Abstract
This planning document provides guidance for various vCenter Server deployment options that are supported on VxRail appliances.
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Executive summary

vCenter Server is the centralized platform for managing a VMware vSphere environment. It is the primary point of management for both ESXi server virtualization and vSAN. It is also the enabling technology for advanced capabilities such as vMotion, Distributed Resource Scheduler (DRS), and HA. vCenter scales to enterprise levels where a single vCenter can support up to 2,500 hosts (VxRail nodes) and 40,000 powered on virtual machines. See VMware Configuration Maximums for the latest recommended limits. vCenter supports a logical hierarchy of data centers, clusters, and hosts. This hierarchy allows resources to be separated by use cases or lines of business and allows resources to be moved as needed dynamically. These resource changes are all performed from a single interface.

Intended use and audience

This guide discusses various VMware vCenter Server™ deployment scenarios that are supported to manage your Dell Technologies VxRail™ clusters. It is intended for customers and field engineers who are involved in selling, planning, and installing VxRail, including Dell Technologies Sales and Support personnel.

VxRail and vSphere/vCenter release alignment

VxRail software releases are structured to align with VMware vSphere releases in order to attain new features and fixes in both software products. vSphere/vCenter are released in sync, and those products are incorporated into the VxRail software stack, and the full bundle is made available to customers. The table in this section describes the partnership between the VxRail major release versions and the major vCenter release versions.

Table 1. vSphere/vCenter and VxRail Version Alignment

<table>
<thead>
<tr>
<th>VxRail Major Release</th>
<th>vCenter Major Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.x</td>
<td>7.x</td>
</tr>
<tr>
<td>4.7</td>
<td>6.7.x</td>
</tr>
<tr>
<td>4.5</td>
<td>6.5.x</td>
</tr>
</tbody>
</table>

vCenter Server 7.x Architecture

Starting with vSphere v7.0, the external Platform Services Controller (PSC) is deprecated. The only option is vCenter Server with embedded PSC. The embedded PSC in the vCenter Server contains all services from the external PSC, preserving the functionality and workflows, including authentication, certificate management, tags, and licensing.

vCenter Server with embedded PSC

The vCenter Server and the PSC are deployed on a single virtual machine.
vCenter Server 6.0.x through 6.7.x Architecture

vSphere v6.0 introduced two supported architectures: a vCenter Server with an embedded Platform Service Controller (PSC), and vCenter Server with an external Platform Service Controller (PSC). The following components are part of the vCenter Server installations:

- The PSC group of infrastructure services contains vCenter Single Sign-On, License service, Lookup service, and VMware Certificate Authority.
- The vCenter Server group of services includes vCenter Server, vSphere Web Client, Inventory Service, vSphere Auto Deploy, vSphere ESXi Dump Collector, VMware vSphere Syslog Collector on Windows, and VMware vSphere Syslog Service for the vCenter Server.

vCenter Server with an embedded PSC

One option is the PSC are deployed on a single virtual machine.

vCenter Server with an external PSC

The other option is the vCenter Server and the PSC are deployed as separate virtual machines. In this architecture, the PSC can be shared across several vCenter Server instances. You can install a PSC and then install several vCenter Server instances and register them with the PSC. You can then install another PSC, configure it to replicate data with the first PSC, and then install additional vCenter Server instances and register them with the second PSC.
VxRail appliances

VxRail is jointly developed by Dell Technologies and VMware. The appliance is fully integrated with best-of-breed products from Dell Technologies and VMware, designed and preconfigured to operate as a scalable, hyperconverged infrastructure solution. VxRail is managed through the vCenter Server interface using the vClient and the VxRail Manager plug-in. This provides the user with a familiar vSphere experience, enables streamlined deployment and operations, and extends the use of existing IT tools and processes.

VxRail appliances are managed using VxRail management software for hardware and maintenance tasks, as well as software life-cycle management (LCM). VxRail incorporates supportability and serviceability capabilities for ease of management.

The VxRail software bundle is preloaded and licensed onto hardware and consists of the following components (specific software versions not shown):

- VxRail Manager
- VMware vCenter Server
- VMware vSAN™
- VMware vSphere®

VxRail is fully compatible with other software in the VMware ecosystem. See the VMware Product Interoperability Matrices for specific software products and versions that are supported on specific versions of vSphere.

VxRail vCenter Server options

A VxRail appliance is deployed and managed as a vSphere cluster. Each vSphere cluster deployment requires a vCenter Server to serve as the overall management platform. VxRail offers two platform options for vCenter: a VxRail-supplied vCenter that resides on the cluster, or a customer-supplied vCenter that resides in the customer data center.

VxRail-supplied vCenter

During the VxRail initial build process, you can either have a vCenter virtual appliance deployed on the cluster, or deploy the cluster on a vCenter instance in your data center. The option to deploy a vCenter virtual appliance on the cluster is referred to as “internal” or “embedded” vCenter Server. A VxRail-supplied vCenter is also considered a “VxRail-managed” vCenter, in the sense that initial configuration and lifecycle management is controlled by VxRail Manager, however the customer has administrative access to all the management features and functionality supported by the vCenter instance. For
consistency, the term that is used throughout this guide is VxRail-managed vCenter Server.

Figure 1. VxRail-supplied vCenter deployed on VxRail cluster

The VxRail-supplied vCenter virtual appliance is deployed on the VxRail vCenter Server Network, which is a vSphere virtual network configured during the initial build process. The VxRail Manager virtual appliance is deployed on this same virtual network. The vCenter Server Network must be able to reach required external management personnel and data center services. See the VxRail Network Planning Guide for details.

A VxRail cluster can optionally join a compatible customer-supplied vCenter Server that is hosted outside of the VxRail cluster. In addition to the centralized management advantage of a customer-supplied vCenter, this environment allows VMs to be easily migrated between nodes and clusters for optimal workload balance, and simplifies VxRail upgrades and expansion.

- Each VxRail cluster appears within the vCenter Server as a cluster of ESXi hosts managed under a data center instance.
- Each cluster within the vCenter Server has its own virtual distributed switch or switches with distinct portgroup names for network connectivity.
- Each VxRail cluster within the vCenter Server has its own datastore or datastores for virtual machine storage purposes.
- Each VxRail cluster within the vCenter Server has its own VxRail Manager virtual appliance deployed.

The option to deploy a vCenter virtual appliance to a vCenter instance not provided by VxRail has been referred to as “external” or “existing” vCenter Server. The term “customer-managed” vCenter is also applicable in this use case, where all planning, preparation, configuration and overall management is the responsibility of the customer. For consistency, the term that is used throughout this guide is customer-supplied vCenter Server.
Figure 2. VxRail clusters joining a customer-supplied vCenter

With the customer-supplied vCenter option, only the VxRail Manager virtual appliance is deployed on the VxRail External Management Network on the VxRail cluster. This External Management Network must be able to reach not only required end users and data center services, but also the customer-supplied vCenter instance. See the VxRail Network Planning Guide for more details.

vCenter Feature Comparison

The VxRail-supplied vCenter and customer-supplied vCenter have different characteristics as it relates to VxRail cluster usability and supportability. These factors are outlined in this section, and each must be taken into account when deciding which vCenter option to consider:

Licensing
- With the VxRail-supplied vCenter option, a Standard vCenter Server license is included. This license is exclusive to this vCenter instance and cannot be transferred to another vCenter instance. As such, it should be considered a limited or restricted-use vCenter Server license.
- The customer is responsible for licensing the customer-supplied vCenter Server.

Compatibility
- The vCenter instance that is bundled with the VxRail software and deployed during the initial build process is compatible with the VxRail/vSphere software stack.
- With VxRail 7.0.130 and later, VxRail Manager no longer validates whether a customer-supplied vCenter Server is compatible with the VxRail/vSphere software stack. See the VxRail and external vCenter interoperability matrix to confirm that your customer-supplied vCenter Server is running the minimum compatible version before commencing initial build.

Deployment and Initial Configuration
- The VxRail initial build process automates the deployment of the vCenter virtual appliance and performs the initial configuration steps to support the VxRail cluster.
- With the customer-supplied vCenter option, the customer is responsible for performing certain pre-requisites before the commencement of VxRail initial build to prepare vCenter for cluster activation and operations. Refer to the vCenter Deployment Details section vCenter Deployment Details for details on these pre-requisites.
Lifecycle Management

- VxRail Manager orchestrates the lifecycle management of the VxRail-supplied vCenter Server.

- The customer is responsible for lifecycle management of the customer-supplied vCenter. Per VMware’s best practices, the vCenter instance is upgraded before performing lifecycle management on a VxRail cluster. Follow the guidance in the VxRail release notes to identify the supported vCenter version based on the target VxRail version. See Overview of the vSphere Process for best practice order for upgrades.

Cluster Migration

- Due to the tight integration between vSphere and VxRail, a migration of the VxRail cluster between vCenter instances can be challenging and disruptive.

- Migrating a VxRail cluster from a customer-supplied vCenter to a VxRail-supplied vCenter requires a factory reset and rebuild of the cluster. This action causes all virtual machines and all data on the cluster to be wiped out during the process.

- The VxRail cluster can be migrated to a customer-supplied vCenter. This service must be performed by your Dell Technologies services team.

vCenter Migration

- A VxRail-supplied vCenter cannot be migrated off of the VxRail cluster.

- A customer-supplied vCenter can be migrated to a VxRail cluster.

- Upgrades of customer-supplied vCenter instances are not supported by VxRail lifecycle management, even if relocated on a VxRail cluster. The customer is responsible for all upgrades and maintenance to this vCenter instance.

Host Management

- A customer-supplied vCenter has no restrictions regarding placing additional ESXi host under its management.

- A VxRail-supplied vCenter is restricted to only managing VxRail clusters and cannot support the addition of other ESXi hosts under its management. Lifecycle management can be disrupted because VxRail Manager has no visibility of these outside hosts.

Multi-Homing

- VxRail-supplied vCenter supports only one public IP address, and cannot be configured to support High Availability.

- There are no multi-homing restrictions on customer-supplied vCenter.

Single Sign-On (SSO) Domain

- VxRail-supplied vCenter only supports the ‘vsphere.local’ SSO domain.

- There are no domain restrictions with a customer-supplied vCenter.

- For VxRail-supplied vCenter deployments with a separate Platform Service Controller, only a single Platform Service Controller instance is supported.

- The single Platform Service Controller instance restriction is not applicable for a customer-supplied vCenter.
VxRail and vCenter Version Comparison

There are differences in the support of certain features that are dependent on the version of VxRail and the versions of vSphere/vCenter being deployed. This section highlights major features that are impacted based on the VxRail and vSphere/vCenter versions targeted for deployment.

Multi-Cluster Management

- There are no restrictions on a customer-supplied vCenter managing multiple VxRail clusters.
- The VxRail cluster must be running a minimum version of 7.0.130 to enable the VxRail-supplied vCenter it is hosting to support managing multiple VxRail clusters.
- Multi-cluster management support is not supported in versions of VxRail earlier than 7.0.130.
- Note for planning purposes that the VxRail-supplied vCenter by default is configured for ‘Small’ environments, which can support up to 100 hosts or 1000 virtual machines.
- When performing lifecycle management in a multi-cluster environment, perform LCM on the VxRail cluster that is hosting the vCenter instance first, then proceed to perform LCM on the VxRail clusters being managed by this vCenter instance.
- When performing a series of cluster shutdown operations, shut down the clusters under management first, then shut down the cluster hosting the vCenter instance last.
- When performing cluster startup, go in the reverse direction, and power on the cluster hosting the vCenter instance first.

Figure 3. vCenter instances managing multiple clusters
**vCenter Hosting**

- A customer-supplied vCenter can be deployed on or migrated to a VxRail cluster.
- In versions earlier than VxRail 4.5.200, the customer-supplied vCenter cannot be hosted on the VxRail cluster it is managing.
- Starting with VxRail 4.5.200, the customer-supplied vCenter Server can be hosted on the VxRail cluster it is managing.
- Be aware that the VxRail cluster shutdown procedure can impact access to a customer-supplied vCenter instance when in this location.
  - If the customer-supplied vCenter instance is managing the VxRail cluster on which it is residing, you must migrate the vCenter Server manually to maintain connectivity to the vCenter instance.
  - If the customer-supplied vCenter instance is not managing the VxRail cluster it is residing on, you must manually power off or migrate the vCenter instance before attempting to use the VxRail cluster shutdown feature.

**vCenter mode conversion**

- Starting in VxRail version 7.x, a VxRail-supplied vCenter can be converted to be identified by VxRail Manager as an external, or customer-supplied vCenter.
- If the VxRail cluster is converted to an external VMware vCenter server, it cannot be converted back to an internal, VxRail-supplied vCenter.
- After the conversion process, the customer is responsible for providing a permanent vCenter license.
- Since this is no longer a VxRail-supplied vCenter, the converted vCenter must be migrated off of the cluster in order to maintain connectivity and perform a cluster shutdown operation.
- Upgrades of customer-supplied vCenter instances are not supported by VxRail lifecycle management after the conversion. The customer is responsible for all upgrades and maintenance to the vCenter instance.
- Before lifecycle management can be performing on the hosting VxRail cluster, the converted vCenter must be upgraded manually first to the appropriate version.

**Enhanced Linked Mode**

- This feature is supported only in VxRail 7.x clusters. This feature is not supported with earlier major releases of VxRail.
- Enhanced Linked Mode is not supported between a customer-supplied vCenter and a VxRail-supplied vCenter. Enhanced Linked Mode is only supported between VxRail-supplied vCenters.
- Up to fifteen VxRail-supplied vCenters instances can be linked.
- VxRail clusters running a minimum version of 7.0.100 can enable enhanced linked mode during the VxRail initial build process.
- VxRail clusters running a version 7.0.200 or later can enable enhanced linked mode between VxRail-managed vCenter Servers as a day 2 operation after VxRail initial build is completed.
• See the vCenter Enhanced Linked Mode Prerequisites section of the VMware vCenter Installation Guide for more detailed information.

Figure 4. VxRail-supplied vCenters connected in Enhanced Linked Mode

Data Encryption

• vSAN encryption is a vSphere feature to encrypt ‘data at rest’ on the vSAN datastore.

• VxRail-supplied vCenter does not support vSAN encryption in versions earlier than 4.5.200.

Figure 5. vSAN encryption on VxRail cluster

• vSphere also supports encryption at the virtual machine layer as an option to vSAN encryption

• Starting with VxRail 7.0.200, the native key provider embedded with vCenter can be used encryption purposes

Figure 6. Virtual machine encryption on VxRail cluster
VxRail Cluster Types

VxRail supports several different cluster types. Each cluster type addresses a different use case and has requirements that can be unique based on the selected cluster type. The type of cluster you choose to deploy can impact vCenter selection and deployment location.

**VxRail with vSAN**

A VxRail cluster can use a vSAN datastore built from local disk drives as its primary storage. The foundation for vSAN storage is disk groups formed from cache and capacity drives on each node. This type of cluster can support either a VxRail-supplied vCenter or a customer-supplied vCenter.

![Figure 7. VxRail cluster with vSAN](image)

**VxRail Stretched Cluster**

A VxRail stretched cluster spans remote sites to enable protection from a single site failure, and requires a witness as a cluster quorum.

Both a VxRail-supplied vCenter and a customer-supplied vCenter are supported. On VxRail cluster running versions earlier than 4.5.200, a customer-supplied vCenter Server solution is required. If possible, a customer-supplied vCenter is preferred:

- A customer-supplied vCenter remains available in the event of any failure to the cluster. Certain networking failures, such as the inter-switch links, can disable virtual machines under certain affinity rule definitions, and impact troubleshooting efforts.
- The customer is responsible for shutting down the customer-supplied vCenter instance in the event of a VxRail-driven cluster shutdown.
VxRail Two-Node Cluster

The VxRail two-node cluster is for special use cases with minimal resource capacity requirements, such as remote sites and small offices. Both nodes are located in the same site, but depend on a witness deployed off of this cluster to serve as a quorum.

VxRail Dynamic Cluster with vSAN HCI Mesh Storage

A dynamic cluster is a cluster with three or more nodes in the same location that use storage other than local vSAN as its primary storage. One option, vSAN HCI mesh, is a VMware feature that enables a VxRail cluster to share its spare vSAN storage resources with one or more VxRail clusters without local vSAN storage.
In a vSAN HCI Mesh configuration, all the clusters participating in vSAN storage resource sharing must reside in the same vCenter instance and be placed under the same data center instance in vCenter. For these reasons, only a customer-supplied vCenter is supported for this type of dynamic cluster.

**VxRail Dynamic Cluster with external storage**

A dynamic cluster can also use storage resources from an external storage array over a Fibre Channel network or an IP network.

In these use cases, either a VxRail-supplied vCenter or a customer-supplied vCenter is supported.
The customer-supplied vCenter Server requires a separate customer-provided license. Following is a table of the options for vCenter Server licenses from VMware sourced from the VMware vSphere Compute Virtualization Licensing guide. Select the license edition that best meets the requirements for your customer-supplied vCenter Server.

Table 2. VMware vCenter Server licenses

<table>
<thead>
<tr>
<th>Edition</th>
<th>vCenter Server for Essentials</th>
<th>vCenter Server Foundation</th>
<th>vCenter Server Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hosts</td>
<td>Up to 3</td>
<td>Up to 4</td>
<td>Unlimited</td>
</tr>
<tr>
<td>VxRail 7.x support</td>
<td>Not supported</td>
<td>2-node ROBO support only</td>
<td>All VxRail clusters</td>
</tr>
<tr>
<td>VxRail 4.7.x support</td>
<td>Not supported</td>
<td>Not supported</td>
<td>All VxRail clusters</td>
</tr>
</tbody>
</table>

vCenter Deployment Details

Following are the high-level details of each deployment option. It is important to understand the prerequisites before deployment. This document covers the requirements that are related to vCenter Server only. See the Dell VxRail Network Planning Guide for complete VxRail implementation requirements.

VxRail-supplied vCenter Server

During the VxRail initial deployment process, the settings input into VxRail Manager will be used to configure the VxRail-supplied vCenter on the cluster.

Requirements for Deployment

This deployment option requires:

- A reserved vCenter Server hostname
- A reserved IP address for the VxRail vCenter Server
- A reserved Platform Service Controller hostname
- A reserved IP address for the new Platform Service Controller
- Forward and reverse DNS records must be configured correctly if using an external domain name server.
- VMware-compliant passwords for the administration accounts
- If you plan to connect to another VxRail-supplied vCenter instance using Enhanced Linked Mode:
  - Remote VxRail-supplied vCenter hostname
  - Remote VxRail-supplied vCenter HTTPS port
  - Remote VxRail-supplied vCenter administrator credentials
There are certain pre-requisites that must be followed before deploying a VxRail cluster into an existing customer-supplied vCenter Server. Be sure to complete each task to ensure successful preparation.

**Confirm customer-supplied vCenter version**
- Identify the VxRail version planned for deployment.
- Use the [VxRail and external vCenter interoperability matrix](#) to locate the supported vCenter version that matches with the planned VxRail version.

**Confirm customer-supplied vCenter license**
The type of license that can be set on the vCenter instance depends on the type of VxRail cluster being deployed. Follow the guidance in [VMware vSphere Compute Virtualization Licensing Guide](#) to ensure the license edition selected for the customer-supplied vCenter meets the VxRail cluster requirements.

**Confirm vCenter deployment model is supported**
- VxRail clusters running version 7.x require a vCenter instance running 7.x.
  - If the customer-supplied vCenter instance has both a vCenter virtual appliance and a Platform Service Controller virtual appliance, the external Platform Service Controller is deprecated in version 7.x.
  - If the customer-supplied vCenter instance is hosted on a Windows system, this deployment option is deprecated in version 7.x.
- The customer-supplied vCenter can be in Enhanced Linked Mode, so long as it is linked with other customer-supplied vCenter instances.

**Check VxRail Release Notes**
- Check the VxRail Release Notes for details on supported components, features, and product fixes.
  - VxRail 4.5.x and vSphere 6.5 [VxRail Release Notes version 4.5.x](#)
  - VxRail 4.7.x and vSphere 6.7 [VxRail Release Notes version 4.7.x](#)
  - VxRail 7.x and vSphere 7.0 [VxRail Release Notes version 7.0.x](#)

**Prepare vCenter for VxRail cluster deployment**
- Record the customer-supplied vCenter Server FQDN.
- If the customer-supplied vCenter Server has an external PSC, record the PSC FQDN.
- Have access to vCenter credentials with administrator privileges
- Record the *Existing* Single Sign-On domain (SSO) (for example, vsphere.local).
- Create a VxRail management user and password for this VxRail cluster on the customer-supplied vCenter Server. This user must be:
  - Created with no permissions
Note: If a previous VxRail cluster was deployed on the customer-supplied vCenter Server, the same VxRail Management user can be reused for additional VxRail clusters that are managed by the same vCenter Server.

- Create or select a data center on the customer-supplied vCenter Server for the VxRail cluster to join.
- Specify the name of the cluster that is created by VxRail in the selected data center when the cluster is built. This name must be unique and not used anywhere in the data center on the customer-supplied vCenter Server.
- (Optional) Create a VxRail non-admin user and password for VxRail on the customer-supplied vCenter Server. The following will be performed by your Dell Technologies representative:
  - Create two new roles: VxRail Initial Global and VxRail Data Center Global.
  - Assign each of these roles to the new VxRail admin user.

**Conclusion**

During the planning stage of a VxRail cluster configuration, careful planning should take place to determine the best vCenter Server deployment topology for your environment. VxRail gives you the option of using a customer-supplied vCenter Server so that more topologies and more options can be considered.

For more details about the best vCenter deployment options, contact your Dell Technologies Sales team or your VMware representative.