ONTAP Select

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ONTAP Select

ONTAP Select requirements and planning considerations

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

Required Linux knowledge and skills for KVM

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 CLI
- Add software packages as well as any dependencies

For more information on preparing your Linux server, including the required configuration and software packages, refer to 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 a part of configuring the ONTAP Select network in a KVM environment:

- `ovs-vsctl`
- `ip`
- `ip link`
- `systemctl`

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, two, four, six, eight, ten, or twelve 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 multi-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.



You should not directly modify the configuration of an ONTAP Select virtual machine unless directed to do so by NetApp support. A virtual machine should only be configured and modified through the Deploy administration utility. Making changes to an ONTAP Select virtual machine outside of the Deploy utility without assistance from NetApp support can cause the virtual machine to fail and render it unusable.

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)



Beginning with ONTAP Select 9.14.1, support for KVM hypervisor has been reinstated. Previously, support for deploying a new cluster on a KVM hypervisor was removed in ONTAP Select 9.10.1 and support for managing existing KVM clusters and hosts, except to take offline or delete, was removed in ONTAP Select 9.11.1.

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 or more instances of ONTAP Select node per host

Each ONTAP Select node runs as a dedicated virtual machine. You can create multiple nodes on the same hypervisor host, with the following restrictions:

- Multiple nodes from a single ONTAP Select cluster cannot run on the same host. All the nodes on a specific host must be from different ONTAP Select clusters.
- You must use external storage.
- If you use software RAID, you can only deploy one ONTAP Select node on the host.

Hypervisor consistency for the nodes within a cluster

All of the hosts within an ONTAP Select cluster must run on the same version and release of the hypervisor software.

Number of physical ports on each host

You must configure each host to use one, two, or four physical ports. Although you have flexibility when configuring the network ports, you should follow these recommendations where possible:

- A host in a single-node cluster should have two physical ports.
- Each host in a multi-node cluster should have four physical ports

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 a cluster peering relationship 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.

RAID type

When using direct-attached storage (DAS) on ESXi, you should decide whether to use a local hardware RAID controller or the software RAID feature included with ONTAP Select. If you use software RAID, see Storage and RAID considerations for more information.

Local storage

When using local storage managed by a RAID controller, you must decide the following:

- Whether to use one or more RAID groups
- Whether to use one or more LUNs

External storage

When using the ONTAP Select vNAS solution, you must decide where the remote datastores are located and how they are accessed. ONTAP Select vNAS supports the following configurations:

- VMware vSAN
- Generic external storage array

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. Refer to Storage capacity restrictions for more information.



The ONTAP Select storage capacity corresponds to the total allowable size of the data disks attached to the ONTAP Select virtual machine.

Licensing model for production deployment

You must select the Capacity Tiers or Capacity Pools licensing model for each ONTAP Select cluster deployed in a production environment. Review the section *License* for more information.

Authentication using the credential store

The ONTAP Select Deploy credential store is a data base holding account information. Deploy uses the account credentials to perform host authentication as part of cluster creation and management. You should be aware of how the credential store is used as part of planning an ONTAP Select deployment.

> The account information is stored securely in the data base using the Advanced Encryption Standard (AES) encryption algorithm and SHA-256 hashing algorithm.

Types of credentials

The following types of credentials are supported:

- host

  The **host** credential is used to authenticate a hypervisor host as part of deploying an ONTAP Select node directly to ESXi or KVM.

- vcenter

  The **vcenter** credential is used to authenticate a vCenter server as part of deploying an ONTAP Select node to ESXi when the host is managed by VMware vCenter.

Access

The credential store is accessed internally as part of performing normal administrative tasks using Deploy, such as adding a hypervisor host. You can also manage the credential store directly through the Deploy web user interface and CLI.

Related information

- Storage and RAID considerations

ONTAP Select VMware hypervisor and hardware considerations

There are several hardware requirements and planning issues you should consider related to the VMware environment.

Hypervisor requirements

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

> You should review the ONTAP Select Release Notes for any additional known restrictions or limitations.

VMware licensing

To deploy an ONTAP Select cluster, your organization must have a valid VMware vSphere license for the hypervisor hosts where ONTAP Select runs. You should use the licenses that are appropriate for your

deployment.

Software compatibility

You can deploy ONTAP Select on KVM and ESXi hypervisors.

KVM

ONTAP Select supports the following KVM hypervisor versions:

- KVM on Red Hat Enterprise Linux (RHEL) 10.1, 10.0, 9.7, 9.6, 9.5, 9.4, 9.2, 9.1, 9.0, 8.8, 8.7, and 8.6
- KVM on Rocky Linux 10.1, 10.0, 9.7, 9.6, 9.5, 9.4, 9.3, 9.2, 9.1, 9.0, 8.9, 8.8, 8.7, and 8.6

ESXi

ONTAP Select supports the following ESXi hypervisor versions:

- VMware ESXi 9.0
- VMware ESXi 8.0 U3
- VMware ESXi 8.0 U2
- VMware ESXi 8.0 U1 (build 21495797)
- VMware ESXi 8.0 GA (build 20513097)

NetApp supports ONTAP Select on the identified versions of ESXi as long as VMware also continues to support the same versions.

ESXi 7.0 GA reached end of availability status. If you have ONTAP Select clusters with this version, you must upgrade to the supported versions as per the Interoperability Matrix Tool (IMT).

VMware vCenter and standalone ESXi hosts

If an ESXi hypervisor host is managed by a vCenter server, you must register the host to the Deploy administration utility using the vCenter credentials. You cannot register the host as a standalone host using the ESXi credentials.

Core hardware requirements

The physical hypervisor host where you deploy ONTAP Select must meet several 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.

ONTAP Select supports CPU models based on Intel Xeon Sandy Bridge and Advanced Micro Devices (AMD) processors.

Refer to the Interoperability Matrix Tool for more information.

Basic hardware requirements

There are several common hardware requirements that apply to all platforms regardless of the node instance type or license offering.

Processor

The supported microprocessors include Intel Xeon server processors and AMD processors.

Refer to Intel Xeon Processors and AMD EPYC Server CPUs for more information.

Ethernet configuration

There are several supported Ethernet configurations based on the cluster size.

Cluster size	Minimum requirements	Recommended requirements
Single node cluster	2 x 1GbE	2 x 10GbE
Two-node cluster or MetroCluster SDS	4 x 1GbE or 1 x 10GbE	2 x 10GbE
Four, six, eight, ten, or twelve-node cluster	2 x 10GbE	4 x 10GbE or 2 x 25/40GbE

Additional hardware requirements based on the instance type

There are several additional hardware requirements based on the node instance type.

Node size	CPU cores	Memory	Required platform license offering
Small	Six physical cores or greater, with four reserved for ONTAP Select	24GB or greater, with 16GB reserved for ONTAP Select	Standard, premium, or premium XL
Medium	Ten physical cores or greater, with eight reserved for ONTAP Select	72GB or greater, with 64GB reserved for ONTAP Select	Premium or premium XL
Large	Eighteen physical cores or greater, with sixteen reserved for ONTAP Select	136GB or greater, with 128GB reserved for ONTAP Select	Premium XL

There are additional disk requirements based on the platform license. See Storage and RAID for more information.

Related information

Learn about the platform license offerings for ONTAP Select

ONTAP Select storage and RAID considerations

There are several planning issues related to ONTAP Select host storage that you should consider.

External storage support information is outlined for ESXi and KVM hosts. For more information, refer to VMware ESXi requirements and KVM requirements.

Hardware RAID controller requirements

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

> A host where ONTAP Select runs requires local physical drives when using a hardware RAID controller or the software RAID capability provided with ONTAP Select. If you use the ONTAP Select vNAS solution to access external storage, a local RAID controller and software RAID capability are not used.

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 should be configured as a single RAID group; use multiple RAID controllers if needed:
  - Disable the local drive cache for RAID group, which is fundamental to preserving data integrity.
- Perform LUN configuration based on the following guidelines:
  - If the RAID group size exceeds the maximum LUN size of 64TB, 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 of 64TB, configure one LUN consuming all available storage within the RAID group.

Software RAID requirements

When deploying an ONTAP Select cluster on the hypervisor, you can use the software RAID capability provided by ONTAP Select instead of a local hardware RAID controller. Review the following requirements and restrictions before deploying a cluster using software RAID.

General requirements

The environment for a software RAID deployment must meet the following core requirements:

- VMware ESXi 8.0 GA (build 20513097) or later
- ONTAP Select premium license or higher
- Local SSD drives only
- Separation of system disks from the root and data aggregates
- No hardware RAID controller on the host

> If a hardware RAID controller is present, refer to the Deep dive storage section for additional configuration requirements.

ESXi specific requirements

- VMware ESXi 8.0 GA (build 20513097) or later

- VMware VMotion, HA, and DRS are not supported
- You cannot use software RAID with a node that has been upgraded from ONTAP Select 9.4 or earlier. If this is the case, you need to create a new node for software RAID deployment.

KVM specific requirements

There are also specific software package configuration requirements. Refer to the preparation of the Linux server step for more information.

Media expectations for KVM

The SSD flash storage devices used must meet the following additional requirements:

- The SSD devices must accurately and persistently report themselves to the Linux host through the following methods:
  - # cat /sys/block/<device>/queue/rotational

    The value reported for these commands must be '0'.
- It is expected that the devices are connected to an HBA or, in some cases, to a RAID controller configured to operate in JBOD mode. When using a RAID controller, the device function must be passed through the host without overlaying any RAID functionality. When using a RAID controller in JBOD mode, you should review the RAID documentation or contact the vendor as needed to make sure the device reports the rotational speed as '0'.
- There are two separate storage components:
  - Virtual machine storage

    This is an LVM pool (storage pool) containing the system data used to host the ONTAP Select virtual machine. The LVM pool must be backed by a high endurance flash device, and can be either SAS, SATA, or NVMe. An NVMe device is recommended for improved performance.
  - Data disks

    This is a set of SAS or SATA SSD drives used for data management. The SSD devices should be enterprise grade and durable. The NVMe interface is not supported.
- All devices must be formatted with 512BPS.

ONTAP Select node configuration

You must configure each ONTAP Select node and hypervisor host as follows to separate the system disks from the root and data aggregates:

- Create a system storage pool
  You must create a storage pool for the ONTAP Select system data. You must attach the storage pool as part of configuring the ONTAP Select node.
- Attach necessary physical disks
  The hypervisor host must have the required SSD disks attached and available for use by the ONTAP Select virtual machine. These drives hold the root and data aggregates. You must attach the storage disks as part of configuring the ONTAP Select node.

Storage capacity restrictions

As part of planning an ONTAP Select deployment, you should be aware of the restrictions related to storage allocation and use.

The most important storage restrictions are presented below. You should also review the Interoperability Matrix Tool for more detailed information.

ONTAP Select enforces several restrictions related to storage allocation and use. Before you deploy an ONTAP Select cluster or purchase a license, you should be familiar with these restrictions. Refer to the License section for more information.

Calculate raw storage capacity

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. You should consider this when allocating capacity.

Minimum storage capacity for a single-node cluster

The minimum size of the storage pool allocated for the node in a single-node cluster is:

- Evaluation: 500 GB
- Production: 1.0 TB

The minimum allocation for a production deployment consists of 1 TB for user data, plus approximately 266 GB used by various ONTAP Select internal processes, which is considered required overhead.

Minimum storage capacity for a multi-node cluster

The minimum size of the storage pool allocated for each node in a multi-node cluster is:

- Evaluation: 1.9 TB
- Production: 2.0 TB

The minimum allocation for a production deployment consists of 2 TB for user data, plus approximately 266 GB used by various ONTAP Select internal processes, which is considered required overhead.

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

When estimating the amount of storage for an HA pair, you must consider that all aggregates (root and data) are mirrored. As a result, each plex of the aggregate consumes an equal amount of storage.

For example, when a 2TB aggregate is created, it allocates 2TB to two plex instances (2TB for plex0 and 2TB for plex1) or 4TB of the total licensed amount of storage.

Storage capacity and multiple storage pools

You can configure each ONTAP Select node to use up to 400 TB of storage when using local direct-attached storage, VMware vSAN, or external storage arrays. However, a single storage pool has a maximum size of 64 TB when using direct-attached storage or external storage arrays. Therefore, if you plan to use more than 64 TB of storage in these situations, you must allocate multiple storage pools as follows:

- Assign the initial storage pool during the cluster creation process
- Increase the node storage by allocating one or more additional storage pools

> A 2% buffer is left unused in each storage pool and does not require a capacity license. ONTAP Select does not use this storage unless you specify a capacity cap. If you specify a capacity cap, then ONTAP Select uses that amount of storage unless the amount specified falls in the 2% buffer zone. The buffer is needed to prevent occasional errors that occur when attempting to allocate all of the space in a storage pool.

Storage capacity and VMware vSAN

When using VMware vSAN, a datastore can be larger than 64 TB. However, you can only initially allocate up to 64 TB when creating the ONTAP Select cluster. After the cluster is created, you can allocate additional storage from the existing vSAN datastore. The vSAN datastore capacity that can be consumed by ONTAP Select is based on the VM storage policy set.

Best practices

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

- All 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.

Additional disk drive requirements based on the platform license

The drives you choose are limited based on the platform license offering.

> The disk drive requirements apply when using a local RAID controller and drives, as well as software RAID. These requirements do not apply to external storage accessed through the ONTAP Select vNAS solution.

Standard

- 8 to 60 internal HDD (NL-SAS, SATA, 10K SAS)

Premium

- 8 to 60 internal HDD (NL-SAS, SATA, 10K SAS)
- 4 to 60 internal SSD

Premium XL

- 8 to 60 internal HDD (NL-SAS, SATA, 10K SAS)
- 4 to 60 internal SSD
- 4 to 14 internal NVMe

> Software RAID with local DAS drives is supported with the premium license (SSD only) and premium XL license (SSD or NVMe).

NVMe drives with software RAID

You can configure software RAID to use NVMe SSD drives. Your environment must meet the following requirements:

- ONTAP Select with a supported Deploy administration utility
- Premium XL platform license offering or a 90-day evaluation license
- VMware ESXi version 8.0 or later
- NVMe devices conforming to specification 1.0 or later

You need to manually configure the NVMe drives before using them. See Configure a host to use NVMe drives for more information.

External storage requirements

VMware ESXi external storage requirements for ONTAP Select

ONTAP Select vNAS is a solution allowing the ONTAP Select data stores to be external to the ESXi hypervisor host where the ONTAP Select virtual machine runs. These remote data stores can be accessed through VMware vSAN or a generic external storage array.

Basic requirements and restrictions

The ONTAP Select vNAS solution can be used with an ONTAP Select cluster of any size.

All related storage components, including hardware, software, and feature requirements, must adhere to the requirements described in the
Interoperability Matrix Tool. In addition, ONTAP Select supports all external storage arrays described in the VMware Storage/SAN Compatibility documentation, including iSCSI, NAS (NFSv3), Fibre Channel, and Fibre Channel over Ethernet. External array support is limited by the ESXi version supported by ONTAP Select.

The following VMware features are supported when deploying a cluster with ONTAP Select vNAS:

- VMotion
- High Availability (HA)
- Distributed Resource Scheduler (DRS)



These VMware features are supported with single-node and multi-node ONTAP Select clusters. When deploying a multi-node cluster, you should make sure that two or more nodes from the same cluster do not run on the same hypervisor host.

The following VMware features are not supported:

- Fault Tolerance (FT)
- Virtual datastore (VVOL)

Configuration requirements

If you plan to use a VMFS datastore on an external storage array (iSCSI, Fibre Channel, Fibre Channel over Ethernet), you must create a VMFS storage pool before configuring ONTAP Select to use the storage. If you use an NFS datastore, there is no need to create a separate VMFS datastore. All vSAN datastores must be defined within the same ESXi cluster.



You must provide a capacity limit for every datastore on VMware vSAN or an external storage array when configuring a host or performing a storage add operation. The capacity you specify

must be within the allowed storage limits of the external storage. An error will occur if you do not provide a capacity limit or the external storage runs out of space during the disk creation operation.

Best practices

Review the VMware documentation and follow the applicable best practices identified for ESXi hosts. In addition:

- Define dedicated network ports, bandwidth, and vSwitch configurations for the ONTAP Select networks and external storage (VMware vSAN and generic storage array traffic when using iSCSI or NFS)
- Configure the capacity option to restrict storage utilization (ONTAP Select cannot consume the entire capacity of an external vNAS datastore)
- Verify that all generic external storage arrays use the available redundancy and HA features where possible

KVM external storage requirements for ONTAP Select

You can configure ONTAP Select on the KVM hypervisor with an external storage array.

Basic requirements and restrictions

If you use an external array for the ONTAP Select storage pools, the following configuration restrictions apply:

- You must define as the logical pool type using CLVM.
- You must provide a storage capacity limit.
- The configuration only supports FC, Fibre Channel over Ethernet (FCoE), and iSCSI protocols.
- The configuration does not recognize thinly provisioned storage.



The storage capacity you specify must be within the allowed storage limits of the external storage. An error occurs if you do not provide a capacity limit or the external storage runs out of space during the disk creation operation.

Best practices

You should follow these best practices:

- Define dedicated network ports, bandwidth, and vSwitch configurations for the ONTAP Select networks and external storage
- Configure the capacity option to restrict storage utilization (ONTAP Select cannot consume the entire capacity of an external storage pool)
- Verify that all external storage arrays use the available redundancy and high availability (HA) features where possible

ONTAP Select networking requirements

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 and the high speed interface feature, refer to the Deep dive networking section.

Upgrade to VMXNET3 (ESXi only)

Beginning with ONTAP Select 9.5 using Deploy 2.10, VMXNET3 is the default network driver included with new cluster deployments on VMware ESXi. If you upgrade an older ONTAP Select node to version 9.5 or later, the driver is not automatically upgraded.

Cluster MTU

A separate internal network is used to connect the ONTAP Select nodes in a multi-node cluster. Typically the MTU size for this network is 9000. However, there are situations where this MTU size is too large for the network connecting the ONTAP Select nodes. To accommodate the smaller frames, the MTU size used by ONTAP Select on the internal network can be in the range of 7500-9000 bytes.

The MTU size is displayed in the Cluster Details section of the cluster creation page. The value is determined by the Deploy administration utility as follows:

1. Initial default of 9000.
2. As you add the hosts and networks for the HA pairs, the MTU value is reduced as needed, based on the configuration of the vSwitches in the network.
3. The final cluster MTU value for the cluster is set after you have added all the HA pairs and are ready to create the cluster.

You can manually set the cluster MTU value if needed, based on the design of your network.

Two-NIC host with standard vSwitch (ESXi only)

In order to improve ONTAP Select performance in a two-NIC configuration, you should isolate the internal and external network traffic using two port groups. This recommendation applies to the following specific configuration:

- ONTAP Select multi-node cluster
- Two NICs (NIC1 and NIC2)
- Standard vSwitch

In this environment, you should configure the traffic using two port groups as follows:

Port group 1

- Internal network (cluster, RSM, HA-IC traffic)
- NIC1 is active
- NIC2 in standby

Port group 2

- External network (data and management traffic)
- NIC1 is standby
- NIC2 in active

Refer to the Deep dive networking section for more information about two-NIC deployments.

Four-NIC host with standard vSwitch (ESXi only)

In order to improve ONTAP Select performance in a four-NIC configuration, you should isolate the internal and external network traffic using four port groups. This recommendation applies to the following specific configuration:

- ONTAP Select multi-node cluster
- Four NICs (NIC1, NIC2, NIC3, and NIC4)
- Standard vSwitch

In this environment, you should configure the traffic using four port groups as follows:

Port group 1

- Internal network (cluster, RSM traffic)
- NIC1 is active
- NIC2, NIC3, NIC4 in standby

Port group 2

- Internal network (cluster, HA-IC traffic)
- NIC3 is active
- NIC1, NIC2, NIC4 in standby

Port group 3

- External network (data and management traffic)
- NIC2 is active
- NIC1, NIC3, NIC4 in standby

Port group 4

- External network (data traffic)
- NIC4 is active
- NIC1, NIC2, NIC3 in standby

Refer to the Deep dive networking section for more information about four-NIC deployments.

Network traffic requirements

You must make sure that your firewalls are configured properly to allow the network traffic to flow among the various participants in an ONTAP Select deployment environment.

Participants

There are several participants or entities that exchange network traffic as part of an ONTAP Select deployment. These are introduced, and then used in the summary description of the network traffic requirements.

- Deploy
  ONTAP Select Deploy administration utility
- vSphere (ESXi only)
  Either a vSphere server or ESXi host, depending on how the host is managed in your cluster deployment
- Hypervisor server
  ESXi hypervisor host or Linux KVM host
- OTS node
  An ONTAP Select node
- OTS cluster
  An ONTAP Select cluster
- Admin WS
  Local administrative workstation

Summary of network traffic requirements

The following table describes the network traffic requirements for an ONTAP Select deployment.

Protocol / Port	ESXi / KVM	Direction	Description
TLS (443)	ESXi	Deploy to vCenter server (managed) or ESXi (managed or unmanaged)	VMware VIX API
902	ESXi	Deploy to vCenter server (managed) or ESXi (unmanaged)	VMware VIX API
ICMP	ESXi or KVM	Deploy to hypervisor server	Ping
ICMP	ESXi or KVM	Deploy to each OTS node	Ping
SSH (22)	ESXi or KVM	Admin WS to each OTS node	Administration
SSH (22)	KVM	Deploy to hypervisor server nodes	Access hypervisor server
TLS (443)	ESXi or KVM	Deploy to OTS nodes and clusters	Access ONTAP
TLS (443)	ESXi or KVM	Each OTS node to Deploy	Access Deploy (Capacity Pools licensing)
iSCSI (3260)	ESXi or KVM	Each OTS node to Deploy	Mediator/Mailbox disk

ONTAP Select two-node clusters with HA

Deploying a two-node cluster with HA involves the same planning and configuration used with other cluster node configurations. However, there are several differences you should be aware of when creating a two-node cluster.

Target environment

The two-node cluster consists of one HA pair and has been specifically designed for remote office and branch office deployments.

While designed primarily for the remote and branch office environment, you can also deploy a two-node cluster in the data center if needed.

Licensing

You can deploy a two-node cluster using any VMware vSphere license. However, the VMware ROBO Standard and Advanced licenses are ideal for remote and branch office deployments.

Mediator service

When a cluster consists of two nodes, it is not possible to achieve the quorum required when a node fails or loses communication. To resolve these types of split-brain situations, every instance of the ONTAP Select Deploy utility includes a mediator service. This service connects to each node in the active two-node clusters to monitor the HA pairs and assist in managing failures. The mediator service maintains the HA state information at a dedicated iSCSI target associated with each two-node cluster.

If you have one or more active two-node clusters, the ONTAP Select Deploy virtual machine administering the clusters must be running at all times. If the ONTAP Select Deploy virtual machine is halted or fails, the mediator service is unavailable and HA capability is lost for the two-node clusters.

Location of the cluster and mediator service

Because the two-node clusters are typically deployed in a remote or branch office, they can be remote from the corporate data center and the ONTAP Select Deploy utility providing administrative support. With this configuration, the management traffic between the ONTAP Select Deploy utility and cluster flows over the WAN. Refer to the release notes for more information about limitations and restrictions.

Back up the Deploy configuration data

It is a best practice to back up the ONTAP Select Deploy configuration data on a regular basis, including after creating a cluster. This becomes particularly important with two-node clusters, because of the mediator configuration data included with the backup.

Static IP address assigned to Deploy

You must assign a static IP address to the ONTAP Select Deploy administration utility. This requirement applies to all ONTAP Select Deploy instances that manage one or more ONTAP Select two-node clusters.

ONTAP Select remote and branch office deployments

You can deploy ONTAP Select in a remote office/branch office (ROBO) environment. As part of planning a ROBO deployment, you must select the configuration supporting your objectives.

There are two primary configurations available when deploying ONTAP Select in a ROBO environment.

You can use any VMware vSphere license when deploying ONTAP Select.

ONTAP Select two-node cluster with ONTAP HA

The ONTAP Select two-node cluster consists of one HA pair and is ideal for ROBO deployments.

ONTAP Select single-node cluster with VMware support

You can deploy an ONTAP Select single-node cluster in a ROBO environment. While a single node lacks native HA capability, you can deploy the cluster in one of the following ways to provide storage protection:

- Shared external storage using VMware HA
- VMware vSAN

If you use vSAN, you must have a VMware vSAN ROBO license.

ONTAP Select MetroCluster SDS deployment requirements

MetroCluster SDS is a configuration option when creating a two-node ONTAP Select cluster. It is similar to a Remote Office/Branch Office (ROBO) deployment. This enhanced two-node deployment provides additional use case scenarios. You should be aware of the requirements and restrictions as part of preparing to deploy MetroCluster SDS.

Before deploying MetroCluster SDS, verify that the following requirements are met.

Licensing

Each node must have a premium or higher ONTAP Select license.

Hypervisor platforms

MetroCluster SDS can be deployed on the same VMware ESXi and KVM hypervisors as supported for a two-node cluster in a ROBO environment.

Beginning with ONTAP Select 9.14.1, support for KVM hypervisor has been reinstated. Previously, support for deploying a new cluster on a KVM hypervisor was removed in ONTAP Select 9.10.1 and support for managing existing KVM clusters and hosts, except to take offline or delete, was removed in ONTAP Select 9.11.1.

Network configuration

Layer 2 connectivity is required between the participating sites. Both 10GbE and 1GbE are supported, including the following configurations:

- 1 x 10GbE
- 4 x 1GbE

The data serving ports and interconnect ports must be connected to the same first switch.

Latency between the nodes

The network between the two nodes must support a mean latency of 5 ms with an additional 5 ms periodic jitter. Before deploying the cluster, you must test the network using the procedure described in the Deep dive networking section.

Mediator service

As with all two-node ONTAP Select clusters, there is a separate mediator service contained in the Deploy virtual machine that monitors the nodes and assists in managing failures. With the enhanced distance available with MetroCluster SDS, this creates three distinct sites in the network topology. Latency on the link between the mediator and a node should be 125 ms round-trip or less.

Storage

Direct-attached storage (DAS) is supported using either HDD and SSD disks. vNAS is also supported, including external storage arrays and vSAN in a VMware environment.

When deploying MetroCluster SDS, you cannot use vSAN in a distributed or "stretched" topology.

Static IP address assigned to Deploy

You must assign a static IP address to the Deploy administration utility. This requirement applies to all Deploy instances that manage one or more ONTAP Select two-node clusters.

ONTAP Select VMware vCenter server on ESXi

You must define a vCenter server account and associate it with a role containing the necessary administrative privileges.

You also need the fully qualified domain name or IP address of the vCenter server managing the ESXi hypervisor hosts where ONTAP Select is deployed.

Administrative privileges

The minimum administrative privileges needed to create and manage an ONTAP Select cluster are presented below.

Datastore

- Allocate space
- Browse datastore
- Low level file operations
- Update virtual machine files
- Update virtual machine metadata

Host

Configuration

- Network configuration
- System management

Local operations

- Create virtual machine
- Delete virtual machine
- Reconfigure virtual machine

Network

- Assign network

Virtual machine

Configuration

All privileges in the category.

Interaction

All privileges in the category.

Inventory

All privileges in the category.

Provisioning

All privileges in the category.

vApp

All privileges in the category.

Related information

Learn about VMware vSphere privileges for vSAN ESA in vCenter

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