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VMware PowerCLI

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Release Notes

Read the release notes to learn about the latest release of VMware PowerCLI.

VMware PowerCLI 13.3 Release Notes

This document contains the following sections

Introduction

VMware PowerCLI | 25 JUL 2024
VMware PowerCLI 13.3 Build 24145081
Check for additions and updates to these release notes.

About VMware PowerCLI

VMware PowerCLI is a suite of PowerShell modules to manage VMware products and services. VMware PowerCLI includes over 7000 cmdlets to easily manage your infrastructure on a global scale.

Installation, Upgrade, and Removal of VMware PowerCLI

Management of the PowerCLI modules is provided by the PowerShell Gallery and by using the PowerShell default cmdlets for working with modules in the PowerShell Gallery. For detailed information on how to install, upgrade, or remove PowerCLI, refer to the VMware PowerCLI User's Guide.

VMware PowerCLI Components

In VMware PowerCLI 13.3, the following modules have been updated:

- `VMware.VimAutomation.Storage`
- `VMware.VimAutomation.Core`
- `VMware.ImageBuilder`
- `VMware.DeployAutomation`
- `VMware.VimAutomation.Hcx`
- `VMware.Sdk.Vcf.SddcManager`

Supported Platforms

For a list of VMware PowerCLI 13.3 supported operating systems and PowerShell versions, see Compatibility Matrixes for VMware PowerCLI 13.3.

For a list of VMware products with which VMware PowerCLI 13.3 is compatible, see VMware Product Interoperability Matrixes

What's New

New Features

VMware PowerCLI 13.3 introduces the following new features, changes, and improvements:

- The `VMware.ImageBuilder` module is updated with support for Python version 3.12 and OpenSSL 3.0.
- The `VMware.ImageBuilder` and `VMware.DeployAutomation` modules are updated with an option to deactivate host seeding when exporting and deploying an image for the hosts in a cluster managed with a vSphere Lifecycle Manager image.
- The `VMware.VimAutomation.Storage` module is updated to support the vSAN APIs for vSphere 8.0 Update 3.
- The `VMware.VimAutomation.Core` module is updated to support alarm threshold customization.
- The `VMware.VimAutomation.Core` module is updated to support recording the privilege checks that occur for specified sessions during the execution of a specified script block.
- The `VMware.VimAutomation.Core` module is updated to support removing components from the base image for a cluster or standalone host managed with a single image.
- The `VMware.VimAutomation.Core` module is updated to support managing OAuth 2.0 client registrations within the VMware Identity Broker service.
- The `VMware.VimAutomation.Hcx` module is updated to support Guest OS customization.
- The `VMware.Sdk.Vcf.SddcManager` module is updated to enable waiting for generic asynchronous VMware Cloud Foundation operations and for specific VMware Cloud Foundation validation operations.

For more information on changes made in VMware PowerCLI 13.3, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 13.3 Home Page

Product Support Notices

- **Deprecation of the Connect-AutoDeployServer cmdlet**
  Starting with VMware PowerCLI 13.3, `Connect-AutoDeployServer` cmdlet is deprecated and will be removed is a future release. To connect to your vCenter Server instances and use the cmdlets from the `VMware.DeployAutomation` PowerCLI module, you must start using the `Connect-VIServer` cmdlet.
- **Dropping support for OpenSSL 1.1 for the VMware.ImageBuilder module**
  Staring with VMware PowerCLI 13.3, support for OpenSSL 1.1 is dropped due to the announced End Of Life (EOL) for the OpenSSL 1.1 on 11th September 2023.

Resolved Issues

The following issues have been resolved in VMware PowerCLI 13.3:

- **Get-VsanStat**
  Running the `Get-VsanStat` cmdlet without any filters fails in certain cases.
- **Set-VsanClusterConfiguration**
  When you try to deactivate ESA (Express Storage Architecture) on a vSAN cluster, the operation fails.
- **Set-VsanClusterConfiguration**
  When you try to enable vSAN max on a vSAN cluster created with activated ESA (Express Storage Architecture), the operation fails.
- **Get-DepotInfo**
  `Get-DepotInfo` returns the `Vendor name` and `Vendor code` as *unknown*.
- **Get-HCXMigration**
  Running the `Get-HCXMigration` cmdlet with the `-MigrationType` option fails.

- **New-AdvancedSetting**
  Running the `New-AdvancedSetting` cmdlet to create float values for an advanced setting, results in passing a wrong format to the vCenter Server system.
- **Invoke-***
  `Invoke-*` commands in the SDK modules do not serialize default values, even when the values have been set explicitly.
- **Invoke-ListServiceEntries**
  Running the `Invoke-ListServiceEntries` cmdlet, does not return any information regarding `Service Entries` for the specific service.
- **Invoke-SrmGet*** and **Invoke-VrGet***
  When you try to retrieve an SRM/VR object by ID for an object that no longer exists, the operation results in bad error output.
- **Invoke-Srm*** and **Invoke-Vr***
  The `VMware.Sdk.Srm` and `VMware.Sdk.Vr` modules does not work with vCenter Server instances that have UUIDs containing upper case letters.
- **New-OAuthSecurityContext** and **New-VcsOAuthSecurityContext**
  Running the `New-OAuthSecurityContext` and `New-VcsOAuthSecurityContext` cmdlets on PowerShell Core fails for the browser-based authentication workflow.
- **Get-WMNamespacePermission**, **Set-WMNamespacePermission**, **Remove-WMNamespacePermission**, and **New-WMNamespacePermission**
  Running any of the listed cmdlets fails due to issues with the deserialization of the `WMNamespacePermission` attribute.
- **Undesired version of the VMware.Powercli module is installed**
  Attempts to install a lower than the latest version of the `VMware.PowerCLI` module with the `Install-Module` cmdlet instead completes with the installation of the latest released version of the module.
- **VMware.ImageBuilder module**
  The `VMware.ImageBuilder` PowerCLI module cannot be used with Python version 3.12 due to a bug within the `zipfile` system module. The bug interferes with reading compressed files which makes ISO generation impossible. The bug has been resolved in the 3.12.1 release so customers planning to upgrade to Python 3.12 should choose the latest option in order to generate ISO images successfully

Known Issues

VMware PowerCLI 13.3 is known to have the following issues:

- **Get-HCXMigration**
  The *Username* parameter of the `Get-HCXMigration` cmdlet is case-sensitive.
  Workaround: Use the username format supported by API. For example, use *Administrator@VSPHERE.LOCAL*.
- **Get-Tag** and **Get-TagAssignment**
  On vCenter Server version 6.5 and 7.0, the *Name* parameter is case-sensitive.
  Workaround: Use wildcard characters in your parameter value. For example, use `Get-Tag -Name "[T]agName"`.
- **New-HCXServiceMesh**
  When you run `New-HCXServiceMesh` , the `Service Mesh` object accepts destination as an input at the organization virtual data center level, but the `Service Mesh` object is created at an organization level.
- **Test-HCXMigration**
  `Test-HCXMigration` throws an exception instead of a warning. This might mislead you that running `Start-HCXMigration` is not possible.

- **ImageBuilder cmdlets**
  If PowerCLI is configured to use Python 3.7.0 or 3.12.0, `ImageBuilder` cmdlets fail with a message that advises to upgrade to a later Python version.
  Workaround: Configure PowerCLI to use a later Python version. For example, if you use Python 3.12.0, you can either upgrade to version 3.12.1 or you can alternatively use Python 3.11.9.
- **Other**
  – On Windows PowerShell 5.1, when you run a cmdlet and the operation fails on the server side, you might receive a *There is an error in the XML document***.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
  Workaround: Update to PowerShell 7 or use the vSphere Web Client to check the actual server-side error.
  – On MacOS, downloading the PowerCLI ZIP file through Chrome fails with an error message of type *"VibSign.so" cannot be opened because the developer cannot be verified***.**
  Workaround: Use Safari or the Mac Terminal to download the PowerCLI ZIP file.

VMware PowerCLI 13.2 Release Notes

This document contains the following sections

Introduction

VMware PowerCLI 13.2.0 Released 08 November 2023
VMware PowerCLI 13.2.1 Released 27 November 2023
VMware PowerCLI 13.2.0 Build **22746353**
VMware PowerCLI 13.2.1 Build **22851661**
Check frequently for additions and updates to these release notes.

About VMware PowerCLI

VMware PowerCLI is a suite of PowerShell modules to manage VMware products and services. VMware PowerCLI includes over 7000 cmdlets to easily manage your infrastructure on a global scale.

Installation, Upgrade, and Removal of VMware PowerCLI

Management of the PowerCLI modules is provided by the PowerShell Gallery and by using the PowerShell default cmdlets for working with modules in the PowerShell Gallery. For detailed information on how to install, upgrade, or remove PowerCLI, refer to the VMware PowerCLI User's Guide

VMware PowerCLI Components

In VMware PowerCLI 13.2.1, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.Sdk.Vr**: Provides auto-generated cmdlets for managing the vSphere Replication API.
- **VMware.Sdk.Srm**: Provides auto-generated cmdlets for managing the Site Recovery Manager (SRM) API.

In VMware PowerCLI 13.2.0, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Sdk**: Provides SDK functionality that is needed by all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Cis.Core**: Provides cmdlets for managing vSphere Automation SDK servers.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.VimAutomation.HorizonView**: Provides cmdlets for automating VMware Horizon features.
- **VMware.VimAutomation.Vmc**: Provides cmdlets for managing VMware Cloud on AWS features.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.ImageBuilder**: Provides cmdlets for managing depots, image profiles, and VIBs.
- **VMware.DeployAutomation**: Provides cmdlets that provide an interface to VMware Auto Deploy for provisioning physical hosts with ESXi software.
- **VMware.CloudServices**: Provides cmdlets for managing VMware Cloud Services.
- **VMware.Sdk.Nsx.Policy**: Provides auto-generated cmdlets for accessing the NSX Policy API.
- **VMware.Sdk.Vr**: Provides auto-generated cmdlets for managing the vSphere Replication API.
- **VMware.Sdk.Srm**: Provides auto-generated cmdlets for managing the Site Recovery Manager (SRM) API.
- **VMware.Sdk.vSphere.***: Provides auto-generated cmdlets for accessing the vSphere Automation (REST) API.

Supported Platforms

For a list of VMware PowerCLI 13.2.0 supported operating systems and PowerShell versions, see *Compatibility Matrixes for VMware PowerCLI 13.2.0*.

For a list of VMware products with which VMware PowerCLI 13.2.0 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 13.2.1 introduces the following new features, changes, and improvements:

- For the vSphere Replication and Site Recovery Manager SDK cmdlets, the type of the object `Id` properties and `Id` parameters has been changed from `guid` to `string` .

VMware PowerCLI 13.2.0 introduces the following new features, changes, and improvements:

- The `VMware.Sdk.Vcf.CloudBuilder` and `VMware.Sdk.Vcf.SddcManager` modules have been added to provide functionality for managing the VMware Cloud Foundation REST API with VMware PowerCLI.
- The `VMware.Sdk.Srm` module has been updated to support the API features of VMware Site Recovery Manager 8.8.
- The `VMware.Sdk.Vr` module has been updated to support the API features of vSphere Replication 8.8.
- The `VMware.Sdk.Nsx.Policy` module has been updated to support the API features of NSX 4.1.2.
- The `VMware.VimAutomation.HorizonView` module has been updated to support the API features of VMware Horizon 8 2306.
- The `VMware.Vim` and `VMware.Sdk.vSphere.*` modules have been updated to support the API features of VMware vSphere 8.0 Update 2.
- The `VMware.VimAutomation.Vmc` module has been updated to include the following improvements:
  - The `New-VmcSddc` and `New-VmcSddcCluster` cmdlets have been extended to support a new host type - `I4I` .

- A new cmdlet has been added to the **VMware.VimAutomation.Core** module.
  - **New cmdlet to export the desired state of a vSphere Lifecycle Manager host.**
    `Export-LcmVMHostDesiredState`
- A new cmdlet has been added to the `VMware.VimAutomation.Storage` module.
  - **New cmdlet to retrieve a list of the most impactful vSAN performance contributors.**
    `Get-VsanPerformanceContributor`
- The `VMware.VimAutomation.Storage` module has been updated to include the following improvements:
  - The `Get-VsanSpaceUsage` cmdlet has been modified to include an `EsaObjectOverheadGB` value in the returned object.
  - The `VMware.VimAutomation.Storage` module has been updated to support the API features of VMware vSAN 8.0 Update 2.
- A new cmdlet has been added to the `VMware.ImageBuilder` module.
  - **New cmdlet to create a vLCM-compliant offline bundle based on input depots and a software specification.**
    `New-OfflineBundle`

For more information on changes made in VMware PowerCLI 13.2.0, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 13.2.0 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 13.2.1:

- **vSphere Replication and Site Recovery Manager SDK cmdlets**
  On some vCenter Server systems, cmdlets from the **VMware.Sdk.Vr** and **VMware.Sdk.Srm** modules fail because the **Guid** property is provided in upper-case letters.

The following issues have been resolved in VMware PowerCLI 13.2.0:

- **Tagging and content library cmdlets**
  Certain cmdlets that use tagging or content library functionality (**Get-TagAssignments**, **Get-SpbmStoragePolicy**, and so on) stop working and the vCenter has to be rebooted.
- **Remove-AlarmAction**
  Remove-AlarmAction does not remove all triggers for SNMP actions.
- **Set-VMHostNetworkAdapter**
  When you run **Set-VMHostNetworkAdapter -AutomaticIPv6 $false**, a statically configured IPv6 address is also removed.
- **Connect-VIServer**
  Reconnecting to an ESXi host after reboot with **Connect-VIServer** in the same PowerShell session fails with an error message of type **Object reference not set to an instance of an object**.
- **Get-vSANStat**
  Get-vSANStat fails with an error message stating that a vSAN ESA feature is not available.
- **All ImageBuilder Cmdlets**
  If you have installed on your machine the public distribution of **pyVmomi** through **pip**, all **VMware.ImageBuilder** cmdlets do not work.
- **New-IsoImage**, **New-PxeImage**, and **Export-EsxImageProfile**

An image generated through the **VMware.ImageBuilder** module when using Python version 3.8 or later fails to boot even if no issues were encountered during image creation.

- **Remove-EsxSoftwarePackage**
  Remove-EsxSoftwarePackage doesn't throw a warning when removing an invalid software package from the image profile

Known Issues

VMware PowerCLI 13.2.0 and VMware PowerCLI 13.2.1 are known to have the following issues:

- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.
  Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.
- **Get-Tag** and **Get-TagAssignment**
  On vCenter Server version 6.5 and 7.0, the **Name** parameter is case-sensitive.
  Workaround: Use wildcard characters in your parameter value. For example, use **Get-Tag -Name "[T]agName"**.
- **New-HCXServiceMesh**
  When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.
- **Set-WMCluster**
  The default value of the **DefaultImageRegistryHostPort** parameter is 443, but this is not implemented.
  Workaround: Always define the **DefaultImageRegistryHostPort** parameter when the **DefaultImageRegistryHostname** parameter is specified.
- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Other**
  - For Windows PowerShell 5.1, when you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
    Workaround: Update to PowerShell 7 or use the vSphere Web Client to check the actual server-side error.
  - On MacOS, downloading the PowerCLI ZIP file through Chrome fails with an error message of type **"VibSign.so" cannot be opened because the developer cannot be verified**.
    Workaround: Use Safari or the Mac Terminal to download the PowerCLI ZIP file.

VMware PowerCLI 13.1.0 Release Notes

This document contains the following sections

Introduction

Released 19 April 2023
VMware PowerCLI 13.1.0 Build **21624340**
Check frequently for additions and updates to these release notes.

About VMware PowerCLI

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VMware PowerCLI Components

In VMware PowerCLI 13.1.0, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Sdk**: Provides SDK functionality that is needed by all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Cis.Core**: Provides cmdlets for managing vSphere Automation SDK servers.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.VimAutomation.Vds**: Provides cmdlets for managing vSphere distributed switches and distributed port groups.
- **VMware.VimAutomation.HorizonView**: Provides cmdlets for automating VMware Horizon features.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.ImageBuilder**: Provides cmdlets for managing depots, image profiles, and VIBs.
- **VMware.DeployAutomation**: Provides cmdlets that provide an interface to VMware Auto Deploy for provisioning physical hosts with ESXi software.
- **VMware.VimAutomation.Security**: Provides cmdlets for managing vSphere Security, including virtual Trusted Platform Module.
- **VMware.VimAutomation.Cloud**: Provides cmdlets for automating vCloud Director features.
- **VMware.VimAutomation.Nsxt**: Provides cmdlets for managing NSX-T servers.
- **VMware.VimAutomation.vROps**: Provides cmdlets for automating VMware Aria Operations features.
- **VMware.Sdk.Nsx.Policy**: Provides auto-generated cmdlets for accessing the NSX Policy API.
- **VMware.Sdk.vSphere.***: Provides auto-generated cmdlets for accessing the vSphere Automation (REST) API.

Supported Platforms

For a list of VMware products with which VMware PowerCLI 13.1.0 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 13.1.0 introduces the following new features, changes, and improvements:

- The **VMware.Sdk.Srm** module has been added to provide functionality for managing the VMware Site Recovery Manager REST API with VMware PowerCLI.
- The **VMware.Sdk.Vr** module has been added to provide functionality for managing the VMware vSphere Replication REST API with VMware PowerCLI.
- The **VMware.Sdk.Nsx.Policy** module has been updated to support the API features of NSX 4.1.0.
- The **VMware.VimAutomation.HorizonView** module has been updated to support the API features of VMware Horizon 8 2212.
- The **VMware.Vim** and **VMware.Sdk.vSphere.*** modules have been updated to support the API features of VMware vSphere 8.0 Update 1.
- The **VMware.ImageBuilder** module has been updated to work with Python version 3.7.1 or later.
- The **VMware.VimAutomation.Cloud** module has been updated to include the following improvements:
  - The **Connect-CIServer** cmdlet has been modified for authentication through the new VMware Cloud Director API endpoint.
  - A new **URL** parameter has been added to the **Import-CIVappTemplate** cmdlet to enable importing of vApp templates from an URL.
  - The **Import-CIVappTemplate** cmdlet interface has been changed when importing from an OVF file: the **Catalog** parameter is now mandatory and the **OrgVdc** parameter has been removed.
  - The **SourcePath** parameter of the **Import-CIVappTemplate** cmdlet is now mandatory when resuming import from an OVF file.
- A number of new cmdlets have been added to the **VMware.VimAutomation.Core** module.
  - **New cmdlets to manage Lifecycle Manager offline depots.**
    Get-LcmOfflineDepot
    New-LcmOfflineDepot
- The **VMware.VimAutomation.Core** module has been updated to include the following improvements:
  - The **BaseImage**, **VendorAddOn**, **Component**, **FirmwareAddon**, and **DepotOverride** parameters have been added to the **Set-VMHost** cmdlet to enable vSphere Lifecycle Manager host image configuration.
  - The **FirmwareAddon** property has been added to the cluster object to record the hardware support packages associated with the cluster.
  - The performance of the **Get-Stat** cmdlet has been improved for the instances when you use the **Start** parameter.
- The **VMware.VimAutomation.Security** module has been updated to include the following improvements:
  - A **LastAttestedTime** field has been added to the **TrustAuthorityVMhostBaseImage** object to represent the last attested time for Bluehost.
  - The **Export-VMHostImageDb** cmdlet has been modified to warn you about an ESXi Quick Boot and download a **boot_imgdb.tgz** file instead of an **image.tgz** file.
- A number of new cmdlets have been added to the **VMware.VimAutomation.Storage** module.
  - **New cmdlets for vCenter Server remote datastore management.**
    New-VsanHCIMeshDatastoreSource
    Get-VsanHCIMeshDatastoreSource
    Remove-VsanHCIMeshDatastoreSource
    Get-VsanHCIMeshDatastore
  - **New cmdlets for vSAN direct disk management.**
    New-VsanDirectDisk
    Get-VsanDirectDisk
    Remove-VsanDirectDisk
  - **New cmdlets for vSAN cluster shutdown.**
    Get-VsanClusterPowerState

Start-VsanCluster
Stop-VsanCluster
  - **New cmdlet to start objects relayout.**
    Start-VsanRelayoutObjects
  - **New cmdlet to enable the mounting of remote vSAN datastores from vSAN stretched clusters.**
    New-RemoteVsanServerClusterConfig
- The **VMware.VimAutomation.Storage** module has been updated to include the following improvements:
  - The **MountXVCDatastore**, **UnmountXVCDatastore**, and **RemoteVsanClusterServerConfig** parameters have been added to the **Set-VsanClusterConfiguration** cmdlet to support vCenter Server remote datastore management.
  - The **Perspective** parameter has been added to the **Test-VsanClusterHealth** cmdlet to support the precheck for vSAN cluster shutdowns

For more information on changes made in VMware PowerCLI 13.1.0, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 13.1.0 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 13.1.0:

- **New-VM**
  New-VM cannot create a Windows 2019 virtual machine when the ESXi server default compatibility level is set to a version that does not support Windows 2019.
- **Export-VDSwitch**
  In PowerShell 5.1, **Export-VDSwitch** generates a .ZIP file that cannot be imported through the vSphere Client.
- **Get-VIPermission**
  Get-VIPermission fails with a message of type **The given key ... was not present in the dictionary**.
- **Copy-VMGuestFile**
  Copy-VMGuestFile fails if the VM's guest OS information is not fully populated.
- **Export-VDPortGroup**
  Portgroups exported by using **Export-VDPortGroup** cannot be restored with **Set-VDPortGroup**.
- **Import-CIVappTemplate**
  Importing a vApp Template from a local OVF file with **Import-CIVappTemplate** does not work.
- **Get-CNSVolume**
  Get-CNSVolume does not work when there is a mismatch between volume and vDisk.
- **New-SpbmStoragePolicy**
  New-SpbmStoragePolicy fails with a message of type **The parameter CommonRule should contain only VAIOfilter rules**.
- **Import-TrustAuthorityServiceInfo**
  Import-TrustAuthorityServiceInfo fails when a vSphere Trust Authority host is removed.
- **Get-Tag** and **Get-TagAssignment**

On vCenter Server version 8.0 and later, the **Name** parameter is case-sensitive.

- **ImageBuilder cmdlets**
  - On MacOS, **ImageBuilder** cmdlets fail with a message of type **ModuleNotFoundError: No module named 'vmware.esximage'**.
  - On MacOS, if Homebrew and Python are not run and installed through a Rosetta terminal, **ImageBuilder** cmdlets fail with a message related to importing the VibSign module.

Known Issues

VMware PowerCLI 13.1.0 is known to have the following issues:

- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.
  Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.
- **Get-Tag** and **Get-TagAssignment**
  On vCenter Server version 6.5 and 7.0, the **Name** parameter is case-sensitive.
  Workaround: Use wildcard characters in your parameter value. For example, use **Get-Tag -Name "[T]agName"**.
- **New-HCXServiceMesh**
  When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.
- **Set-WMCluster**
  The default value of the **DefaultImageRegistryHostPort** parameter is 443, but this is not implemented.
  Workaround: Always define the **DefaultImageRegistryHostPort** parameter when the **DefaultImageRegistryHostname** parameter is specified.
- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Export-EsxImageProfile**
  On Windows and Linux, ESXi ISO images and offline bundles for vSphere 8.0 Update 1 environments generated by **Export-EsxImageProfile** fail to boot at runtime.
- **New-IsoImage** and **New-PxeImage**
  On Linux, ESXi ISO images of vSphere 8.0 Update 1 environments generated by **New-IsoImage** and **New-PxeImage** fail to boot at runtime.
- **ImageBuilder cmdlets**
  If PowerCLI is configured to use Python 3.7.0, **ImageBuilder** cmdlets fail with a message that advises to upgrade to a later Python version.
  Workaround: Configure PowerCLI to use a later Python version.
- **Other**
  - For Windows PowerShell 5.1, when you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
    Workaround: Update to PowerShell 7 or use the vSphere Web Client to check the actual server-side error.
  - On MacOS, downloading the PowerCLI ZIP file through Chrome fails with an error message of type **"VibSign.so" cannot be opened because the developer cannot be verified**.
    Workaround: Use Safari or the Mac Terminal to download the PowerCLI ZIP file.

VMware PowerCLI 13.0.0 Release Notes

This document contains the following sections

Introduction

Released 22 November 2022
VMware PowerCLI 13.0.0. Build **20829139**
Check frequently for additions and updates to these release notes.

About VMware PowerCLI

VMware PowerCLI is a suite of PowerShell modules to manage VMware products and services. VMware PowerCLI includes over 7000 cmdlets to easily manage your infrastructure on a global scale.

Installation, Upgrade, and Removal of VMware PowerCLI

Management of the PowerCLI modules is provided by the PowerShell Gallery and by using the PowerShell default cmdlets for working with modules in the PowerShell Gallery. For detailed information on how to install, upgrade, or remove PowerCLI, refer to the VMware PowerCLI User's Guide

VMware PowerCLI Components

In VMware PowerCLI 13.0.0, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Sdk**: Provides SDK functionality that is needed by all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Cis.Core**: Provides cmdlets for managing vSphere Automation SDK servers.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.VimAutomation.Vmc**: Provides cmdlets for managing VMware Cloud on AWS features.
- **VMware.VimAutomation.Vds**: Provides cmdlets for managing vSphere distributed switches and distributed port groups.
- **VMware.VimAutomation.HorizonView**: Provides cmdlets for automating VMware Horizon features.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.VimAutomation.StorageUtility**: Provides scripting cmdlet for updating Vmfs datastore.
- **VMware.VimAutomation.Hcx**: Provides cmdlets for managing VMware HCX features.
- **VMware.ImageBuilder**: Provides cmdlets for managing depots, image profiles, and VIBs.
- **VMware.DeployAutomation**: Provides cmdlets that provide an interface to VMware Auto Deploy for provisioning physical hosts with ESXi software.
- **VMware.VimAutomation.Security**: Provides cmdlets for managing vSphere Security, including virtual Trusted Platform Module.
- **VMware.VimAutomation.Cloud**: Provides cmdlets for automating vCloud Director features.

- **VMware.VimAutomation.Nsxt**: Provides cmdlets for managing NSX-T servers.
- **VMware.Sdk.Nsx.Policy**: Provides auto-generated cmdlets for accessing the NSX Policy API.
- **VMware.Sdk.vSphere.***: Provides auto-generated cmdlets for accessing the vSphere Automation (REST) API

Supported Platforms

For a list of VMware products with which VMware PowerCLI 13.0.0 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 13.0.0 introduces the following new features, changes, and improvements:

- The **VMware.ImageBuilder** and **VMware.DeployAutomation** modules have been ported to work on macOS and Linux.
- The **VMware.ImageBuilder** module now requires **Python 3.7** and the **six**, **psutil**, **lxml**, and **pyopenssl** Python packages as a prerequisite.
- The **VMware.VimAutomation.Cloud** module has been updated to include the following improvements:
  - A new parameter set has been added to the **New-CIVM** cmdlet to allow the creation of an empty VM in a vApp.
  - The **StorageProfile** parameter has been added to the **New-OrgVdc** cmdlet to enable the creation of an organization virtual datacenter with a specified storage profile.
  - The **Get/New/Set/Remove-OrgNetwork** cmdlets have been removed. Use **Get/New/Set/Remove-OrgVdcNetwork** instead.
  - The **VMHardwareVersion** property has been added to the **CIVM** object to replace the **VMVersion** property which has been deprecated.
  - The **HighestSupportedHardwareVersionString** property has been added to the **ProviderVdc** object to replace the **HighestSupportedHardwareVersion** property which has been deprecated.
  - The **VMware.VimAutomation.Cloud** module has been updated to support the API features of VMware Cloud Director 10.4.
- The **VMware.VimAutomation.Core** module has been updated to include the following improvements:
  - The **PytonPath** parameter has been added to the **Set-PowerCLIConfiguration** cmdlet to allow specifying the path to the Python version required by the **VMware.ImageBuilder** module.
  - The **CustomizationScript** parameter has been added to the **New/Set-OsCustomizationSpec** cmdlet to allow specifying a customization script to be executed during OS customization.
  - The **Ipv6Prefix**, **Ipv6Address**, **Ipv6Mode**, **Ipv6VcApplicationArgument**, **Ipv6Gateway**, and **Ipv6AlternateGateway** parameters have been added to the **New/Set-OsCustomizationNicMapping** cmdlets to allow specifying Ipv6 customization parameters.
  - The **VsanEsaEnabled** parameter has been added to the **New-Cluster** and **Set-Cluster** cmdlets to enable support for vSAN ESA enabled clusters.
- A number of new cmdlets have been added to the **VMware.VimAutomation.Storage** module.
  - **New cmdlets to enable vSAN ESA cluster disk management support.**
    Get-VsanEsaEligibleDisk
    Add-VsanStoragePoolDisk
    Get-VsanStoragePoolDisk

Remove-VsanStoragePoolDisk

- The **VMware.VimAutomation.Storage** module has been updated to include the following improvements:
  - The **VsanEsaEnabled** parameter has been added to the **Get-VsanClusterConfiguration** cmdlet to check if a cluster is vSAN ESA enabled.
  - The **Get/New/Set-SpbmStoragePolicy** cmdlets have been updated to support consumption domain (availability zone) storage policy.
  - The **VMware.VimAutomation.Storage** module has been updated to support the API features of vSAN 8.0.
- A new cmdlet has been added to the **VMware.VimAutomation.Security** module.
  - **New cmdlet to retrieve Trusted Platform Module (TPM) devices from a specified host.**
    Get-VMHostTPM
- The **VMware.VimAutomation.Security** module has been updated to include the following improvements:
  - The **VMHostTPM** parameter has been added to the **Get-Tpm2EndorsementKey** cmdlet to allow getting TPM 2.0 endorsement key information.
- The **VMware.VimAutomation.Hcx** module has been updated to include the following improvements:
  - The **EnableSeedCheckpoint** parameter has been added to the **New-HCXMigration** cmdlet to enable a seed checkpoint for Bulk migration.
  - The **MigrateCustomAttributes** parameter has been added to the **New-HCXMigration** and **New-HCXMobilityGroupConfiguration** cmdlets to enable migration of custom attributes.
- The **VMware.Sdk.Nsx.Policy** module now accepts JSON and PowerShell objects as input for its client-side parameters (usually built with **Initialize-*** cmdlets).
- The **VMware.Vim** and **VMware.Sdk.vSphere.*** modules have been updated to support the API features of VMware vSphere 8.0.
- The **VMware.VimAutomation.HorizonView** module has been updated to support the API features of VMware Horizon 8 2209.
- The **Get-NsxtPolicyService**, **Get-NsxtGlobalManagerService**, and **Get-VmcSddcNetworkService** cmdlets have been deprecated. Use the cmdlets from the **VMware.Sdk.Nsx.Policy** module instead.

For more information on changes made in VMware PowerCLI 13.0.0, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 13.0.0 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 13.0.0:

- **Get-NetworkPool**
  Get-NetworkPool does not return NSX-backed network pools.
- **Connect-CIServer**
  Get-NetworkPool fails when trying to connect to VMware Cloud Director 10.4 with a message of type **NOT_ACCEPTABLE: The request has invalid accept header: Invalid API version requested**.
- **New-VM**
  - **New-VM** fails when trying to create a VM with a user with limited permissions to **CryptoManager** even if encryption is not requested.
  - The customization script in the VM customization spec is not applied when cloning a Linux VM by using PowerCLI.
- **Get-Tag**

Get-Tag fails when executed in a remote session with a message of type **Failed to create RSA key: The requested operation cannot be completed. The computer must be trusted for delegation and the current user account must be configured to allow delegation**.

- **Test-HCXMigration**
  Test-HCXMigration throws an **INVALID_REQUEST** error when there are any errors or warnings in the migration request.
- **Test-HCXMobilityGroup**
  Test-HCXMobilityGroup throws an **INVALID_REQUEST** error when there are any errors or warnings in the mobility group request.

Known Issues

VMware PowerCLI 13.0.0 is known to have the following issues:

- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.
  Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.
- **New-HCXServiceMesh**
  When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.
- **Set-WMCluster**
  The default value of the **DefaultImageRegistryHostPort** parameter is 443, but this is not implemented.
  Workaround: Always define the **DefaultImageRegistryHostPort** parameter when the **DefaultImageRegistryHostname** parameter is specified.
- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Other**
  – For Windows PowerShell 5.1, when you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
  Workaround: Update to PowerShell 7 or use the vSphere Web Client to check the actual server-side error.

VMware PowerCLI 12.7.0 Release Notes

This document contains the following sections

Introduction

Released 14 July 2022
Updated 06 October 2022
VMware PowerCLI 12.7.0. Build **20091289**
Check frequently for additions and updates to these release notes.

About VMware PowerCLI

VMware PowerCLI is a suite of PowerShell modules to manage VMware products and services. VMware PowerCLI includes over 7000 cmdlets to easily manage your infrastructure on a global scale.

Installation, Upgrade, and Removal of VMware PowerCLI

Management of the PowerCLI modules is provided by the PowerShell Gallery and by using the PowerShell default cmdlets for working with modules in the PowerShell Gallery. For detailed information on how to install, upgrade, or remove PowerCLI, refer to the VMware PowerCLI User's Guide

VMware PowerCLI Components

In VMware PowerCLI 12.7.0, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Sdk**: Provides SDK functionality that is needed by all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Vmc**: Provides cmdlets for managing VMware Cloud on AWS features.
- **VMware.VimAutomation.Vds**: Provides cmdlets for managing vSphere distributed switches and distributed port groups.
- **VMware.VimAutomation.HorizonView**: Provides cmdlets for automating VMware Horizon features.
- **VMware.VimAutomation.Srm**: Provides cmdlets for managing VMware Site Recovery Manager features.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.VimAutomation.Hcx**: Provides cmdlets for managing VMware HCX features.
- **VMware.Sdk.Nsx.Policy**: Provides auto-generated cmdlets for accessing the NSX Policy API.

Supported Platforms

For a list of VMware products with which VMware PowerCLI 12.7.0 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 12.7.0 introduces the following new features, changes, and improvements:

- The **VMware.VumAutomation** module has been ported to work on macOS and Linux.
- The **VMware.Sdk.Nsx.Policy** module has been updated to include the following improvements:
  - The **UseRemoteAuthentication** parameter has been added to the **Connect-NsxServer** cmdlet to enable remote authentication.
  - The **Get-NsxOperation** cmdlet has been modified to return only exact matches of the **Path** parameter and to accept target paths in various formats.
  - The **VMware.Sdk.Nsx.Policy** module has been updated with the latest NSX Policy API features.
- A new cmdlet has been added to the **VMware.VimAutomation.Storage** module.
  New cmdlet to specify a vSAN health check threshold.
  New-VsanHealthCheckThreshold
- The **VMware.VimAutomation.Storage** module has been updated to include the following improvements:
  - The **CapacityThreshold** parameter has been added to the **Set-VsanClusterConfiguration** cmdlet to enable the setting of a vSAN health check threshold.
  - The **CapacityThreshold** property has been added to the **VsanClusterConfiguration** object to indicate a vSAN health check threshold.
- The **VMware.VimAutomation.HorizonView** module has been updated to support the API features of Horizon 8.4.

For more information on changes made in VMware PowerCLI 12.7.0, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 12.7.0 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 12.7.0:

- **Get-ApplianceBackupJob**
  The behavior of the parameters **StartDate** and **EndDate** is swapped.
- **Connect-SrmServer**
  - **Connect-SrmServer** fails on PowerShell 7.2.2 and later.
  - **Connect-SrmServer** performance on Linux is slow.
- **Export-VDSwitch** and **Export-VDPortGroup**
  Export-VDSwitch and **Export-VDPortGroup** fail with an error message of type **Could not load file or assembly ICSharpCode.SharpZipLib or one of its dependencies. The system cannot find the file specified**.
- **Get-VsanClusterConfiguration**
  Get-VsanClusterConfiguration does not return the full vSAN cluster configuration when remote datastores are mounted in a vSAN HCI Mesh architecture.
- **Set-VsanClusterConfiguration**
  Set-VsanClusterConfiguration fails if there is a disk group present when configuring shared witness node.
- **New-HCXMigration**
  New-HCXMigration requires target data center as a mandatory value for PCLI OSAM migrations.
- **Get-HCXVM**
  There is a delay in getting response from **Get-HCXVM**.
- **Multiple VMC cmdlets**
  Multiple VMC cmdlets use **CisServer** instead of **VmcServer** as input for the **Server** parameter.

Known Issues

VMware PowerCLI 12.7.0 is known to have the following issues:

- **Add-EsxSoftwareDepot**
  On ESXi 8.0, **Add-EsxSoftwareDepot** fails with an error message of type **System.TypeInitializationException,VMware.ImageBuilder.Commands.AddDepot**.
  Workaround: None. The issue will be fixed with the next PowerCLI version.
- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.
  Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.
- **Import-Module**
  If you try to import **VMware.PowerCLI** module on PowerShell Core, you receive an error message and the import process fails.
  Workaround: Import each module separately.
- **New-HCXServiceMesh**
  When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.
- **Set-VsanClusterConfiguration**
  When you run **Set-VsanClusterConfiguration** on vSAN 6.5 or vSAN 6.6, the **AddSilentHealthCheck** and **RemoveSilentHealthCheck** parameters do not update any values.
  Workaround: Update to vSAN 6.7.
- **Set-WMCluster**
  The default value of the **DefaultImageRegistryHostPort** parameter is 443, but this is not implemented.
  Workaround: Always define the **DefaultImageRegistryHostPort** parameter when the **DefaultImageRegistryHostname** parameter is specified.
- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Get-CustomCertificates**, **Add-CustomCertificate** and **Remove-CustomCertificates**
  Get-CustomCertificates, **Add-CustomCertificate**, and **Remove-CustomCertificates** fail with a message of type **Unsupported version URI**.
- **Other**
  – For Windows PowerShell 5.1, when you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
  Workaround: Update to PowerShell 7 or use the vSphere Web Client to check the actual server-side error.

VMware PowerCLI 12.6.0 Release Notes

This document contains the following sections

Introduction

Released 07 April 2022
VMware PowerCLI 12.6.0. Build **19610541**
Check frequently for additions and updates to these release notes.

About VMware PowerCLI

VMware PowerCLI is a suite of PowerShell modules to manage VMware products and services. VMware PowerCLI includes over 800 cmdlets to easily manage your infrastructure on a global scale.

Installation, Upgrade, and Removal of VMware PowerCLI

Management of the PowerCLI modules is provided by the PowerShell Gallery and by using the PowerShell default cmdlets for working with modules in the PowerShell Gallery. For detailed information on how to install, upgrade, or remove PowerCLI, refer to the VMware PowerCLI User's Guide

VMware PowerCLI Components

In VMware PowerCLI 12.6.0, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Cis.Core**: Provides cmdlets for managing vSphere Automation SDK servers.
- **VMware.VimAutomation.Vmc**: Provides cmdlets for managing VMware Cloud on AWS features.
- **VMware.VimAutomation.Srm**: Provides cmdlets for managing VMware Site Recovery Manager features.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.DeployAutomation**: Provides cmdlets that provide an interface to VMware Auto Deploy for provisioning physical hosts with ESXi software.
- **VMware.ImageBuilder**: Provides cmdlets for managing depots, image profiles, and VIBs.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.VimAutomation.Hcx**: Provides cmdlets for managing VMware HCX features.
- **VMware.CloudServices**: Provides cmdlets for managing VMware Cloud Services.
- **VMware.PowerCLI.VCenter.***: Provide PowerShell-based cmdlets for automated administration of the vSphere environment.
- **VMware.PowerCLI.Sdk.***: Provide help functionalities for the PowerShell-based cmdlets. These modules have no cmdlets but are required for other modules to function correctly.

In VMware PowerCLI 12.6.0, the following modules have been added:

- **VMware.Sdk.Nsx.Policy**: Provides auto-generated cmdlets for accessing the NSX Policy API.

Supported Platforms

For a list of VMware products with which VMware PowerCLI 12.6.0 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 12.6.0 introduces the following new features, changes, and improvements:

- The **VMware.Sdk.Nsx.Policy** module has been added to provide functionality, which enables you to manage the NSX Policy API with VMware PowerCLI.
- A number of new cmdlets have been added to the **VMware.VimAutomation.Core** module.
  - **New cmdlets to manage vCenter Server appliance backups.**
    Get-ApplianceBackupJob
    Get-ApplianceBackupPart
    New-ApplianceBackupJob
    Stop-ApplianceBackupJob
    Wait-ApplianceBackupJob
- The **VMware.VimAutomation.Srm** module has been updated to support VMware Site Recovery Manager 8.5.

For more information on changes made in VMware PowerCLI 12.6.0, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 12.6.0 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 12.6.0:

- **New-HCXMigration**
  New-HCXMigration does not verify whether all the source networks are mapped to the target networks during VM mobility group migration.
- **New-HCXMigration**
  When you initiate a non-mobility migration, the network mapping does not appear in the migration dashboard UI.
- **Get-HCXMigration**
  Get-HCXMigration throws an error message if a migration was triggered without providing the **TargetStorageProfile** parameter.
- **Get-HCXVM**
  Get-HCXVM is unable to handle pagination and throws an error message when there is a large number of VMs to list.
- **Get-VsanView**
  When run on PowerShell 7.2.2, **Get-VsanView** throws an error message of type **Object reference not set to an instance of an object**.
- **Other**
  - Cmdlets from the **VMware.DeployAutomation** module might throw error messages of type **No sessionId found** or **vimSessionKey parameter is missing** when invoked against certain vSphere versions.
  - The **GetRecoveryLocationSettings** API does not return the correct object type.

Known Issues

VMware PowerCLI 12.6.0 is known to have the following issues:

- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.
  Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.
- **Import-Module**

If you try to import **VMware.PowerCLI** module on PowerShell Core, you receive an error message and the import process fails.
Workaround: Import each module separately.

- **New-HCXServiceMesh**
  When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.
- **Set-VsanClusterConfiguration**
  When you run **Set-VsanClusterConfiguration** on vSAN 6.5 or vSAN 6.6, the **AddSilentHealthCheck** and **RemoveSilentHealthCheck** parameters do not update any values.
  Workaround: Update to vSAN 6.7.
- **Set-WMCluster**
  The default value of the **DefaultImageRegistryHostPort** parameter is 443, but this is not implemented.
  Workaround: Always define the **DefaultImageRegistryHostPort** parameter when the **DefaultImageRegistryHostname** parameter is specified.
- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Get-CustomCertificates**, **Add-CustomCertificate** and **Remove-CustomCertificates**
  Get-CustomCertificates, **Add-CustomCertificate**, and **Remove-CustomCertificates** fail with a message of type **Unsupported version URI**.
- **Export-VDSwitch** and **Export-VDPortGroup**
  Export-VDSwitch and **Export-VDPortGroup** fail with an error message of type **Could not load file or assembly ICSharpCode.SharpZipLib or one of its dependencies. The system cannot find the file specified**.
  Workaround: Update to PowerShell 7.
- **Other**
  – For Windows PowerShell 5.1, when you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
  Workaround: Update to PowerShell 7 or use the vSphere Web Client to check the actual server-side error.

VMware PowerCLI 12.5.0 Release Notes

This document contains the following sections

Introduction

Released 13 January 2022
VMware PowerCLI 12.5.0. Build **19195797**
Check frequently for additions and updates to these release notes.

About VMware PowerCLI

VMware PowerCLI is a suite of PowerShell modules to manage VMware products and services. VMware PowerCLI includes over 800 cmdlets to easily manage your infrastructure on a global scale.

Installation, Upgrade, and Removal of VMware PowerCLI

Management of the PowerCLI modules is provided by the PowerShell Gallery and by using the PowerShell default cmdlets for working with modules in the PowerShell Gallery. For detailed information on how to install, upgrade, or remove PowerCLI, refer to the VMware PowerCLI User's Guide

VMware PowerCLI Components

In VMware PowerCLI 12.5.0, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.PowerCLI.VCenter.***: Provide PowerShell-based cmdlets for automated administration of the vSphere environment.
- **VMware.PowerCLI.Sdk.***: Provide help functionalities for the PowerShell-based cmdlets. These modules have no cmdlets but are required for other modules to function correctly.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Sdk**: Provides SDK functionality that is needed by all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Vds**: Provides cmdlets for managing vSphere distributed switches and distributed port groups.
- **VMware.VimAutomation.Cis.Core**: Provides cmdlets for managing vSphere Automation SDK servers.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.VimAutomation.HorizonView**: Provides cmdlets for automating VMware Horizon features.
- **VMware.VimAutomation.Vmc**: Provides cmdlets for managing VMware Cloud on AWS features.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.VimAutomation.Hcx**: Provides cmdlets for managing VMware HCX features.
- **VMware.VimAutomation.vROps**: Provides cmdlets for automating vRealize Operations Manager features.
- **VMware.DeployAutomation**: Provides cmdlets that provide an interface to VMware Auto Deploy for provisioning physical hosts with ESXi software.
- **VMware.ImageBuilder**: Provides cmdlets for managing depots, image profiles, and VIBs.
- **VMware.CloudServices**: Provides cmdlets for managing VMware Cloud Services.

Supported Platforms

For a list of VMware products with which VMware PowerCLI 12.5.0 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 12.5.0 introduces the following new features, changes, and improvements:

- A number of new cmdlets have been added to the **VMware.VimAutomation.Core** module.
  - **New cmdlets to retrieve, start, stop and restart vSphere appliance services.**
    Get-VIApplianceService
    Start-VIApplianceService

Stop-VIApplianceService
Restart-VIApplianceService

- The **VMware.VimAutomation.Core** module has been updated to include the following improvements:
  - The **CpuHotAddEnabled**, **CpuHotRemoveEnabled**, and **MemoryHotAddEnabled** parameters have been added to the **New-VM** and **Set-VM** cmdlets to allow the enabling/disabling of cpu/memory hot add/remove.
  - The **MigrationEncryption** parameter has been added to the **New-VM** and **Set-VM** cmdlets to allow the enabling of encrypted migration.
- A number of new cmdlets have been added to the **VMware.VimAutomation.Vmc** module.
  - **New cmdlet to retrieve the outposts available in the organization.**
    Get-VmcOutpost
  - **New cmdlet to retrieve the available SDDC groups.**
    Get-VmcSddcGroup
- The **VMware.VimAutomation.Vmc** module has been updated to include the following improvements:
  - The **Outpost** parameter has been added to the **New-VmcSddc** cmdlet to allow the specifying of outposts on which to create an SDDC.
  - The **SddcGroup** parameter has been added to the **Get-VmcSddc** cmdlet to allow the filtering of SDDCs by SDDC group.
- The **VMware.VimAutomation.vROps** module has been updated to include the following improvements:
  - The **Get-OMResource** cmdlet now supports resources that are monitored by multiple adapter instances. The properties of the **OMResource** output object type (**AdapterInstanceId**, **Status**, **State**, and **StatusMessage**) have been deprecated in favor of the newer **ResourceStatus** property. It is an array of objects, each one representing the status of the resource for a particular adapter instance. The deprecated properties will be removed in a future release.
- The **VMware.VimAutomation.HorizonView** module has been updated to support the API features of Horizon 8.4.

For more information on changes made in VMware PowerCLI 12.5.0, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 12.5.0 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 12.5.0:

- **New-HardDisk**
  New-HardDisk does not allow more than 64 disks on a VM with PVSCSI controller.
- **New-VM**
  OVF parameters that have **ClassID** or **InstanceID** are not set correctly when deploying a VM from the content library.
- **Get-CisService**
  Get-CisService does not work on PowerShell 7.2.
- **Get-NetworkAdapter**
  Get-NetworkAdapter fails when the network adapter is connected to an opaque network that has been removed.
- **Get-VIEvent**
  The datetime properties of some events are incorrectly converted to the client machine's local time.
- **New-DrsRule**

You can receive an error message when creating a VM affinity rule, although the rule is properly created.

- **Connect-VIServer** and **Disconnect-VIServer**
  Memory usage increases after multiple **Connect-VIServer** and **Disconnect-VIServer** operations.
- **Get-AlarmAction**
  PowerCLI does not return all alarm action triggers when multiple triggers are specified.
- **Get-SpbmEntityConfiguration**
  Get-SpbmEntityConfiguration -VMsOnly fails with a message of type **Object reference not set to an instance of an object**.
- **Get-HCXVM**
  Get-HCXVM does not list some networks when the imported DVPG networks have different vCenter Server MoRef IDs.
- **Get-HCXReplication**
  Get-HCXReplication fails with a message of type **Invalid date time string**.
- **Get-OMAlert**
  The **Resource** property of the returned object is empty.
- **New-IsoImage** and **New-PxeImage**
  - **New-IsoImage** and **New-PxeImage** fail when the software spec requests reserved VIBs with a message of type **Could not download and package reserved VIBs**.
  - **New-IsoImage** and **New-PxeImage** fail when you omit the **Destination** parameter and, in the subsequent request to enter it manually, provide a path containing invalid characters.
- **Other**
  - Calling **UnmarkResourceAsBeingMaintained** on an **OMResource** object fails on PowerShell 5.1.

Known Issues

VMware PowerCLI 12.5.0 is known to have the following issues:

- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.
  Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.
- **Import-Module**
  If you try to import **VMware.PowerCLI** module on PowerShell Core, you receive an error message and the import process fails.
  Workaround: Import each module separately.
- **New-HCXServiceMesh**
  When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.
- **Set-VsanClusterConfiguration**
  When you run **Set-VsanClusterConfiguration** on vSAN 6.5 or vSAN 6.6, the **AddSilentHealthCheck** and **RemoveSilentHealthCheck** parameters do not update any values.
  Workaround: Update to vSAN 6.7.
- **Set-WMCluster**
  The default value of the **DefaultImageRegistryHostPort** parameter is 443, but this is not implemented.

Workaround: Always define the **DefaultImageRegistryHostPort** parameter when the **DefaultImageRegistryHostname** parameter is specified.

- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Get-CustomCertificates**, **Add-CustomCertificate** and **Remove-CustomCertificates**
  Get-CustomCertificates, **Add-CustomCertificate**, and **Remove-CustomCertificates** fail with a message of type **Unsupported version URI**.
- **Other**
  – For Windows PowerShell 5.1, when you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
  Workaround: Use PowerShell 7 or use the vSphere Web Client to check the actual server-side error.

VMware PowerCLI 12.4 Release Notes

This document contains the following sections

Introduction

VMware PowerCLI 12.4.1 Released 18 October 2021
VMware PowerCLI 12.4.0 Released 16 September 2021
VMware PowerCLI 12.4.1 Build **18769701**
VMware PowerCLI 12.4.0 Build **18633274**
Check frequently for additions and updates to these release notes.

About VMware PowerCLI

VMware PowerCLI is a suite of PowerShell modules to manage VMware products and services. VMware PowerCLI includes over 800 cmdlets to easily manage your infrastructure on a global scale.

Installation, Upgrade, and Removal of VMware PowerCLI

Management of the PowerCLI modules is provided by the PowerShell Gallery and by using the PowerShell default cmdlets for working with modules in the PowerShell Gallery. For detailed information on how to install, upgrade, or remove PowerCLI, refer to the VMware PowerCLI User's Guide

VMware PowerCLI Components

In VMware PowerCLI 12.4.1, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.Sdk.VSphere.***: Provide functionality for the vSphere Automation SDK for PowerShell.

- **VMware.PowerCLI.VCenter.***: Provide PowerShell-based cmdlets for automated administration of the vSphere environment.
- **VMware.PowerCLI.Sdk.***: Provide help functionalities for the PowerShell-based cmdlets. These modules have no cmdlets but are required for other modules to function correctly.

In VMware PowerCLI 12.4.0, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Sdk**: Provides SDK functionality that is needed by all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Vds**: Provides cmdlets for managing vSphere distributed switches and distributed port groups.
- **VMware.VimAutomation.Cis.Core**: Provides cmdlets for managing vSphere Automation SDK servers.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.VimAutomation.HorizonView**: Provides cmdlets for automating VMware Horizon features.
- **VMware.VimAutomation.Vmc**: Provides cmdlets for managing VMware Cloud on AWS features.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.VimAutomation.Hcx**: Provides cmdlets for managing VMware HCX features.
- **VMware.VimAutomation.WorkloadManagement**: Provides cmdlets for managing Project Pacific.
- **VMware.CloudServices**: Provides cmdlets for managing VMware Cloud Services.

In VMware PowerCLI 12.4.0, the following modules have been added:

- **VMware.Sdk.VSphere.***: Provide functionality for the vSphere Automation SDK for PowerShell.
- **VMware.PowerCLI.VCenter.***: Provide PowerShell-based cmdlets for automated administration of the vSphere environment.
- **VMware.PowerCLI.Sdk.***: Provide help functionalities for the PowerShell-based cmdlets. These modules have no cmdlets but are required for other modules to function correctly.

Supported Platforms

For a list of VMware products with which VMware PowerCLI 12.4 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 12.4.1 introduces the following new features, changes, and improvements:

- The **VMware.Sdk.VSphere.*** modules have been updated to support VMware vSphere 7.0 Update 3.
- The **VMware.Vim** module has been updated to support VMware vSphere 7.0 Update 3.
- The **VMware.VimAutomation.Storage** module has been updated to include the following improvements:
  - The **Get-VsanStat** cmdlet has been extended to support more stats: vSAN cluster capacity and vSAN file share performance.
  - The **VMware.VimAutomation.Storage** module has been updated to support VMware vSphere 7.0 Update 3.

VMware PowerCLI 12.4.0 introduces the following new features, changes, and improvements:

- The **VMware.Sdk.VSphere.*** modules have been added to provide functionality for the vSphere Automation SDK for PowerShell, which enables you to manage the vSphere Automation API with VMware PowerCLI.
- A number of new cmdlets have been added to the **VMware.PowerCLI.VCenter** module.
  - **New cmdlets to manage certificates on vCenter Server and ESXi.**
    Get-VITrustedCertificate
    Add-VITrustedCertificate
    Remove-VITrustedCertificate
    Get-VIMachineCertificate
    Set-VIMachineCertificate
    New-VIMachineCertificateSigningRequest
- The **VMware.VimAutomation.Core** module has been updated to include the following improvements:
  - The **Get-VMHostNetworkAdapter** and **Set-VMHostNetworkAdapter** cmdlets have been extended to allow the enablement and disablement of the following services on a VMKernel port: provisioning, vSphere replication, vSphere replication NFC, and vSphere Backup NFC.
  - The **New-TagAssignment** cmdlet has been extended to allow tagging content libraries and content library items.
  - The **Tag** parameter has been added to the **Get-TagAssignment** cmdlet to allow filtering tag assignments by tag.
  - The **Copy-DatastoreItem** cmdlet has been extended to support the copying of **vmdk** files to/from the vSAN datastore.
  - The **FriendlyName** property has been added to the datastore folder object to display the friendly name of a vSAN datastore folder.
- The **VMware.VimAutomation.Vmc** module has been updated to include the following improvements:
  - The **Upsize** parameter has been added to the **Set-VmcSddc** cmdlet to allow SDDC upsizing.
- The **VMware.VimAutomation.Hcx** module has been updated to include the following improvements:
  - The **BytesTransferred** property of the **HCXMobilityGroupMigration** type has been added to reflect the amount of transferred data during migration. It replaces the **UsedSize** property, which has been deprecated.
- The **VMware.VimAutomation.HorizonView** module has been updated to support the API features of Horizon 8.3.

For more information on changes made in VMware PowerCLI 12.4, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 12.4 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 12.4.1:

- **Get-VsanObject**
  Get-VsanObject fails to execute when a linked clone VM is present in the vSAN datastore.

The following issues have been resolved in VMware PowerCLI 12.4.0:

- **Get-TagAssignment**
  Get-TagAssignment fails if you have assigned a tag on a VSS or VDS portgroup.
- **Copy-VMGuestFile**
  Copying a **simlink** file to the guest OS fails with a message of type **Response status code does not indicate success: 500**.
- **New-VM**

New-VM occassionally fails when cloning a VM from NFS to VMFS6 datastore with a message of type **The specified delta disk format 'redoLogFormat' is not supported**.

- **Get-SpbmReplicationGroup** and **Get-SpbmReplicationPair**
  Get-SpbmReplicationGroup and **Get-SpbmReplicationPair** return data slower than expected.
- **Start-HCXReplication**
  Start-HCXReplication fails in a vCloud Director environment, when the **TargetStorageProfile** parameter is passed.
- **Get-HCXMigration**
  The **TargetStorageProfile** property of the returned object shows up as blank, even when you set it explicitly.
- **Get-HCXMigration**
  Get-HCXMigration throws an error when you pass the value **Migrating** for the **State** parameter.
- **Other**
  – When you disconnect from the server and connect again in the same PowerShell session, all cmdlets from the Workload Management module fail with a **Server is not connected** message.
  – When PowerCLI is installed on a computer with Turkish regional settings, some cmdlets don't work properly.

Known Issues

VMware PowerCLI 12.4.0 and 12.4.1 are known to have the following issues:

- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.
  Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.
- **Import-Module**
  If you try to import **VMware.PowerCLI** module on PowerShell Core, you receive an error message and the import process fails.
  Workaround: Import each module separately.
- **New-HCXServiceMesh**
  When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.
- **Set-VsanClusterConfiguration**
  When you run **Set-VsanClusterConfiguration** on vSAN 6.5 or vSAN 6.6, the **AddSilentHealthCheck** and **RemoveSilentHealthCheck** parameters do not update any values.
  Workaround: Update to vSAN 6.7.
- **Set-WMCluster**
  The default value of the **DefaultImageRegistryHostPort** parameter is 443, but this is not implemented.
  Workaround: Always define the **DefaultImageRegistryHostPort** parameter when the **DefaultImageRegistryHostname** parameter is specified.
- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Other**
  – For Windows PowerShell 5.1, when you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.

Workaround: Use PowerShell 7 or use the vSphere Web Client to check the actual server-side error.

– Certain methods in **com.vmware.nsx.model.firewall_section** enforce optional strings where they are not required.

VMware PowerCLI 12.3.0 Release Notes

This document contains the following sections

Introduction

Released 08 April 2021
VMware PowerCLI 12.3.0. Build **17860403**
Check frequently for additions and updates to these release notes.

About VMware PowerCLI

VMware PowerCLI is a suite of PowerShell modules to manage VMware products and services. VMware PowerCLI includes over 800 cmdlets to easily manage your infrastructure on a global scale.

Installation, Upgrade, and Removal of VMware PowerCLI

Management of the PowerCLI modules is provided by the PowerShell Gallery and by using the PowerShell default cmdlets for working with modules in the PowerShell Gallery. For detailed information on how to install, upgrade, or remove PowerCLI, refer to the VMware PowerCLI User's Guide

VMware PowerCLI Components

In VMware PowerCLI 12.3.0, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Vds**: Provides cmdlets for managing vSphere distributed switches and distributed port groups.
- **VMware.VimAutomation.Cis.Core**: Provides cmdlets for managing vSphere Automation SDK servers.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.VimAutomation.Security**: Provides cmdlets for managing vSphere Security, including virtual Trusted Platform Module.
- **VMware.VimAutomation.Srm**: Provides cmdlets for managing VMware Site Recovery Manager features.
- **VMware.VimAutomation.HorizonView**: Provides cmdlets for automating VMware Horizon features.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.VimAutomation.Hcx**: Provides cmdlets for managing VMware HCX features.
- **VMware.VimAutomation.WorkloadManagement**: Provides cmdlets for managing Project Pacific.
- **VMware.VimAutomation.Nsxt**: Provides cmdlets for managing NSX-T servers.
- **VMware.ImageBuilder**: Provides cmdlets for managing depots, image profiles, and VIBs.

- **VMware.DeployAutomation**: Provides cmdlets that provide an interface to VMware Auto Deploy for provisioning physical hosts with ESXi software

Supported Platforms

For a list of VMware products with which VMware PowerCLI 12.3.0 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 12.3.0 introduces the following new features, changes, and improvements:

- A number of new cmdlets have been added to the **VMware.VimAutomation.Storage** module.
  - **New cmdlets to manage vSAN file service snapshots**
    Get-VsanFileShareSnapshot
    New-VsanFileShareSnapshot
    Remove-VsanFileShareSnapshot
- The **VMware.VimAutomation.Storage** module has been updated to include the following improvements:
  - The **Get-KeyProvider** and **Set-KeyProvider** cmdlets have been extended to support the native key provider type.
- A number of new cmdlets have been added to the **VMware.VimAutomation.Security** module.
  - **New cmdlets to support the native key provider type**
    Import-KeyProvider
    Export-KeyProvider
- A new cmdlet has been added to the **VMware.VimAutomation.WorkloadManagement** module.
  - **New cmdlet to create a namespace network specification**
    New-WMNamespaceNetworkSpec
- The **VMware.VimAutomation.WorkloadManagement** module has been updated to include the following improvements:
  - A new parameter set has been added to the **Enable-WMCluster** cmdlet to enable workload management on a cluster that uses vSphere networking.
- The **VMware.VimAutomation.Core** module has been updated to include the following improvements:
  - The **New-VM**, **New-HardDisk**, **Set-VM**, **Set-HardDisk**, and **Set-VMHost** cmdlets have been extended to support the native key provider type for encryption operation.
  - The **New-VM** cmdlet has been extended to support cross-vCenter cloning.
  - The **KeyProvider** parameter has been added to the **New-VM** cmdlet to support VM encryption during cloning.
  - The **Reason** parameter has been added to the **Set-VMHost**, **Stop-VMHost**, and **Restart-VMHost** cmdlets to allow adding an explanation for putting a host in maintenance mode, stopping, or restarting it.
- The **VMware.VimAutomation.Hcx** module has been updated to include the following improvements:
  - The **ReplicateSecurityTags** parameter has been added to the **New-HCXMigration** and **New-HCXMobilityGroupConfiguration** cmdlets to enable turning on and off the replicate security tags feature for migrations.
  - The **Get-HCXMigration** cmdlet has been updated to show migration status as **Cancelled** and not as **Aborted** as the latter term has been deprecated.
- The **VMware.Vim** module has been updated to support VMware vSphere 7.0 Update 2.
- The **VMware.VimAutomation.HorizonView** module has been updated to support VMware Horizon 2103.
- The **VMware.VimAutomation.Srm** module has been updated to support VMware Site Recovery Manager 8.4.

For more information on changes made in VMware PowerCLI 12.3.0, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 12.3.0 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 12.3.0:

- **Connect-NsxtServer**
  When running **Connect-NsxtServer**, you cannot connect to VMware NSX-T Data Center version 2.5.
- **New-VM**
  The **StorageProfile** parameter is not accounted for when deploying from an OVF template in a content library.
- **Use-PowerCLIContext**
  Use-PowerCLIContext occassionally fails to import the PowerCLI context.
- **Get-VMHostNetworkAdapter**
  Get-VMHostNetworkAdapter fails with a message of type **Value cannot be null. Parameter name: collection**.
- **Get-VsanStat**
  When using the **TimeRange** parameter with value **LastWeek**, duplicated records are returned.
- **Get-VasaProvider** and **Get-VasaStorageArray**
  For PowerCLI 12.x, **Get-VasaProvider** fails to populate registered standby provider information which causes **Get-VasaStorageArray** to fail with a message of type **Object reference not set to an instance of an object**.
- **Get-SpbmStoragePolicy**
  For PowerCLI 12.2.0, **Get-SpbmStoragePolicy** fails with a message of type **Rule set has other line of service rules without any persistence line of service rule**.
- **Set-TrustedCluster**
  Set-TrustedCluster acts incosistently when some **serviceInfos** are configured.
- **New-HCXMobilityGroup**
  – Networks mapping is not displayed on the migration tracking page.
  – The MAC address and network adapters to a networks mapping issue are not retained.
  – The storage policy is not applied after migration.
- **Get-HCXVM**
  If a source virtual machine consists of bonded interfaces, **Get-HCXVM** retrieves duplicated network output entries for the bonded interfaces.
- **Other**
  – Calling PowerCLI cmdlets in parallel and specifying parameters by name causes exceptions of type **Could not find object with name...** or **An item with the same key has already been added**.

Known Issues

VMware PowerCLI 12.3.0 is known to have the following issues:

- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.

Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.

- **Import-Module**
  If you try to import **VMware.PowerCLI** module on PowerShell Core, you receive an error message and the import process fails.
  Workaround: Import each module separately.
- **New-HCXServiceMesh**
  When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.
- **Set-VsanClusterConfiguration**
  When you run **Set-VsanClusterConfiguration** on vSAN 6.5 or vSAN 6.6, the **AddSilentHealthCheck** and **RemoveSilentHealthCheck** parameters do not update any values.
  Workaround: Update to vSAN 6.7.
- **Set-WMCluster**
  The default value of the **DefaultImageRegistryHostPort** parameter is 443, but this is not implemented.
  Workaround: Always define the **DefaultImageRegistryHostPort** parameter when the **DefaultImageRegistryHostname** parameter is specified.
- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Other**
  – For Windows PowerShell 5.1, when you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
  Workaround: Use PowerShell 7 or use the vSphere Web Client to check the actual server-side error.
  – Certain methods in **com.vmware.nsx.model.firewall_section** enforce optional strings where they are not required.

VMware PowerCLI 12.2.0 Release Notes

This document contains the following sections

Introduction

Released 04 February 2021
VMware PowerCLI 12.2.0. Build **17538434**
Check frequently for additions and updates to these release notes.

About VMware PowerCLI

VMware PowerCLI is a suite of PowerShell modules to manage VMware products and services. VMware PowerCLI includes over 800 cmdlets to easily manage your infrastructure on a global scale.

Installation, Upgrade, and Removal of VMware PowerCLI

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VMware PowerCLI Components

In VMware PowerCLI 12.2.0, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Sdk**: Provides SDK functionality that is needed by all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Vds**: Provides cmdlets for managing vSphere distributed switches and distributed port groups.
- **VMware.VimAutomation.Cis.Core**: Provides cmdlets for managing vSphere Automation SDK servers.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.VimAutomation.Srm**: Provides cmdlets for managing VMware Site Recovery Manager features.
- **VMware.VimAutomation.HorizonView**: Provides cmdlets for automating VMware Horizon features.
- **VMware.VimAutomation.Vmc**: Provides cmdlets for managing VMware Cloud on AWS features.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.VimAutomation.Hcx**: Provides cmdlets for managing VMware HCX features.
- **VMware.VimAutomation.WorkloadManagement**: Provides cmdlets for managing Project Pacific.
- **VMware.CloudServices**: Provides cmdlets for managing VMware Cloud Services.
- **VMware.VimAutomation.Nsxt**: Provides cmdlets for managing NSX-T servers.
- **VMware.VimAutomation.vROps**: Provides cmdlets for automating vRealize Operations Manager features.

Supported Platforms

For a list of VMware products with which VMware PowerCLI 12.2.0 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 12.2.0 introduces the following new features, changes, and improvements:

- A number of new cmdlets have been added to the **VMware.VimAutomation.Common** module.
  - **New cmdlets for PowerShell runspace support**
    Get-PowerCLIContext
    Use-PowerCLIContext
- A number of new cmdlets have been added to the **VMware.VimAutomation.WorkloadManagement** module.
  - **New cmdlets for managing namespace limits**
    Get-WMNamespaceLimits
    Set-WMNamespaceLimits
- A number of new cmdlets have been added to the **VMware.VimAutomation.Core** module.
  - **New cmdlets for vSphere Lifecycle Manager**
    Export-LcmClusterDesiredState
    Import-LcmClusterDesiredState

Get-LcmClusterDesiredStateRecommendation
Get-LcmHardwareCompatibility

- The **VMware.VimAutomation.Core** module has been updated to include the following improvements:
  - The **DepotOverride** parameter has been added to the **Set-Cluster** cmdlet to allow specifying a depot address for vSphere LCM operations.
  - The **Package** parameter has been added to the **Set-Cluster** cmdlet to allow specifying a package from a hardware support manager that the hosts on a cluster should comply with.
  - The **SHAAlgorithm** parameter has been added to the **Export-VApp** cmdlet to enable support for SHA256 signing.
  - The **BootDelayMillisecond** parameter has been added to the **New-VM** and **Set-VM** cmdlets to allow specifying virtual machine boot delay.
  - The **OVFConfiguration** parameter has been added to the **New-VM** cmdlet to allow specifying OVF parameters when deploying OVF template from the content library.
  - The **DisableOvfCertificateChecks** parameter has been added to the **New-ContentLibraryItem** and **Set-ContentLibraryItem** cmdlets to allow skiping all OVA and OVF certificate checks during the upload to the content library.
  - The **DestinationSslThumbprint** parameter has been added to the **Move-VM** and **Move-Inventory** cmdlets to allow specifying the SSL thumbprint of the destination server when moving virtual machines between vCenter Server systems.
  - The **Get-OvfConfiguration** cmdlet has been extended to accept OVF templates from the content library.
  - The **New-VM** cmdlet has been extended to allow deploying virtual machines from VM templates in the content library.
  - The **New-ContentLibraryItem** and **Set-ContentLibraryItem** cmdlets have been extended to allow creating OVF or VM templates in the content library from a virtual machine or vApp.
  - The **Move-HardDisk** cmdlet has been extended to accept a datastore cluster as a destination to move a hard disk to.
  - The **New-Datastore** cmdlet has been extended to allow creating virtual volume (vVol) datastores.
- A number of new cmdlets have been added to the **VMware.VimAutomation.Vmc** module.
  - **New cmdlets for site recovery management**
    Get-VmcSddcSiteRecoveryInstance
    New-VmcSddcSiteRecoveryInstance
    Remove-VmcSddcSiteRecoveryInstance
    Get-VmcSddcSiteRecovery
- The **VMware.VimAutomation.Vmc** module has been updated to include the following improvements:
  - The **EnableSiteRecovery**, **SrmExtensionSuffix**, and **DisableSiteRecovery** parameters have been added to the **Set-VmcSddc** cmdlet to allow the enabling and disabling of DRaaS on an SDDC.
- The **Get-NsxtGlobalManagerService** cmdlet has been added to the **VMware.VimAutomation.Nsxt** module to provide the ability to expose the NSX-T Global Manager API.
- The **VMware.VimAutomation.HorizonView** module has been ported to work on macOS and Linux and has been updated for Horizon 2012.
- The performance of all **Get-*Service** cmdlets, such as **Get-CisService** and **Get-NsxtService**, has been improved.

For more information on changes made in VMware PowerCLI 12.2.0, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 12.2.0 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 12.2.0:

- **Connect-VIServer**
  - PowerCLI creates a temporary file in the **%appdata%\Microsoft\Crypto\RSA\<*user_account*>** folder and the file is not deleted when no longer needed.
  - The connection to vCenter Server might fail if the client machine is located behind a proxy.
- **Get-DrsVMHostRule**
  The Get-DrsVMHostRule cmdlet displays VM group members incorrectly when a VM is removed from the inventory.
- **Get-VMHostNetworkAdapter**
  The **Get-VMHostNetworkAdapter** cmdlet fails and displays a **Value cannot be null** message on some environments.
- **Install-VMHostPatch**
  Installing VIBs by using **Install-VMHostPatch -LocalPath** fails due to a credentials error on ESXi 6.7.x and ESXi 7.0.x.
- **Move-VM**
  When migrating a virtual machine from one resource pool to another in the same DRS cluster, the host might change.
- **New-VM**
  When creating a new VM, for some guest operating systems the boot option is set to BIOS, rather than to the default EFI.
- **New-VM** and **Set-VM**
  The **MemoryGB** parameter accepts only values up to 1024 GB, rather than the actual configuration maximums.
- **Test-HCXMigration** and **Start-HCXMigration**
  You cannot pass the target storage policy details in migration requests.
- **Other**
  - In vROps, when calling the **DownloadReport** API function, you get an error message of type **Exception calling "DownloadReport" with "2" argument(s)**.
  - When configuring SRM settings, the Windows-specific NIC customization settings are not set correctly.

Known Issues

VMware PowerCLI 12.2.0 is known to have the following issues:

- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.
  Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.
- **Import-Module**
  If you try to import **VMware.PowerCLI** module on PowerShell Core, you receive an error message and the import process fails.
  Workaround: Import each module separately.
- **New-HCXServiceMesh**
  When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.
- **Set-VsanClusterConfiguration**

When you run **Set-VsanClusterConfiguration** on vSAN 6.5 or vSAN 6.6, the **AddSilentHealthCheck** and **RemoveSilentHealthCheck** parameters do not update any values.
Workaround: Update to vSAN 6.7.

- **Set-WMCluster**
  The default value of the **DefaultImageRegistryHostPort** parameter is 443, but this is not implemented.
  Workaround: Always define the **DefaultImageRegistryHostPort** parameter when the **DefaultImageRegistryHostname** parameter is specified.
- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Other**
  – When you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
  Workaround: Use the vSphere Web Client to check the actual server-side error.
  – Certain methods in **com.vmware.nsx.model.firewall_section** enforce optional strings where they are not required.

VMware PowerCLI 12.1.0 Release Notes

This document contains the following sections

Introduction

Released 13 October 2020
VMware PowerCLI 12.1.0 Build **17009493**
Check frequently for additions and updates to these release notes.

About VMware PowerCLI

VMware PowerCLI is a suite of PowerShell modules to manage VMware products and services. VMware PowerCLI includes over 700 cmdlets to easily manage your infrastructure on a global scale.

Installation, Upgrade, and Removal of VMware PowerCLI

Management of the PowerCLI modules is provided by the PowerShell Gallery and by using the PowerShell default cmdlets for working with modules in the PowerShell Gallery. For detailed information on how to install, upgrade, or remove PowerCLI, refer to the VMware PowerCLI User's Guide

VMware PowerCLI Components

In VMware PowerCLI 12.1.0, the following modules have been updated:

- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Sdk**: Provides SDK functionality that is needed by all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Vds**: Provides cmdlets for managing vSphere distributed switches and distributed port groups.
- **VMware.VimAutomation.Cis.Core**: Provides cmdlets for managing vSphere Automation SDK servers.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.VimAutomation.StorageUtility**: Provides utility scripts for storage.
- **VMware.VumAutomation**: Provides cmdlets for automating vSphere Update Manager features.
- **VMware.VimAutomation.Srm**: Provides cmdlets for managing VMware Site Recovery Manager features.
- **VMware.VimAutomation.HorizonView**: Provides cmdlets for automating VMware Horizon features.
- **VMware.VimAutomation.Vmc**: Provides cmdlets for managing VMware Cloud on AWS features.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.VimAutomation.Security**: Provides cmdlets for managing vSphere Security, including virtual Trusted Platform Module.
- **VMware.VimAutomation.Hcx**: Provides cmdlets for managing VMware HCX features.
- **VMware.VimAutomation.WorkloadManagement**: Provides cmdlets for managing Project Pacific.
- **VMware.CloudServices**: Provides cmdlets for managing VMware Cloud Services.

Supported Platforms

For a list of VMware products with which VMware PowerCLI 12.1.0 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 12.1.0 introduces the following new features, changes, and improvements:

- A number of new cmdlets have been added to the **VMware.VimAutomation.WorkloadManagement** module.
  - **New cmdlets for managing Workload Management clusters**
    Get-WMCluster
    Set-WMCluster
    Enable-WMCluster
    Disable-WMCluster
- A number of new cmdlets have been added to the **VMware.VimAutomation.Core** module.
  - **New cmdlets for vSphere Lifecycle Manager**
    Get-LcmImage
    Test-LcmClusterCompliance

Test-LcmClusterHealth

- The **VMware.VimAutomation.Core** module has been updated to include the following improvements:
  - The **BaseImage** and **VendorAddOn** parameters have been added to the **New-Cluster** and **Set-Cluster** cmdlets to allow specifying the base image and vendor add-ons for the ESXi hosts in the cluster.
  - The **Component** parameter has been added to the **Set-Cluster** cmdlet to allow specifying the ESXi components that the cluster's hosts should comply with.
  - The **Remediate** and **AcceptEULA** parameters have been added to the **Set-Cluster** cmdlet to allow remediation of the cluster's hosts to the target state.
  - The **Uri**, **FileName**, and **SslThumbprint** parameters have been added to the **New-ContentLibraryItem** cmdlet to allow uploading files from the Internet or datastore URLs.
  - The **ItemType** parameter has been added to the **New-ContentLibraryItem** and **Set-ContentLibraryItem** cmdlets to allow specifying the type of the content library item.
  - The **SEVEnabled** parameter has been added to the **New-VM** and **Set-VM** cmdlets to allow enabling the Secure Encrypted Virtualization feature.
  - The **VvolStorageContainer** parameter has been added to the **New-Datastore** cmdlet to allow creating Virtual Volume (vVol) datastores.
  - The **DiskType** parameter of the **New-HardDisk** cmdlet has been extended to support the Persistent Memory (PMem) disk type.
  - The performance of the **Get-NetworkAdapter** and **Get-VirtualNetwork** cmdlets for opaque networks has been improved.
  - The **NoCommandsSwitch** and **NoBlocksSwitch** parameters of the **Set-ScsiLun** cmdlet have been deprecated when using the cmdlet against ESXi 7.0 or later.
- A number of new cmdlets have been added to the **VMware.VimAutomation.Vmc** module.
  - **New cmdlets for specifying cluster's EDRS policies**
    Get-VmcClusterEdrsPolicy
    Set-VmcClusterEdrsPolicy
- The **VMware.VimAutomation.Vmc** module has been updated to include the following improvements:
  - The **SddcAppliancesSize** parameter has been added to the **New-VmcSddc** cmdlet to allow specifying the SDDC appliances size. The SDDC appliance size can be Medium and Large. The default value is Medium.
  - The **StretchedCluster** parameter has been added to the **New-VmcSddc** cmdlet to allow stretching out the SDDC to two availability zones.
  - The **HostType** parameter has been added to the **New-VmcSddc** cmdlet to allow specifying the host type. The supported host types are i3 and i3en.
  - The **Cluster** parameter has been added to the **Add-VmcSddcHost** cmdlet to allow adding hosts to a specific cluster.
  - The **Cluster** parameter has been added to the **Remove-VmcSddcHost** cmdlet to allow removing hosts from a specific cluster.
  - The **VCenterHostName** and **VCenterCredentials** properties have been added to the SDDC object to allow easier connection to the SDDC, when using the **Connect-VIServer** cmdlet.
- A number of new cmdlets have been added to the **VMware.VimAutomation.Storage** module.
  - **New cmdlets for managing vSAN secure disk wipe**
    Start-VsanWipeVsanDisk
    Get-VsanWipeDiskState
    Stop-VsanWipeVsanDisk
  - **New cmdlets for managing Cloud Native Storage volumes**
    Get/New/Set/Remove-CnsVolume
    New-CnsContainerCluster

New-CnsKubernetesEntityReference
New-CnsKubernetesEntityMetadata
New-CnsVolumeMetadata
Add-CnsAttachment
Remove-CnsAttachment
  - **New cmdlet for managing Virtual Volume (vVol) storage containers**
    Get-VvolStorageContainer

- The **VMware.VimAutomation.Storage** module has been updated to include the following improvements:
  - The **Set-VsanClusterConfiguration** and **Get-VsanClusterConfiguration** cmdlets have been extended to support the vSAN compression only mode and vSAN enforce capacity reservation.
  - The **Get-VsanSpaceUsage** cmdlet has been improved to return slack space related breakdowns.
  - The **Get-VasaStorageArray** and **Get-VasaProvider** cmdlets have been improved to filter the retrieved VASA providers by the vVol storage containers.
- The **VMware.VimAutomation.Security** module has been updated to include the following improvements:
  - The new **Get-TrustedClusterAppliedStatus** cmdlet has been added to the **VMware.VimAutomation.Security** module providing the ability to retrieve the applied status of the trusted service information on the trusted clusters.
  - The **Set-TrustedCluster** cmdlet has been improved to automatically remediate the cluster if its applied status is not healthy in the workload vCenter Server system.
  - The **MasterKeyId** parameter is obsolete and replaced with the **PrimaryKeyId** parameter for the **New-TrustAuthorityKeyProvider** and **Set-TrustAuthorityKeyProvider** cmdlets.
  - The **Server** parameter has been added to the **Set-TrustAuthorityTpm2AttestationSettings** cmdlet.
  - The **Add-TrustedClusterAttestationServiceInfo**, **Add-TrustedClusterKeyProviderServiceInfo**, **Remove-TrustedClusterKeyProviderServiceInfo**, and **Remove-TrustedClusterAttestationServiceInfo** cmdlets have been improved to provide a warning message when the trusted cluster applied status is not healthy.
- The **Disconnect-Vcs** cmdlet has been added to the **VMware.CloudServices** module to allow disconnecting from a VMware Cloud Services server.
- The **VMware.Vim** module has been updated to contain API bindings for vSphere 7.0 Update 1.
- The **VMware.VimAutomation.Srm** module has been updated to support VMware Site Recovery Manager 8.3.1.
- The **VMware.VimAutomation.HorizonView** module has been updated to support VMware Horizon 7 version 7.13.
- The **VMware.VimAutomation.Hcx** module has been updated to configure VMware Cloud Director as target for HCX OS Assisted Migration.
- The **Wait-HCXJob** cmdlet has been improved to retrieve the status of the **Update-HCXSentinel** cmdlet.

For more information on changes made in VMware PowerCLI 12.1.0, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 12.1.0 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 12.1.0:

- **Get-HCXMigration**
  When using **Get-HCXMigration**, the migration progress percentage shows 0.
- **Get-HCXNetwork**
  When running **Get-HCXNetwork**, PowerCLI does not recognize the **OpaqueNetwork** network types.
- **Get-OvfConfiguration**

Get-OvfConfiguration does not display the full network name when it contains **"."**.

- **Get-SpbmCapability**
  When running **Get-SpbmCapability**, PowerCLI does not interpret correctly capabilities of type **System.Array**.
- **Get-VMHostHardware**
  When using **Get-VMHostHardware** for some ESXi hosts, the PowerShell process fails.
- **Move-VM**
  - When you run **Move-VM** against vSphere 6.7 or later, you cannot move a virtual machine to the folder destination.
  - When running Cross vCenter vMotion with PowerCLI, an error message of type **Object reference not set to an instance of an object** appears.
  - When you try to move a powered off virtual machine to a folder, the operation fails with a message of type **Unable to access the virtual machine configuration: Unable to access file**.
- **New-HCXMigration**
  You cannot trigger an HCX OS Assisted Migration, if the destination site is VMware Cloud Director.
- **New-NetworkAdapter**
  When using **New-NetworkAdapter** on some guest operating systems, the cmdlet does not respect the **Type** parameter and always creates **Vmxnet** network adapters.
- **Remediate-Inventory**
  When you run **Remediate-Inventory**, the operation fails with a message of type **"registry.proxy.' is invalid or exceeds the maximum number of characters permitted'**.
- **Set-DrsClusterGroup**
  When using **Set-DrsClusterGroup**, you cannot add virtual machines to an empty DRS group.
- **Set-DRSRule**
  If you try to update multiple DRS rules from different servers and specify virtual machines with identical IDs on different servers, you receive an error message and the process fails.
- **Update-Entity**
  When you run **Update-Entity**, the operation fails with a message of type **"registry.proxy.' is invalid or exceeds the maximum number of characters permitted'**.
- **Update-VmfsDatastore**
  When you try to upgrade a VMFS5 datastore to VMFS6 by using the **Update-VmfsDatastore** cmdlet, an error message of type **item has already been added. key in dictionary** appears.

Known Issues

VMware PowerCLI 12.1.0 is known to have the following issues:

- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.
  Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.
- **Import-Module**
  If you try to import **VMware.PowerCLI** module on PowerShell Core, you receive an error message and the import process fails.
  Workaround: Import each module separately.
- **New-HCXServiceMesh**

When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.

- **Set-VsanClusterConfiguration**
  When you run **Set-VsanClusterConfiguration**, the **AddSilentHealthCheck** and **RemoveSilentHealthCheck** parameters do not update any values.
  Workaround: Update to vSAN 6.7.
- **Set-WMCluster**
  The default value of the **DefaultImageRegistryHostPort** parameter is 443, but this is not implemented.
  Workaround: Always define the **DefaultImageRegistryHostPort** parameter when the **DefaultImageRegistryHostname** parameter is specified.
- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Other**
  – When you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
  Workaround: Use the vSphere Web Client to check the actual server-side error.
  – If you use multiple PowerShell ISE tabs and try to run **Import-Module**, you might receive an error message.
  Workaround: Use multiple PowerShell ISE instances instead of using multiple ISE tabs within a single ISE instance.
  – Certain methods in **com.vmware.nsx.model.firewall_section** enforce optional strings where they are not required.

VMware PowerCLI 12.0.0 Release Notes

This document contains the following sections

Introduction

Released 02 April 2020
VMware PowerCLI 12.0.0 Build **15947286**
Release notes last updated on 16 September 2020.
Check frequently for additions and updates to these release notes.

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VMware PowerCLI Components

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- **VMware.PowerCLI**: Provides a root module which other modules are dependent on. This ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
- **VMware.VimAutomation.Core**: Provides cmdlets for automated administration of the vSphere environment.
- **VMware.VimAutomation.Common**: Provides functionality that is common to all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Sdk**: Provides SDK functionality that is needed by all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
- **VMware.VimAutomation.Vds**: Provides cmdlets for managing vSphere distributed switches and distributed port groups.
- **VMware.VimAutomation.Cis.Core**: Provides cmdlets for managing vSphere Automation SDK servers.
- **VMware.VimAutomation.Storage**: Provides cmdlets for managing vSphere policy-based storage.
- **VMware.VimAutomation.License**: Provides the Get-LicenseDataManager cmdlet for managing VMware License components.
- **VMware.ImageBuilder**: Provides cmdlets for managing depots, image profiles, and VIBs.
- **VMware.DeployAutomation**: Provides cmdlets that provide an interface to VMware Auto Deploy for provisioning physical hosts with ESXi software.
- **VMware.VimAutomation.Cloud**: Provides cmdlets for automating vCloud Director features.
- **VMware.VimAutomation.vROps**: Provides cmdlets for automating vRealize Operations Manager features.
- **VMware.VimAutomation.HorizonView**: Provides cmdlets for automating VMware Horizon features.
- **VMware.VimAutomation.Nsxt**: Provides cmdlets for managing NSX-T servers.
- **VMware.VimAutomation.Vmc**: Provides cmdlets for managing VMware Cloud on AWS features.
- **VMware.Vim**: Provides vSphere low-level binding libraries. This module has no cmdlets.
- **VMware.VimAutomation.Security**: Provides cmdlets for managing vSphere Security, including virtual Trusted Platform Module.
- **VMware.VimAutomation.Hcx**: Provides cmdlets for managing VMware HCX features.

In VMware PowerCLI 12.0.0, the following modules have been added:

- **VMware.VimAutomation.WorkloadManagement**: Provides cmdlets for managing Project Pacific.
- **VMware.CloudServices**: Provides cmdlets for managing VMware Cloud Services.

Supported Platforms

For a list of VMware products with which VMware PowerCLI 12.0.0 is compatible, see VMware Product Interoperability Matrixes.

What's New

New Features

VMware PowerCLI 12.0.0 introduces the following new features, changes, and improvements:

- The new **VMware.VimAutomation.WorkloadManagement** module provides cmdlets for managing namespace lifecycle and policy.
  - **New cmdlets**
    Get/New/Set/Remove-WMNamespace

Get/New/Set/Remove-WMNamespacePermission
Get/New/Set/Remove-WMNamespaceStoragePolicy

- The new **VMware.CloudServices** module provides cmdlets for managing user invitation, activation, and roles.
  - **New cmdlets**
    Connect-Vcs
    Get-VcsOrganizationRole
    Get-VcsService
    Get-VcsServiceRole
    Get-VcsUser
    Get-VcsUserInvitation
    New-VcsOAuthSecurityContext
    New-VcsUserInvitation
    Remove-VcsUser
    Remove-VcsUserInvitation
- A number of new cmdlets have been added to the **VMware.VimAutomation.Vmc** module.
  - **New cmdlets for managing VMware Cloud on AWS clusters and organization information**
    Get-VmcOrganization
    Get-VmcSddcCluster
    New-VmcSddcCluster
    Remove-VmcSddcCluster
- A number of new cmdlets have been added to the **VMware.VimAutomation.Storage** module.
  - **New cmdlets for lifecycle management of the vSAN file service domain**
    Get/New/Set/Remove-VsanFileServiceDomain
    New-VsanFileServiceIpConfig
  - **New cmdlets for lifecycle management of the vSAN file share**
    Get/New/Set/Remove-VsanFileShare
    New-VsanFileShareNetworkPermission
  - **New cmdlets for management of the vSAN file service OVF**
    Add-VsanFileServiceOvf
    Get-VsanFileServiceOvfInfo
- A number of new cmdlets have been added to the **VMware.VimAutomation.Hcx** module.
  - **New cmdlets for managing HCX Mobility Group**
    Get/New/Set-HCXMobilityGroup
    New-HCXMobilityGroupConfiguration
    Start-HCXMobilityGroupMigration
    Stop-HCXMobilityGroupMigration
    Set-HCXMobilityGroupConfiguration
  - **New cmdlets for managing VMware HCX OS Assisted Migration (OSAM)**
    Uninstall-HCXSentinel
    Update-HCXSentinel
- A number of new cmdlets have been added to the **VMware.VimAutomation.Core** module.
  - **New cmdlets for managing vSphere network stacks**
    Get-VMHostNetworkStack
    Set-VMHostNetworkStack
  - **New cmdlet for managing vSphere guest disk information**

Get-VMGuestDisk

- A number of new cmdlets have been added to the **VMware.DeployAutomation** and **VMware.ImageBuilder** modules.
  - **New cmdlets for managing auto-bootstrapping**
    New/Set/Reset-LCMClusterRuleWithTransform
  - **New cmdlets for managing new-style depots in vSphere 7.0**
    Get-DepotAddons
    Get-DepotBaseImages
    Get-DepotComponents
    Get-DepotInfo
    Get-DepotVibs
    New-IsoImage
    New-PxeImage
- A number of new cmdlets have been added to the **VMware.VimAutomation.Security** module.
  - **New cmdlets for lifecycle management of the Workload vCenter Server system**
    Add/Get/Remove-AttestationServiceInfo
    Add/Get/Remove-KeyProviderServiceInfo
    Add-TrustedClusterAttestationServiceInfo
    Add-TrustedClusterKeyProviderServiceInfo
    Get-TrustedCluster
    Get-TrustedPrincipal
    Get-Tpm2EndorsementKey
    Import-TrustAuthorityServicesInfo
    Set-TrustedCluster
    Register-KeyProvider
    Unregister-KeyProvider
    Export-Tpm2CACertificate
    Export-Tpm2EndorsementKey
    Export-TrustedPrincipal
    Export-VMHostImageDb
    Remove-TrustedClusterAttestationServiceInfo
    Remove-TrustedClusterKeyProviderServiceInfo
  - **New cmdlets for lifecycle management of the Trust Authority vCenter Server system**
    Add/Get/Remove-TrustAuthorityKeyProviderServer
    Add/Get/Set/Remove-TrustAuthorityKeyProviderServerCertificate
    Get-TrustAuthorityAttestationService
    Get-TrustAuthorityCluster
    Get/New/Set/Remove-TrustAuthorityKeyProvider
    Get/New/Set/Export-TrustAuthorityKeyProviderClientCertificate
    Get/New/Remove-TrustAuthorityPrincipal
    Get/New/Remove-TrustAuthorityTpm2CACertificate
    Get/New/Remove-TrustAuthorityTpm2EndorsementKey
    Get/New/Remove-TrustAuthorityVMHostBaseImage
    Get-TrustAuthorityKeyProviderClientCertificateCSR
    Get-TrustAuthorityKeyProviderService
    Get-TrustAuthorityTpm2AttestationSettings
    Get-TrustAuthorityServicesStatus

New-TrustAuthorityKeyProviderClientCertificateCSR
Set-TrustAuthorityTpm2AttestationSettings
Set-TrustAuthorityCluster
Export-TrustAuthorityServicesInfo

- The **VMware.VimAutomation.vROps** module has been updated to support VMware vRealize Operations Manager 8.0 and work on Linux and macOS.
- The **VMware.VimAutomation.License** module has been ported to work on Linux and macOS.
- The **VMware.Vim** module has been updated to contain API bindings for vSphere 7.0.
- The **VMware.VimAutomation.HorizonView** module has been updated to support VMware Horizon 7 version 7.12.
- The **New-VcsOAuthSecurityContext** cmdlet has been moved from the **VMware.VimAutomation.Vmc** module to the new **VMware.CloudServices** module.
- The security of the **New-VcsOAuthSecurityContext** cmdlet has been improved when using a browser authentication by adding support for Proof Key for Code Exchange (PKCE).
- The **New-OAuthSecurityContext** cmdlet has been added to the **VMware.VimAutomation.Common** module to allow an OAuth authentication in vSphere 7.0.
- The **Network** and **StoragePolicy** parameters have been added to the **Move-VM** cmdlet. The **Network** parameter allows to specify the virtual network, including opaque networks, to which you want to migrate the virtual machine network adapters. The **StoragePolicy** parameter provides the ability to specify the storage policy for the virtual machine.
- The **Get-VMGuestDisk** cmdlet has been added to provide guest disk information for a virtual hard disk.
- The **VMGuestDisk** parameter has been added to the **Get-HardDisk** cmdlet to allow retrieving virtual hard disks by guest disks.
- The **NetworkStack** parameter has been added to the **New-VMHostNetworkAdapter** cmdlet to allow specifying the network stack of a virtual machine host network adapter.
- The **Open-VMConsoleWindow** cmdlet has been ported to work on Linux and macOS and VMware VMRC is a prerequisite for this cmdlet.
- The **UseRemoteAuthentication** parameter has been added to the **Connect-NsxtServer** cmdlet to support the Workspace ONE authentication.
- The **MobilityGroupMigration** parameter has been added to the **New-HCXMigration** cmdlet enabling you to create a client side **HCXMigration** object which can be provided as an input to the **New-HCXMobilityGroup** cmdlet.
- The **Vcpus** and **Memory** parameters have been added to the **Get-HCXMigration** cmdlet.
- The **Force** parameter has been added to the **Remove-HCXServiceMesh** and **Remove-HCXNetworkExtension** cmdlets providing the ability to force remove the service mesh and network extensions.

For more information on changes made in VMware PowerCLI 12.0.0, including improvements, security enhancements, and deprecated features, see the VMware PowerCLI Change Log. For more information on specific product features, see the VMware PowerCLI User's Guide. For more information on specific cmdlets, see the VMware PowerCLI Cmdlet Reference. For the full list of PowerCLI documentation, visit the VMware PowerCLI 12.0.0 Home Page

Resolved Issues

The following issues have been resolved in VMware PowerCLI 12.0.0:

- **Add-Passthroughdevice**
  Add-Passthroughdevice fails when you try to add another PCI device.
- **Get-AlarmDefinition**
  When using **Remove-AlarmAction**, you cannot remove some actions for a predefined alarm.
- **Get-CIUSer**
  If your role is not set, **Get-CIUser** fails.

- **Get-ContentLibrary**
  Get-ContentLibrary throws an error for content libraries that are backed by a file share.
- **Get-HCXMigration**
  When using **Get-HCXMigration**, some filters like **State**, **NumberOfMigration**, and **Username** might not work.
- **Get-OMAlertDefinition**
  If you run **Get-OMAlertDefinition** against vRealize Operations Manager 7.0 or later, you receive an error message of type **fromIndex(1000) > toIndex(448)**.
- **Get-SpbmStoragePolicy**
  When trying to retrieve Virtual Volumes replication group details, the operation throws an exception of type **The string was not recognized as a valid DateTime. There is an unknown word starting at index 0**.
- **Get-SpbmReplicationGroup**
  If the environment has a large number of replication groups, **Get-SpbmReplicationGroup** throws an error message of type **Exceeded the maximum number of elements in batch that the VASA provider can support**.
- **Move-VM**
  Cross vCenter vMotion of powered off virtual machines may fail to properly attach the network adapters to the specified port group and may leave them disconnected.
- **New-AlarmAction**
  When creating an email alarm action with multiple recipients, they do not appear correctly in the UI.
- **New-HardDisk**
  When running **New-HardDisk**, the maximum number of hard disks per SCSI controller is incorrectly determined by the ESXi server version instead of by the virtual machine hardware version.
- **Set-HCXMobilityGroupMigration**
  – When using **Set-HCXMobilityGroupMigration**, you cannot edit multiple parameters at the same time
  – When running **Set-HCXMobilityGroupMigration**, you cannot perform successive update operations on the mobility group.
- **Set-NetworkAdapter**
  You cannot connect virtual machine network adapters to opaque networks.
- **Other**
  – When calling **UpdateServerData()** method on a **vCloud Director** object, you might receive an error message of type **Resource not found**.

Known Issues

VMware PowerCLI 12.0.0 is known to have the following issues:

- **Add-EntityBaseline**
  The text of the error message that appears when you try to attach a baseline to a non-existing entity is improper.
- **Apply-DrsRecommendation**
  Apply-DrsRecommendation runs in asynchronous mode even when called without the **RunAsync** parameter.
- **Connect-VIServer**
  – **Connect-VIServer** cannot use the Kerberos network authentication protocol to connect to vCenter Server systems that are installed under a custom user account on a Windows system. **Connect-VIServer** uses NTLM instead.
  Workaround: Install and run vCenter Server under the default system account. Alternatively, you can:
    a. Add another IP to the Windows system where vCenter Server is running.
    b. Register a new A DNS record for the IP.

c. Run the **setspn** tool to register an SPN for the new DNS record and associate it with the vCenter Server account under which vCenter Server was installed.
   For example: To register an SPN for the vc-alias.domain.com DNS and the VCAccount account, run:
   setspn -A -HOST/vc-alias.domain.com Domain\VCAccount
d. Use the new DNS name to connect to the vCenter Server system.
   For example: Run **Connect-VIServer vc-alias.domain.com**

– When you use the **User** and **Password** parameters to authenticate with a vCenter Server 5.1 or later system, you might not be recognized as a domain user.
  Workaround: Pass the domain name and the user name to the **User** parameter.
  For example: Run **Connect-VIServer my.server.com -Username MyDomain\MyUserName -Password MyPassword**
– When you want to reconnect to a server in the same session by running **Connect-VIServer** on Windows 7, you might receive an error message of type **Invalid server certificate** or similar to this. The issue might occur even if you specify that invalid certificate errors should be ignored.
  Workaround:
  a. Use Windows 10.
  b. Restart the PowerShell session.
  c. Increase the value of **[System.Net.ServicePointManager]::MaxServicePointIdleTime** to a value that is larger than the expected idle time of the script.
  d. Trust the certificate of the server from the Windows systems certificate store.

- **Copy-DatastoreItem**
  Copy-DatastoreItem throws an error when uploading an item to the root folder of a Datastore Provider drive.
- **Copy-HardDisk**
  – On vCenter Server 5.0, **Copy-HardDisk** cannot change the storage format of the destination hard disk.
  – Using the **Thick2GB** value for the **DestinationStorageFormat** parameter is not supported. If you specify this value against an ESX 5.0 host, the connection to the ESX environment is lost.
- **Get-CIDatastore**
  When you specify the **ProviderVdc** parameter, **Get-CIDatastore** might return incorrect results if multiple provider virtual data centers share a datastore.
- **Get-CIVM**
  When you are logged in as SysAdmin, the **Get-CIVM** cmdlet returns system vShield Edge virtual machines used to establish perimeter security in the NAT-routed network.
- **Get-CIVApp**
  Get-CIVApp returns all virtual appliance objects in the inventory including expired ones.
- **Get-CIVAppTemplate**
  Get-CIVAppTemplate returns all virtual appliance templates in the inventory including expired ones.
- **Get-Cluster**
  You cannot specify the **VM** or **VMHost** parameters in combination with the **Location** and **NoRecursion** parameters.
- **Get-Datacenter**
  You cannot specify the **VM** or **VMHost** parameters in combination with the **Location** and **NoRecursion** parameters.
- **Get-HardDisk**
  The value of the **Persistence** property of the object returned by **Get-HardDisk** is different depending on the way the hard disk is retrieved by the cmdlet.
- **Get-HCXMigration**
  The **Username** parameter of the **Get-HCXMigration** cmdlet is case-sensitive.

Workaround: Use the username format supported by API. For example, use **Administrator@VSPHERE.LOCAL**.

- **Get-Log**
  When you try to retrieve a log from vSphere 6.0 or later, you might receive a **There is an error in XML document** error message.
  Workaround: Use the **Bundle** parameter to retrieve the whole log bundle, or the **StartLineNum** and **NumLines** parameters to retrieve specific lines from the log.
- **Get-OMAlert**
  If you use the **AssignedUser** parameter to filter alerts and some of the retrieved alerts are assigned to the **admin** user, **Get-OMAlert** returns those alerts with empty **AssignedUser** property.
  Workaround: To retrieve only the non-assigned alerts, use both the **AssignedUser** and **Status** parameters as filters.
- **Get-OMResource**
  The **ResourceKind** parameter does not work against vRealize Operations Manager 6.1.
  Note: The parameter works against vRealize Operations Manager 6.2.
- **Get-OMStat**
  The **Key** parameter does not work against vRealize Operations Manager 6.1.
  Workaround: Use a client-side script to filter by key.
  Note: The parameter works against vRealize Operations Manager 6.2.
- **Get-OMStatKey**
  If you retrieve statistic keys by **OMResource** instance, some items might have empty properties. The returned keys that identify metric data for a specific instance object, like a CPU or network adapter, do not contain a description or **ExtensionData** info.
- **Get-OMStatKey** does not work against vRealize Operations Manager 6.1.
  Note: The cmdlet works against vRealize Operations Manager 6.2.
- **Get-OMUser**
  Get-OMUser does not return the vRealize Operations Manager **amdin** user and other internal users. If you specify **admin** for the **Name** parameter, **Get-OMUser** returns **$null**.
- **Get-ResourcePool**
  You cannot specify the **VM** parameter in combination with the **Location** and **NoRecursion** parameters.
- **Get-ScsiLun**
  When you use **Get-ScsiLun** to retrieve Powerpath devices, the value of their **MultipathPolicy** property is shown as **Unknown**.
- **Get-SpbmStoragePolicy**
  If you try to retrieve storage policy contents and any VASA provider does not comply with the constraints in the resource storage policy, you receive a validation error for these resource storage policies. All valid storage policies are returned by the cmdlet.
- **Get-TagAssignment**
  If you run **Get-TagAssignment** against a vCenter Server 6.0.x system that uses a non-default HTTPS port, the cmdlet fails.
  Workaround: Configure the vCenter Server 6.0.x system to use the default HTTPS port (443).
- **Get-Template**
  The **Location** parameter of **Get-Template** does not accept **Cluster** objects.
- **Get-UsbDevice**

Get-UsbDevice cannot obtain USB devices from snapshots.

- **Get-View**
  - If you run **Get-View** with the **SearchRoot** and **ViewType** parameters and specify a property path for the **Property** parameter, the linked view of the cmdlet output is not populated.
  - You cannot retrieve the VMware PowerCLI view of the underlying port group from the vCloud Director PowerCLI view of a network pool backed by the port group.
- **Get-VIEvent**
  - If a nonexisting user is specified, **Get-VIEvent** returns the events for all existing users.
  - Objects returned by **Get-VIEvent** contain **ManagedObjectReference** types that are not compatible with the **Get-View** cmdlet.
- **Get-VM**
  - If a virtual machine is in the root virtual machine folder within a vApp and you try to retrieve the virtual machine by using the **NoRecoursion** parameter of **Get-VM** and specifying the root folder for the **Location** parameter, the virtual machine is not returned.
  - If a virtual machine is in the root virtual machine folder within a vApp and you try to retrieve the virtual machine by using **Get-VM**, the **<vm>.Folder** and **<vm>.FolderId** properties are returned as **$null**.
  - During the process of creating a template from a virtual machine, **Get-VM** returns both the virtual machine and template objects.
- **Get-VMHostProfileRequiredInput**
  On vCenter Server 5.0, **Get-VMHostProfileRequiredInput** returns a result even if you pass a hashtable with inapplicable elements.
- **Get-VsanResyncingComponent**
  Even if vCenter Server 6.0.x shows there are synchronizing components, **Get-VsanResyncingComponent** returns **$null**.
  Workaround: Upgrade to vCenter Server 6.5 or later.
- **Get-VTpmCertification**
  When you run **Get-VTpmCertification** on Linux or macOS, the **Subject** and **SubjectName** parameters do not appear correct.
- **Import-Module**
  - If you try to import the **VMware.ImageBuilder** module in a clean PowerShell session, you receive an error message and the import process fails.
    Workaround: Import the **VMware.VimAutomation.Core** module before importing the **VMware.ImageBuilder** module.
  - If you try to import **VMware.PowerCLI** module on PowerShell Core 6.0.1, you receive an error message and the import process fails.
    Workaround: Import each module separately.
- **Import-vApp**
  When you try to import a vApp and specify a datastore cluster to the **Datastore** parameter, PowerCLI automatically selects datastores from the specified cluster where to store the vApp, and if some of the datastores do not have enough free space, you receive an **Invalid datastore format** error message.
  Workaround: Ensure that there is enough free space on all datastores in the cluster, or use the **Datastore** parameter to specify a datastore that has enough free space.
- **Install-VMHostPatch**
  - **Install-VMHostPatch** cannot install patches on diskless ESXi servers.
  - **Install-VMHostPatch** cannot apply VIB patches.

Workaround: Use **metadata.zip** patches.

- **Invoke-VMScript**
  When using **Invoke-VMScript** to invoke multi-line BAT and BASH scripts, the command might not run all the script lines.
- **Move-VM**
  - When you run **Move-VM** and you try to pass two virtual machines by pipeline, the destination vApp might fail.
    Workaround: Use the following syntax:
    ```
    @($vm1, $vm2) | %{
    $_ | Move-VM -Destination $destVApp
    }
    ```
  - When you use **Move-VM** to migrate a virtual machine to another vCenter Server system, the operation fails with a message of type **A general system error occurred: Signature verification error. No verification key available**.
    This error occurs when the following criteria are met:
    The source vCenter Server system is version 6.5 or 6.5 Update 1.
    The source and destination vCenter Servers systems are associated with different Platform Services Controllers.
    The Secure Token Service (STS) instances on the two Platform Service Controllers are configured to use different signing certificates.
    Workaround: Upgrade the source vCenter Server system to version 6.5 Update 2 or later.
  - When you run **Move-VM** against vSphere 6.7 or later, you cannot move a virtual machine to the folder destination.
    Workaround: Instead of passing folders to the **Location** parameter, use the **InventoryLocation** parameter.
- **New-CIVAppNetwork**
  You can create a vApp network by specifying inconsistent network settings. While the settings of the newly created vApp network are inconsistent, you can only modify them to restore their consistency. To configure the vApp network, run **Set-CIVAppNetwork**.
- **New-DrsRule**
  If you try to create a new DRS rule by specifying multiple clusters from different servers and virtual machines with identical IDs on different servers, you receive an error message and the process fails.
  Workaround: Create a new DRS rule for each cluster separately.
- **New-HardDisk**
  New-HardDisk does not prompt for confirmation when you try to create a VMDK anti-affinity rule that overwrites an existing one.
- **New-HCXMigration**
  You cannot trigger an HCX OS Assisted Migration, if the destination site is vCloud Director.
- **New-HCXServiceMesh**
  When you run **New-HCXServiceMesh**, the **Service Mesh** object accepts destination as an input at the organization virtual datacenter level, but the **Service Mesh** object is created at an organization level.
- **New-OSCustomizationSpec**
  You cannot add a virtual machine to a domain by using OS customization.
- **New-PSDrive**
  When you run **New-PSDrive** on PowerShell Core 6.2 to create a new PSDrive with a root on a PowerCLI drive, the operation fails with a message of type **The specified root path does not exist or is not a container**.
  Workaround: Use an older version of PowerShell or use the PowerCLI drive.
- **New-SpbmRule**
  When you create an SPBM rule, you can specify a value for the **CacheReservation** property that is outside the valid range of 0 to 100. You can specify a value from 0 to 1,000,000 and divide it by 10,000 to get the value in percentage.

This value in percentage is displayed in the vSphere Web Client, while the actual value that you provide is displayed in PowerCLI.

- **New-VAIOFilter**
  If you try to install a VAIO filter on a cluster, the VAIO filter might install successfully on some hosts, but fail to install on other hosts.
  Workaround: Use **Get-VAIOFilter** to check whether the same VAIO filter is already installed on the cluster. If installed, use **Remove-VAIOFilter** before trying to install the same VAIO filter again.
- **New-VM**
  When you are connected to a server which uses an invalid certificate and you specify the **ContentLibraryItem** parameter when running **New-VM**, the process might become non-responsive.
  Workaround: Run **Set-PowerCLIConfiguration** and set the value of the **InvalidCertificateAction** parameter to **Ignore** or **Fail**.
- **New-VMHostNetworkAdapter**
  When you run **New-VMHostNetworkAdapter** against vSphere 6.7 and specify the **FaultToleranceLoggingEnabled** parameter, you might receive an error message of type **The VirtualNic capability 'faultToleranceLogging' is not supported on VMHost**.
  Workaround:
  a. Create a network adapter without specifying the **FaultToleranceLoggingEnabled** parameter.
  b. Update the network adapter by running **Set-VMHostNetworkAdapter** and specifying the **FaultToleranceLoggingEnabled** parameter.
- **Remove-VMHostNtpServer**
  When you run **Remove-VMHostNtpServer** with an ESX host version 7.0, you cannot remove the last NTP server from the list of the configured NTP servers.
  Workaround:
  a. To set a different NTP server, add the new NTP server by using **Add-VMHostNtpServer** and then remove the old NTP server by running **Remove-VmHostNtpServer**.
  b. To clear the list of the configured NTP servers, use the following script:
  ```
  $dateTimeConfig = New-Object VMware.Vim.HostDateTimeConfig
  $dateTimeConfig.NtpConfig = New-Object VMware.Vim.HostNtpConfig
  $dateTimeConfig.NtpConfig.Server = ""
  $dateTimeSystem = Get-View -Id $vmHost.ExtensionData.ConfigManager.DateTimeSystem
  $dateTimeSystem.UpdateDateTimeConfig($dateTimeConfig)
  ```
- **Set-DRSRule**
  If you try to update multiple DRS rules from different servers and specify virtual machines with identical IDs on different servers, you receive an error message and the process fails.
  Workaround: Update each DRS rule separately.
- **Set-OSCustomizationSpec**
  When you try to set the **Workgroup** parameter of **Set-OSCustomizationSpec** against .NET core on macOS, the cmdlet may fail with a message of type **Value cannot be null**.
- **Set-ScsiController**
  Set-ScsiController cannot set both the **Type** and **BusSharingMode** parameters at the same time when running against vCenter Server or ESX/ESXi versions 5.1 or earlier.
  Workaround: First run the cmdlet to set the type and then run it again to configure the bus sharing mode.
- **Set-SpbmEntityConfiguration**

You cannot disable SPBM on clusters in vSphere 6.0 environments.

- **Set-VMGuestNetworkInterface**
  On Windows operating systems, **Set-VMGuestNetworkInterface** becomes non-responsive if the provided IP address conflicts with an existing IP address on the network.
- **Set-VMHost**
  - When an ESX/ESXi host is registered with multiple vCenter Server systems, you cannot change the state of the disconnected host to connected.
    Workaround:
    a. Run **Remove-VMHost** to remove the disconnected host from the vCenter Server system that it is registered with.
    b. Run **Add-VMHost** to attach the host to the vCenter Server system again.
    c. (Optional) Run **Set-VMHost** to restore the initial configuration of the host.
    The operation authenticates you with the host and automatically changes its state to connected.
  - When you update the value of the **VMSwapfileDatastore** parameter and immediately retrieve the host information, the value of **VMSwapfileDatastore** might appear unchanged. If you retrieve the host information after a brief period of time, the change of the property value should be reflected.
- **Set-VMHostAuthentication**
  When you use **Set-VMHostAuthentication**, the host can leave the domain without an error even if the domain user is used for permission on that host.
- **Set-VMHostNetwork**
  Set-VMHostNetwork cannot clear the values of the **ConsoleV6Gateway** and **VMKernelV6Gateway** properties of the input object.
- **Set-VMHostNetworkAdapter**
  - If you connect to a vCenter Server 6.5 system and set an IPv6 address to a virtual NIC, the value of the **AutomaticIPv6** property is changed to **$true** instead of **$false**
    Workaround: When you set the IPv6 address, explicitly specify the value of the **AutomaticIPv6** parameter as **$false**.
  - If you have vMotion enabled on one VMKernel NIC and you enable it on a second NIC on the same switch by using **Set-VMHostNetworkAdapter**, the **VMotionEnabled** property of the second NIC might still report that vMotion is not enabled. This is because only one NIC can be selected for vMotion, but more than one can be candidate NICs for vMotion. To change the currently active vMotion NIC, first disable the current one and then enable the one you want.
- **Set-VMHostSNMP**
  - The default value of the **Set-VMHostSNMP TargetPort** parameter is a random number instead of the port number.
  - **Set-VMHostSNMP** skips the value of the **TargetPort** parameter.
  - **Set-VMHostSNMP** fails to enable **VMHostSNMP** and to set the **ReadOnlyCommunityString** when called for the first time.
    Workaround: Run the command again.
- **Set-VsanClusterConfiguration**
  When you run **Set-VsanClusterConfiguration**, the **AddSilentHealthCheck** and **RemoveSilentHealthCheck** parameters do not update any values.
  Workaround: Update to vSAN 6.7.
- **Test-HCXMigration**
  Test-HCXMigration throws an exception instead of a warning. This might mislead you that running **Start-HCXMigration** is not possible.
- **Inventory Provider**

When run within the Inventory Provider, **Get-Datacenter** returns the data centers from the default servers instead from the **VIServer** folder of the Inventory Provider drive.

- **Other**
  - If you have installed the SAP Crystal Reports runtime engine for .NET Framework and try to start the 64-bit version of PowerCLI, you might receive an error message of type **Could not load file or assembly 'log4net, Version=1.2.10.0, Culture=neutral, PublicKeyToken=692fbea5521e1304' or one of its dependencies. The system cannot find the file specified.**
    Workaround: Start Windows PowerShell (x86) and import the PowerCLI modules that you want to use.
  - When you run a cmdlet and the operation fails on the server side, you might receive a **There is an error in the XML document.** error message. This is not a valid server error and it is returned when PowerShell is unable to read the actual server-side error.
    Workaround: Use the vSphere Web Client to check the actual server-side error.
  - If you use multiple PowerShell ISE tabs and try to run **Import-Module**, you might receive an error message.
    Workaround: Use multiple PowerShell ISE instances instead of using multiple ISE tabs within a single ISE instance.
  - If you apply a policy created from VASA 1.0 capabilities to a virtual machine created on a vSAN datastore, the compliance status of the virtual machine is incorrectly displayed as non-compliant instead of not-applicable.
  - If you clone a virtual machine from an NFS datastore to a vSAN datastore with a mixed storage policy that has both VASA 1.0 and vSAN rule sets, the policy associated with **VM Home** is removed from the virtual machine.
  - If you create a linked clone of a virtual machine which is associated with a VASA 1.0 profile and then move the cloned virtual machine to a vSAN datastore, the virtual machine's **VM Home** and **HardDisk** properties are incorrectly displayed as compliant.
  - If you apply a storage policy that has vSAN capabilities to a **HardDisk** object, the SPBM compliance status of the **HardDisk** object changes to **outOfDate**.
  - You can modify the SPBM configuration of **VirtualMachine** and **HardDisk** objects after disabling SPBM on the cluster in which the objects are located.
  - Users without the **Profile-driven storage update** privilege can modify SPBM configuration on **VirtualMachine** and **HardDisk** objects, and can also enable or disable SPBM on **Cluster** objects.
  - You cannot create a storage policy if you do not specify a description for a tag or tag category.
  - You can create a storage policy by using a tag that has already been deleted from the SPBM server. When you retrieve information about the policy, the tag is shown as missing.
    Workaround: Use the **Get-Tag** cmdlet to verify that the tag you want to use exists on the SPBM server.
  - You can create rules by specifying a value for vSAN capabilities of the type **ValueType**. However, PowerCLI cannot verify whether the value assigned to the capability is within the allowed range of values because the **AllowedValue** property is not populated.
  - If you are logged in to vCloud Director as a regular user or an organization administrator, you might not be able to retrieve CIView by ID for some of the cloud objects.
    Workaround: Pass the object to the **Get-CIView** cmdlet.
  - If you try to run a script or binary code which creates new instances of the **VimClient** class from the **VMware.Vim.dll** module, you might receive a **MissingMethodException** error message.
    Workaround: Create new instances of the **VimClientImpl** class instead of the **VimClient** class.
  - The types labels in the **UpdateViewData** property are case-sensitive.
  - All guest OS cmdlets support use of SSPI for Windows guest machines if the underlying vCenter Server is version 5.0. This might not be valid for users who are local, and not domain users. Gest OS cmdlets are **Invoke-VMScript** and **Set-HardDisk** when used for guest disk resizing.
  - If you run an HCX cmdlet when the HCX service is down, you might receive an error message of type **Could not convert field messages of structure 'com.vmware.vapi.std.errors.service_unavailable'**.
    Workaround: Verify that the HCX services are working and run the command again.
  - Certain methods in **com.vmware.nsx.model.firewall_section** enforce optional strings where they are not required.

VMware PowerCLI Change Log

This document lists all changes introduced in the following VMware PowerCLI releases:

VMware PowerCLI 13.3

Released 25 Jul 2024 | Documentation

Change type	Description
feature	The `Get-VIPrivilegeReport` cmdlet is added to record the privilege checks that occur while running a specific script or task.
feature	The `New-AlarmTriggerArgumentNew-AlarmTriggerArgument` and `Get-AlarmTriggerArgumentAttributeName` cmdlets are added to support customizations to the alarms threshold.
feature	The `-NoHostSeeding` option is added to the `Export-EsxImageProfile` and `New-DeployRule` cmdlets to allow deploying hosts which do not support the host seeding feature. Such hosts cannot be used as a reference host when you create an image for a cluster or standalone host managed with a vSphere Lifecycle Manager image.
feature	The `New-HCXGuestOSNetworkCustomization` and `New-HCXGuestOSCustomization` cmdlets are added to support Guest OS customizations.
feature	To support managing OAuth 2.0 client registrations in vCenter Server, the following cmdlets are added to the `VMware.VimAutomation.Core` module: • `Get-VIOAuth2Client` • `New-VIOAuth2Client` • `Set-VIOAuth2Client` • `Remove-VIOAuth2Client` • `Start-VIOAuth2ClientSecretRotation` • `Complete-VIOAuth2ClientSecretRotation`
modification	The `Set-Cluster` , `Set-VMHost` , `Get-VMHost` , and `Get-Cluster` cmdlets are updated to support removing of components from the base image.
modification	The `Get-VsanSpaceUsage` , `Set-VsanClusterConfiguration` , and `Get-VsanClusterConfiguration` cmdlets are updated with new parameters to support vSAN Max clusters.
bug fix	`Get-VsanStat` Running the `Get-VsanStat` cmdlet without any filters fails in certain cases.
bug fix	`Set-VsanClusterConfiguration` When you try to deactivate ESA (Express Storage Architecture) on a vSAN cluster, the operation fails.
bug fix	`Set-VsanClusterConfiguration` When you try to enable vSAN max on a vSAN cluster created with activated ESA (Express Storage Architecture), the operation fails.
bug fix	`Get-DepotInfo` `Get-DepotInfo` returns the `Vendor name` and `Vendor code` as *unknown*.
bug fix	`Get-HCXMigration` Running the `Get-HCXMigration` cmdlet with the `-MigrationType` option fails.
bug fix	`New-AdvancedSetting` Running the `New-AdvancedSetting` cmdlet to create float values for an advanced setting, results in passing a wrong format to the vCenter Server system.

Change type	Description
bug fix	`Invoke-*` `Invoke-*` commands in the SDK modules do not serialize default values, even when the values have been set explicitly.
bug fix	`Invoke-ListServiceEntries` Running the `Invoke-ListServiceEntries` cmdlet, does not return any information regarding `Service Entries` for the specific service.
bug fix	`Invoke-SrmGet*` and `Invoke-VrGet*` When you try to retrieve an SRM/VR object by ID for an object that no longer exists, the operation results in bad error output.
bug fix	`Invoke-Srm*` and `Invoke-Vr*` The `VMware.Sdk.Srm` and `VMware.Sdk.Vr` modules does not work with vCenter Server instances that have UUIDs containing upper case letters.
bug fix	`New-OAuthSecurityContext` and `New-VcsOAuthSecurityContext` Running the `New-OAuthSecurityContext` and `New-VcsOAuthSecurityContext` cmdlets on PowerShell Core fails for the browser-based authentication workflow.
bug fix	`Get-WMNamespacePermission` , `Set-WMNamespacePermission` , `Remove-WMNamespacePermission` , and `New-WMNamespacePermission` Running any of the listed cmdlets fails due to issues with the deserialization of the `WMNamespacePermission` attribute.
bug fix	Undesired version of the `VMware.Powercli` module is installed Attempts to install a lower than the latest version of the `VMware.PowerCLI` module with the`Install-Module` cmdlet instead completes with the installation of the latest released version of the module.
bug fix	`VMware.ImageBuilder` module The `VMware.ImageBuilder` PowerCLI module cannot be used with Python version 3.12 due to a bug within the *zipfile* system module. The bug interferes with reading compressed files which makes ISO generation impossible. The bug has been resolved in the 3.12.1 release so customers planning to upgrade to Python 3.12 should choose the latest option in order to generate ISO images successfully.

VMware PowerCLI 13.2.1

Released 27 Nov 2023 | Documentation

Change type	Description
modification	**Id** properties and **Id** parameters has been changed from **guid** to **string**.For the vSphere Replication and Site Recovery Manager SDK cmdlets, the type of the object
bug fix	**vSphere Replication and Site Recovery Manager SDK cmdlets** On some vCenter Server systems, cmdlets from the **VMware.Sdk.Vr** and **VMware.Sdk.Srm** modules fail because the **Guid** property is provided in upper-case letters.

VMware PowerCLI 13.2.0

Released 8 Nov 2023 | Documentation

Change type	Description
feature	The **VMware.Sdk.Vcf.CloudBuilder** and **VMware.Sdk.Vcf.SddcManager** modules have been added to provide functionality for managing the VMware Cloud Foundation REST API with VMware PowerCLI.
feature	New cmdlet to export the desired state of a vSphere Lifecycle Manager host has been added to the **VMware.VimAutomation.Core** module: • **Export-LcmVMHostDesiredState**
feature	New cmdlet to retrieve a list of the most impactful vSAN performance contributors has been added to the **VMware.VimAutomation.Storage** module. • **Get-VsanPerformanceContributor**
feature	New cmdlet to create a vLCM-compliant offline bundle based on input depots and a software specification has been added to the **VMware.ImageBuilder** module. • **New-OfflineBundle**
modification	The **New-VmcSddc** and **New-VmcSddcCluster** cmdlets have been extended to support a new host type - **I4I**.
modification	The **Get-VsanSpaceUsage** cmdlet has been modified to include an **EsaOjectOverhead** value in the returned object.
modification	The **VMware.Vim** and **VMware.Sdk.vSphere.*** modules have been updated to support the API features of VMware vSphere 8.0 Update 2.
modification	The **VMware.VimAutomation.Storage** module has been updated to support the API features of VMware vSAN 8.0 Update 2.
modification	The **VMware.Sdk.Srm** module has been updated to support the API features of VMware Site Recovery Manager 8.8.
modification	The **VMware.Sdk.Vr** module has been updated to support the API features of vSphere Replication 8.8.
modification	The **VMware.Sdk.Nsx.Policy** module has been updated to support the API features of NSX 4.1.2.
modification	The **VMware.VimAutomation.HorizonView** module has been updated to support the API features of VMware Horizon 8 2306.
bug fix	**Tagging and content library cmdlets** Certain cmdlets that use tagging or content library functionality (**Get-TagAssignments**, **Get-SpbmStoragePolicy**, and so on) stop working and the vCenter has to be rebooted.
bug fix	**Remove-AlarmAction** **Remove-AlarmAction** does not remove all triggers for SNMP actions.
bug fix	**Set-VMHostNetworkAdapter** When you run **Set-VMHostNetworkAdapter -AutomaticIPv6 $false**, a statically configured IPv6 address is also removed.
bug fix	**Connect-VIServer** Reconnecting to an ESXi host after reboot with **Connect-VIServer** in the same PowerShell session fails with an error message of type **Object reference not set to an instance of an object**.
bug fix	**Get-vSANStat** **Get-vSANStat** fails with an error message stating that a vSAN ESA feature is not available.
bug fix	**All ImageBuilder Cmdlets** If you have installed on your machine the public distribution of **pyVmomi** through **pip**, all **VMware.ImageBuilder** cmdlets do not work.

Change type	Description
bug fix	**New-IsoImage**, **New-PxeImage**, and **Export-EsxImageProfile** An image generated through the **VMware.ImageBuilder** module when using Python version 3.8 or later fails to boot even if no issues were encountered during image creation.
bug fix	**Remove-EsxSoftwarePackage** **Remove-EsxSoftwarePackage** doesn't throw a warning when removing an invalid software package from the image profile.

VMware PowerCLI 13.1.0

Released 19 Apr 2023 | Documentation

Change type	Description
feature	The **VMware.Sdk.Vr** module has been added to provide functionality for managing the VMware vSphere Replication REST API with VMware PowerCLI.
feature	The **VMware.Sdk.Srm** module has been added to provide functionality for managing the VMware Site Recovery Manager REST API with VMware PowerCLI.
feature	New cmdlets to manage Lifecycle Manager offline depots have been added to the **VMware.VimAutomation.Core** module. • **Get-LcmOfflineDepot** • **New-LcmOfflineDepot**
feature	New cmdlets for vCenter Server remote datastore management have been added to the **VMware.VimAutomation.Storage** module: • **New-VsanHCIMeshDatastoreSource** • **Get-VsanHCIMeshDatastoreSource** • **Remove-VsanHCIMeshDatastoreSource** • **Get-VsanHCIMeshDatastore**
feature	New cmdlets for vSAN direct disk management have been added to the **VMware.VimAutomation.Storage** module: • **New-VsanDirectDisk** • **Get-VsanDirectDisk** • **Remove-VsanDirectDisk**
feature	New cmdlets for vSAN cluster shutdown have been added to the **VMware.VimAutomation.Storage** module: • **Get-VsanClusterPowerState** • **Start-VsanCluster** • **Stop-VsanCluster**
feature	New cmdlet to start objects relayout has been added to the **VMware.VimAutomation.Storage** module: **Start-VsanRelayoutObjects**
feature	New cmdlet to enable the mounting of remote vSAN datastores from vSAN stretched clusters has been added to the **VMware.VimAutomation.Storage** module: **New-RemoteVsanServerClusterConfig**
modification	The **MountXVCDatastore**, **UnmountXVCDatastore**, and **RemoteVsanClusterServerConfig** parameters have been added to the **Set-VsanClusterConfiguration** cmdlet to support vCenter Server remote datastore management.
modification	The **Perspective** parameter has been added to the **Test-VsanClusterHealth** cmdlet to support the precheck for vSAN cluster shutdowns.

Change type	Description
modification	The **Connect-CIServer** cmdlet has been modified for authentication through the new VMware Cloud Director API endpoint.
modification	The **Import-CIVappTemplate** cmdlet interface has been changed when importing from an OVF file: the **Catalog** parameter is now mandatory and the **OrgVdc** parameter has been removed.
modification	The **SourcePath** parameter of the **Import-CIVappTemplate** cmdlet is now mandatory when resuming import from an OVF file.
modification	A new **URL** parameter has been added to the **Import-CIVappTemplate** cmdlet to enable importing of vApp templates from an URL.
modification	The **BaseImage**, **VendorAddOn**, **Component**, **FirmwareAddon**, and **DepotOverride** parameters have been added to the **Set-VMHost** cmdlet to enable vSphere Lifecycle Manager host image configuration.
modification	The **FirmwareAddon** property has been added to the cluster object to record the hardware support packages associated with the cluster.
modification	The performance of the **Get-Stat** cmdlet has been improved for the instances when you use the **Start** parameter.
modification	A **LastAttestedTime** field has been added to the **TrustAuthorityVMhostBaseImage** object to represent the last attested time for Bluehost.
modification	The **Export-VMHostImageDb** cmdlet has been modified to warn you about an ESXi Quick Boot and download a **boot_imgdb.tgz** file instead of an **image.tgz** file.
modification	The **VMware.ImageBuilder** module has been updated to work with Python version 3.7.1 or later.
modification	The **VMware.Vim** and **VMware.Sdk.vSphere.*** modules have been updated to support the API features of VMware vSphere 8.0 Update 1.
modification	The **VMware.Sdk.Nsx.Policy** module has been updated to support the API features of NSX 4.1.0.
modification	The **VMware.VimAutomation.HorizonView** module has been updated to support the API features of VMware Horizon 8 2212.
bug fix	**New-VM** **New-VM** cannot create a Windows 2019 virtual machine when the ESXi server default compatibility level is set to a version that does not support Windows 2019.
bug fix	**Export-VDSwitch** In PowerShell 5.1, **Export-VDSwitch** generates a .ZIP file that cannot be imported through the vSphere Client.
bug fix	**Get-VIPermission** **Get-VIPermission** fails with a message of type **The given key ... was not present in the dictionary**.
bug fix	**Copy-VMGuestFile** **Copy-VMGuestFile** fails if the VM's guest OS information is not fully populated.
bug fix	**Export-VDPortGroup** Portgroups exported by using **Export-VDPortGroup** cannot be restored with **Set-VDPortGroup**.
bug fix	**Import-CIVappTemplate** Importing a vApp Template from a local OVF file with **Import-CIVappTemplate** does not work.
bug fix	**Get-CNSVolume** **Get-CNSVolume** does not work when there is a mismatch between volume and vDisk.
bug fix	**New-SpbmStoragePolicy** **New-SpbmStoragePolicy** fails with a message of type **The parameter CommonRule should contain only VAIOfilter rules**.

Change type	Description
bug fix	**Import-TrustAuthorityServiceInfo** **Import-TrustAuthorityServiceInfo** fails when a vSphere Trust Authority host is removed.
bug fix	**Get-Tag** and **Get-TagAssignment** On vCenter Server version 8.0 and later, the **Name** parameter is case-sensitive.
bug fix	**ImageBuilder cmdlets** • On MacOS, **ImageBuilder** cmdlets fail with a message of type **ModuleNotFoundError: No module named 'vmware.esximage'**. • On MacOS, if Homebrew and Python are not run and installed through a Rosetta terminal, **ImageBuilder** cmdlets fail with a message related to importing the VibSign module.

VMware PowerCLI 13.0.0

Released 22 Nov 2022 | Documentation

Change type	Description
feature	The **VMware.ImageBuilder** and **VMware.DeployAutomation** modules have been ported to work on macOS and Linux (the **VMware.ImageBuilder** module now requires **Python 3.7** and the **six**, **psutil**, **lxml**, and **pyopenssl** Python packages as a prerequisite).
feature	New cmdlets have been added to the **VMware.VimAutomation.Storage** module to enable vSAN ESA cluster disk management support: • **Get-VsanEsaEligibleDisk** • **Add-VsanStoragePoolDisk** • **Get-VsanStoragePoolDisk** • **Remove-VsanStoragePoolDisk**
feature	New cmdlet has been added to the **VMware.VimAutomation.Security** module to retrieve Trusted Platform Module (TPM) devices from a specified host: **Get-VMHostTPM**
modification	The **VMware.VimAutomation.Cloud** module has been updated to support the API features of VMware Cloud Director 10.4.
modification	A new parameter set has been added to the **New-CIVM** cmdlet to allow the creation of an empty VM in a vApp.
modification	The **StorageProfile** parameter has been added to the **New-OrgVdc** cmdlet to enable the creation of an organization virtual datacenter with a specified storage profile.
modification	The **VMHardwareVersion** property has been added to the **CIVM** object to replace the **VMVersion** property which has been deprecated.
modification	The **HighestSupportedHardwareVersionString** property has been added to the **ProviderVdc** object to replace the **HighestSupportedHardwareVersion** property which has been deprecated.
modification	The **PytonPath** parameter has been added to the **Set-PowerCLIConfiguration** cmdlet to allow specifying the path to the Python version required by the **VMware.ImageBuilder** module.
modification	The **CustomizationScript** parameter has been added to the **New/Set-OsCustomizationSpec** cmdlet to allow specifying a customization script to be executed during OS customization.
modification	The **Ipv6Prefix**, **Ipv6Address**, **Ipv6Mode**, **Ipv6VcApplicationArgument**, **Ipv6Gateway**, and **Ipv6AlternateGateway** parameters have been added to the **New/Set-OsCustomizationNicMapping** cmdlets to allow specifying Ipv6 customization parameters.
modification	The **VsanEsaEnabled** parameter has been added to the **New-Cluster** and **Set-Cluster** cmdlets to enable support for vSAN ESA enabled clusters.

Change type	Description
modification	The **VMHostTPM** parameter has been added to the **Get-Tpm2EndorsementKey** cmdlet to allow getting TPM 2.0 endorsement key information.
modification	The **VsanEsaEnabled** parameter has been added to the **Get-VsanClusterConfiguration** cmdlet to check if a cluster is vSAN ESA enabled.
modification	The **Get/New/Set-SpbmStoragePolicy** cmdlets have been updated to support consumption domain (availability zone) storage policy.
modification	The **VMware.VimAutomation.Storage** module has been updated to support the API features of vSAN 8.0.
modification	The **VMHostTPM** parameter has been added to the **Get-Tpm2EndorsementKey** cmdlet to allow getting TPM 2.0 endorsement key information.
modification	The **EnableSeedCheckpoint** parameter has been added to the **New-HCXMigration** cmdlet to enable a seed checkpoint for Bulk migration.
modification	The **MigrateCustomAttributes** parameter has been added to the **New-HCXMigration** and **New-HCXMobilityGroupConfiguration** cmdlets to enable migration of custom attributes.
modification	The **VMware.Sdk.Nsx.Policy** module now accepts JSON and PowerShell objects as input for its client-side parameters (usually built with **Initialize-*** cmdlets).
modification	The **VMware.Vim** and **VMware.Sdk.vSphere.*** modules have been updated to support the API features of VMware vSphere 8.0.
modification	The **VMware.VimAutomation.HorizonView** module has been updated to support the API features of VMware Horizon 8 2209.
deprecation	The **Get-NsxtPolicyService**, **Get-NsxtGlobalManagerService**, and **Get-VmcSddcNetworkService** cmdlets have been deprecated. Use the cmdlets from the **VMware.Sdk.Nsx.Policy** module instead.
deprecation	The **Get/New/Set/Remove-OrgNetwork** cmdlets have been removed. Use **Get/New/Set/Remove-OrgVdcNetwork** instead.
bug fix	**Get-NetworkPool** **Get-NetworkPool** does not return NSX-backed network pools.
bug fix	**Connect-CIServer** **Connect-CIServer** fails when trying to connect to VMware Cloud Director 10.4 with a message of type **NOT_ACCEPTABLE: The request has invalid accept header: Invalid API version requested**.
bug fix	**New-VM** • **New-VM** fails when trying to create a VM with a user with limited permissions to **CryptoManager** even if encryption is not requested. • The customization script in the VM customization spec is not applied when cloning a Linux VM by using PowerCLI.
bug fix	**Get-Tag** **Get-Tag** fails when executed in a remote session with a message of type **Failed to create RSA key: The requested operation cannot be completed. The computer must be trusted for delegation and the current user account must be configured to allow delegation**.
bug fix	**Test-HCXMigration** **Test-HCXMigration** throws an **INVALID_REQUEST** error when there are any errors or warnings in the migration request.
bug fix	**Test-HCXMobilityGroup** **Test-HCXMobilityGroup** throws an **INVALID_REQUEST** error when there are any errors or warnings in the mobility group

Compatibility Matrix for VMware PowerCLI

This document lists all changes introduced in the following VMware PowerCLI releases:

Compatibility Matrix for VMware PowerCLI 13.3

Last Updated on: 24 July 2024

The *Compatibility Matrix for VMware PowerCLI 13.3* describe the compatibility between VMware PowerCLI 13.3 and platforms, guest operating systems, PowerShell versions, and other VMware solutions. Where compatibility information for VMware PowerCLI exists in the *VMware Product Interoperability Matrix*, the present matrixes describe how to use this tool to find the relevant information. Where the *VMware Product Interoperability Matrix* do not provide information relating to VMware PowerCLI, this information is listed here.

Local operating system support

You can install VMware PowerCLI 13.3 on the following operating systems:

OS Type	64-Bit
Server	Windows Server
Workstation	• Windows • Linux • macOS

The local operating system needs to support required .NET and PowerShell versions (check the *Installation Prerequisites* section for more details).

Guest operating system support

You can run VMware PowerCLI 13.3 guest cmdlets against virtual machines with installed VMware Tools. Check the release notes of the specific VMware Tools version for a list of supported operating systems.

> **NOTE**
> Guest cmdlets are not compatible with IPv6 environments.

Supported PowerShell versions

VMware PowerCLI 13.3 is compatible with the following PowerShell versions:

- Windows PowerShell 5.1
- PowerShell 7.x

Installation Prerequisites

Before installing and running VMware PowerCLI, verify that you have installed the required software on the same machine.

If you want to work with VMware PowerCLI 13.3, make sure that the following software is present on your system:

OS Type	.NET Version	PowerShell Version
Windows	.NET Framework 4.7.2 or later .NET Core 3.1	Windows PowerShell PowerShell 7.x
Linux	.NET Core 3.1	PowerShell 7.x
macOS	.NET Core 3.1	PowerShell 7.x

Some specific PowerCLI functionalities listed below have additional prerequisites:

Functionality	Prerequisite
VMware.ImageBuilder module	Python 3.7.1 or newer and the following additional Pytho
Open-VMConsoleWindow cmdlet	VMware Remote Console (VMRC)

Interoperability with VMware Solutions

You can use the VMware PowerCLI components to manage all supported VMware products.For details of the interoperability of VMware PowerCLI with vCenter Server, ESXi, VMware Cloud Director, VMware vSAN, VMware Site Recovery Manager, vSphere Replication, VMware Aria Operations, VMware Cloud on AWS, VMware NSX-T, VMware Hybrid Cloud Extension, and VMware Horizon, check the VMware Product Interoperability Matrix.

1. Go to https://interopmatrix.broadcom.com/Interoperability.
2. Make sure **Interoperability** is selected.
3. From the **Select a Solution** drop-down menu, select **VMware PowerCLI**.
4. From the **Version** drop-down menu, select **13.3**.
5. From the **Add Platform/Solution** drop-down menu, select a VMware solution, product, or feature, for example, **VMware vCenter Server** or **VMware ESX/ESXi**.
6. If you want to add more solutions, click **Add Another Solution**.

Disclaimer

VMware PowerCLI User's Guide

The *VMware PowerCLI User's Guide* provides information about installing and using the VMware PowerCLI cmdlets (pronounced “commandlets”) for managing, monitoring, automating, and handling operations for VMware® vSphere, VMware Site Recovery Manager (SRM), vSphere Automation API, vSAN, VMware Cloud Director, vSphere Update Manager, VMware Aria Operations, VMware Horizon, VMware NSX, VMware HCX, and VMware Cloud on AWS components.

To help you start with PowerCLI, this documentation includes descriptions of specific PowerCLI concepts and features. In addition, this documentation provides a set of use case examples and sample scripts.

Intended Audience

This guide is intended for anyone who wants to install and use PowerCLI. This documentation is written for administrators and developers who are familiar with virtual machine technology and PowerShell.

- Basic administrators can use cmdlets included in PowerCLI to manage their vSphere, VMware Site Recovery Manager (SRM), vSphere Automation API, vSAN, VMware Cloud Director, vSphere Update Manager, VMware Aria Operations, VMware Horizon, VMware NSX, VMware HCX, and VMware Cloud on AWS infrastructure from the command line.
- Advanced administrators can develop PowerShell scripts that other administrators can reuse or integrate into other applications.

Updated Information

This section is updated with each release of the product or when necessary.

This table tracks record of the updated information in the *VMware PowerCLI User's Guide* starting from the 12.4.0 release.

PowerCLI Version / Publish Date	Description
13.3.0 / 1 OCTOBER 2024	Updated the information about how to connect to vCenter Server federated to Active Directory Federation Services (AD FS) or to another external identity provider managed by VMware Identity Services. See Connecting to a vCenter Server System
13.2.0 / 27 NOVEMBER 2023	• Added two new topics to Managing VMware vSAN with VMware PowerCLI: – Create a vSAN ESA-Enabled Cluster – Mount and Unmount Remote vSAN Datastores
13.2.0 / 08 NOVEMBER 2023	• Added information about non-disruptive Machine SSL certificate renewal. See Change the Machine SSL Certificate of vCenter Server. • Revamped and reorganized Managing vSphere with VMware PowerCLI. • Updated Installing and Configuring Python for PowerCLI and its subtopics. • Added the new modules, `VMware.Sdk.Vcf.*` to PowerCLI Modules.
13.1.0 / 04 AUGUST 2023	• Added a new chapter: Managing vSphere Lifecycle Manager with VMware PowerCLI. • Optimized the Introduction to VMware PowerCLI chapter.
13.1.0 / 27 JUNE 2023	• Added a new chapter: Managing the Site Recovery Manager (SRM) API with VMware PowerCLI. • Added two new modules, `VMware.Sdk.Vr` and `VMware.Sdk.Srm` to PowerCLI Modules. • Reorganized the chapter structure of the book.
13.1.0 / 22 MAY 2023	• Added a new chapter: Managing the vSphere Replication API with VMware PowerCLI.
13.0.0 / 22 NOV 2022	• Added a new chapter: Installing and Configuring Python for PowerCLI. Starting from PowerCLI 13.0, Python is a requirement for the `VMware.ImageBuilder` module.
12.7.0 / 07 NOV 2022	• Added a new chapter: Managing the NSX Policy API with VMware PowerCLI.
12.7.0 / 08 AUG 2022	• Added information on how to connect to a vCenter Server that is federated to Active Directory Federation Services (AD FS). See Connect to a vCenter Server System Configured to Use AD FS for an External Identity Provider.
12.6.0 / 07 APR 2022	• Removed non-inclusive language terms from the *PowerCLI User's Guide* and replaced them with appropriate alternatives. • Added a new module, `VMware.Sdk.Nsx.Policy`, to PowerCLI Modules.
12.5.0 / 13 JAN 2022	• Added information on how to manage the certificates of your vSphere environment with VMware PowerCLI. See the new chapter Managing Certificates.
12.4.0 / 28 SEP 2021	• Added an Updated Information topic. • Updated the procedure for uninstalling PowerCLI from your system. See Uninstall PowerCLI.
12.4.0 / 16 SEP 2021	• Added information about the new VMware PowerCLI modules for the 12.4.0 release. See PowerCLI Modules. • Updated the chapter on managing VMware Cloud on AWS with PowerCLI and added many new scripts. See Managing VMware Cloud on AWS with VMware PowerCLI. • Added information, procedures, and sample scripts for the vSphere Automation SDK for PowerShell, which was introduced in VMware PowerCLI 12.4.0. See Managing the vSphere Automation API with VMware PowerCLI.

Introduction to VMware PowerCLI

VMware PowerCLI contains modules of cmdlets based on Microsoft PowerShell for automating vSphere, VMware Site Recovery Manager (SRM), vSphere Automation API, vSAN, VMware Cloud Director, vSphere Update Manager, VMware Aria Operations, VMware Horizon, VMware NSX, VMware HCX, and VMware Cloud on AWS administration. VMware PowerCLI provides a PowerShell interface to the VMware product APIs.

Microsoft PowerShell Basics

PowerCLI is based on Microsoft PowerShell and uses the PowerShell basic syntax and concepts.

Microsoft PowerShell is both a command-line and scripting environment. It uses the .NET object model and provides administrators with system administration and automation capabilities. To work with PowerShell, you run commands, named cmdlets.

PowerShell Command-Line Syntax

PowerShell cmdlets use a consistent verb-noun structure, where the verb represents the action and the noun represents the object to operate on.

PowerShell cmdlets follow consistent naming patterns, ensuring that construction of a command is easy if you know the object that you want to work with.

All command categories take parameters and arguments. A parameter starts with a hyphen and is used to control the behavior of the command. An argument is a data value consumed by the command.

A simple PowerShell command has the following syntax:

```
command -parameter1 -parameter2 argument1, argument2
```

PowerShell Pipelines

A pipeline is a series of commands separated by the pipe operator |.

Each command in the pipeline receives an object from the previous command, performs some operation on it, and then passes it to the next command in the pipeline. Objects are output from the pipeline as soon as they become available.

PowerShell Wildcards

PowerShell has a number of pattern-matching operators named wildcards that you can use to substitute one or more characters in a string, or substitute the complete string.

All wildcard expressions can be used with the PowerCLI cmdlets. For example, you can view a list of all files with a `.txt` extension by running `dir *.txt`. In this case, the asterisk * operator matches any combination of characters.

With wildcard patterns you can indicate character ranges as well. For example, to view all files that start with the letter S or T and have a `.txt` extension, you can run `dir [st]*.txt`.

You can use the question mark ? wildcard to match any single character within a sequence of characters. For example, to view all `.txt` files with names that consist of `string` and one more character at the end, run `dir string?.txt`.

PowerShell Common Parameters

The PowerShell engine retains a set of parameter names, referred to as common parameters. All PowerShell cmdlets, including the PowerCLI cmdlets, support them.

Some of the PowerShell common parameters are `Verbose`, `Debug`, `ErrorAction`, `ErrorVariable`, `OutVariable`, and `OutBuffer`. For a full list of the common parameters and more details on their usage, run `Get-Help about_CommonParameters` .

PowerShell offers two risk mitigation parameters: `WhatIf` and `Confirm`.

WhatIf

Displays the effects of a command without running it.

Confirm

Prompts for confirmation before running a command that stops a program or service, or deletes data.

PowerCLI Concepts

PowerCLI cmdlets are created to automate VMware environments administration and to introduce some specific features in addition to the PowerShell concepts.

PowerCLI Modules

VMware PowerCLI consists of multiple modules that you can install and use according to your needs and environments.

The following table lists all official VMware PowerCLI modules.

Module	Description
`VMware.PowerCLI`	Provides a root module which other modules are dependent on. This module ensures the PowerCLI product can be installed, upgraded, and removed as a complete package if needed.
`VMware.VimAutomation.Core`	Provides cmdlets for automated administration of the vSphere environment.
`VMware.VimAutomation.Common`	Provides help functionalities. This module has no cmdlets, but is required for other modules to function correctly.
`VMware.VimAutomation.Sdk`	Provides SDK functionality that is needed by all PowerCLI modules. This module has no cmdlets, but is required for other modules to function correctly.
`VMware.VimAutomation.Vds`	Provides cmdlets for managing vSphere distributed switches and distributed port groups.
`VMware.VimAutomation.Cis.Core`	Provides cmdlets for managing vSphere Automation API servers.
`VMware.VimAutomation.Storage`	Provides cmdlets for managing vSAN and vSphere policy-based storage.
`VMware.VimAutomation.StorageUtility`	Provides utility scripts for storage.
`VMware.VimAutomation.License`	Provides the `Get-LicenseDataManager` cmdlet for managing VMware License components.
`VMware.ImageBuilder`	Provides cmdlets for managing depots, image profiles, and VIBs.
`VMware.DeployAutomation`	Provides cmdlets that provide an interface to VMware Auto Deploy for provisioning physical hosts with ESXi software.
`VMware.VimAutomation.Cloud`	Provides cmdlets for automating VMware Cloud Director features.
`VMware.VumAutomation`	Provides cmdlets for automating vSphere Update Manager features.
`VMware.VimAutomation.vROps`	Provides cmdlets for automating VMware Aria Operations features.

Module	Description
VMware.VimAutomation.Srm	Provides cmdlets for managing VMware Site Recovery Manager (SRM) features.
VMware.VimAutomation.HorizonView	Provides cmdlets for automating VMware Horizon features.
VMware.VimAutomation.Nsxt	Provides cmdlets for managing VMware NSX servers.
VMware.VimAutomation.Vmc	Provides cmdlets for automating VMware Cloud on AWS features.
VMware.Vim	Provides a module that contains the vSphere low-level binding libraries.
VMware.VimAutomation.Security	Provides cmdlets for managing vSphere Security, including virtual Trusted Platform Module.
VMware.VimAutomation.Hcx	Provides cmdlets for managing VMware HCX features.
VMware.VimAutomation.WorkloadManagement	Provides cmdlets for managing VMware vSphere with VMware Tanzu features.
VMware.CloudServices	Provides cmdlets for managing VMware Cloud Services.
VMware.Sdk.VSphere.*	Provides auto-generated cmdlets for managing the vSphere Automation API.
VMware.Sdk.Nsx.Policy	Provides auto-generated cmdlets for managing the NSX Policy API.
VMware.Sdk.Vr	Provides auto-generated cmdlets for managing the vSphere Replication API.
VMware.Sdk.Srm	Provides auto-generated cmdlets for managing the Site Recovery Manager (SRM) API.
VMware.Sdk.Vcf.*	Provide functionality for managing the VMware Cloud Foundation API.
VMware.PowerCLI.VCenter.*	Provide PowerShell-based cmdlets for automated administration of the vSphere environment.
VMware.PowerCLI.Sdk.*	Provide help functionalities for the PowerShell-based cmdlets. These modules have no cmdlets but are required for other modules to function correctly.

Retrieving vSphere Inventory Objects from Cloud Resources

You can retrieve vSphere inventory objects from cloud resources by using the `RelatedObject` parameter of PowerCLI cmdlets. This interoperability expands your cloud administration, automation, reporting, and troubleshooting options.

You can use the `RelatedObject` parameter of PowerCLI cmdlets to retrieve vSphere inventory objects from VMware Cloud Director objects. Passing the retrieved objects to the cmdlets of the `VMware.VimAutomation.Core` and `VMware.VimAutomation.Vds` modules, extends your administration options.

> **NOTE**
> Use of the `VMware.VimAutomation.Core` and `VMware.VimAutomation.Vds` modules to modify the configuration of objects that are managed by VMware Cloud Director might result in unpredictable behavior of the cloud environment.

Table 1: List of Supported vSphere Inventory Objects You Can Retrieve from Cloud Objects

Cloud Object	Retrieved vSphere Inventory Object	Sample Script for Retrieving the vSphere Inventory Object
ProviderVdc	Datastore	`Get-ProviderVdc -Name 'MyProviderVdc' | Get-Datastore`
CIVM	VirtualMachine	`Get-CIVM -Name 'MyCloudVM' | Get-VM`
NetworkPool	VDSwitch	`Get-NetworkPool -Name 'MyNetworkPool' | Get-VDSwitch`
NetworkPool	VDPortgroup	`Get-NetworkPool -Name 'MyNetworkPool' | Get-VDPortGroup`
ExternalNetwork	VDPortgroup	`Get-ExternalNetwork -Name 'MyExternalNetwork' | Get-VDPortGroup`

Selecting Objects in PowerCLI

You can pass strings and wildcards to all parameters that take inventory objects, datastores, `OSCustomizationSpec` objects, and `VIServer` objects as arguments. PowerCLI then transforms the strings into PowerShell objects. This approach is called Object-by-Name (OBN) selection.

Using OBN

For example, if you pass `Start-VM -VM "myVM"` , PowerCLI trasforms the string parameter, "myVM", into a PowerShell object. This is how OBN works.

For more details about OBN, run `help about_OBN` .

Using pipelines and variables

Instead of assigning an object name to a cmdlet parameter, you can pass the object through a pipeline or a variable. For example, the following three commands are interchangeable:

- `Remove-VM -VM "Win 7 SP1"`
- `Get-VM -Name "Win 7 SP1" | Remove-VM`
- `Remove-VM -VM (Get-VM -Name "Win 7 SP1")`

> **NOTE**
> In PowerCLI, passing strings as pipeline input is not supported.

An OBN failure

If you provide a non-existing object name, an OBN failure occurs. In such cases, PowerCLI generates a non-terminating error and runs the cmdlet ignoring the invalid name. This example illustrates the occurrence of an OBN failure.

```
Set-VM –VM “VM1”, “VM2”, “VM3” –Server $server1, $server2 –MemoryGB 4
```

If the *VM2* virtual machine does not exist on either of the selected servers, PowerCLI generates a non-terminating error and applies the command only on the *VM1* and *VM3* virtual machines.

Processing Non-alphanumeric Characters in PowerCLI

When you provide login credentials in the command prompt or in a script file, a PowerShell limitation might prevent PowerCLI from processing non-alphanumeric characters correctly. To prevent login problems, escape the non-alphanumeric characters in your credentials.

To escape non-alphanumeric characters in PowerCLI, you need to place the expression that contains them in single quotes (').

NOTE
When you provide your login credentials in the Specify Credential dialog box, you do not need to escape non-alphanumeric characters.

Connecting to a vCenter Server System

This example illustrates how to escape non-alphanumeric characters when connecting to a selected vCenter Server instance with the `Adminis!ra!or` user name and the `pa$$word` password.

```
Connect-VIServer -Server 10.23.112.235 -Protocol https -Username 'Adminis!ra!or' -Password 'pa$
$word'
```

Running PowerCLI Cmdlets Asynchronously

By default, PowerCLI cmdlets return an output only after completion of the requested tasks. If you want a cmdlet to return to the command line immediately, without waiting for the tasks to complete, you can use the `RunAsync` parameter.

When you use the `RunAsync` parameter, the cmdlet returns `Task` objects instead of its usual output. The `Status` property of a returned `Task` object contains a snapshot of the initial state of the task. This state is not updated automatically and has the values Error, Queued, Running, or Success. You can refresh a task state by retrieving the task object with the `Get-Task` cmdlet. If you want to observe the progress of a running task and wait for its completion before running other commands, use the `Wait-Task` cmdlet.

NOTE
In PowerCLI, the `RunAsync` parameter affects only the invocation of a cmdlet and does not control whether the initiated tasks run consecutively or in parallel. For example, the `Remove-VM` cmdlet might remove the selected virtual machines simultaneously or consecutively depending on the internal design of PowerCLI. To make sure that tasks initiated by a cmdlet run consecutively, run the cmdlet in a loop, each time applying it to a single object.

Running Remove-VM with and without the RunAsync parameter

```
Remove-VM $vmList
```

The command returns no output when all virtual machines stored in the *`$vmList`* variable are removed, irrespective of whether they are removed simultaneously.

```
Remove-VM $vmList -RunAsync
```

The command returns an output that consists of one or more `Task` objects immediately.

Managing Default Server Connections in PowerCLI

By default, PowerCLI cmdlets run on the vCenter Server or VMware Cloud Director systems you are connected to, if no target servers can be determined from the provided parameters. Use the *`$DefaultVIServers`* and *`$DefaultCIServers`* variables to manage the default server connections.

When you connect to a vCenter Server system by using `Connect-VIServer`, the server connection is stored in the *`$DefaultVIServers`* array variable. This variable contains all connected servers for the current PowerCLI session. To remove a server from the *`$DefaultVIServers`* variable, you can either use `Disconnect-VIServer` to close all active connections to this server, or modify the value of *`$DefaultVIServers`* manually.

When you connect to a system by using `Connect-CIServer`, the server connection is stored in the *`$DefaultCIServers`* array variable. This variable contains all connected servers for the current session. To remove a server from the *`$DefaultCIServers`* variable, you can either use `Disconnect-CIServer` to close all active connections to this server, or modify the value of *`$DefaultCIServers`* manually.

Customization Specification Objects in PowerCLI

You can use customization specifications to define the configuration settings and parameters for customizing virtual machines during the deployment or cloning process. PowerCLI provides two types of objects for customization specification: persistent and nonpersistent.

Persistent Customization

Persistent customization specification objects are stored on the vSphere server. All persistent customization specifications created by using vSphere Client or VMware PowerCLI 4.1 or later are encrypted. Encrypted customization specifications can be applied only by the server that has encrypted them.

Nonpersistent Customization

Nonpersistent customization specification objects exist only inside the current PowerShell process. Nonpersistent customization specification objects are not encrypted, but cloning them to a vSphere server encrypts them.

Using ESXCLI with PowerCLI

With PowerCLI you can invoke ESXCLI commands within your PowerShell session and manage your ESXi hosts.

You can use PowerCLI to access ESXCLI in the following ways:

By Using the Get-ESXCli cmdlet

Use the `Get-ESXCli` cmdlet to invoke ESXCLI commands within your PowerShell console.

For example:

```
$vmHost = Get-VMHost <vmHostIp>
$esxcli = Get-EsxCli -VMHost $vmHost -V2
$esxcli.storage.nmp.device.list.Invoke()
```

For more information, see `Get-EsxCli` in the PowerCLI Reference.

By Using .NET Methods

You can use .NET methods to create managed objects that correspond to specific ESXCLI applications. To access the ESXCLI, you can call methods on these managed objects.

> **NOTE**
> To call a method of an ESXCLI object, you must provide values for all parameters. If you want to omit a given parameter, pass *`$null`* as its argument.

Using the PowerCLI About Articles

Learn about PowerCLI concepts and features from the built-in help articles named *About Articles*. You can access them through a running PowerCLI process.

Running `Help About_*` lists all built-in PowerShell and VMware PowerCLI*About Articles*.

Table 2: Built-In *About Articles* for PowerCLI

Article Title	Command	Article Description
Customer Experience Improvement Program (CEIP)	`Help About_CEIP`	Provides information about VMware's Customer Experience Improvement Program ("CEIP").
Handling Invalid Certificates	`Help About_Invalid_Certificates`	When you connect to a server, VMware PowerCLI checks if the server certificate is valid. If the certificate is not trusted for this server, by default, VMware PowerCLI fails to connect to the server.
Object-by-Name (OBN)	`Help About_OBN`	To help you save time and effort, PowerCLI lets you select objects by their names.
VMware PowerCLI Objects	`Help About_PowerCLI_Objects`	For their input and output, the PowerCLI cmdlets use a set of .NET types that reside in the `VMware.VimAutomation.ViCore.Types` namespace.
Using the RunAsync Parameter	`Help About_RunAsync`	When you set the `RunAsync` parameter, you indicate that you want to run the cmdlet asynchronously.
Authenticating with a vCenter Server System or a VMware Cloud Director Server	`Help About_Server_Authentication`	To authenticate with vCenter Server and VMware Cloud Director servers, you can provide a user name and password through the `User` and `Password` parameters, or a `PSCredential` object through the `Credential` parameter.
Unique Identifiers for PowerCLI Objects (UID)	`Help About_UID`	You can uniquely identify a PowerCLI object on a server or across multiple servers by providing its UID.
Datastore Provider (VimDatastore)	`Help About_VimDatastore`	The Datastore Provider (`VimDatastore`) provides a filesystem-style view and access to the contents of datastores.
LicenseDataManager	`Help About_LicenseDataManager`	The `LicenseDataManager` component lets you extend the vCenter Server inventory with license data.

Installing VMware PowerCLI

VMware PowerCLI lets you manage, monitor, automate, and handle lifecycle operations on VMware vSphere, VMware Aria Operations, vSAN, VMware Cloud Director, vSphere Update Manager, VMware NSX, VMware Cloud on AWS, VMware HCX, VMware Horizon, and VMware Site Recovery Manager (SRM) systems. You can install VMware PowerCLI modules on all supported operating systems.

After installing the package on your machine, you can connect to your ESXi, vCenter Server, VMware Aria Operations, VMware Cloud Director, VMware NSX, VMware Cloud on AWS, VMware Horizon, or VMware Site Recovery Manager (SRM) system by providing valid authentication credentials.

Supported Operating Systems

You can install PowerCLI on supported operating systems. You can run guest cmdlets against virtual machines on which supported guest operating systems are installed.

PowerCLI Local Operating Systems

For a list of operating systems on which you can install VMware PowerCLI , see the Compatibility Matrix on the PowerCLI home page.

PowerCLI Guest Operating Systems

You can run VMware PowerCLI guest cmdlets against virtual machines with supported guest operating systems. For a list of supported operating systems, see the Compatibility Matrix on the PowerCLI home page.

NOTE
Guest cmdlets are not compatible with IPv6 environments.

Supported VMware Products

You can use the PowerCLI modules to manage all supported VMware products.

For a list of VMware products with which VMware PowerCLI is compatible, see VMware Product Interoperability Matrixes.

Supported PowerShell Versions

PowerCLI is compatible with multiple versions of PowerShell.

For a list of PowerShell versions with which VMware PowerCLI is compatible, see the Compatibility Matrix on the PowerCLI home page.

Install PowerCLI

You can download and install PowerCLI modules from the PowerShell Gallery. You can install all VMware PowerCLI modules with a single PowerShell command, or install modules individually.

- Verify that your system is compatible with PowerCLI. See the Compatibility Matrix .
- Verify that your system is connected to the Internet.
- Verify that PowerShell is available on your system. For Linux and macOS, you must install PowerShell. See how to install PowerShell on different platforms.
- For Windows, if you have PowerCLI 6.5 R1 or earlier, uninstall it.

Use the `Install-Module` cmdlet to download and install PowerCLI modules. See the PowerShell Gallery for the complete list of available PowerCLI modules.

1. Open PowerShell on your workstation.
2. To install all PowerCLI modules, run the command:

   ```
   Install-Module VMware.PowerCLI -Scope CurrentUser
   ```

   Alternatively, you can install individual PowerCLI modules by running the `Install-Module` cmdlet with the module name.
3. If you see a warning that you are installing modules from an untrusted repository, press `y` and then press Enter to confirm the installation.

Enable execution of local scripts. See Allow Execution of Local Scripts.

Install PowerCLI Offline

You can install all VMware PowerCLI modules in offline mode by using a ZIP file.

- Verify that your system is compatible with PowerCLI. See the Compatibility Matrix .
- Verify that PowerShell is available on your system. For Linux and macOS, you must install PowerShell. See how to install PowerShell on different platforms.
- For Windows, if you have PowerCLI 6.5 R1 or earlier, uninstall it.
- Download the PowerCLI ZIP file from the PowerCLI home page and transfer the ZIP file to your local machine.

You might need to install PowerCLI on a local machine with no Internet connectivity due to security reasons and deployment restrictions. If you are using such an environment, you can download the PowerCLI ZIP file on a computer with Internet access, transfer the ZIP file to your local machine and install PowerCLI.

1. Open PowerShell on your local machine.
2. To view the folder paths to which you can extract the PowerCLI ZIP file, run the command:

   ```
   $env:PSModulePath
   ```

3. Extract the contents of the PowerCLI ZIP file to one of the listed folders.
4. For Windows, run the command to unblock the copied files.

   ```
   Get-ChildItem -Path 'folder_path' -Recurse | Unblock-File
   ```

   Replace *folder_path* with the path to the folder where you extracted the contents of the ZIP file.
5. Optional: Verify that the VMware PowerCLI modules have installed successfully.

   ```
   Get-Module VMware* -ListAvailable
   ```

You can now run PowerCLI on your local machine.

Enable execution of local scripts. See Allow Execution of Local Scripts.

Update PowerCLI

You can update PowerCLI when a new version of the product becomes available. See the PowerShell Gallery for the latest PowerCLI versions.

Use the `Update-Module` cmdlet to update PowerCLI modules. You can update all VMware PowerCLI modules with a single command, or update modules individually.

You cannot use the `Update-Module` cmdlet in offline mode. To update PowerCLI in offline mode, you must perform a new installation. See Install PowerCLI Offline.

1. Open PowerShell.
2. To update all PowerCLI modules, run the command:

   ```
   Update-Module VMware.PowerCLI -Scope CurrentUser
   ```

   Alternatively, you can update individual PowerCLI modules by running the `Update-Module` cmdlet with the module name.

Uninstall PowerCLI

You can uninstall VMware PowerCLI by deleting the VMware PowerCLI modules from your system.

- Close all PowerShell sessions that are running PowerCLI.

To uninstall VMware PowerCLI, you must locate your VMware PowerCLI modules and delete them.

1. In PowerShell, to see the location of the `Vmware.PowerCLI` modules, run `Get-Module -ListAvailable VMware*`.
2. In your operating system, navigate to the destination folder(s) and delete all modules that start with `VMware`.

You removed PowerCLI from your system.

Configuring VMware PowerCLI

Configure how VMware PowerCLI responds to invalid server certificates, choose the application settings for different users and user groups, modify the script configuration file, and add custom scripts.

Allow Execution of Local Scripts

If you want to run scripts and load configuration files with PowerCLI, you must set the execution policy of PowerShell to RemoteSigned.

For security reasons, PowerShell supports an execution policy feature. It determines whether scripts are allowed to run and whether they must be digitally signed. By default, the execution policy is set to Restricted, which is the most secure policy. For more information about the execution policy and script digital signing in PowerShell, run `Get-Help About_Signing`.

You can change the execution policy by using the `Set-ExecutionPolicy` cmdlet.

1. Open the PowerShell console.
2. Run `Set-ExecutionPolicy RemoteSigned`.

Configuring PowerCLI Response to Untrusted Certificates

When you try to connect to a server, PowerCLI checks whether the server certificate is valid. You might have to configure the PowerCLI settings to be able to connect to servers with untrusted certificates.

You might not be able to connect to a server because of the default action configured for PowerCLI and untrusted certificates.

By default, PowerCLI is set to deny connections to servers with invalid certificates. You can retrieve the current setting for invalid server certificates, and configure it as required. For more information, see Configure the PowerCLI Response to Untrusted Certificates.

Configure the PowerCLI Response to Untrusted Certificates

You can configure how PowerCLI responds when a server certificate is not valid.

Use the `InvalidCertificateAction` parameter of the `Set-PowerCLIConfiguration` cmdlet to configure how PowerCLI responds to invalid server certificates.

1. Run `Get-PowerCLIConfiguration` and view the current setting of the `InvalidCertificateAction` parameter.
2. To change the setting, run `Set-PowerCLIConfiguration -InvalidCertificateAction` and specify one of the following values.
   - `Unset` . This is the default value and corresponds to `Fail` .
   - `Fail` . PowerCLI does not establish a connection if a certificate is not valid.
   - `Ignore` . PowerCLI ingnores certificate validity and establishes a connection.
   - `Warn` . PowerCLI logs a warning message that a certificate is not valid, displays additional information about the certificate, and establishes the connection.
   - `Prompt` . If a server certificate is not valid, PowerCLI prompts you to choose an action before it continues. You can choose one of the following options.

Option	Action
Deny (default)	Cancel the server connection.
Accept Once	Establish the server connection and suppress further warnings for the current PowerShell session.
Accept Permanently	Save the server certificate in the PowerCLI Trusted Certificate Store for the current user and establish the server connection.
Accept For All Users	Save the server certificate both in the current user's Trusted Certificate Store and in the all users' Trusted Certificate Store and establish the server connection.

NOTE
For Linux and macOS, only the `Fail` and `Ignore` options are supported.

A warning message prompts you to confirm the operation. Press Y and then press Enter to confirm your choice.

You configured the invalid server certificate action setting. PowerCLI displays a table with the updated configuration settings.

Trusted certificates are saved in the PowerCLI Trusted Certificate Store.

Use PowerCLI to connect to a server system.

PowerCLI Trusted Certificate Store

The PowerCLI trusted certificate store is a CSV file that stores trusted server certificates for the current user or for all users.

The PowerCLI trusted certificate store is named `SslCertificateExceptions.csv` and contains server addresses and certificate thumbprints. You can edit the file with a text editor. You can transfer the CSV file to another machine if you want to use your saved certificates.

NOTE
You must permanently accept at least one certificate as trusted for the CSV file to appear on your system.

The certificate store file is saved in a different location depending on the type of user. For more information about the exact file path of the trusted certificate store file, see PowerCLI Configuration Files.

Modify the Timeout Setting for Web Tasks

To avoid unexpected timeouts, you can run `Set-PowerCLIConfiguration` to modify the PowerCLI settings for long-running Web tasks.

Verify that you are connected to a vCenter Server system.

You might want to change the PowerCLI setting for long-running Web tasks to avoid unexpected timeouts. The default value for the `WebOperationTimeoutSeconds` setting is 300 seconds.

1. Optional: Learn more about what settings you can configure with `Set-PowerCLIConfiguration`.
   ```
   Get-HelpSet-PowerCLIConfiguration
   ```
2. Store the value of the timeout setting for the current session in the *`$initialTimeout`* variable.
   ```
   $initialTimeout = (Get-PowerCLIConfiguration -Scope Session).WebOperationTimeoutSeconds
   ```
3. Set the timeout setting for the current session to 30 minutes.
   ```
   Set-PowerCLIConfiguration -Scope Session -WebOperationTimeoutSeconds 1800
   ```
4. Run your Web task.
   - You can run an `esxcli` command to install a software profile.
     ```
     $vmHost = Get-VMHost "vmHostIp"
     $esxcli = Get-EsxCli -VMHost $vmHost -V2
     $arguments = $esxcli.software.profile.install.CreateArgs()
     $arguments.depot = "http://mysite.com/publish/proj/index.xml"
     $arguments.profile = "proj-version"
     $esxcli.software.profile.install.Invoke($arguments)
     ```
   - Alternatively, you can directly specify the arguments hash table in-line.
     ```
     $vmHost = Get-VMHost "vmHostIp"
     $esxcli = Get-EsxCli -VMHost $vmHost -V2
     $esxcli.software.profile.install.Invoke(@{depot="http://mysite.com/publish/proj/index.xml"; pro-
     file="proj-version"})
     ```

     NOTE
     The two examples use the ESXCLI V2 interface of PowerCLI.
5. Revert the timeout setting for the current session to the initial value.
   ```
   Set-PowerCLIConfiguration -Scope Session -WebOperationTimeoutSeconds $initialTimeout
   ```

Scoped Settings of PowerCLI

In PowerCLI you can set the scope of the settings to enhance security and personalize the configuration.

Configuring the Scope of the PowerCLI Settings

Scoped configuration enhances system security and prevents nonadministrator users from introducing global changes to the configuration of PowerCLI.

For greater control over the PowerCLI configuration, the `Set-PowerCLIConfiguration` cmdlet provides the `Scope` parameter.

Table 3: Valid Values for the Scope Parameter

Parameter Value	Description
`Session`	Configures settings for the current PowerCLI session and does not modify any PowerCLI configuration files on your system.
`User`	Configures settings for the current Windows user and modifies some PowerCLI configuration files on your system.
`AllUsers`	Configures settings for all users and modifies some PowerCLI configuration files on your system.

Priority of Settings Scopes in PowerCLI

PowerCLI loads the program configuration based on the scope that you select for each setting.

Table 4: Scope Impact on the Behavior of PowerCLI

Scope	Priority	Impact
`Session`	High	• When started, PowerCLI tries to load settings with the `Session` scope first. • `Session` settings override `User` and `AllUsers` settings. • `Session` settings are valid for the current PowerCLI session only.
`User`	Medium	• When PowerCLI cannot detect `Session` settings, the program tries to load `User` settings from the PowerCLI configuration files. • `User` settings override `AllUsers` settings. • `User` settings are automatically detected from the PowerCLI configuration files.
`AllUsers`	Low	• When PowerCLI cannot detect `Session` and `User` settings, the program loads `AllUsers` settings. • `AllUsers` settings do not override `Session` and `User` settings. • `AllUsers` settings are automatically detected from the PowerCLI configuration files.

PowerCLI Configuration Files

The copies of the `PowerCLI_settings.xml` file on your system contain `User` and `AllUsers` settings for PowerCLI.

Configuring PowerCLI by running `Set-PowerCLIConfiguration` creates a copy of `PowerCLI_settings.xml` on your system. The location of the `PowerCLI_settings.xml` file depends on the value of the `Scope` parameter.

NOTE
You must have administrator privileges to change the settings for `AllUsers`.

Table 5: Location of `PowerCLI_settings.xml`

Operating System	Scope	Location	Description
Windows	`User`	`%APPDATA%\VMWare\PowerCLI`	Contains settings for the current Windows user.
	`AllUsers`	`%SYSTEMDRIVE%\ProgramData\VMware\PowerCLI`	Contains settings for all users.
Linux	`User`	`$HOME/.local/share/VMware/PowerCLI`	Contains settings for the current Linux user.
	`AllUsers`	/var/opt/VMware/PowerCLI	Contains settings for all users.
macOS	`User`	`$HOME/Library/Preferences/VMware/PowerCLI`	Contains settings for the current macOS user.
	`AllUsers`	/Library/Preferences/VMware/PowerCLI	Contains settings for all users.

Users with advanced knowledge and understanding of PowerShell and VMware PowerCLI can manually modify the contents of `PowerCLI_settings.xml` to change PowerCLI settings. Modifying `PowerCLI_settings.xml` might require administrator privileges.

NOTE
If you modify the contents of `PowerCLI_settings.xml` manually while PowerCLI is running, you must restart PowerCLI for the changes to take effect.

Installing and Configuring Python for PowerCLI

Starting from VMware PowerCLI 13.0, Python 3.7.1 or later is a prerequisite for using the `VMware.ImageBuilder` module.

To use the `VMware.ImageBuilder` module, you must install Python 3.7.1 or later with four additional software packages and configure PowerCLI.

You must install the following additional packages in Python:

- `six`
- `psutil`
- `lxml`
- `pyopenssl`

You must configure PowerCLI by setting the path to your Python installation.

Restart your PowerShell session if you tried to execute a cmdlet from the `VMware.ImageBuilder` module before setting the path to the Python executable.

Install and Configure Python on Windows

On Windows, you must install Python 3.7.1 or later with the required packages and configure PowerCLI to use the `VMware.ImageBuilder` module.

1. Download Python 3.7.1 or later from https://www.python.org/downloads and complete the installation on your machine.
2. Save the `get-pip.py` file from https://bootstrap.pypa.io/get-pip.py.
3. Open a terminal and install `pip` package manager.

   ```
   <pythonVer-directory>\python.exe <get-pip-directory>\get-pip.py
   ```

   For example:

   ```
   <python3.10-directory>\python.exe <get-pip-directory>\get-pip.py
   ```

4. In the terminal, install the required Python modules.

   ```
   <pythonVer-directory>\Scripts\pip<Version>.exe install six psutil lxml pyopenssl
   ```

   For example:

   ```
   <python3.10-directory>\Scripts\pip3.10.exe install six psutil lxml pyopenssl
   ```

5. Open PowerShell and set the path to the Python executable.

   ```
   Set-PowerCLIConfiguration -PythonPath <pythonVer-directory>\python.exe -Scope User
   ```

   For example:

   ```
   Set-PowerCLIConfiguration -PythonPath <python3.10-directory>\python.exe -Scope User
   ```

You can now use the PowerCLI`VMware.ImageBuider` module.

Install and Configure Python on macOS

On macOS, you must install Python 3.7.1 or later with the required packages and configure PowerCLI to use the `VMware.ImageBuilder` module.

Verify that you have OpenSSL version 1.1.1 installed on your machine.

1. Install Python.

Option	Action
By Using the Mac Terminal	Open the Mac Terminal and run `brew install python@<Version>`. For example: `brew install python@3.10`
By Using the Python Installer	Download the Python installer from https://www.python.org/downloads and complete the installation on your machine.

2. Save the `get-pip.py` file from https://bootstrap.pypa.io/get-pip.py.
3. In the Mac Terminal, install `pip` package manager.

   ```
   <pythonVer-directory>/<pythonVer> <get-pip-directory>/get-pip.py
   ```

   For example:

   ```
   <python3.10-directory>/python3.10 <get-pip-directory>/get-pip.py
   ```

4. Install the required Python modules.

   ```
   <pythonVer-directory>/Scripts/pip<Version> install six psutil lxml pyopenssl
   ```

   For example:

   ```
   <python3.10-directory>/Scripts/pip3.10 install six psutil lxml pyopenssl
   ```

5. Open PowerShell and set the path to the Python executable.

   ```
   Set-PowerCLIConfiguration -PythonPath <pythonVer-directory>/<pythonVer> -Scope User
   ```

   For example:

   ```
   Set-PowerCLIConfiguration -PythonPath <python3.10-directory>/python3.10 -Scope User
   ```

You can now use the PowerCLI`VMware.ImageBuider` module.

Install and Configure Python on Linux

On Linux, you must install Python 3.7.1 or later with the required packages and configure PowerCLI to use the `VMware.ImageBuilder` module.

Verify that you have OpenSSL version 1.1.1 installed on your machine.

1. Open a terminal and install Python by running `apt-get install python<version>`.

   For example:

   ```
   apt-get install python3.10
   ```

2. Save the `get-pip.py` file from https://bootstrap.pypa.io/get-pip.py.
3. In the terminal, install `pip` package manager.

   ```
   <pythonVer-directory>/<pythonVer> <get-pip-directory>/get-pip.py
   ```

   For example:

   ```
   <python3.10-directory>/python3.10 <get-pip-directory>/get-pip.py
   ```

4. Install the required Python modules.

   ```
   <pythonVer-directory>/Scripts/pip<Version> install six psutil lxml pyopenssl
   ```

   For example:

   ```
   <python3.10-directory>/Scripts/pip3.10 install six psutil lxml pyopenssl
   ```

5. Open PowerShell and set the path to the Python executable.

   ```
   Set-PowerCLIConfiguration -PythonPath <pythonVer-directory>/<pythonVer> -Scope User
   ```

   For example:

   ```
   Set-PowerCLIConfiguration -PythonPath <python3.10-directory>/python3.10 -Scope User
   ```

You can now use the PowerCLI`VMware.ImageBuider` module.

Configuring Customer Experience Improvement Program

You can participate in the Customer Experience Improvement Program (CEIP) to provide anonymous feedback or information to VMware for quality, reliability, and functionality improvments of VMware products and services.

VMware Customer Experience Improvement Program

vCenter Server participates in VMware's Customer Experience Improvement Program (CEIP).

Details regarding the data collected through CEIP and the purposes for which it is used by VMware are set forth at the Trust & Assurance Center at http://www.vmware.com/trustvmware/ceip.html.

Join the Customer Experience Improvement Program in PowerCLI

You can choose to join the Customer Experience Improvement Program (CEIP), or leave the CEIP at any time.

Run `Set-PowerCLIConfiguration`.

- To join the CEIP, run the following command.
  ```
  Set-PowerCLIConfiguration -ParticipateInCeip $true
  ```
- To leave the CEIP, run the following command.
  ```
  Set-PowerCLIConfiguration -ParticipateInCeip $false
  ```

Managing vSphere with VMware PowerCLI

To help you get started with VMware PowerCLI, this documentation provides a set of sample scripts that illustrate basic and advanced tasks in vSphere administration.

Connecting to a vCenter Server System

You can connect to a vCenter Server system with PowerCLI no matter if you are using the default VMware vCenter Single Sign-On identity service, or an external identity provider.

Connect to a vCenter Server System

To run PowerCLI cmdlets on vSphere and perform administration or monitoring tasks, you must establish a connection to an ESXi host or a vCenter Server system.

- If the certificate of the server you want to connect to is not trusted, verify that your PowerCLI invalid server certificate action settings are configured properly. For more information, see Configuring PowerCLI Response to Untrusted Certificates.
- If you use a proxy server for the connection, verify that it is configured properly, so that the connection is kept alive long enough for tasks to complete running.

  NOTE
  If you do not want to use a proxy server for the connection, run `Set-PowerCLIConfiguration -ProxyPolicy NoProxy`.

You can have more than one connection to the same server. For more information, see Managing Default Server Connections in PowerCLI.

If your login credentials contain non-alphanumeric characters, you might need to escape them. For more information, see Processing Non-alphanumeric Characters in PowerCLI.

Run `Connect-VIServer` with the server name and valid credentials.

```
Connect-VIServer -Server vc1.example.com -Protocol http -User 'MyAdministratorUser' -Password 'MyPassword'
```

Connect to a vCenter Server System Configured for an External Identity Provider

If your vCenter Server is configured with an external identity provider, such as Microsoft Active Directory Federation Services (AD FS) or other external identity provider supported by VMware Identity Service, you can authenticate with PowerCLI by using the OAuth 2.0 Authorization Code grant type.

You can authenticate to a federated vCenter Server by creating a new OAuth security context and then exchanging it for a SAML security context. You create an OAuth security context for PowerCLI by using the New-OAuthSecurityContext cmdlet. One way to do this is to authenticate through the Authorization Code grant type, which is illustrated by this example. This workflow guarantees a substantial degree of security and can be used with multi-factor authentication.

NOTE

You can use PowerCLI to authenticate with the other OAuth 2.0 grant types as well, such as the Client Credentials, Refresh Token, and Password grant types. For more information, run `Get-HelpNew-OAuthSecurityContext -full`.

Connect to a vCenter Server System Configured to Use AD FS for an External Identity Provider

If your vCenter Server is federated to Active Directory Federation Services (AD FS), you can authenticate with PowerCLI by using the OAuth 2.0 Authorization Code grant type.

- Verify that your vCenter Server system is federted to AD FS. For more information, see *Federate vCenter Server to Microsoft Active Directory Federation Services (AD FS)* in the *VMware vSphere Automation REST API Programming Guide*.
- Create an OAuth client for PowerCLI on the authentication server (AD FS). Configure the OAuth client to do the same token transformation as your vCenter Server system . You must configure a redirect URL according to the requirements in the procedure below. Save the Client ID and Client Secret that are generated by the authentication server. For more information, see the Microsoft documentation.

1. Create an OAuth security context object for PowerCLI.

   In the background, PowerCLI sends an authentication request to the authentication server, AD FS. A web browser opens that prompts the user to authorize the client application's request. On confirmation, PowerCLI interacts with the authentication server to obtain the access and ID tokens (JWT tokens) and creates a new OAuth security context.

   ```
   $oauthSecContext = New-OAuthSecurityContext -TokenEndpointUrl "https://<AD FS FQDN>/adfs/oauth2/token/"
    -AuthorizationEndpointUrl "https://<AD FS FQDN>/adfs/oauth2/authorize/"
   -RedirectUrl "http://localhost:8844/auth" -ClientId "powercli-native" -OtherArguments @{ "resource" = "my-
   vcenter" }
   ```

   This script contains the following parameters.

Parameter	Description	Example value
`TokenEndpointUrl`	The base URL where the authentication server listens for requests to issue access tokens. You can see this value in the openid-configuration file of the authentication server under `token_endpoint` key.	https://<AD FS FQDN>/adfs/oauth2/token/
`AuthorizationEndpointUrl`	The base URL at the authentication server where users are redirected in order to authenticate. You can see this value in the openid-configuration file under the `authorization_endpoint` key.	https://<AD FS FQDN>/adfs/oauth2/authorize/
`RedirectUrl`	The URL where the user is redirected after he approves the authentication request. This URL must be on a localhost and a free port on the machine where PowerCLI is running. This URL must use the `http` schema.	http://localhost:8844/auth
`ClientId`	The ID that you received from the authentication server when you registered the client application.	powercli-native
`OtherArguments`	A hashtable of (String, String) pairs that represent arguments to the server-specific parameters. In the following example, it is used for an AD FS Application Group for vCenter Server with an example ID "my-vcenter".	{ "resource" = "my-vcenter" }

2. Exchange the OAuth security context for an SAML security context.

```
$samlSecContext = New-VISamlSecurityContext -VCenterServer 'myVC' -OAuthSecurityContext $oauthSecCon-
text
```

3. Connect to your vCenter Server system by using the SAML security context.

```
Connect-VIServer -Server 'myVC' -SamlSecurityContext $samlSecContext
```

Connect to a vCenter Server System Configured to Use External Identity Providers Supported by VMware Identity Services

With vSphere 8.0 Update 1, VMware Identity Services is a built-in container within vCenter Server that you can use for identity federation to external identity providers. It serves as an independent identity broker within vCenter Server and currently supports Okta, Microsoft Entra ID, and PingFederate as external identity providers. Starting with vSphere 8.0 Update 3, PowerCLI integrates with VMware Identity Services to support the use of external identity providers to authenticate to vCenter Server .

- Verify that your vCenter Server system is federated to an identity provider supported by VMware Identity Service. See the *Configuring vCenter Server Identity Provider Federation* chapter in the *vSphere Authentication* guide.
- Verify that you have the vCenter Single Sign-On administrator privileges.

1. Log in as an administrator to vCenter Server.
2. Create a new OAuth client registration with the VMware Identity Services.

```
New-VIOAuth2Client -ClientId "powercli-native" -Name "PowerCLI Client" -Scope @("openid", "user", "group")
 -GrantTypes @("authorization_code", "refresh_token") -RedirectUris @("http://localhost:8844/authcode")
 -AccessTokenTimeToLiveMinutes 30 -RefreshTokenTimeToLiveMinutes 43200 -RefreshTokenIdleTimeToLiveMinutes
 28800 -PkceEnforced $true -Secret "<secret_value>"
```

   The New-VIOAuth2Client cmdlet accepts the following parameters:

Parameter	Description	Example
`ClientId`	The identifier used from the client to identify itself during the OAuth exchanges. The client ID must contain only alphanumeric (A-Z, a-z, 0-9), period (.), underscore (_), hyphen (-) and the at sign (@) characters.	`"powercli-native"`
`Name`	The user-friendly name that you set for this OAuth client.	`"PowerCLI Client"`
`Scope`	A list of access request scopes that are allowed by this OAuth client. Available scope options are: admin, user, profile, email, openid, and group. • admin - Provides admin level access. • user - Provides user level access. • profile - Provides access to the user's profile (first name, last name, display name, and image) • email - Provides access to the user's email. • openid - Provides access to an OpenID token for the user. • group - Provides access to the user's groups. The minimal set of values is @("openid", "user", "group")	`@("openid", "user", "group")`

Parameter	Description	Example
`GrantTypes`	A list of OAuth access grant types that are enabled in this OAuth client. Possible values are: `password`, `client_credentials`, `refresh_token`, `authorization_code`, and `token, id_token`. The minimal set of values is `@("authorization_code", "refresh_token")`	`@("authorization_code", "refresh_token")`
`RedirectUris`	A list of absolute URIs of application endpoints that are allowed to receive the authorization code and access token. The redirect URI sent by the application as part of the authorization code grant OAuth flow is verified against this list. A wildcard can be substituted for any string to skip the check for a particular URL section. The field is required if the `GrantTypes` parameter contains an `"authorization_code"` grant type. This URL must point to localhost and use a free port on the machine where PowerCLI is running. The URL must use the HTTP schema.	`@("http://localhost:8844/authcode")`
`AccessTokenTimeToLiveMinutes`	The period of time, in minutes, for which the new access tokens issued to this client should live.	`30`
`RefreshTokenIdleTimeToLiveMinutes`	The period of time, in minutes, for which the new refresh tokens issued to this client can be idle. This parameter is only applicable and mandatory if `GrantTypes` includes `"refresh_token"`. Its value should be less than the value specified by the `RefreshTokenTimeToLiveMinutes` parameter.	`28800`
`RefreshTokenTimeToLiveMinutes`	The period of time, in minutes, for which the new refresh tokens issued to this client should live. Only applicable and mandatory if the `GrantTypes` parameter includes `"refresh_token"`.	`43200`
`PkceEnforced`	Auth client. If not specified, the value is `false`.	`$true`
`Secret`	Specifies the OAuth client secret. If a secret string is not provided, an auto-generated secret is returned. For additional security, the stored secret is not be returned by the `Get-VIOAuth2Client` cmdlet. Public clients must not have any secret auto generated for them while confidential clients must always have a client secret. **NOTE** The secret is required to connect to the vCenter Server and must be distributed to the users of this OAuth client..	`"<secret_value>"`

3. Create an OAuth security context object for PowerCLI.

```
$oauthSecContext = New-OAuthSecurityContext -TokenEndpointUrl "https://<vcenter_fqdn>/acs/t/CUSTOMER/token" -AuthorizationEndpointUrl "https://<vcenter_fqdn>/acs/t/CUSTOMER/authorize" -RedirectUrl "http://localhost:8844/auth" -ClientId "powercli-native" -ClientSecret "<secret_value>"
```

   The script contains the following parameters:

Parameter	Description	Example
`TokenEndpointUrl`	The base URL used by the VMware Identity Services to listen for access token requests.	`https://<vcenter_fqdn>/acs/t/CUSTOMER/token`
`AuthorizationEndpointUrl`	The VMware Identity Services URL used to redirect users to authenticate.	`https://<vcenter_fqdn>/acs/t/CUSTOMER/authorize`
`RedirectUrl`	The URL where the user is redirected after the approval of the authentication request. This URL must point to localhost and use a free port on the machine where PowerCLI is running. This URL must use the HTTP schema. **NOTE** The value of this property must match the value specified with the `RedirectUris` parameter used for the registration of the OAuth client in step 2.	`http://localhost:8844/auth`
`ClientId`	The ID of the PowerCLI OAuth client created in step 2.	`powercli-native`
`ClientSecret`	The client secret of the PowerCLI OAuth client created in step 2	`"<secret_value>"`

   When this script runs, PowerCLI uses VMware Identity Services to send an authentication request to the authentication server. A Web browser opens and prompts the user to authorize the request of the client application. On confirmation, VMware Identity Services interacts with the authentication server to obtain the access and ID tokens, JSON Web Token (JWT). Based on this output PowerCLI creates a new OAuth security context.

4. Exchange the OAuth 2.0 security context for a SAML security context.

```
$samlSecContext = New-VISamlSecurityContext -VCenterServer '<vcenter_fqdn>' -OAuthSecurityContext $oauthSecContext
```

5. Connect to your vCenter Server system by using the SAML security context.

```
Connect-VIServer -Server '<vcenter_fqdn>' -SamlSecurityContext $samlSecContext
```

Unattended Logins to a Federated vCenter Server System

Unattended logins to a federated vCenter Server system represent a security threat and must be allowed with great caution.

When you register the vCenter Server OAuth client with the OAuth provider, you can create a configuration that allows password grant type (Resource Owner Password Credentials grant type) for some users. Such users can then perform unattended logins to the federated vCenter Server system.

> **NOTE**
> This flow exposes the user credentials to the client application, PowerCLI, and to vCenter Server. To minimize the security risk, allow access only to service users with limited permissions. For more information, see: https://oauth.net/2/grant-types/password/.

To connect to the vCenter Server system, you can directly use the `Connect-VIServer` cmdlet in the following way:

```
Connect-VIServer -Server '<vcenter_fqdn>' -User '<user_name>' -Password '<user_password>'
```

Create vSphere Inventory Objects

By using PowerCLI cmdlets, you can automate creating different inventory objects on vSphere.

Verify that you are connected to a vCenter Server system.

1. Get the inventory root folder and create a new folder named `Folder` in it.
   ```
   $folder = Get-Folder -NoRecursion | New-Folder -Name Folder
   ```
2. Create a new data center named `DC` in the `Folder` folder.
   ```
   New-Datacenter -Location $folder -Name DC
   ```
3. Create a folder named `Folder1` under `DC`.
   ```
   Get-Datacenter DC | New-Folder -Name Folder1
   $folder1 = Get-Folder -Name Folder1
   ```
4. Create a new cluster Cluster1 in the `Folder1` folder.
   ```
   New-Cluster -Location $folder1 -Name Cluster1 -DrsEnabled -DrsAutomationLevel FullyAutomated
   ```
   Distributed Resource Scheduler (DRS) is a feature that provides automatic allocation of cluster resources.
5. Add a host in the cluster by using the `Add-VMHost` command, and provide credentials when prompted.
   ```
   $vmhost1 = Add-VMHost -Name 10.23.112.345 -Location (Get-Cluster Cluster1)
   ```
6. Create a resource pool in the root resource pool of the cluster.
   ```
   $myClusterRootRP = Get-Cluster Cluster1 | Get-ResourcePool -Name Resources
   New-ResourcePool -Location $myClusterRootRP -Name MyRP1 -CpuExpandableReservation $true -CpuReservation-
   Mhz 500 -CpuSharesLevel high -MemExpandableReservation $true -MemReservationGB 1 -MemSharesLevel high
   ```
7. Create a virtual machine asynchronously.
   ```
   $vmCreationTask = New-VM -Name VM2 -VMHost $vmhost1 -ResourcePool MyRP01 -DiskGB 100 -MemoryGB 2 -RunAsync
   ```
   The `RunAsync` parameter indicates that the command runs asynchronously. This means that in contrast to a synchronous operation, you do not have to wait for the process to complete before supplying the next command at the command line.

vCenter Server and Host Management

This section provides sample scripts for PowerCLI with basic and advanced tasks in vCenter Server and host management.

Get a List of Hosts on a vCenter Server System and View Their Properties

With PowerCLI, you can get information about all available hosts in a data center and view their properties.

Verify that you are connected to a vCenter Server system.

1. Get a list of all hosts that are part of a data center.
   ```
   Get-Datacenter DC | Get-VMHost | Format-Custom
   ```
2. View the properties of the first host in the data center.
   ```
   Get-Datacenter DC | Get-VMHost | Select-Object -First 1 | Format-Custom
   ```
3. View the `Name` and the `OverallStatus` properties of the hosts in the *DC* data center.
   ```
   Get-Datacenter DC | Get-VMHost | Get-View | Format-Table -Property Name, OverallStatus -AutoSize
   ```

4. View all hosts and their properties, and save the results to a file.
   ```
   Get-Datacenter DC | Get-VMHost | Format-Custom | Out-File -FilePath hosts.txt
   ```
5. View a list of the hosts that are in maintenance mode and can be configured for vMotion operations.
   ```
   Get-VMHost -State maintenance | Get-View | Where-Object -FilterScript { $_.capability -ne $null -and
    $_.capability.vmotionSupported }
   ```

Add a Standalone Host to a vCenter Server System

You can add standalone hosts to a vCenter Server system by using the `Add-VMHost` cmdlet. After adding the hosts, you will be able to manage them through the vCenter Server system.

Verify that you are connected to a vCenter Server system.

1. View all hosts on the vCenter Server system that you have established a connection with.

   ```
   Get-VMHost
   ```

2. Add the *`Host`* standalone host.

   ```
   Add-VMHost -Name Host -Location (Get-Datacenter DC) -User root -Password pass
   ```

Set the License Key for a Host on vCenter Server

You can set the license key for a host on a vCenter Server system by using the `LicenseKey` parameter of the `Set-VMHost` cmdlet.

Verify that you are connected to a vCenter Server system.

1. Save the *`Host`* host object as a variable.
   ```
   $vmhost = Get-VMHost -Name Host
   ```
2. Set the host to evaluation mode or provide a valid license key.
   - Set the host to evaluation mode by providing the evaluation key.
     ```
     Set-VMHost -VMHost $vmhost -LicenseKey 00000-00000-00000-00000-00000
     ```
   - Provide a valid license key.
     ```
     Set-VMHost -VMHost $vmhost -LicenseKeyYour_license_key
     ```

Activate Maintenance Mode for a Host on vCenter Server

To complete some specific administration tasks, you might need to activate maintenance mode for a host. On vCenter Server, you can activate maintenance mode by using the `Set-VMHost` cmdlet.

Verify that you are connected to a vCenter Server system.

1. Save the *`Host`* host object as a variable.
   ```
   $vmhost = Get-VMHost -Name Host
   ```
2. Get the cluster to which *`Host`* belongs and save the cluster object as a variable.
   ```
   $vmhostCluster = Get-Cluster -VMHost $vmhost
   ```

3. Start a task that activates maintenance mode for the *Host* host and save the task object as a variable.
```
$updateHostTask = Set-VMHost -VMHost $vmhost -State "Maintenance" -RunAsync
```

NOTE
If the host is not automated or is partially automated and has powered-on virtual machines running on it, you must use the `RunAsync` parameter and wait until all powered-on virtual machines are relocated or powered off before applying DRS recommendations.

4. Get and apply the recommendations generated by DRS.
```
Get-DrsRecommendation -Cluster $vmhostCluster | where {$_.Reason -eq "Host is entering maintenance mode"} | Invoke-DrsRecommendation
```

5. Get the task output object and save it as a variable.
```
$myUpdatedHost = Wait-Task $updateHostTask
```

Change the Host Advanced Configuration Settings on vCenter Server

You can modify host configuration, including advanced settings related to virtual machine migration, and apply them to another host.

Verify that you are connected to a vCenter Server system.

1. Change the migration timeout for the *ESXHost1* host.
```
Get-VMHost ESXHost1 | Set-VmHostAdvancedConfiguration -Name Migrate.NetTimeout -Value ( [system.int32] 10 )
```

2. Enable creation of a checksum of the virtual machines memory during the migration.
```
Get-VMHost ESXHost1 | Set-VmHostAdvancedConfiguration -Name Migrate.MemChksum -Value ( [system.int32] 1 )
```

3. Get the *ESXHost1* host migration settings.
```
$migrationSettings = Get-VMHost ESXHost1 | Get-VmHostAdvancedConfiguration -Name Migrate.*
```

4. Apply the migration settings to *ESXHost2*.
```
Set-VmHostAdvancedConfiguration -VMHost ESXHost2 -Hashtable $migrationSettings
```

Create a Host Profile on a vCenter Server System

The VMware Host Profiles feature enables you to create standard configurations for ESXi hosts. With PowerCLI, you can automate creation and modifying of host profiles.

Verify that you are connected to a host that runs vCenter Server 4.0 or later.

1. Get the host named *Host1* and store it in the *$vmhost* variable.
```
$vmhost = Get-VMHost Host1
```

2. Create a profile based on the *Host1* host.
```
New-VMHostProfile -Name MyHostProfile01 -Description "This is my test profile based on Host1." -ReferenceHost $vmhost
```

3. Get the newly created host profile.
```
$hp1 = Get-VMHostProfile -Name MyHostProfile01
```

4. Change the description of the *HostProfile1* host profile.
   ```
   Set-VMHostProfile -Profile $hp1 -Description "This is my old test host profile based on Host1."
   ```

Apply a Host Profile to a Host on vCenter Server

To simplify operational management of large-scale environments, you can apply standard configurations called host profiles to hosts on vCenter Server. If you want to set up a host to use the same host profile as a reference host, you can attach the host to a profile.

Verify that you are connected to a host that runs vCenter Server 4.0 or later.

1. Get the *Host2* host.
   ```
   $vmhost2 = Get-VMHost Host2
   ```
2. Attach the *Host2* host to the *HostProfile1* host profile.
   ```
   Set-VMHost -VMHost $vmhost2 -Profile HostProfile1
   ```
3. Verify that the *Host2* host is compliant with the *HostProfile1* profile.
   ```
   Test-VMHostProfileCompliance -VMHost $vmhost2
   ```
   The output of this command contains the incompliant settings of the host, if any.
4. Apply the profile to the *Host2* host.
   ```
   $neededVariables = Invoke-VMHostProfile -Entity $vmhost2 -Profile $hp1 -Confirm:$false
   ```
   The *$neededVariables* variable contains the names of all required variables and their default or current values, as returned by the server. Otherwise, the *$neededVariables* variable contains the name of the host on which the profile has been applied.

Create a vSphere Role and Assign Permissions to a User

With PowerCLI, you can automate management of vSphere permissions, roles, and privileges.

Verify that you are connected to a vCenter Server system.

> **NOTE**
> vSphere permissions determine your level of access to vCenter Server, and ESXi hosts. Privileges define individual rights to perform actions and access object properties. Roles are predefined sets of privileges.

1. Get the privileges of the **Readonly** role.
   ```
   $readOnlyPrivileges = Get-VIPrivilege -Role Readonly
   ```
2. Create a new role with custom privileges.
   ```
   $role1 = New-VIRole -Privilege $readOnlyPrivileges -Name Role1
   ```
3. Add the **PowerOn** privileges to the new role.
   ```
   $powerOnPrivileges = Get-VIPrivilege -Name "PowerOn"
   $role1 = Set-VIRole –Role $role1 –AddPrivilege $powerOnPrivileges
   ```
4. Create a permission and apply it to a vSphere root object.
   ```
   $rootFolder = Get-Folder -NoRecursion
   $permission1 = New-VIPermission -Entity $rootFolder -Principal "user" -Role readonly -Propagate
   ```
   The `Principal` parameter accepts both local and domain users and groups if the vCenter Server system is joined in AD.

5. Update the new permission with the custom role.

```
$permission1 = Set-VIPermission -Permission $permission1 -Role $role1
```

You created a new role and assigned permissions to a user.

Modify the vCenter Server Email Configuration

You can modify the email configuration settings of a vCenter Server.

Verify that you are connected to a vCenter Server system.

1. View the current email configuration settings of the vCenter Server from the *$srv* variable.

```
Get-AdvancedSetting -Entity $srv -Name mail.*
```

2. Update the SMTP server name and port.

```
Get-AdvancedSetting -Entity $srv  -Name mail.smtp.server | Set-AdvancedSetting -Value smtp.vmware.com
Get-AdvancedSetting -Entity $srv  -Name mail.smtp.port | Set-AdvancedSetting -Value 25
```

Modify the vCenter Server SNMP Configuration

To use SNMP, you must first configure the SNMP settings of the vCenter Server.

Verify that you are connected to a vCenter Server system.

1. View the current SNMP configuration settings of the vCenter Server from the *$srv* variable.

```
Get-AdvancedSetting -Entity $srv  -Name snmp.*
```

2. Modify the SNMP receiver data.

```
Get-AdvancedSetting -Entity $srv  -Name snmp.receiver.2.community | Set-AdvancedSetting -Value public
Get-AdvancedSetting -Entity $srv  -Name snmp.receiver.2.enabled | Set-AdvancedSetting -Value $true
Get-AdvancedSetting -Entity $srv  -Name snmp.receiver.2.name | Set-AdvancedSetting -Value 192.168.1.10
```

Now you can use SNMP with vCenter Server.

Compute Cluster Administration

This section provides sample scripts for PowerCLI with basic and advanced tasks in compute cluster administration.

Create and Modify Advanced Settings for a Cluster

You can customize the behavior of a cluster on a vCenter Server system by creating and modifying custom advanced settings for it.

Verify that you are connected to a vCenter Server system.

1. Create a new cluster named *Cluster*.

```
$cluster = New-Cluster -Name Cluster -Location (Get-Datacenter Datacenter)
```

2. Create two advanced settings for the new cluster.
   ```
   $setting1 = New-AdvancedSetting -Type "ClusterHA" -Entity $cluster -Name 'das.defaultfailoverhost' -Value '192.168.10.1'
   $setting2 = New-AdvancedSetting -Type "ClusterHA" -Entity $cluster -Name 'das.isolationaddress' -Value '192.168.10.2'
   ```
3. Modify the value of the advanced setting stored in the *$setting2* variable.
   ```
   Get-AdvancedSetting -Entity $cluster -Name 'das.isolationaddress' | Set-AdvancedSetting -Value '192.168.10.3' -Confirm:$false
   ```
4. Create another advanced setting.
   ```
   New-AdvancedSetting -Entity $cluster -Name 'das.allowNetwork[Service Console]' -Value $true -Type 'ClusterHA'
   ```
5. Get the `Service Console` setting and store it in a variable.
   ```
   $setting3 = Get-AdvancedSetting -Entity $entity -Name 'das.allowNetwork`[Service Console`]'
   ```
   The ` character is used to escape the wildcard characters [and] in the advanced setting name.

Create a New VM-VM DRS Rule

You can create a VM-VM DRS affinity rule within a cluster.

- Verify that you are connected to a vCenter Server system.
- Verify that virtual machines and hosts exist within a cluster with enabled DRS in the vCenter Server environment.

1. Get the virtual machines for the VM-VM DRS rule.
   ```
   $affinityVMs = Get-VM "VM1", "VM2"
   ```
2. Get the cluster where you want to create the rule.
   ```
   $cluster = Get-Cluster "MyCluster"
   ```
3. Create the VM-VM DRS rule within the *MyCluster* cluster.
   ```
   New-DrsRule -Cluster $cluster -Name "AffinityRule1" -KeepTogether $true -VM $affinityVMs
   ```

Create a New VM-VMHost DRS Rule

You can create a VM-VMHost DRS rule within a cluster after creating a VM DRS cluster group and a VMHost DRS cluster group.

- Verify that you are connected to a vCenter Server system.
- Verify that virtual machines and hosts exist within a cluster with enabled DRS in the vCenter Server environment.

1. Get the virtual machines for the VM DRS cluster group.
   ```
   $vms = Get-VM "VM1", "VM2"
   ```
2. Get the hosts for the VMHost DRS cluster group.
   ```
   $vmHosts = Get-VMHost "hostname1", "hostname2"
   ```
3. Get the cluster where you want to create the rule.
   ```
   $cluster = Get-Cluster "MyCluster"
   ```
4. Create a VM DRS cluster group.
   ```
   $vmGroup = New-DrsClusterGroup -Name "MyVmsDrsClusterGroup" -VM $vms -Cluster $cluster
   ```

5. Create a VMHost DRS cluster group.

```
$vmHostGroup = New-DrsClusterGroup -Name "MyVmHostsDrsClusterGroup" -VMHost $vmHosts -Cluster $cluster
```

6. Create the VM-VMHost DRS rule by using the newly created VM DRS cluster group and VMHost DRS cluster group.

```
New-DrsVMHostRule -Name "MyDrsRule" -Cluster $cluster -VMGroup $vmGroup -VMHostGroup $vmHostGroup -Type
 "MustRunOn"
```

Virtual Machine Administration

This section provides sample scripts for PowerCLI with basic and advanced tasks in virtual machine administration.

Manage Virtual Machines on vSphere

With PowerCLI, you can automate various administration tasks on virtual machines, for example retrieving information, shutting down and powering off virtual machines.

1. View all virtual machines on the target system.

```
Get-VM
```

2. Save the name and the power state properties of the virtual machines in the *ResourcePool* resource pool into a file named `myVMProperties.txt`.

```
$respool = Get-ResourcePool ResourcePool
Get-VM -Location $respool | Select-Object Name, PowerState > myVMProperties.txt
```

3. Start the *VM* virtual machine.

```
Get-VM VM | Start-VM
```

4. Get information of the guest OS of the *VM* virtual machine.

```
Get-VMGuest VM | fc
```

5. Shut down the OS of the *VM* virtual machine.

```
Stop-VMGuest VM
```

6. Power off the *VM* virtual machine.

```
Stop-VM VM
```

7. Move the virtual machine *VM* from the *Host01* host to the *Host02* host.

```
Get-VM -Name VM -Location Host01 | Move-VM -Destination Host02
```

NOTE
If the virtual machine you want to move across hosts is powered on, it must be located on a shared storage registered as a datastore on both the original and the new host.

Create Virtual Machines on vCenter Server Using an XML Specification File

You can use a specification provided in an XML file to automate the creation of virtual machines on vCenter Server.

Verify that you are connected to a vCenter Server system.

The `myVM.xml` file must be present with the following content:

```
<CreateVM>
<VM>
<Name>MyVM1</Name>
<HDDCapacity>100</HDDCapacity>
</VM>
<VM>
```

```
<Name>MyVM2</Name>
<HDDCapacity>100</HDDCapacity>
</VM>
</CreateVM>
```

1. Read the content of the `myVM.xml` file.
   ```
   [xml]$s = Get-Content myVM.xml
   ```
2. Create the virtual machines.
   ```
   $s.CreateVM.VM | foreach {New-VM -VMHost $vmHost1 -Name $_.Name -DiskGB $_.HDDCapacity}
   ```

Manage Virtual Machine Templates on vCenter Server

You can use PowerCLI to create virtual machines templates and convert them to virtual machines on vCenter Server.

Verify that you are connected to a vCenter Server system.

> **NOTE**
> A virtual machine template is a reusable image created from a virtual machine. The template, as a derivative of the source virtual machine, includes virtual hardware components, an installed guest operating system, and software applications.

1. Create a template from the *VM1* virtual machine.
   ```
   New-Template -VM VM1 -Name VM1Template -Location (Get-Datacenter DC )
   ```
2. Convert the *VM1Template* template for use by a virtual machine named *VM3*.
   ```
   Get-Template VM1Template | Set-Template -ToVM -Name VM3
   ```
3. Create a template from the *VM2* virtual machine.
   ```
   New-Template -VM VM2 -Name VM2Template -Location (Get-Datacenter DC )
   ```
4. Convert the *VM2Template* template to a virtual machine named *VM4*.
   ```
   Get-Template VM2Template | Set-Template -ToVM -Name VM4
   ```
5. Convert the *VM4* virtual machine to a template.
   ```
   Set-VM –VM VM4 –ToTemplate –Name "VM4Template"
   ```
6. Create a template called *VM3Template* by cloning *VM2Template*.
   ```
   Get-Template VM2Template | New-Template -Name VM3Template –VMHost $targetVMHost
   ```

Create and Use Snapshots on vCenter Server

You can use the `Snapshot` parameter of `Get-VM` to take a snapshot of virtual machines and then revert the states of the virtual machines back to the snapshot.

Verify that you are connected to a vCenter Server system.

> **NOTE**
> A snapshot captures the memory, disk, and settings state of a virtual machine at a particular moment. When you revert to a snapshot, you return all these items to the state they were in at the time you took that snapshot.

1. Take a snapshot of all virtual machines in the *MyRP01* resource pool.

   ```
   Get-ResourcePool MyRP01 | Get-VM | New-Snapshot -Name InitialSnapshot
   ```

   The `Location` parameter takes arguments of the `VIContainer` type, on which `Cluster`, `Datacenter`, `Folder`, `ResourcePool`, and `VMHost` object types are based. Therefore, the `Location` parameter can use arguments of all these types.

2. Revert all virtual machines in the *MyRP01* resource pool to the *InitialSnapshot* snapshot.

```
$VMs = Get-ResourcePool MyRP01 | Get-VM
foreach( $vm in $VMs ) { Set-VM -VM $vm -Snapshot InitialSnapshot }
```

Update the Resource Configuration Settings of a Virtual Machine on vCenter Server

You can use the `Set-VMResourceConfiguration` cmdlet to modify the resource configuration properties of a virtual machine, including memory, CPU shares, and other settings.

Verify that you are connected to a vCenter Server system.

1. View the resource configuration for the *VM1* virtual machine.

```
Get-VMResourceConfiguration -VM VM1
```

2. View the disk share of the *VM1* virtual machine.

```
Get-VMResourceConfiguration -VM VM1 | Format-Custom -Property DiskResourceConfiguration
```

3. Change the memory share of the *VM1* virtual machine to low.

```
Get-VM VM1 | Get-VMResourceConfiguration | Set-VMResourceConfiguration -MemSharesLevel
low
```

4. Change the CPU shares of the *VM1* virtual machine to high.

```
Get-VM VM1 | Get-VMResourceConfiguration | Set-VMResourceConfiguration -CpuSharesLevel
high
```

5. Change the disk share of the *VM1* virtual machine to 100.

```
$vm1 = Get-VM VM1
$vm1disk = Get-HardDisk $vm1
Get-VMResourceConfiguration $vm1 | Set-VMResourceConfiguration -Disk $vm1disk -DiskSharesLevel cus-
tom -NumDiskShares 100
```

Move a Virtual Machine to a Different Host Using VMware vSphere vMotion

You can migrate a virtual machine between vCenter Server hosts by using vSphere vMotion.

Verify that you are connected to a vCenter Server system.

The virtual machine must be stored on a datastore shared by the current and the destination host, and the vMotion interfaces on the two hosts must be configured.

NOTE
You can use vSphere vMotion to move a powered-on virtual machine from one host to another.

Get the *VM1* virtual machine and move it to a host named *ESXHost2*.

```
Get-VM VM1 | Move-VM -Destination (Get-VMHost ESXHost2)
```

Move a Virtual Machine to a Different Datastore Using VMware vSphere Storage vMotion

You can migrate a virtual machine between datastores using the VMware Storage vMotion feature of vCenter Server.

Verify that you are connected to a vCenter Server system.

The host on which the virtual machine is running must have access both to the datastore where the virtual machine is located and to the destination datastore.

NOTE
You can use Storage vMotion to move a powered-on virtual machine from one datastore to another.

Get the *VM1* virtual machine and move it to a datastore named *DS2*:

```
Get-VM VM1 | Move-VM -Datastore DS2
```

Move a Virtual Machine to a Different vCenter Server System

You can migrate a virtual machine from one vCenter Server system to another by using Cross vCenter Server vMotion.

You can move virtual machines between vCenter Server systems of vSphere version 6.0 and later by using the `Move-VM` cmdlet. When you move a virtual machine from one vCenter Server system to another, only datastores are supported as storage destinations.

1. Connect to the *myVC1* source vCenter Server system.

   ```
   Connect-VIServer 'myVC1' -Username MyUser1 -Password MyPass1
   ```

2. Connect to the *myVC2* destination vCenter Server system.

   ```
   Connect-VIServer 'myVC2' -Username MyUser2 -Password MyPass2
   ```

3. Store the *MyVM* virtual machine, its network adapters, the destination host, port group, and datastore in variables.

   ```
   $vm = Get-VM 'myVM' -Location 'myVMhostOnVC1'
   $destination = Get-VMHost 'MyVMhostOnVc2'
   $networkAdapter = Get-NetworkAdapter -VM $vm
   $destinationPortGroup = Get-VDPortgroup -VDSwitch 'myVDSwitchOnVC2' -Name 'myPortGroup'
   $destinationDatastore = Get-Datastore 'MyDatastoreOnVc2'
   ```

4. Migrate the virtual machine to the specified destination host and datastore and attach the virtual machine network adapters to the destination port group.

   ```
   Move-VM -VM $vm -Destination $destination -NetworkAdapter $networkAdapter -PortGroup $destinationPort-
   Group -Datastore $destinationDatastore
   ```

Add Passthrough Devices to a Host and Virtual Machine

You can get information about existing passthrough devices and add new SCSI and PCI devices to virtual machines and hosts.

Verify that you are connected to a vCenter Server system.

1. Get a list of the PCI passthrough devices of the *VMHost* host

   ```
   $vmhost = Get-VMHost ESXHost
   Get-PassthroughDevice -VMHost $vmhost -Type Pci
   ```

2. Get a list of the SCSI passthrough devices of the *VM* virtual machine

   ```
   $vm = Get-VM VM
   Get-PassthroughDevice -VM $vm -Type Scsi
   ```

3. Add a SCSI passthrough device to the *VM* virtual machine

   ```
   $scsiDeviceList = Get-PassthroughDevice -VMHost ESXHost -Type Scsi
   Add-PassthroughDevice -VM $vm -PassthroughDevice $scsiDeviceList[0]
   ```

Apply a Customization Object to a Cloned Virtual Machine

You can apply a custom configuration to a cloned virtual machine by using a customization object.

Verify that you are connected to a vCenter Server system.

NOTE
This feature runs only on a 32-bit PowerCLI process.

1. Get the *Spec* customization specification and clone it for temporary use.
   ```
   Get-OSCustomizationSpec Spec | New-OSCustomizationSpec -Type NonPersistent -Name ClientSpec
   ```
2. Change the `NamingPrefix` property of the customization object to the name of the virtual machine you want to create.
   ```
   Set-OSCustomizationSpec -Spec ClientSpec -NamingPrefix VM1
   ```
3. Create a virtual machine named *VM1* by cloning the existing *VM* virtual machine and applying the customization specification.
   ```
   Get-VM VM | New-VM -VMHost Host -Datastore Storage1 -OSCustomizationSpec ClientSpec -Name VM1
   ```

Modify the Default NIC Mapping Object of a Customization Specification

You can modify the default NIC mapping object of a customization specification and apply the specification on a newly created virtual machine.

1. Create a nonpersistent customization specification for Windows operating systems.
   ```
   New-OSCustomizationSpec -Type NonPersistent -Name Spec -OSType Windows -Workgroup Workgroup
   -OrgName Company -Fullname User -ProductKey “valid_key” -ChangeSid -TimeZone "Central European" -Nam-
   ingScheme VM
   ```
2. View the default NIC mapping objects of the *Spec* specification.
   ```
   Get-OSCustomizationNicMapping -Spec Spec | Set-OSCustomizationNicMapping -IpMode
   UseStaticIP -IpAddress 172.16.1.30 -SubnetMask 255.255.255.0 -DefaultGateway 172.16.1.1 -Dns 172.16.1
   ```
   Each customization specification object has one default NIC mapping object.
3. Modify the default NIC mapping object of the *Spec* customization specification to use static IP.
   ```
   Get-OSCustomizationNicMapping -Spec Spec | Set-OSCustomizationNicMapping  -IpMode
   UseStaticIP -IpAddress 172.16.1.30 -SubnetMask 255.255.255.0 -DefaultGateway 172.16.1.1 -Dns 172.16.1.1
   ```
4. Create a new virtual machine named *VM1* from a template, and apply the static IP settings.
   ```
   New-VM -Name VM1 -VMHost Host -Datastore Storage1 -OSCustomizationSpec Spec -Template Template
   ```

Modify Multiple NIC Mapping Objects of a Customization Specification

You can modify multiple NIC mapping objects of a customization specification and apply the specification to an existing virtual machine.

1. Get the network adapters of a virtual machine named *VM*.
   ```
   Get-NetworkAdapter VM
   ```

When you apply a customization specification, each network adapter of the customized virtual machine must have a corresponding NIC mapping object. You can correlate network adapters and NIC mapping objects either by their position numbers, or by MAC address.

2. Create a customization specification named *Spec*.

```
New-OSCustomizationSpec -Type NonPersistent -Name Spec -OSType Windows -Workgroup Workgroup
 -OrgName Company -Fullname User -ProductKey “valid_key” -ChangeSid -TimeZone "Central European" -Nam-
ingScheme VM
```

3. Add a new NIC mapping object that uses a static IP address.

```
New-OSCustomizationNicMapping -Spec Spec -IpMode UseStaticIP -IpAddress 172.16.1.30 -Sub-
netMask 255.255.255.0 -DefaultGateway 172.16.1.1 -Dns 172.16.1.1
```

4. View the NIC mapping objects and verify that two NIC mapping objects are available.

```
Get-OSCustomizationNicMapping -Spec Spec
```

The default NIC mapping object is DHCP enabled, and the newly added one uses a static IP address.

5. Apply the Spec customization specification to the *VM* virtual machine.

```
Get-VM VM | Set-VM -OSCustomizationSpec -Spec Spec
```

6. Associate a network adapter from the *VMNetwork* network with the NIC mapping object that uses DHCP mode.

```
$netAdapter = Get-NetworkAdapter VM | where { $_.NetworkName -eq 'VMNetwork' }
Get-OSCustomizationNicMapping -Spec Spec | where { $_.IPMode -eq 'UseDHCP' } | Set-OSCustomization-
NicMapping -NetworkAdapterMac $netAdapter.MacAddress
```

Create Multiple Virtual Machines that Use Static IP Addresses

You can deploy multiple virtual machines with a single network adapter and configure the deployed virtual machines to use static IP addresses by applying a customization specification.

Verify that you have defined a list of static IP addresses in a CSV file.

1. Define the naming convention for the virtual machines.

```
$vmNameTemplate = "VM-{0:D3}"
```

2. Save the cluster in which the virtual machines should be created into a variable.

```
$cluster = Get-Cluster MyCluster
```

3. Save the template on which the virtual machines should be based into a variable.

```
$template = Get-Template MyTemplate
```

4. Create the virtual machines.

```
$vmList = @()

for ($i = 1; $i -le 100; $i++) {
    $vmName = $vmNameTemplate -f $i
    $vmList += New-VM -Name $vmName -ResourcePool $cluster -Template $template
}
```

5. Save the static IP addresses from the stored CSV file into a variable.

```
$staticIpList = Import-CSVC:\StaticIPs.csv
```

6. Create the customization specification.
```
$linuxSpec = New-OSCustomizationSpec -Name LinuxCustomization -Domain vmware.com -DomainUser-
name "your_domain_username" -DomainPassword "your_domain_password" -DnsServer "192.168.0.10",
 "192.168.0.20" -NamingScheme VM -OSType Linux
```
7. Clone the customization specification to a nonpersistent type.
```
$specClone = New-OSCustomizationSpec -Spec $linuxSpec -Type NonPersistent
```
8. Apply the customization specification to each virtual machine.
```
for ($i = 0; $i -lt $vmList.Count; $i++) {
    # Acquire a new static IP from the list
    $ip = $staticIpList[$i].IP

    # The specification has a default NIC mapping - retrieve it and update it with the static IP
    $nicMapping = Get-OSCustomizationNicMapping -OSCustomizationSpec $specClone
    $nicMapping | Set-OSCustomizationNicMapping -IpMode UseStaticIP -IpAddress $ip -SubnetMask
 "255.255.252.0" -DefaultGateway "192.168.0.1"

    # Apply the customization
    Set-VM -VM $vmList[$i] -OSCustomizationSpec $specClone -Confirm:$false
}
```

Create Multiple Virtual Machines with Two Network Adapters

You can deploy multiple virtual machines with two network adapters each and configure each adapter to use specific network settings by applying a customization specification.

Verify that you have defined a list of static IP addresses in a CSV file.

You can configure each virtual machine to have one network adapter attached to a public network and one network adapter attached to a private network. You can configure the network adapters on the public network to use static IP addresses and the network adapters on the private network to use DHCP.

1. Define the naming convention for the virtual machines.
```
$vmNameTemplate = "VM-{0:D3}"
```
2. Save the cluster in which the virtual machines should be created into a variable.
```
$cluster = Get-Cluster MyCluster
```
3. Save the template on which the virtual machines should be based into a variable.
```
$template = Get-Template MyTemplate
```
4. Create the virtual machines.
```
$vmList = @()

for ($i = 1; $i -le 100; $i++) {
    $vmName = $vmNameTemplate -f $i
    $vmList += New-VM -Name $vmName -ResourcePool $cluster -Template $template
}
```
5. Save the static IP addresses from the stored CSV file into a variable.
```
$staticIpList = Import-CSVC:\StaticIPs.csv
```

6. Create the customization specification.

```
$linuxSpec = New-OSCustomizationSpec -Name LinuxCustomization -Domain vmware.com -DnsServer
 "192.168.0.10", "192.168.0.20" -NamingScheme VM -OSType Linux -Type NonPersistent
```

7. Apply the customization specification to each virtual machine.

```
for ($i = 0; $i -lt $vmList.Count; $i++) {
    # Acquire a new static IP from the list
    $ip = $staticIpList[$i].IP

    # Remove any NIC mappings from the specification
    $nicMapping = Get-OSCustomizationNicMapping -OSCustomizationSpec $linuxSpec
    Remove-OSCustomizationNicMapping -OSCustomizationNicMapping $nicMapping -Confirm:$false

    # Retrieve the virtual machine's network adapter attached to the public network named "Public"
    $publicNIC = $vmList[$i] | Get-NetworkAdapter | where {$_.NetworkName -eq "Public"}

    # Retrieve the virtual machine's network adapter attached to the private network named "Private"
    $privateNIC = $vmList[$i] | Get-NetworkAdapter | where {$_.NetworkName -eq "Private"}

    # Create a NIC mapping for the "Public" NIC that should use static IP
    $linuxSpec | New-OSCustomizationNicMapping -IpMode UseStaticIP -IpAddress $ip -SubnetMask
 "255.255.252.0" -DefaultGateway "192.168.0.1" -NetworkAdapterMac $publicNIC.MacAddress

    # Create a NIC mapping for the "Private" NIC that should use DHCP
    $linuxSpec | New-OSCustomizationNicMapping -IpMode UseDhcp -NetworkAdapterMac $privateNIC.MacAd-
dress

    # Apply the customization
    Set-VM -VM $vmList[$i] -OSCustomizationSpec $linuxSpec -Confirm:$false
}
```

vSphere vApp Administration

This section provides sample scripts for PowerCLI with basic and advanced tasks in vSphere vApp administration.

Use vSphere vApp to package and manage virtual machines as a single entity. vApps are typically used to simplify the deployment and management of multi-tier applications.

Create a vApp on vCenter Server

With PowerCLI, you can create and manage vApps.

Verify that you are connected to a vCenter Server system.

1. Create a new vApp named *VApp* on a host.

```
New-VApp -Name VApp -CpuLimitMhz 4000 -CpuReservationMhz 1000 -Location (Get-VMHost Host1)
```

2. Start the new virtual appliance.

```
Start-VApp VApp
```

Modify the Properties of a vApp

With PowerCLI, you can start and stop vApps, and modify their properties.

Verify that you are connected to a vCenter Server system.

1. Get the vApp named *VApp* and stop it.
   ```
   Get-VApp VApp | Stop-VApp -Confirm:$false
   ```
2. Change the name and memory reservation for the vApp.
   ```
   Get-VApp VApp | Set-VApp -Name OldVApp -MemReservationGB 2
   ```

Export or Import vApps

You can import and export vApps to OVA and OVF files.

Verify that you are connected to a vCenter Server system.

1. Get the vApp you want to export.
   ```
   $oldVApp = Get-VApp OldVApp
   ```
2. Export the *OldVApp* vApp to a local directory and name the exported appliance *WebApp*.

   ```
   Export-VApp -VApp $oldVApp -Name WebApp -Destination D:\vapps\ -CreateSeparateFolder
   ```
3. Import the *WebApp* vApp from a local directory to the *Storage2* datastore.

   ```
   Import-VApp -Source D:\vapps\WebApp\WebApp.ovf -VMHost (Get-VMHost Host1) -Datastore (Get-
   Datastore -VMHost MyHost01 -Name Storage2)
   ```

Using Tags

The vSphere Tag Service supports the definition of tags that you can associate with different types of vSphere objects, such as virtual machines, resource pools, datastores, and distributed switches. You can use PowerCLI to create and manage tags and tag categories, and to retrieve specified groups of objects.

You create a vSphere tag to add metadata to objects in the vSphere inventory. Tags are grouped in categories and each tag must have at least one category related to it. After you create the tag, you can associate the tag with a vSphere object.

After you create a tag category and create a tag within the category, you can associate the tag with a vSphere managed object. An association is a simple link that contains no data of its own. You can enumerate objects that are attached to a tag or tags that are attached to an object.

Retrieve a Tag and Save It into a Variable

You can retrieve existing tags defined in vSphere and save a specific tag into a variable.

Verify that you are connected to a vCenter Server system.

1. Get the tag named *MyTag*.
   ```
   Get-Tag -Name 'MyTag'
   ```
2. Save the tag into a variable.
   ```
   $tag = Get-Tag -Name 'MyTag'
   ```

Retrieve a Tag Category and Save It into a Variable

You can retrieve existing tag categories defined in vSphere and save a specific tag category into a variable.

Verify that you are connected to a vCenter Server system.

1. Get the tag category named *MyTagCategory*.

```
Get-TagCategory -Name 'MyTagCategory'
```

2. Save the tag category into a variable.

```
$tagCategory = Get-TagCategory -Name 'MyTagCategory'
```

Create a Tag Category and a Tag

You can create a tag category and add a new tag in that category.

Verify that you are connected to a vCenter Server system.

1. Create a tag category named *Department*.

```
$departmentTagCategory = New-TagCategory -Name 'Department'
```

2. Create a new tag named *SalesDpt* in the *Department* category.

```
$salesDptTag = New-Tag -Name 'SalesDpt' -Category $departmentTagCategory
```

Assign a Tag to Virtual Machines

You can assign a tag to a group of virtual machines. For example, you can assign a custom tag to all virtual machines that belong to a specific department in your organization.

Verify that you are connected to a vCenter Server system.

1. Get the virtual machines of a department in your organization.

```
$vms = Get-VM sales-dpt*
```

2. Assign the custom tag to the group of virtual machines.

```
New-TagAssignment -Tag $salesDptTag -Entity $vms
```

Retrieve Objects by Tag

You can retrieve all objects that have a specific tag assigned to them.

Verify that you are connected to a vCenter Server system.

Get all virtual machines tagged with the *salesDptTag* tag.

```
Get-VM -Tag 'salesDptTag'
```

NOTE
You can only specify a tag filter parameter for the `VM` , `VMHost` , `Datastore` , and `VirtualPortGroup` object types.

Generate Tags Automatically by Using a Script

You can use a script to generate tags automatically. For example, you can create a virtual machine owner tag for each user account in a domain.

- Verify that you are connected to a vCenter Server system.
- Verify that the user accounts and the vCenter Server system are in the same domain.

You must use the `Get-VIAccount` cmdlet to retrieve user accounts. For more information, see the documentation of the cmdlet.

1. Create a new tag category and specify that tags in this category can only be assigned to entities of type `VirtualMachine` .

   ```
   $ownerTagCategory = New-TagCategory -Name Owner -EntityType VirtualMachine
   ```

   NOTE
   If you do not specify an entity type, tags from this category can be assigned to all entity types.

2. Retrieve all domain user accounts and save them in a variable.

   NOTE
   You This cmdlet works only with the vCenter Server built-in identity provider that supports local accounts, Active Directory or OpenLDAP, Integrated Windows Authentication (IWA), and miscellaneous authentication mechanisms (smart card and RSA SecurID).You cannot retrieve user accounts for users who use external identity providers to authenticate with vCenter Server.

   ```
   $accounts = Get-VIAccount -User -Domain 'DomainName' -Category | select -ExpandProperty Id
   ```

3. Create a tag for each user account.

   ```
   $accounts | foreach { New-Tag -Category $ownerTagCategory -Name $_ }
   ```

4. Retrieve a specific tag from the *`Owner`* category, so that you can later assign it to a specific virtual machine.

   ```
   $ownerTag = Get-Tag -Category $ownerTagCategory -Name 'John_Smith'
   ```

Add an Entity Type to a Tag Category

You can extend the list of entity types associated with a tag category.

Verify that you are connected to a vCenter Server system.

Add the *`vApp`* entity type to the *`ownerTagCategory`* tag category.

```
$ownerTagCategory | Set-TagCategory -AddEntityType vApp
```

Retrieve Tag Assignments

You can retrieve tag assignments by using category and entity filters.

Verify that you are connected to a vCenter Server system.

1. Retrieve all virtual machines that have a tag from the *`ownerTagCategory`* tag category assigned to them.

   ```
   Get-TagAssignment -Category $ownerTagCategory
   ```

2. Retrieve the owner of the *`MyVM`* virtual machine.

   ```
   Get-TagAssignment -Category $ownerTagCategory -Entity 'MyVM'
   ```

Using Content Libraries

Use content libraries with PowerCLI to store and distribute various forms of content within your vSphere environment. Content libraries function as container entities within vSphere, allowing you to save and distribute items such as OVF and OVA packages, virtual machine templates, vApp templates, and various file types.

You can use content libraries to share VM and vApp templates, and other types of files, such as ISO images, text files, and so on, across your vCenter Server instances. Sharing templates across your virtual environment promotes consistency, compliance, efficiency, and automation in deploying workloads at scale.

A content library instance represents a container for a set of library items. A content library item instance represents the logical object stored in the content library, which might be one or more usable files.

You create and manage the content of a content library on a single vCenter Server instance, but you can distribute the content to other vCenter Server instances.

Depending on your needs, you can maintain two types of content libraries: local and subscribed. You can shape the contents of a library item and then combine several library items in a local content library. Furthermore, you can publish the library to make its content available to other users.

Create a Local Content Library

With PowerCLI, you can create a local content library.

Verify that you are connected to a vCenter Server system.

1. Get the datastore that you want to use to store files for library items in this library.

   ```
   $datastore = Get-Datastore myDatastore
   ```

2. Create the *My Local Content Library* published local content library that uses the *myDatastore* datastore.

   ```
   New-ContentLibrary -Name 'My Local Content Library' -Description 'Local content library description.'
    -Datastore $Datastore1 -Published
   ```

Create a Subscribed Content Library

With PowerCLI, you can create a subscribed content library.

Verify that you are connected to a vCenter Server system.

Create the *My Subscribed Content Library* subscribed content library that uses the *myDatastore* datastore.

```
New-ContentLibrary -Name 'My Subscribed Content Library' -Description 'Subscribed content library descrip-
tion.' -Datastore $Datastore1 -SubscriptionUrl $Url
```

Create a Content Library Item

With PowerCLI, you can create content library items.

Verify that you are connected to a vCenter Server system.

1. Get the files that you want to upload to the content library.

   ```
   $files = Get-ChildItem -File
   ```

2. Get the content library that you want to upload.

   ```
   $contentLibrary = Get-ContentLibrary -name 'MyContentLibrary'
   ```

3. Create a content library item.

```
New-ContentLibraryItem -ContentLibrary $contentLibrary -name 'New item' -Files $files
```

Create a Virtual Machine from a Content Library Item

You can deploy a virtual machine from a content library template.

- Verify that you are connected to a vCenter Server system.
- Verify that you have a content library with virtual machine templates available.

> **NOTE**
> VMware PowerCLI cannot distinguish between OVF content library items of type virtual machine template and vApp template. As a result, `New-VM` creates a vApp if you specify a vApp template from the content library by using the `ContentLibraryItem` parameter of the cmdlet. If this happens, `New-VM` returns an error, notifying that the cmdlet produced an inventory item of the wrong type. Avoid creating vApps by using the `New-VM` cmdlet, as this behavior will be deprecated in future releases.

1. Get the virtual machine host.

```
$myVMHost = Get-VMHost myVMHost
```

2. Create the *MyVM* virtual machine from the *MyVMContentLibrayItemName* content library item.

```
Get-ContentLibraryItem -Name MyVMContentLibrayItemName | New-VM -Name MyVM -VMHost $myVMHost
```

Create a vApp from a Content Library Item

You can deploy a vApp from a content library template.

- Verify that you are connected to a vCenter Server system.
- Verify that you have a content library with vApp templates available.

> **NOTE**
> VMware PowerCLI cannot distinguish between OVF content library items of type virtual machine template and vApp template. As a result, `New-VApp` creates a virtual machine if you specify a virtual machine template from the content library by using the `ContentLibraryItem` parameter of the cmdlet. If this happens, `New-VApp` returns an error, notifying that the cmdlet produced an inventory item of the wrong type. Avoid creating virtual machines by using the `New-VApp` cmdlet, as this behavior will be deprecated in future releases.

1. Get the virtual machine host.

```
$myVMHost = Get-VMHost myVMHost
```

2. Create the *MyVApp* vApp from the *MyVAppContentLibrayItemName* content library item.

```
Get-ContentLibraryItem -Name MyVAppContentLibrayItemName | New-VApp -Name MyVApp -VMHost $myVMHost
```

Export Content Library Item's Files to a Local Machine

With PowerCLI, you can export content library item's files to a local machine.

Verify that you are connected to a vCenter Server system.

1. Get a content library item.

```
$item = Get-ContentLibraryItem -Name 'myVM'
```

2. Export a content library item to a local machine.

```
Export-ContentLibraryItem -ContentLibraryItem $item -Destination ./myVM-files
```

vSphere Networking

This section provides sample scripts for PowerCLI with basic and advanced tasks in vSphere Networking.

Modify the Settings of the NIC Teaming Policy for a Virtual Switch

You can set the NIC teaming policy on a vSwitch. The NIC teaming policy determines the load balancing and failover settings of a virtual switch and lets you mark NICs as unused.

Verify that you are connected to a vCenter Server system.

1. Get a list of the physical NIC objects on the host network and store them in a variable.
   ```
   $pn = Get-VMHost 10.23.123.128 | Get-VMHostNetwork | Select -Property physicalnic
   ```
2. Store the physical NIC objects you want to mark as unused in separate variables.
   ```
   $pn5 = $pn.PhysicalNic[2]
   $pn6 = $pn.PhysicalNic[3]
   $pn7 = $pn.PhysicalNic[0]
   ```
3. View the NIC teaming policy of the *VSwitch01* virtual switch.
   ```
   $policy = Get-VirtualSwitch -VMHost 10.23.123.128 -Name VSwitch01 | Get-NicTeamingPolicy
   ```
4. Change the policy of the switch to indicate that the *$pn5*, *$pn6*, and *$pn7* network adapters are unused.
   ```
   $policy | Set-NicTeamingPolicy -MakeNicUnused $pn5, $pn6, $pn7
   ```
5. Modify the load balancing and failover settings of the virtual switch NIC teaming policy.
   ```
   $policy | Set-NicTeamingPolicy -BeaconInterval 3 -LoadBalancingPolicy 3 -NetworkFailoverDetectionPolicy
    1 -NotifySwitches $false -FailbackEnabled $false
   ```

Network Management with vSphere Distributed Switches

The cmdlets provided in the `VMware.VimAutomation.VDS` module let you manage networking with vSphere distributed switches and port groups.

Create a Distributed Switch and Configure Networking

A vSphere distributed switch lets you handle networking traffic for all associated hosts in a data center. After you create a new vSphere distributed switch in PowerCLI, you can add hosts and connect virtual machines to it.

Verify that you are connected to a vCenter Server system.

1. Get the data center where you want to create the vSphere distributed switch.
   ```
   $myDatacenter = Get-Datacenter -Name "MyDatacenter"
   ```
2. Get all hosts in your data center.
   ```
   $vmHosts = $myDatacenter | Get-VMHost
   ```
3. Create a new vSphere distributed switch.
   ```
   $myVDSwitch = New-VDSwitch -Name "MyVDSwitch" -Location $myDatacenter
   ```
   The distributed switch is created with no port groups.
4. Add the hosts in your data center to the distributed switch.
   ```
   Add-VDSwitchVMHost -VDSwitch $myVDSwitch -VMHost $vmHosts
   ```
5. Get a physical network adapter from your hosts.
   ```
   $hostsPhysicalNic = $vmHosts | Get-VMHostNetworkAdapter -Name "vmnic2"
   ```

6. Add the physical network adapter to the distributed switch that you created.
```
Add-VDSwitchPhysicalNetworkAdapter -VMHostNetworkAdapter $hostsPhysicalNic -DistributedSwitch
 $myVDSwitch
```
7. Create a new distributed port group with 1000 ports and add it to the distributed switch.
```
$myVDPortGroup = New-VDPortgroup -Name "MyVMsPortGroup" -VDSwitch $myVDSwitch -NumPorts 1000
```
8. Connect all virtual machines running on the hosts in your data center to the distributed port group.
```
$vmHosts | Get-VM | Get-NetworkAdapter | Set-NetworkAdapter -PortGroup $myVDPortGroup
```

Adjust the settings of the distributed switch. See Configure a Distributed Switch.

Configure a Distributed Switch

Based on your networking requirements, you can adjust the settings of a newly created or an existing distributed switch.

Verify that you are connected to a vCenter Server system.

- Modify the maximum MTU size setting for a distributed switch.
```
Get-VDSwitch -Name 'MyVDSwitch' | Set-VDSwitch -Mtu 2000
```
- Modify the number of uplink ports on a distributed switch.
```
Get-VDSwitch -Name 'MyVDSwitch' | Set-VDSwitch -NumUplinkPorts 4
```
- Modify the maximum number of ports on a distributed switch.
```
Get-VDSwitch -Name 'MyVDSwitch' | Set-VDSwitch -MaxPorts 1000
```
- Modify the discovery protocol settings on a vSphere distributed switch.
```
Get-VDSwitch -Name 'MyVDSwitch' | Set-VDSwitch -LinkDiscoveryProtocol LLDP -LinkDiscoveryProtocolOpera-
tion Both
```

Migrate Virtual Machine Networking Configuration from a vSphere Standard Switch to a vSphere Distributed Switch

To manage virtual machine networks on a data center level, you might need to migrate existing networks from vSphere standard switches to vSphere distributed switches.

Verify that you are connected to a vCenter Server system.

1. Get the source vSphere standard switch from which you want to migrate the virtual machine networking.
```
$virtualSwitch = Get-VirtualSwitch -Name 'MyVirtualSwitch'
```
2. Get the source standard port group to which the virtual machines are connected.
```
$vmsPortGroup = $virtualSwitch | Get-VirtualPortGroup -Name 'VM Network'
```
3. Get the target vSphere distributed switch to which you want to migrate the virtual machine networking.
```
$vdSwitch = Get-VDSwitch -Name 'MyTargetVDSwitch'
```
4. Get the target port group to which you want to connect the virtual machines.
```
$vdPortGroup = Get-VDPortGroup -VDSwitch $vdSwitch -Name 'DPortGroup'
```
5. Get the virtual machine network adapters connected to the source port group.
```
$vmsNetworkAdapters = Get-VM -RelatedObject $vmsPortGroup | Get-NetworkAdapter | where { $_.NetworkName
 -eq $vmsPortGroup.Name }
```
6. Disconnect the retrieved network adapters from the standard port group and connect them to the distributed port group.
```
Set-NetworkAdapter -NetworkAdapter $vmsNetworkAdapters -PortGroup $vdPortGroup
```

Migrate Physical and Virtual NICs to a vSphere Standard Switch

You can migrate both physical and virtual network adapters to a vSphere standard switch simultaneously.

Verify that you are connected to a vCenter Server system.

1. Get the physical network adapters that you want to migrate.

```
$pNics = Get-VMHostNetworkAdapter -VMHost $vmhost -Physical
```

2. Get the virtual network adapters that you want to migrate.

```
$vNicManagement = Get-VMHostNetworkAdapter -VMHost $vmhost -Name vmk0
$vNicvMotion = Get-VMHostNetworkAdapter -VMHost $vmhost -Name vmk1
```

3. Get the vSphere standard switch to which you want to migrate the network adapters.

```
$vSwitch = Get-VirtualSwitch -VMHost $vmhost -Name vSwitch0
```

4. Migrate all network adapters to the vSphere standard switch.

```
Add-VirtualSwitchPhysicalNetworkAdapter -VirtualSwitch $vSwitch -VMHostPhysicalNic $pNics -VMHostVir-
tualNic $vNicManagement,$vNicvMotion
```

Migrate Physical and Virtual NICs to a vSphere Distributed Switch

You can migrate both physical and virtual network adapters to a vSphere distributed switch simultaneously.

Verify that you are connected to a vCenter Server system.

1. Get the physical network adapters that you want to migrate.

```
$pNics = Get-VMHostNetworkAdapter -VMHost $vmhost -Physical
```

2. Get the virtual network adapters that you want to migrate.

```
$vNicManagement = Get-VMHostNetworkAdapter -VMHost $vmhost -Name vmk0
$vNicvMotion = Get-VMHostNetworkAdapter -VMHost $vmhost -Name vmk1
```

3. Get the port groups corresponding to the virtual network adapters that you want to migrate to the vSphere distributed switch.

```
$vdPortgroupManagement = Get-VDPortgroup -VDSwitch $vds -Name 'Management Network'
$vdPortgroupvMotion = Get-VDPortgroup -VDSwitch $vds -Name 'vMotion Network'
```

4. Migrate all network adapters to the vSphere distributed switch.

```
Add-VDSwitchPhysicalNetworkAdapter -DistributedSwitch $vds -VMHostPhysicalNic $pNics -VMHostVirtualNic
 $vNicManagement,$vNicvMotion -VirtualNicPortGroup $vdPortGroupManagement, $vdPortGroupvMotion
```

You migrated the *$vNicManagement* network adapter to the Management Network port group and the *$vNicvMotion* network adapter to the vMotion Network port group.

Configure the Traffic Shaping Policy

You can modify the traffic shaping policy of a port group to limit the bandwidth of the incoming traffic and ensure that enough bandwidth is available for other port groups on the same vSphere distributed switch.

Verify that you are connected to a vCenter Server system.

1. Get the current traffic shaping policy of the port group.

```
$policy = Get-VDTrafficShapingPolicy -Direction In -VDPortGroup $myVDPortGroup
```

2. Set the peak bandwidth to 100 Mbps.

```
Set-VDTrafficShapingPolicy -Policy $policy -PeakBandwidth 104857600
```

Configure the Security Policy

You can modify the security policy of a port group to enable promiscuous mode, which allows monitoring of the traffic generated by virtual machines.

Verify that you are connected to a vCenter Server system.

1. Get the current security policy of the port group.

```
$policy = Get-VDSecurityPolicy -VDPortGroup $myVDPortGroup
```

2. Enable promiscuous mode for the port group.

```
Set-VDSecurityPolicy $policy -AllowPromiscuous $true
```

vSphere Storage

This section provides sample scripts for PowerCLI with basic and advanced tasks in vSphere Storage.

Create an iSCSI Host Storage

For a host, you can enable iSCSI, add iSCSI targets, and create new host storages.

Verify that you are connected to a vCenter Server system.

1. Enable software iSCSI on a host.

```
$vmhost = Get-VMHost ESXHost1
Get-VMHostStorage $myHost | Set-VMHostStorage -SoftwareIScsiEnabled $true
```

2. Get the iSCSI Host Bus Adapter (HBA) that is on the host.

```
$iscsiHba = Get-VMHostHba -Type iScsi
```

3. Add a new iSCSI target for dynamic discovery.

```
$iscsiHba | New-IScsiHbaTarget -Address 192.168.0.1 -Type Send
```

4. Rescan the HBAs on the host.

```
Get-VMHostStorage $vmhost -RescanAllHba
```

5. Get the path to the SCSI LUN.

```
$lunPath = Get-ScsiLun -VMHost $vmhost -CanonicalName ($iscsiHba.Device + "*") | Get-ScsiLunPath
```

You can provide the LUN path by using its canonical name beginning with the device name of the iSCSI HBA.

6. Create a new host storage.

```
New-Datastore -Vmfs -VMHost $vmhost -Path $lunpath.LunPath -Name iSCSI
```

Storage Policy Based Management with VMware PowerCLI

Manage your storage policies with PowerCLI. Storage Policy Based Management (SPBM) is a storage policy framework that operates on the virtual machine level and serves as a single unified control panel across a broad range of data services and storage solutions.

Create a Tag-Based Storage Policy

You can create storage policies by using tags from vCenter Server.

- Verify that you are connected to a vCenter Server system.
- Verify that you have Profile-driven storage update privileges.
- Verify that a tag named *Tag1* exists in the vCenter Server environment.

1. Get the *Tag1* tag and store it in the *$tag* variable.

```
$tag = Get-Tag -Name 'Tag1'
```

2. Create a rule with the *$tag* tag and store the rule in the *$rule* variable.

```
$rule = New-SpbmRule -AnyOfTags $tag
```

3. Create a rule set by using the *$rule* rule and store the rule set in the *$ruleset* variable.

```
$ruleset = New-SpbmRuleSet -AllOfRules $rule
```

4. Create a tag-based policy named *Tag-Based-Policy* by using the *$ruleset* rule set and store the policy in the *$policy* variable.

```
$policy = New-SpbmStoragePolicy -Name 'Tag-Based-Policy' -Description 'This policy is created by using a
 tag' -AnyOfRuleSets $ruleset
```

Create a Capability-Based Storage Policy

You can create storage policies by using vendor-exposed capabilities.

- Verify that you are connected to a vCenter Server system.
- Verify that you have Profile-driven storage update privileges.
- Verify that a storage provider is registered with the vCenter Server system.

1. Get the *VSAN.hostFailuresToTolerate* capability and store it in the *$cap* variable.

```
$cap = Get-SpbmCapability -Name 'VSAN.hostFailuresToTolerate'
```

2. Create a rule with the *$cap* capability and store the rule in the *$rule* variable.

```
$rule = New-SpbmRule -Capability $cap -value 1
```

3. Create a rule set by using the *$rule* rule and store the rule set in the *$ruleset* variable.

```
$ruleset = New-SpbmRuleSet -AllOfRules $rule
```

4. Create a capability-based policy named *Capability-Based-Policy* by using the *$ruleset* rule set and store the policy in the *$policy* variable.

```
$policy = New-SpbmStoragePolicy -Name 'Capability-Based-Policy' -Description 'This policy is created by
 using capabilities' -AnyOfRuleSets $ruleset
```

Associate a Storage Policy with a Virtual Machine and Its Hard Disk

You can associate a storage policy with a virtual machine and its hard disk and check if they are compliant with the policy.

- Verify that you are connected to a vCenter Server system.
- Verify that a storage policy named *Str-Policy* exists in the vCenter Server environment.
- Verify that a virtual machine named *Target-VM* exists in the vCenter Server environment.

1. Get the *Str-Policy* storage policy and store it in the *$policy* variable.

```
$policy = Get-SpbmStoragePolicy -Name 'Str-Policy'
```

2. Get the *Target-VM* virtual machine and store it in the *$vm* variable.

```
$vm = Get-VM -Name 'Target-VM'
```

3. Get the hard disk associated with the *$vm* virtual machine and store it in the *$hd* variable.

```
$hd = Get-HardDisk -VM $vm
```

4. Assign the *$policy* storage policy to the *$vm* virtual machine and the *$hd* hard disk.

```
Set-SpbmEntityConfiguration $vm, $hd -StoragePolicy $policy
```

5. View the *$policy* storage policy's compliance with the *$vm* virtual machine and the *$hd* hard disk.

```
Get-SpbmEntityConfiguration $vm, $hd
```

NOTE
The storage policy can be compliant only if the datastore on which the virtual machine and hard disk are created is compliant with the storage policy.

Disassociate a Storage Policy Associated with a Virtual Machine and Its Hard Disk

You can disassociate a storage policy that is associated with a virtual machine and its hard disk.

- Verify that you are connected to a vCenter Server system.
- Verify that a virtual machine named *Target-VM* exists in the vCenter Server environment.
- Verify that a storage policy is associated with the *Target-VM* virtual machine.

1. Get the *Target-VM* virtual machine and store it in the *$vm* variable.

```
$vm = Get-VM -Name 'Target-VM'
```

2. Get the hard disk associated with the *$vm* virtual machine and store it in the *$hd* variable.

```
$hd = Get-HardDisk -VM $vm
```

3. Disassociate all storage policies that are associated with the *$vm* virtual machine and the *$hd* hard disk.

```
Set-SpbmEntityConfiguration $vm, $hd -StoragePolicy $null
```

Remove a Storage Policy

You can disassociate all entities associated with a storage policy and remove the policy completely.

- Verify that you are connected to a vCenter Server system.
- Verify that you have Profile-driven storage update privileges.
- Verify that a storage policy named *pol-tag* exists in the vCenter Server environment.

1. Get the *pol-tag* storage policy and store it in the *$policy* variable.

```
$policy = Get-SpbmStoragePolicy -Name 'pol-tag'
```

2. Disassociate all entities associated with the *$policy* storage policy.

```
Set-SpbmEntityConfiguration (Get-SpbmEntityConfiguration -StoragePolicy $policy) -StoragePolicy
 $null
```

3. Remove the *$policy* storage policy.

```
Remove-SpbmStoragePolicy -StoragePolicy $policy
```

Edit a Storage Policy

You can modify a storage policy to replace an existing rule set with a new rule set.

- Verify that you are connected to a vCenter Server system.
- Verify that you have Profile-driven storage update privileges.
- Verify that a storage provider is registered with the vCenter Server system.
- Verify that a storage policy named *pol-tag* exists in the vCenter Server environment.

1. Get the *pol-tag* storage policy and store it in the *$policy* variable.

```
$policy = Get-SpbmStoragePolicy -Name 'pol-tag'
```

2. Create a new rule and store it in the *$newRule* variable.

```
$newRule = New-SpbmRule -Capability (Get-SpbmCapability -Name 'VSAN.hostFailuresToTolerate') -Value 1
```

3. Create a new rule set by using the *$newRule* rule and store it in the *$newRuleset* variable.

```
$newRuleset = New-SpbmRuleSet -AllOfRules $newRule
```

4. Modify the *$policy* storage policy by replacing the existing rule set with the newly created *$newRuleset* rule set.

```
$modPolicy = Set-SpbmStoragePolicy -StoragePolicy $policy -AnyOfRuleSets $newRuleset
```

Export and Import a Storage Policy

You can back up a storage policy by exporting it as a file. You can later import the same storage policy.

- Verify that you are connected to a vCenter Server system.
- Verify that you have Profile-driven storage update privileges.
- Verify that you have read-write permissions for the directory in which the storage policy is saved.
- Verify that a storage policy named *pol-tag* exists in the vCenter Server environment.

1. Export the *pol-tag* storage policy.

```
Export-SpbmStoragePolicy -StoragePolicy 'pol-tag' -FilePath 'C:\Policy\pol-tag.xml'
```

2. Import the *pol-tag* storage policy and name it *Imported-Policy*.

```
Import-SpbmStoragePolicy -FilePath 'C:\Policy\pol-tag.xml' -Name 'Imported-Policy' -Description 'Im-
ported policy description'
```

Create a Virtual Machine in a Datastore Compatible with Storage Policy

You can retrieve a datastore compatible with storage policy and create a virtual machine in the datastore.

- Verify that you are connected to a vCenter Server system.
- Verify that a tag-based storage policy named *Tag-Policy* exists in the vCenter Server environment.
- Verify that the tag of the *Tag-Policy* storage policy is associated with one of the available datastores in the vCenter Server environment.

1. Get the tag-based *Tag-Policy* storage policy and store it in the *$policy* variable.

```
$policy = Get-SpbmStoragePolicy -Name 'Tag-Policy'
```

2. Get the tag used in the *Tag-Policy* storage policy and store it in the *$tag* variable.

```
$tag = ($($($policy.AnyOfRulesets).AllOfRules).AnyOfTags)[0]
```

3. Get a datastore compatible with the *$policy* storage policy and store it in the *$ds* variable.

```
$ds = Get-SpbmCompatibleStorage -StoragePolicy $policy
```

4. Get the virtual machine host that contains the *$ds* datastore and store it in the *$vmhost* variable.

   ```
   $vmHost = Get-VMHost -Datastore $ds
   ```

5. Create a virtual machine named *VM-Tag* in the *$ds* datastore and store the virtual machine object in the *$vm* variable.

   ```
   $vm = New-VM -Name 'VM-Tag' -ResourcePool $vmHost -Datastore $ds -NumCPU 2 -MemoryGB 4 -DiskMB 1
   ```

6. Associate the *$policy* storage policy with the *$vm* virtual machine.

   ```
   Set-SpbmEntityConfiguration $vm -StoragePolicy $policy
   ```

7. Verify that the *$vm* virtual machine is compliant with the *$policy* storage policy.

   ```
   Get-SpbmEntityConfiguration $vm
   ```

   The status should be `Compliant`.

8. Get the `Tag-Assignment` object for the *$ds* datastore and store it in the *$tagAs* variable.

   ```
   $tagAs = Get-TagAssignment -Entity $ds
   ```

9. Remove the *$tag* tag association from the *$ds* datastore.

   ```
   Remove-TagAssignment -TagAssignment $tagAs
   ```

10. Check the compliance of the *$vm* virtual machine with the *$policy* storage policy.

    ```
    Get-SpbmEntityConfiguration $vm
    ```

    The status should be `NonCompliant`.

Add a VASA Provider and Create a Policy

You can add a VASA provider to a vCenter Server system and create a storage policy.

- Verify that you are connected to a vCenter Server system.
- Verify that the datastore is mounted to the ESXi host.

1. Add a VASA provider to the vCenter Server system.

   ```
   $script:vasProvider = New-VasaProvider -Name 'name' -Url 'URL' -Username 'user_name' -Password 'pass-
   word'  -Description 'description' -Force
   ```

2. Get all SPBM capabilities exposed by the registered VASA provider.

   ```
   Get-SpbmCapability
   ```

3. Create a new SPBM rule with the exposed capabilities of the registered VASA provider.

   ```
   $rule = New-SpbmRule -Capability $capability -Value $value
   ```

4. Create a new SPBM rule set.

   ```
   New-SpbmRuleSet -Name $ruleset -AllofRules @(($rule))
   ```

5. Create a storage policy.

   ```
   New-SpbmStoragePolicy -Name $storagepolicy -RuleSet $ruleset
   ```

6. Refresh the VASA provider registered with the vCenter Server system.

   ```
   $provider = Get-VasaProvider -Name $providername -Refresh
   ```

7. Verify the VASA storage array.

   ```
   $vasaStorageArray = Get-VasaStorageArray -Provider $vasaProvider -Server $script:vcsrv
   ```

8. Refresh the VASA provider registered with the vCenter Server system.

```
$provider = Get-VasaProvider -Name $providername -Refresh
```

9. Get the VASA provider registered with the vCenter Server system.

```
$vasaProvider = Get-VasaProvider -Name $providername
```

10. Optional: Remove the VASA provider.

```
Remove-VasaProvider -Provider $provider -Confirm:$false
```

11. Optional: Verify that the VASA provider is removed.

```
$provider = Get-VasaProvider -Name $providername
```

Invoke a Planned Failover on a Replication Group and Reverse the Replication

You can invoke a planned failover on a target replication group and recover the devices on the target site. After that, you can reverse the direction of the replication and make the target site the source site.

- Verify that you are connected to the vCenter Server systems of the source and target sites.
- Verify that you have access to at least one virtual machine host on each site.
- Verify that you have registered a Virtual Volume VASA provider and have access to a Virtual Volume datastore on each site.

1. Create a storage policy with replication capability on the source site.

```
$replicationCapability = Get-SpbmCapability -Name *replication.RPO -Server $srcServer
$persistenceCapability = Get-SpbmCapability -Name *persistence1-readLatency -Server $srcServer
$replicationRule = New-SpbmRule -Capability $ replicationCapability -Value (New-TimeSpan -Hours 4)
$persistenceRule = New-SpbmRule $persistenceCapability -Value 25
$ruleSet = New-SpbmRuleSet -AllOfRules $replicationRule, $persistenceRule
$replicationPolicy = New-SpbmStoragePolicy -Name cokeRep -AnyOfRuleSets $ruleSet -Server $srcServer
```

2. Get a datastore compatible with the created replication storage policy and store it in the *$ds* variable.

```
$ds = Get-SpbmCompatibleStorage -StoragePolicy $replicationPolicy
```

3. Create a virtual machine named *MyVM* with a hard disk in the *$ds* datastore.

```
$vm = New-VM -Name 'MyVM' -VMHost 'Host-Source' -DiskMB 512 -Datastore $ds
$hd = Get-HardDisk -VM $vm
```

4. Get a replication group for the *$ds* datastore and the *$replicationPolicy* storage policy, and store the replication group in the *$rg* variable.

```
$rg = Get-SpbmReplicationGroup –Datastore $ds –StoragePolicy $replicationPolicy
```

5. Associate the *$vm* virtual machine and its hard disk with the *$replicationPolicy* storage policy, and put them in the *$rg* replication group.

```
Set-SpbmEntityConfiguration -Configuration $vm, $hd -StoragePolicy $replicationPolicy -ReplicationGroup
 $rg
```

6. Check the compliance of the *$vm* virtual machine and *$hd* hard disk with the *$replicationPolicy* storage policy.

```
Get-SpbmEntityConfiguration $vm, $hd
```

7. Get the replication pair corresponding to the *$rg* source replication group, and store that pair in the *$rgPair* variable.

```
$rgPair = Get-SpbmReplicationPair -Source $rg
```

8. Synchronize the target replication group.

```
Sync-SpbmReplicationGroup $rgPair.Target
```

9. Power off the *$vm* virtual machine and unregister it.

```
Stop-VM $vm
Remove-VM $vm
```

10. Prepare the failover on the source replication group.

```
Start-SpbmReplicationPrepareFailover $rgPair.Source
```

11. Synchronize the target replication group again, to get the latest state of the source devices.

```
Sync-SpbmReplicationGroup $rgPair.Target
```

12. Invoke the planned failover on the source replication group and store the virtual machine file path on the target site in the *$vmFilePath* variable.

```
$vmFilePath = Start-SpbmReplicationFailover $rgPair.Target
```

13. Register the virtual machine on the *Host-Target* host and power on the virtual machine.

```
$vm = New-VM -VMFilePath $vmFilePath -VMHost 'Host-Target'
Start-VM $vm
```

14. Reverse the direction of the replication.

```
Start-SpbmReplicationReverse $rgPair.Target
```

Attach a Flat VDisk to a Virtual Machine

You can create a flat `VDisk` object and attach it to a virtual machine as a hard disk. After that, you can verify whether the operation was completed successfully.

- Verify that you are connected to a vCenter Server system.
- Verify that you have access to at least one virtual machine host.
- Verify that there is at least one datastore mounted on the virtual machine host.

1. Mount the datastore on the virtual machine host and store the datastore in the *$ds* variable.

```
$vmHost = Get-VMHost 'Host-A'
$ds = Get-Datastore -RelatedObject $vmHost
```

2. Create a flat, thin-provisioned virtual disk with 2-GB capacity on the *$ds* datastore.

```
$vDisk = New-VDisk -Name 'VirtualDisk' -DiskType Flat -StorageFormat Thin -CapacityGB 2 -Datastore $ds
```

3. Create a virtual machine named *VirtualMachine* with one hard disk and store this virtual machine in the *$vm* variable.

```
$vm = New-VM -Name 'VirtualMachine' -VMHost 'Host-A' -Datastore $ds -DiskMB 512
```

4. Power on the *$vm* virtual machine.

```
Start-VM -VM $vm
```

5. Attach the `VDisk` object to the *$vm* virtual machine.

```
New-HardDisk -VM $vm -VDisk $vDisk
```

6. Verify that the `VDisk` object has been attached and the virtual machine now has two hard disks.

```
Get-HardDisk -VM $vm
```

Create an NFS 4.1 Datastore

You can create an NFS 4.1 datastore with Kerberos authentication and multipathing.

- Verify that you are connected to a vCenter Server system.
- Verify that the remote NFS share supports multipathing and Kerberos authentication.

1. Get the virtual machine host where you want to create the NFS 4.1 datastore.

```
$vmhost = Get-VMHost 'hostname'
```

2. Set NTP servers for the virtual machine host.

```
Add-VMHostNtpServer -VMHost $vmhost -NtpServer 'ntp_server_ip'
```

3. Set a DNS server and search the domain for the virtual machine host.

```
$vmhostnetwork = Get-VMHostNetwork -VMHost $vmhost
Set-VMHostNetwork -Network $vmhostnetwork -DnsFromDhcp $false -DnsAddress 'dns_server_ip' -DomainName
 'domain_name' -SearchDomain 'search_domain'
```

4. Add the virtual machine to the Active Directory domain.

```
$vmhost | Get-VMHostAuthentication | Set-VMHostAuthentication -JoinDomain -Domain 'AD_domain_name'
 -Username 'AD_user_name' -Password 'AD_password'
```

5. Create an NFS user on the virtual machine host for Kerberos-based authentication for the NFS 4.1 datastore.

```
New-NfsUser -VMHost $vmhost -Username 'NFS_user_name' -Password 'password'
```

6. Create an NFS 4.1 datastore with Kerberos authentication and multipathing.

```
New-Datastore -Name 'NFS_datastore_name' -Nfs -FileSystemVersion '4.1' -VMHost $vmhost -Nf-
sHost @('remote_host_1_ip', 'remote_host_2_ip') -Path 'NFS_datastore_remote_path' -Kerberos
```

7. Optional: Retrieve the datastore.

```
$ds = Get-Datastore 'NFS_datastore_name'
```

8. Optional: Remove the datastore.

```
Remove-Datastore $ds -VMHost $vmhost
```

9. Optional: Get the NFS user from the virtual machine host.

```
$user = Get-NfsUser -VMHost $vmhost
```

10. Optional: Update the password of the NFS user.

```
$user = Set-NfsUser -NfsUser $user -Password 'new_password'
```

11. Optional: Remove the NFS user.

```
Remove-NfsUser -NfsUser $user
```

Managing Certificates

You can use VMware PowerCLI to manage certificates for both vCenter Server and ESXi no matter if you are using Hybrid, Subordinate CA, or Full Custom Mode.

Starting from VMware PowerCLI 12.4.0, you can do various certificate management operations in your vSphere environment. The certificate management functionality is included in the `VMware.PowerCLI.VCenter` module.

Add a Root Certificate to vCenter Server and ESXi

You can use PowerCLI to add a root certificate or certificate chain to the trusted root store of vCenter Server and to the certificate stores of the connected ESXi hosts.

- Verify that you are connected to a vCenter Server system.
- Verify that the root certificate or certificate chain you want to add is available on your machine.

1. Optional: List the trusted root certificates on your vCenter Server system and the connected ESXi hosts.

   ```
   Get-VITrustedCertificate
   ```

2. Create a variable with the root certificate or certificate chain you want to add.

   ```
   $trustedCertChain = Get-Content "C:\Users\jdoe\Downloads\ca-chain.cert.pem" -Raw
   ```

3. Add the root certificate or certificate chain to vCenter Server and to the connected ESXi hosts

   ```
   Add-VITrustedCertificate -PemCertificateOrChain $trustedCertChain
   ```

4. Optional: Verify that your new root certificate or certificate chain has been added to the trusted certificate stores.

   ```
   Get-VITrustedCertificate
   ```

Change the Machine SSL Certificate of vCenter Server

You can use PowerCLI to change the Machine SSL certificate of a vCenter Server system. For a custom certificate, you must generate a certificate signing request (CSR) and send it to the certificate authority (CA) of your choice.

- Verify that you are connected to a vCenter Server system.
- Verify that the root certificate of the CA you are going to use is added to the trusted root store of vCenter Server.

1. Optional: Retrieve the current Machine SSL certificate of the vCenter Server system.

   ```
   Get-VIMachineCertificate -VCenterOnly
   ```

2. Generate a CSR.

   ```
   $csrParams = @{
       Country="US"
       Email="jdoe@vmware.com"
       Locality="San Francisco"
       Organization="My Company"
       OrganizationUnit="PowerCLI"
       StateOrProvince="California"
   }
   $csr = New-VIMachineCertificateSigningRequest @csrParams
   ```

3. Save the CSR to your system.

   ```
   $csr.CertificateRequestPEM | Out-File "C:\Users\jdoe\Downloads\vc.csr.pem" -Force
   ```

4. Send the CSR to the CA of your choice.
5. Save the issued custom certificate to your system.
6. Set the new custom certificate to the vCenter Server system.

```
$vcCert = Get-Content "C:\Users\jdoe\Downloads\vc.cert.jdoe.pem" -RawSet-VIMachineCertificate -PemCer-
tificate $vcCert
```

NOTE

Starting with vSphere 8.0 Update 2, restart of vCenter Server services after the certificate change is no longer necessary. The certificate replacement is completed seamlessly and all your sessions remain active.

For older vSphere versions, the change of the Machine SSL certificate triggers a restart of vCenter Server. Wait for the system to reboot and log in when available.

Change the Machine SSL Certificate of an ESXi Host

You can use PowerCLI to change the Machine SSL certificates of one or more ESXi hosts in your vSphere environment.

- Verify that the root certificate of the CA you are going to use is added to the trusted root store of vCenter Server and to the connected ESXi hosts.

1. Connect to the vCenter Server system.

```
$vCenterConnection = Connect-VIServer vc1.example.com `
    -User 'My User' `
    -Password 'My Password'
```

2. In the vCenter Server system, retrieve the setting for the ESXi host certificate management mode.

```
$certModeSetting = Get-AdvancedSetting "vpxd.certmgmt.mode" -Entity $vCenterConnection
$certModeSetting.Value
```

3. Change the setting to *custom*.

```
Set-AdvancedSetting $certModeSetting -Value "custom"
```

4. For the new certificate management mode to take effect, reboot your vCenter Server system.
5. Connect to the vCenter Server system.

```
$vCenterConnection = Connect-VIServer vc1.example.com `
    -User 'My User' `
    -Password 'My Password'
```

6. Set the ESXi host you want to manage to *Maintenance* mode.

```
$vmhost = Get-VMHost 'MyESXiHost' `
Set-VMHost -VMHost $vmhost -State Maintenance
```

7. Generate a certificate signing request (CSR) for the ESXi host.

```
$esxRequest = New-VIMachineCertificateSigningRequest `
    -VMHost $vmhost `
    -Country "US" `
    -Locality "San Francisco" `
    -Organization "My Company" `
    -OrganizationUnit "PowerCLI" `
    -StateOrProvince "California" `
```

```
-CommonName <ESXi host's FQDN> or <ESXi host's IP address>
```

NOTE

For `CommonName`, you must use either the ESXi host's FQDN or IP address. The common name must match the identifier you use to add the host to the vCenter Server system.

8. Save the CSR to your system.

```
$esxRequest.CertificateRequestPEM | Out-File "C:\Users\jdoe\Downloads\esx.csr.pem" -Force
```

9. Send the CSR to the CA of your choice.
10. Save the issued custom certificate to your machine.
11. Create a variable with your issued custom certificate.

```
$esxCertificatePem = Get-Content "C:\Users\jdoe\downloads\myesxcert.pem" -Raw
```

12. Remove the ESXi host from the vCenter Server system.

```
Remove-VMHost $vmhost
```

13. Disconnect from the vCenter Server system.

```
Disconnect-VIServer $vCenterConnection
```

14. Connect directly to the ESXi host.

```
$esxConnection = Connect-VIServer $vmhost.Name `
    -User 'My User' `
    -Password 'My Password' `
    -Force
```

15. Set the custom Machine SSL certificate to the ESXi host.

```
$targetEsxHost = Get-VMHost $vmhost.Name
Set-VIMachineCertificate -PemCertificate $esxCertificatePem -VMHost $targetEsxHost | Out-Null
```

16. To apply the change, restart the ESXi host.

```
Restart-VMHost $targetEsxHost
```

17. Disconnect from the ESXi host.

```
Disconnect-VIServer $esxConnection
```

18. Connect to the vCenter Server system.

```
$vCenterConnection = Connect-VIServer vc1.example.com `
    -User 'My User' `
    -Password 'My Password'
```

19. Add the ESXi host to the vCenter Server system.

```
$vmhost = Add-VMHost -Name<ESXi host's FQDN> or <ESXi host's IP address> `
    -Location (Get-Datacenter "My Datacenter")`
    -User "My User" `
    -Password "My Password"
```

20. Set the ESXi host to the *Connected* mode.

```
$vmhost = Set-VMHost -VMHost $vmhost -StateConnected
```

21. Optional: Verify that the Machine SSL certificate of the ESXi host is changed.

```
Get-VIMachineCertificate -VMHost $vmhost
```

Using Get-View

Use `Get-View` to access vSphere Management API view objects with PowerCLI.

The `Get-View` cmdlet operates on the low level and binds directly to the vSphere Management API objects. You can use this cmdlet for high-performance automation as it overrides the PowerCLI high-level architecture.

You can use `Get-View` in combination with `Get-VIObjectByVIView` to retrieve the PowerCLI variant of a vSphere Management API view object.

Filter vSphere Objects with Get-View

You can use the `Get-View` cmdlet to filter vSphere objects before performing various actions on them.

Verify that you are connected to a vCenter Server system.

The filter parameter is a `HashTable` object containing one or more pairs of filter criteria. Each of the criteria consists of a property path and a value that represents a regular expression pattern used to match the property.

1. Create a filter by the power state and the guest operating system name of the virtual machines.
   ```
   $filter = @{"Runtime.PowerState" ="poweredOn"; "Config.GuestFullName" = "Windows XP"}
   ```
2. Get a list of the virtual machines by using the created filter and call the `ShutdownGuest` method for each virtual machine in the list.

   ```
   Get-View -ViewType "VirtualMachine" -Filter $filter | foreach{$_.ShutdownGuest()}
   ```

The filter gets a list of the powered-on virtual machines whose guest OS names contain the string `Windows XP` . The `Get-View` cmdlet then initiates shutdown for each guest operating system in the list.

Populate a View Object with Get-View

To save time and efforts, you can use `Get-View` to retrieve PowerCLI views from previously retrieved view objects.

Verify that you are connected to a vCenter Server system.

1. Get a view of the *`VM2`* virtual machine by name.
   ```
   $vm2 = Get-View -ViewType VirtualMachine -Filter @{"Name" = "VM2"}
   ```
2. Populate the *`$vmhostView`* object.
   ```
   $vmhostView = Get-View -Id $vm2.Runtime.Host
   ```
3. Retrieve the runtime information for the *`$vmhostView`* object.
   ```
   $vmhostView.Summary.Runtime
   ```

Update the State of a Server-Side Object

You can use the `Get-View` cmdlet to update server-side objects.

Verify that you are connected to a vCenter Server system.

1. Get the *`VM2`* virtual machine by name.
   ```
   $vm2 = Get-View -ViewType VirtualMachine -Filter @{"Name" = "VM2"}
   $vmhostView = Get-View -Id $vm2.Runtime.Host
   ```
2. View the current power state.
   ```
   $vm2.Runtime.PowerState
   ```

3. Power off the virtual machine.
```
If ($vm2.Runtime.PowerState -ne “PoweredOn”) {
  $vm.PowerOnVM($vm2.Runtime.Host)
} else {
$vm2.PowerOffVM()
}
```
4. View the value of the *$vm2* power state.
```
$vm2.Runtime.PowerState
```
The power state is not updated yet because the virtual machine property values are not updated automatically.
5. Update the view object.
```
$vm2.UpdateViewData()
```
6. Obtain the actual power state of the virtual machine.
```
$vm2.Runtime.PowerState
```

Reboot a Host with Get-View

You can reboot a host by using its corresponding view object.

Verify that you are connected to a vCenter Server system.

1. Use the `Get-VMHost` cmdlet to get a host by its name, and pass the result to the `Get-View` cmdlet to get the corresponding view object.
```
$vmhostView = Get-VMHost -Name Host | Get-View
```
2. Call the reboot method of the host view object to reboot the host.
```
$vmhostView.RebootHost()
```

Modify the CPU Levels of a Virtual Machine with Get–View and Get–VIObjectByVIView

You can use `Get-View` in combination with `Get-VIObjectByVIView` to invoke a vSphere Management API view object and retrieve its PowerCLI variant.

Verify that you are connected to a vCenter Server system.

You can modify the CPU levels of a virtual machine by using a combination of the `Get-View` and `Get-VIObjectByVIView` cmdlets.

1. Get the *VM2* virtual machine, shut it down, and pass it to the `Get-View` cmdlet to view the virtual machine view object.
```
$vmView = Get-VM VM2 | Stop-VM | Get-View
```
2. Create a *VirtualMachineConfigSpec* object to modify the virtual machine CPU levels and call the `ReconfigVM` method of the virtual machine view managed object.
```
$spec = New-Object VMware.Vim.VirtualMachineConfigSpec;
$spec.CPUAllocation = New-Object VMware.Vim.ResourceAllocationInfo;
$spec.CpuAllocation.Shares = New-Object VMware.Vim.SharesInfo;
$spec.CpuAllocation.Shares.Level = "normal";
$spec.CpuAllocation.Limit = -1;
$vmView .ReconfigVM_Task($spec)
```
3. Get the virtual machine object by using the `Get-VIObjectByVIView` cmdlet and start the virtual machine.
```
$vm =  Get-VIObjectByVIView $vmView  | Start-VM
```

Creating Custom Properties

You can use PowerCLI to create custom properties for different PowerCLI object types. Then, you can use the custom properties to retrieve objects based on specified criteria.

Create a Custom Property Based on an Extension Data Property

You can create custom properties to add more information to vSphere objects. Custom properties based on extension data properties correspond directly to the property of the corresponding .NET view object.

Verify that you are connected to a vCenter Server system.

1. Create a new custom property based on the `Guest.ToolsVersion` property.

```
New-VIProperty -ObjectType VirtualMachine -Name ToolsVersion -ValueFromExtensionProperty
'Guest.ToolsVersion'
```

2. View the `ToolsVersion` properties of the available virtual machines.

```
Get-VM | Select Name, ToolsVersion
```

You have created a custom property named `ToolsVersion` for `VirtualMachine` objects.

Create a Script-Based Custom Property for a vSphere Object

You can create a custom property by writing a script and providing a name for the property. The script evaluates when the custom property is called for the first time.

Verify that you are connected to a vCenter Server system.

1. Create a new custom property named *`NameOfHost`* that stores the name of the host on which a virtual machine resides.

```
New-VIProperty -Name NameOfHost -ObjectType VirtualMachine -Value { return
$args[0].VMHost.Name }
```

2. View the *`NameOfHost`* properties of the available virtual machines.

```
Get-VM | select Name, NameOfHost | Format-Table -AutoSize
```

You created a custom script property named *`NameOfHost`* for `VirtualMachine` objects.

Using the PowerCLI Inventory Provider

Use the PowerCLI Inventory Provider to interact with the VMware vSphere inventory through a file system interface, so that it is easier to navigate, manipulate, and automate tasks.

The PowerCLI Inventory Provider allows navigation and file-style management of the VMware vSphere inventory. By creating a PowerShell drive based on a managed object (such as a data center), you can obtain a view of its contents and the relationships between the items. In addition, you can move, rename, or delete objects by running commands from the PowerShell console.

When you connect to a server with `Connect-VIServer`, the cmdlet builds two default inventory drives: `vi` and `vis`.

To access the inventory of the last connected server, run: `cd vi:\`.

To access the inventory of all vSphere servers connected within the current PowerCLI session, run `cd vis:\`.

Use the `dir` and `cd` commands to navigate the inventories.

Browse the Default Inventory Drive

You can browse the default inventory drive and view its contents.

Verify that you are connected to a vCenter Server system.

> **NOTE**
> For more information about the Inventory Provider and the default inventory drive, see Using the PowerCLI Inventory Provider.

1. Navigate to the `vi` inventory drive.
   ```
   cd vi:
   ```
2. View the drive content.
   ```
   dir
   ```
   `dir` is an alias of the `Get-ChildItem` cmdlet.

Create a New Custom Inventory Drive

In addition to the default drive, you can create new custom inventory drives by using the `New-PSDrive` cmdlet.

Verify that you are connected to a vCenter Server system.

> **NOTE**
> An alternative to creating an inventory drive is to map an existing inventory path. For example, run: `New-PSDrive -Name myVi -PSProvider VimInventory -Root "vi:\Folder01\Datacenter01"`.

1. Get the root folder of the server.
   ```
   $root = Get-Folder -NoRecursion
   ```
2. Create a PowerShell drive named `myVi` in the server root folder.
   ```
   New-PSDrive -Location $root -Name myVi -PSProvider VimInventory -Root '\'
   ```
   > **NOTE**
   > You can use the `New-InventoryDrive` cmdlet, which is an alias of `New-PSDrive`. This cmdlet creates a new inventory drive using the `Name` and `Datastore` parameters. For example: `Get-Folder -NoRecursion | New-VIInventoryDrive -Name myVi`.

Manage Inventory Objects Through Inventory Drives

You can use the PowerCLI Inventory Provider to browse, modify, and remove inventory objects from inventory drives.

Verify that you are connected to a vCenter Server system.

1. Navigate to a host in your server inventory by running the `cd` command with the full path to the host.
   ```
   cd Folder01\DataCenter01\host\Web\Host01
   ```
2. View the content of the host using the `ls` command.
   ```
   ls
   ```
   `ls` is the UNIX style alias of the `Get-ChildItem` cmdlet.
   This command returns the virtual machines and the root resource pool of the host.

3. View only the virtual machines on the host.
   ```
   Get-VM
   ```
   When called within the inventory drive, `Get-VM` gets a list only of the virtual machines on the current drive location.
4. Delete a virtual machine named *VM1*.
   ```
   del VM1
   ```
5. Rename a virtual machine, for example, from *VM1New* to *VM1*.
   ```
   ren VM1New VM1
   ```
6. Start all virtual machines with names that start with *VM*.
   ```
   dir VM* | Start-VM
   ```

Using the PowerCLI Datastore Provider

Use the PowerCLI Datastore Provider to access the contents of one or more datastores through a file system interface, so that it is easier to navigate, manipulate, and automate tasks.

The items in a datastore are files that contain configuration, virtual disk, and other data associated with a virtual machine.

When you connect to a server with `Connect-VIServer`, the cmdlet builds two default datastore drives: `vmstore` and `vmstores`.

To access the datastores of the last connected vCenter Server or ESXi, run: `cd vmstore:\`.

To access the datastores available on all vCenter Server and ESXi systems you are currently connected to, run: `cd vmstores:\`.

Use the `dir` and `cd` commands to navigate the inventories.

Browse the Default Datastore Drives

You can use the PowerCLI Datastore Provider to browse the default datastore drives: `vmstore` and `vmstores`.

Verify that you are connected to a vCenter Server system.

> **NOTE**
> For more information about default datastore drives, see Using the PowerCLI Datastore Provider.

1. Navigate to the `vmstore` drive.
   ```
   cd vmstore:
   ```
2. View the drive content.
   ```
   dir
   ```

Create a New Custom Datastore Drive

You can use the PowerCLI Datastore Provider to create custom datastore drives.

Verify that you are connected to a vCenter Server system.

1. Get a datastore by its name and assign it to the *$datastore* variable.
   ```
   $datastore = Get-Datastore Storage1
   ```

2. Create a new PowerShell drive `ds:` in *`$datastore`*.
   ```
   New-PSDrive -Location $datastore -Name ds -PSProvider VimDatastore -Root '\'
   ```

   NOTE
   You can use the `New-PSDrive` cmdlet, which is an alias of `New-DatastoreDrive`. It creates a new datastore drive using the `Name` and `Datastore` parameters. For example: `Get-Datastore Storage1 | New-DatastoreDrive -Name ds`.

Manage Datastores Through Datastore Drives

You can use the PowerCLI Datastore Provider to browse datastores from datastore drives.

Verify that you are connected to a vCenter Server system.

1. Navigate to a folder on the `ds:` drive.
   ```
   cd VirtualMachines\XPVirtualMachine
   ```
2. View the files of the folder by running the `ls` command.
   ```
   ls
   ```
   `ls` is the UNIX style alias of the `Get-ChildItem` cmdlet.
3. Rename a file by running the `Rename-Item` cmdlet or its alias `ren`.

   For example, to change the name of the `vmware-3.log` file to `vmware-3old.log`, run:

   ```
   ren vmware-3.log vmware-3old.log
   ```

   All file operations apply only on files in the current folder.
4. Delete a file by running the `Remove-Item` cmdlet or its alias `del`.

   For example, to remove the `vmware-3old.log` file from the `XPVirtualMachine` folder, run:

   ```
   del ds:\VirtualMachines\XPVirtualMachine\vmware-2.log
   ```
5. Copy a file by running the `Copy-Item` cmdlet or its alias `copy`.
   ```
   copy ds:\VirtualMachines\XPVirtualMachine\vmware-3old.log ds:\VirtualMachines\vmware-3.log
   ```
6. Copy a file to another datastore by running the `Copy-Item` cmdlet or its alias `copy`.
   ```
   copy ds:\Datacenter01\Datastore01\XPVirtualMachine\vmware-1.log ds:\Datacenter01\Datastore02\XPVirtualMachine02\vmware.log
   ```
7. Create a new folder by running the `New-Item` cmdlet or its alias `mkdir`.
   ```
   mkdir -Path ds:\VirtualMachines -Name Folder01 -Type Folder
   ```
8. Download a file from the datastore drive to the local machine by running the `Copy-DatastoreItem` cmdlet.
   ```
   Copy-DatastoreItem ds:\VirtualMachines\XPVirtualMachine\vmware-3.log C:\Temp\vmware-3.log
   ```
9. Upload a file from the local machine by running the `Copy-DatastoreItem` cmdlet.
   ```
   Copy-DatastoreItem C:\Temp\vmware-3.log  ds:\VirtualMachines\XPVirtualMachine\vmware-3new.log
   ```

Managing vSphere Update Manager with VMware PowerCLI

This section provides sample scripts for PowerCLI with basic and advanced tasks in vSphere Update Manager administration.

The vSphere Update Manager module provides a set of cmdlets for downloading software patches, creating and modifying baselines, and for scanning and remediating virtual machines or hosts.

Create Patch Baselines

You can apply patch baselines to hosts. Depending on the patch criteria you select, patch baselines can be either dynamic or fixed.

Verify that you are connected to a vCenter Server system.

Patch data in dynamic baselines changes depending on the criteria you specify each time Update Manager downloads new patches. Fixed baselines contain only the patches you have selected, regardless of new patch downloads.

1. Retrieve all host patches released after 1 Jan 2015 for ESXi products, and create a fixed baseline named *Static Baseline*, containing the retrieved patches.

```
$patches = Get-Patch -After "1 Jan 2015" -Product "ESXi"
$staticBaseline = New-PatchBaseline -Static -Name "Static Baseline" -IncludePatch $patches
```

2. Create a critical dynamic baseline named *Dynamic Baseline* by using a fetch-all query.

```
$criticalPatchBaseline = New-PatchBaseline -Dynamic -Name "Dynamic Baseline" -SearchPatchSeverity Criti-
cal
```

3. Create an extension baseline that contains all available extensions.

```
$extensions = Get-Patch -BundleType Extension
New-PatchBaseline -Static -Name "Extension Baseline" -Extension -IncludePatch $extensions
```

Attach and Detach Baselines

You can attach baselines to individual objects and to container objects, such as folders, hosts, clusters, and data centers. Attaching a baseline to a container object attaches the baseline to all objects in the container.

Verify that you are connected to a vCenter Server system.

1. Attach the host patch baselines stored in the provided variables to the host named *Host*.

```
Add-EntityBaseline -Baseline $staticBaseline, $criticalPatchBaseline -Entity Host
```

2. Detach the two baselines from the host.

```
Remove-EntityBaseline -Baseline $dynamicBaseline, $staticBaseline -Entity Host
```

Scan a Virtual Machine

You can scan a virtual machine against the baselines attached to it or inherited by its parent object.

Verify that you are connected to a vCenter Server system.

1. Initialize scanning on a virtual machine that is named *VM* against baselines containing virtual machine hardware upgrades and VMware Tools upgrades.

```
$task = Test-Compliance -Entity VM -UpdateType VmHardwareUpgrade, VmToolsUpgrade -RunAsync
```

   The command initializes a task on the server, returns a snapshot object of the initial state of the task, and saves it in the *$task* variable.

2. View the initial status of the scanning task.

```
$task
```

> **NOTE**
> The task object is not updated with the actual state of the task process running on the server. Even after the task is completed, the *$task* variable value is running. To view the actual status of the tasks running on the server, use the `Get-Task` cmdlet.

3. Optional: Run the `Wait-Task` cmdlet to monitor the process progress and wait for the task to complete before running other commands.

```
Wait-Task -Task $task
```

Check Virtual Machine Baseline Status

You can check whether a virtual machine has any baselines with unknown compliance status attached to it and start a scan.

Verify that you are connected to a vCenter Server system.

1. Retrieve the compliance statuses with the value `Unknown` for the baselines attached to the *`VM`* virtual machine and store them in the *`$statuses`* variable.

```
$statuses = Get-Compliance -Entity VM -ComplianceStatus Unknown
```

2. Check whether the virtual machine has any baselines with unknown compliance status attached to it and start a scan.

```
if ($statuses.Count -gt 0) {
Test-Compliance -Entity VM -RunAsync"
}
```

Stage Patches

Staging allows you to download patches and extensions from the Update Manager server to the ESXi hosts without applying the patches and extensions immediately.

Verify that you are connected to a vCenter Server system.

> **NOTE**
> Staging can be performed only for hosts, clusters, and data centers.

1. Retrieve a host and store it in the *`$vmHost`* variable.

```
$vmHost = Get-VMHost -Name 10.23.112.233
```

2. Stage the patches for upgrading the host.

```
Stage-Patch -Entity $vmHost
```

Remediate a Virtual Machine

You can retrieve all baselines attached to a virtual machine and remediate the virtual machine.

Verify that you are connected to a vCenter Server system.

1. Retrieve all baselines attached to the *`VM`* virtual machine.

```
$baselines = Get-Baseline –Entity VM
```

2. Remediate the virtual machine.

```
Update-Entity –Entity VM –Baseline $baselines
```

Upgrade Virtual Machine Hardware

You can upgrade virtual machine hardware and VMware Tools for all virtual machines in a data center.

Verify that you are connected to a vCenter Server system.

1. Retrieve all virtual machines in the *Datacenter* data center.

```
$vms = Get-VM -Location Datacenter
```

2. Retrieve all virtual machine upgrade baselines.

```
$ugradeBaselines = Get-Baseline -TargetType VM -BaselineType Upgrade
```

3. Remediate all virtual machines against the virtual machine upgrade baselines.

```
foreach ($vm in $vms) {
Update-Entity -Entity $vm -Baseline $upgradeBaselines
}
```

Remediate a Cluster

You can retrieve all baselines attached to a cluster and remediate the cluster.

Verify that you are connected to a vCenter Server system.

> **NOTE**
> Before remediation, you must temporarily deactivate the Distributed Power Management (DPM), High Availability (HA) admission control, and Fault Tolerance (FT) features of the clusters you want to remediate. After remediation, Update Manager automatically activates the deactivated features.

1. Retrieve all baselines attached to the *Cluster* cluster.

```
$baselines = Get-Baseline –Entity Cluster
```

2. Remediate the cluster.

```
Update-Entity –Entity Cluster –Baseline $baselines -ClusterDisableDistributedPowerManagement $true –Clus-
terDisableHighAvailability $true -ClusterDisableFaultTolerance $true
```

Remediate a Host

You can retrieve all baselines attached to a host and remediate the host.

Verify that you are connected to a vCenter Server system.

> **NOTE**
> When remediating a host, you can configure the maintenance mode settings. You can temporarily disconnect any removable media devices that might prevent the host from entering maintenance mode as well.

1. Retrieve all baselines attached to the *Host* host.

```
$baselines = Get-Baseline –Entity Host
```

2. Remediate the host.

```
Update-Entity –Entity Host –Baseline $baselines –HostFailureAction Retry –HostNumberOfRetries 2 -HostDis-
ableMediaDevices $true
```

Download Patches and Scan Objects

You can download patches from a previously defined location.

Verify that you are connected to a vCenter Server system.

1. Retrieve all entities from the *Datacenter* data center and store the result in a variable.

```
$entities = Get-Inventory -Location Datacenter
```

2. Download all available patches and store the result in a variable.

```
$result = Sync-Patch
```

3. Check whether new patches are downloaded and start scanning the entities in the *Datacenter* data center.

```
if ($result.Count > 0) {
Test-Compliance -Entity $entities
}
```

Managing vSphere Lifecycle Manager with VMware PowerCLI

This section provides sample scripts for PowerCLI with basic and advanced tasks in vSphere Lifecycle Manager administration.

You can use PowerCLI to manage vSphere Lifecycle Manager on the cluster and host level.

You can use cluster-level and host-level administration starting from the following vSphere and PowerCLI product versions:

Table 6: vSphere Lifecycle Manager Availability

	Available from vSphere version	Available from PowerCLI version
Cluster-level administration	7.0	12.1.0
Host-level administration	8.0	13.1.0

Understanding vSphere Lifecycle Manager

With VMware vSphere® Lifecycle Manager™, you can manage ESXi clusters and hosts by using images.

Starting with vSphere 7.0 and PowerCLI 12.1.0, you can use high-level cmdlets for operations on the cluster level as a part of the `VMware.VimAutomation.Core` module. Starting with vSphere 7.0 and PowerCLI 12.4.0, you can also use low-level cmdlets for cluster-level operations.

Starting with vSphere 8.0 and PowerCLI 13.1.0, you can use high-level and low-level cmdlets for vSphere Lifecycle Manager host-level operations.

The low-level cmdlets map directly to the syntax of the `ESX REST APIs` and empower you to use the full API functionality within your PowerShell console.

You can construct low-level SDK cmdlets by using the `Initialize-` and `Invoke-` cmdlet verbs in combination with the names of the `ESX REST API` data structures or operations.

The `ESX REST API` Reference on VMware Developer features ready-to-use vSphere Lifecycle Manager SDK code samples that you can paste directly into PowerShell. You can find a PowerCLI code snippet for each operation under *PowerCLI Client SDK Example* in the *Code Samples* section.

Lifecycle Management in vSphere

Lifecycle management refers to the process of installing software, maintaining it through updates and upgrades, and decommissioning it.

In the context of maintaining a vSphere environment, your clusters and hosts in particular, lifecycle management refers to tasks such as installing ESXi and firmware on new hosts, and updating or upgrading the ESXi version and firmware when required.

What Is vSphere Lifecycle Manager

vSphere Lifecycle Manager is a service that operates within vCenter Server, by using the built-in PostgreSQL database. No additional setup is required to use vSphere Lifecycle Manager. When you deploy the vCenter Server appliance, the vSphere Lifecycle Manager user interface is automatically activated in the HTML5-based vSphere Client. You can also access vSphere Lifecycle Manager functions through PowerCLI.

vSphere Lifecycle Manager encompasses the functionality of vSphere Update Manager from previous vSphere versions and enhances it by introducing new features and options for managing the ESXi lifecycle at a cluster and host level.

Up to vSphere 7.0, the Update Manager allowed the use of baselines and baseline groups for patching and upgrading hosts. With vSphere 7.0, vSphere Lifecycle Manager introduced the alternative approach of using vSphere Lifecycle Manager images to manage the life cycle of hosts and clusters in your environment. It also makes possible the upgrade of virtual machine hardware and VMware Tools versions.

vSphere Lifecycle Manager is compatible with an internet-connected environment, either directly or through a proxy server. It can also operate in a secure network without internet access. In such cases, you can use the Update Manager Download Service (UMDS) to download updates to the vSphere Lifecycle Manager depot, or import updates manually.

vSphere Lifecycle Manager and PowerCLI

Starting with vSphere 7.0 and PowerCLI 12.1.0, you can create and manage vSphere Lifecycle Manager clusters. For more information, see Creating and Managing vSphere Lifecycle Manager Clusters with PowerCLI.

Starting with vSphere 8.0 and PowerCLI 13.1.0, you can manage standalone ESXi hosts with vSphere Lifecycle Manager images. For more information, see Managing vSphere Lifecycle Manager Standalone Hosts with PowerCLI.

Creating and Managing vSphere Lifecycle Manager Clusters with PowerCLI

Starting with vSphere 7.0 and VMware PowerCLI 12.1.0, you can create and manage vSphere Lifecycle Manager clusters with PowerCLI.

Cluster-level Functionality Starting from vSphere 7.0 and VMware PowerCLI 12.1.0

Starting from vSphere 7.0 and VMware PowerCLI 12.1.0, some of the cluster-level operations that you can perform are:

- Create a vSphere Lifecycle Manager cluster with a desired state.
- View desired state elements:
  - ESXi version
  - Vendor add-ons
  - Firmware/ drivers
  - Components
- View/ check recommended images.
- Add hosts to a cluster.
- Retrieve a cluster with a vLCM desired state.
- Update a cluster's ESXi base image.
- Add, remove, replace, upgrade, or downgrade a vendor add-on on a cluster.
- Update a cluster's vSphere Lifecycle Manager component list.
- Add, remove, replace, upgrade, or downgrade a firmware add-on to a cluster.
- Modify the desired state of a vSphere Lifecycle Manager cluster.
- Convert a vSphere Update Manager cluster into a vSphere Lifecycle Manager cluster.
- Check compliance of the ESXi hosts on a cluster.
- Apply the desired state on hosts in a cluster, whose current state is different from the desired specification (remediate cluster).

- Export a desired state from a cluster.
- Import a desired state to a cluster.
- View hardware compatibility.

Cluster-level Functionality Starting from vSphere 8.0 and VMware PowerCLI 13.1.0

Starting from vSphere 8.0 and VMware PowerCLI 13.1.0, some of the new cluster-level operations that you can perform are:

- Update hardware compatibility list.
- View parallel remediation settings.
- Activate/ deactivate parallel remediation.
- Create or modify a cluster by importing an ESXi base image.
- Retrieve pre-check results.
- Stage a cluster.

Sample Scripts for vSphere Lifecycle Manager Cluster-Level Operations

The following scripts demonstrate how you can use vSphere Lifecycle Manager on the cluster level with PowerCLI.

Retrieve vSphere Lifecycle Manager (vLCM) Image Profiles

You can retrieve vLCM images from a vCenter Server system based on different filters by using the `Get-LcmImage` cmdlet. You can pass IDs or a combination of name and version filters to the `Get-LcmImage` parameters.

List all types of vLCM images

```
Get-LcmImage
```

List only `BaseImage` (ESXi) vLCM images

```
Get-LCMImage -Type 'BaseImage'
```

List only `VendorAddOn` vLCM images

```
Get-LCMImage -Type 'VendorAddOn'
```

List only `Component` vLCM images

```
Get-LCMImage -Type 'Component'
```

List only `Package` (FirmwareAddOn) vLCM images

```
Get-LCMImage -Type 'Package'
```

Create a New Cluster with a vLCM Desired State

You can create a new vSphere Lifecycle Manager cluster in the following ways:

- By specifying parameters from the VMware depots:

```
$clusterName= Read-Host -Prompt 'Provide the cluster Name'
$vLCMBaseImage = Get-LCMImage -Version '7.0 GA - 15843807' -Type BaseImage
$vendorAddon = Get-LcmImage -Name 'NEC-addon-GEN' -Version '7.0.2-02'
New-Cluster -Location Datacenter -Name $clusterName -BaseImage  $vLCMBaseImage -VendorAddOn $vendorAddon -
HAEnabled -DrsEnabled
```

- By importing a vLCM desired state spec.

```
New-Cluster -Name 'MyCluster' -Location <MyDatacenter> | Import-LcmClusterDesiredState -LocalSpecLocation
 F:\Image\desired-state-spec.json
```

Retrieve a Cluster's Desired State

```
Get-Cluster -Name $clusterName | Select-Object -Property Name, BaseImage, @{n='BaseImageVersion'; e={$_.BaseI-
mage.Version}}, Components, VendorAddon, FirmwareAddons
```

Update a Cluster's vLCM Base Image

You cannot remove or downgrade an ESXi base image - you can only upgrade it. The following example demonstrates an upgrade of a cluster's desired state to ESXi 7.0 U2.

```
$vLCMBaseImageu2 = Get-LcmImage -Version '7.0 U2a - 17867351' -Type BaseImage
Get-Cluster -Name $clusterName | Set-Cluster -BaseImage $vLCMBaseImageu2
```

Remove a vLCM Vendor Add-on from a Cluster

```
Get-Cluster -Name $clusterName | Set-Cluster -VendorAddOn $null
```

> **NOTE**
> You can add, replace, remove, upgrade, or downgrade a vendor add-on.

Update a Cluster's vLCM Component List

Replace a `Component` list with a new one.

```
$components = Get-LcmImage -Id 'Component-<Component1 Name>/<Component1 Version>', 'Component-<Component2
 Name>/<Component2 Version>'
Get-Cluster -Name $clusterName | Set-Cluster -Component $components
```

> **NOTE**
> To remove all components, use `Set-Cluster -Component $null`

Add a vLCM Firmware Add-on

```
$firmwareAddon = Get-LcmImage -Id '<FirmwareAddOn_Id>'
Get-Cluster -Name $clusterName | Set-Cluster -FirmwareAddOn $firmwareAddon
```

> **NOTE**
> You can add, replace, remove, upgrade, or downgrade a firmware add-on.

Modify a Cluster's vLCM Desired State

```
$vLCMBaseImage = Get-LCMImage -Version '7.0 U3f - 20036589'
$vendorAddOn = get-lcmimage -type vendoraddon -Version '703.0.0.10.9.0-11'
Set-Cluster 'vlcm-cluster-pcli' -BaseImage $vLCMBaseImage -VendorAddOn $vendorAddOn
```

Convert a vSphere Update Manager Cluster to a vSphere Lifecycle Manager Cluster

Convert a vSphere Update Manager cluster to a vSphere Lifecycle Manager cluster.

```
$vLCMBaseImage = Get-LCMImage -Version '7.0 U3f - 20036589'
$vendorAddOn = get-lcmimage -type vendoraddon -Version '703.0.0.10.9.0-11'
Set-Cluster 'vum-cluster' -BaseImage $vLCMBaseImage -VendorAddOn $vendorAddOn
```

Check Cluster Compliance

Check the compliance of the hosts on the cluster against the cluster's desired state.

```
Get-Cluster -Name $clusterName | Test-LcmClusterCompliance
```

Remediate a Cluster

Apply the desired state to the hosts in the cluster, whose current state is different from the desired software specification.

```
Get-Cluster -Name $clusterName | Set-Cluster -Remediate -AcceptEULA
```

Export a vLCM Desired State

```
Get-Cluster -Name $clusterName | Export-LcmClusterDesiredState -Destination 'F:\Image' -ExportOfflineBundle -
ExportIsoImage
```

Import a vLCM Desired State

```
Import-LcmClusterDesiredState -Cluster 'ExistingCluster' -LocalSpecLocation F:\Image\desired-state-spec.json -
Verbose
```

View / Check Recommended Images

Generate a desired state recommendation of a vSphere Lifecycle Manager cluster.

- Based on the latest ESXi base image version.
  ```
  Get-LcmClusterDesiredStateRecommendation 'lcm-cluster' -Latest
  ```
- Based on the latest patch or update of the currently installed ESXi base image version.
  ```
  Get-LcmClusterDesiredStateRecommendation 'lcm-cluster' -Current
  ```

View Hardware Compatibility

```
Get-LcmHardwareCompatibility -Cluster 'lcm-cluster'
```

Update Hardware Compatibility List

```
Invoke-DownloadHclCompatibilityDataAsync
```

View Parallel Remediation Settings

```
Invoke-GetDefaultsClustersPoliciesApply
Invoke-GetClusterPoliciesApply -Cluster $clusterId
```

Activate or Deactivate Parallel Remediation

Activate or deactivate parallel remediation with the maximum number of concurrent remediations.

```
$ParallelRemediationSetting = Initialize-SettingsDefaultsClustersPoliciesParallelRemediationAction -Enabled
 $true -MaxHosts $maxHostCount
$PolicySpec = Initialize-SettingsDefaultsClustersPoliciesApplyConfiguredPolicySpec -ParallelRemediationAction
 $ParallelRemediationSetting
Invoke-SetDefaultsClustersPoliciesApply -Cluster $clusterID -SettingsClustersPoliciesApplyConfiguredPolicySpec
 $PolicySpec
```

Create a Cluster by Importing an Image from a Standalone Host

Extract a software specification from an ESXi host and import it into the software depot.

```
$SettingsDepotsOfflineHostCredentials = Initialize-SettingsDepotsOfflineHostCredentials -HostName "MyHostName"
 -UserName "MyUserName" -Password "MyPassword" -Port 0 -SslThumbPrint "MySslThumbPrint"
$SettingsDepotsOfflineConnectionSpec = Initialize-SettingsDepotsOfflineConnectionSpec -AuthType "USER-
NAME_PASSWORD" -HostCredential $SettingsDepotsOfflineHostCredentials
```

```
Invoke-CreateFromHostDepotsOfflineAsync -SettingsDepotsOfflineConnectionSpec $SettingsDepotsOfflineConnec-
tionSpec
```

Then use `New-Cluster` or `Set-Cluster` to create or modify a cluster's desired state from the returned software spec.

Retrieve Pre-check Results

Return the last remediation pre-check results.

```
$cluster = Get-Cluster -Name <cluster_name>
Invoke-GetClusterSoftwareReportsLastCheckResult -Cluster $cluster.ExtensionData.MoRef.Value
```

Stage a Cluster

Stage a desired software specification on a vSphere Lifecycle Manager cluster.

```
$SettingsClustersSoftwareStageSpec = Initialize-SettingsClustersSoftwareStageSpec -Commit <myCommit> -Hosts
 <MyHosts>
Invoke-StageClusterSoftwareAsync -Cluster <MyCluster> -SettingsClustersSoftwareStageSpec $spec
```

Managing vSphere Lifecycle Manager Standalone Hosts with PowerCLI

Starting with vSphere 8.0 and VMware PowerCLI 13.1.0, you can manage vSphere Lifecycle Manager standalone hosts with PowerCLI.

Host-level Functionality in PowerCLI

In PowerCLI 13.1.0 and later, you can use both high-level and low-level cmdlets that bind directly to the `ESX REST APIs` to manage vSphere Lifecycle Manager hosts.

Starting with VMware PowerCLI 13.1.0, some of the host-level operations you can perform are:

- Activate vSphere Lifecycle Manager on a standalone host.
- Retrieve vSphere Lifecycle Manager image profiles:
  - ESXi version
  - Vendor add-ons
  - Firmware/ drivers
  - Components
- View/ check recommended images.
- Retrieve a host with a vSphere Lifecycle Manager desired state.
- Modify the desired state of a vSphere Lifecycle Manager host.
- Convert a vSphere Update Manager host into a vSphere Lifecycle Manager host.
- Update the ESXi base image of a standalone host.
- Add, remove, replace, upgrade, or downgrade a vendor add-on on a standalone host.
- Add remove, replace, upgrade, or downgrade a vSphere Lifecycle Manager firmware add-on on a standalone host.
- Check compliance of a standalone ESXi host.
- Pre-check a host.
- Stage a host.
- Apply the desired state on a standalone host, whose current state is different from the desired specification (remediate host).

Sample Scripts for vSphere Lifecycle Manager Host-Level Operations

The following scripts demonstrate how you can use vSphere Lifecycle Manager on the host level with PowerCLI.

Activate vSphere Lifecycle Manager on a Standalone Host

```
$hostName = <host_ip_address_or_fqdn>
$vmhost = Get-Vmhost $hostName
$spec=Initialize-SettingsHostsEnablementSoftwareEnableSpec -SkipSoftwareCheck $false
Invoke-SetHostEnablementSoftwareAsync -Host $vmhost.ExtensionData.MoRef.Value -SettingsHostsEnablementSoftwa-
reEnableSpec $spec
```

Retrieve vSphere Lifecycle Manager (vLCM) Image Profiles

You can retrieve vLCM images from a vCenter Server system based on different filters by using the `Get-LcmImage` cmdlet. You can pass IDs or a combination of name and version filters to the `Get-LcmImage` parameters.

List all types of vLCM images

```
Get-LcmImage
```

List only `BaseImage` (ESXi) vLCM images

```
Get-LCMImage -Type 'BaseImage'
```

List Only `VendorAddOn` vLCM images

```
Get-LCMImage -Type 'VendorAddOn'
```

List only `Component` vLCM images

```
Get-LCMImage -Type 'Component'
```

List only `Package` (Firmware) vLCM images

```
Get-LCMImage -Type 'Package'
```

View / Check Recommended Images

```
$vmhost = Get-VMHost -Name $hostName
Invoke-GetHostSoftwareRecommendations -Host $vmhost.ExtensionData.MoRef.Value
```

Retrieve a Host's Desired State

```
Get-VMHost -Name $hostName | Select-Object -Property Name, BaseImage, @{n='BaseImageVersion'; e={$_.BaseI-
mage.Version}}, Components, VendorAddon, FirmwareAddons
```

Modify a Host's vLCM Desired State

```
$vLCMBaseImageu2 = Get-LCMImage -Version '7.0 GA - 15843807' -Type BaseImage
$vendorAddon = Get-LcmImage -Name 'NEC-addon-GEN' -Version '7.0.2-02'
$components = $components = Get-LcmImage -Id 'Component-<Component1 Name>/<Component1 Version>'
$firmwareAddon = Get-LcmImage -Id '<FirmwareAddOn_Id>'
Get-VMHost -Name $hostName | Set-VMHost -BaseImage $vLCMBaseImageu2 -VendorAddOn $vendorAddon -Component $com-
ponents -FirmwareAddOn $firmwareAddon
```

Update a Host's vLCM Base Image

You cannot remove or downgrade an ESXi base image - you can only upgrade it. The following example demonstrates an upgrade of a host's desired state to ESXi 7.0 U2.

```
$vLCMBaseImageu2= Get-LcmImage -Version '7.0 U2a - 17867351' -Type BaseImage
Get-VMHost -Name $hostName | Set-VMHost -BaseImage $vLCMBaseImageu2
```

Remove a vLCM Vendor Add-on from a Host

```
Get-VMHost -Name $hostName | Set-VMHost -VendorAddOn $null
```

NOTE
You can add, replace, remove, upgrade, or downgrade a vendor add-on.

Update a Host's vLCM Component List

Replace a `Component` list with a new one.

```
$components = Get-LcmImage -Id 'Component-<Component1 Name>/<Component1 Version>', 'Component-<Component2
 Name>/<Component2 Version>'
Get-VMHost -Name $hostName | Set-VMHost -Component $components
```

NOTE
To remove all components, use `Set-Cluster -Component $null`

Add a vLCM Firmware Add-on

```
$firmwareAddon = Get-LcmImage -Id '<FirmwareAddOn_Id>'
Get-VMHost -Name $hostName | Set-VMHost -FirmwareAddOn $firmwareAddon
```

NOTE
You can add, replace, remove, upgrade, or downgrade a firmware add-on.

Check Compliance of a Host

Compare the current image on the standalone host against the desired image that you specified and define the compatibility status of the host.

```
$vmhost = Get-VMHost -Name $hostName
Invoke-ScanHostSoftwareAsync -Host $vmhost.ExtensionData.MoRef.Value
```

Pre-check a Host

Run a remediation pre-check on the host to ensure software and hardware compatibility with the desired software specification.

```
$spec = Initialize-SettingsHostsSoftwareCheckSpec -Commit <MyCommit>
$vmhost = Get-VMHost -Name $hostName
Invoke-CheckHostSoftwareAsync -Host $vmhost.ExtensionData.MoRef.Value -SettingsHostsSoftwareCheckSpec $spec
```

Stage a Host

Stage the desired state on a standalone ESXi host.

```
$spec = Initialize-SettingsHostsSoftwareStageSpec -Commit <myCommit>
$vmhost = Get-VMHost -Name $hostName
Invoke-StageHostSoftwareAsync -Host $vmhost.ExtensionData.MoRef.Value -SettingsHostsSoftwareStageSpec $spec
```

Remediate a Host

Apply the desired state on a standalone host, whose current state is different from the desired software specification.

```
$spec = Initialize-SettingsHostsSoftwareApplySpec -AcceptEula $true
$vmhost = Get-VMHost -Name $hostName
Invoke-ApplyHostSoftwareAsync -Host $vmhost.ExtensionData.MoRef.Value -SettingsHostsSoftwareApplySpec $spec
```

vSphere Monitoring and Performance

You can monitor your virtual environment with PowerCLI to locate the source of current and potential issues. Some monitoring and performance tools you can use with PowerCLI are the vCenter Server alarms, and the `esxtop` functionality. You can also use PowerCLI to retrieve valuable statistics about your virtual infrastructure.

Use Esxtop to Get Information on the Virtual CPUs of a Virtual Machine

You can use the `Get-EsxTop` cmdlet to retrieve real-time data for troubleshooting performance problems on your ESXi hosts.

Verify that you are connected to a server that runs ESX 4.0, vCenter Server 5.0 or later.

The `Get-EsxTop` cmdlet exposes the `esxtop` functionality that provides real-time monitoring and performance analysis of an ESXi host's resources. You can use `esxtop` to gain insights into the performance and resource utilization of virtual machines and the underlying hardware.

1. Get the group to which the virtual machine belongs and save it as a variable.
   ```
   $group = Get-EsxTop -CounterName SchedGroup | where {$_.VMName -eq $vm.Name}
   ```
2. Get the IDs of all virtual CPUs of the virtual machine and store them in an array.
   ```
   $gr = Get-EsxTop -TopologyInfo -Topology SchedGroup | %{$_.Entries} | where {$group.GroupID -contains
    $_.GroupId} $group.GroupID
   $cpuIds = @()
   $gr.CpuClient | %{$cpuIds += $_.CPUClientID}
   ```
3. Get the CPU statistics for the virtual machine.
   ```
   $cpuStats = Get-EsxTop -CounterName VCPU | where {$cpuIds -contains $_.VCPUID}
   ```
4. Calculate the used and ready for use percentage by using the `UsedTimeInUsec` and `ReadyTimeInUsec` stats.
   ```
   $result = @()
   $cpuStats | %{ `
   $row = "" | select VCPUID, Used, Ready; `
   $row.VCPUID = $_.VCPUID; `
   $row.Used = [math]::Round(([double]$_.UsedTimeInUsec/[double]$_.UpTimeInUsec)*100, 2); `
   $row.Ready = [math]::Round(([double]$_.ReadyTimeInUsec/[double]$_.UpTimeInUsec)*100, 2);`
   $result += $row
   }
   ```
5. View the used and ready for use percentage for each virtual CPU of the virtual machine.
   ```
   $result | Format-Table –AutoSize
   ```

Manage Statistics and Statistics Intervals on vCenter Server

You can use the PowerCLI cmdlets to automate tasks for viewing and managing statistics for vCenter Server inventory objects.

Verify that you are connected to a vCenter Server system.

You can modify the properties of a statistics interval and view statistics for a selected cluster.

1. Increase the amount of time for which statistics of the previous day are stored.
   ```
   Set-StatInterval -Interval "past day" -StorageTimeSecs 700000
   ```
2. View the available memory metric types for the *`Cluster1`* cluster.
   ```
   $cluster = Get-Cluster Cluster1
   ```

```
$statTypes = Get-StatType -Entity $cluster -Interval "past day" -Name mem.*
```

3. View the cluster statistics collected for the day.

```
Get-Stat -Entity $cluster -Start ([System.DateTime]::Now.AddDays(-1)) -Finish ([System.DateTime]::Now)
 -Stat $statTypes
```

Alarm Management

You can use a set of preconfigured alarms in vCenter Server to monitor the operations of vSphere inventory objects. This section provides sample scripts with basic and advanced tasks for vCenter Server alarm management.

View Actions and Triggers for an Alarm on vCenter Server

You can see which actions and triggers are configured for an alarm.

Verify that you are connected to a vCenter Server system.

1. Get all PowerCLI supported alarm actions for the *Host Processor Status* alarm.

```
Get-AlarmDefinition -Name "Host Processor Status" | Get-AlarmAction -ActionType "ExecuteScript",
 "SendSNMP", "SendEmail"
```

2. Get all the triggers for the first alarm definition found.

```
Get-AlarmDefinition | select -First 1 | Get-AlarmTrigger
```

Create Alarm Definitions on vCenter Server

With PowerCLI, you can create vCenter Server alarm definitions.

Verify that you are connected to a vCenter Server system.

1. Create an alarm action trigger.

```
$actionTrigger = New-AlarmActionTrigger -StartStatus Green -EndStatus Yellow
```

2. Create an alarm action email.

```
$emailAction = New-AlarmAction -Email -To 'test@vmware.com' -CC @('test1@vmware.com',
 'test2@vmware.com') -Body 'Email text' -Subject 'Email subject' -AlarmActionTrigger $actionTrigger
```

3. Create an event-based alarm trigger.

```
$vmReconfigEvt = Get-EventType | Where-Object {$_.Description -eq "VM reconfigured"}
$eventTrigger = New-AlarmTrigger -EventType $vmReconfigEvt -EntityStatus Yellow -EntityType "VirtualMa-
chine"
```

4. Create an alarm definition.

```
$vm = Get-VM | Select-Object -First 1
New-AlarmDefinition -Name "MyAlarm" -Description "Description" -AlarmTrigger $eventTrigger -AlarmAction
 $emailAction -Entity $vm
```

Modify Alarm Definitions on vCenter Server

With PowerCLI, you can modify vCenter Server alarm definitions.

Verify that you are connected to a vCenter Server system.

1. For all host alarms, modify the interval after the action repeats.
```
Get-AlarmDefinition -Entity (Get-VMHost) | foreach { $_ | Set-AlarmDefinition -ActionRepeatMinutes
 ($_.ActionRepeatMinutes + 1)}
```
2. Modify the name and the description of a selected alarm definition, and enable the alarm.
```
Get-AlarmDefinition -Name AlarmDefinition | Set-AlarmDefinition -Name AlarmDefinitionNew -Description
 'Alarm Definition Description' -Enabled:$true
```

Create Alarm Actions and Triggers on vCenter Server

With PowerCLI, you can create vCenter Server alarm actions and triggers.

Verify that you are connected to a vCenter Server system.

1. Create an alarm action `email` for the renamed alarm definition.
```
Get-AlarmDefinition -Name AlarmDefinitionNew | New-AlarmAction -Email -To 'test@vmware.com' -CC
 @('test1@vmware.com', 'test2@vmware.com') -Body 'Email text' -Subject 'Email subject'
```
2. Create an `snmp` alarm action.
```
Get-AlarmDefinition -Name AlarmDefinitionNew | New-AlarmAction -Snmp
```
3. Create a `script` alarm action.
```
Get-AlarmDefinition -Name AlarmDefinitionNew | New-AlarmAction -Script -ScriptPath 'c:\test.ps1'
```
4. Create a metric-based alarm trigger.
```
$metric = Get-Metric -MetricGroup CPU -Name Usage | Where-Object {$_.Key -eq 2}
$metricTrigger = New-AlarmTrigger -Metric $metric -Red 9000 -RedIntervalSeconds 3000 -EntityType  "Vir-
tualMachine" -MetricAlarmOperator Above
```
5. Create a state-based alarm trigger.
```
$stateTrigger = New-AlarmTrigger -StatePath "runtime.powerState" -Value "poweredOff" -EntityStatus Red
 -EntityType "VirtualMachine" -StateAlarmOperator Equal
```

Remove Alarm Definitions and Actions

In some cases, you might want to remove obsolete alarm definitions and actions.

Verify that you are connected to a vCenter Server system.

1. Remove all the actions for an alarm definition.
```
Get-AlarmDefinition -Name AlarmDefinition | Get-AlarmAction | Remove-AlarmAction -Con-
firm:$false
```
2. Remove an alarm definition.
```
Get-AlarmDefinition -Name AlarmDefinition | Remove-AlarmDefinition
```

Managing the vSphere Automation API with VMware PowerCLI

You can manage the vSphere Automation API with PowerCLI by using the vSphere Automation SDK for PowerShell. Starting from VMware PowerCLI version 12.4.0, the vSphere Automation SDK provides low-level cmdlets for all available vSphere Automation API services.

Understanding the vSphere Automation SDK for PowerShell

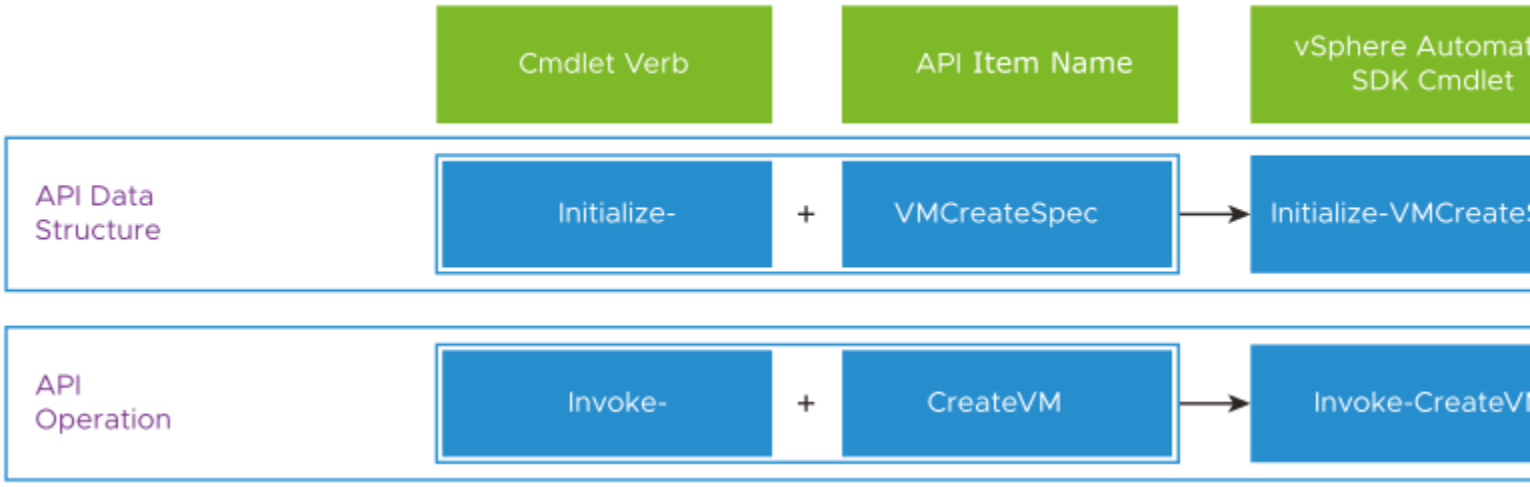
You can manage the vSphere Automation API with VMware PowerCLI by using the vSphere Automation SDK for PowerShell.

Starting from VMware PowerCLI 12.4.0, you can use the vSphere Automation SDK for PowerShell to communicate with all available vSphere Automation REST APIs.

The modules that start with the `VMware.vSphere.Sdk` prefix contain automatically-generated SDK cmdlets that bind directly to the vSphere Automation REST APIs. The modules function on a low level and communicate directly with the vSphere Automation API server.

You can construct vSphere Automation SDK cmdlets by using the `Initialize-` and `Invoke-` cmdlet verbs in combination with the names of the vSphere Automation API data structures or operations.

Figure 1: Constructing vSphere Automation SDK Cmdlets



- Use `Initialize-` cmdlets to prepare the data structures, if any, for your API calls. These cmdlets function on the client side and do not communicate with the API server.
- Use `Invoke-` cmdlets to call the vSphere Automation API server and invoke the operations.

Navigating the vSphere Automation SDK for PowerShell

You can navigate the vSphere Automation SDK for PowerShell by using the VMware Developer website, and the `Get-Help` and `Get-Command` cmdlets.

To use the vSphere Automation SDK for PowerShell effectively, you must be familiar with the vSphere Automation API reference documentation .

How to Find a vSphere Automation SDK Cmdlet

To search for vSphere Automation SDK cmdlets:

- In your browser, navigate the vSphere Automation API reference documentation.
  The vSphere Automation API reference on VMware Developer features ready-to-use vSphere Automation SDK code samples that you can paste directly into PowerShell. You can find a PowerCLI code snippet for each operation under *PowerCLI Client SDK Example* in the *Code Samples* section.
- In PowerShell, run `Get-Command -Module VMware.Sdk.vSphere.*` to list all available vSphere Automation SDK cmdlets.

How to Get Information About a Cmdlet

To get information about a vSphere Automation SDK cmdlet, run `Get-Help` with the cmdlet name. For example:

```
Get-Help Invoke-CreateVm -full
```

To open the online information in a browser, run `Get-Help` with the cmdlet name and the `Online` parameter. For example:

```
Get-Help Invoke-CreateVm -Online
```

Connecting to a vSphere Automation API Server

You can connect to the vSphere Automation API with VMware PowerCLI through the `Connect-VIServer` cmdlet or through a configuration object.

You can access a vSphere Automation API server in two ways with PowerCLI.

- Through the `Connect-VIServer` cmdlet.
- Through a configuration object.

Connect Through Connect-VIServer

Use the `Connect-VIServer` cmdlet to connect to a vCenter Server system and access the vSphere Automation API.

- If the certificate of the server you want to connect to is not trusted, verify that your PowerCLI invalid server certificate action settings are configured properly. For more information, see Configuring PowerCLI Response to Untrusted Certificates.
- If you use a proxy server for the connection, verify that it is configured properly, so that the connection is kept alive long enough for tasks to complete running.

  NOTE
  If you do not want to use a proxy server for the connection, run `Set-PowerCLIConfiguration -ProxyPolicy NoProxy`.

You can have more than one connection to the same server. For more information, see Managing Default Server Connections in PowerCLI.

If your login credentials contain non-alphanumeric characters, you might need to escape them. For more information, see Processing Non-alphanumeric Characters in PowerCLI.

Run `Connect-VIServer` with the server name and valid credentials.

```
Connect-VIServer -Server vc3.example.com -User 'MyUser' -Password 'MyPassword'
```

Connect Through a Configuration Object

You can access the vSphere Automation API by connecting to a vCenter Server system through a configuration object.

You can create a configuration object and pass information about the vCenter Server system on which you want to use the vSphere Automation SDK for PowerShell. You can use this connection method if you don't want to use the PowerCLI high-level cmdlets or if you don't have the `VMware.VimAutomation.Core` module installed on your system.

1. Create a server configuration for a vCenter Server system.

```
$Server = 'vCenter Server address'
$User = 'username'
$Password = Read-Host -AsSecureString -Prompt "Password:"
$serverConfig = New-vSphereServerConfiguration -Server $Server -User $User -Password $Password
 -SkipCertificateCheck
```

2. Create a vSphere Automation API session.

```
$apiSession = Invoke-CreateSession -WithHttpInfo
```

3. Update the server configuration with the created API session key.

```
$serverConfig | Set-vSphereServerConfigurationApiKey -SessionResponse $apiSession
```

To learn more about using server configuration objects with the vSphere Automation SDK, see Managing vCenter Server Connections Through Configuration Objects.

Managing vCenter Server Connections Through Configuration Objects

The vSphere Automation SDK for PowerShell features special configuration object cmdlets to manage vCenter Server connections. A configuration object is a client-side PowerShell object that holds information about a server that the `Invoke-` cmdlets can interact with.

Table 7: Configuration Object Cmdlets

Cmdlet	Description
`New-vSphereServerConfiguration`	Creates a vCenter Server configuration object.
`Get-vSphereServerConfiguration`	Retrieves the existing vCenter Server configuration objects.
`Set-vSphereServerConfiguration`	Updates a vCenter Server configuration object.
`Set-vSphereServerConfigurationApiKey`	Updates a vCenter Server configuration object with an API key for authorization.
`Remove-vSphereServerConfiguration`	Removes a vCenter Server configuration object.

Working with Configuration Objects

You can create multiple vCenter Server configuration objects and manage all of them simultaneously with the `Invoke-` cmdlets. For example, `Invoke-DeleteSession` deletes all existing vSphere Automation API sessions.

If you want to apply the `Invoke-` cmdlets to a specific configuration object, you must specify it in the command. For example,

```
Invoke-ListFolder -Server $serverConfig
```

Example Use Cases with vCenter Server Configuration Objects

- You can create a session and authenticate to a vSphere Automation API server - see Connect Through a Configuration Object.
- You can retrieve the active server configurations.

  ```
  Get-vSphereServerConfiguration
  ```
- You can remove a specific server configuration.

  ```
  $serverConfig | Remove-vSphereServerConfiguration
  ```

Create a Local User Account in vCenter Server

You can create a local user account in vCenter Server by using the vSphere Automation SDK for PowerShell.

Verify that you are connected to a vSphere Automation API server.

1. Prepare the data structures for the API operation.

```
$LocalAccountsConfig = Initialize-LocalAccountsConfig -Password '$trongPa$$w0rd' -Roles "superAdmin"
```

```
$LocalAccountsCreateRequestBody = Initialize-LocalAccountsCreateRequestBody -Username "MyUsername" -Config
 $LocalAccountsConfig
```

2. Invoke the API operation.

```
Invoke-CreateLocalAccounts -LocalAccountsCreateRequestBody $LocalAccountsCreateRequestBody
```

3. Optional: Retrieve the local account you created.

```
Invoke-GetUsernameLocalAccounts -Username "MyUsername"
```

Update the Local Accounts Global Password Policy in vCenter Server

You can update the local accounts global password policy in vCenter Server by using the vSphere Automation SDK for PowerShell.

Verify that you are connected to a vSphere Automation API server.

1. Retrieve the current local accounts global password policy.

```
Invoke-GetLocalAccountsGlobalPolicy
```

2. Prepare the data structures for the operation.

```
$LocalAccountsPolicyInfo = Initialize-LocalAccountsPolicyInfo -MaxDays 352 -MinDays 1 -WarnDays 7
```

3. Invoke the API operation.

```
Invoke-SetLocalAccountsGlobalPolicy -LocalAccountsPolicyInfo $LocalAccountsPolicyInfo
```

4. Optional: Retrieve the new local accounts global password policy.

```
Invoke-GetLocalAccountsGlobalPolicy
```

Create a Virtual Machine

You can create virtual machines in vCenter Server by using the vSphere Automation SDK for PowerShell.

Verify that you are connected to a vSphere Automation API server.

1. Retrieve a target datastore ID.

```
$targetDatastore = Invoke-ListDatastore -Names 'local-0'
```

2. Retrieve a target folder ID.

```
$targetFolder = Invoke-ListFolder -Names 'vm'
```

3. Retrieve a target host ID.

```
$targetHost = Invoke-ListHost -Names '10.185.41.87'
```

4. Prepare the virtual machine placement specification.

```
$placementSpec = Initialize-VMPlacementSpec -Folder $targetFolder.folder -Datastore $targetDatastore.data-
store -VarHost $targetHost.host
```

5. Prepare the virtual machine create specification.

```
$vmCreateSpec = Initialize-VMCreateSpec -Name 'TestVM' -GuestOS WIN_31 -Placement $placementSpec
```

6. Invoke the `CreateVM` API operation.

```
Invoke-CreateVM -VMCreateSpec $vmCreateSpec
```

Create Tag Category, Tag, and Tag Association

You can create a tag category, tag, and tag association by using the vSphere Automation SDK for PowerShell.

Verify that you are connected to a vSphere Automation API server.

1. Create a tag category.

```
$categoryCreateSpec = Initialize-TaggingCategoryCreateSpec -Cardinality 'MULTIPLE' -AssociableTypes 'Vir-
tualMachine' -Name 'TestCategory' -Description 'TestDescription'
$categoryId = Invoke-CreateCategory -TaggingCategoryCreateSpec $categoryCreateSpec
```

2. Create a tag.

```
$tagCreateSpec = Initialize-TaggingTagCreateSpec -Name 'TestVMTag' -Description 'This is a test tag for
 vms' -CategoryId $categoryId
$tag = Invoke-CreateTag -TaggingTagCreateSpec $tagCreateSpec
```

3. Create a tag association.

```
$vmId = Invoke-ListVM -Names 'MyVM'
$vmDynamicId = Initialize-StdDynamicID -Type 'VirtualMachine' -Id $vmId
$tagAssociationBody = Initialize-TaggingTagAssociationAttachRequestBody -ObjectId $vmDynamicId Invoke-At-
tachTagIdTagAssociation -TagId $tag -TaggingTagAssociationAttachRequestBody $tagAssociationBody
```

Create Content Library and Content Library Item

You can create a content library and content library item by using the vSphere Automation SDK for PowerShell.

Verify that you are connected to a vSphere Automation API server.

1. Specify a datastore for storage backing.

```
$backingDatastore = Invoke-ListDatastore -Names 'local-0'
```

2. Create a content library.

```
$storageBacking = Initialize-LibraryStorageBacking -DatastoreId $backingDatastore.datastore -Type 'DATAS-
TORE'
$libraryModel = Initialize-LibraryModel -Name 'TestLocalContentLibrary' -StorageBackings $storageBacking
$contentLibraryId = Invoke-CreateContentLocalLibrary -LibraryModel $libraryModel
```

3. Create a content library item.

```
$libraryItemModel = Initialize-LibraryItemModel -Name 'TestContentLibraryItem' -LibraryId $contentLi-
braryId
$libraryItemId = Invoke-CreateContentLibraryItem -LibraryItemModel $libraryItemModel
```

Managing VMware vSAN™ with VMware PowerCLI

To help you get started with VMware PowerCLI, this documentation provides a set of sample scripts that illustrate basic and advanced tasks in VMware vSAN™ management.

Create a vSAN Datastore

You can create vSAN disk groups on standalone hosts and add the hosts to a vSAN-enabled cluster to form a vSAN datastore. You can then create a virtual machine on the vSAN datastore and assign a storage policy to the virtual machine and its hard disk.

- Verify that you are connected to a vCenter Server system.
- Verify that you have access to at least three virtual machine hosts.
- Verify that each of the virtual machine hosts has at least one SSD and one HDD.

- Verify that the virtual machine hosts are in maintenance mode.

1. Create a vSAN enabled cluster with manual disk claim mode.

```
$vsanCluster = New-Cluster -Name 'VsanCluster' -Location (Get-Datacenter) -VsanEnabled -VsanDiskClaim-
Mode 'Manual'
```

2. Configure a vSAN VMkernel port on each of the three hosts.

```
New-VMHostNetworkAdapter -VMHost 'Host-A' -PortGroup 'VMkernel' -VirtualSwitch 'vSwitch0' -VsanTraffi-
cEnabled $true
New-VMHostNetworkAdapter -VMHost 'Host-B' -PortGroup 'VMkernel' -VirtualSwitch 'vSwitch0' -VsanTraffi-
cEnabled $true
New-VMHostNetworkAdapter -VMHost 'Host-C' -PortGroup 'VMkernel' -VirtualSwitch 'vSwitch0' -VsanTraffi-
cEnabled $true
```

3. Create a vSAN disk group on each of the three hosts.

```
New-VsanDiskGroup -DataDiskCanonicalName 'HDD1-CanonicalName' -SsdCanonicalName 'SSD1-CanonicalName'
 -VMHost 'Host-A'
New-VsanDiskGroup -DataDiskCanonicalName 'HDD1-CanonicalName' -SsdCanonicalName 'SSD1-CanonicalName'
 -VMHost 'Host-B'
New-VsanDiskGroup -DataDiskCanonicalName 'HDD1-CanonicalName' -SsdCanonicalName 'SSD1-CanonicalName'
 -VMHost 'Host-C'
```

4. Add each of the three hosts to the vSAN cluster to create a vSAN datastore.

```
Move-VMHost -VMHost 'Host-A' -Destination $vsanCluster
Move-VMHost -VMHost 'Host-B' -Destination $vsanCluster
Move-VMHost -VMHost 'Host-C' -Destination $vsanCluster
```

5. Revert the virtual machine hosts to the Connected state.

```
Set-VMHost -VMHost 'Host-A','Host-B','Host-C' -State 'Connected'
```

6. Create a virtual machine on the vSAN datastore.

```
$vsanDS = Get-Datastore -Name 'vsanDatastore'
$vm = New-VM -Name 'newVM' -DiskMB 1024 -Datastore $vsanDS -VMHost 'Host-A'
```

7. Create a storage policy by using any of the vSAN capabilities.

```
$cap = Get-SpbmCapability -Name vSAN*
$rule = New-SpbmRule $cap[1] $true
$ruleset = New-SpbmRuleSet $rule
$policy = New-SpbmStoragePolicy -Name 'vsan policy' -RuleSet $ruleset -Description 'vSAN-based storage
 policy'
```

8. Assign the storage policy to the virtual machine and its hard disk.

```
$vmHdd = Get-HardDisk -VM $vm
Set-SpbmEntityConfiguration $vm, $vmHdd -StoragePolicy $policy
```

9. Check the compliance of the virtual machine and its hard disk with the storage policy.

```
Get-SpbmEntityConfiguration $vm, $vmHdd
```

   The status should be `Compliant`.

Modify a vSAN Datastore

You can add or remove local disks from existing vSAN disk groups or remove entire vSAN disk groups.

- Verify that you are connected to a vCenter Server system.
- Verify that at least one vSAN disk group exists in the cluster.

1. Get the vSAN disk group from a cluster.

```
$dgs = Get-VsanDiskGroup -Cluster 'VsanCluster'
```

2. Get all vSAN disks from the vSAN disk group.

```
$dg = $dgs[0]
Get-VsanDisk –VsanDiskGroup $dg
```

3. Add a hard disk to the vSAN disk group.

```
$disk = New-VsanDisk -CanonicalName 'HDD-CanonicalName' -VsanDiskGroup $dg
```

4. Remove a hard disk from the vSAN disk group.

```
Remove-VsanDisk -VsanDisk $disk
```

5. Remove the entire vSAN disk group.

```
Remove-VsanDiskGroup -VsanDiskGroup $dg
```

Create a vSAN Stretched Cluster

You can create a vSAN stretched cluster with a witness node. You can then create a vSAN storage policy and enable performance service on the vSAN cluster.

- Verify that you are connected to a vCenter Server system.
- Verify that you have access to at least two virtual machine hosts.
- Verify that each of the virtual machine hosts has at least one SSD and one HDD.
- Verify that the virtual machine hosts are in maintenance mode.
- Verify that you have access to an ESXi host that can be used as a witness host or deploy a witness appliance on any node. Ensure that the witness host or appliance is outside the vSAN cluster.

1. Configure a vSAN VMkernel port on each of the two hosts.

```
New-VMHostNetworkAdapter -VMHost 'Host-A' -PortGroup 'VMkernel' -VirtualSwitch 'vSwitch0' -VsanTraffi-
cEnabled $true
New-VMHostNetworkAdapter -VMHost 'Host-B' -PortGroup 'VMkernel' -VirtualSwitch 'vSwitch0' -VsanTraffi-
cEnabled $true
```

2. Create a vSAN enabled cluster with automatic disk claim mode.

```
$vsanCluster = New-Cluster -Name 'VsanCluster' -Location (Get-Datacenter) -VsanEnabled -VsanDiskClaim-
Mode 'Automatic'
```

3. Add the two hosts to the vSAN cluster to create a vSAN datastore.

```
Move-VMHost -VMHost 'Host-A' -Destination $vsanCluster
Move-VMHost -VMHost 'Host-B' -Destination $vsanCluster
```

4. Revert the virtual machine hosts to the Connected state.

```
Set-VMHost -VMHost 'Host-A','Host-B' -State 'Connected'
```

5. Create two fault domains in the vSAN cluster.

```
$primaryFd = New-VsanFaultDomain -Name 'Primary' -VMHost 'Host-A'
```

```
$secondaryFd = New-VsanFaultDomain -Name 'Secondary' -VMHost 'Host-B'
```

6. Enable stretched cluster.

```
Set-VsanClusterConfiguration -Configuration $vsanCluster -StretchedClusterEnabled $true -Preferred-
FaultDomain $primaryFd -WitnessHost 'Witness-Virtual-Appliance-IP'
```

7. Create a storage policy by using any vSAN capability.

```
$cap = Get-SpbmCapability -Name vSAN*
$rule = New-SpbmRule $cap[1] $true
$ruleset = New-SpbmRuleSet $rule
$policy = New-SpbmStoragePolicy -Name 'vsan policy' -RuleSet $ruleset -Description 'vSAN-based storage
 policy'
```

8. Enable performance service on the vSAN cluster.

```
Set-VsanClusterConfiguration -Configuration $vsanCluster -PerformanceServiceEnabled $true –StoragePoli-
cy $policy
```

Enable a vSAN File Service

With PowerCLI, you can enable a vSAN file service.

Verify that you are connected to a vCenter Server system.

1. Add a vSAN file service OVF to the OVF repository of the vCenter Server system.

```
Add-VsanFileServiceOvf
```

2. Verify that the vSAN file service OVF is successfully added.

```
Get-VsanFileServiceOvfInfo
```

3. Increase the PowerCLI timeout for the current session, so that the operation does not stop.

```
Set-PowerCLIConfiguration -WebOperationTimeoutSeconds 3600 -Scope Session
```

4. Retrieve the network that you want to use for the vSAN file service.

```
$net = Get-VirtualNetwork -Name ‘MyNetwork’
```

5. Modify the vSAN cluster configuration that you want to use to enable the vSAN file service.

```
$config = Get-VsanClusterConfigurationSet-VsanClusterConfiguration $config -FileServiceEnabled
 $true -FileServiceNetwork $net
```

Create a vSAN File Service Domain

With PowerCLI, you can create a vSAN file service domain.

- Verify that you are connected to a vCenter Server system.
- Verify that the vSAN file service is enabled.

1. Configure a vSAN file server IP configuration. You can use the IPs as an IP pool for the file service domain.

```
$ipConfig = New-VsanFileServerIpConfig -Fqdn "h101.vmware.com" -Gateway "192.2.8.3" -IpAddress
 "192.2.8.4" -SubnetMask "255.255.254.0" -IsPrimary
```

2. Create a vSAN file service domain.

```
New-VsanFileServiceDomain -DnsServerAddress "10.172.199.241" -VsanFileServerIpConfig $ipConfig -Name
 "MyFileServiceDomain" -DnsSuffix "vmware.com" -Cluster $config.Cluster
```

Create a vSAN File Share

With PowerCLI, you can create a vSAN file share.

- Verify that you are connected to a vCenter Server system.
- Verify that the vSAN file service is enabled.
- Verify that the vSAN file service domain is created.

1. Get a vSAN file service domain.

```
$domain = Get-VsanFileServiceDomain -Name “MyFileServiceDomain”
```

2. Create a vSAN file share.

```
New-vsanfileshare -FileServiceDomain $domain -Name "MyVsanFileShare"
```

Create a vSAN ESA-Enabled Cluster

Starting from VMware PowerCLI 13.0.0 and vSAN 8.0, you can activate vSAN ESA (Express Storage Architecture) and manage storage pools on your clusters.

- Verify that you are connected to a vCenter Server 8.0 or later system.
- Verify that you have access to at least three virtual machine hosts.
- Verify that each of the virtual machine hosts has at least one SSD.

Starting from VMware PowerCLI 13.0.0 and vSAN 8.0, you can use vSAN ESA and the new storage format called storage pool disks. With vSAN ESA, you can boost performance with more predictable I/O latencies and optimized space efficiency. Each host that contributes storage contains a single storage pool of flash devices. Each flash device provides both caching and capacity to the vSAN ESA cluster. This is different from a disk group, which has dedicated devices in different tiers of cache and capacity.

1. Create a vSAN ESA-enabled cluster.

```
$vsanEsaCluster = New-Cluster -Name 'VsanESACluster' -Location (Get-Datacenter <MyDatacenter>) -VsanEn-
abled -VsanEsaEnabled
```

2. Retrieve the available storage pool disks to claim on your cluster.

```
Get-VsanEsaEligibleDisk -Cluster $vsanEsaCluster
```

   The system returns the `ScsiLun` type of the available storage pool disks.

3. Add disks to the storage pool on the specified host.

   For `DiskCanonicalName`, use the canonical name from `ScsiLun`.

```
Add-VsanStoragePoolDisk -VMHost (Get-VMHost <MyVMHost>) -VsanStoragePoolDiskType "singleTier" -DiskCanoni-
calName ("mpx.vmhba0:C0:T11:L0","mpx.vmhba0:C0:T12:L0")
```

4. Optional: You can remove a storage pool disk from the specified host.

```
$disks = Get-VsanStoragePoolDisk -VMHost <MyVMHost>
Remove-VsanStoragePoolDisk -VsanStoragePoolDisk $disks -VsanDataMigrationMode "nodatamigration" -Purpose
 "test" -Confirm:$false
```

Mount and Unmount Remote vSAN Datastores

Starting from VMware PowerCLI 12.7 and vSAN 7.0 Update 1, you can mount and unmount remote vSAN datastores to your vSAN-enabled clusters.

You can mount a remote datastore:

- From a vSAN or vSAN ESA-enabled cluster on the same vCenter Server system.
- From a vSAN stretched cluster.
- From a vSAN cluster on a different vCenter Server system.

Mount and Unmount a Remote vSAN Datastore from the Same vCenter Server System

Starting from VMware PowerCLI 12.7 and vSAN 7.0 Update 1, you can mount a remote vSAN datastore from another vSAN-enabled cluster residing on the same vCenter Server system.

To mount a datastore:

1. Retrieve the vSAN cluster configuration of the cluster to which you want to mount the remote datastore.
   ```
   $config = Get-VsanClusterConfiguration -Cluster "MyCluster"
   ```
2. Mount the remote datastore.
   ```
   Set-VsanClusterConfiguration -Configuration $config -MountRemoteDatastore (Get-Datastore -Name "MyDatas-
   tore")
   ```
3. Retrieve the mounted datatore.
   ```
   $newVsanConfiguration = Get-VsanClusterConfiguration -Cluster "MyCluster"
   $newVsanConfiguration.RemoteDatastore
   ```

To unmount a datastore:

1. Retrieve the new vSAN cluster configuration of the cluster from which you want to unmount the remote datastore.
   ```
   $vsanConfiguration = Get-VsanClusterConfiguration -Cluster "MyCluster"
   ```
2. Unmount the remote datastore.
   ```
   Set-VsanClusterConfiguration -Configuration $vsanConfiguration -UnMountRemoteDatastore $vsanConfigura-
   tion.RemoteDatastore
   ```

   IMPORTANT
   Starting from VMware PowerCLI 13.1.0 and vSAN 8.0 Update 1, you can mount remote datastores from vSAN ESA-enabled clusters. You can follow the same steps as for vSAN clusters.

Mount and Unmount a Remote vSAN Datastore from a vSAN Stretched Cluster

Starting from VMware PowerCLI 13.1.0 and vSAN 8.0 Update 1, you can mount a remote vSAN datastore to a vSAN cluster from a vSAN stretched cluster.

To mount a datastore:

1. Configure the remote vSAN server cluster configuration.
   It depends on the network topology between the client and server clusters in your HCI Mesh configuration.
   a. In a symmetric HCI Mesh configuration:
      ```
      $serverconfig = New-RemoteVsanServerClusterConfig -cluster $clusterServer -networktopology "Symmetric"
      ```
   b. In an asymmetric HCI Mesh configuration with one stretched cluster.
      ```
      $serverconfig = New-RemoteVsanServerClusterConfig -cluster $clusterServer -networktopology "Asymmet-
      ric" -ServerSiteName "Secondary"
      ```
   c. In an asymmetric configuration where both the client and server cluster are stretched clusters.
      ```
      $serverconfig = New-RemoteVsanServerClusterConfig -cluster $clusterServer -networktopology "Asymmet-
      ric" -ServerSiteName "Secondary" -ClientSiteName "Preferred"
      ```
2. Retrieve the vSAN cluster configuration of the cluster to which you want to mount the remote datastore.
   ```
   $clusterClient = Get-VsanClusterConfiguration -Cluster "MyCluster"
   ```

3. Mount the remote datastore.
```
Set-VsanClusterConfiguration -configuration $clusterClient -MountRemoteDatastore (Get-Datastore -Name "My-Datastore") -RemoteVsanServerClusterConfig $serverconfig
```

To unmount a datastore:

1. Retrieve the new vSAN cluster configuration of the cluster from which you want to unmount the remote datastore.
```
$newVsanConfiguration = Get-VsanClusterConfiguration -Cluster "MyCluster"
```
2. Unmount the datastore.
```
Set-VsanClusterConfiguration -configuration $newVsanConfiguration -UnmountRemoteDatastore $newVsanConfiguration.RemoteDatastore
```

Mount and Unmount a Remote vSAN Datastore from a Different vCenter Server System

Starting from VMware PowerCLI 13.1.0 and vSAN 8.0 Update 1, you can mount a remote vSAN datastore to a vSAN cluster from a vSAN cluster residing on a different vCenter Server system.

To mount a datastore:

1. Add the different vCenter Server as a datastore source to your current vCenter Server system.
```
$dsSource = New-VsanHCIMeshDatastoreSource -VCHost <RemoteVCAddress> -User <MyVCUser>  -Password <MyVC-Password>
```
2. Retrieve the available remote datastores.
```
$ds = Get-VsanHCIMeshDatastore -VsanHCIMeshDatastoresource $dsSource
```
3. Retrieve the vSAN cluster configuration of the cluster to which you want to mount the remote datastore.
```
$clusterClient = Get-VsanClusterConfiguration -Cluster "MyCluster"
```
4. Mount the remote datastore.
```
Set-VsanClusterConfiguration -Configuration $clusterClient -MountXVCDatastore $ds
```
5. Retrieve the mounted remote datastore.
```
$vsanConfiguration = Get-VsanClusterConfiguration -Cluster "MyCluster"
$vsanConfiguration.VsanXVCDatastore
```

To unmount the datastore:
```
Set-VsanClusterConfiguration -Configuration $vsanConfiguration -UnmountXVCDatastore $ds
```

Managing the vSphere Replication API with VMware PowerCLI

Use the vSphere Replication SDK for PowerShell to access the vSphere Replication API with PowerCLI. Starting from VMware PowerCLI version 13.1.0, the vSphere Replication SDK provides low-level cmdlets for all available vSphere Replication API operations.

Understanding the vSphere Replication SDK for PowerShell

You can access the vSphere Replication API with VMware PowerCLI by using the vSphere Replication SDK for PowerShell.

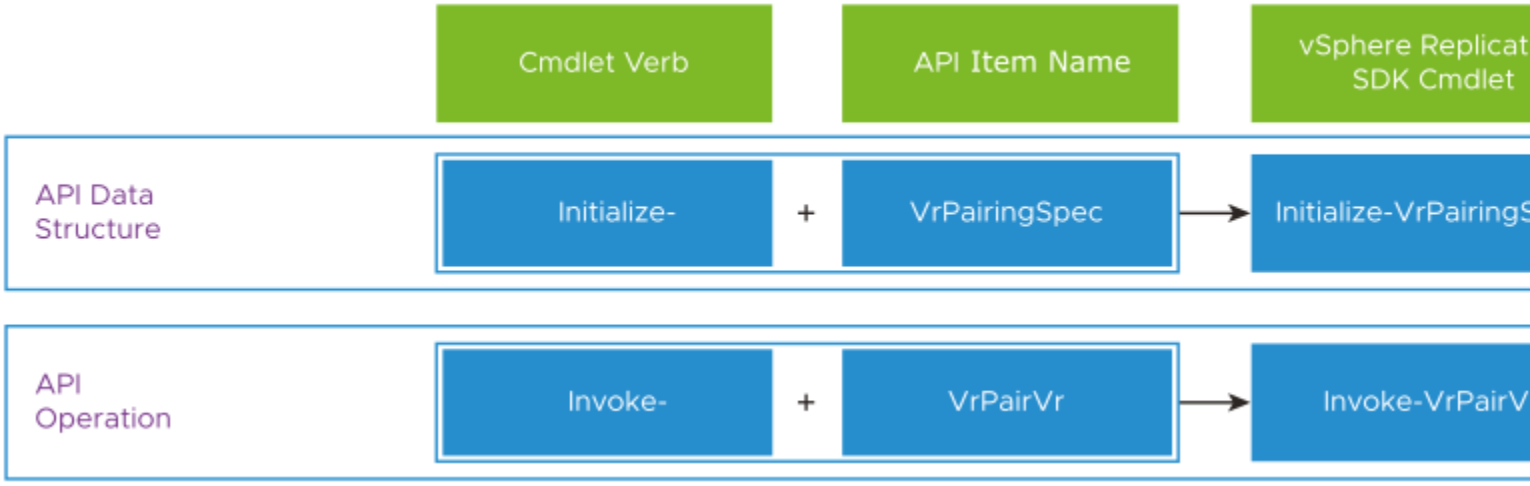
How Does the vSphere Replication SDK for PowerShell Work

Starting from VMware PowerCLI 13.1.0, you can use the vSphere Replication SDK for PowerShell to communicate with all available vSphere Replication REST APIs.

The `VMware.Sdk.Vr` module contains automatically-generated SDK cmdlets that bind directly to the vSphere Replication REST APIs. The module functions on a low level and communicates directly with the vSphere Replication API server.

You can construct vSphere Replication SDK cmdlets by using the `Initialize-` and `Invoke-` cmdlet verbs in combination with the names of the vSphere Replication API data structures or operations.

Figure 2: Constructing vSphere Replication SDK Cmdlets



- Use `Initialize-` cmdlets to prepare the data structures, if any, for your API calls. These cmdlets function on the client side and do not communicate with the vSphere Replication API server.
- Use `Invoke-` cmdlets to call the vSphere Replication API server and invoke the operations.

Navigating the vSphere Replication SDK for PowerShell

You can navigate the vSphere Replication SDK for PowerShell by using the VMware Developer website, and the `Get-Help`, `Get-Command`, and `Get-VrOperation` cmdlets.

To use the vSphere Replication SDK for PowerShell effectively, you must be familiar with the vSphere Replication API reference documentation .

How to Find a vSphere Replication Cmdlet

There are several ways to find the vSphere Replication cmdlets you need.

- In your browser, navigate the vSphere Replication API reference documentation.
  The vSphere Replication API Reference on VMware Developer features ready-to-use vSphere Replication SDK code samples that you can paste directly into PowerShell. You can find a PowerCLI code snippet for each operation under *PowerCLI Client SDK Example* in the *Code Samples* section.
- In PowerShell, run `Get-Command -Module VMware.Sdk.Vr` to list all available vSphere Replication cmdlets.
- If you want to use information from the REST API specification to find a cmdlet, you can run `Get-VrOperation` with the `Method` and `Path` parameters.
  For example:

  ```
  Get-VrOperation -Method GET -Path '/replication-servers'
  ```

  The command returns an object with the operation details.

  ```
  Name                : GetAllVrServers
  CommandInfo         : Invoke-VrGetAllVrServers
  ApiName             : ServerApi
  Path                : /replication-servers
  Tags                : {server}
  RelatedCommandInfos : {}
  Method              : GET
  ```

```
Parameters          : {filterProperty, filter, sortBy, orderBy...}
```

The cmdlet name is listed in the `CommandInfo` property.

How to Get Information About a Cmdlet

To get information about a vSphere Replication cmdlet, run `Get-Help` with the cmdlet name. For example:

```
Get-Help Invoke-VrConfigureReplication -full
```

Connect to a Local vSphere Replication Server

For replications within the same vCenter Server system, you must first connect to a local vSphere Replication server. You can do this by using the `Connect-VrServer` cmdlet.

- Verify that a vSphere Replication appliance is deployed at the local vCenter Server system.
- If the certificate of the server you want to connect to is not trusted, verify that your PowerCLI invalid server certificate action settings are configured properly. For more information, see Configuring PowerCLI Response to Untrusted Certificates.
- If you use a proxy server for the connection, verify that it is configured properly, so that the connection is kept alive long enough for tasks to complete running.

  NOTE
  If you do not want to use a proxy server for the connection, run `Set-PowerCLIConfiguration -ProxyPolicy NoProxy`.

1. Run `Connect-VrServer` and create a variable for the connection. Use the local vSphere Replication server address with the local vCenter Server user credentials.

   ```
   $vr1 = Connect-VrServer -Server <local_vr_address_or_fqdn> -User 'MyVCUser' -Password 'MyVCPassword'
   ```

2. Optional: Print the connection variable to see the `VrServerConnection` object you created.

   ```
   $vr1
   ```

   The `VrServerConnection` object contains the `ConnectedPairings` property with the pairing you created. You might need this property to extract information required by some vSphere Replication operations.

Connect to a Local and to a Remote vSphere Replication Server

For replications from a source to a target vCenter Server system, you use the `Connect-VrServer` cmdlet to connect to the local and to the remote vSphere Replication server.

- Verify that vSphere Replication appliances are deployed at the local and at the remote vCenter Server systems.
- If the certificate of the server you want to connect to is not trusted, verify that your PowerCLI invalid server certificate action settings are configured properly. For more information, see Configuring PowerCLI Response to Untrusted Certificates.
- If you use a proxy server for the connection, verify that it is configured properly, so that the connection is kept alive long enough for tasks to complete running.

  NOTE
  If you do not want to use a proxy server for the connection, run `Set-PowerCLIConfiguration -ProxyPolicy NoProxy`.

1. Run `Connect-VrServer` and create a variable for the connection. Use the local vSphere Replication server address with the local vCenter Server user credentials. For the remote server connection, use the remote vCenter Server address with the remote vCenter Server user credentials.

   ```
   $vr2 = Connect-VrServer -Server <local_vr_address_or_fqdn> -User 'MyVCUser' -Password 'MyVCPassword' -Re-
   moteServer <remote_vc_server_name> -RemoteUser 'MyRemoteVCUser' -RemotePassword 'MyRemoteVCPassword'
   ```

2. Optional: Print the connection variable to see the `VrServerConnection` object you created.

   ```
   $vr2
   ```

   The `VrServerConnection` object contains the `ConnectedPairings` property with the pairing you created. You might need this property to extract information required by some vSphere Replication operations.

Use the ConnectedPairings Property

Use the `ConnectedPairings` property to extract connection information that you might need for vSphere Replication SDK operations.

Verify that you have a valid `VrServerConnection` . This example uses the *$vr2* connection variable from Connect to a Local and to a Remote vSphere Replication Server.

The `ConnectedPairings` property is a key-value dictionary that contains information about all available vSphere Replication pairings. Use `ConnectedPairings` to extract information such as `PairingID` and `VcServerID`, which is required for some vSphere Replication SDK operations.

1. To list the connected pairings for a vSphere Replication connection, run:

   ```
   $vr2.ConnectedPairings
   ```

   The system lists a key-value map with your connected pairings.

2. To list a pairing, run:

   ```
   $vr2.ConnectedPairings[<vc_server_name>].Pairing
   ```

   The system returns the Pairing object with all its properties. You can copy the `PairingID` property as it is required by some vSphere Replication API operations.

3. To list the `LocalVcServer` object, run:

   ```
   $vr2.ConnectedPairings[<vc_server_name>].Pairing.LocalVcServer
   ```

   The system returns a `ServerInfo` object that contains a server ID that is required by some vSphere Replication API operations.

4. To list the `RemoteVcServer` object, run:

   ```
   $vr2.ConnectedPairings[<vc_server_name>].Pairing.RemoteVcServer
   ```

   The system returns a `ServerInfo` object that contains a server ID that is required by some vSphere Replication API operations.

Replicate a VM to a Datastore on the Local vCenter Server System

You can use the vSphere Replication SDK for PowerShell to replicate a VM from a source to a target datastore on the local vCenter Server system.

- Verify that the vSphere Replication appliance is deployed on the vCenter Server system.
- Verify that you are connected to the vCenter Server system. This example uses the *$vr1* connection variable from Connect to a Local vSphere Replication Server.
- You must have the required privileges to configure replications and manage datastores on the vCenter Server system.

This example shows how to replicate a single VM from a source to a target datastore on the same vCenter Server system.

1. Get the local VM that you want to replicate.

   ```
   $pairing = $vr1.ConnectedPairings["<local_vc_address_or_fqdn>"].Pairing
   $replicatedVm = Invoke-VrGetLocalVms -PairingId $pairing.PairingId `
       -VcenterId $pairing.LocalVcServer.Id `
       -FilterProperty "Name" `
   ```

```
    -Filter "<my_vm_name>" `
    -Server $vr1
```

2. Get the VM hard disks that you want to replicate.

```
$replicatedHdds = Invoke-VrGetLocalVmDisks -PairingId $pairing.PairingId `
    -VcenterId $pairing.LocalVcServer.Id `
    -VmId $replicatedVm.List[0].Id `
    -Server $vr1
```

3. Get the target datastore for the replication.

```
$targetDatastore = Invoke-VrGetVrCapableTargetDatastores -PairingId $pairing.PairingId `
    -VcenterId  $pairing.PairingId.RemoteVcServer.Id `
    -FilterProperty "Name" `
    -Filter "<target_datastore_name>" `
    -Server $vr1
```

4. Create the configuration for disks replication.

```
$replicationVmDisks = @()
$replicatedHdds.List | ForEach-Object {
   $replicationVmDisks += Initialize-VrConfigureReplicationVmDisk -VmDisk $_ `
     -EnabledForReplication:$true `
     -DestinationDatastoreId $targetDatastore.List[0].Id `
     -DestinationDiskFormat 'SAMEASSOURCE'
```

5. Create the replication spec.

```
$replicationSpec = Initialize-VrConfigureReplicationSpec `
    -Rpo 60 -NetworkCompressionEnabled:$true `
    -MpitEnabled:$true -AutoReplicateNewDisks:$true `
    -LwdEncryptionEnabled:$false `
    -Disks $replicationVmDisks `
    -MpitInstances 1 `
    -MpitDays 1 `
    -TargetVcId $pairing.RemoteVcServer.Id `
    -VmId $replicatedVm.List[0].Id
```

6. Invoke the ConfigureReplication operation.

```
$task = Invoke-VrConfigureReplication -PairingId $pairing.PairingId `
    -ConfigureReplicationSpec $replicationSpec -Server $vr1
```

   vSphere Replication starts replicating the virtual machine files to the target datastore.

7. Monitor the task progress.

```
$t = Invoke-VrGetTaskInfo -TaskId $task.List[0].Id -Server $vr1
$t
```

   Eventually, the task status changes to `SUCCESS` .

8. Optional: Get the replication on the target datastore.

```
$rep1 = Invoke-VrGetAllReplications -PairingId $pairing.PairingId `
-FilterProperty "Name" -Filter <my_vm_name> -Server $vr1
```

9. Sync your virtual machine to the configured replication on the target datastore.

```
Invoke-VrSyncReplication -PairingId $pairing.PairingId `
```

```
    -ReplicationId $rep1.List[0].Id -Server $vr1
```

Replicate a VM to a Datastore on a Remote vCenter Server System

You can use the vSphere Replication SDK for PowerShell to replicate a VM from a source to a target vCenter Server system.

- Verify that the vSphere Replication appliance is deployed on the source and target sites.
- Verify that your `VrServerConnection` is authenticated against the source and target vCenter Server systems. This example uses the *`$vr2`* connection variable from Connect to a Local and to a Remote vSphere Replication Server.
- You must have the required privileges to configure replications and manage datastores on the source and target sites.

This example shows how to replicate a single VM from a datastore on the local vCenter Server system to a datastore on a remote vCenter Server system.

1. Get the local VM that you want to replicate.

```
$pairing = $vr2.ConnectedPairings["<remote_vc_server_name>"].Pairing
$replicatedVm = Invoke-VrGetLocalVms -PairingId $pairing.PairingId `
    -VcenterId $pairing1.LocalVcServer.Id `
    -FilterProperty "Name" `
    -Filter "<my_vm_name>" `
    -Server $vr2
```

2. Get the VM hard disks that you want to replicate.

```
$replicatedHdds = Invoke-VrGetLocalVmDisks -PairingId $pairing.PairingId `
    -VmId $replicatedVm.List[0].Id `
    -VcenterId $pairing.LocalVcServer.Id `
    -Server $vr2
```

3. Get the target datastore on the remote site.

```
$targetDatastore = Invoke-VrGetVrCapableTargetDatastores  -PairingId $pairing.PairingId `
    -VcenterId $pairing.RemoteVcServer.Id `
    -FilterProperty "Name" -Filter "<remote_datastore_name>" -Server $vr2
```

4. Create the configuration for disks replication.

```
   $replicatedHdds.List | ForEach-Object {
      $replicationVmDisks += Initialize-VrConfigureReplicationVmDisk -VmDisk $_ `
         -EnabledForReplication:$true `
         -DestinationDatastoreId $targetDatastore.List[0].Id `
         -DestinationDiskFormat 'SAMEASSOURCE'
   }
```

5. Create the replication spec.

```
$replicationSpec = Initialize-VrConfigureReplicationSpec `
    -Rpo 60 -NetworkCompressionEnabled:$true `
    -MpitEnabled:$true -AutoReplicateNewDisks:$true `
    -LwdEncryptionEnabled:$false `
    -Disks $replicationVmDisks `
    -MpitInstances 1 `
    -MpitDays 1 `
    -TargetVcId $pairing.RemoteVcServer.Id `
    -VmId $replicatedVm.List[0].Id
```

6. Invoke the ConfigureReplication operation.

```
$task = Invoke-VrConfigureReplication -PairingId $pairing.PairingId `
```

```
    -ConfigureReplicationSpec $replicationSpec -Server $vr2
```

vSphere Replication starts replicating the virtual machine files to the target site datastore.

7. Monitor the task progress.

```
$t = Invoke-VrGetTaskInfo -TaskId $task.List[0].Id -Server $vr2
$t
```

Eventually, the task status must change to `SUCCESS`.

8. Optional: Get the replication on the remote site.

```
$rep2 = Invoke-VrGetAllReplications -PairingId $pairing.PairingId `
-FilterProperty "Name" -Filter <my_vm_name> -Server $vr2
```

9. Optional: Sync your virtual machine to the configured replication on the target site.

```
Invoke-VrSyncReplication -PairingId $pairing.PairingId `
    -ReplicationId $rep2.List[0].Id -Server $vr2
```

Managing VMware Site Recovery Manager (SRM) with VMware PowerCLI

To help you get started with VMware PowerCLI, this documentation provides a set of sample scripts that illustrate basic and advanced tasks in VMware Site Recovery Manager (SRM) (SRM) administration.

Connect to an SRM Server

To use the SRM API, you must establish a connection to an SRM server.

- If the certificate of the server you want to connect to is not trusted, verify that your PowerCLI invalid server certificate action settings are configured properly. For more information, see Configuring PowerCLI Response to Untrusted Certificates.
- If you use a proxy server for the connection, verify that it is configured properly, so that the connection is kept alive long enough for tasks to complete running.

  NOTE
  If you do not want to use a proxy server for the connection, run `Set-PowerCLIConfiguration -ProxyPolicy NoProxy`.

Some of the objects returned by the SRM API are objects from the vSphere API. To use those objects in integration with the vSphere API through PowerCLI, you can connect to the vCenter Server system that the SRM server is registered with.

1. To connect to the vCenter Server system that the SRM server is registered with, run `Connect-VIServer` with the server name and valid credentials.

```
Connect-VIServer -Server vc3.example.com -User 'MyAdministratorUser' -Password 'MyPassword'
```

2. To connect to the SRM server registered with the connected vCenter Server system, run `Connect-SrmServer`.

```
$srmConnection = Connect-SrmServer
```

NOTE
If you have previously connected to other vCenter Server systems configured with SRM server support, this cmdlet invocation establishes a connection to their corresponding SRM servers as well.

3. Optional: To use the SRM API, you can call methods of the root object and instances of the objects that those calls return.

```
$srmApi = $srmConnection.ExtensionData
```

NOTE
The root SRM API object is the `ExtensionData` property of the `SrmServer` object.

Protect a Virtual Machine

You can protect a virtual machine by replicating it to a remote SRM site.

1. Connect to the vCenter Server system that the SRM server is registered with.

```
Connect-VIServer -Server vc3.example.com -User 'MyAdministratorUser' -Password 'MyPassword'
```

2. Establish a connection to the local SRM server by providing credentials to the remote SRM site.

```
$srmConnection = Connect-SrmServer -RemoteUser 'MyRemoteUser' -RemotePassword 'MyRemotePassword'
```

3. List all protection groups associated with the SRM server.

```
$srmApi = $srmConnection.ExtensionData
$protectionGroups = $srmApi.Protection.ListProtectionGroups()
```

4. Associate the *`TestVM`* virtual machine with the *`ProtGroup1`* protection group and enable the protection for that virtual machine.

```
$vmToAdd = Get-VM "TestVM"

$targetProtectionGroup = $protectionGroups | where {$_.GetInfo().Name -eq "ProtGroup1" }

$targetProtectionGroup.AssociateVms(@($vmToAdd.ExtensionData.MoRef))

# Enable protection for that virtual machine
$protectionSpec = New-Object VMware.VimAutomation.Srm.Views.SrmProtectionGroupVmProtectionSpec
$protectionSpec.Vm = $vmToAdd.ExtensionData.MoRef
$protectTask = $targetProtectionGroup.ProtectVms($protectionSpec)
while(-not $protectTask.IsComplete()) { sleep -Seconds 1 }
```

Create a Report of the Protected Virtual Machines

You can create a simple report containing information about the protected virtual machines associated with an SRM server.

- Verify that you are connected to a vCenter Server system.
- Verify that you are connected to an SRM server.

1. List all protection groups associated with the SRM server.

```
$srmApi = $srmConnection.ExtensionData
$protectionGroups = $srmApi.Protection.ListProtectionGroups()
```

2. Generate a report of the protected virtual machines.

```
$protectionGroups | % {
    $protectionGroup = $_

    $protectionGroupInfo = $protectionGroup.GetInfo()

    # The following command lists the virtual machines associated with a protection group
    $protectedVms = $protectionGroup.ListProtectedVms()
```

```
    # The result of the above call is an array of references to the virtual machines at the vSphere API
    # To populate the data from the vSphere connection, call the UpdateViewData method on each virtual ma-
chine view object
    $protectedVms | % { $_.Vm.UpdateViewData() }
    # After the data is populated, use it to generate a report
    $protectedVms | %{
        $output = "" | select VmName, PgName
        $output.VmName = $_.Vm.Name
        $output.PgName = $protectionGroupInfo.Name
        $output
    }
} | Format-Table @{Label="VM Name"; Expression={$_.VmName} }, @{Label="Protection group name"; Expres-
sion={$_.PgName} }
```

Create a Report of the Virtual Machines Associated with All Protection Groups

You can create a simple report containing information about the virtual machines associated with all protection groups.

- Verify that you are connected to a vCenter Server system.
- Verify that you are connected to an SRM server.

1. List all protection groups associated with the SRM server.

```
$srmApi = $srmConnection.ExtensionData
$protectionGroups = $srmApi.Protection.ListProtectionGroups()
```

2. Generate a report of the virtual machines associated with all protection groups.

```
$protectionGroups | % {
    $protectionGroup = $_

    $protectionGroupInfo = $protectionGroup.GetInfo()

    # The following command lists the virtual machines associated with a protection group
    $vms = $protectionGroup.ListAssociatedVms()
    # The result of the above call is an array of references to the virtual machines at the vSphere API
    # To populate the data from the vSphere connection, call the UpdateViewData method on each virtual ma-
chine view object
    $vms | % { $_.UpdateViewData() }
    # After the data is populated, use it to generate a report
    $vms | %{
        $output = "" | select VmName, PgName
        $output.VmName = $_.Name
        $output.PgName = $protectionGroupInfo.Name
        $output
    }
} | Format-Table @{Label="VM Name"; Expression={$_.VmName} }, @{Label="Protection group name"; Expres-
sion={$_.PgName} }
```

Managing the Site Recovery Manager (SRM) API with VMware PowerCLI

Use the Site Recovery Manager SDK for PowerShell to access the Site Recovery Manager (SRM) API with PowerCLI. Starting from VMware PowerCLI version 13.1.0, the Site Recovery Manager SDK provides low-level cmdlets for all available Site Recovery Manager (SRM) API operations.

Understanding the Site Recovery Manager SDK for PowerShell

You can access the Site Recovery Manager (SRM) API with VMware PowerCLI by using the Site Recovery Manager SDK for PowerShell.

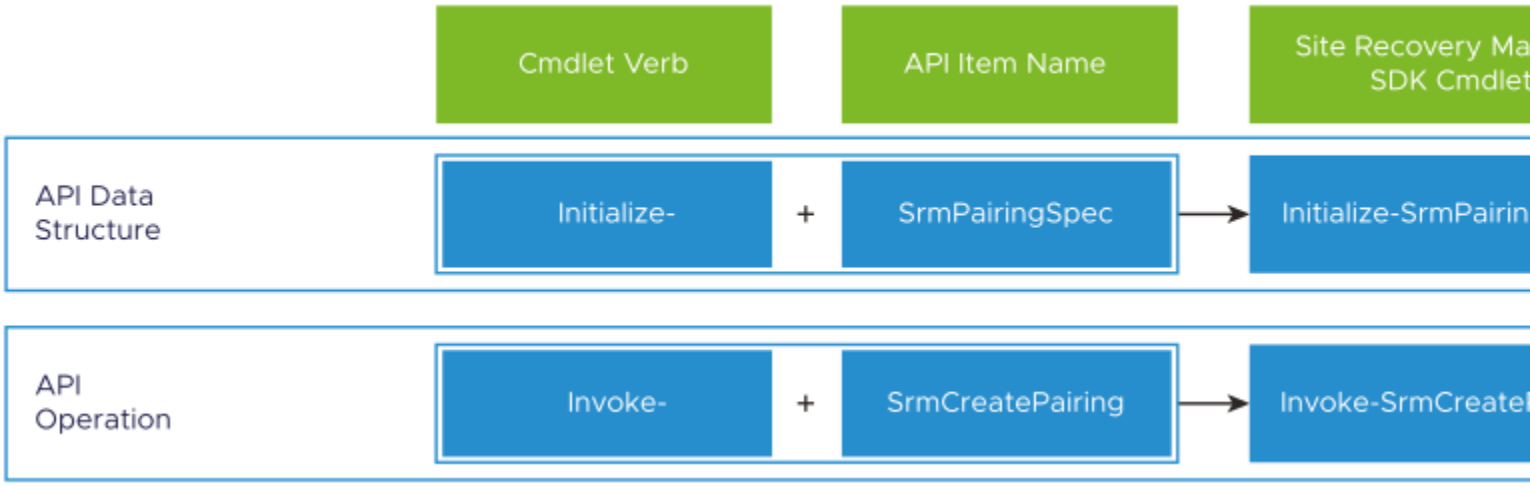
How Does the Site Recovery Manager SDK for PowerShell Work

Starting from VMware PowerCLI 13.1.0, you can use the Site Recovery Manager SDK for PowerShell to communicate with the Site Recovery Manager (SRM) REST APIs.

The `VMware.Sdk.Srm` module contains automatically-generated SDK cmdlets that bind directly to the Site Recovery Manager (SRM) REST APIs. The module functions on a low level and communicates directly with the Site Recovery Manager (SRM) API server.

You can construct Site Recovery Manager SDK cmdlets by using the `Initialize-` and `Invoke-` cmdlet verbs in combination with the names of the Site Recovery Manager (SRM) API data structures or operations.

Figure 3: Constructing Site Recovery Manager SDK Cmdlets



- Use `Initialize-` cmdlets to prepare the data structures, if any, for your API calls. These cmdlets function on the client side and do not communicate with the Site Recovery Manager (SRM) API server.
- Use `Invoke-` cmdlets to call the Site Recovery Manager (SRM) API server and invoke the operations.

Navigating the Site Recovery Manager SDK for PowerShell

You can navigate the Site Recovery Manager SDK for PowerShell by using the VMware Developer website, and the `Get-Help`, `Get-Command`, and `Get-SrmOperation` cmdlets.

To use the Site Recovery Manager SDK for PowerShell effectively, you must be familiar with the `VMware Site Recovery Manager REST API reference documentation` .

How to Find a Site Recovery Manager SDK Cmdlet

There are several ways to find the Site Recovery Manager SDK cmdlets you need.

- In your browser, navigate the Site Recovery Manager (SRM) API reference documentation.

The Site Recovery Manager (SRM) API Reference on VMware Developer features ready-to-use Site Recovery Manager SDK code samples that you can paste directly into PowerShell. You can find a PowerCLI code snippet for each operation under *PowerCLI Client SDK Example* in the *Code Samples* section.

- In PowerShell, run `Get-Command -Module VMware.Sdk.Srm` to list all available vSphere Replication cmdlets.
- If you want to use information from the REST API specification to find a cmdlet, you can run `Get-SrmOperation` with the `Method` and `Path` parameters.

  For example:

  ```
  Get-SrmOperation -Method GET -Path '/pairings/{pairing_id}/protection-management/groups'
  ```

  The command returns an object with the operation details.

  ```
  Name                : GetAllGroups
  CommandInfo         : Invoke-SrmGetAllGroups
  ApiName             : ProtectionApi
  Path                : /pairings/{pairing_id}/protection-management/groups
  Tags                : {protection}
  RelatedCommandInfos : {}
  Method              : GET
  Parameters          : {pairingId, filterProperty, filter, sortBy...}
  ```

  The cmdlet name is listed in the `CommandInfo` property.

How to Get Information About a Cmdlet

To get information about a Site Recovery Manager SDK cmdlet, run `Get-Help` with the cmdlet name. For example:

```
Get-Help Invoke-SrmGetAllGroups -full
```

Connect to a Local and to a Remote Site Recovery Manager (SRM) Server

To invoke operations on the Site Recovery Manager (SRM) API, you must first connect to the Site Recovery Manager (SRM) instances on the local (protected) and the remote (recovery) sites.

- Verify that VMware Site Recovery Manager (SRM) is deployed to the local (protected) and to the remote (recovery) vCenter Server systems.
- Verify that the Site Recovery Manager (SRM) instances on the local and the remote sites are connected.
- If the certificate of the server you want to connect to is not trusted, verify that your PowerCLI invalid server certificate action settings are configured properly. For more information, see Configuring PowerCLI Response to Untrusted Certificates.
- If you use a proxy server for the connection, verify that it is configured properly, so that the connection is kept alive long enough for tasks to complete running.

  NOTE

  If you do not want to use a proxy server for the connection, run `Set-PowerCLIConfiguration -ProxyPolicy NoProxy`.

1. Connect to the local and to the remote Site Recovery Manager (SRM) servers.

   ```
   $localSrm = <local_srm_address_or_fqdn>
   $srmConnection = Connect-SrmSdkServer -Server $localSrm `
       -User 'MyLocalVCUser' `
       -Password 'MyLocalVCPassword' `
       -RemoteUser 'MyRemoteVCUser' `
       -RemotePassword 'MyRemoteVCPassword'
   ```

2. Optional: Print the `ConnectedPairing` property of the connection you created.

```
$srmConnection.ConnectedPairing
```

The command prints the `Pairing` object that represents the pair between the local and the remote Site Recovery Manager (SRM) sites.

You will need the `Pairing` object and its properties for various Site Recovery Manager (SRM) API operations.

Host-Based Replication Scenarios

You can use the Site Recovery Manager SDK for PowerShell to manage scenarios for host-based replication (HBR) with VMware PowerCLI. HBR operates at the hypervisor level and allows you to replicate virtual machine data across different hosts or storage systems.

Create Protection Group for Host-Based Replication

To activate the protection of virtual machines, you first create a protection group for host-based replication (HBR).

- Verify that your SRM connection is authenticated against the protected (local) and recovery (remote) vCenter Server systems. This example uses the *`$srmConnection`* variable from Connect to a Local and to a Remote Site Recovery Manager (SRM) Server.
- The VMs that you want to protect must be replicated by using vSphere Replication.
- You must have the required privileges to create protection groups on the recovery site.

You create protection groups to enable Site Recovery Manager (SRM) to protect virtual machines. This example shows how to create a protection group for host-based replication by using the Site Recovery Manager SDK for PowerShell.

1. Get the VM that you want to add to a protection group.

```
$replicatedVm = Invoke-SrmGetReplicatedVms `
    -PairingId $srmConnection.ConnectedPairing.PairingId `
    -VcenterId $srmConnection.ConnectedPairing.LocalVcServer.Id `
    -FilterProperty "Name" `
    -Filter "<myVmName>"
```

2. Prepare the HBR protection group spec.

```
$hbrSpec = Initialize-SrmHbrProtectionGroupSpec -Vms $replicatedVm.List[0].Id
```

3. Prepare the protection group creation spec.

   For the `ReplicationType` parameter, specify *`HBR`*.

```
$protectionGroupSpec = Initialize-SrmProtectionGroupCreateSpec -Name "<myProtectionGroupName>" `
    -ReplicationType HBR `
    -ProtectedVcGuid $srmConnection.ConnectedPairing.LocalVcServer.Id `
    -HbrSpec $hbrSpec
```

4. Create the protection group task.

```
$task = Invoke-SrmCreateGroup -PairingId $srmConnection.ConnectedPairing.PairingId `
    -ProtectionGroupCreateSpec $protectionGroupSpec
```

5. Monitor the task progress.

```
$task = Invoke-SrmGetTaskInfo -TaskId $task.Id
```

   `$task.Status` eventually changes to `SUCCESS` .

6. Optional: Retrieve the protection group you created.

```
$protectionGroup = Invoke-SrmGetGroup -PairingId $srmConnection.ConnectedPairing.PairingId `
   -GroupId $task.Result
```

Create a recovery plan for your protection group.

Create Recovery Plan

To ensure business continuity and facilitate efficient disaster recovery for your virtual machines, you create a recovery plan for a protection group in a given pairing.

- Verify that your Site Recovery Manager (SRM) connection is authenticated against the protected (local) and recovery (remote) vCenter Server systems. This example uses the *$srmConnection* variable from Connect to a Local and to a Remote Site Recovery Manager (SRM) Server.
- You must have created one or more protection groups on the protected (local) site. This example uses the *$protectionGroup* variable from Create Protection Group for Host-Based Replication.
- You must have the required privileges to create recovery plans on the recovery site.

1. Create the recovery plan spec.

```
$recPlanSpec = Initialize-SrmRecoveryPlanCreateSpec `
    -Name "<myRecoveryPlanName>" `
    -ProtectedVcGuid $srmConnection.ConnectedPairing.LocalVcServer.Id `
    -ProtectionGroups $protectionGroup.Id
```

2. Create the recovery plan task.

```
$task = Invoke-SrmCreatePlan -PairingId $srmConnection.ConnectedPairing.PairingId `
    -RecoveryPlanCreateSpec $recPlanSpec
```

3. Monitor the task progress.

```
$task = Invoke-SrmGetTaskInfo -TaskId $task.Id
```

   Eventually, the task status changes to `SUCCESS` .

4. Optional: Retrieve the recovery plan you created.

```
$recoveryPlan = Invoke-SrmGetRecoveryPlan -PairingId $srmConnection.ConnectedPairing.PairingId `
-PlanId $task.Result
```

Array-Based Replication Scenarios

You can use the Site Recovery Manager SDK for PowerShell to manage scenarios for array-based replication (ABR) with VMware PowerCLI. With ABR, storage arrays at the protected site replicate data to peer arrays at the recovery site, typically at the block level.

Configure Array Managers for an Array Pair

Before creating a replicated array pair, you must configure array managers for the protected (local) and recovery (remote) SRM sites.

- Verify that your SRM connection is authenticated against the protected (local) and recovery (remote) vCenter Server systems. This example uses the *$srmConnection* variable from Connect to a Local and to a Remote Site Recovery Manager (SRM) Server.
- Verify that the SRM instances on the protected (local) and recovery (remote) sites are connected. This is known as site pairing.
- Verify that storage replication adapters (SRAs) are installed at both sites.

- You must have the required privileges to create array managers on the protected and recovery sites.

Configure array managers for the protected and recovery sites to enable the creation of an array pair for array-based replication (ABR). Array managers must be configured so that Site Recovery Manager (SRM) can discover replicated devices, compute datastore groups, and initiate storage operations.

1. Retrieve the storage replication adapter (SRA) for the local array manager.

```
$localAdapter = (Invoke-SrmGetStorageAdapters -PairingId $srmConnection.ConnectedPairing.PairingId `
   -SrmId $srmConnection.ConnectedPairing.LocalSrmServer.Id `
   -FilterProperty "Name" `
   -Filter "<myAdapterName>").List[0]
```

2. Prepare the connection parameters for the local SRA.
   a) Retrieve the `ConnectionParamGroup` object for the local SRA.

```
$localConnectionParamGroup = (Invoke-SrmGetStorageAdapterConnectionParams `
   -PairingId $srmConnection.ConnectedPairing.PairingId `
   -SrmId $srmConnection.ConnectedPairing.LocalSrmServer.Id `
   -StorageAdapterId $localAdapter.Id).List[0]
```

   b) Provide values to the connection parameters, available in the *`$localConnectionParamGroup.ConnectionParams`* list.

   The set of connection parameters is specific to the used SRA. This example uses parameters specific to the NetApp SRA.

```
($localConnectionParamGroup.ConnectionParams | where {$_.key -eq "username"}).Value = "<myNetAppUser>"
($localConnectionParamGroup.ConnectionParams | where {$_.key -eq "password"}).Value = "<myNetAppPass>"
($localConnectionParamGroup.ConnectionParams | where {$_.key -eq "VolumeInclusion"}).Value = "<myVol-
ume>"
($localConnectionParamGroup.ConnectionParams | where {$_.key -eq "SVM Name"}).Value = "<myLocalSvm-
Name>"
($localConnectionParamGroup.ConnectionParams | where {$_.key -eq "mgmtIP"}).Value = "<myNetAppMgmtIP>"
```

3. Prepare the local array manager creation spec.

```
$localArrayManagerSpec = Initialize-SrmArrayManagerSpec -Name "<myLocalArrayManagerName>" `
   -StorageAdapter $localAdapter.Id `
   -ConnectionParams $localConnectionParamGroup
```

4. Create the local array manager.

```
$task = Invoke-SrmCreateArrayManager -PairingId $srmConnection.ConnectedPairing.PairingId `
   -SrmId $srmConnection.ConnectedPairing.LocalSrmServer.Id `
   -ArrayManagerSpec $localArrayManagerSpec
```

5. Monitor the task progress.

```
$task = Invoke-SrmGetTaskInfo -TaskId $task.Id
```

   `$task.Status` eventually changes to `SUCCESS` .

6. Optional: Retrieve the local array manager.

   The `Result` property of the *`$localManagerTask`* object contains the ID of the created array manager.

```
$localManagerTask = Invoke-SrmGetTaskInfo -TaskId $task.Id

$localArrayManager = Invoke-SrmGetArrayManager -PairingId $srmConnection.ConnectedPairing.PairingId `
   -SrmId $srmConnection.ConnectedPairing.LocalSrmServer.Id `
   -ArrayManagerId $localManagerTask.Result
```

7. Create the remote array manager by using the same approach.

```
$remoteAdapter = (Invoke-SrmGetStorageAdapters -PairingId $srmConnection.ConnectedPairing.PairingId `
   -SrmId $srmConnection.ConnectedPairing.RemoteSrmServer.Id `
   -FilterProperty "Name" `
   -Filter "<myAdapterName>").List[0]

$remoteConnectionParamGroup = (Invoke-SrmGetStorageAdapterConnectionParams `
   -PairingId $srmConnection.ConnectedPairing.PairingId `
   -SrmId $srmConnection.ConnectedPairing.RemoteSrmServer.Id `
   -StorageAdapterId $remoteAdapter.Id).List[0]

($remoteConnectionParamGroup.ConnectionParams | Where-Object {$_.key -eq "username"}).Value = "<myNetAp-
pUser>"
($remoteConnectionParamGroup.ConnectionParams | Where-Object {$_.key -eq "password"}).Value = "<myNetApp-
Pass>"
($remoteConnectionParamGroup.ConnectionParams | Where-Object {$_.key -eq "VolumeInclusion"}).Value =
 "<myVolume>"
($remoteConnectionParamGroup.ConnectionParams | Where-Object {$_.key -eq "SVM Name"}).Value = "<myRe-
moteSvmName>"
($remoteConnectionParamGroup.ConnectionParams | Where-Object {$_.key -eq "mgmtIP"}).Value = "myNetApp-
MgmtIP"

$remoteArrayManagerSpec = Initialize-SrmArrayManagerSpec -Name "<myRemoteArrayManagerName>" `
   -StorageAdapter $remoteAdapter.Id `
   -ConnectionParams $remoteConnectionParamGroup

$task = Invoke-SrmCreateArrayManager -PairingId $srmConnection.ConnectedPairing.PairingId `
   -SrmId $srmConnection.ConnectedPairing.RemoteSrmServer.Id `
   -ArrayManagerSpec $remoteArrayManagerSpec

#Wait for the create array manager task to complete.
$remoteManagerTask = Invoke-SrmGetTaskInfo -TaskId $task.Id

$remoteArrayManager = Invoke-SrmGetArrayManager -PairingId $srmConnection.ConnectedPairing.PairingId `
   -SrmId $srmConnection.ConnectedPairing.RemoteSrmServer.Id `
   -ArrayManagerId $remoteManagerTask.Result
```

Create a replicated array pair for array-based replication.

Create Replicated Array Pair

Before you can create protection groups and recovery plans for ABR, you must create a replicated array pair for the protected (local) and recovery (remote) SRM sites.

- Verify that your SRM connection is authenticated against the protected and recovery vCenter Server systems. This example uses the *$srmConnection* variable from Connect to a Local and to a Remote Site Recovery Manager (SRM) Server.
- Verify that you configured array managers for the protected (local) and recovery (remote) SRM sites. This example uses the variables from Configure Array Managers for an Array Pair.
- You must have the required privileges to create replicated array pairs on the protected and recovery sites.

1. Prepare the replicated array pair create spec.

   You must specify the local array manager ID, and the storage array keys of the local (protected) and remote (recovery) array managers.

   ```
   $replicatedArrayPairSpec = Initialize-SrmReplicatedArrayPairSpec -ArrayManagerId $localArrayManager.Id `
      -StorageArrayKey $localArrayManager.StorageArrays[0].StorageArrayKey `
      -PeerStorageArrayKey $remoteArrayManager.StorageArrays[0].StorageArrayKey
   ```

2. Create the replicated array pair.

   ```
   $task = Invoke-SrmCreateReplicatedArrayPair -PairingId $srmConnection.ConnectedPairing.PairingId `
      -SrmId $srmConnection.ConnectedPairing.LocalSrmServer.Id `
      -ReplicatedArrayPairSpec $replicatedArrayPairSpec
   ```

3. Monitor the task progress.

   ```
   $task = Invoke-SrmGetTaskInfo -TaskId $task.Id
   ```

   `$task.Status` eventually changes to `SUCCESS` .

4. Optional: Retrieve the replicated array pair.

   The `Result` property of the *$replicatedArrayPairTask* object contains the ID of the replicated array pair.

   ```
   $replicatedArrayPairTask = Invoke-SrmGetTaskInfo -TaskId $task.Id

   $replicatedArrayPair = Invoke-SrmGetReplicatedArrayPair -PairingId $srmConnection.ConnectedPairing.Pair-
   ingId `
      -SrmId $srmConnection.ConnectedPairing.LocalSrmServer.Id `
      -ArrayPairId $replicatedArrayPairTask.Result
   ```

Create protection group and recovery plan by using the replicated array pair.

Create Protection Group and Recovery Plan for ABR

To ensure business continuity and facilitate efficient disaster recovery for your virtual machines with array-based replication, you create protection groups and recovery plans.

- Verify that your SRM connection is authenticated against the protected and recovery vCenter Server systems. This example uses the *$srmConnection* variable from Connect to a Local and to a Remote Site Recovery Manager (SRM) Server.
- Verify that you created a replicated array pair for the protected (local) and recovery (remote) SRM sites. This example uses the variables from Create Replicated Array Pair
- You must have the required privileges to create protection groups and recovery plans on the recovery site.

1. Discover the storage devices of the replicated array pair.

   ```
   $task = Invoke-SrmDiscoverStorageDevices -PairingId $srmConnection.ConnectedPairing.PairingId `
   ```

```
   -SrmId $srmConnection.ConnectedPairing.LocalSrmServer.Id `
   -ArrayPairId $replicatedArrayPair.Id
```

2. Monitor the task progress.

   ```
   $task = Invoke-SrmGetTaskInfo -TaskId $task.Id
   ```

   `$task.Status` eventually changes to `SUCCESS` .

3. Retrieve the storage devices from the replicated array pair.

   ```
   $storageDevices = Invoke-SrmGetStorageDevices -PairingId $srmConnection.ConnectedPairing.PairingId `
      -SrmId $srmConnection.ConnectedPairing.LocalSrmServer.Id `
      -ArrayPairId $replicatedArrayPair.Id
   ```

4. Prepare the ABR protection group spec.

   This example uses the replicated array pair with a single storage device and a single datastore created in Create Replicated Array Pair.

   ```
   $abrProtectionGroupSpec = Initialize-SrmAbrProtectionGroupSpec `
      -ReplicatedArrayPair $replicatedArrayPair.Id `
      -Datastores $storageDevices.StorageDevicesData[0].Datastores[0].Id
   ```

5. Prepare the protection group create spec.

   For the `ReplicationType` parameter, specify *ABR*.

   ```
   $protectionGroupSpec = Initialize-SrmProtectionGroupCreateSpec -Name "<MyAbrProtectionGroup>" `
      -ReplicationType ABR `
      -ProtectedVcGuid $srmConnection.ConnectedPairing.LocalVcServer.Id `
      -AbrSpec $abrProtectionGroupSpec
   ```

6. Create the ABR protection group.

   ```
   $task = Invoke-SrmCreateGroup -PairingId $srmConnection.ConnectedPairing.PairingId `
      -ProtectionGroupCreateSpec $protectionGroupSpec
   ```

7. Monitor the task progress.

   ```
   $task = Invoke-SrmGetTaskInfo -TaskId $task.Id
   ```

   `$task.Status` eventually changes to `SUCCESS` .

8. Optional: Retrieve the ABR protection group.

   ```
   $protectionGroup = Invoke-SrmGetGroup -PairingId $srmConnection.ConnectedPairing.PairingId `
      -GroupId $task.Result
   ```

9. Prepare the recovery plan create spec.

   ```
   $recPlanSpec = Initialize-SrmRecoveryPlanCreateSpec `
      -Name "<MyAbrRecoveryPlan>" `
      -ProtectedVcGuid $srmConnection.ConnectedPairing.LocalVcServer.Id `
      -ProtectionGroups @($protectionGroup.Id)
   ```

10. Create the recovery plan.

    ```
    $task = Invoke-SrmCreatePlan -PairingId $srmConnection.ConnectedPairing.PairingId `
       -RecoveryPlanCreateSpec $recPlanSpec
    ```

11. Monitor the task progress.

```
$task = Invoke-SrmGetTaskInfo -TaskId $task.Id
```

`$task.Status` eventually changes to `SUCCESS` .

Managing the NSX Policy API with VMware PowerCLI

Manage your networking automation with PowerCLI and the NSX Policy SDK for PowerShell. Starting from PowerCLI 12.6, you can use low-level SDK cmdlets to communicate with all available NSX Policy REST APIs.

Understanding the NSX Policy SDK for PowerShell

You can manage the NSX Policy API with VMware PowerCLI by using the NSX Policy SDK for PowerShell.

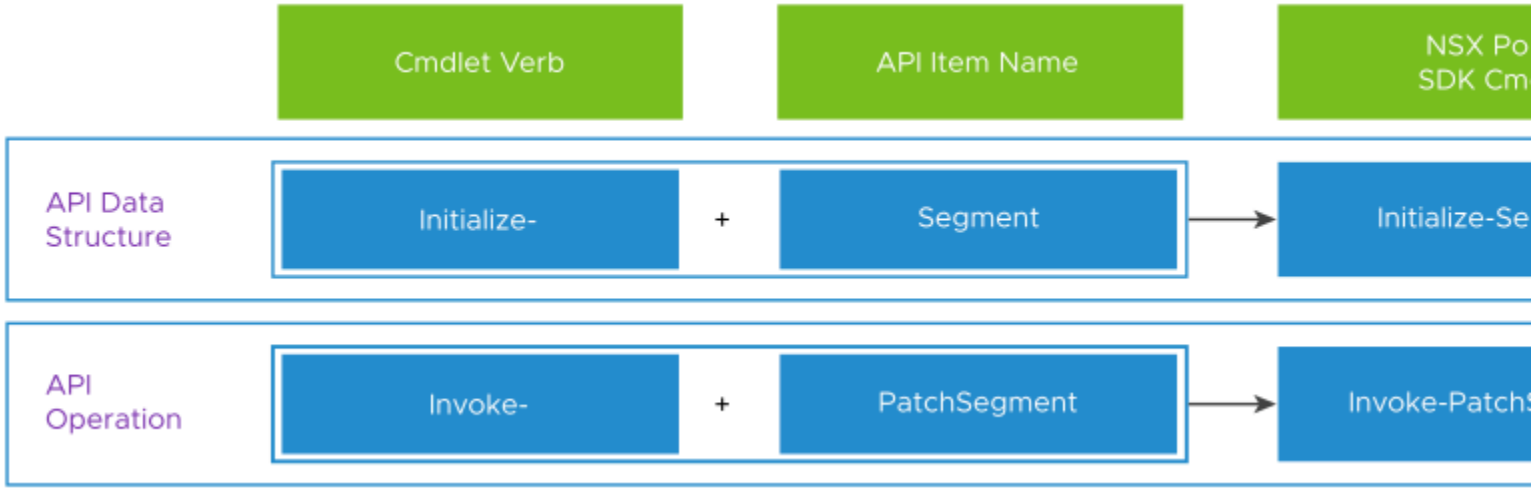
How Does the NSX Policy SDK for PowerShell Work

Starting from VMware PowerCLI 12.6, you can use the NSX Policy SDK for PowerShell to communicate with all available NSX Policy REST APIs.

The `VMware.Sdk.Nsx.Policy` module contains SDK cmdlets that are automatically generated and provide PowerShell bindings to the NSX REST APIs. The PowerCLINSX module functions on a low level and communicates directly with the NSX Policy API server.

You can construct NSX Policy SDK cmdlets by using the `Initialize-` and `Invoke-` cmdlet verbs in combination with the names of the API data structures or operations.

Figure 4: Constructing NSX Policy SDK Cmdlets



- Use `Initialize-` cmdlets to prepare the data structures, if any, for your API calls. These cmdlets function on the client side and do not communicate with the API server.
- Use `Invoke-` cmdlets to call the NSX Policy API server and invoke the operations.

Navigate the NSX Policy SDK for PowerShell

You can navigate the NSX Policy SDK for PowerShell by using the `Get-NsxOperation` and `Get-Help` cmdlets.

To navigate the NSX Policy SDK for PowerShell, you must be familiar with the NSX Policy API and its reference documentation.

You can access two NSX REST API references on the VMware Developer website:

- The `NSX REST API reference` that contains all NSX networking services, for both on-prem and VMware Cloud on AWS.
- The `NSX VMC Policy API reference` that contains only the networking services for VMware Cloud on AWS. Here, you can find ready-to-use PowerCLI samples that you can paste directly into your PowerShell console.

The following procedure is based on the NSX REST API reference.

1. In the NSX REST API reference, navigate to the NSX Policy API operation you want to use.

   For example, go to **Segments (Fixed)** > **Create or update a segment**.

2. Copy the method and the path of the operation.
3. In PowerShell, run `Get-NsxOperation` with the `Method` and `Path` parameters.

   For example:

   ```
   Get-NsxOperation -Method PUT -Path '/policy/api/v1/infra/tier-1s/<tier-1-id>/segments/<segment-id>'
   ```

   The command retrieves a custom object with the NSX operation details.

   ```
   Name                : CreateOrReplaceSegment
   CommandInfo         : Invoke-CreateOrReplaceSegment
   ApiName             : PolicyConnectivityApi
   Path                : /infra/tier-1s/{tier-1-id}/segments/{segment-id}
   Tags                : {Policy, Networking, Connectivity, Segments...}
   RelatedCommandInfos : {Initialize-Segment}
   Method              : PUT
   Parameters          : {tier1Id, segmentId, segment}
   ```

4. Copy the PowerCLI cmdlet that corresponds to the API operation.

   It is listed in the `CommandInfo` property.

5. To retrieve information about the cmdlet , run Get-Help.

   For example:

   ```
   Get-Help Invoke-CreateOrReplaceSegment -full
   ```

   You can see the full information about the cmdlet such as its description, parameters, and code examples.

Connect to an On-Prem NSX Server

You can connect to an on-prem NSX server by using the `Connect-NsxServer` cmdlet.

- If the certificate of the server you want to connect to is not trusted, verify that your PowerCLI invalid server certificate action settings are configured properly. For more information, see Configuring PowerCLI Response to Untrusted Certificates.
- If you use a proxy server for the connection, verify that it is configured properly, so that the connection is kept alive long enough for tasks to complete running.

Run `Connect-NsxServer` with the NSX server IP address or FQDN and valid user credentials.

```
Connect-NsxServer -Server <nsx_server_ip_address_or_fqdn> -User <my_username> -Password <my_password>
```

Connect to an NSX Server on VMware Cloud on AWS

You can connect to an NSX server on VMware Cloud on AWS by using the `Connect-NsxVmcServer` cmdlet.

- Verify that you have a valid API token from VMware Cloud services.
- Verify that you know the name of the SDDC, in which the server you want to connect to resides.

1. Create a variable with the VMware Cloud on AWS server connection.

```
$vmcServer = Connect-VmcServer -ApiToken $apiToken
```

2. Create a variable with the SDDC name.

```
$sddc = Get-VmcSddc -Name $sddcName
```

3. Connect to the NSX server on VMware Cloud on AWS.

```
Connect-NsxVmcServer -VmcConnection $vmcServer -VmcSddc $sddc
```

Create a Tier-0 Gateway

You can create a Tier-0 gateway with the NSX Policy SDK for PowerShell by using the `Initialize-Tier0` and `Invoke-PatchTier0` cmdlets.

Verify that you are connected to an NSX server system.

1. Prepare the input for the operation.

```
$t0 = Initialize-Tier0 -ArpLimit 5000 -DisplayName $T0GatewayName
```

2. Invoke the operation.

```
Invoke-PatchTier0 -Tier0Id $T0GatewayName -Tier0 $t0
```

Create a Tier-1 Gateway

You can create a Tier-1 gateway with the NSX Policy SDK for PowerShell by using the `Initialize-Tier1` and `Invoke-PatchTier1` cmdlets.

- Verify that you are connected to an NSX server system.
- Verify that your system has Tier-0 gateway(s).

1. Retrieve the Tier-0 paths.

```
$t0s = Invoke-ListTier0s
$t0 = $t0s.Results | where {$_.DisplayName -eq $T0GatewayName}
```

2. Prepare the input for the operation.

```
$t1 = Initialize-Tier1 -ArpLimit 5000 -DisplayName $T1GatewayName -Tier0Path $t0.Path
```

3. Invoke the operation.

```
Invoke-PatchTier1 -Tier1Id $T1GatewayName -Tier1 $t1
```

Add an Existing Tier-1 Gateway to a Specific Edge Cluster

You can add an existing Tier-1 gateway to a specific Edge Cluster with the NSX Policy SDK for PowerShell by using the `Invoke-PatchTier1LocaleServices` cmdlet.

- Verify that you are connected to an NSX server system.
- Verify that you know the Edge Cluster name of the Edge Cluster to which you want to add the Tier-1 gateway.

1. Retrieve the Edge Cluster information.

```
$edgeClusters = Invoke-ListEdgeClustersForEnforcementPoint -SiteId default -EnforcementPointId default
$edgeCluster = $edgeClusters.Results | where {$_.Displayname -eq $edgeClusterName}
```

2. Create a client-side object for locale service with the Edge Cluster path.

```
$localeService = Initialize-LocaleServices -EdgeClusterPath $edgeCluster.Path -
DisplayName default -Id default
```

3. Invoke the operation.

```
Invoke-PatchTier1LocaleServices -Tier1Id $T1.Id -LocaleServices $localeService -LocaleServicesId default
```

Create a Segment (On-Prem)

You can create a segment on an on-prem NSX server system by using the `Invoke-PatchInfraSegment` cmdlet.

- Verify that you are connected to an on-prem NSX server system.
- Verify that your system has Tier-1 gateway(s).

To create an on-prem (flexible) segment, you must specify a transport zone and assign a subnet.

1. Retrieve transport zone details.

```
$tzs = Invoke-ListTransportZonesForEnforcementPoint -EnforcementpointId default -SiteId default
$tz = $tzs.Results | where {$_.DisplayName -eq $TransportZone}
```

2. Prepare the input for the segment subnet.

```
$segmentSubnet = Initialize-SegmentSubnet -GatewayAddress $GatewayCIDR
```

3. Retrieve the Tier-1 paths.

```
$t1s = Invoke-ListTier1
$t1 = $t1s.Results | where {$_.DisplayName -eq $T1GatewayName}
```

4. Prepare the input for the segment.

```
$segment = Initialize-Segment -DisplayName $SegmentName -TransportZonePath $tz.Path `
           -Subnets $segmentSubnet -ConnectivityPath $t1.Path
```

5. Invoke the operation.

```
Invoke-PatchInfraSegment -Segment $segment -SegmentId $SegmentName
```

Create a Segment (VMware Cloud on AWS)

You can create a segment for an NSX server system on VMware Cloud on AWS by using the `Invoke-CreateOrReplaceSegment` cmdlet.

- Verify that you are connected to an NSX server system on VMware Cloud on AWS.
- Verify that your system has Tier-1 gateway(s).

1. Prepare the input for the segment subnet.

```
$segmentSubnet = Initialize-SegmentSubnet -GatewayAddress $GatewayCIDR
```

2. Prepare the input for the segment.

```
$segment = Initialize-Segment -DisplayName $SegmentName -Subnets @($segmentSubnet)
```

3. Invoke the operation.

```
Invoke-CreateOrReplaceSegment -Tier1Id $T1GatewayName -SegmentId $SegmentName -Segment $segment
```

Create a Distributed Firewall Policy

You can create a distributed firewall policy for an NSX server system by using the `Invoke-PatchSecurityPolicyForDomain` cmdlet.

- Verify that you are connected to an NSX server system.

1. Create lookup object variables.

```
$serviceList = @("SSH", "HTTP")
$sourceGroups = @("ANY")
$destinationGroups = @("MyGroupName")
```

2. Look up groups and services.

```
$allServices = Invoke-ListServicesForTenant
$ServicePathList = @()
foreach ($serv in $serviceList) {
    $s = $allServices.Results | where {$_.DisplayName -eq $serv}
    $ServicePathList += $s.Path
}

$allGroups = Invoke-ListGroupForDomain -DomainId default
$sourceGroupList = @()
foreach ($gp in $sourceGroups) {
    if ($gp -eq "ANY") {
        $SourceGroupList += "ANY"
    } else {
        $g = $AllGroups.Results | where {$_.DisplayName -eq $gp}
        $SourceGroupList += $g.Path
    }
}

$destinationGroupList = @()
foreach ($gp in $destinationGroups) {
    if ($gp -eq "ANY") {
        $DestinationGroupList += "ANY"
    } else {
        $g = $AllGroups.Results | where {$_.DisplayName -eq $gp}
        $DestinationGroupList += $g.Path
    }
}
```

3. Prepare the input for the policy rule.

```
$rule = Initialize-Rule -DisplayName $ruleName -Id $ruleName -SourceGroups $sourceGroupList -Destination-
Groups $destinationGroupList -Services $servicePathList -Action "ALLOW"
```

4. Prepare the input for the security policy.

```
$securityPolicy = Initialize-SecurityPolicy -DisplayName $policyName -Rules @($rule)
```

5. Invoke the operation.

```
Invoke-PatchSecurityPolicyForDomain -DomainId default -SecurityPolicyId $policyName -SecurityPolicy $secu-
rityPolicy
```

Managing VMware Cloud Director with VMware PowerCLI

To help you get started with VMware PowerCLI, this documentation provides a set of scripts that illustrate basic and advanced tasks in cloud administration.

Connect to a VMware Cloud Director Server

To run cmdlets on a VMware Cloud Director server and perform administration or monitoring tasks, you must establish a connection to the server.

- If the certificate of the server you want to connect to is not trusted, verify that your PowerCLI invalid server certificate action settings are configured properly. For more information, see Configuring PowerCLI Response to Untrusted Certificates.
- If you use a proxy server for the connection, verify that it is configured properly, so that the connection is kept alive long enough for tasks to complete running.

  NOTE
  If you do not want to use a proxy server for the connection, run `Set-PowerCLIConfiguration -ProxyPolicy NoProxy`.

You can have more than one connection to the same server. For more information, see Managing Default Server Connections in PowerCLI.

If your login credentials contain non-alphanumeric characters, you might need to escape them. For more information, see Processing Non-alphanumeric Characters in PowerCLI.

Run `Connect-CIServer` with the server name and valid credentials.

```
Connect-CIServer -Server cloud.example.com -User 'MyAdministratorUser' -Password 'MyPassword'
```

Create and Manage Organizations

Organizations provide resources to a group of users and set policies that determine how users can consume those resources. Create and manage organizations for each group of users that requires its own resources, policies, or both.

Verify that you are connected to a VMware Cloud Director server as a provider administrator.

1. Generate a customized report for all organizations on the server.

```
Get-Org | Select Name, Enabled, StoredVMQuota, DeployedVMQuota
```

2. Add a new organization on the server and provide a name and a full name for it.

```
New-Org -Name 'MyOrg1' -FullName 'My Organization 1'
```

   By default, the new organization is enabled. Enabling the organization lets users log in.

3. Add a description for the new organization.

```
Get-Org -Name 'MyOrg1' | Set-Org -Description "This organization provides resources to John
Doe."
```

4. Deactivate and remove the new organization.

```
Get-Org -Name 'MyOrg1' | Set-Org -Enabled $false | Remove-Org
```

Create and Manage Organization Virtual Data Centers

To allocate resources to an organization, you need to create an organization virtual data center (vDC). When the demands of the organization change, you can modify or remove the organization vDC.

- Verify that you are connected to a VMware Cloud Director server as a provider administrator.
- Verify that at least one enabled provider vDC is available on the server.

1. Create a new organization vDC using the Pay As You Go model for resource allocation.

```
$myOrg = Get-Org -Name 'MyOrg1'
$myPVdc = Get-ProviderVdc -Name 'MyProvidervDC'
New-OrgVdc -Name 'MyOrgvDC' -AllocationModelPayAsYouGo -Org $myOrg -ProviderVdc $myPVdc -VMCPUCoreMHz
 1000
```

   To create the organization vDC, VMware Cloud Director PowerCLI uses a default configuration based on the selected resource allocation model.

   - VMMaxCount is set to 100
   - NetworkMaxCount is set to 1024
   - The vDC is automatically enabled
   - Thin provisioning is deactivated
   - Fast provisioning is deactivated
   - NicMaxCount is set to $null (unlimited)
   - MemoryGuaranteedPercent is set to 100
   - CpuGuaranteedPercent is set to 0

2. Modify the vCPU speed setting for the virtual machines in the organization vDC.

```
Get-OrgVdc -Name 'MyOrgVdc' | Set-OrgVdc -VMCpuCoreMhz 2000
```

3. Enable fast provisioning for the virtual machines in the organization vDC.

```
Get-OrgVdc -Name 'MyOrgVdc' | Set-OrgVdc -UseFastProvisioning $true
```

4. Deactivate and remove the new organization vDC.

```
Get-OrgVdc -Name 'MyOrgVdc' | Set-OrgVdc -Enabled $false | Remove-OrgVdc
```

Filter and Retrieve Organization Virtual Data Center Networks

To generate reports about organization vDC networks, you need to retrieve the respective organization vDC networks. You can use search criteria to filter the results returned by `Get-OrgVdcNetwork`.

Verify that you are connected to a VMware Cloud Director server.

- Get all organization vDC networks for the organization named *`MyOrgVdc`*.

```
Get-OrgVdc -Name 'MyOrgVdc' | Get-OrgVdcNetwork
```

- Get the organization vDC network that is named *`MyOrgVdcNetwork`*.

```
Get-OrgVdc -Name 'MyOrgVdc' | Get-OrgVdcNetwork -Name 'MyOrgVdcNetwork'
```

Import a vApp Template from the Local Storage

To make an OVF package from your local storage available to other cloud users, you can import the package and save it as a vApp template in a catalog.

Verify that you are connected to a VMware Cloud Director server.

1. Retrieve the catalog to which you want to add the imported vApp template.

```
$myCatalog = Get-Catalog -Name 'MyCatalog'
```

2. Retrieve the organization virtual data center (vDC) to which you want to add the imported vApp template.
```
$myOrgVdc = Get-OrgVdc -Name 'MyOrgVdc'
```
3. Import a virtual machine from your local storage and save it as a vApp template in the cloud.
```
Import-CIVAppTemplate -SourcePath 'C:\OVFs\WindowsXP\WindowsXP.ovf' -Name 'MyWin-
dowsXPVAppTemplate' -OrgVdc $myOrgVdc -Catalog $myCatalog
```

Create a vApp Template from a vApp

Creating vApp templates from vApps in the cloud might minimize future efforts for cloning vApps. You can use the templates later to create vApps that are based on the source vApp.

Verify that you are connected to a VMware Cloud Director server.

1. Retrieve the source vApp for the vApp template that you want to create.
```
$myVApp = Get-CIVApp -Name 'MyVApp'
```
2. If the source vApp is running, stop it.
```
$myVApp = Stop-CIVApp -VApp $myVApp
```
3. Retrieve the catalog to which you want to add the new vApp template.
```
$myCatalog = Get-Catalog -Name 'MyCatalog'
```
4. Retrieve the organization vDC to which you want to add the new vApp template.
```
$myOrgVdc = Get-OrgVdc -Name 'MyOrgVdc'
```
5. Create a vApp template.
```
New-CIVAppTemplate -Name 'MyVAppTemplate' -VApp $myVApp -OrgVdc $myOrgVDC -Catalog $myCata-
log
```
6. Start the source vApp.
```
$myVApp = Start-CIVApp -VApp $myVApp
```

Create a vApp from the template and modify the vApp. See Create and modify a vApp.

Import a vApp from vSphere

To make a virtual machine from the underlying vSphere infrastructure available to your VMware Cloud Director server, you can import it and save it as a vApp.

- Verify that you are connected to a VMware Cloud Director server as a provider administrator.
- Verify that you are connected to a vCenter Server system.

1. Retrieve the vSphere virtual machine that you want to import.
```
$myVm = Get-VM -Name 'MyVMToImport'
```
2. Retrieve the organization vDC to which you want to import the virtual machine.
```
$myOrgVdc = Get-OrgVdc -Name 'MyOrgVdc'
```
3. Import the virtual machine and store it as a vApp.
```
Import-CIVApp -VM $myVm -OrgVdc $myOrgVdc
```

Create and Modify a vApp

You can use vApp templates to instantiate vApps. After creating the vApp, you can modify its settings to minimize the consumption of computing and storage resources.

Verify that you are connected to a VMware Cloud Director server.

1. Retrieve the organization vDC to which you want to add the new vApp.
   ```
   $myOrgVdc = Get-OrgVdc -Name 'MyOrgVdc'
   ```
2. Retrieve the source vApp template for your new vApp.
   ```
   $myVAppTemplate = Get-CIVAppTemplate -Name 'MyVAppTemplate'
   ```
3. Create your new vApp.
   ```
   $myVApp = New-CIVApp -Name 'MyVApp' -VAppTemplate $myVAppTemplate -OrgVdc $myOrgVDC
   ```
   By default, the vApp is powered off.
4. Renew the runtime lease for the new vApp and set it to 12 hours.
   ```
   Set-CIVApp -VApp $myVApp -RuntimeLease "12:0:0" -RenewLease
   ```
   To set leases, you can use the *days.hours:minutes:seconds* syntax.
5. Start the new vApp.
   ```
   Start-CIVApp -VApp $myVApp
   ```

Manage Virtual Machines with vApps

For a large-scale approach to administration, you can start, stop, or restart virtual machines or their guest operating systems by running cmdlets on the associated vApps.

Verify that you are connected to a VMware Cloud Director server.

1. Power on all virtual machines in all vApps with names starting with *MyVApp*.
   ```
   Get-CIVApp -Name 'MyVApp*' | Start-CIVApp
   ```
2. Suspend all virtual machines in all vApps with names starting with *YourVApp*.
   ```
   Get-CIVApp -Name 'YourVApp*' | Suspend-CIVApp
   ```
3. Power off all virtual machines in the vApp named *MyVApp1*.
   ```
   Get-CIVApp -Name 'MyVApp1' | Stop-CIVApp
   ```
4. Shut down the guest operating systems of all virtual machines in the vApp named *MyVApp2*.
   ```
   Get-CIVApp -Name 'MyVApp2' | Stop-CIVAppGuest
   ```
5. Restart the guest operating systems of all virtual machines in the vApp named *MyVApp3*.
   ```
   Get-CIVApp -Name 'MyVApp3' | Restart-CIVAppGuest
   ```
6. Reset all virtual machines in the vApp.
   ```
   Get-CIVApp -Name 'MyVApp4' | Restart-CIVApp
   ```

Manage Virtual Machines and Their Guest Operating Systems

For a targeted approach to administration, you can use the `CIVM` and `CIVMGuest` cmdlets to handle lifecycle operations for one or more virtual machines.

Verify that you are connected to a VMware Cloud Director server.

1. Retrieve all virtual machines with names starting with *MyVM* and power them on.

```
Get-CIVM -Name 'MyVM*' | Start-CIVM
```

2. Suspend all virtual machines with names starting with *YourVM*.

```
Get-CIVM -Name 'YourVM*' | Suspend-CIVM
```

3. Power off the virtual machine named *MyVM1*.

```
Get-CIVM -Name 'MyVM1' | Stop-CIVM
```

4. Shut down the guest operating system of the virtual machine named *MyVM2*.

```
Get-CIVM -Name 'MyVM2' | Stop-CIVMGuest
```

5. Restart the guest operating system of the virtual machine named *MyVM3*.

```
Get-CIVM -Name 'MyVM3' | Restart-CIVMGuest
```

6. Reset the nonresponsive virtual machine named *MyVM4*.

```
Get-CIVM -Name 'MyVM4' | Restart-CIVM
```

Retrieve a List of the Internal and External IP Addresses of Virtual Machines in vApps

When managing vApps in the cloud, you might need to obtain information about the NIC settings of the associated virtual machines.

Verify that you are connected to a VMware Cloud Director server.

1. Retrieve the organization for which you want to generate the report.

```
$myOrg = Get-Org -Name 'MyOrg'
```

2. Retrieve all vApps in the organization.

```
$vApps = Get-CIVApp -Org $myOrg
```

3. Populate an array with the information that you want to report.

```
$vAppNetworkAdapters = @()
foreach ($vApp in $vApps) {
        $vms = Get-CIVM -VApp $vApp
        foreach ($vm in $vms) {
                $networkAdapters = Get-CINetworkAdapter -VM $vm
                foreach ($networkAdapter in $networkAdapters) {
                        $vAppNicInfo = New-Object "PSCustomObject"
                        $vAppNicInfo | Add-Member -MemberType NoteProperty -Name VAppName -Value $vAp-
p.Name
                        $vAppNicInfo | Add-Member -MemberType NoteProperty -Name VMName   -Value $vm.Name
                        $vAppNicInfo | Add-Member -MemberType NoteProperty -Name NIC      -Value ("NIC" +
 $networkAdapter.Index)
                        $vAppNicInfo | Add-Member -MemberType NoteProperty -Name ExternalIP -Value $net-
workAdapter.ExternalIpAddress
```

```
                        $vAppNicInfo | Add-Member -MemberType NoteProperty -Name InternalIP -Value $net-
workAdapter.IpAddress

                        $vAppNetworkAdapters += $vAppNicInfo
                    }
                }
}
```

Running this script retrieves the names of the virtual machines and their associated vApp, the IDs of the NICs of the virtual machines, and external, and internal IP addresses of the NICs.

4. Display the report on the screen.
   ```
   $vAppNetworkAdapters
   ```

Create and Manage Access Control Rules

By defining access control rules you can assign levels of access to separate users, user groups, or everyone in the organization. You can define access control rules for catalogs and vApps.

Verify that you are connected to a VMware Cloud Director server.

1. Create a new rule for accessing the vApp named *MyVApp*.

   ```
   New-CIAccessControlRule -Entity 'MyVApp' -EveryoneInOrg -AccessLevel "Read"
   ```

   All users in the organization have read-only access to the vApp.
2. Modify the access rule for a trusted user who needs full control over *MyVApp*.

   ```
   New-CIAccessControlRule -Entity 'MyVApp' -User "MyAdvancedUser" -AccessLevel "FullControl"
   ```

3. Restrict the full control access of *MyAdvancedUser* to read/write access.
   ```
   $accessRule = Get-CIAccessControlRule -Entity 'MyVApp' -User 'MyAdvancedUser'
   $accessRule | Set-CIAccessControlRule -AccessLevel "ReadWrite"
   ```
4. Remove the custom rule that you created earlier for *MyAdvancedUser*.
   ```
   $accessRule | Remove-CIAccessControlRule
   ```

Filter and Retrieve vApp Networks

To generate reports about vApp networks, you need to retrieve the respective vApp networks. You can use search criteria to filter the results returned by `Get-CIVAppNetwork`.

Verify that you are connected to a VMware Cloud Director server.

- Get the vApp network named *MyVAppNetwork*.
  ```
  Get-CIVAppNetwork -Name 'VAppNetwork'
  ```
- Get all vApp networks for the vApp named *MyVApp*.
  ```
  Get-CIVApp -Name 'MyVApp'| Get-CIVAppNetwork
  ```
- Get all vApp networks of connection type direct and direct fenced.
  ```
  Get-CIVAppNetwork -ConnectionType Direct, DirectFenced
  ```
- Get all direct vApp networks that connect to the organization vDC network named *MyOrgVdcNetwork*.
  ```
  Get-OrgVdcNetwork -Name 'MyOrgVdcNetwork' | Get-CIVAppNetwork -ConnectionType Direct
  ```

Create vApp Networks for a Selected vApp

To define how the virtual machines in a vApp connect to each other and access other networks, you need to create a vApp network. When creating the vApp network, you can select the settings for the network, or adopt them from an organization policy.

To address multiple networking scenarios for a vApp, you can create multiple vApp networks.

Create an Isolated vApp Network

When you do not want the virtual machines in a vApp to connect to objects outside the vApp, you must create an isolated vApp network.

Verify that you are connected to a VMware Cloud Director server.

1. Retrieve the vApp for which you want to create a vApp network.
   ```
   $myVApp = Get-CIVApp -Name 'MyVApp'
   ```
2. Create the new vApp network with a selected gateway and network mask.
   ```
   New-CIVAppNetwork -VApp $myVApp -Name 'MyVAppInternalNetwork' -Routed -Gateway '192.168.2.1'
   -Netmask '255.255.255.0' -ParentOrgVdcNetwork $null
   ```
   By default, the vApp network has an enabled firewall.

Create an NAT Routed vApp Network

To provide a vApp network with DHCP, firewall, NAT, and VPN services, you must create it as an NAT routed vApp network.

Verify that you are connected to a VMware Cloud Director server.

1. Retrieve the vApp for which you want to create a vApp network.
   ```
   $myVApp = Get-CIVApp -Name 'MyVApp'
   ```
2. Retrieve the organization vDC network to which you want to connect the vApp network.
   ```
   $myOrgVdcNetwork = Get-OrgVdcNetwork -Name 'MyOrgVdcNetwork'
   ```
3. Create the new vApp network with a gateway and network mask, defined pool of static IP addresses, and a deactivated firewall.
   ```
   New-CIVAppNetwork -VApp $myVApp -ParentOrgVdcNetwork $myOrgVdcNetwork -Name 'MyVAppInternalNetwork'
    -Routed -Gateway '192.168.2.1' -Netmask '255.255.255.0' -DisableFirewall -StaticIPPool "192.168.2.100 -
    192.168.2.199"
   ```
   If you do not run `New-CIVAppNetwork` with the `DisableFirewall` parameter, the new vApp network has an active firewall by default.

Create a Direct vApp Network

To establish a network connection between the virtual machines in a vApp and an organization network, you need to create a direct vApp network.

Verify that you are connected to a VMware Cloud Director server.

1. Retrieve the vApp for which you want to create a vApp network.
   ```
   $myVApp = Get-CIVApp -Name 'MyVApp'
   ```

2. Retrieve the organization vDC network that you want to connect to.
   ```
   $myOrgVdcNetwork = Get-OrgVdcNetwork -Name 'MyOrgVdcNetwork'
   ```
3. Create a direct vApp network that connects to the selected organization vDC network.
   ```
   New-CIVAppNetwork -VApp $myVapp -Direct -ParentOrgVdcNetwork $myOrgVdcNetwork
   ```
   By default, the new vApp network has an enabled firewall.

Modify or Remove vApp Networks

Based on the type of the vApp network, you can configure various network settings, such as DNS, static IP pools, and firewalls. If you no longer need a vApp network, you can remove it.

Verify that you are connected to a VMware Cloud Director server.

1. Retrieve the vApp for which you want to modify vApp networks.
   ```
   $myVApp = Get-CIVApp -Name 'MyVApp'
   ```
2. Modify the settings for DNS and static IP pool for the vApp network named *MyVAppNetwork*.
   ```
   Get-CIVAppNetwork -VApp $myVApp -Name 'MyVAppNetwork' | Set-CIVAppNetwork -PrimaryDns 10.17.0.94 -SecondaryDns 10.17.0.95 -DnsSuffix 'my.domain.com' -StaticIPPool "10.151.168.1 - 10.151.169.240"
   ```
3. Optional: Remove *MyVAppNetwork*.
   ```
   $myVApp | Get-CIVAppNetwork -Name 'MyVAppNetwork' | Remove-CIVAppNetwork
   ```
4. Optional: Remove all isolated vApp networks for the vApp named *MyVapp*.
   ```
   $myVApp | Get-CIVAppNetwork -ConnectionType Isolated | Remove-CIVAppNetwork
   ```
5. Retrieve the organization vDC network named *MyOrgVdcNetwork1*.
   ```
   $myOrgVdcNetwork1 = Get-OrgVdcNetwork -Name 'MyOrgVdcNetwork1'
   ```
6. Retrieve the organization vDC network named *MyOrgVdcNetwork2*.
   ```
   $myOrVdcgNetwork2 = Get-OrgVdcNetwork -Name 'MyOrgVdcNetwork2'
   ```
7. Redirect all vApp networks that connect to *MyOrgVdcNetwork1* to connect to *MyOrgVdcNetwork2*.
   ```
   Get-CIVAppNetwork -ParentOrgVdcNetwork $myOrgVdcNetwork1 | Set-CIVAppNetwork -ParentOrgVdcNetwork $myOrgVdcNetwork2 -NatEnabled $false -FirewallEnabled $false
   ```
   The operation deactivates the firewall and NAT routing for all vApp networks that are connected to *MyOrgVdcNetwork1*.

Managing VMware Aria Operations with VMware PowerCLI

To help you get started with VMware PowerCLI, this documentation provides a set of sample scripts that illustrate basic and advanced tasks in VMware Aria Operations.

Connect to a VMware Aria Operations Server

To run VMware Aria Operations cmdlets, you must establish a connection to a VMware Aria Operations server and a vCenter Server system that is monitored by the VMware Aria Operations instance.

- If the certificate of the server you want to connect to is not trusted, verify that your PowerCLI invalid server certificate action settings are configured properly. For more information, see Configuring PowerCLI Response to Untrusted Certificates.
- If you use a proxy server for the connection, verify that it is configured properly, so that the connection is kept alive long enough for tasks to complete running.

NOTE
If you do not want to use a proxy server for the connection, run `Set-PowerCLIConfiguration -ProxyPolicy NoProxy`.

You can have more than one connection to the same server. For more information, see Managing Default Server Connections in PowerCLI.

If your login credentials contain non-alphanumeric characters, you might need to escape them. For more information, see Processing Non-alphanumeric Characters in PowerCLI.

1. Run `Connect-OMServer` with the server name and valid credentials.

```
Connect-OMServer -Server vrops3.example.com -User 'MyAdministratorUser' -Password 'MyPassword'
```

2. Run `Connect-VIServer` with the server name and valid credentials.

```
Connect-VIServer -Server vc3.example.com -User 'MyAdministratorUser' -Password 'MyPassword'
```

Check Memory Waste Levels

You can check the memory waste levels of a virtual machine host for a specific period of time. For example, you can check the memory waste levels in the last month.

- Verify that you are connected to a VMware Aria Operations instance.
- Verify that you are connected to the vCenter Server system that is monitored by the VMware Aria Operations instance.

1. Browse the vCenter Server inventory and select a virtual machine host for which you want to check the memory waste levels.

```
$vmHost = Get-VMHost 'MyHost'
```

2. Get the VMware Aria Operations resource that refers to this virtual machine host.

```
$hostResource = $vmHost | Get-OMResource
```

3. Check the defined metrics for this VMware Aria Operations resource type.

```
Get-OMStatKey -AdapterKind $hostResource.AdapterKind -ResourceKind $hostResource.ResourceKind
```

4. Get data for a specific metric.

```
$hostResource | Get-OMStat -Key "mem|waste"
```

NOTE
This command retrieves all available metric data with the highest available granularity.

5. Get metric data for the last month aggregated on a daily basis.

```
$hostResource | Get-OMStat -Key "mem|waste" -From ([datetime]::Now.AddMonths(-1)) -IntervalType Days -IntervalCount 1 -RollupType Avg
```

Get Remediation Recommendations

You can get remediation recommendations for a specific resource, such as a problematic virtual machine.

- Verify that you are connected to a VMware Aria Operations instance.
- Verify that you are connected to the vCenter Server system that is monitored by the VMware Aria Operations instance.
- Verify that at least one alert is triggered for the virtual machine.

1. Get the virtual machine you want to check for alerts.

```
$myVm = Get-VM 'MyVM'
```

2. Get the associated VMware Aria Operations resource and its associated active alerts.

```
$myVmAlerts = $myVm | Get-OMResource | Get-OMAlert -Status  Active
```

3. List the remediation recommendations for the obtained alerts.

```
$myVmAlerts | Get-OMRecommendation
```

Change Alert Ownership

You can retrieve all active alerts for a specific datastore and assign the alert ownership to your user profile.

- Verify that you are connected to a VMware Aria Operations instance.
- Verify that you are connected to the vCenter Server system that is monitored by the VMware Aria Operations instance.

1. Get all active alerts for the datastore.

```
$alerts = Get-Datastore 'shared' | Get-OMResource | Get-OMAlert -Status Active | where { ($_.Assigne-
dUser -eq $null) -and ($_.ControlState -eq 'Open') }
```

2. Assign the obtained alerts to the user profile you are currently using.

```
$alerts | Set-OMAlert -TakeOwnership
```

Create a Report for Problematic Hosts

You can create a report for virtual machine hosts that have problematic health status.

- Verify that you are connected to a VMware Aria Operations instance.
- Verify that you are connected to the vCenter Server system that is monitored by the VMware Aria Operations instance.

1. Get all problematic host resources in VMware Aria Operations that have red or yellow health status.

```
$hosts = Get-OMResource | where { $_.ResourceKind -eq 'HostSystem' -and $_.Health -in ('Red', 'Yellow') }
```

2. Get the virtual machine hosts that cause the problem.

```
$hosts | Get-VmHost
```

Managing VMware Cloud on AWS with VMware PowerCLI

To familiarize yourself with VMware PowerCLI, you can use a set of scripts that illustrate basic and advanced tasks in the VMware Cloud on AWS administration.

Connecting to VMware Cloud on AWS

You can use VMware Cloud on AWS to provision and manage vCenter Server virtual data centers in the cloud. VMware Cloud on AWS is a cloud service that belongs to the VMware Cloud services platform.

The VMware Cloud services platform is a web-based application that supports any number of VMware Cloud services. When you sign up for VMware Cloud services, you access your services and manage all your users, organizations, and payment methods through this platform. The VMware Cloud services platform manages common requirements for all cloud services, such as authentication, user roles, and so on.

When connecting to a VMware Cloud on AWS service, you need to authenticate with the corresponding VMware Cloud services platform.

Connect to VMware Cloud on AWS by Using an API Token

To authenticate with VMware Cloud on AWS, you can use an API token from the VMware Cloud service web portal.

Use the VMware Cloud service web portal to generate an API token for authentication with PowerCLI.

- To connect to a VMware Cloud on AWS server by using the API token, run the following command.

```
Connect-Vmc -ApiToken "Your API token"
```

Connect to VMware Cloud on AWS by Using an OAuth Security Context

To connect to VMware Cloud on AWS through an OAuth 2.0 authentication mechanism, you need an OAuth security context for the VMware Cloud services platform.

Use the VMware Cloud service web portal to generate an API token for authentication with PowerCLI.

You can create an OAuth security context by using the `New-VcsOAuthSecurityContext` cmdlet.

1. Create an OAuth security context for the VMware Cloud services platform by using an API token.

```
$oauthSecContext = New-VcsOAuthSecurityContext -ApiToken "Your API token"
```

2. Connect to VMware Cloud on AWS by using an OAuth security context.

```
Connect-Vmc -OAuthSecurityContext $oauthSecContext
```

Connect to VMware Cloud on AWS GovCloud (US)

You can use PowerCLI to connect to VMware Cloud on AWS GovCloud (US).

Use the VMware Cloud service web portal to generate an API token for authentication with PowerCLI.

1. Create variables to store the VMware Cloud API token and the VMware Cloud on AWS GovCloud (US) endpoints.

```
$APIToken = "Your API Token"
$VCSEndpoint = "console.cloud-us-gov.vmware.com"
$VMCEndpoint = "www.vmc-us-gov.vmware.com"
```

2. Create an OAuth security context and login to VMware Cloud services.

```
$oauthSecContext = New-VcsOAuthSecurityContext -VcsServer $VCSEndpoint -ApiToken $APIToken
```

3. Connect to VMware Cloud on AWS GovCloud (US).

```
Connect-Vmc -Server $VMCEndpoint -OAuthSecurityContext $oauthSecContext
```

View the Available Software-Defined Data Centers

With PowerCLI, you can view the available Software-Defined Data Centers (SDDCs) in your VMware Cloud on AWS organization.

Verify that you are connected to VMware Cloud on AWS.

View the available SDDCs in your VMware Cloud on AWS organization.

```
Get-VmcSddc
```

Connect to a vCenter Server on VMware Cloud on AWS

You can use PowerCLI to connect to a vCenter Server system running on VMware Cloud on AWS.

- Verify that you are connected to VMware Cloud on AWS.
- Configure the VMware Cloud on AWS networking to provide access to the vCenter Server system running on the cloud.

1. Create a variable with the SDDC you want to connect to.

```
$SDDC = Get-VmcSddc'Your SDDC'
```

2. To connect to the vCenter Server system, provide the vCenter host name and credentials.

```
Connect-VIServer $sddc.VCenterHostName -Credential $sddc.VCenterCredentials
```

Connect to a vCenter Server on VMware Cloud on AWS by Using an OAuth 2.0 Authentication

If the vCenter Server system has an OpenID authentication enabled, you can authenticate with the vCenter Server system by using an OAuth security context for the VMware Cloud services platform.

- Verify that you are connected to VMware Cloud on AWS.
- Configure the VMware Cloud on AWS networking to provide access to the vCenter Server system running on the cloud.

1. Create an OAuth security context for the VMware Cloud service by using an API token.

```
$oauthSecContext = New-VcsOAuthSecurityContext -ApiToken "Your API token"
```

2. Create a variable with the SDDC you want to connect to.

```
$SDDC = Get-VmcSddc'Your SDDC'
```

3. Exchange the OAuth security context for an SAML security context.

```
$samlSecContext = New-VISamlSecurityContext -VCenterServer $sddc.VCenterHostName -OAuthSecurityContext
 $oauthSecContext
```

4. Connect to a vCenter Server system by using an SAML security context.

```
Connect-VIServer -Server $sddc.VCenterHostName -SamlSecurityContext $samlSecContext
```

Create a Software-Defined Data Center

With PowerCLI, you can create a Software-Defined Data Center (SDDC) in your VMware Cloud on AWS organization.

Verify that you are connected to VMware Cloud on AWS.

1. Get a VMware Cloud on AWS account.

```
$awsAccount = Get-AwsAccount
```

2. Get the VMware Cloud on AWS Virtual Private Cloud (VPC) subnets.

```
$awsVpcSubnets = Get-AwsVpcSubnet -AwsAccount $awsAccount -Region "US_EAST_1"
```

3. Create an SDDC.

```
New-VmcSddc -Name "MySDDC" -HostCount 3 -Region "US_EAST_1" -AwsAccount $awsAccount -AwsVpcSubnet
 $awsVpcSubnets[0]
```

Create a Cluster in a Software-Defined Data Center

With PowerCLI, you can create a cluster in a Software-Defined Data Center (SDDC) in your VMware Cloud on AWS organization.

Verify that you are connected to VMware Cloud on AWS.

1. Retrieve the SDDC in which you want to create a cluster.

```
$sddc = Get-VmcSddc'Your SDDC'
```

2. Create the cluster.

```
New-VmcSddcCluster -Sddc$sddc -HostCount3
```

Set the Elastic Distributed Resource Scheduler (EDRS) Policy of a Cluster

With PowerCLI, you can set the Elastic Distributed Resource Scheduler (EDRS) policy of clusters.

Verify that you are connected to VMware Cloud on AWS.

1. Create a variable with the SDDCs of the clusters you want to manage.

```
$sddc = Get-VmcSddc'Your SDDC'
```

2. Create a variable with the clusters you want to manage.

```
$cluster = Get-VmcSddcCluster -Name'Your Cluster' -Sddc$sddc
```

3. Set the EDRS policy.

```
Set-VmcClusterEdrsPolicy -Cluster$cluster -PolicyTypecost -MinHostCount6 -MaxHostCount15
```

Remove a Cluster from a Software-Defined Data Center

With PowerCLI, you can remove clusters from Software-Defined Data Centers (SDDCs) in your VMware Cloud on AWS organization.

Verify that you are connected to VMware Cloud on AWS.

1. Create a variable with the SDDCs from which you want to remove clusters.

```
$sddc = Get-VmcSddc'Your SDDC'
```

2. Create a variable with the clusters you want to remove.

```
$cluster = Get-VmcSddcCluster -Name'Your Cluster' -Sddc$sddc
```

3. Remove the clusters.

```
Remove-VmcSddcCluster -VmcSddcCluster$cluster
```

Add Hosts to a Software-Defined Data Center

With PowerCLI, you can add hosts to a Software-Defined Data Center (SDDC) in your VMware Cloud on AWS organization.

Verify that you are connected to VMware Cloud on AWS.

Add hosts to an SDDC with PowerCLI. You can use the `Cluster` parameter to indicate in which cluster you want to add the hosts. If you do not specify a cluster, the hosts are added to the default cluster of the SDDC.

1. Create a variable with the SDDCs in which you want to add hosts.

```
$sddc = Get-VmcSddc'Your SDDC'
```

2. Add the hosts to the default cluster of the specified SDDCs.

```
Add-VmcSddcHost -Sddc$sddc -HostCount2
```

Remove Hosts from a Software-Defined Data Center

With PowerCLI, you can remove hosts from a Software-Defined Data Center (SDDC) in your VMware Cloud on AWS organization.

Verify that you are connected to VMware Cloud on AWS.

Remove hosts from an SDDC with PowerCLI. You can use the `Cluster` parameter to indicate from which cluster you want to remove hosts. If you do not specify a cluster, the hosts are removed from the default cluster of the SDDC.

1. Create a variable with the SDDCs from which you want to remove hosts.

   ```
   $sddc = Get-VmcSddc'Your SDDC'
   ```

2. Remove hosts from the default cluster of the specified SDDCs.

   ```
   Remove-VmcSddcHost -Sddc$sddc -HostCount2
   ```

Help and Support for VMware PowerCLI

If you cannot resolve a problem with PowerCLI on your own, you can file a support request under the conditions of your VMware contract.

You can use the following options to troubleshoot problems with PowerCLI.

Self-Help

As a first step, use the existing documentation to search for a solution to your problem. You can search the following resources.

- The PowerCLI official documentation.
- The PowerCLI community.
- The PowerCLI blog.

File a Support Request Under a Basic or Production Support Contract

You can file a technical support request under the terms of a Basic or Production Support contract with VMware. You can get support for the following types of problems.

- Cmdlets are not working as documented.
- Installation problems with PowerCLI.

> **NOTE**
> PowerCLI is not available for selection as a product in the technical support request form. You must select the product that you are having issues with, for example, vCenter Server, ESXi, and so on.

File a Support Request Under an SDK and API Support Contract

The SDK and API Support package increases the scope of the professional assistance you can request. In addition to the incidents covered under Basic and Production support, you can request the following assistance.

- Clarification of the scope of tasks for which you can use PowerCLI.
- Guidance on how to use PowerCLI to accomplish tasks.
- Assistance with custom scripts.

> **NOTE**
> The SDK and API support engineers do not write or test your code, but they might suggest sample code for a possible solution.

Generate a PowerCLI Support Bundle

Generate a PowerCLI support bundle and send it to VMware support to help them resolve your problem.

If you encounter a problem in PowerCLI that you cannot resolve, you can open a support request for VMware.

Generate and download a PowerCLI support bundle in the form of a ZIP file and attach it to your VMware support request.

1. Create a variable with the script that produced the error.

```
$errorcode = {
    $vm = Get-VM vCLS*
    Start-VM $vm
}
```

2. Generate and download the support bundle by running the `Get-ErrorReport` cmdlet.

```
Get-ErrorReport -ProblemScript $errorcode -Destination .\Downloads -ProblemDescription "VM would not power
 on"
```

   Optional: To limit the size of your support bundle, include the `MaxDataDepth` parameter which specifies object data depth for the report. For example, to limit object data depth to one level, add `-MaxDataDepth1` to the above example.

The ZIP file that contains environmental information about the error is saved at the specified destination.

Attach or upload the ZIP file and submit your VMware support request.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