default password (admin123) and change the password when prompted.

2. Confirm that you have met the configuration requirements and prerequisites as described in the Welcome to ONTAP Select popup window and click OK.

3. On the Getting Started page, define your first hypervisor host and click Add.
   Make sure that the vCenter option is off before adding host details.

4. Add the three additional hypervisor hosts needed for the four-node cluster.

5. Refresh the page as needed and confirm that the Type value of every host is KVM.

6. Click Next to begin the process of creating an ONTAP Select cluster.

7. In the Cluster Details section of the page, provide all the required information describing the cluster and click Done.
   
   The ONTAP image you select is used for each node in the new cluster.

8. In the Setup HA Pair 1 section of the page, click Select Hosts.

9. In the Select hosts for the HA pair popup window, select the host type, instance type, and storage pool capacity to filter the list of possible hosts for the two nodes in the HA pair.
   
   A Small instance and Medium instance are the two available hypervisor configuration types. These instance types are supported by the standard and premium offerings of the purchased license, respectively. The license applied to a node must match or exceed the instance type.

10. Select two hosts from the list and click Done.
    
    The list of available hosts is filtered based on the host type, instance type, and storage pool capacity. You can select hosts from the list or add more hosts by clicking Add Hypervisor.

11. Click License HA Pair to display a list of available licenses for the nodes in the HA pair.

12. If the required licenses are not available in the list, click Upload License(s) and select the licenses from your local workstation, then click Open to upload the licenses to the Deploy utility.
    
    Each license is displayed in the list, including the serial number, type, and capacity.
13. Select the licenses from the list and click **Done**.

   **Note:** Instead of applying a license, you can select **Enter Serial Number** to provide a serial number assigned by NetApp. If you provide a serial number, you must apply a license within 30 days.

14. Click **Configure Hosts** and select the networks and storage pool for the first host.

   The values on the page may be pre-populated based on the previous configuration choices as well as the configuration of the hypervisors.

   You can optionally assign a VLAN ID to the network types to separate the traffic when a shared physical network is used.

15. Select the networks and storage pool for the second host in the HA pair and click **Apply** and then **Done**.

   If all SSD drives are used for both hosts, you can optionally enable storage efficiency.

16. In the **Setup HA Pair 2** section of the page, click **Select Hosts**.

17. Configure the second HA pair following the same steps that you used for the first HA pair.

18. After both HA pairs have been configured, click **Configure Network** to configure the cluster network.

19. Provide all network configuration parameters in the **Configure Network** window and click **Done**.

   The three values at the bottom of the page related to DNS and NTP are optional.

20. Review and confirm the configuration of the cluster.

   You can change the configuration by clicking **Edit** in the applicable section.

21. Run the network connectivity checker which is part of the web user interface to test the connectivity of the internal cluster network.

22. Click **Create Cluster** to begin the cluster creation process and then click **OK** in the **Cluster create operation started** popup window.

   It can take up to 30 minutes for the cluster to be created.

23. Select **View Clusters** and on the **Clusters** page, select the new cluster and monitor the cluster creation process.

   The page is automatically refreshed at regular intervals. Notice that three tabs are available at the top of the page.

   **Attention:** If the cluster creation operation is initiated but fails to complete, the ONTAP administrative password you define is not registered. In this case, you can access the management interface for the ONTAP Select cluster using the password `changeme123` for the admin account.

**After you finish**

You should configure the ONTAP Select AutoSupport feature. You should also back up the ONTAP Select Deploy configuration data.

**Related tasks**

[Backing up the Deploy configuration data](#) on page 53
Creating a single-node cluster

You can use the ONTAP Select Deploy web user interface to deploy a single-node ONTAP Select cluster.

Before you begin

You must prepare the hypervisor host where ONTAP Select runs and have a capacity license file for the node.

About this task

An ONTAP Select single-node cluster is created with the following characteristics and assumptions:

- No hosts have yet been added using the Deploy utility
- A purchased license is used
- A capacity license file will be applied to the node

Steps

1. Sign in to the Deploy utility through the web interface using the administrator account.
   If this is the first time you are signing in to Deploy, provide the default password (admin123) and change the password when prompted.

2. Confirm that you have met the configuration requirements and prerequisites as described in the Welcome to ONTAP Select popup window and click OK.

3. On the Getting Started page, define a hypervisor host and click Add.
   Make sure that the vCenter option is off before adding host details.

4. Refresh the page as needed and confirm that the Type value of the host is KVM.

5. Click Next to begin the process of creating an ONTAP Select cluster.

6. In the Cluster Details section of the page, provide all the required information describing the cluster and click Done.

7. In the Setup Host section of the page, click Select Hosts.

8. In the Select hosts for the HA pair popup window, select the host type, instance type, and storage pool capacity to filter the list of possible hosts.

   A Small instance and Medium instance are the two available hypervisor configuration types. These instance types are supported by the standard and premium offerings of the purchased license, respectively. The license applied to a node must match or exceed the instance type.

9. Select the host from the list and click Done.

   The list of available hosts is filtered based on the host type, instance type, and storage pool capacity. You can select hosts from the list or add more hosts by clicking Add Hypervisor.

10. Click License Host to display a list of available licenses for the single node.

11. If the required licenses are not available in the list, click Upload License(s) and select a license from your local workstation and click Open to upload the license to the Deploy utility.

   Each license is displayed in the list, including the serial number, type, and capacity.

12. Select the license from the list and click Done.
Note: Instead of applying a license, you can select Enter Serial Number to provide a serial number assigned by NetApp. If you provide a serial number, you must apply a license within 30 days.

13. Click Configure Hosts and select the networks and storage pool for the host and click Apply and then Done.

The values on the page may be pre-populated based on the previous configuration choices as well as the configuration of the hypervisor.

You can optionally assign a VLAN ID to the network types which provides a way to separate the traffic when they share network.

14. Click Configure Network to configure the cluster network.

15. Provide all network configuration parameters in the Configure Network window and click Done.

The three values at the bottom of the page related to DNS and NTP are optional.

16. Review and confirm the configuration of the cluster.

You can change the configuration by clicking Edit in the applicable section.

17. Click Create Cluster to begin the cluster creation process and then click OK in the Cluster create operation started popup window.

It can take up to 30 minutes for the cluster to be created.

18. Select View Clusters and on Clusters page, select the new cluster and monitor the cluster creation process.

The page is automatically refreshed at regular intervals. Notice that three tabs are available at the top of the page.

Attention: If the cluster creation operation is initiated but fails to complete, the ONTAP administrative password you define is not registered. In this case, you can access the management interface for the ONTAP Select cluster using the password changeme123 for the admin account.

After you finish

You should configure the ONTAP Select AutoSupport feature. You should also back up the ONTAP Select Deploy configuration data.

Related tasks

Backing up the Deploy configuration data on page 53
Administering an ONTAP Select cluster

After you complete the deployment of an ONTAP Select cluster, you are ready to begin the process of administering the ONTAP-managed storage.

Initial state of the cluster after deployment

You should be aware of the initial state of the ONTAP Select cluster immediately after it is deployed. Based on this, you can decide how to configure and administer the cluster.

Summary of the cluster configuration state

After an ONTAP Select cluster is deployed, it has the following characteristics:

- Two types of customer-specified LIFs are assigned:
  - Cluster management (one per cluster)
  - Node management (one per node)
- Two administrative SVMs are active:
  - Default SVM
  - Cluster SVM
- The root aggregate is created
- All features are licensed and available

**Note:** There are no data SVMs created. Also, the multi-node cluster has an internal network with autogenerated LIFs.

ONTAP features enabled by default

ONTAP Select automatically licenses several features for each node. The following ONTAP features are included:

- NFS
- CIFS
- iSCSI
- FlexClone
- SnapRestore
- SnapVault
- SnapMirror
- Deduplication and compression
- ONTAP multitenancy capability
Performing additional configuration

After your ONTAP Select cluster is deployed, you can configure and manage the cluster just as you would a hardware-based ONTAP system. For example, you can use OnCommand System Manager or the ONTAP CLI to configure the ONTAP Select cluster.

**NetApp client software**

You can connect to ONTAP Select using the following supported NetApp client software:

- OnCommand System Manager
- OnCommand Unified Manager for ONTAP
- OnCommand Performance Manager
- Virtual Storage Console for VMware vSphere
- SnapCenter (refer to the NetApp Interoperability Matrix Tool for more details)

To identify the supported versions of the client software, refer to the NetApp Interoperability Matrix Tool. If the client software supports ONTAP 9, then the same version is also supported with ONTAP Select.

**Restriction:** The use of SnapCenter and the corresponding plug-ins requires server-based licenses. Storage system licensing of the SnapCenter plug-ins is not currently supported with ONTAP Select.

Any other NetApp client software that is not included in the list is not supported by ONTAP Select.

**Possible configuration options**

There are several options available when configuring the cluster, including the following:

- Creating the networking configuration
- Laying out your aggregates
- Creating the data Storage Virtual Machines (SVMs)

**Purchased licenses with storage capacity**

If you decided not to install the license files with storage capacity as part of deploying the ONTAP Select cluster, you must acquire and install the license files before the grace period expires for clusters running with a purchased license.

**Mirrored aggregates**

There are two data spares created for each ONTAP Select node (one in Pool0 and one in Pool1). To implement high availability for your data, you must create a mirrored aggregate using these spares.

**Related information**

*NetApp Interoperability Matrix Tool*
Upgrading the ONTAP Select nodes

After you deploy an ONTAP Select cluster, you can upgrade the ONTAP image of each node as needed using the standard ONTAP software upgrade procedure.

Restriction: You cannot use the Deploy administration utility to perform upgrades of existing ONTAP Select nodes. The Deploy utility can only be used to install new ONTAP Select nodes.

Attention: You cannot revert an ONTAP Select node to a version prior to the version that was originally installed. For example:

- ONTAP Select 9.1 is initially installed
  You can upgrade the node to version 9.2 and then revert back to version 9.1 if needed.

- ONTAP Select 9.2 is initially installed
  You cannot revert to version 9.1 because this version is prior to the version that was originally installed.

Related information

NetApp Support
Upgrade, revert, or downgrade
Software express upgrade
Supporting ONTAP Select and the ONTAP Select Deploy utility

After deploying an ONTAP Select cluster, you should prepare to support the cluster and the ONTAP Select Deploy administration utility. While it is typically more convenient to use the web user interface, in most cases you can also choose to use the command line interface. However, there are some tasks that you can only perform using either the web user interface or the CLI.

Related tasks

- Signing in to the Deploy utility web interface on page 38
- Signing in to the Deploy utility using SSH on page 36

Confirming network connectivity among ONTAP Select nodes using the CLI

You can test the network connectivity among two or more ONTAP Select nodes on the internal cluster network. You typically run this test before a multi-node cluster is created to detect issues that might cause the cluster create operation to fail. However, you can also run the test after a cluster is created and online.

Before you begin

All the ONTAP Select nodes included in the test must be added and configured using the web GUI or CLI. You must also have the host IDs assigned to the hosts.

About this task

You must use the network connectivity checker from the command line interface. Each time you issue a CLI command to start the test, a new process run is created in the background and assigned a unique run identifier. Only one run can be active at a time.

The test has two modes that determine its operation:

- **Quick**
  - This mode performs a basic non-disruptive test. A PING test is performed, along with a test of the network MTU size and vSwitch.

- **Extended**
  - This mode performs a more comprehensive test over all the redundant network paths. If you run this on an active ONTAP Select cluster, the performance of the cluster can be impacted.

**Note:** It is recommended that you always perform a quick test before creating a multi-node cluster. After the quick test completes successfully, you can optionally perform an extended test based on your production requirements.

Steps

1. Sign in to the Deploy utility CLI using the administrator account.
2. Display the current runs of the network connectivity checker and verify that no runs are active:
   
   `network connectivity-check show-all`
3. Start the network connectivity checker and note the run identifier in the command output:
network connectivity-check start --host-ids <host_id1> <host_id2> <host_id3> <host_id4> --vswitch-type StandardVSwitch --mode quick

4. Monitor the progress of the network connectivity checker based on the run identifier:

    network connectivity-check show --run-id <run_id>

After you finish

The network connectivity checker normally cleans up by removing any temporary vmkernel ports and IP addresses added to the ONTAP-Internal port group. However, if the connectivity checker fails to remove the temporary vmkernel ports, you must perform a manual cleanup operation by rerunning the CLI command with the --cleanup option. If you do not remove the temporary vmkernel ports from the ONTAP-Internal port group on a Standard Vswitch, the ONTAP Select virtual machine may not be created successfully.

### Changing the Deploy administrator password

You can change the password for the Deploy virtual machine administrator account as needed using the web user interface.

**Steps**

1. Sign in to the Deploy utility web user interface using the administrator account.
2. Click the figure icon at the top right of the page and select **Change Password**.
3. Provide the current and new password as prompted and click **Apply**.

### Changing the Deploy administrator password using the CLI

You can change the password for the Deploy virtual machine administrator account as needed using the command line interface.

**Steps**

1. Sign in to the Deploy utility CLI using the administrator account.
2. Change the password:

    user password modify

3. Respond to all prompts as appropriate for your environment.

### Displaying the ONTAP Select event messages

The ONTAP Select Deploy utility includes an event logging facility that provides information about the activity of the system. You should view the contents of the event log to debug any issues or when directed to do so by support.

**About this task**

You can filter the list of event messages based on several characteristics, including:

- Category
- Type
- Level
Steps
1. Sign in to the Deploy utility web user interface using the administrator account.
2. Click the Administration tab at the top of the page.
3. Click Events and then click Deploy.
4. Optionally click Filtering and create a filter to limit the event messages displayed.

Configuring AutoSupport

You should configure AutoSupport immediately after creating the first ONTAP Select cluster. You can update the configuration as needed at any time.

About this task
The AutoSupport configuration you define is applied to both the Deploy utility and the ONTAP Select clusters you create using the Deploy utility.

If you use a proxy server, you can configure the proxy URL as follows: http://<proxy_username>:<password>@<proxyURLorIP>:<port>.

Steps
1. Sign in to the Deploy utility web user interface using the administrator account.
2. Click the Administration tab at the top of the page.
3. Click AutoSupport and then click Configure.
4. Provide the configuration data as appropriate for your environment and click Save.

After you finish
AutoSupport is the primary troubleshooting tool used by NetApp in supporting ONTAP Select. Therefore, you should not disable AutoSupport unless absolutely necessary. If you do disable AutoSupport, data is still collected but not transmitted to NetApp.

Related tasks
Generating and downloading an AutoSupport package on page 50

Generating and downloading an AutoSupport package

ONTAP Select includes the ability to generate an AutoSupport package. You should generate a package to debug any issues or when directed to do so by support.

About this task
You can generate the following AutoSupport packages under the direction and guidance of NetApp support:

- Deploy logs
  Log files created by the ONTAP Select Deploy utility
- Troubleshooting
Troubleshooting and debugging information about the hypervisor host where ONTAP Select runs

- Performance
  Performance information about the hypervisor host where ONTAP Select runs

- Corefile
  The corefile generated by the ONTAP Select node

**Steps**

1. Sign in to the Deploy utility web user interface using the administrator account.
2. Click the **Administration** tab at the top of the page.
3. Click **AutoSupport** and then click **Generate**.
4. Select the type and provide a description for the package; you can optionally provide a case.
5. Click **Generate AutoSupport**.
   Each AutoSupport package is assigned a unique sequence number.
6. On the left side of the page, click **History** and locate the correct package; you can click **Refresh** as needed.
7. Optionally click the download icon to save the AutoSupport file to your local workstation.

---

**Moving an ONTAP Select cluster to the offline and online states**

After you have created a cluster, you can change its status to offline and then online as needed using the web user interface.

**Before you begin**

After a cluster is created it is initially in the online state.

**Steps**

1. Sign in to the Deploy utility web user interface using the administrator account.
2. Click the **Clusters** tab at the top of the page and select the desired cluster from the list.
3. Click the gear icon on the right of the cluster and select **Offline**.
   If the offline option is not available, then the cluster is already in the offline state.
4. Click **Yes** in the popup window to confirm the request.
5. Click **Refresh** occasionally and hover over the icon to the left of the cluster name until the state of the cluster is offline.
6. Click the gear icon on the right of the cluster and select **Online**.
7. Click **Refresh** occasionally and hover over the icon on the left until the state of the cluster is online.
Deleting an ONTAP Select cluster

You can delete an ONTAP Select cluster when it is no longer needed using the web user interface.

**Before you begin**
The cluster must be in the offline state.

**Steps**
1. Sign in to the Deploy utility web user interface using the administrator account.
2. Click the **Clusters** tab at the top of the page and select the desired cluster from the list.
3. Click the gear icon on the right of the cluster and select **Delete**.
   If the delete option is not available, then the cluster is not in an offline state. You must assure that the cluster is offline.
4. Click **Refresh** occasionally until the cluster is removed from the list.

**Result**
After the cluster is deleted, all the hosts that were part of the cluster are moved to the unassigned state.

Deleting an ONTAP Select cluster using the CLI

You can delete an ONTAP Select cluster when it is no longer needed using the command line interface.

**About this task**
The cluster must be in the offline state.

**Steps**
1. Sign in to the Deploy virtual machine CLI using the administrator account.
2. Display the cluster status:
   ```
   cluster show --cluster-name <cluster_name>
   ```
3. If the cluster is not offline, move it to an offline state:
   ```
   cluster offline --cluster-name <cluster_name>
   ```
4. After confirming the cluster is in an offline status, delete the cluster:
   ```
   cluster delete --cluster-name <cluster_name>
   ```

**Result**
After the cluster is deleted, all the hosts that were part of the cluster are moved to the unassigned state.
Accessing the ONTAP Select Deploy virtual machine console

You can access the console of the KVM virtual machine where the ONTAP Select Deploy administration utility is running.

**About this task**

You might need to access the virtual machine console to troubleshoot an issue or when asked to do so by NetApp support.

**Steps**

1. Sign in to the command line interface of the Linux server.
2. Connect to the virtual machine console:
   ```
   virsh console <vm_name>
   ```

Migrating a Deploy instance to a new virtual machine using the CLI

You can migrate an existing instance of the Deploy administration utility to a new virtual machine using the command line interface.

**Before you begin**

You must be familiar with the procedures used to download and deploy the ONTAP Select Deploy virtual machine in a KVM environment.

**About this task**

This procedure is based on creating a new virtual machine that uses the configuration data from the original virtual machine. The new and original virtual machines must run the same version and release of the Deploy utility. You cannot migrate to a different version and release of the Deploy utility.

Backing up the Deploy configuration data

You must create a backup of the configuration data from a Deploy virtual machine as part of migrating the virtual machine. You should also create a backup after creating an ONTAP Select cluster. The data is saved to a single file that you must download to your local workstation.

**About this task**

The backup file you create captures all the configuration data from the virtual machine. This data describes aspects of your deployment environment, including the ONTAP Select hosts and clusters. By default, the backup file is stored in the home directory of the administration user at the Deploy virtual machine but you can specify a different target directory as needed.

**Steps**

1. Sign in to the Deploy utility CLI using SSH with the administrator account.
2. Create a backup of the configuration data to the administrator's home directory at the Deploy virtual machine:
configuration backup --path /home/admin

3. Record the name of the backup file displayed after the command completes.

4. In a separate command shell on your local workstation, use the sftp utility to download the configuration file:
   
   ```
sftp admin@<ip_address>
   (type password and press Enter)
   get <backup_file_name>
   exit
   ```

Installing a new instance of the Deploy virtual machine

You must create a new instance of the Deploy virtual machine which you can update with the configuration data from the original virtual machine.

About this task

This task is described at a high level.

Step

1. Create a new instance of the Deploy virtual machine:
   
   a. Download the virtual machine image.
   
   b. Deploy the virtual machine and configure the network interface.
   
   c. Access the Deploy utility using SSH.

Related tasks

*Installing and configuring the ONTAP Select Deploy utility* on page 34

Restore the Deploy configuration data to the new virtual machine

You must restore the configuration data from the original Deploy utility virtual machine to the new virtual machine. The data is in a single file that you must upload from your local workstation.

Before you begin

You must have the configuration data from a previous backup. The data is contained in a single file and must be available on your local workstation.

Steps

1. In a command shell on your local workstation, use the sftp utility to upload the configuration file to the new Deploy virtual machine image:
   
   ```
sftp admin@<ip_address>
   (type password and press Enter)
   put <backup_file_name>
   exit
   ```

2. Sign in to the Deploy utility CLI using SSH with the administrator account.

3. Restore the configuration data from the administrator's home directory:
   
   ```
   configuration restore --path /home/admin
   ```
Upgrading an existing Deploy virtual machine using the CLI

You can upgrade an existing Deploy utility virtual machine in-place using the command line interface.

Before you begin
It is recommended that you back up the configuration of the Deploy virtual machine before beginning the upgrade. Make sure that Deploy is not used to perform any other tasks during the upgrade.

About this task
You can only perform this procedure when upgrading from a previous Deploy version (for example, from Deploy 2.1 to 2.2).

After you finish
It is recommended that you back up the configuration of the Deploy virtual machine after the upgrade procedure is completed.

Steps
1. Downloading the upgrade package on page 55
2. Uploading the package to the Deploy virtual machine on page 55
3. Applying the upgrade package on page 56

Downloading the upgrade package
To begin the upgrade process, you must download the appropriate Deploy virtual machine upgrade file from the NetApp Support Site. The upgrade package is formatted as a single compressed file.

Steps
1. Access the NetApp Support Site using a web browser and click the Downloads tab at the top of the page.
2. Click Software and log in to the site.
3. Scroll to the line displaying ONTAP Select and select Deploy Upgrade on the right and click GO!.
4. Click View & Download for the desired software level.
5. Click CONTINUE and accept the End User License Agreement (EULA).
6. Select and download the appropriate upgrade file, responding to all prompts as needed for your environment.

Uploading the package to the Deploy virtual machine
After acquiring the upgrade package, you must upload the file to the Deploy virtual machine.

Before you begin
You must have the upgrade file available on your local workstation. You must also have the password for the administrator user account.
About this task

This task describes one method for uploading the file to the Deploy virtual machine. There may be other more suitable options in your environment.

Step

1. In a command shell on your local workstation, use the sftp utility to upload the license file to the Deploy virtual machine:

```
sftp admin@<ip_address>
(type password and press Enter)
put <file_name>
Exit
```

Result

The upgrade file is stored in the home directory of the admin user.

Applying the upgrade package

After the upgrade file has been uploaded to the Deploy virtual machine, you can apply the upgrade.

Before you begin

You must known which directory the upgrade file has been placed in at the Deploy utility virtual machine. Also, assure that Deploy is not used to perform any other tasks while the upgrade is performed.

Steps

1. Sign in to the Deploy utility CLI using SSH with the administrator account.

2. Perform the upgrade using the appropriate directory path and file name:

```
upgrade /home/admin/<file_name>
```

Understanding the EMS notifications

After you install a purchased license with storage capacity, ONTAP Select monitors the license and generates Event Management System (EMS) notifications based on activity. You should understand the associated EMS notifications.

`license.capac.valid (notice)`

This message occurs when a valid capacity license has been installed on a node in your organization.

`license.capac.warning (notice)`

This message occurs when the total storage capacity of all disks currently assigned to your system is close to exceeding the limit of your current license. If the capacity limit is exceeded, a forced shutdown of the system may result.

`license.capac.enforce (alert)`

This message occurs when the total storage capacity of all disks currently assigned to your system exceeds the limit of your capacity license. The system will shut down within the next 72 hours.
**license.capac.shutdown (alert)**

This message occurs when the total storage capacity of all disks currently assigned to your system has exceeded the limit of your capacity license. The system will shut down within the next 10 minutes.
Deploying an ONTAP Select cluster using the CLI

You can use the command line interface provided with the ONTAP Select Deploy administration utility to create a multi-node or single-node ONTAP Select cluster.

Related tasks

Signing in to the Deploy utility using SSH on page 36

Related information

ONTAP Select 9 Quick Start Guide: Deploying an Evaluation Cluster on VMware
ONTAP Select 9 Quick Start Guide: Deploying an Evaluation Cluster on KVM

Adding an ONTAP Select host

Adding a host is the first task you must perform as part of creating an ONTAP Select cluster. When you add a host, the Deploy administration utility records the information in the local Deploy utility configuration database.

Before you begin

You must have the basic configuration information for the ONTAP Select host.

About this task

If authentication is performed by an Active Directory server, you must format the username parameter as follows:

\--username DOMAIN\\user

Steps

1. Sign in to the Deploy utility CLI using SSH with the administrator account.
2. Add the host:
   
   ```
   host add --host-id vsanane38.coco.netapp.com --username admin@server1.local --password mypwd
   ```
   
   **Tip:** If you omit the password, you will be prompted to provide one.

3. Display the status of the host:
   
   ```
   host show-all
   ```

4. Confirm the status of the host is authenticated before continuing.
**Configuring an ONTAP Select host**

After a host has been added, you must configure the host. This task allows you to provide the configuration details needed prior to including the host in an ONTAP Select cluster.

**Before you begin**

You must have the complete configuration information for the ONTAP Select host and have already added the host using the Deploy administration utility. You must have created the storage pool and defined the networking on the host.

**Steps**

1. Sign in to the Deploy utility CLI using SSH with the administrator account.
2. Configure the host:
   ```
   host configure --host-id vsanane38.coco.netapp.com --location coco --
   storage-pool vsanane38_1 --serial-number 320000xxx --instance-type small
   --internal-network vsanane38_internal --management-network
   vsanane38_network --data-network vsanane38_network
   ```
   For each of the three networks identified in the command, you must identify the portgroup name.
   You can optionally assign a VLAN ID to the networks using the `--internal-vlan` parameter.
3. Display the status of the host:
   ```
   host show-all
   ```
4. Confirm that the status of the host is configured before continuing.

**Installing the ONTAP Select license file**

When you deploy an ONTAP Select cluster with a purchased license, you must acquire and install a license file with storage capacity for each node in the cluster. You can install a license for a node either before the cluster is deployed or within 30 days after the cluster is deployed. In both cases, after the license is registered with the Deploy virtual machine, it is applied to the node.

**Before you begin**

The host must be added and configured. Also, you must acquire the license file with storage capacity and save it on your local workstation.

**About this task**

You should perform this task for each of the nodes in an ONTAP Select cluster.

**Steps**

1. [Uploading a license file to the Deploy virtual machine](#) on page 60
2. [Registering a license for an ONTAP Select node](#) on page 60
Uploading a license file to the Deploy virtual machine

After acquiring a license file with storage capacity, you must upload the file containing the license to the Deploy virtual machine.

Before you begin

You can receive the license file for a ONTAP Select node either as a downloaded file or in an email. Whatever the delivery method, you must have the license file available on your local workstation. Also, you must have the password for the admin user account.

Step

1. In a command shell on your local workstation, use the sftp utility to upload the license file to the Deploy virtual machine:
   
   ```
   sftp admin@10.63.65.101 (type password and press Enter)
   put NLF-3200000022.txt
   exit
   ```

Registering a license for an ONTAP Select node

After a license file with storage capacity has been uploaded to the Deploy virtual machine, you can register the license so that it is applied when the ONTAP Select cluster is deployed.

Before you begin

You must have uploaded the license file to the Deploy virtual machine. Also, you must have the password for the admin user account.

About this task

As part of registering the license for a node, you should confirm its state. A node can be in one of the following states:

- licensed
- unlicensed
- not_used

Steps

1. Sign in to the Deploy utility CLI using SSH with the administrator account.

2. Register the license:
   
   ```
   license add --serial-number 320000xxx --file-name NLF-320000xxx.txt
   ```

3. Display the license:
   
   ```
   license show-all
   ```
Creating an ONTAP Select cluster using the CLI

You can create an ONTAP Select cluster using a CLI command with the associated input parameters.

Before you begin

**Best practice:** After creating a cluster, you should back up the ONTAP Select Deploy configuration data.

Before creating a multi-node cluster, you should run the network connectivity checker to confirm the connectivity among the cluster nodes on the internal network.

About this task

This example task illustrates how to create a single-node and four-node cluster.

Steps

1. Sign in to the Deploy utility CLI using SSH with the administrator account.
2. Create the ONTAP Select cluster.
   - Create a single-node cluster:
     ```
     cluster create --name mo-cluster38 --cluster-mgmt-ip 10.96.141.17 --node-mgmt-ips 10.96.141.25 --netmask 255.255.248.0 --gateway 10.96.141.1 --node-names mo-node38 --node-hosts vsanane38.coco.netapp.com
     ```
   - Create a four-node cluster:
     ```
     ```
   Several of the parameters include values for the four nodes. Where needed, the parameters are related to each other based on the position of the values. For example, the values in the parameter `--node-mirrors` are mapped to the values in the parameter `--node-names`. In this case, the first value of `--node-mirrors` (mo-node26) is mapped to the first value of `--node-names` (mo-node25).
3. Display the cluster status:
   ```
   cluster show-all
   ```

   **Attention:** If the cluster creation operation is initiated but fails to complete, the ONTAP administrative password you define is not registered. In this case, you can access the management interface for the ONTAP Select cluster using the password *changeme123* for the *admin* account.

After you finish

You should configure the ONTAP Select AutoSupport feature. You should also back up the ONTAP Select Deploy configuration data.
Related tasks

*Backing up the Deploy configuration data* on page 53
Appendix A: Understanding the ONTAP Select storage environment

As part of preparing the host servers that are part of an ONTAP Select cluster, you should understand the storage environment including configuration options and requirements.

Related concepts

Appendix B: Understanding the ONTAP Select networking environment on page 66

Related information


General storage concepts and characteristics

There are several general storage concepts that apply to the ONTAP Select environment. You should first be familiar with these general concepts before exploring the specific storage components and characteristics.

Phases of storage configuration

The major configuration phases of the ONTAP Select host storage include the following:

1. Pre-deployment prerequisites
   You must make sure that each hypervisor host is configured and ready for an ONTAP Select deployment. The configuration involves the physical drives, RAID controllers and groups, and LUNs, as well as related network preparation. This configuration is performed outside of ONTAP Select.

2. Configuration using the hypervisor administrator tool
   You can configure certain aspects of the storage using the hypervisor administration tool (for example, the `virsh` command in a KVM environment). This configuration is performed outside of ONTAP Select.

3. Configuration using the ONTAP Select Deploy administration utility
   You can use the Deploy administration utility to configure the core logical storage constructs. This is performed either explicitly through CLI commands or automatically by the utility as part of a deployment.

4. Post-deployment configuration
   After an ONTAP Select deployment completes, you can configure the cluster using the ONTAP CLI or System Manager. This configuration is performed outside of ONTAP Select Deploy.

Managed versus unmanaged storage

Storage that is accessed and directly controlled by ONTAP Select is considered to be managed storage. Any other storage on the same hypervisor host is considered to be unmanaged.

All the managed storage devices used by ONTAP Select must be locally attached to the host server.

Homogeneous physical storage

All the physical drives comprising the ONTAP Select managed storage must be homogeneous. That is, all the hardware must be the same regarding the following characteristics:
- Type (SAS, NL-SAS, SATA, SSD)
- Speed (RPM)

**Storage limitations and restrictions**

There are several restrictions that apply to the ONTAP Select storage environment. Some are best practices while others are actual limitations. You should be aware of these restrictions in the applicable context.

**Illustration of the local storage environment**

Each hypervisor host contains local disks and other logical storage components that can be used by ONTAP Select. These storage components are arranged in a layered structure, from the physical disk drives to the ONTAP software.

**Characteristics of the local storage components**

There are several concepts that apply to the local storage components used in an ONTAP Select environment. You should be familiar with these concepts before preparing for an ONTAP Select deployment. These concepts are arranged according to category: RAID groups and LUNs, storage pools, and virtual disks.
Considerations for RAID groups and LUNs

There are several issues related to the RAID groups and LUNs that you should be aware of as part of preparing to deploy ONTAP Select.

Grouping physical drives into RAID groups

One or more physical disks can be locally attached to the host server and available to ONTAP Select. The physical disks are assigned to RAID groups, which are then presented to the hypervisor host operating system as one or more LUNs. Each LUN is presented to the hypervisor host operating system as a physical hard drive.

When configuring an ONTAP Select host, you should be aware of the following:

• All managed storage must be accessible through a single RAID controller

• Depending on the vendor, each RAID controller supports a maximum number of drives per RAID group.

One or more RAID groups

Each ONTAP Select host must have a single RAID controller. You should create a single RAID group for ONTAP Select. However, in certain situations you might consider creating more than one RAID group. Refer to the ONTAP Select on KVM Product Architecture and Best Practices Technical Report for more information.

Considerations when configuring storage pools

There are several issues related to the storage pools that you should be aware of as part of preparing to deploy ONTAP Select.

Storage pools and LUNs

Each LUN is seen as a local disk on the hypervisor host and can be part of one storage pool. Each storage pool is formatted with a file system that the hypervisor host OS can use.

Configuring the storage pools

You must make sure that the storage pools are created properly as part of an ONTAP Select deployment. You can create a storage pool using the hypervisor administration tool. For example, with KVM you can use the `virsh` command to create a storage pool. The storage pool is then passed in to the ONTAP Select Deploy administration utility.
Appendix B: Understanding the ONTAP Select networking environment

As part of preparing each of the host servers within an ONTAP Select cluster, you should understand the networking environment including the configuration options and requirements.

**Note:** You should review the *ONTAP Select on KVM Product Architecture and Best Practices Technical Report* to learn more about how to configure the host networking.

Related concepts

*Appendix A: Understanding the ONTAP Select storage environment* on page 63

Related information


General network concepts and characteristics

There are several general networking concepts that apply to the ONTAP Select environment. You should first be familiar with these general concepts before exploring the specific characteristics and options available with the single-node and multi-node clusters.

Physical networking

The physical network supports an ONTAP Select cluster deployment primarily by providing the underlying layer two switching infrastructure. The configuration related to the physical network includes both the hypervisor host and the broader switched network environment.

Host NIC options

Each ONTAP Select hypervisor host must be configured with either two or four physical ports. The exact configuration you choose depends on several factors, including:

- Whether the cluster contains one or multiple ONTAP Select hosts
- What hypervisor operating system is used
- How the virtual switch is configured
- Whether LACP is used with the links or not

Physical switch configuration

You must make sure that the configuration of the physical switches supports the ONTAP Select deployment. The physical switches are integrated with the hypervisor-based virtual switches. The exact configuration you choose depends on several factors. The primary considerations include the following:

- How will you maintain separation between the internal and external networks?
- Will you maintain a separation between the data and management networks?
- How will the layer two VLANs be configured?
Logical networking

ONTAP Select uses two different logical networks, separating the traffic according to type. Specifically, traffic can flow among the hosts within the cluster as well as to the storage clients and other machines outside of the cluster. The virtual switches managed by the hypervisors help support the logical network.

Internal network

With a multi-node cluster deployment, the individual ONTAP Select nodes communicate using an isolated “internal” network. This network is not exposed or available outside of the nodes in the ONTAP Select cluster.

Note: The internal network is only present with a multi-node cluster.

The internal network has the following characteristics:

- Used to process ONTAP intra-cluster traffic including:
  - Cluster
  - High Availability Interconnect (HA-IC)
  - RAID Synch Mirror (RSM)
- Single layer-two network based on a VLAN
- Static IP addresses are assigned by ONTAP Select:
  - IPv4 only
  - DHCP not used
  - Link-local address
- The MTU size is 9000 bytes

External network

The external network processes traffic between the nodes of an ONTAP Select cluster and the external storage clients as well as the other machines. The external network is a part of every cluster deployment and has the following characteristics:

- Used to process ONTAP traffic including:
  - Data (NFS, CIFS, iSCSI)
  - Management (cluster and node; optionally SVM)
  - Intercluster (optional)
- Optionally supports VLANs:
  - Data port group
  - Management port group
- IP addresses that are assigned based on the configuration choices of the administrator:
  - IPv4 or IPv6
- MTU size is 1500 bytes by default (can be adjusted)

The external network is present with clusters of all sizes.
Virtual machine networking environment

The hypervisor host provides several networking features.

ONTAP Select relies on the following capabilities exposed through the virtual machine:

- Virtual machine ports
  There are six ports available for use by ONTAP Select. They are assigned and used based on several factors, including the size of the cluster.
- Virtual switch
  The virtual switch (vSwitch) software within the hypervisor environment joins the ports exposed by the virtual machine with the physical Ethernet NIC ports. You must configure a vSwitch for every ONTAP Select host.

Single-node cluster deployment

ONTAP Select can be deployed as a single-node cluster. The single node includes a virtual switch that provides access to the external network.

Virtual machine ports

Each of the virtual machine ports handles a specific type of ONTAP Select traffic.

The ports are assigned as follows:

- Port e0a – Data and management
- Port e0b – Data and management

ONTAP LIFs

There are several logical interfaces used by the ONTAP Select node in a single-node cluster. Some of the LIFs are required, while others are optional based on your goals. The LIFs are created in one of two different ways.

Required LIFs assigned by the administrator

You must configure the following LIFs during an ONTAP Select deployment:

- Node management
  There is one LIF per node, and the IP address you assign can be either IPv4 or IPv6
- Cluster management
  There is one LIF per cluster, and the IP address you assign can be either IPv4 or IPv6.

These LIFs operate on the external network. Also note that while the use of an IPv6 address is possible, the creation of an IPv6 LIF by the ONTAP Select Deploy administration utility is not supported.

Optional LIFs assigned by the administrator

You can optionally configure several LIFs after an ONTAP Select deployment is completed. Using the System Manager or ONTAP CLI, you can configure the following LIFs:

- NAS data
  You can configure one or more NAS data LIFs per SVM. Each IP address you assign can be either IPv4 or IPv6.
You can configure one or more SAN (that is, iSCSI) data LIFs per SVM. Each IP address you assign can be either IPv4 or IPv6.

- SVM management
  There is one management LIF per SVM and the IP address you assign can be either IPv4 or IPv6.

- Intercluster management
  You can create one or more intercluster management LIFs per node. The IP addresses you assign can be either IPv4 or IPv6.

These LIFs operate on the external network.

### Four-node cluster deployment

ONTAP Select can be deployed as a four-node cluster. Each node in the cluster includes a virtual switch that provides access to the network. The nodes communicate directly with each other using the cluster internal network.

### Virtual machine ports

Each of the virtual machine ports handles a specific type of ONTAP Select traffic. A specific port is associated with either the internal network or the external network, but not both.

The ports are assigned as follows:

- Port e0a – Data and management
- Port e0b – Data and management
- Port e0c – Cluster
- Port e0d – Cluster
- Port e0e – RSM
- Port e0f – HA-IC

**Note:** The first two ports are associated with the external network, while the last four ports are associated with the internal cluster network.

### ONTAP LIFs

There are several logical interfaces used by each ONTAP Select node in a four-node deployment. Some of the LIFs are required, while others are optional based on your goals. The LIFs are created in one of three different ways.

#### Required LIFs automatically assigned by ONTAP Select

The following LIFs are automatically generated by ONTAP Select during a deployment:

- **Cluster**
  There are two cluster LIFs per node. Static link-local IP addresses are generated and assigned to virtual machine ports e0c and e0d.

- **RAID Sync Mirror**
  There is one RSM LIF per node. A static link-local IP address is generated and assigned to virtual machine port e0e.

- **High Availability Interconnect**
There is one HA-IC LIF per node. A static link-local IP address is generated and assigned to virtual machine port e0f.

These LIFs operate on the internal network.

**Required LIFs assigned by the administrator**

You must configure the following LIFs during an ONTAP Select deployment:

- **Node management**
  There is one LIF per node and the IP address you assign can be either IPv4 or IPv6.

- **Cluster management**
  There is one LIF per cluster, and the IP address you assign can be either IPv4 or IPv6.

These LIFs operate on the external network. Also note that while the use of an IPv6 address is possible, the creation of an IPv6 LIF by the ONTAP Select Deploy administration utility is not supported.

**Optional LIFs assigned by the administrator**

You can optionally configure several LIFs using the System Manager or ONTAP CLI after an ONTAP Select deployment is completed. Unless noted, you can assign either an IPv4 or IPv6 address. You can configure the following LIFs:

- **NAS data**
  You can configure one or more NAS data LIFs per SVM.

- **SAN data**
  You can configure one or more SAN (that is, iSCSI) data LIFs per SVM.

- **SVM management**
  There is one management LIF per SVM.

- **Intercluster management**
  You can create one or more intercluster management LIFs per node.

These LIFs operate on the external network.
Where to find additional information

After you deploy an ONTAP Select cluster, you should see the additional available resources to help manage and utilize the deployment.

**ONTAP Select resources**

- *NetApp ONTAP Select Resources*
  Provides documentation, videos, and other helpful links needed to plan, deploy, and support an ONTAP Select cluster.

**ONTAP 9 resources**

- *ONTAP 9 Documentation Center*
  Provides all of the documentation for ONTAP 9.

- *NetApp ONTAP Resources*
  Provides documentation and other helpful links needed to plan, administer, and support ONTAP 9.

**NetApp resources**

- *NetApp Support*
  Access troubleshooting tools, documentation, and technical support assistance.

- *NetApp Interoperability Matrix Tool*
  Access requirements and compatibility information related to using ONTAP Select.

- *NetApp library of technical reports and white papers*
  Access technical reports, white papers, and other documents.
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