

HOL-2401-02-CMP

Getting More Out of It! (Intermediate)

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Lab Overview - HOL-2401-02-CMP - Aria Operations - Getting More Out of It! (Intermediate)

Lab Description

[2]

Explore advanced capacity and cost calculations. Customize alerts and metrics to monitor applications. Explore advanced troubleshooting techniques including automating remediation.

Lab Guidance

[3]

Welcome! This lab is available for you to repeat as many times as you want. To start somewhere other than the beginning, use the Table of Contents in the upper right-hand corner of the Lab Manual or click on one of the modules below.

- [Module 1 - Extending your Solution with Management Packs](#) (15 minutes) (Basic)
- [Module 2 - Monitoring and Troubleshooting Kubernetes](#) (15 minutes) (Basic)
- [Module 3 - Advanced Capacity Management](#) (30 minutes) (Intermediate)
- [Module 4 - Integrating and Troubleshooting with Logs](#) (30 minutes) (Advanced)
- [Module 5 - Configuring Costs to Match your Business Needs](#) (30 minutes) (Intermediate)
- [Module 6 - Customizing Alerts and Leveraging Notifications](#) (15 minutes) (Basic)
- [Module 7 - Creating Views for Better Visibility](#) (15 minutes) (Basic)
- [Module 8 - Using Metrics and Metric Charts for Troubleshooting](#) (15 minutes) (Basic)
- [Module 9 - Advanced Troubleshooting Techniques](#) (15 minutes) (Intermediate)
- [Module 10 - Save Time by Automating Remediation](#) (15 minutes) (Basic)
- [Module 12 - Achieve Optimal Performance with Rightsizing](#) (45 minutes) (Advanced)
- [Module 13 - Enabling Chargeback for your Business](#) (30 minutes) (Advanced)
- [Module 14 - Plan for your Future Capacity Needs](#) (30 minutes) (Intermediate)
- [Module 15 - Application Monitoring](#) (45 minutes) (Intermediate)

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- Module 14 - Bengt Grønås, Senior Specialist Solution Engineer, Norway
- Module 15 - Bengt Grønås, Senior Specialist Solution Engineer, Norway

This lab manual can be downloaded from the Hands-on Labs document site found here:

<http://docs.hol.vmware.com>

This lab may be available in other languages. To set your language preference and view a localized manual deployed with your lab, utilize this document to guide you through the process:

<http://docs.hol.vmware.com/announcements/nee-default-language.pdf>

First time using Hands-on Labs?

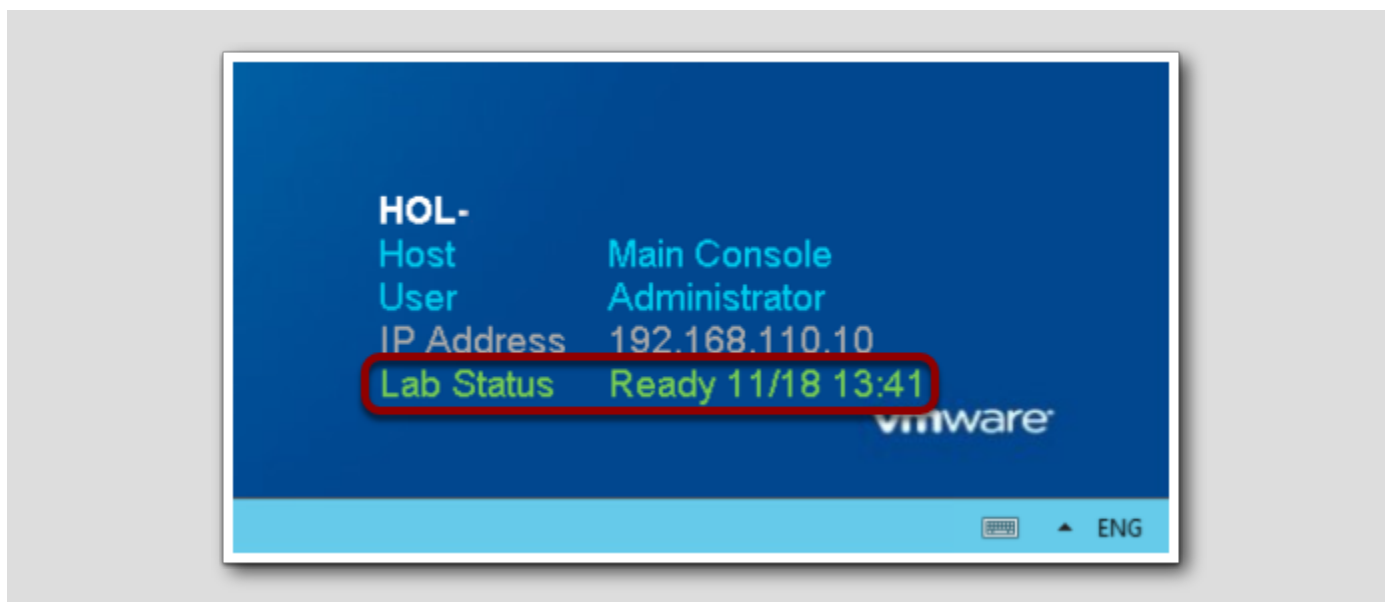
[4]

Welcome! If this is your first time taking a lab review the VMware Learning Platform interface and features before proceeding.

For returning users, feel free to start your lab by clicking next in the manual.

You are ready....is your lab?

[5]



The lab console will indicate when your lab has finished all the startup routines and is ready for you to start. If you see anything other than "Ready", please wait for the status to update. If after 5 minutes your lab has not changed to "Ready", please ask for assistance.

Module 1 - Extending Your Solution with Management Packs (15 minutes) Basic

Introduction [7]

VMware Aria Operations provides monitoring capabilities for vSphere environments in a standard configuration. But a modern enterprise includes several layers of infrastructure, such as compute and storage, as well as multiple applications and cloud resources. Management packs allow you to extend the monitoring capabilities of VMware Aria Operations in order to analyze data from more of your environment. These packs allow you to correlate events across multiple tiers, and they provide Aria Operations with additional visibility and alerting.

In this lesson, we will review some of the available management packs for VMware Aria Operations, install a new management pack, and review new capabilities the management pack provides.

Management Pack Options [8]

VMware Aria Operations includes several pre-installed management pack integrations for VMware and public cloud solutions. Some of these management packs are activated by default, but others require activation after deploying Aria Operations. See the [Connecting VMware Aria Operations to Data Sources](#) documentation page for a list of pre-installed management packs.

In addition to the pre-installed management packs, several third-party management packs can be downloaded from the [VMware Marketplace](#).

VMware Aria Operations users are entitled to third-party compute management packs, such as Cisco UCS and Pure Storage FlashArray. Additional third-party management packs can be purchased as part of [VMware Aria Operations for Integrations](#). These management packs provide additional visibility into network solutions, applications and databases, as well as connectors to other monitoring and management solutions.

Management Pack Documentation [9]

The [VMware Aria Operations for Integration Documentation](#) includes a list of available management packs, release notes on the latest updates, and links to documentation covering each individual management pack.

The documentation for each management pack includes prerequisites, installation and usage instructions, and information on functionality provided, including dashboards, metrics, alerts, and more.

Log in to Aria Operations [10]

We will log in to a live instance of Aria Operations running in this lab.

Open the Firefox Browser from the Windows Task Bar

[11]

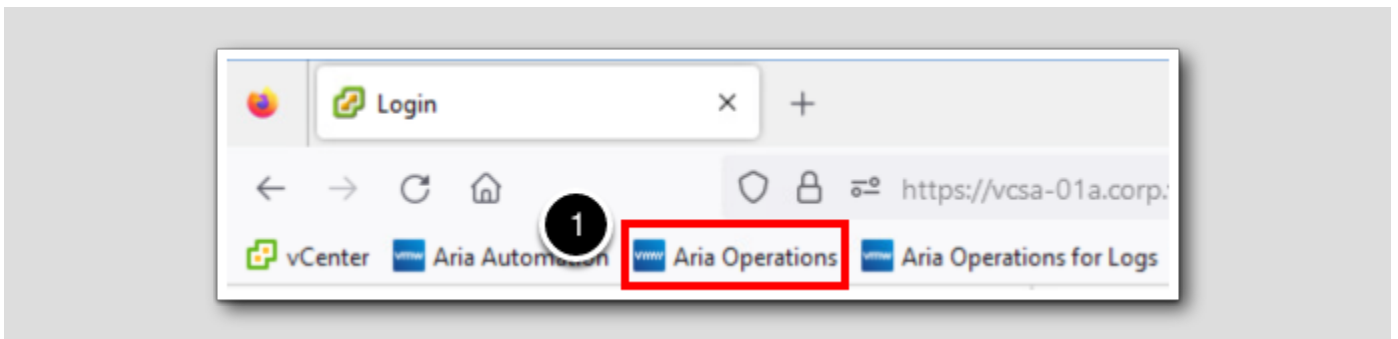


If the browser is not already open, launch Firefox.

1. Click the Firefox icon in the Windows Quick Launch Task Bar at the bottom of the screen.

Navigate to Aria Operations

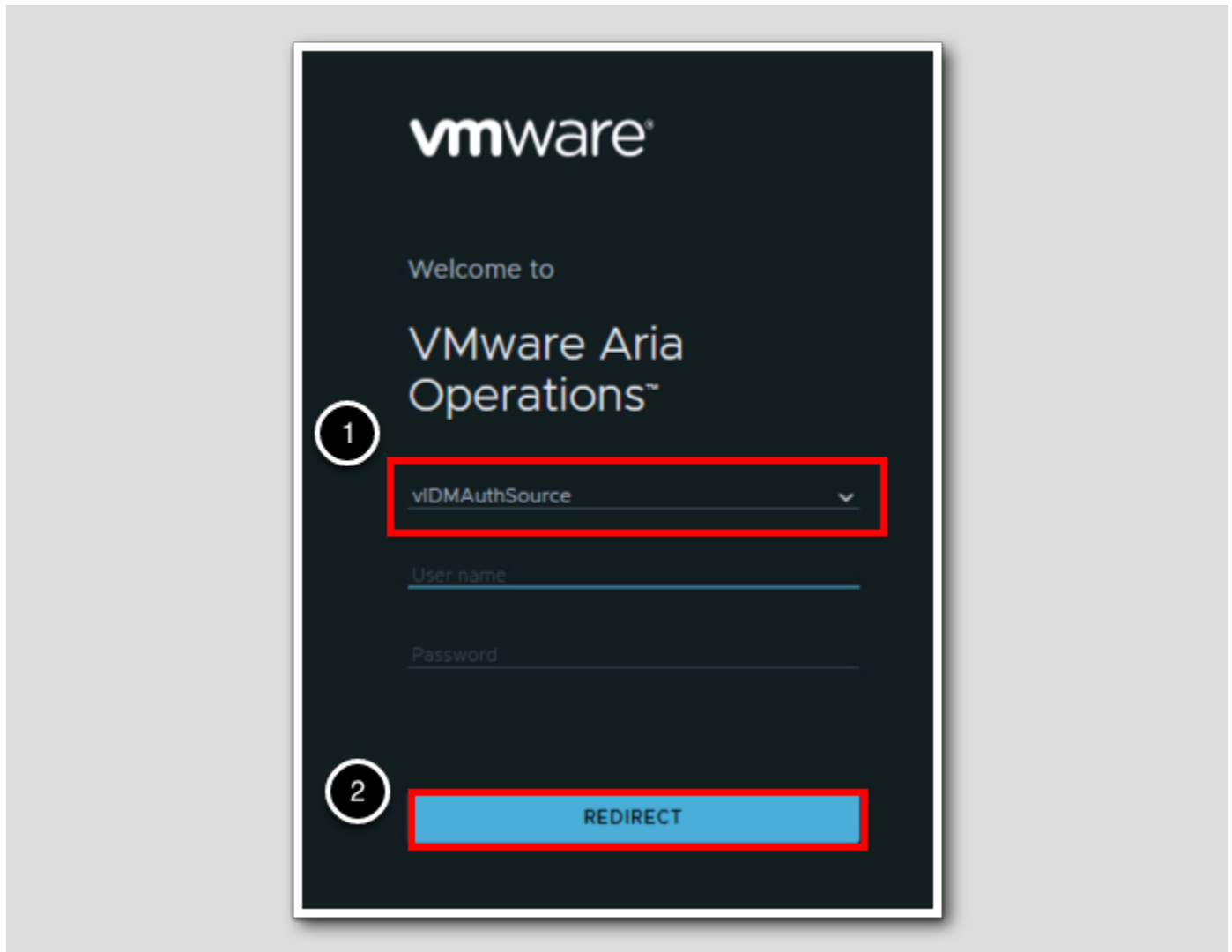
[12]



1. Click the Aria Operations bookmark in the bookmarks toolbar.

Log in to Aria Operations

[13]



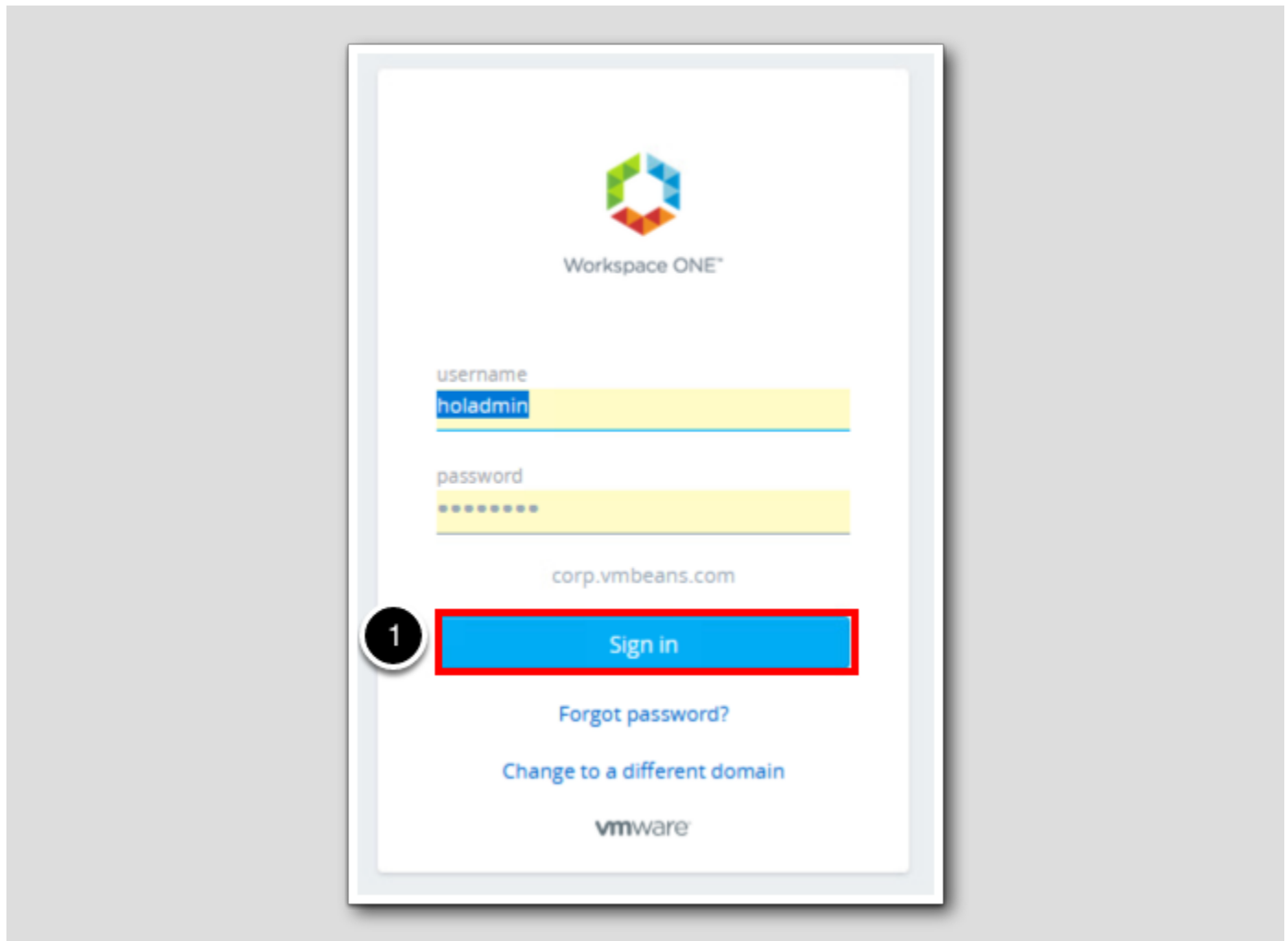
Aria Operations is integrated with VMware Workspace ONE Assist (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

vIDMAuthSource may be pre-selected as the default identity source. If it is not, then you will need to select it.

1. Click the **drop-down arrow** and select vIDMAuthSource if it is not already selected.
2. Click **REDIRECT** to be taken to the authentication page.

VMware Identity Manager Login

[14]



VMware Identity Manager acts as the identity provider for the Active Directory authentication source in this lab.

Credentials for the default user, holadmin, have already been provided.

1. Click Sign in

Reviewing and Installing Management Packs

[15]

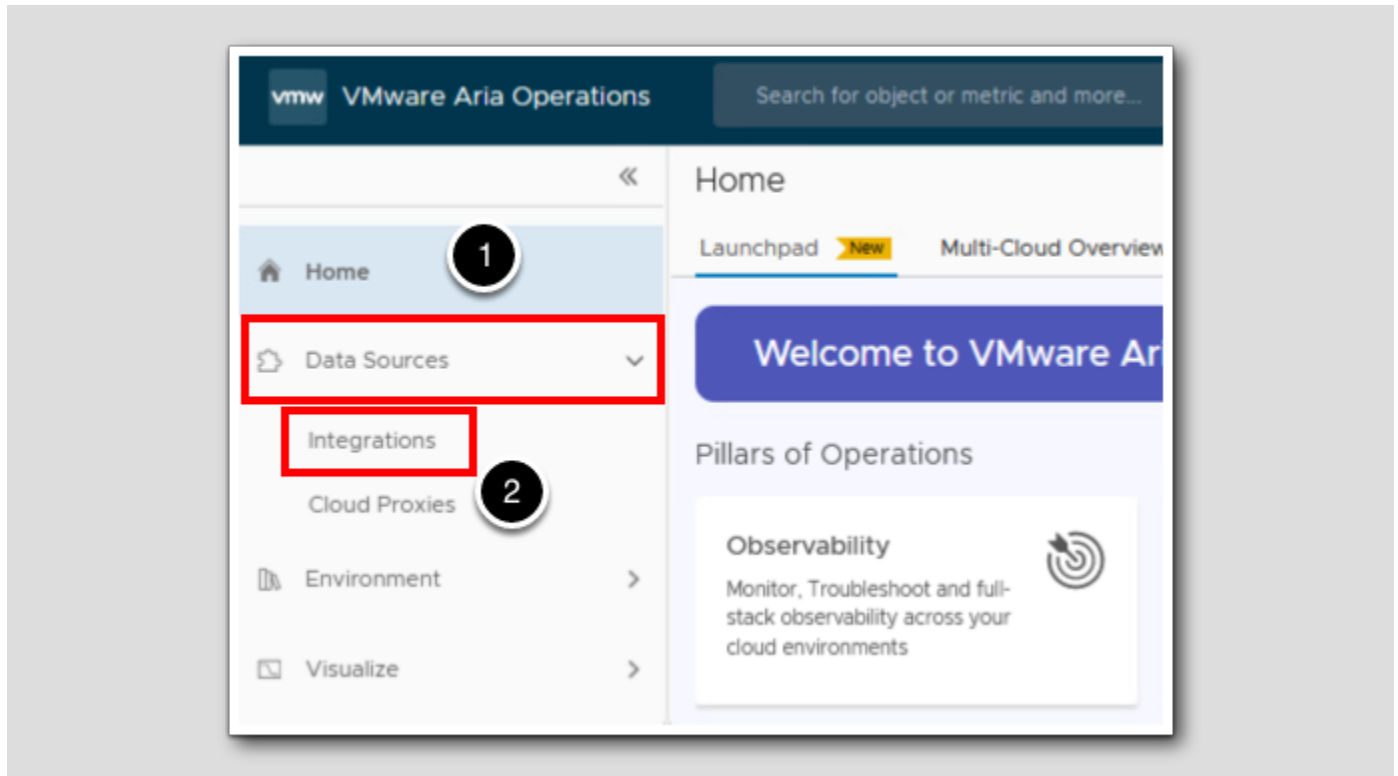
In this exercise, we will review the pre-installed management packs in our lab environment. Next, we will install one of the available management packs, the Management Pack for Storage Devices, configure it, and review some of the functionality this management pack provides.

The [Management Pack for Storage Devices Guide](#) provides documentation on how to install and configure this management pack,

along with information on provided dashboards, alerts, and metrics.

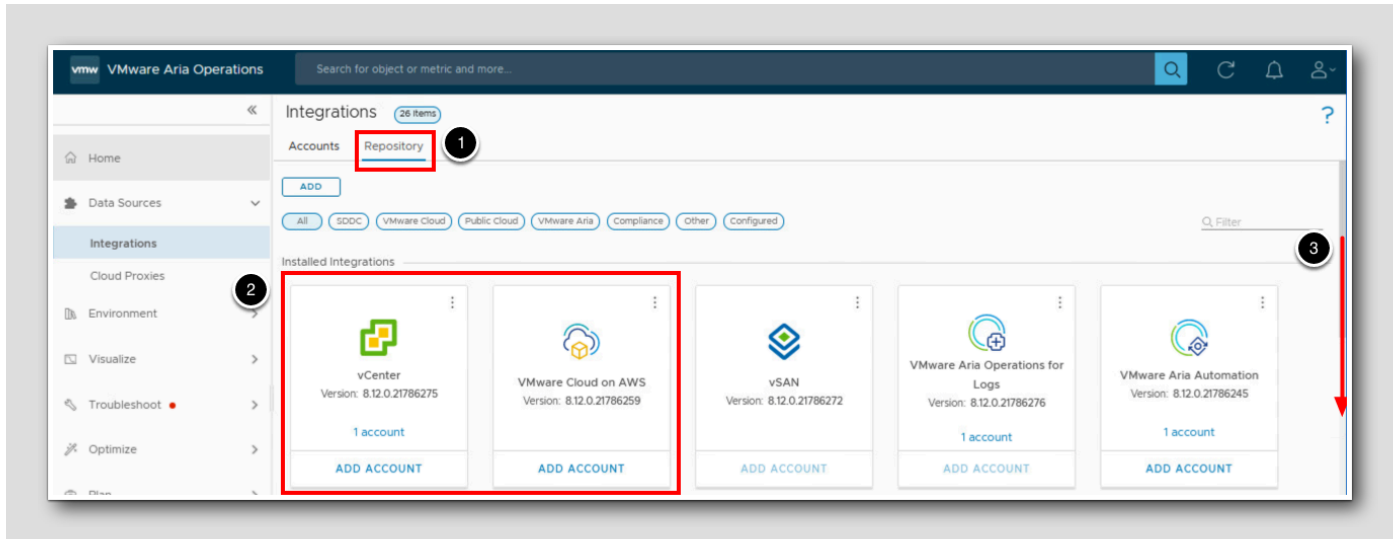
Navigate to Integrations Page

[16]



1. Click **Data Sources** in the left navigation menu to open the Data Sources menu.
2. Click **Integrations** to navigate to the Integrations view.

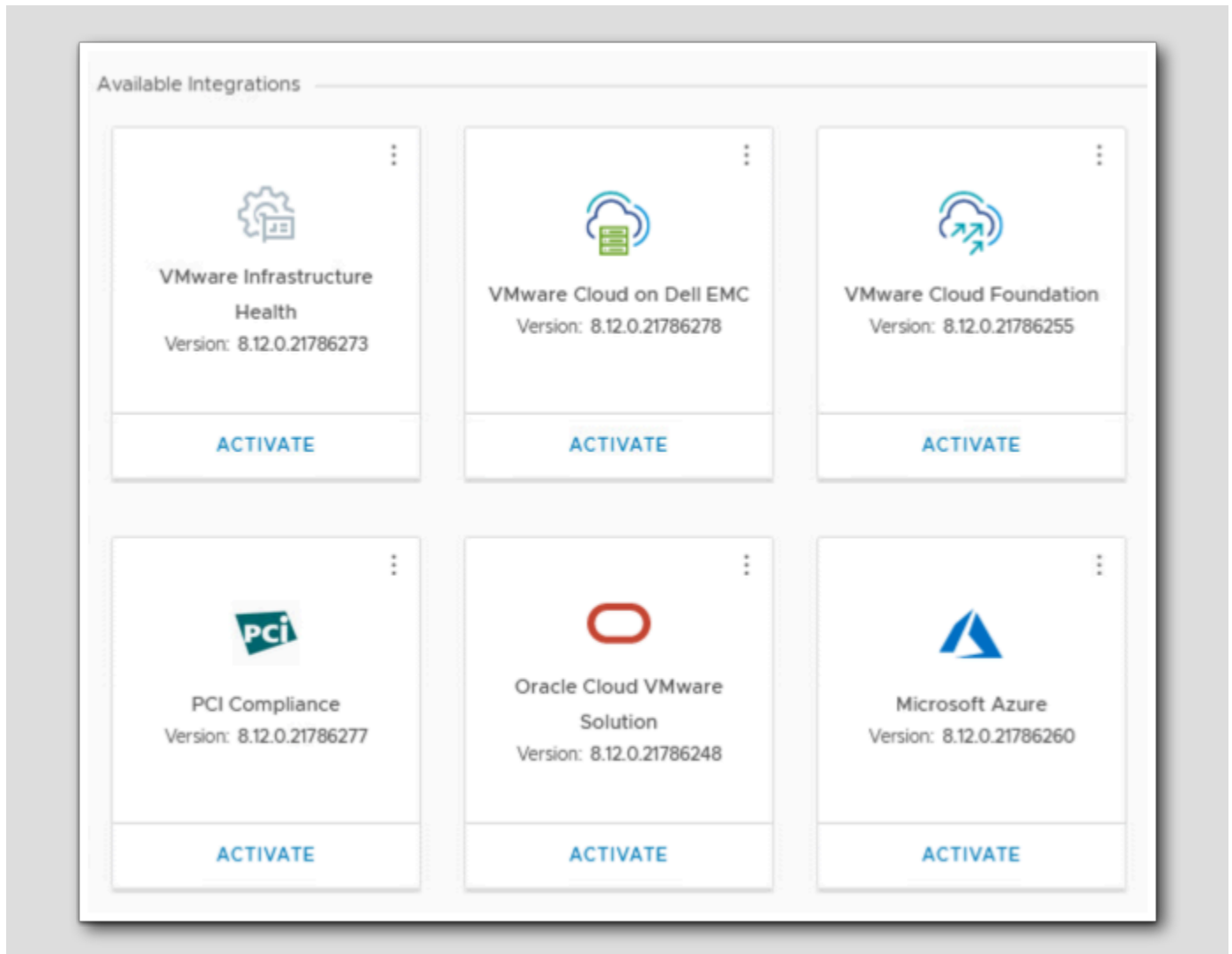
View the Repository Tab



1. Click **Repository**.
2. The **Repository** includes all pre-installed integrations. Note that the vCenter integration has 1 account configured for this lab, but the VMware Cloud on AWS integration does not have any configured accounts.
3. Use the **scrollbar** to scroll down and view additional integrations.

View Available Integrations

[18]

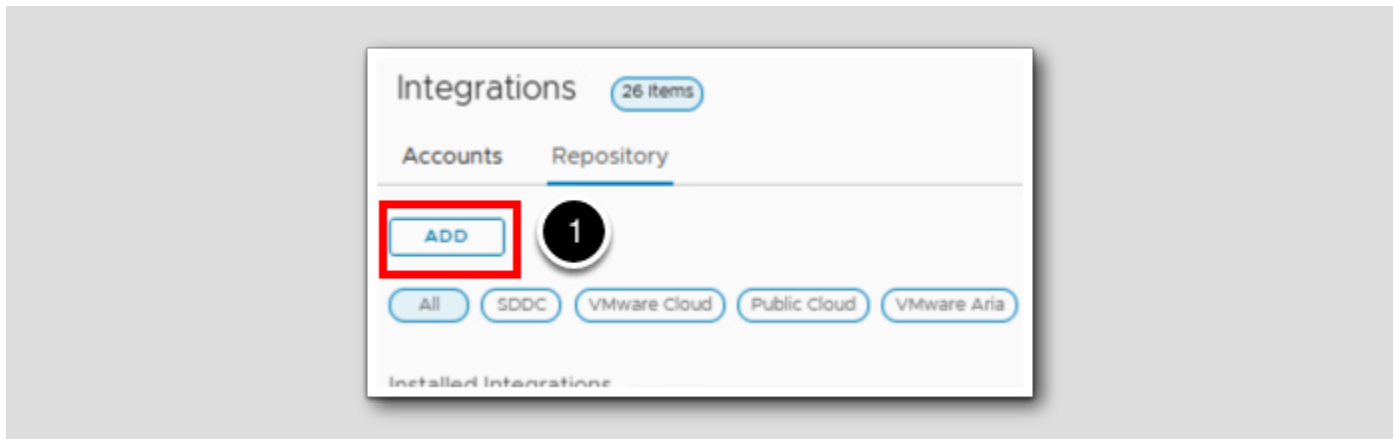


The list of available integrations includes additional VMware solutions, public cloud integrations, and compliance templates. These integrations are installed, but not yet activated.

1. Use the scrollbar (not shown) to return to the top of the Repository.

Add a New Management Pack

[19]

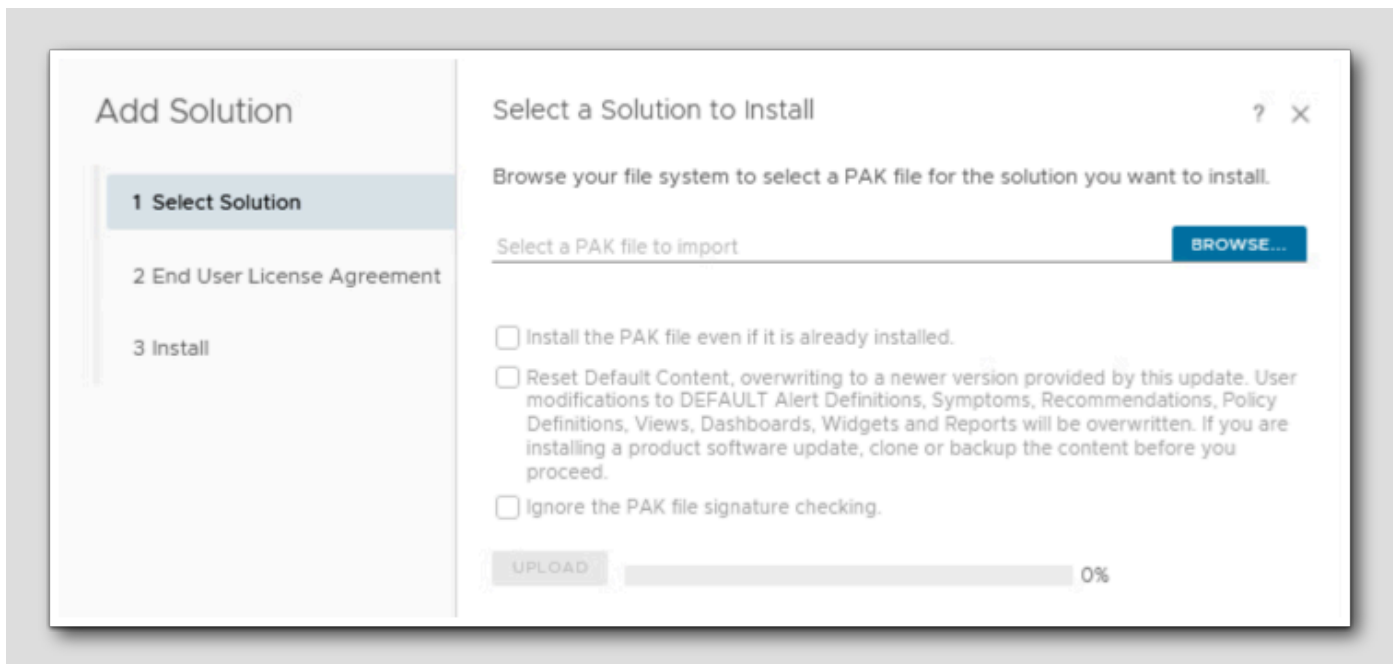


The VMware Aria Operations Repository includes several integration options by default. But the list of available integrations does not include management packs for compute, storage, network, or applications. How can we extend VMware Aria Operations beyond these pre-installed integrations? We'll demonstrate that next.

1. Click **ADD** to add a new management pack to the Repository.

Add Solution

[20]

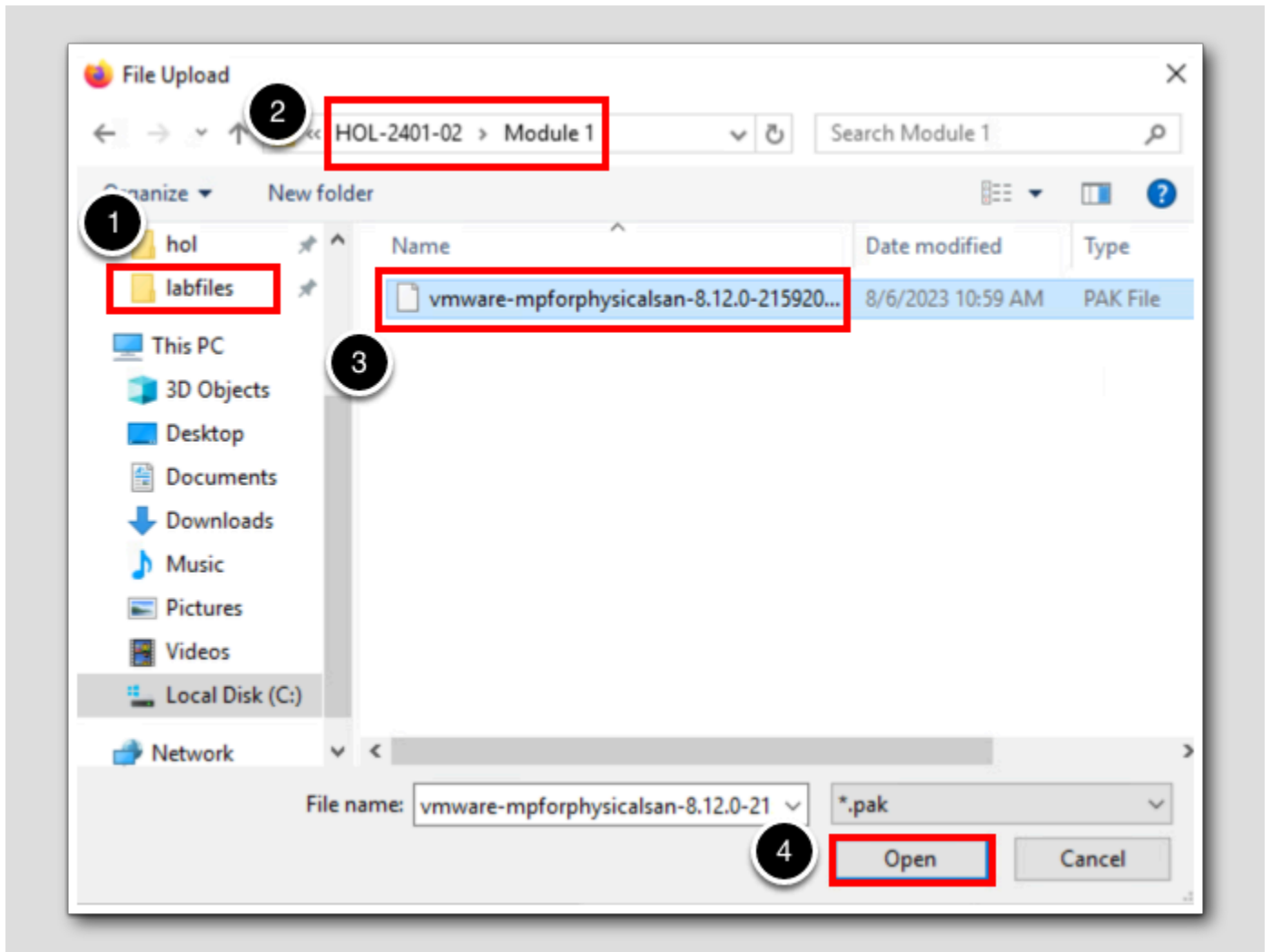


In addition to the pre-installed management packs, several other management packs can be downloaded from the [VMware Marketplace](#). These management packs are provided as .pak files to be imported into VMware Aria Operations. In this lab, we have already downloaded the VMware Aria Operations Management Pack for Storage Devices.

1. Click BROWSE...

Locate the .pak File

[21]



1. Click the **labfiles** shortcut.
2. Navigate to the **HOL-2401-02** folder, and then to the **Module 1** folder.
3. Click on the **.pak file** in this folder. (Note: if you see 2 or more files in this list, make sure to select the file named "vmware-mpforphysicalsan-8.12...")
4. Click **Open**.

Install the .pak File

Add Solution

- 1 Select Solution
- 2 End User License Agreement
- 3 Install

Select a Solution to Install

Browse your file system to select a PAK file for the solution you want to install.

Select a PAK file to import BROWSE...

Install the PAK file even if it is already installed.

Reset Default Content, overwriting to a newer version provided by this update. User modifications to DEFAULT Alert Definitions, Symptoms, Recommendations, Policy Definitions, Views, Dashboards, Widgets and Reports will be overwritten. If you are installing a product software update, clone or backup the content before you proceed.

Ignore the PAK file signature checking.

1 UPLOAD 100%

Name	Management Pack for Storage Devices
Description	VMware Management Pack for Storage Devices
Version	8.12.0.21592050

2 ✓ The PAK file signature is valid.

3 CANCEL NEXT

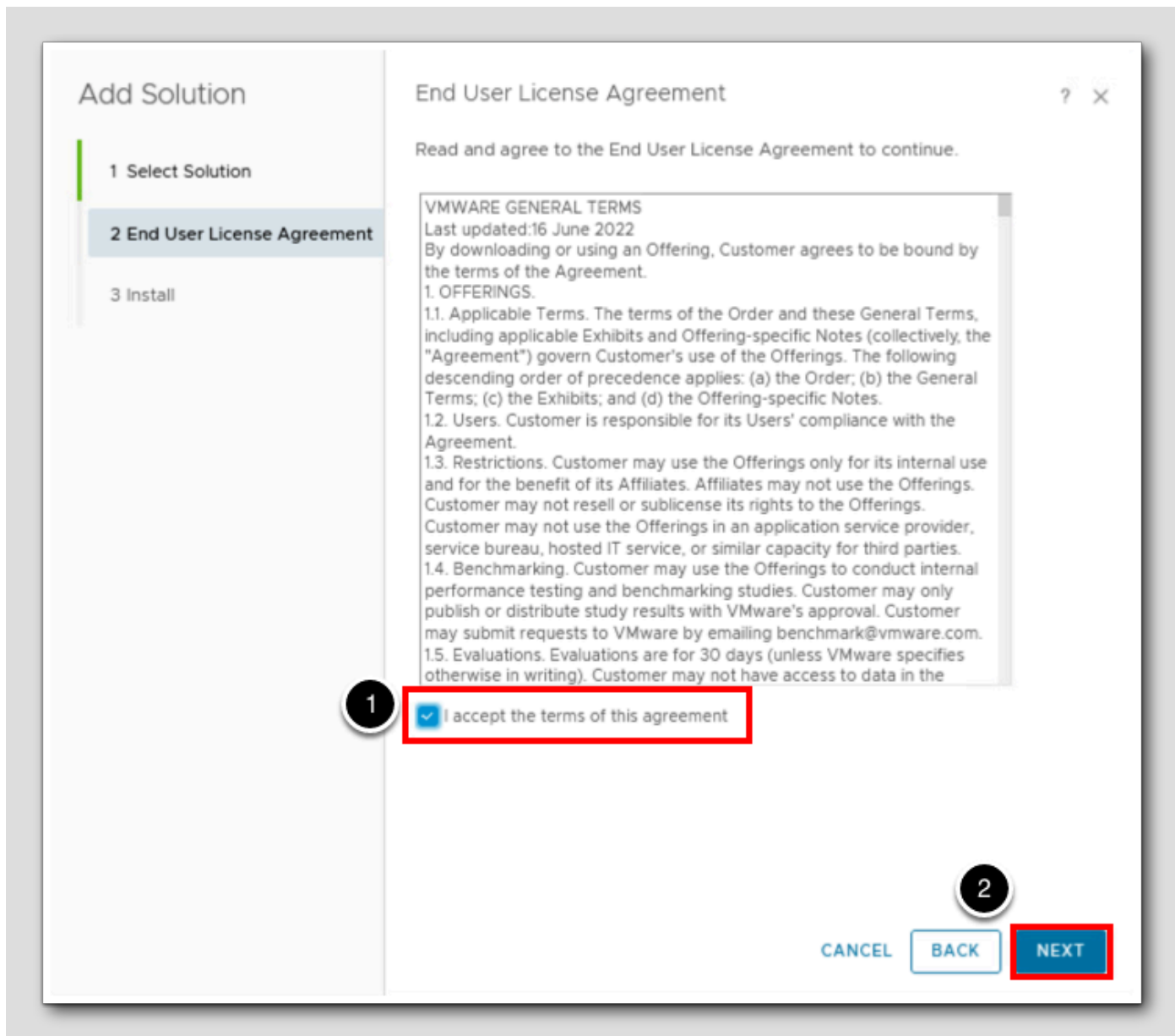
Once the PAK file has been selected, it can be uploaded and verified.

1. Click **UPLOAD** to upload and validate the PAK file. This process will take 1-2 minutes.

NOTE: the options above the **UPLOAD** button allow for overwriting of already installed PAK files, and to skip signature checking if needed. Since management packs provide additional alerts, symptoms, and more, it is highly recommended to backup existing content if reinstalling a management pack. As with out of the box Aria Operations content, default management content should not be modified directly in order to avoid overwriting customizations when updating management packs.

2. Once the validation is complete, additional detail will be displayed below the upload progress bar including the management pack name, version, and signature validation.
3. Click **NEXT**.

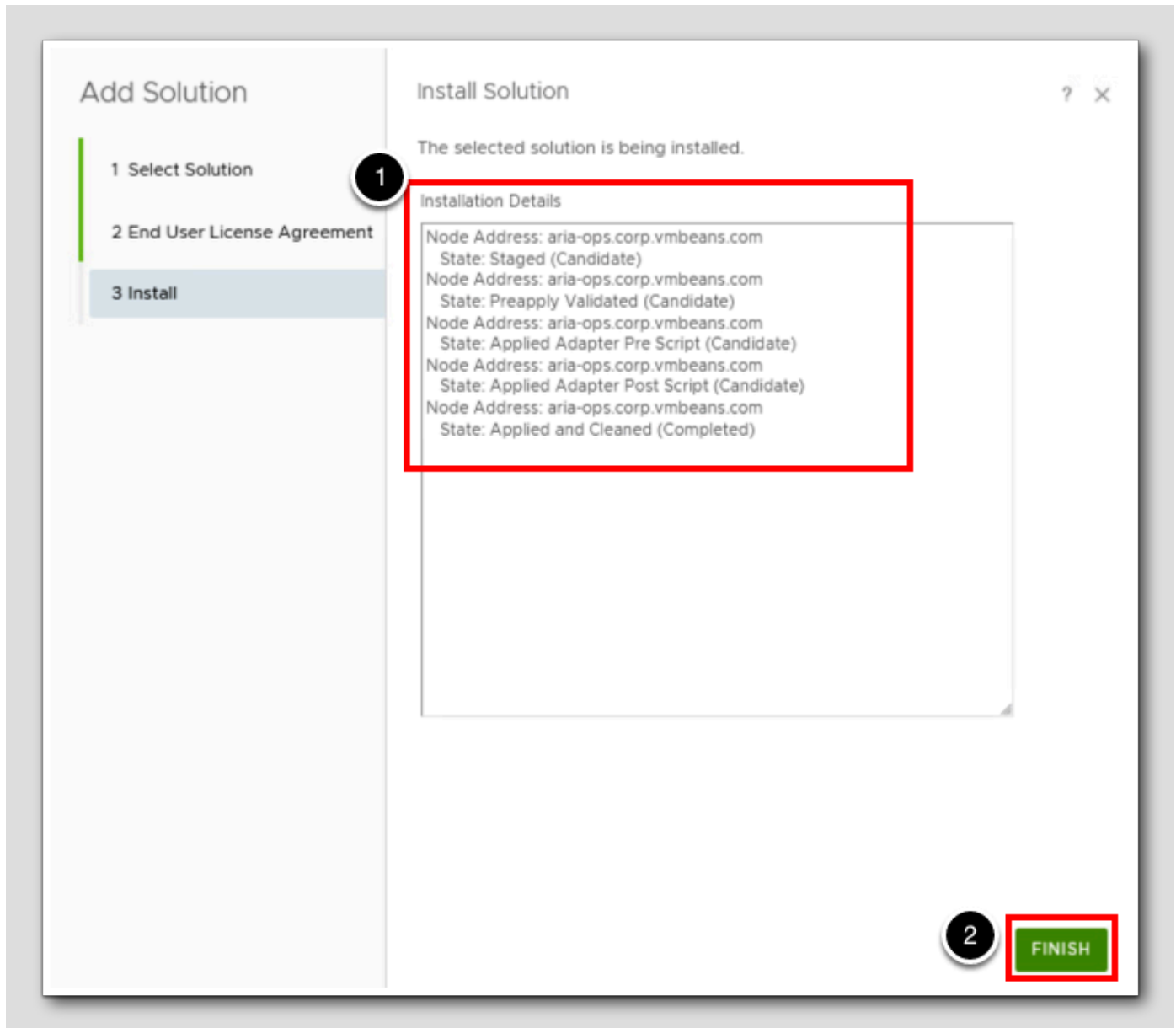
Review and Accept the End User License Agreement



Review and accept the End User License Agreement before proceeding with the management pack install.

1. Click the checkbox next to I accept the terms of this agreement.
2. Click **NEXT** to proceed and begin the installation.

Complete the Management Pack Installation

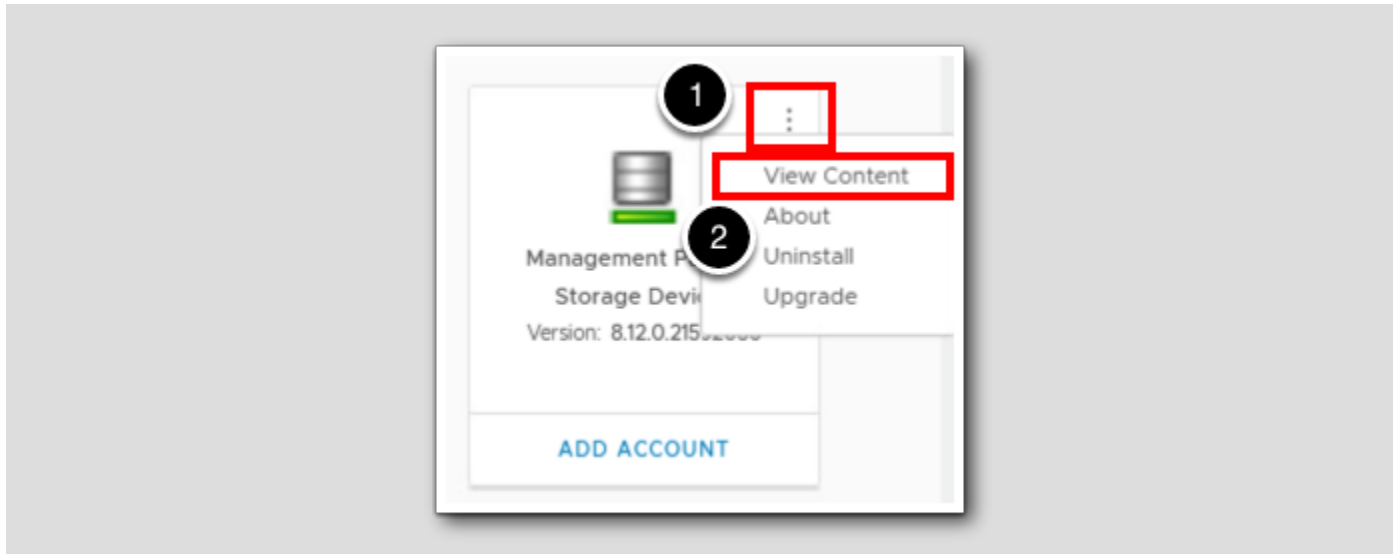


The management pack installation will proceed immediately.

1. Review the installation progress. This management pack installation will take 2-3 minutes to complete.
2. Once the installation is complete, click **FINISH**.

View Management Pack Content

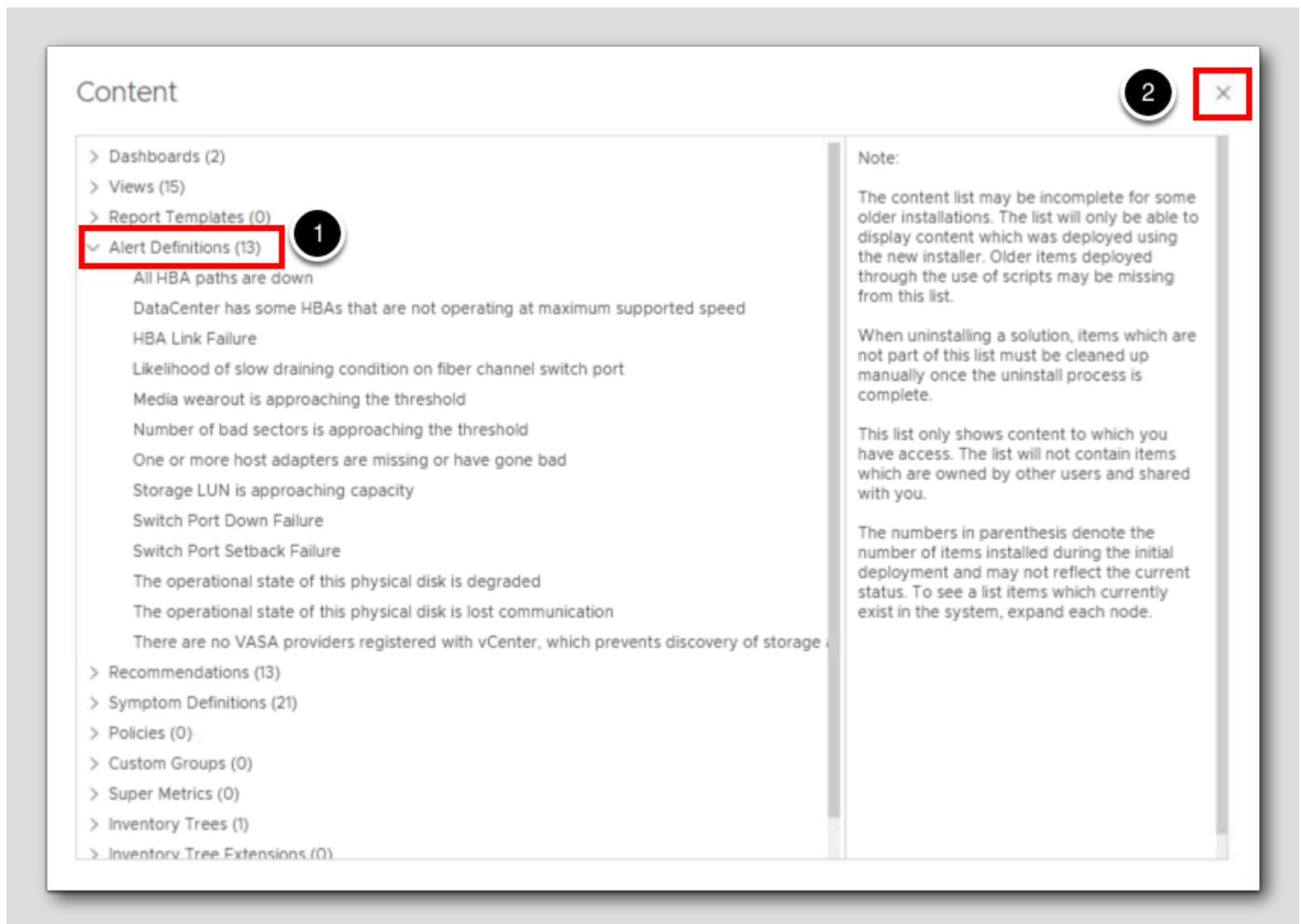
[25]



With the management pack installed, the Management Pack for Storage Devices tile will appear in the Installed Integrations section of the Repository. Now we can view the content provided by this management pack.

1. Click the **three vertical dots** on the Management Pack for Storage Devices tile to open the menu.
2. Select **View Content** from the list.

View Content

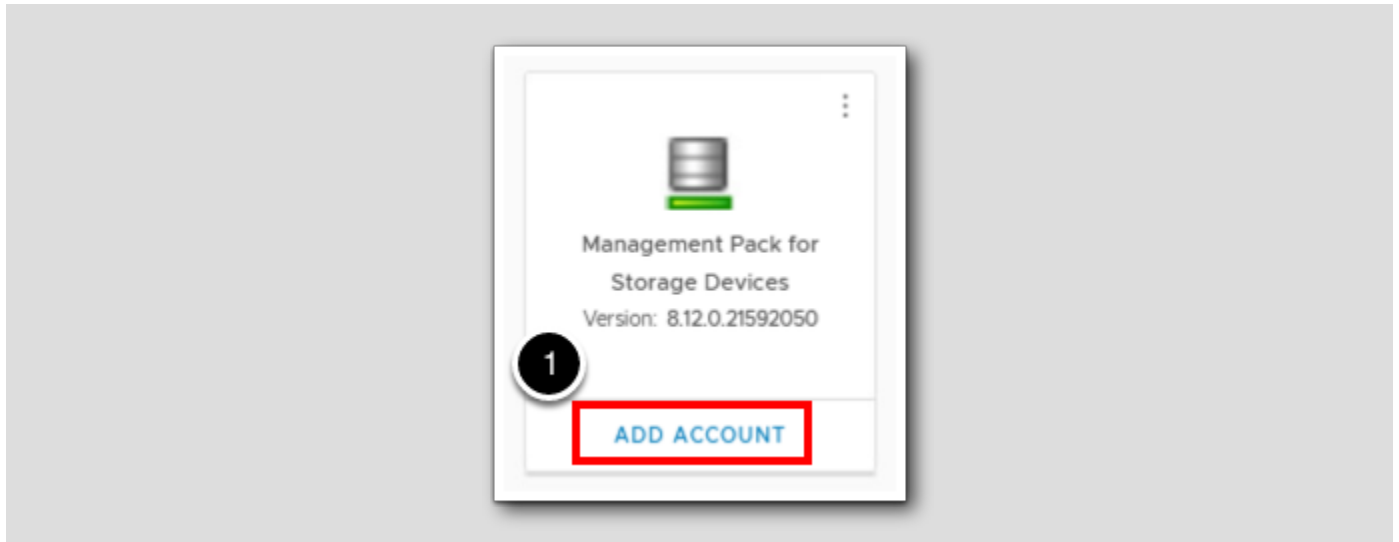


The View Content window provides a list of several categories of potential additions provided by this management pack. The Management Pack for Storage Devices does not provide every single type of content, but it does provide a variety of alerts, views, and more.

1. Click one of the **categories** (for example, Alert Definitions) to view the list of provided content. Feel free to review other categories as well.
2. When ready, click the x in the upper right to close the View Content window.

Add Account

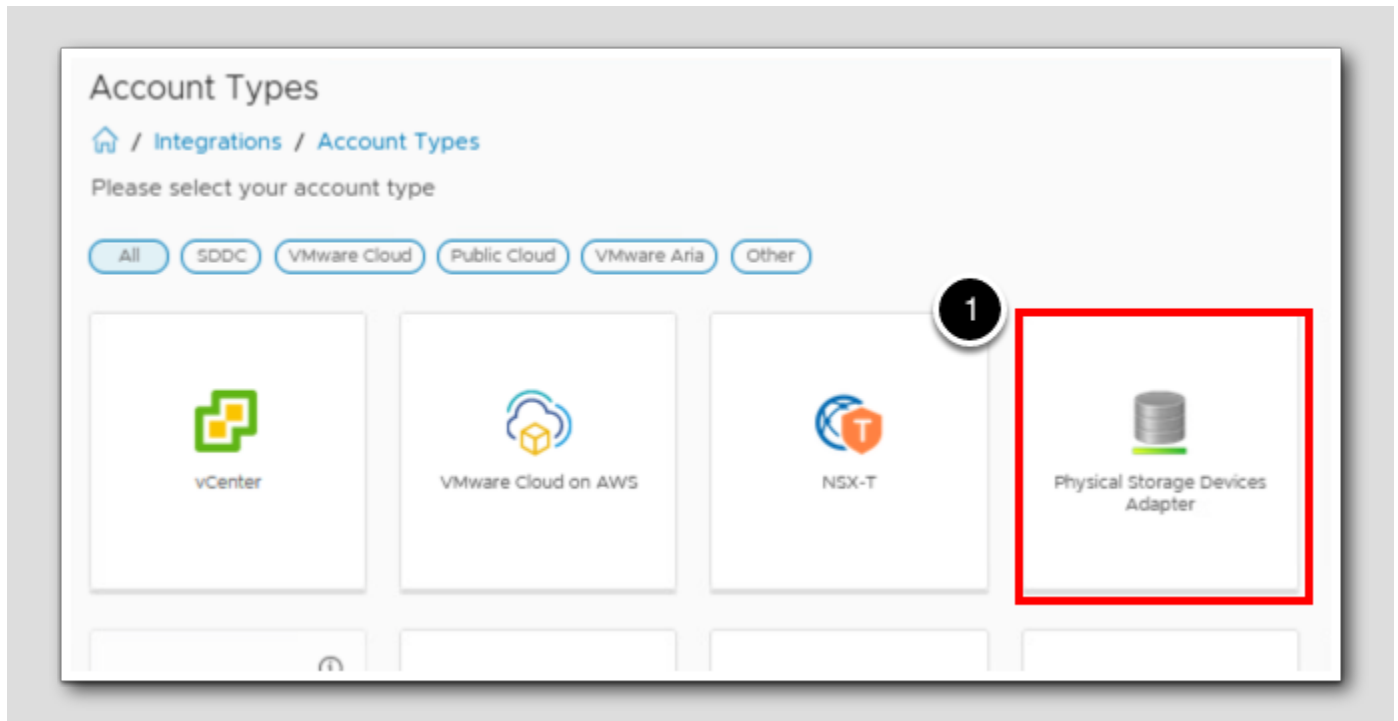
[27]



With the Management Pack for Storage Devices installed, we will now create an account and begin to collect data from the lab environment.

1. Click **ADD ACCOUNT**. (Note: it may be necessary to scroll down in order to see the **ADD ACCOUNT** link.)

Select Account Type



The list of available account types varies based on which management packs are installed.

1. Click Physical Storage Devices Adapter.

Configure Account

[29]

Add Account - Physical Storage Devices Adapter
Home / Integrations / Account Types

Cloud Account Information

Name: **1**

Description:

Connect Information

vCenter Server: **2**

Credential: **3**

Collector / Group:

> Advanced Settings

4

1. For Name, type HOL vCenter.
2. For vCenter Server, type `vcasa-01a.corp.vmbeans.com`.
3. We will need to create a new credential for this account to use. Click the + to open the Manage Credential window (not shown) and create a credential with the following information:
 - Credential name: HOL
 - vCenter User Name: `administrator@vsphere.local`
 - vCenter Password: `VMware!`
 - Click OK to create the credential (if prompted to save the password in the browser, choose Don't Save.)
4. Click ADD to add the account, and accept the vCenter Server certificate when the Review and Accept Certificate window appears (not shown.)

Review Account Status

[30]

The screenshot displays the VMware vCenter 'Integrations' page, which has 6 items. The 'Accounts' tab is selected. At the top, there is an 'ADD ACCOUNT' button and a menu icon. Below this are filter buttons for 'All', 'SDDC', 'VMware Cloud', 'Public Cloud', 'VMware Aria', and 'Other'. The main content area shows a list of integrations. A red box highlights a dropdown arrow next to 'Physical Storage Devices Adapter'. Another red box highlights the 'Status' column for the 'HOL vCenter' integration, which shows a green checkmark and 'OK'. A third red box highlights the 'Name' column for the 'HOL vCenter' integration. A fourth red box highlights the 'Status' column for the 'Physical Storage Devices Adapter' integration.

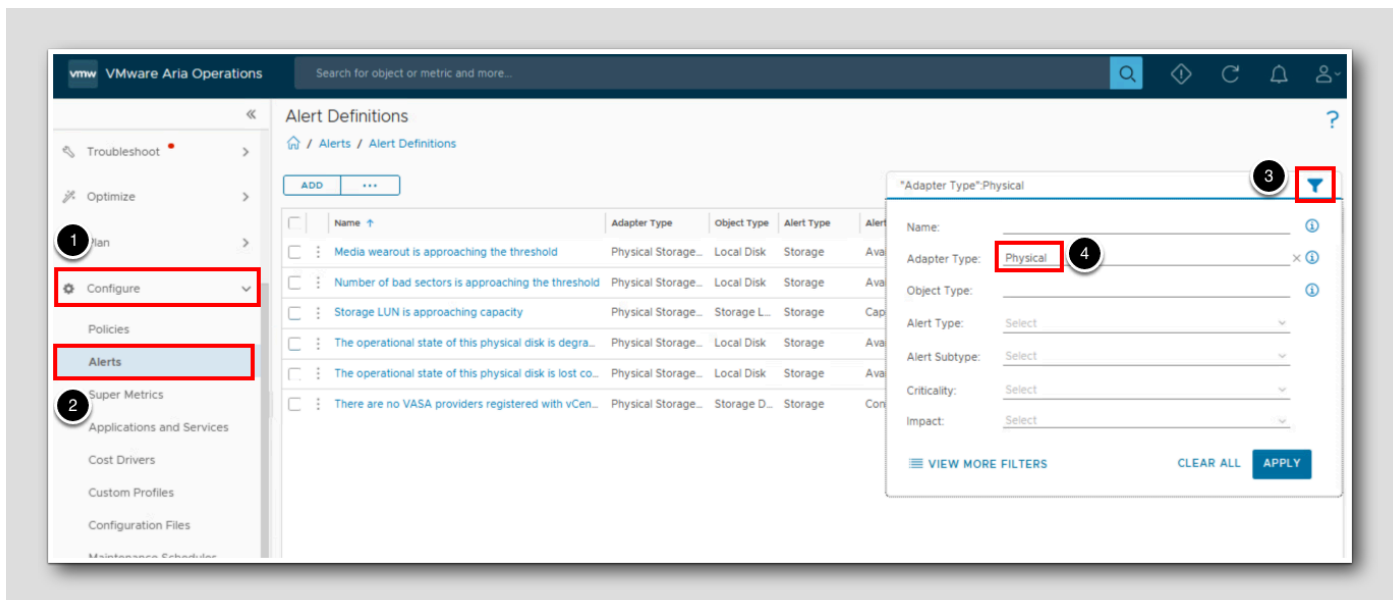
Name	Status	Description
HOL vCenter	OK	
Physical Storage Devices Adapter		
VMware Aria Automation		1 Account
VMware Aria Operations Application Management Pack		2 Accounts

1. Click the > next to Physical Storage Devices Adapter to expand the account list.
2. Verify that the Status of the newly added account is OK.

The Management Pack for Storage Devices is now collecting data from vCenter in the lab. This management pack includes a Fabric Server Adapter as well, but we will not be configuring that adapter in this lab.

View Provided Alert Definitions

[31]



With the Physical Storage Devices Adapter configured, we can view alert definitions provided by the adapter.

1. Click **Configure** on the left navigation menu.
2. Click **Alerts** and select **Alert Definitions** (not shown)
3. Click the **Filter** icon in the filters search bar to open the filter options.
4. For Adapter Type, type **Physical** and press **Enter**.

This will filter the list of alert definitions to those provided by the management pack. We can follow a similar filter process to view provided Symptoms and Recommendations, or view available Views, Dashboards, and other items provided by the management pack elsewhere in Aria Operations.

Conclusion

[32]

In this module, we reviewed pre-installed Aria Operations management packs and we installed, configured, and reviewed the

Management Pack for Storage Devices. Management packs provide significant extensibility to Aria Operations, allowing for proactive management of a multi-cloud enterprise.

You've finished the module

[33]

Congratulations on completing the lab module.

For more information on getting started with Aria Operations, see the [VMware Aria Operations: Journey to Success](#) guide at the [VMware Apps & Cloud Management Tech Zone](#).

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 2 - Monitoring and Troubleshooting Kubernetes (15 minutes) Basic

Introduction

[35]

In Module 1 we reviewed management packs to provide further extensibility for VMware Aria Operations. In this module we will review one management pack in particular - the VMware Aria Operations Management Pack for Kubernetes. We will deploy a required prerequisite, then deploy and configure the management pack itself, and then we will review detail discovered by the management pack.

VMware Aria Operations Management Pack for Kubernetes

[36]

As with other management packs, the VMware Aria Operations Management Pack for Kubernetes provides alerts, dashboards, and other additional functionality to Aria Operations. In addition, this management pack allows for complete visualization of Kubernetes resources as well as autodiscovery of specific clusters on Tanzu Kubernetes Grid and in Amazon Web Services. Monitoring of other cluster types including Red Hat OpenShift is also supported.

The management pack has its own [documentation](#) providing additional information.

Log in to Aria Operations

[37]

We will log in to a live instance of Aria Operations running in this lab.

Open the Firefox Browser from the Windows Task Bar

[38]

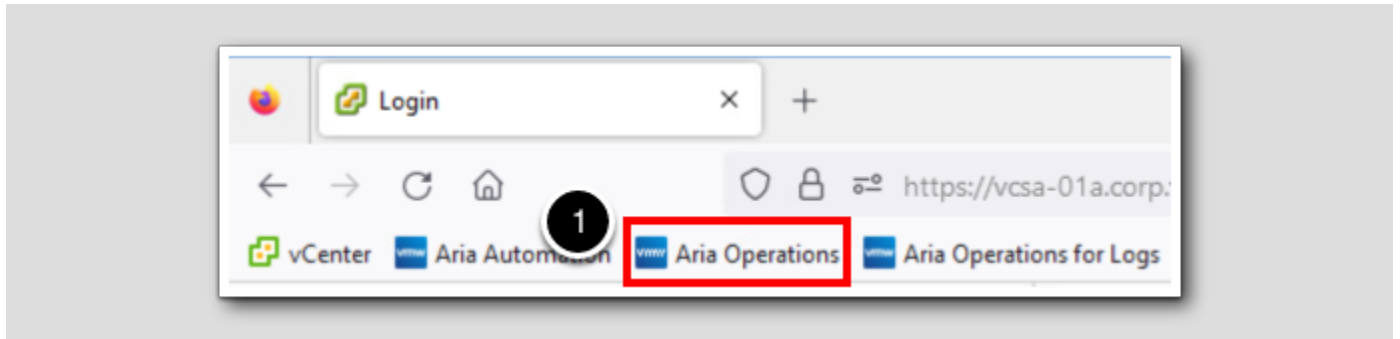


If the browser is not already open, launch Firefox.

1. Click the **Firefox** icon in the Windows Quick Launch Task Bar at the bottom of the screen.

Navigate to Aria Operations

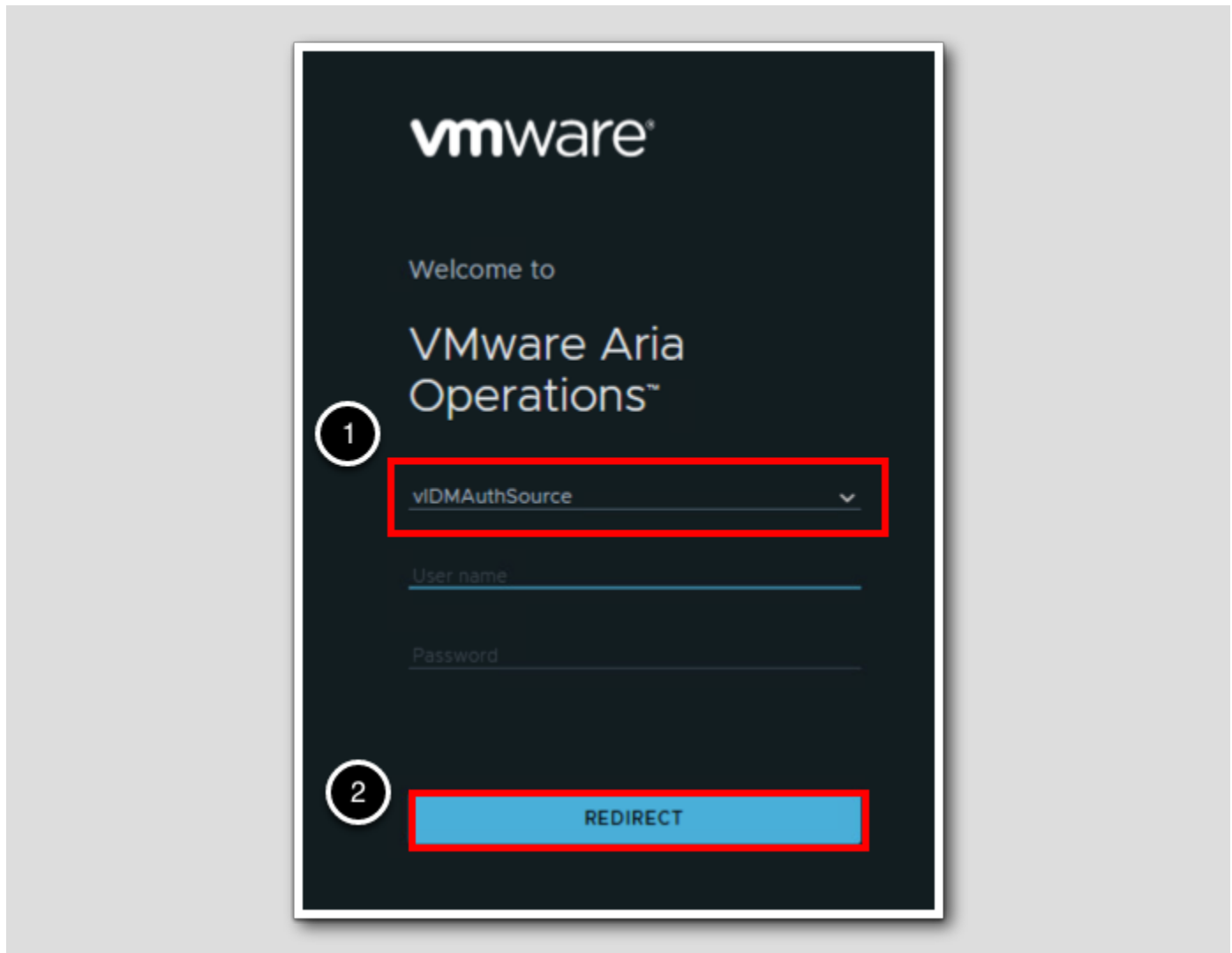
[39]



1. Click the Aria Operations bookmark in the bookmarks toolbar.

Log in to Aria Operations

[40]



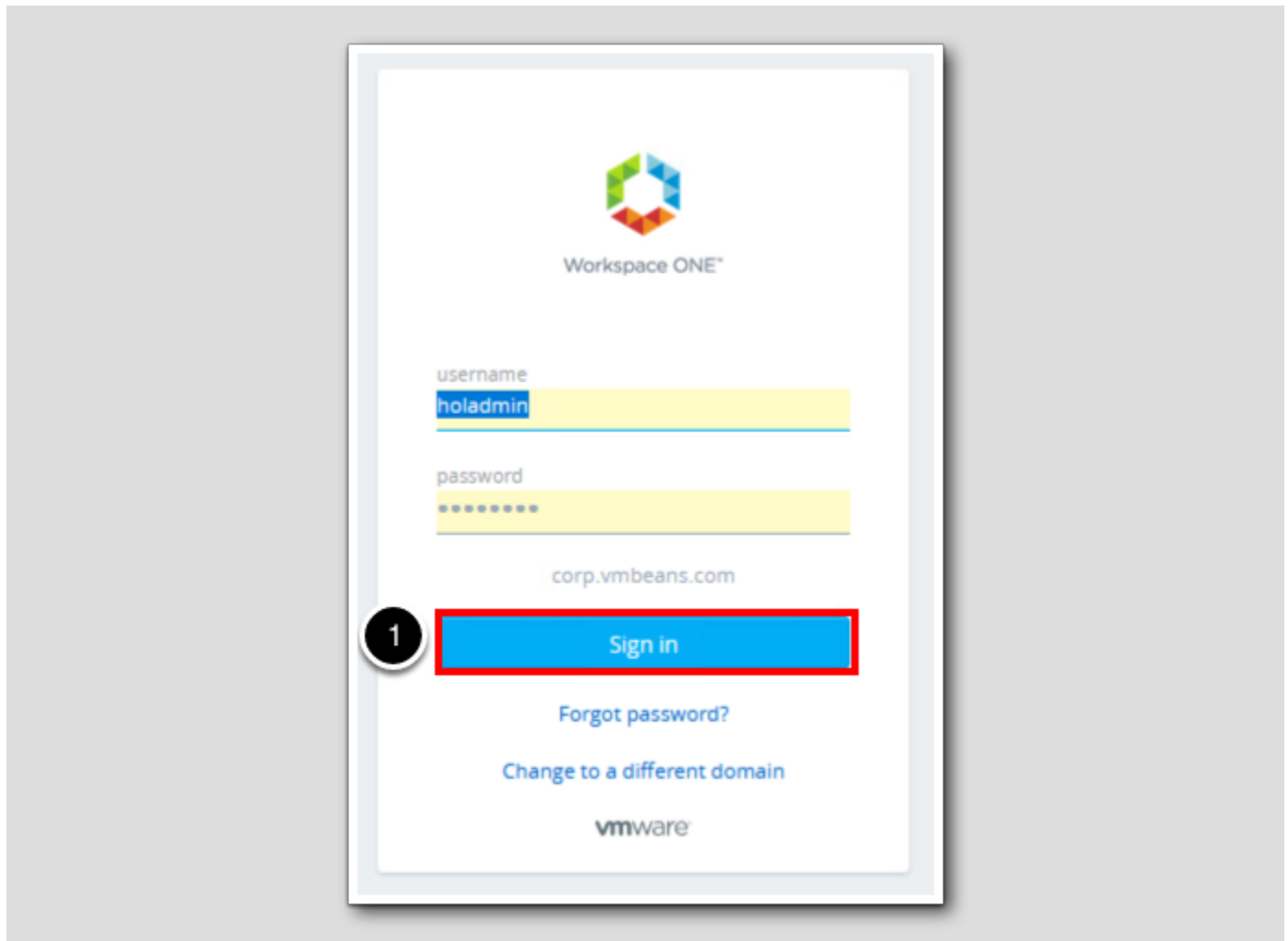
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vIDMAuthSource may be pre-selected as the default identity source. If it is not, then you will need to select it.

1. Click the **drop-down arrow** and select vIDMAuthSource if it is not already selected.
2. Click **REDIRECT** to be taken to the authentication page.

VMware Identity Manager Login

[41]



VMware Identity Manager acts as the identity provider for the Active Directory authentication source in this lab.

Credentials for the default user, holadmin, have already been provided.

1. Click Sign in

Deploying the Management Pack

[42]

This lab environment includes a vSphere with Tanzu deployment with one supervisor, one namespace, and one deployed cluster. In this exercise, we will deploy the Management Pack for Kubernetes and configure it to monitor this environment.

Prerequisites

[43]

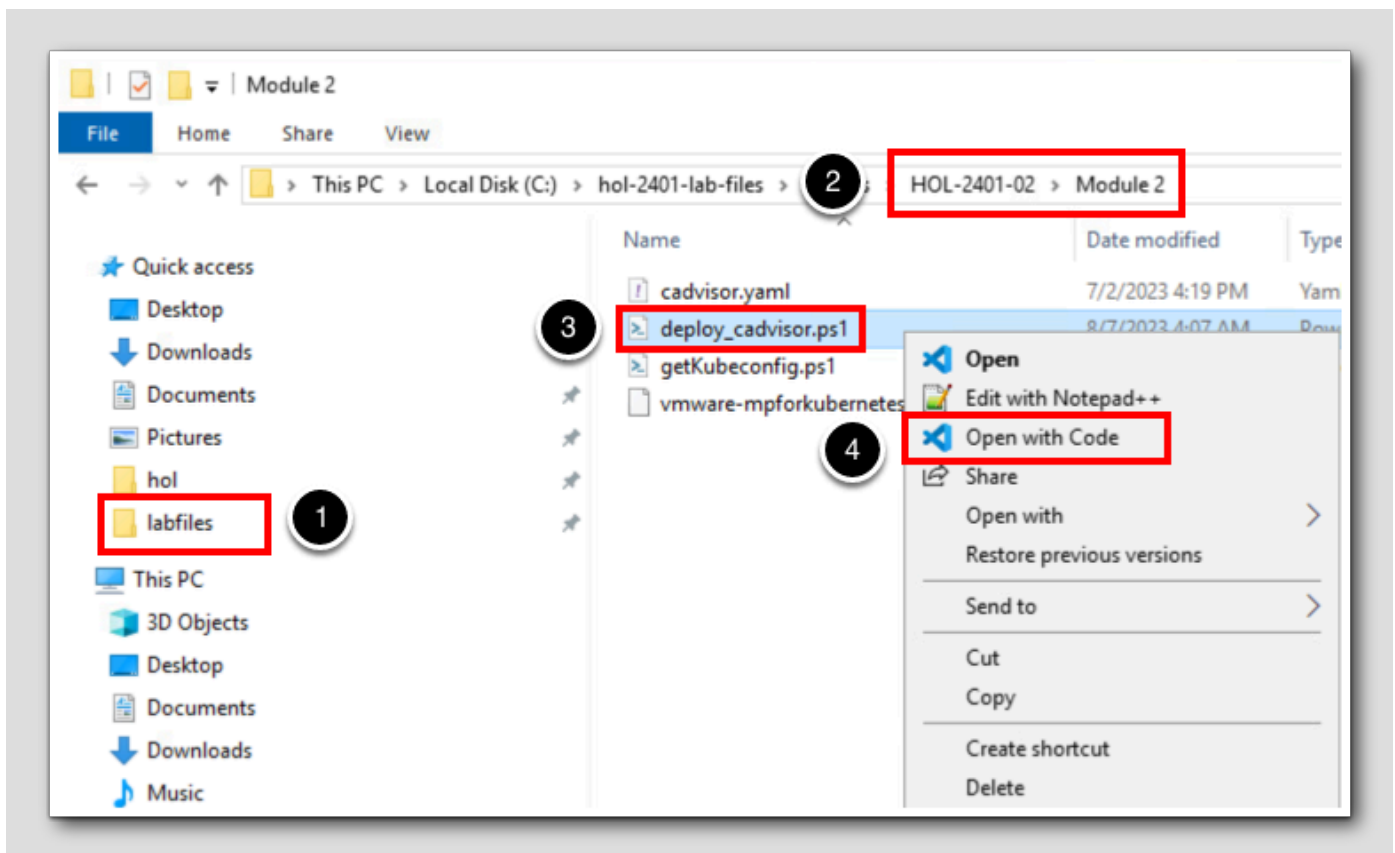


The VMware Aria Operations Management Pack for Kubernetes requires either cAdvisor or Prometheus to be running in the environment to be monitored. Both tools provide data and extensibility, but in this exercise we will be using [cAdvisor](#).

1. Click on the File Explorer icon in the Windows task bar to open Explorer.

Open cAdvisor Deployment Script

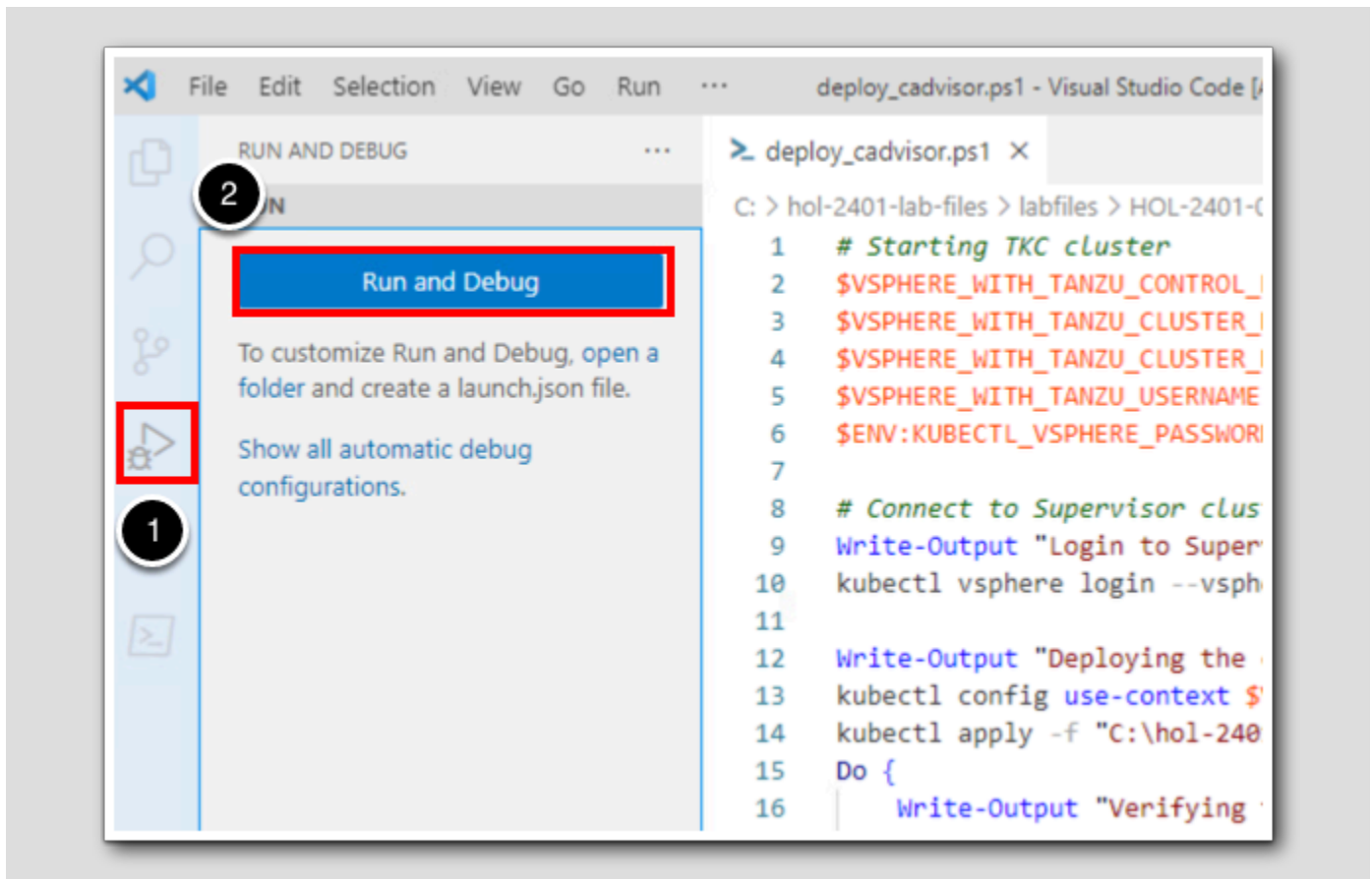
[44]



1. Click on the **labfiles** shortcut.
2. Navigate to the **HOL-2401-02** folder, and then to the **Module 2** folder (not shown)
3. Right click on the file **deploy_cadvisor.ps1**
4. Select **Open with Code** from the menu to open the file in Visual Studio Code.

Run the Deployment Script

[45]

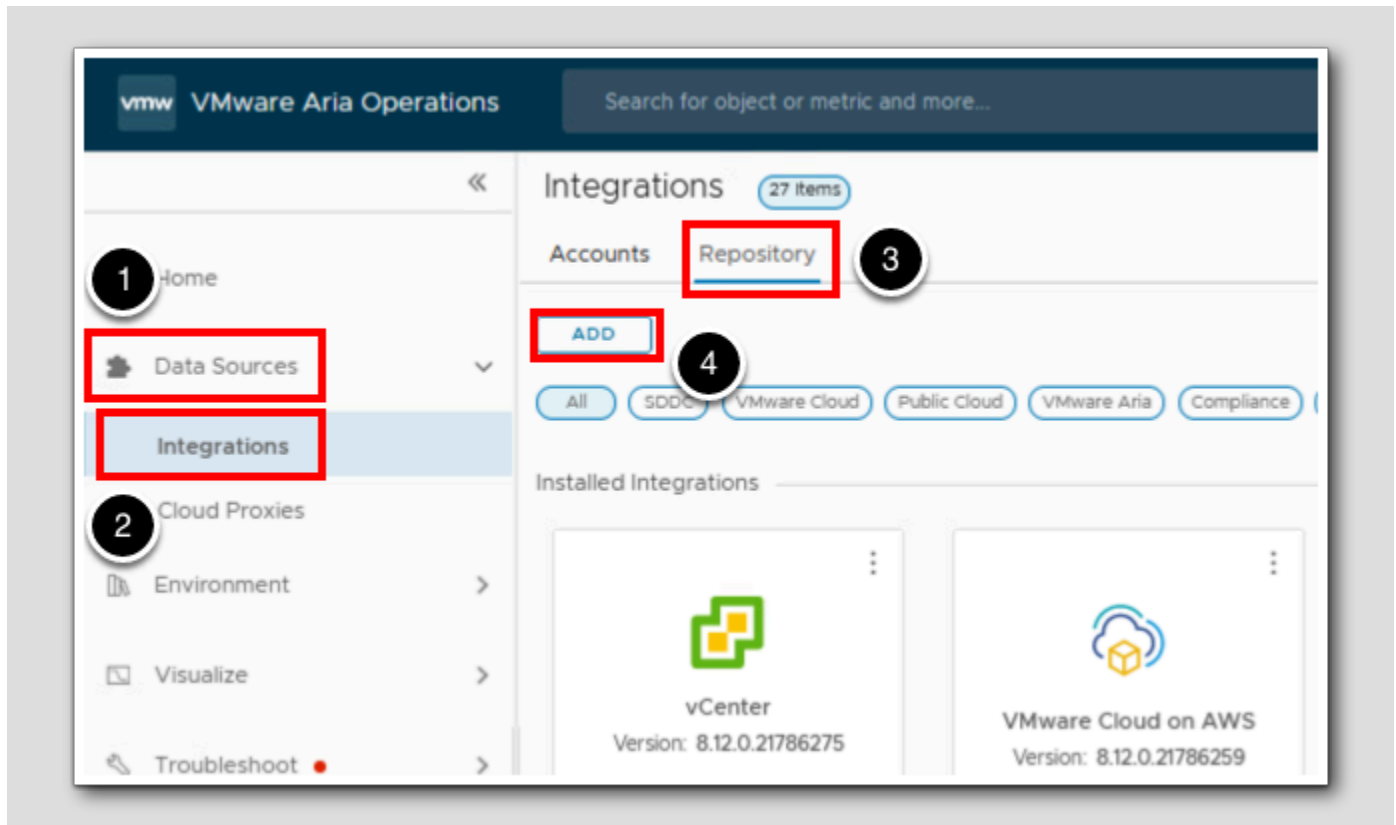


1. Click the **Run and Debug** badge in the Activity Bar on the left.
2. Click **Run and Debug** to run the script. A terminal window will open below the script itself with output. The script will take 20-30 seconds to complete.

Now that cadvisor has been deployed, we can proceed with installing the management pack.

3. Click the **Firefox** browser icon in the Windows task bar to return to Firefox (not shown)

Navigate to Repository



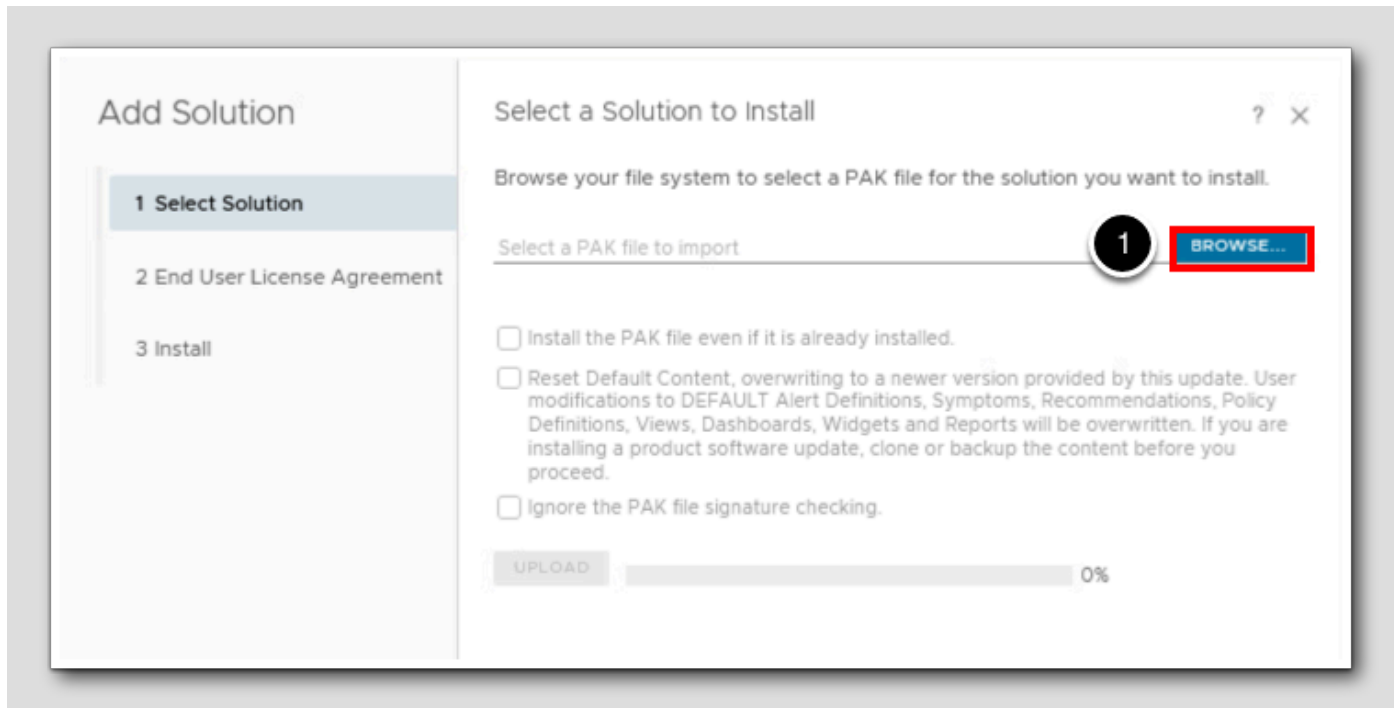
1. In Aria Operations, click **Data Sources** in the left navigation menu.
2. Click on **Integrations**.
3. In the Integrations view, click the **Repository** tab.

The Management Pack for Kubernetes is not installed by default. We will install the management pack now.

4. Click **ADD**.

Add Solution

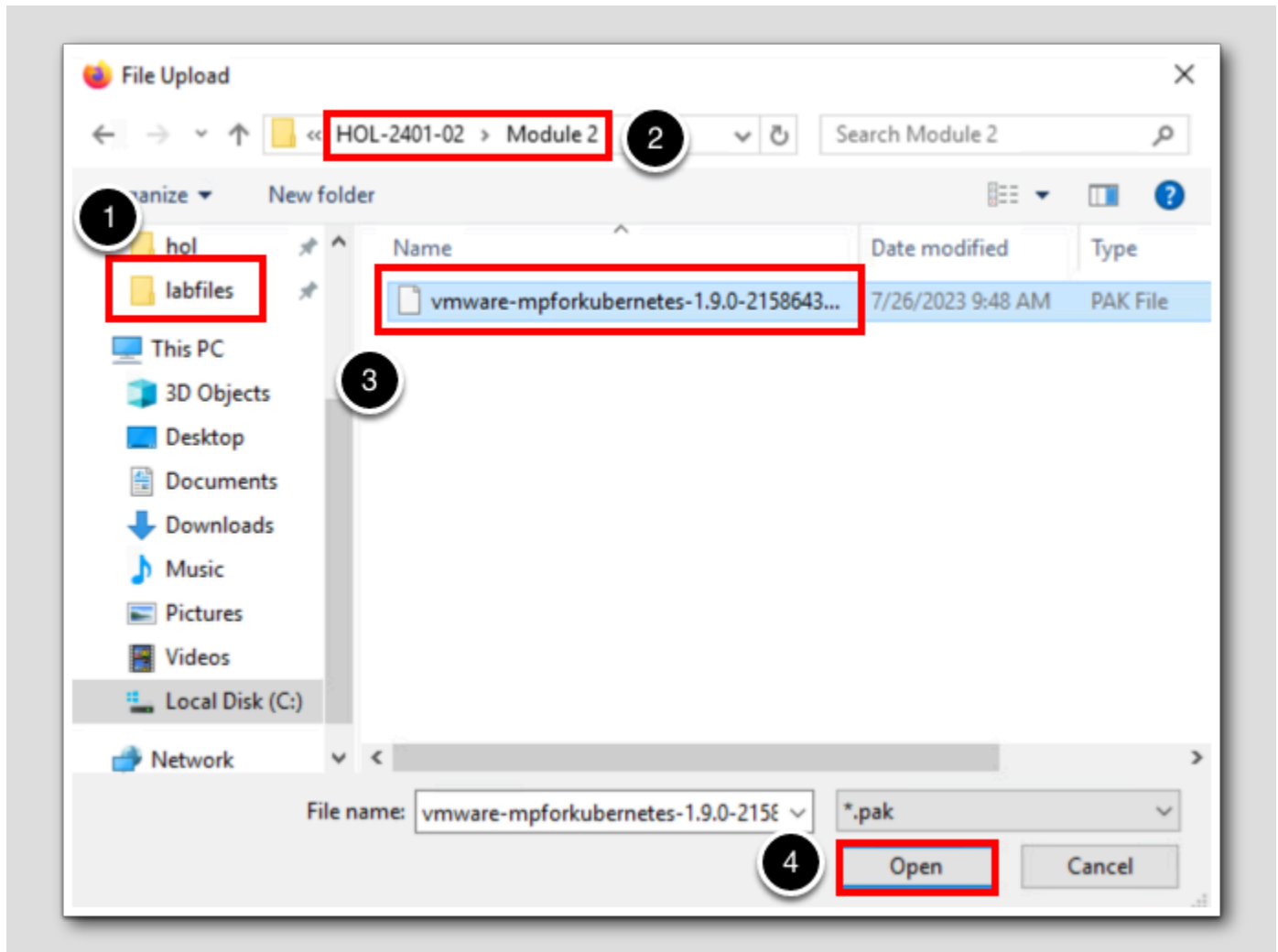
[47]



As with other management paks, the Management Pack for Kubernetes is installed using the Add Solution wizard. This process is covered in more detail in module 1 of this lab.

1. Click **BROWSE...**

Find and Open PAK File



1. Click on the **labfiles** shortcut.
2. Navigate to the **HOL-2401-02** folder, and then to the **Module 2** folder (not shown.)
3. Click on the **vmware-mpforkubernetes** file shown.
4. Click **Open**.

Upload and Validate Management Pack

Add Solution

- 1 Select Solution
- 2 End User License Agreement
- 3 Install

Select a Solution to Install

Browse your file system to select a PAK file for the solution you want to install.

Select a PAK file to import BROWSE...

Install the PAK file even if it is already installed.

Reset Default Content, overwriting to a newer version provided by this update. User modifications to DEFAULT Alert Definitions, Symptoms, Recommendations, Policy Definitions, Views, Dashboards, Widgets and Reports will be overwritten. If you are installing a product software update, clone or backup the content before you proceed.

Ignore the PAK file signature checking.

1 UPLOAD 100%

2

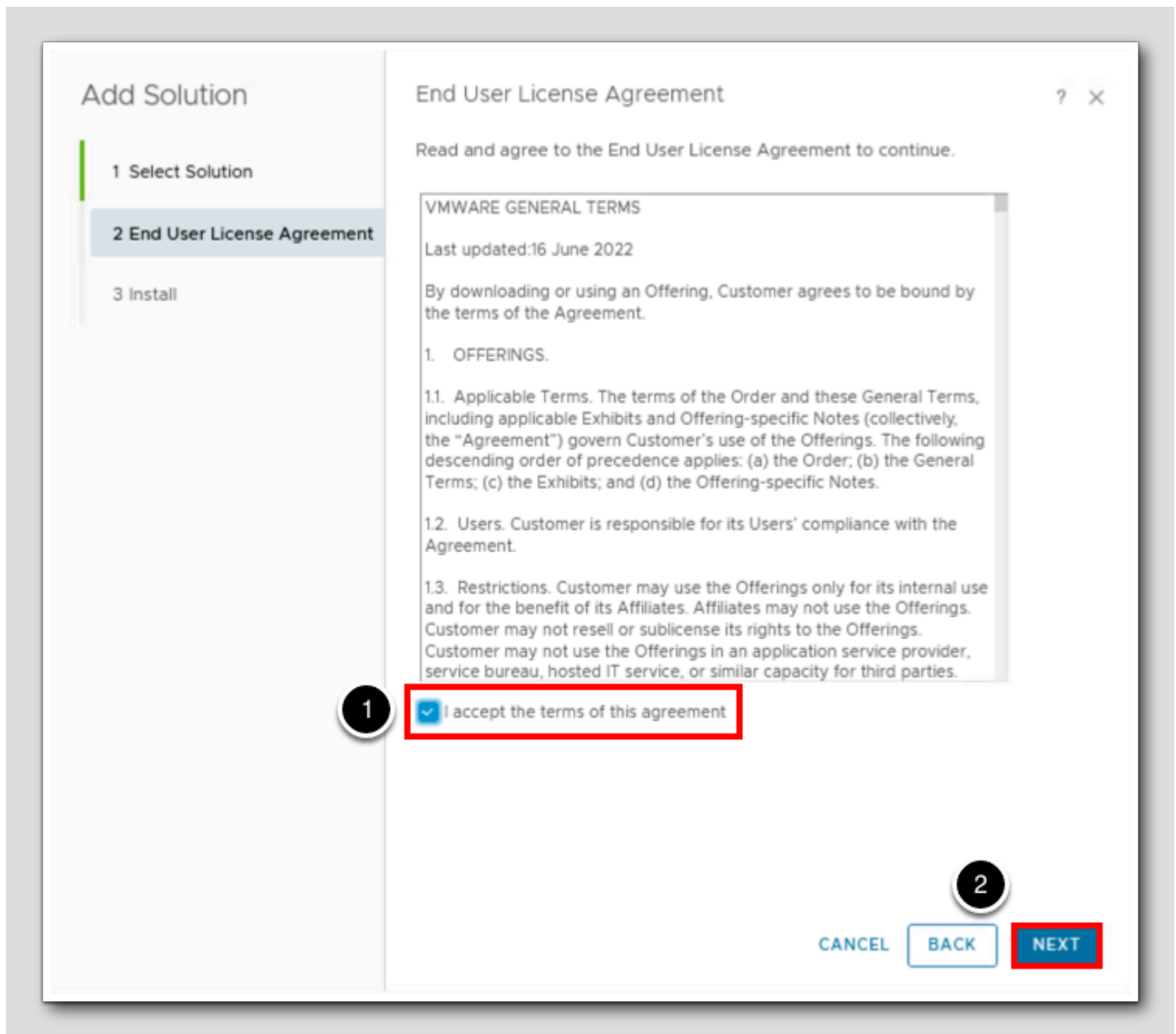
Name	Kubernetes
Description	VMware Aria Operations Management Pack for Kubernetes extends the monitoring capability of VMware Aria Operations Manager to provide insights into Kubernetes clusters to the Cloud Infrastructure Administrators. It provides a single pane of glass to monitor and troubleshoot Kubernetes based container infrastructure with its rich set of metrics, cluster visualization and dashboards.
Version	1.9.0.21586432

✔ The PAK file signature is valid.

3 CANCEL NEXT

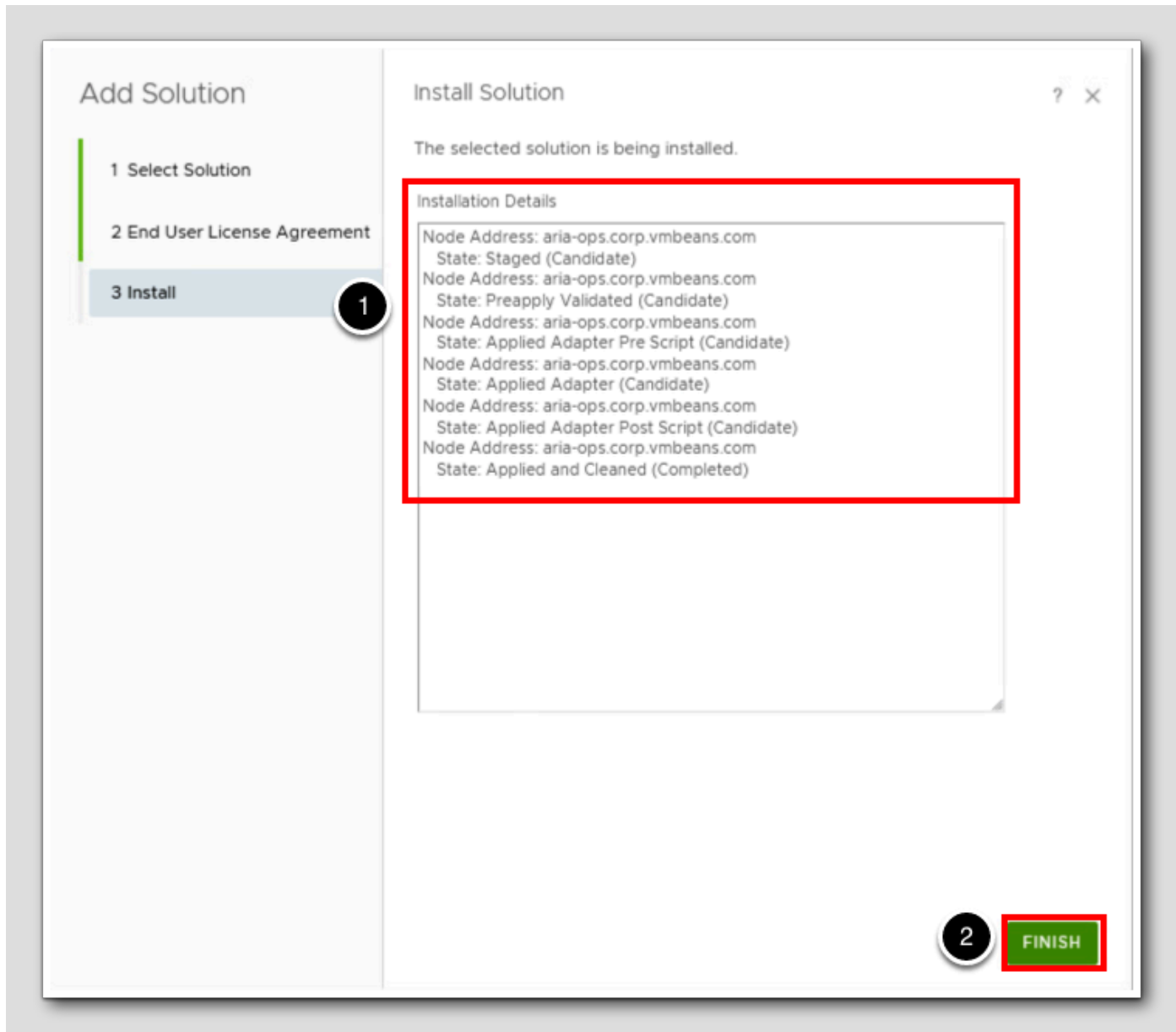
1. Click the **UPLOAD** button to begin the upload and validation process. This process will take 1-2 minutes to complete.
2. Review the information displayed once the validation is complete.
3. Click **NEXT**.

Review and Accept the End User License Agreement



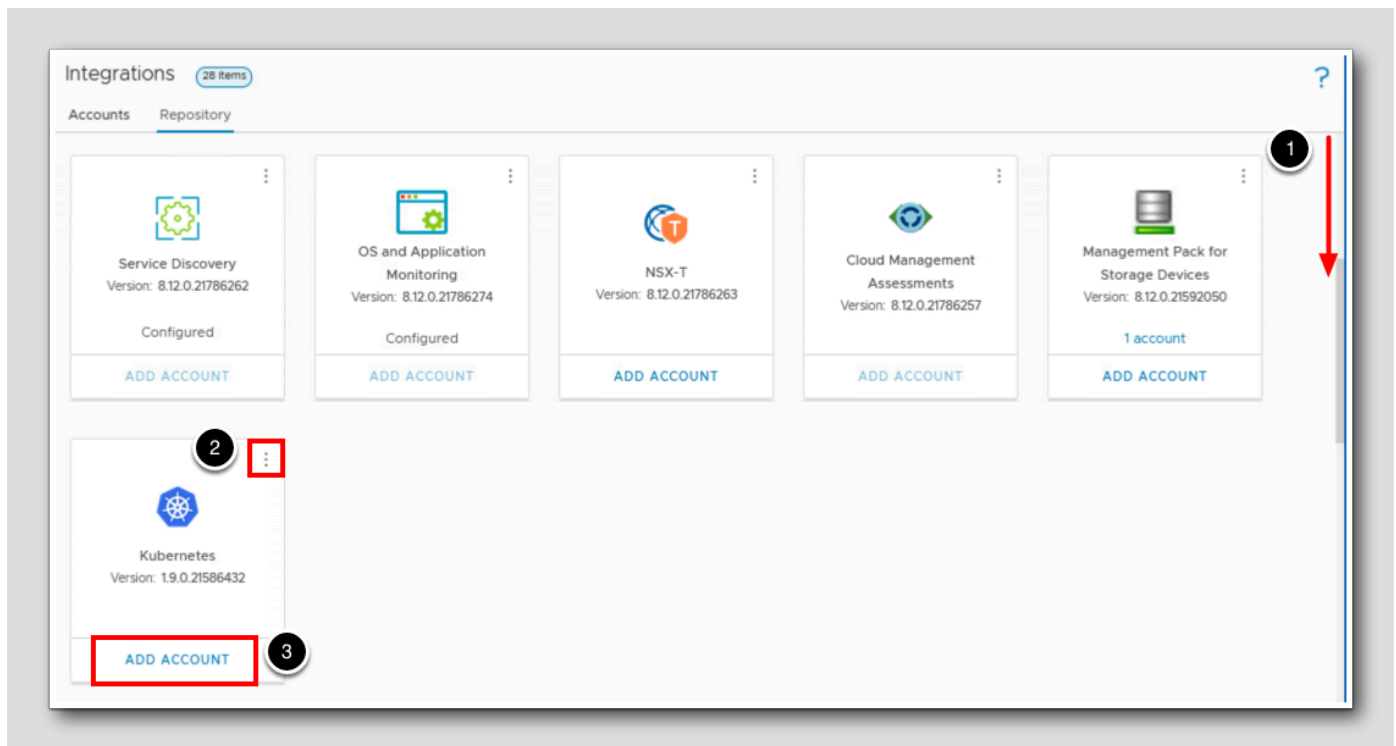
1. Review the End User License agreement, and when complete click the checkbox next to "I accept the terms of this agreement."
2. Click **NEXT**. This will begin the management pack installation.

Complete the Management Pack Installation



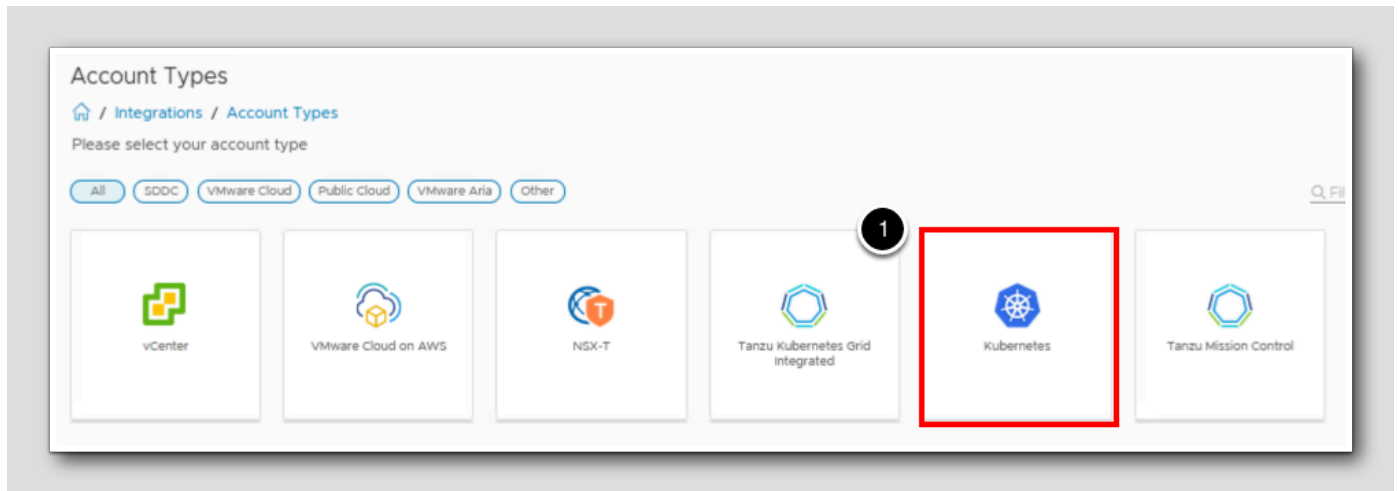
1. The management pack installation will proceed automatically. This installation requires 2-3 minutes to complete.
2. Once the installation is complete, click **FINISH** to close the Add Solution window.

Add Account



1. Use the scrollbar to scroll down and view the Kubernetes management pack in the Installed Integrations section of the repository.
2. In Module 1 we viewed the content of the installed management pack, but we will not do so in this exercise. If you do want to view the content, click the 3 vertical dots to open the window and click the x to close the window when complete.
3. Click ADD ACCOUNT.

Select Account Type



The management pack provides several account types. In this exercise, we will use the Kubernetes account.

1. Click **Kubernetes**.

Enter Account Information

Add Account - Kubernetes
Home / Integrations / Account Types

Cloud Account Information

Name:

Description:

Connect Information

Control Plane URL:

Collector Service:

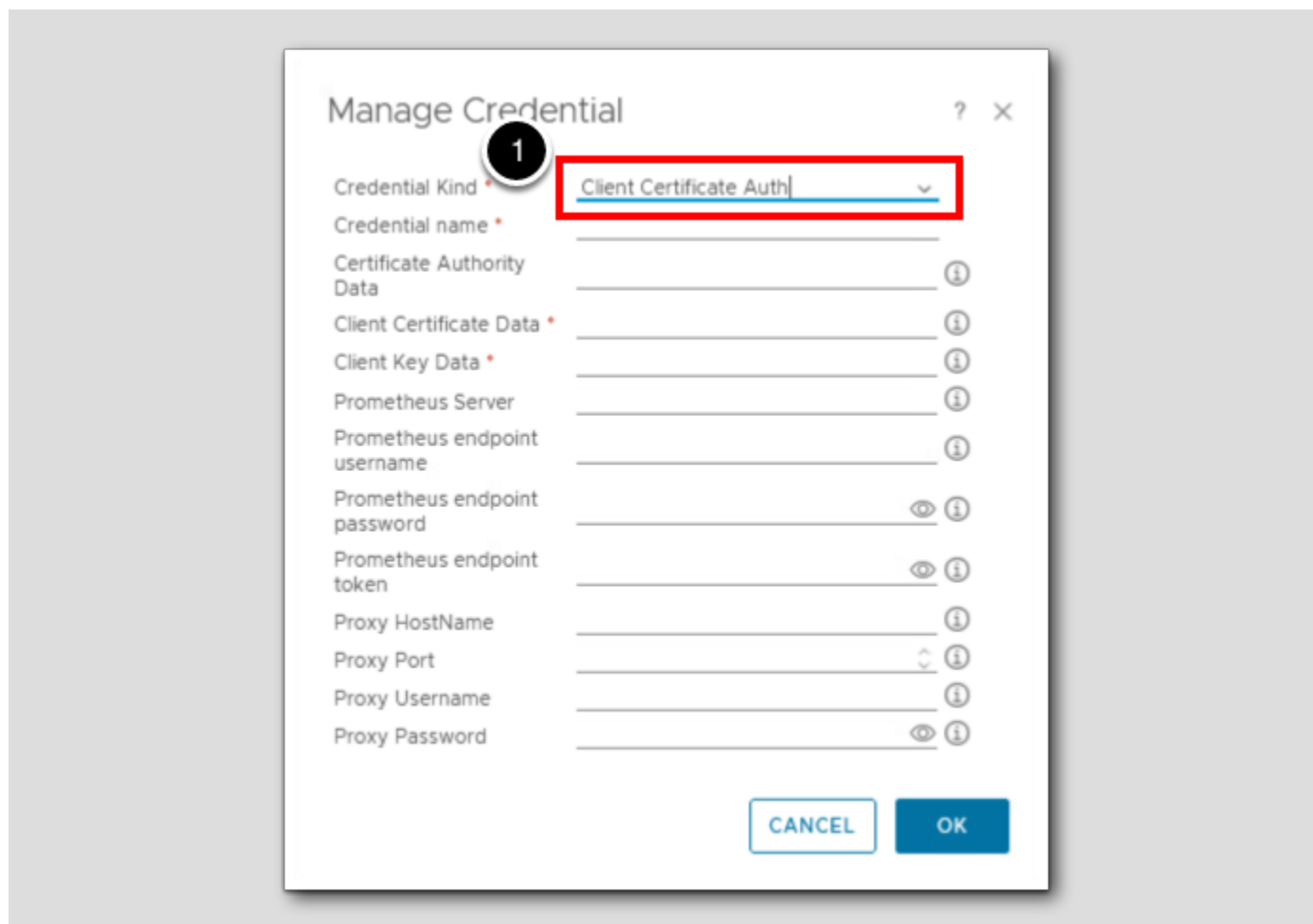
cAdvisor Port (DaemonSet):

Credential:

Collector / Group:

1. For Name, type HOL TKG.
2. For Control Plane URL, type `https://172.16.10.3:6443`
3. For Collector Service, click on the select box and select `cAdvisor - DaemonSet`
4. For cAdvisor Port, type `31194`
5. Click the + next to the Credential list to create a new credential.

Select Credential Type

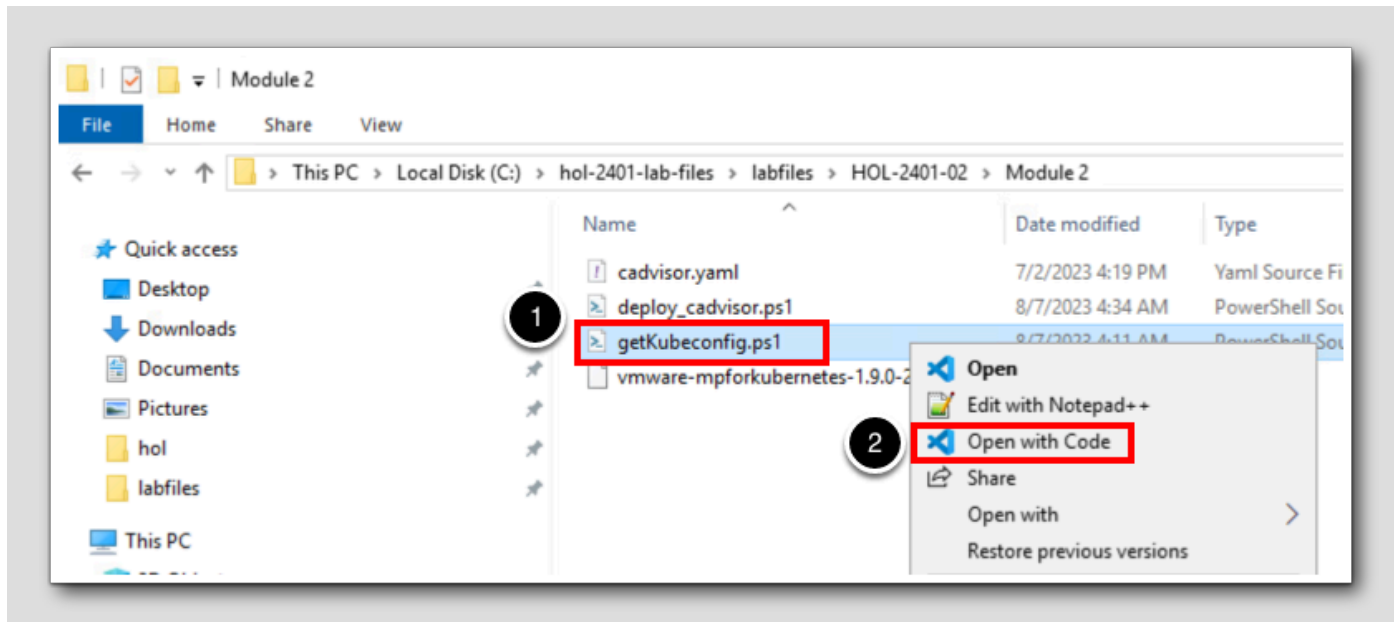


1. Click the select box next to Credential Kind, and change it to Client Certificate Auth.

Note that this adds several more options to the Manage Credential window. This information would normally come from our Kubernetes administrator, but in this exercise we are able to retrieve the information from the deployment ourselves.

2. Click the File Explorer icon in the Windows task bar (not shown) to return to Explorer.

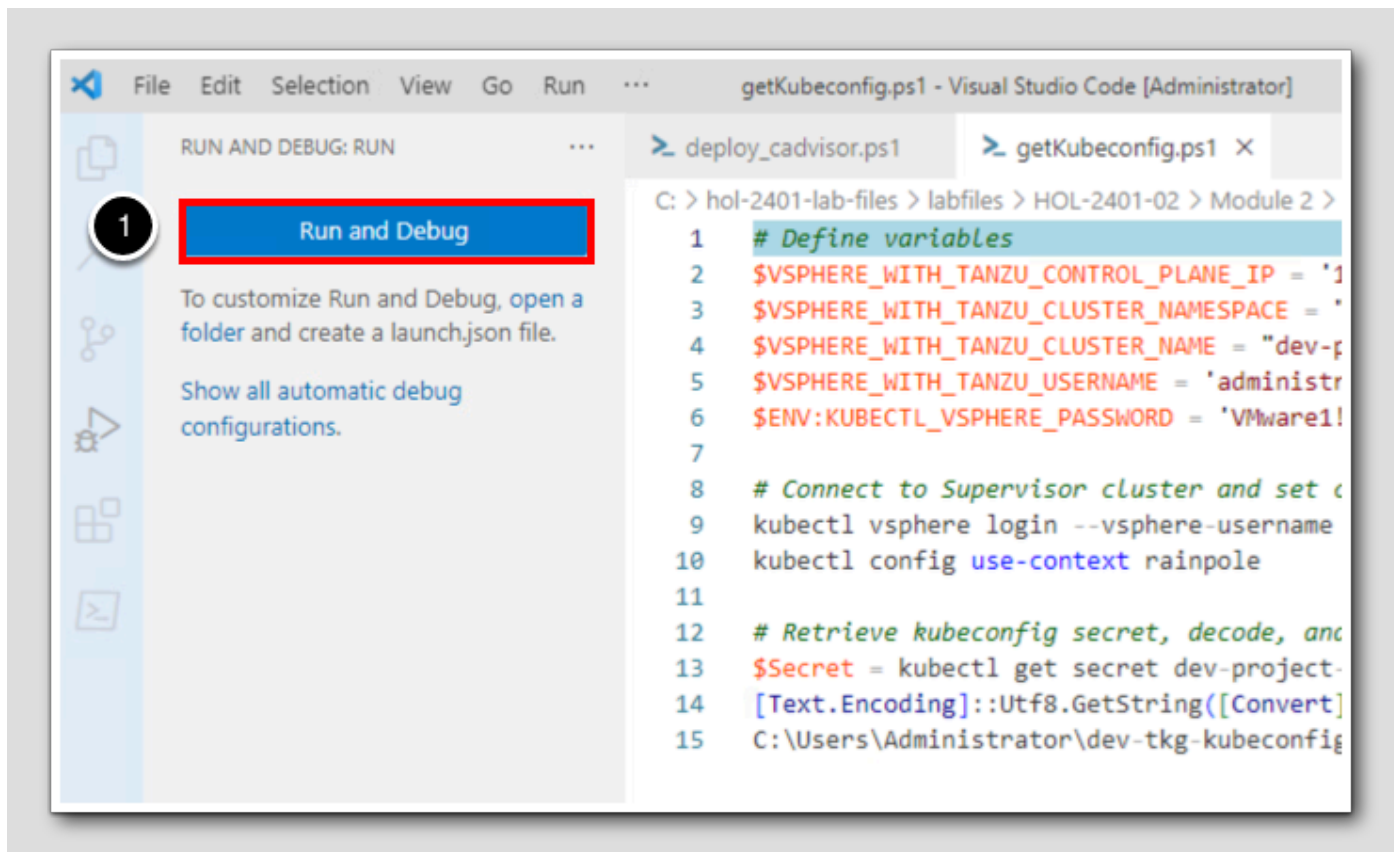
Open Script



1. Right click on the `getKubeconfig.ps1` file.
2. Select `Open with Code` from the menu to open this file.

Note: if you navigated away from the folder containing these files, click on the labfiles shortcut in the Quick access section and then navigate to the HOL-2401-02 folder, and then to the Module 2 folder.

Run Script

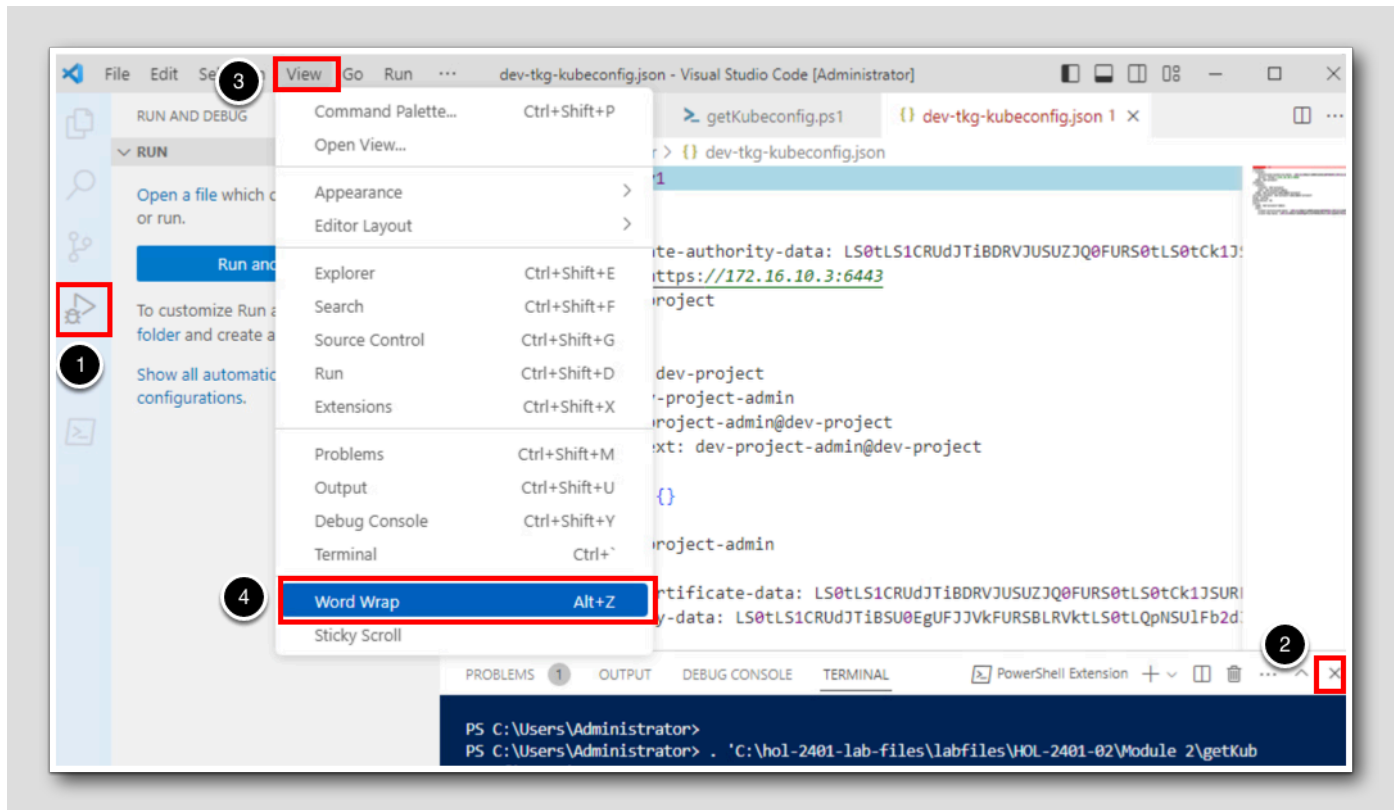


This script will retrieve credential information from the TKG supervisor, and open it in Visual Studio Code.

1. Click **Run and Debug** to run the script. The script output will open in a new tab in Code once the script has completed.

Note: if you've closed the Run and Debug menu, click on the Run and Debug badge in the Activity Bar on the left to re-open it.

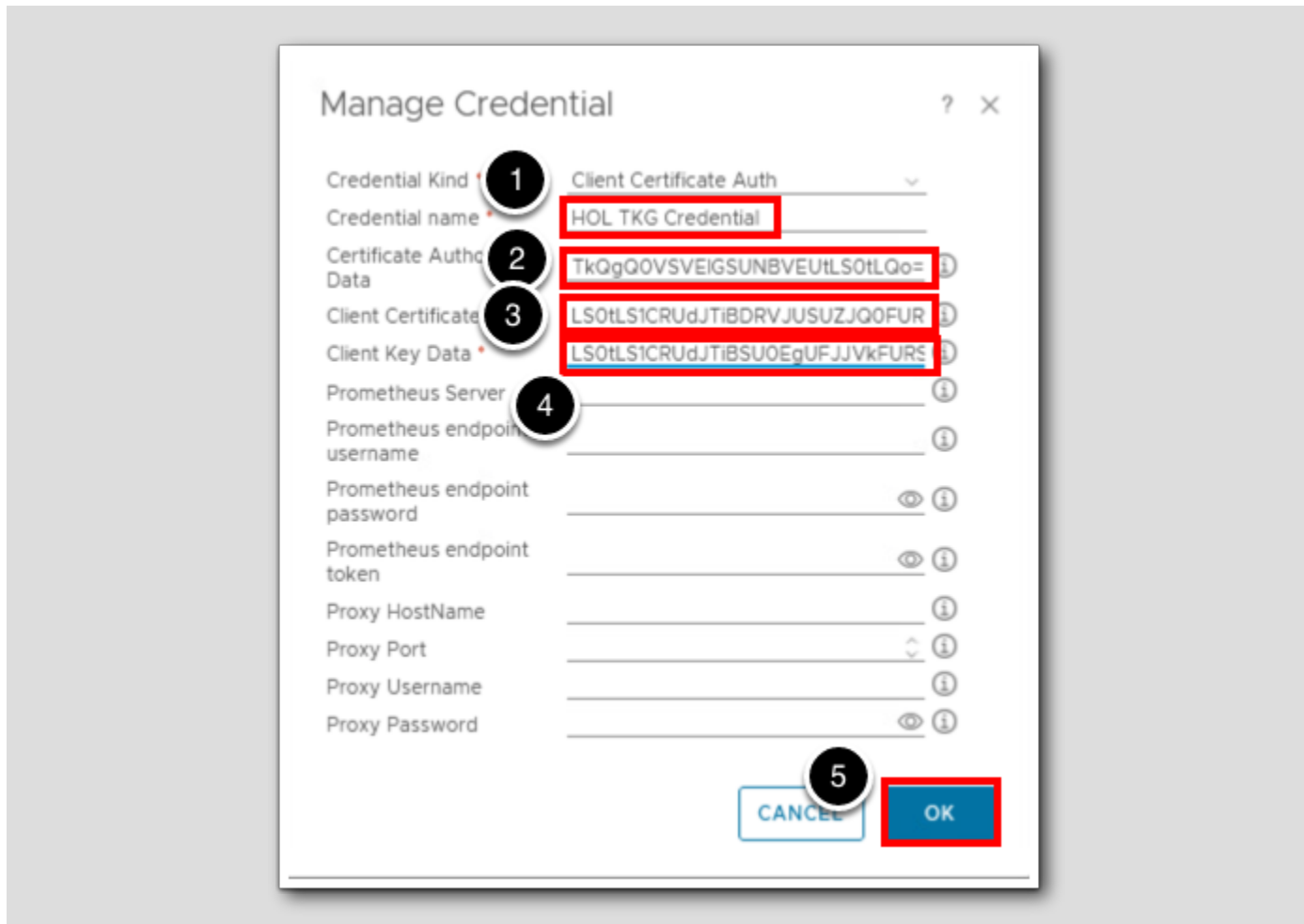
View Script Output



The script output opens in a new tab in Visual Studio Code. However, it will be difficult to see all of the required values initially.

1. Click the **Run and Debug** icon in the Activity Bar on the left to close the Run and Debug pane.
2. Click the **x** in the terminal window on the lower right side to close the terminal.
3. Click on **View** to open the View menu.
4. Click **Word Wrap** to enable word wrap for this file.
5. Return to the **Firefox** browser (not shown) to continue.

Copy and Paste Credential Info



Now that we have the required credential information, we can create the credential and continue with configuring the account.

Note: for steps 2-4 we will copy the information from the script output file in vscode and paste it into the respective fields. You can copy and paste using ctrl+c and ctrl+v in this lab.

1. For Credential Name, type **HOL TKG Credential**
2. For the Certificate Authority Data, copy the value from the kubeconfig file **certificate-authority-data** field (line 4) and paste here.
3. For the Client Certificate Data, copy the value from the kubeconfig file **client-certificate-data** field (line 18) and paste here.
4. For the Client Key Data, copy the value from the kubeconfig file **client-key-data** field (line 19) and paste here.
5. Click **OK**

Complete Configuration and Validate

Add Account - Kubernetes
Home / Integrations / Account Types

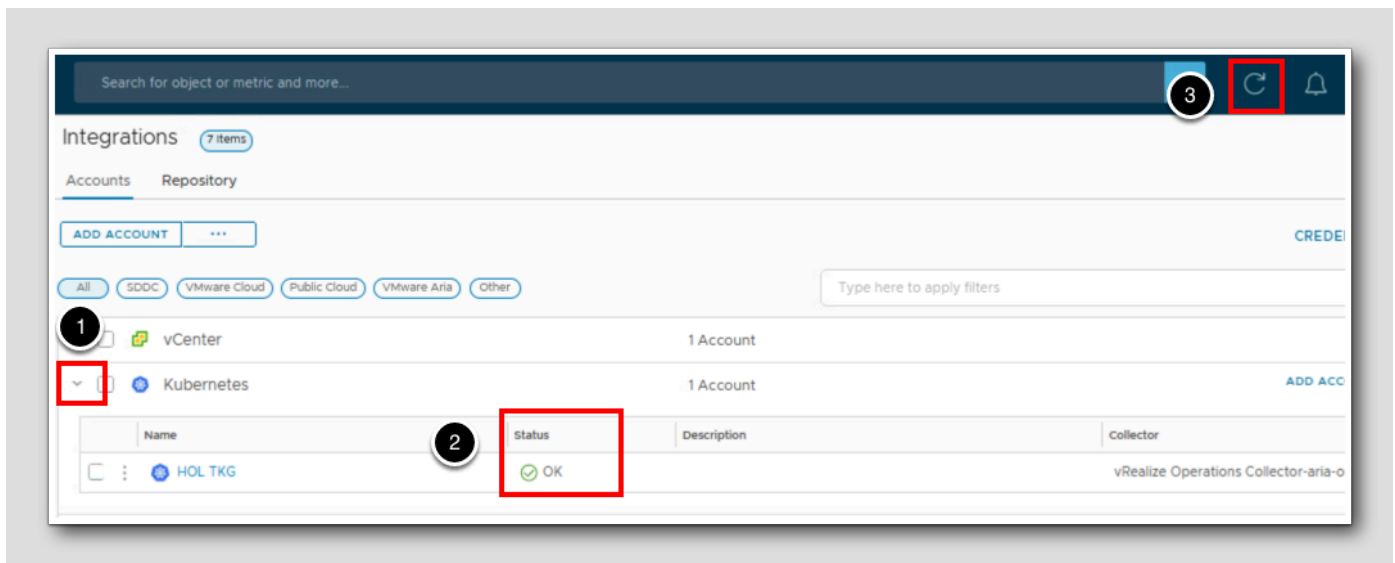
Collector Service	cAdvisor - DaemonSet	ⓘ
cAdvisor Port (DaemonSet)	31194	ⓘ
Credential	HOL TKG Credential	× + ✎
Collector / Group	Default collector group	⌵
	VALIDATE CONNECTION	3
1		
⌵ Advanced Settings		
Auto-Discover TKG Workload Clusters	Deactivated	ⓘ
Auto-Delete TKG Workload Clusters	Deactivated	ⓘ
vCenter Server	vcsa-01a.corp.vmbeans.com	ⓘ
Java Process Monitoring	Deactivated	ⓘ
Delete nonexistent objects older than	Use Platform Global Setting	ⓘ
cAdvisor Install Check	Activated	ⓘ

ADD **CANCEL**

1. Click on **Advanced Settings** to open additional settings. Note: it may be necessary to scroll down to view these settings.
2. For vCenter Server, type `vcsa-01a.corp.vmbeans.com`
3. Click **VALIDATE CONNECTION**.
4. When the Review and Accept Certificate window appears, click **ACCEPT** to accept the certificate (not shown.)
5. Click **OK** to close the info window once the validation is complete (not shown.)

Create Account and View Status

[61]



Clicking ADD in the previous step (not shown) will create the account and return us to the Accounts tab of the Integrations page. From here, we can verify the status of the configured account.

1. Click the > next to Kubernetes to open the account list.
2. Note the **Status** of the HOL TKG account. The status may initially show as Warning.
3. If the Status is not yet OK, click the **Refresh** icon in the upper right until the Status updates. This should take less than 30 seconds.

The Management Pack for Kubernetes has been installed in this environment.

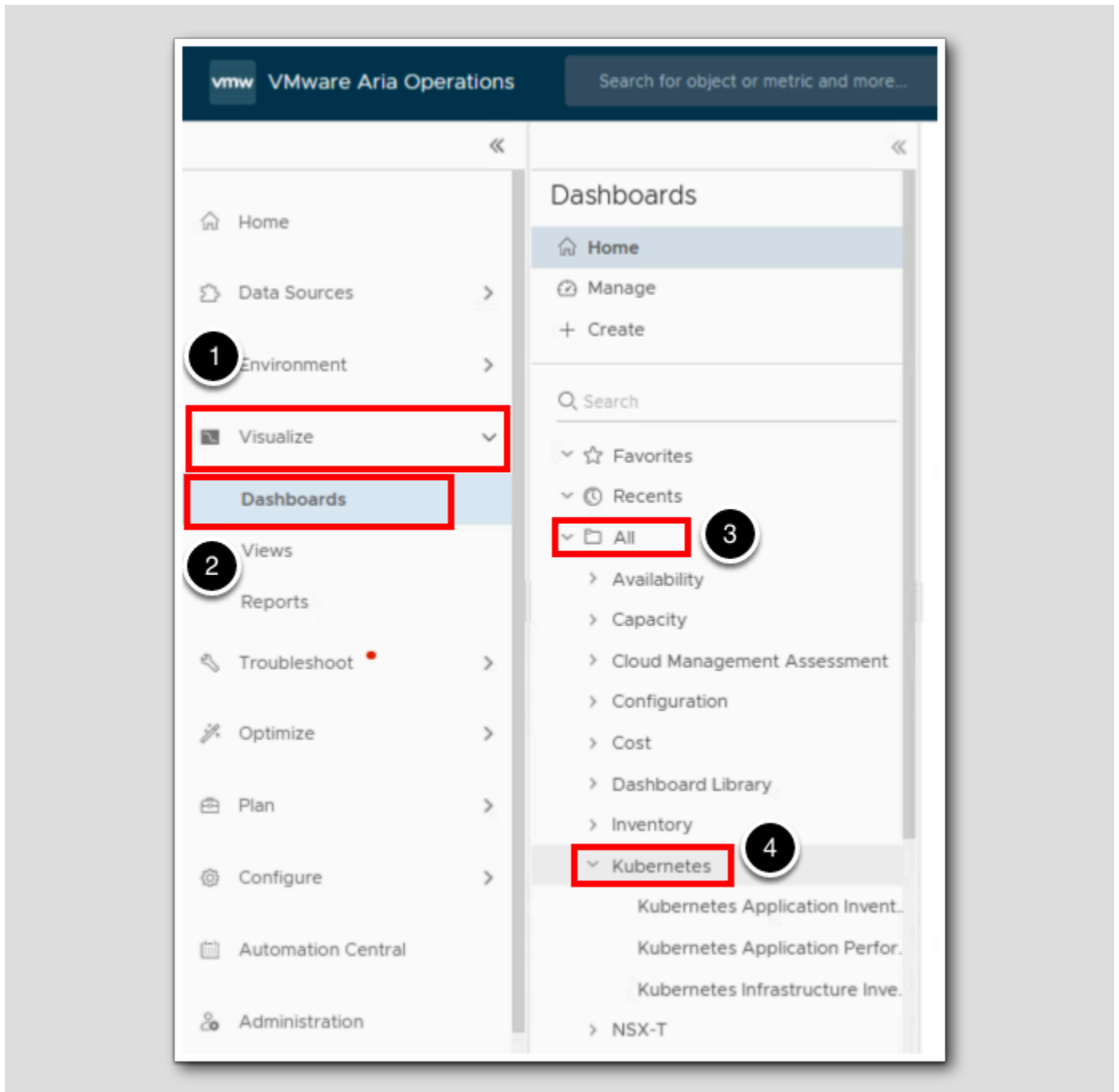
Review the Management Pack

[62]

Now that the VMware Aria Operations Management Pack for Kubernetes has been installed, we will review some of the functionality it provides.

Navigate to Dashboards

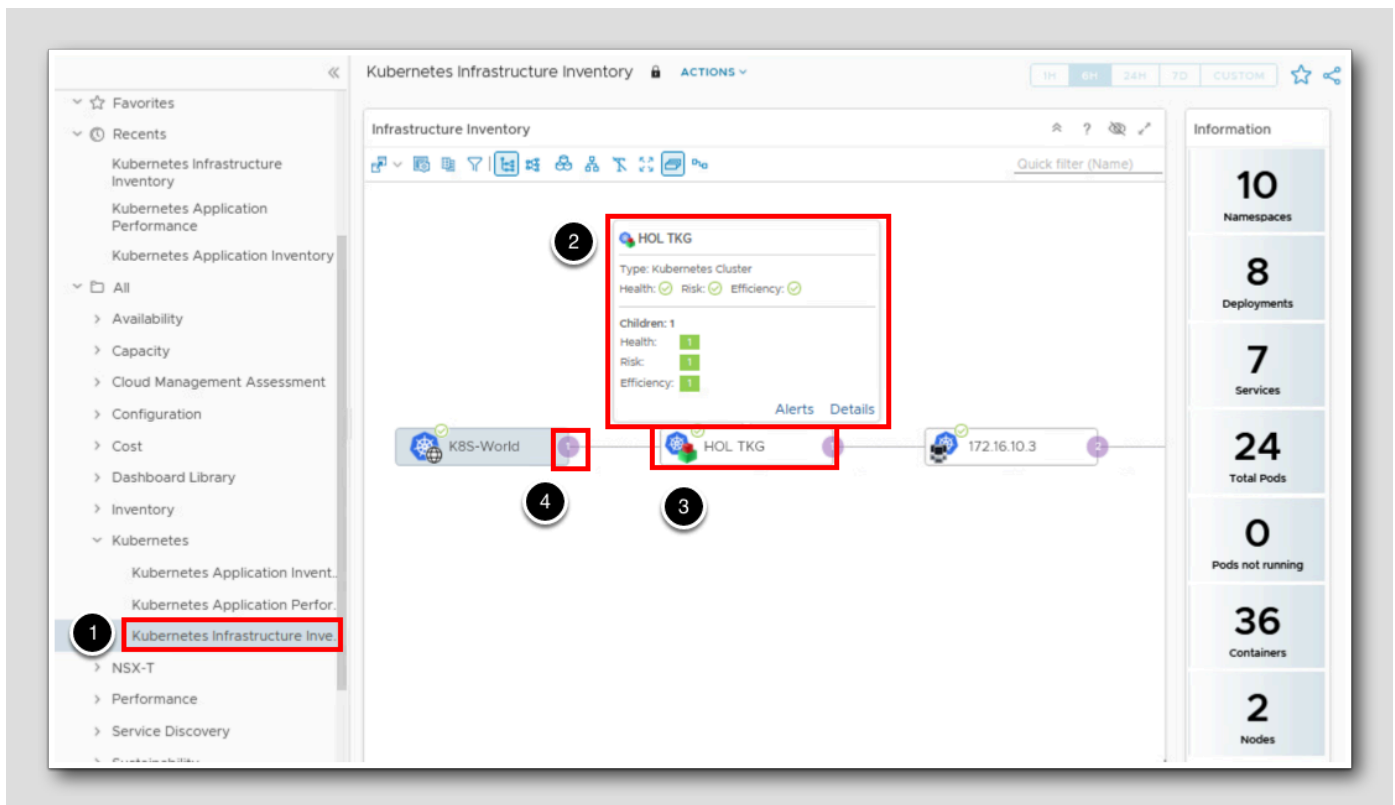
[63]



1. Click **Visualize** in the left navigation menu to expand the Visualize category.
2. Click **Dashboards**.
3. In the Dashboards list, click **All** to expand it.
4. Click **Kubernetes** to open the category and see the provided Kubernetes dashboards.

View Kubernetes Infrastructure Inventory Dashboard

[64]



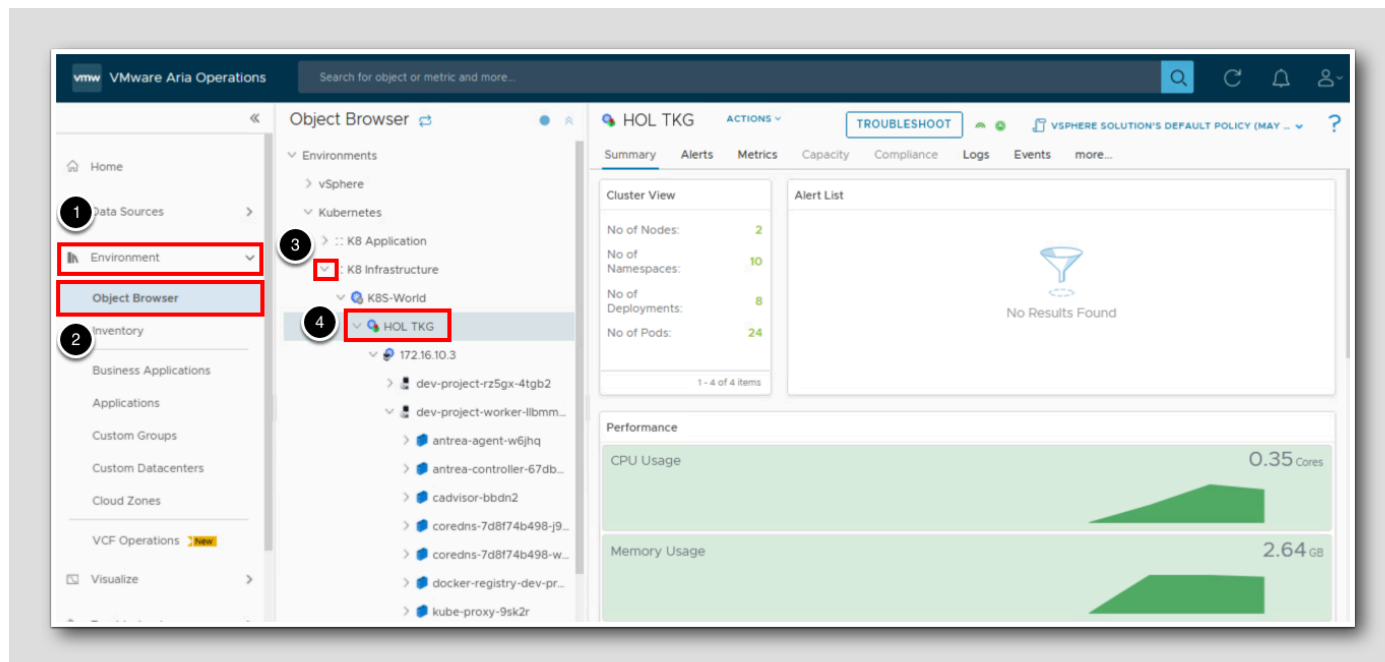
1. In the Kubernetes dashboard list, click on **Kubernetes Infrastructure Inventory** to open the dashboard.

This dashboard shows a visualization of the Kubernetes environment discovered by Aria Operations.

2. **Mouse over** any of the objects in this visualization to see a popup showing the overall health of the object.
3. Click on an **individual object** in the visualization, and the Information view on the right will update accordingly.
4. Click on the **purple circles** containing numbers to collapse or expand the view.

The other dashboards in this list (Kubernetes Application Inventory and Kubernetes Application Performance) similarly allow for visibility into running pods, namespaces, and workloads.

Navigate to Object Browser



1. Click on **Environment** in the left navigation menu.
2. Click on **Object Browser**.
3. The Object Browser listing now includes Kubernetes components. Click the > next to Kubernetes to expand this menu, and then click the > next to K8 Infrastructure.

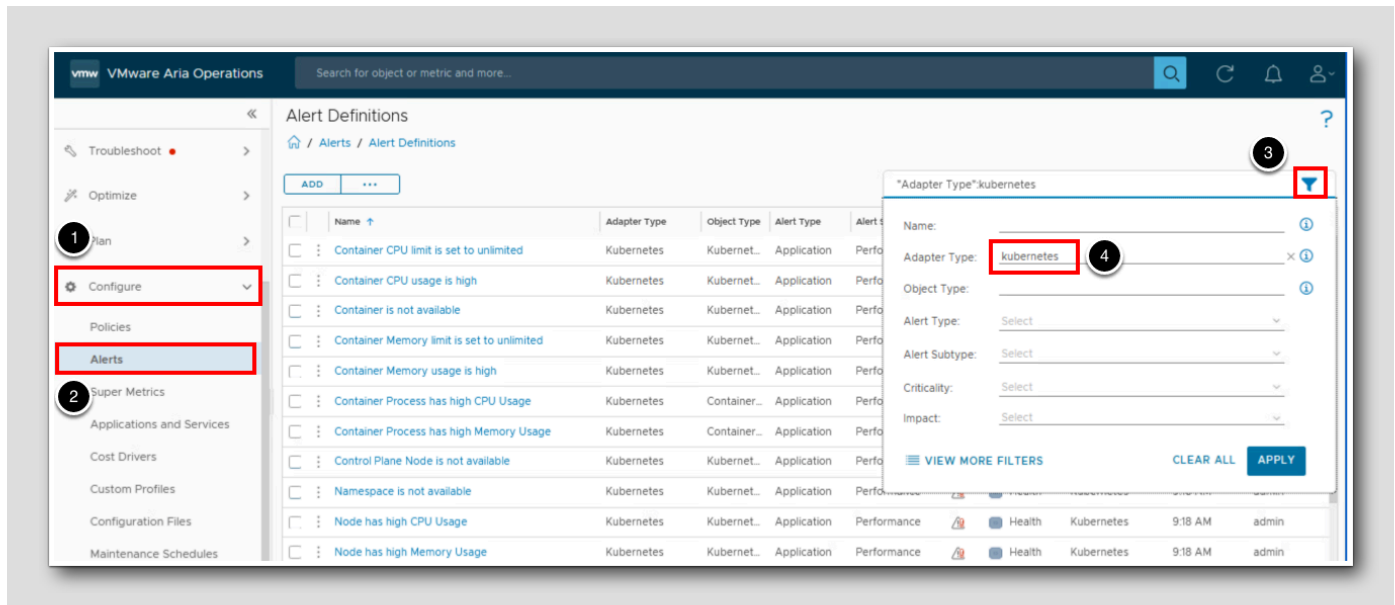
As with the vSphere environment, we can continue to expand the Kubernetes objects to drill down into the TKG supervisor, then to the deployed Tanzu Kubernetes Cluster, to the control plane and worker nodes for this cluster, and to running pods.

4. Click on **HOL TKG** to open the Summary view for the HOL TKG supervisor.

Scroll down to see all of the data provided for this object. We can click on the other objects in the Object Browser inventory to view similar summaries.

View Provided Alerts

[66]



As with other management packs, the Management Pack for Kubernetes provides alerts in addition to dashboards and object views.

1. Click on **Configure** in the left navigation menu.
2. Click **Alerts** and then click **Alert Definitions** (not shown) to open the alert definitions list.
3. Click the **Filter** icon in the filter search bar.
4. For **Adapter Type**, type **kubernetes** and press **Enter**.

The listed alerts are provided by the Management Pack for Kubernetes. Feel free to click on any alert to view more detail, including symptoms and recommendations also provided by this management pack.

Conclusion

[67]

In this module, we installed and reviewed the VMware Aria Operations Management Pack for Kubernetes. With the management pack installed, we were able to view some of the additional data that VMware Aria Operations is able to collect and display, and how it correlates to the rest of the environment.

You've finished the module

[68]

Congratulations on completing the lab module.

For more information on getting started with Aria Operations, see the [VMware Aria Operations: Journey to Success](#) guide at the [VMware Apps & Cloud Management Tech Zone](#).

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 3 - Advanced Capacity Management (30 minutes) Intermediate

Introduction

[70]

In Aria Operations, capacity settings play a crucial role in effectively managing and optimizing the utilization of your infrastructure resources which is essential for effective resource management and optimization.

We will provide an understanding of various capacity settings so we can ensure efficient utilization of your infrastructure resources while maintaining high availability and minimizing risks.

At the end of this lab we will have discussed these topics:

- Capacity Models and Algorithms
- Configuring Policy Settings
- Criticality Thresholds
- Allocation Model vs. Demand Model
- Risk Level (Conservative vs. Aggressive)
- HA and Buffers
- Business Hours

Remember, customizing these settings based on your organization's unique requirements is key to achieving optimal results.

Log in to Aria Operations

[71]

We will log in to a live instance of Aria Operations running in this lab.

Open the Firefox Browser from the Windows Task Bar

[72]

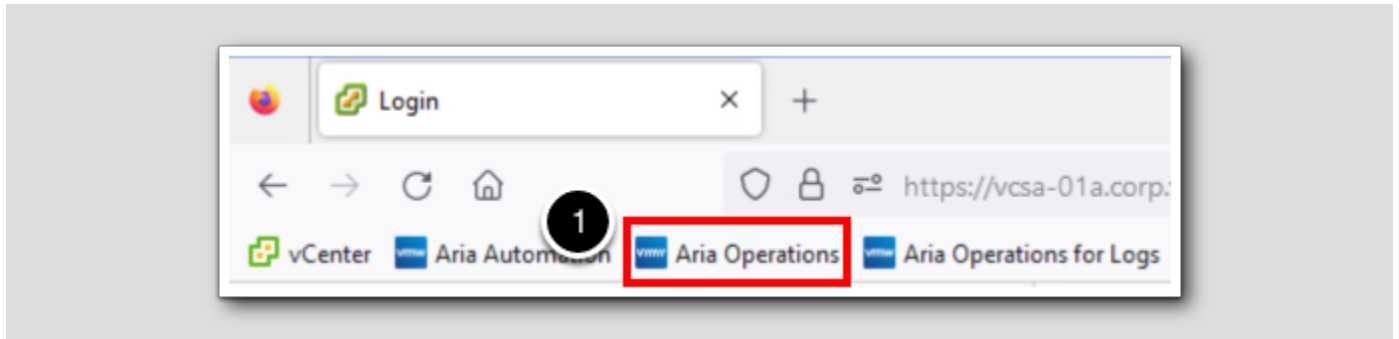


If the browser is not already open, launch Firefox.

1. Click the **Firefox** icon in the Windows Quick Launch Task Bar at the bottom of the screen.

Navigate to Aria Operations

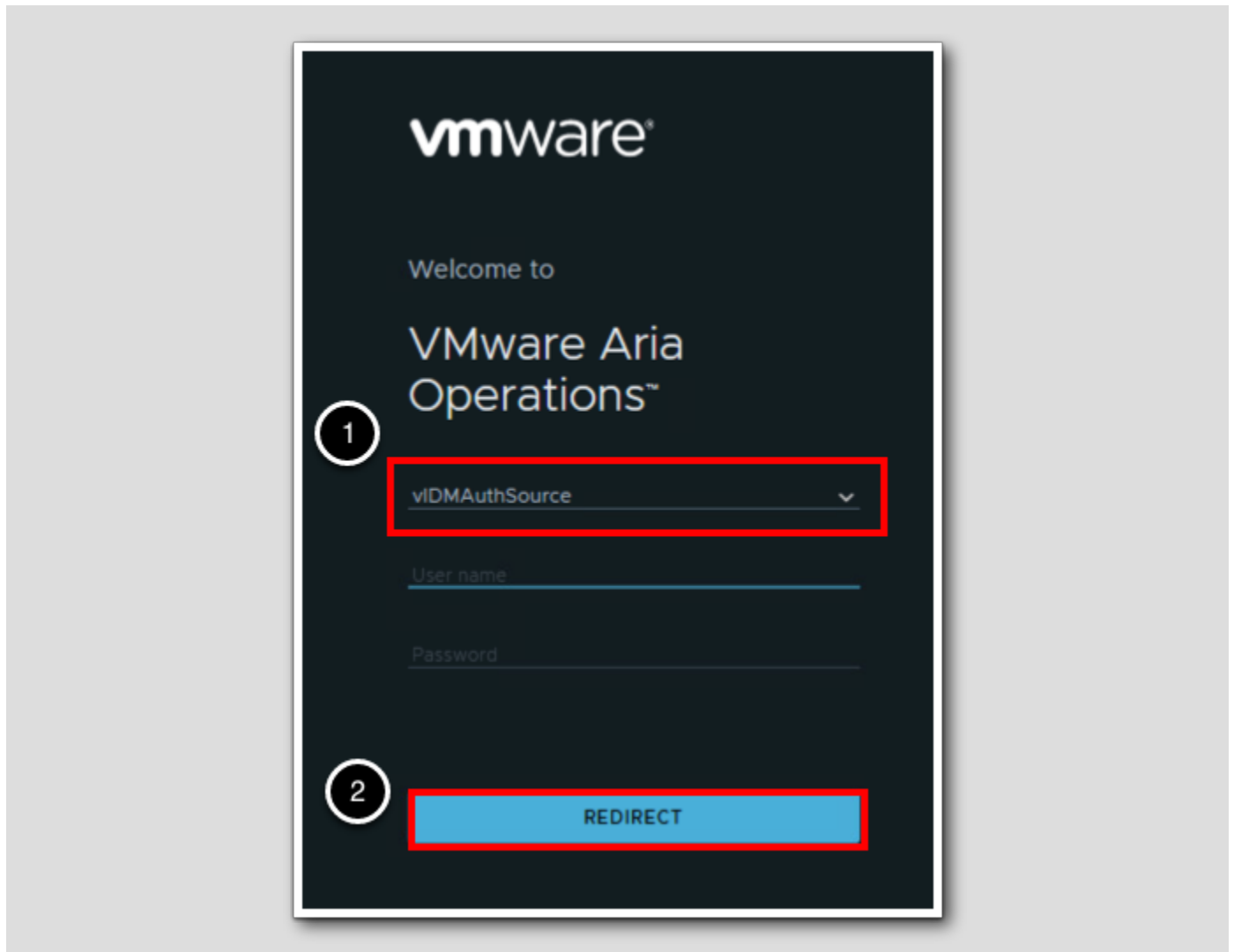
[73]



1. Click the Aria Operations bookmark in the bookmarks toolbar.

Log in to Aria Operations

[74]



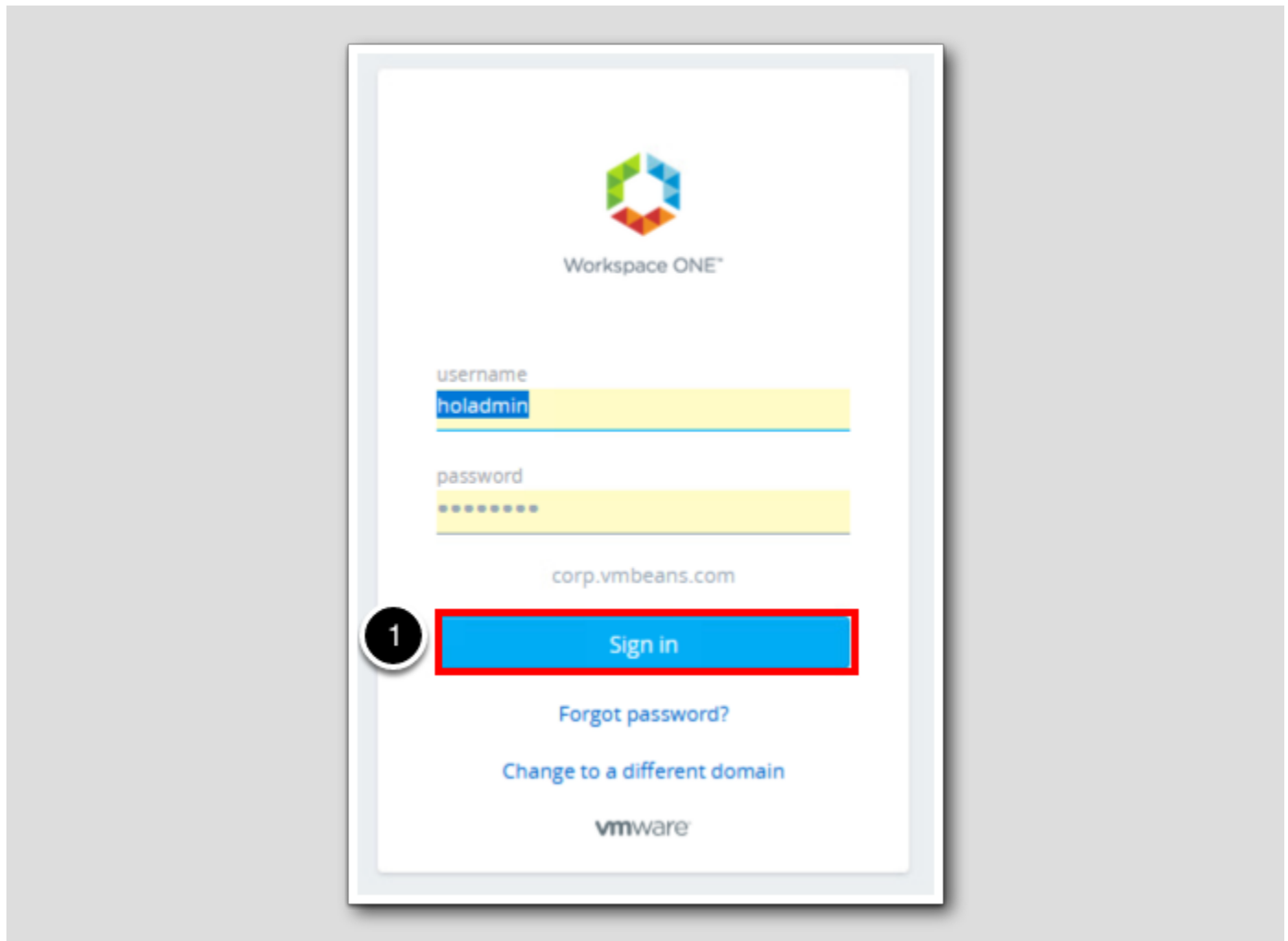
Aria Operations is integrated with VMware Workspace ONE Assist (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

vIDMAuthSource may be pre-selected as the default identity source. If it is not, then you will need to select it.

1. Click the **drop-down arrow** and select vIDMAuthSource if it is not already selected.
2. Click **REDIRECT** to be taken to the authentication page.

VMware Identity Manager Login

[75]



VMware Identity Manager acts as the identity provider for the Active Directory authentication source in this lab. The credentials `holadmin/VMware1!` for the default user, `holadmin`, have already been provided.

1. Enter `holadmin` into the username field.
2. Into the password field, Enter `VMware1!`
3. Click Sign in

Understanding Capacity Settings

[76]

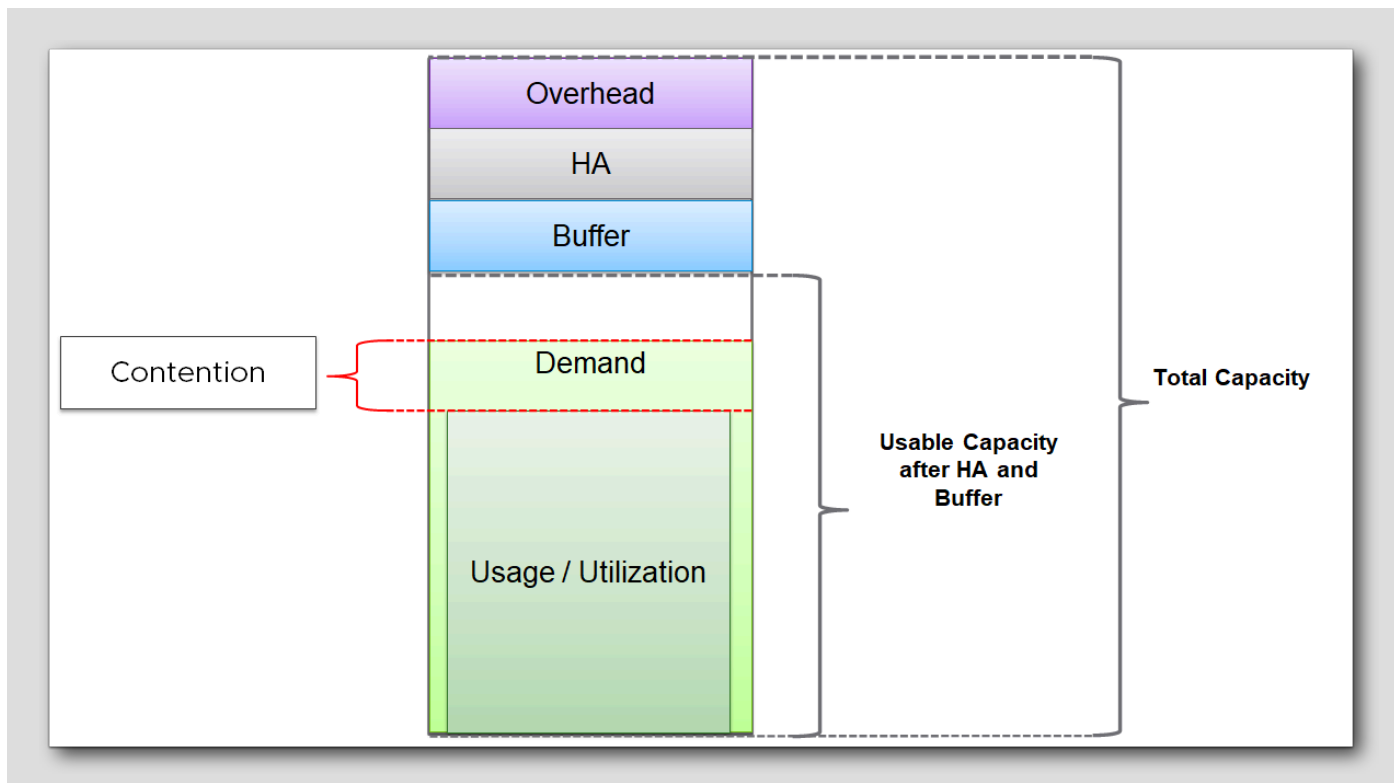
In this lesson, we'll look at VMware Aria Operations **Capacity Management**. We'll discuss what it is, how the engine works, predictions, and policies. This will include some images and reading to help explain things.

VMware Aria Operations uses an advanced capacity engine to predict resource needs based on industry data, preventing resource deficits.

With Aria Operations, you can view both current and projected capacity across your private cloud, and unlike vCenter's real-time resource view, Aria Operations offers forward-looking analytics for proactive planning.

Aria Operations Capacity Definitions

[77]

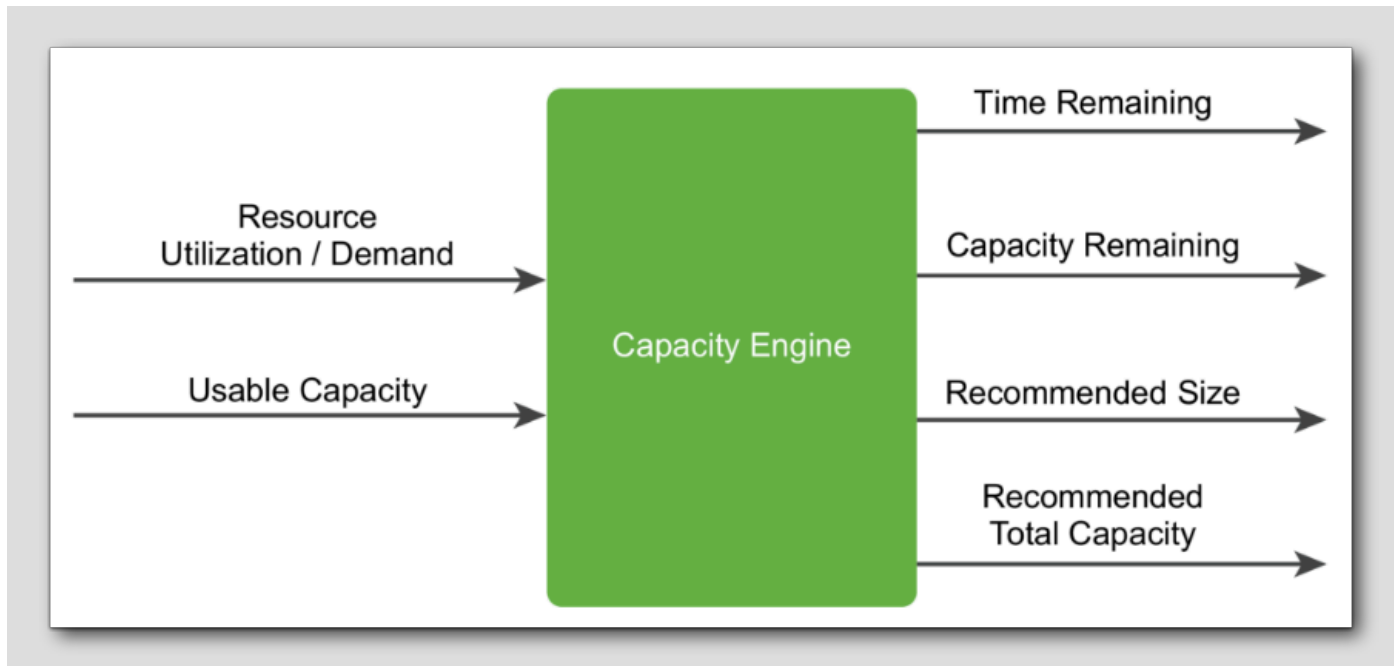


Definitions

- Total Capacity: All available resources (CPU, memory, disk space, IOPS) in the environment.
- Usage: Resources presently utilized by VMs and system services.
- Demand: Resources needed by VMs; equals usage unless a resource is constrained.
- Usable Capacity: Total capacity minus a buffer set aside for workload spikes.
- Usable Capacity after HA and Buffer: Usable capacity less resources reserved for HA failover.

Capacity Engine and Calculations

[78]



The capacity engine analyzes historical utilization and projects future workload by using real-time predictive capacity analytics, which is based on an industry-standard statistical analysis model of demand behavior. The image shows how Demand and Usable Capacity are used to estimate certain output metrics.

Inputs:

- Demand
- Usable Capacity

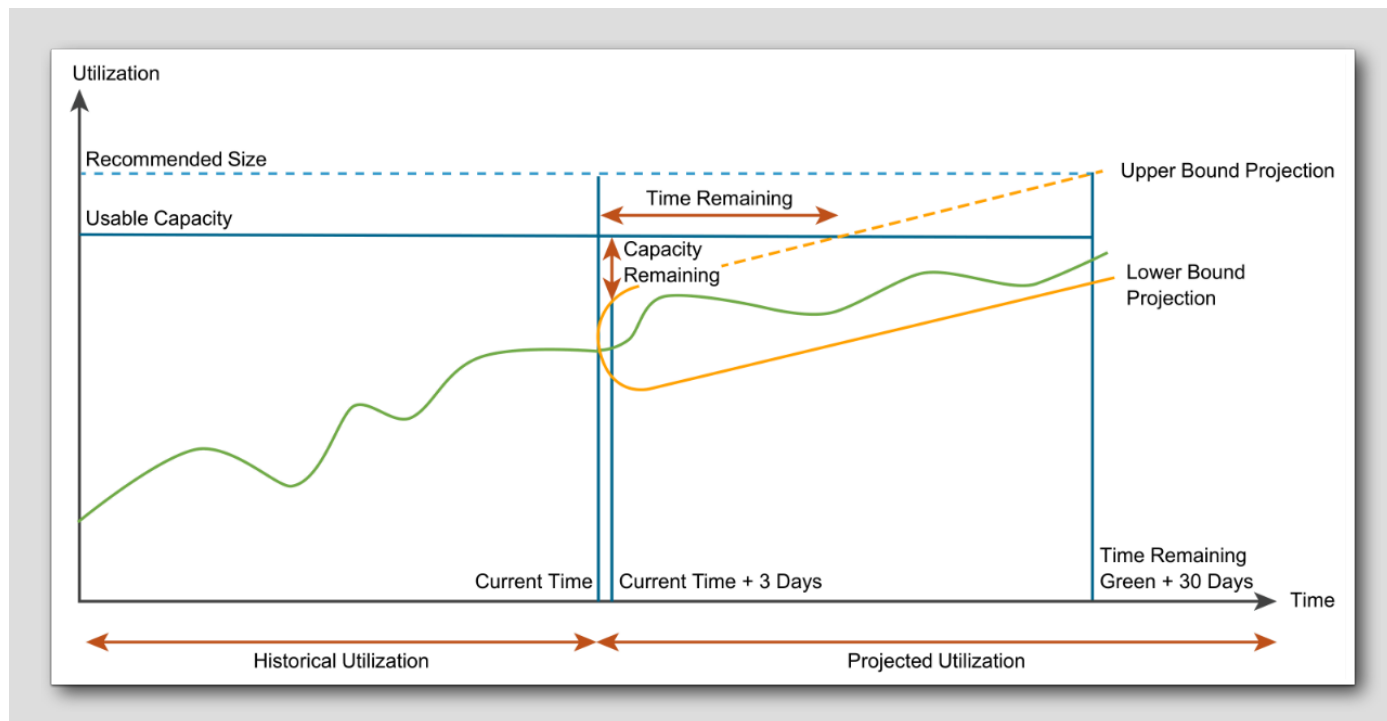
Outputs:

- **Time Remaining:** Days until usable capacity threshold is exceeded or estimated time before full utilization.
- **Capacity Remaining:** Available capacity. Difference between current capacity and projected use in the next 3 days. If over 100% used, it's 0
- **Recommended Size:** Optimal resource configuration. Predicted need for 150 days ahead, excluding HA settings. Aria Operations caps this:
 - **Oversized:** Max 50% of current. If 8 vCPUs use only 10% CPU, reclaim just 4 vCPUs, not 7.
 - **Undersized:** Max 100% of current. If 4 vCPUs are always busy, only add 4 vCPUs, not 8.
- **Recommended Total Capacity:** Required future capacity. Predicted need for 150 days ahead, including HA settings.

Projection

Metrics helps us with workload management, resource allocation, and capacity planning. The projection window for the capacity engine is 1 year into the future. The engine consumes data points every 5 minutes to ensure real-time calculation of output metrics.

Projection - Conservative Risk



The figure shows the capacity calculations for a *conservative risk level*.

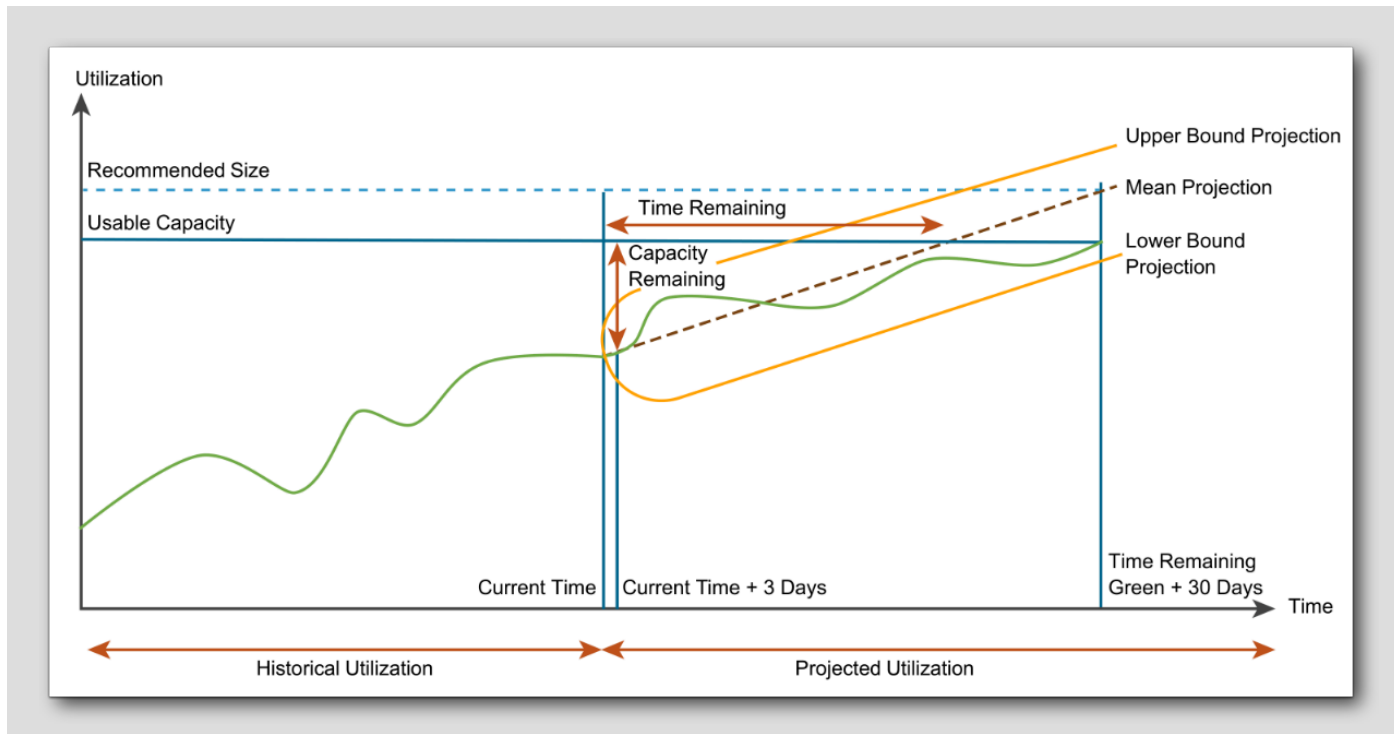
Conservative Risk Level

In Aria Operations, capacity calculations can be adjusted based on the desired risk level, allowing you to customize the level of conservatism in capacity planning. Capacity calculations at a conservative risk level prioritize stability, ensuring ample resources for future growth and potential spikes in demand. This setting takes a more cautious approach to capacity planning, allowing for more headroom and buffer in resource allocations. It may result in lower consolidation ratios and higher resource overhead.

Conservative risk level settings can also be adjusted typically in the capacity planning or policy settings, where you can specify the desired level of conservatism.

Upper bound / Lower bound: Upper bound projection and lower bound projection are concepts used in forecasting and predicting future values or trends. The capacity engine projects the future workload in a range. Capacity calculations are based on the time remaining and risk level. The engine considers the upper bound projection for a conservative risk level and the *mean* of the upper bound projection and lower bound projection for an aggressive risk level.

Projection - Aggressive risk



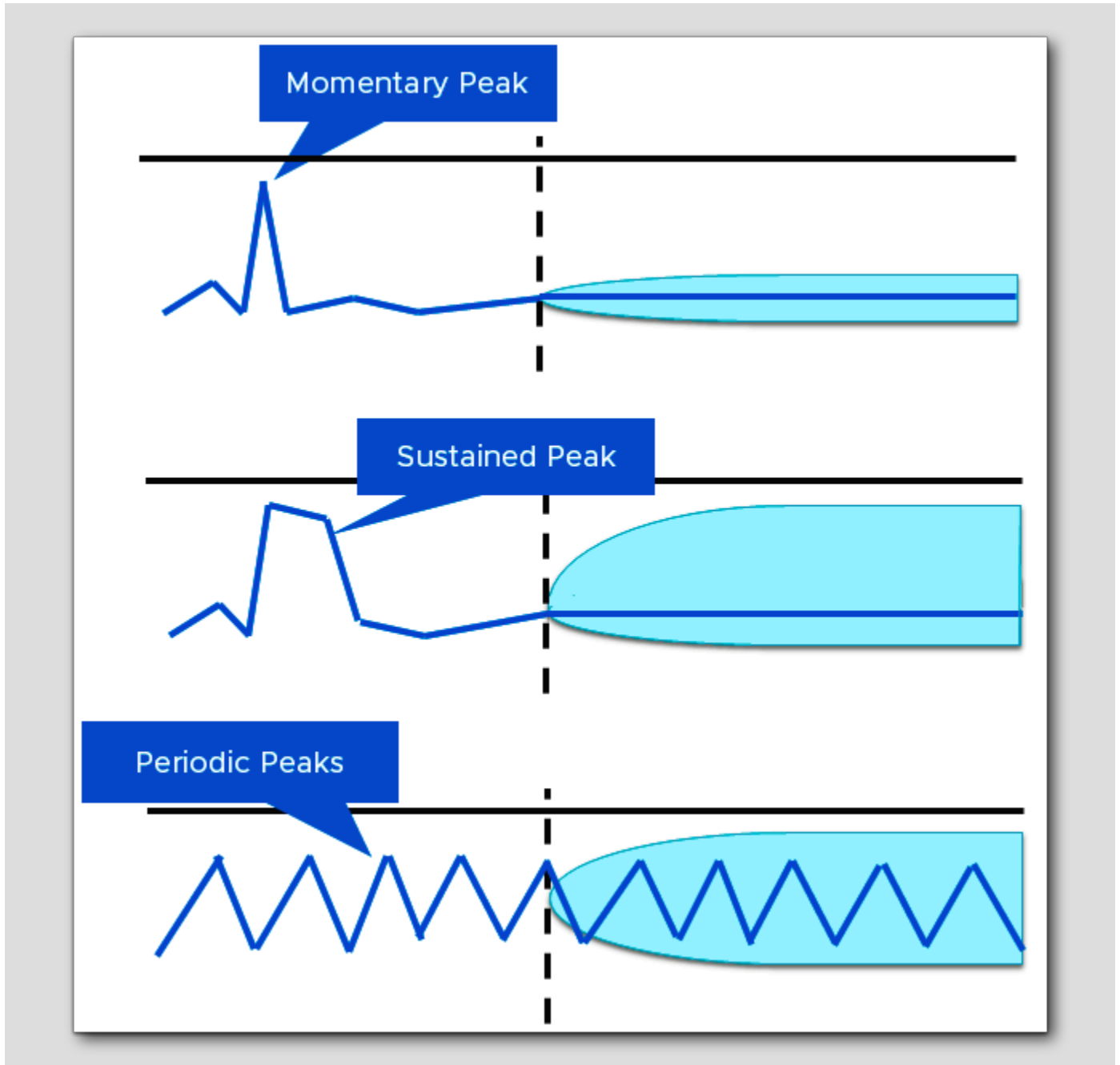
Aggressive Risk Level:

- Capacity calculations at an aggressive risk level aim to **maximize resource utilization and minimize overhead**.
- This setting assumes a higher tolerance for risk and allows for more aggressive allocation of resources.
- It may result in higher consolidation ratios and tighter resource utilization.

Aggressive risk level settings can be adjusted typically in the capacity planning or policy settings, where you can specify the desired level of aggressiveness.

Utilization Peaks

[81]



The historical utilization of resources can have peaks, which are periods of maximum utilization. The projection of future workload depends on the types of peaks. According to the frequency of peaks, they can be momentary, sustained, or periodic.

Momentary Peaks

Short-lived peaks that are a one-time occurrence. The peaks are not significant enough to require additional capacity, so they do not impact capacity planning and projection.

Sustained Peaks

Peaks that last for a longer time and impact projections. If a sustained peak is not periodic, the impact on the projection lessens over time because of exponential decay.

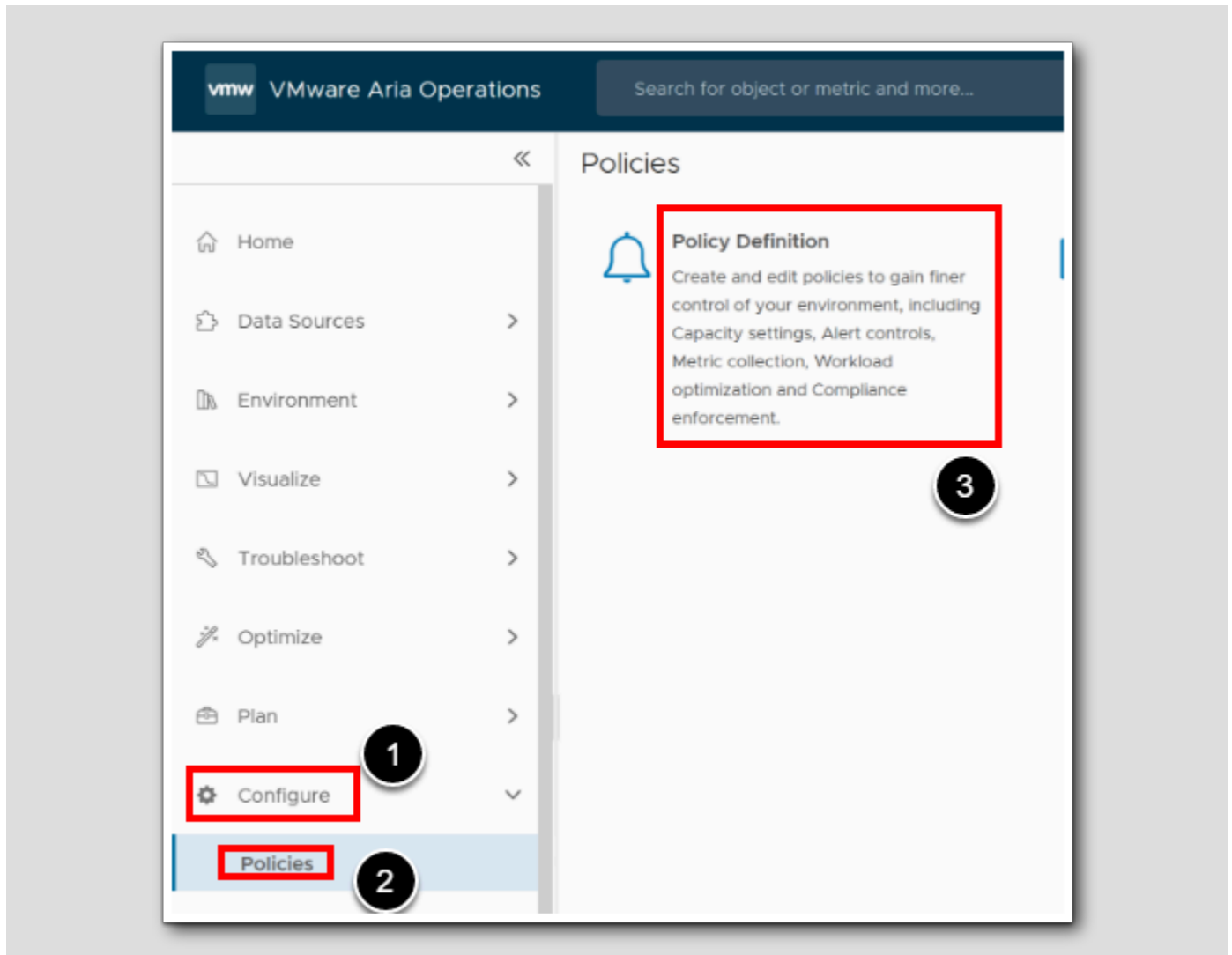
Periodic Peaks

Peaks that exhibit cyclical patterns or waves. The peaks can be hourly, daily, weekly, monthly, during the last day of the month, and so on. The capacity engine also detects multiple overlapping cyclical patterns.

Let's see if we can find these settings in the policy...

Capacity Policy

[82]



Let's have a look at the policy

1. Click **Configure**
2. Click **Policies**
3. Click **Policies Definition**

Edit Policy definition

The screenshot shows the 'Policy Definition' page in VMware vSphere. A table lists various policies. The 'vSphere Solution's Default Policy (May 12, 2023 10:12:11 AM)' is highlighted in blue. A red box highlights this row. A context menu is open over the ellipsis menu (three dots) in the top left, with 'Edit' selected. Red arrows and numbered callouts (1, 2, 3) indicate the steps: 1. Highlight the policy row, 2. Click the ellipsis menu, 3. Click Edit.

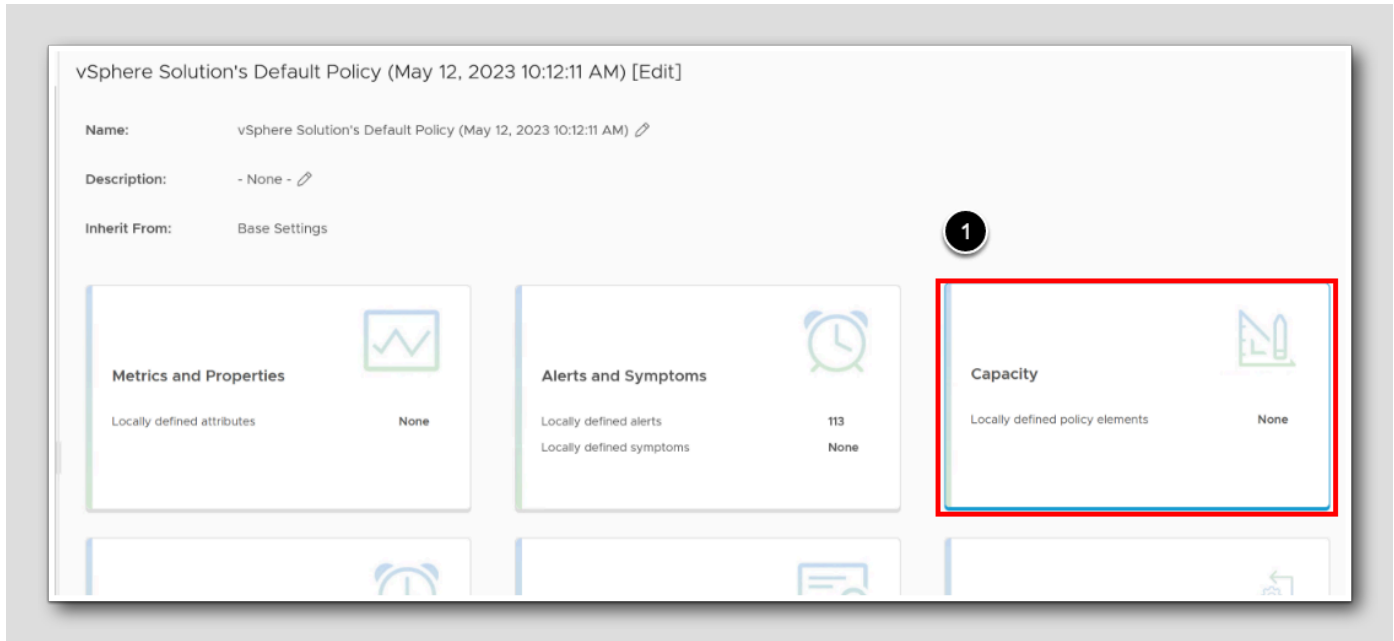
Name	Status	Priority
Bas...	Inactive	
> Bas...	Inactive	
Bas...	Inactive	
HOL Policy	Inactive	
NSX-T Security Configuration Guide	Inactive	
Policy for Virtual Machines - Risk Profile 1	Inactive	
Policy for Virtual Machines - Risk Profile 2	Inactive	
Policy for Virtual Machines - Risk Profile 3	Inactive	
vSAN Security Configuration Policy	Inactive	
vSphere Security Configuration Guide	Inactive	
vSphere Solution's Default Policy (May 12, 2023 10:12:11 AM)	Active	D

We are going to edit the default policy, but normally you would have multiple policies for multiple purposes.

1. In the policy list, find and highlight the **Status Active** and **Priority Default (D)**
2. Click the **ellipsis menu**
3. Choose **Edit**

Go to Capacity

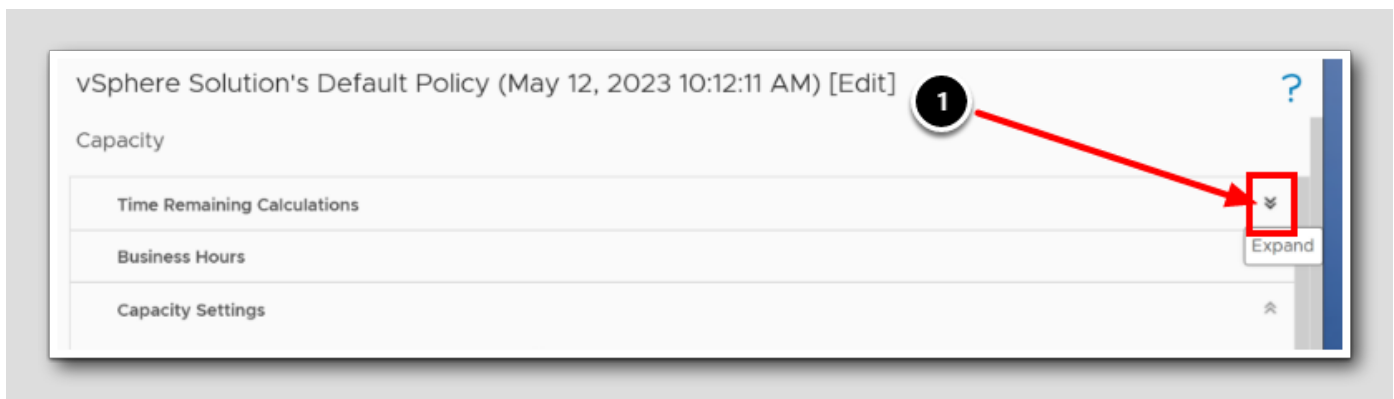
[84]



1. Click Capacity

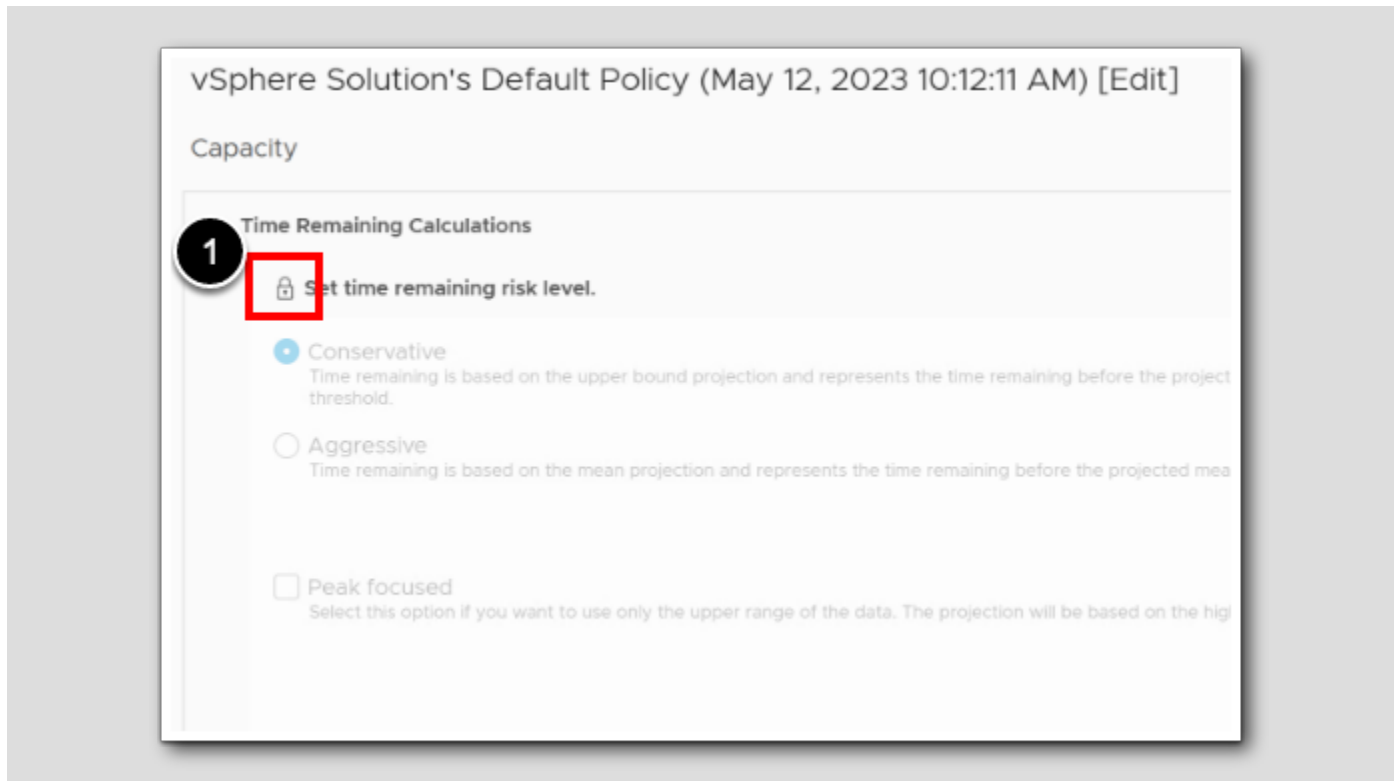
Expand first section

[85]



1. If we scroll to the top, we will see Time Remaining Calculations, Click the Expand Arrows

Open the settings



The capacity settings for host systems, virtual machines, and other object types that you select appears in the workspace.

1. To open the settings, Click on the **padlock**

Conservative time remaining

Capacity

Time Remaining Calculations

Set time remaining risk level.

Conservative **1**
Time remaining is based on the upper bound projection and represents the time remaining before the projected upper bound crosses the usable capacity threshold.

Aggressive
Time remaining is based on the mean projection and represents the time remaining before the projected mean crosses the usable capacity threshold.

Peak focused **2**
Select this option if you want to use only the upper range of the data. The projection will be based on the high utilization points.

3 **Conservativeness Level**
Levels: 3
[-] [+]

Now

— Historical Utilization
- - - Conservative (Upper Bound)
- - - Usable Capacity
— Projection

You can set the risk level for the time that is remaining when the forecasted total need of a metric reaches usable capacity.

1. To use the option for production and mission-critical workloads, we select **Conservative**.
2. Unselect **Peak focused**: Select this option if you want to use only the upper range of the data. The projection will be based on the high utilization points.
3. **Conservativeness Strength ***: You can tune the level of Conservativeness Level from 1-5, with level 1 being the least conservative and level 5 being the most conservative. By default, the level of conservativeness is set to 3.
Leave the Conservativeness Level at level 3

Rare and momentary peaks may be considered outliers and may not impact the projections even at the most conservative risk level.

* **Conservativeness strength** is supported by the Conservative risk level. The Aggressive risk level produces Time Remaining, Capacity Remaining, Recommended Size metrics always based on the mean of the projection.

The **upper bound** will vary based on the level of conservativeness that you choose. Modifying the level of conservativeness will make the projection bounds narrower or wider. Higher the level, the wider the bounds and more conservative the projections for Time Remaining, Capacity Remaining, and Recommended Size.

Aggressive Time Remaining

Capacity

Time Remaining Calculations

Set time remaining risk level.

Conservative
Time remaining is based on the upper bound projection and represents the time remaining before the projected upper bound crosses the usable capacity threshold.

Aggressive
Time remaining is based on the mean projection and represents the time remaining before the projected mean crosses the usable capacity threshold.

Peak focused
Select this option if you want to use only the upper range of the data. The projection will be based on the high utilization points.

Now

— Historical Utilization
- - - Aggressive (Mean)
- - - Usable Capacity
— Projection

Conservativeness Level

Levels: 3

You can set the risk level for the time that is remaining when the forecasted total need of a metric reaches usable capacity. Let's change from Conservative to Aggressive.

1. For non-critical workloads, select **Aggressive**.
2. Unselect **Peak focused**: Select this option if you want to use only the upper range of the data. The projection will be based on the high utilization points.

Note: The **Aggressive** risk level produces Time Remaining, Capacity Remaining, Recommended Size metrics always based on the mean of the projection. You see this demonstrated in the little illustration on the right.

Saving and Exiting

[89]

The screenshot displays the 'vSphere Solution's Default Policy (May 12, 2023 10:12:11 AM) [Edit]' configuration page. The 'Capacity' section is active, showing 'Time Remaining Calculations' with three radio button options: 'Conservative', 'Aggressive' (selected), and 'Peak focused'. A legend on the right includes 'Historical Utilization', 'Aggressive (Mean)', 'Usable Capacity', and 'Projection'. Below the legend is a 'Conservativeness Level' control set to 'Levels: 3'. The 'Criticality Thresholds' section is partially visible and marked with a circled '1'. At the bottom, the 'SAVE' button is highlighted with a red rectangle.

1. To save and exit, Click **SAVE**

Comparing Aria Operations with vCenter

FEATURE	ARIA OPERATIONS	VCENTER SERVER
Buffer	Allows setting up a buffer capacity to handle workload spikes	<i>Not provided</i>
Usable Capacity	Calculated by deducting the buffer and overhead from the total capacity	<i>Not provided</i>
Usable Capacity after HA	Calculated by deducting HA reservations from usable capacity	<i>Not provided</i>
What-If Analysis	Allows modeling various scenarios to predict their impact on capacity	<i>Not available</i>
Usage	Amount of resource that is currently being used by your VMs and other system services.	<i>The Same</i>
Demand	Amount of a resource that your VMs would use if there were <u>no constraints</u> .	<i>The Same</i>
Total Capacity	Total amount of a resource in the environment	<i>The Same</i>
Consumed	Resources allocated and used or recently used	<i>The Same</i>
HA (High Availability)	Deducts resources reserved for HA from usable capacity	Configures and manages HA. Doesn't deduct it from displayed capacity!
Overhead	Overhead is deducted from total capacity to calculate usable capacity	Displays overhead usage. Doesn't deduct it from total capacity!
Utilization	Detailed utilization metrics across various timescales	Real-time utilization data
Contention	Contention metrics, useful for identifying overcommitment issues	Real-time contention data. Lacks historical trend analysis!
Entitlement	Approximated using Demand and Allocated Capacity metrics	Amount of a resource a VM is entitled to, based on shares, reservations, and limits
Active	Approximated using the Workload metric	Amount of a resource a VM is actively using
Granted	Approximated using the Demand metric	Amount of a resource that the host has granted to a VM
Capacity Analytics	Advanced analytics for capacity prediction	Very limited capacity analytics
Policy-Based Management	Allows granular control over capacity management based on policies	Resource allocation managed through shares, reservations, and limits but not at the same granular policy-based level!

The table shows a Comparison of capacity-related features in Aria Operations and vCenter Server

Aria Operations is focused on capacity planning and ensuring you have enough resources to meet your workload needs now and in the future, taking into account buffers for workload spikes and HA failovers. vSphere/vCenter terms are more operationally focused, detailing how resources are allocated and used at a given point in time. While vSphere/vCenter gives you the real-time operational perspective, Aria Operations adds the predictive analytics and capacity planning layer that helps you stay proactive and plan for the future.

Note: The 'Usage' and 'Demand' terms are conceptually similar in both Aria Operations and vSphere/vCenter, representing the amount of a resource being used and the amount needed by VMs. However, Aria Operations provides additional capacity metrics (Usable Capacity, Usable Capacity after HA and Buffer) that take into account the extra resources needed to handle workload spikes and HA failover, which vSphere/vCenter does not explicitly provide.

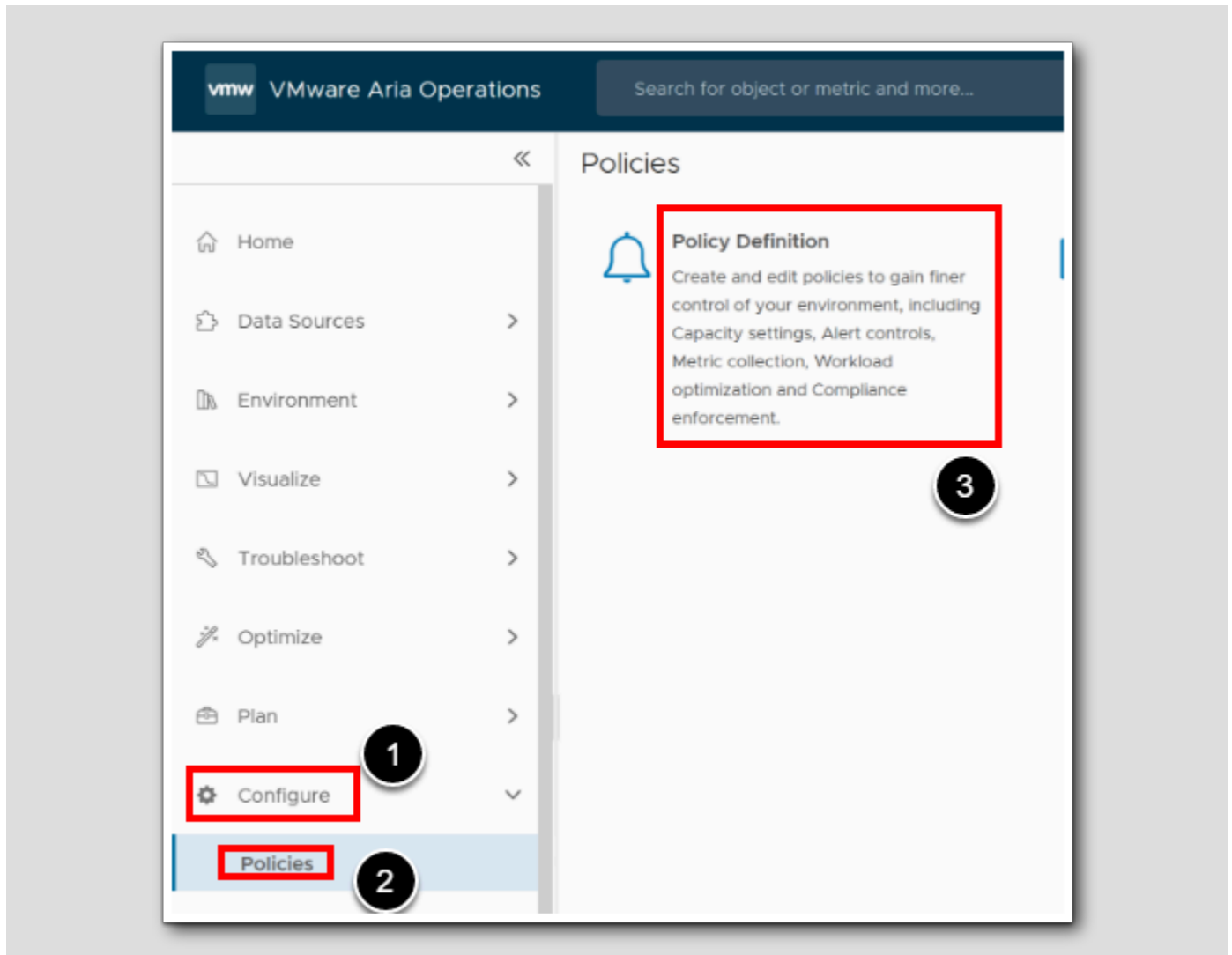
Approximations are used for "Active", "Granted", and "Entitlement" in Aria Operations, and they may not exactly match the vSphere calculations due to the differences in how vSphere and Aria Operations calculate and interpret these metrics.

Configure Policy Settings

During this section we will investigate all the policy settings related to capacity. We have already set the Capacity time remaining calculations to *Aggressive*, meaning that the time remaining is based on the mean projection and represents the time remaining before the projected mean crosses the *usable capacity* threshold. This can be reviewed in the previous section [Projection - Aggressive risk](#)

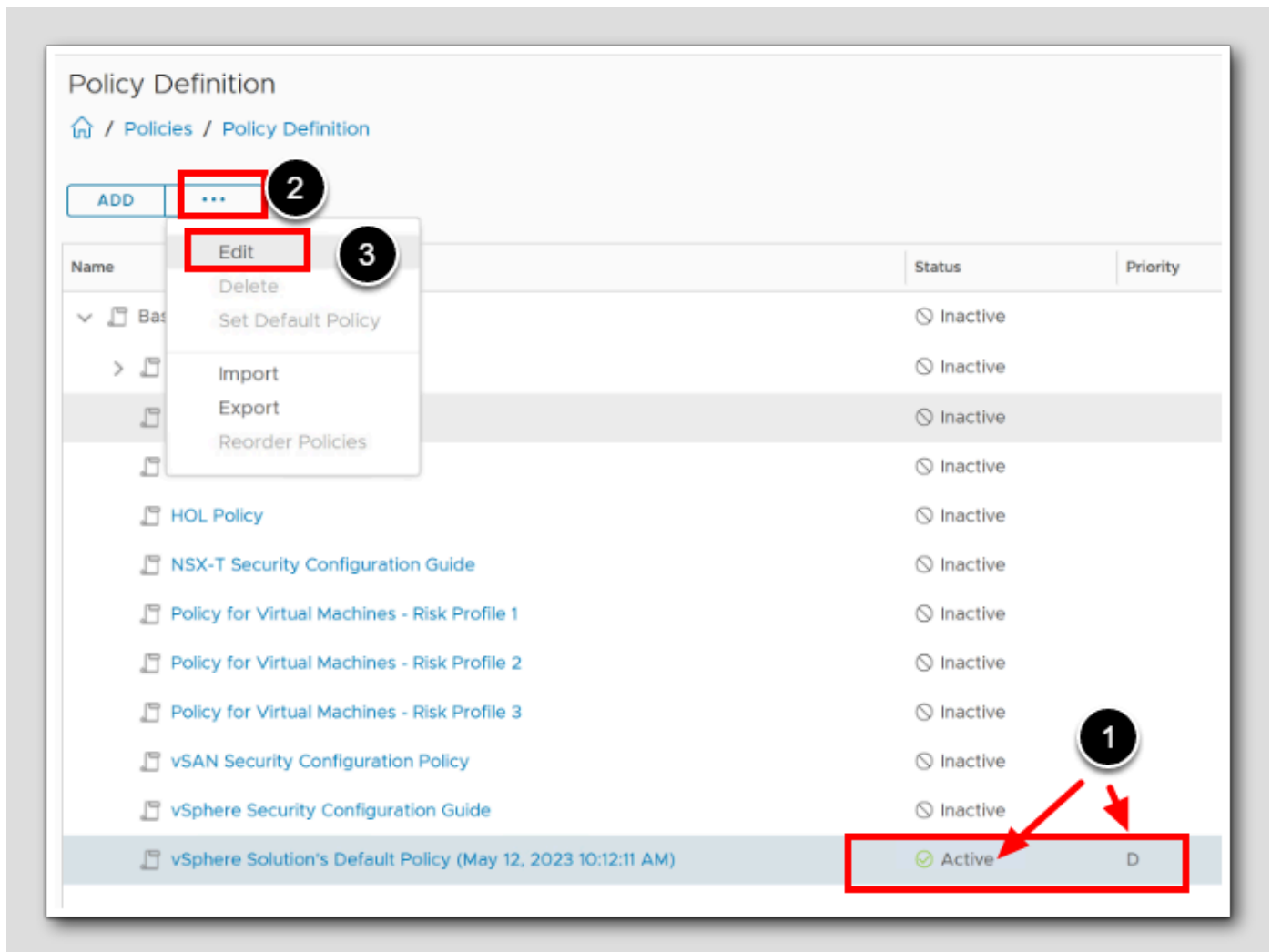
Capacity

[92]



1. Click Configure
2. Click Policies
3. Click Policies Definition

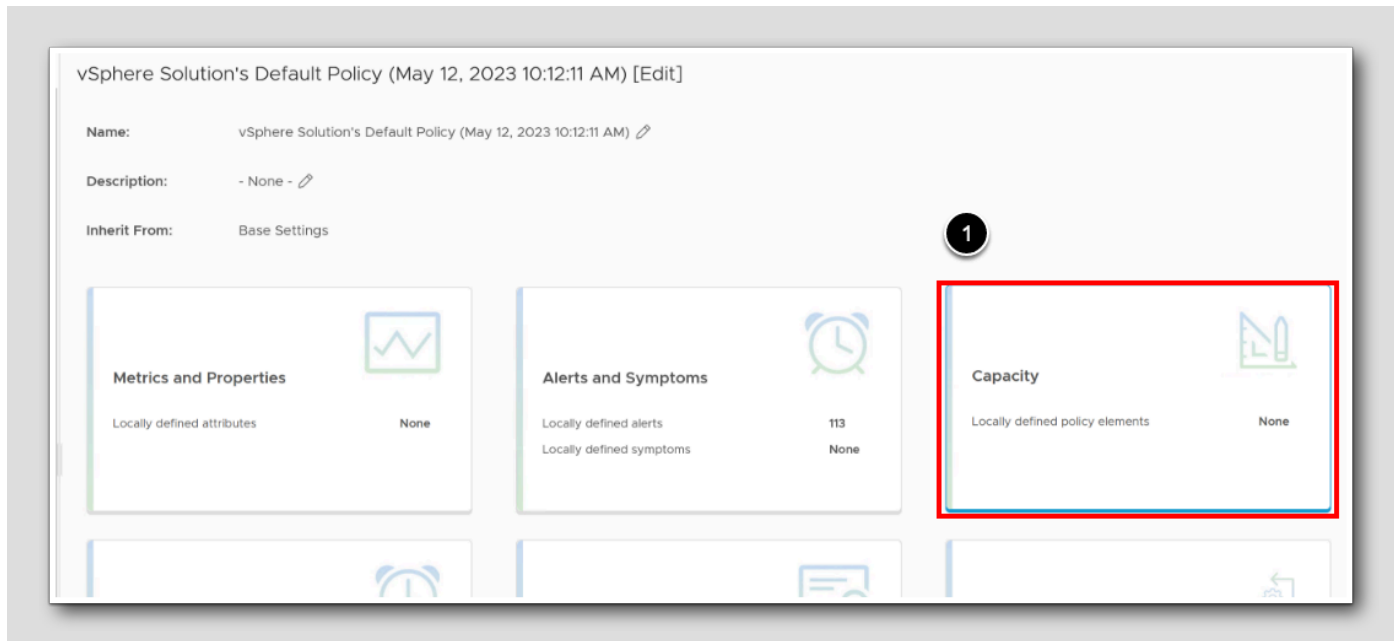
Edit Policy definition



We are going to edit the default policy, but normally you would have multiple policies for multiple purposes.

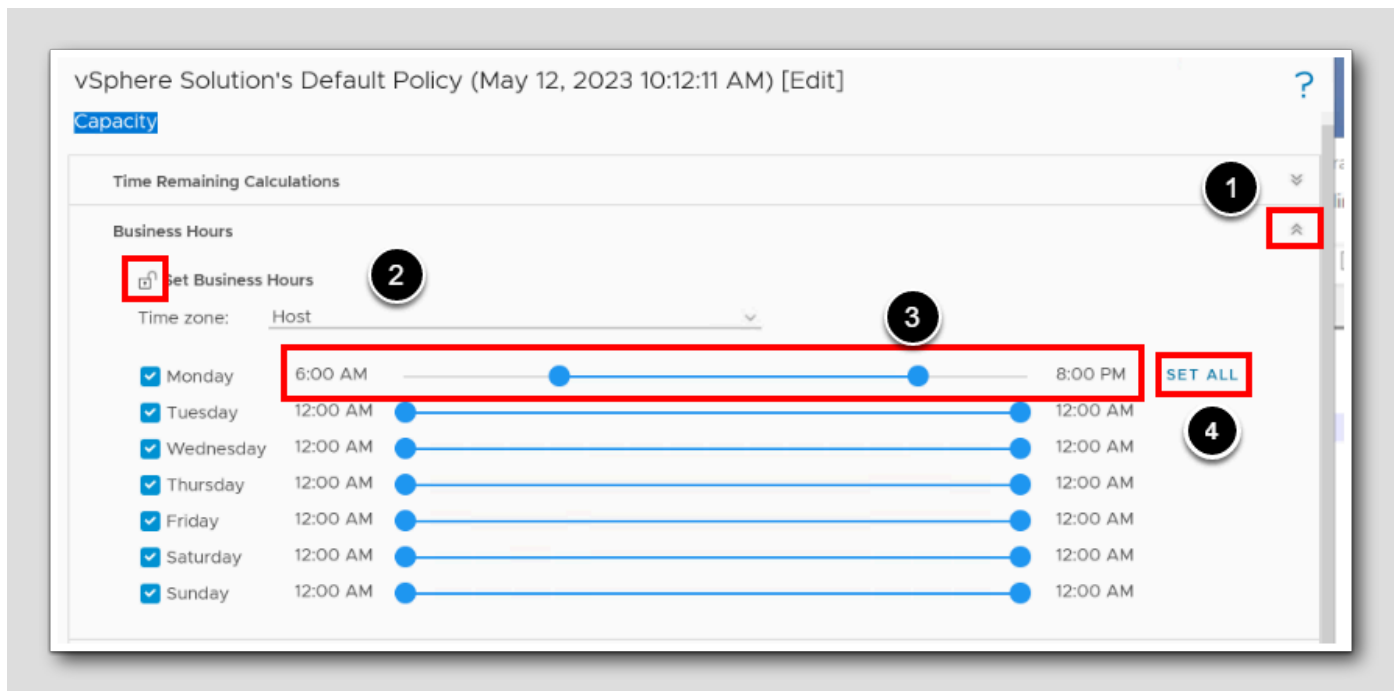
1. In the policy list, find and highlight the **Status Active** and **Priority Default (D)**
2. Click the **ellipsis menu**
3. Choose **Edit**

Go to Capacity



1. Click Capacity

Set business hours



Business Hours Schedule

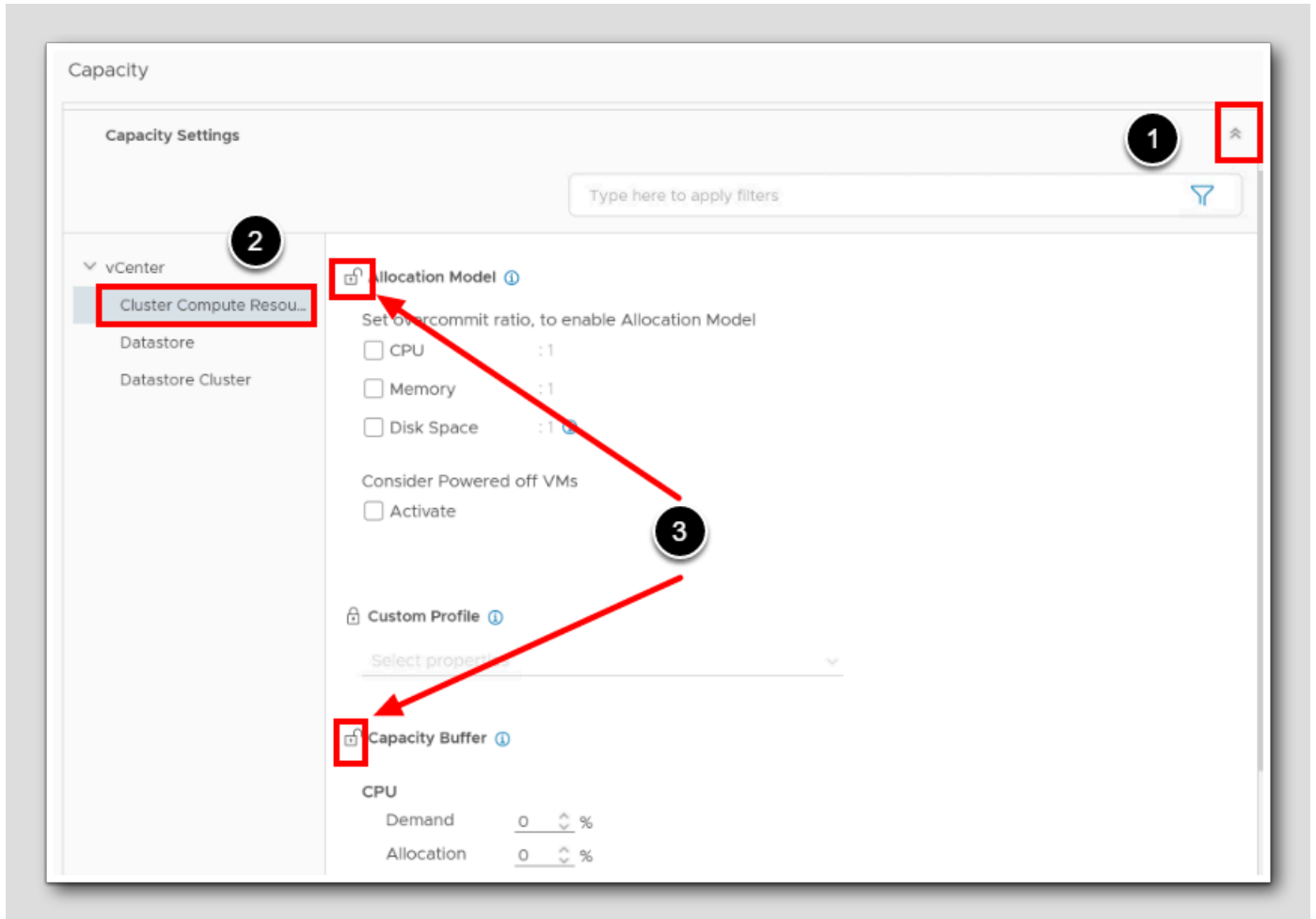
Note: You can set business hours schedule for VMs and clusters only. After you specify business hours, the capacity forecast for the object will be based on the business hours and not 24 hours.

1. Expand **Business Hours**
2. Unlock business hours by clicking the **padlock**
3. Under Monday, set the business hours from **6am** (06:00) to **8pm** (20:00)
4. Click **SET ALL**

Configure business hours according to your time zone for enhanced capacity analysis and projections in VMware Aria Operations. Non-business hour activities on VMs, such as OS upgrades or virus scans, can skew perceived idleness. By setting business hours, off-hour metrics can be effectively analyzed for inventory, compliance, and troubleshooting. Analysis and recommendations for reclamation and rightsizing consider only these hours, ignoring post-business hour spikes. Policies allow different objects to have varied business hours, which are reflected in capacity charts.

Capacity Settings

[96]



Policy elements include:

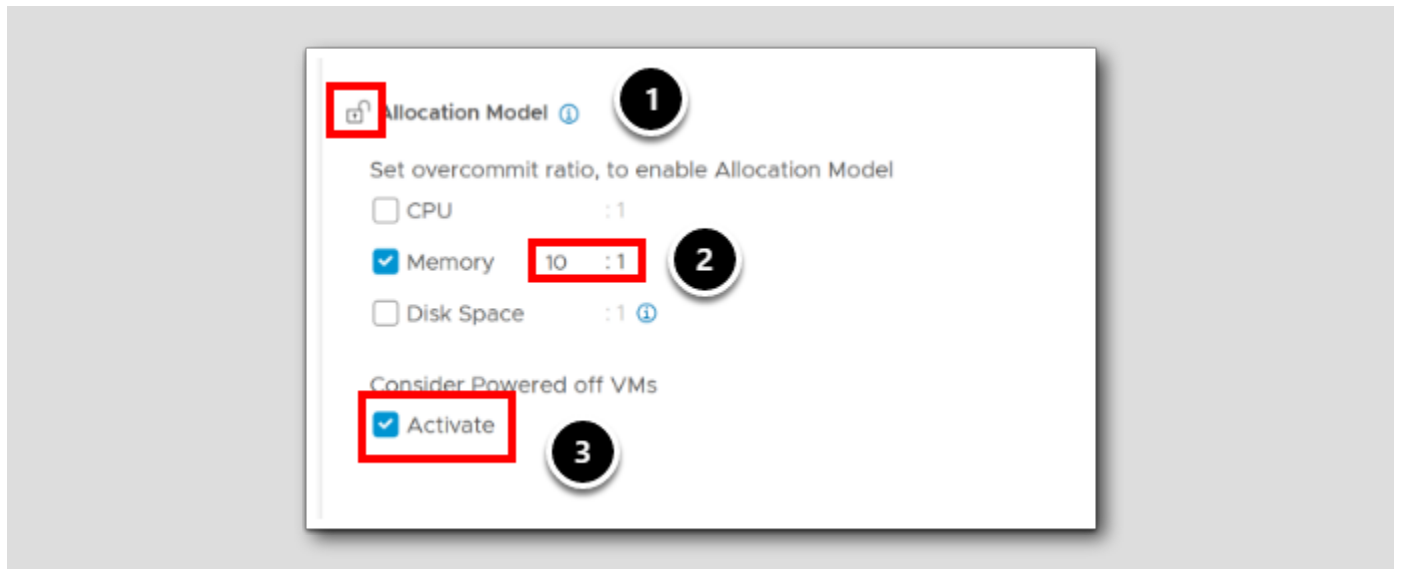
- **Allocation Model:** Allocation Model differs to Demand Model as it does not consider Utilization. It's simply based on configured amount (e.g. 4 vCPU, 16 GB virtual RAM, 100 GB virtual Disk) that is allocated to VMs. As a result, Demand Model is still considered when Allocation is enabled. The Allocation Model in vROps incorporates VM-level resource reservations and limits, calculating resource consumption as the maximum of reservation, limit, or actual usage. Although it offers less accurate real-time resource utilization, it is optimally utilized in chargeback/showback scenarios and environments with strict resource reservation settings. Note: **These settings will also apply to What-If Analysis, Committed Projects, and WLP calculations.**
- **Custom Profile:** Custom Profile is a user defined virtual machine profile, to determine the number of virtual machines which will fit within the remaining capacity.
- **Capacity Buffer:** Buffer reduces the usable capacity. In vSphere Cluster, it's applied after High Availability (HA). Use buffer as safety net in capacity. The Capacity Buffer is a reserved resource pool to handle unexpected demand, reducing usable capacity but enhancing reliability. In a vSphere Cluster, it's applied post-High Availability (HA) calculations. It helps mitigate risk during resource surges and aids accurate capacity planning by reflecting a realistic view of available resources. Buffer size should balance between accommodating unexpected demands and not overly reducing usable capacity.

For more information, have a look at [Projection - Conservative Risk](#) from [Module 3 - Advanced Capacity Management](#)

1. Expand **Capacity Settings**
2. To view the policy elements and settings for the object type (Cluster) so that you can have VMware Aria Operations analyze the object type, **Select Cluster Compute Resource.**
3. Click the padlock icons on the left of each element to override the settings and change the thresholds for your policy. **Unlock Allocation Model and Capacity Buffer**

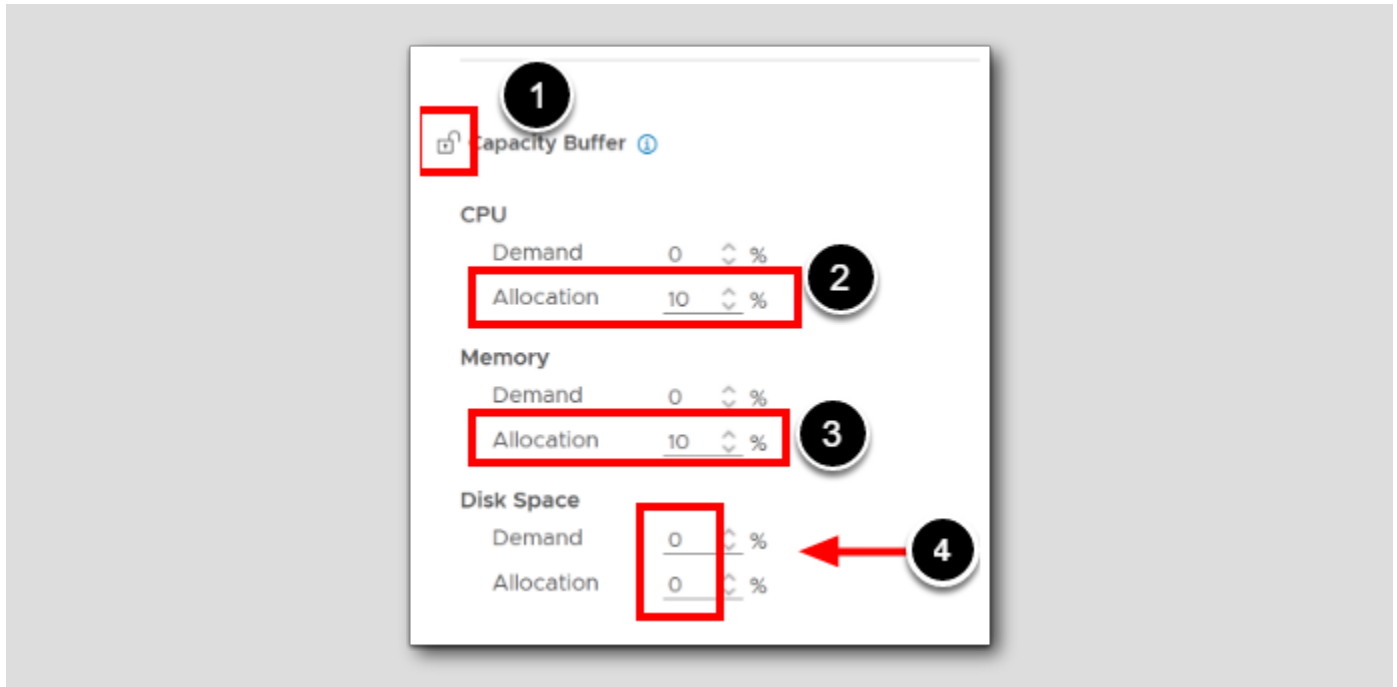
Allocation Model settings

[97]



1. Unlock *Allocation Model* by clicking the padlock
2. For the allocation model settings, set Memory to 10:1
3. Set Consider powered off VMs to Activate

Capacity Buffer Settings



Capacity Buffer is a safety net in capacity to handle unexpected demand enhancing reliability. It helps mitigate risk during resource surges and aids accurate capacity planning by reflecting a realistic view of available resources. Buffer size should balance between accommodating unexpected demands and not overly reducing usable capacity. Let's add a small buffer on CPU Allocation and Memory Allocation.

1. Unlock *Capacity Buffer*, click the padlock
2. Under CPU Allocation add 10%
3. Under Memory Allocation add 10%
4. Whatever disk allocation is set to, do not change it

Criticality Thresholds

[99]

The screenshot displays the vSphere Capacity Criticality Thresholds configuration page. The page title is "vSphere Solution's Default Policy (May 12, 2023 10:12:11 AM) [Edit]". The main section is "Capacity", which includes sub-sections for "Time Remaining Calculations", "Business Hours", "Capacity Settings", and "Criticality Thresholds".

Annotations on the screenshot:

- 1**: A red box highlights the "Criticality Thresholds" section header.
- 2**: A red box highlights the "Cluster Compute Resource" item in the left-hand navigation tree under the "vCenter" category.
- 3**: A red circle highlights a central point where three red arrows originate, pointing to the "Time Remaining", "Capacity Remaining", and "Workload" metrics.

The "Criticality Thresholds" section contains a search bar with the text "Type here to apply filters" and a filter icon. Below this, three metrics are displayed, each with a lock icon and a help icon:

- Time Remaining**: A horizontal bar chart showing a value of 365. The scale ranges from 0 to 120, with a red segment from 0 to 90 and a yellow segment from 90 to 120.
- Capacity Remaining**: A horizontal bar chart showing a value of 100. The scale ranges from 0 to 100, with a red segment from 0 to 5 and a yellow segment from 5 to 10.
- Workload**: A horizontal bar chart showing a value of 100. The scale ranges from 0 to 100, with a red segment from 80 to 90, a yellow segment from 90 to 95, and a green segment from 95 to 100.

Criticality Thresholds allows us to define when an alert should be triggered for a particular symptom based on the severity of a condition. In the policy settings, we set thresholds for each metric Aria Operations collects. Each metric has five threshold levels: **Info**, **Warning**, **Immediate**, **Critical**, and **Alert**. When the value of a particular metric crosses a defined threshold, an alert is triggered. The severity level of the alert corresponds to the severity of the threshold level that the metric has crossed. The criticality thresholds allow you to fine-tune your policies so that you are alerted to potential issues at the right time, allowing you to address them before they have a significant impact on performance.

1. While you still have the policy open in Edit mode, **expand Criticality Thresholds**
2. Select **Cluster Compute Resource**
3. To unlock and override parent policy settings, **click each of the padLocks**

Threshold levels

- **Info**: This threshold is used for informational purposes and typically does not trigger an alert.
- **Warning**: This threshold is set to a value where the system is still functioning normally, but the value of the metric is moving towards a level where it could impact performance.
- **Immediate**: This threshold level indicates that the system might soon experience performance issues if the metric value continues to rise.
- **Critical**: At this threshold level, the system is likely experiencing performance issues. The issues should be addressed immediately to prevent further degradation of performance.
- **Alert**: This is the highest threshold level. At this level, the system is likely experiencing severe performance issues.

Setting the Threshold

[100]



Time Remaining is how many days you have until the utilization projection crosses the usable capacity threshold. It has 2 settings: Conservative and Aggressive.

Capacity Remaining is the % of usable capacity not consumed.

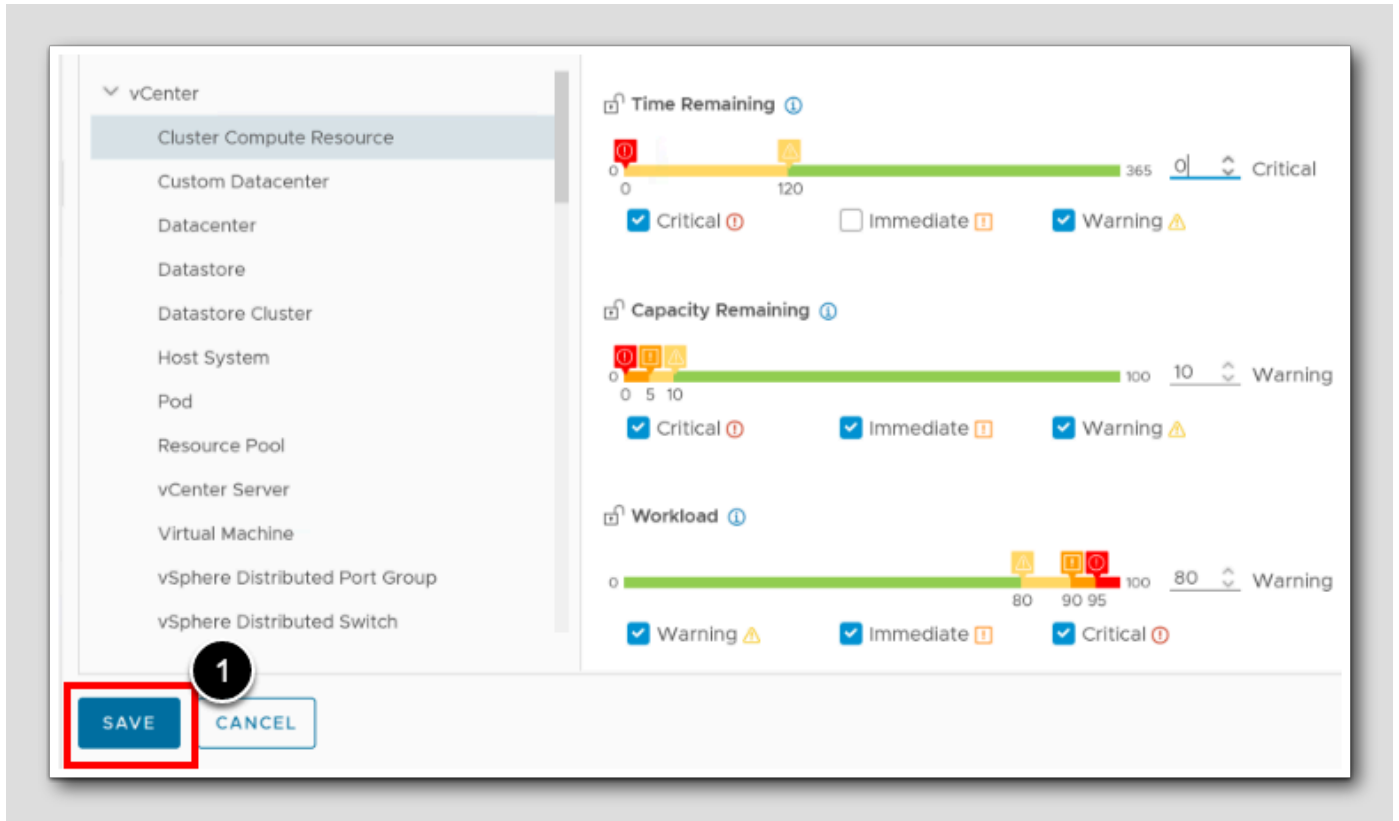
Workload is the immediate % of capacity consumed of the most constrained of several key resource containers. Since workload changes every collection cycle, you can set how many cycles it takes to trigger or clear an alert.

1. Under Time Remaining, Click the red Critical slider
2. Set the value to 0

From what we have learned in this module, could we answer this question: What that does this mean for the utilization projection and when it crosses the usable capacity threshold? What is this early warning system telling us. Look for this later: ****

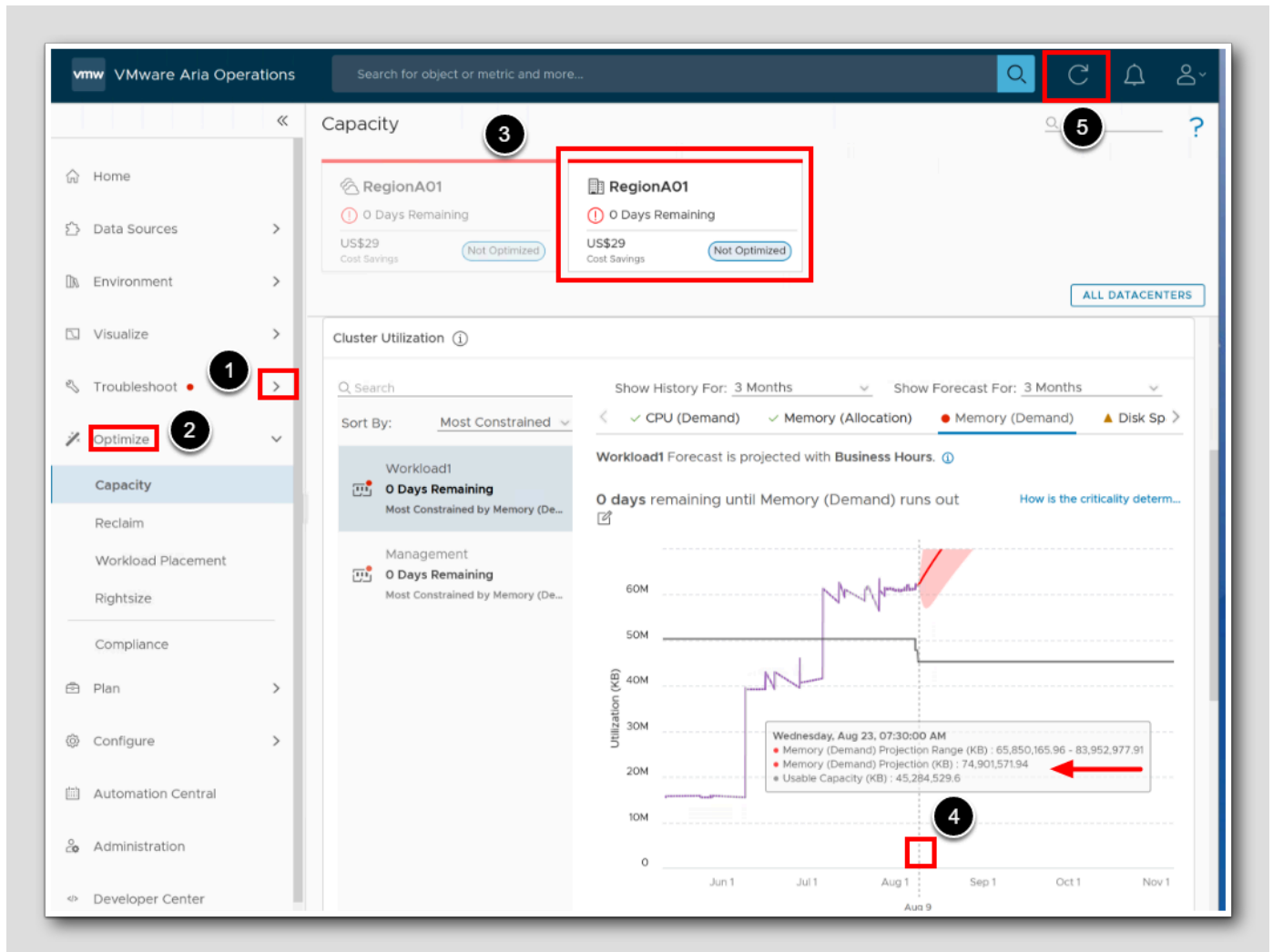
Saving and Exiting

[10]



1. To save and exit, Click **SAVE**

Cluster Utilization



1. Go to the Capacity settings and see what has happened there, click **Optimize**
2. Click **Capacity**
3. Select **RegionA01**

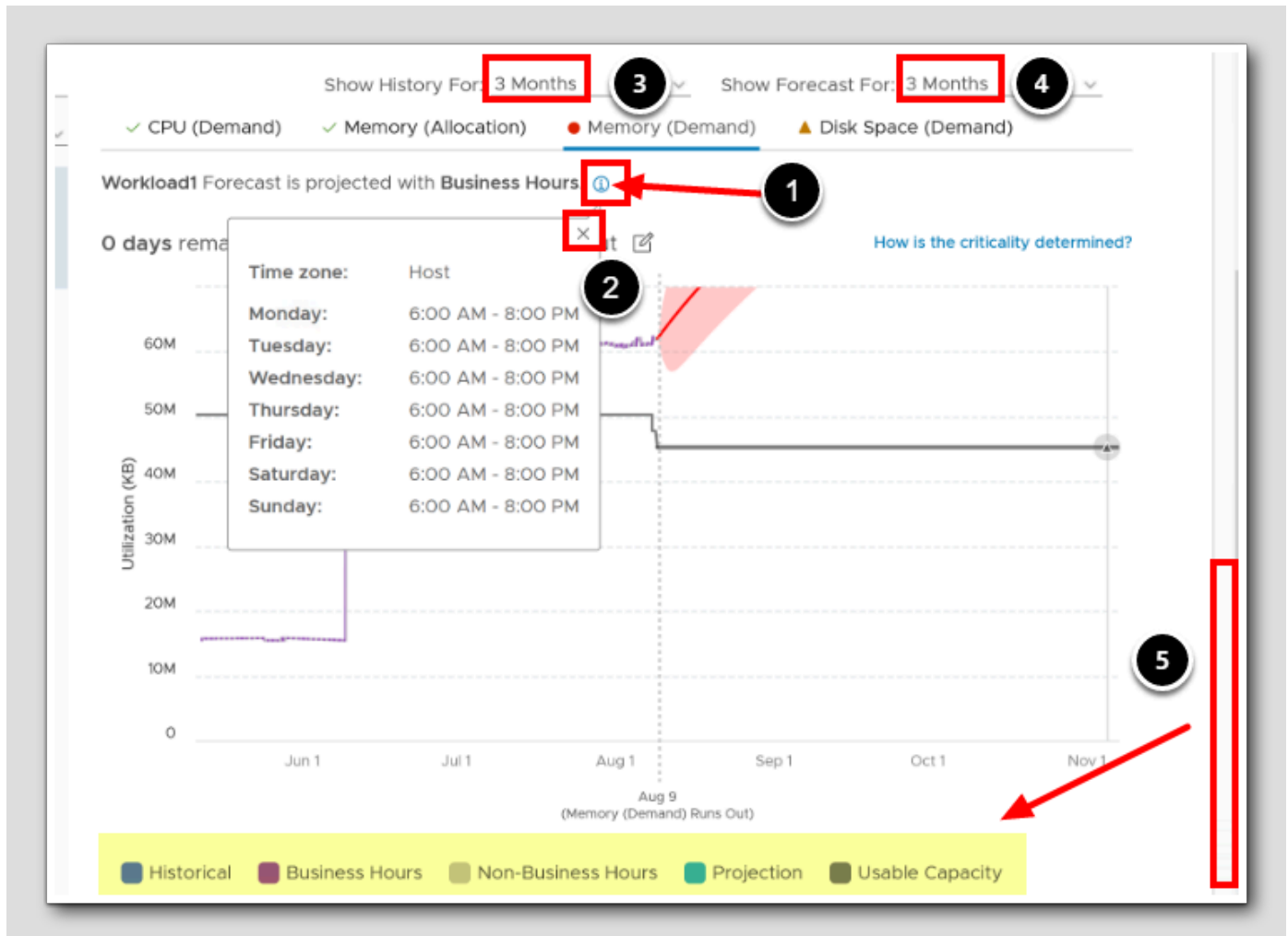
There could be some changes. The Business Hours and that the Risk Level changes needs a collection cycle (a 5 minutes wait). Memory (Demand) is the most constrained.

4. Hover with the mouse over the **Usable Capacity** line.

Notice the values.

5. Click the **refresh** button

Checking the business hours



1. Behind business hours, Click the information button (i)

Notice that the previously values entered in our policy for the business hours are shown

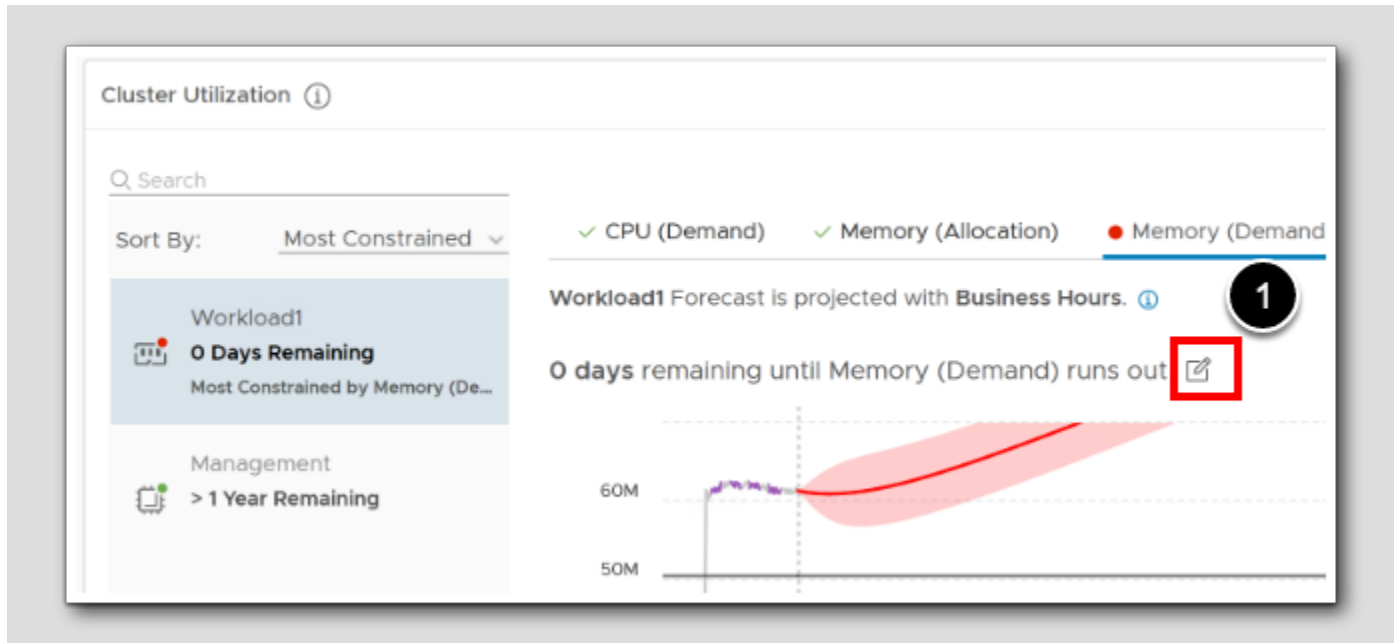
2.To close the business hours preview, Click the 'x'

3.To change the period before forecasting begins (does not impact the forecast calculation). Behind *Show history for* Select 3 months

4.To change the forecast period, behind *Show Forecast For* select 3 Months.

5.Use the scroll bar to reveal the legend to make it more understandable

Revisit the policy settings



1. Behind the x days remaining until Memory (Demand) runs out, click the Edit Icon

Direct policy editing

[105]

Cluster Time Remaining Settings

Affected Policy: vSphere Solution's Default Policy (May 12, 2023 10:12:11 AM)

Criticality Threshold

⚠ Applying these changes affects all clusters in the policy.

Set the time remaining thresholds.

Critical Threshold 0 Days

Warning Threshold 120 Days

Risk Level

⚠ Applying these changes affects all objects in the policy.

Set time remaining risk level.

Conservative
Time remaining is based on the upper bound projection and represents the time remaining before the projected upper bound crosses the usable capacity threshold.

Aggressive
Time remaining is based on the mean projection and represents the time remaining before the projected mean crosses the usable capacity threshold.

Peak focused
Select this option if you want to use only the upper range of the data. The projection will be based on the high utilization points.

Allocation Model

⚠ Applying these changes affects all clusters in the policy.

Set overcommit ratio, to enable Allocation Model

1 **CANCEL** **SAVE**

From this pop-up page you can edit everything related to the policy directly.

1. Click **Cancel** to exit

Conclusion

[106]

Understanding capacity settings in Aria Operations is crucial for effective resource management and optimization. By comprehending capacity models and algorithms, configuring policy settings, setting criticality thresholds, selecting appropriate allocation and demand models, determining risk levels, ensuring high availability and buffers, and considering business hours, you can unlock the full potential of your infrastructure resources while minimizing risks.

Customizing these settings to your organization's unique requirements is key to achieving optimal results.

You have finished Module 3

[107]

Congratulations on completing the lab module.

If you are looking for additional general information on Aria Operations, try one of these:

- **VMware Product Public Page - Aria Operations:** <https://www.vmware.com/products/aria-operations.html>
- **Aria Operations - Documentation:** <https://docs.vmware.com/en/VMware-Aria-Operations/index.html>
- **Aria Operations - Optimize Capacity:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Using-Operations/GUID-62358711-BEA7-4C26-8BB2-8247DDEE03E2.html>

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 4 - Integrating and Troubleshooting with Logs (30 minutes) Advanced

Introduction

[109]

Aria Operations for Logs is commonly integrated with Aria Operations for centralized log management and analysis, and creates a seamless and robust troubleshooting process. **By combining log data with metrics from Aria Operations, we efficiently pinpoint the exact cause of issues, resulting in reduced time-to-resolution.**

Additionally, Aria Operations can enable proactive measures through predefined remediation steps based on logs, addressing specific conditions proactively. In this module we will investigate how to troubleshoot with logs within Aria Operations

We will also learn how to install and configure a linux agent so you can get detailed information from enterprise business applications running on servers with applications for finance, HR, ERP, CRM, mail, web servers, databases, proxy, VPN, authentication, security, backup or simply desktops.

Let's go!

Log in to Aria Operations

[110]

We will log in to a live instance of Aria Operations running in this lab.

Open the Firefox Browser from the Windows Task Bar

[111]

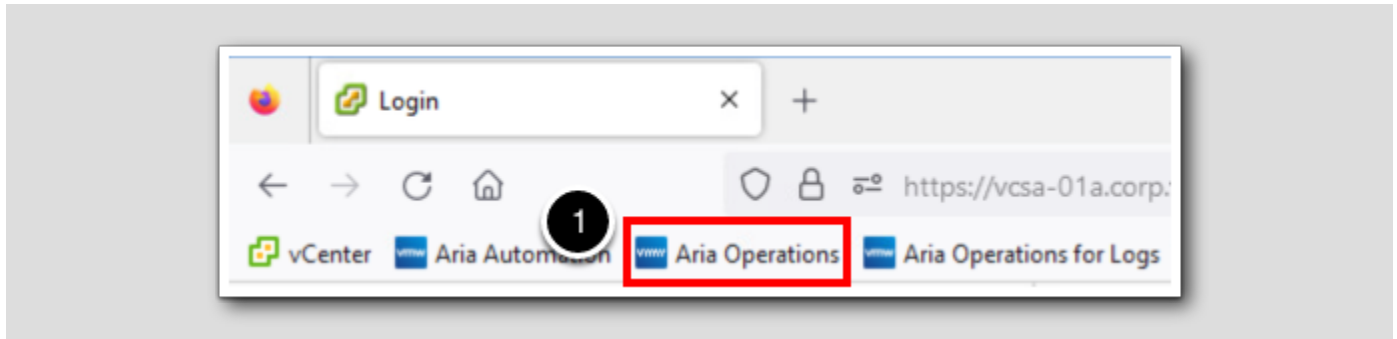


If the browser is not already open, launch Firefox.

1. Click the **Firefox** icon in the Windows Quick Launch Task Bar at the bottom of the screen.

Navigate to Aria Operations

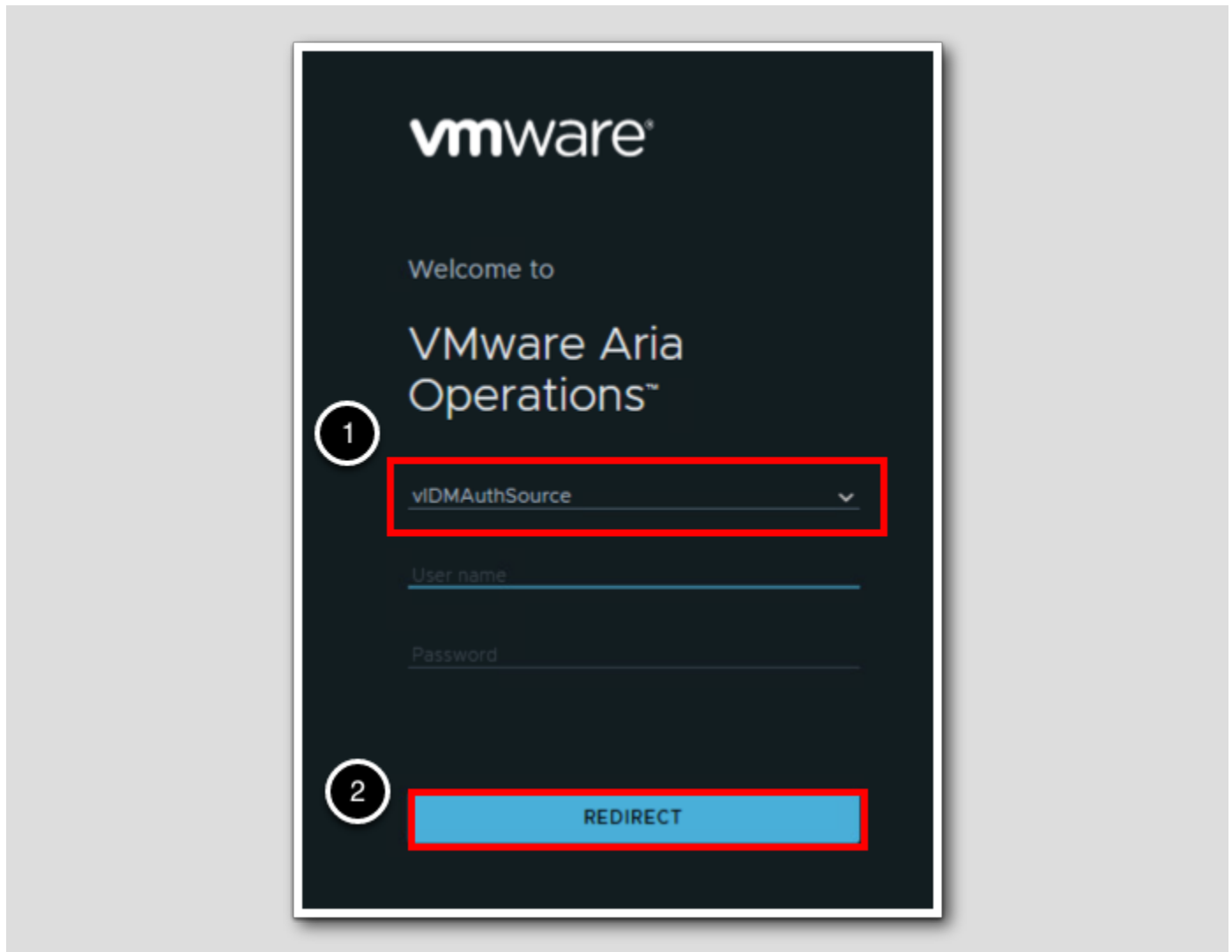
[112]



1. Click the Aria Operations bookmark in the bookmarks toolbar.

Log in to Aria Operations

[113]



Aria Operations is integrated with VMware Workspace ONE Assist (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

vIDMAuthSource may be pre-selected as the default identity source. If it is not, then you will need to select it.

1. Click the **drop-down arrow** and select vIDMAuthSource if it is not already selected.
2. Click **REDIRECT** to be taken to the authentication page.

VMware Identity Manager Login

[114]



VMware Identity Manager acts as the identity provider for the Active Directory authentication source in this lab.

Credentials for the default user, holadmin, have already been provided.

1. Click **Sign in**

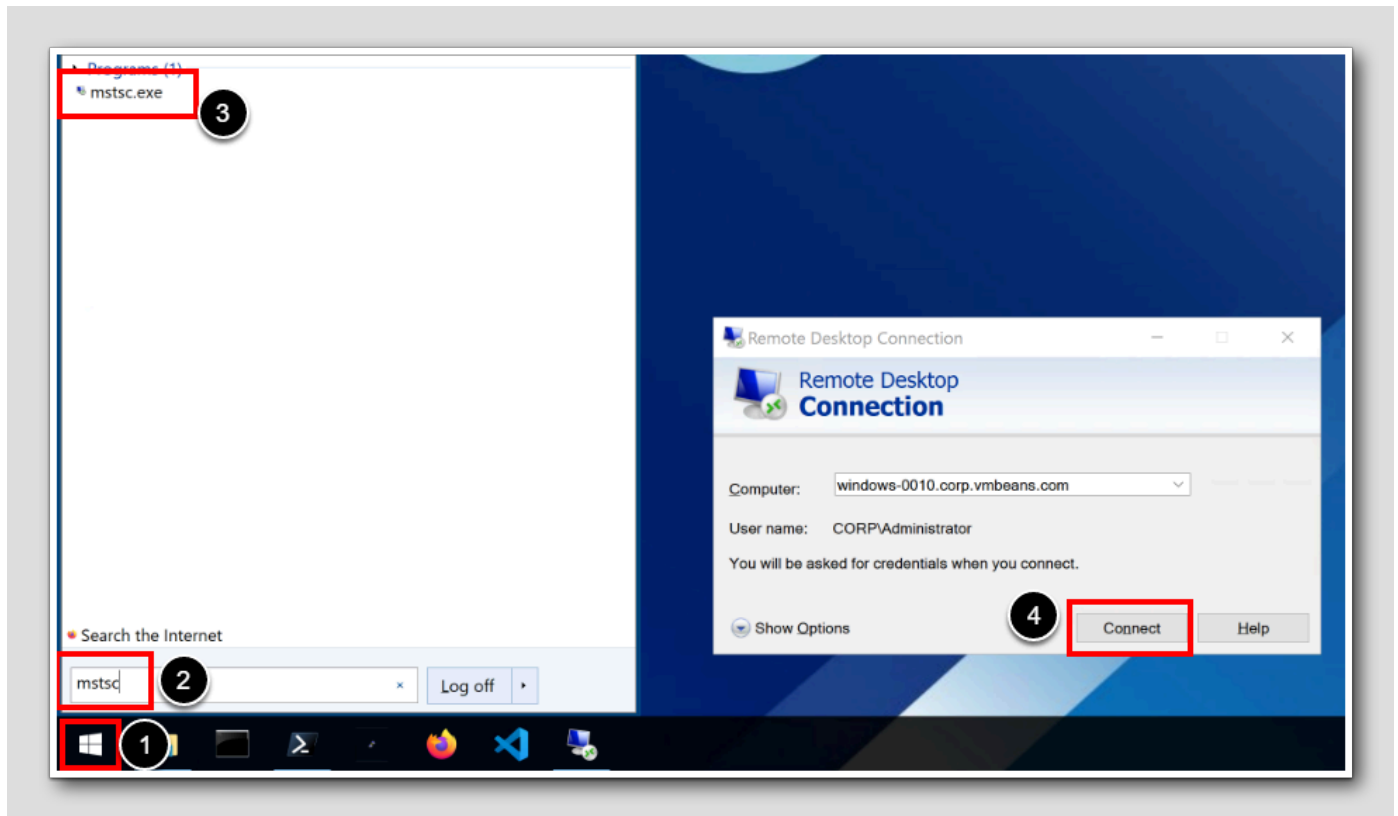
Troubleshooting with Logs Inside of Aria Operations

[115]

Before our session on troubleshooting with logs **within** Aria Operations, we will engage in some activities to generate various log entries that Aria Operations for Logs can discover and analyze.

For this scenario, our focus will be on the communication between the *Financial App* and the *local Tax service*, as well as the *remote bank*, which involves interactions with databases and files.

Preparing the data

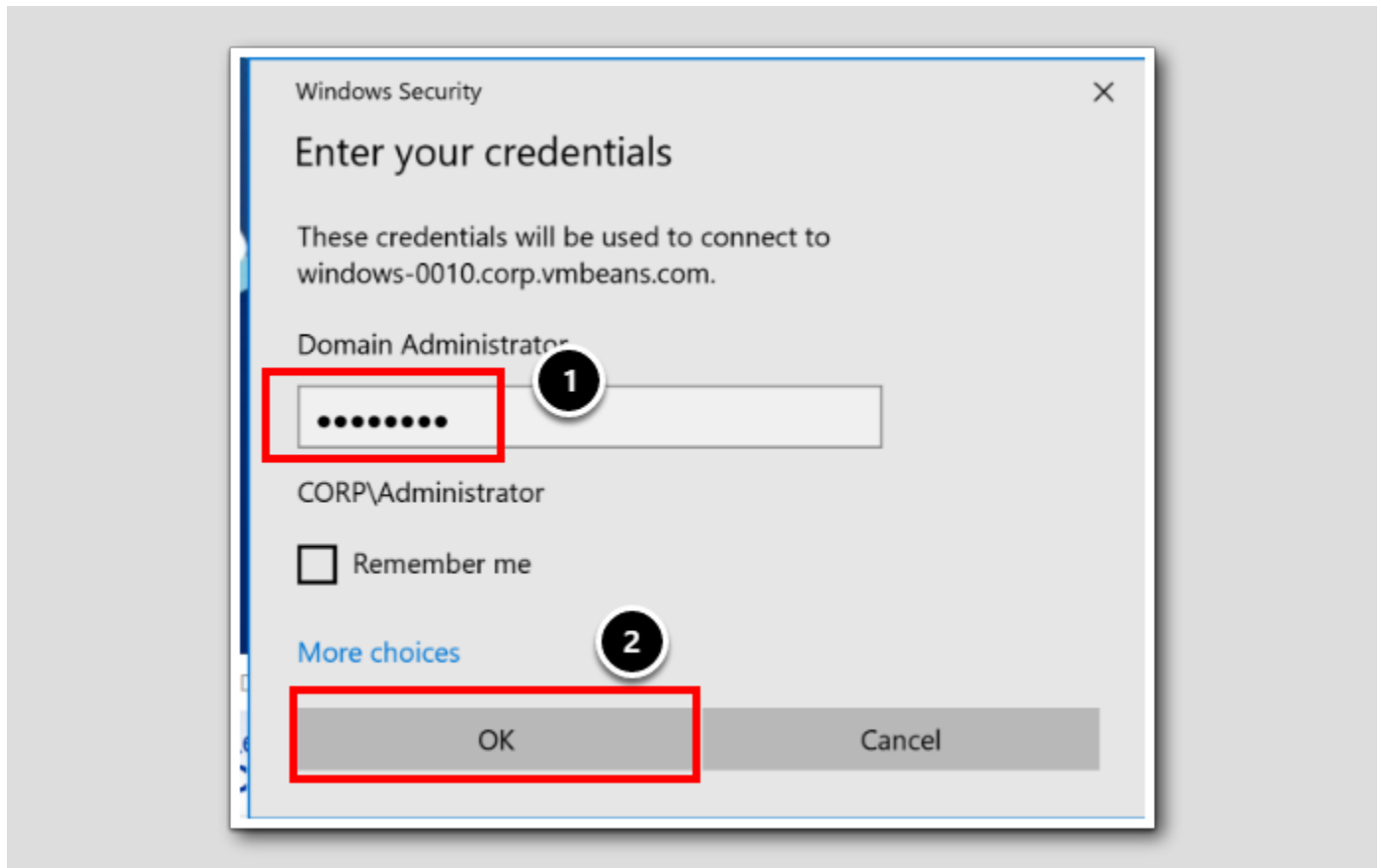


Let's proceed with activities on our application server windows-0010 to generate some essential log entries for our investigation within Aria Operations. We will use terminal services console to connect to it, and just run a script.

1. Click the **windows start menu**.
2. Type **mstsc** Note: "mstsc" is an abbreviation for *Microsoft Terminal Server Concole*.
3. Under Programs, select **mstsc.exe**.
4. When the Microsoft Terminal Server Console starts, we will connect to *windows-0010.corp.vmbeans.com* as user *CORP\Administrator* click **CONNECT**.

Windows Security

[117]

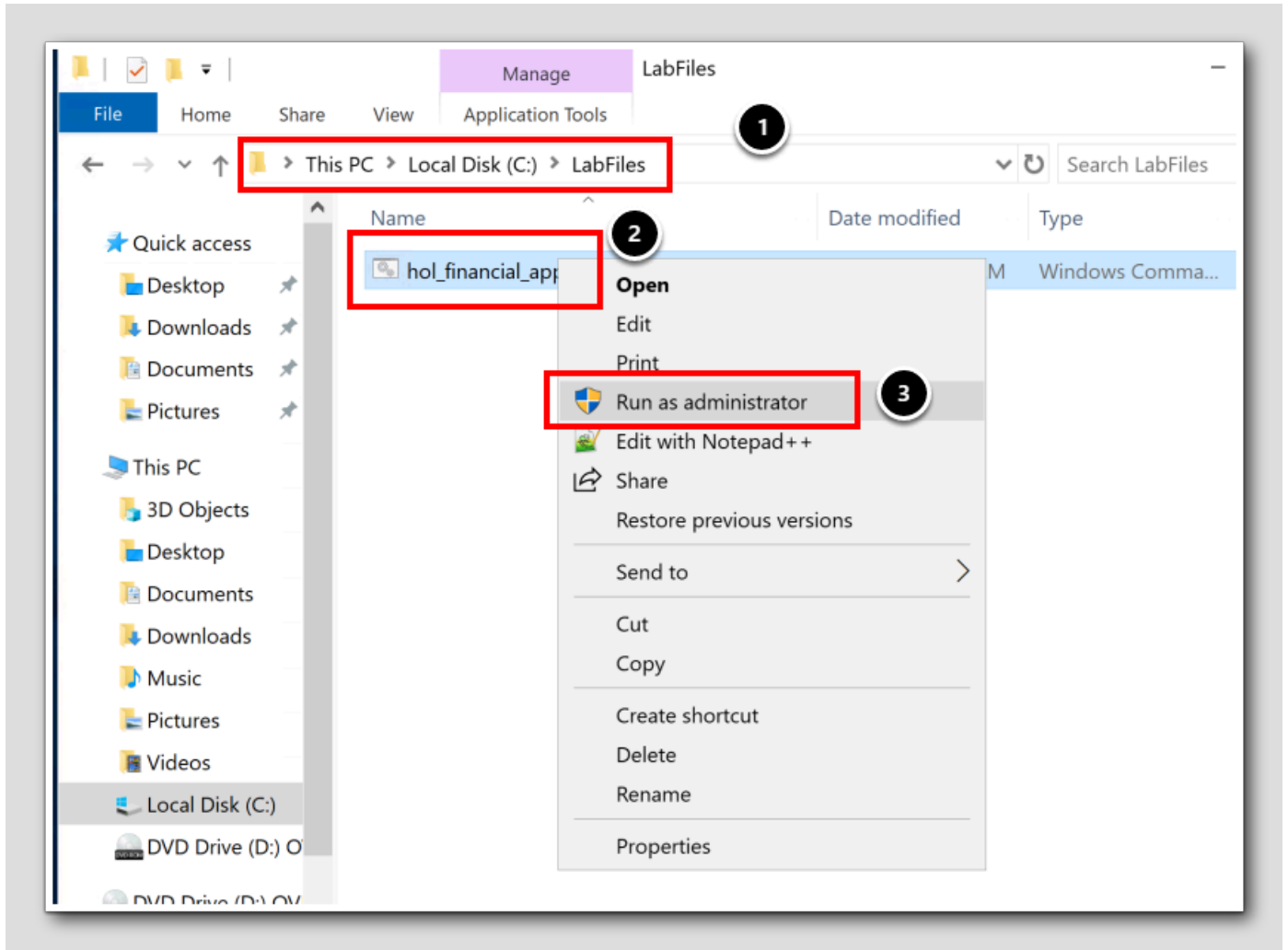


1. In the Windows Security box for the terminal server console connection to windows-0010, type the password **VMware!**
2. Click **OK**
3. If you get a yellow Certificate Challenge, then click **YES** (Not shown)

Note: For the next step, make sure that we are logged on *windows-0010* as *CORP\Administrator* with the password *VMware!*. The following script needs to be executed on that server.

Enterprise Financial Application - Script

[118]



To imitate artificial log data from a financial application called "The Hands-On Labs Application" and put the various error messages into the Application Event log on the windows server, we will now run a script that will automatically generate log messages coming from our financial app.

1. From within the Terminal Server Console, on windows-0010, navigate to the folder: C:\LabFiles
2. Right-click the file `hol_financial_app.cmd`
3. Select Run as administrator

For future reference, here is the entire `hol_financial_app.cmd` file content:

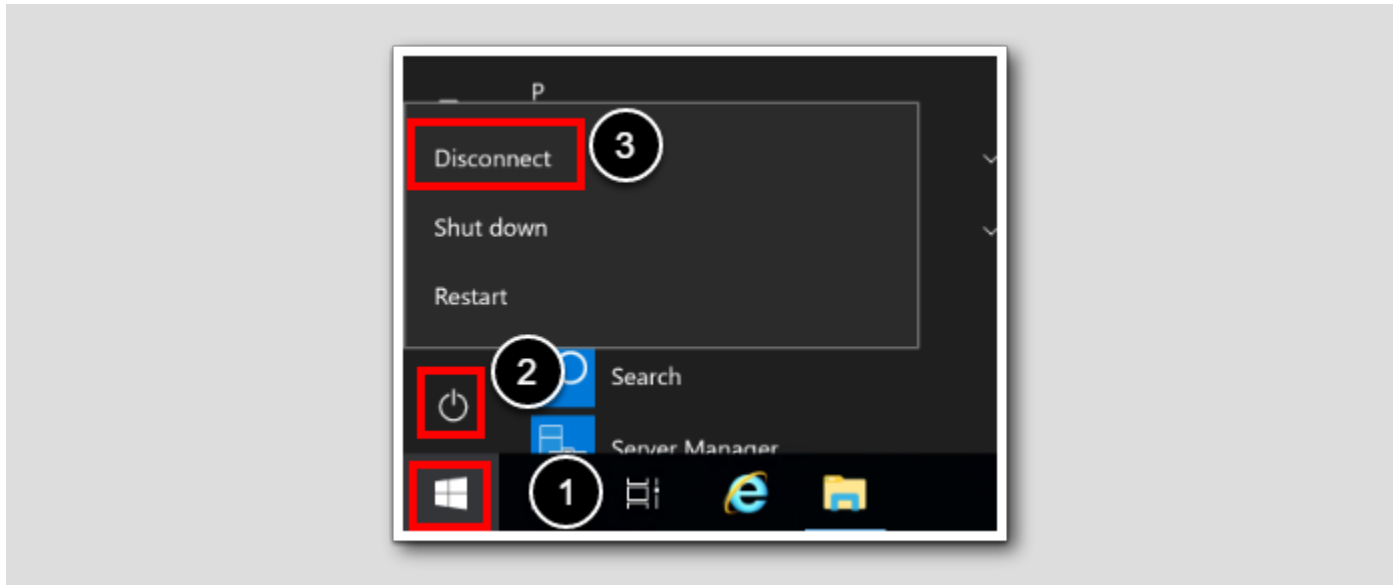
```
@echo off
setlocal enabledelayedexpansion
:: # Module 4 - Integrating and Troubleshooting with Logs
:: # Setting error messages and source (application) in pseudo-arrays.
set "Error[1]=Could not open Bank File bank_id.txt"
set "Error[2]=Unable to communicate with the main bank server"
set "Error[3]=The main communication service has stopped"
set "Error[4]=Unable to connect to the database bank_transaction.db"
set "Error[5]=Failed to generate the financial report for current Quarter"
set "Error[6]=Balance sheet calculation internal error"
set "Error[7]=Tax calculation service is not responding"
set "Application=The Hands-On Labs Application (Fake HOL Financial app)"
:: # Generating errors in the event log.
for /L %%i in (1,1,10) do (
    :: # Generate two random numbers.
    set /A "randError=!random! %% 7 + 1"
    set /A "randEventID=!random! %% 100 + 1"

    :: # Use 'call' to indirectly reference array element
    call set "errorMessage=%%Error[!randError!]%%"

    :: # Create the event, including the application name and "ERROR, " in the error message.
    eventcreate /ID !randEventID! /L APPLICATION /T ERROR /SO "!Application!" /D "!Application! ER
)
```

Back to Aria Operations

[119]

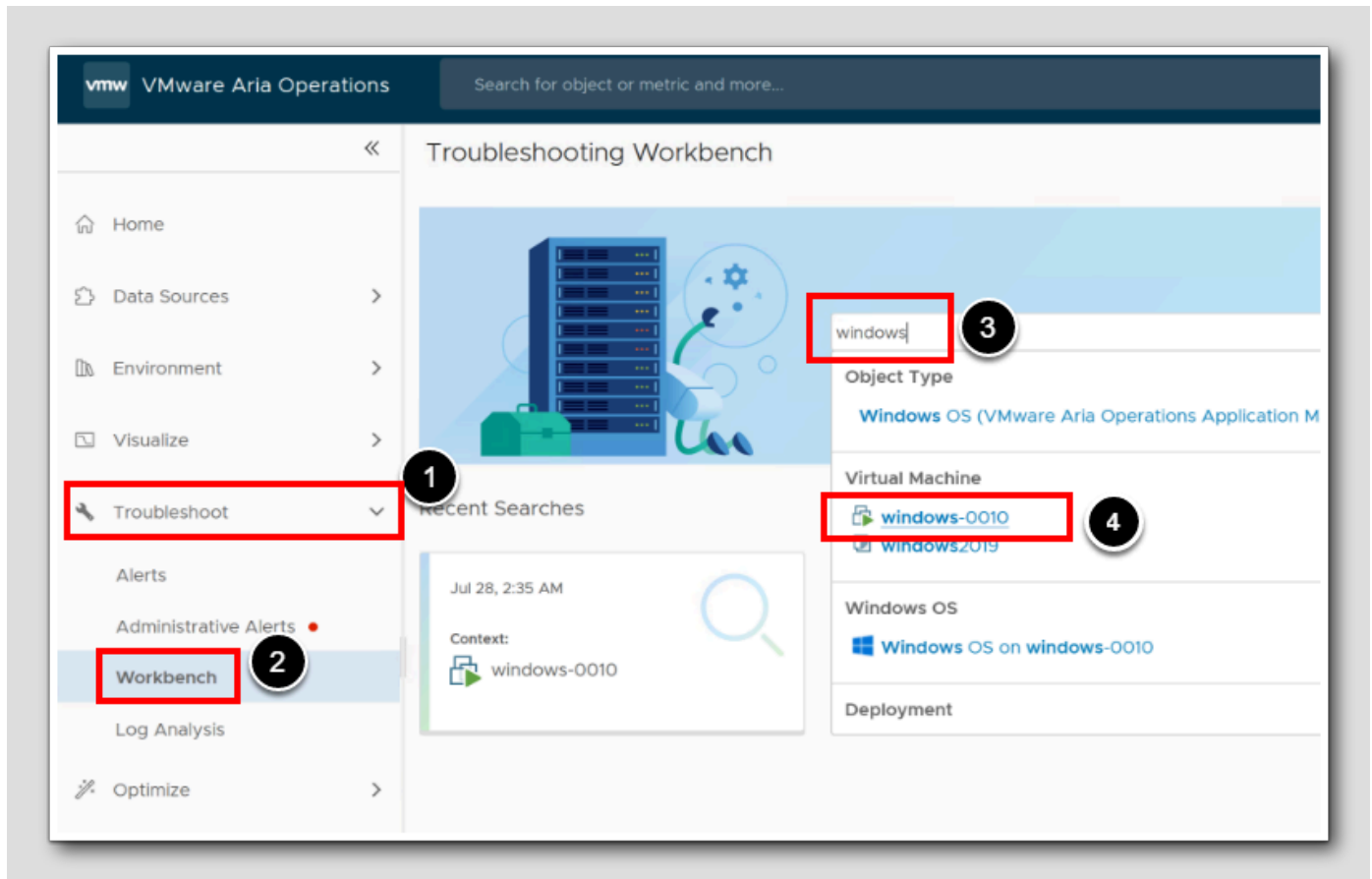


Now let's disconnect from windows-0010 and return to Aria Operations.

1. From the Terminal Server Console on windows-0010, Windows Toolbar, Click the **Windows Start Menu**.
2. Click the **Power Icon**.
3. Click **Disconnect**.

Troubleshooting Workbench

[120]



We know the Windows machine called *windows-0010* is running our financial application server. As an Aria Operations expert, when troubleshooting, we will, as usual, start with the *Troubleshooting Workbench*.

1. Click **Troubleshoot**.
2. Click **Workbench**.
3. In the search field, type **windows**.
4. Under the Virtual Machine search results, click the link to **windows-0010**.

Aria Operations Forensics

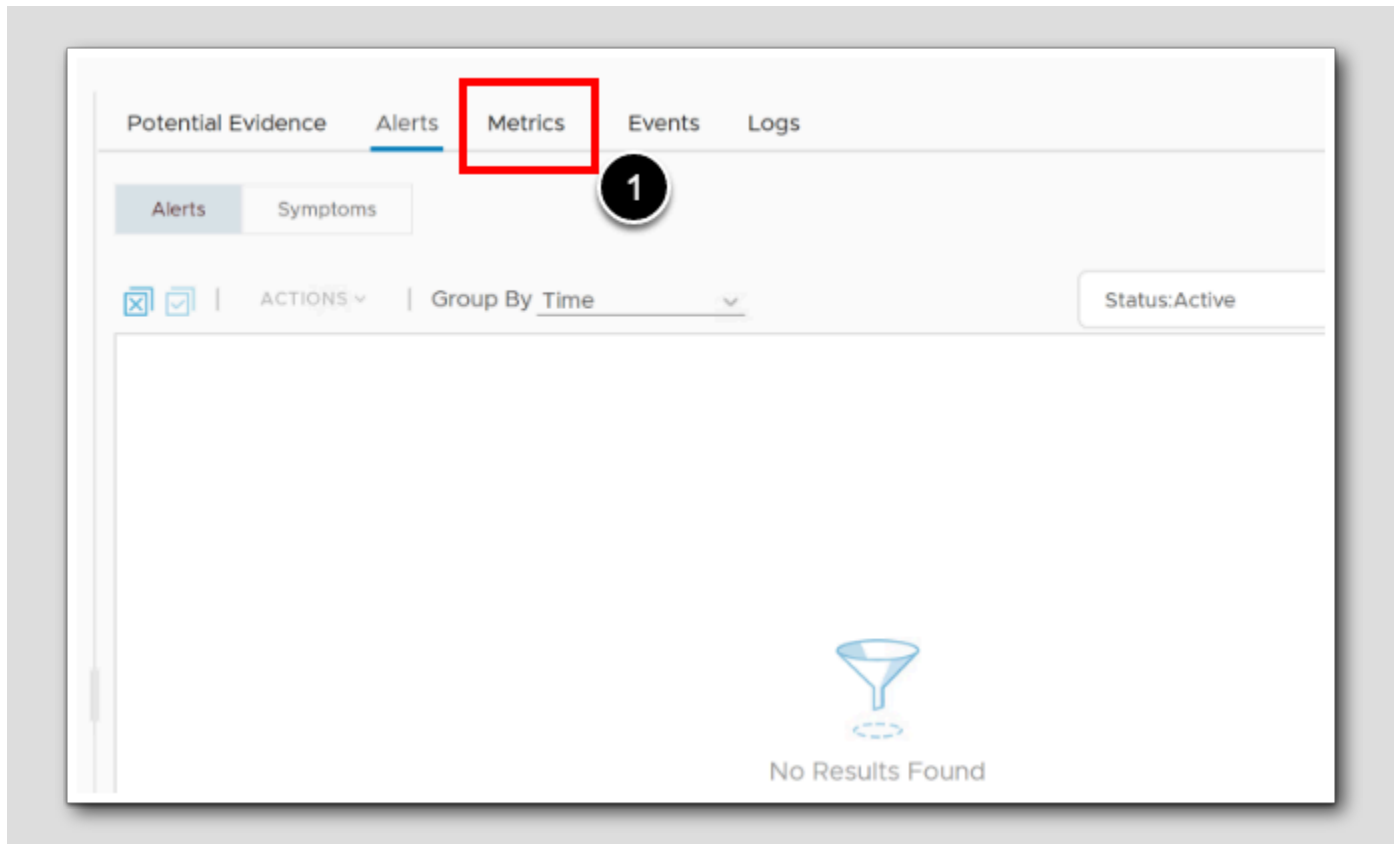
The screenshot shows the Troubleshooting Workbench interface for a virtual machine named 'windows-0010'. The interface is divided into several sections:

- Left Sidebar:** Shows the 'Selected Scope' with a 'CUSTOM' filter and a list of 'All Objects' including 'Virtual Machine' and 'windows-0010'.
- Top Navigation:** Features tabs for 'Potential Evidence', 'Alerts' (highlighted with a red box and a circled '1'), 'Metrics', 'Events', and 'Logs'.
- Main Content Area:** Contains three columns of data:
 - Events:** Displays a log entry for 'windows-0010' at 3:25:58 AM: "'Guest Info Tools Status' changed from guestToolsNotRunning to guestToolsRunning".
 - Property Changes:** Shows a message: "No property changes were found in this time range and scope."
 - Anomalous Metrics:** Displays a line graph for 'MemoryUtilization (KB)' for 'windows-0010' at 1:13:37 AM. The graph shows a significant spike in memory usage from approximately 1.500K to 2.500K between Jul 28 and 04:00 AM.

The Troubleshooting Workbench presents three columns with vital forensics info: Events, Property Changes, and Anomalous Metrics. These could be system alerts or notifications, changes to the properties of objects, and highlights of metric data that deviates significantly. From this page, log data is not shown.

1. Let's have a look at possible alerts on this VM (*windows-0010*), Click **Alerts**.

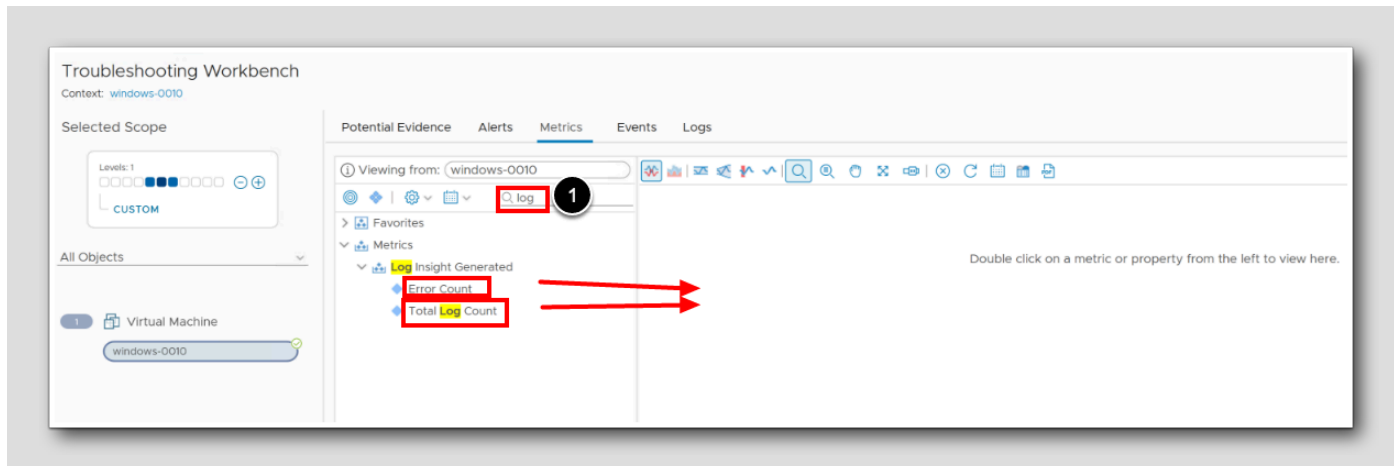
Alerts



As we can see from the image, there are no interesting alerts. If anything should show up here, we would have to add a notification from the logging system, *Aria Operations for Logs*, and send the alert to Aria Operations.

1. Click **Metrics**.

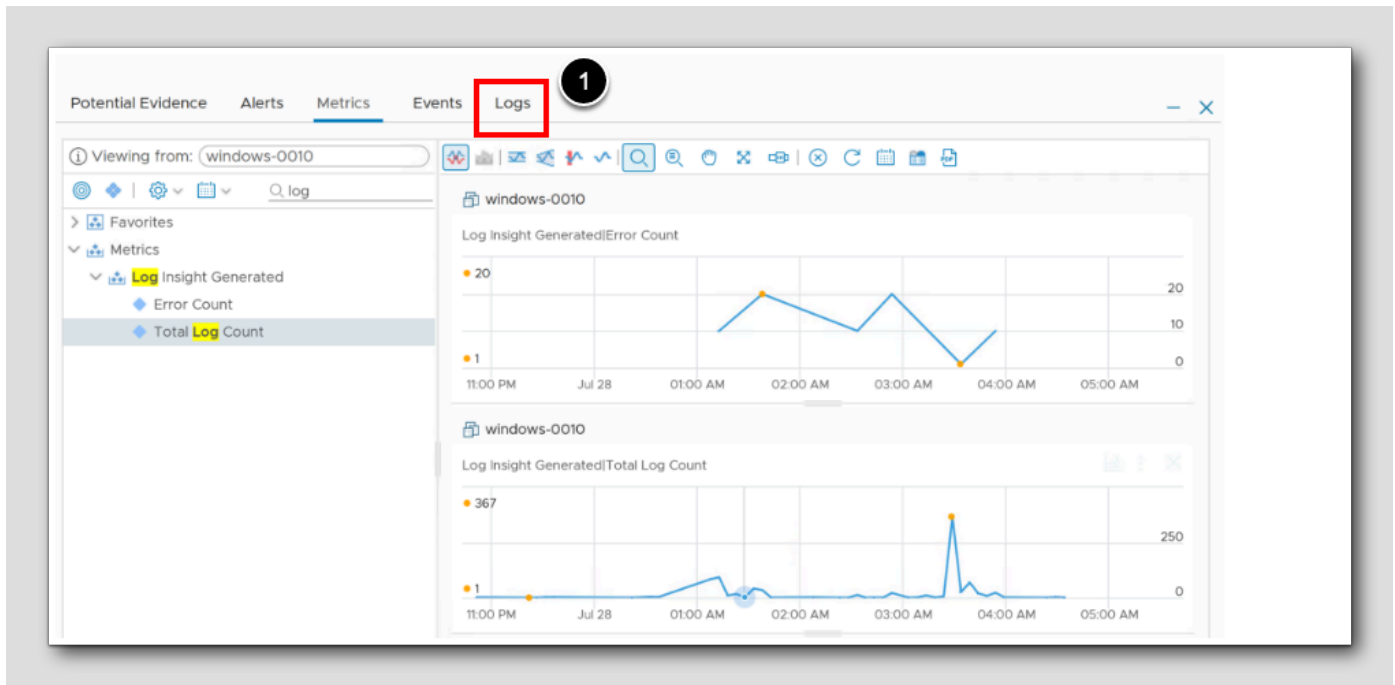
Aria Operation for Logs metrics



Aria Operations for Logs used to be called *vRealize Log Insight*, or just *Log Insight* for short.

1. To find metrics from the logging tool, go to the metrics search field and type log.
2. We need to double-click on a metric or a property from the left side to view the metrics.
double-click on Error Count.
3. Next, double-click on Total Log Count.

Viewing log counts



While reviewing the *Total Log Count*, we see that something is going on. If we see any anomalies about the logging, it is worth while to troubleshoot with logs. That is exactly what we intend to do! For now, we remember that there were no interesting events coming from the first forensic dashboard, so we will just skip it.

1. Click Logs.

Financial App logging

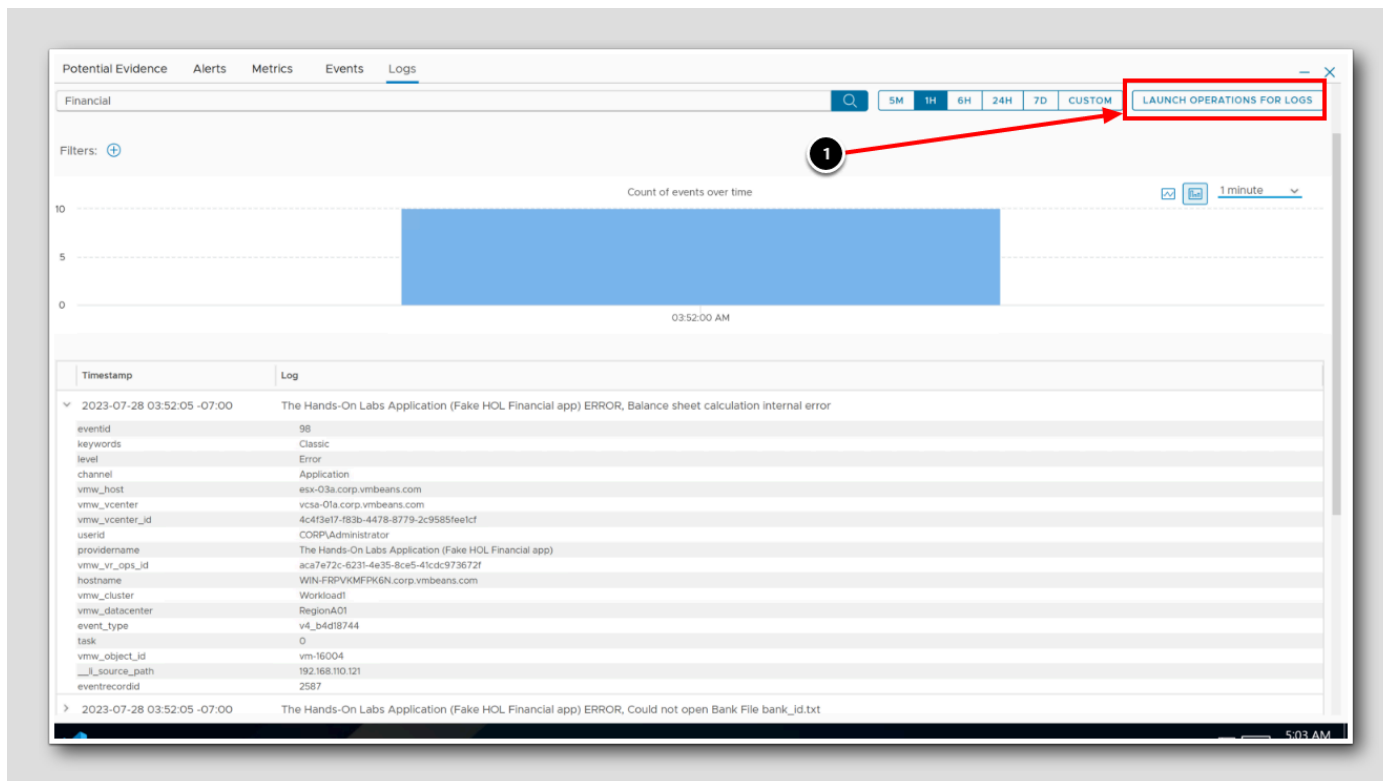
The screenshot shows the Troubleshooting Workbench interface for a 'Financial' application. The interface is divided into several sections:

- Left Sidebar:** Contains 'All Objects' with a tree view showing categories like Datastore, Windows OS, Virtual Machine, Deployment, vSphere Distributed Port Gro, and Host System. The 'Host System' category is expanded to show 'esx-03a.corp.vmbeans.com'.
- Top Navigation:** Includes tabs for 'Potential Evidence', 'Alerts', 'Metrics', 'Events', and 'Logs'. The 'Logs' tab is selected.
- Search and Filter:** A search bar contains the text 'Financial'. Below it, a time range selector is set to '1H' (1 hour). A 'LAUNCH OPERATIONS FOR LOGS' button is visible.
- Chart:** A bar chart titled 'Count of events over time' shows a single bar at 03:52:00 AM with a count of approximately 10.
- Log Table:** A table with columns 'Timestamp' and 'Log'. It contains three entries, all with a timestamp of '2023-07-28 03:52:05 -07:00'. The third entry is expanded, showing the error message: 'The Hands-On Labs Application (Fake HOL Financial app) ERROR, Unable to connect to the database bank_transaction.db'.

1. It could be more than 5 minutes since we did Start the script, so click on 1H (one hour).
2. Please review the multitude of events coming from the event logs on windows-0010. As the volume of results can be somewhat overwhelming, it is necessary to apply filtering. In the search field enter **Financial**.
3. Click the Search Icon.
4. We see the data coming in from our artificial financial application.
Expand one of the errors (could differ from the image) by clicking the '>'.
 - Expand one of the errors (could differ from the image) by clicking the '>'.

Log Details

[126]



In the top bar chart, observe the count of events over time. There should be 10 events, which implies that we ran the script. Each additional time we ran the script would add 10 more events.

From the bottom pane, we see the details, such as the source log channel (Application, System, or Security), the provider name, the source IP address and more.

If we wanted to investigate our logs even further, the best tool for doing so is of course Aria Operations for Logs.

1. The tool can be launched directly from here by clicking **LAUNCH OPERATIONS FOR LOGS**

Final thoughts

[127]

So far, we've explored troubleshooting with logs from within Aria Operations without launching Aria Operations for Logs, streamlining troubleshooting for better insights, and problem resolution.

This method is useful when investigating issues logged in event logs or application logs on various operating systems. This particular example focused on Windows logs, but the approach can be adapted to other scenarios as well.

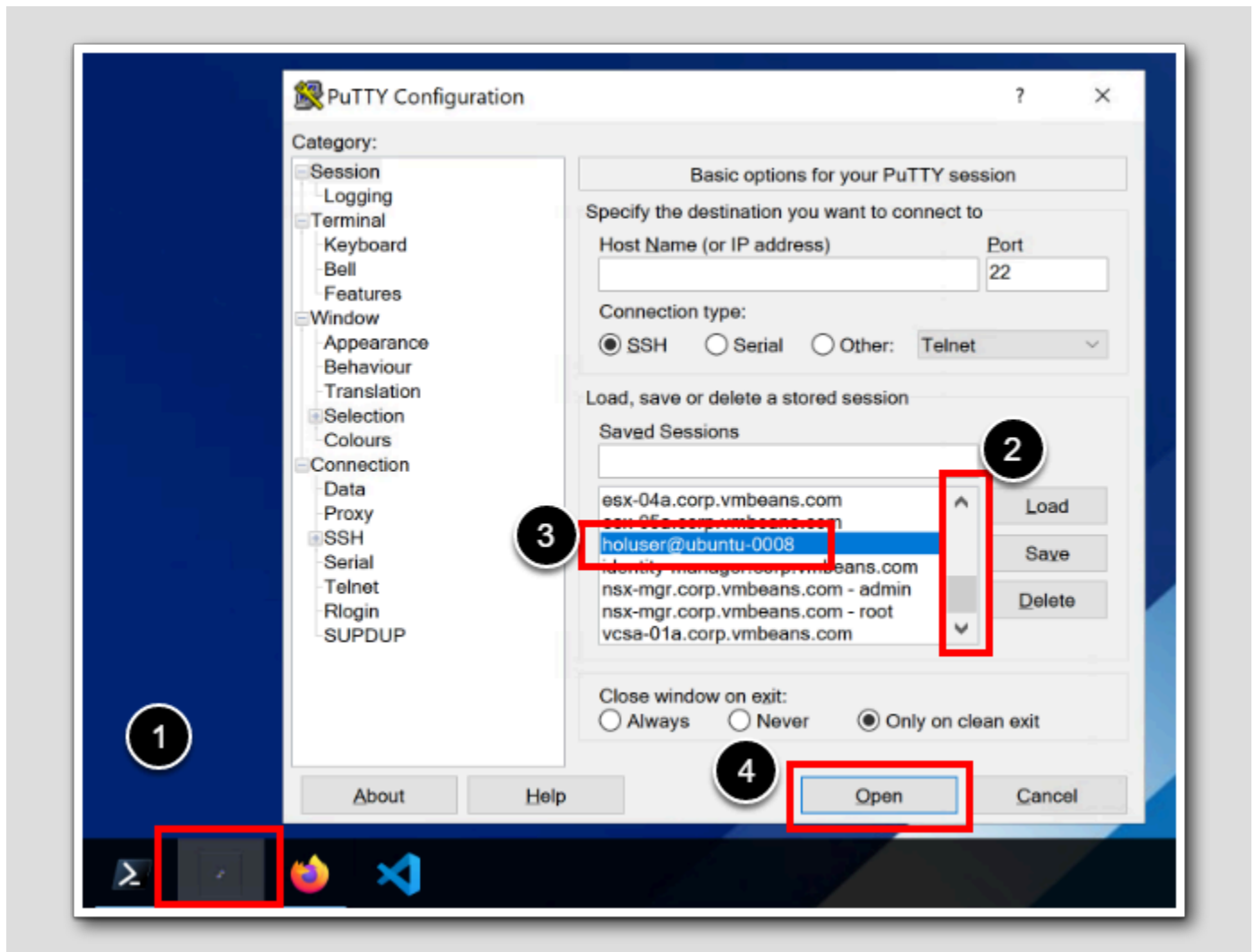
Add Aria Operations for Logs Agent on Linux

[128]

In this part of the module, we will show how to both install and configure the Aria Operation for Logs agent inside the operating system on a Linux virtual machine.

Putty Log on

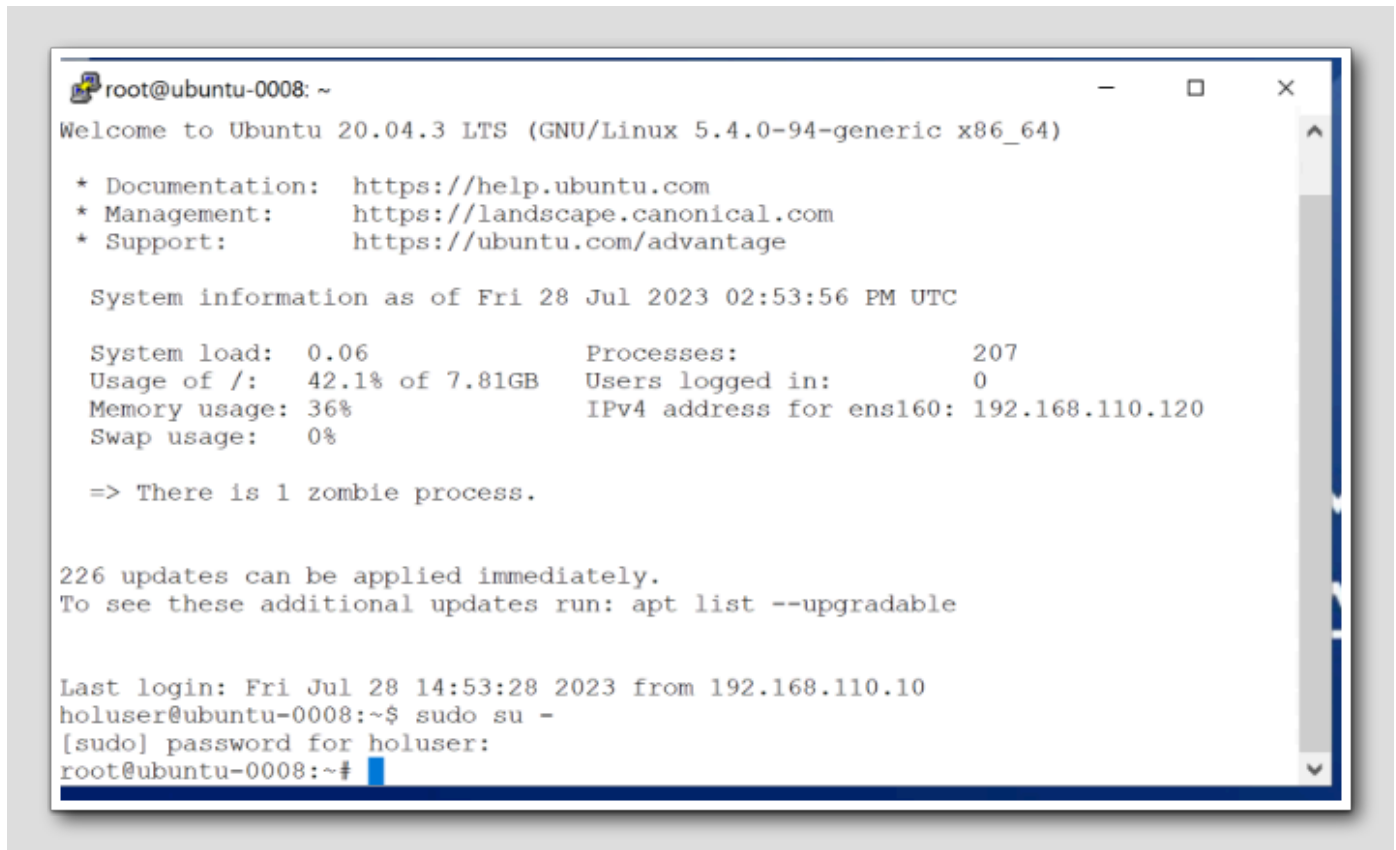
[129]



1. From the Windows Task Bar, click the PuTTY shortcut to open PuTTY.
2. Scroll down to the bottom of the list of saved sessions.
3. Select holuser@ubuntu-0008.
4. Click Open.

Become Administrator

[130]

A terminal window titled 'root@ubuntu-0008: ~' showing system information and a user login process. The window has standard Ubuntu window controls (minimize, maximize, close) in the top right. The terminal output includes: 'Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.4.0-94-generic x86_64)', links for documentation, management, and support, system information as of 'Fri 28 Jul 2023 02:53:56 PM UTC', system load, usage of /, memory usage, swap usage, processes, users logged in, and IPv4 address for ens160. It also shows a message about 1 zombie process and 226 updates available. The user 'holuser' logs in and runs 'sudo su -', providing the password 'VMware!' to become root.

```
root@ubuntu-0008: ~
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.4.0-94-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Fri 28 Jul 2023 02:53:56 PM UTC

System load:  0.06          Processes:           207
Usage of /:   42.1% of 7.81GB Users logged in:    0
Memory usage: 36%          IPv4 address for ens160: 192.168.110.120
Swap usage:   0%

=> There is 1 zombie process.

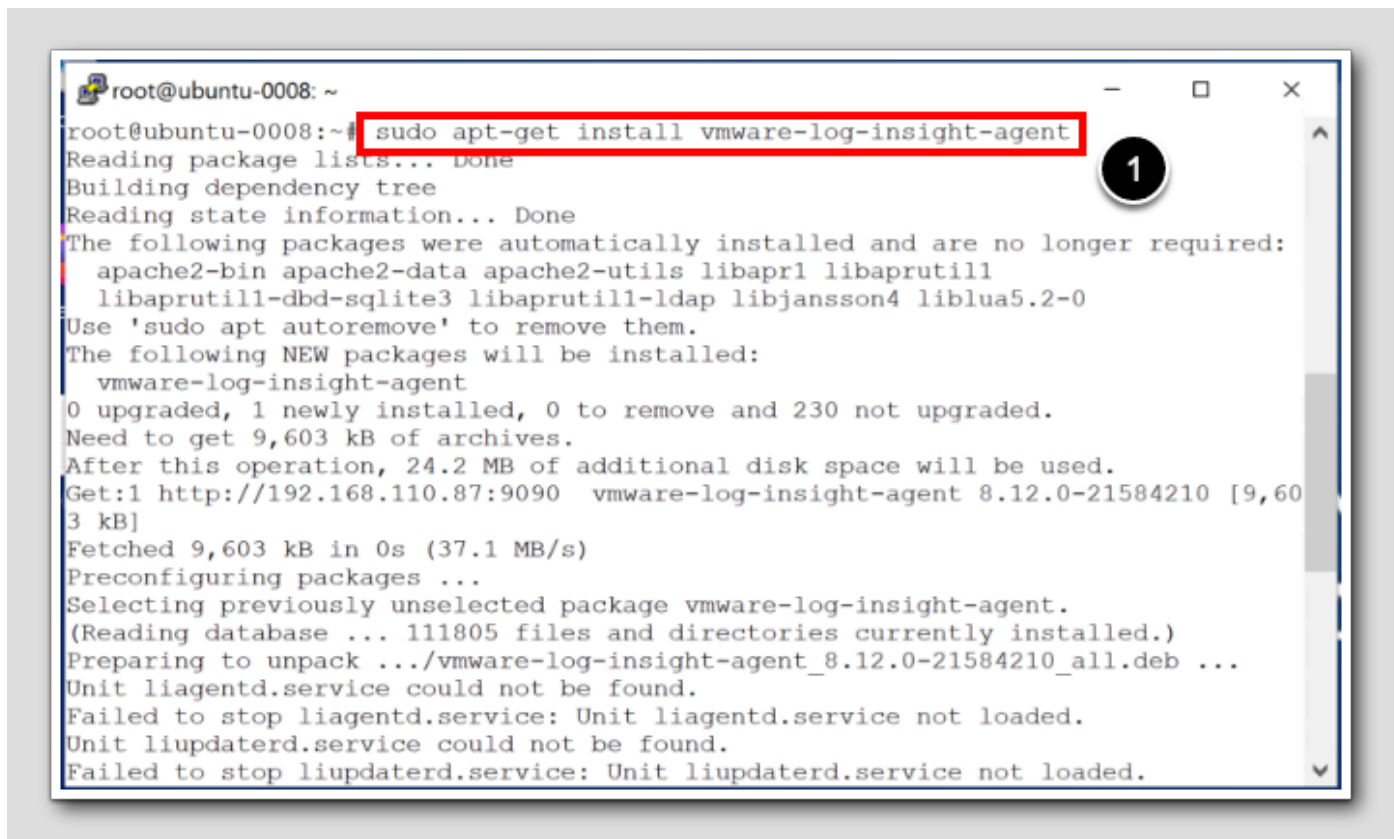
226 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

Last login: Fri Jul 28 14:53:28 2023 from 192.168.110.10
holuser@ubuntu-0008:~$ sudo su -
[sudo] password for holuser:
root@ubuntu-0008:~#
```

We will perform the rest of the commands as *root*.

1. Type `sudo su -` and press ENTER
2. When prompted `[sudo] password for holuser:` type `VMware!` and press ENTER

Installing the agent on Ubuntu



```
root@ubuntu-0008: ~  
root@ubuntu-0008:~# sudo apt-get install vmware-log-insight-agent  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following packages were automatically installed and are no longer required:  
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1  
  libaprutil1-dbd-sqlite3 libaprutil1-ldap libjansson4 liblua5.2-0  
Use 'sudo apt autoremove' to remove them.  
The following NEW packages will be installed:  
  vmware-log-insight-agent  
0 upgraded, 1 newly installed, 0 to remove and 230 not upgraded.  
Need to get 9,603 kB of archives.  
After this operation, 24.2 MB of additional disk space will be used.  
Get:1 http://192.168.110.87:9090 vmware-log-insight-agent 8.12.0-21584210 [9,603 kB]  
Fetched 9,603 kB in 0s (37.1 MB/s)  
Preconfiguring packages ...  
Selecting previously unselected package vmware-log-insight-agent.  
(Reading database ... 111805 files and directories currently installed.)  
Preparing to unpack .../vmware-log-insight-agent_8.12.0-21584210_all.deb ...  
Unit liagentd.service could not be found.  
Failed to stop liagentd.service: Unit liagentd.service not loaded.  
Unit liupdaterd.service could not be found.  
Failed to stop liupdaterd.service: Unit liupdaterd.service not loaded.
```

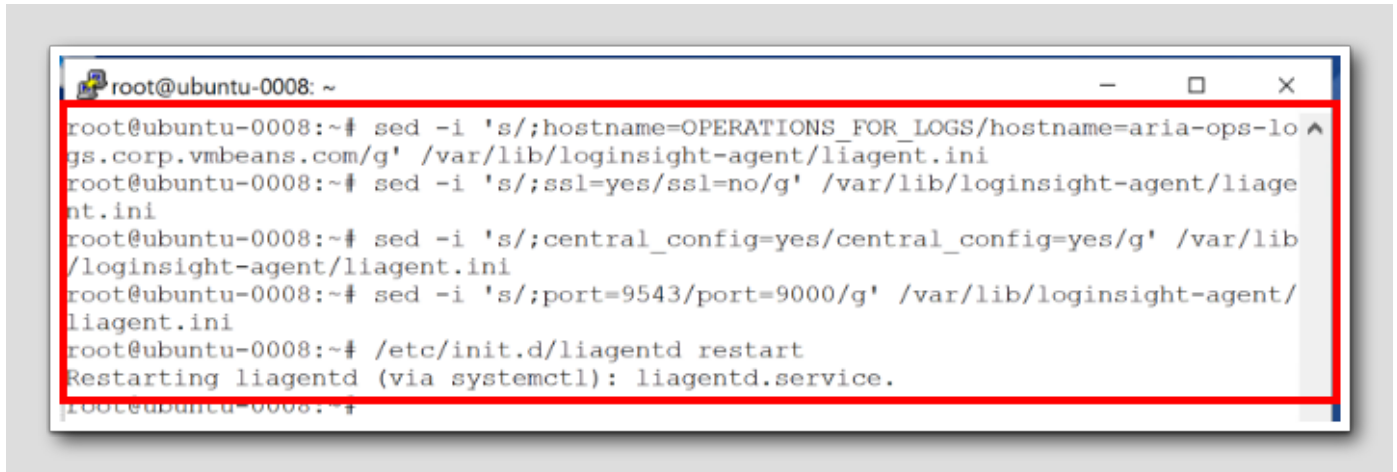
We are going to install the Aria Operation for Logs Agent inside the Operating system on this Ubuntu virtual machine. Then we will configure the right parameters to make it communicate well with our Aria Operations for Logs Server. We are not going to use our favorite editor 'vi' to edit these files, but use some nifty commands to perform actions on the file automatically.

1. In the putty window, type **sudo apt-get install vmware-log-insight-agent** and press ENTER.

Note: When the install finished the installation script will tell us to edit the configuration file */etc/liagent.ini*.

The */etc/liagent.ini* is a linked file to */var/lib/loginsight-agent/liagent.ini*.

Configure liagent.ini

A terminal window titled 'root@ubuntu-0008: ~' with standard window controls. The terminal shows a series of commands being executed to configure the liagent.ini file. The commands are: 1. 'sed -i 's/;hostname=OPERATIONS_FOR_LOGS/hostname=aria-ops-logs.corp.vmbeans.com/g' /var/lib/loginsight-agent/liagent.ini' 2. 'sed -i 's/;ssl=yes/ssl=no/g' /var/lib/loginsight-agent/liagent.ini' 3. 'sed -i 's/;central_config=yes/central_config=yes/g' /var/lib/loginsight-agent/liagent.ini' 4. 'sed -i 's/;port=9543/port=9000/g' /var/lib/loginsight-agent/liagent.ini' 5. '/etc/init.d/liagentd restart'. The output of the last command is 'Restarting liagentd (via systemctl): liagentd.service.'. The entire terminal content is enclosed in a red rectangular border.

```
root@ubuntu-0008: ~  
root@ubuntu-0008:~# sed -i 's/;hostname=OPERATIONS_FOR_LOGS/hostname=aria-ops-logs.corp.vmbeans.com/g' /var/lib/loginsight-agent/liagent.ini  
root@ubuntu-0008:~# sed -i 's/;ssl=yes/ssl=no/g' /var/lib/loginsight-agent/liagent.ini  
root@ubuntu-0008:~# sed -i 's/;central_config=yes/central_config=yes/g' /var/lib/loginsight-agent/liagent.ini  
root@ubuntu-0008:~# sed -i 's/;port=9543/port=9000/g' /var/lib/loginsight-agent/liagent.ini  
root@ubuntu-0008:~# /etc/init.d/liagentd restart  
Restarting liagentd (via systemctl): liagentd.service.  
root@ubuntu-0008:~#
```

After installation, we need to configure the agent to communicate with our Aria Operation for Logs server. Typically, this involves specifying the server's hostname and the port for sending logs. We are also specifying that we're not using SSL in our lab, and that we would like a central configuration.

Type or copy/paste each of these lines of code, and then press ENTER after each line of code:

```
sed -i 's/;hostname=OPERATIONS_FOR_LOGS/hostname=aria-ops-logs.corp.vmbeans.com/g' /var/lib/loginsight-agent/liagent.ini
```

```
sed -i 's/;ssl=yes/ssl=no/g' /var/lib/loginsight-agent/liagent.ini
```

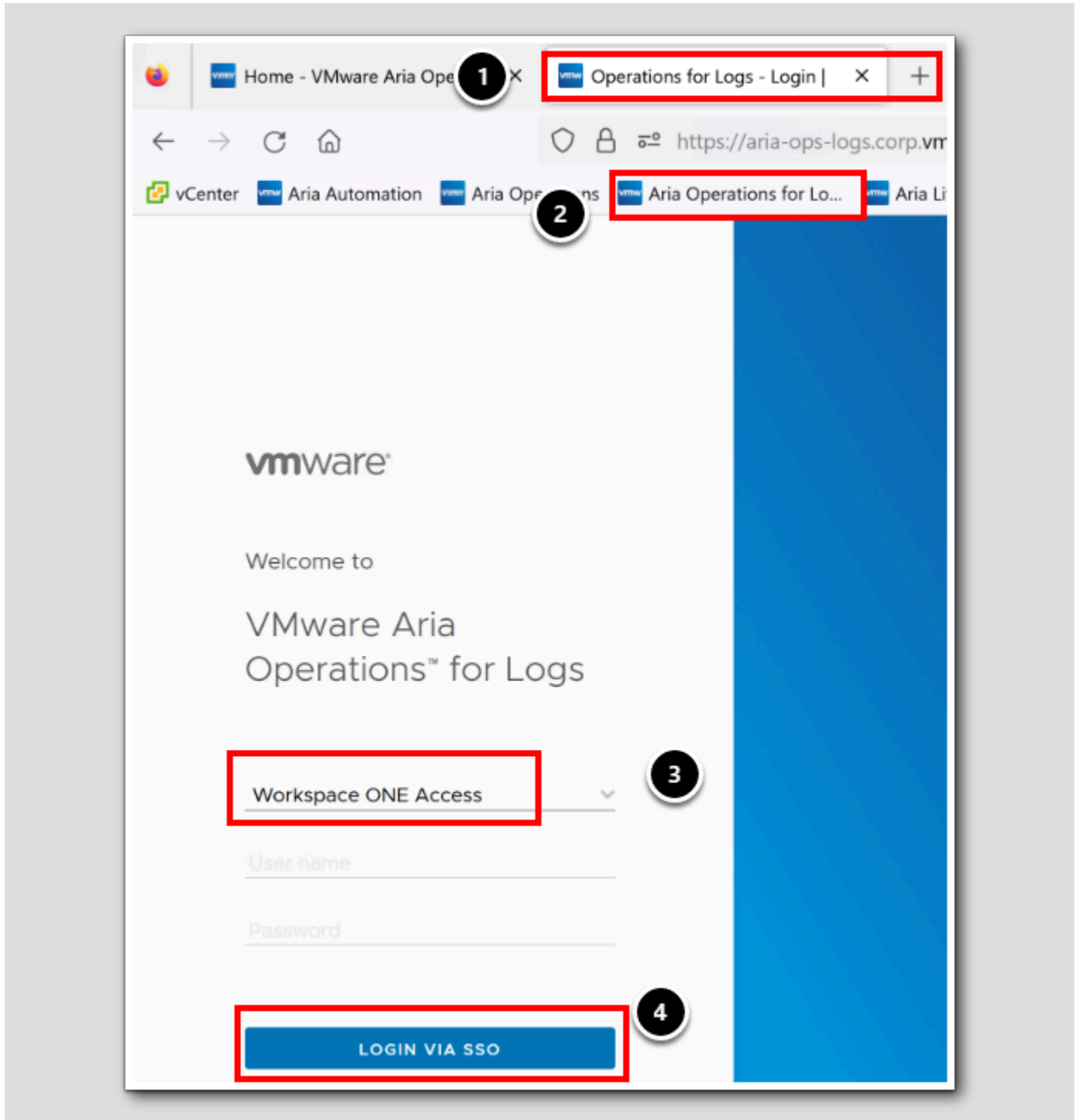
```
sed -i 's/;central_config=yes/central_config=yes/g' /var/lib/loginsight-agent/liagent.ini
```

```
sed -i 's/;port=9543/port=9000/g' /var/lib/loginsight-agent/liagent.ini
```

```
/etc/init.d/liagentd restart
```

Starting Aria Operations for Logs

[133]



Installing a Linux OS agent can be done manually or as part of an automated deployment process for example when using Aria Automation.

1. In FireFox, open up a new Tab '+'.
2. On the firefox toolbar, click Aria Operations for Logs.
3. Choose **Workspace ONE Access**.
4. Click **LOGIN VIA SSO**.

Workspace ONE

[134]



If you are prompted for credentials...

1. In username, type holadmin
2. in password type VMware!
3. Click Sign In

Agents Configuration

The screenshot shows the VMware Aria Operations for Logs interface. The left navigation menu has 'Management' (circled 2) and 'Agents' (circled 3) highlighted. The main area shows a list of agents:

IP Address	Hostname	Version	OS	Last Seen
192.168.110.121	WIN-FRPVKMFPK6N.corp.vmbeans.com	8.12.0.21584210	Microsoft Windows Server 2019 Standard	Les
192.168.110.120	ubuntu-0008.corp.vmbeans.com	8.12.0.21584210	Ubuntu 20.04.3 LTS	Les

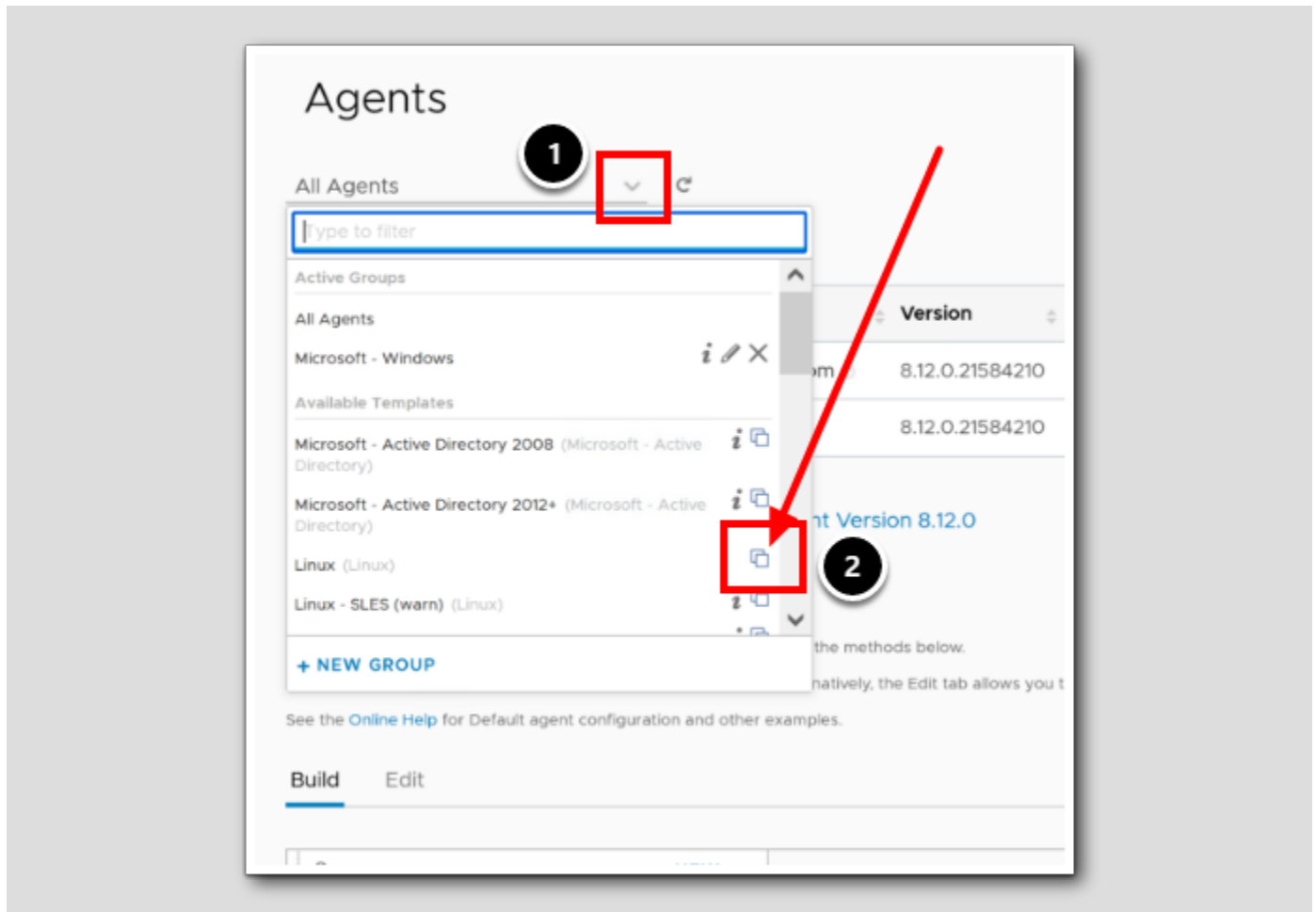
Below the table is a 'Download VMware Aria Operations for Logs Agent Version 8.12.0' button. The 'Agent Configuration' section is also visible, with 'Build' and 'Edit' tabs.

Once the agent is connected to the Aria Operations for Logs server, the next step is to configure log filtering. This ensures that we're monitoring only the relevant logs. This is crucial to avoid overwhelming the Log Insight server with unnecessary data. Aria Operations for Logs uses the concept of "Content Packs" that define parsing rules for different log sources. Aria Operations for Logs' filtering capabilities is used to specify which logs should be forwarded from the agent to the server. This can be based on log levels, keywords, or any other relevant criteria.

1. In Aria Operation for Logs, **Expand** the left menu Click the '>'.
 2. Click **Management**.
3. Click **Agents**.

Note: We see a list of All OS and Application Agents, both Linux and Windows that are running out on the Operative systems.

Find the Linux Template

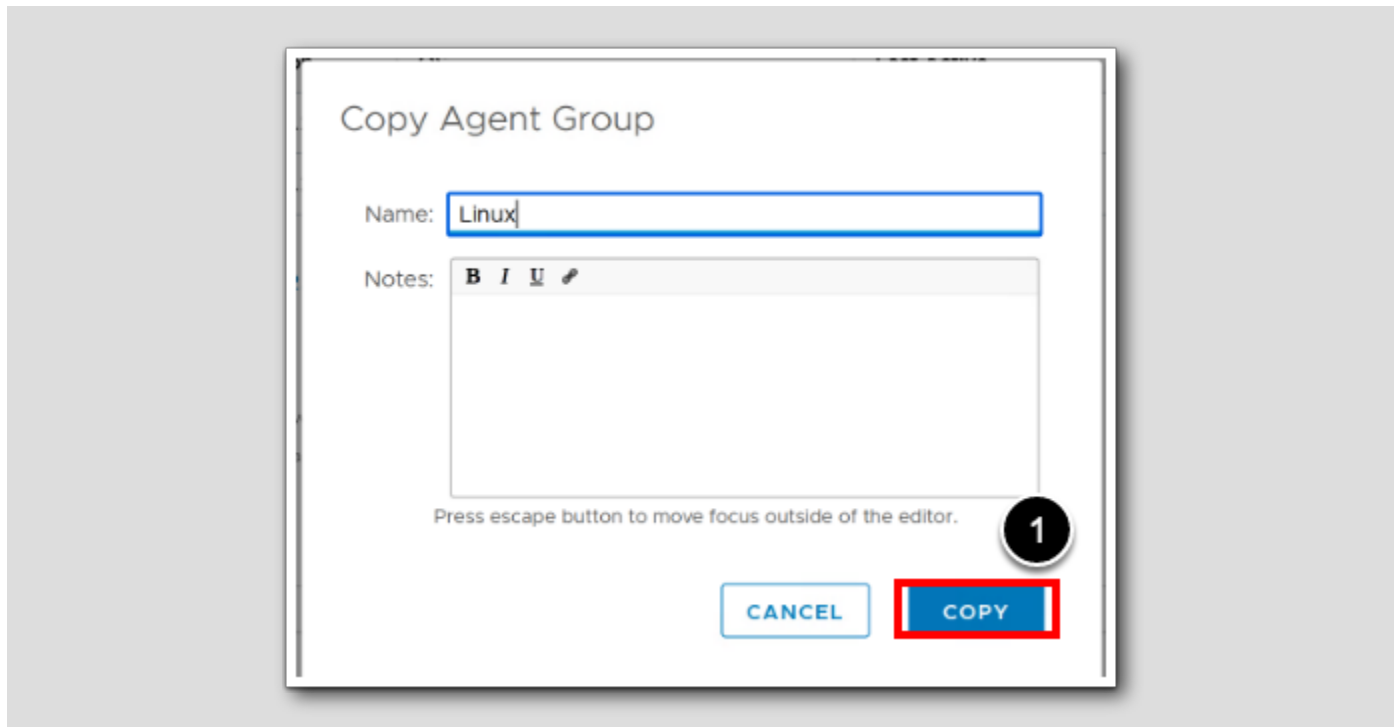


Aria Operation for Logs is already configured to receive the Windows Logs. We will now configure Aria Operation for Logs to also receive Logs from Linux; in particular, an Ubuntu server called ubuntu-0008. The installed Linux Content Pack comes with templates that we copy. We will have multiple servers and want to manage them collectively, and therefore we are utilizing *agent groups*. This helps us streamline log management and filtering for our future set of servers.

1. To expand our agents scope and find an available template, click the **All Agents** drop-down.
2. From the drop-down menu, under **Available Templates**, besides Linux (Linux), click the **Copy Template** icon.

Copy the Agent Group

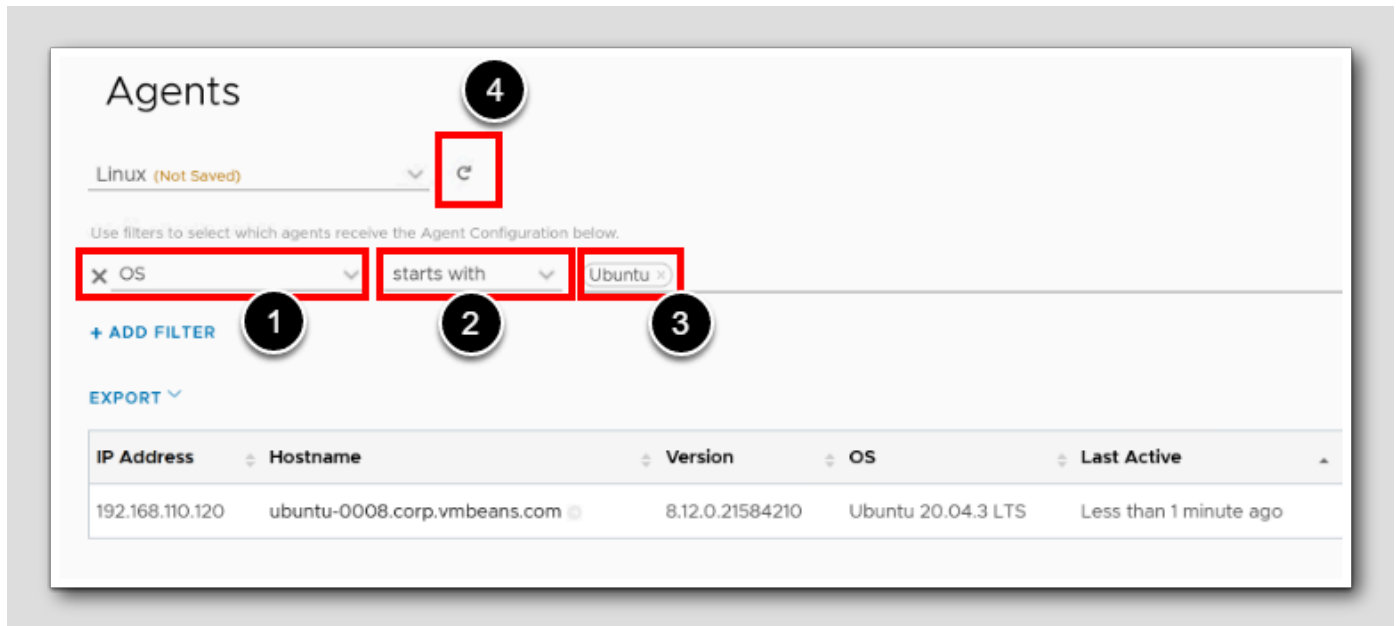
[137]



We could have changed the name on our Linux agent group, but we'll leave it as-is for now.

1. Click COPY.

Filter Linux Agents



The screenshot shows the 'Agents' page in VMware vSphere. The 'Linux (Not Saved)' template is selected. A filter is applied: 'OS starts with Ubuntu'. The filter is applied to the 'OS' column. The table below shows one agent with IP 192.168.110.120 and OS Ubuntu 20.04.3 LTS.

IP Address	Hostname	Version	OS	Last Active
192.168.110.120	ubuntu-0008.corp.vmbeans.com	8.12.0.21584210	Ubuntu 20.04.3 LTS	Less than 1 minute ago

Once the Linux template is copied, we need to specify the servers by adding a filter to limit the results to only servers with OS names starting with 'Ubuntu'.

1. From the filter section, change IP Address to OS.
2. Change matches to starts with.
3. Type Ubuntu and press ENTER.
4. Click the refresh button.

Observe that at the time of writing, there was just one server that had the Linux Client installed and with its OS starting with 'Ubuntu'.

Save

The screenshot displays the 'Agent Configuration' interface. At the top, there is a title 'Agent Configuration' and a brief introduction. Below this, there are two tabs: 'Build' (selected) and 'Edit'. The main area is divided into a sidebar on the left and a configuration panel on the right. The sidebar shows a tree view with categories like 'Servers', 'General', 'Common', 'Windows Event Log', 'File Logs', 'Journal Logs', and 'Parsers'. Under 'File Logs', 'syslog' is selected. The configuration panel for '[filelog|syslog]' includes fields for 'Directory' (set to '/var/log'), 'Event marker', 'Character set' (set to 'UTF-8'), 'Include files' (set to 'syslog;syslog?'), 'Exclude files' (set to 'hidden.log; secur?.*'), 'Raw Syslog' (unchecked), 'Tags' (with 'vmw_cp' and 'linux' listed), 'Exclude fields' (set to 'secure_code; filepath'), and 'Acceptlist filter expression'. A 'SAVE NEW GROUP' button is located at the bottom left of the configuration panel. A red arrow points from a circled '1' at the top right to the scrollbar, and a circled '2' is placed over the 'SAVE NEW GROUP' button.

1. Scroll to the bottom of the page.
2. Click SAVE NEW GROUP.

View incoming data

The screenshot shows the VMware vSphere Agents page. At the top, the title 'Agents' is followed by a count of 2. Below this, a dropdown menu is set to 'All Agents' and a refresh button is visible. A table lists agents with columns for IP Address, Hostname, Version, OS, Last Active, Events Sent, and Ev. The 'Events Sent' column is highlighted in yellow. A red arrow points to the right edge of the page, indicating a scroll action.

IP Address	Hostname	Version	OS	Last Active	Events Sent	Ev
192.168.110.120	ubuntu-0008.corp.vmbeans.com	8.12.0.21584210	Ubuntu 20.04.3 LTS	Less than 1 minute ago	24	0.4
192.168.110.121	WIN-FRPVKMFPK6N.corp.vmbeans.com	8.12.0.21584210	Microsoft Windows Server 2019 Standard	Less than 1 minute ago	536	0

1. Scroll to the very top of the page.
2. In the drop-down menu. Choose All Agents.
3. Click the refresh button.

The Events Sent Column should start to populate (highlighted)

See incoming log lines

1. To Expand the left menu, Click '>>'.
2. In the Aria Operations for Logs UI, click **Explore Logs**.
3. In the CONTENT PACKS drop-down, deselect **All**.
4. In the CONTENT PACKS drop-down, select **Linux**.
5. Click the **Search** Icon.

What we have done now is to single out messages coming in via the Linux Content pack

Validating the search

The screenshot displays the VMware vRealize Operations console interface. At the top, a bar chart titled "Count of events over time" shows event counts from 08:35 to 09:30. Below the chart, a search bar contains the text "Latest hour of data" and a search button. The search results are filtered by "hostname starts with ubuntu" and "text contains error warn unable". The "Event Types" tab is selected, showing a list of events. A "Manage Fields" panel is visible on the right side of the interface.

Event ID	Time	Host	Event Type	Message
552	Jul 28 16:30:27	ubuntu-0008	multipathd[631]	sda: failed to get sgio+ uid: No such file or- directory-
1	Jul 28 16:21:12	ubuntu-0008	salt-minion[24467]	[ERROR] Future <salt.ext.tornado.concurrent.Future object at 0x7fd4526b2160> exception was never retrieved: Traceback (most recent call last):

While the screen capture is elaborately annotated, these final steps are an important exercise in using filters to identify data sources, and to isolate references to errors, warnings, etc., within log originating from the syslog or application log files on a server. Thank you for the patience and attention on these last steps to success..

1. Click + **ADD FILTER** twice.
2. For the first filter:
 - Change **text** to **hostname**
 - Change **contains** to **starts with**
 - In the text field, type ‘ubuntu’ (all lowercase) and press <Enter>”
3. For the second filter:
 - Leave the **text** selection unchanged
 - Change **does not contain** to **contains**
 - In the text field, type ‘error*’ (all lowercase) and press <Enter>”
 - In the text field, type ‘fail*’ (all lowercase) and press <Enter>”
 - In the text field, type ‘warn*’ (all lowercase) and press <Enter>”
 - In the text field, type ‘unable*’ (all lowercase) and press <Enter>”
4. Select **Latest Hour of Data**.
5. Click the **Search** button.
6. Lastly click **Event Types**.

Observe we are receiving data from *ubuntu-0008* server, and that there are several types of events coming from the server.

Note: Since this is a lab environment, the image and data will differ.

Closing comments

[143]

To enhance our ability to respond promptly to issues, we could configure alerts and notifications within Aria Operations for Logs to stay informed about critical events or anomalies in our log data. Alternatively, we could send *Aria Operation for Logs (Log Insight)* alerts to Aria Operations, which we walked through in the previous lesson [Troubleshooting Workbench](#).

Conclusion

[144]

The integration of Aria Operations for Logs with Aria Operations for centralized log management and analysis establishes a seamless and robust troubleshooting process. By combining log data with metrics from Aria Operations, we can efficiently identify the precise root cause of issues, leading to a reduction in time-to-resolution.

- In our investigation, we have demonstrated how we can significantly shorten the quest for Meantime to Resolution (MTTR) and find the root cause of errors by extending troubleshooting with logs from within Aria Operations, without the need to launch Aria Operations for Logs separately.
- Additionally, we explored the installation and configuration of the Aria Operations for Logs OS and Application Agent on

Linux. This ensures that the system is equipped to take advantage of the powerful log management and analysis features provided by Aria Operations.

You've finished Module 4

[145]

Congratulations on completing the lab module.

If you are looking for additional general information on Aria Operations, try one of these:

- **VMware Product Public Page - Aria Operations:** <https://www.vmware.com/products/aria-operations.html>
- **Aria Operations - Documentation:** <https://docs.vmware.com/en/VMware-Aria-Operations/index.html>
- **Aria Operations - Logs Integration:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Configuring-Operations/GUID-33DAA688-CED8-4D24-8359-1FC1CEDD1191.html>

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 5 - Configuring Costs to Match Your Business Needs (30 minutes) Intermediate

Introduction

[147]

This module focuses on configuring cost settings in Aria Operations to align with your organization's specific requirements.

By completing this module, you will have a comprehensive understanding of how to configure cost settings in Aria Operations to match your organization's needs. You will be equipped with the knowledge to track expenses, calculate costs, and analyze cost data effectively, enabling better cost management and decision-making within your IT environment.

Log in to Aria Operations

[148]

We will log in to a live instance of Aria Operations running in this lab.

Open the Firefox Browser from the Windows Task Bar

[149]

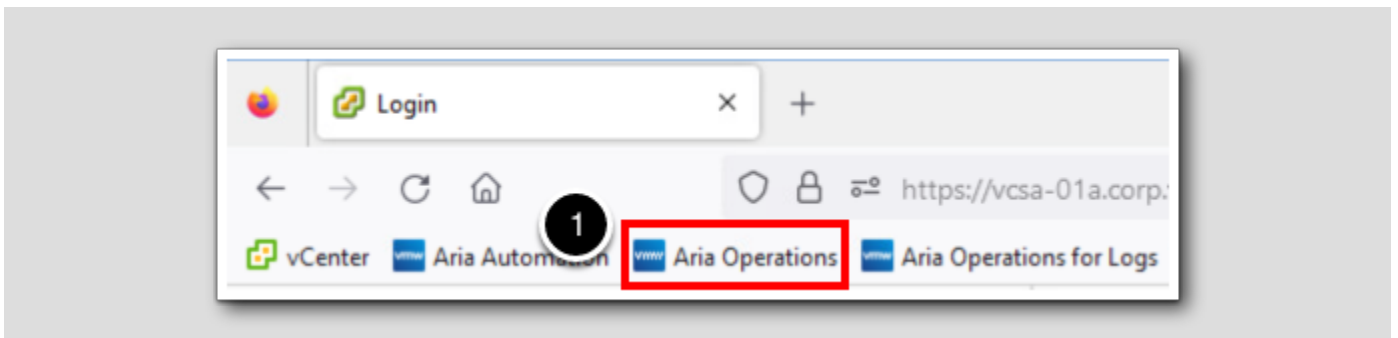


If the browser is not already open, launch Firefox.

1. Click the Firefox icon in the Windows Quick Launch Task Bar at the bottom of the screen.

Navigate to Aria Operations

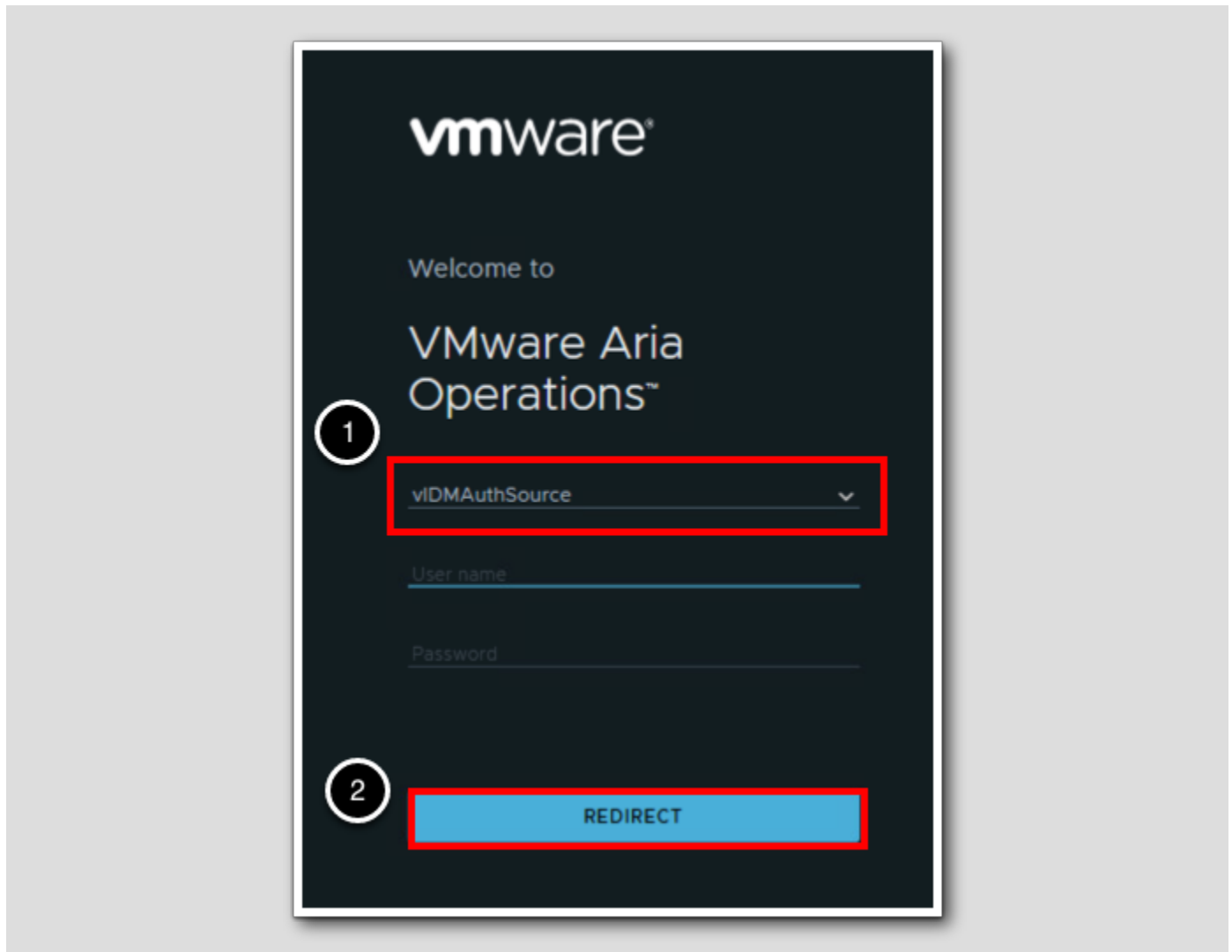
[150]



1. Click the **Aria Operations** bookmark in the bookmarks toolbar.

Log in to Aria Operations

[15]



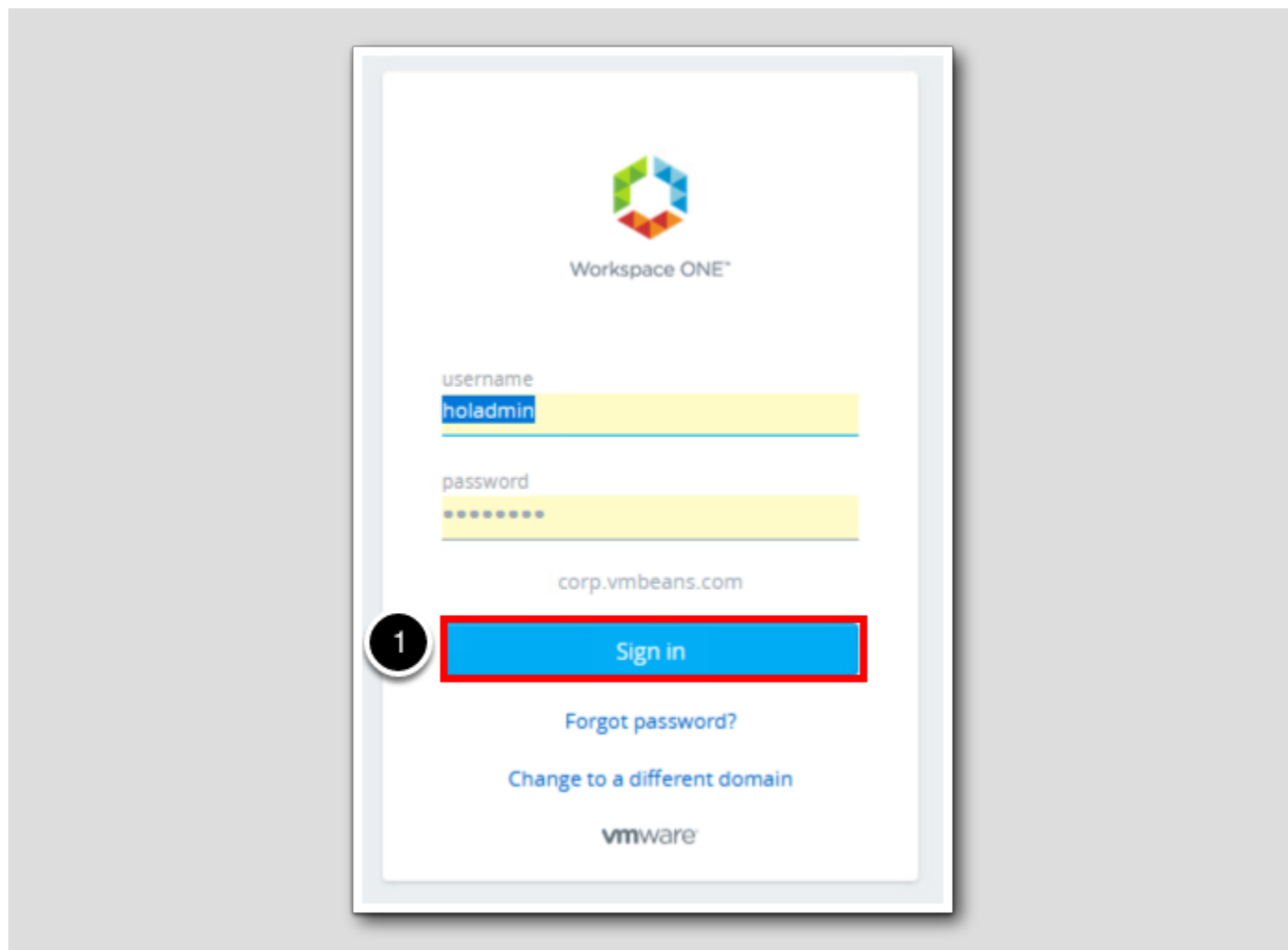
Aria Operations is integrated with VMware Workspace ONE Assist (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

vIDMAuthSource may be pre-selected as the default identity source. If it is not, then you will need to select it.

1. Click the **drop-down arrow** and select vIDMAuthSource if it is not already selected.
2. Click **REDIRECT** to be taken to the authentication page.

VMware Identity Manager Login

[152]



VMware Identity Manager acts as the identity provider for the Active Directory authentication source in this lab.

Credentials for the default user, holadmin, have already been provided.

1. Click Sign in

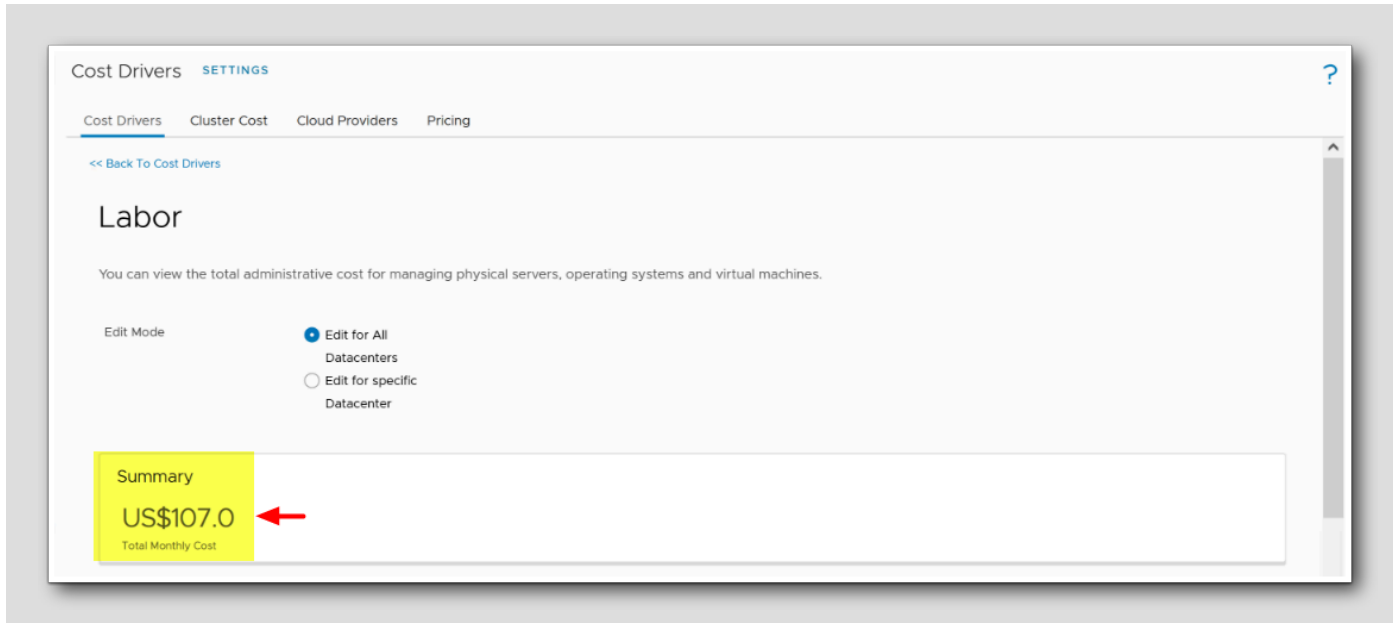
Costing and Cost Drivers

[153]

We will focus on reviewing and customizing cost driver settings within Aria Operations.

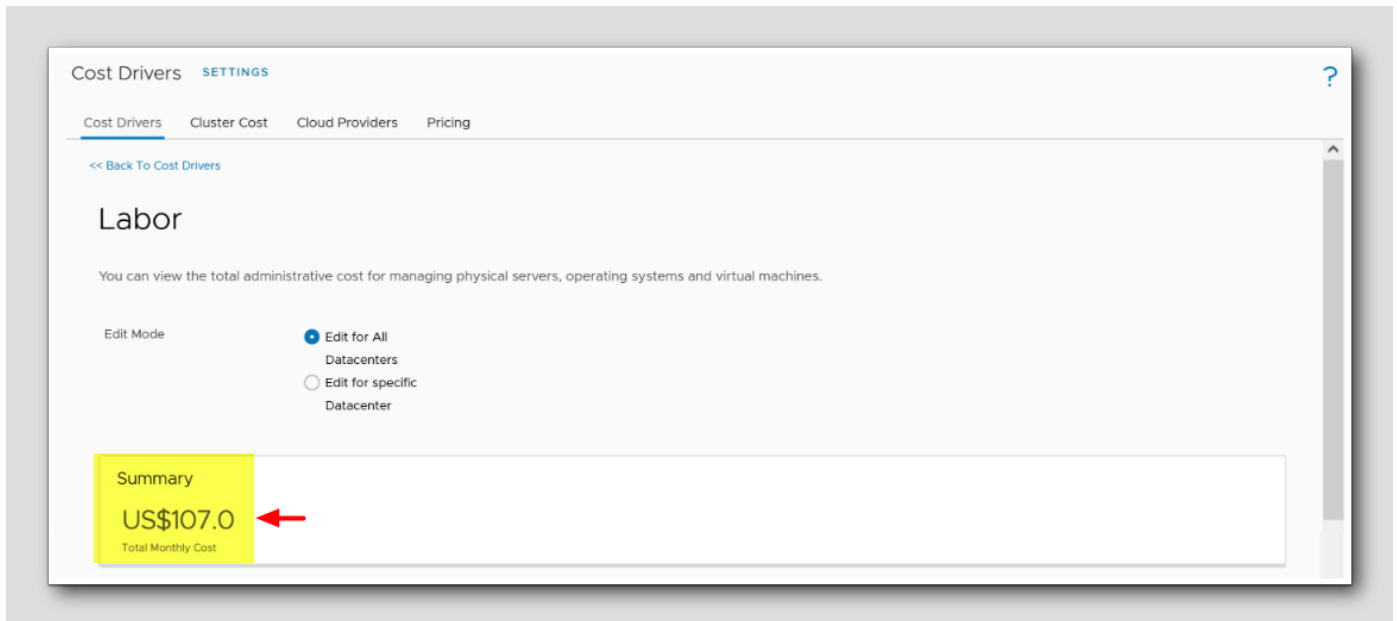
- Reviewing Cost Driver Settings: Explore cost driver settings related to server hardware, network resources, and labor.
- Customizing Cost Calculation Settings: We will learn how to customize cost calculations by editing the cost drivers

Note: SDDC costing is out-of-the box with VMware Aria Operations. There is no integration required with the old vRealize Business for Cloud.

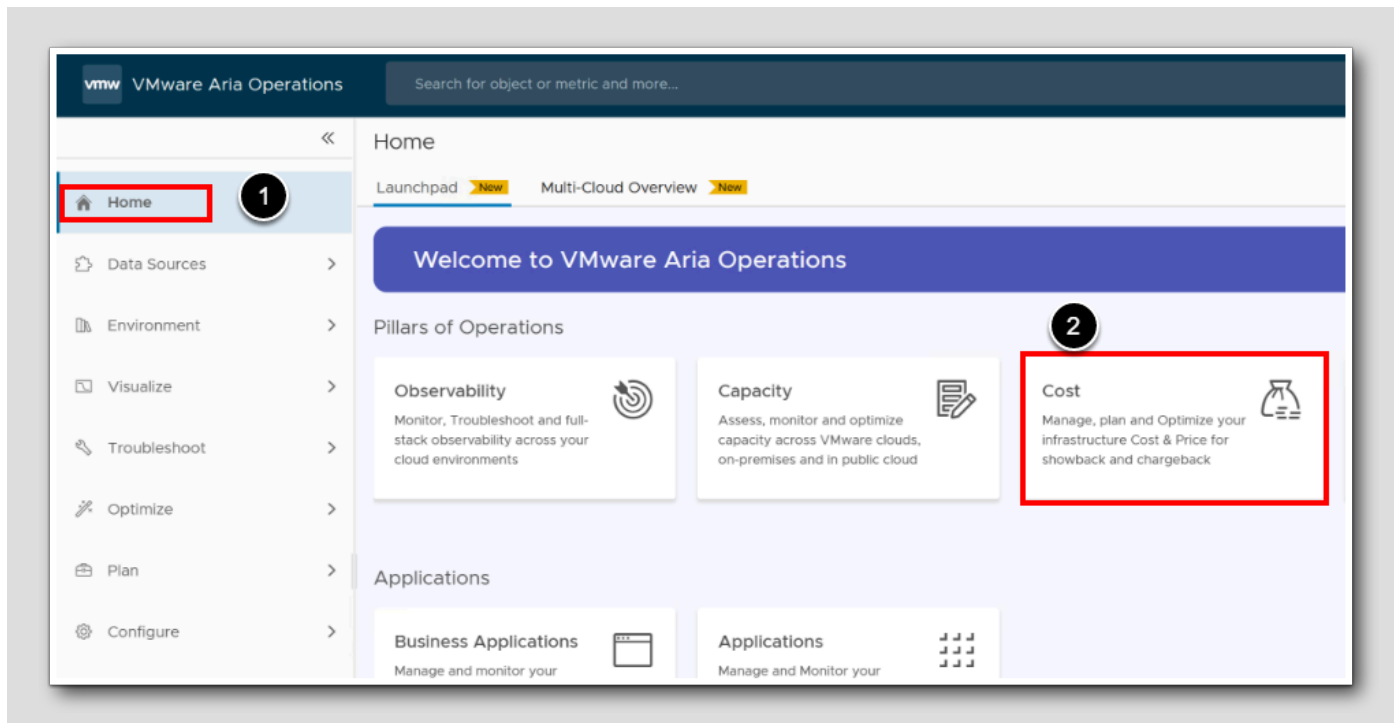


Review the Summary Total Monthly Cost for Labor (\$107)

1. Scroll up
2. Click << Back To Cost Drivers



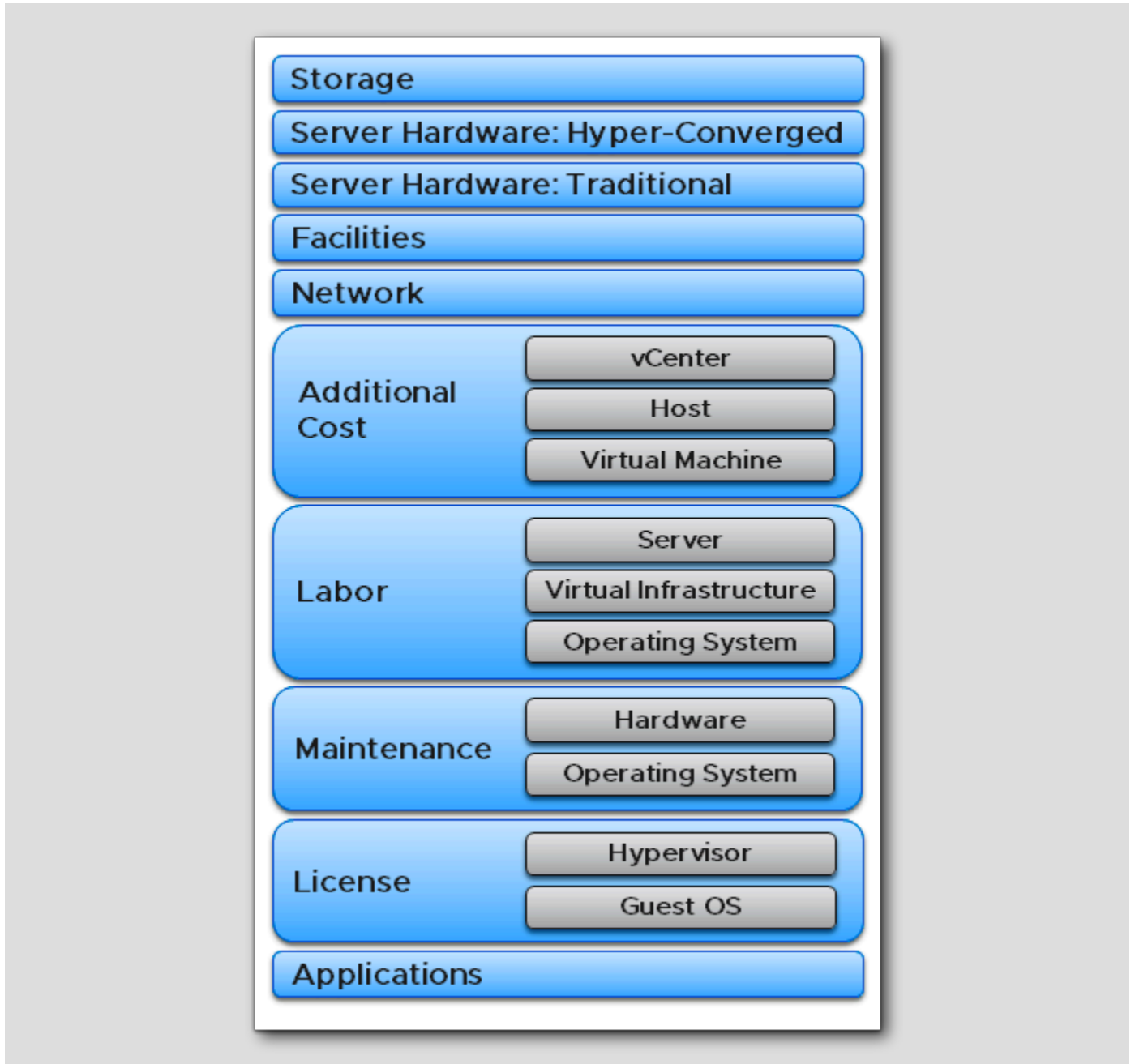
Launching cost



1. If you're not on the home page, click Home
2. Click Cost

About Cost Drivers

[155]

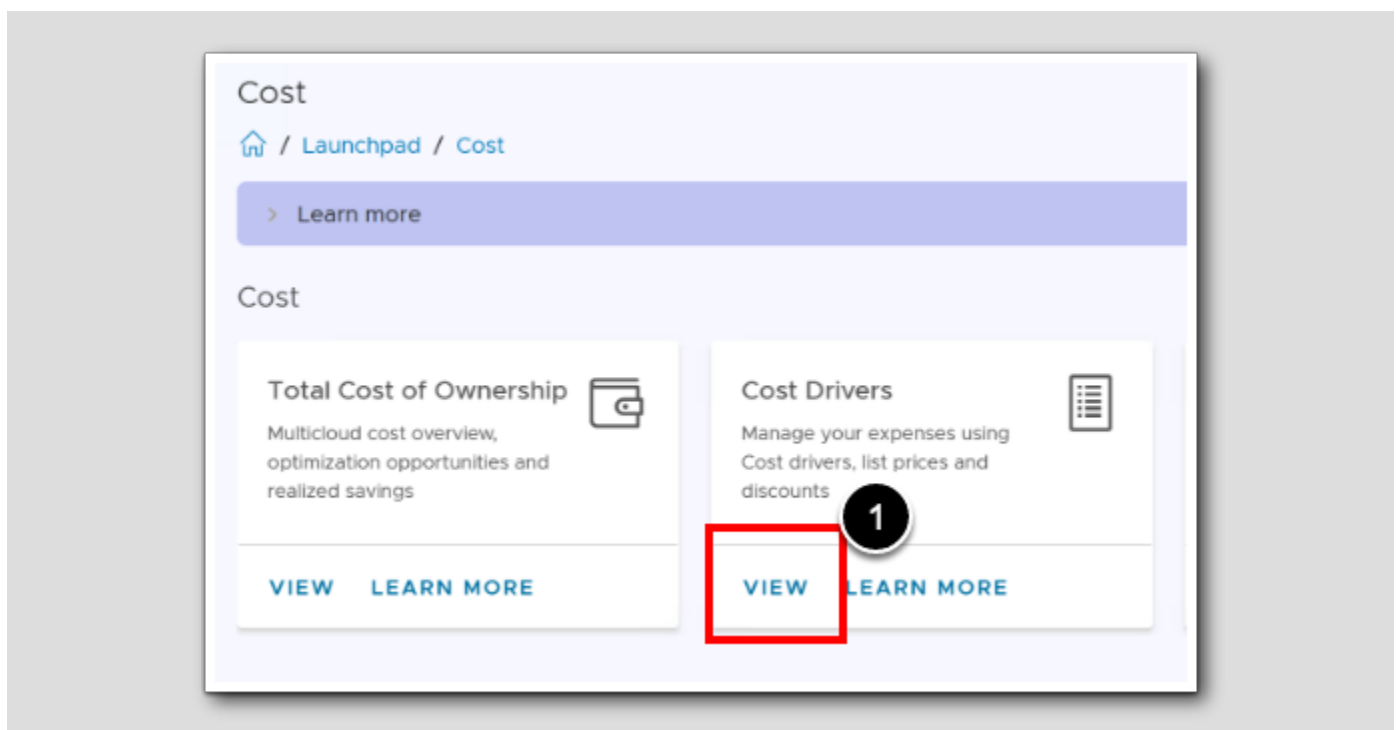


Cost Drivers: Cost Drivers are the aspect that contributes to the expense of your business operations. Cost drivers provide a link between a pool of costs. Cost Drivers help you with expense management. There are various cost drivers such as Server Hardware, Maintenance Contracts, Facilities like real estate, Power and Cooling, Network, Storage, Labour and even licenses like OS, VMware software, SQL Server etc. You can set a total cost for the License, Labor, Network, Maintenance, and facilities cost drivers in VMware Aria Operations.

Cost Reference Database: According to the industry standard, VMware Aria Operations maintains a reference cost for these cost drivers, meaning that Cost Drivers are populated by default using the Cost Reference Database that ships with Aria Operations. If we modify the reference cost of cost drivers in VMware Aria Operations, we override the values in the reference database.

Launching the Cost Drivers

[156]



1. In the Cost page, launch the Cost drivers by clicking **View**

Hardware Monthly expense

The screenshot displays the 'Cost Drivers' settings page in VMware Aria Operations. The page is titled 'Cost Drivers SETTINGS' and has tabs for 'Cost Drivers', 'Cluster Cost', 'Cloud Providers', and 'Pricing'. The 'Cost Drivers' tab is active. Below the tabs, there is a descriptive paragraph about cost drivers and their calculation. The 'Infrastructure Type' is set to 'vCenter'. There are 'EXPORT' and 'IMPORT' buttons. A 'Select Datacenter' dropdown is set to 'All Datacenters'. A table lists the cost drivers with their respective monthly expenses. The 'Server Hardware: Traditional' driver is highlighted with a red box and a circled '1', and its expense of 'US\$492.0' is highlighted in yellow with a red arrow pointing to it.

Private Cloud Cost Driver	Comparison with industry benchmark	Industry Benchmark	Monthly Expense
<input type="checkbox"/> Server Hardware: Traditional	0.00%		US\$492.0
<input type="checkbox"/> Server Hardware: Hyper-Converged	Not Applicable		US\$0.0

Review the monthly expense for the Private Cloud Cost Driver for *Server Hardware: Traditional*

1. To review the details, click **Server Hardware: Traditional**

Cost Drivers SETTINGS

Cost Drivers Cluster Cost Cloud Providers Pricing

<< Back To Cost Drivers

Server Hardware : Traditional

You can view the total cost of servers such as tower, blade or desktop that are associated with all your vCenter Server instances. The amortized cost of each server hardware is calculated based upon depreciation years and model defined in Cost Settings. Please refer to Storage tab to enter cost per GB, for datastores.

Edit Mode

- Edit for All Datacenters **1**
- Edit for specific Datacenter

Summary

US\$492.0 **5**

Server Hardware Cost by Server Configuration Total Number of Servers

Server Group Description	No. of Servers	Monthly Cost
> VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 42GB RAM	1	US\$98.47
> VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 16GB RAM	3	US\$295.41
> VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 52GB RAM	1	US\$98.47
Total		US\$492.35

The summary shows that we have 5 servers costing US\$ 492, -/month. The server details and Monthly cost is per server type. Observe the number of each server type.

1. We will Edit the settings for all datacenters
2. Click ">" to expand

Review the costs per server

[159]

VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 16GB RAM 3 US\$295.41

You have altogether **3 Server(s)** in this group out of which 0 Server(s) are customized for purchase date, purchase type or cost per server.

[3 Server\(s\)](#) and any new server(s) with identical configuration will use values under the highlighted row.

Reference values are (Purchase Date : 1/1/2022, Purchase Type : Owned, Reference cost : US\$5.91K)

Number of Servers	Purchase Date	Purchase Type	Cost Per Server	Purchase Cost	Monthly Cost	Remove
3 Server(s)	01/01/2022	Owned	US\$ 5908.21	US\$17.72K	US\$295.41	NA

+ ADD COST PER SERVER One or more servers from batch can be selected to assign custom purchase cost

SAVE

1. As you can see we have 3 servers of identical configuration. Click on either of the links [3 Server\(s\)](#)

Reviewing which servers

[160]

Server Group Description	No. of Servers	Monthly Cost
VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 42GB RAM	1	
VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 16GB RAM	3	

You have altogether [3 Server\(s\)](#) in this group out of which 0 Server(s) are customized for purchase date, purchase type or cost per server.

[3 Server\(s\)](#) and any new server(s) with identical configuration will use values under the highlighted row.

Reference values are (Purchase Date : 1/1/2022, Purchase Type : Owned, Reference cost : US\$5.91K)

Number of Servers	Purchase Date	Purchase Type	Cost Per Server
3 Server(s)		Owned	US\$ 5908.21

+ ADD COST PER SERVER One or more servers from batch can be selected to assign custom purchase cost

SAVE

All Servers

- esx-03a.corp.vmbeans.com
- esx-04a.corp.vmbeans.com
- esx-05a.corp.vmbeans.com

The 3 servers Servers in this group with identical configuration in our domain corp.vmbeans.com are esx-03a, esx-04a, and esx-05a.

1. Click the Purchase type Owned

Get back to all Cost Drivers

Cost Drivers **SETTINGS** ?

Cost Drivers Cluster Cost Cloud Providers Pricing

[<< Back To Cost Drivers](#) 2

Server Hardware : Traditional

You can view the total cost of servers such as tower, blade or desktop that are associated with all your vCenter Server instances. The amortized cost of each server hardware is calculated based upon depreciation years and model defined in Cost Settings. Please refer to Storage tab to enter cost per GB, for datastores.

Edit Mode

- Edit for All Datacenters
- Edit for specific Datacenter

Summary

US\$492.0 **5**

Server Hardware Cost by Server Configuration Total Number of Servers

Server Group Description	No. of Servers	Monthly Cost
> VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 42GB RAM	1	US\$98.47
▼ VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 16GB RAM	3	US\$295.41

You have altogether [3 Server\(s\)](#) in this group out of which 0 Server(s) are customized for purchase date, purchase type or cost per server.
[3 Server\(s\)](#) and any new server(s) [with identical configuration](#) will use values under the highlighted row.
 Reference values are (Purchase Date : 1/1/2022, Purchase Type : Owned, Reference cost : US\$5.91K)

Number of Servers	Purchase Date	Owned Leased	Cost Per Server	Purchase Cost	Monthly Cost	Remove
3 Server(s)	01/01/2022	Owned	US\$ 5908.21	US\$17.72K	US\$295.41	NA

The Server Hardware cost driver tracks all the expenses for purchasing of hardware servers that are part of vCenter Servers. You see the server cost based on CPU age and server cost details. Observe that we can have leased servers, not just owned servers.

Note: We could have selected an individual server from the server group and specified the unique cost for each individual server

1. Scroll to the top
2. Click << Back To Cost Drivers

Launch Network Cost Driver Settings

<input type="checkbox"/>	Cost Driver	benchmark	Industry Benchmark	Monthly Expense
<input type="checkbox"/>	Server Hardware : Traditional	0.00%		US\$492.0
<input type="checkbox"/>	Server Hardware : Hyper-Converged	Not Applicable		US\$0.0
<input type="checkbox"/>	Storage	0.00%		US\$83.0
<input type="checkbox"/>	License	0.00%		US\$320.0
<input type="checkbox"/>	Applications	Not Applicable		US\$0.0
<input type="checkbox"/>	Maintenance	0.00%		US\$250.0
<input type="checkbox"/>	Labor	0.00%		US\$85.0
<input type="checkbox"/>	Network	0.00%		US\$900.0

1. In the Cost Drivers page scroll down to the bottom
2. Click **Network**

Changing 10 Gbit costs

The screenshot displays the 'Cost Drivers' settings page in VMware vRealize Cloud Manager. The 'Summary' section shows a total monthly cost of US\$900.0. Below this, there is a table of network interface controller (NIC) costs. The '10 Gigabit NIC' row is highlighted with a red box, showing a cost of US\$ 250 and a count of 10. A red arrow points to the '250' value. A 'SAVE' button is highlighted with a red box and a circled '2' next to it. A circled '1' is next to the '10 Gigabit NIC' row.

NIC Type	Cost (US\$)	Reference Cost (US\$)	Count
1 Gigabit NIC	45	US\$45	0
10 Gigabit NIC	250	US\$90	10
25 Gigabit NIC	135	US\$135	0
40 Gigabit NIC	180	US\$180	0
100 Gigabit NIC	225	US\$225	0

Observe that we have ten 10 Gigabit NICs and the Total Monthly Cost is \$900

At the moment, Maybe as suggested, a 10 Gigabit NIC can cost a reasonable price of \$90. But in our organization, our gigantic gigabit switches are the best of breed so it is necessary to use high-end premium NICs with top-notch features for professional use and businesses. These are super expensive at \$250 each.

1. Change the price from 90 to 250
2. Click Save

After the change

[<< Back To Cost Drivers](#)

Network

You can view the total cost of physical network infrastructure that includes internet bandwidth, which is estimated by count and type of network ports on the ESXi Servers.

Edit Mode

- Edit for All Datacenters
- Edit for specific Datacenter

Summary

US\$2.5K
Total Monthly Cost

[EDIT FOR INDIVIDUAL SERVERS](#)

Edit the total monthly cost per Network Interface Controller

1 Gigabit NIC	US\$	45	(Reference Cost : US\$45, Count : 0)
10 Gigabit NIC	US\$	250	(Reference Cost : US\$90, Count : 10)
25 Gigabit NIC	US\$	125	(Reference Cost : US\$125, Count : 0)

Notice that our ten 10 Gigabit NICs cost \$250/each and we have a Summary of US\$2.5K as Total Monthly Cost

1. Scroll up
2. Click << Back To Cost Drivers

Network Cost Driver Result

[165]



1. Again Scroll down (*scrollbar not visible*)

Notice the "drift" from the reference value. For Network, we cost 177.78% more than the reference value because of our fancy NICs.

2. Click Labor

Changing Labor Values

Cost Drivers Cluster Cost Cloud Providers Pricing

Enter detailed cost of labor

Category	Calculated By	Total Monthly Cost
Operating System	Hourly Rate	
Monthly hours of labor per Linux Instance	hours 0.08 (1)	(Reference value: 0.04)
Labor hourly rate	US\$ 40 (2)	(Reference Cost: US\$35.12)
Monthly hours of labor per Windows Desktop Instance	hours 0.02 (3)	(Reference value: 0.04)
Labor hourly rate	US\$ 35.12	(Reference Cost: US\$35.12)
Monthly hours of labor per Windows Server Instance	hours 0.02 (4)	(Reference value: 0.04)
Labor hourly rate	US\$ 35.12	(Reference Cost: US\$35.12)
Servers	Hourly Rate	
EDIT FOR INDIVIDUAL SERVERS		
Monthly hours of labor per server	hours 0.08	(Reference value: 0.08)
Labor hourly rate	US\$ 35.12	(Reference Cost: US\$35.12)
Virtual Infrastructure/ VM	Hourly Rate	
Monthly hours of labor per VM	hours 0.03 (5)	(Reference value: 0.04)
Labor hourly rate	US\$ 45 (6)	(Reference Cost: US\$49.4)

Enter total monthly labor cost for servers, virtual infrastructure and operating system

Total Monthly Cost US\$ 0

[SAVE](#) (7)

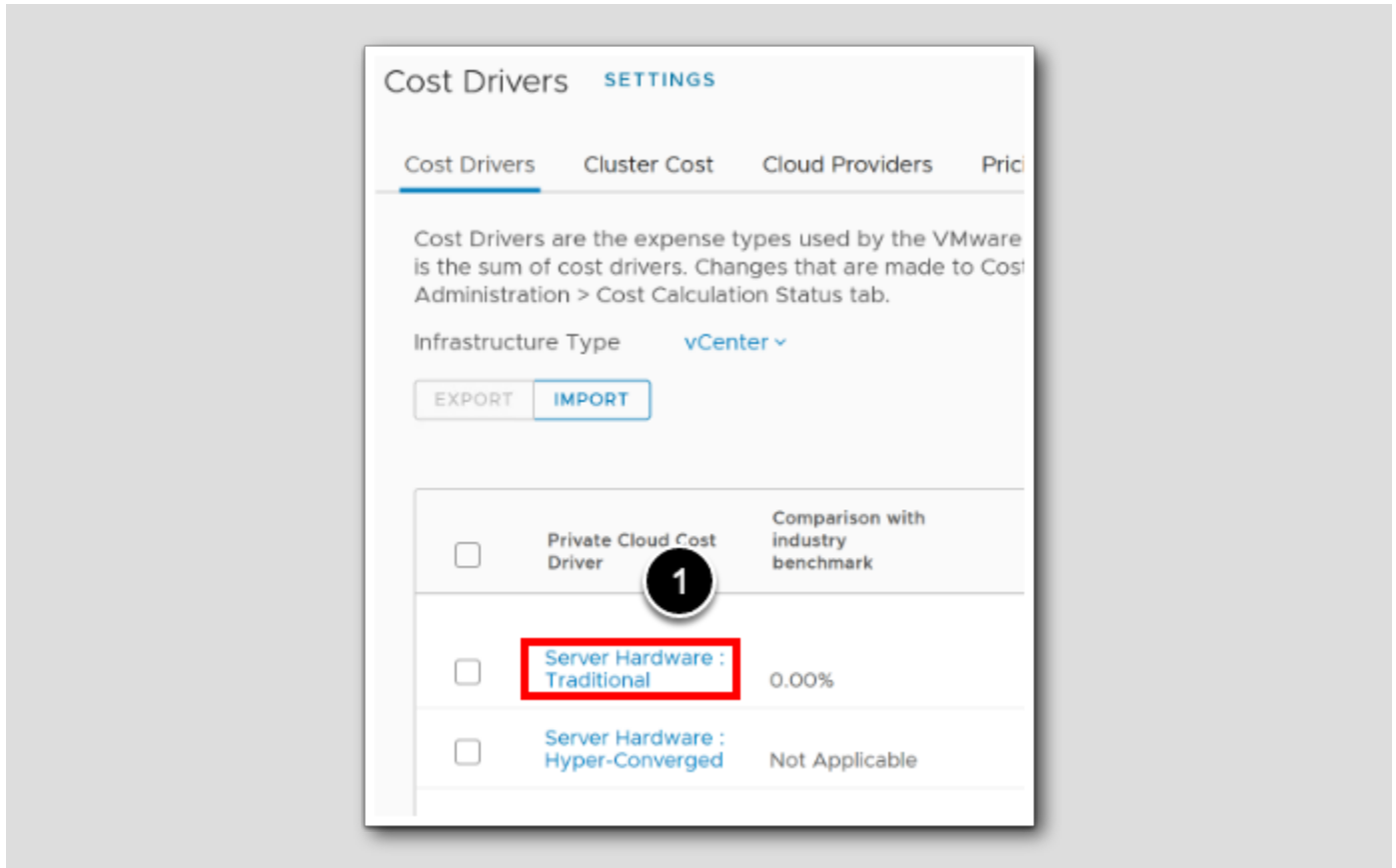
Within our organization, we possess a group of individuals who specialize in hardware management and boast exceptional proficiency in vSphere, surpassing the capabilities of VI Admins. Among our pool of employees, there is an abundance of expertise in the Windows operating system; however, we face a significant deficit in Linux knowledge. Consequently, our administrators frequently resort to online searches for resolving Ubuntu-related queries. The scarcity of Linux knowledge within our organization results in higher labor costs associated with Linux expertise. In contrast, expenses related to other areas remain comparatively lower. This discrepancy arises due to the need for additional time and resources allocated by our administrators to research and resolve Ubuntu-related issues, resulting in increased expenses.

1. Change the Monthly hours of labor per Linux Instance from 0.04 to 0.08
2. Change the Linux Labor hourly rate to 40
3. Change the Monthly hours of labor per Windows Desktop Instance from 0.04 to 0.02
4. Change the Monthly hours of labor per Windows Server Instance from 0.04 to 0.02
5. Change the Monthly hours of labor per VM from 0.04 to 0.03
6. Change the Virtual Infrastructure/ VM Labor hourly rate from 49.4 to 45
7. Click **Save**

Review Summary

[167]

Advantageous hardware acquisition



Our company has recently secured a highly favorable hardware acquisition deal, obtaining servers at a significantly reduced cost. Based on our procurement purchase order, it appears that the price paid for each server was approximately 15% lower than the prevailing market price. In line with this, our finance department has requested that these cost savings be accurately recorded in our cost database. Consequently, it is necessary for us to update the current pricing information with the new values reflecting the revised and reduced costs.

1. To Enter new values click **Server Hardware : Traditional**

Entering 15% less

Cost Drivers Cluster Cost Cloud Providers Pricing

[<< Back To Cost Drivers](#)

Server Hardware : Traditional

You can view the total cost of servers such as tower, blade or desktop that are associated with all your vCenter Server instances. The amortized cost of each server. Please refer to Storage tab to enter cost per GB, for datastores.

Edit Mode

- Edit for All Datacenters
- Edit for specific Datacenter

Summary

US\$419.0 **5**

Server Hardware Cost by Server Configuration Total Number of Servers

Server Group Description	No. of Servers
> VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 42GB RAM	
> VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 16GB RAM	
▼ VMware, Inc. VMware7,1 Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 52GB RAM	

You have altogether **1 Server(s)** in this group out of which 0 Server(s) are customized for purchase date, purchase type or cost per server.
[1 Server\(s\)](#) and any new server(s) with identical configuration will use values under the highlighted row.
Reference values are (Purchase Date : 1/1/2022, Purchase Type : Owned, Reference cost : US\$5.91K)

Number of Servers	Purchase Date	Purchase Type ⓘ	Cost Per Server
1 Server(s)	01/01/2022	Owned	US\$ 5022

+ ADD COST PER SERVER One or more servers from batch can be selected to assign custom purchase cost

SAVE

In our environment our default Purchase cost pr server is \$5908.21 each.
 15% of \$5908.21 is approx. \$ 886,2315, and If we subtract the 15% from the original price we get an approximate Cost Per Server: \$5022,- which will be our **new** Cost per server value.

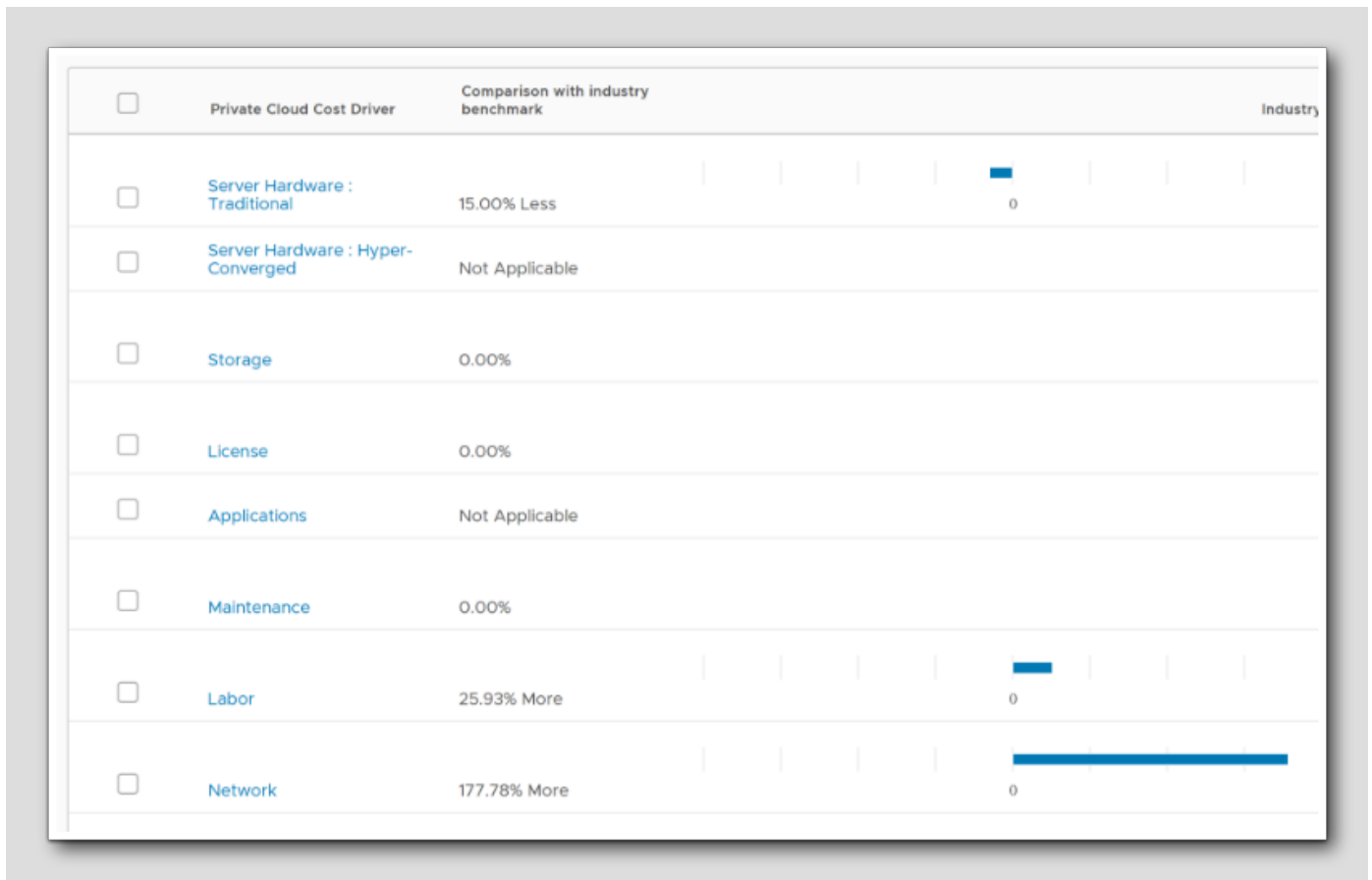
1. For each of the three server group descriptions, click the ">" to expand
2. Change the Cost Per server to 5022
3. Click **Save**

Note: Do this for all three!

4. When you have done all three, click << **Back To Cost Drivers**

Cost Summary

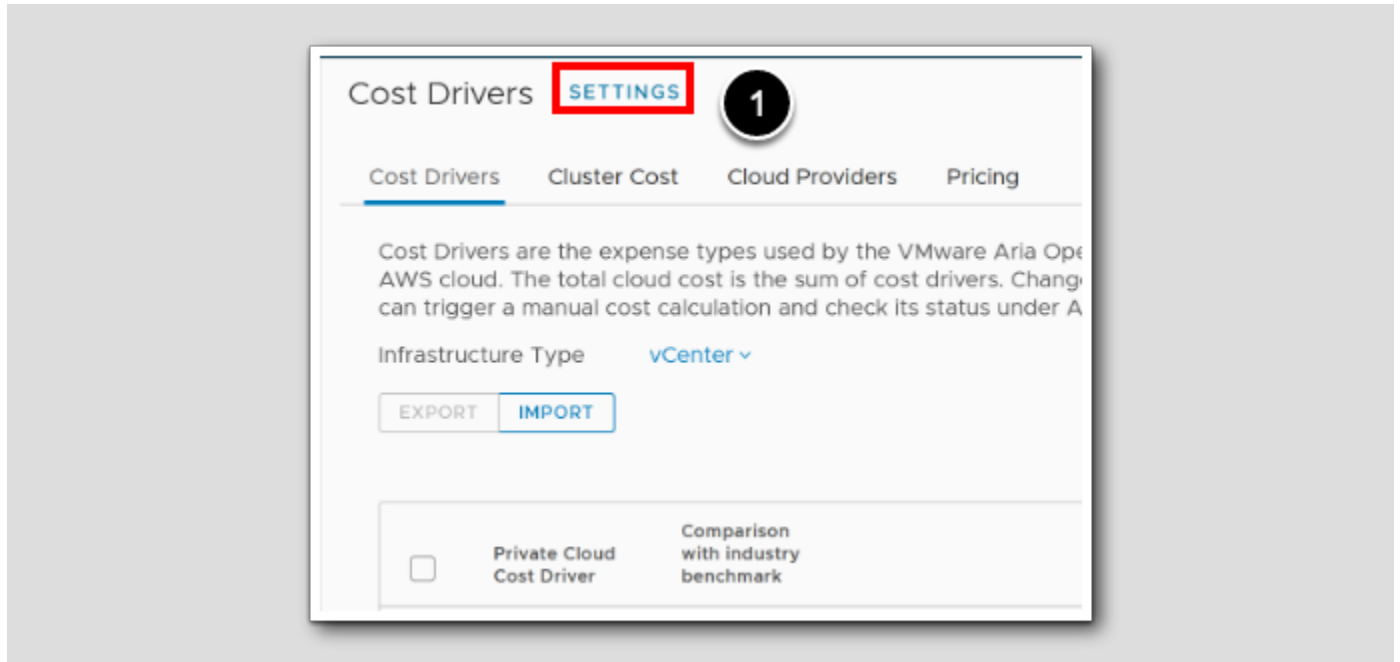
[170]



As you can see from the summary, our hardware now costs 15% less than the industry standard, and our Labor costs and network costs are higher than the reference value.

Pricing and Calculation [171]

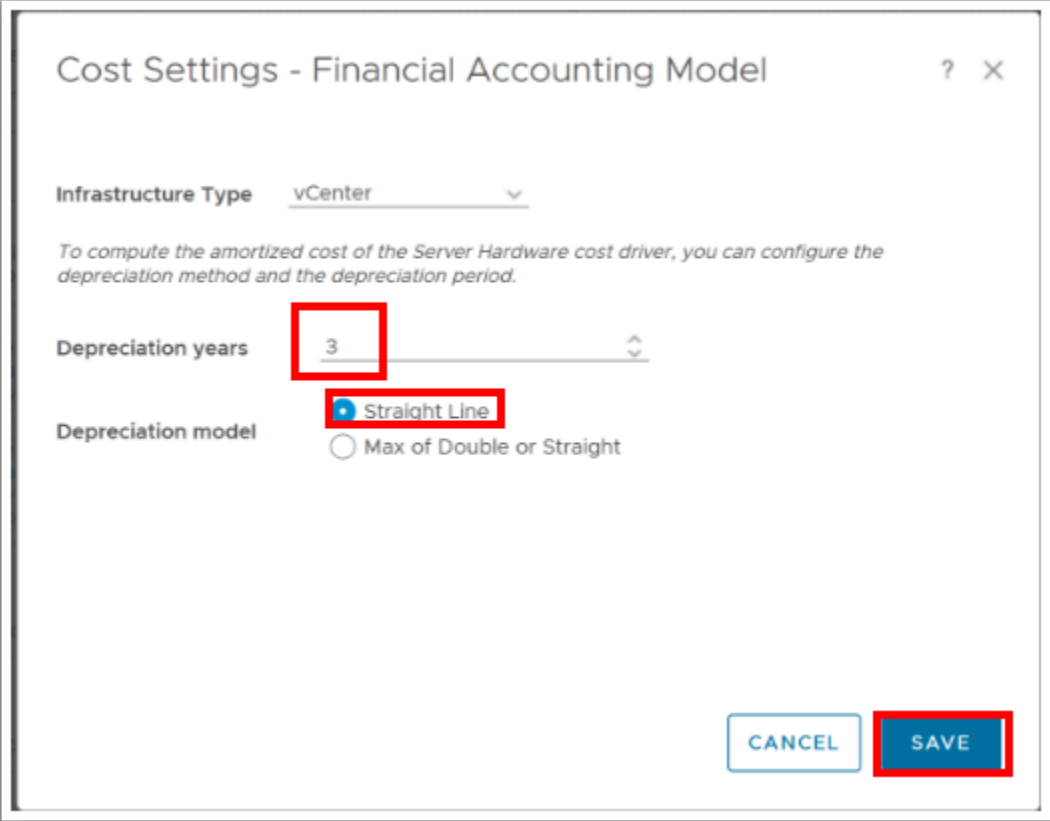
Financial Accounting Model: Depreciation [172]



Depreciation is like splitting the cost of a pricey item, like a server, over the years it's used. Instead of saying we spent all the money in year one, we spread the cost over its lifespan. Each year, we "use up" some of the server's value. It's like slicing a cake over several days, so everyone gets a piece when they want it. This gives a better picture of yearly expenses, reflecting when we're actually using the server.

1. To edit these values, on top, Click **SETTINGS**

Updating Cost Settings



Cost Settings - Financial Accounting Model ? X

Infrastructure Type vCenter

To compute the amortized cost of the Server Hardware cost driver, you can configure the depreciation method and the depreciation period.

Depreciation years 3

Depreciation model
 Straight Line
 Max of Double or Straight

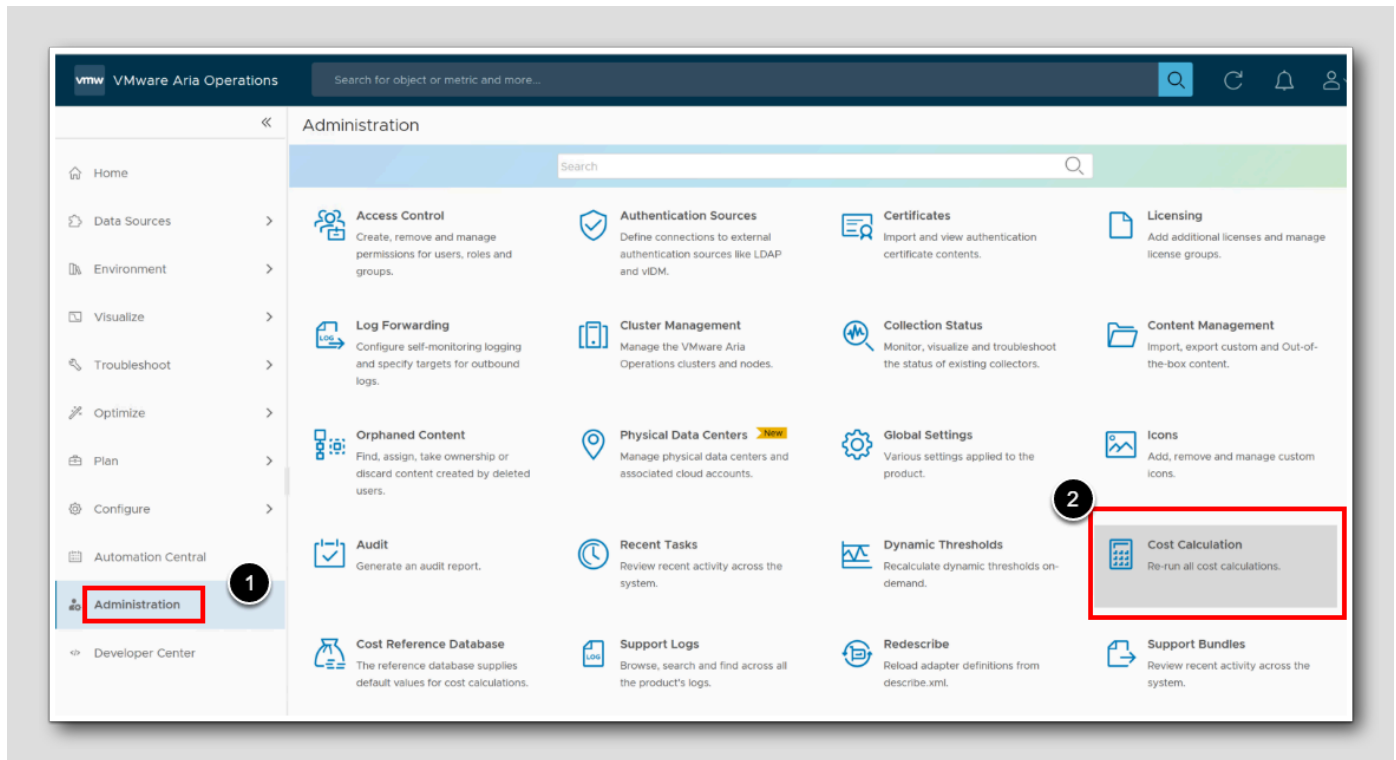
CANCEL SAVE

We buy a server for \$6,000. We expect it to last for 3 years, and after that, it will have no resale value (salvage value) meaning that after 3 years, the server's book value is \$0, which matches its expected resale value. Using the straight-line depreciation method, we calculate the annual depreciation:

$$\begin{aligned} & (\text{Cost of Server} - \text{Salvage Value}) / \text{Useful Life in Years} \\ & = (\$6,000 - \$0) / 3 \\ & = \$3,333 \text{ per year} \end{aligned}$$

1. Change the Depreciation Years to 3
2. For the Depreciation model, Choose **Straight Line**
3. Click **Save**

Cost Calculation

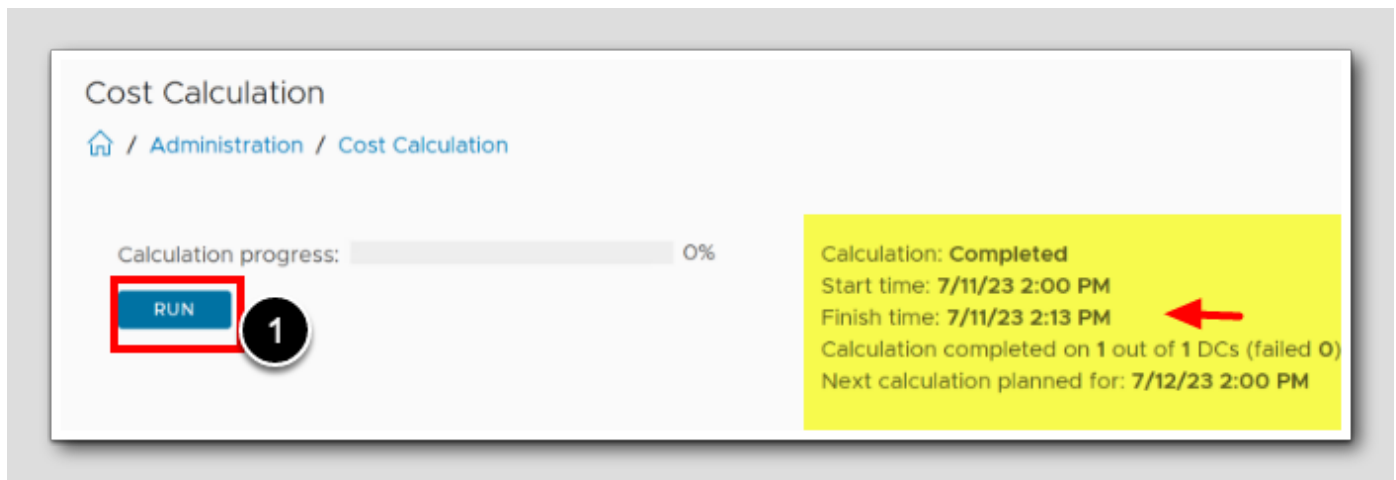


Sometimes it is necessary to run a manual cost calculation to see the impact of changes immediately, rather than waiting for the next automatic calculation cycle. For example when we have updated the cost settings, **Changes in Pricing** and / or if you need to generate a report or dashboard immediately. Aria Operations runs these calculations periodically in an automated fashion but manual calculations gives you flexibility and control over your cost analysis process.

1. Click **Administration**
2. Click **Cost Calculation**

Running a manual Cost Calculation

[175]

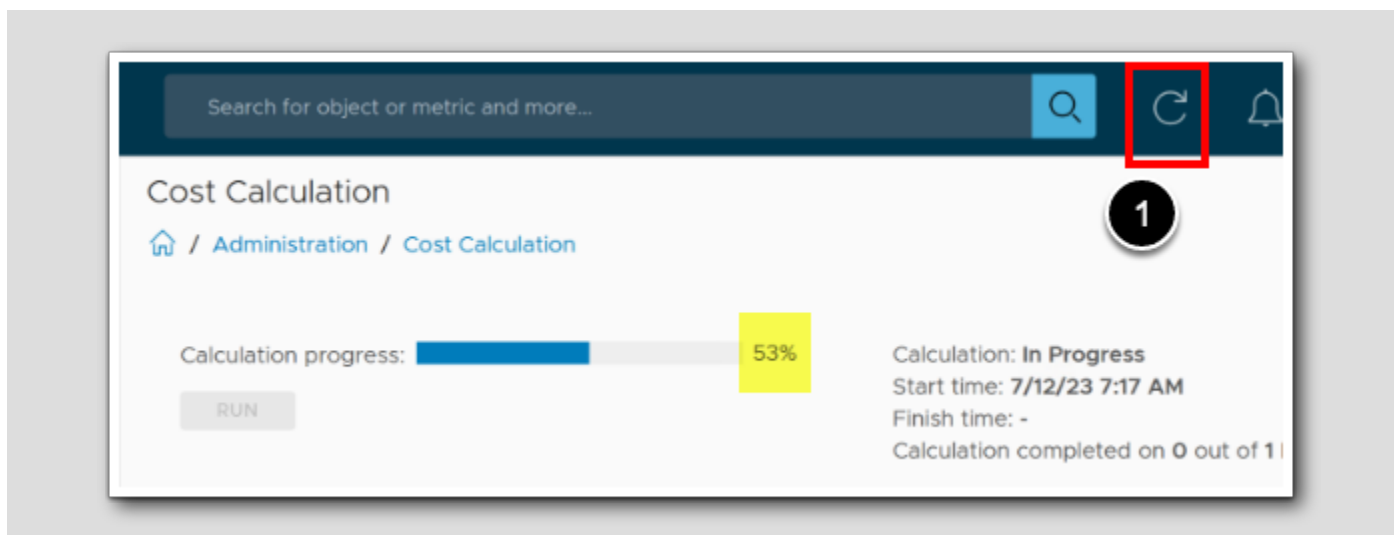


Notice when the cost calculation had a last automatic run. Notice that the cost calculation took approximately 13 minutes to run. In normal production cases, this means it's coffee time.

1. To run a Cost Calculation manually, Click RUN

Cost calculation results

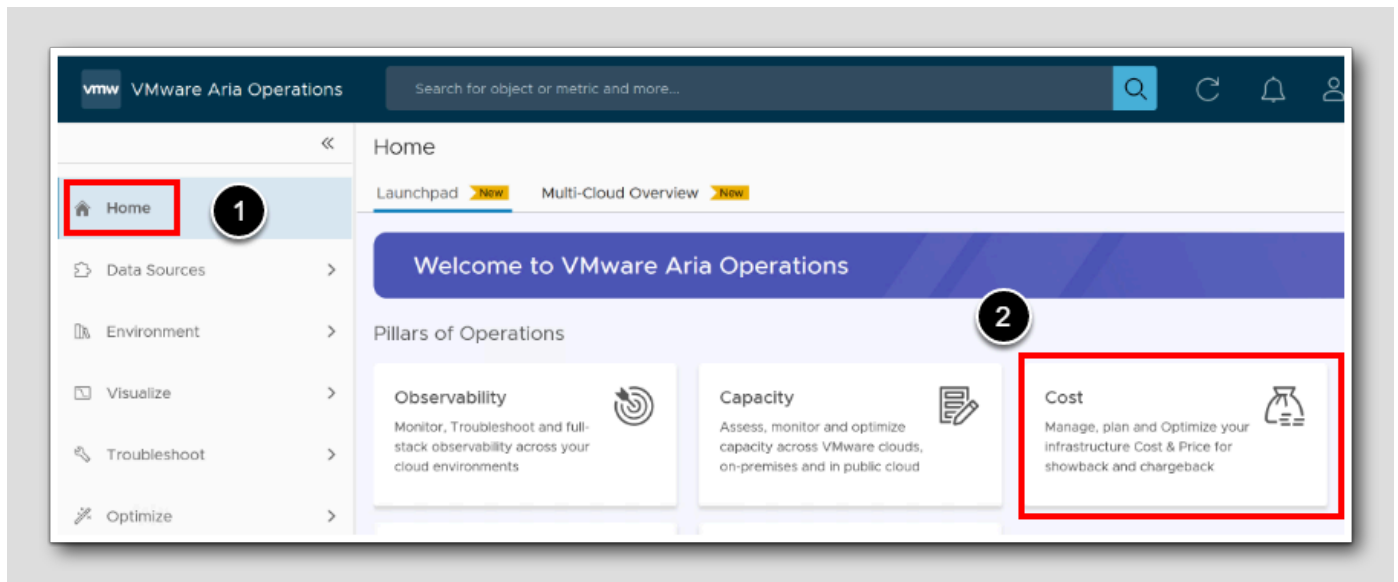
[176]



1. To refresh the progress of the calculation, click the refresh button on top

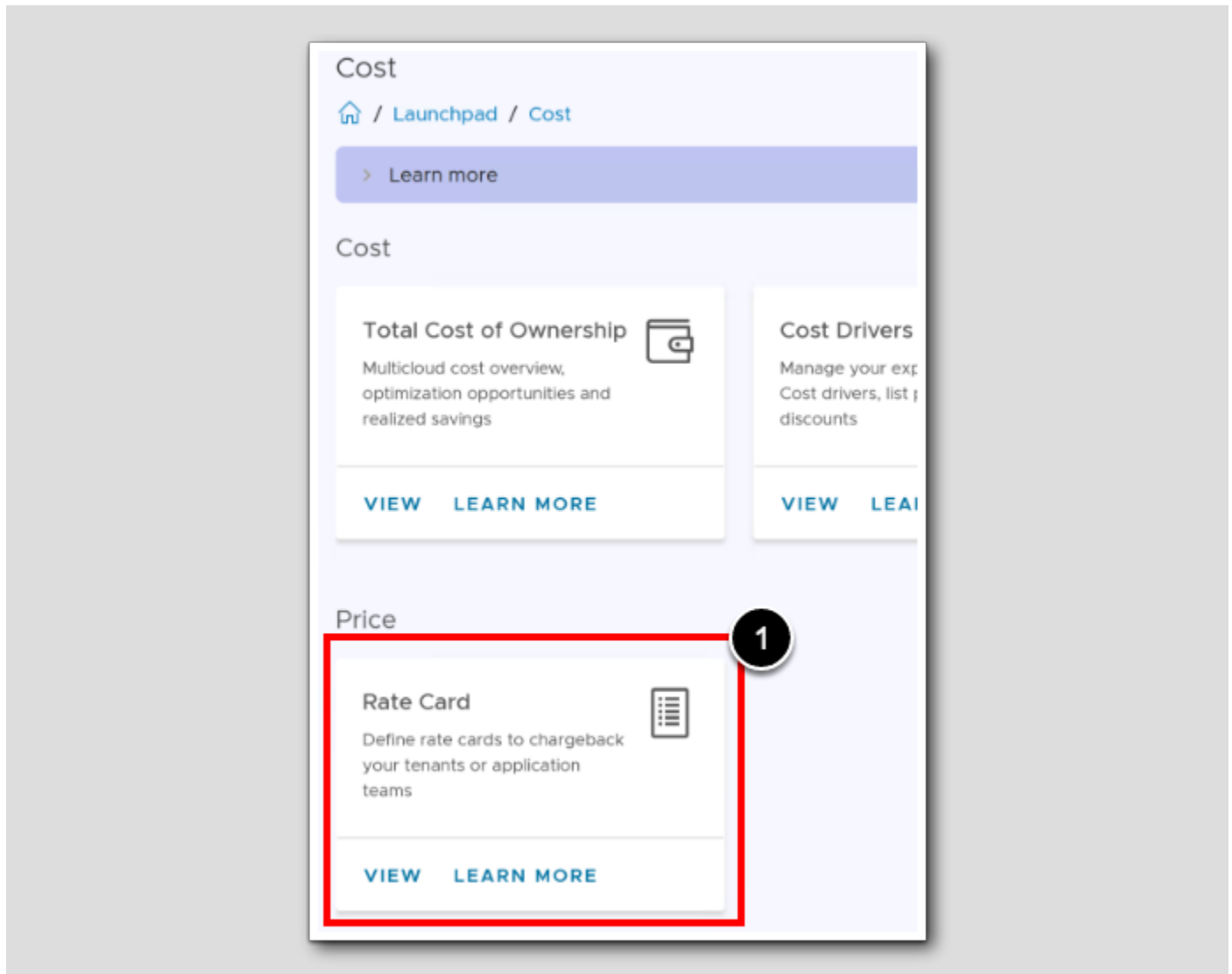
Note: You don't have to wait for it to finish, unless you need more coffee or a BIO break, so let's move on..

Start from home



1. Click Home
2. Click Cost

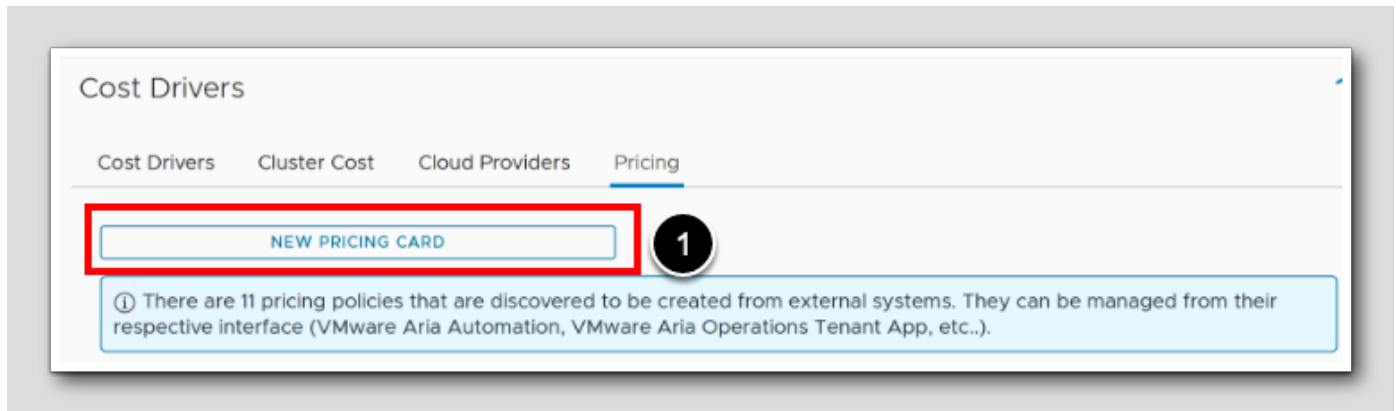
Price Rate Card



1. On the Cost page under the Price heading, click **VIEW** on the Rate Card

New Pricing card

[179]



A rate card is a document that outlines the pricing structure of the company services we offer. The purpose of a rate card is to provide "clients" or "consumers" with a clear understanding of the costs associated with specific services. By adding a Price Card we can produce a Provider-Price, that will be the Consumer-Cost.

1. To get started, Click **NEW PRICING CARD**

Pricing, Name and Description

[180]

The screenshot shows the 'Add New Pricing Card' dialog box. The sidebar on the left has 'Name and Description' selected. The main area has the following fields:

- Name: Default workloads
- Description: Rate card for NON- Aria Automation workloads
- Default for unassigned workloads?

At the bottom right, there are 'CANCEL' and 'NEXT' buttons.

The pricing card can be cost-based or rate-based. We will customize the cost-based pricing card as per our requirement. Then we will assign the pricing card to our vCenter rather than to our Clusters, but maybe companies would have another pricing strategy in real life.

1. Enter the Name: Default Workloads
2. Enter a Description: Rate card for NON- Aria Automation workloads
3. Select Default for Unassigned Workloads
4. Click Next

Note: This Default pricing card will apply to all vCenter resources which do not have a direct cost policy assigned to them.

Pricing, Basic Charges

Add New Pricing Card ? X

Basic Charges ⓘ

Cost or Rate based?: Cost Rate

CPU Cost: 1.05 (factor) 1

Memory Cost: 1.35 (factor) 2

Storage Cost: 0.9 (factor) 3

Additional Cost: 1.25 (factor) 4

CANCEL BACK NEXT 5

NOTE: The factor entered here is multiplied with the cost calculated as a derivative of cost drivers.

1. CPU costs are fair, so we will add a factor: 1.05
2. Our Company got really high memory costs, so we will add a factor: 1.35
3. Our storage costs are very low, so we will add a factor: 0.9
4. Any Additional Cost, such as DRaaS (Disaster Recover as a Service) gives a factor: 1.25
5. Click **Next**

Pricing, Adding Linux Expenses

Add New Pricing Card

Guest OSs ⓘ

Guest OS Name:

Base Rate: US\$

Charging Period:

Guest OS Name	Rate	Charging Period
No Data Available		

The scarcity of Linux knowledge within our organization results in higher costs associated with Linux expertise due to the need for additional time and resources allocated by our administrators to research and resolve Ubuntu-related issues, resulting in increased expenses (assumed \$100/day)

Currently we have just two OS types, "Microsoft Windows Server 2019 (64-bit)" and "Ubuntu Linux (64-bit)"

1. Enter the exact Guest OS Name **Ubuntu Linux (64-bit)**
2. Enter Base Rate: 100
3. Enter Charging Period: **Daily**
4. Click **Save**

Pricing, Adding Windows expenses

Add New Pricing Card

Guest OSs

Guest OS Name: Microsoft Windows Server 2019

Base Rate: US\$ 5

Charging Period: Daily

SAVE

Guest OS Name	Rate	Charging Period
⋮ Ubuntu Linux (64-bit)	US\$100	Daily

CANCEL **BACK** **NEXT**

The abundance of Windows knowledge within our organization results in a rather low costs associated with Windows expertise resulting in lower expenses (assumed \$5/day)

1. Enter the exact Guest OS Name **Microsoft Windows Server 2019 (64-bit)**
2. Enter Base Rate: 5
3. Enter Charging Period: **Daily**
4. Click **Save**
5. Click **NEXT**

Pricing, Tags

The screenshot shows the 'Add New Pricing Card' dialog box. On the left is a navigation menu with options: Name and Description, Basic Charges, Guest OSs, Tags (selected), Overall Charges, and Assignments. The main area is titled 'Tags' and contains the following fields:

- Tag Category: db
- Tag Value: oracle
- Charging Method: One Time
- Base Rate: US\$ 500

A 'SAVE' button is located below the form fields. Below the form is a table with the following structure:

Tag	Rate	Charging Method
No Data Available		

Some of our VMs are tagged with "oracle" or "mssql" under a tag category "db" to indicate that a rather expensive database is running on top of the VM. resulting in a higher expense for installation, meaning a one-time expense. For Oracle this expense is \$500 and for MSSQL it is \$100

1. Under Tag Category, Type db
2. Tag value, type oracle
3. Charging method, Choose One Time
4. Base Rate type 500
5. Click SAVE

Note: actually no VMs are tagged in vSphere, but in the future they will be tagged in vSphere by the application owners

Pricing, MSSQL Tag

Add New Pricing Card

Tags ⓘ

Tag Category: db

Tag Value: mssql

Charging Method: One Time

Base Rate: US\$ 50

SAVE

Tag	Rate	Charging Method
db:oracle	US\$500 Once	One Time

CANCEL **BACK** **NEXT**

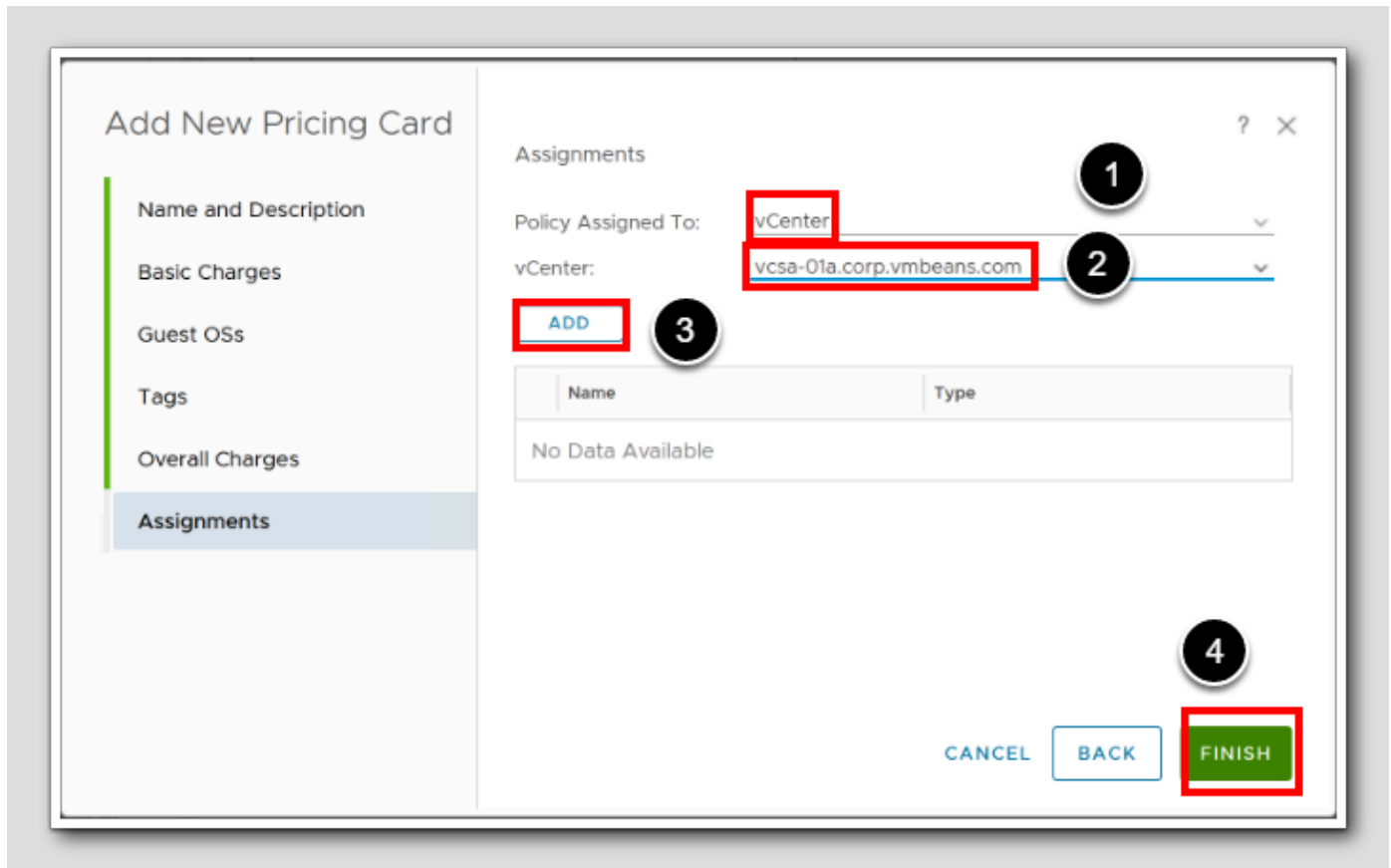
1. Under Tag Category, Type db
2. Tag value, type mssql
3. Charging method, Choose One Time
4. Base Rate type 50
5. Click SAVE
6. Click NEXT

Pricing, flat charges

The screenshot shows the 'Add New Pricing Card' interface. On the left is a navigation menu with the following items: Name and Description, Basic Charges, Guest OSs, Tags, Overall Charges (highlighted), and Assignments. The main content area is titled 'Overall Charges' and contains two input fields. The first field is labeled 'VM setup charges:' and has a value of '100' (circled with a '1' and a red box). The second field is labeled 'Recurring:' and has a value of '10' (circled with a '2' and a red box) and a frequency of 'Monthly'. At the bottom right, there are three buttons: 'CANCEL', 'BACK', and 'NEXT' (circled with a '3' and a red box).

These Overall Charges are flat charges that are applied to all VMs that match this policy. We charge \$100 extra to set up a VM, and a little extra \$10 monthly.

1. Under VM Setup charges, type 100
2. Under Recurring type 10
3. Click **Next**



Almost Done! We can assign the new pricing card to vCenters and Clusters. We will assign our pricing to anything in our vCenter.

1. Under Policy Assigned to, select vCenter
2. Select the vCenter we want to apply the pricing card vcsa-01a.corp.vmbeans.com
3. Click ADD
4. Click FINISH

Pricing Card Result

[188]

Cost Drivers ?

Cost Drivers Cluster Cost Cloud Providers Pricing

[NEW PRICING CARD](#)

ⓘ There are 11 pricing policies that are discovered to be created from external systems. They can be managed from their respective interface (VMware Aria Automation, VMware Aria Operations Tenant App, etc..).

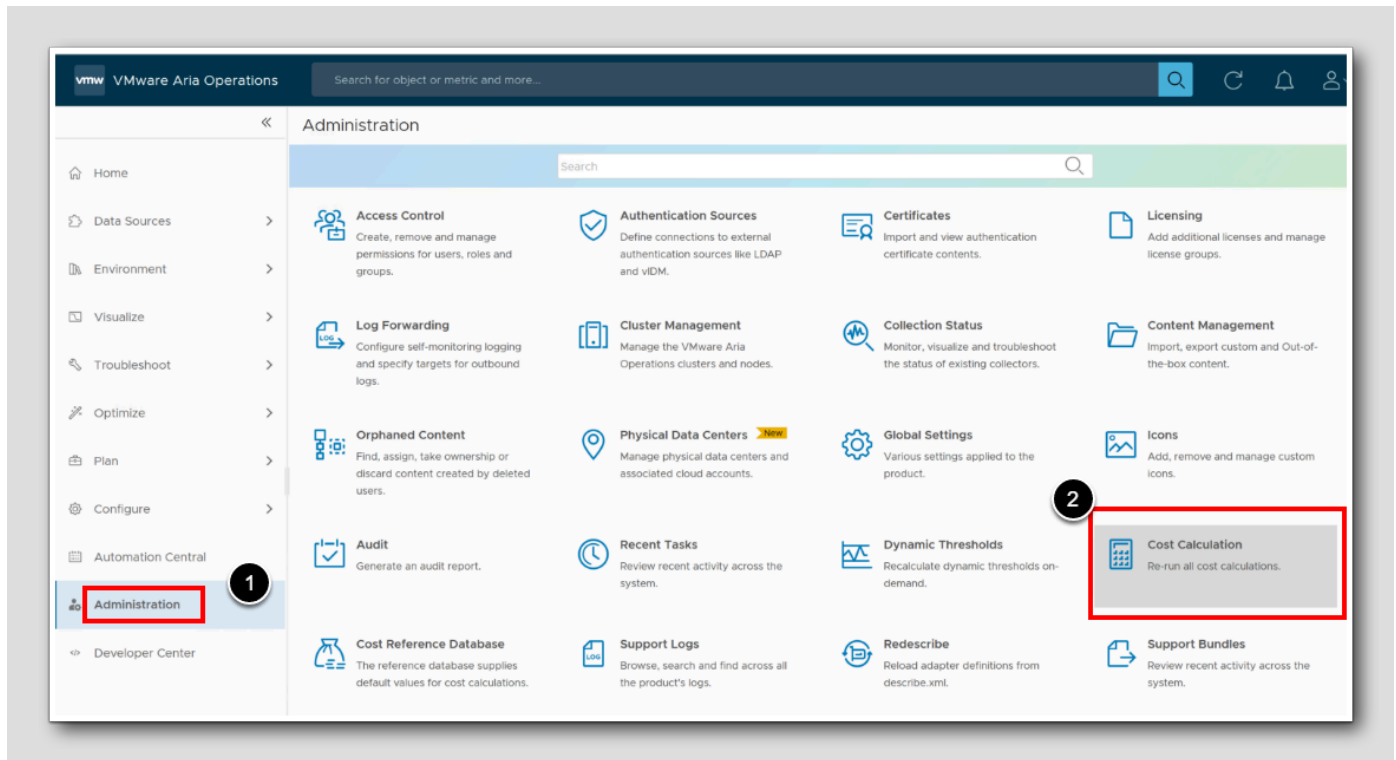
Default workloads (Default)

Description	Rate card for NON- Ar...
Workloads	1
Policy	Cost Based

[EDIT](#) [DELETE](#)

Notice that there are pricing policies other than our policy coming from workloads deployed by Aria Automation. These Pricing cards or Rate cards for those workloads are all handled by Aria Automation.

Cost Calculation

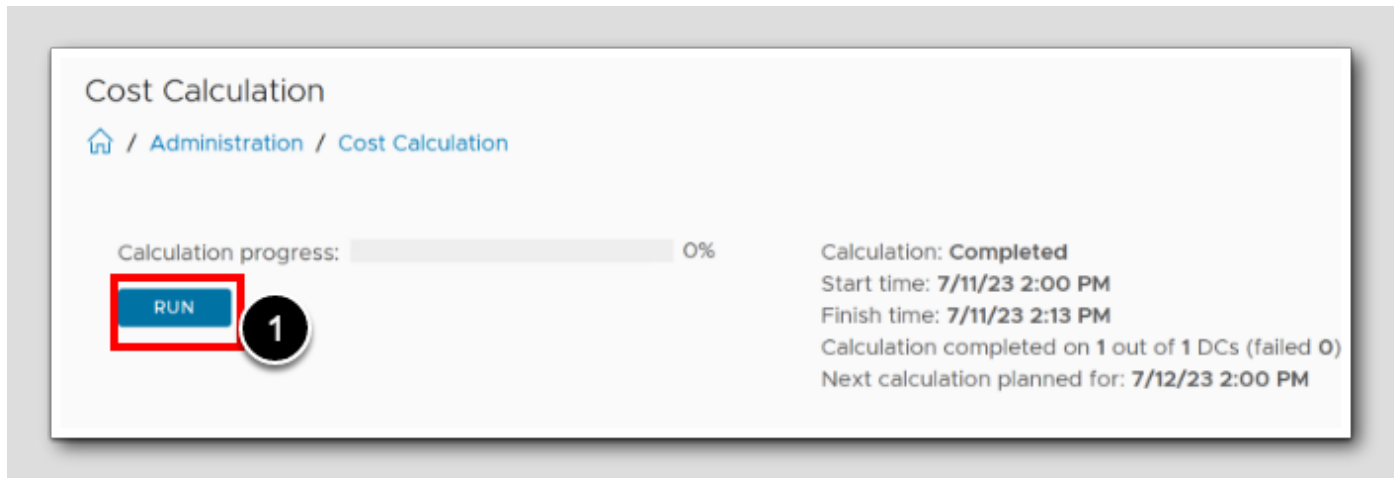


Changes in Pricing means it is necessary to run a new manual cost calculation to see the impact of changes immediately, rather than waiting for the next automatic calculation cycle.

1. Click **Administration**
2. Click **Cost Calculation**

Running a manual Cost Calculation

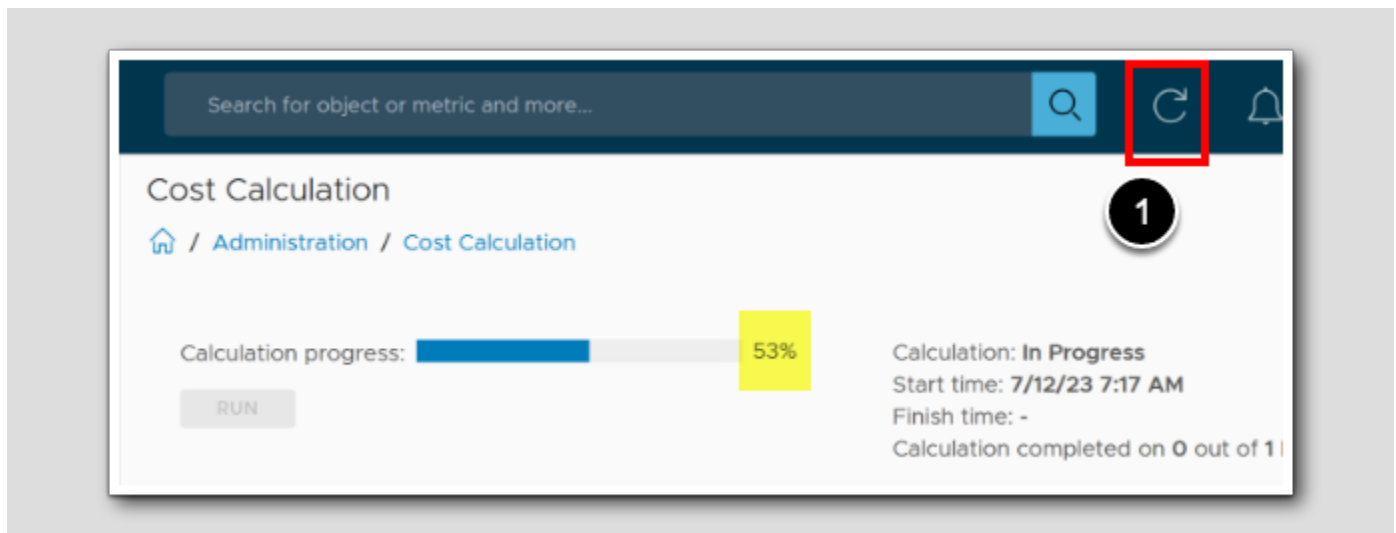
[190]



1. To run a new manual Cost Calculation, Click RUN

Cost calculation results

[191]



1. To refresh the progress of the calculation, click the refresh button on top

Note: You don't have to wait for it to finish, let's move on..

Showback

[192]

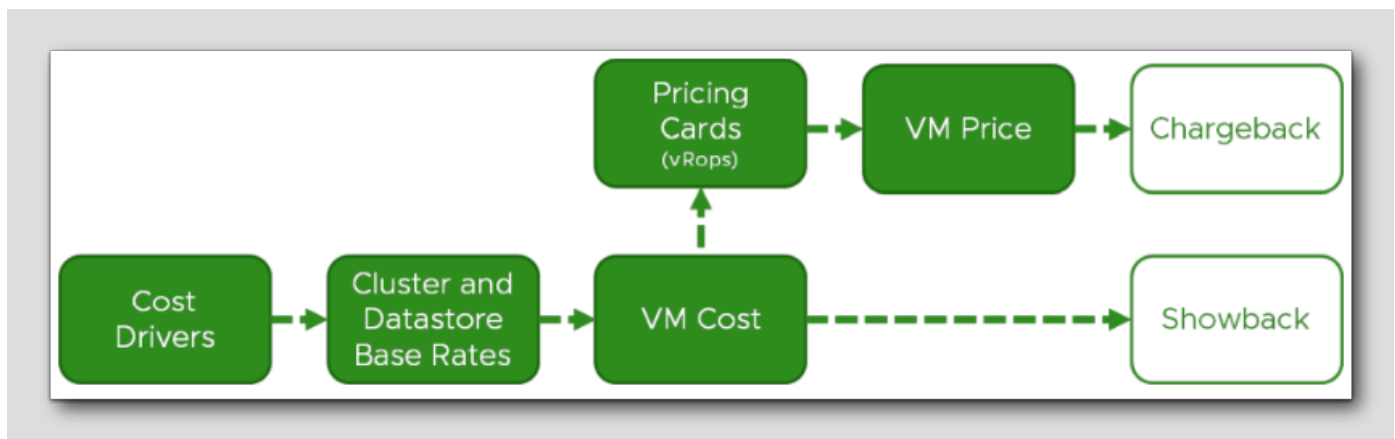
Showback offers a transparent representation of resource usage costs, enabling stakeholders to understand and optimize their IT investments.

Showback as a mechanism allows us to give god visibility of the usage and costs of resources and services utilized by various departments, business units or projects. Showback is not Chargeback or billing, so we use it to promote responsibility and accountability.

With Showback we demystify resource consumption, and it gives us awareness around the use of IT resources.

Cost and Showback

[193]

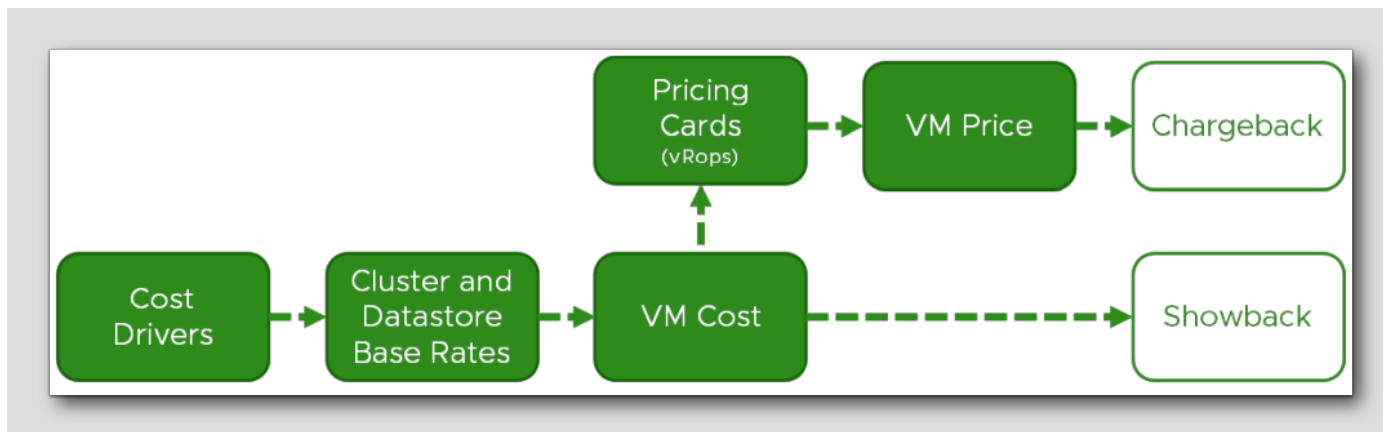


Quantifying costs and implementing showback practices are vital in cloud-based IT environments. Continuously analyzing running VM costs and implementing showback practices optimize resource allocation, improve cost-efficiency, and promote transparency in cloud-based IT environments.

1. **Cost Analysis:** Cost refers to expenses incurred in running VMs within the cloud, particularly in IaaS (Infrastructure as a Service.) Costs can be based on utilization or allocation of resources.
2. **Showback:** Reveals VM costs to enhance transparency and accountability. It provides cost visibility, fosters transparency and accountability, and facilitates informed decision-making.

Price and Chargeback

[194]



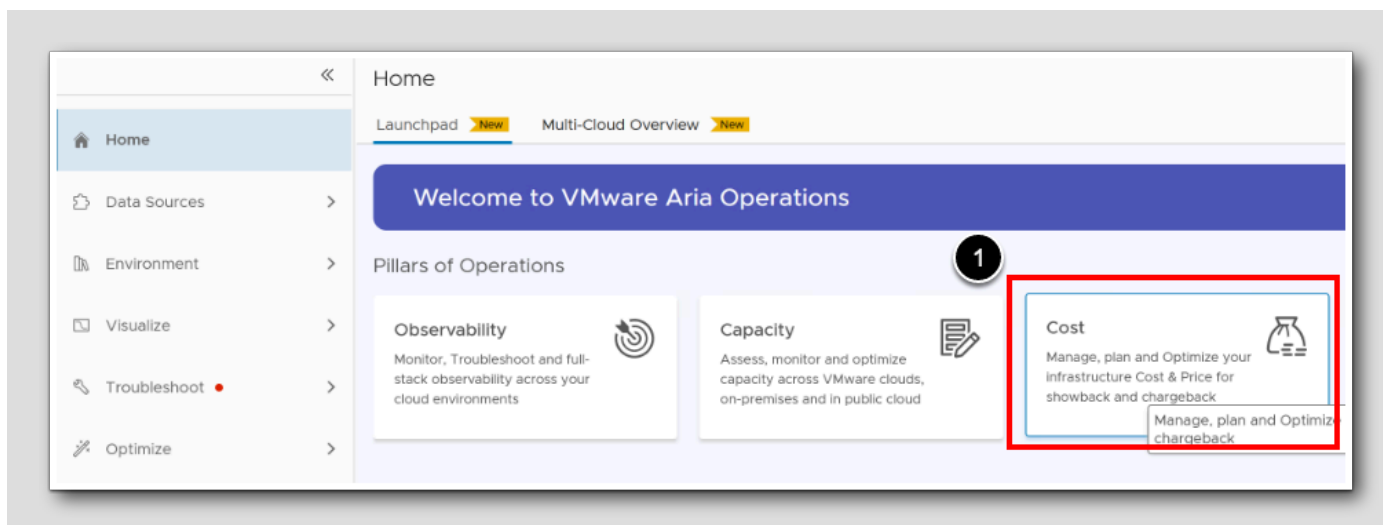
Accurately determining prices and implementing chargeback processes are crucial for **billing** customers based on their virtual machine (VM) usage.

Price: Price represents the amount charged to customers for utilizing a VM. The price of a VM most often differ from its actual operational costs, as additional charges or profit margins (up-charge) is included. Price considerations are often specific to VMs, and customers are typically billed on a monthly basis.

Chargeback: Involves generating a bill for customers based on the determined price for their VM usage. The bill should include a breakdown of the charges associated with each VM, reflecting the price per month.

Go to Cost

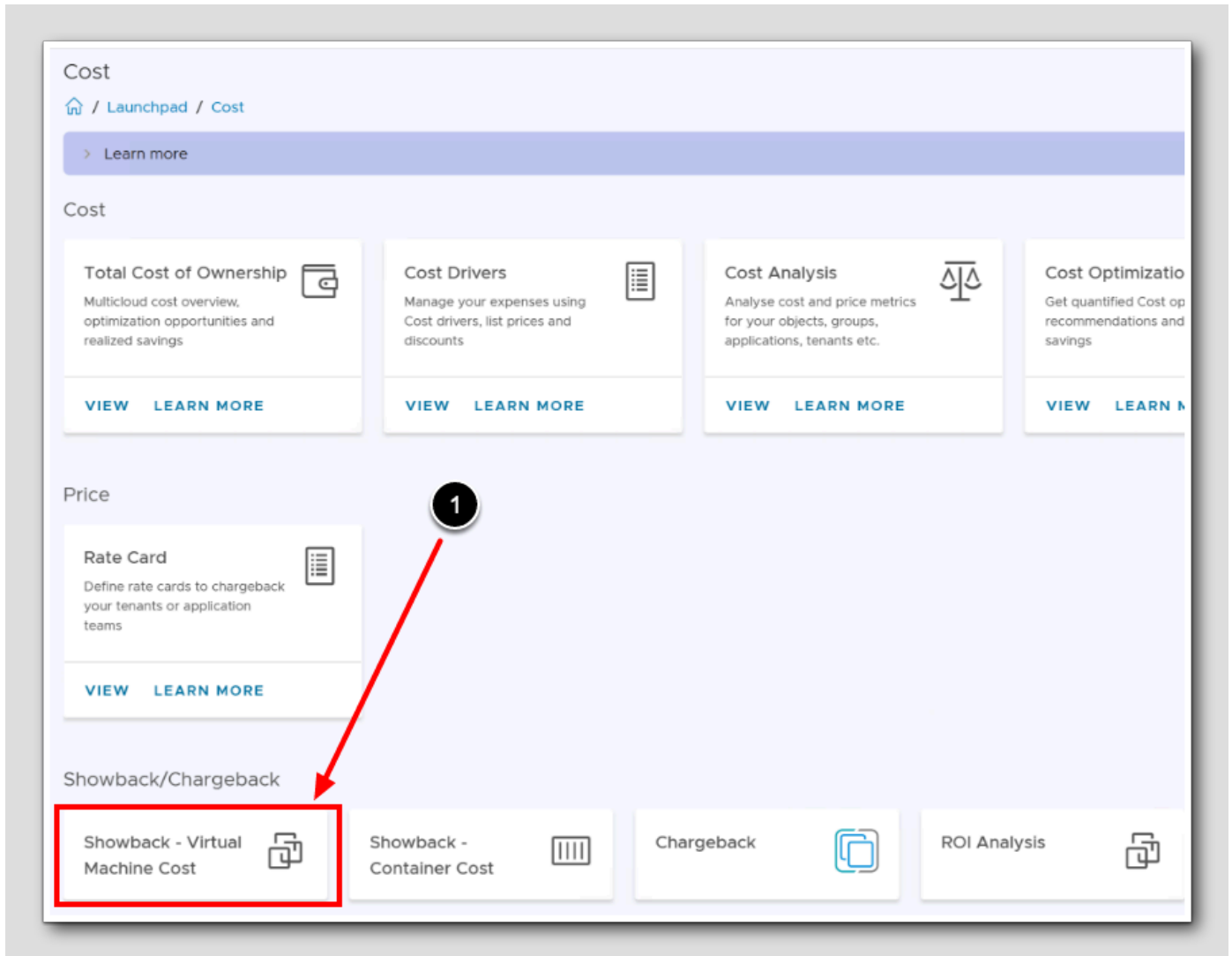
[195]



1. From the Home page Click Cost

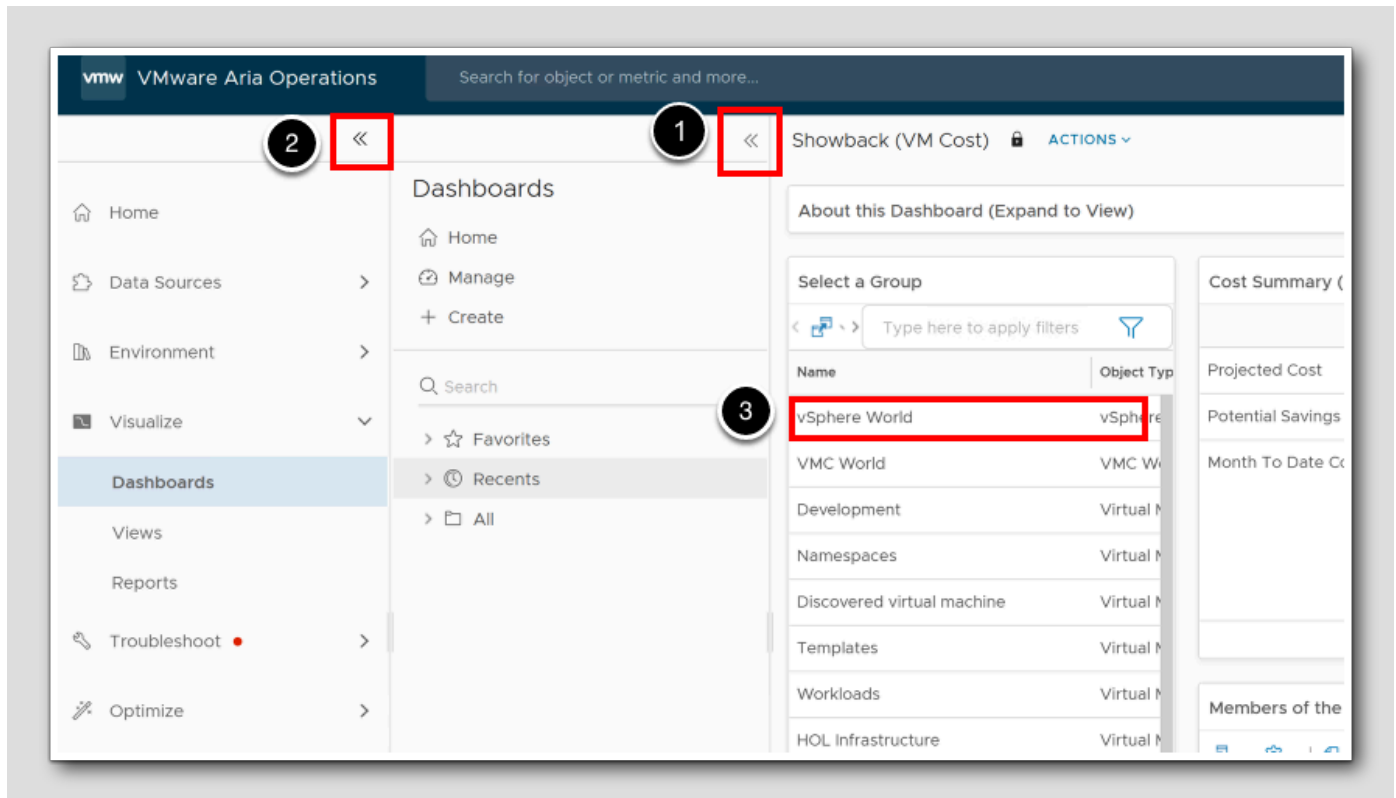
Start Showback

[196]



1. From the Cost page, under the Showback/Chargeback heading, Click Showback - Virtual Machine Cost

Find the right object



Let's make things more visible and take a closer look by selecting all objects in vSphere from the Group Selection list

1. Click the Collapse Icon <<
2. Click the Collapse Icon <<
3. Select vSphere World

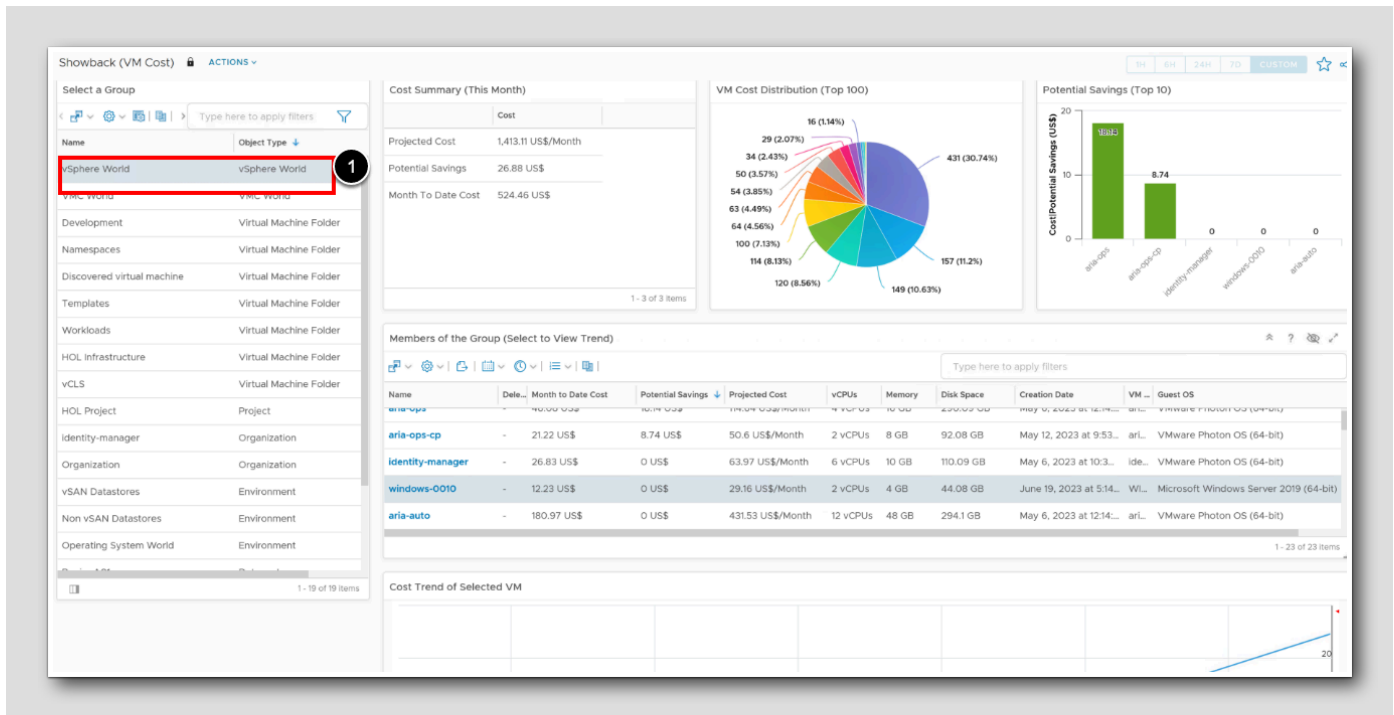
Showback, expand cost trend

The screenshot shows the VMware vRealize Cloud Manager Showback (VM Cost) dashboard. Key elements include:

- Cost Summary (This Month):** A table showing financial metrics: Projected Cost (1,413.11 US\$/Month), Potential Savings (26.88 US\$), and Month To Date Cost (524.46 US\$).
- VM Cost Distribution (Top 100):** A pie chart showing the distribution of costs across various VMs.
- Potential Savings (Top 10):** A bar chart showing potential savings for the top 10 VMs.
- Members of the Group (Select to View Trend):** A table listing VMs with columns: Name, Deletion Time, Month to Date Cost, Potential Savings, Projected Cost, vCPUs, Memory, Disk Space, and Creation Date.
 - Column 4 (Potential Savings) is highlighted with a red box and labeled '1'.
 - Row 4 (windows-0010) is highlighted with a red box and labeled '2'.
 - A red arrow points to a downward arrow icon in the bottom right corner of the table, labeled '3'.

1. Sort on Potential Savings (descending) by clicking the header Potential Savings (maybe twice)
2. Select the server windows-0010
3. Click the downwards expand icon

Showback Dashboard details



How to Use the Dashboard

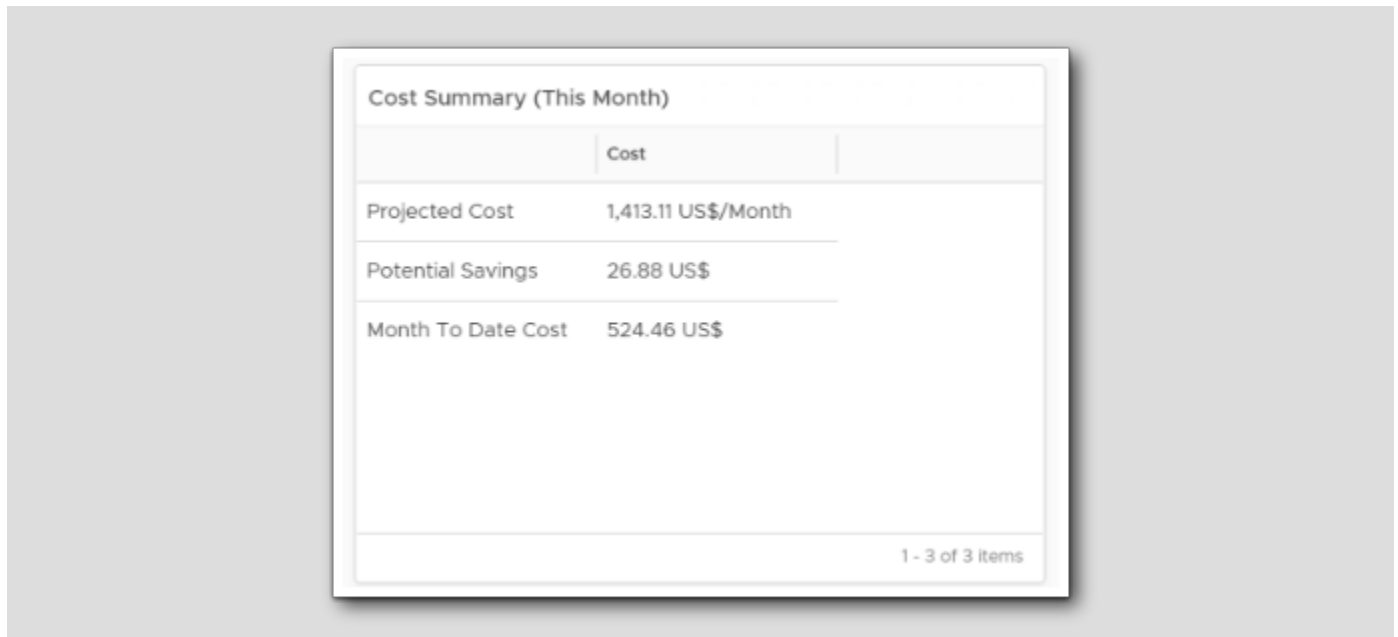
1. Select an object in the Select a Group widget to view the cost of the group. If not already selected, just Select **vSphere World**
 Another Example: Try selecting the **Workload1 Cluster**, to observe the difference
- **Cost Summary (This Month)** shows the month to date cost, potential savings, and projected cost.
 - **VM Cost Distribution (Top 100)** shows the most expensive VMs.
 - **Potential Savings (Top 10)** shows the VMs ranked by their potential savings.
 - **Members of the Group (Select to View Trend)** shows the cost and configuration of each VM.
 - **Cost Trend of Selected VM** *windows-0010* shows the trend of the VMs cost over time.

When we navigate the dashboard we can leverage the provided information to gain insights into the cost breakdown, potential savings, and trends related to the VMs in the selected group.

The "Showback (VM Cost)" dashboard is a pre-built tool designed to track and analyze virtual machine (VM) costs. It offers an overview of the costs associated with VMs in a group, allowing for quick assessment. To enhance cost accuracy, the cost drivers can be edited, although customization options are only available in the Advanced or Enterprise edition of VMware Aria Operations. This dashboard provides comprehensive information on VM costs, including total costs, cost distribution by resource groups or subscriptions, cost trends over time, top VM costs, and analyses based on VM size. Its purpose is to help identify areas of high costs, optimize spending, and enable informed decision-making to enhance cost efficiency and resource allocation.

Cost Summary

[200]



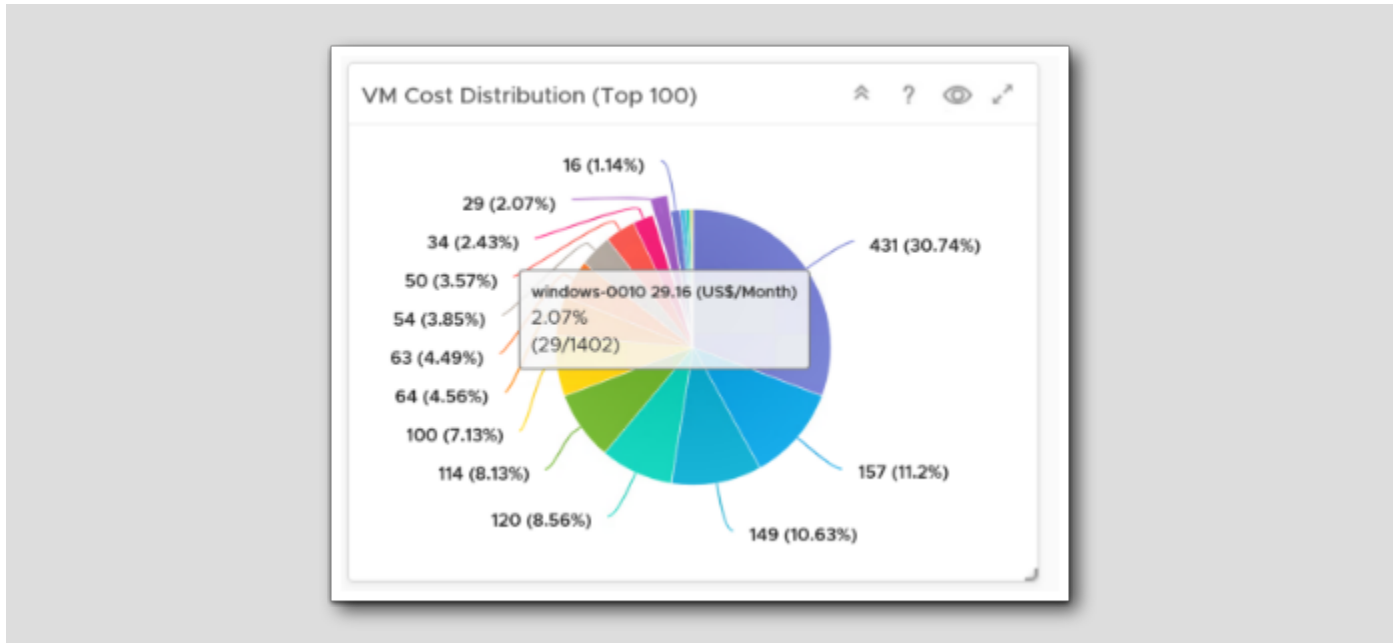
	Cost
Projected Cost	1,413.11 US\$/Month
Potential Savings	26.88 US\$
Month To Date Cost	524.46 US\$

1 - 3 of 3 items

Cost Summary (This Month): In this section, you will find a summary of the cost associated with the selected group for the current month. It provides an overview of the month-to-date cost, potential savings, and projected cost for the group. This summary gives you a quick snapshot of the financial aspects of the selected group.

VM Cost Distribution

[201]



VM Cost Distribution (Top 100): This section provides a breakdown of the top 100 most expensive VMs within the selected group. It helps you identify the VMs that are incurring the highest costs. By analyzing this information, you can focus on optimizing the resources and configurations of these high-cost VMs to reduce expenses. Hovering over, or clicking each "piece of the cake" gives you an overview over that specific object, in the image we have clicked windows-0010.

Potential Savings

[202]



Potential Savings (Top 10): The "Potential Savings (Top 10)" section lists the VMs ranked by their potential for cost savings. It highlights the VMs that have the highest potential for optimization and cost reduction. By focusing on these VMs, you can identify opportunities to improve efficiency, right-size resources, or explore alternative cost-effective solutions.

Members detailed breakdown

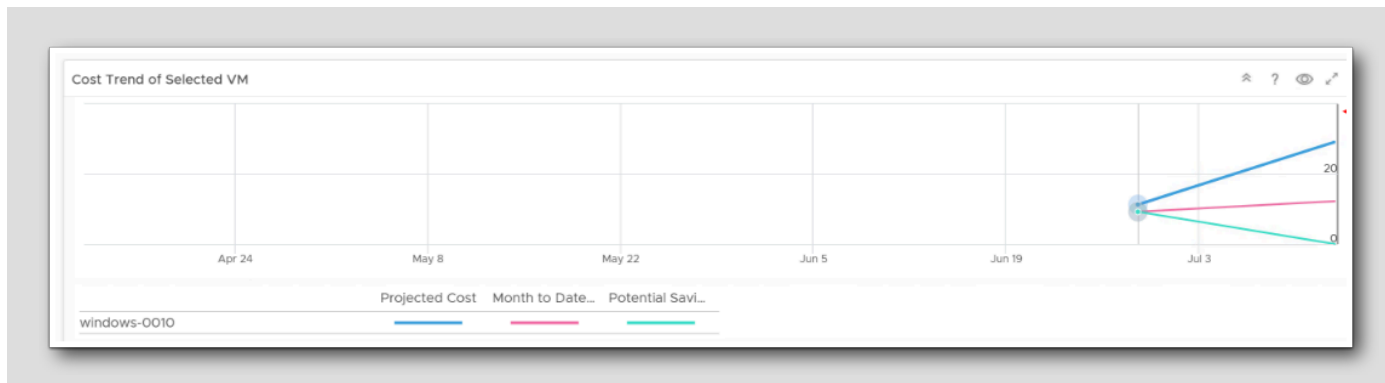
[203]

Name	Dele...	Month to Date Cost	Potential Savings ↓	Projected Cost	vCPUs	Memory	Disk Space	Creation Date	VM ...	Guest OS
aria-ops	-	46.06 US\$	10.14 US\$	114.04 US\$/Month	4 vCPUs	10 GB	290.05 GB	May 6, 2023 at 12:14...	ari...	VMware Photon OS (64-bit)
aria-ops-cp	-	21.22 US\$	8.74 US\$	50.6 US\$/Month	2 vCPUs	8 GB	92.08 GB	May 12, 2023 at 9:53...	ari...	VMware Photon OS (64-bit)
identity-manager	-	26.83 US\$	0 US\$	63.97 US\$/Month	6 vCPUs	10 GB	110.09 GB	May 6, 2023 at 10:3...	ide...	VMware Photon OS (64-bit)
windows-0010	-	12.23 US\$	0 US\$	29.16 US\$/M...	4 vCPUs	4 GB	44.08 GB	June 19, 2023 at 5:14...	WI...	Microsoft Windows Server 2019 (64-bit)
aria-auto	-	180.97 US\$	0 US\$	431.53 US\$/Month	12 vCPUs	48 GB	294.1 GB	May 6, 2023 at 12:14...	ari...	VMware Photon OS (64-bit)

Members of the Group (Select to View Trend): In this section, you can view a detailed breakdown of each VM within the selected group. It displays the cost and configuration information of individual VMs. You can click on a specific member to access more information about its cost trend and performance over time, which is the next widget. Notice we've selected windows-0010

Cost Trend

[204]



Cost Trend of Selected VM: This section displays the cost trend over time for the selected VM. It helps you visualize how the cost of a specific VM within the group has changed over a selected time period. By monitoring the cost trend, you can identify any unusual spikes, patterns, or anomalies in the cost behavior of the VM, enabling you to take appropriate actions if needed.

Closing Comments

[205]

By utilizing these widgets effectively and following the outlined steps, we can effectively navigate the dashboard and gain comprehensive insights into the cost breakdown, potential savings, and trends related to the VMs within our selected group(s).

Conclusion

[206]

By completing this module, we gain the technical knowledge and skills to configure and customize cost settings in Aria Operations to match our business needs accurately. This empowers our organization to effectively track expenses, optimize resource usage, and make informed cost management decisions within our IT environments.

You've finished Module 5

[207]

Congratulations on completing the lab module.

If you are looking for additional general information on Aria Operations, try one of these:

- **VMware Product Public Page - Aria Operations:** <https://www.vmware.com/products/aria-operations.html>
- **Aria Operations - Documentation:** <https://docs.vmware.com/en/VMware-Aria-Operations/index.html>
- **Aria Operations - Cost Overview:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Configuring-Operations/GUID-79297017-77F1-40C3-930A-90CE5C388362.html>

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 6 - Customizing Alerts and Leveraging Notifications (15 minutes) Basic

Introduction

[209]

Upon completing this lab, you will be able to:

- Understand Alerts, Symptoms, Recommendations and Actions
- Build a custom Alert Definition
- Simulate issues in the environment to demonstrate how to customize the alerts
- Utilize the different ways alerts can be used based on the critical nature or other characteristics of the monitored infrastructure

Log in to Aria Operations

[210]

To begin this exercise, we will log in to Aria Operations. If you are not currently logged into any instance of Aria Operations, continue to the next page, but if you are already logged into Aria Operations, click [here](#) to skip ahead.

Open the Firefox Browser from Windows Quick Launch Task Bar

[211]

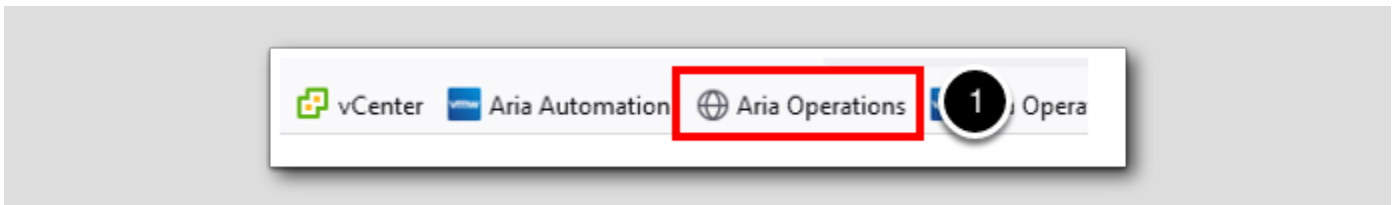


If your browser isn't already open, launch Firefox

1. Click the **Firefox** icon on the Windows Quick Launch Task Bar

Launch Aria Operations

[212]

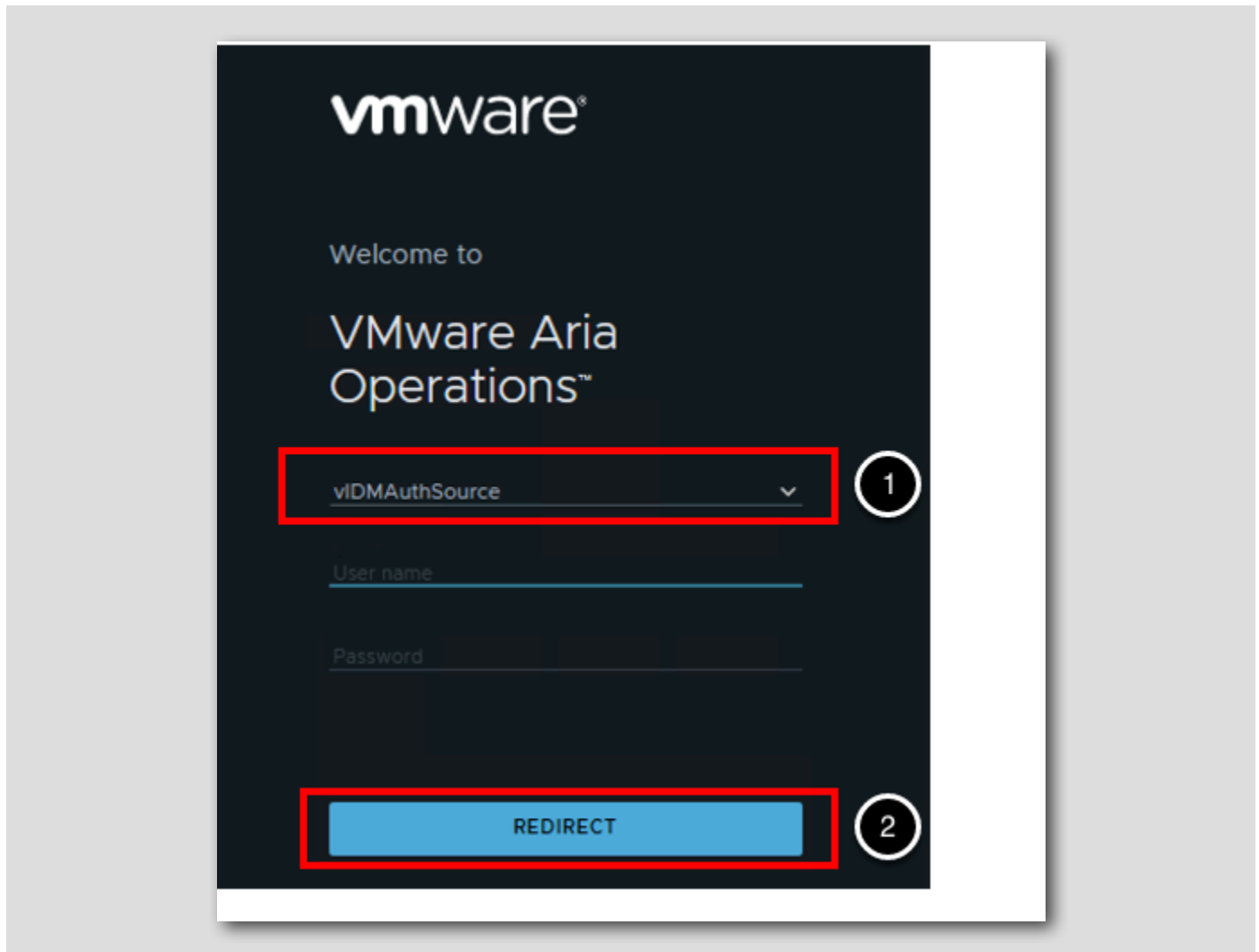


The browser Bookmarks Bar has links to the different applications that are running in the lab.

1. Click the **Aria Operations** Bookmark

Log in to Aria Operations

[213]

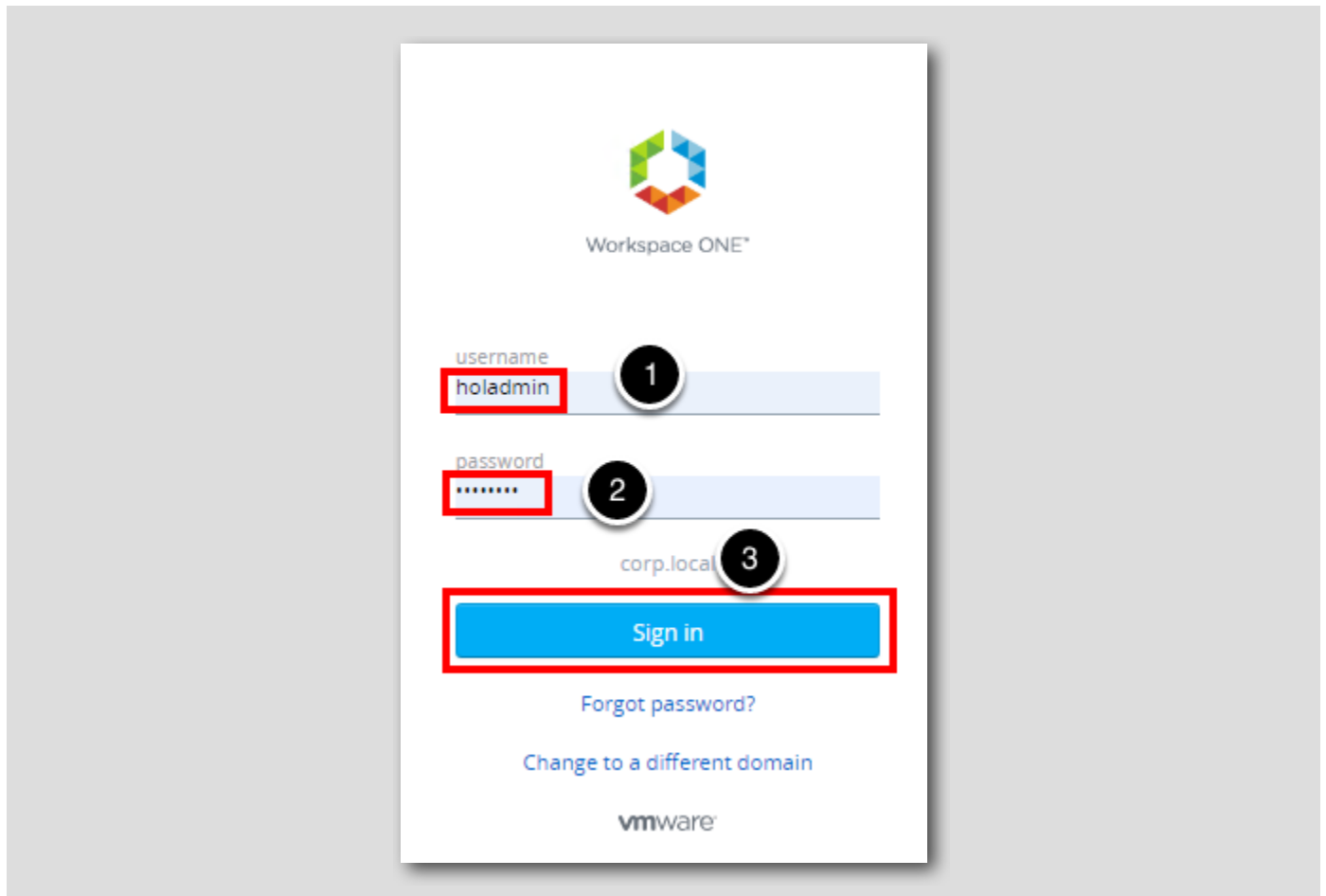


Aria Operations is integrated with VMware Identity Manager which we will use for user authentication in this lab.

vIDMAuthSource (VMware Identity Manager) should be pre-selected as the identity source. However, if it is not you will choose it.

1. Click the drop-down arrow if vIDMAuthSource is not selected.
2. Click REDIRECT to be taken to the authentication page.

VMware Identity Manager Login

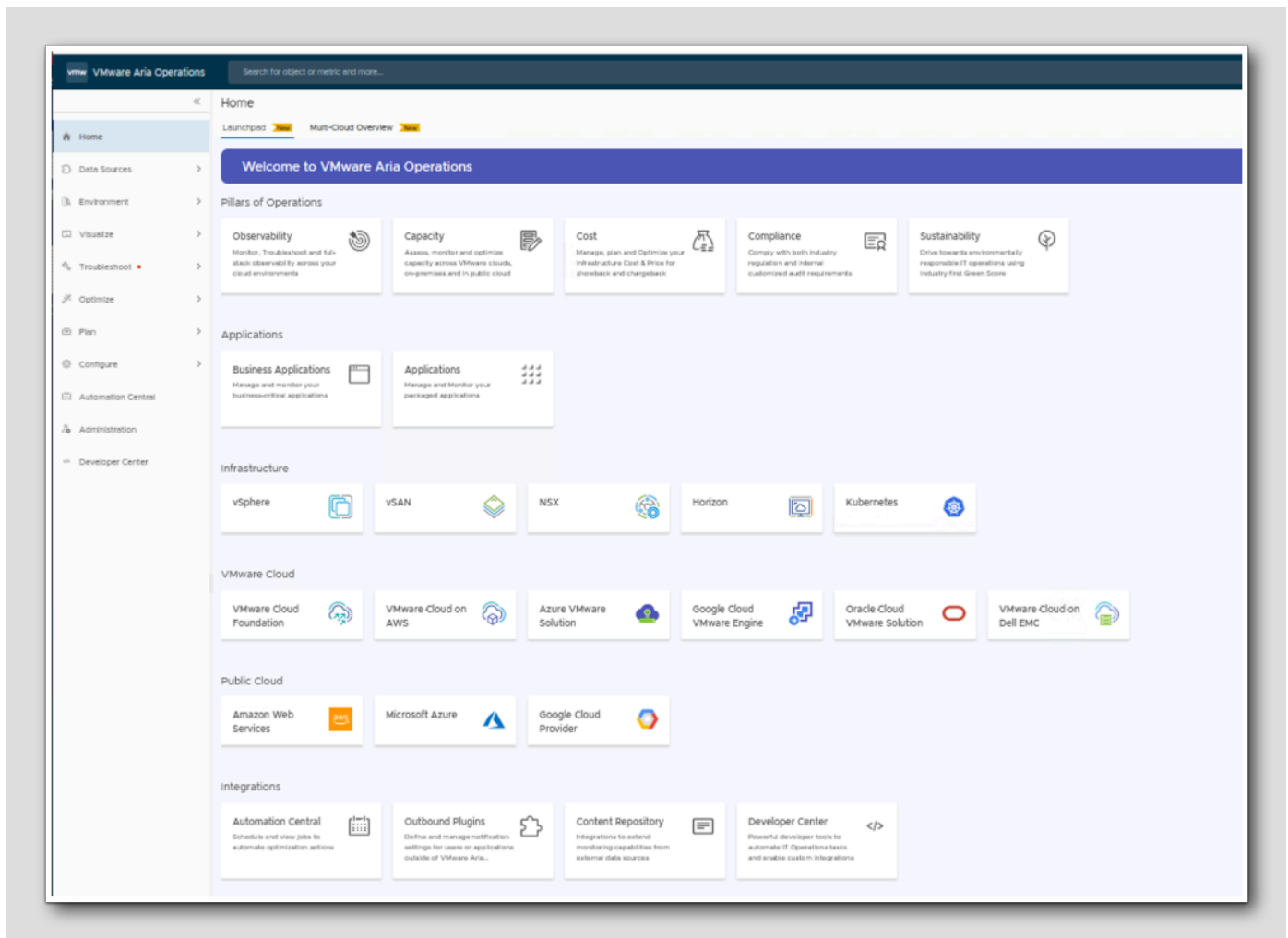


At the Workspace ONE login screen, use these credentials:

1. username: **holadmin**
2. password: **VMware1!**
3. Click **Sign in**

Aria Operations Home Screen

[215]



You should be at the Aria Operations Home screen and ready to start the module.

Using Symptoms and Alerts to Trigger Recommendations and Actions

[216]

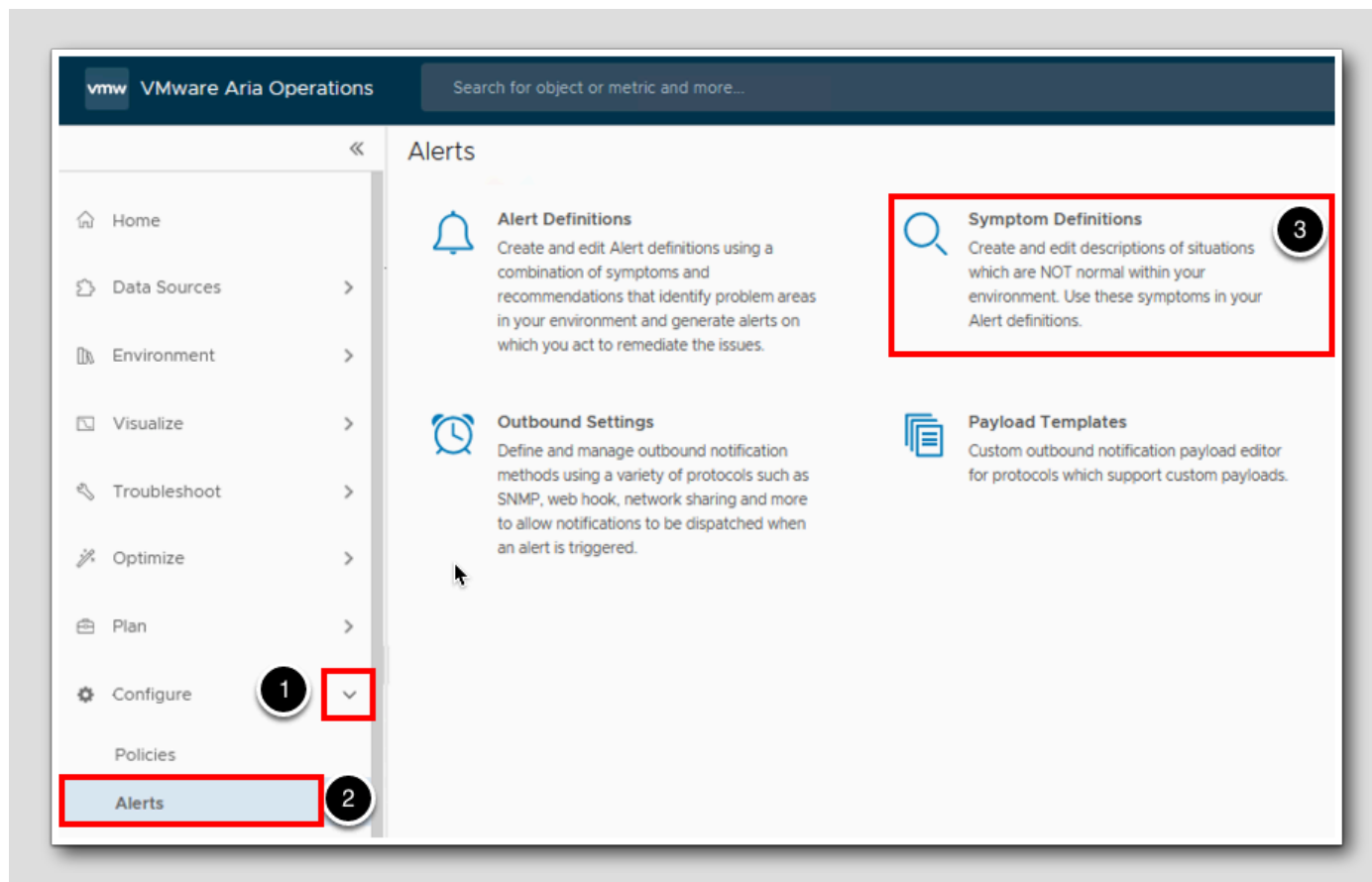
Aria Operations Alerts are similar to rules used for years in monitoring critical IT resources. However, previous rule-based systems tended to be static and difficult to build, deploy, and maintain. Aria Operations leverages built-in analytics and pre-defined content to provide a dynamic, effective, and scalable approach for identifying and resolving issues in your environment.

For this lesson, we will start by creating a Symptom Definition. Symptom Definitions enable Aria Operations to identify problems with objects in your environment. These Symptom Definitions will then trigger Alerts when conditions qualify as problems. In this scenario, the condition to monitor is the high CPU workload on the virtual machine "ubuntu-0008". Creating one or more of the Symptoms enables them to be added to an Alert Definition. When a symptom is triggered, vRealize Operations will then issue an alert. In this lesson, we'll go through this in more detail and we'll also show how you can automate certain actions to occur when an alert is triggered

in vRealize Operations.

Creating Custom Alerts

[217]

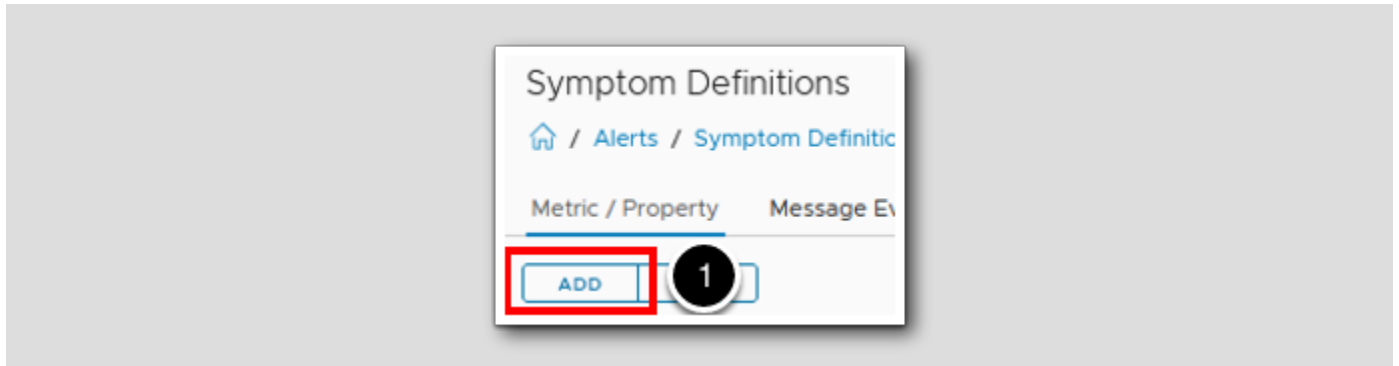


Symptom Definitions evaluate conditions in your environment that, if the conditions become true, trigger a symptom and can result in a generated alert. You can add symptom definitions that are based on metrics or super metrics, properties, message events, fault events, or metric events. You can create a symptom definition as you create an alert definition or as an individual item in the appropriate symptom definition list.

1. Click the chevron to expand Configuration if needed to show the configuration options.
2. Click Alerts
3. Click on the Symptom Definitions box .

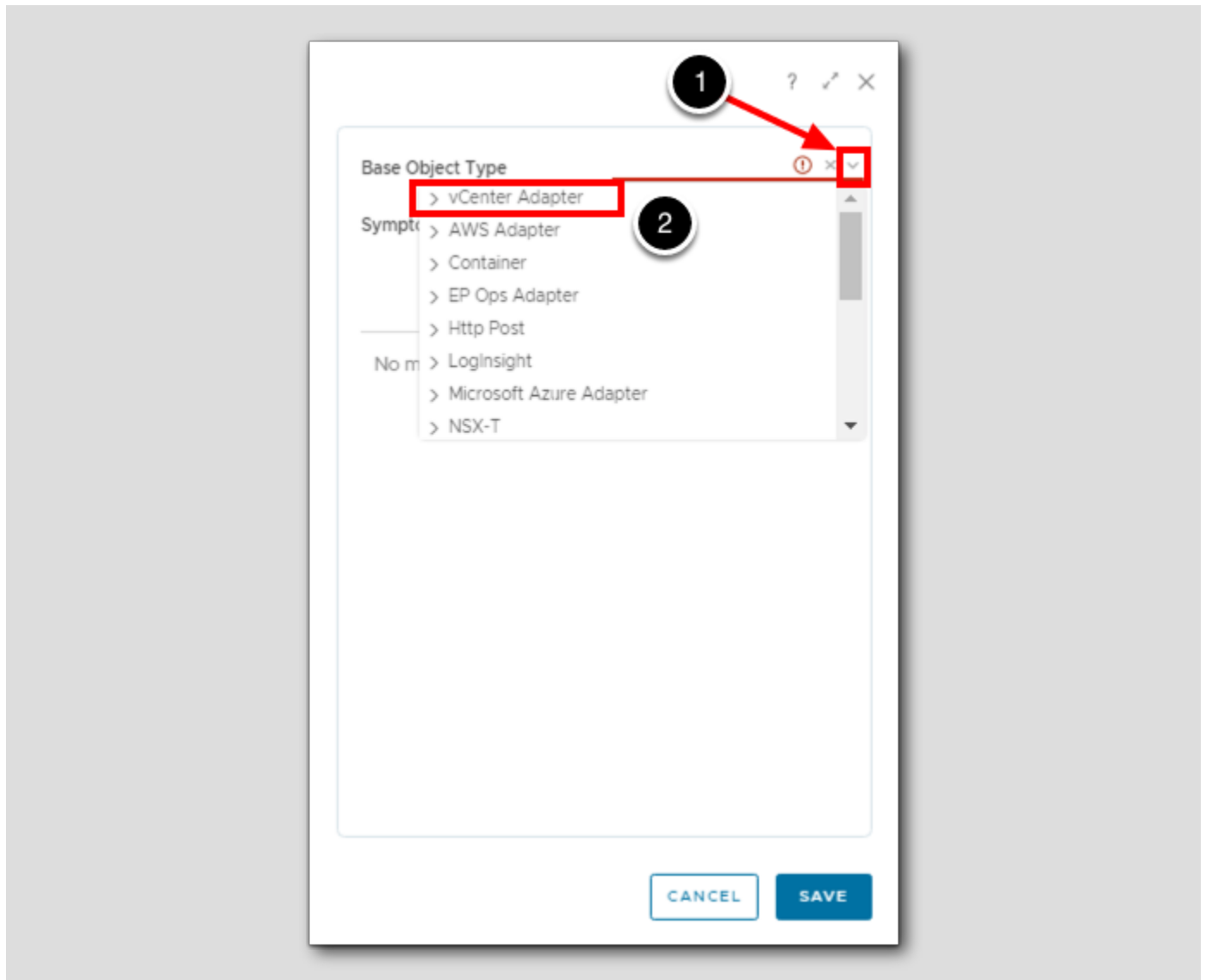
Add a Symptom Definition

[218]



1. Click **ADD** to create a new Symptom Definition.

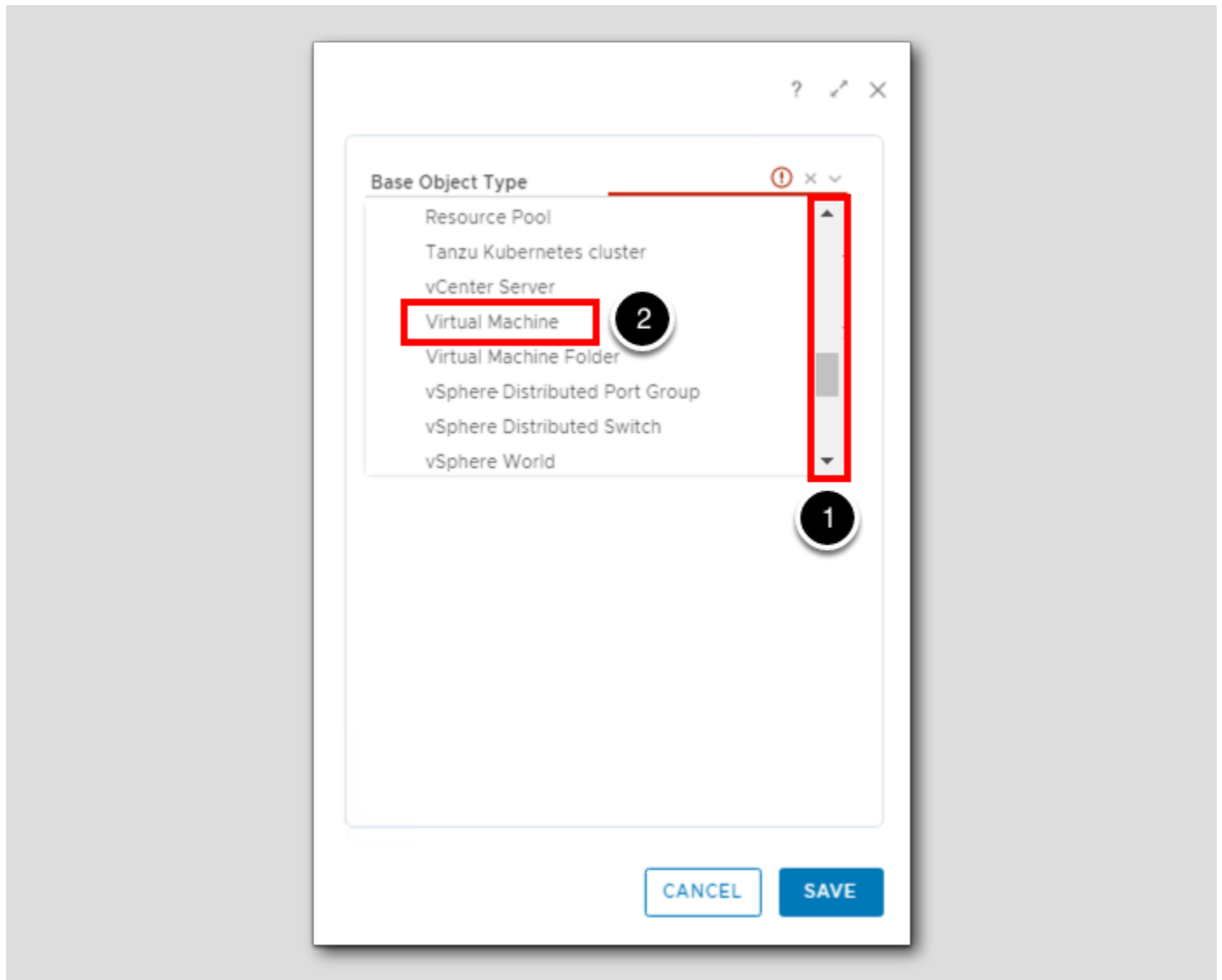
Select vCenter Object



1. Click the chevron to show the list of Base Object Types.
2. Click **vCenter Adapter** which should be the first item in the drop-down list.

Select Virtual Machine

[220]



1. Scroll down until you see Virtual Machine.
2. Select Virtual Machine.

CPU Usage Definition

Add Symptom Definition

Alerts / Symptom Definitions / Metric / Property

Virtual Machine : CPUUsage (%) Static Threshold

Name: **High CPU** (3)

If Metric: **>** (Condition) **90** (4) (Value) trigger: **Critical** (5) (Criticality)

Advanced Settings

Wait Cycle: **1** (7) Cancel Cycle: **2** (8)

Evaluate on instanced metrics

Drop here or double click to create new symptom definition

Drop here or double click to create new symptom definition

SAVE (9) CANCEL

Base Object Type: Virtual Machine

Symptom Type: Metrics

Select Specific Object: **cpulusage** (1)

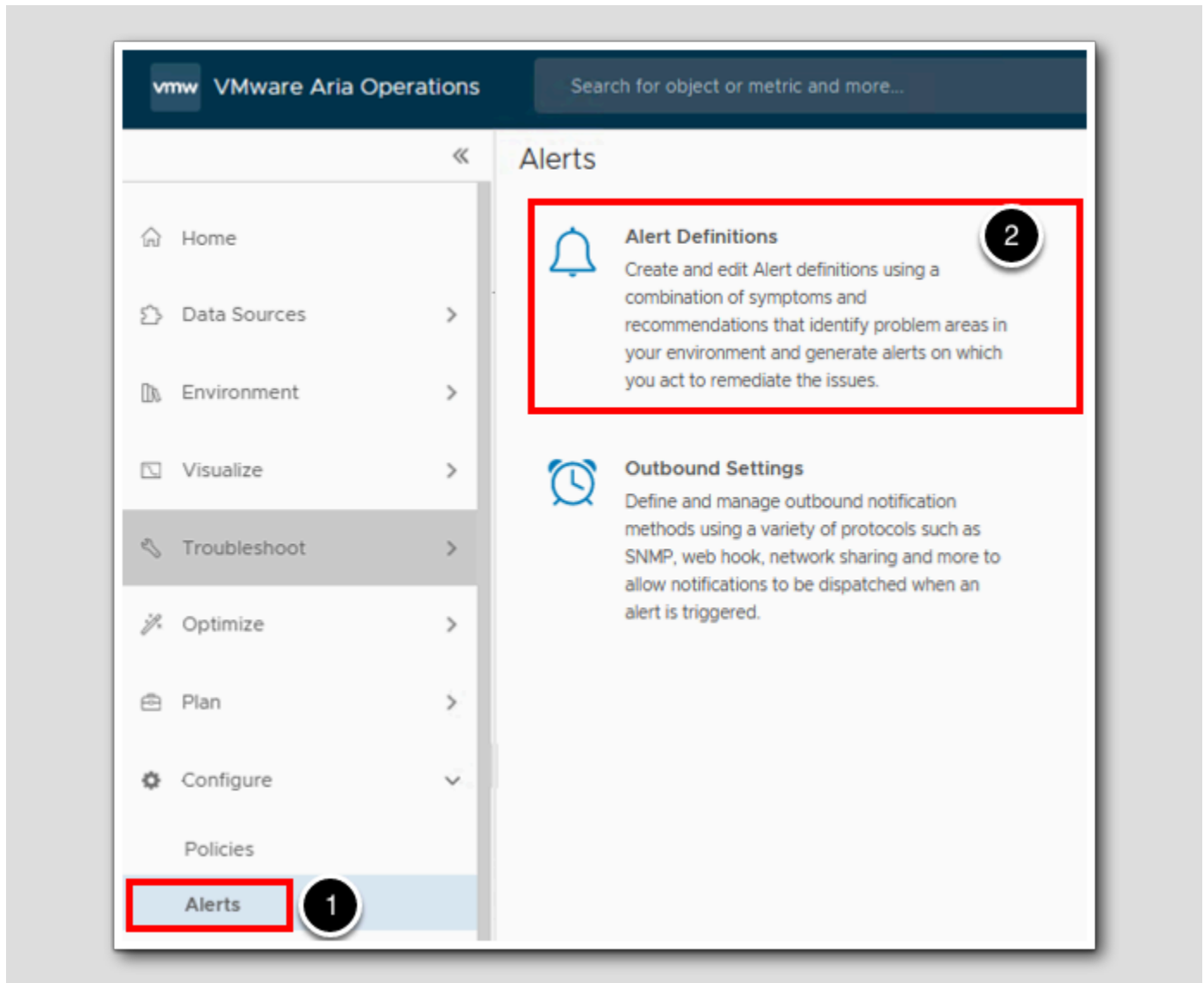
CPU

- Usage (%)** (2)
- Usage (MHz)
- Usage average Daily (MHz)

Configure the Symptom Definition with the following parameters.

1. Type a metric filter of **CPU|USAGE** and hit Enter.
2. Double-click **Usage (%)**.
3. Type **High CPU** for the symptom name.
4. Type **90** as the value the symptom must exceed to be triggered.
5. Set the definition to **Critical**.
6. Click to expand the **Advanced** section.
7. Modify the **Wait Cycle** to 1.
 - The Wait Cycle field shows that the trigger condition should remain true for this number of collection cycles before the symptom is triggered. This means that the symptom is triggered in the same collection cycle when the condition became true.
8. Modify the **Cancel Cycle** to 2.
 - The Cancel Cycle field shows that the symptom after the trigger condition is false for this number of collection cycles, after which the symptom is canceled. This means that the symptom is canceled in the same cycle when the condition becomes false.
9. Click **SAVE**.

Alert Definition



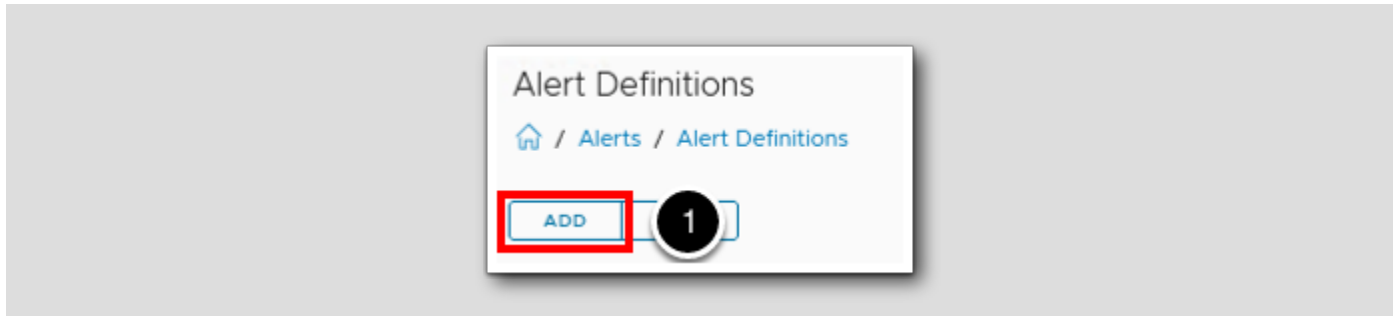
An alert definition is comprised of one or more symptom definitions, and the alert definition is associated with a set of recommendations and actions that help you resolve the problem. Alert definitions include triggering symptom definitions and actionable recommendations. You create the alert definitions so that the generated alerts tell you about problems in the monitored environment. You can then respond to the alerts with effective solutions that are provided in the recommendations.

To create Alert Definitions:

1. Click **Alerts** to go back to the Alerts Main Page.
2. Click **Alert Definitions**.

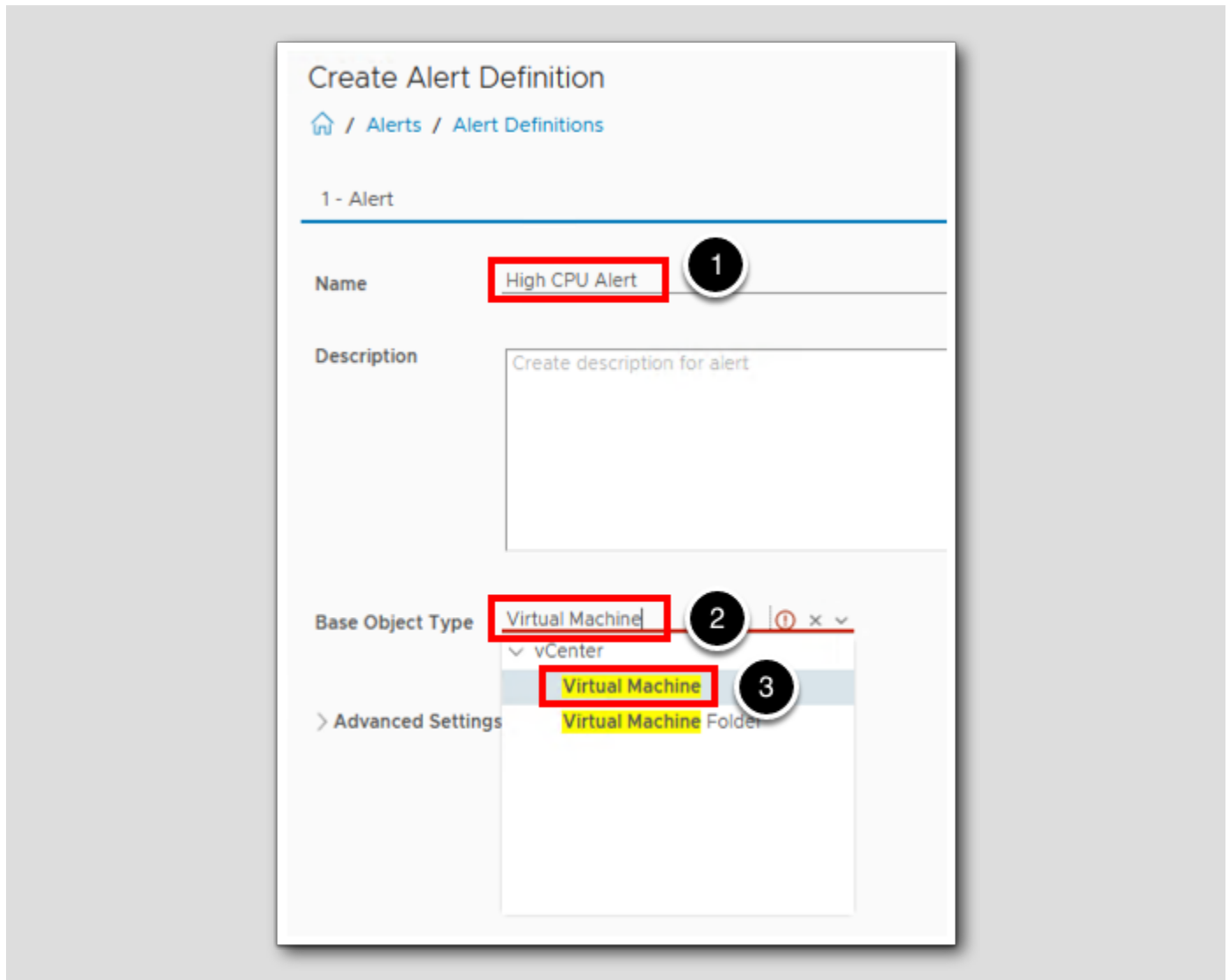
Add Alert Definition

[223]



1. Click **ADD** to create a new Alert Definition.

Alert Name and Base Object Type



This time we will use the find function to get our desired Base Object Type.

1. Type **High CPU Alert** for the alert name.
2. Click in the **Base Object Type** search field and type **Virtual Machine**.
3. Click **Virtual Machine**.

Alert Impact Settings

[225]

Create Alert Definition Virtual Machine

[Home](#) / Alerts / Alert Definitions

1 - Alert !

Name

Description

Base Object Type

Advanced Settings

Impact	<input type="text" value="Health"/>
Criticality	<input type="text" value="Symptom Based"/>
Alert Type & Subtype	<input type="text" value="Application : Performance"/>
Wait Cycle	<input type="text" value="1"/>
Cancel Cycle	<input type="text" value="1"/>

Schedules

Alert Impact

Alert Impact settings and their definitions are shown below. These settings determine how your alert will be classified and triggered.

Note: The default settings will be used in this scenario.

- The **Impact** field will categorize the alert as a health, risk, or efficiency problem
- The **Criticality** field shows how serious the problem is

For **Criticality**, you can select one of the following values:

- Info (informational purposes only; does not affect badge colors)
- Warning (lowest level; displays yellow)
- Immediate (medium level; displays orange)
- Critical (highest level; displays red)
- The **Alert Type** and **Subtype** fields can be used to classify the alert; an example would be using these fields' information to route the alert to the appropriate personnel in your organization

Finally, choose settings for your cycle, which are data collection intervals.

- **Wait Cycle** indicates how many cycles should pass before triggering the alert
- **Cancel Cycle** indicates how many cycles without symptoms should pass before the alert is canceled

1. Click the **chevron** to show the Advanced Settings.
2. Review the **Alert Impact** Settings. We will be using the default settings, so no changes are needed.
3. Click **NEXT**.

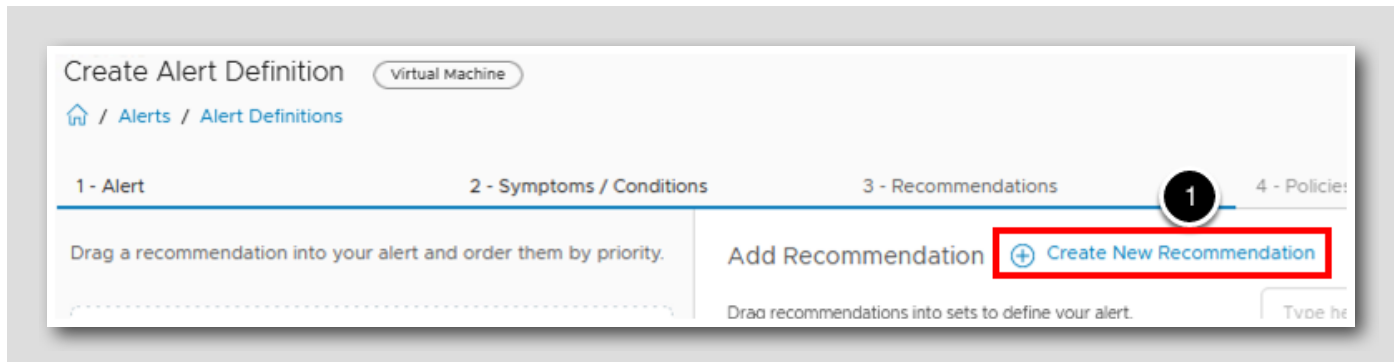
Add Symptom to Alert Definition

The screenshot shows the 'Create Alert Definition' wizard for a 'Virtual Machine' alert. The current step is '2 - Symptoms / Conditions'. On the left, a 'Symptoms' panel is open, showing a list of symptoms. One symptom is defined: 'High CPU' with the condition 'If CPUUsage (%) > 90 trigger Critical'. A red box highlights this symptom, and a red arrow points to a '3' in a circle, indicating where to drag it. On the right, the 'Symptoms' tab is selected, and a search filter 'high cpu' is applied. A table lists the 'High CPU' symptom with a red box around it and a '2' in a circle. At the bottom, the 'NEXT' button is highlighted with a red box and a '4' in a circle.

1. Click **Symptoms** to filter the Symptom Definitions to what we created in a previous step.
2. Type **High CPU** in the filter field and press the **Enter** key.
3. Drag **High CPU** to the Symptom Definition section on the left to the workspace as shown above.
4. Click **NEXT**.

Add Recommendation

[227]



Recommendations are the remediation options that you provide to your users to resolve the problems that the generated alert indicates. Now, we will define a new Recommendation for our custom alert based on our organization's policies.

1. Click + Create New Recommendation.

Custom Recommendation

Create Alert Definition Virtual Machine

Alerts / Alert Definitions

1 - Alert 2 - Symptoms / Conditions 3 - Recommendations

Create New Recommendation

Add a description and select an action to your new recommendation.

Description [🔗](#)

For Production Virtual Machines, please assess the trend and add CPU Resources if trend is high. All development machines are shut down and the developer is notified.

Action (Optional)

Adapter Type vCenter ⌵

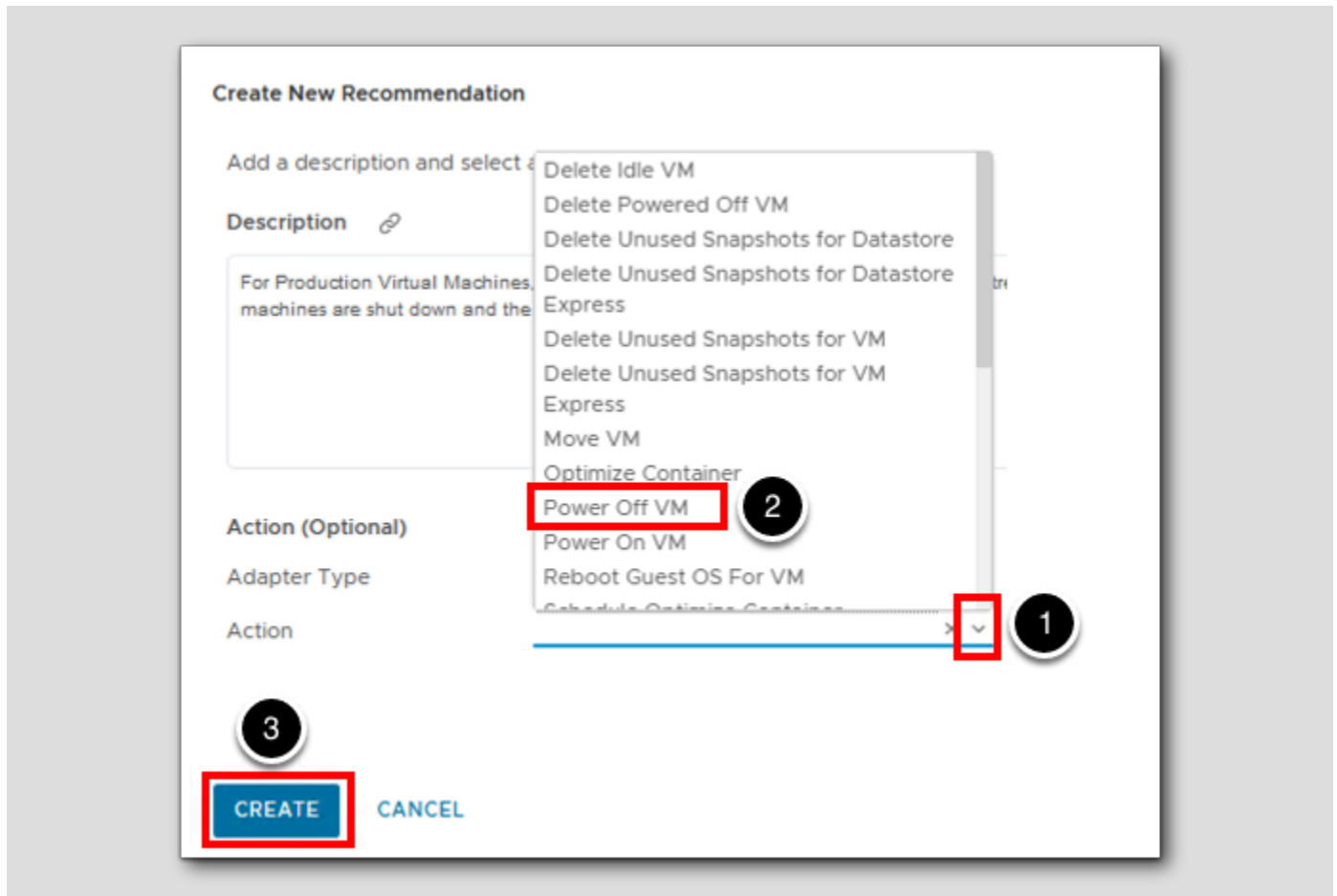
Action

- Service Discovery Adapter
- vCenter
- VMware Aria Automation
- VMware Aria Operations Application
- Management Pack

For Production Virtual Machines, please assess the trend and add CPU Resources if trend is high. All development machines are shut down and the developer is notified.

1. Paste the text shown above into the Recommendation Text area.
2. Click **Adapter Type** to show the adapter type options.
3. From the list shown, select **vCenter Adapter**.

Set Recommendation Action



Actions are accessible in several places inside of vRealize Operations. They can link to recommendations for the user to execute after review, or they can be fully automated to execute when the alert is triggered.

1. Click the down arrow on the Action Menu to show the action options.
2. Select Power Off VM.
3. Click CREATE.

Save New Alert Definition

The screenshot shows the 'Create Alert Definition' wizard for a 'Virtual Machine' alert. The wizard is currently on the '3 - Recommendations' step. A search filter 'production' is applied to the recommendation list. A recommendation card for 'Power Off VM' is being dragged from the 'Add Recommendation' list to the 'Drop recommendation here' area. The 'NEXT' button is highlighted at the bottom.

1 - Alert **2 - Symptoms / Conditions** **3 - Recommendations** 4 - Policies

Drag a recommendation into your alert and order them by priority.

Power Off VM ×

For Production Virtual Machines, please assess the trend and add CPU Resources if trend is high. All development machines are shut down and the developer is notified.

Drop recommendation here

Add Recommendation + Create New Recommendation

Drag recommendations into sets to define your alert. **production** 1 ×

Description	Action	Defined By	Modified By
For Production Virtual Machines, please assess the tren...	Power ...	User	holadmin@c...

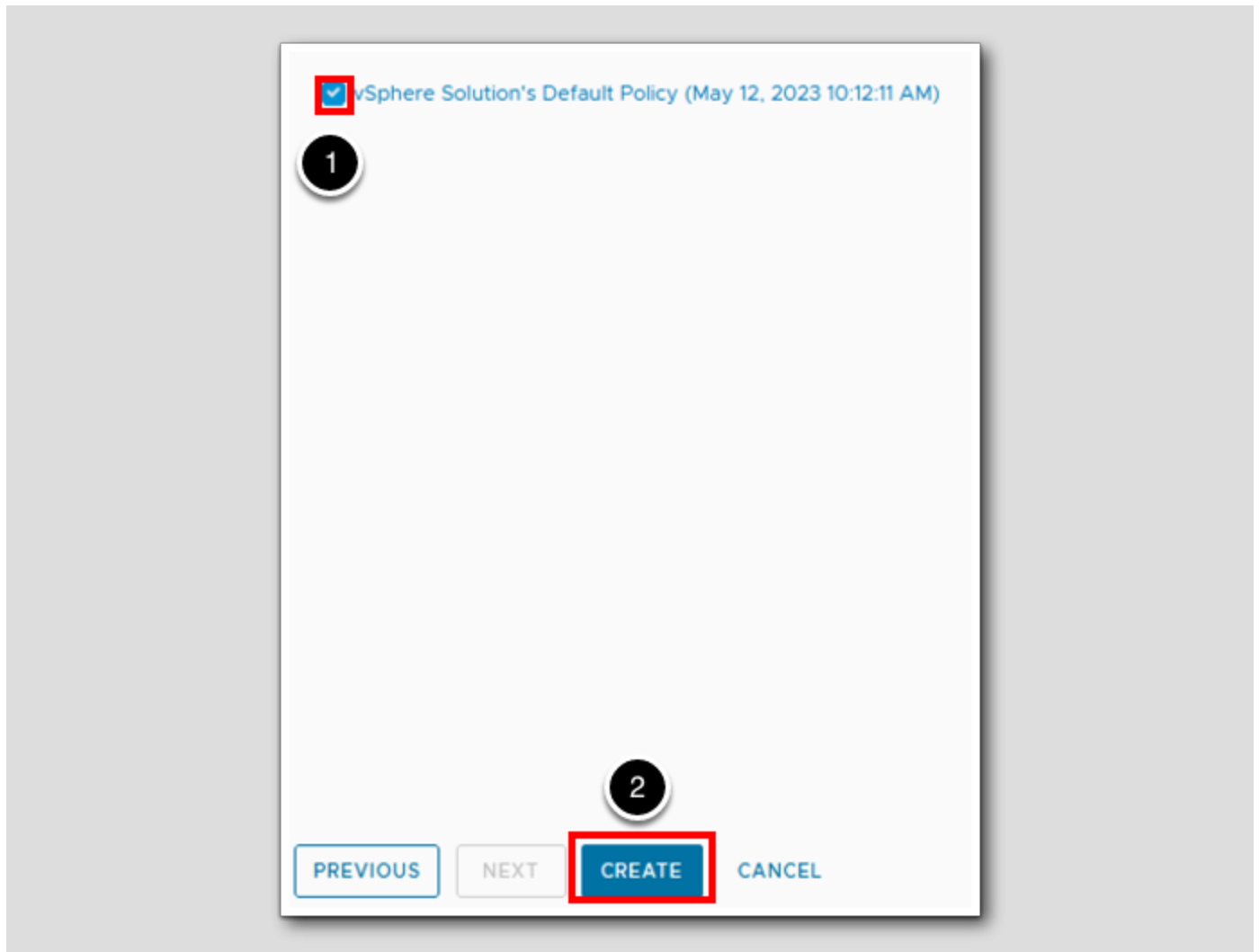
1 - 1 of 1 items

PREVIOUS **NEXT** **CREATE** CANCEL

1. Type **production** in the filter field and hit **Enter**.
2. Drag your newly created custom recommendation onto the Alert Definition.
3. Click **NEXT** to go to the Policies tab.

Set Effective Policy

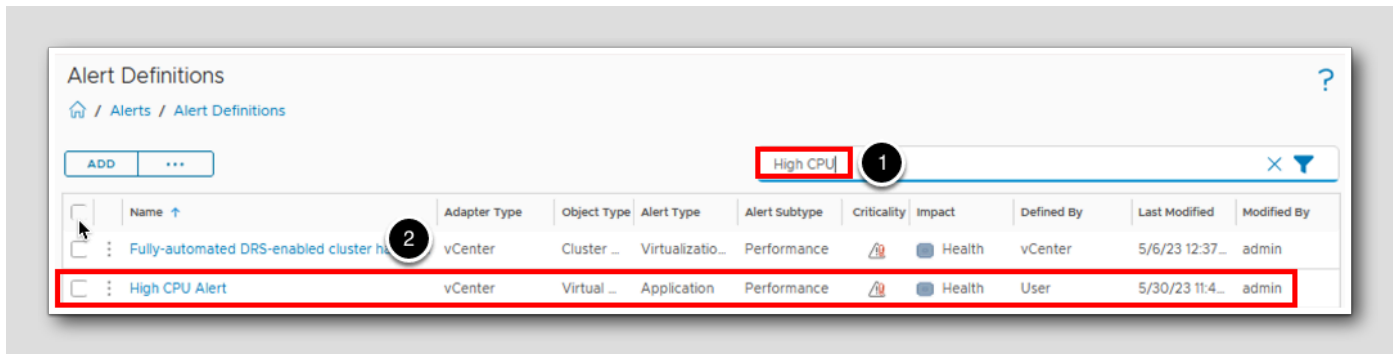
[231]



1. Click the **checkbox** to select vSphere Solution's Default Policy.
2. Click **CREATE** to create the new Alert Definition.

Alert List

[232]



Verify that the Alert exists.

1. Type **High CPU** in the Alert Definitions quick filter and then press the **Enter** key to reduce the Alert Definition list.
2. We can verify that our new **High CPU Alert** has been created.

Now that our symptoms and alert has been configured, we're ready to test it out!

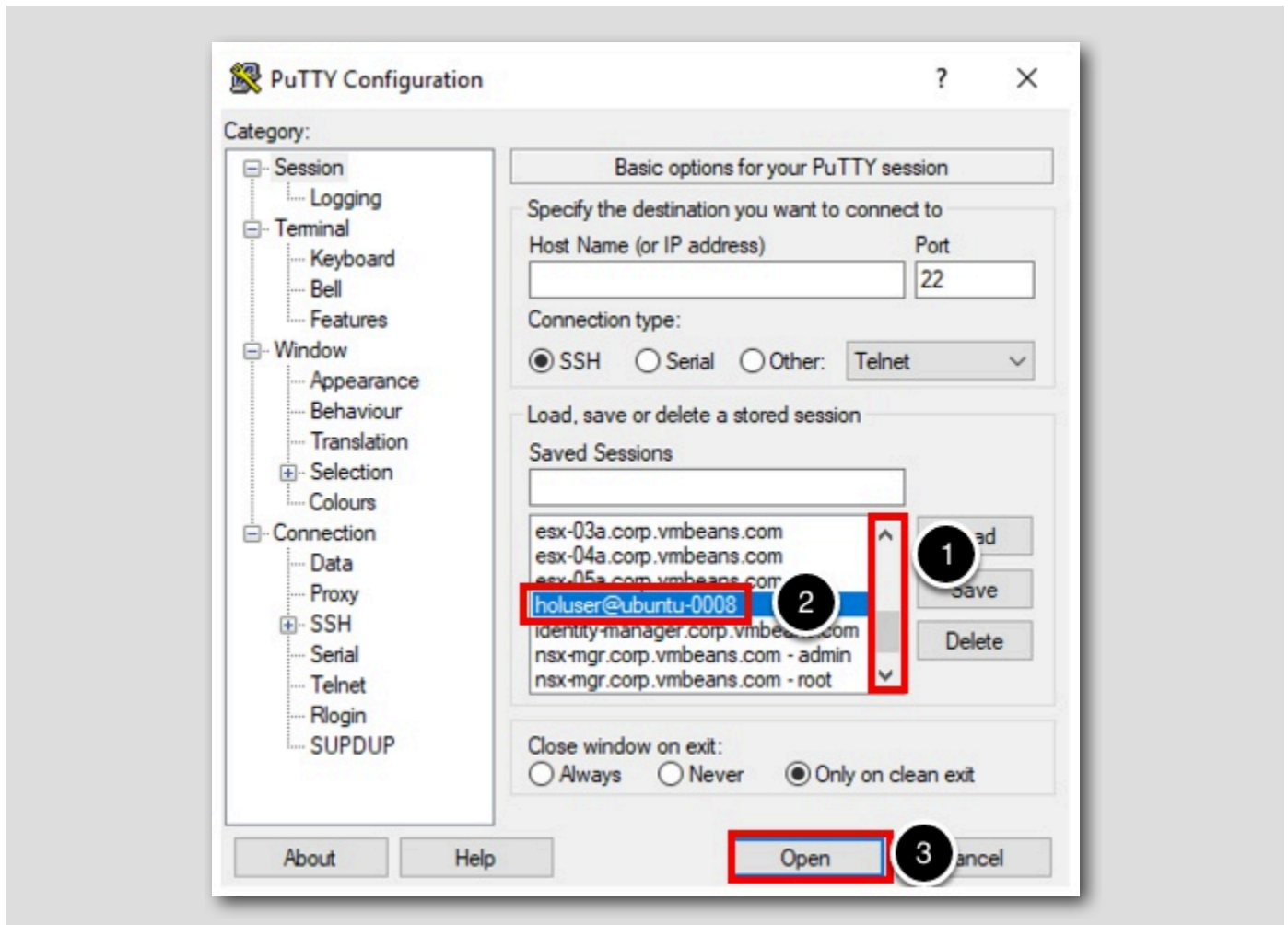
PuTTY to ubuntu-0008 VM

[233]



1. Click on the PuTTY icon in System tray.

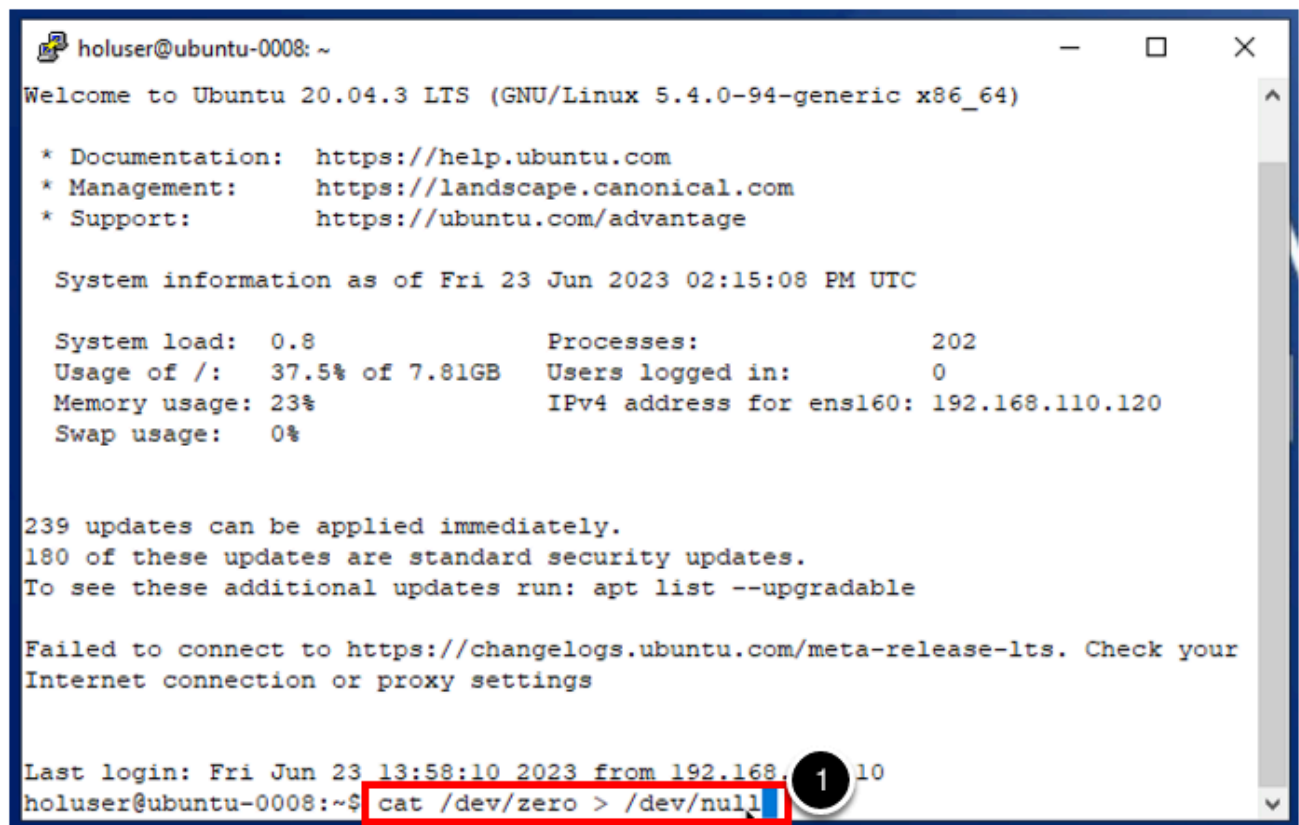
Start PuTTY Session



1. Scroll down on the right hand side of Saved Sessions
2. Click on holuser@ubuntu-0008.
3. Click Open to start the PuTTY session.

Run CPU Load

[235]



```
holuser@ubuntu-0008: ~  
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.4.0-94-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:       https://ubuntu.com/advantage  
  
System information as of Fri 23 Jun 2023 02:15:08 PM UTC  
  
System load:  0.8          Processes:           202  
Usage of /:   37.5% of 7.81GB  Users logged in:   0  
Memory usage: 23%          IPv4 address for ens160: 192.168.110.120  
Swap usage:   0%  
  
239 updates can be applied immediately.  
180 of these updates are standard security updates.  
To see these additional updates run: apt list --upgradable  
  
Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your  
Internet connection or proxy settings  
  
Last login: Fri Jun 23 13:58:10 2023 from 192.168.1.10  
holuser@ubuntu-0008:~$ cat /dev/zero > /dev/null
```

We will now redirect dev/zero to dev/null to generate CPU load so that we can see the impact on the VM in vRealize Operations.

1. Type `cat /dev/zero > /dev/null` and press the Enter key to start the CPU load.

Leave this putty window open, we'll come back to this later in the lesson.

Return to vRealize Operations and Search for VM

[236]

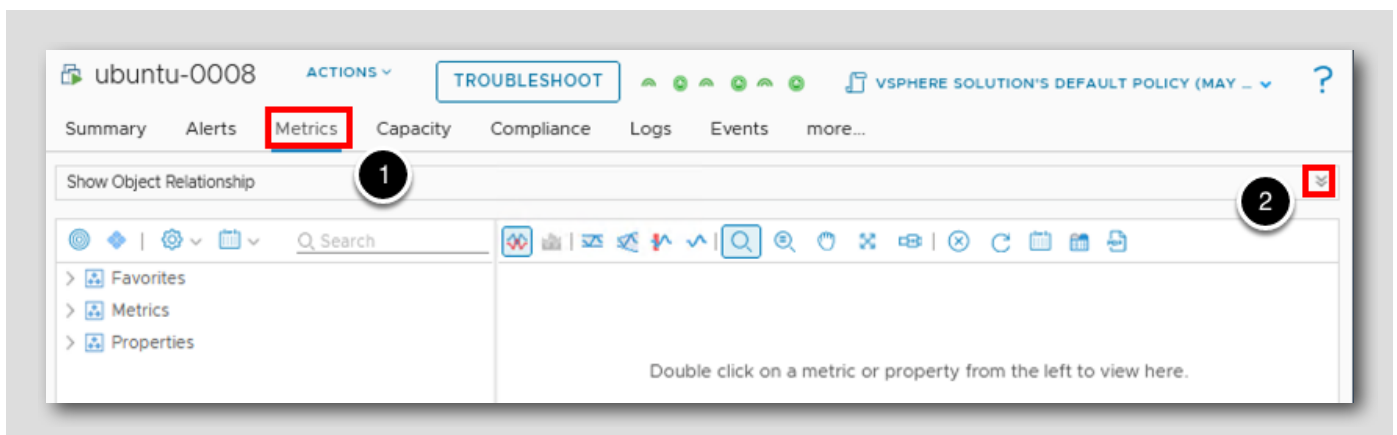


Back in Aria Operations we now need to search for the ubuntu-0008 VM

1. In the Search Bar type **ubuntu-**
2. Click on **ubuntu-0008**.

Metrics and Object Relationships

[237]



1. Click **Metrics** to open the Metrics tab.
2. If the Object relationship window is not already visible, Click the chevrons to show the object relationships for the VM ubuntu-0008.

Metrics Graphs

The screenshot displays the VMware vSphere interface for the VM 'ubuntu-0008'. The 'Metrics' tab is active, showing a search bar with 'cpuusage' entered. The search results list several objects, with 'ubuntu-0008' highlighted in a red box. The left-hand navigation menu shows the 'Usage (%)' metric under the CPU section highlighted in a red box. The main content area displays a line graph for 'CPUUsage (%)' over time, with a peak of 3.21% and a low of 1.72%.

Set up the CPU graphs by completing the following:

1. Click **ubuntu-0008** so we can explore the Metrics on this object.
2. Type **cpu | usage** in the quick filter and then press the **Enter** key.
3. Double-click **Usage (%)** under Metrics / CPU to create a chart on the lower right hand side of the window.
4. In our example, the color of the VM Health badge will turn red once the alert we configured has been activated due to the high CPU Usage. However, the color can be green, yellow, orange, or red, depending on the status of the object and the severity of the alert.

Refresh Metric Graphs

1. If the VM Health Badge is not yet red, then we may need to click **Refresh**.
 - The graph will eventually show the increase in CPU usage on the Metric chart. Once CPU usage is above 90%, an alert will be generated. (NOTE: It may take a few minutes for the VM Health Badge to turn red).
2. Notice the increased CPU usage on the graph.
3. Click **Summary** to move to the Summary page.

Summary Page

[240]

The screenshot displays the vSphere Summary page for a virtual machine named 'ubuntu-0008'. The interface includes a navigation bar with tabs for Summary, Alerts, Metrics, Capacity, Compliance, Logs, Events, and more. The Summary tab is active, showing the VM's status as 'Powered On' and its IP address as 192.168.110.120. The 'Active Alerts' section is highlighted with a red box, indicating one Critical alert. Below this, the 'Time Remaining' and 'Capacity Remaining' sections show 0 Days and 0% (0 MHz) respectively, both most constrained by CPU Demand. The 'Utilization' and 'Performance' sections provide detailed metrics for CPU usage, memory, and disk performance.

Alert Type	Self	All
Critical	1	1
Immediate	0	0
Warning	0	0
Info	0	0

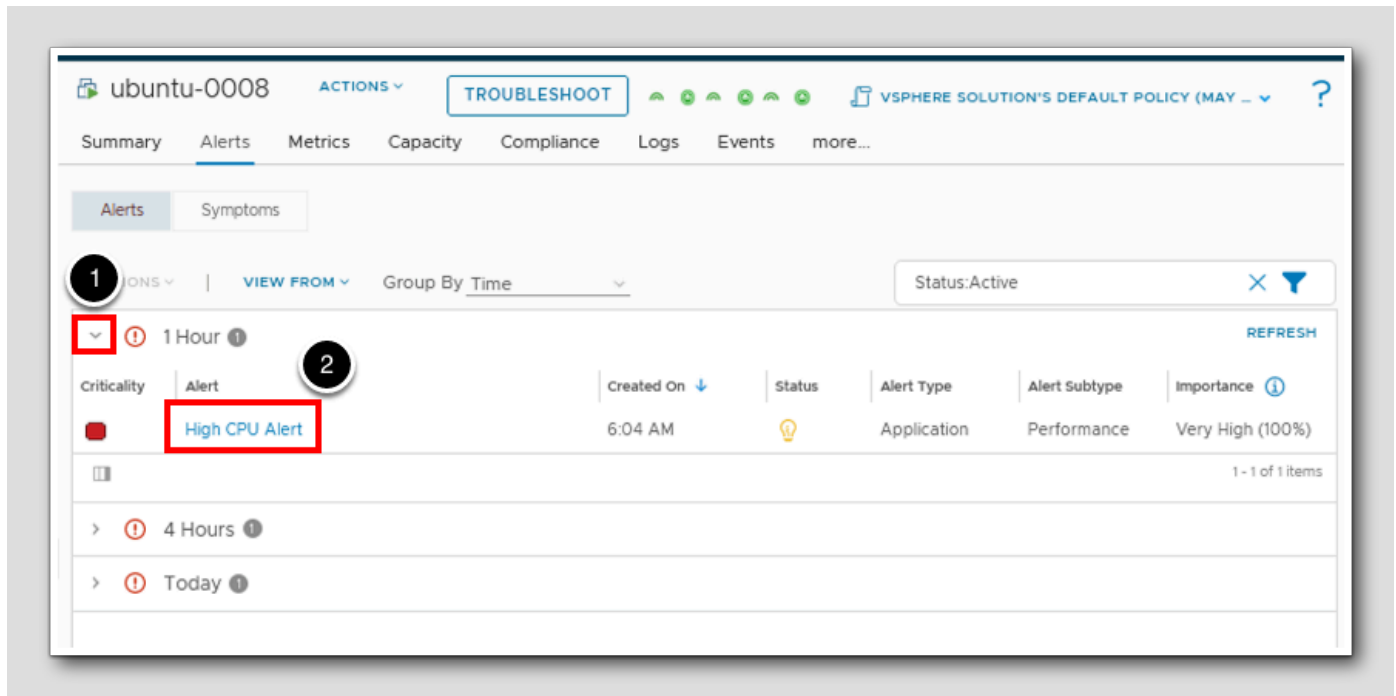
Metric	Value
CPU Usage	2.1 GHz
Free Memory	150.02 MB
Guest Page In Rate per second	0
Page Out Rate per second	10.4
Virtual Disk Total IOPS	1.33
Virtual Disk Total Throughput	10.47 KBps

Metric	Value
CPU Queue	127
CPU Context Switch Rate	135
Disk Queue	0.00067
CPU Ready	0.057 %
CPU Co-stop	0 %
Memory Contention	0 %
Virtual Disk Total Latency	2.13 ms

As shown here, we can see quite a bit of information about this particular object that we've selected.

1. Click **Summary**.
2. Notice under **Active Alerts**, we can see that we have active Critical Alerts.
3. Click **Alerts** here to open the Alerts Tab.

View Critical Alerts



The screenshot displays the Alerts tab for the VM 'ubuntu-0008'. The interface includes a navigation bar with tabs for Summary, Alerts, Metrics, Capacity, Compliance, Logs, and Events. The Alerts tab is active, showing a table of alerts. The table has columns for Criticality, Alert, Created On, Status, Alert Type, Alert Subtype, and Importance. A 'High CPU Alert' is highlighted in red, and a chevron icon next to '1 Hour' is also highlighted in red. A 'REFRESH' button is visible in the top right corner.

Criticality	Alert	Created On	Status	Alert Type	Alert Subtype	Importance
Critical	High CPU Alert	6:04 AM	Warning	Application	Performance	Very High (100%)

In the Alerts Tab, we see all of the alerts related to this vm ubuntu-0008.

1. Click the chevron beside 1 Hour to open the most recent alerts for the VM ubuntu-0008.
2. Click High CPU Alert in the Alert column for more details about the alert.

Note: You may see additional alerts for this VM as there are other alerts active within our environment. If it does not show as Critical, you may need to hit Refresh in the top right corner.

Alert Details

The screenshot displays the VMware vSphere Alerts interface for the virtual machine 'ubuntu-0008'. The 'Alerts' tab is active, and the 'Symptoms' sub-tab is highlighted with a red box and a circled '2'. The main alert details for 'High CPU Alert' are shown, including a recommendation text box with a 'POWER OFF VM' button, highlighted with a red box and a circled '1'. The 'Alert Basis' section shows the symptom: 'The Critical symptom High CPU has been observed on ubuntu-0008 (Self) Usage (%) 99.845 > Threshold (%) 90'.

From this Alerts screen we can see details about the alert.

1. We can see our Recommendation text we entered earlier, and again we see the POWER OFF VM action button where we could manually kick off the action we configured earlier which was to shut down the VM.
2. Click Symptoms.

Alert Symptom Details

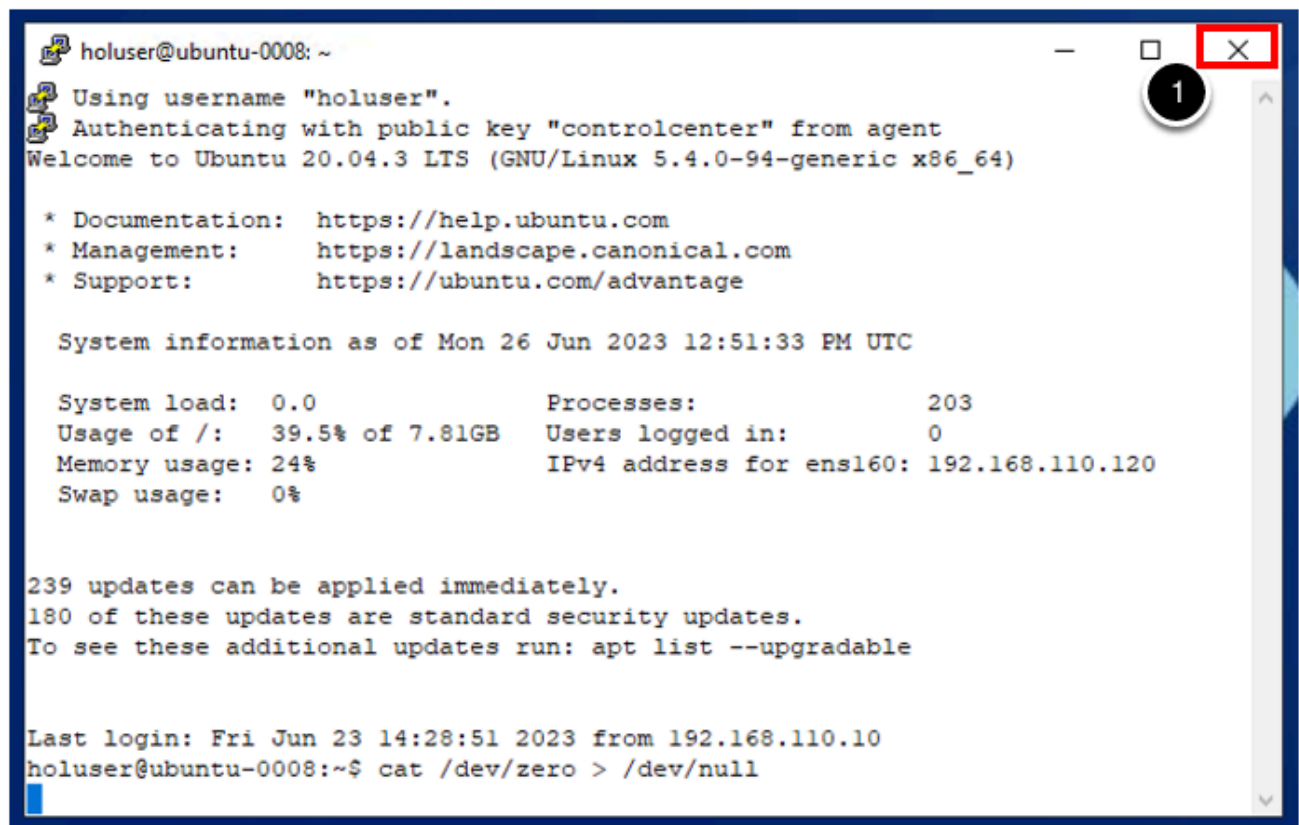
The screenshot shows the vSphere Alert Symptom Details page for the VM 'ubuntu-0008'. The page is divided into several sections:

- Header:** 'ubuntu-0008' with 'ACTIONS' and 'TROUBLESHOOT' buttons. A policy dropdown shows 'VSPHERE SOLUTION'S DEFAULT POLICY (MAY ...)'. Navigation tabs include Summary, Alerts, Metrics, Capacity, Compliance, Logs, Events, and more...
- Alerts/Symptoms:** A filter for 'Status:Active' and a list of symptoms. The 'High CPU' symptom is highlighted with a red box and a circled '1'.
- Symptom Details:**
 - Title:** 'High CPU' (with a red warning icon)
 - Created On:** 6:02:03 AM
 - Information:** Usage (%) 99.845 > Threshold (%) 90
 - Details:** A line chart showing CPU usage over time. The x-axis ranges from 01:00 AM to 07:00 AM. The y-axis shows CPU usage percentage from 0 to 100. The usage is near 0% until approximately 05:50 AM, then spikes sharply to nearly 100% by 06:00 AM, where a red dot marks the alert trigger. A red shaded area highlights the period from 06:00 AM to 07:00 AM.

1. Click on the **High CPU** Symptom.

From here we can see the CPU chart and we see the timing and details of this alert. We will now stop the CPU load so that we can complete some additional configuration to enable the automation of our configured recommendation for this High CPU alert.

Stop CPU Load



```
holuser@ubuntu-0008: ~  
Using username "holuser".  
Authenticating with public key "controlcenter" from agent  
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.4.0-94-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:       https://ubuntu.com/advantage  
  
System information as of Mon 26 Jun 2023 12:51:33 PM UTC  
  
System load:  0.0          Processes:           203  
Usage of /:   39.5% of 7.81GB  Users logged in:   0  
Memory usage: 24%          IPv4 address for ens160: 192.168.110.120  
Swap usage:   0%  
  
239 updates can be applied immediately.  
180 of these updates are standard security updates.  
To see these additional updates run: apt list --upgradable  
  
Last login: Fri Jun 23 14:28:51 2023 from 192.168.110.10  
holuser@ubuntu-0008:~$ cat /dev/zero > /dev/null
```

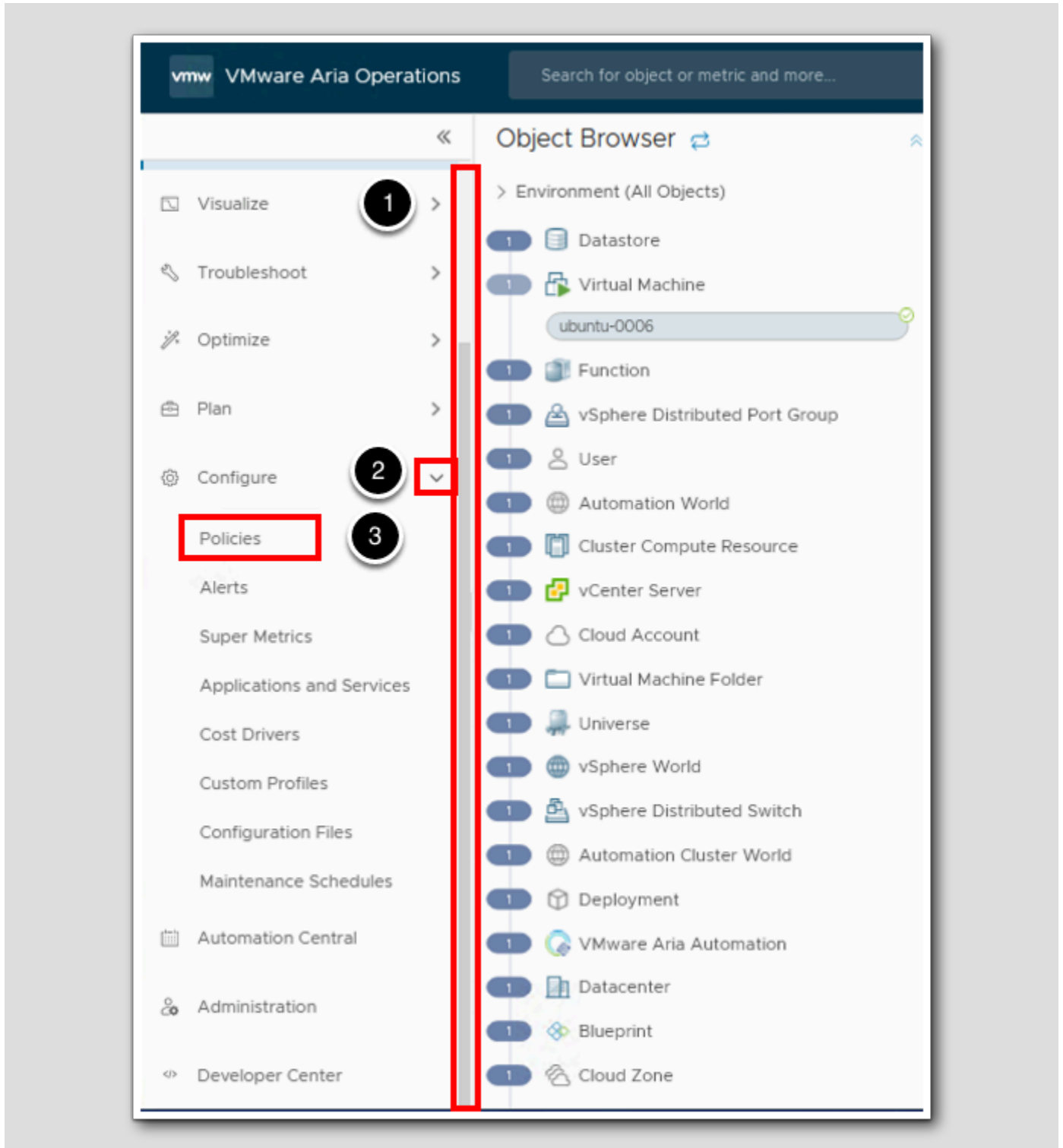
We've seen how we can manually create Alerts and Recommended Actions based on Symptom Definitions. Now let's end this part of the lesson and look at how we can automate these Recommended Actions by using the vRealize Operations Policies.

Return to your open PuTTY window. Closing this PuTTY session will end the CPU load command, and the alert will clear.

1. Click the X in the upper-right corner to close the PuTTY session.
2. Click OK in the PuTTY Exit Confirmation Pop-up Window (*Not Shown*).

Fully Automated Actions

[245]

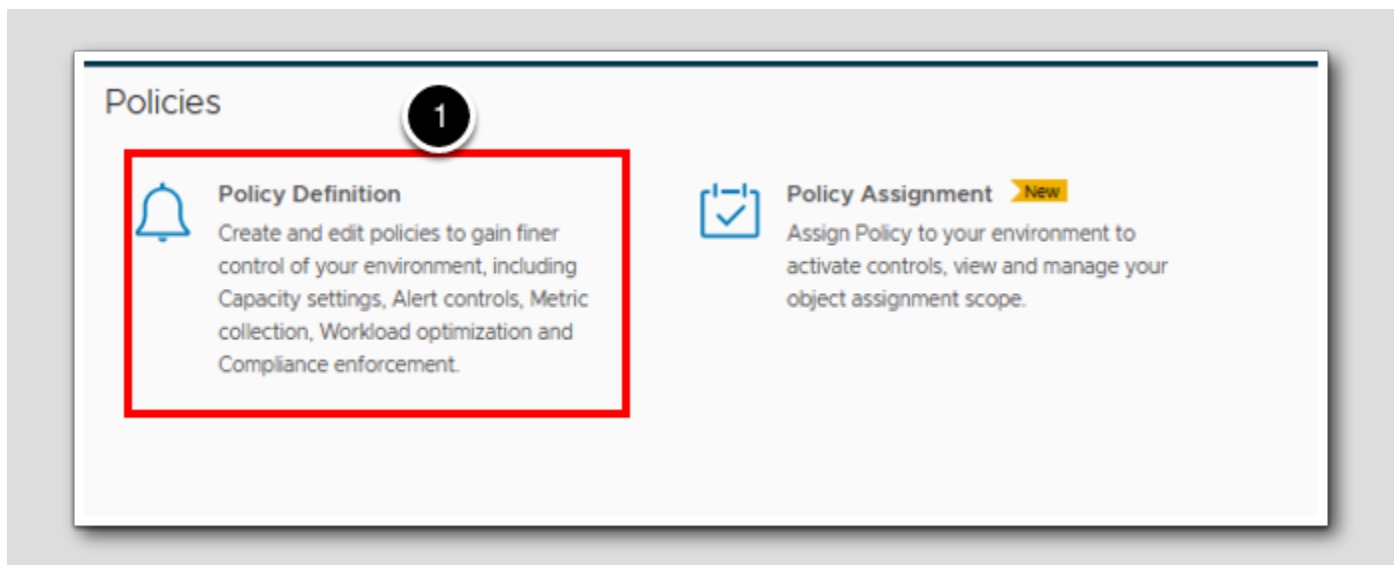


Here, we will create a custom policy for test VMs to enable the system to act based on the VM's policy assignment. In this case, we will automatically power off test VMs that spike CPU usage to prevent them from causing resource constraints in the virtual environment. By using the HOL Policy, all settings in that policy will be applied if they are not explicitly set in our new policy.

1. Scroll down on the left hand menu
2. Click the chevron to expand **Configuration** if needed to show the configuration options.
3. Click **Policies**.

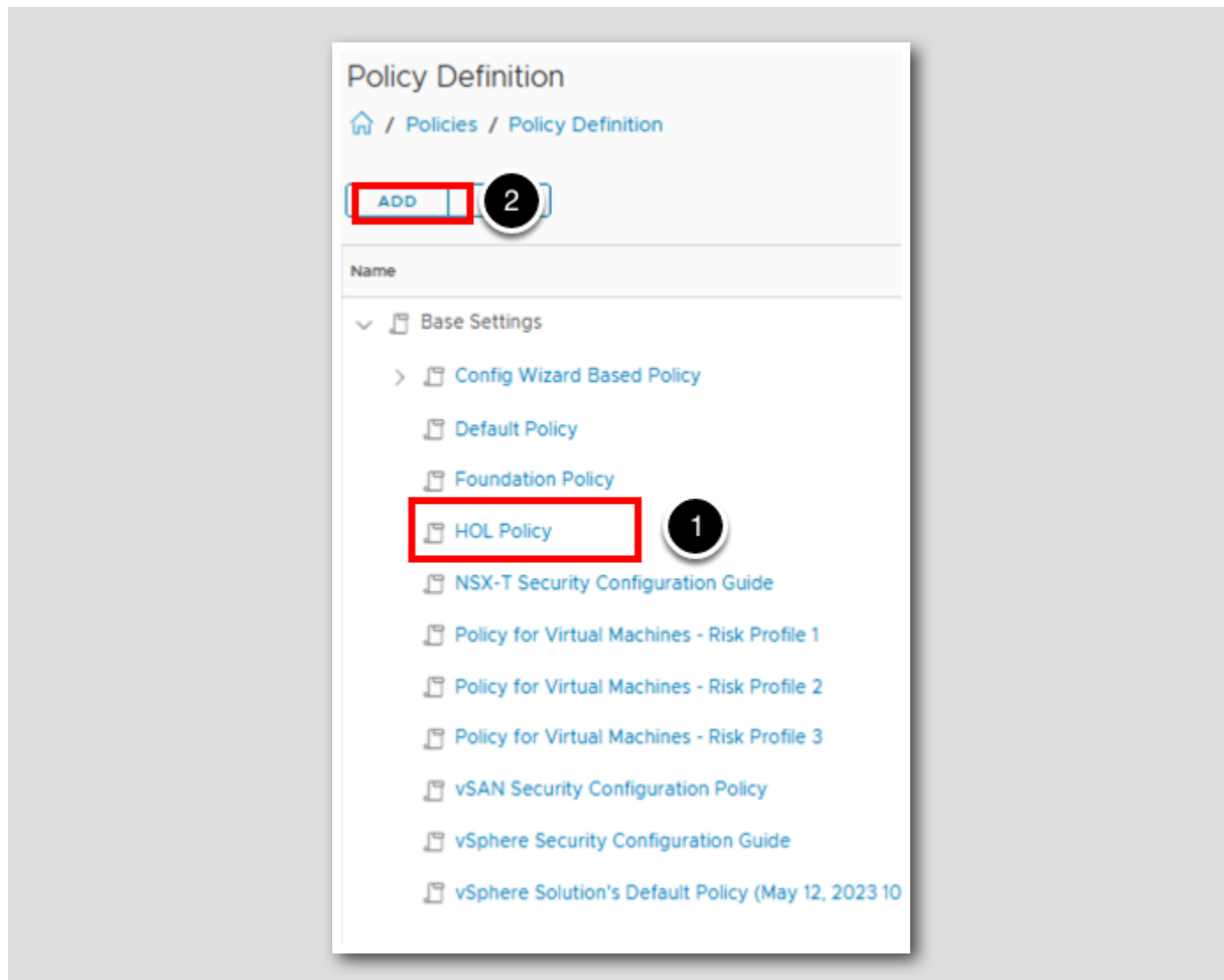
Policy Definition

[246]



1. Click Policy Definition.

Add Policy



1. Click **HOL Policy** to highlight, this will enable this selected policy to be our beginning baseline.
2. Click **ADD** to create a new policy.

Name the Policy

[248]

Create New Policy

Name: 1

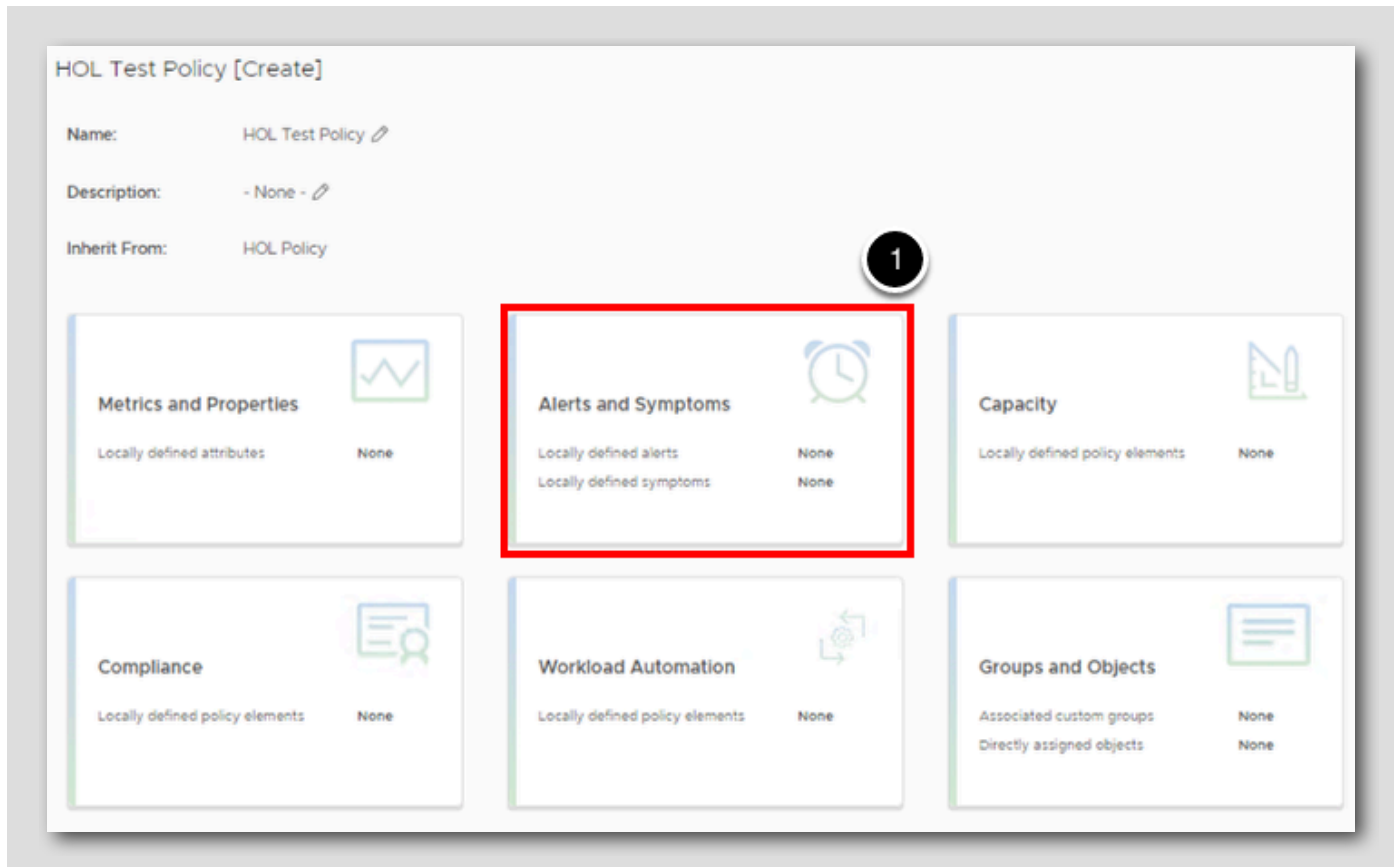
Description:

Inherit From: 2

1. Enter **HOL Test Policy** in the Name field
2. Select **CREATE POLICY**.

Policy Alerts and Symptoms

[249]



After creating the policy, we can now edit this Policy.

1. Select Alerts and Symptoms to edit this new policy.

Edit Alert Definition Settings

The screenshot shows the 'HOL Test Policy [Create]' interface. The 'Alert Definitions' tab is active. A search bar at the top right contains the text 'high cpu'. Below it, a table lists alert definitions. The 'High CPU Alert' row is selected. A dropdown menu is open under the 'State' and 'Automate' columns, showing 'Activated' as the selected option. At the bottom left, the 'SAVE' button is highlighted.

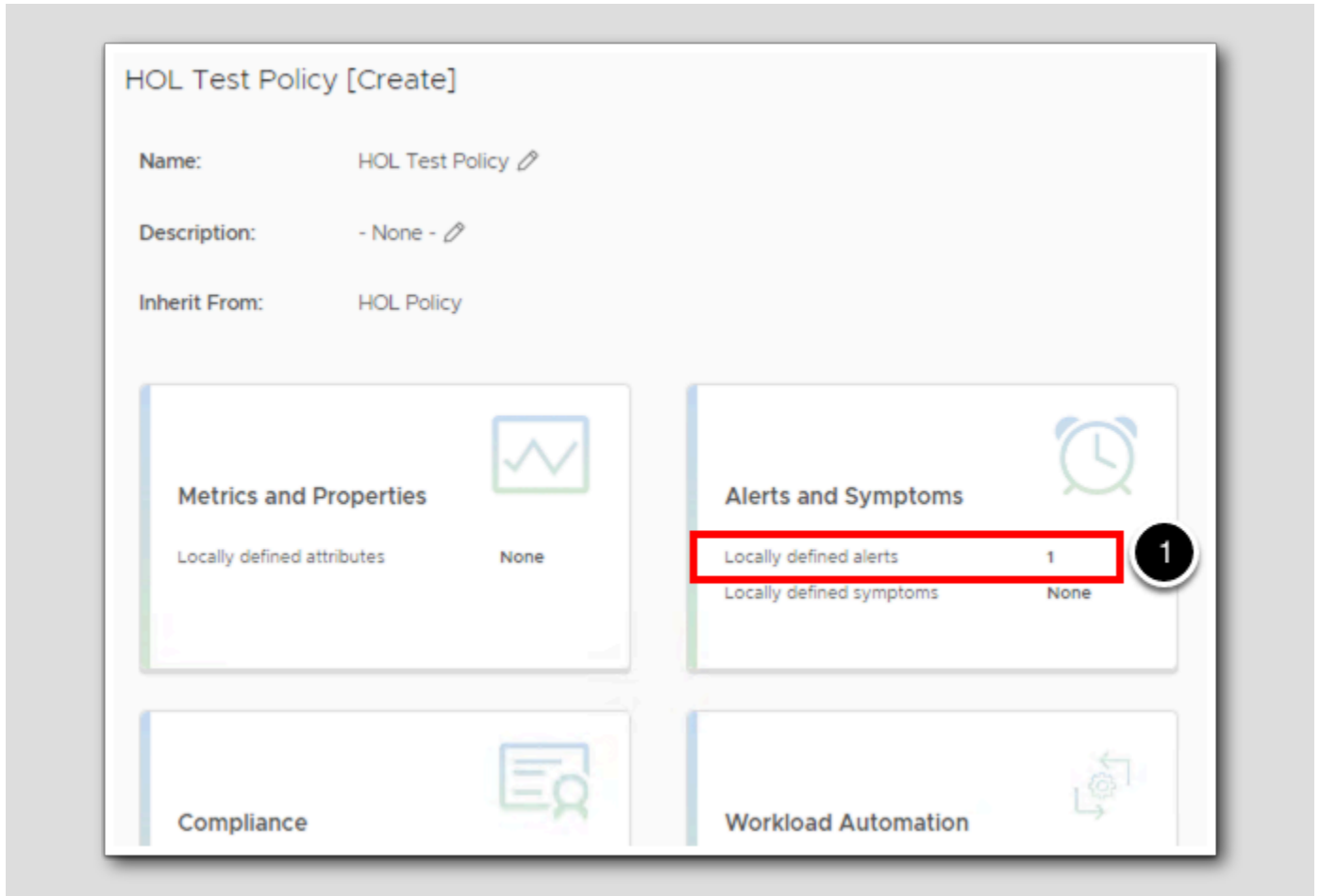
Alert Definition	State	Automate	Symptoms / Conditions	Criticality
Fully-automated DRS-enabled cluster has high CPU worki...	Activated (Inherited)	Not Applicable	5	
High CPU Alert	Activated	Activated	1	

The policy allows us to set the action to be run at the time of an alert.

1. Type **high cpu** in the filter box and hit **Enter**.
2. In the Alert Definitions Window, select our **High CPU Alert**
3. Click on **Activated** (with the green checkmark to the left of it) in the drop-down list under the **State** and **Automate** columns.
Note that the action we assign in the alert is linked in the policy.
4. Click **SAVE**.

Confirm Alert was defined in the New Policy

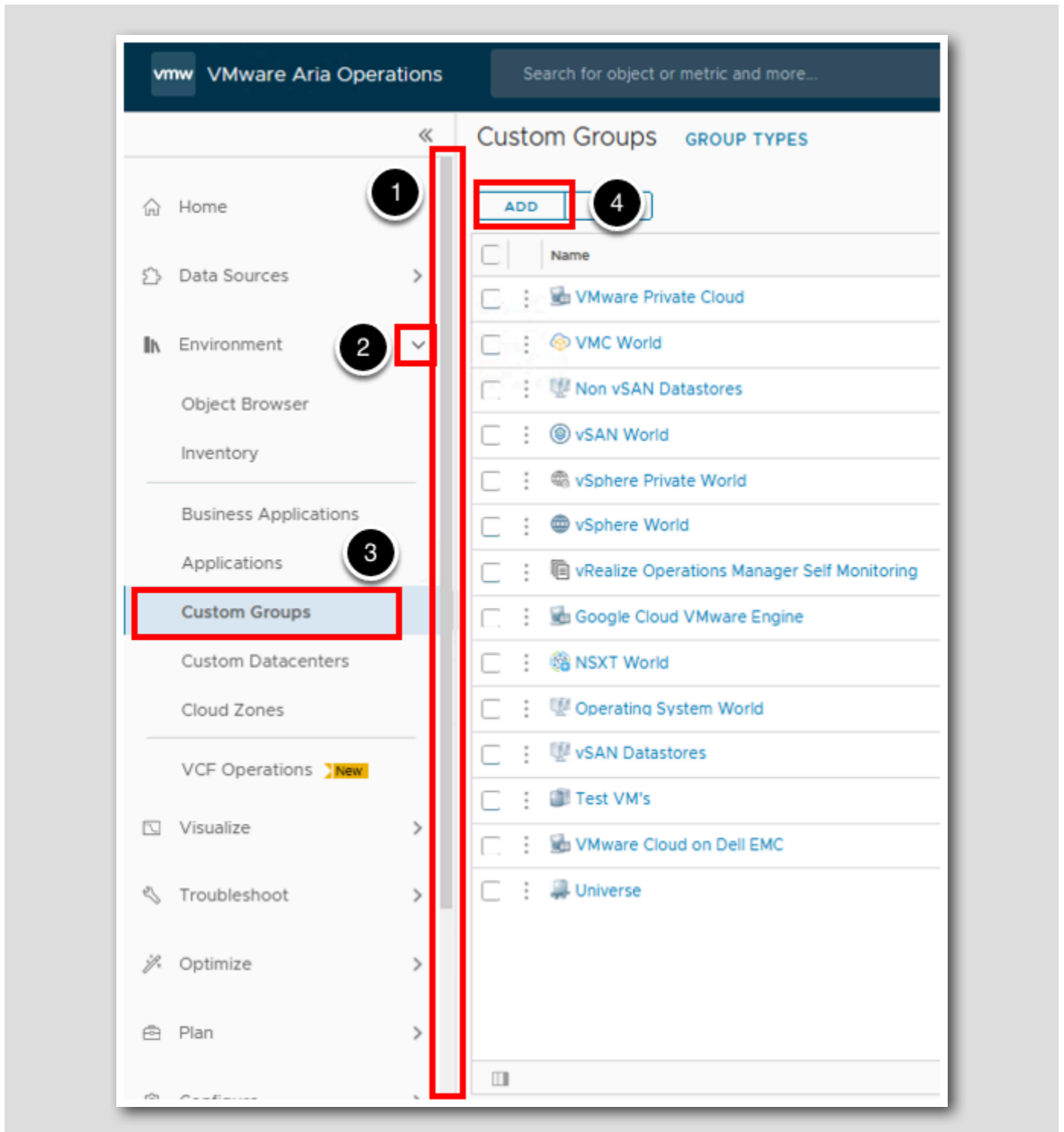
[251]



1. Now we can confirm that our new Policy "HOL Test Policy" was created, and under Alerts and Symptom we can see that we do have 1 Locally defined alert.

Add VM to Test Group

[252]

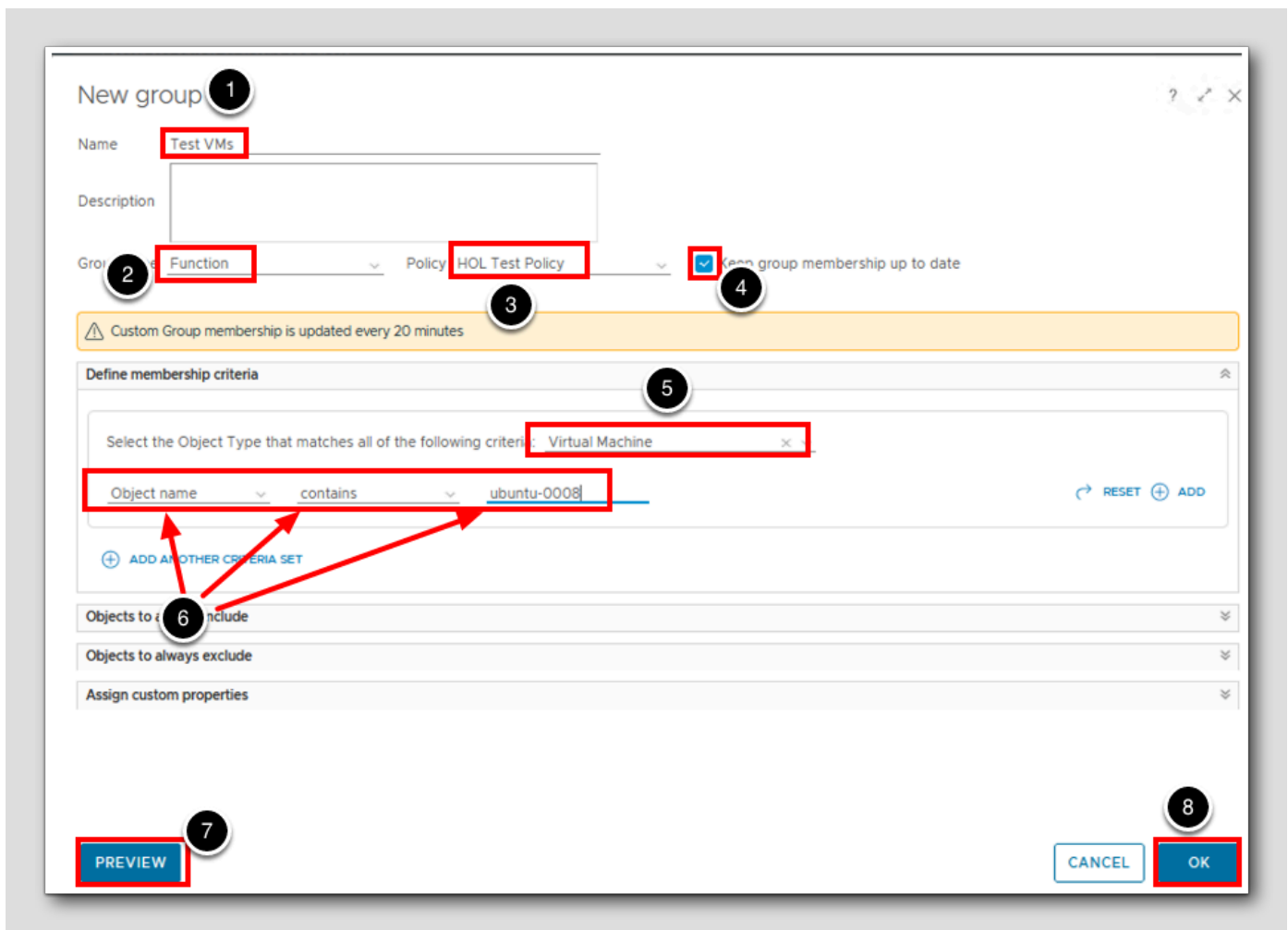


We will now create a new group for test VMs and apply our HOL Test Policy to it. In this lab, we only have one test VM, but we will be able to configure the group to add additional machines dynamically and apply our policy.

1. Scroll up on the left hand menu bar.
2. Expand Environment.
3. Click Custom Groups.
4. Click ADD to create a new group.

Define the New Group

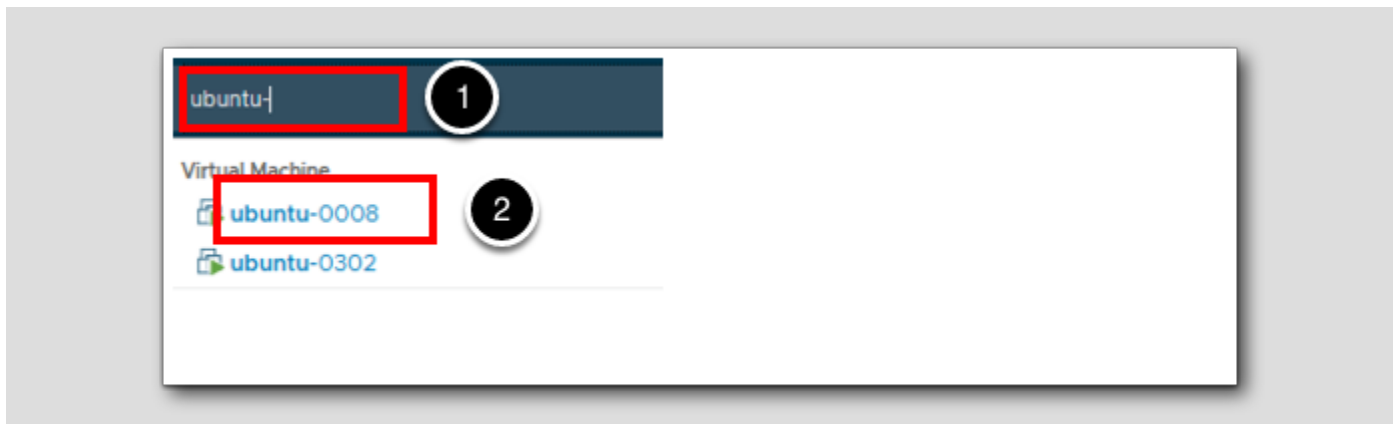
[253]



1. Enter **Test VMs** in the **Name** field.
2. Select **Function** for Group Type.
3. Select **HOL Test Policy**.
4. Click the check box to select **Keep group membership up to date**.
5. Select **Virtual Machine** under the vCenter Adapter for object type.
6. Under **Object Name**, select **contains** and then enter **ubuntu-0008** for the selection criteria.
7. Click **PREVIEW** to preview the machines that fit this search criteria and make sure only the VM **ubuntu-0008** shows up in the list.
 - Click **CLOSE** on the Preview Screen (not shown above).
8. Click **OK**.

Check Policy

[254]

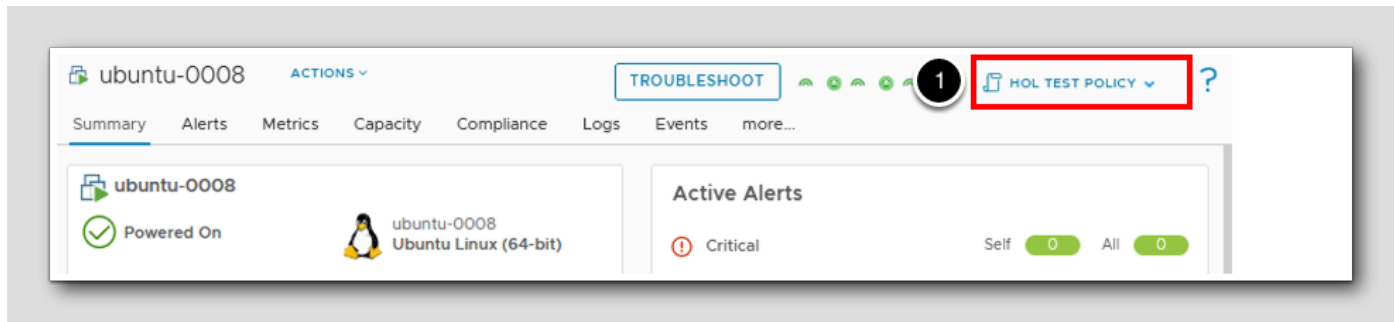


Verify our critical VM has the newly assigned policy.

1. Click in the **Search Bar** and enter **ubuntu-**
2. Click the VM **ubuntu-0008**.

Confirm HOL Test Policy

[255]



1. Verify that HOL TEST POLICY is now assigned to this VM.

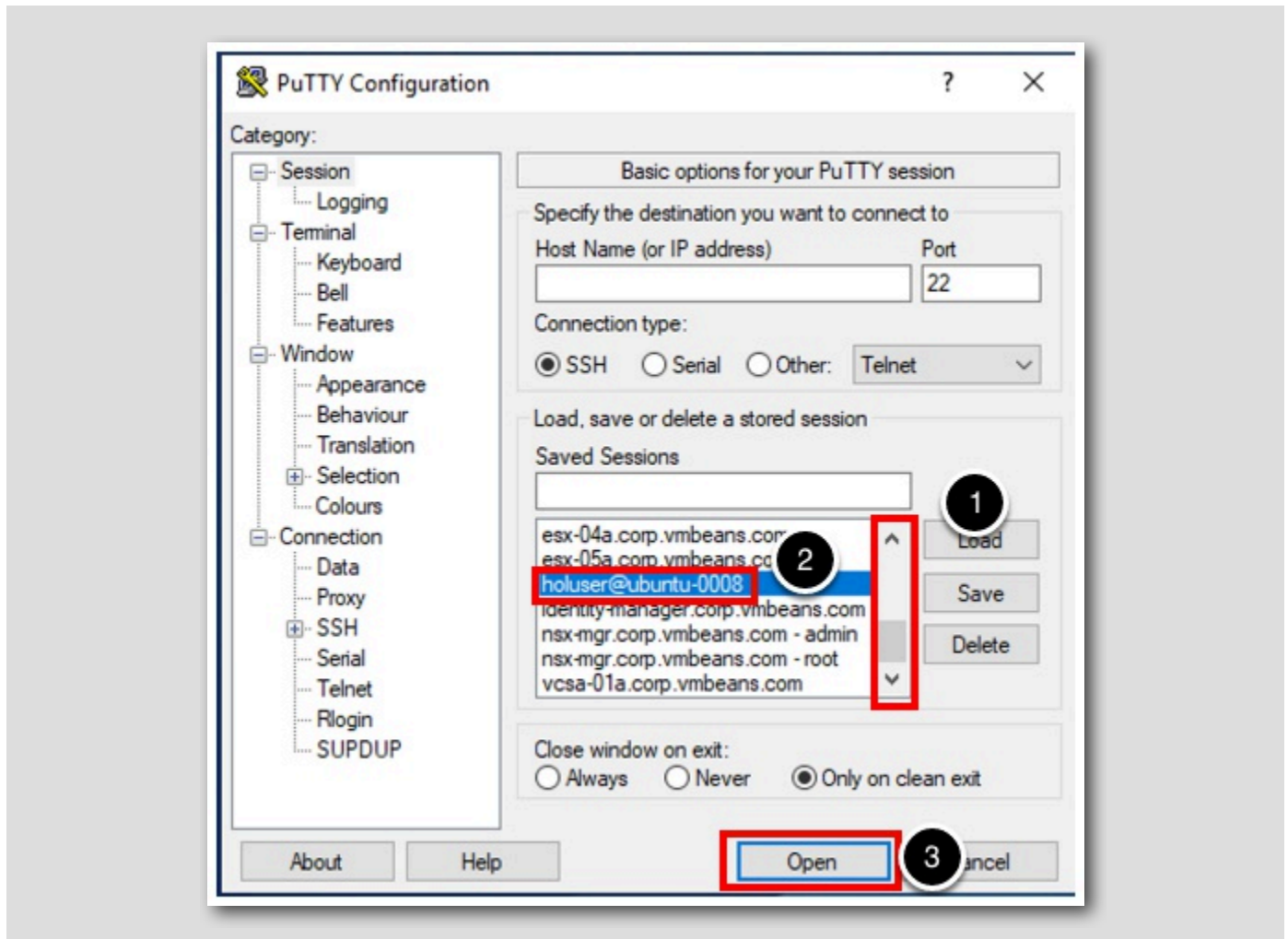
Open PuTTY Session

[256]



1. Click on PuTTY icon in System tray to view the PuTTY Configuration options.

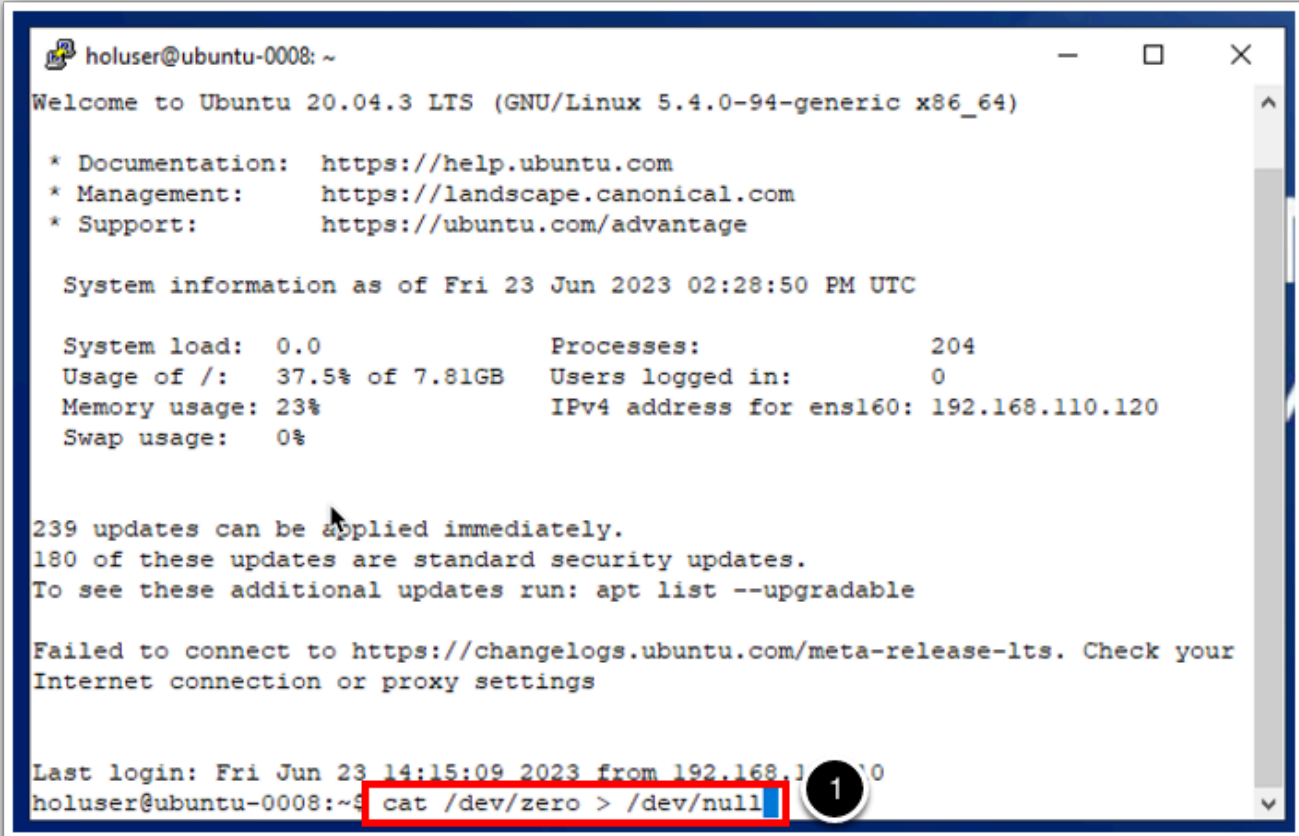
Open PuTTY Session



1. Scroll down on the right of Saved Sessions
2. Click on holuser@ubuntu-0008.
3. Click Open to start the PuTTY session.

Run CPU Load

[258]



The screenshot shows a terminal window titled 'holuser@ubuntu-0008: ~'. The terminal output includes the Ubuntu welcome message, system information as of Fri Jun 23 2023 02:28:50 PM UTC, and a list of updates. The command `cat /dev/zero > /dev/null` is entered at the prompt and highlighted with a red box. A circled number '1' is placed next to the command.

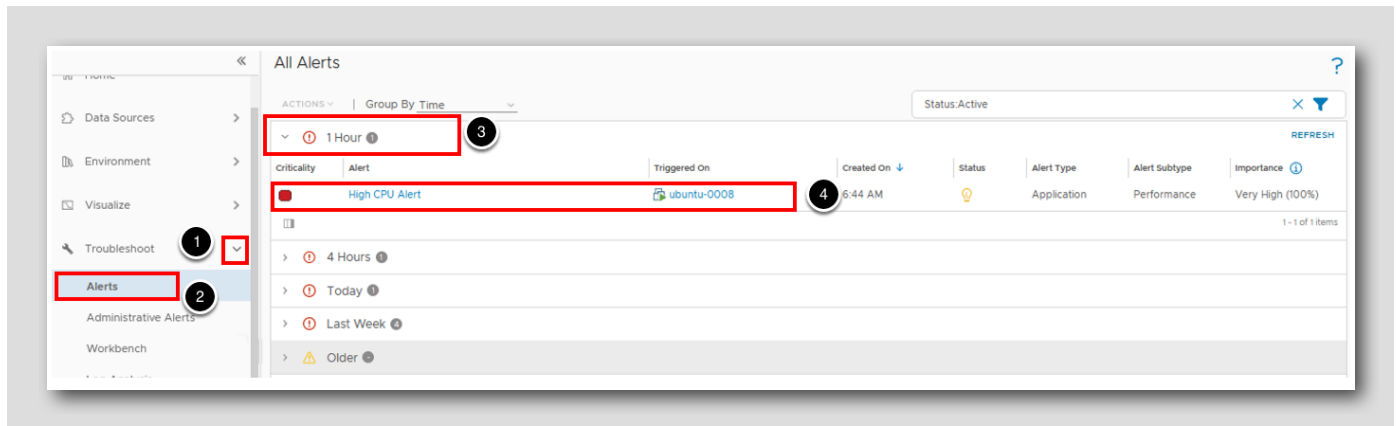
```
holuser@ubuntu-0008: ~  
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.4.0-94-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:       https://ubuntu.com/advantage  
  
System information as of Fri Jun 23 2023 02:28:50 PM UTC  
  
System load:  0.0          Processes:           204  
Usage of /:   37.5% of 7.81GB  Users logged in:    0  
Memory usage: 23%          IPv4 address for ens160: 192.168.110.120  
Swap usage:   0%  
  
239 updates can be applied immediately.  
180 of these updates are standard security updates.  
To see these additional updates run: apt list --upgradable  
  
Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your  
Internet connection or proxy settings  
  
Last login: Fri Jun 23 14:15:09 2023 from 192.168.1.10  
holuser@ubuntu-0008:~$ cat /dev/zero > /dev/null
```

Redirect `dev/zero` to `dev/null` to generate CPU load again; this will trigger the alert and show how it behaves with the new policy.

1. Type `cat /dev/zero > /dev/null` and press the **Enter** key to start the CPU load.

Again, leave this PuTTY window open.

Check for the Alert



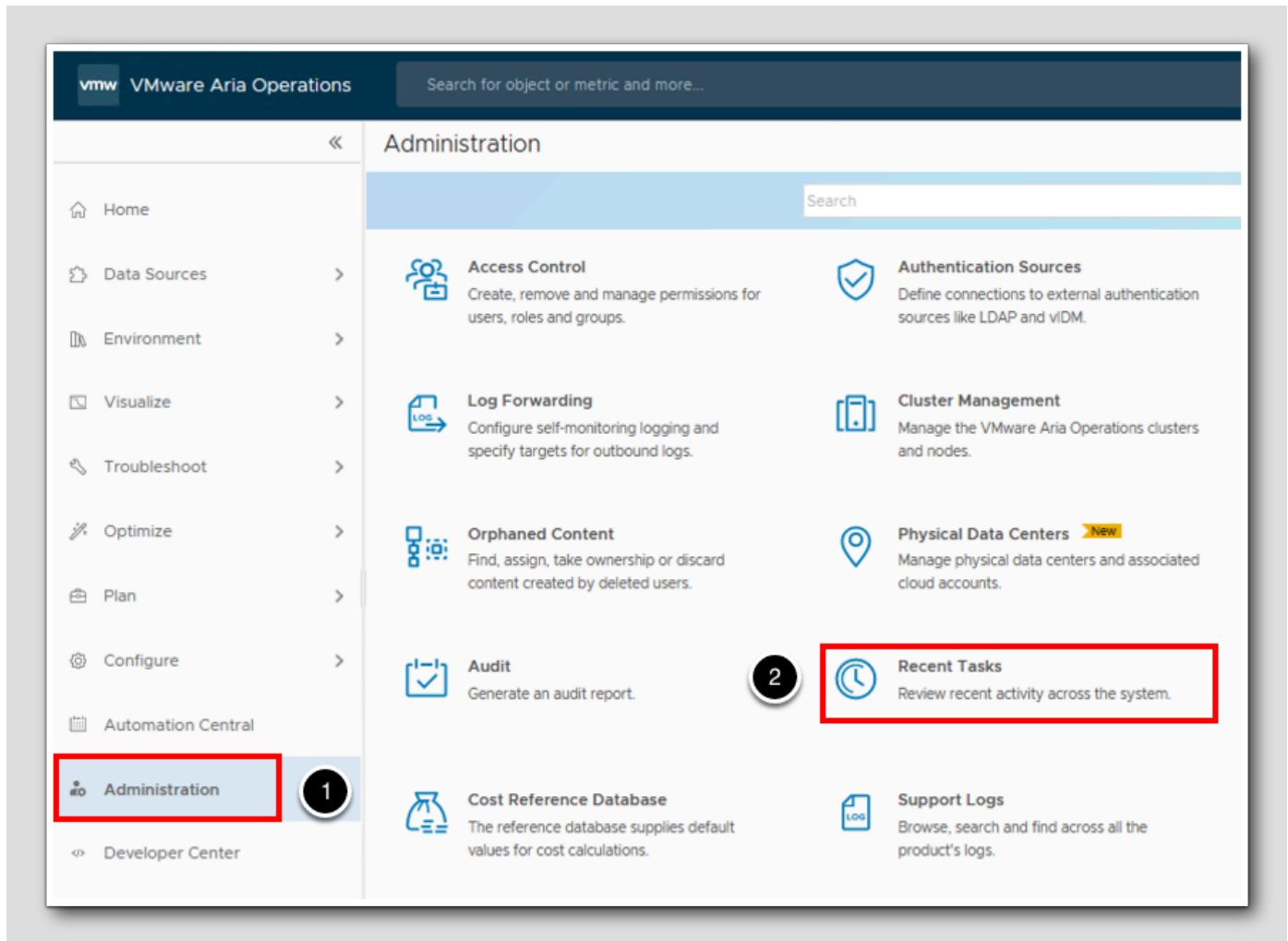
Let the CPU load command run for a couple minutes, and then return to vRealize Operations and check the alerts from the Alerts screen.

Note, you may need to hit refresh in the upper right hand corner. The High CPU Alert will not show until the next collection cycle runs.

1. Click the chevron to expand **Troubleshoot** if needed to show the Troubleshoot options.
2. Click **Alerts**. (NOTE: It may take a few minutes for the Alert to show up).
3. Click the chevron beside **1 Hour** to show the most recent alerts.
4. Notice we do see our **High CPU Alert** has been triggered because of High CPU Usage.

We looked at the alert previously, so now we'll check the recent tasks and check the status of the action.

Recent Task List

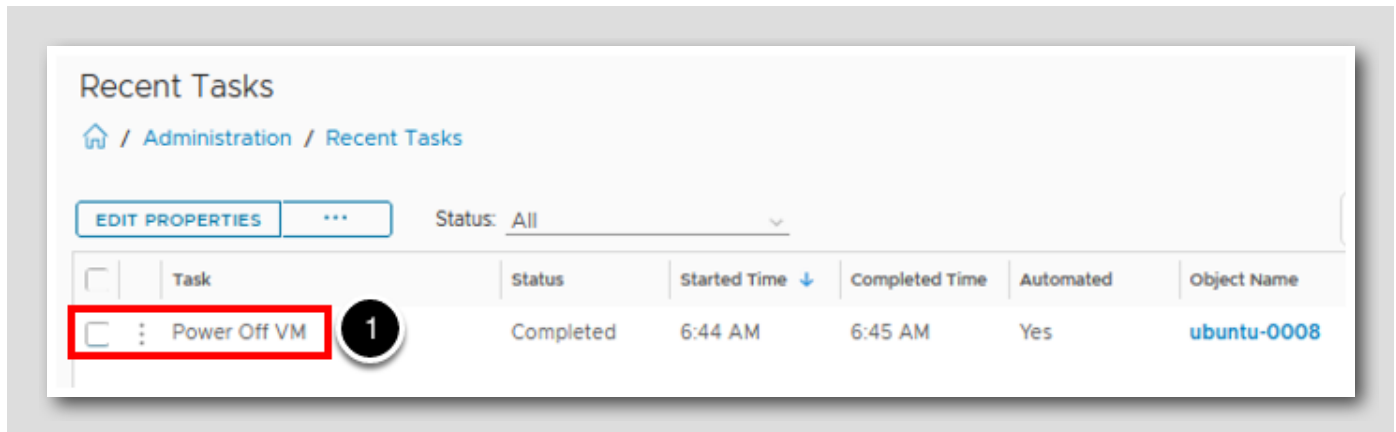


The screenshot displays the VMware Aria Operations interface. The top navigation bar includes the VMware logo and the text 'VMware Aria Operations', along with a search bar. The left sidebar contains a list of navigation options: Home, Data Sources, Environment, Visualize, Troubleshoot, Optimize, Plan, Configure, Automation Central, Administration, and Developer Center. The 'Administration' option is highlighted with a red box and a circled '1'. The main content area is titled 'Administration' and features a search bar and a grid of administrative tasks. The 'Recent Tasks' option is highlighted with a red box and a circled '2'. The 'Recent Tasks' option includes a clock icon and the text 'Recent Tasks' and 'Review recent activity across the system.'

1. Click **Administration**.
2. Click **Recent Tasks**.

Inspect Power Off VM Task

[261]

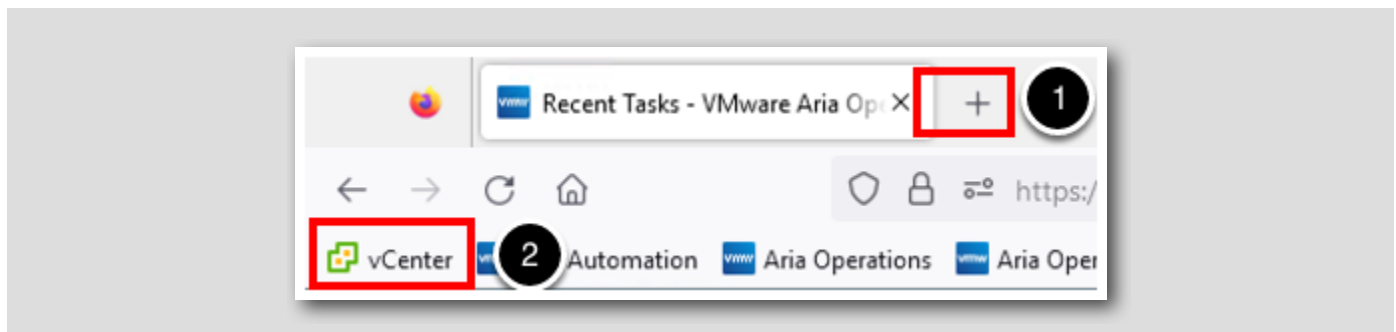


1. Click the **Power Off VM** task. Additional details regarding the completed operations are displayed now at the bottom of the screen.

Let's take a look at the VM in the vSphere Client to ensure that the action has turned off our ubuntu-0008 VM.

Open vSphere Client - Open a new Browser Tab

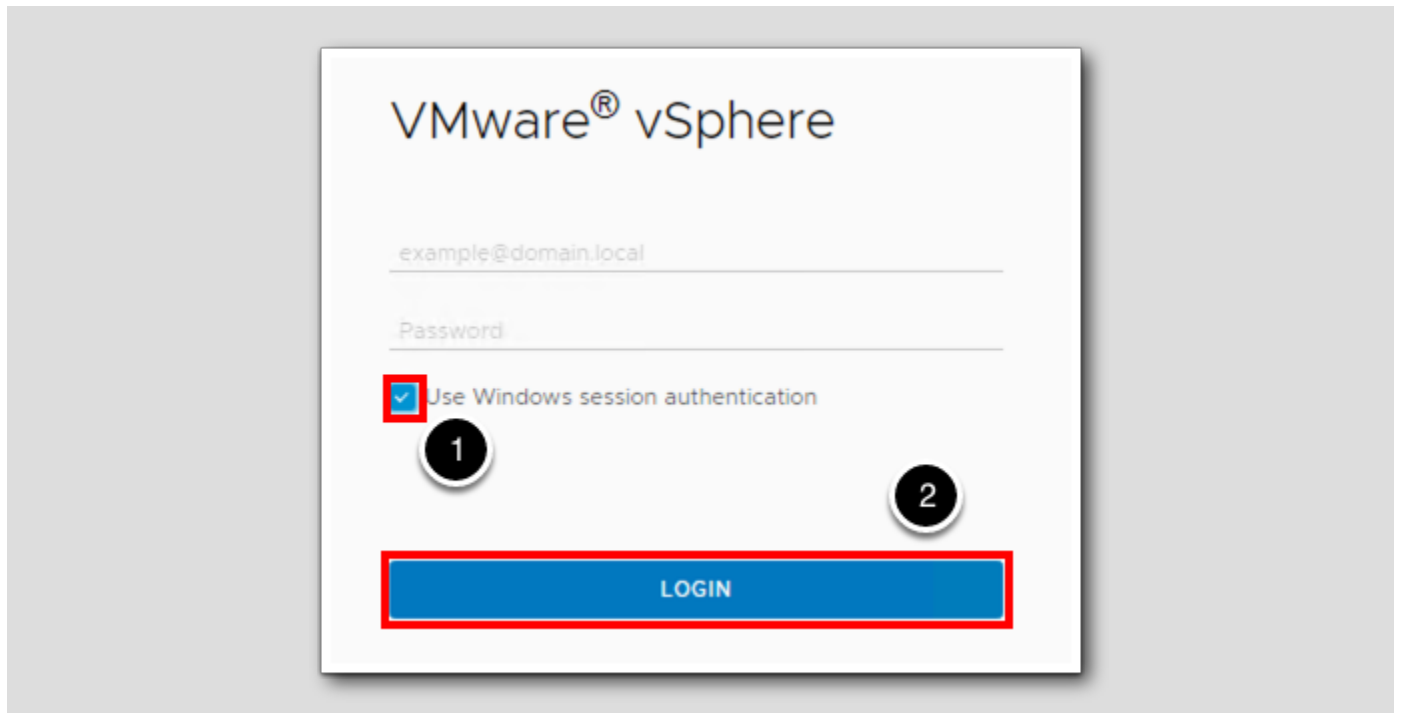
[262]



1. Click the + to open a new Firefox Tab.
2. Click on the **vCenter** link in the bookmarks bar.

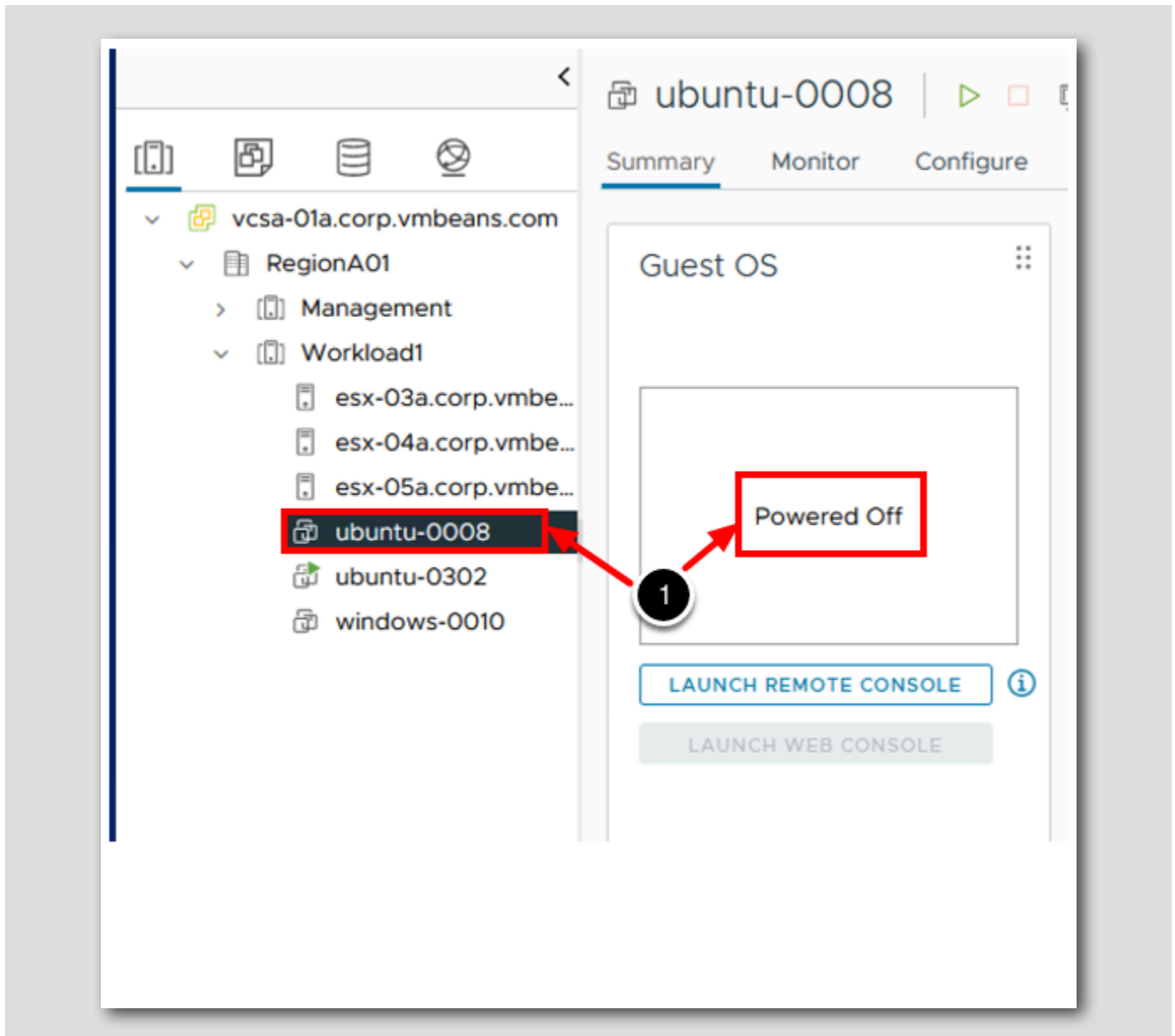
Login to vCenter

[263]



1. Click the checkbox to select Use Windows session authentication.
2. Click LOGIN.

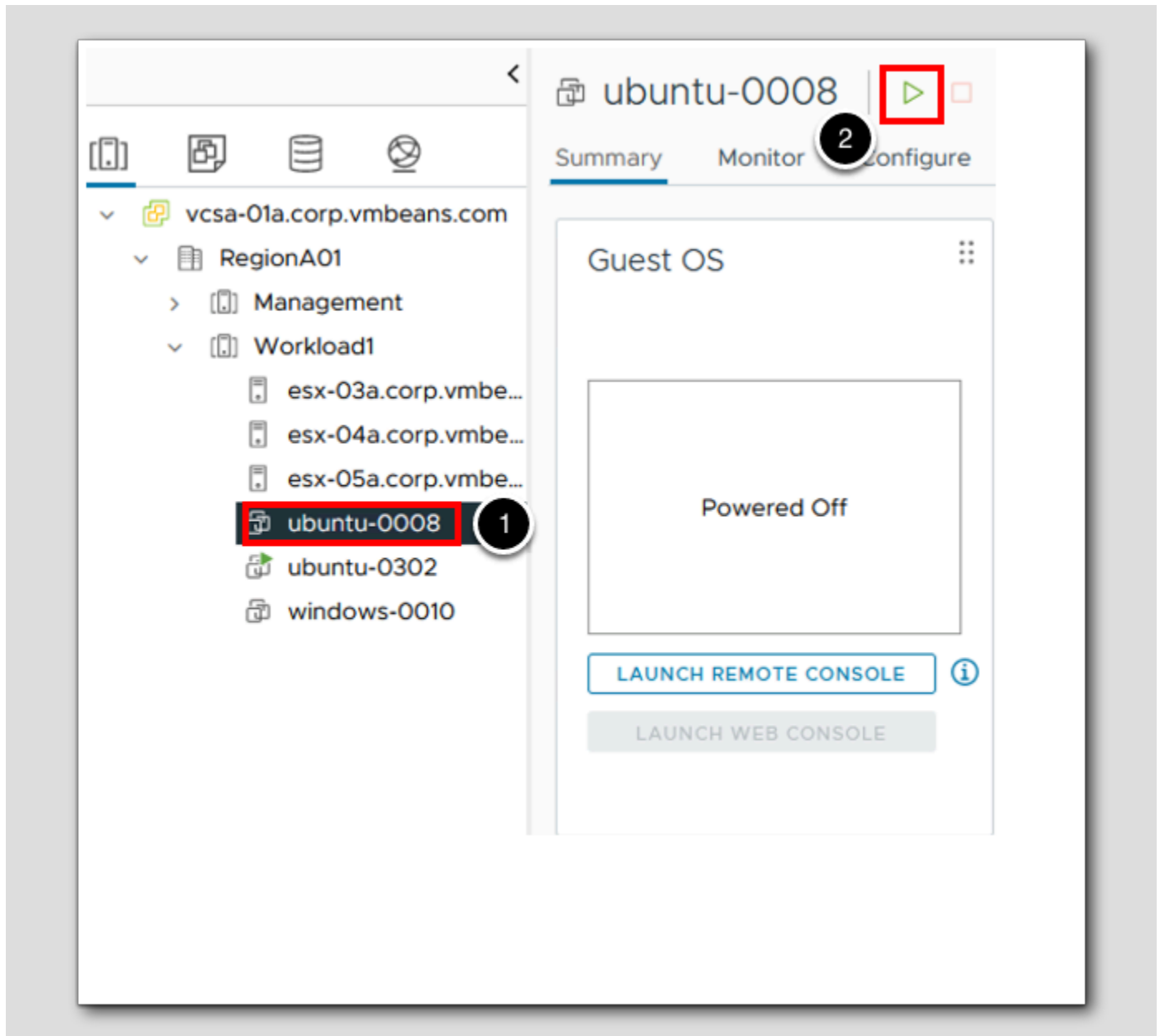
Check the VM Status



1. In vCenter we can see that the `ubuntu-0008` VM has indeed been turned off by our automated action in vRealize Operations.

Automating actions in vRealize Operations is a key part of creating a Self Driving Datacenter!

Restart the ubuntu-0008 VM

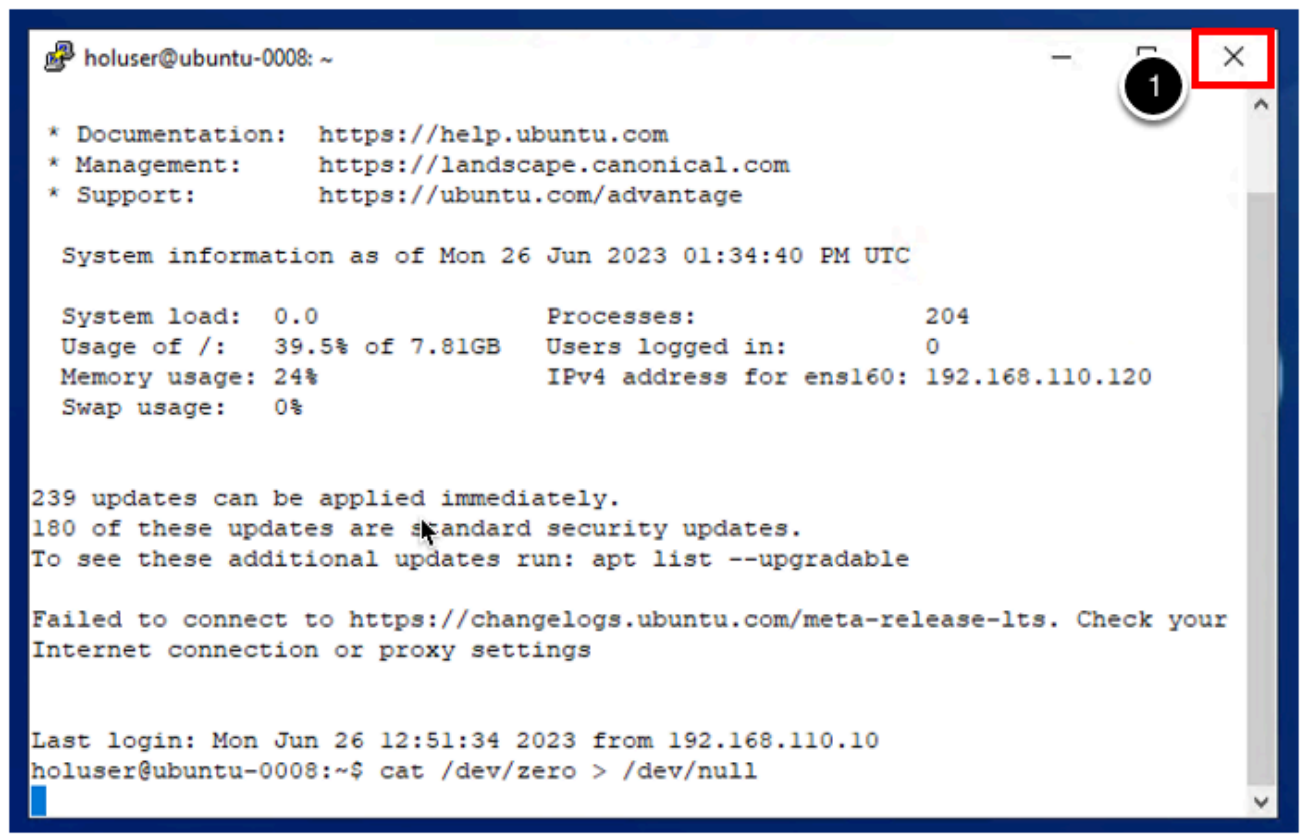


Let's restart the `ubuntu-0008` VM as it will be needed in later lessons.

1. Click the VM `ubuntu-0008`.
2. Click the green start icon at the top of the VM summary page (or right-click and select Power On).

Stop CPU Load

[266]



```

holuser@ubuntu-0008: ~
* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:       https://ubuntu.com/advantage

System information as of Mon 26 Jun 2023 01:34:40 PM UTC

System load:  0.0          Processes:           204
Usage of /:   39.5% of 7.81GB  Users logged in:    0
Memory usage: 24%          IPv4 address for ens160: 192.168.110.120
Swap usage:   0%

239 updates can be applied immediately.
180 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your
Internet connection or proxy settings

Last login: Mon Jun 26 12:51:34 2023 from 192.168.110.10
holuser@ubuntu-0008:~$ cat /dev/zero > /dev/null

```

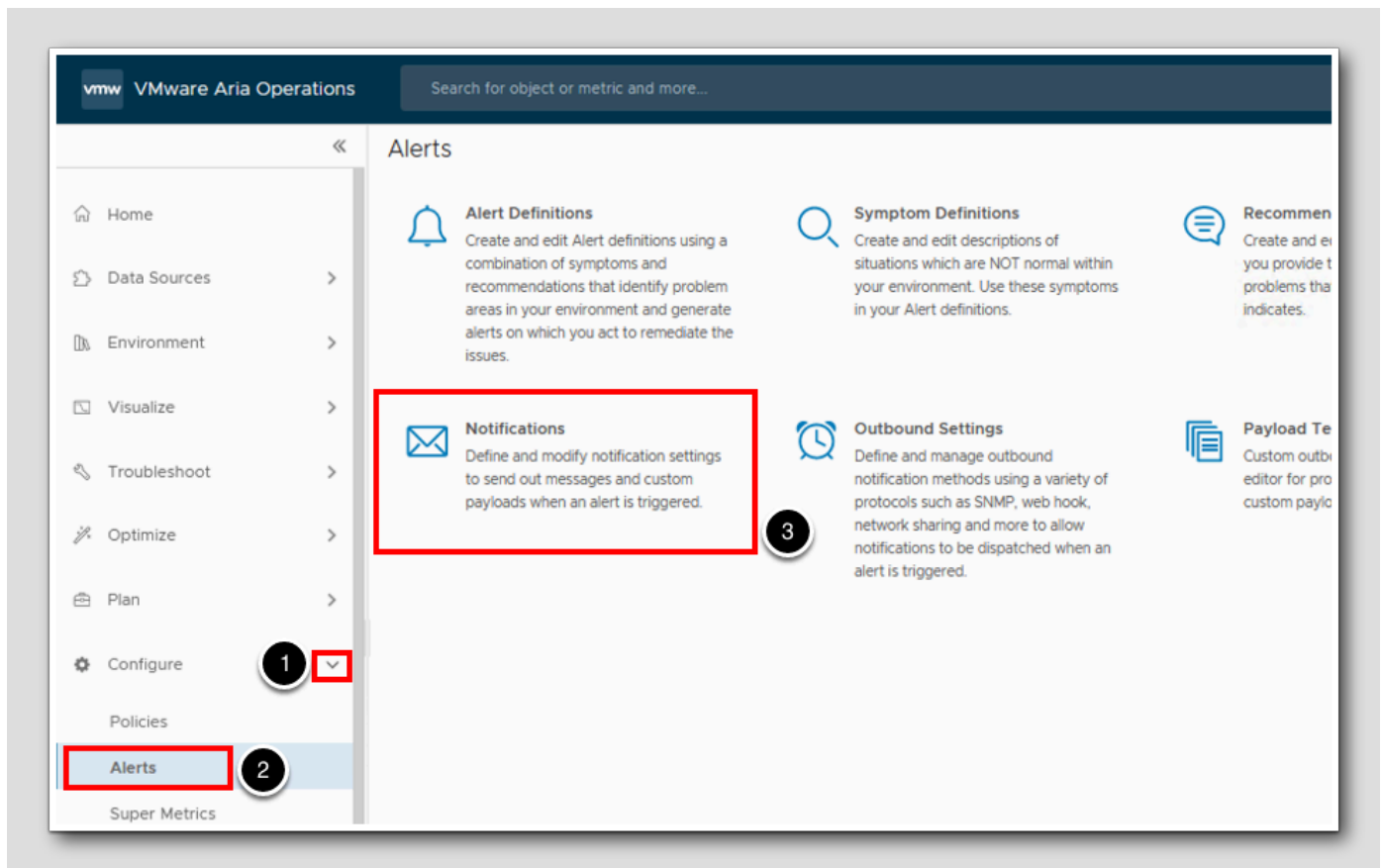
Return to your open PuTTY window. Closing this PuTTY session will end the CPU load command.

1. Click the X in the upper-right corner to close the PuTTY session.
2. Click OK in the PuTTY Exit Confirmation Pop-up Window (*Not Shown*).

Configuring Notifications

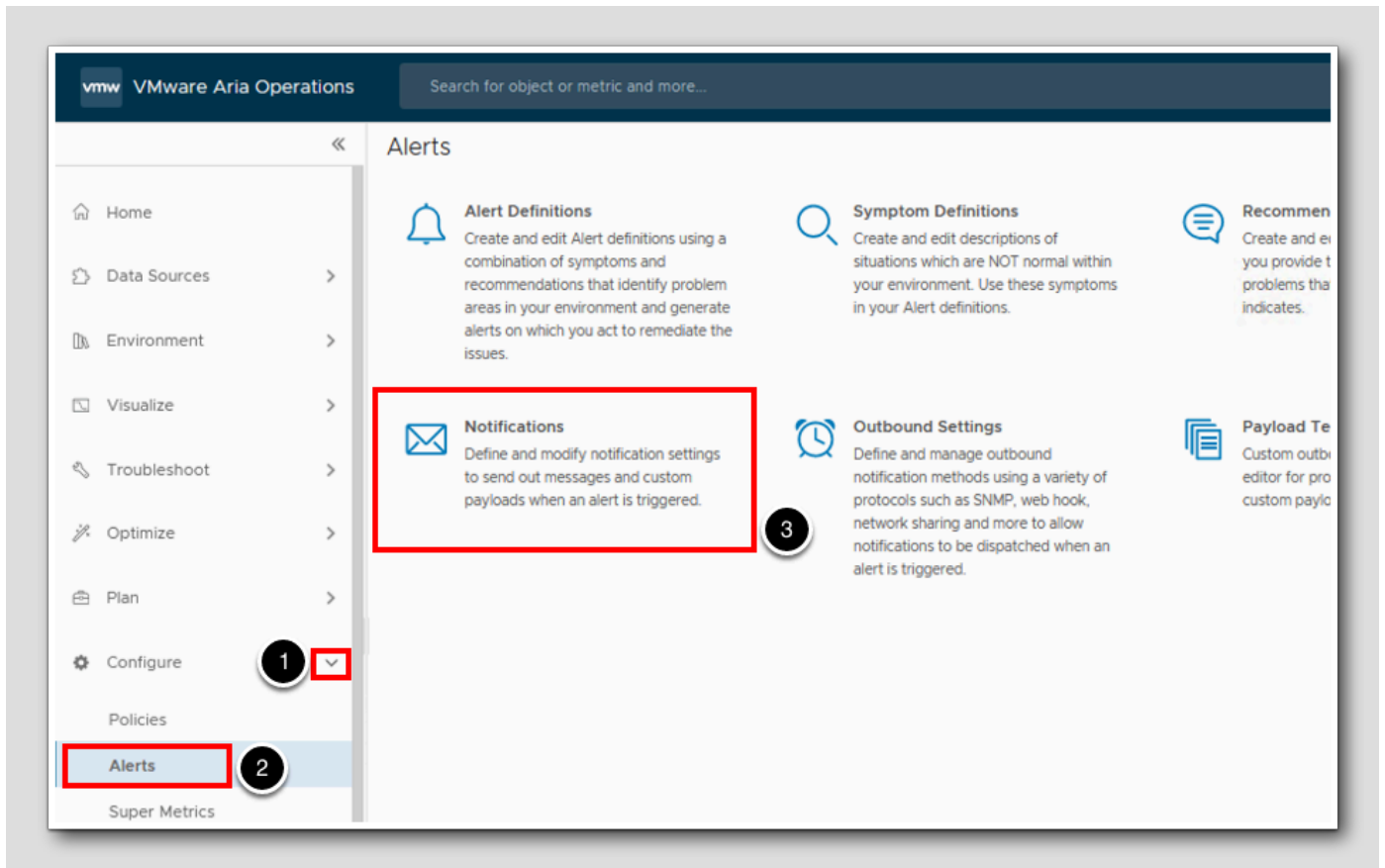
[267]

In this lesson we will create an Email Notification triggered on the High CPU Alert created in the last section.



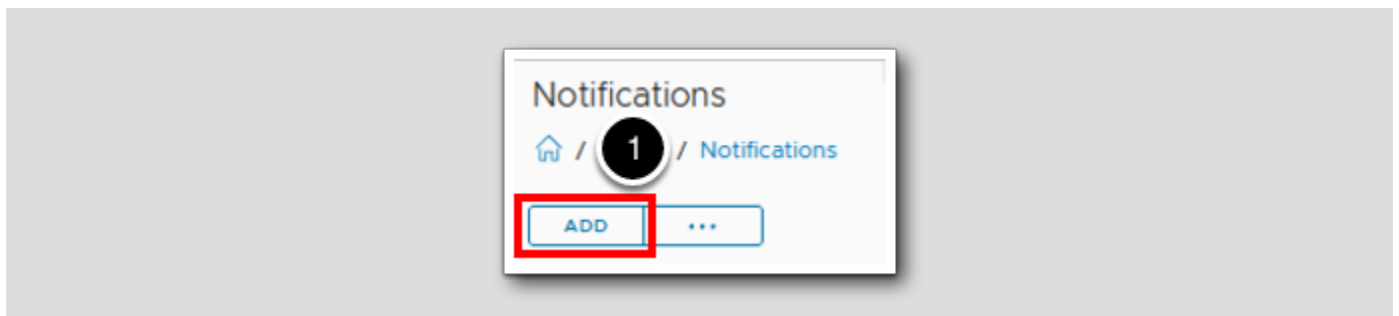
From the Home screen

1. Expand Configure.
2. Click on Alerts.
3. Click on Notifications.



Adding a Notification

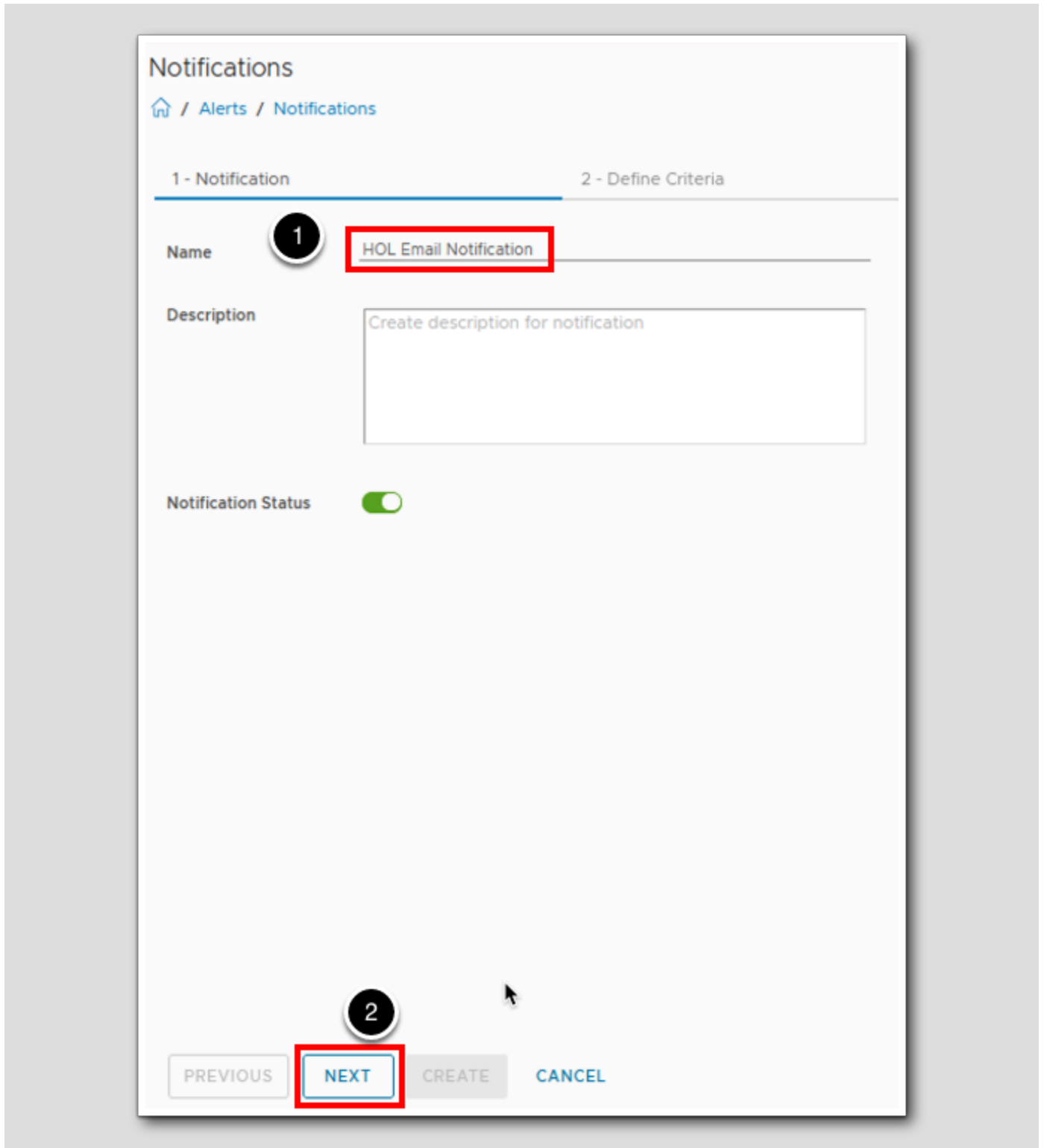
[268]



1. Click ADD.

1 - Notification

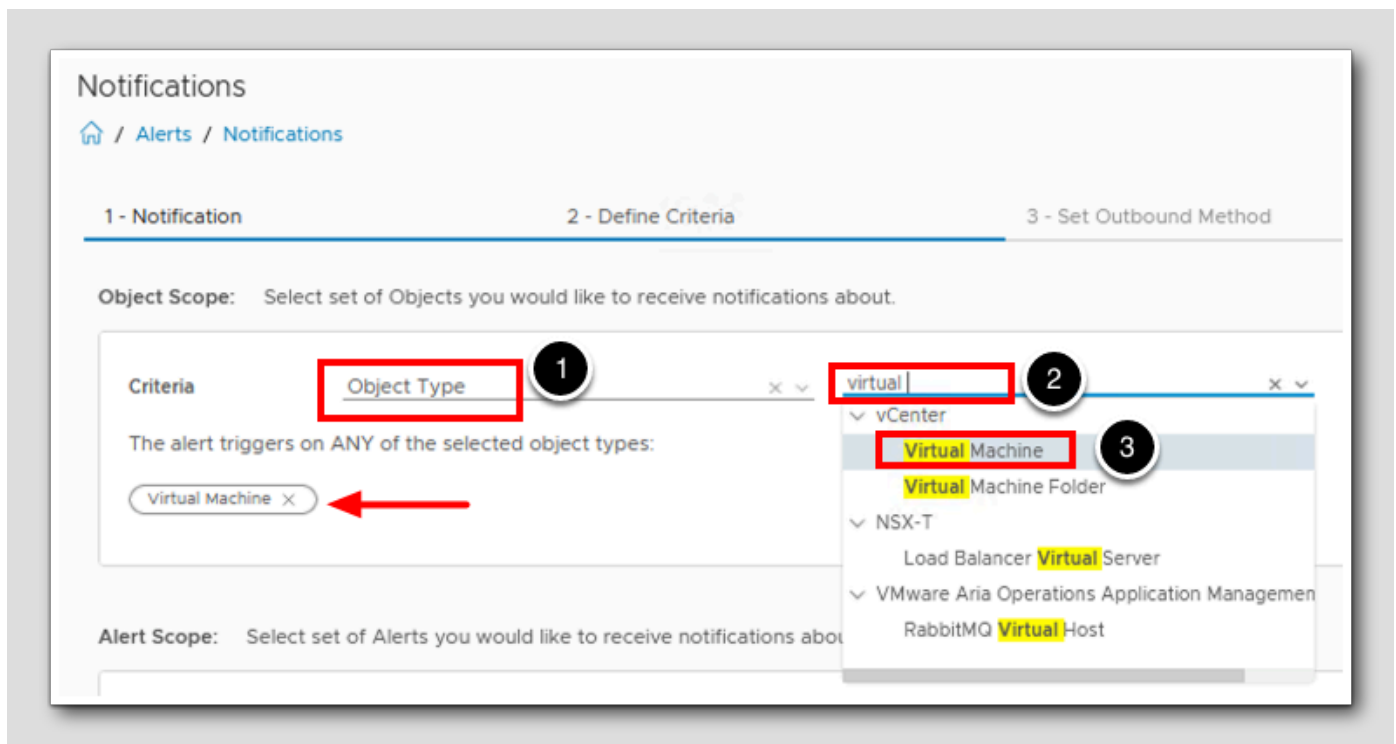
[269]



1. In the Name field type HOL Email Notification.
2. Click NEXT.

Define Criteria

[270]

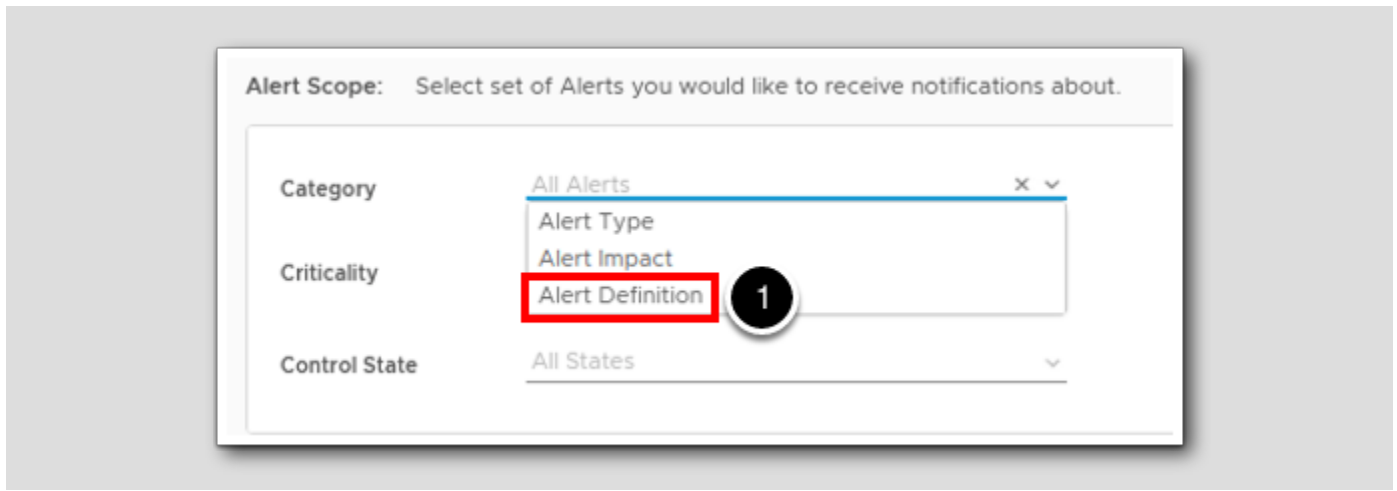


1. In the Criteria drop down select Object Type.
2. In the Search field start typing virtual machine.
3. Select Virtual Machine.

Notice Virtual Machine populates under the Criteria section.

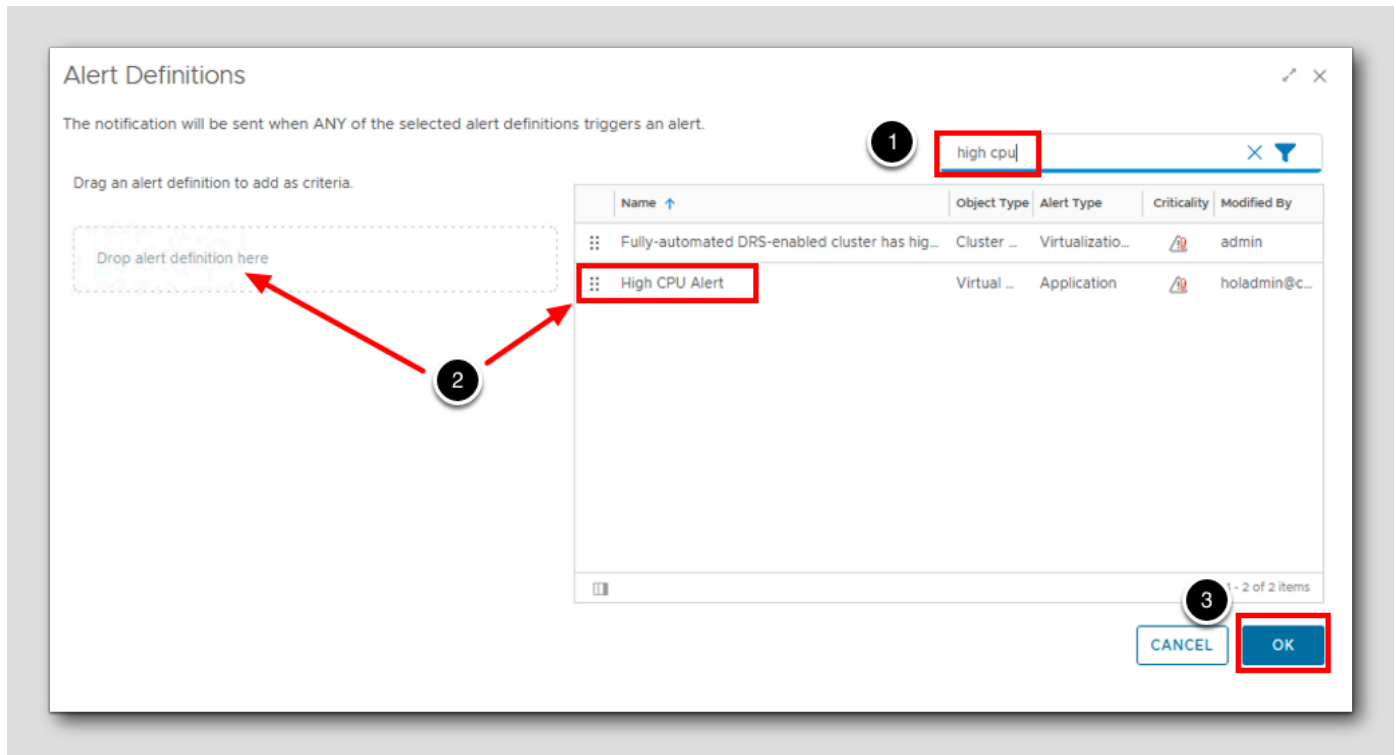
Category

[27]



1. Under **Alert Scope**: expand **Category** and select **Alert Definition**.

High CPU Alert

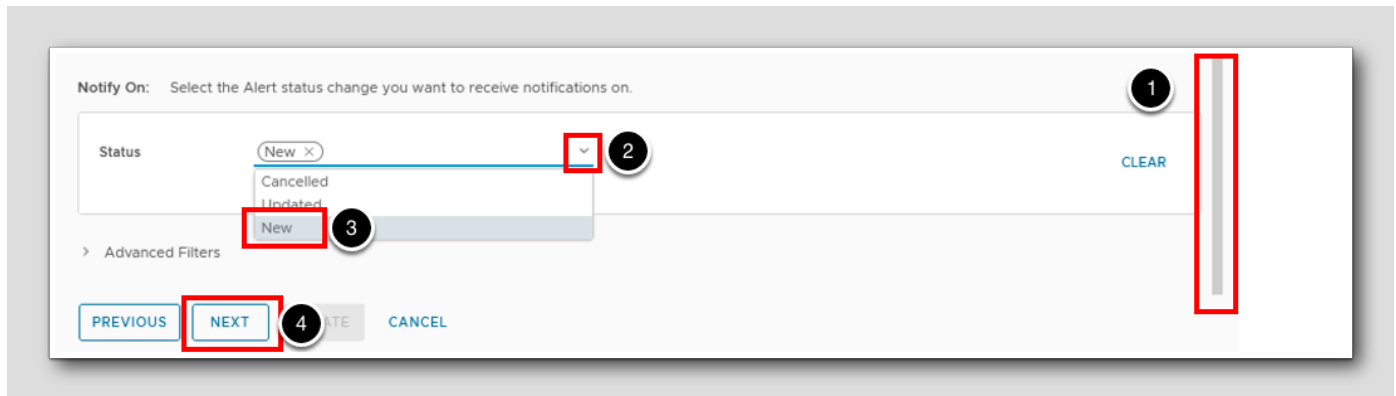


Here we will use the High CPU Alert created in the previous module.

1. In the **search bar**, type `high cpu` and hit **Enter**.
2. Drag and drop the **High CPU Alert** alert definition into the **Drop alert definition here** box.
3. Click **OK**.

Status New Only

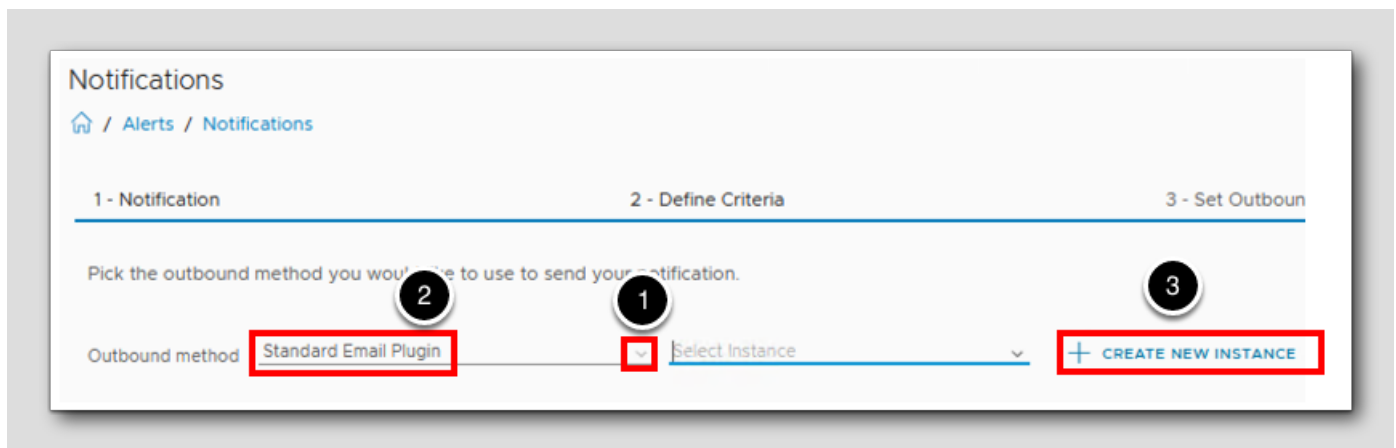
[273]



1. Scroll down to the bottom on the right hand side.
2. Expand Status.
3. Click **New** to ensure only new alert notifications are sent.
4. Click **NEXT**.

Set Outbound Method

[274]



We need to create an Outbound Instance for the Notifications to use. In this lab we will create a Standard Email Plugin method.

1. Expand the **Outbound method** dropdown.
2. Click **Standard Email Plugin**.
3. Click **CREATE NEW INSTANCE**.

Populate the **Standard Email Plugin** fields.

1. **Instance Name** - HOL Email
2. Check **Use Secure Connection**
3. **SMTP Host** - mail.corp.vmbeans.com
4. **SMTP Port** - 25
5. **Sender Email Address** - administrator@corp.vmbeans.com
6. **Sender Name** - Administrator
7. **Receiver Email Address** - holadmin@corp.vmbeans.com
8. Click **TEST** and ensure you get a **Test connection successful** response (Not Shown).
9. If the **TEST** is successful, click **SAVE**. If the **TEST** fails, verify the above information has been entered correctly and re-test.

Notifications (Continued)

[276]

The screenshot shows the 'Notifications' configuration page in a web interface. The page title is 'Notifications' and the breadcrumb is 'Home / Alerts / Notifications'. The page is divided into three steps: '1 - Notification', '2 - Define Criteria', and '3 - Set Outbound'. The current step is '1 - Notification'. The instruction reads: 'Pick the outbound method you would like to use to send your notification.' Below this, there are two dropdown menus. The first is labeled 'Outbound method' and has 'Standard Email Plugin' selected. The second dropdown menu has 'HOL Email' selected. To the right of these dropdowns is a '+ CREATE NEW INSTANCE' link. At the bottom of the page, there are four buttons: 'PREVIOUS', 'NEXT', 'CREATE', and 'CANCEL'. The 'NEXT' button is highlighted with a red square.

1. Click NEXT.

Payload Template

Notifications

Alerts / Notifications

1 - Notification 2 - Define Criteria 3 - Set Outbound Method 4 - Select Payload

Pick a payload template to include in the notification. The template includes additional content about the alert or object which will reflect in the notification.

Payload Template Default Email Template

1

Default Email Template

Description for Default Email Template

Payload Details

New Alert Updated Alert Canceled Alert

Subject

[VMware Aria Operations] new alert Type:\$(ALERT_TYPE), Sub-Type:\$(ALERT_SUBTYPE), State:\$(ALERT_CRITICALITY), Object Type:\$(RESOURCE_KIND), Name:\$(RESOURCE_NAME)

Body

New alert was generated at \$(CREATE_TIME):
Info:\$(RESOURCE_NAME) \$(RESOURCE_KIND) is acting abnormally since \$(CREATE_TIME) and was last updated at \$(UPDATE_TIME)

Alert Definition Name: \$(ALERT_DEFINITION)
Alert Definition Description: \$(ALERT_DEFINITION_DESCRIPTION)
Object Name : \$(RESOURCE_NAME)
Object Type : \$(RESOURCE_KIND)
Alert Impact: \$(ALERT_IMPACT)
Alert State : \$(ALERT_CRITICALITY)
Alert Type : \$(ALERT_TYPE)

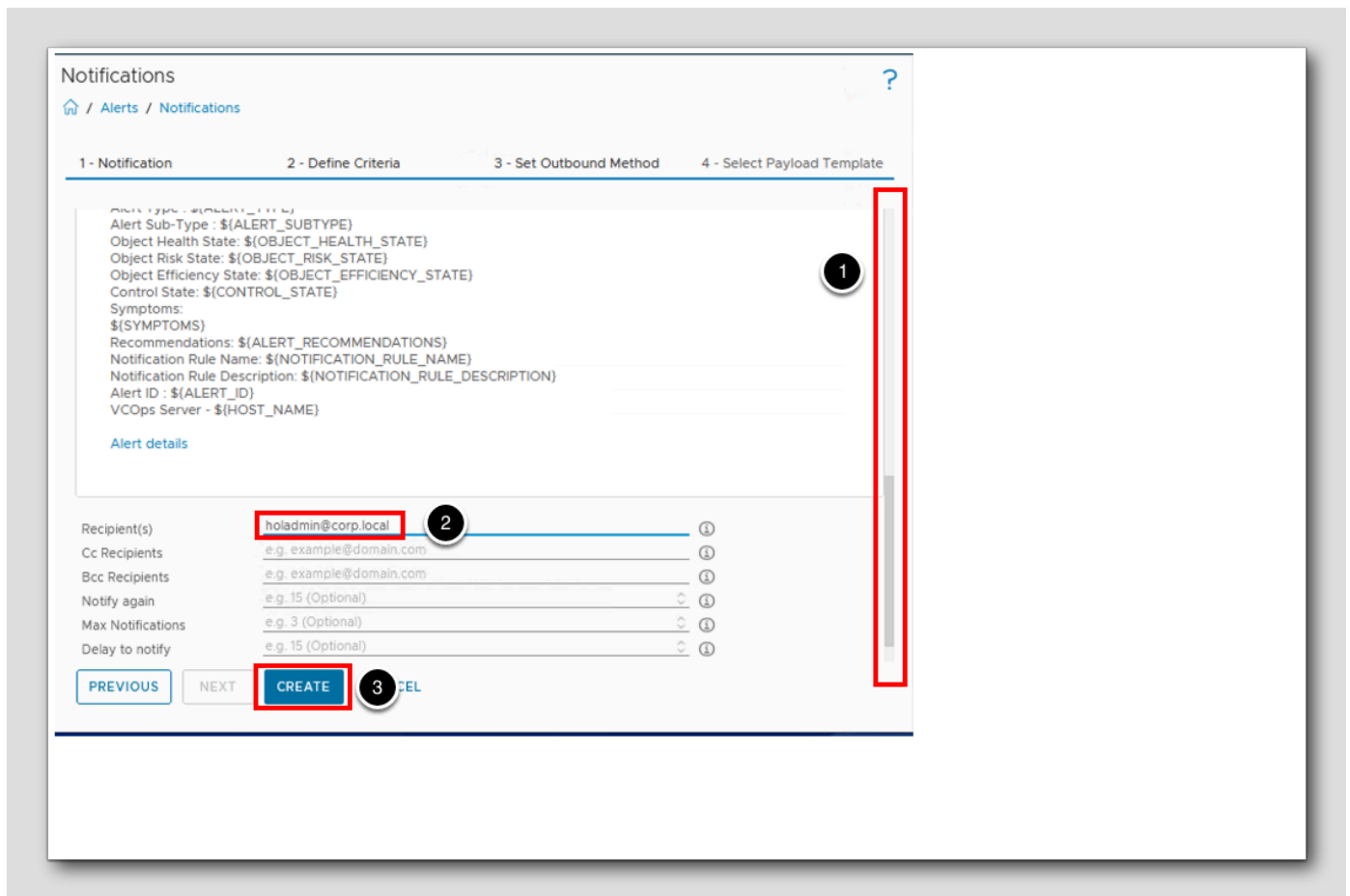
PREVIOUS NEXT CREATE CANCEL

Lastly we select the Email Template that will be sent. For this lab we will use the Default Email Template.

1. Expand the **Default Email Template**. Notice the format and fields that are used to build the Notification message.

Recipients

[278]



1. Scroll down to the bottom on the right side of the window.
2. In the Recipient(s) field type holadmin@corp.local.
3. Click CREATE.

PuTTY to ubuntu-0008 VM

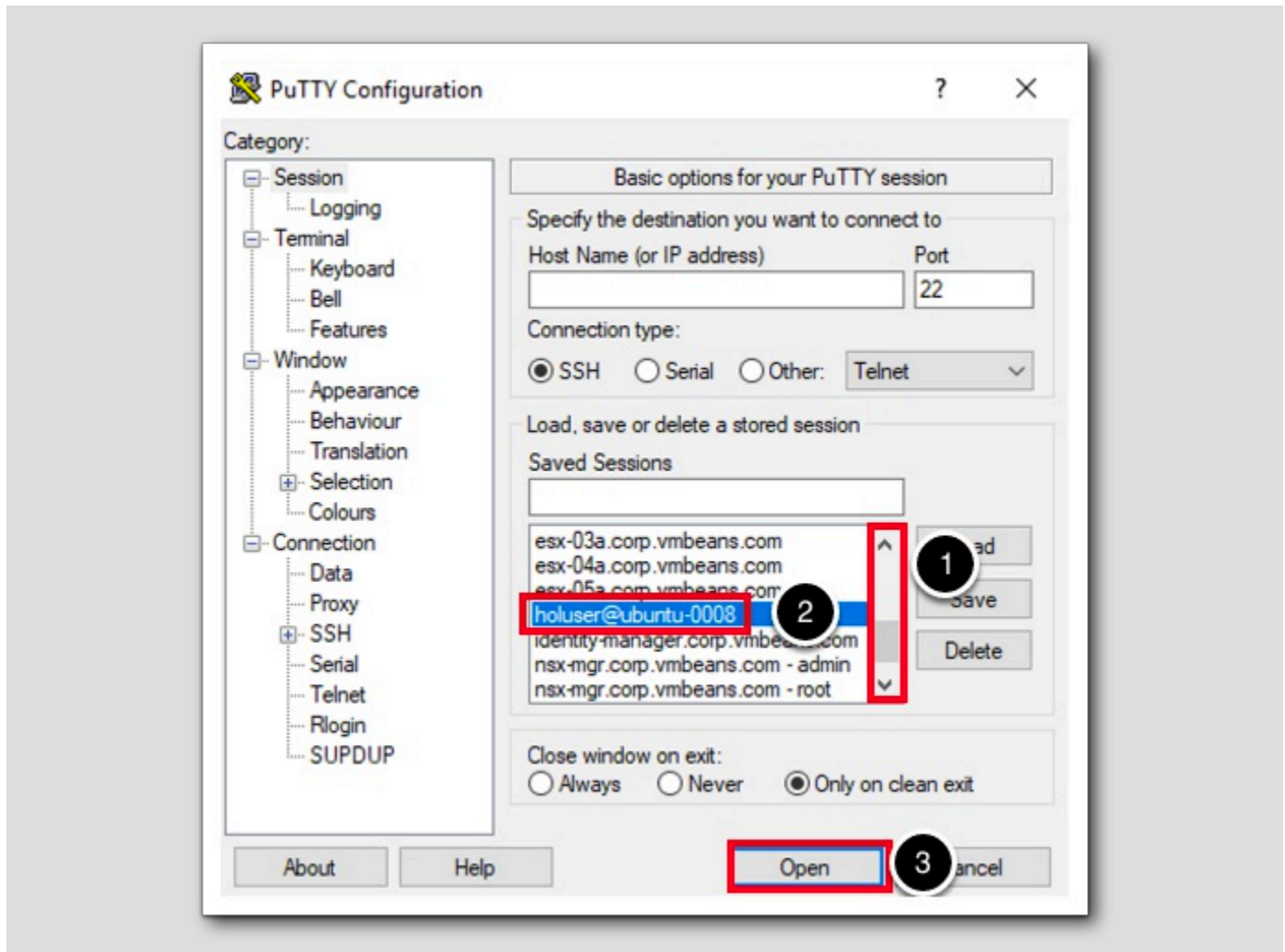
[279]



1. Click on the PuTTY icon in System tray.

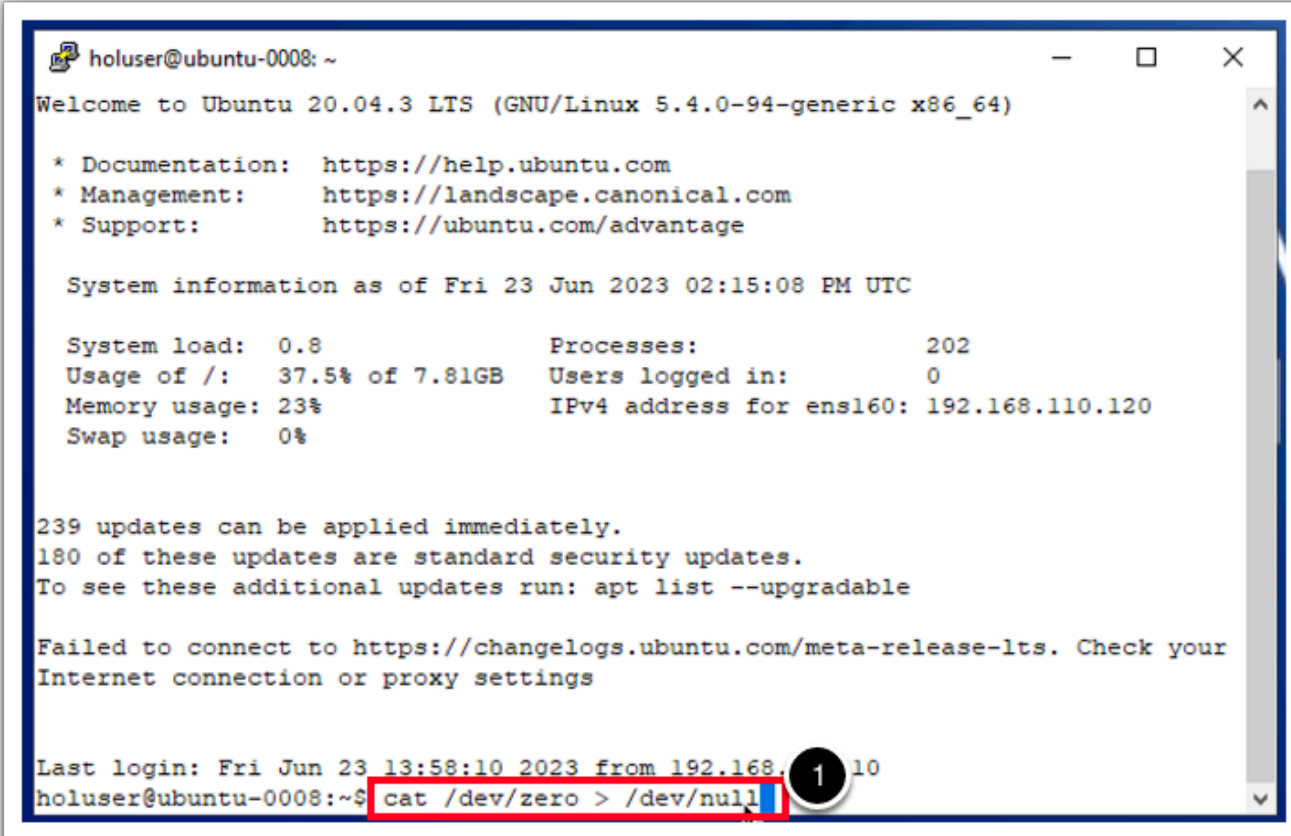
Start PuTTY Session

[280]



1. Scroll down on the right hand side of Saved Sessions
2. Click on holuser@ubuntu-0008.
3. Click Open to start the PuTTY session.

Run CPU Load

A terminal window titled 'holuser@ubuntu-0008: ~' showing system information for Ubuntu 20.04.3 LTS. The output includes system load (0.8), memory usage (23%), and a list of updates. A red box highlights the command 'cat /dev/zero > /dev/null' being entered at the prompt. A circular callout with the number '1' points to the command.

```
holuser@ubuntu-0008: ~
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.4.0-94-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Fri 23 Jun 2023 02:15:08 PM UTC

System load:  0.8          Processes:           202
Usage of /:   37.5% of 7.81GB Users logged in:     0
Memory usage: 23%        IPv4 address for ens160: 192.168.110.120
Swap usage:   0%

239 updates can be applied immediately.
180 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your
Internet connection or proxy settings

Last login: Fri Jun 23 13:58:10 2023 from 192.168.1.10
holuser@ubuntu-0008:~$ cat /dev/zero > /dev/null
```

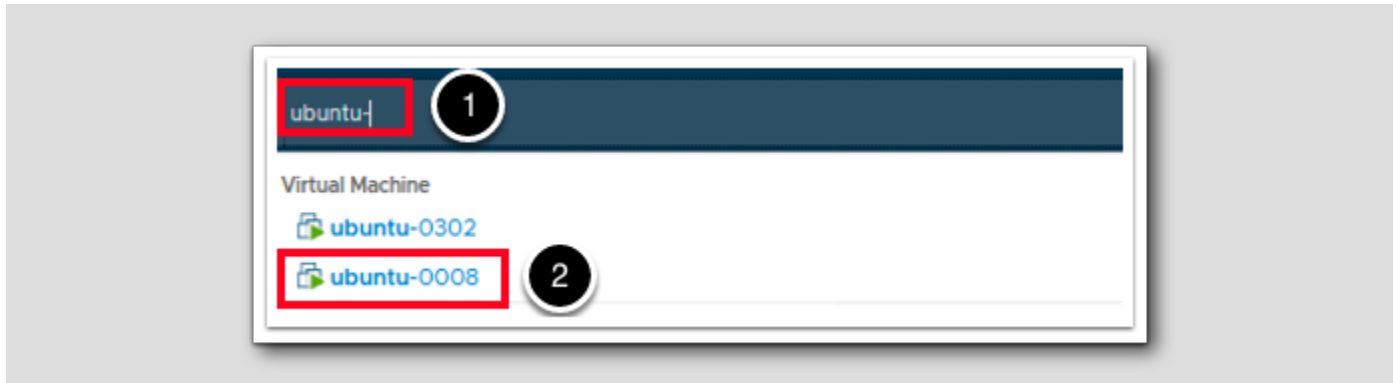
We will now redirect dev/zero to dev/null to generate CPU load so that we can see the impact on the VM in Aria Operations.

1. Type `cat /dev/zero > /dev/null` and press the **Enter** key to start the CPU load.

Leave this putty window open, we'll come back to this later in the lesson.

Return to vRealize Operations and Search for VM

[282]

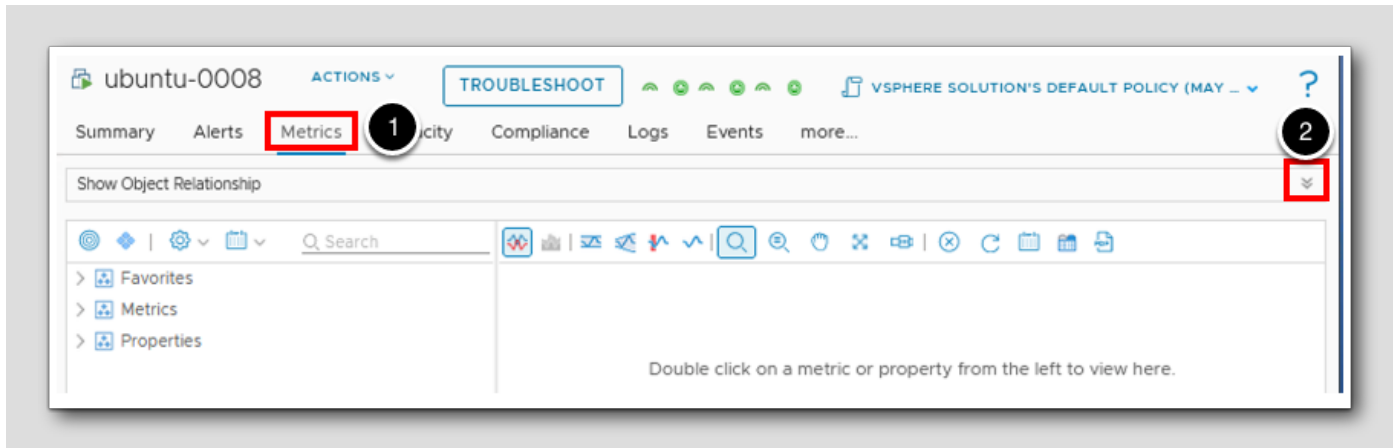


Back in Aria Operations we now need to search for the ubuntu-0008 VM

1. In the Search Bar type `ubuntu-`
2. Click on `ubuntu-0008`.

Metrics and Object Relationships

[283]



1. Click **Metrics** to open the Metrics tab.
2. If the Object relationship window is not already visible, Click the chevrons to show the object relationships for the VM `ubuntu-0008`.

Using Symptoms and Alerts to Trigger Recommendations and Actions

The screenshot displays the VMware vSphere interface for the VM 'ubuntu-0008'. The top navigation bar includes 'ubuntu-0008', 'ACTIONS', and 'TROUBLESHOOT' tabs. Below the navigation bar, there are tabs for 'Summary', 'Alerts', 'Metrics', 'Capacity', 'Compliance', 'Logs', 'Events', and 'more...'. The main content area shows a tree view of objects, with 'ubuntu-0008' highlighted in a red box and labeled with a '1'. A red arrow points from a '4' callout to the 'ubuntu-0008' VM. The left sidebar has a search filter 'cpulusage' (labeled '2') and a list of metrics, with 'Usage (%)' under 'CPU' highlighted in a red box and labeled '3'. The right sidebar shows a line graph for 'CPUUsage (%)' with a peak of 3.21 and a low of 1.72. The 'ubuntu-0008' VM health badge is red, indicating an active alert.

Set up the CPU graphs by completing the following:

1. Click **ubuntu-0008** so we can explore the Metrics on this object.
2. Type **cpu|usage** in the quick filter and then press the **Enter** key.
3. Double-click **Usage (%)** under Metrics / CPU to create a chart on the lower right hand side of the window.
4. In our example, the color of the VM Health badge will turn red once the alert we configured has been activated due to the high CPU Usage. However, the color can be green, yellow, orange, or red, depending on the status of the object and the severity of the alert.

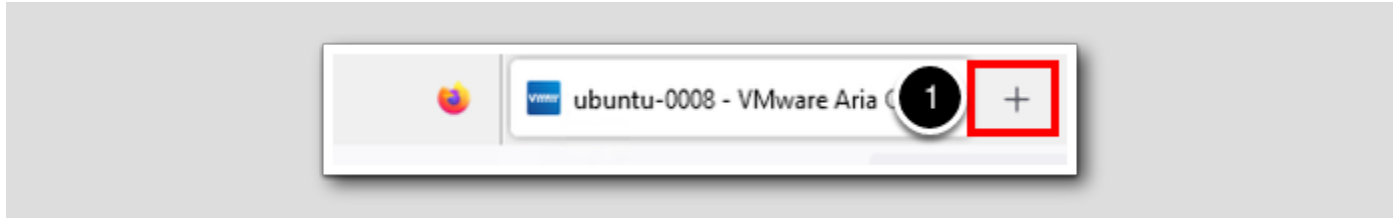
Refresh Metric Graphs

1. If the VM Health Badge is not yet red, then we may need to click **Refresh**.
 - The graph will eventually show the increase in CPU usage on the Metric chart. Once CPU usage is above 90%, an alert will be generated. (NOTE: It may take a few minutes for the VM Health Badge to turn red).
2. Notice the increased CPU usage on the graph.

Checking for the Alert Email

[286]

Please ensure the alert has triggered from the step above

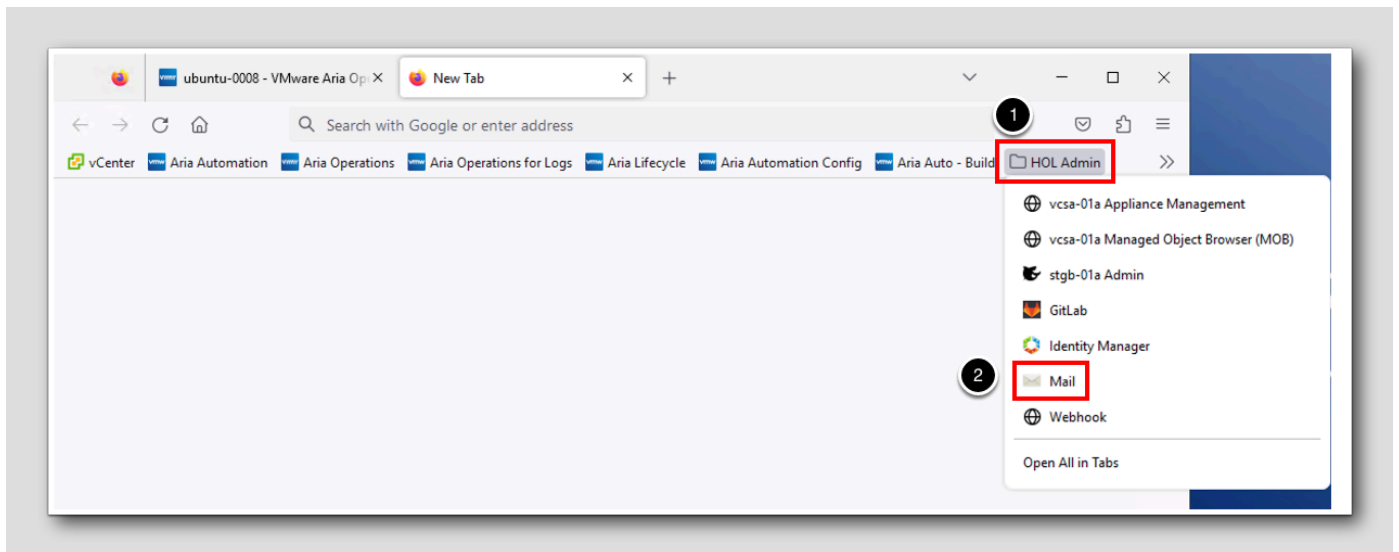


Open a new Firefox tab

1. Click the + add new tab

HOL Admin Mail

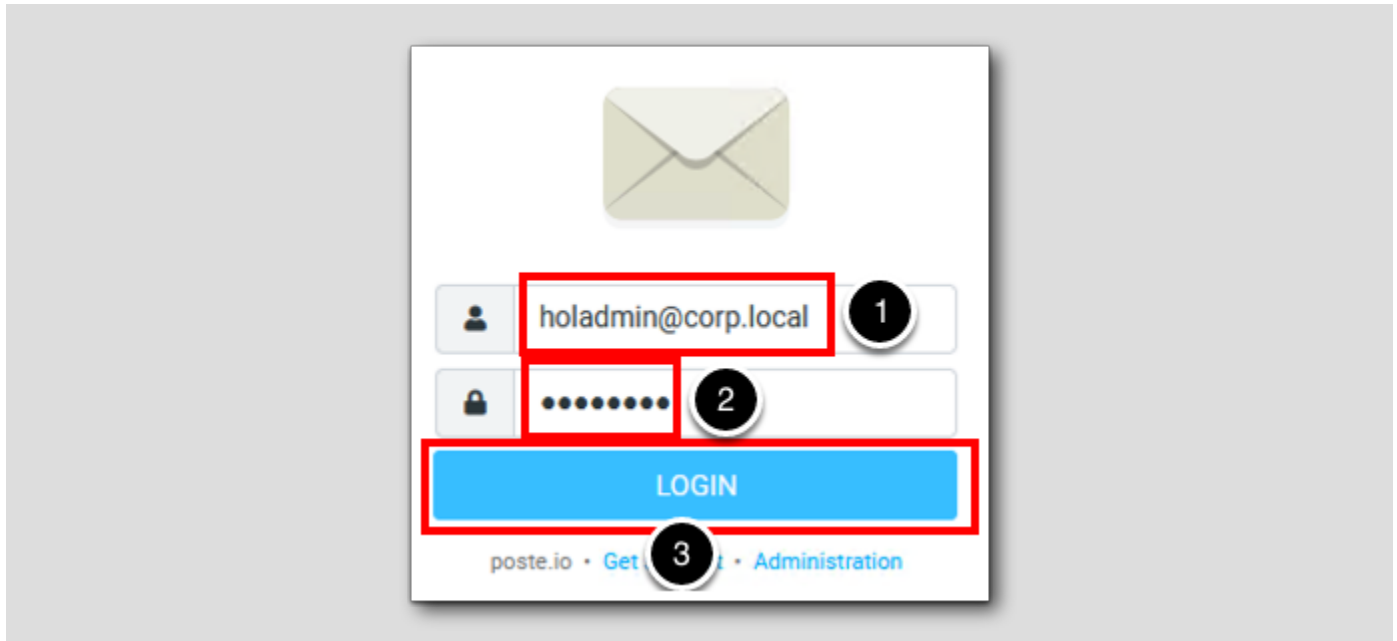
[287]



1. Click on the HOL Admin bookmarks folder
2. Click Mail.

HOL Admin Login

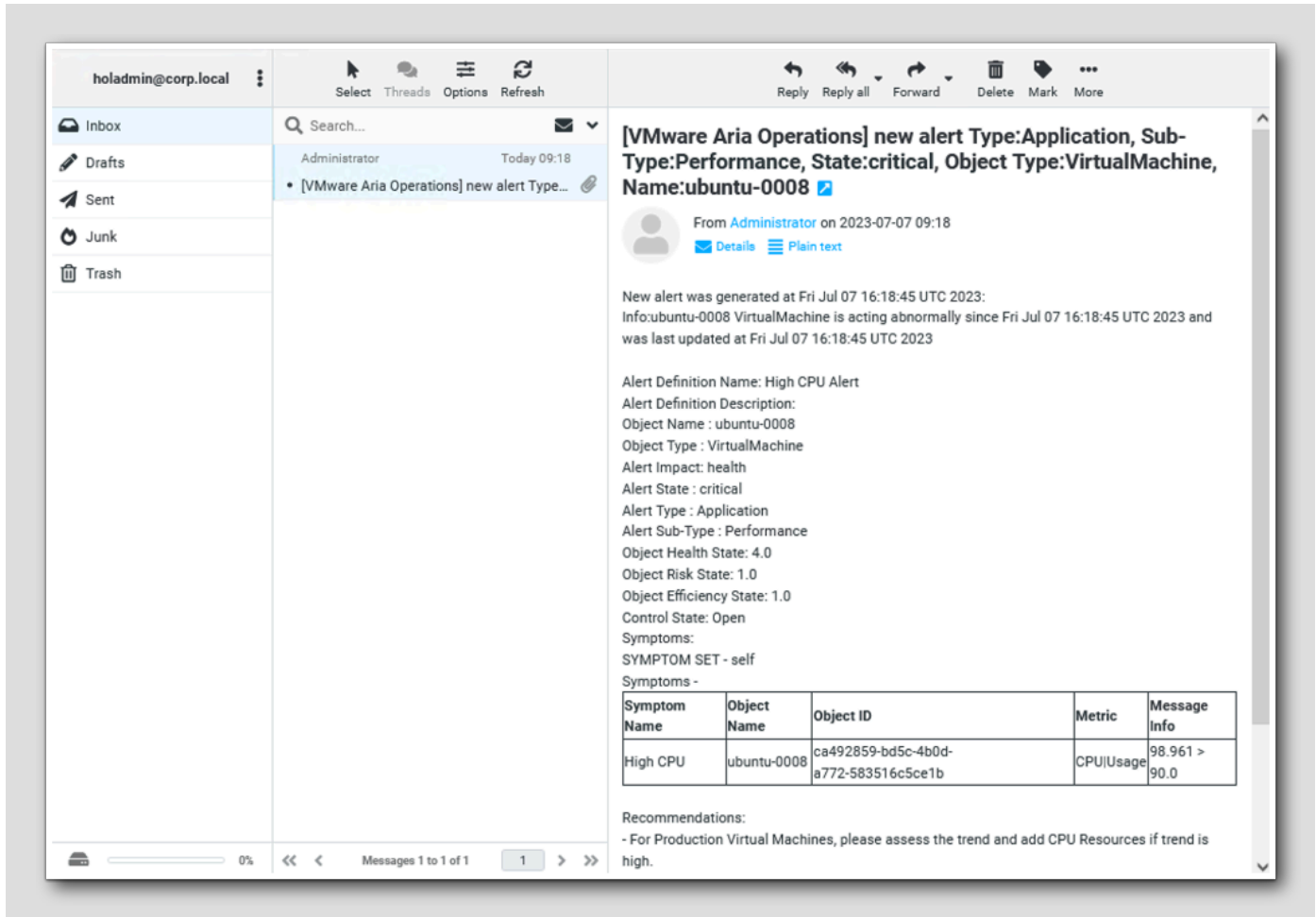
[288]



1. Type holadmin@corp.local for the user name
2. Type VMware!! for the password
3. Click LOGIN.

Click **Don't save** on the Save login for vmbeans.com (Not Shown).

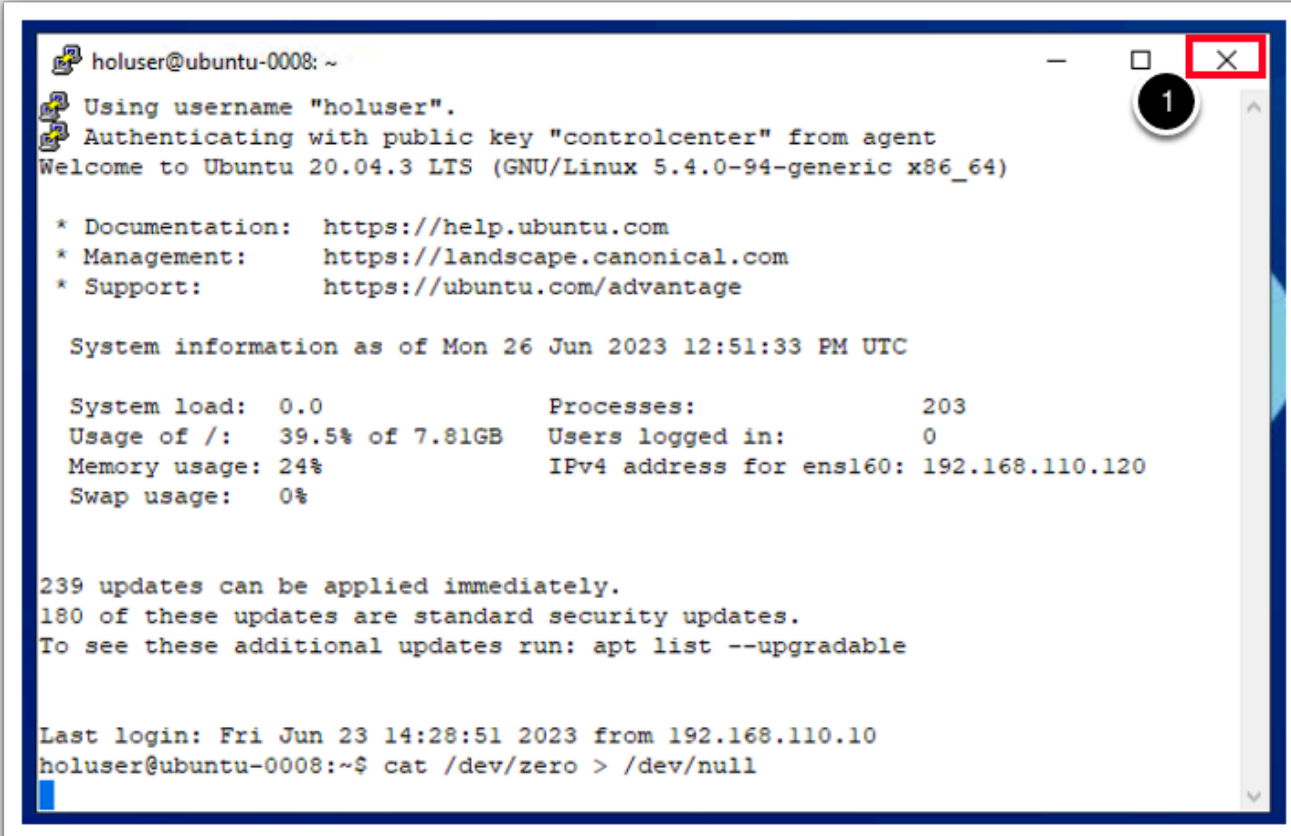
Verify Email Notification Sent



Notice the format of the email in contrast of the layout in the Payload Template step above.

Stop CPU Load

[290]



```
holuser@ubuntu-0008: ~  
Using username "holuser".  
Authenticating with public key "controlcenter" from agent  
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.4.0-94-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:       https://ubuntu.com/advantage  
  
System information as of Mon 26 Jun 2023 12:51:33 PM UTC  
  
System load:  0.0          Processes:           203  
Usage of /:   39.5% of 7.81GB  Users logged in:   0  
Memory usage: 24%          IPv4 address for ens160: 192.168.110.120  
Swap usage:   0%  
  
239 updates can be applied immediately.  
180 of these updates are standard security updates.  
To see these additional updates run: apt list --upgradable  
  
Last login: Fri Jun 23 14:28:51 2023 from 192.168.110.10  
holuser@ubuntu-0008:~$ cat /dev/zero > /dev/null
```

Return to your open PuTTY window. Closing this PuTTY session will end the CPU load command, and the alert will clear.

1. Click the X in the upper-right corner to close the PuTTY session.
2. Click OK in the PuTTY Exit Confirmation Pop-up Window (*Not Shown*).

Lesson End

[291]

This concludes the Notifications Lesson.

Thank You.

Conclusion

[292]

Self-driving operations by Aria Operations automates and simplifies IT operations management and provides unified visibility from applications to infrastructure across physical, virtual and cloud environments. We hope in this module you learned how create custom Alerts and Notifications to fine tune Aria Operations to what is important to your infrastructure.

You've finished Module 6

[293]

Congratulations on completing the lab module.

If you are looking for additional general information on Aria Operations 8.4, try one of these:

- **VMware Product Public Page -Aria Operations:** <https://www.vmware.com/products/aria-operations.html>
- **Aria Operations 8.12 - Release Notes:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/rn/vmware-aria-operations-812-release-notes/index.html>
- **Aria Operations - Documentation:** <https://docs.vmware.com/en/VMware-Aria-Operations/index.html>
- **VMware Cloud Management Blog - What's New in Aria Operations 8.12 and Cloud:** <https://blogs.vmware.com/management/2023/04/whats-new-in-vmware-aria-operations-8-12.html>

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 7 - Creating Views for Better Visibility (15 minutes) Basic

Introduction

[295]

Reports and Dashboards are the key to understanding and visualizing the environment that is being monitored. The key component of a Report or a Dashboard is a View. A View helps you interpret data (such as metrics, properties, policies and symptoms) from a number of perspectives. Those perspectives can be transformed to highlight how the data has historically changed (trend) or how the data may look in the future (forecast) built on the historical trend. In this module we will walk through the creation of custom views in Aria Operations. Successfully creating custom views will ensure we can use Aria Operations to track what is important/critical to the monitoring of our VMware Cloud Infrastructure.

The following lessons are within this Module:

- Create Customized View
- Simple View showing VM list with Metrics and Properties
- Create a View with Variable data
- Create a View with Trends
- Create a View with Distribution data
- Create Reports from Views and Dashboards

Log in to Aria Operations

[296]

To begin this exercise, we will log in to Aria Operations. If you are not currently logged into any instance of Aria Operations, continue to the next page, but if you are already logged into Aria Operations, click [here](#) to skip ahead.

Open the Firefox Browser from Windows Quick Launch Task Bar

[297]

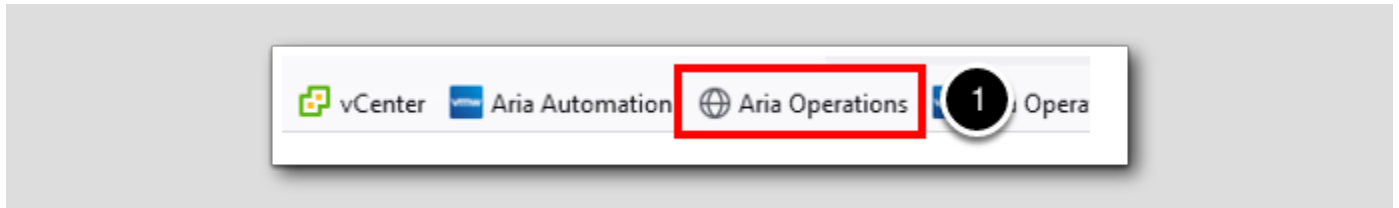


If your browser isn't already open, launch Firefox

1. Click the **Firefox** icon on the Windows Quick Launch Task Bar

Launch Aria Operations

[298]

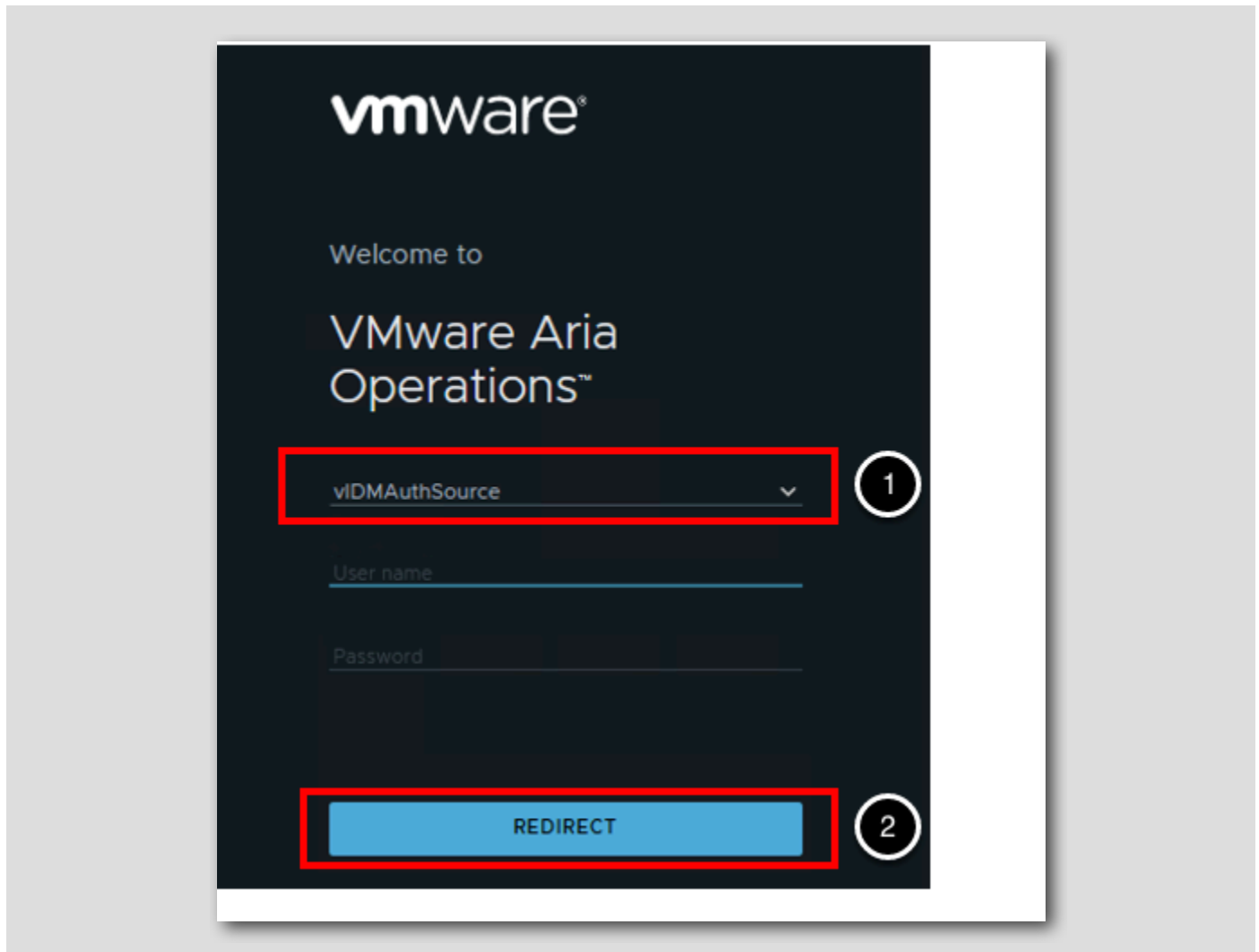


The browser Bookmarks Bar has links to the different applications that are running in the lab.

1. Click the Aria Operations Bookmark

Log in to Aria Operations

[299]



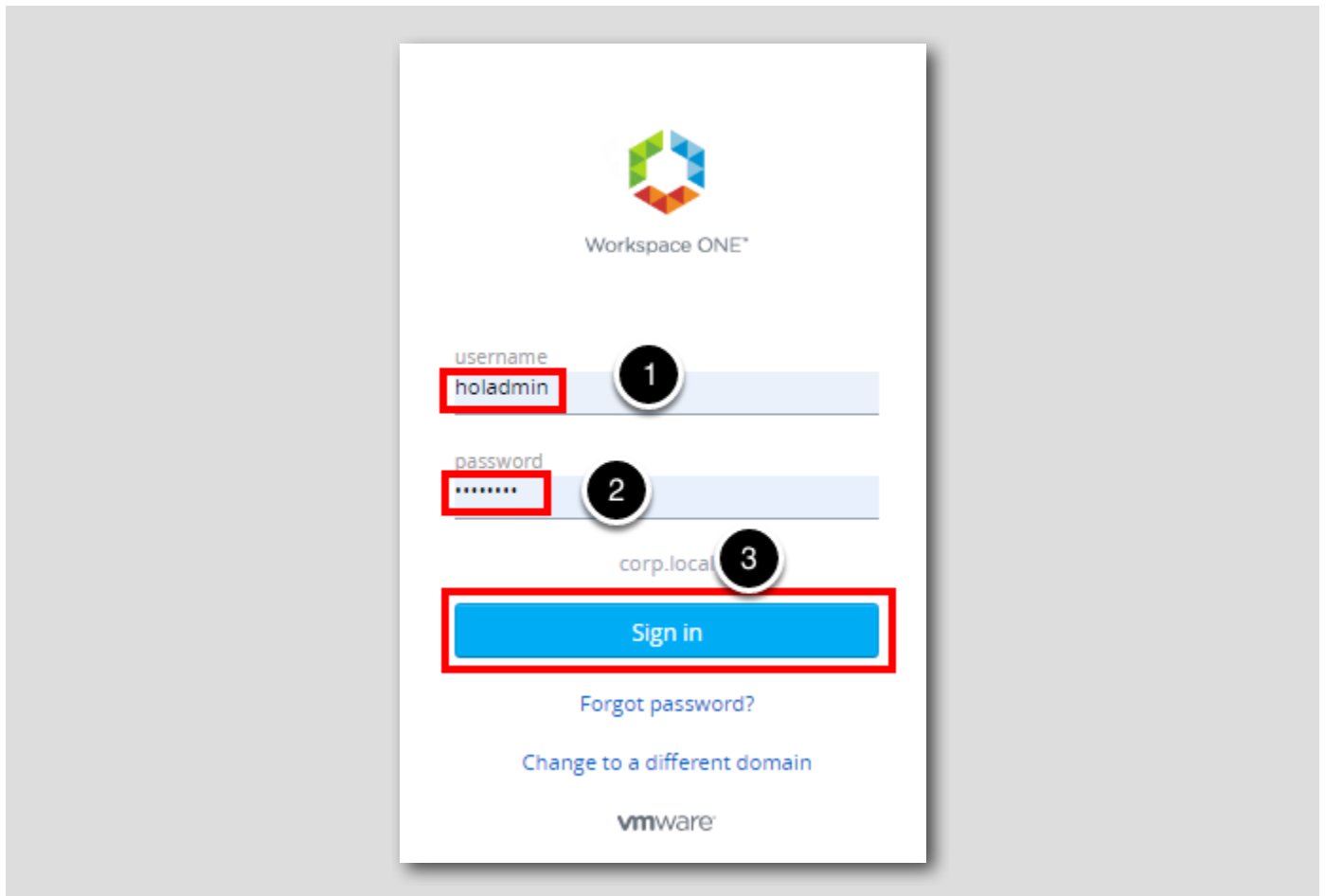
Aria Operations is integrated with VMware Identity Manager which we will use for user authentication in this lab.

vIDMAuthSource (VMware Identity Manager) should be pre-selected as the identity source. However, if it is not you will choose it.

1. Click the drop-down arrow if vIDMAuthSource is not selected.
2. Click REDIRECT to be taken to the authentication page.

VMware Identity Manager Login

[300]

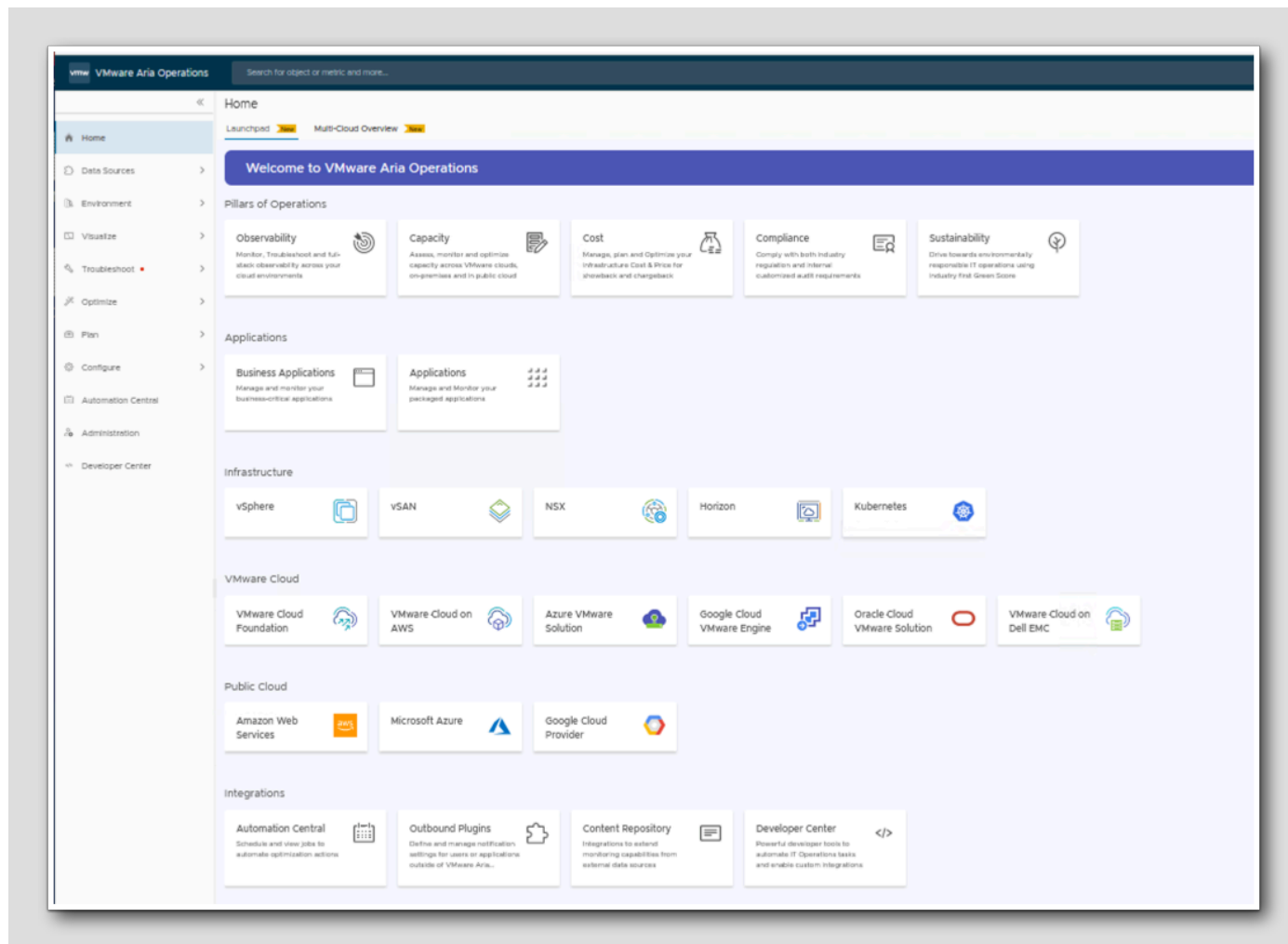


At the Workspace ONE login screen, use these credentials:

1. username: **holadmin**
2. password: **VMware1!**
3. Click **Sign in**

Aria Operations Home Screen

[301]



You should be at the Aria Operations Home screen and ready to start the module.

Create Simple View showing VM list with Metrics and Properties

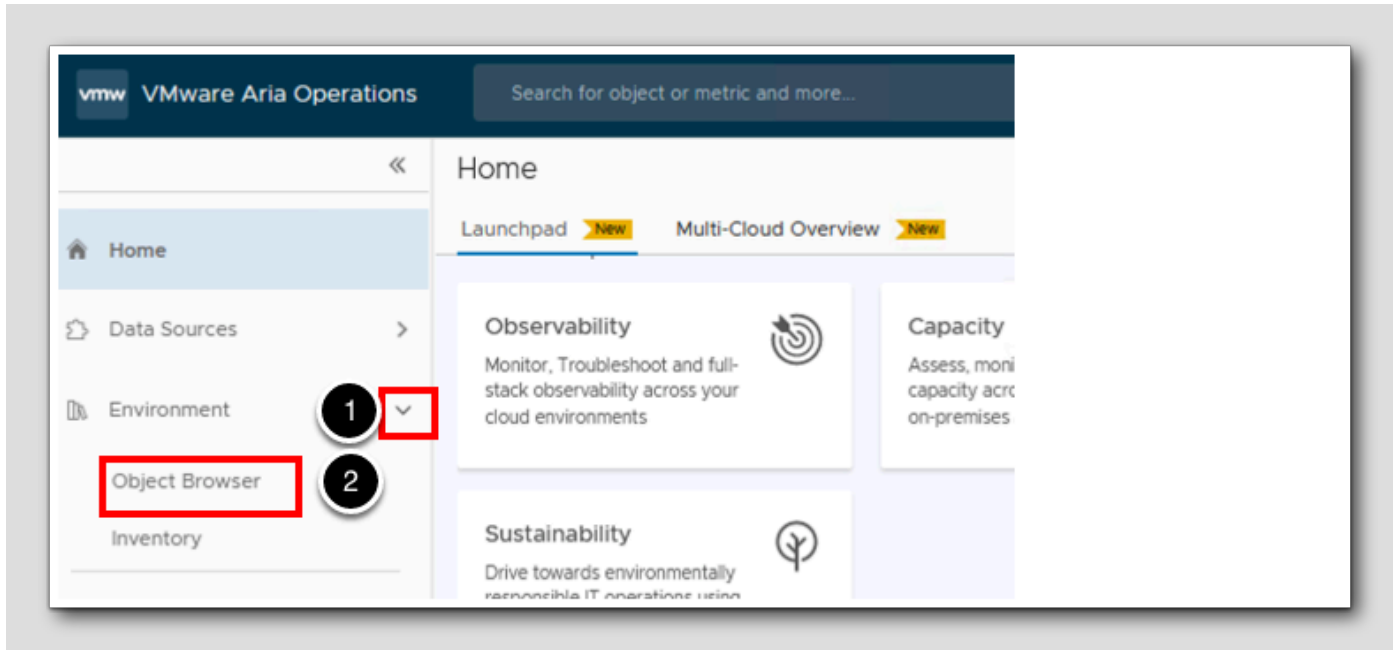
[302]

In this lesson, we will create a view. A view can be used in dashboards and reports. A view is also viewable as its own content in the Details section of the Aria Operations interface.

The view for this lesson is a starting point and intended to be a simple example to create. It will contain some basic metrics and properties for virtual machines.

Go to Environment

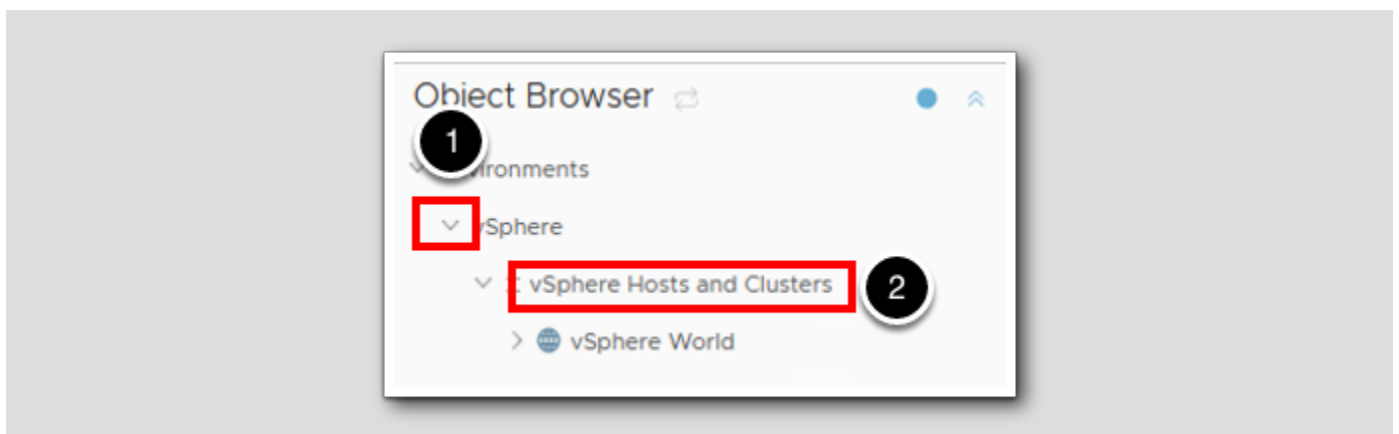
[303]



1. Click on the > next to Environment to show the drop-down options.
2. Click Object Browser

Hosts and Clusters

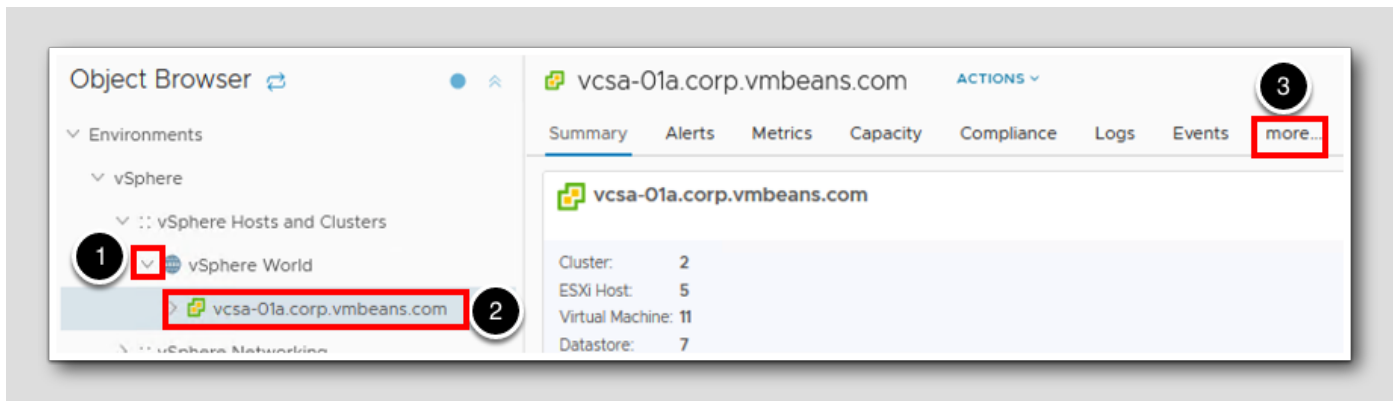
[304]



1. Click on the > next to vSphere to show the drop-down options.
2. Click on vSphere Hosts and Clusters

Expand vSphere World

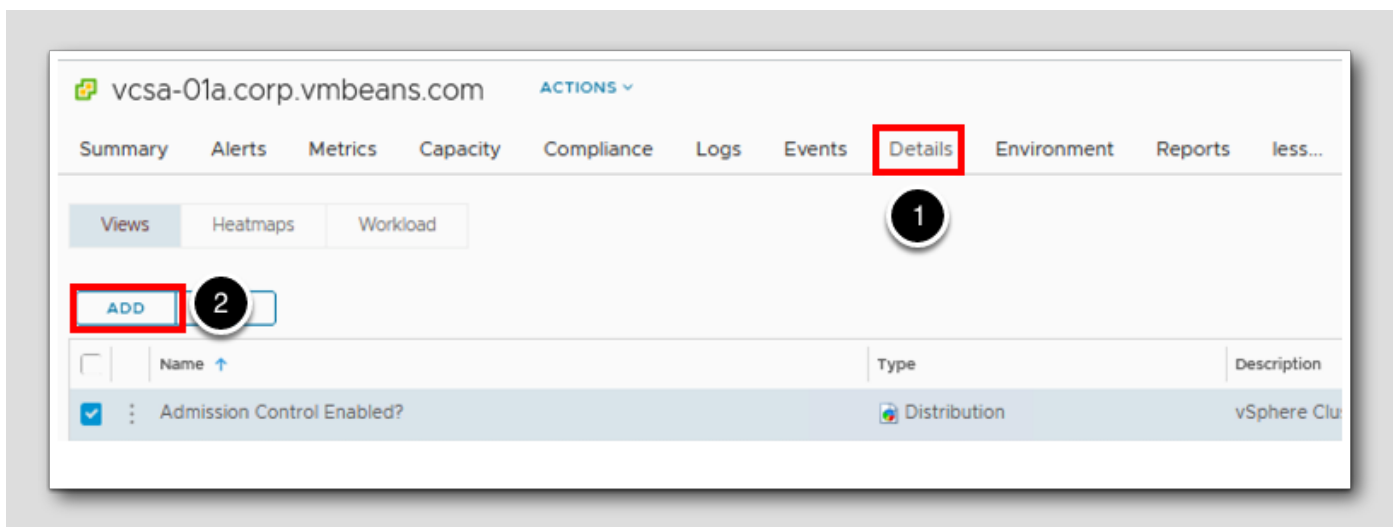
[305]



1. Expand vSphere World.
2. Select vcsa-01a.corp.vmbeans.com.
3. Click on more...

Create a View

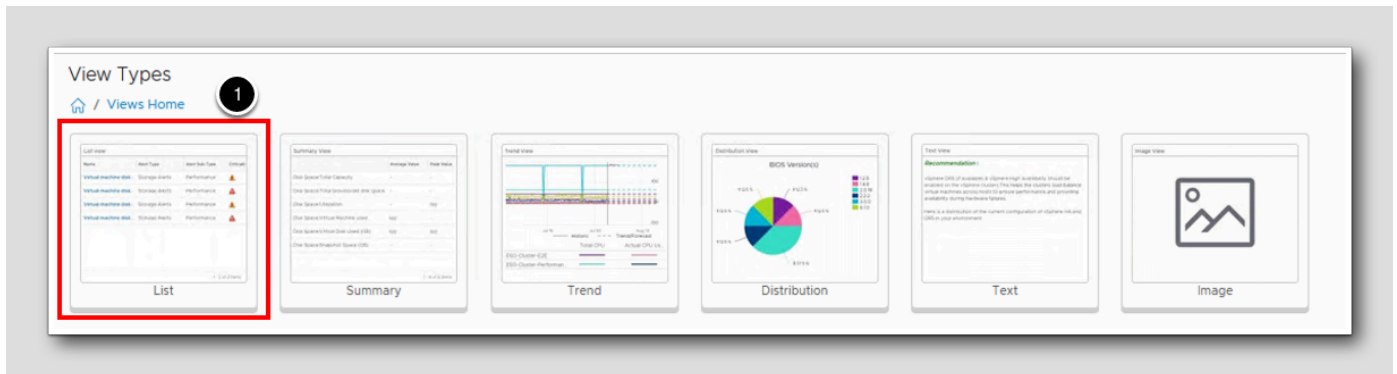
[306]



1. Click on **Details**.
2. Click **ADD** to create a new view.

View Types

[307]



There are six different types of Views you can create. List, Summary, Trend, Distribution, Text and Image. In this exercise we will be creating a List View.

1. Click **List**.

View Name

[308]

Create View

1 - Name & Configuration 2 - Data 3 - Ti

Name Demo - Simple List of VMs with Metrics and Properties 1

Description

2

▾ **Settings**

Items per page 50 ▾

Top result count _____ ▾

Show Objects Existing ▾

Show Object Creation Date

Make the view available for

- Dashboards through the View widget
- Report template creation and modification
- Details tab in the environment

Hide the view for the selected Object Types Select an Object Type x ▾

3

PREVIOUS NEXT CREATE CANCEL

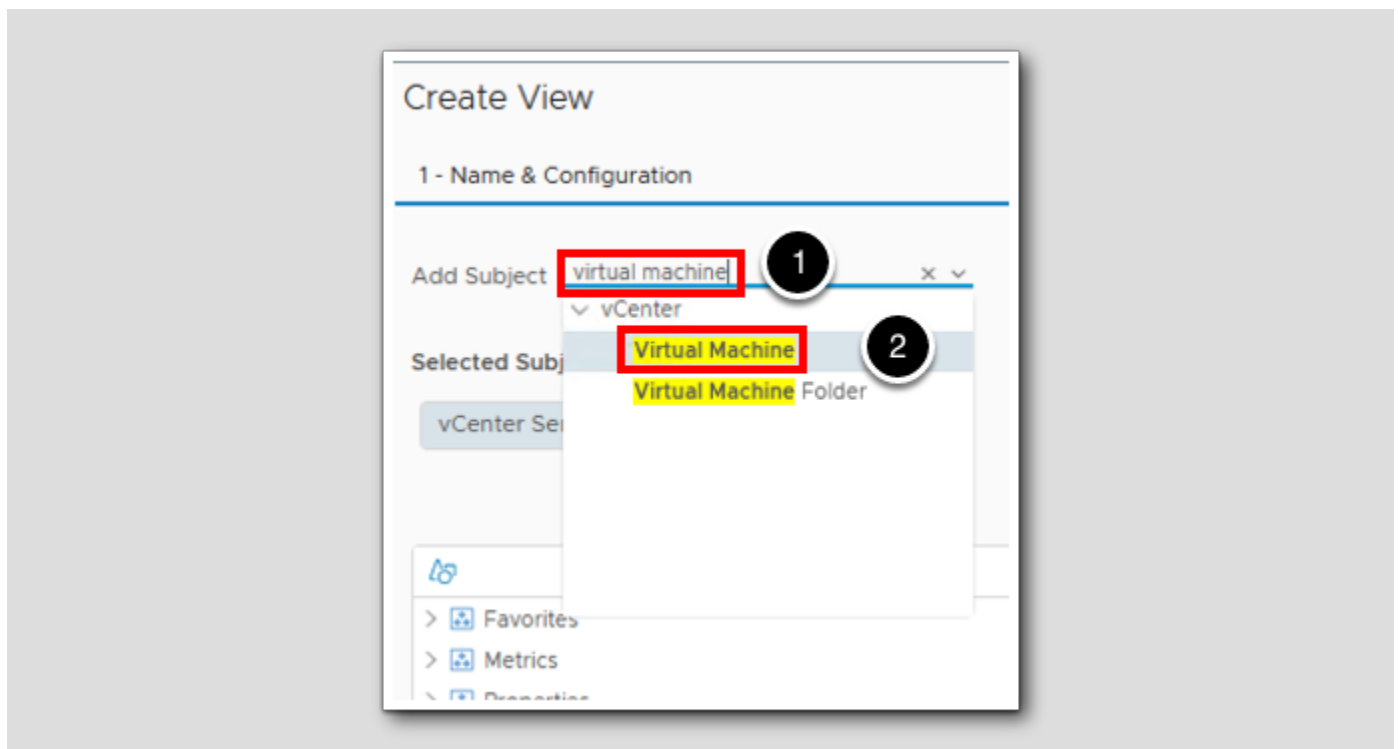
The view creation wizard starts. Create a view with the following:

Name and Description

1. Enter the name **Demo - Simple List of VMs with Metrics and Properties**.
2. Click on the > next to **Settings** to show the additional settings possible. Leave default values for now.
3. Click **Next**.

Subjects

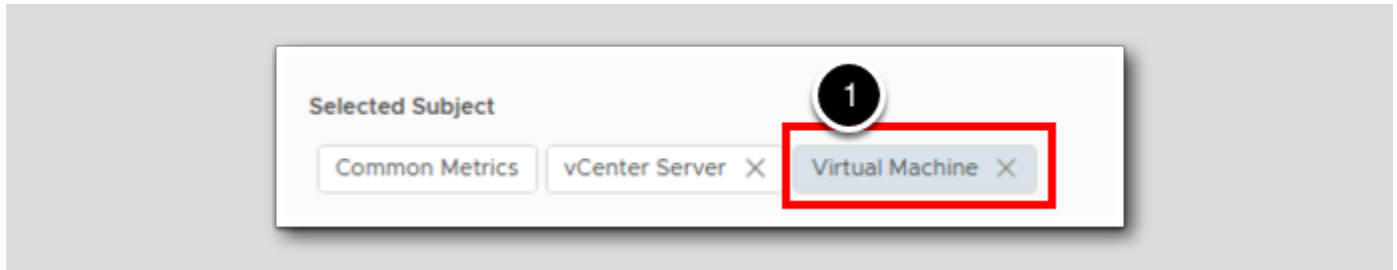
[309]



1. In the **Add Subject** line, enter **virtual machine** (Begin typing and the list will populate with matched options).
2. Click on **Virtual Machine**.

Select Virtual Machine

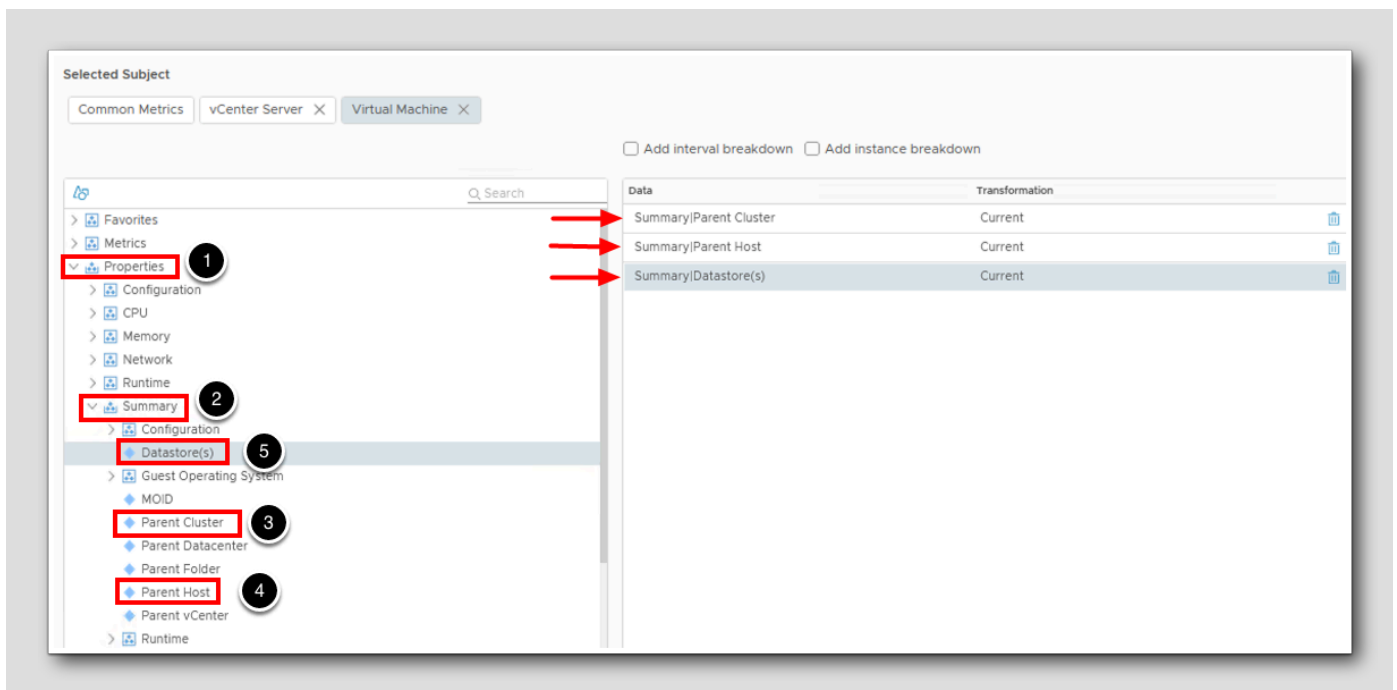
[310]



1. Under Selected Subject, click Virtual Machine.

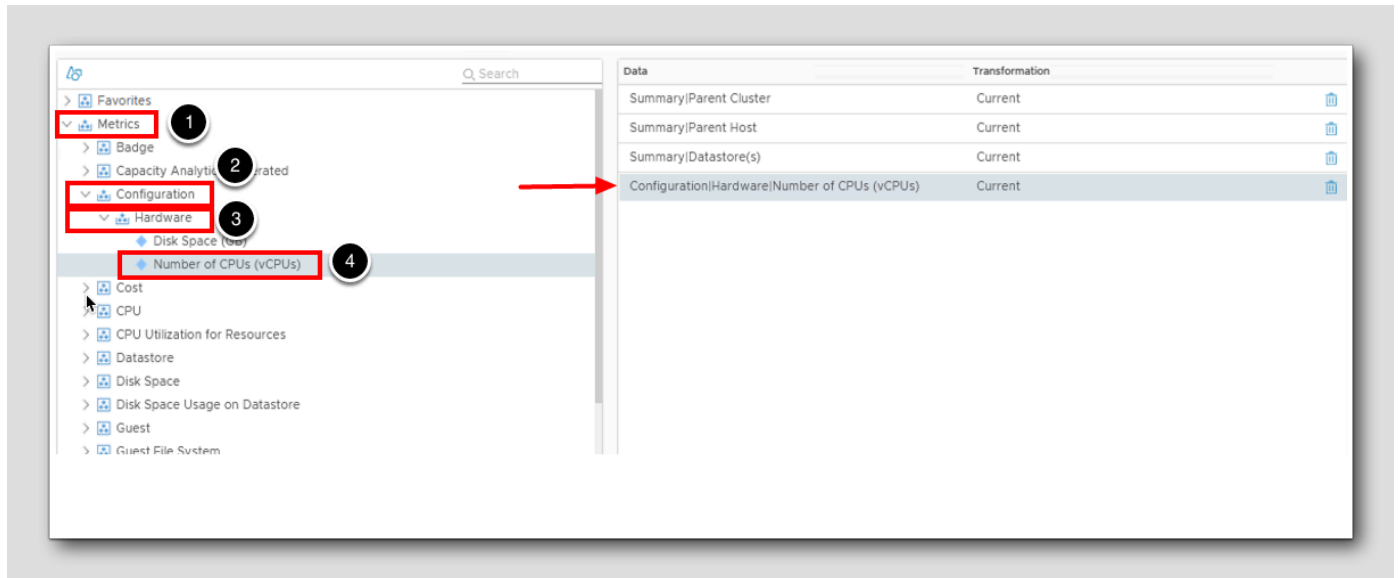
Selected Properties

[311]



1. Expand Properties.
2. Expand Summary (Note: you may need to scroll down to see Summary).
3. Double-click on Parent Cluster (drag and drop the data to the center will work also).
4. Double-click on Parent Host.
5. Double-click on Datastore(s).

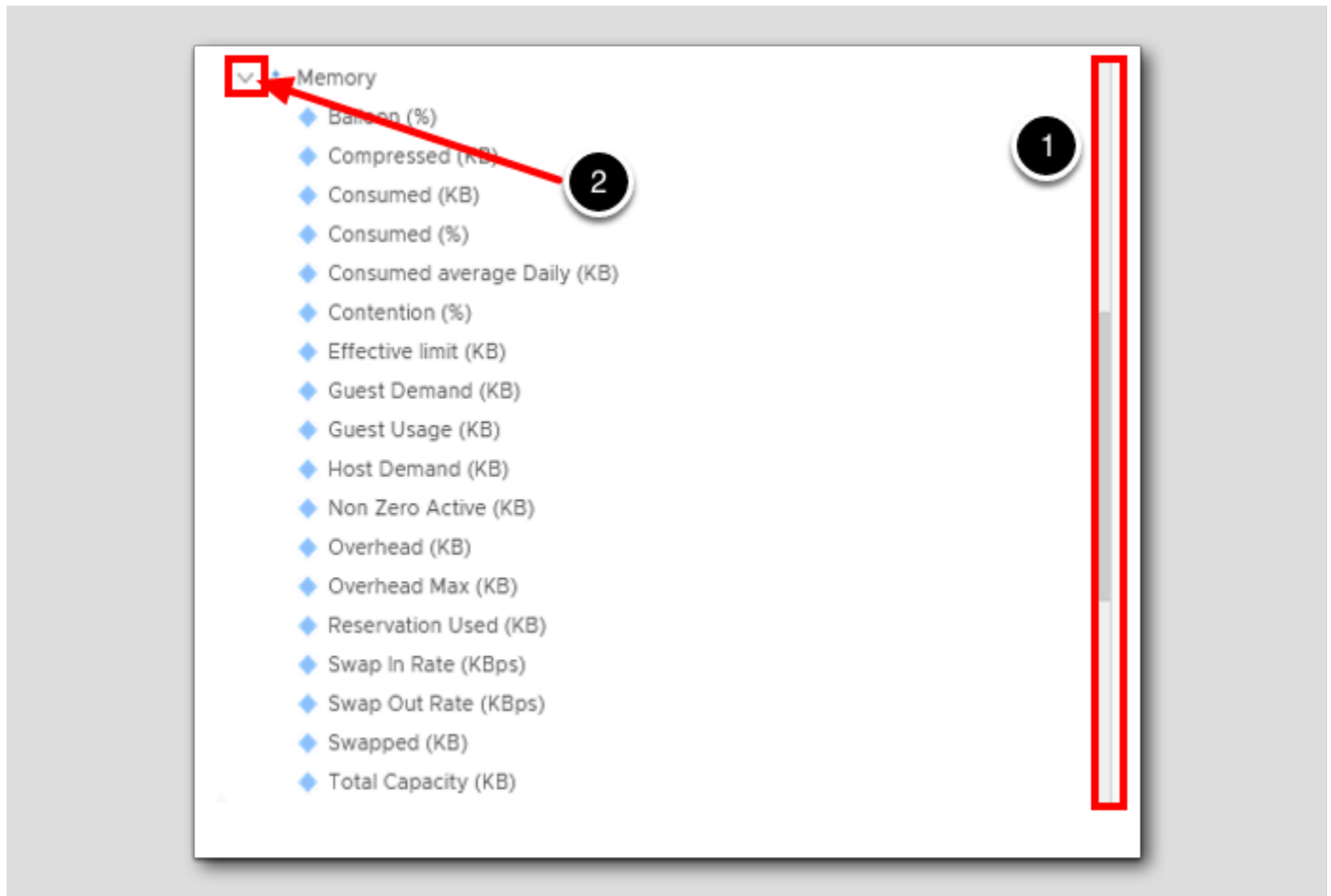
Data - Metrics



We've been working with Virtual Machine Properties, now we need to select Virtual Machine metrics.

1. Expand **Metrics**.
2. Expand **Configuration**.
3. Expand **Hardware**.
4. Double-click on **Number of CPUs (vCPUs)** (drag and drop the data to the center will work also).

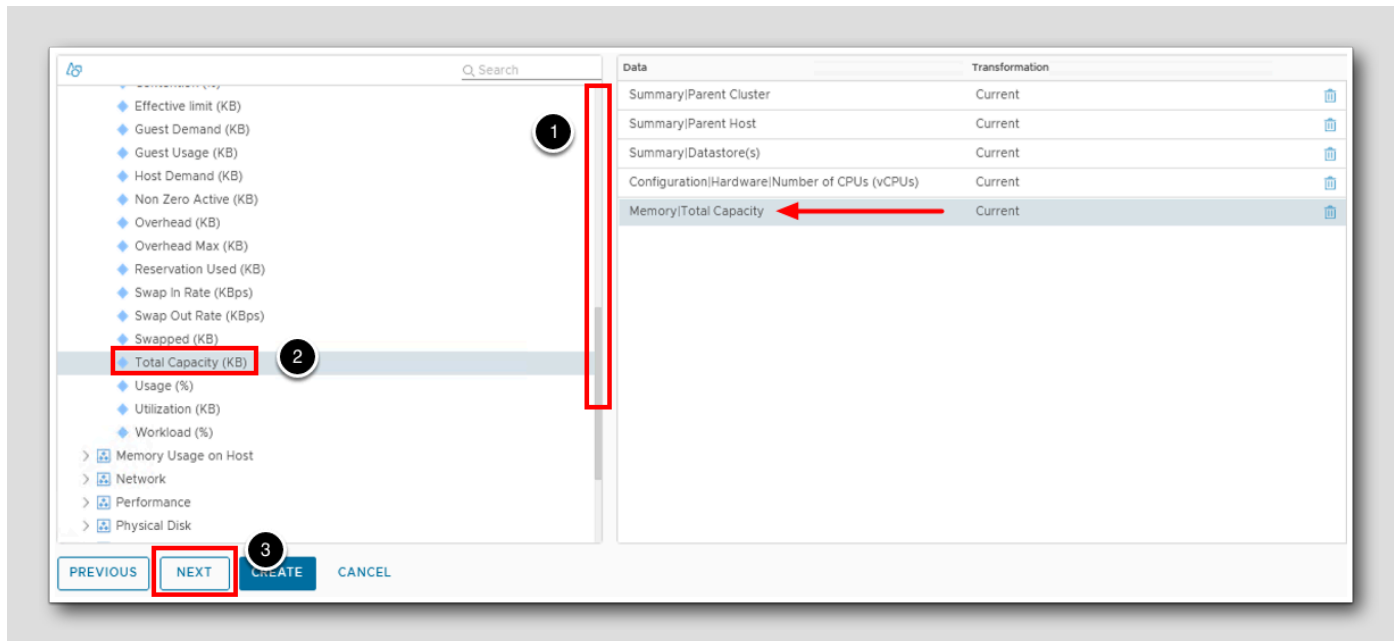
Memory Metrics



Scroll down and Expand Memory

1. Scroll down until you see the **Memory** category item.
2. Expand the **Memory** category by clicking the chevron.

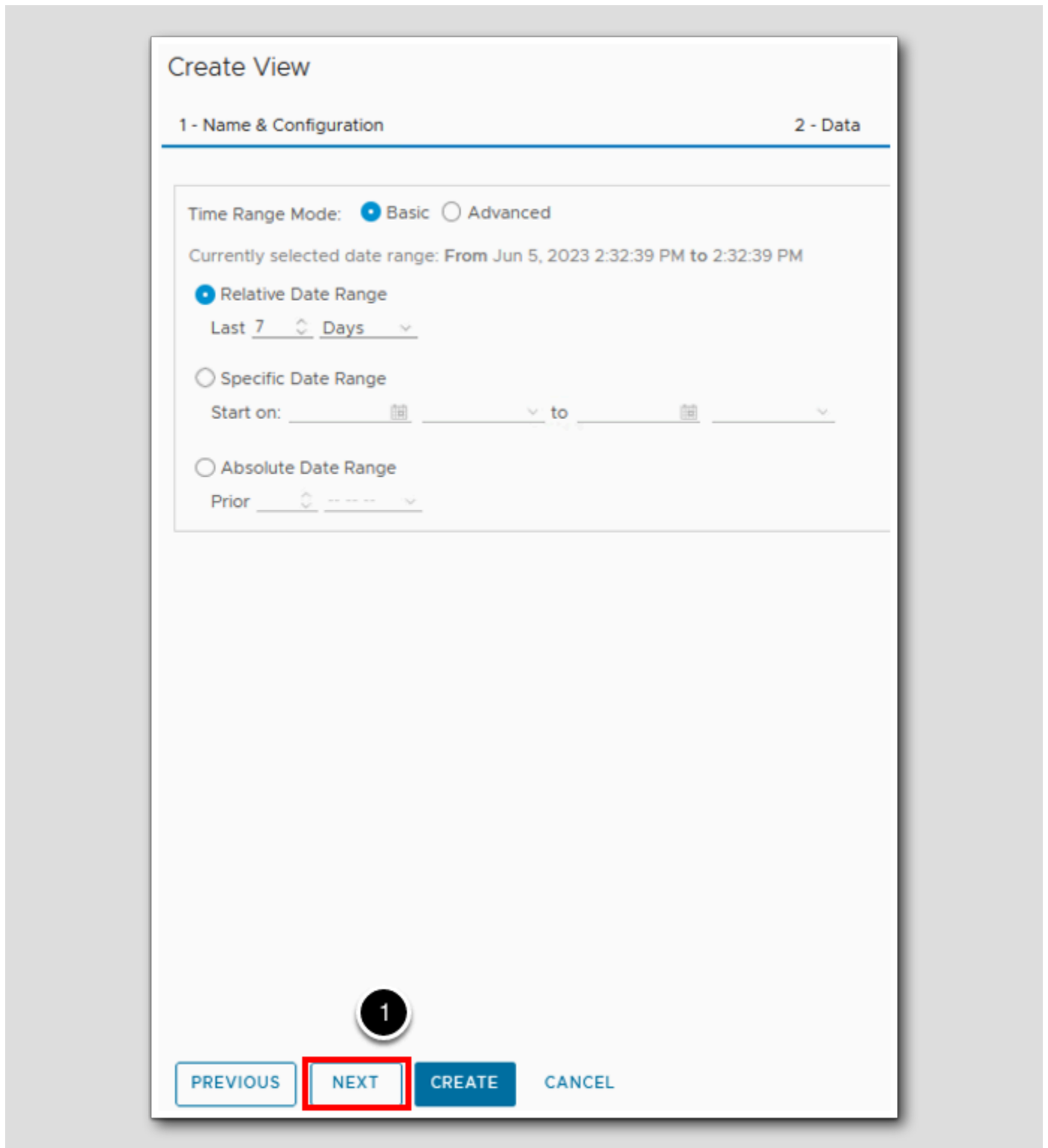
Total Capacity



1. Scroll down to until you see the Total Capacity (KB) item.
2. Double-click on Total Capacity (KB) to add it to the view.
3. Click Next.

Time Settings

[315]



Time Settings is where you specify the desired Date Range for your custom View. You can choose **Relative**, **Specific** or **Absolute** Date Ranges. For this exercise we will leave the default **Relative Date Range** of **Last 7 Days**.

1. Click **NEXT**.

Filter

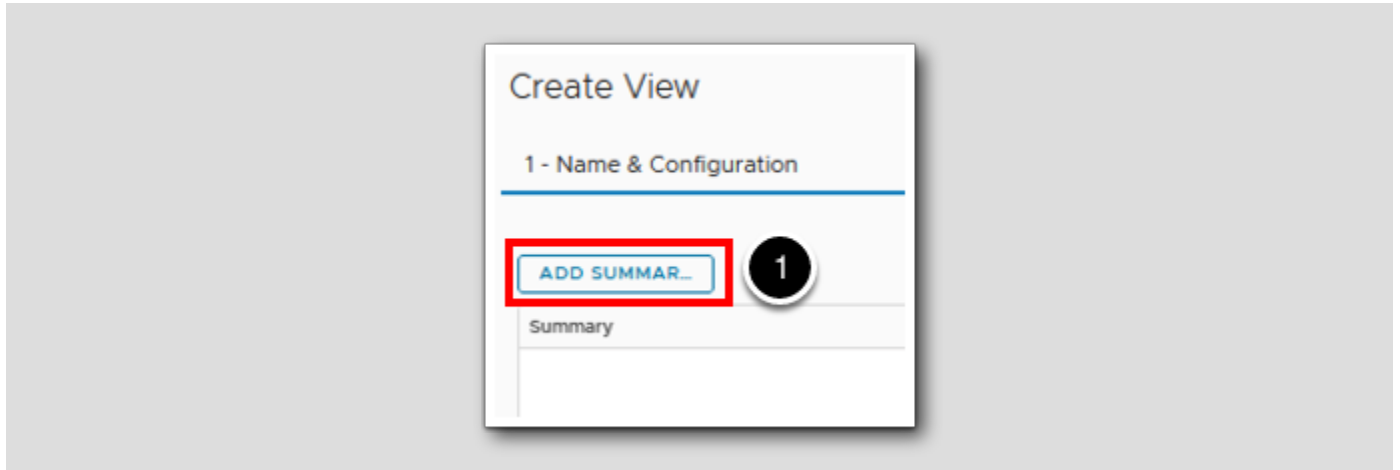
The screenshot shows the 'Create View' wizard in vSphere, specifically the 'Data' step. The wizard is divided into two sections: '1 - Name & Configuration' and '2 - Data'. Under '2 - Data', there are two filter sections. The first is 'vCenter Server filter', which has a red arrow pointing to it. Below it, there is a dropdown menu for 'Object Type' set to 'vCenter Server', and a 'Metrics' section with a dropdown for 'Pick a metric' set to 'Current', a '--Select--' dropdown, and a 'Metric value' input field. Below this is a '+ ADD ANOTHER CRITERIA SET' button. The second filter is 'Virtual Machine filter', also with a red arrow pointing to it. It has a similar structure with 'Object Type' set to 'Virtual Machine' and the same 'Metrics' section. Below this is another '+ ADD ANOTHER CRITERIA SET' button. At the bottom of the wizard, there are four buttons: 'PREVIOUS', 'NEXT', 'CREATE', and 'CANCEL'. The 'NEXT' button is highlighted with a red box, and a circled '1' is placed above it, indicating the next step in the process.

Notice there is a filter for the **Subjects** we added, **vCenter Server** and **Virtual Machine**. It is possible to filter your View results based on **Metrics** or **Properties** within each **Subject**. A popular example of this would be to filter out any **Powered Off Virtual Machines**. We will not add any filters for this exercise.

1. Click **Next**.

Summary

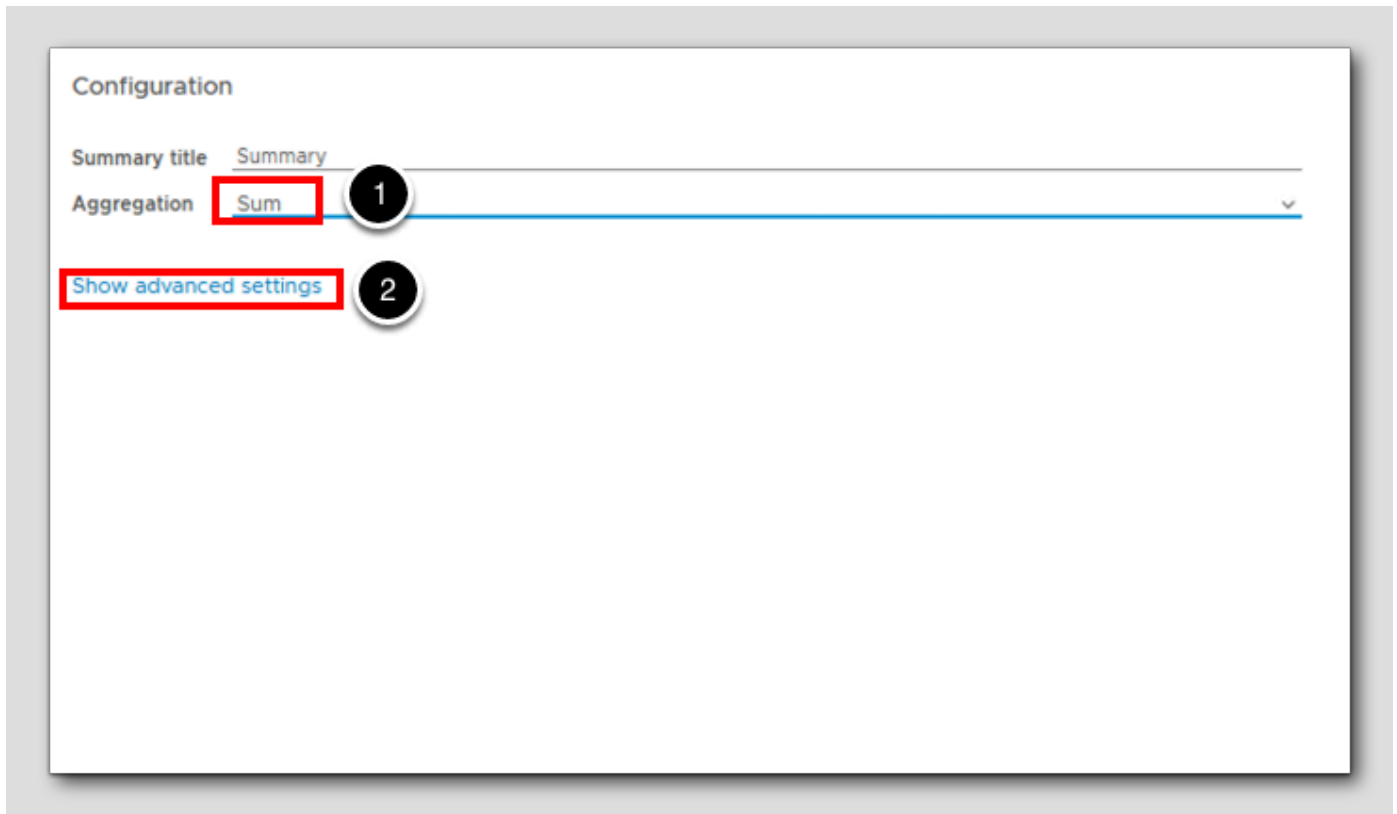
[317]



1. Click Add Summary.

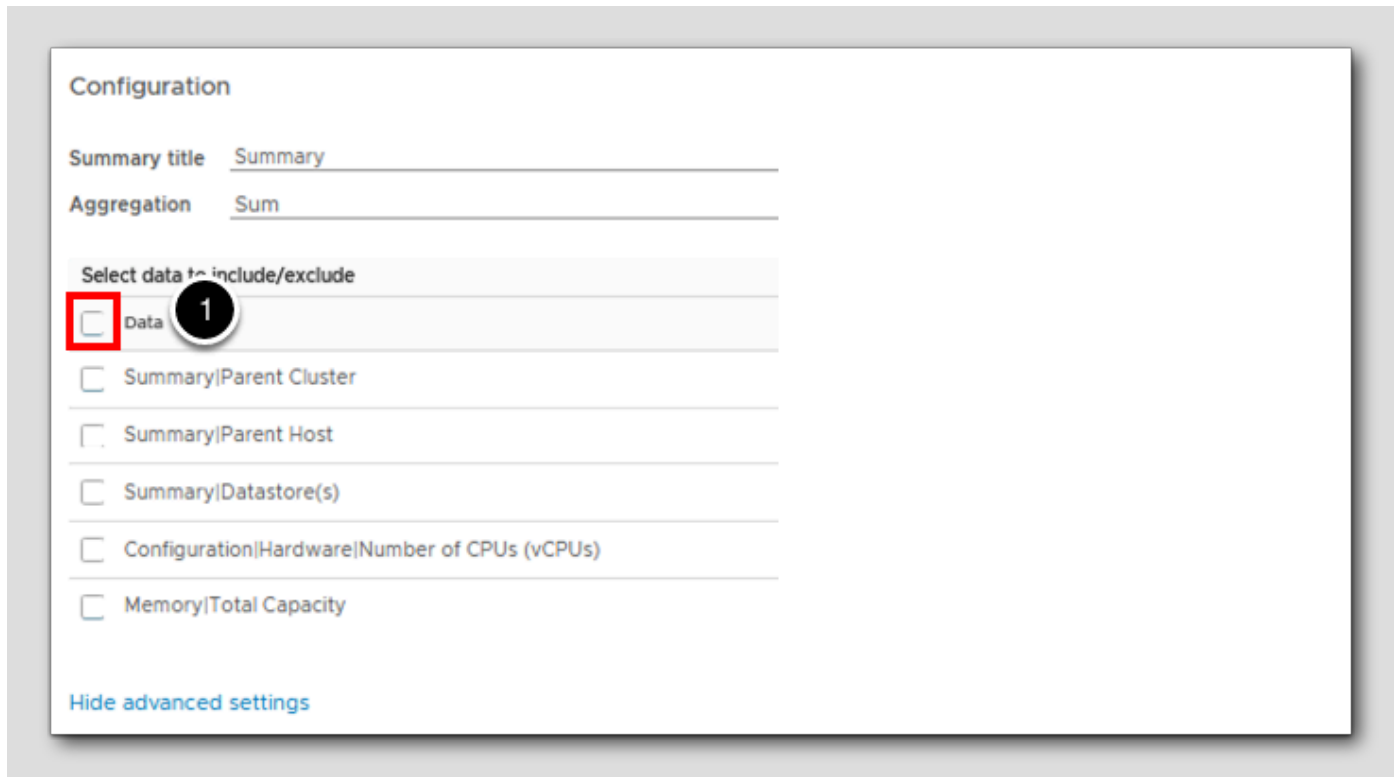
Aggregation

[318]



1. Change aggregation to Sum by using the drop-down menu.
2. Click show advanced settings.

Clear All



1. Deselect all by clearing the check box next to **Data**.

Clicking the box will toggle 'Select all' and 'De-select All'.

Make sure your screen matches the image. Nothing should be selected at this point.

Selected Sum

Summary

Configuration

Summary title

Aggregation

Select data to include/exclude

Data

Summary|Parent Cluster

Summary|Parent Host

Summary|Datastore(s)

Configuration|Hardware|Number of CPUs (v...

Memory|Total Capacity

[Hide advanced settings](#)

1. Select Configuration|Hardware|Number of CPU(s) (vCPUs).
2. Select Memory|Total Capacity.
3. Click CREATE.

Viewing the data

The screenshot shows the VMware vSphere interface. The top section displays a list of datastores with columns for Name, Type, Description, Subject, Last Modified, and Modified By. The selected view is 'Demo - Simple List of VMs with Metrics and Properties'. Below this, a table lists various VMs with their respective parent clusters, hosts, datastores, hardware configurations, and memory capacities.

Name	Summary Parent Cluster	Summary Parent Host	Summary Datastore(s)	Configuration Hardware ...	Memory Total Capacity
aria-auto	Management	esx-01a.corp.vmbea...	esx-01a_LOCAL	12 vCPUs	48 GB
aria-auto-config	Management	esx-02a.corp.vmbea...	esx-02a_LOCAL	4 vCPUs	8 GB
aria-ops	Management	esx-02a.corp.vmbea...	esx-02a_LOCAL	4 vCPUs	16 GB
aria-ops-cp	Management	esx-02a.corp.vmbea...	esx-02a_LOCAL	2 vCPUs	8 GB
aria-ops-logs	Management	esx-02a.corp.vmbea...	esx-02a_LOCAL	4 vCPUs	8 GB
identity-manager	Management	esx-02a.corp.vmbea...	local2_esx-02a	6 vCPUs	10 GB
linux-dev-0010	Workload1	esx-03a.corp.vmbea...	RegionA01-ISCSI01-C...	1 vCPUs	1 GB
linux-dev-0011	Workload1	esx-04a.corp.vmbea...	RegionA01-ISCSI01-C...	1 vCPUs	1 GB
SupervisorControlPI...	Workload1	esx-05a.corp.vmbea...	esx-05a_LOCAL	2 vCPUs	8 GB

After clicking Save you will be in the view area again. The view we just created will be selected.

You should see the three properties and two metrics we selected. At this point, your view is created and saved.

View the Sums

[322]

The screenshot shows a table titled "Demo - Simple List of VMs with Metrics and Properties". The table has six columns: Name, Summary|Parent Cluster, Summary|Parent Host, Summary|Datastore(s), Configuration|Hardware|..., and Memory|Total Capacity. The rows list several VMs, including ubuntu20, ubuntu22, vCLS-6c061569-00..., vCLS-c9a991fe-65c..., vcsa-01a.corp.vmbe..., windows-0008, and windows2019. A red box highlights the final row, which is a summary row with the following values: Summary, -, -, -, 42 vCPUs, and 110.25 GB.

Name	Summary Parent Cluster	Summary Parent Host	Summary Datastore(s)	Configuration Hardware ...	Memory Total Capacity
ubuntu20	Workload1	esx-04a.corp.vmbea...	RegionA01-ISCSI01-C...	1 vCPUs	1 GB
ubuntu22	Workload1	esx-04a.corp.vmbea...	RegionA01-ISCSI01-C...	1 vCPUs	1 GB
vCLS-6c061569-00...	Management	esx-01a.corp.vmbea...	RegionA01-ISCSI01-C...	1 vCPUs	128 MB
vCLS-c9a991fe-65c...	Management	esx-02a.corp.vmbea...	RegionA01-ISCSI01-C...	1 vCPUs	128 MB
vcsa-01a.corp.vmbe...	-	-	-	-	-
windows-0008	Workload1	esx-04a.corp.vmbea...	RegionA01-ISCSI01-C...	2 vCPUs	4 GB
windows2019	Workload1	esx-03a.corp.vmbea...	RegionA01-ISCSI01-C...	2 vCPUs	4 GB
Summary	-	-	-	42 vCPUs	110.25 GB

Scroll Down (not shown) to the bottom of the results to see the summary for the total vCPUs and Total Memory.

The sum is for all the Virtual Machines contained in the view.

Because we used Virtual Machines as our subject matter, the view can be utilized for a single VM or anything that contains Virtual Machines like Hosts, Groups, Clusters, Datacenters, Applications, etc.

Feel free to navigate to a Host or any object that contains virtual machines to see the flexibility of a View.

Lesson End

[323]

This completes the Simple View creation. In the next lesson, we will show how to create a view with variable data.

Create a View with Variable Data

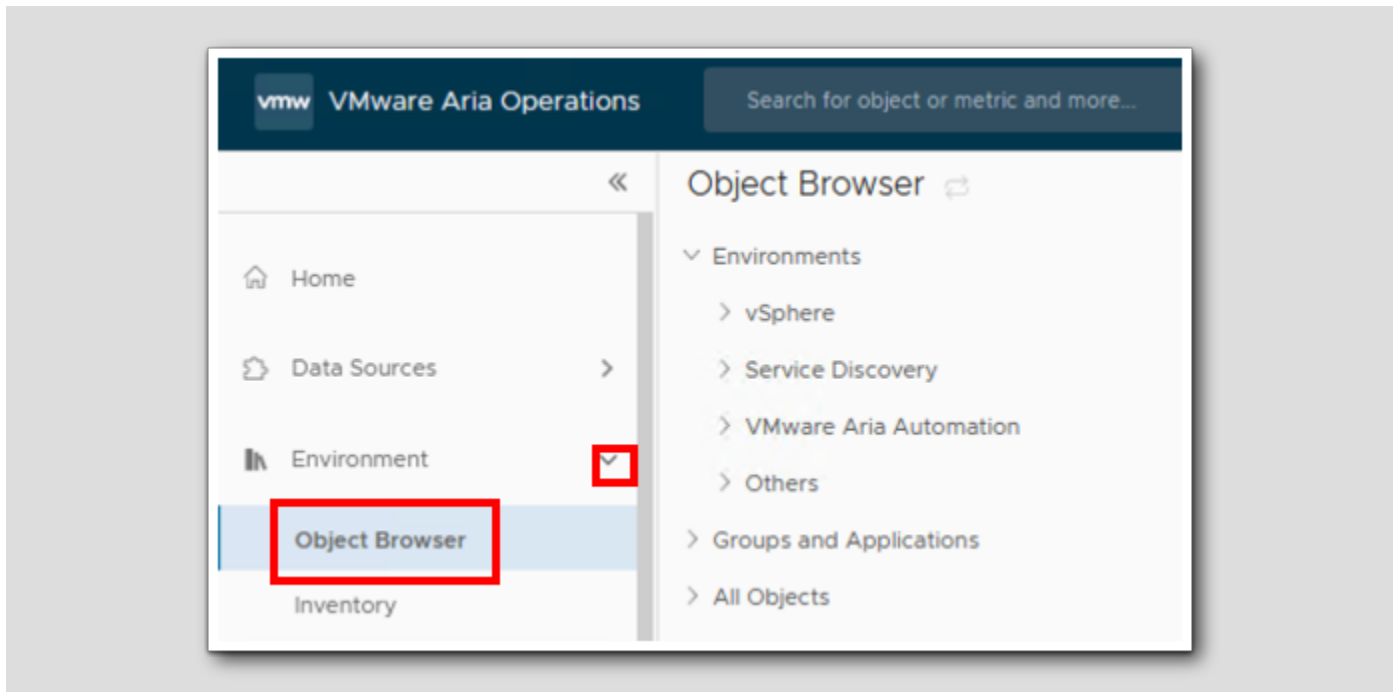
[324]

In this lesson, we are going to create a custom view. The view will concentrate on Virtual Machine data but can be applied to any resource collected in Aria Operations.

Views can be used within reports and dashboards. They also allow Users to see data within Aria Operations.

Open Object Browser

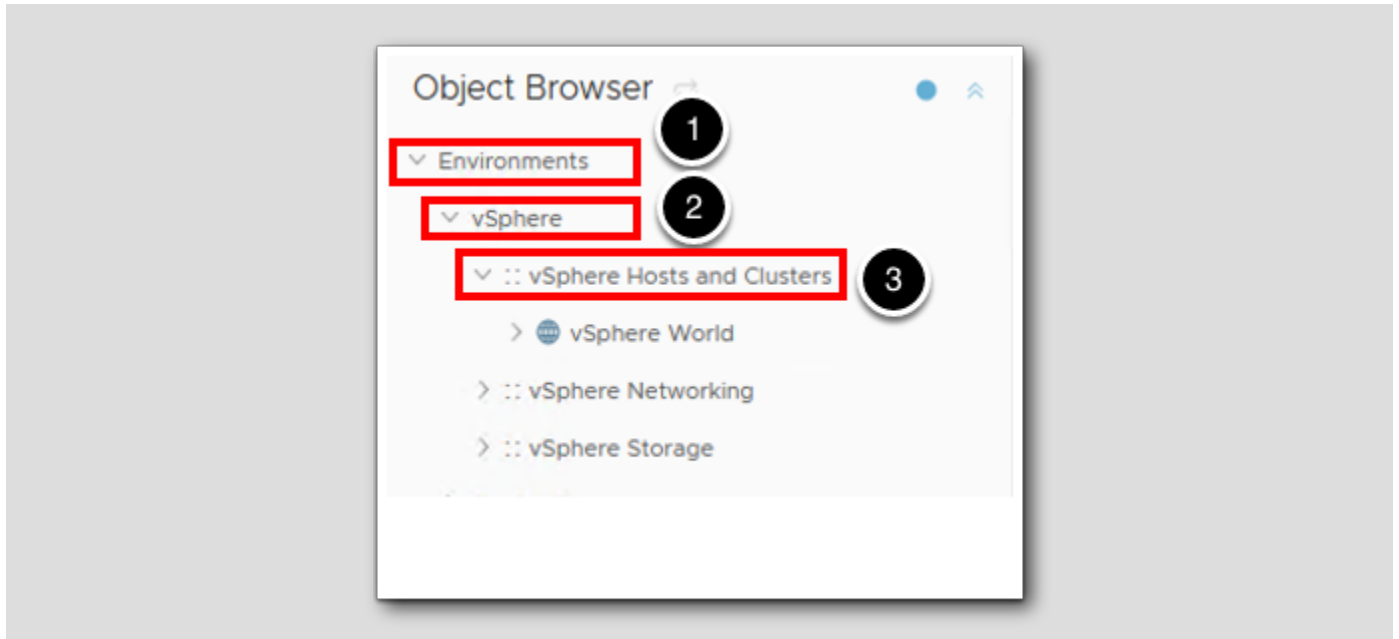
[325]



1. Expand Environment.
2. Click on Object Browser.

Hosts and Clusters

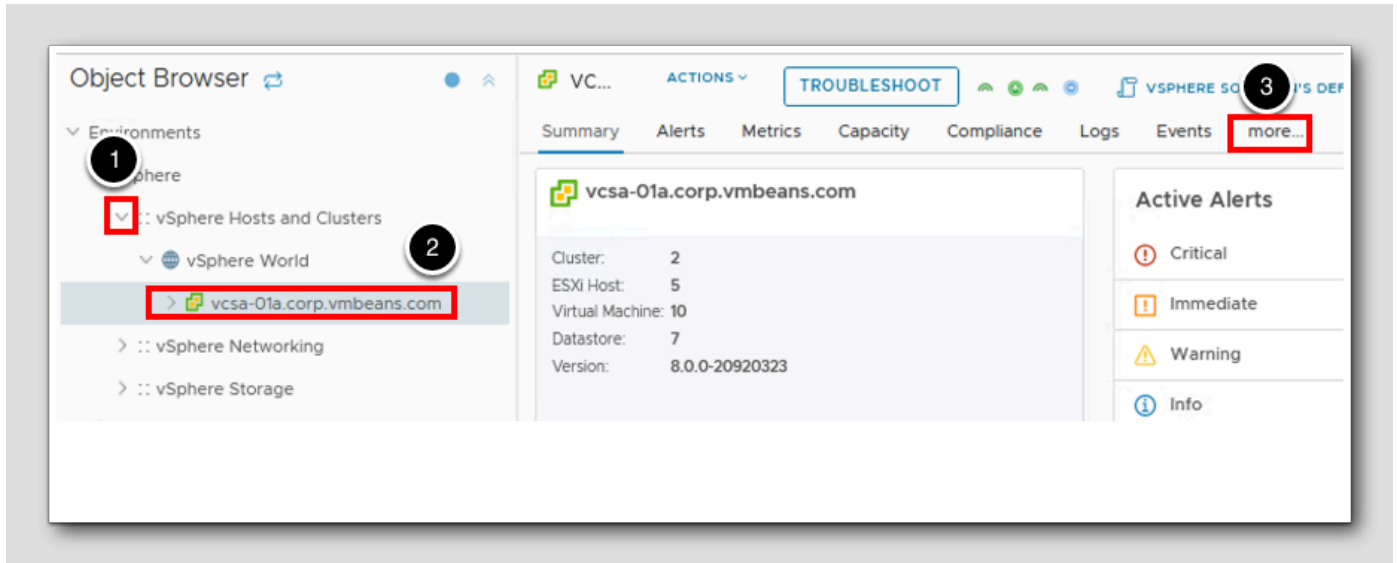
[326]



1. Expand vSphere Environment if needed.
2. Click on vSphere Hosts and clusters.

Select a vCenter Server

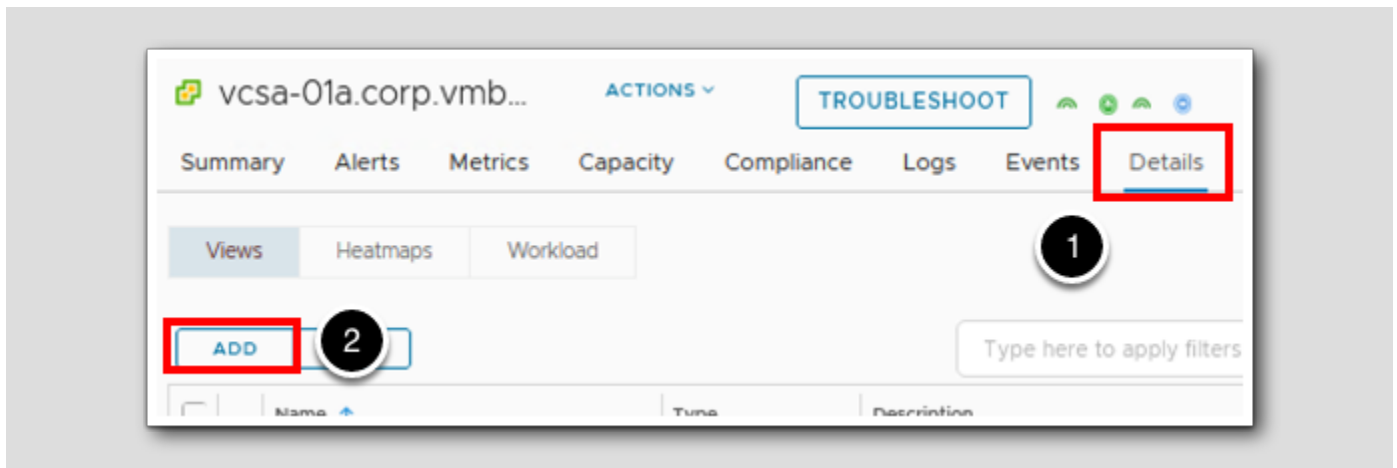
[327]



1. Expand vSphere World.
2. Select vCenter Server Private Cloud.
3. Click on more...

Create a View

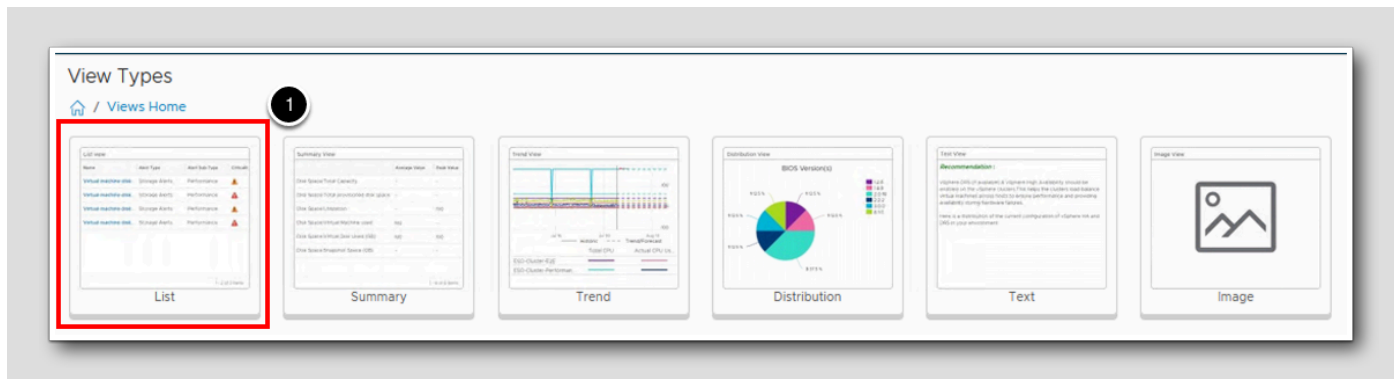
[328]



1. Click on **Details**.
2. Click the **ADD** to create a new view.

View Type

[329]



1. Click on **List** for the View Type.

View Name

[330]

Create View

1 - Name & Configuration 2 - Data

1

Name

Description

Settings

Items per page: 50

Top result count:

Show Objects: Existing

Show Object Creation Date:

Make the view available for:

- Dashboards through the View widget
- Report template creation and modification
- Details tab in the environment

Hide the view for the selected Object Types:

2

PREVIOUS **NEXT** CREATE CANCEL

Create a view with the following data:

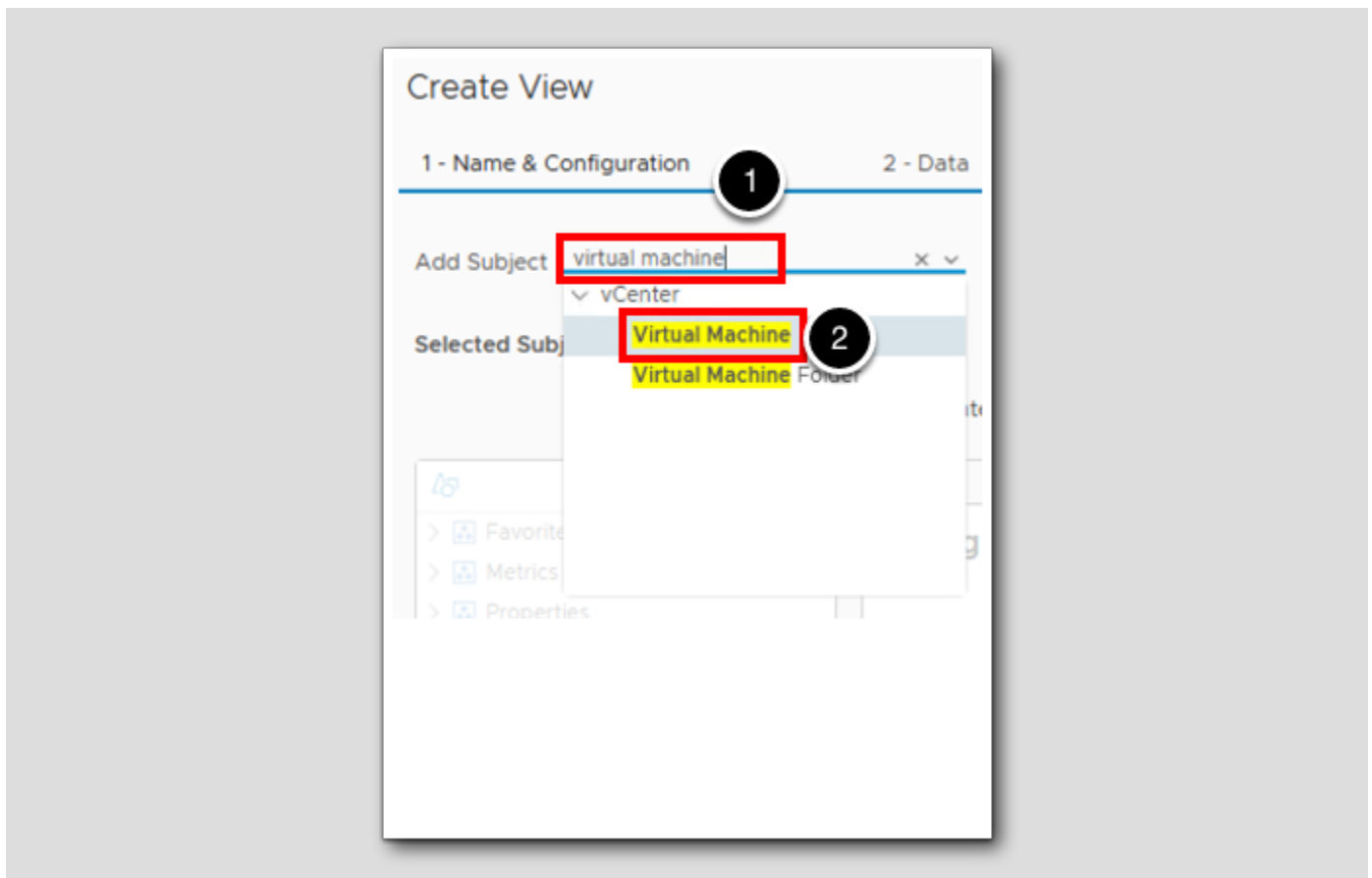
Section 1. Name & Configuration.

1. Enter **Demo - Variable Data**.
2. Click **NEXT**.

Note the fields under Settings that are available.

Subjects - Virtual Machine

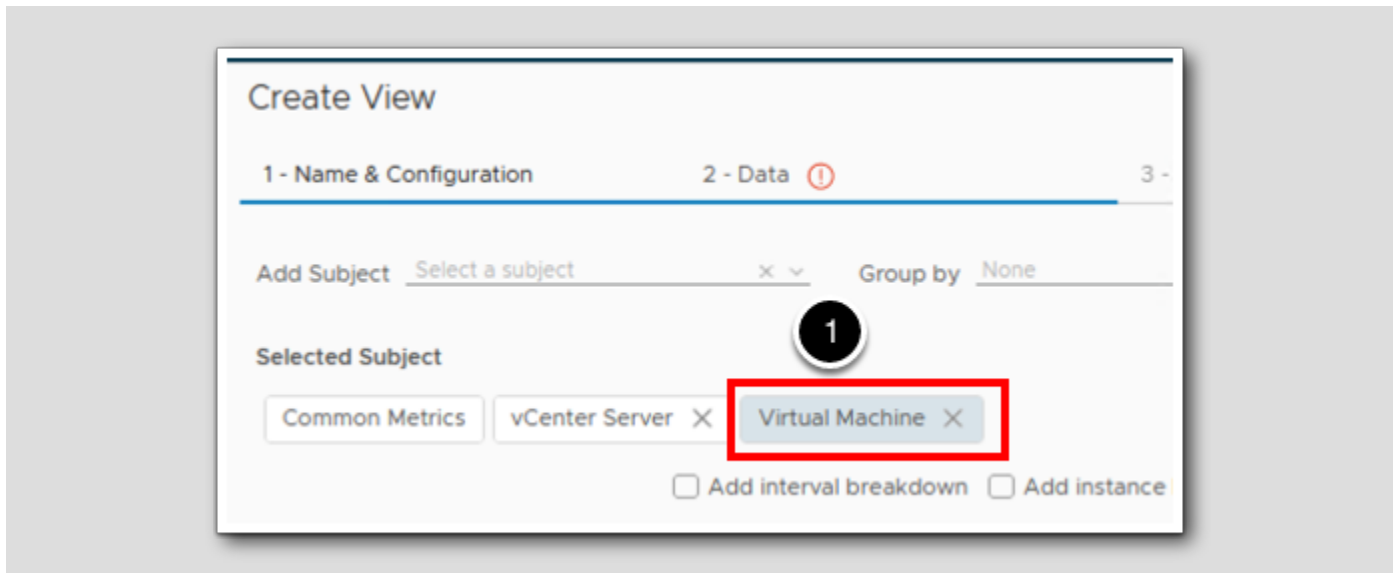
[331]



1. In the **Add Subject** field, begin typing **virtual machine** (Start typing **virtual** and the list will show available resources that match).
2. Click on **Virtual Machine**.

Select Virtual Machine

[332]



1. Select Virtual Machine.

Data Metrics

The screenshot displays the VMware vSphere Data Metrics configuration interface. On the left, a navigation pane shows a tree view of metrics. The 'Metrics' folder is expanded (1), and the 'CPU' folder is also expanded (2). The 'Demand (%)' metric is highlighted in the list (3), and a second instance of 'Demand (%)' is shown in the 'Data' table (4). The right-hand pane shows the configuration for the selected metric, including 'Metric name', 'Metric label', 'Units', 'Sort order', and 'Transformation'.

Data	Transformation
CPU Demand (%)	Current
CPU Demand (%)	Current

Configuration

General

Metric name CPU|Demand (%)

Metric label CPU|Demand (%)

Units %

Sort order None

Transformation

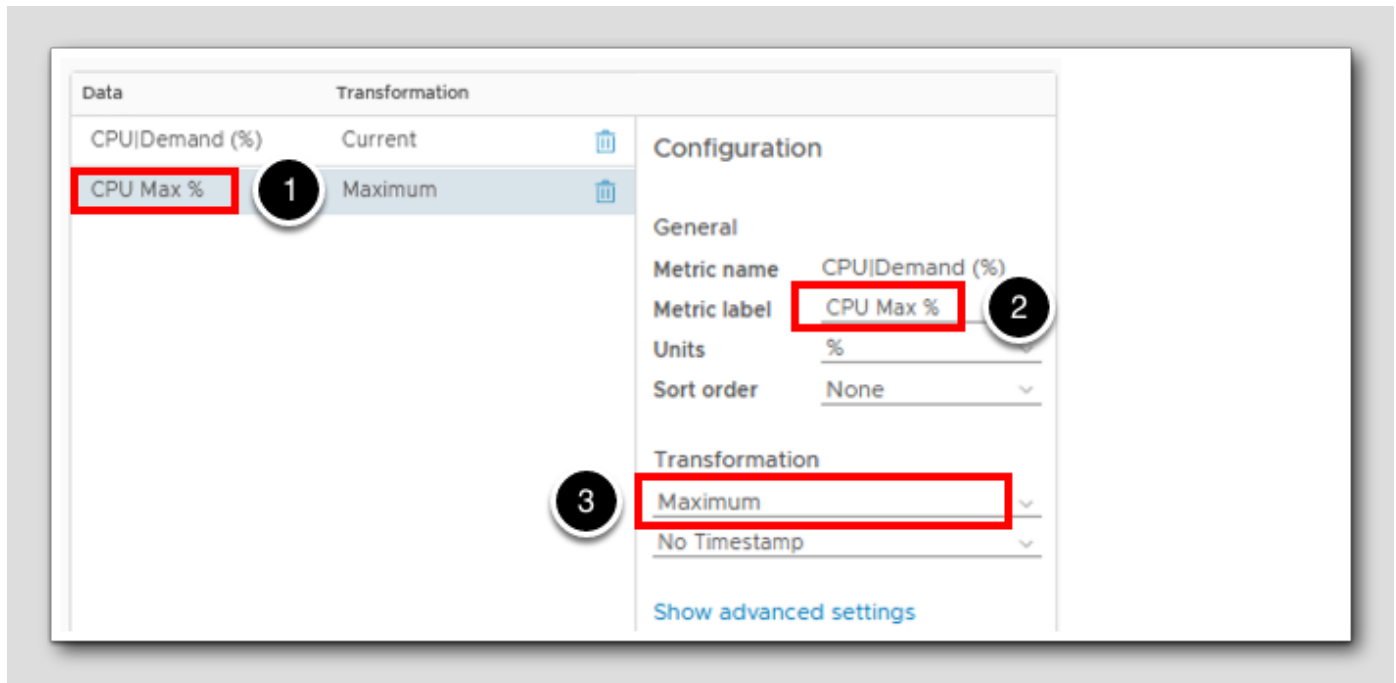
Current

No Timestamp

[Show advanced settings](#)

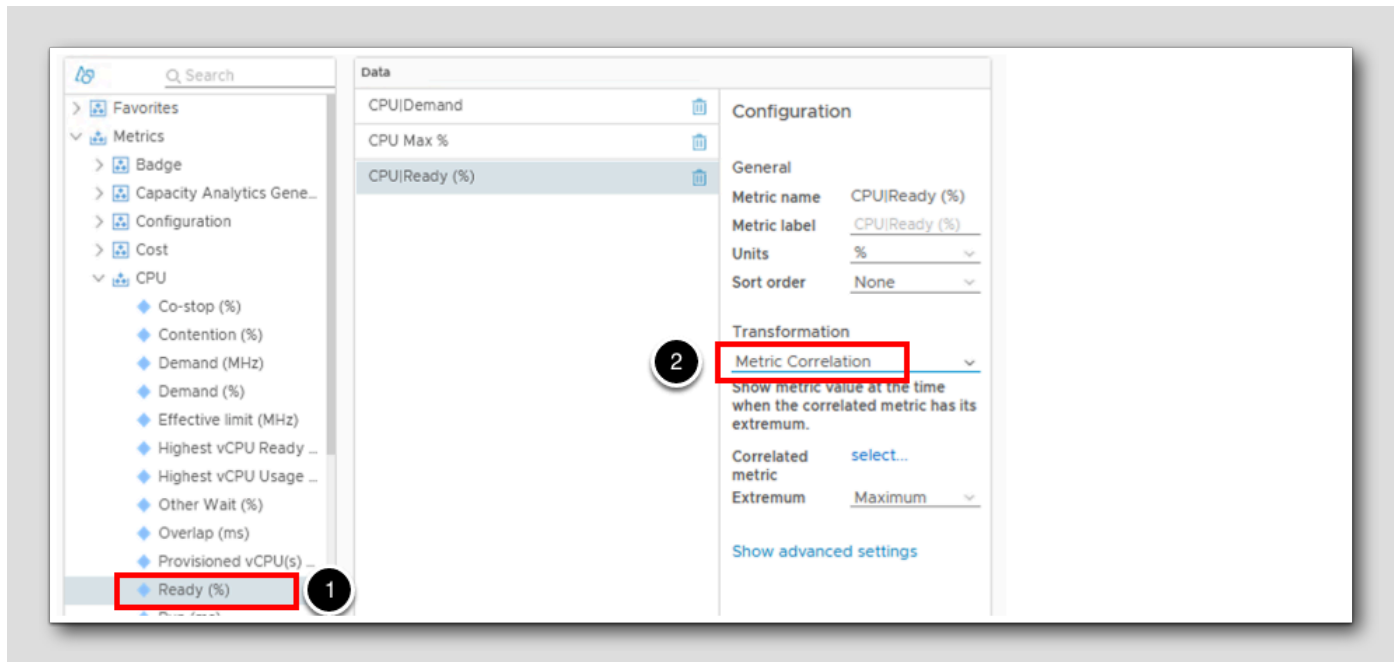
1. Expand Metrics.
2. Expand CPU.
3. Double-Click Demand (%).
4. Double-Click Demand (%) again (It will be in the list on the right two times).

Metric Transformation



1. After Demand (%) is in the list a second time, select the second instance with a single click.
 - The screenshot was taken after the changes were made to the Metric label. The Data column will reflect what you type into the Metric label.
2. For **Metric label**: Enter "CPU Max %" (This will be our column header name in the final view).
3. For **Transformation**, Select **Maximum** in the drop down list.

CPU Ready



1. Double click Ready (%).
2. Change Transformation to Metric Correlation in the drop down list.

Correlation

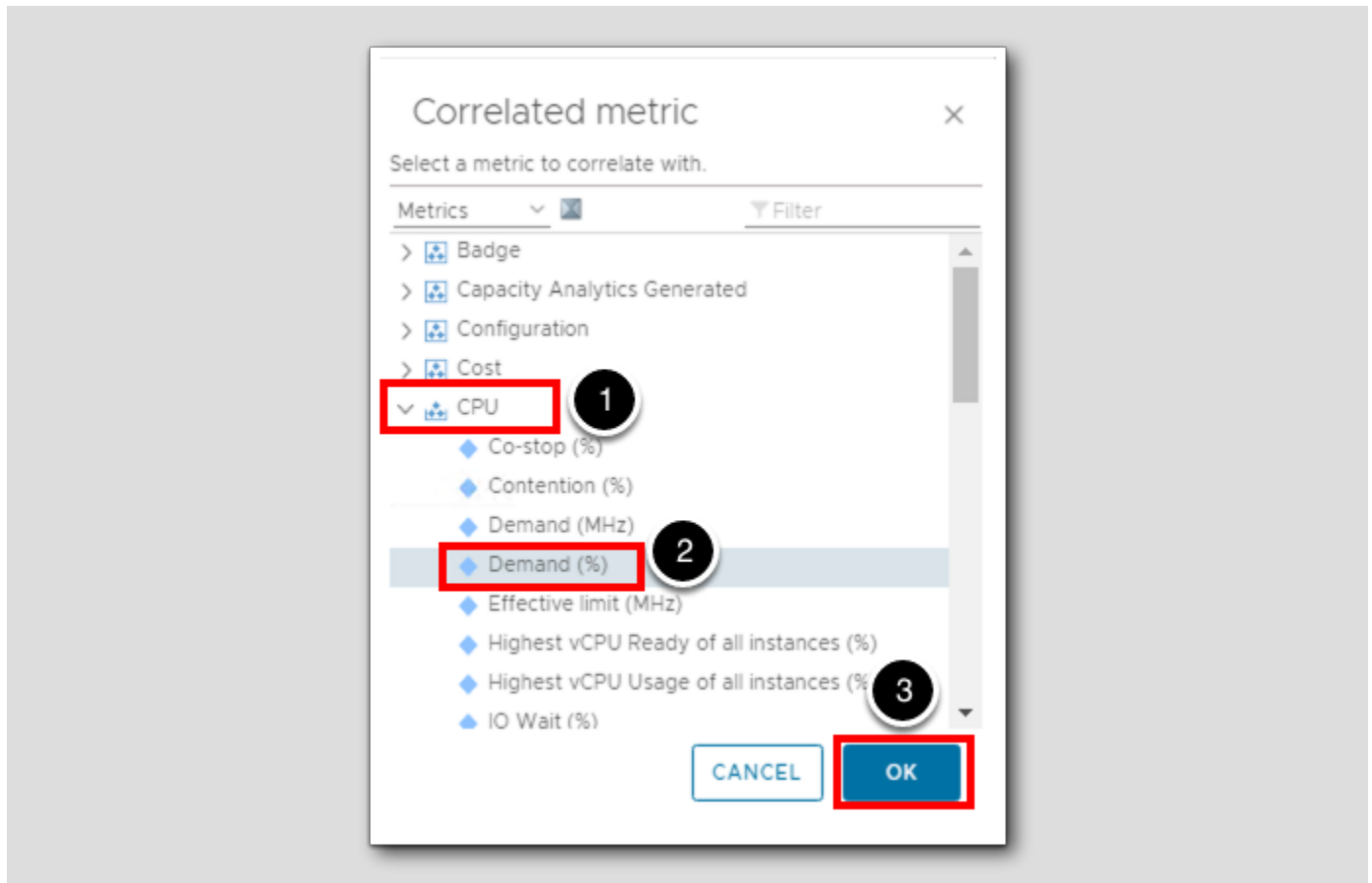
The screenshot shows the configuration panel for the 'CPU|Ready (%)' metric. The 'Data' list on the left includes 'CPU|Demand', 'CPU Max %', and 'CPU|Ready (%)'. The 'Configuration' panel on the right has the following settings:

- General**
 - Metric name: CPU|Ready (%)
 - Metric label: CPU|Ready (%)
 - Units: %
 - Sort order: None
- Transformation**
 - Metric Correlation: (dropdown)
 - Show metric value at the time when related metric has its extremum: (dropdown)
 - Correlated metric: select... (highlighted with a red box and a '1' in a circle)
 - Extremum: Maximum

At the bottom of the configuration panel, there is a link for 'Show advanced settings'.

1. Click select... beside Correlated Metric.

Correlated Metric



In the pop-up window:

1. Expand CPU
2. Select Demand (%)
3. Click OK

With this correlation, we are going to see the value of CPU Ready (%) when the CPU Demand (%) is at a maximum.

Time Settings

The screenshot shows the VMware vSphere configuration interface for a metric. On the left, a navigation pane lists various metrics under the 'CPU' category, with 'Ready (%)' selected. The main area is divided into 'Data' and 'Configuration' sections. The 'Data' section lists 'CPU|Demand', 'CPU Max %', and 'CPU|Ready (%)'. The 'Configuration' section includes 'General' settings (Metric name: CPU|Ready (%), Metric label: CPU|Ready (%), Units: %, Sort order: None), 'Transformation' settings (Metric Correlation: None, Show metric value at the time when the correlated metric has its extremum), and 'Correlated' settings (Correlated metric: CPU|Demand (...), Extremum: Maximum). At the bottom, there are four buttons: 'PREVIOUS', 'NEXT', 'CREATE', and 'CANCEL'. The 'NEXT' button is highlighted with a red box, and a circled '1' is placed over it, indicating the next step in the process.

1. Click **NEXT** to go to Time Settings.

Number of Days

[339]

Create View

1 - Name & Configuration

2 - Data

Time Range Mode: Basic Advanced

Currently selected date range: From Jun 4, 2023 9:14:14 AM to 9:14:14 AM

Relative Date Range

Last 30 (1)

Specific Date Range

Start on: _____ to _____

Absolute Date Range

Prior _____

2

PREVIOUS

NEXT

CREATE

CANCEL

1. Set the Relative Date Range to the Last 30 Days.
2. Click NEXT.

Filter

[340]

The screenshot displays the VMware vCenter Server filter configuration interface. It is divided into two main sections: "vCenter Server filter" and "Virtual Machine filter".

The "vCenter Server filter" section is currently inactive. It features a "REMOVE CRITERIA" button and a text prompt: "Select the Object Type that matches all of the following criteria: vCenter Server". Below this, there are dropdown menus for "Metrics" (set to "Pick a metric"), "Current" (set to "--Select--"), and "Metric value".

The "Virtual Machine filter" section is active. It also features a "REMOVE CRITERIA" button and a text prompt: "Select the Object Type that matches all of the following criteria: Virtual Machine". Below this, there are dropdown menus for "Metrics" (set to "Properties"), "Pick a property" (highlighted with a red box), "Current" (set to "--Select--"), and "Property value".

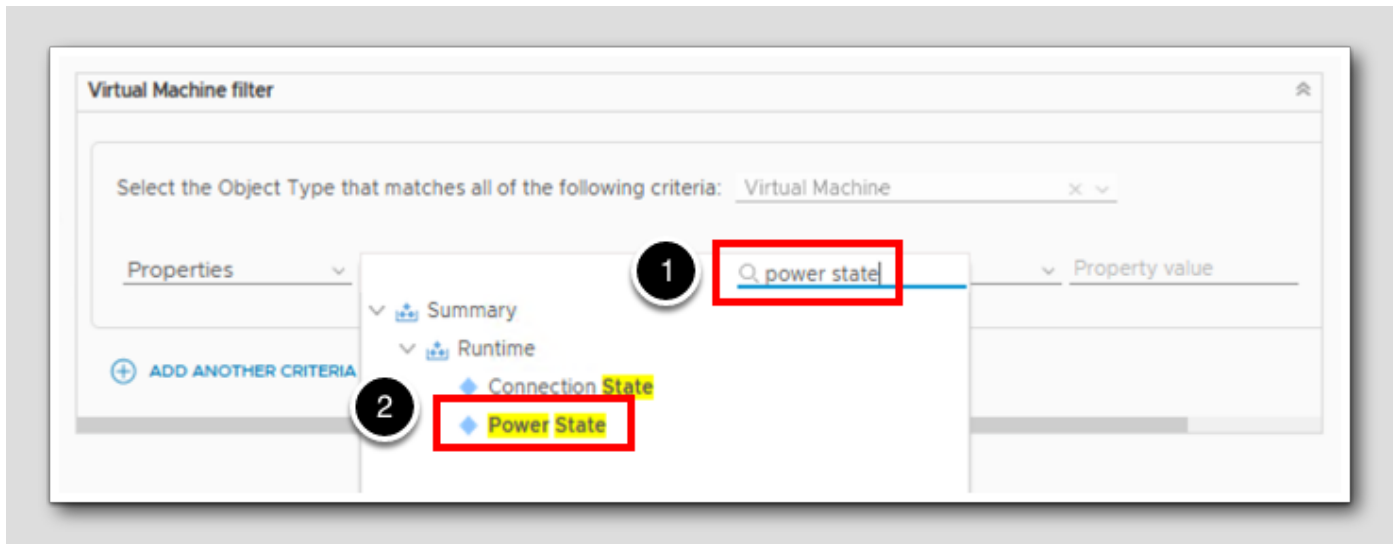
At the bottom of the interface, there are four buttons: "PREVIOUS", "NEXT", "CREATE", and "CANCEL".

Make sure you are in the Virtual Machine filter box.

1. Change **Metrics** to **Properties**.
2. Click into the **Pick a property field**.

Power State

[341]



1. In the Search Bar type power state.
2. Double click on Power State.

Create View

1 - Name & Configuration 2 - Data 3 - Time Settings 4 - |

vCenter Server filter

REMOVE CRITERIA

Select the Object Type that matches all of the following criteria: vCenter Server

Metrics Pick a metric Current --Select-- Metric value

Or

REMOVE CRITERIA

Select the Object Type that matches all of the following criteria: vCenter Server

Metrics Pick a metric Current --Select-- Metric value

ADD ANOTHER CRITERIA SET

Virtual Machine filter

Select the Object Type that matches all of the following criteria: Virtual Mach

Properties ry|Runtime|Power State Current is Property value

Powered Off

Powered On

ADD ANOTHER CRITERIA SET

PREVIOUS NEXT **CREATE** CANCEL

1. Select **Current**.
2. Select: **is**
3. Click into the property value field. You should see the available options of **Powered On** and **Powered Off**.
4. Select: **Powered On** from Property Value Menu.
5. Click **CREATE**.

View Results

[342]

The screenshot shows the vSphere interface for a host named 'vcsa-01a.corp.vmb...'. The 'Detail' tab is active, and the 'Views' section is selected. A list of views is shown, with 'Demo - Variable Data' selected. Below this, a table displays CPU metrics for various VMs. Three red arrows point to the 'CPU Demand (%)', 'CPU Max %', and 'CPU Ready (%) (at CPU...)' columns.

Name	CPU Demand (%)	CPU Max %	CPU Ready (%) (at CPU...)
aria-auto	25.03 %	70.69 %	0.72 %
aria-auto-config	5.95 %	36.51 %	2.19 %
aria-ops	9.59 %	83.04 %	19.16 %
aria-ops-cp	6.45 %	94.11 %	20.08 %
aria-ops-logs	12.76 %	71.87 %	13.95 %
identity-manager	4.87 %	31.68 %	5.54 %
ubuntu-0008	2.07 %	10.58 %	0.17 %
windows-0010	7.82 %	31.61 %	0.52 %

We now have a view that shows us the last CPU Demand collected for each Powered ON Virtual Machine. We also show the Maximum CPU Demand as a percentage for the last 30 days. The last value in our view shows us what the Ready % was when the demand was at maximum during the same 30 day period.

This is a very powerful feature of the product. While we are showing the ready % when the CPU is highly demanded, you may wish to see what disk latency looks like when network transmissions are high. You can correlate any two metrics that are being collected in vRealize Operations.

Lesson End

[343]

This completes this lesson. In the next lesson, we will create a view with trended data.

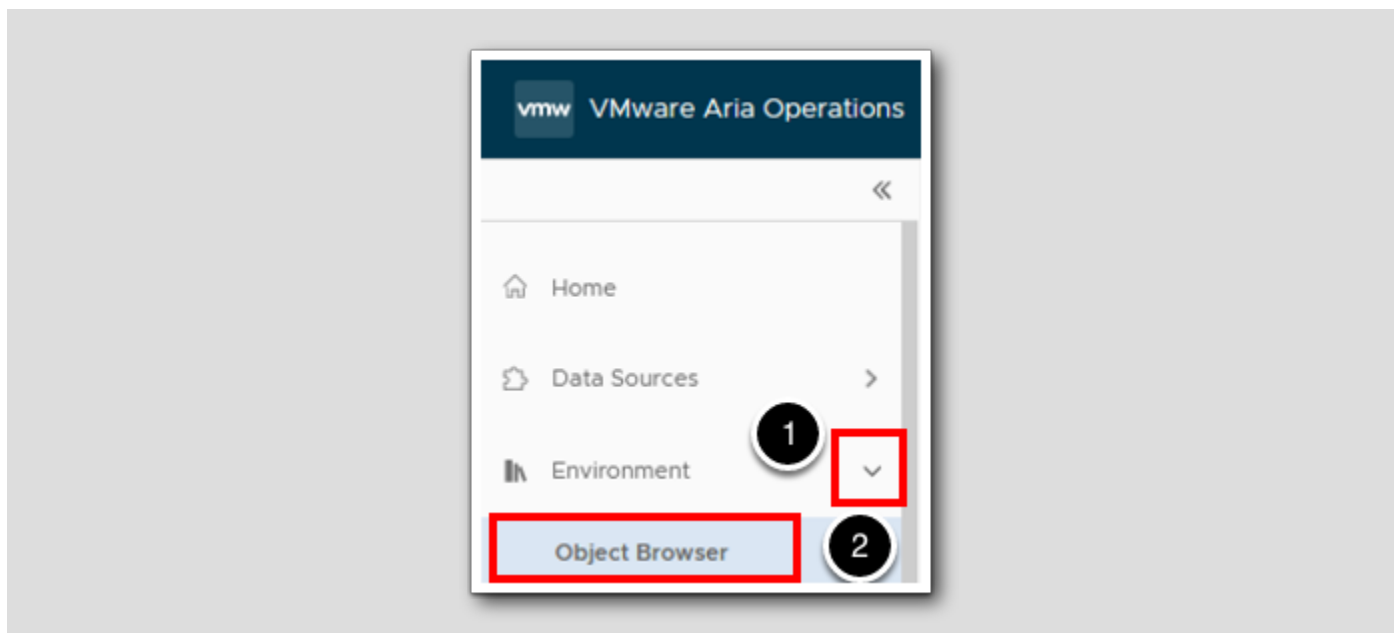
Create a View with Trends

[344]

In this lesson, we continue the concept of creating custom views. This time, we will create a view with data that is trended over a period of time.

Go to Environment

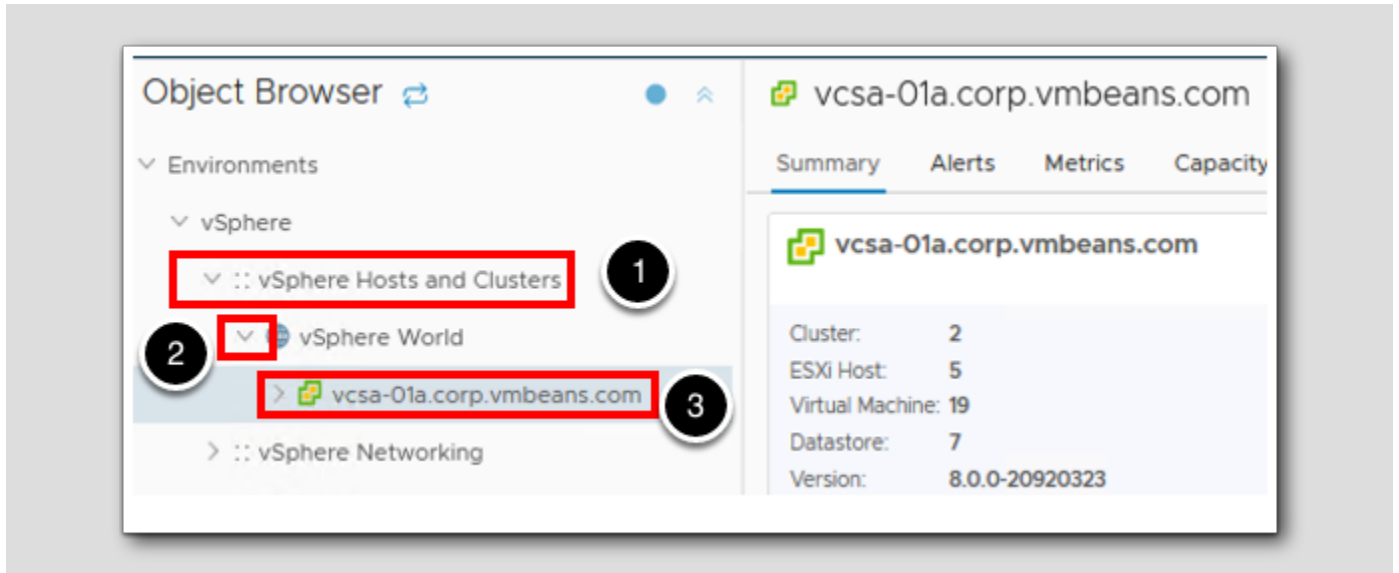
[345]



1. Expand Environment.
2. Click on Object Browser

Hosts and Clusters

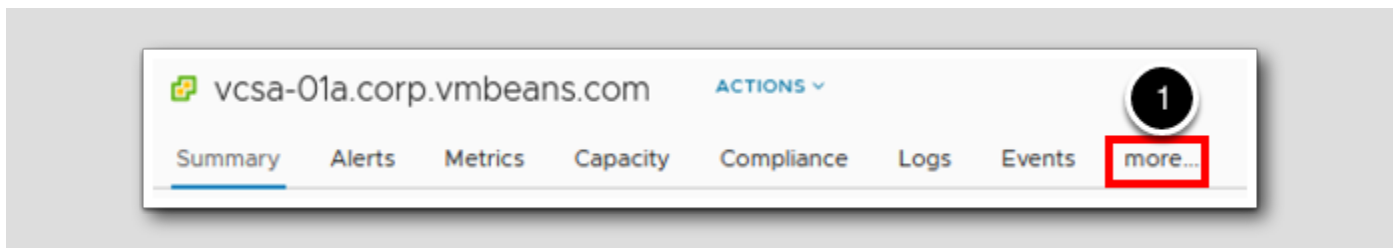
[346]



1. Click on vSphere Hosts and Clusters.
2. Expand vSphere World.
3. Click on vcsa-01a.corp.vmbeans.com.

Expand the Categories

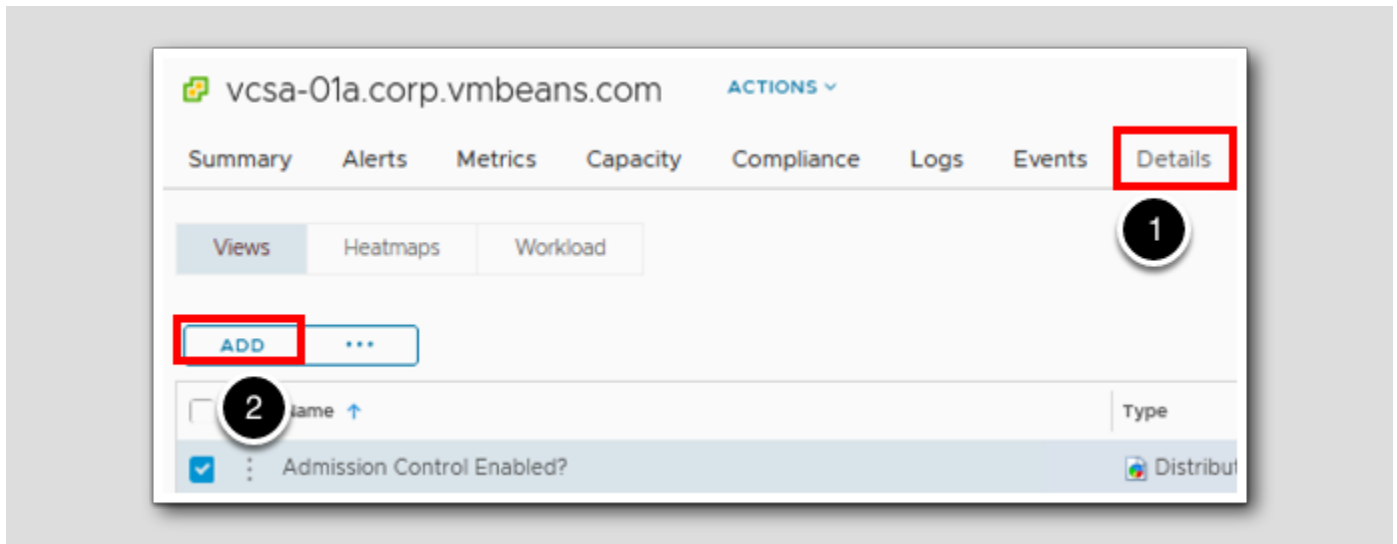
[347]



1. Click on more...

Create a View

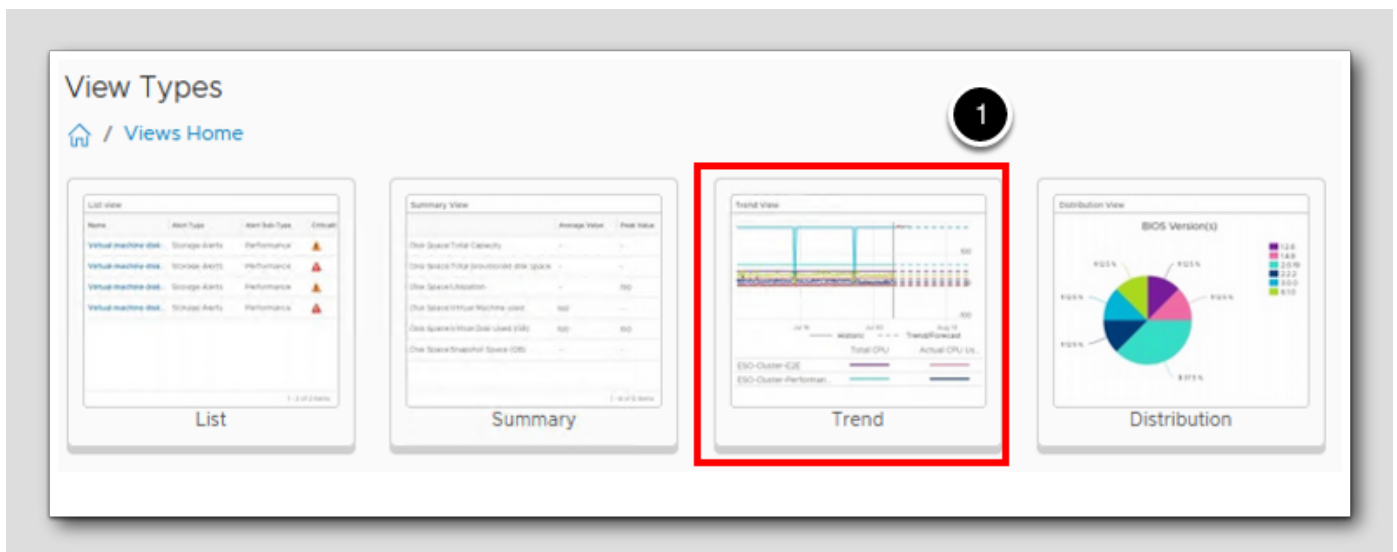
[348]



1. Click on Details.
2. Click ADD to create a new view.

View Types

[349]



1. Click on Trend as the type of view we are creating.

View Name

[350]

Create View

1 - Name & Configuration 2 - Data

Name Demo - Trend View 1

Description

Settings 2

Items per page 50

Top result count

Show Objects Existing

Show Object Creation Date

Make the view available for

- Dashboards through the View widget
- Report template creation and modification
- Details tab in the environment

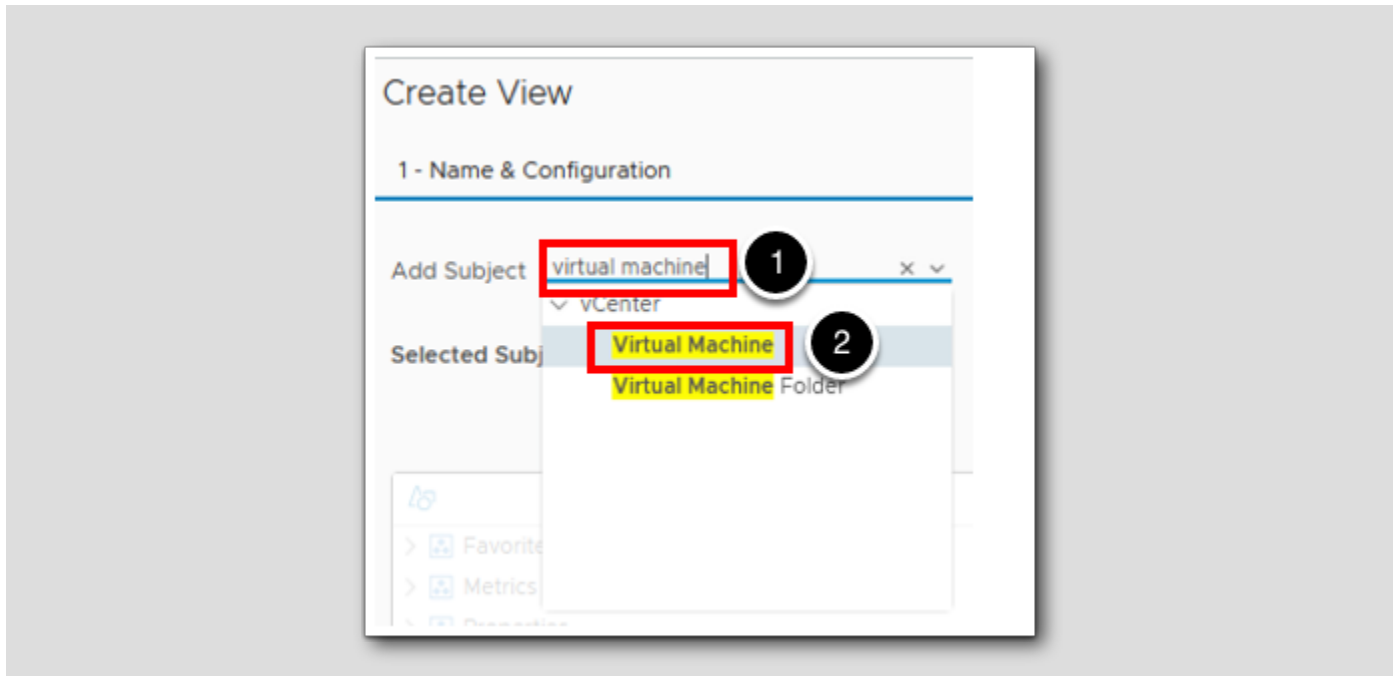
Hide the view for the selected Object Types Select an Object Type

PREVIOUS NEXT CREATE CANCEL 3

1. Enter the name **Demo - Trend View**.
2. Expand **Settings** to note what can be customized. For this lesson we will leave the defaults.
3. Click **NEXT**.

Data

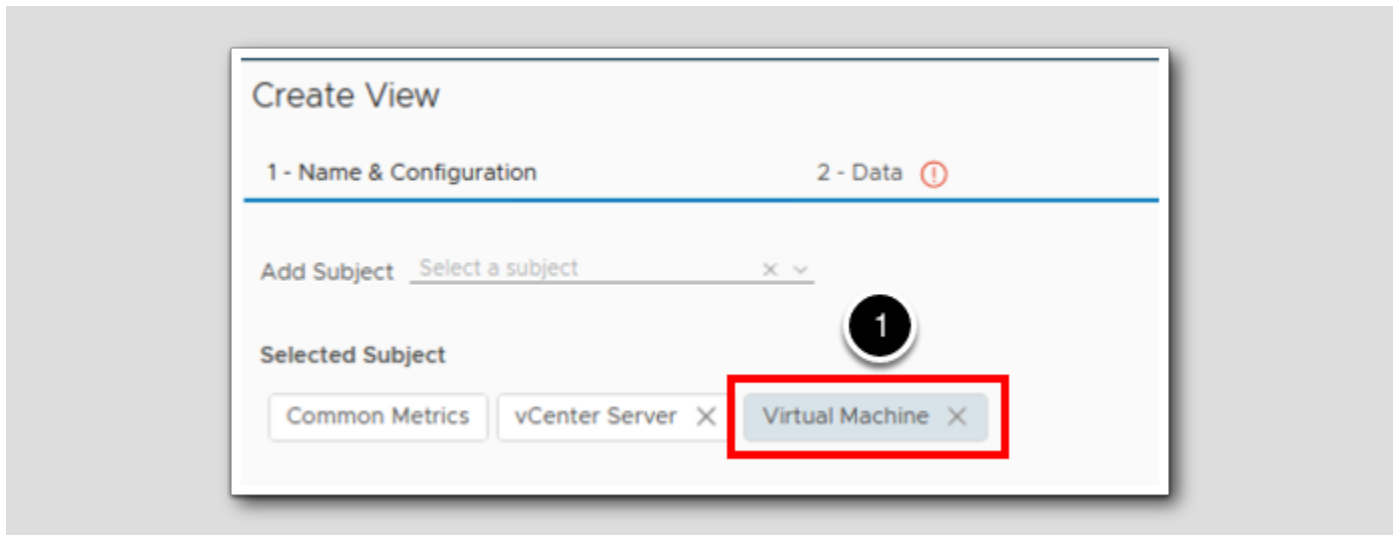
[351]



1. Click on **Add Subject**.
2. Type **virtual machine** in the search field and a filtered list will appear.
3. Click on **Virtual Machine**.

Select Virtual Machine

[352]



1. Select Virtual Machine.

Select metric

[353]

Create View

1 - Name & Configuration 2 - Data

Add Subject x v

Selected Subject

Common Metrics vCenter Server x Virtual Machine x

🔍 Search

- > Badge
- > Capacity Analytics Generated
- > Configuration
- > Cost
- > CPU
- > CPU Utilization for Resources
- > Datastore
- > Disk Space
- > Disk Space Usage on Datast...
- > Guest
- > Guest File System
- > Guest OS Services
- > Memory
- > Memory Usage on Host
- > Network
- > Performance
- 1 Physical Disk
- > Power
- ▼ Storage
- 2 Read Latency (ms)
- Write Latency (ms)
- > Summary
- > System
- > Virtual Disk
- > VMware Aria Operations Gen...

Data

Storage|Read Latency 🗑

1. Expand Storage.
2. Double click on Read Latency (ms).

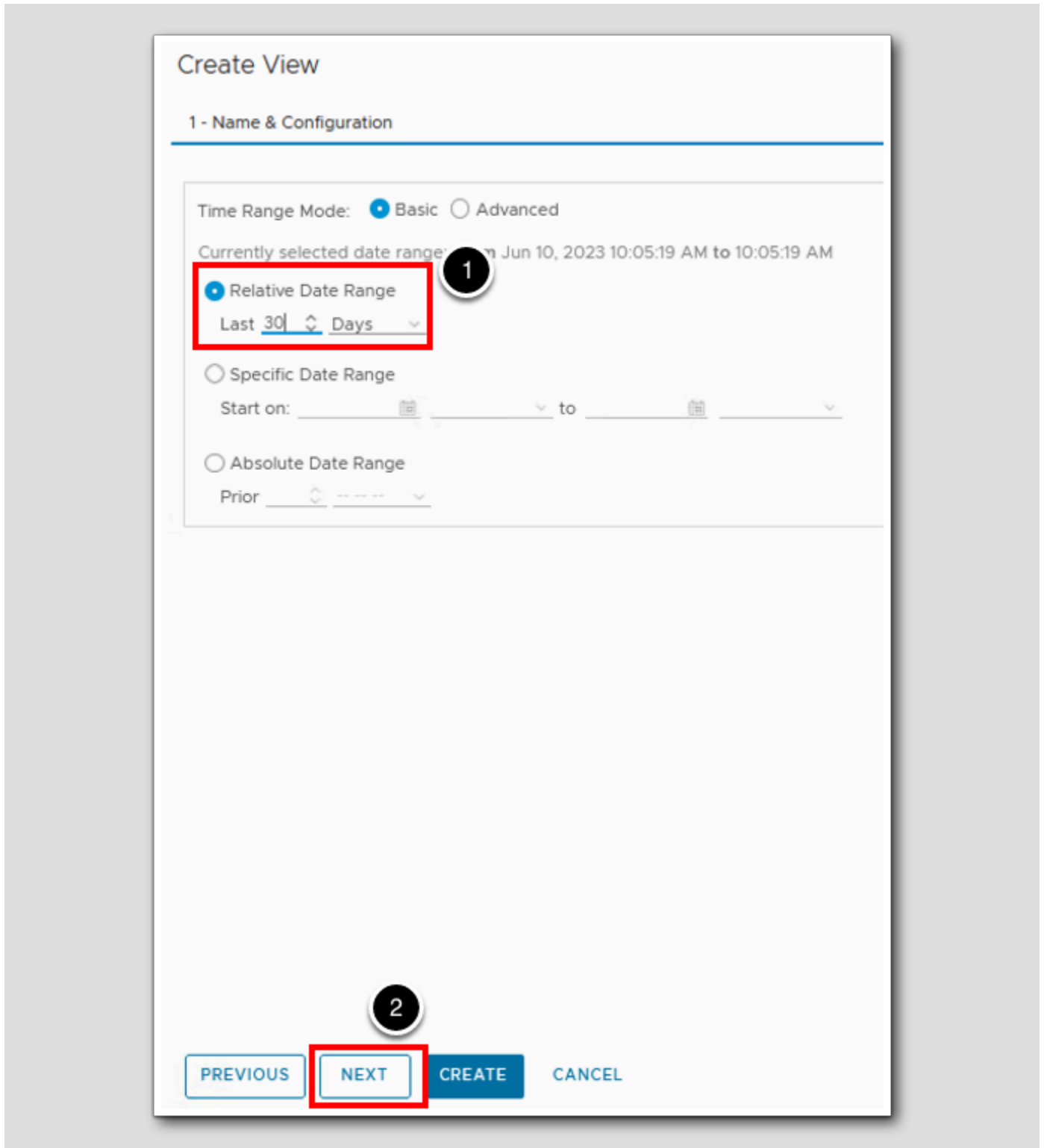
Trend the Data

The screenshot shows the VMware vSphere configuration interface for 'Storage|Read Latency'. The left-hand navigation pane is expanded to 'Storage' > 'Read Latency (ms)'. The main area displays the 'Configuration' tab for 'Storage|Read Latency'. Under 'Data Series', the 'Historical data' checkbox is checked, while 'Trend of the historical data' and 'Forecast data for the next' are unchecked. A red box highlights the 'NEXT' button at the bottom of the configuration pane. Two numbered callouts (1 and 2) point to the 'Trend of the historical data' and 'Forecast data for the next' checkboxes respectively.

1. Uncheck Trend of the historical data.
2. Uncheck Forecast data for the next.
3. Click NEXT.

Time Range

[355]



1. Change the Relative Date Range to Last 30 Days.
2. Click **NEXT**.

Filter

[356]

Create View

1 - Name & Configuration 2 - Data

Virtual Machine filter

Select the Object Type that matches all of the following criteria: Virtual Machine x v

Metrics v Pick a metric Current v --Select-- v Metric value

[+](#) ADD ANOTHER CRITERIA SET

1

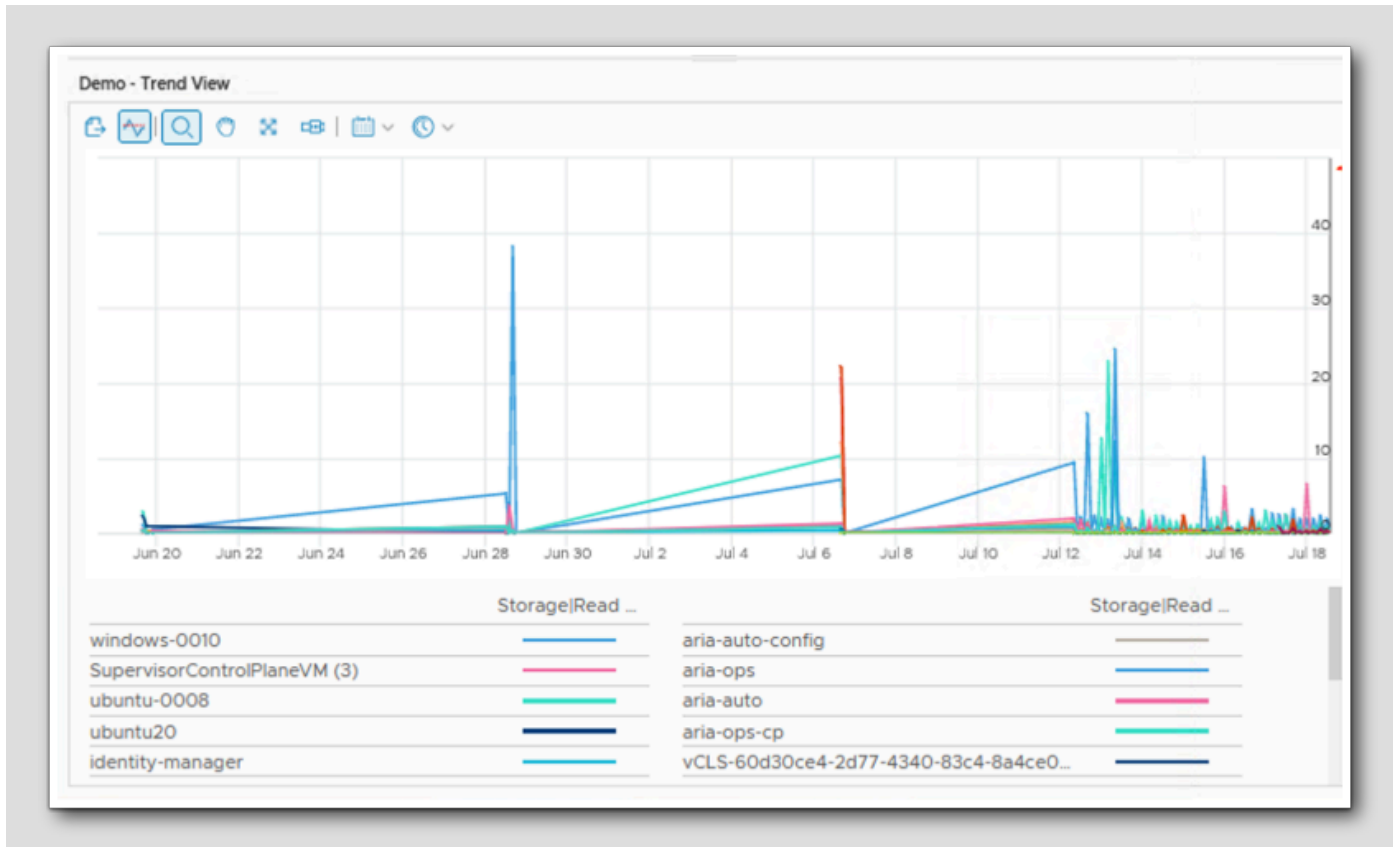
[PREVIOUS](#) [NEXT](#) [CREATE](#) [CANCEL](#)

In the Filter section you have the ability to filter in or out objects based on a certain criteria i.e. only include powered on virtual machines. For this lesson we will not use the Filter function.

1. Click CREATE.

Summary

[357]



You now have a view that shows selected virtual machines read latency trended over the last 30 days. While we unchecked the forecast data option, leaving it checked would have trended the forecast of the selected metrics for up to a year.

Lesson End

[358]

You have completed this lesson. The next lesson will show how to create a view with distribution data.

Create a View that shows VM Growth

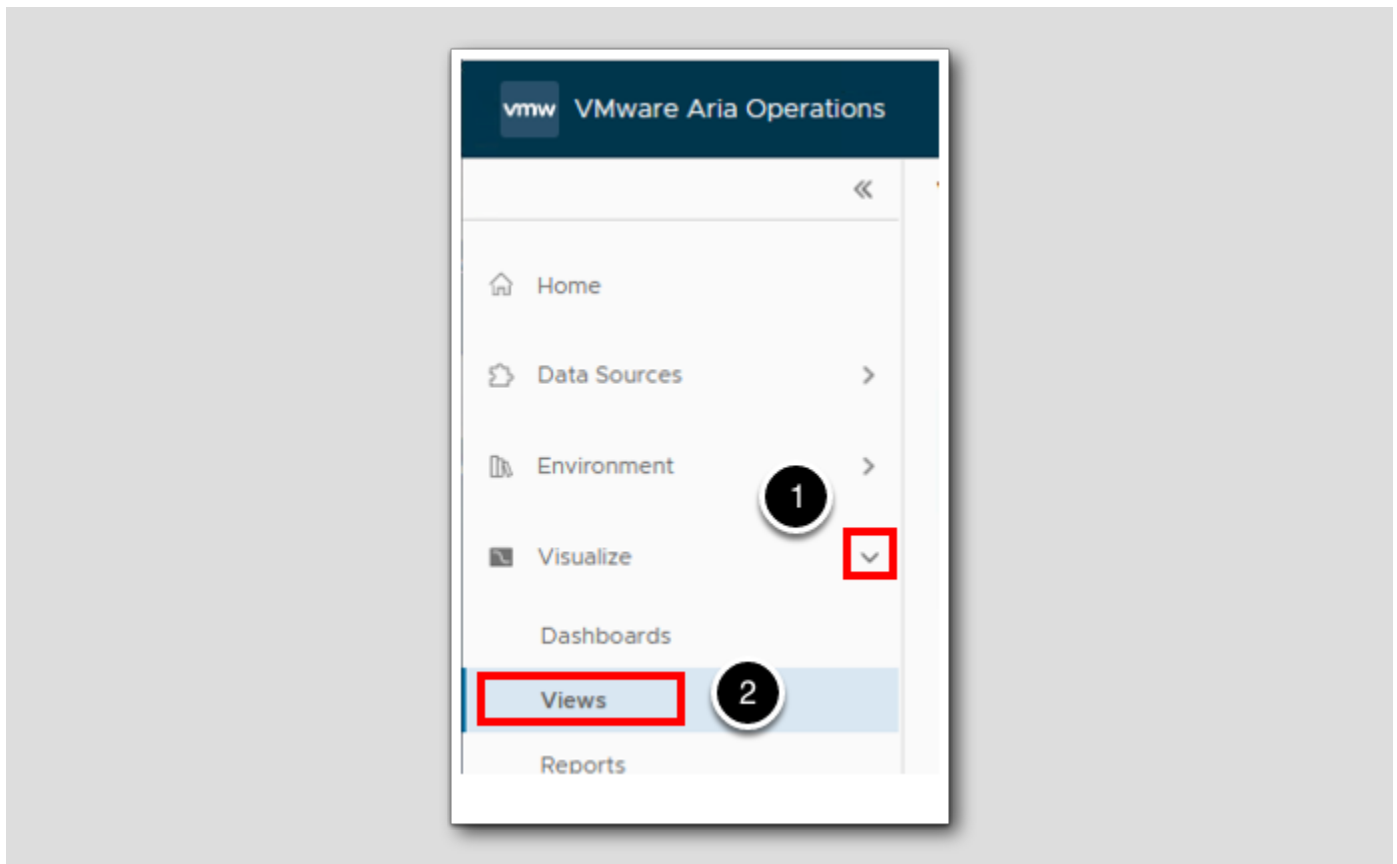
[359]

If you've completed the previous lessons in this module, we have created various views. In this lesson, we continue creating custom views with data transformation. With data transformation, we can represent the maximum value as well as expressions to show datacenter VM growth.

1. Notice in the Preview source: section that RegionA01 is pre-populated.

Go to Views

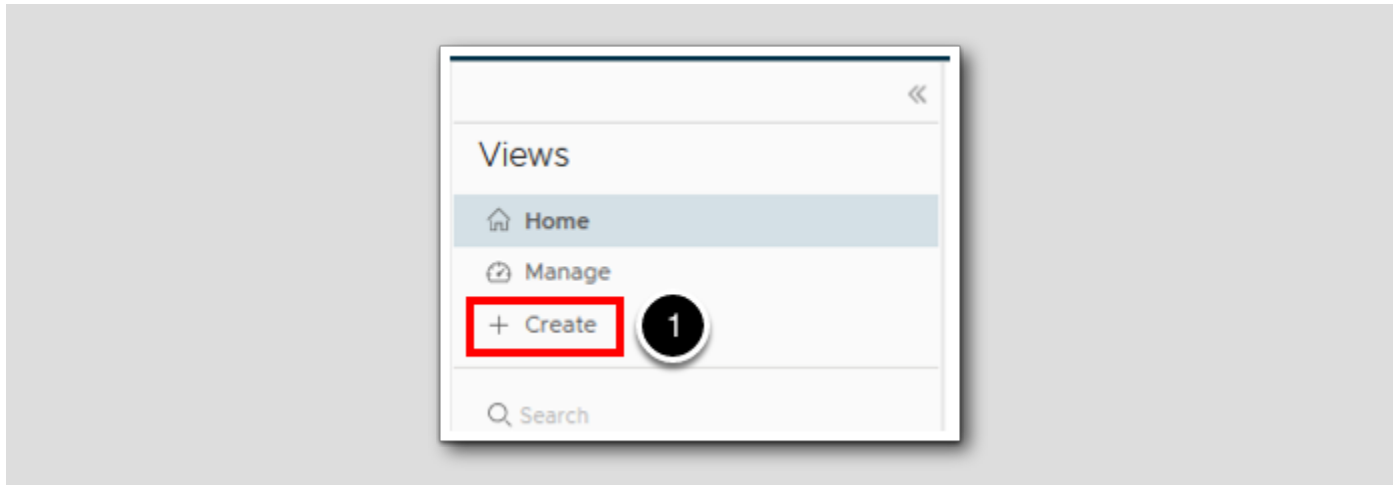
[360]



1. Expand Visualize.
2. Click on Views.

Create a New View

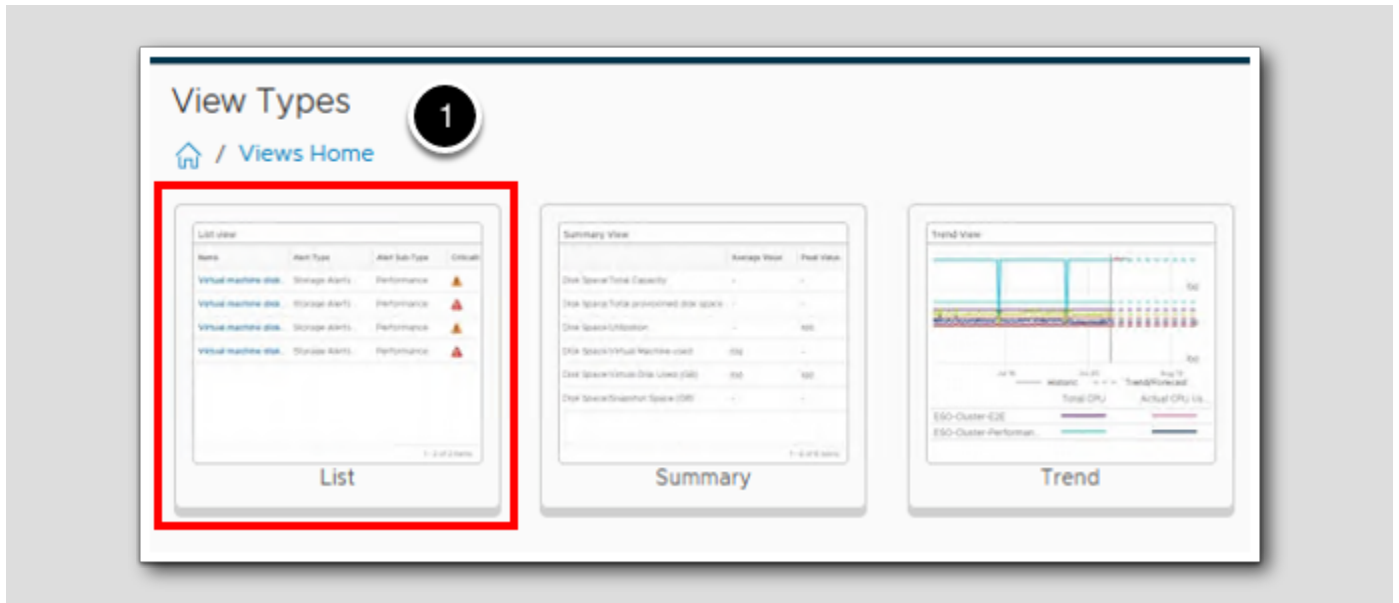
[361]



1. Click + Create.

Create a List View

[362]



1. Select List.

Add View Name

[363]

Create View

1 - Name & Configuration 2 - Data

Name VM Growth Detail 1

Description

> Settings

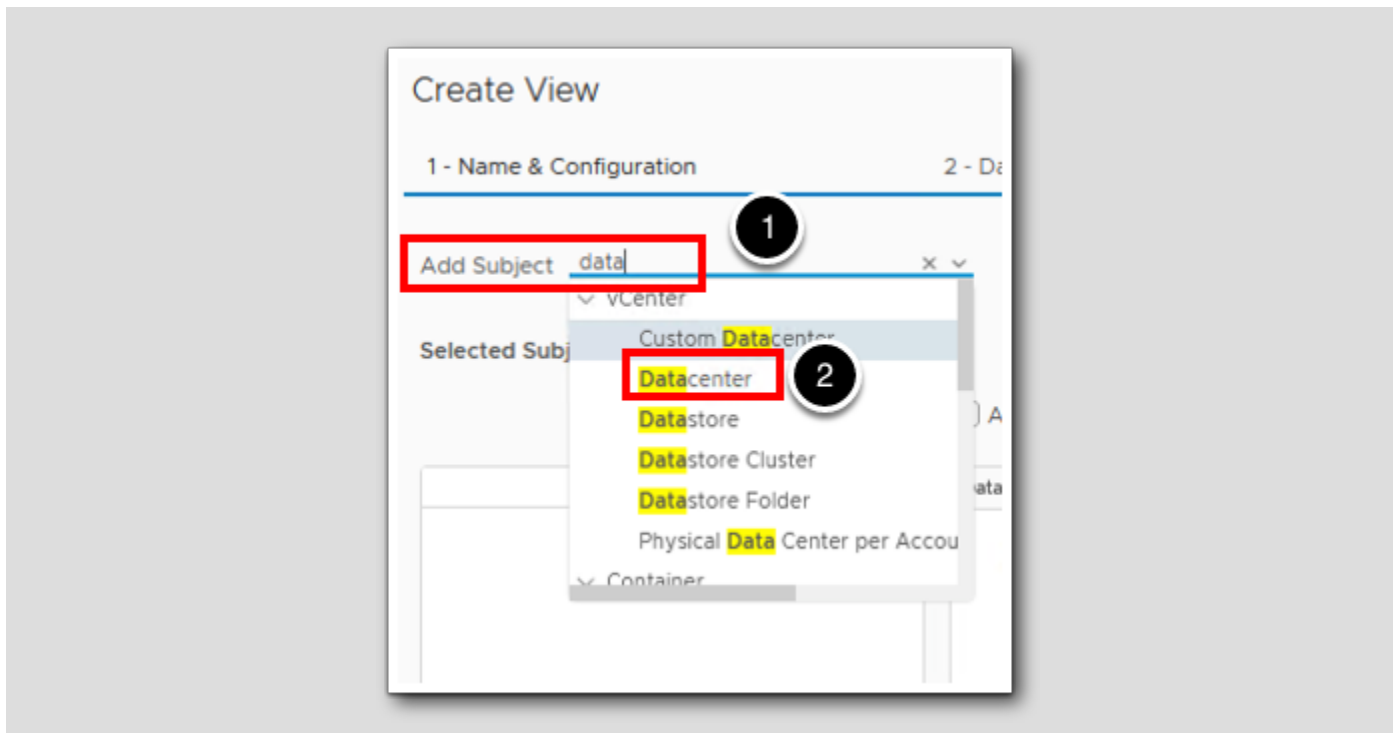
2

PREVIOUS NEXT CREATE CANCEL

1. Input the name: VM Growth Detail.
2. Select NEXT.

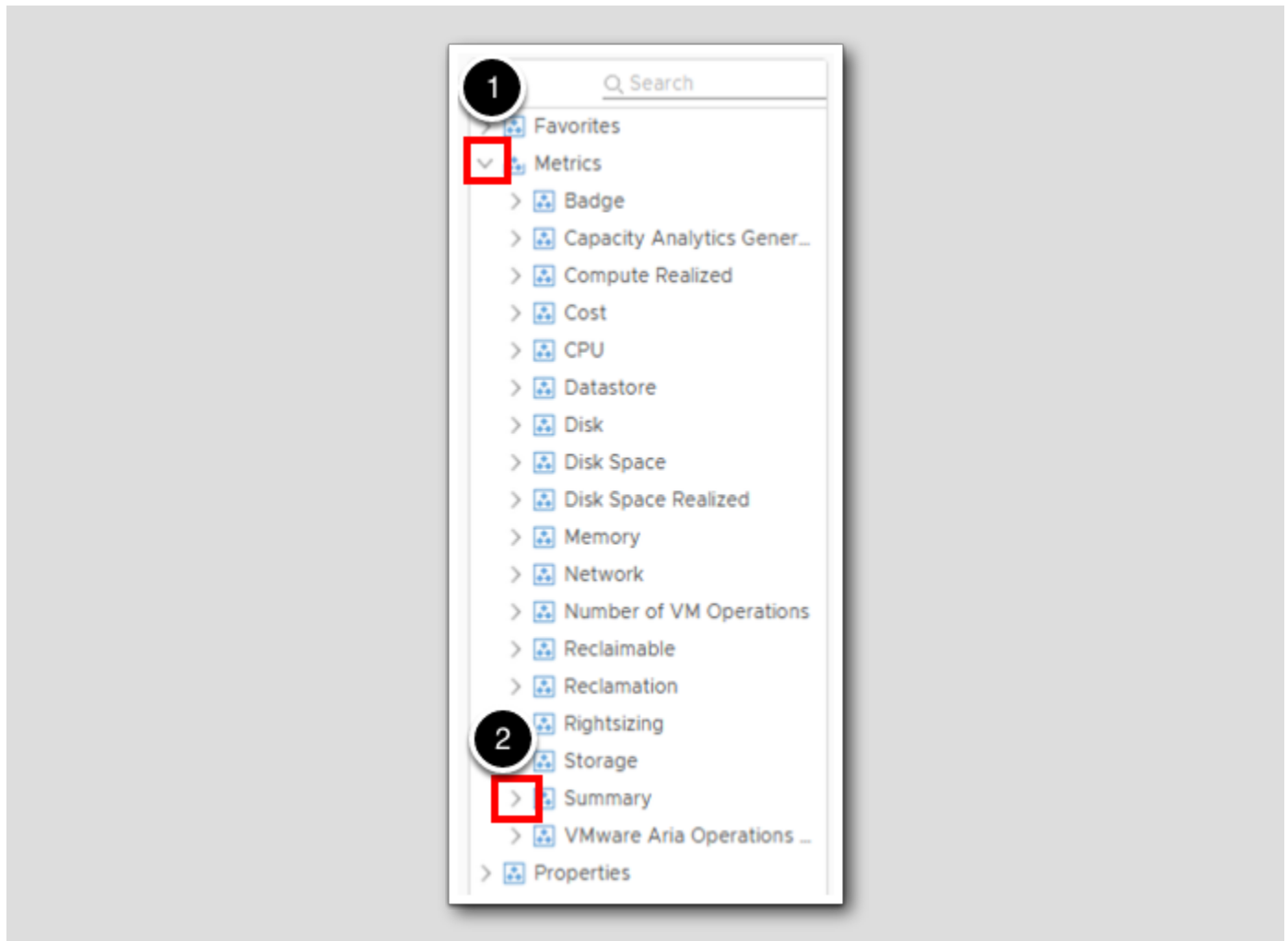
Add View Subject

[364]



1. Click in the subject input field and type "data".
2. Select the auto populated Datacenter.

Add Metrics to your View



1. Expand Metrics.
2. Expand Summary.

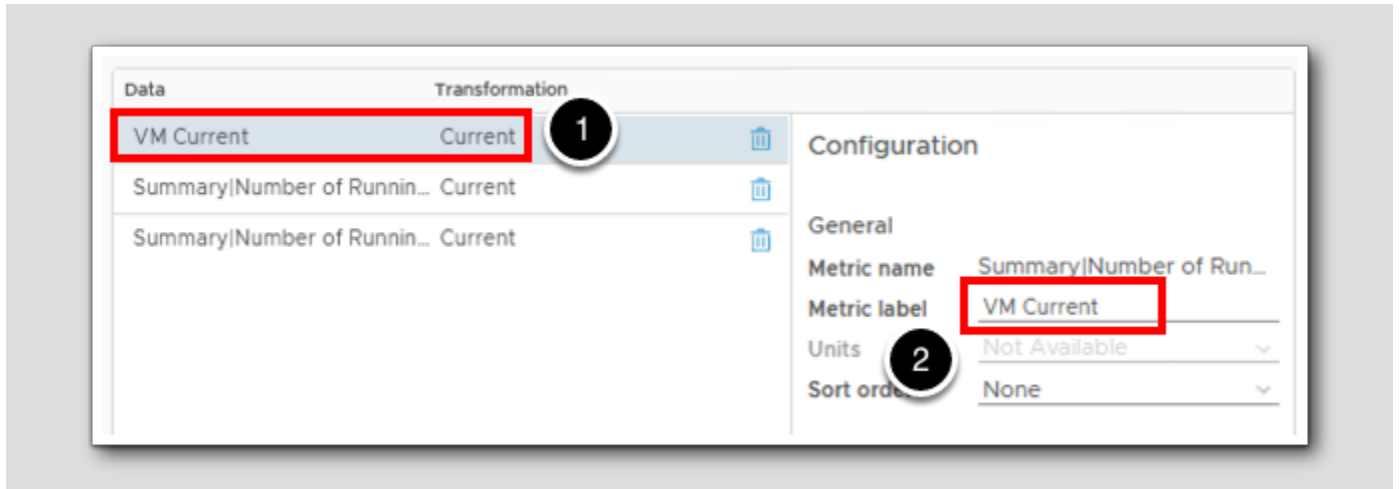
Add Data to your View

The screenshot shows the 'Create View' dialog in VMware vSphere. It is divided into three tabs: '1 - Name & Configuration', '2 - Data', and '3 - Time Setting'. The '2 - Data' tab is active. At the top, there are fields for 'Add Subject' (set to 'Select a subject') and 'Group by' (set to 'None'). Below that, the 'Selected Subject' is 'Datacenter'. There are checkboxes for 'Add interval breakdown' and 'Add instance breakdown', both of which are unchecked. The main area is split into two panes. The left pane has a search bar and a list of metrics under the 'Summary' category. The 'Number of Running VMs' metric is selected and circled with a '2'. A red box highlights the scroll bar. The right pane shows a table with columns 'Data' and 'Transformation'. Three rows are visible, each containing 'Summary|Number of Runnin... Current', and a '3' is circled next to the first row. A red box highlights the table rows. At the bottom, there are buttons for 'PREVIOUS', 'NEXT', 'CREATE', and 'CANCEL'.

1. Scroll down to see the item Number of Running VMs.
2. Double-click Number of Running VMs 3 times.
3. Afterwards, you should see 3 items in the window on the right.

Modify Current Number of VMs

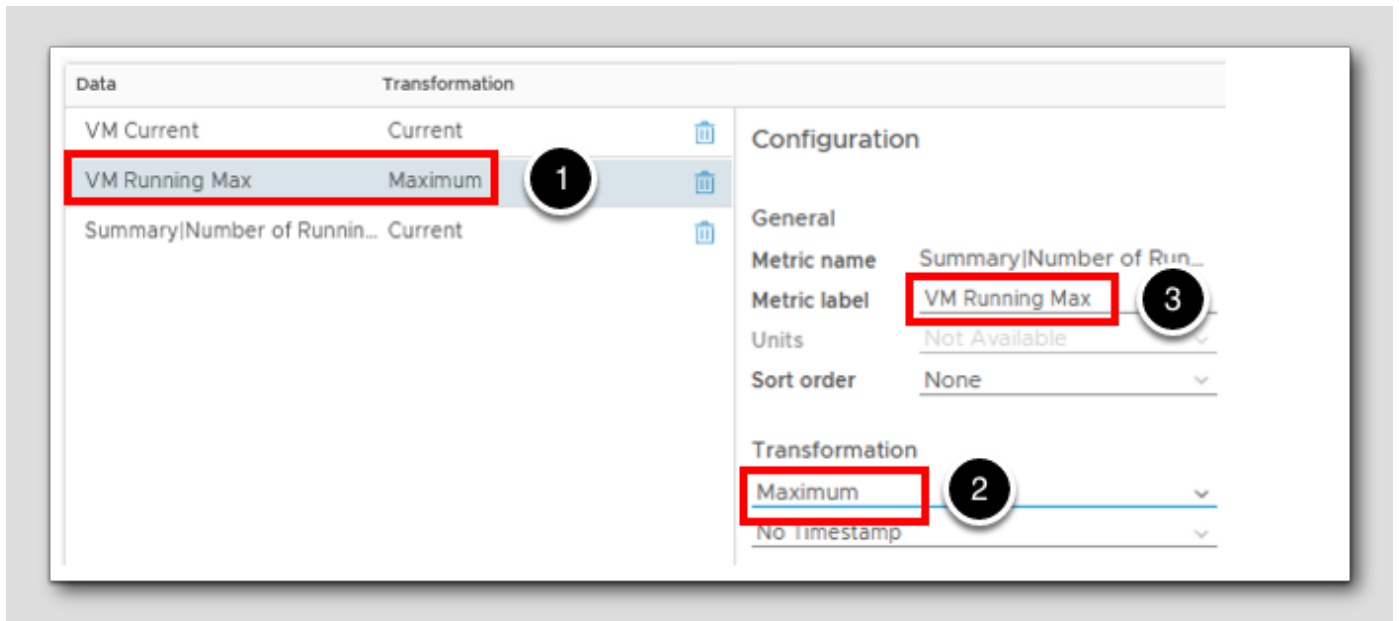
[367]



1. Select the 1st Number of Running VMs Metric.
2. In the Metric label field, Type VM Current as the label.

Add Max Transformation

[368]



1. Select the 2nd Number of Running VMs Metric.
2. In the Transformation field, select **Maximum** in the drop down list.
3. Type **VM Running Max** for the Metric Label.

Add Growth Transformation

[369]

The screenshot displays the configuration interface for a metric. On the left, a table lists data objects and their transformations:

Data	Transformation
VM Current	Current
VM Running Max	Maximum
VM Growth	Current

The 'VM Growth' row is highlighted with a red box and a circled '1'. On the right, the 'Configuration' panel shows the following settings:

- General**
- Metric name: Summary|Number of Run...
- Metric label**: VM Growth (highlighted with a red box and a circled '2')
- Units: Not available
- Sort order: No
- Transformation**
- Current
- No Timestamp

1. Select the 3rd Data object.
2. Name this data Object **VM Growth** in the Metric label field.

Add Growth Transformation Expression

Data	Transformation
VM Current	Current
VM Running Max	Maximum
VM Growth	Expression

Configuration

General

Metric name: Summary|Number of Run...

Metric label: VM Growth

Units: No unit

Sort order: None

Transformation

Expression

Expression Formula (All calculations are based on the base unit)

(((last-first)/first)*100)

Show advanced settings

For this datapoint we are adding our own expression for growth. To show growth of VM's per datacenter we will use this expression: $(((last-first)/first)*100)$. This will give use the percentage of growth in VM for the time period of this view.

1. Change the Transformation field type from current to Expression.
2. Add the expression $(((last-first)/first)*100)$
3. Optional: If you have many datacenters you can select to sort the list by growth - ascending or descending.

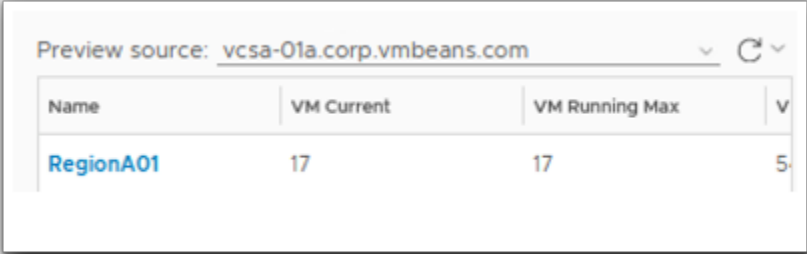
Preview Source Test

[37]

Name	VM Current	VM Running Max	VM
RegionA01	17	17	5

Preview Data

[372]

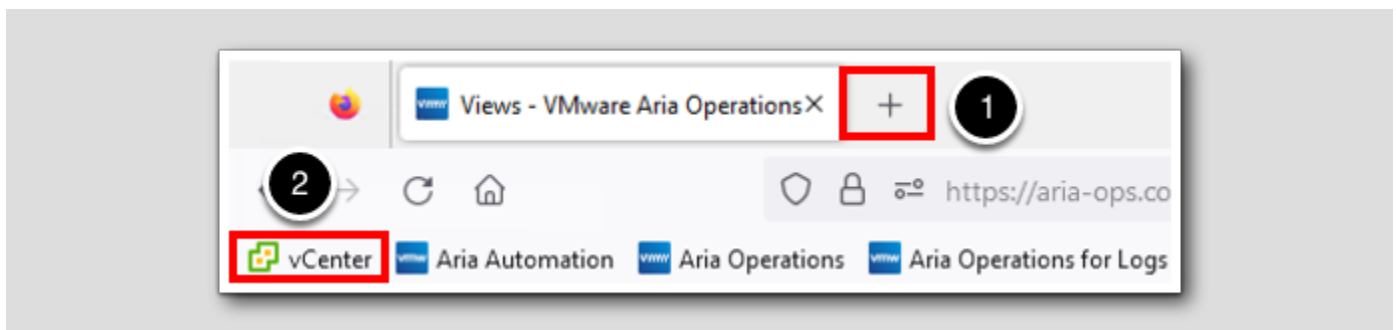


Name	VM Current	VM Running Max	
RegionA01	17	17	5

When we look at the preview data, it is always best to ensure the view is working correctly, and it is the right data we want to represent. Notice that the VM current and Max are the same, and we have no VM growth. Now we will make a change in the environment to make our new expression work!

Open vCenter in a new tab

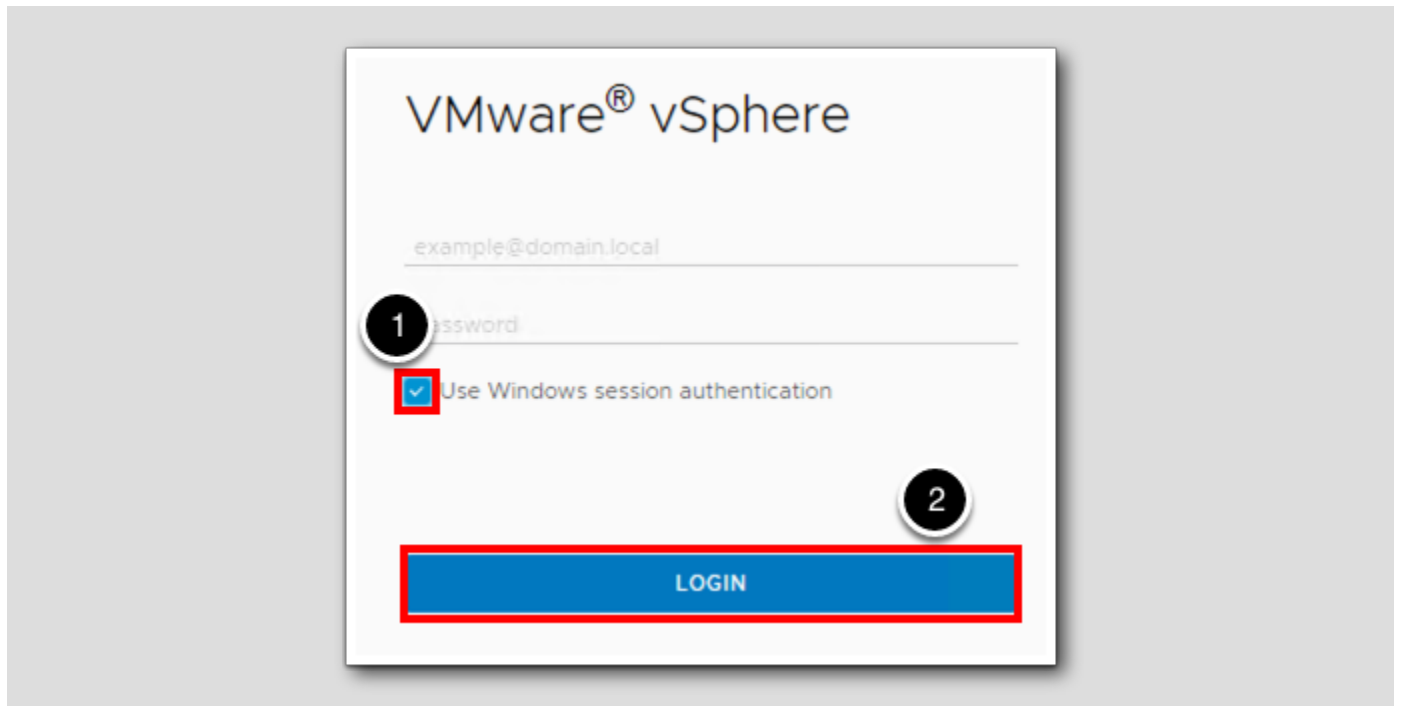
[373]



1. Select a new Tab to open a new Chrome tab.
2. Click on the vSphere Client button in the bookmarks bar.

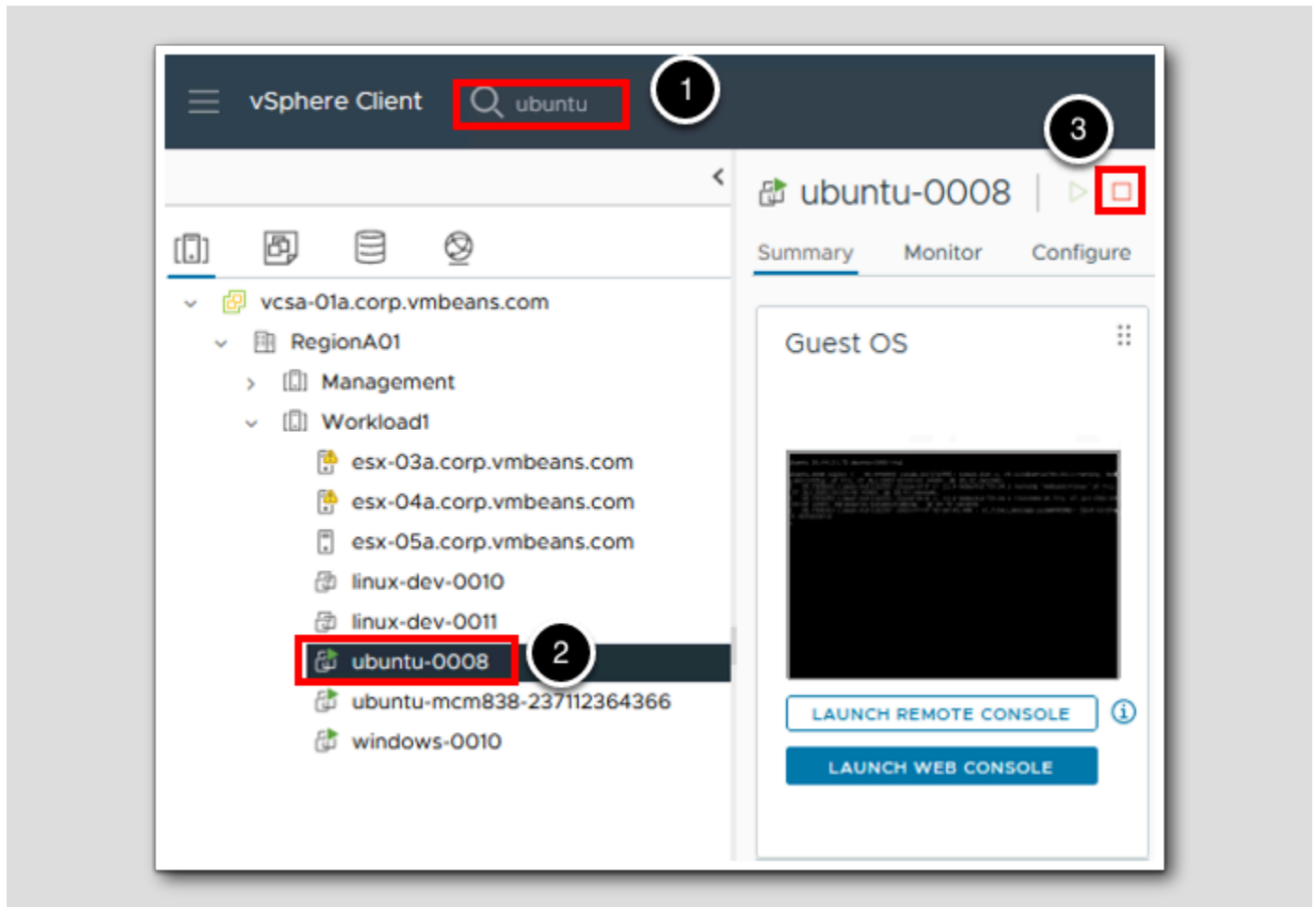
Log into vCenter

[374]



1. Select Use Windows session authentication.
2. Select Login.

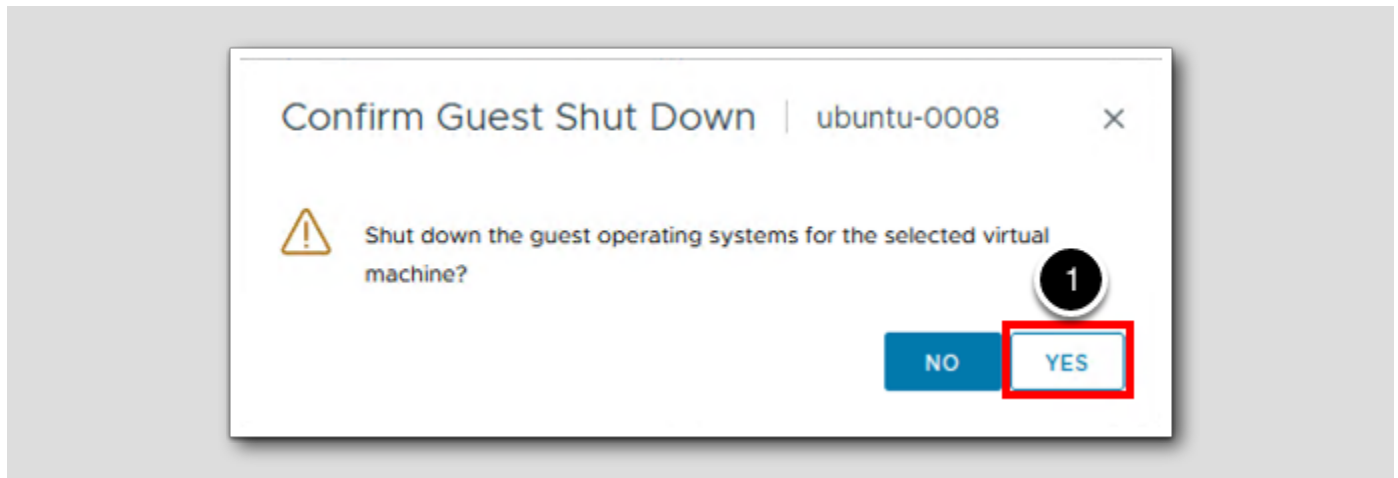
Power Off VM



1. In the search bar type ubuntu.
2. Select the ubuntu-0008 VM.
3. Select Shut Down Guest OS.

Confirm Power Off

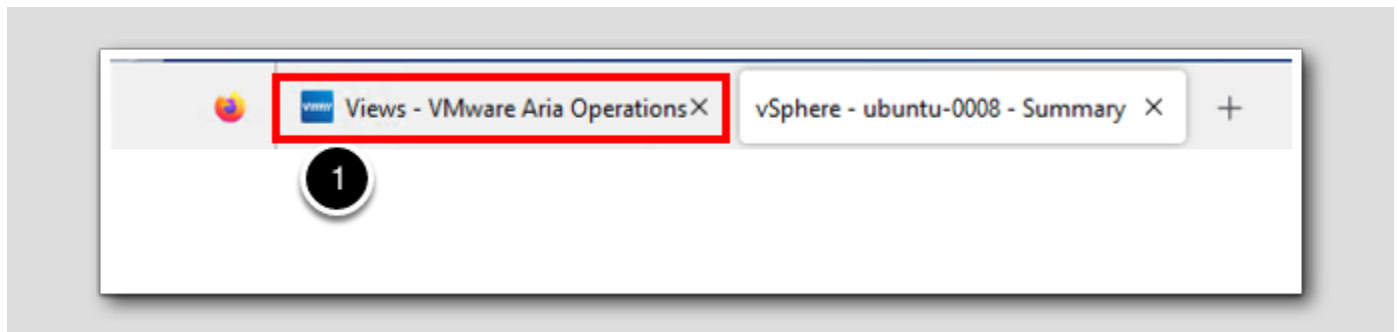
[376]



1. Select YES to power off the VM.

Switch back to vRealize Operations

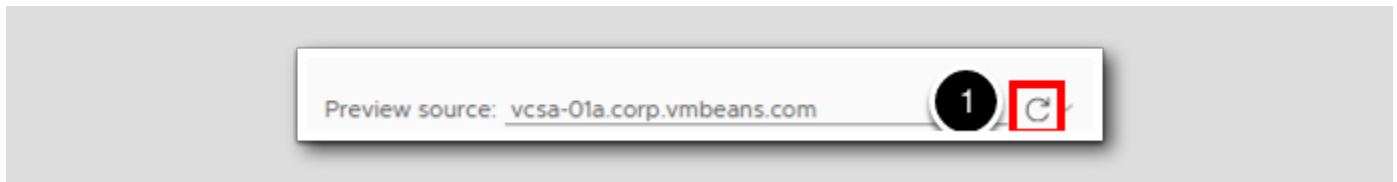
[377]



1. Select the Views - VMware Aria Operations Tab to return to Aria Operations.

Refresh the View

[378]



1. Select the **refresh** button to preview the source again.

Note - this may take 1-2 minutes for the next collection cycle to refresh content.

Preview Final Data

[379]

Preview source: vcsa-01a.corp.vmbeans.com

Name	VM Current	VM Running Max	VM
RegionA01	16	17	4

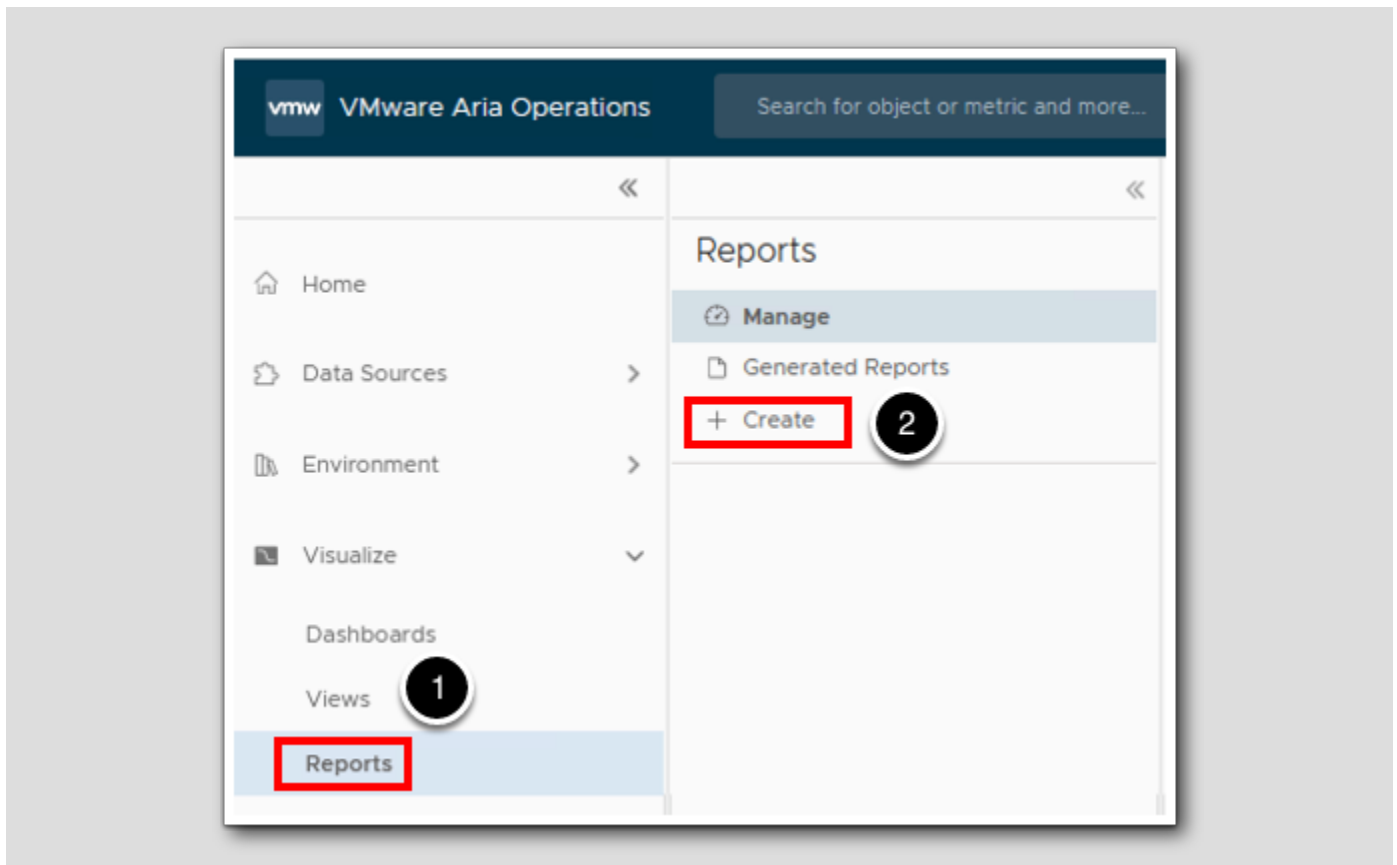
1

CREATE 2 CEL

1. Now we can see that the amount of VM's running has decreased from the max value and the VM Growth has also decreased.
2. If you are comfortable with the data, click CREATE.

Make a Growth List Report

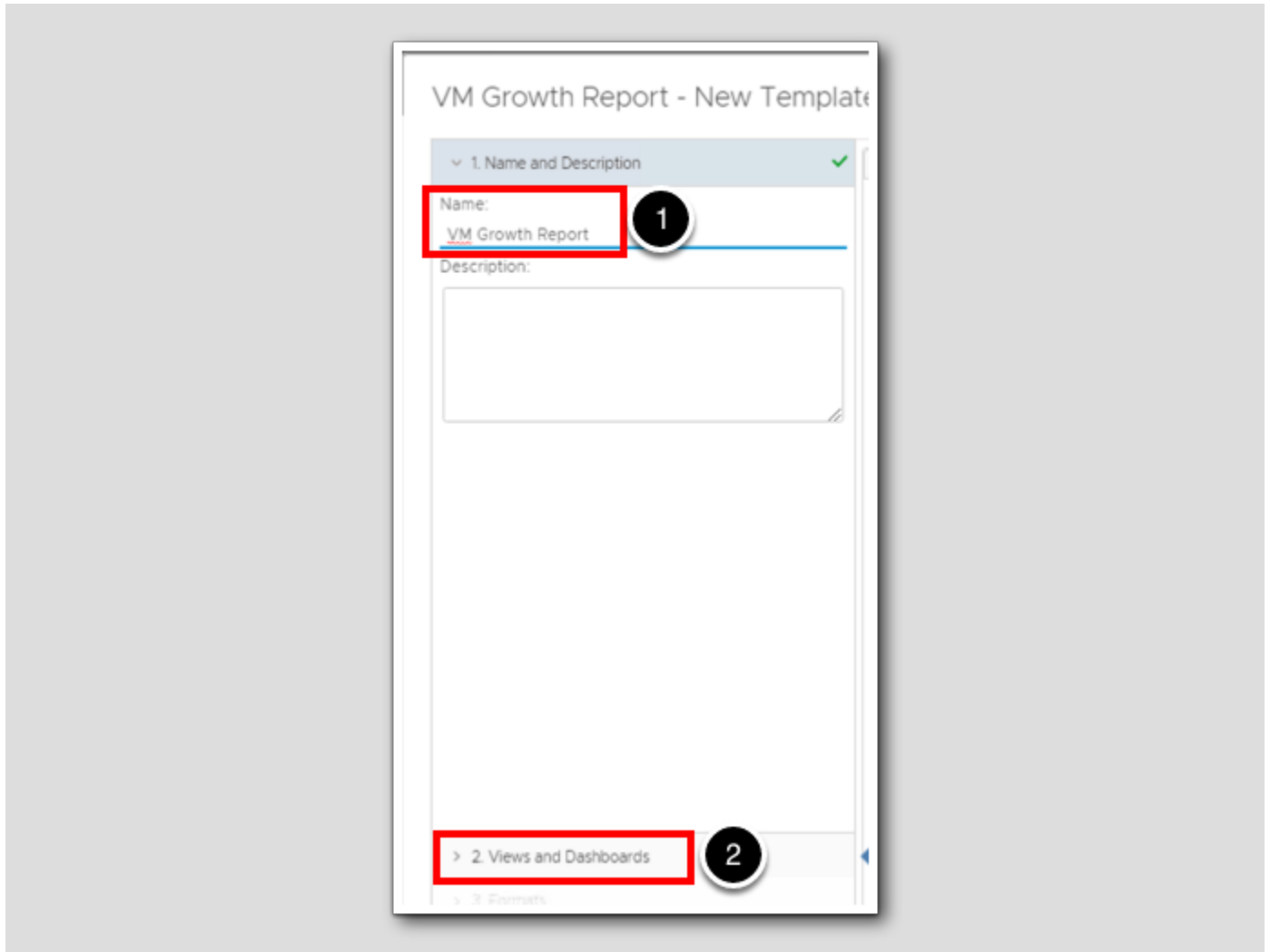
[380]



1. Click Reports.
2. Then select + Create to create a new report.

Name the Report

[381]



1. Name the Report VM Growth Report.
2. Select 2. Views and Dashboard.

Add the VM Growth Detail view to the report

VM Growth Report - New Template

1. Name and Description

2. Views and Dashboards

Data type: Views

1 vm growth

Capacity | Cluster VM Growth

Capacity | Datastore VM growth

Capacity | vSphere World VM Growth

Cluster VM Growth Trend View

Datacenter VM Growth Trend View

Trend of VM Growth

vCenter VM Growth Trend View

2 VM Growth Detail

vSphere World VM Growth Trend View

1 - 9 of 9 items

3. Formats

4. Layout Options

Views and Dashboards in the report (sample data)

VM Growth Detail Colorization

	VM Current	VM Running Max	VM Growth
Datacenter 1	Value 1	Value 1	Value 1
Datacenter 2	Value 2	Value 2	Value 2
Datacenter 3	Value 3	Value 3	Value 3
Datacenter 4	Value 4	Value 4	Value 4
Datacenter 5	Value 5	Value 5	Value 5

1 - 15 of 15 items

Click to expand and select report components.

3

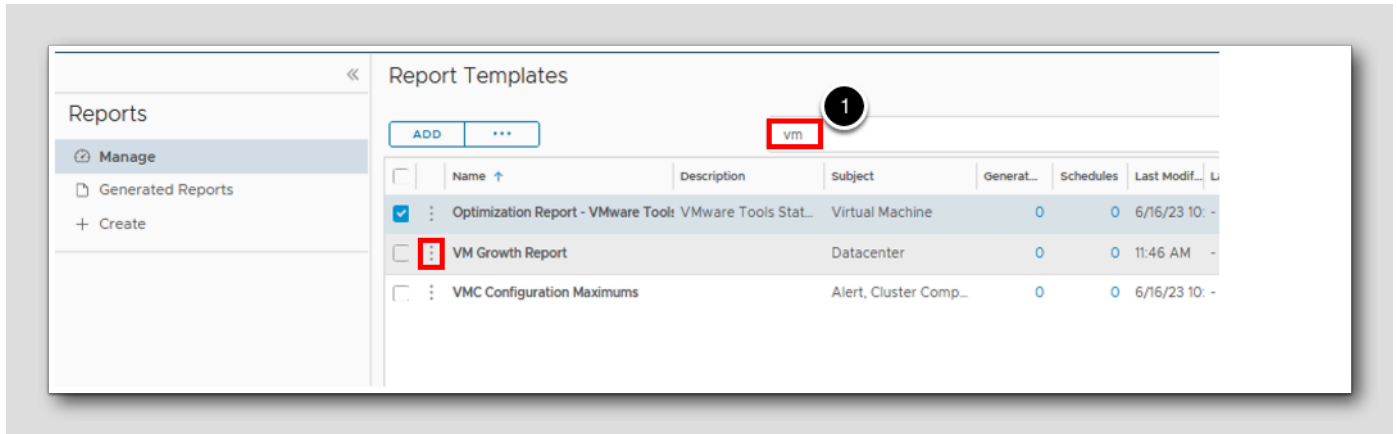
CANCEL SAVE

Getting Started - Select Views and Dashboards

1. Click in the Filter area, and type VM Growth and press Enter.
2. Select the VM Growth Detail View and drag it to the right.
3. Select SAVE.

Locate the Newly Created Report

[383]

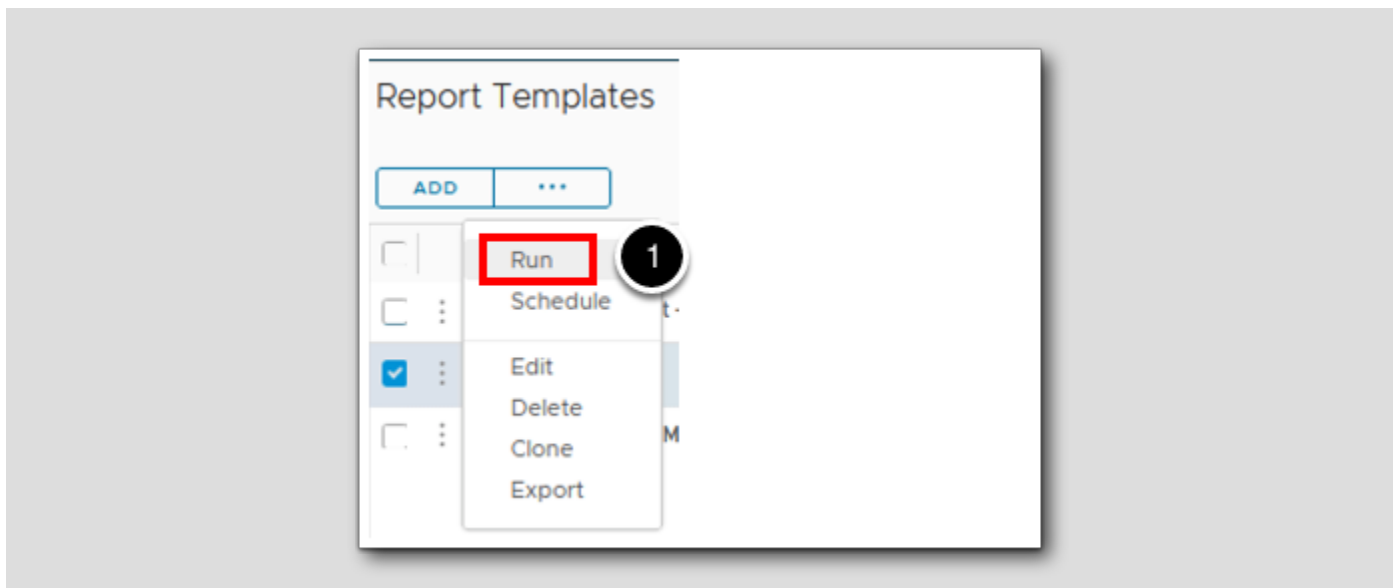


You will now see the list of Reports that have been created in vRealize Operations.

1. In the Quick Filter, type `vm` and then hit **Enter** to filter the list.
2. On the VM Growth Report, click the 3 dots beside the checkbox to open the actions menu.

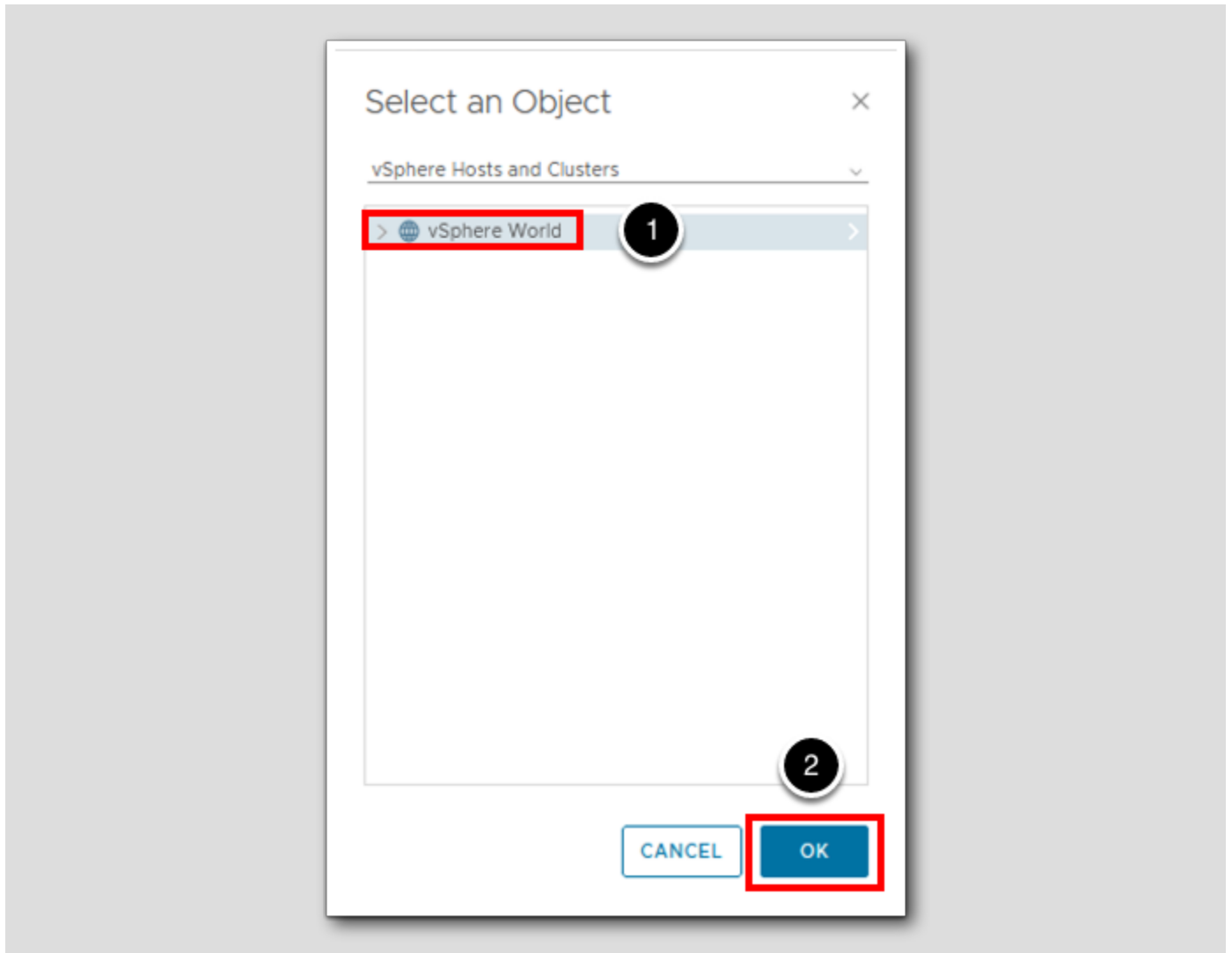
Run the Report

[384]



1. Select **Run** to run the Growth Report.

Select Object to run the report

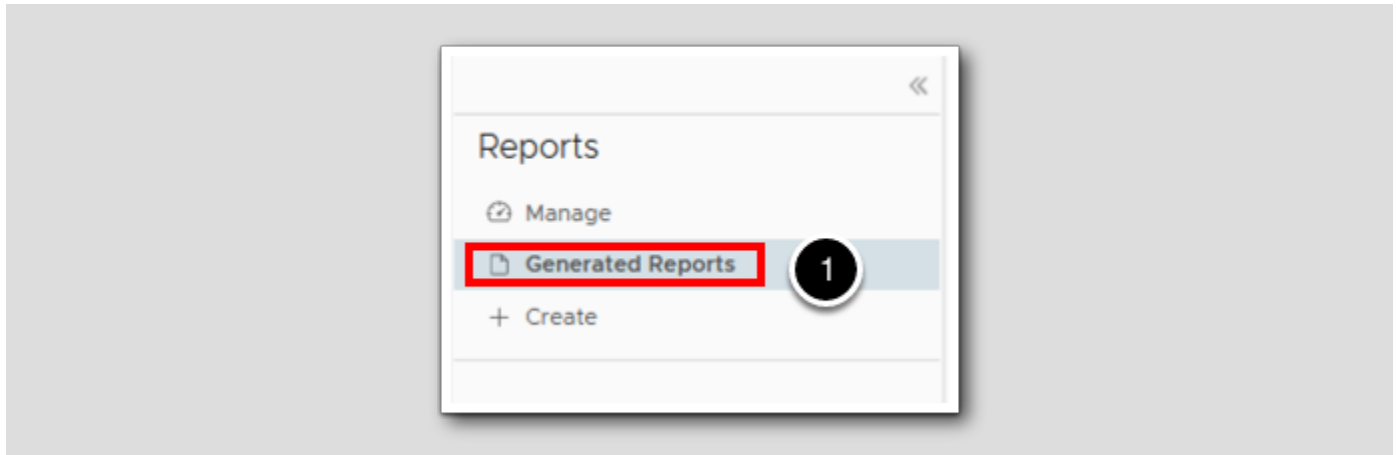


1. Select vSphere World.

2. Click OK.

View the Report

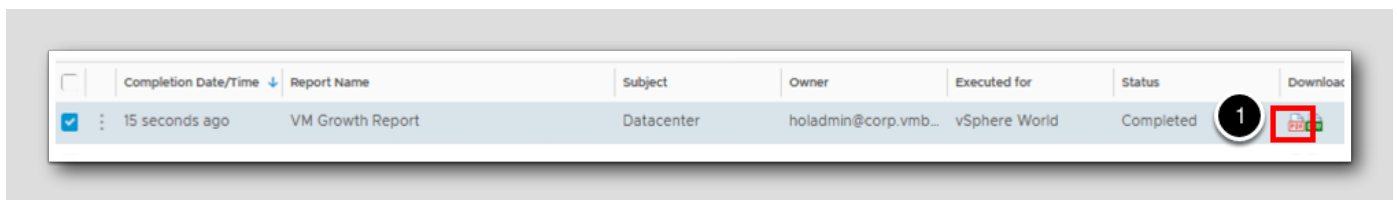
[386]



1. Select Generated Reports.

PDF or CSV

[387]



1. We have the option to download the report in either PDF or CSV format, for this exercise select the **red** PDF icon (note you may have to wait a moment for the report to finish).

Review the Report

[388]

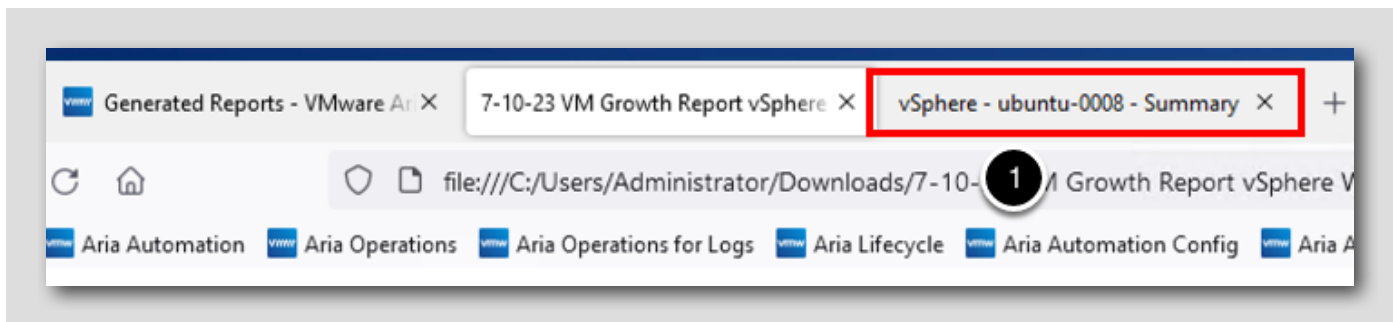
1. VM Growth Detail
Jul 03, 2023 11:52 AM - Jul 10, 2023 11:52 AM (GMT-07:00)

Name	VM Current	VM Running Max	VM Growth
RegionA01	15	17	36.36

The report should automatically open a new browser tab and default to it. Now we have a report that includes detail about the growth of VM's in each DataCenter. We can send this to leadership to identify the growth trends each month, each week, or every day!

Switch Back to vCenter

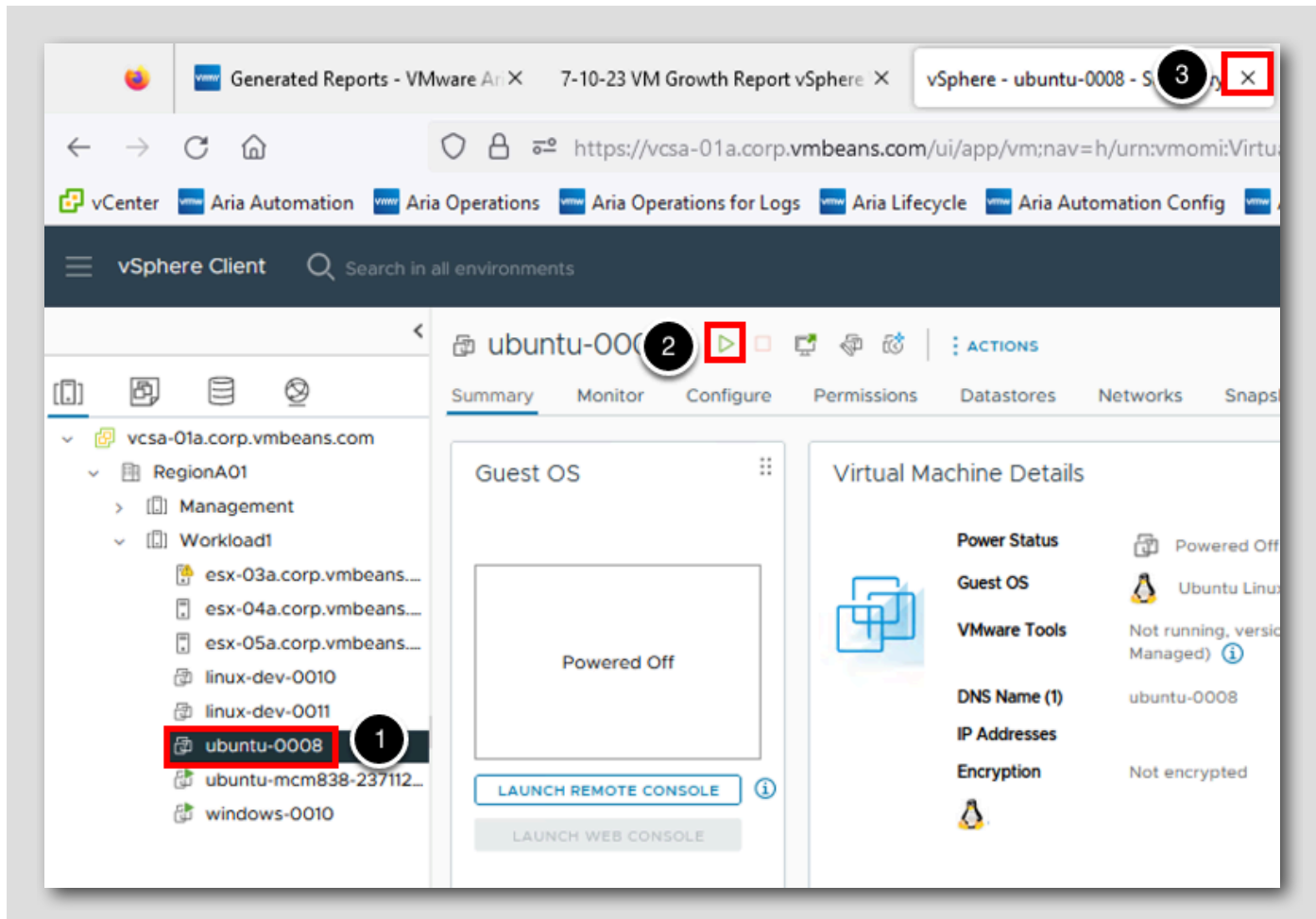
[389]



1. Return to the vCenter by clicking back to the open vCenter Tab. If you closed this tab, you will need to open a new tab and log back into vCenter.

Start the ubuntu-0008 VM

[390]



Let's restart the ubuntu-0008 VM that we shutdown earlier because this VM will be needed in future lessons.

1. Click on the VM `ubuntu-0008`.
2. Click the green **Start** icon to restart this VM (or right-click and select Power On).
3. You may now click the x on the vCenter tab to close it.

Lesson End

[391]

This concludes the Create a View that shows VM Growth Lesson.

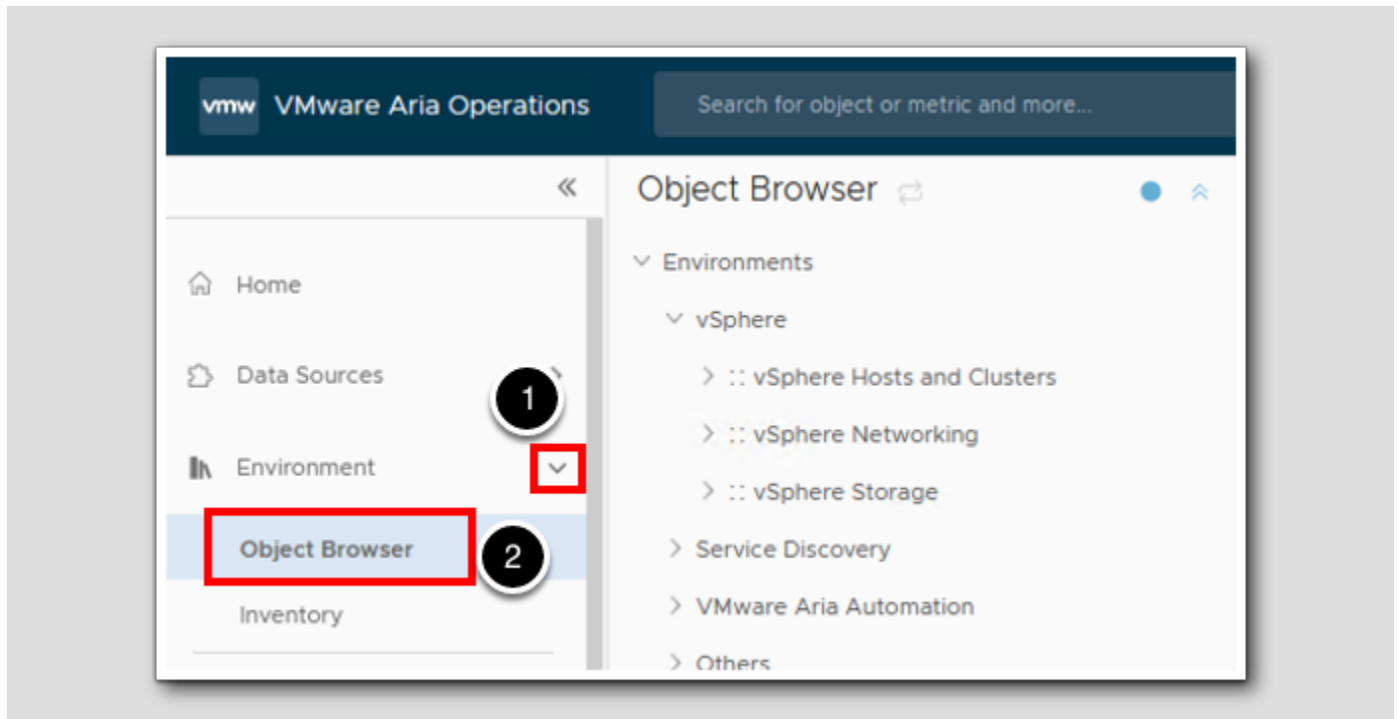
Create a View with Distribution Data

[392]

If you've completed the previous lessons in this module, we have created various views. In this lesson, we continue creating custom views with the Distribution view. The distribution view gives us the ability to create pie charts based on data from selected object type.

Go to Environment

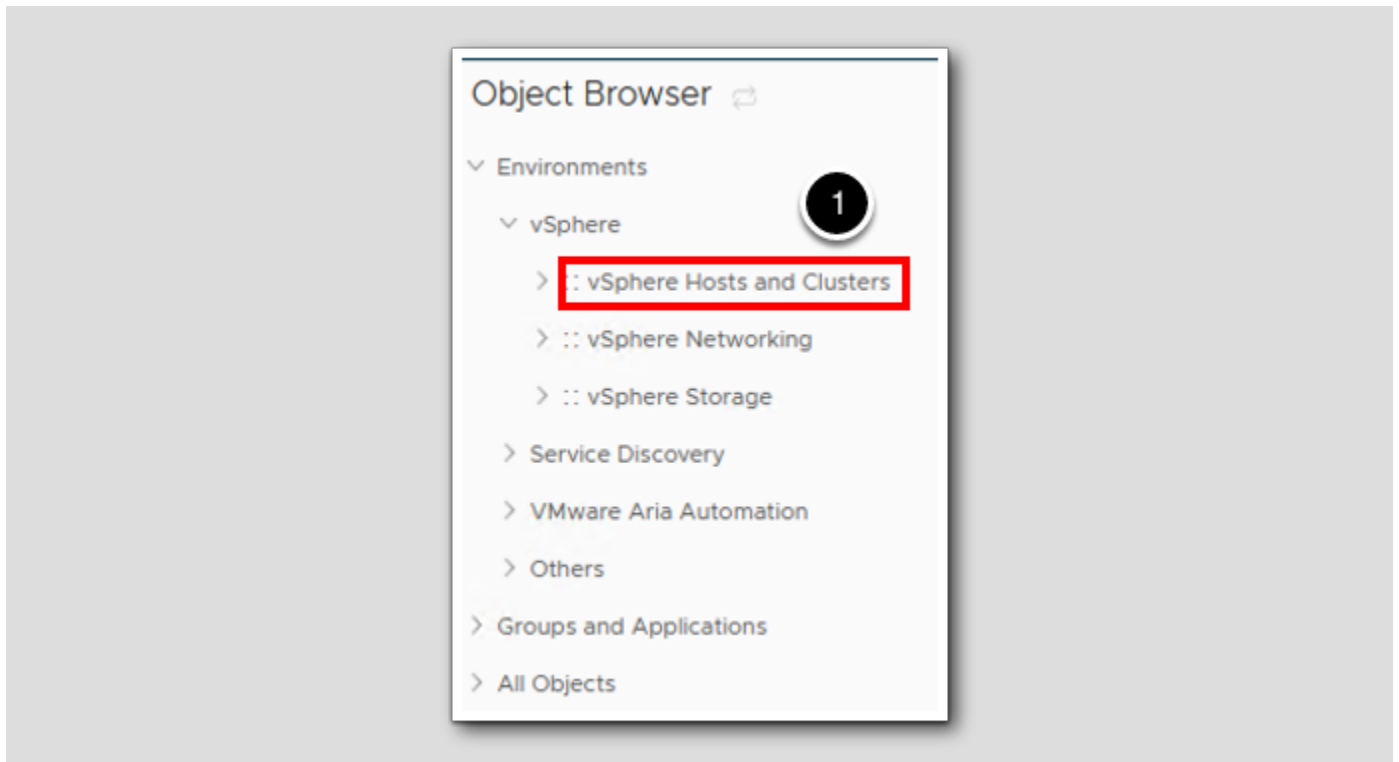
[393]



1. Expand Environment.
2. Click on Object Browser.

Hosts and Clusters

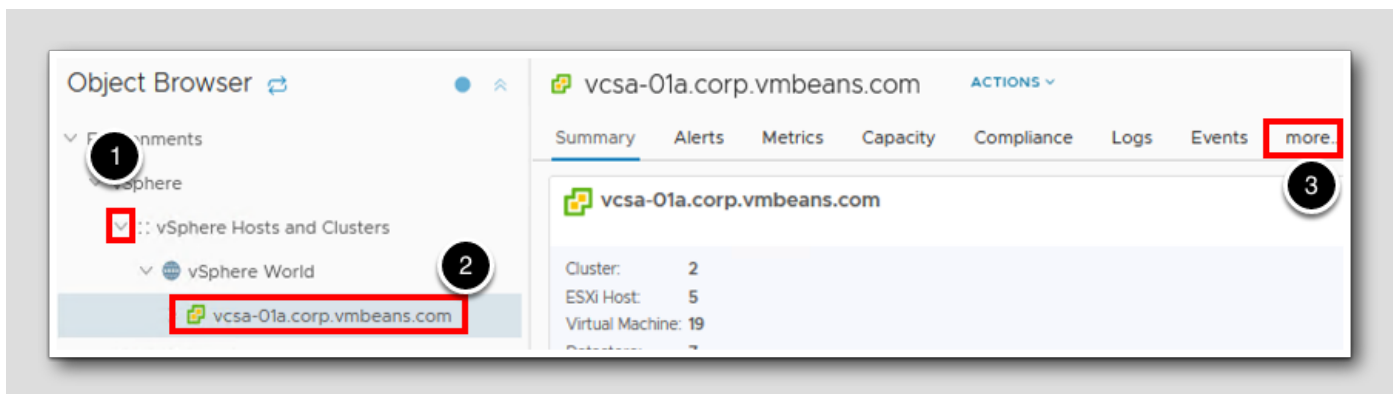
[394]



1. Click on vSphere Hosts and Clusters.

Select a vCenter Server

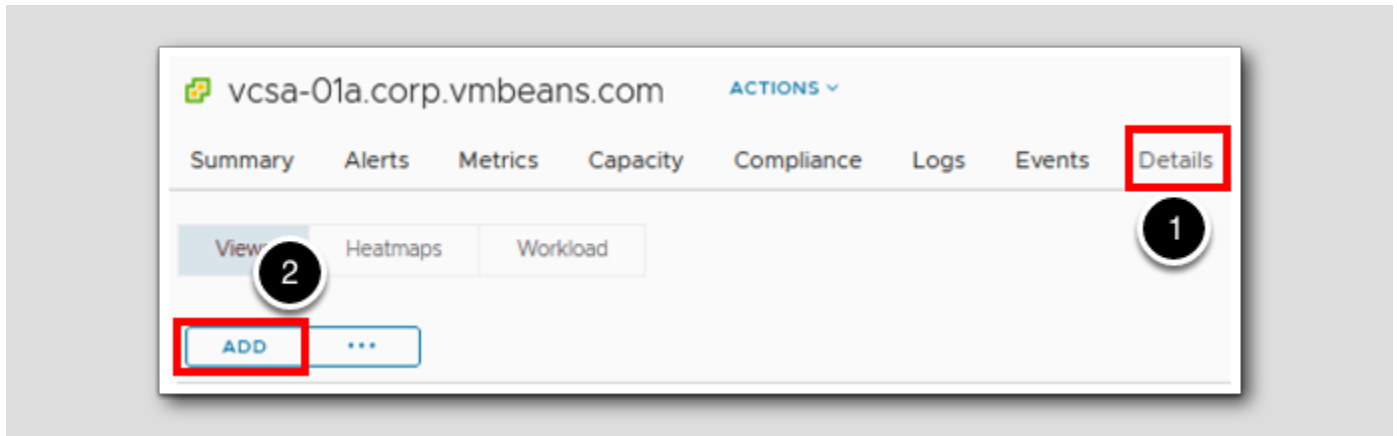
[395]



1. Expand vSphere World by clicking the chevron to the left of the text.
2. Select vCenter Server `vcasa-01a.corp.vmbeans.com`.
3. Click on more...

Create a View

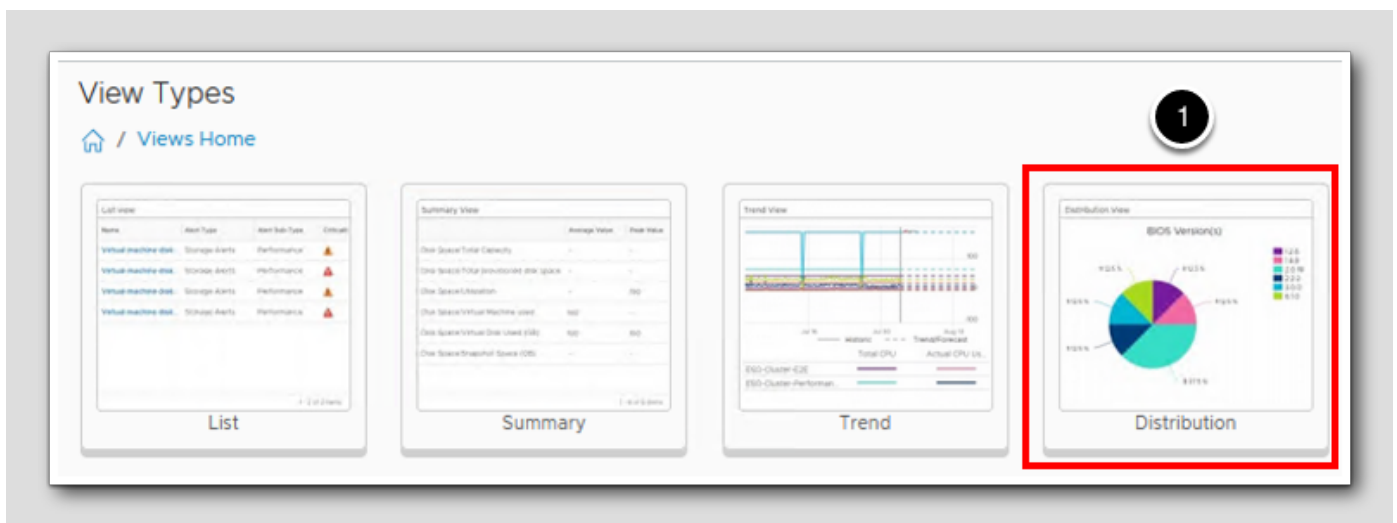
[396]



1. Click on Details.
2. Click ADD to create a new view.

View Type

[397]



Click **Distribution** as the view type.

Enter the View name

[398]

Create View

1 - Name & Configuration 2 - I

Name Demo - Distribution View 1

Description

Configuration

Visualization Pie chart v

Coloring

Colorize

Select color

Distribution Type

Dynamic distribution

Manual distribution

2 Discrete distribution

Summary

Settings

3

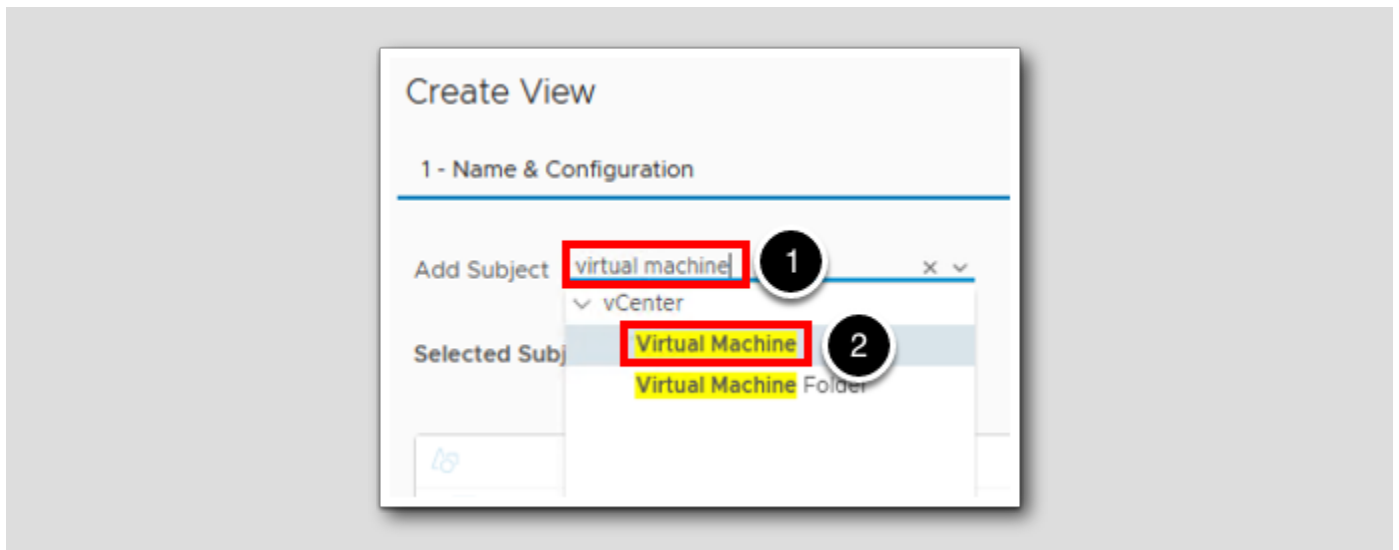
PREVIOUS NEXT CREATE CANCEL

For this lesson we will use a **Discrete distribution** which allows us to specify the number of buckets in which VMware Aria Operations distributes the data. If you increase the number of buckets, you can see more detailed data

1. Enter the view name **Demo - Distribution View**.
2. Click **Discrete distribution**.
3. Click **NEXT**.

Add Virtual Machines as the subject

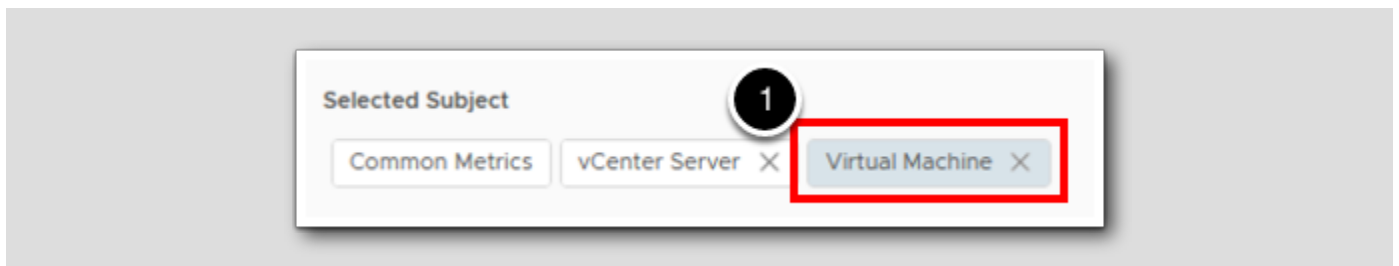
[399]



1. In the **Add Subject** line, start typing **virtual machine**.
2. Click **Virtual Machine** when it auto populates below.

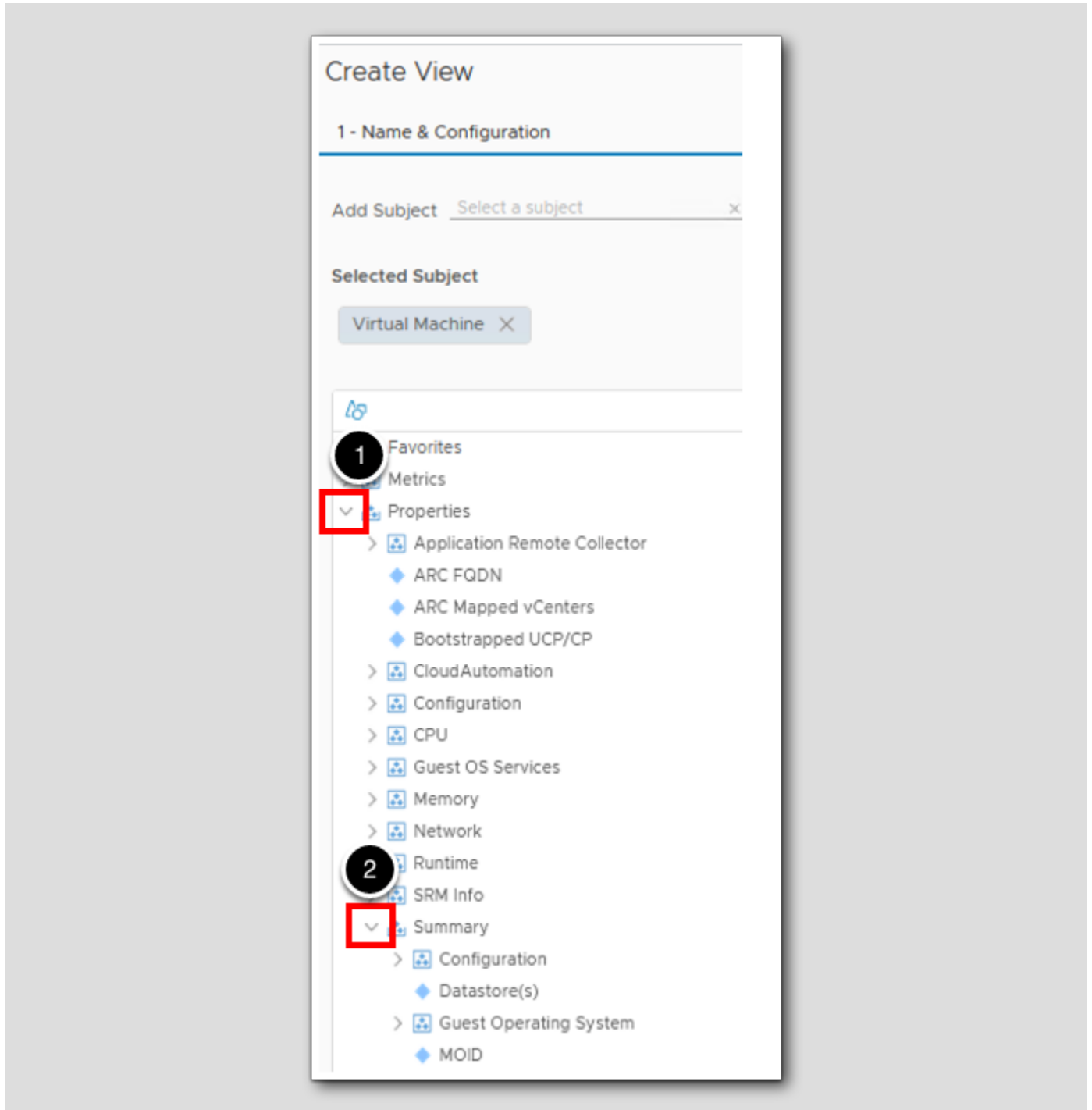
Select Virtual Machine as the Subject

[400]



1. Select Virtual Machine.

Select Properties

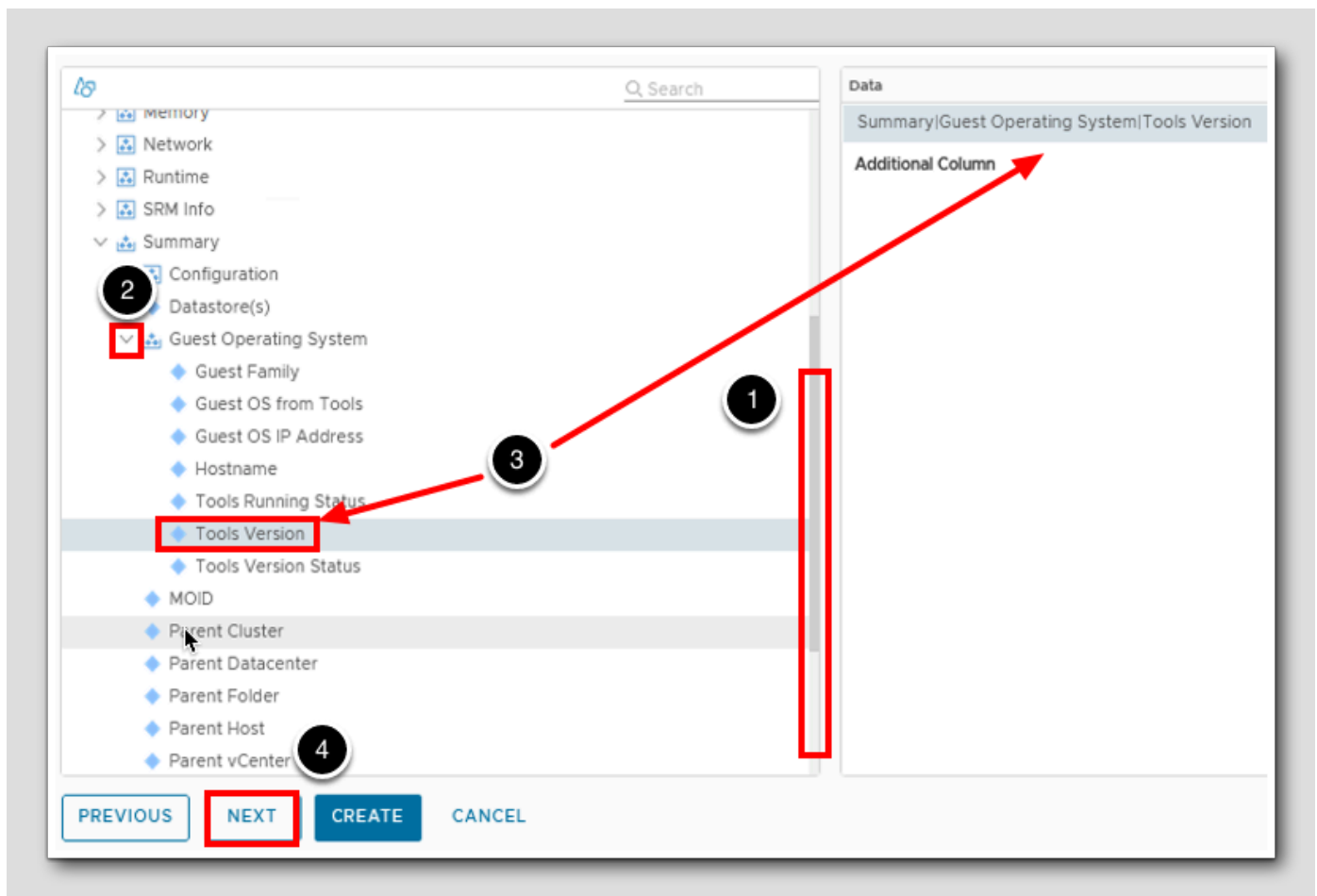


This time we will be selecting from the Properties list.

1. Expand Properties.
2. Expand Summary.

Select a Property

[402]



1. Scroll down so we can see the Guest Operation System Item under the Summary group.
2. Expand Guest Operating System.
3. Double-click on Tools Version to add it to the Data list on the right side of this window.
4. Click NEXT.

Time Settings

[403]

Create View

1 - Name & Configuration

Time Range Mode: Basic Advanced

Current selected date range: From Jun 1

Relative Date Range

Last Days

Specific Date Range

Start on: _____

Absolute Date Range

Prior _____

1

2

PREVIOUS NEXT CREATE

1. Change **Relative Date Range** to Last 30 Days.
2. Click **NEXT**.

Filter

[404]

Create View

1 - Name & Configuration

Virtual Machine filter

Select the Object Type that matches all of

Metrics

[+](#) ADD ANOTHER CRITERIA SET

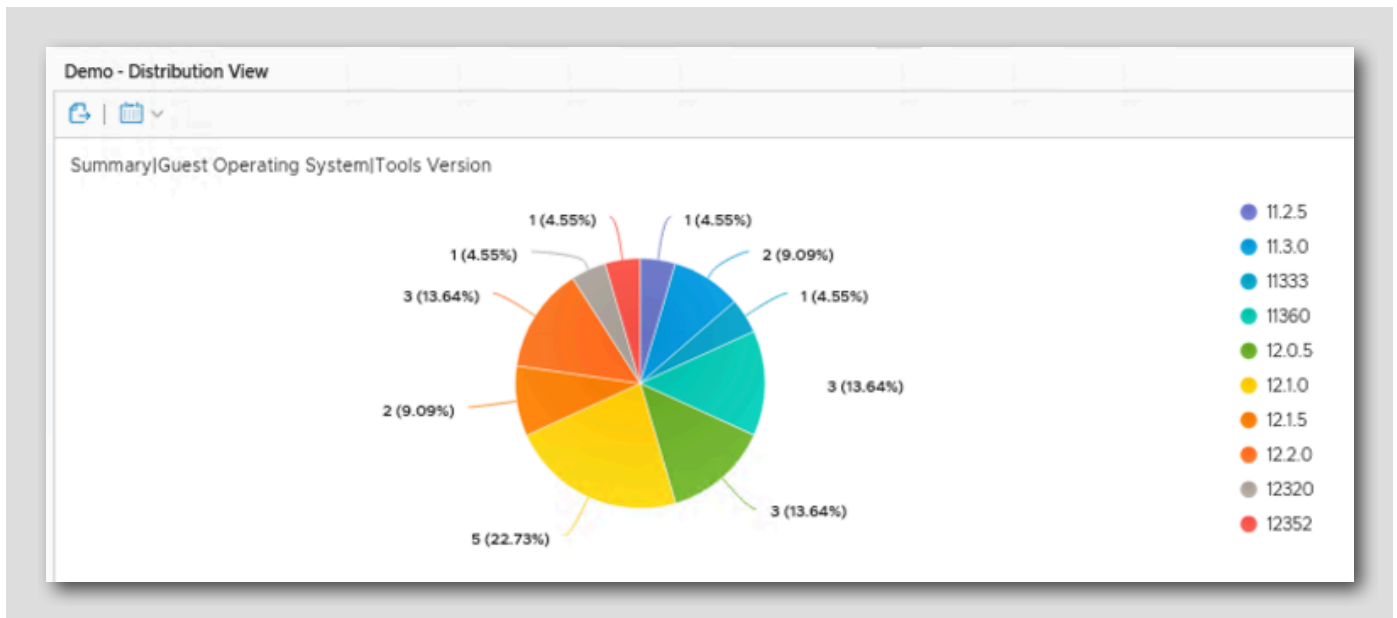
[PREVIOUS](#) [NEXT](#) [CREATE](#)

For this lesson we will not filter on any criteria

1. Click CREATE.

View Report Output

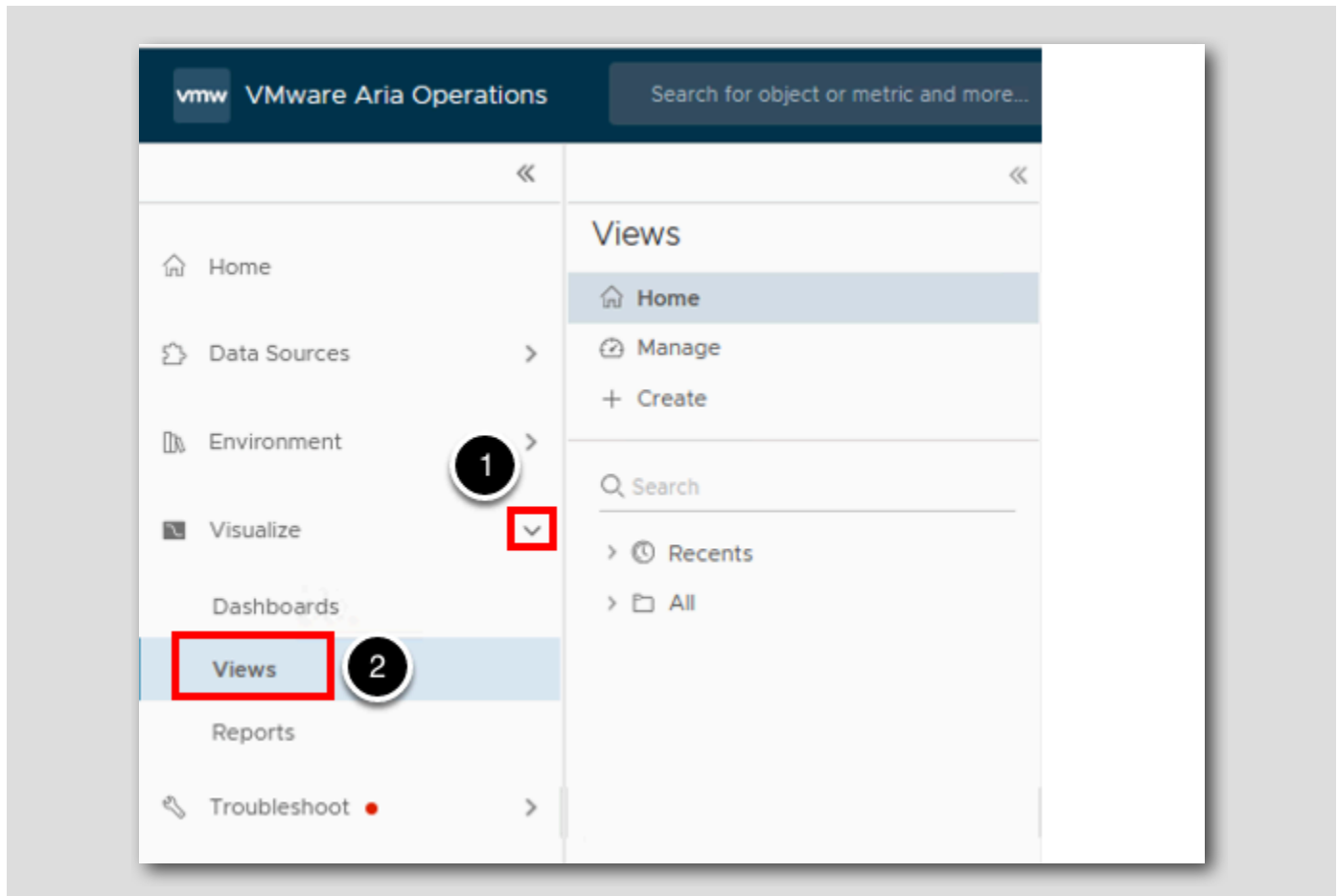
[405]



We can now see the results of our new View for the 'vcsa-01a.corp.vmbeans.com' vSphere environment that we selected in the beginning of this lesson. But what if we have multiple environments that we want to look at and inspect individually? To do that we can go to the main views page and then select the environment we want to use as the source to create this view. In the next steps, we'll walk through this.

Go to Views

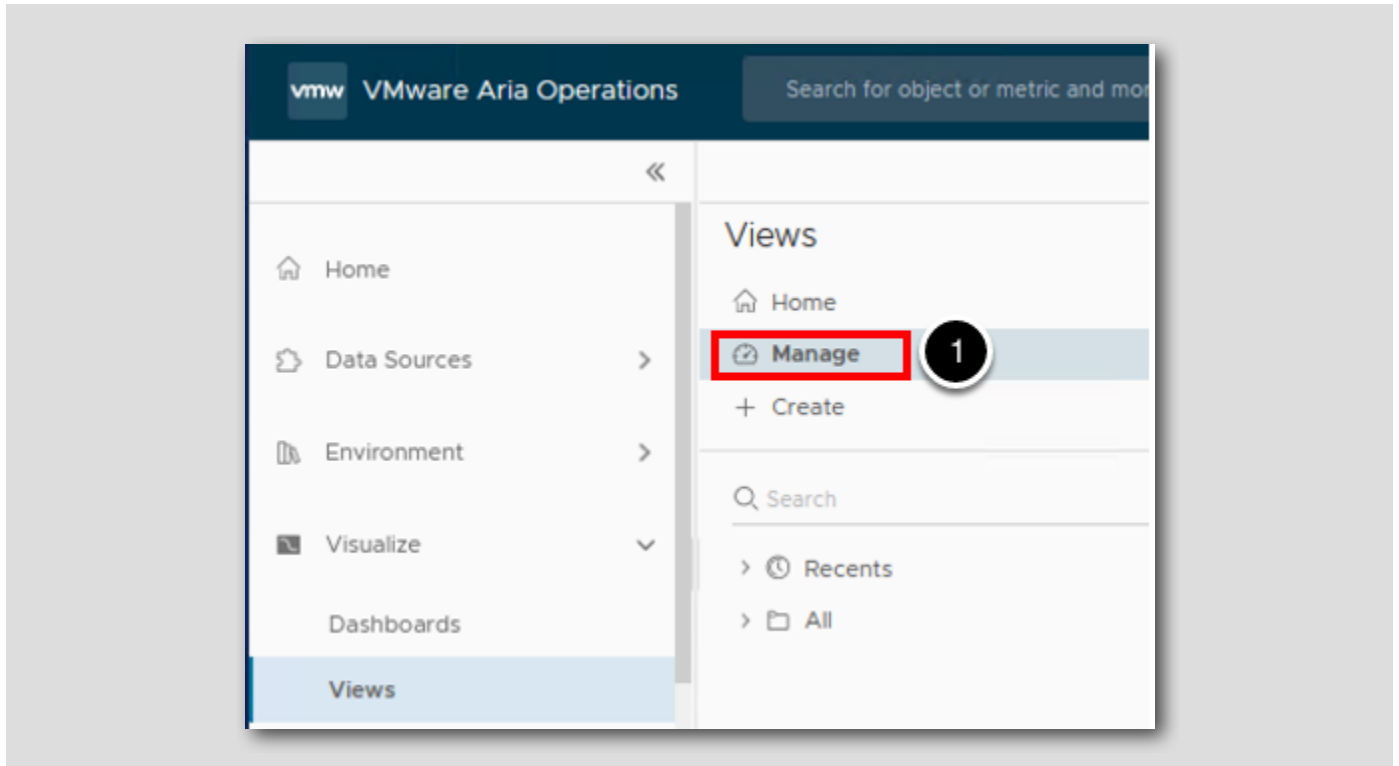
[406]



1. Expand Visualize.
2. Click Views.

Open Manage View

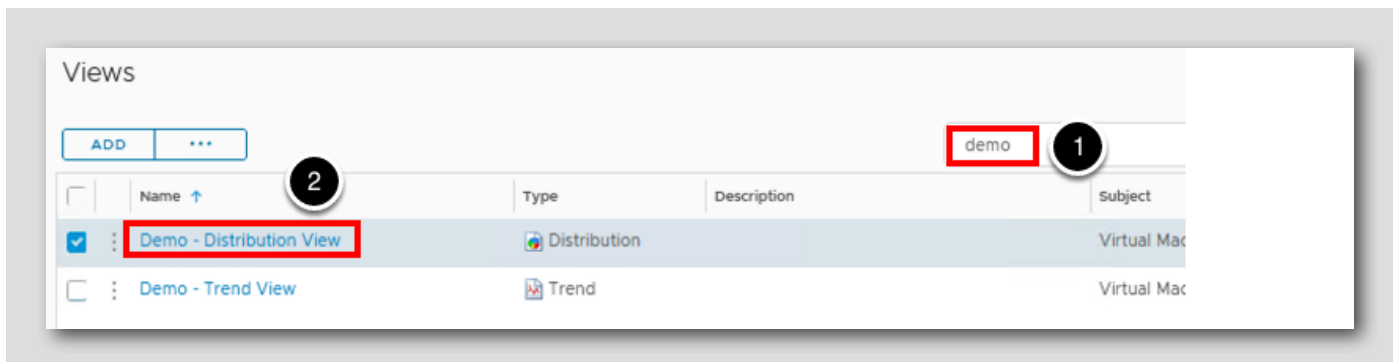
[407]



1. Click on **Manage** to open the list of Views.

Find our Newly Created View

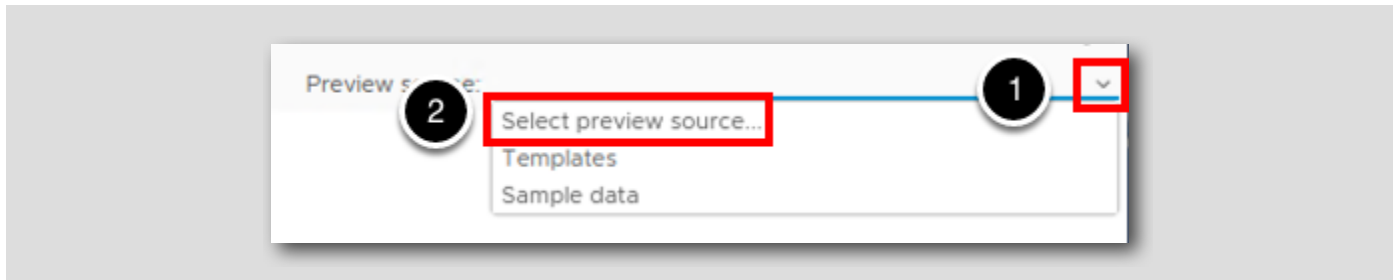
[408]



1. In the quick search filter, type demo and hit Enter.
2. Click on the text Demo - Distribution View to open the View.

Select Preview Source

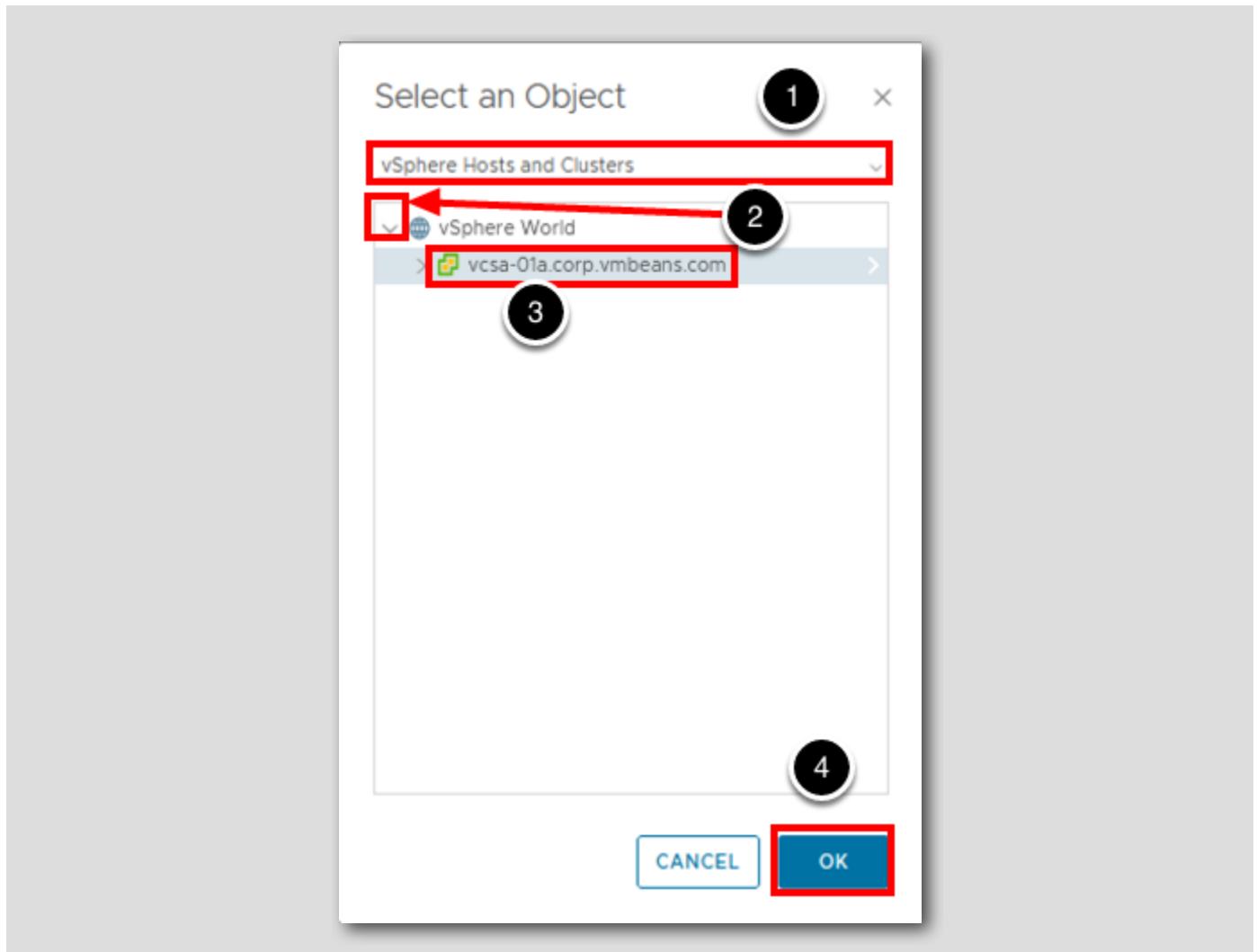
[409]



Our view may default to a source we don't want to see.

1. Expand Preview source in the top right-hand corner of the window.
2. Click on Select Preview source...

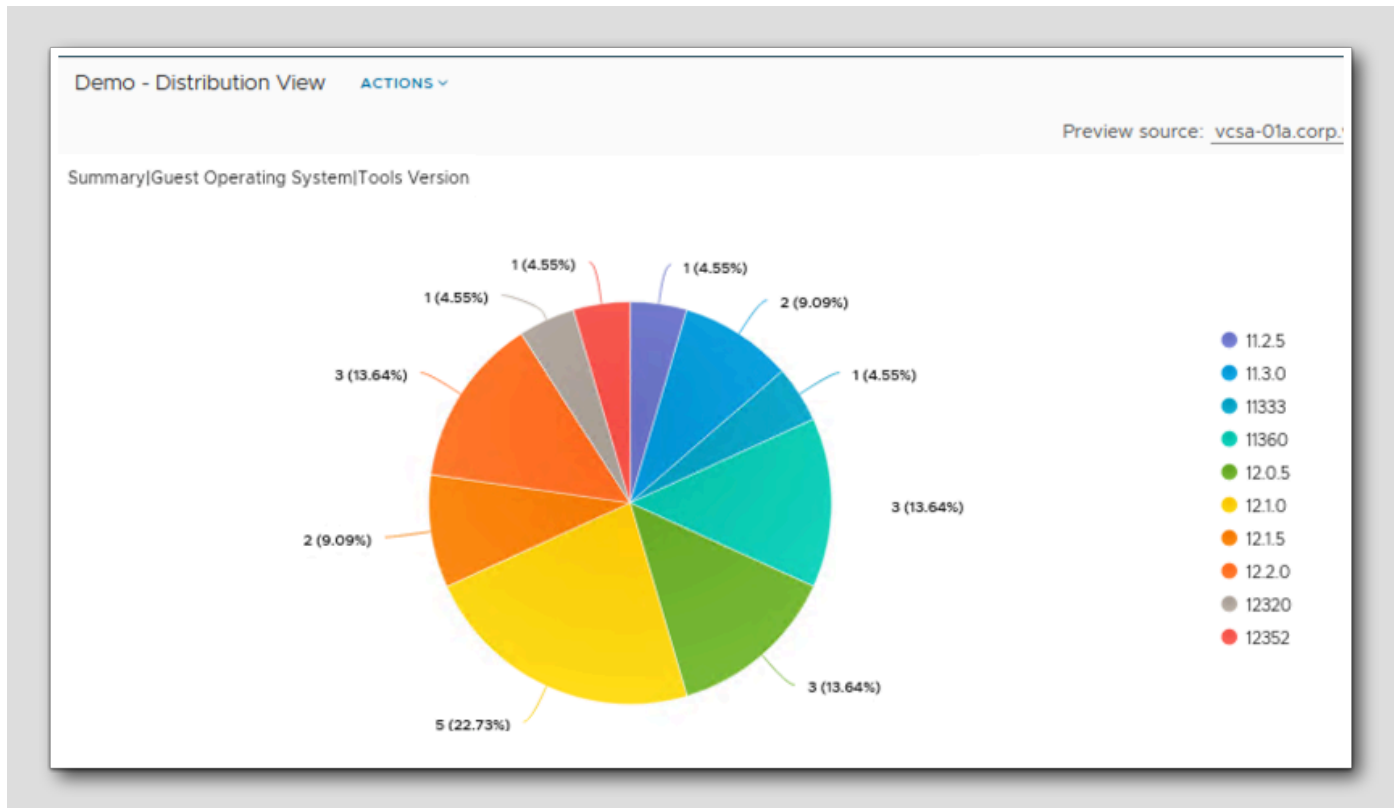
Select the `vcsa-01a.corp.vmbeans.com` Object



1. In the drop-down, ensure vSphere Hosts and Clusters is selected. If it isn't expand the field and select vSphere Hosts and Clusters.
2. Expand vSphere World.
3. Click `vcsa-01a.corp.vmbeans.com` to select that object as the preview source for our new view.
4. Click OK.

View Results

[411]



We will now have a distribution of the VMware Tools versions in the environment!

Lesson End

[412]

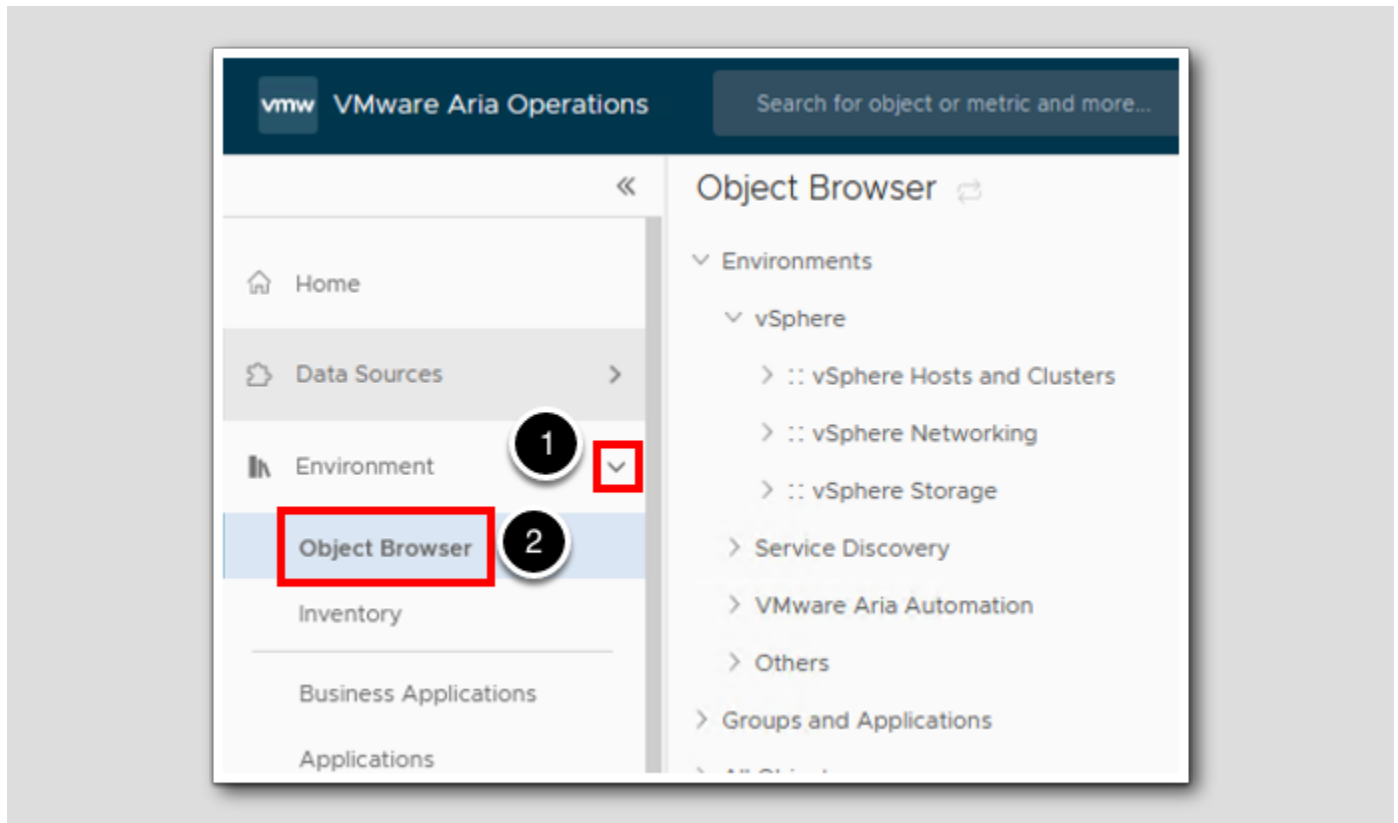
We have completed this lesson on Creating a View with Distribution Data! In the next lesson, we take you through the process to put views and dashboards into reports.

Create Reports from Views and Dashboards

[413]

In this lesson, we show how to create custom reports using both views and dashboards.

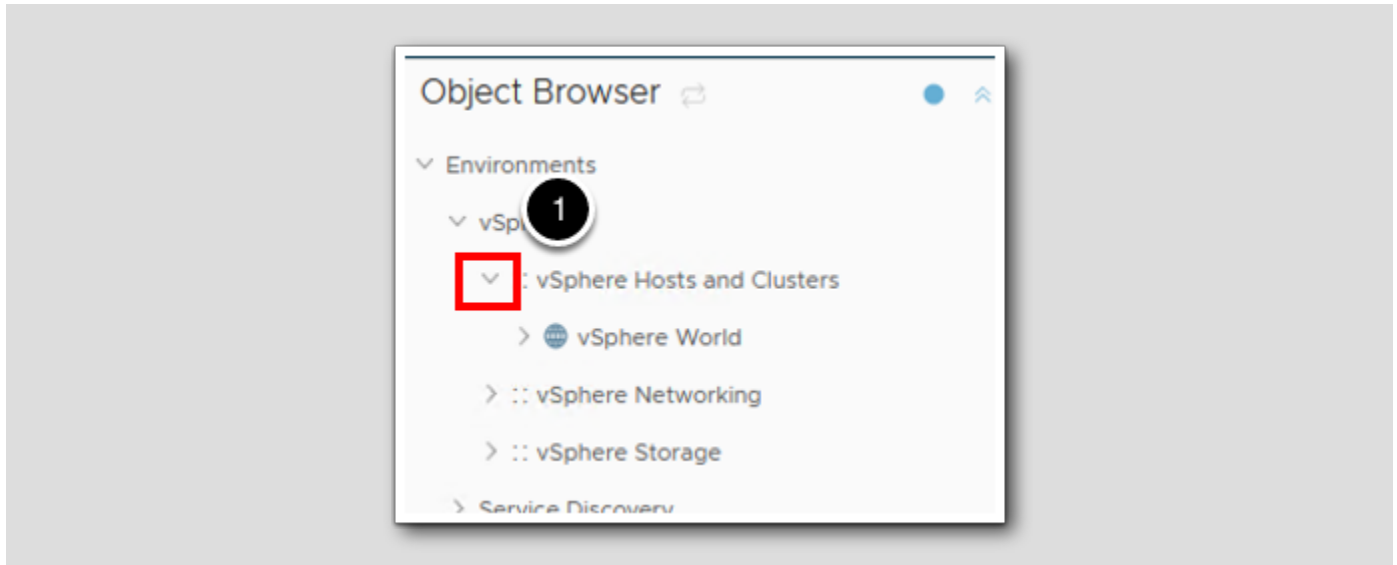
Go to Environment



1. Expand Environment.
2. Click on Object Browser.

Hosts and Clusters

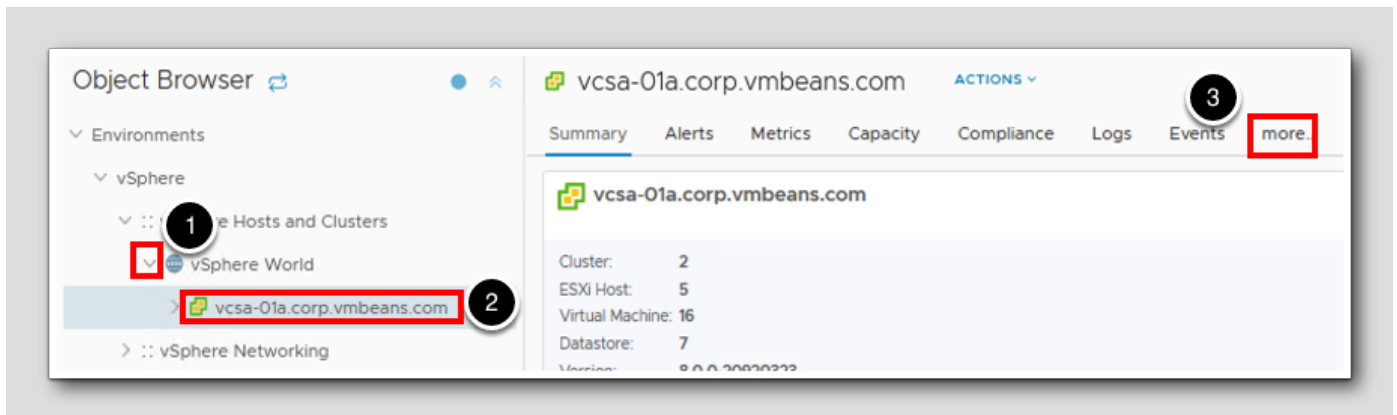
[415]



1. Expand vSphere Hosts and Clusters.

Select a vCenter Server

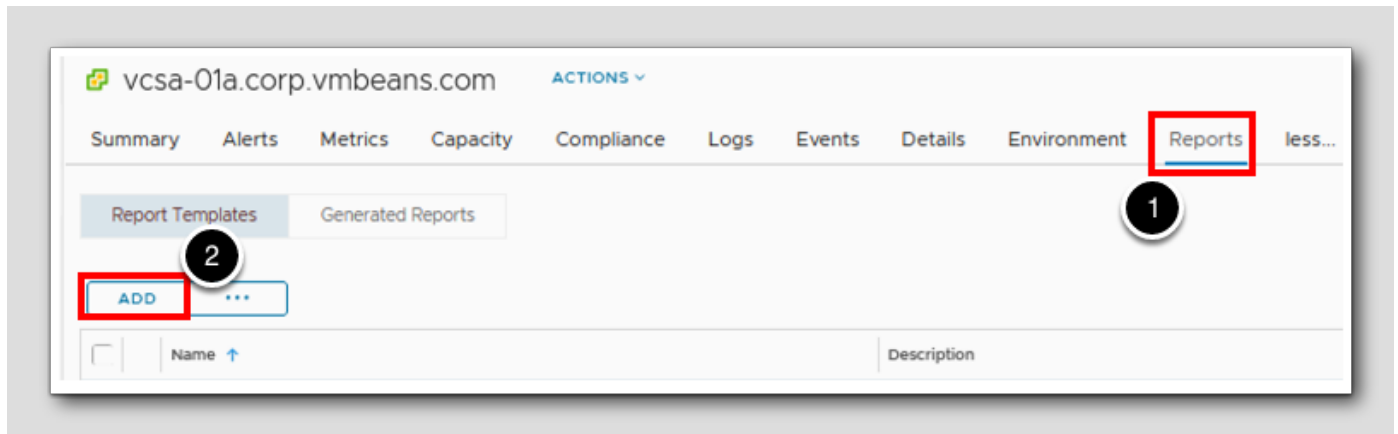
[416]



1. Expand vSphere World by clicking the chevron to the left of the text.
2. Select vCenter Server vcsa-01a.corp.vmbeans.com.
3. Click on more...

Create a Report

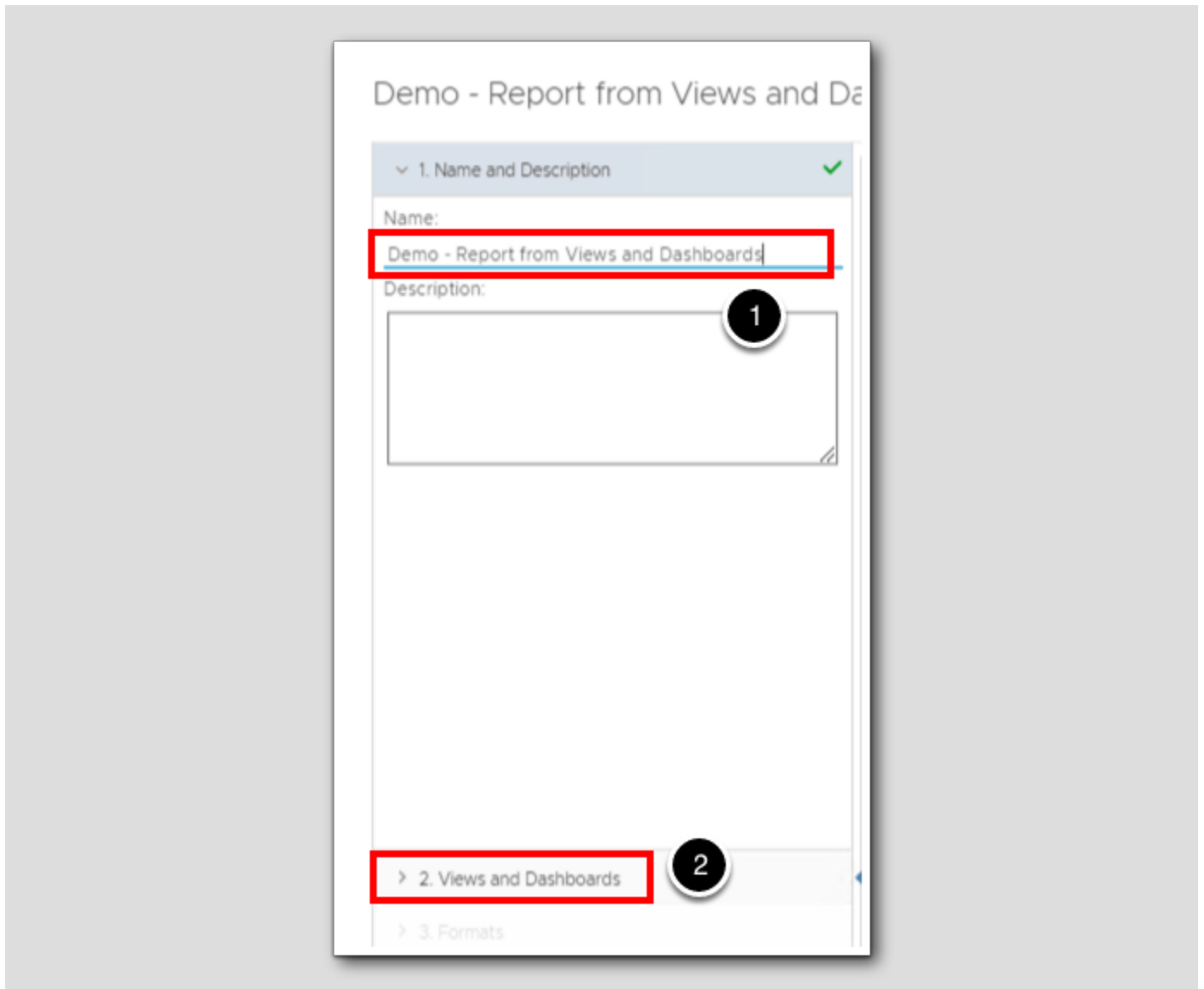
[417]



1. Click on Reports.
2. Click ADD to create a new report.

Report Name

[418]



1. Name the report Demo - Report from Views and Dashboards.
2. Click 2. Views and Dashboards.

Selected Views

Demo - Report from Views and Dashboards - New Tem

1. Name and Description ✓

2. Views and Dashboards ✓

Data type: Views 1

Name: > ALL FILTERS v sized

CMA-Oversized Virtual Machine Details

CMA-Oversized VMs

CMA-Undersized Virtual Machine Details

CMA-Undersized VMs

Oversized Virtual Machines 2

Rightsizing | Oversized Virtual Machine Details

Rightsizing | Undersized Virtual Machine Details

Rightsizing | VM Oversized and Undersized Status

Undersized Virtual Machines 3

1 - 9 of 9 items

3. Formats ✓

Views and Dashboards in the report

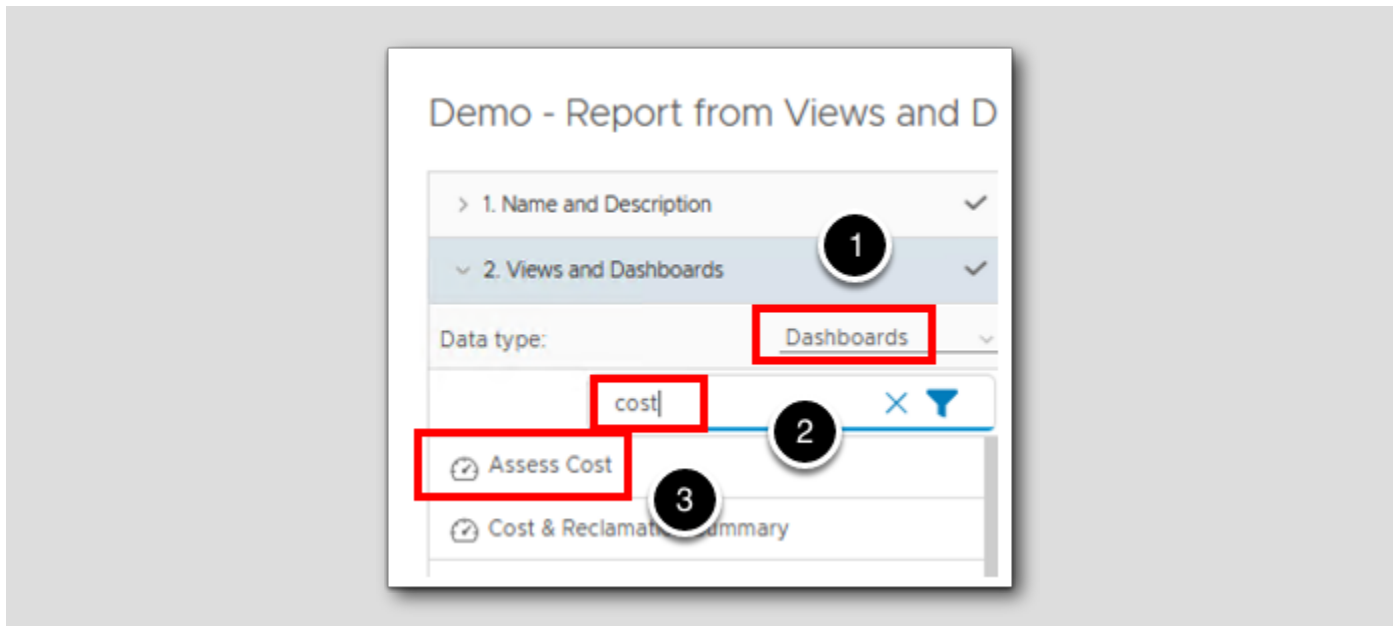
Name	Configured
vr-automation	12
saltstack	8
identity-manager	6
SupervisorControlPI...	2
SupervisorControlPI...	2
←	
Undersized Virtual Machines	
Name	Configured
dev-project-worker...	2
vr-loginsight	4
Total	6
←	

Click to expand and select report components.

1. In the search box, type sized and hit Enter.
2. Double-click Oversized Virtual Machines.
3. Double-click Undersized Virtual Machines.

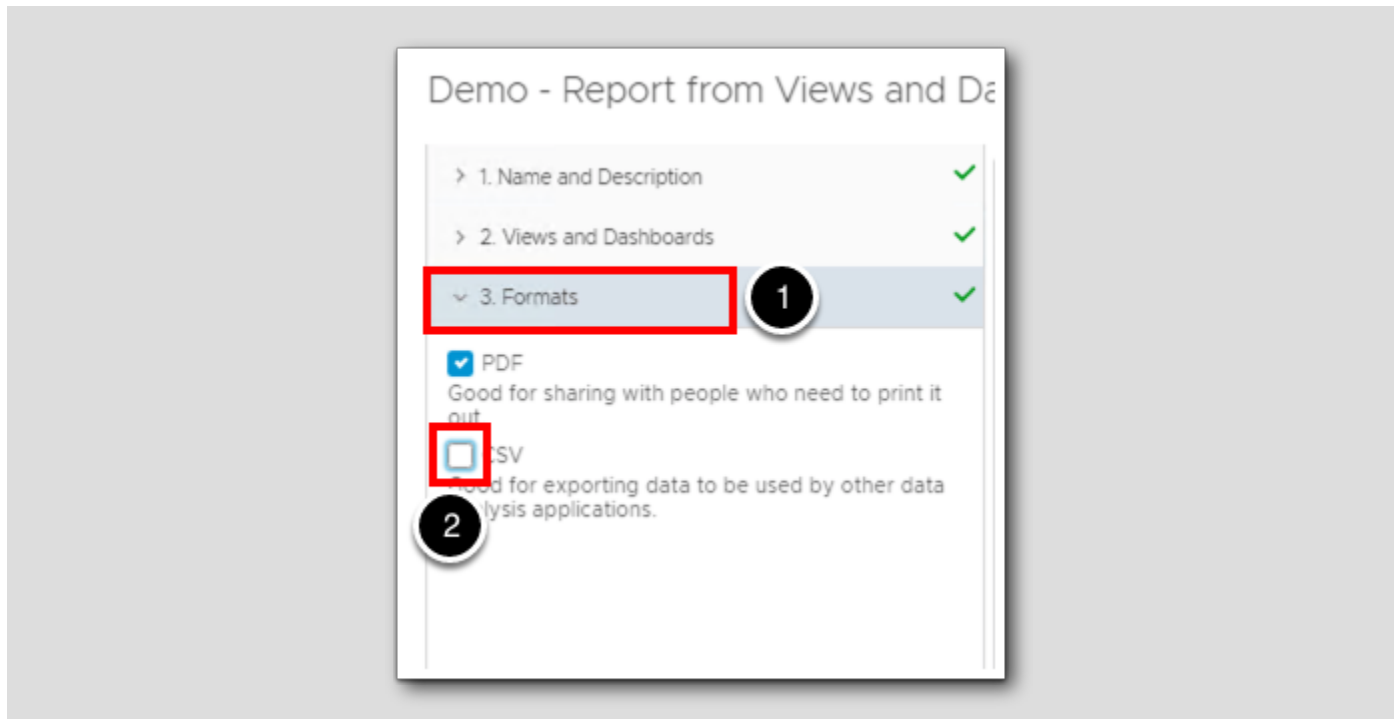
Select Dashboard

[420]



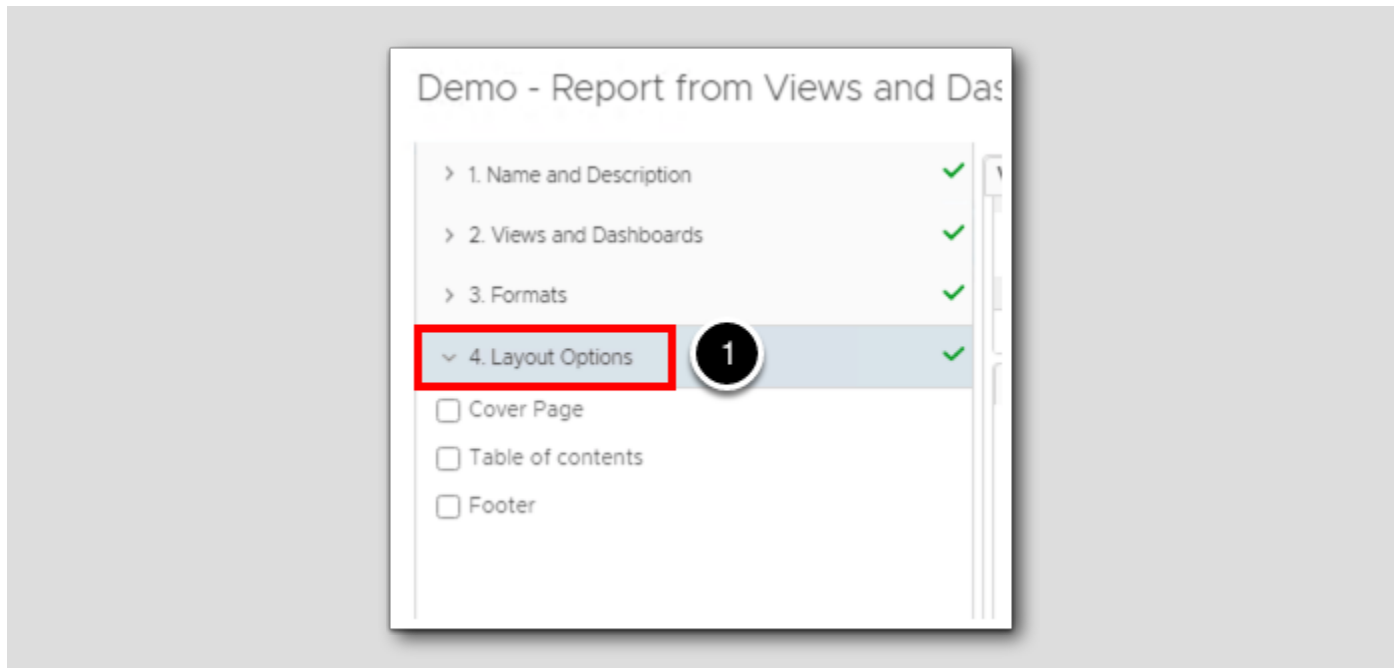
1. Change the Data Type from Views to Dashboards.
2. In the Quick Filter, type cost and hit Enter.
3. Double-click **Assess Cost** to add it to the Report.

Report Format



1. Select 3. Formats.
2. Since we are including a dashboard as part of this report, uncheck CSV. A dashboard will not convert to CSV (comma separated values).

Layout Options



1. Select 4. Layout Options.

We have the ability to include the following:

- Cover Page
- Table of contents
- Footer

For a Cover Page:

- Can contain an image up to 5 MB.
- The default report size is 8.5 inches by 11 inches. The image is resized to fit the report front page.

Table of Contents

- Provides a list of the template parts, organized in the order of their appearance in the report

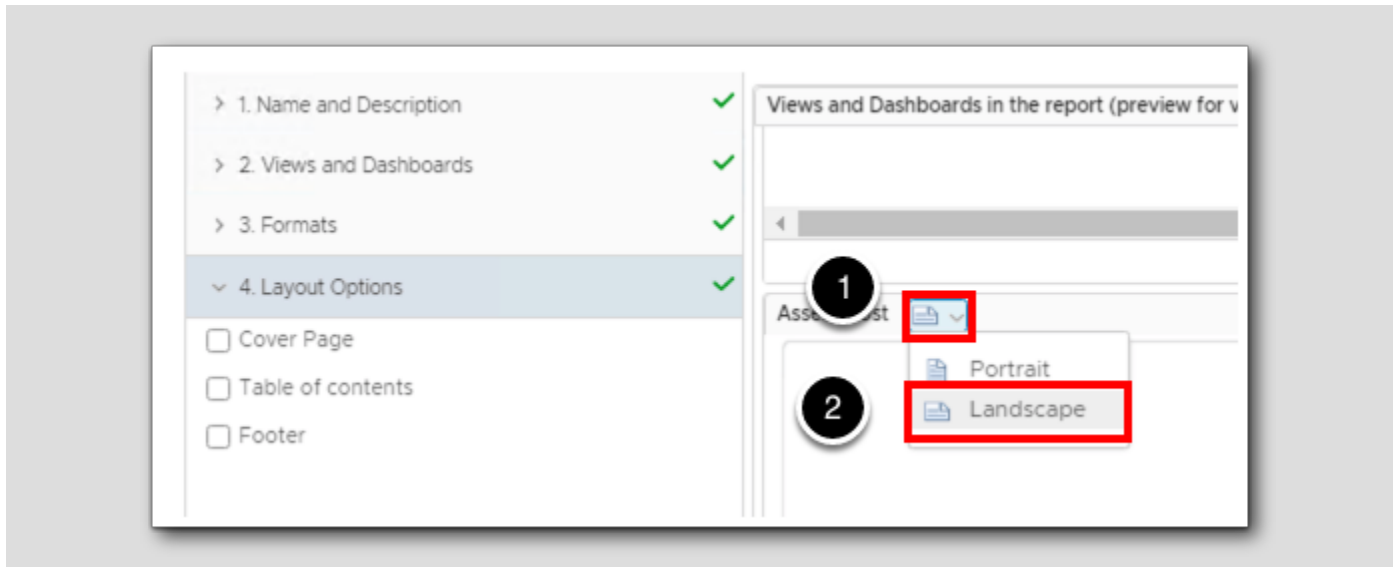
Footer

- Includes the date when the report is created, a note that the report is created by VMware vRealize Operations Manager, and page number.

Don't make any changes here, we will use the default settings.

Portrait or Landscape

[423]

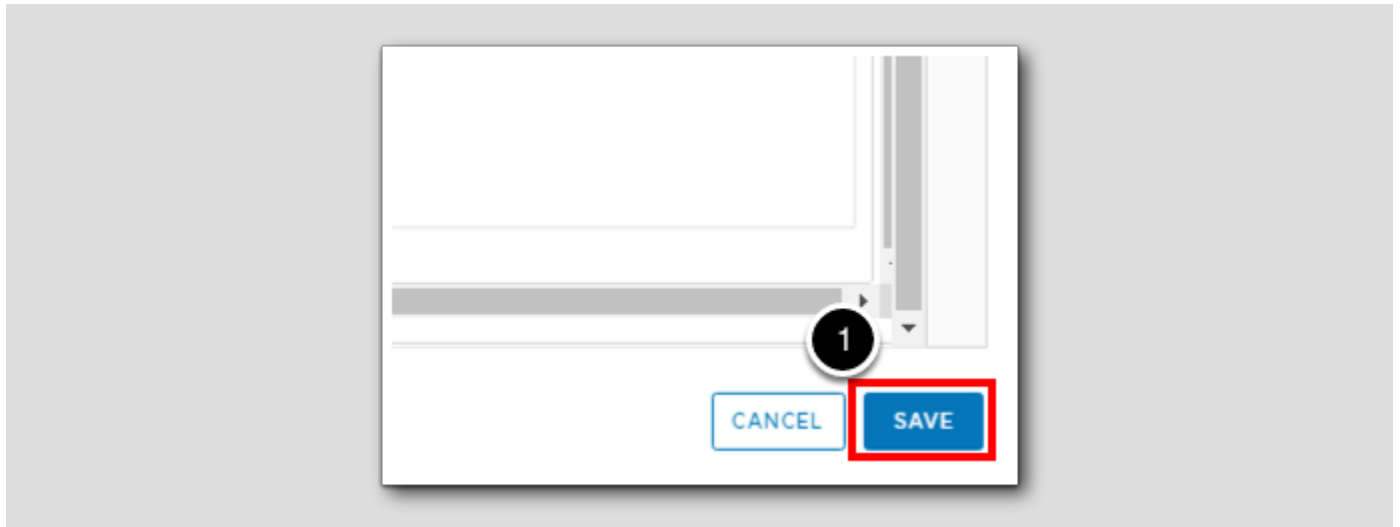


Each view and dashboard can be oriented to portrait or landscape mode. For dashboards in a report, landscape will likely be a better choice to simulate the aspect ratio of a monitor. Some dashboards require scrolling. When a dashboard is too large to be displayed on the screen, it will not fit into a report very well either. Make sure Assess Cost is set to Landscape.

1. Click the **layout** icon
2. Select **Landscape**.

Save

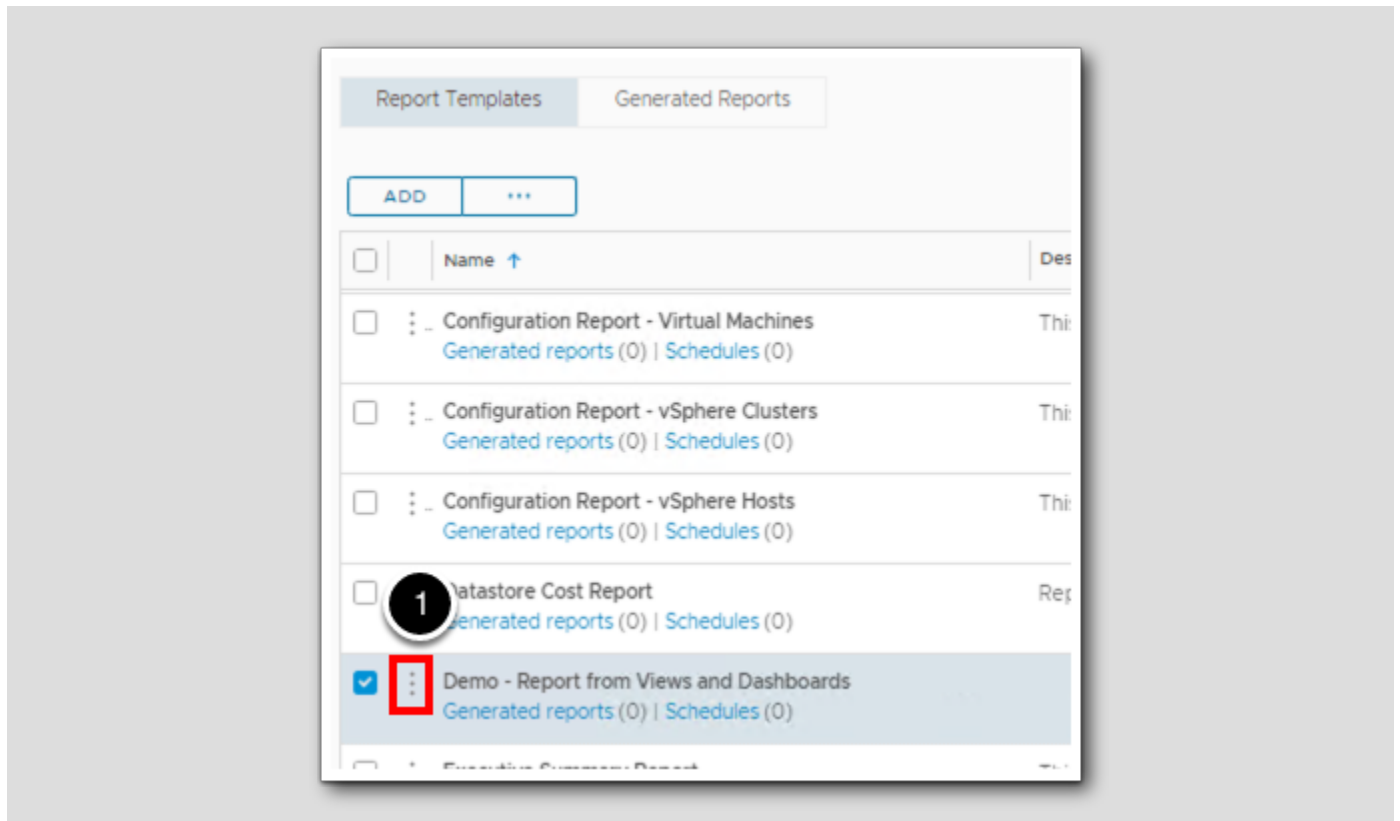
[424]



1. Click **SAVE** in the bottom right corner of the window.

New Report has been Created

[425]

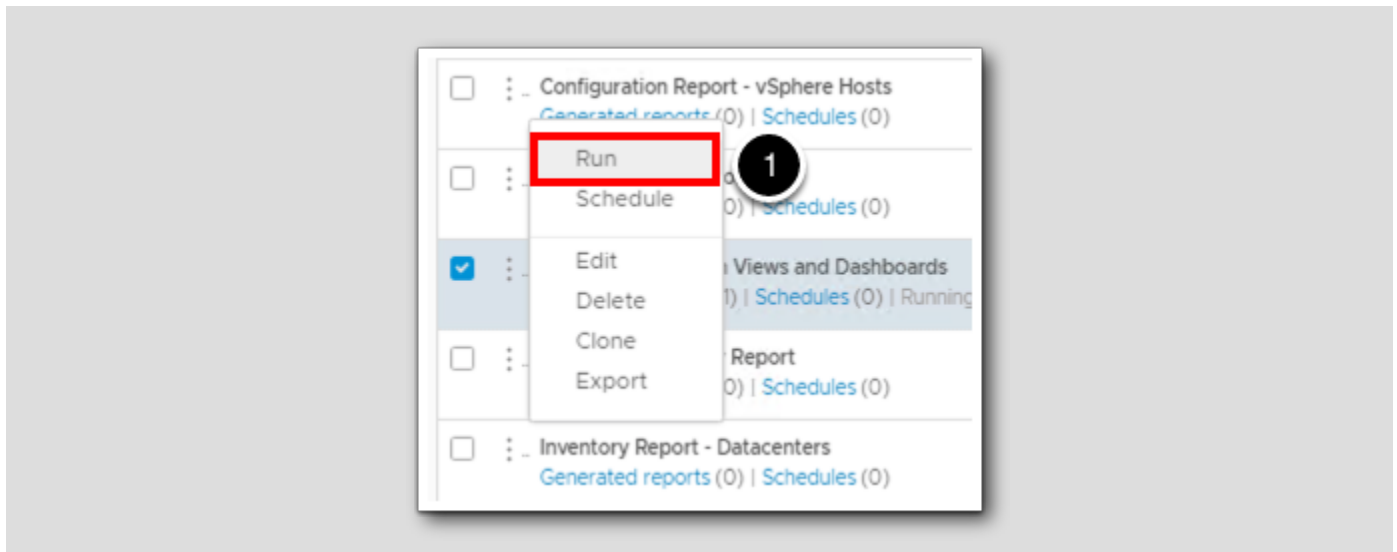


We can now see our new report in the Reports List.

1. Click the 3 dots to the left of the report name to open the actions menu.

Run the Report

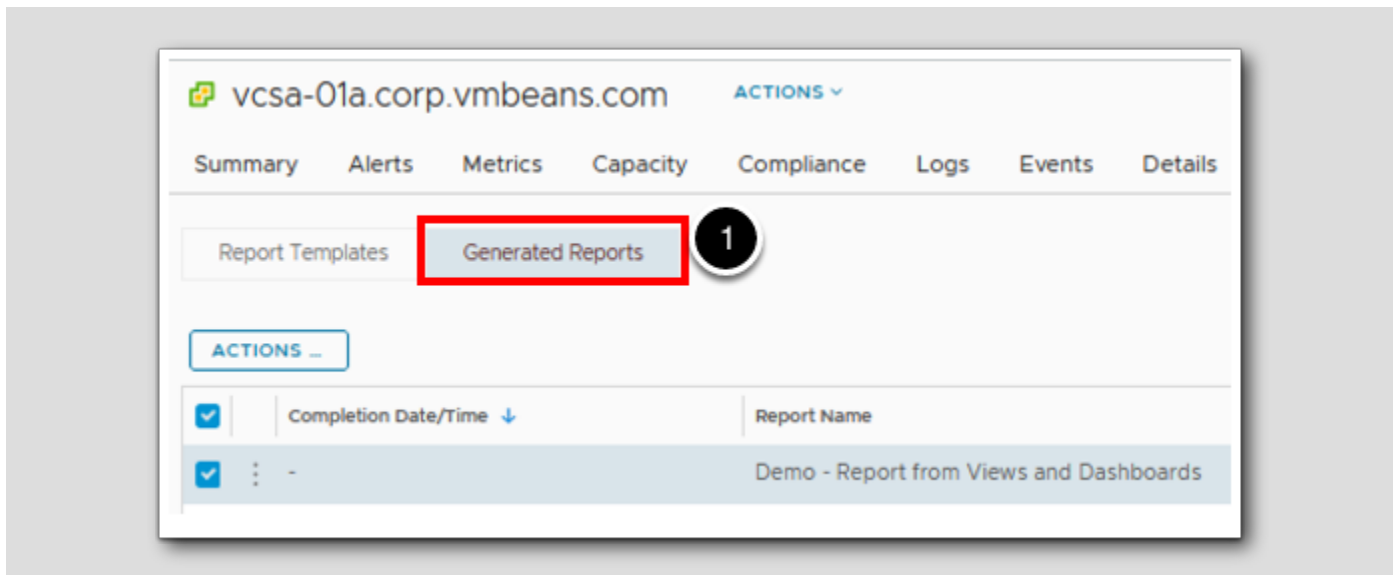
[426]



1. Click Run the run the report.

Generated Reports

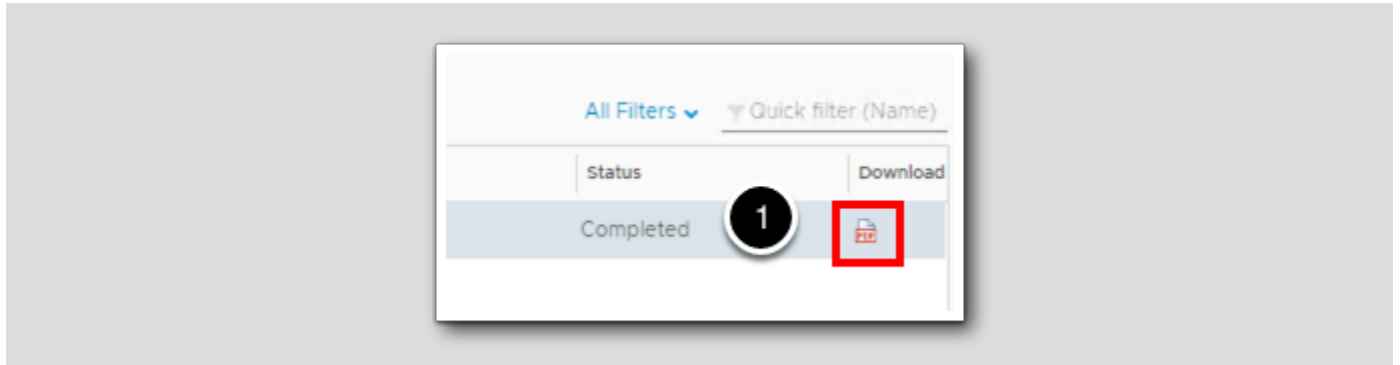
[427]



1. Click on Generated Reports to see the newly created report.

Select PDF

[428]



1. Click on the PDF icon.

View the Data

Demo - Report from Views and Dashboards -2 vcsa-01a.corp.vmbeans.com

1. Oversized Virtual Machines

List of the virtual machines which are marked as oversized. Reclaim from these virtual machines to reduce wastage and improve performance.
May 19, 2023 02:26 PM - Jul 18, 2023 02:26 PM (GMT-07:00)

Name	Configured vCPU	Reclaimable vCPU(s)	Configured Memory	Reclaimable Memory	Parent vCenter
aria-auto	12	6	48 GB	3 GB	vcsa-01a.corp.vmbean
identity-manager	6	2	10 GB	2 GB	vcsa-01a.corp.vmbean
aria-ops-logs	4	2	8 GB	0 GB	vcsa-01a.corp.vmbean
aria-auto-config	4	2	8 GB	4 GB	vcsa-01a.corp.vmbean
SupervisorControlPlaneVM (1)	2	0	8 GB	3 GB	vcsa-01a.corp.vmbean
windows-0010	2	0	4 GB	1 GB	vcsa-01a.corp.vmbean
aria-ops	4	0	16 GB	3 GB	vcsa-01a.corp.vmbean
aria-ops-cp	2	0	8 GB	2 GB	vcsa-01a.corp.vmbean
SupervisorControlPlaneVM (2)	2	0	8 GB	4 GB	vcsa-01a.corp.vmbean
Total	38	12	118 GB	22 GB	-

The report should open automatically in a new browser tab.

Lesson End

You have completed the last lesson in this module. You should now have an understanding in creating new views. You also now have the tools to create reports from any view or dashboard.

Conclusion

[431]

Understanding how to create custom Views in Aria Operations can be a powerful skill to fine tune Aria Operations to track what is important/critical to the monitoring of our VMware Cloud Infrastructure. We hope this lesson has highlighted the power and ease of building custom views in Aria Operations.

You've finished Module 7

[432]

Congratulations on completing the lab module.

If you are looking for additional general information on Aria Operations 8.4, try one of these:

- **VMware Product Public Page -Aria Operations:** <https://www.vmware.com/products/aria-operations.html>
- **Aria Operations 8.12 - Release Notes:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/rn/vmware-aria-operations-812-release-notes/index.html>
- **Aria Operations - Documentation:** <https://docs.vmware.com/en/VMware-Aria-Operations/index.html>
- **VMware Cloud Management Blog - What's New in Aria Operations 8.12 and Cloud:** <https://blogs.vmware.com/management/2023/04/whats-new-in-vmware-aria-operations-8-12.html>

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 8 - Using Metrics and Metric Charts for Troubleshooting (15 minutes) Basic

Introduction

[434]

Upon completing this lab, you will be able to:

- Understand how to build a multi-chart view into a VM
- Understand the chart toolbar icons and their uses
- Use the chart toolbar options to finetune your trouble

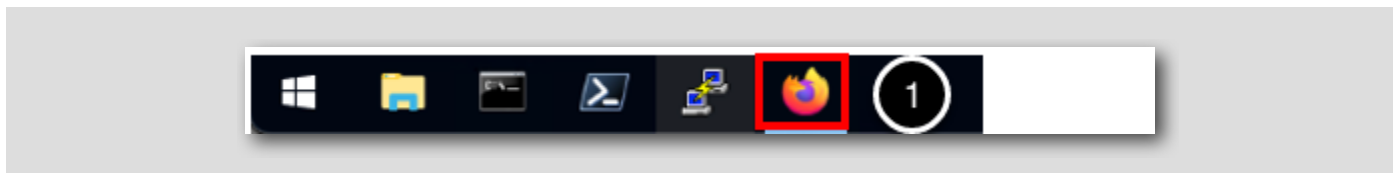
Log in to Aria Operations

[435]

To begin this exercise, we will log in to Aria Operations. If you are not currently logged into any instance of Aria Operations, continue to the next page, but if you are already logged into Aria Operations, click [here](#) to skip ahead.

Open the Firefox Browser from Windows Quick Launch Task Bar

[436]

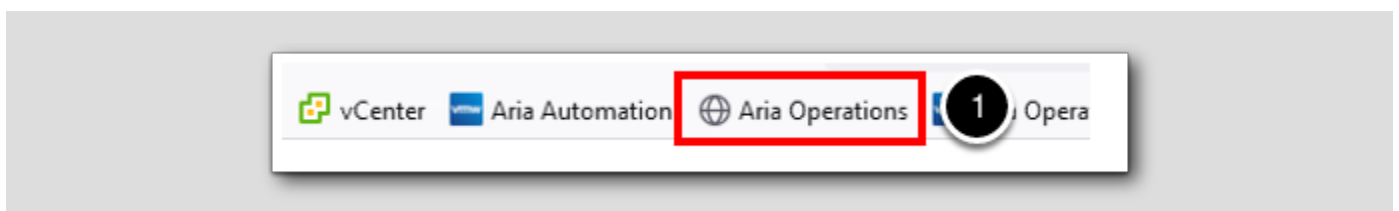


If your browser isn't already open, launch Firefox

1. Click the **Firefox** icon on the Windows Quick Launch Task Bar

Launch Aria Operations

[437]

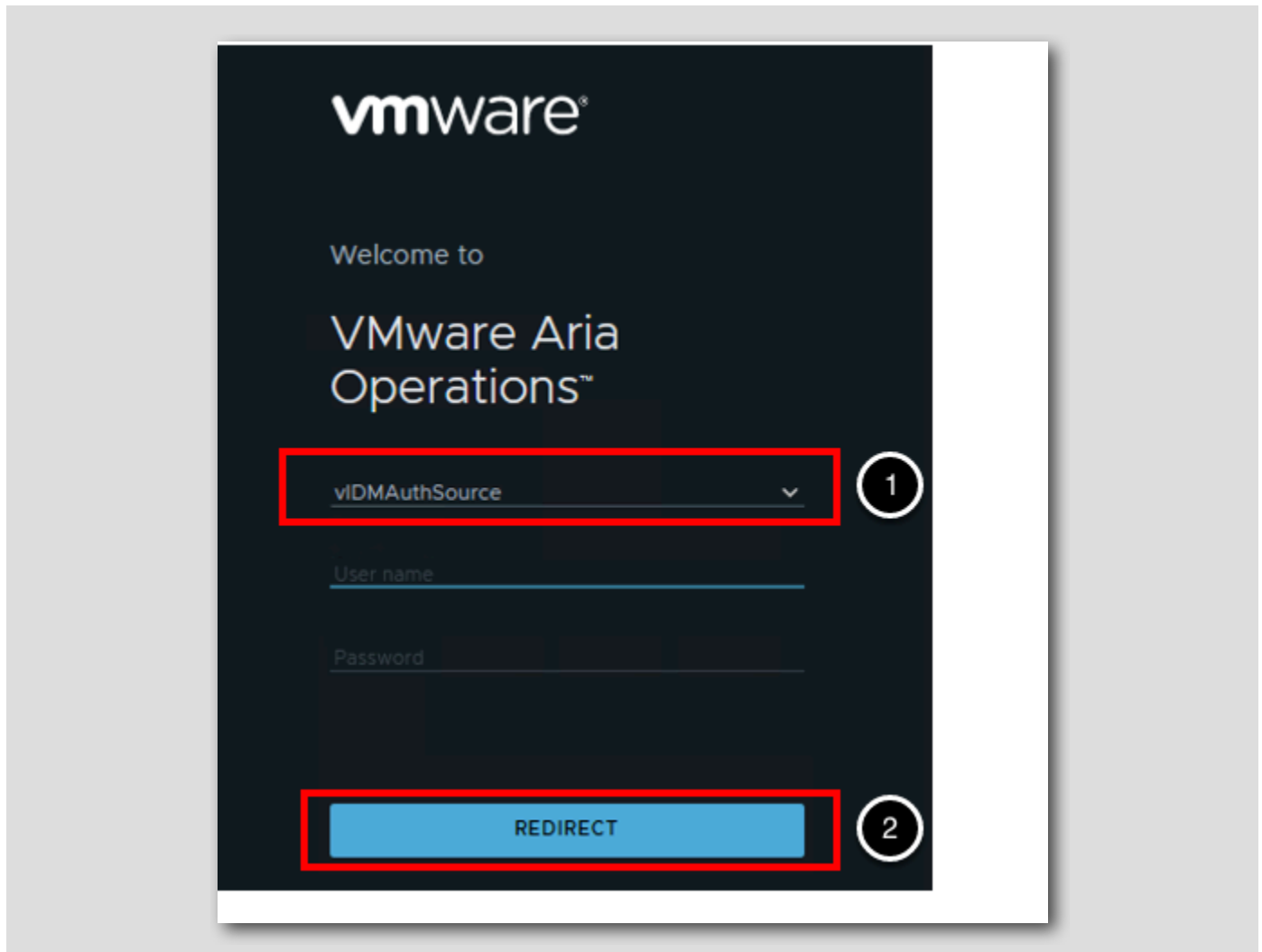


The browser Bookmarks Bar has links to the different applications that are running in the lab.

1. Click the **Aria Operations** Bookmark

Log in to Aria Operations

[438]



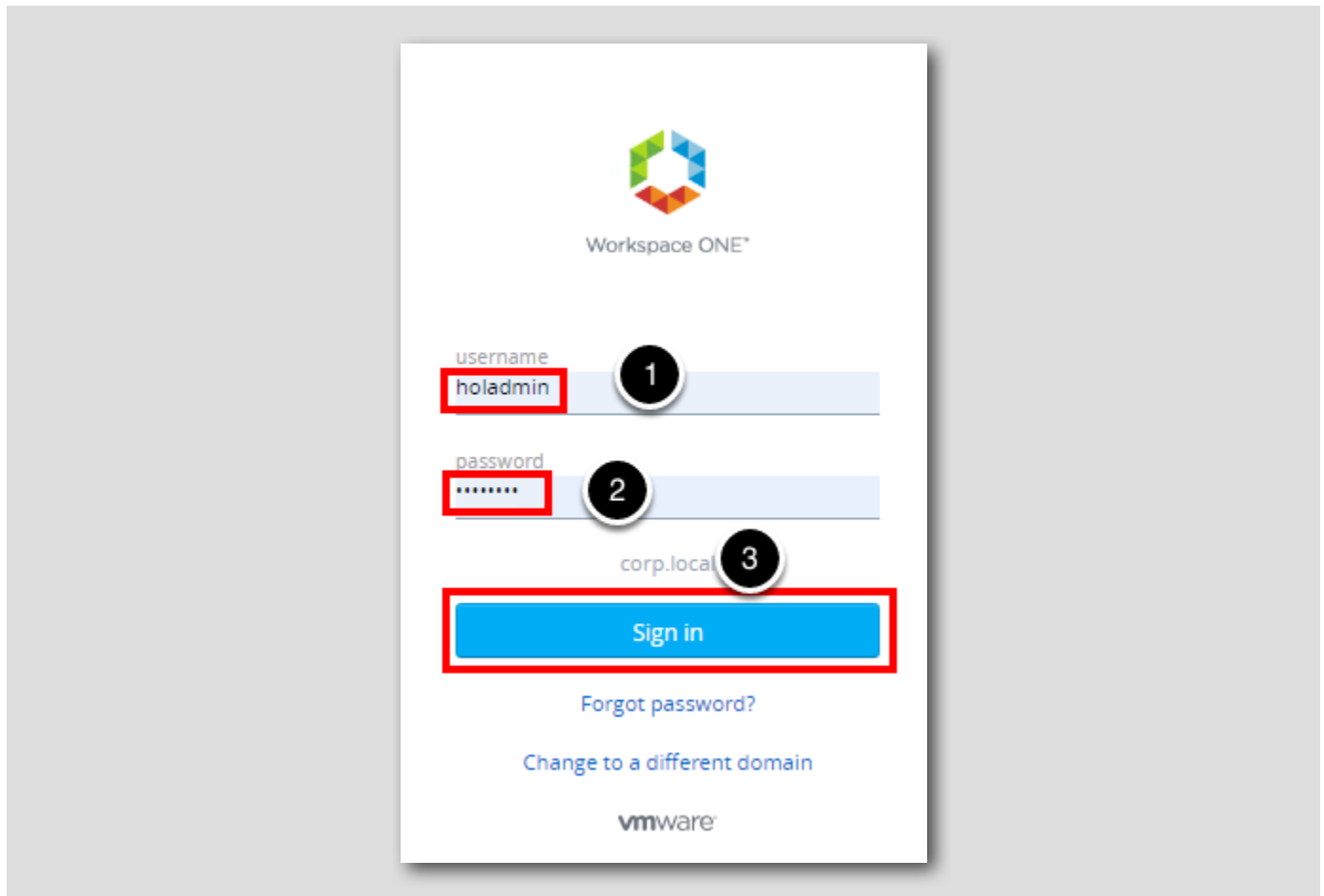
Aria Operations is integrated with VMware Identity Manager which we will use for user authentication in this lab.

vIDMAuthSource (VMware Identity Manager) should be pre-selected as the identity source. However, if it is not you will choose it.

1. Click the drop-down arrow if vIDMAuthSource is not selected.
2. Click REDIRECT to be taken to the authentication page.

VMware Identity Manager Login

[439]

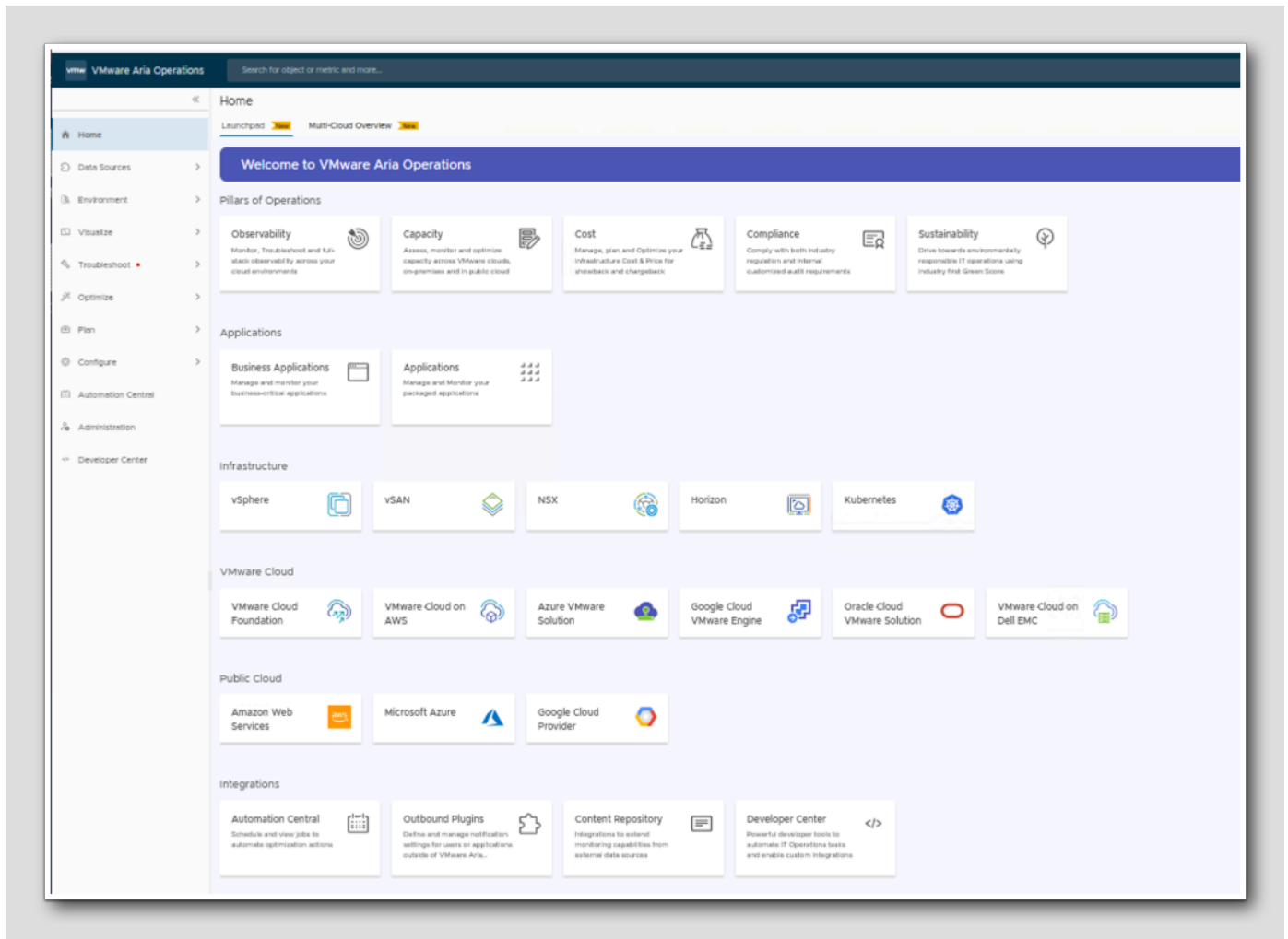


At the Workspace ONE login screen, use these credentials:

1. username: **holadmin**
2. password: **VMware1!**
3. Click **Sign in**

Aria Operations Home Screen

[440]



You should be at the Aria Operations Home screen and ready to start the module.

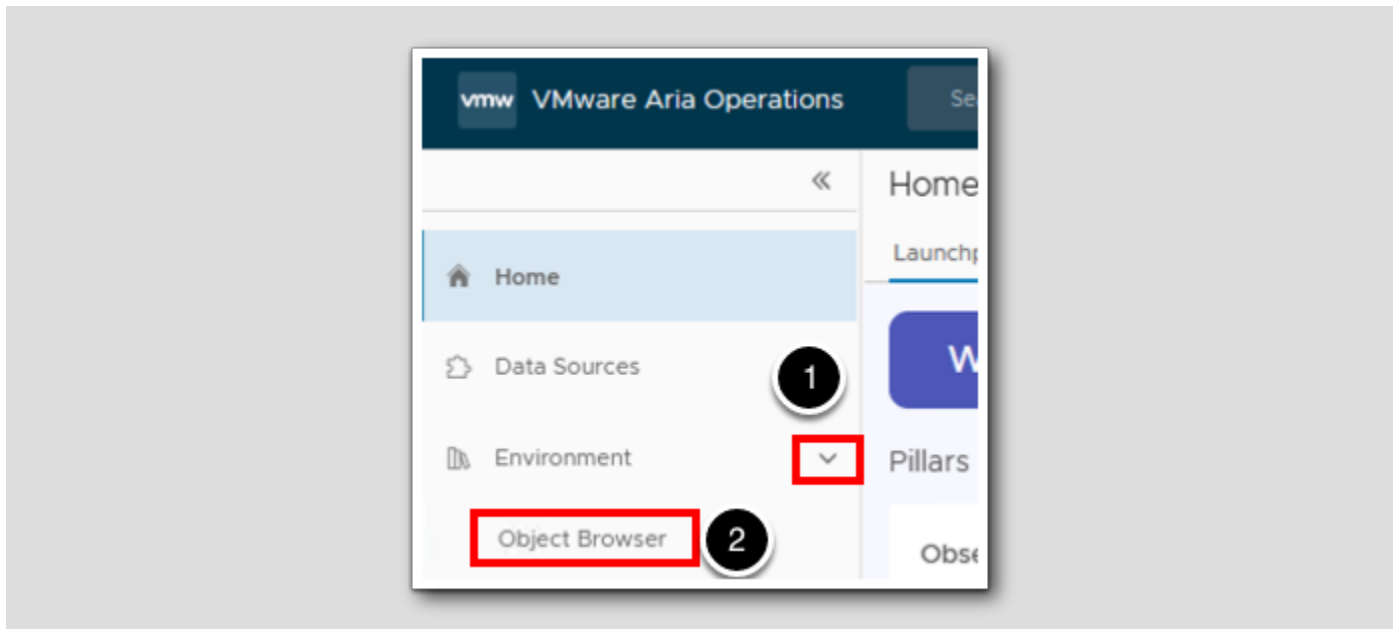
How to use Metrics

[441]

In this lesson we will dive into how metrics can help with troubleshooting.

Environment

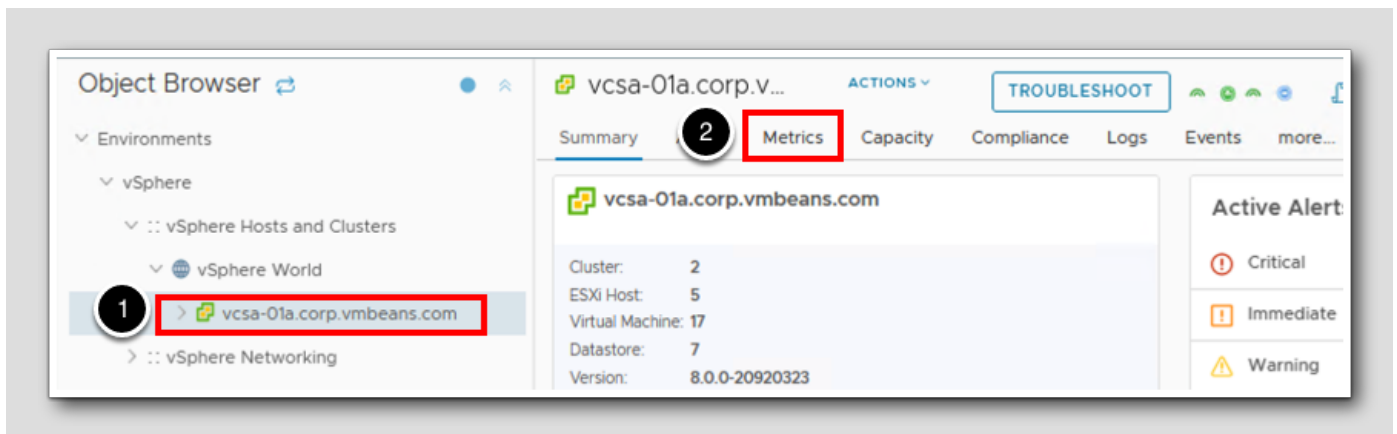
[442]



1. Click on > next to Environment.
2. Click Object Browser.

vSphere Hosts and Clusters

[443]



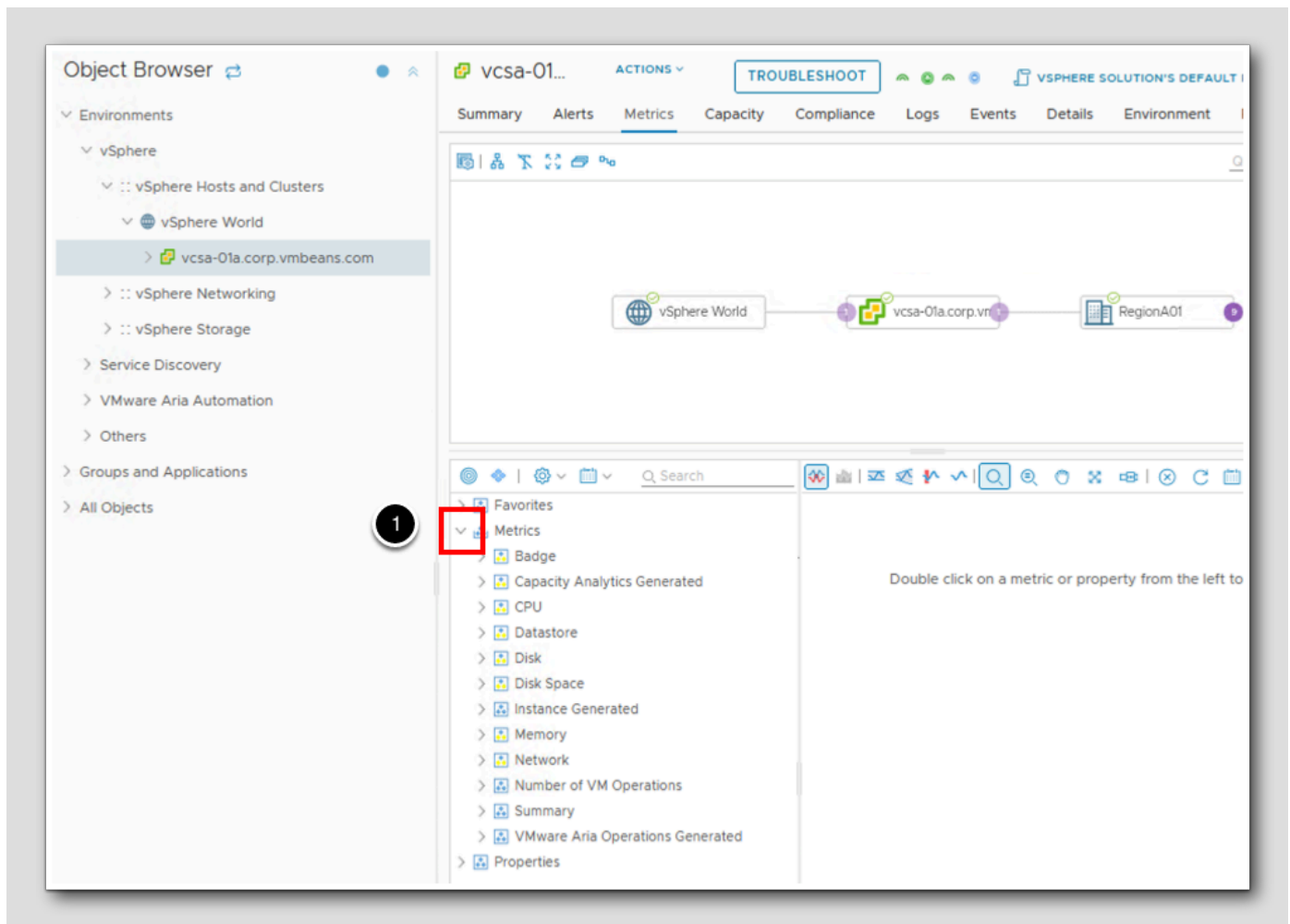
The Object Browser should have expanded the vSphere environment down to the vCenter vcsa-01a.corp.vmbeans.com. If it did not, click each > to expand down to vcsa-01a.corp.vmbeans.com.

1. Click on `vcsa-01a.corp.vmbeans.com`.
2. Click on **Metrics**.

How the Metrics category works

[444]

The Metrics category is dependent on what is selected in Object Browser



1. Click > next to **Metrics**.

The Metrics list is populated based on what is selected in Object Browser. The Metrics shown here are what is relevant for a vCenter object.

Select a Cluster

The screenshot displays the VMware vSphere Object Browser interface. The left pane shows the navigation tree with the following path highlighted: vSphere > vSphere Hosts and Clusters > vSphere World > vcsa-01a.corp.vmbeans.com > RegionA01 > Workload1. The right pane shows the 'Workload1' cluster details, with the 'Metrics' tab selected. The 'Object Relationship' box at the bottom right shows the hierarchy: RegionA01 > Workload1 > esx-04a.corp.vmb > esx-05a.corp.vmb > esx-03a.corp.vmb > Namespaces. A red arrow points from the 'Workload1' cluster icon to the 'Object Relationship' box.

1. Click > next to `vcsa-01a.corp.vmbeans.com`.
2. Click > next to `RegionA01`.
3. Click on the `Workload1` cluster.
4. Click > next to `Metrics`.
5. Notice how the `Object Relationship` box has changed to show the `Workload1` parent and child objects.

Note that the list of Metrics for a cluster is longer than the list of Metrics for a vCenter.

Select a VM

Notice that some of the Metrics have yellow in the little box in between the > and the Metric name. This indicates that something is currently alerting under that Metric category. This provides real-time troubleshooting information as you are selecting what to see.

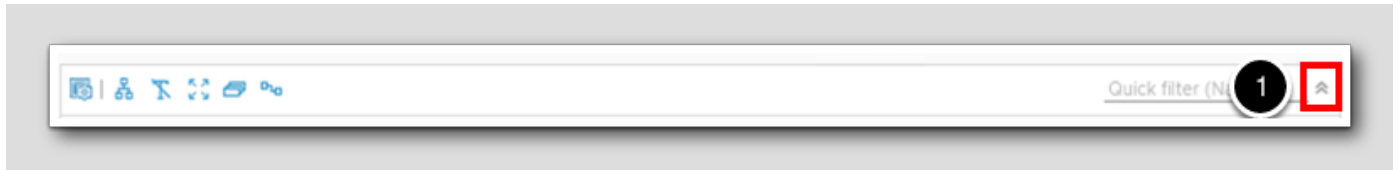
The screenshot displays the VMware vSphere interface. On the left, the Object Browser shows a navigation tree. Four numbered steps are highlighted with red boxes and circles: 1. Click > next to Workload1, 2. Click > next to esx-04a.corp.vmbeans.com, 3. Select the VM ubuntu-0008, and 4. Click > next to Metrics. The main panel shows the Metrics page for the selected VM, with a yellow alert icon next to the Metrics category. The Metrics list includes items like CPU, Memory, and Network, with a yellow box next to the Metrics category name.

1. Click > next to Workload1.
2. Click > next to esx-04a.corp.vmbeans.com.
3. Select the VM ubuntu-0008.
4. Click > next to Metrics.

Note that the Metrics list for a VM is much longer than what is available for a vCenter or a Cluster.

Collapse the Object Relationship window to provide more space

[447]

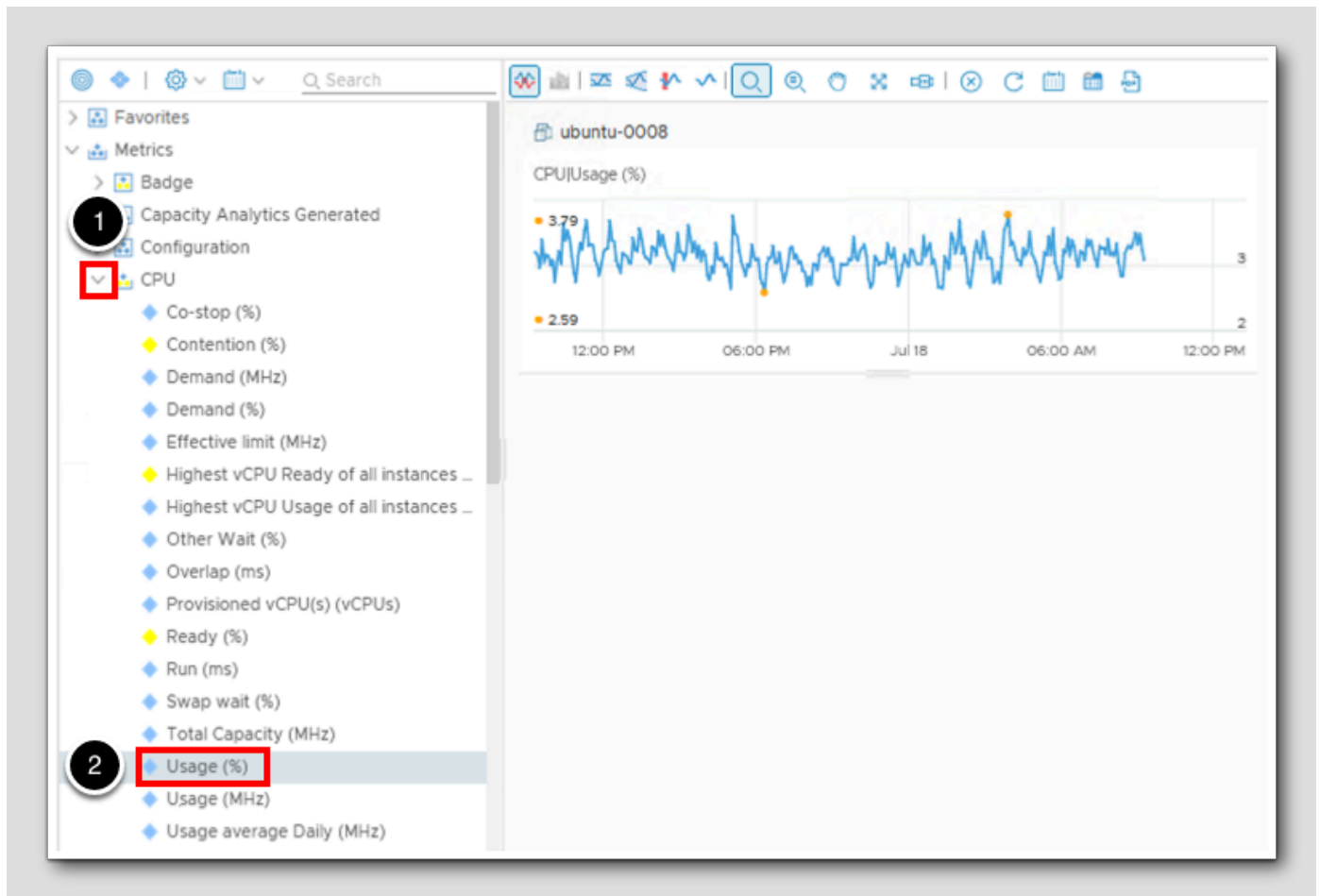


1. Click the **double chevron** on the right side of the screen.

My VM is slow and I need more resources

[448]

This is a common complaint vSphere administrators will hear. Metrics can be used to give a customer a simple wholistic view of how their VM is and has been performing.



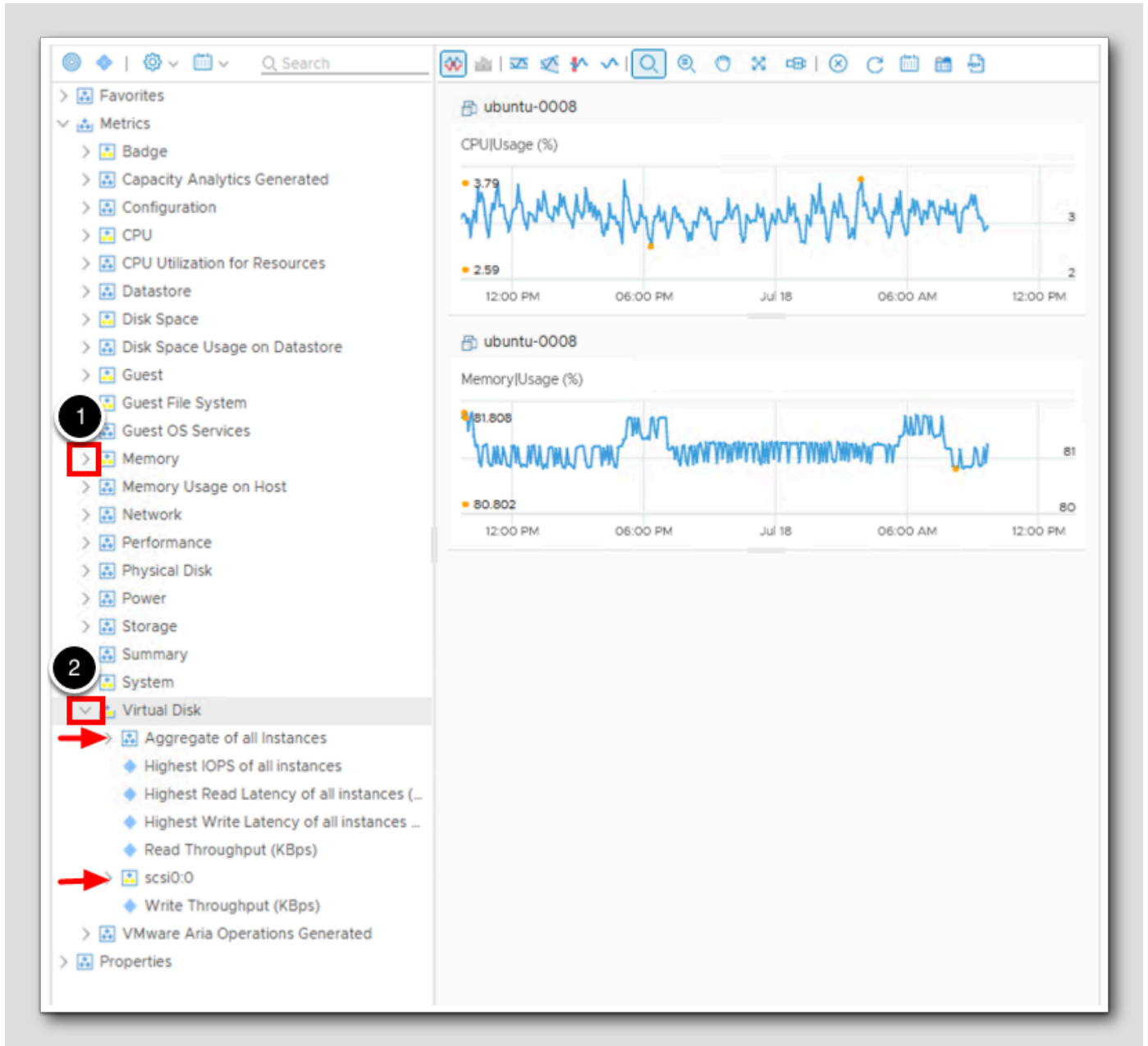
1. Click > next to CPU.
2. Double click on Usage%.

Add Memory Usage%

The screenshot displays the vSphere Performance Monitor interface. On the left, the 'Metrics' tree is expanded to 'Memory', and the 'Usage (%)' metric is selected. On the right, two line charts are shown for VM 'ubuntu-0008': 'CPUUsage (%)' and 'MemoryUsage (%)'. The CPU chart shows usage fluctuating between approximately 2.59% and 3.79%. The Memory chart shows usage fluctuating between approximately 80.802% and 81.808%.

1. Collapse the CPU Metric list to conserve space.
2. Click > next to **Memory**.
3. Double click **Usage%**. (you may need to scroll down)

Add Disk performance Metrics



1. Collapse the Memory Metric list to conserve space.

2. Click > next to Virtual Disk.

Notice that there are two sub categories here. Aggregate of all Instances is relevant if you have multiple Virtual Disks on the VM. on ubuntu-0008 there is only on Virtual Disk labeled scsi0:0. This allows granular data for your disk performance

Add Disk performance Metrics continued

[451]

The screenshot shows the VMware vSphere Performance Monitor interface. On the left, the 'Metrics' tree is expanded to 'Virtual Disk'. Three items are highlighted with red boxes and numbered:

1. **Aggregate of all Instances** (under Virtual Disk)
2. **Read Latency (ms)** (under Aggregate of all Instances)
3. **Write Latency (ms)** (under Aggregate of all Instances)

The main area displays four performance graphs for VM 'ubuntu-0008':

- CPUUsage (%)**: Shows a fluctuating line between approximately 2.59% and 3.79%.
- Memory(Usage (%))**: Shows a fluctuating line between approximately 80.802% and 81.808%.
- Virtual Disk:Aggregate of all Instances|Read Latency (ms)**: Shows a line with several spikes, with a peak value of 2.47 ms.
- Virtual Disk:Aggregate of all Instances|Write Latency (ms)**: Shows a line with a single prominent spike reaching 13.8 ms.

For this lesson we will use the Aggregate Metrics as we are building out a high level view of the VM performance and would be more versatile to make a View out of.

1. Click > next to **Aggregate of all Instances**.
2. Double click on **Read Latency (ms)**.
3. Double click on **Write Latency (ms)**.

Add Network performance

The screenshot displays the vSphere Performance Monitor interface for a VM named 'ubuntu-0008'. The left-hand navigation pane is expanded to show the 'Network' category, with 'Data Transmit Rate (KBps)' selected. Four performance charts are visible on the right:

- Virtual Disk:Aggregate of all Instances|Read Latency (ms)**: Shows a peak value of 2.47 ms.
- Virtual Disk:Aggregate of all Instances|Write Latency (ms)**: Shows a peak value of 13.8 ms.
- Network|Data Receive Rate (KBps)**: Shows a peak value of 0.067 KBps.
- Network|Data Transmit Rate (KBps)**: Shows a peak value of 0.067 KBps.

The charts display data for July 18th, with time markers at 12:00 PM, 06:00 PM, 06:00 AM, and 12:00 PM.

1. Collapse the **Virtual Disk** Metric list to conserve space.
2. Click > next to **Network**.
3. Double click **Data Receive Rate (KBps)**.
4. Double click **Data Transmit Rate (KBps)**.

We have just built a window into what ubuntu-0008 is consuming for CPU, Memory, Disk and Network resources. Now lets learn how to navigate what was built

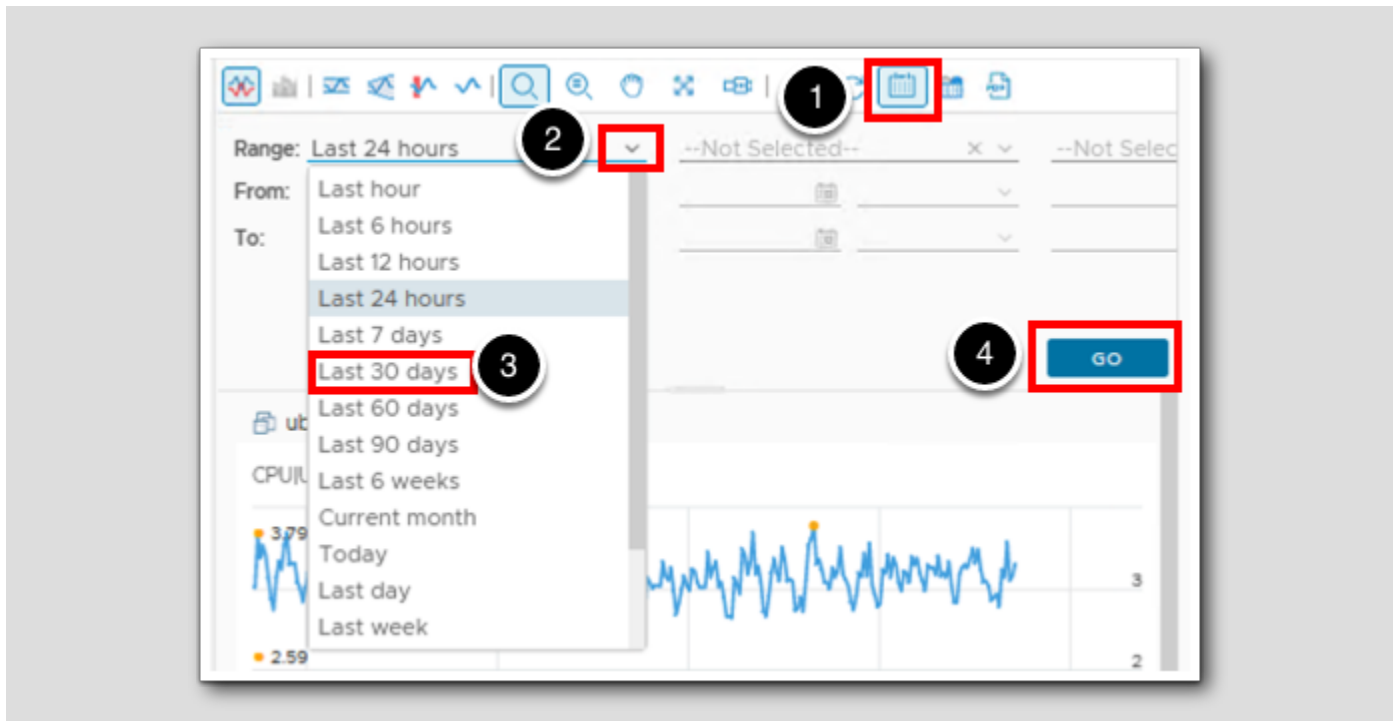
Refresh and Date Control

[453]



At the top of the charts that we added there is a tool bar. The two icons shown above are the Refresh Charts icon (left) and the Date Controls icon (right). The Refresh Charts icon will force a refresh of all the charts added. The Date Controls icon is what we will use now.

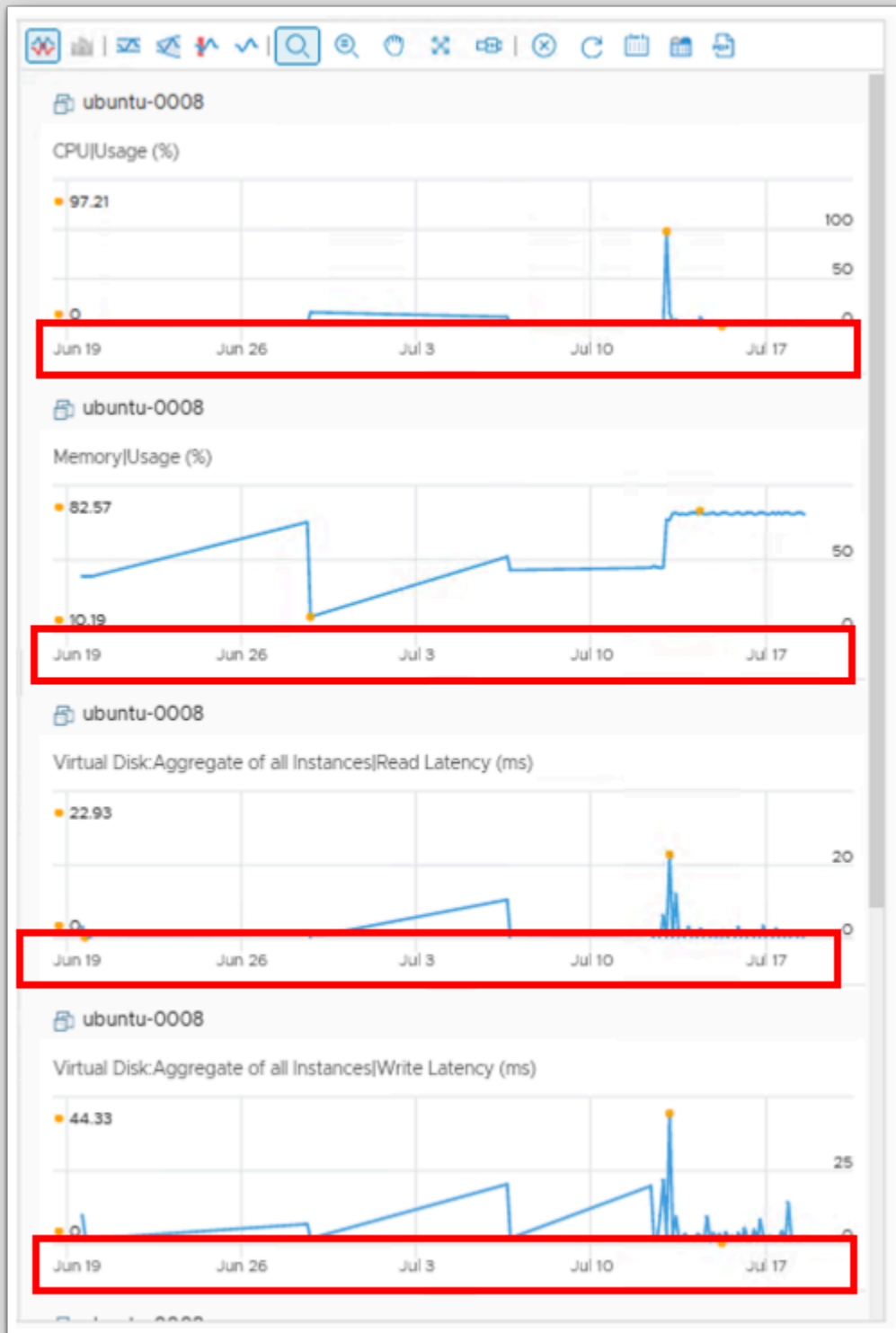
What timeframe do we want to see



1. Click on the Date Controls icon.
2. Click > at the end of the Range field.
3. Select Last 30 days.
4. Click GO.

All charts date range changed

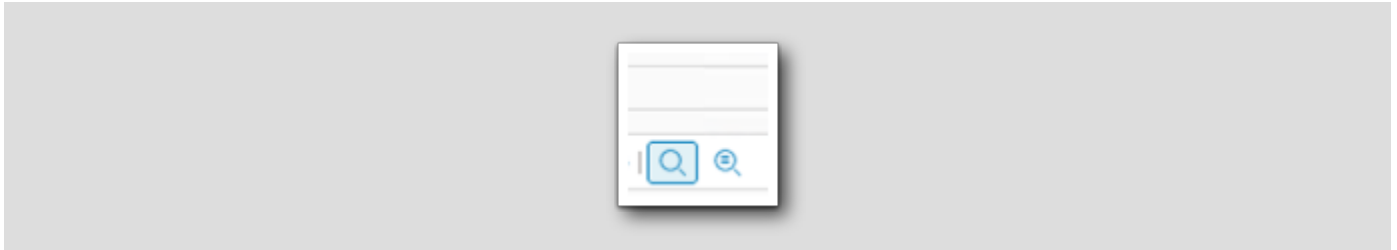
[455]



Notice that the date range for all of the charts have been changed to a 30 day window.

Zoom one or zoom all

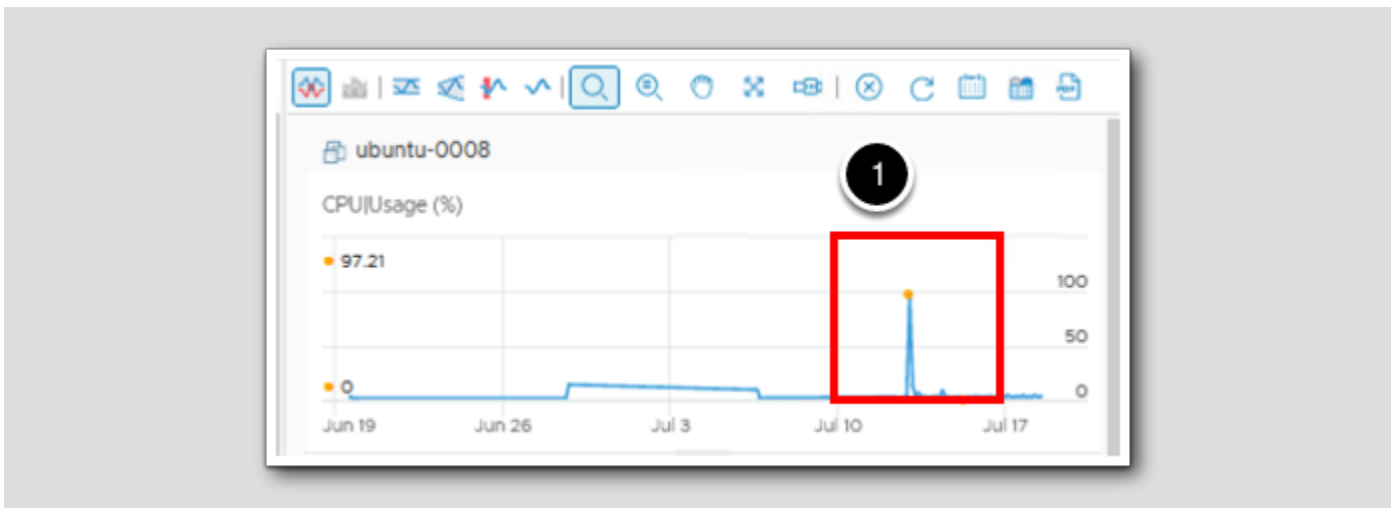
[456]



At the top of the charts that we added, there is a tool bar. In that tool bar are two magnifying glasses. The one on the left is blank (Zoom the view) and the other has a square in the middle of it (Zoom All Charts). The blank magnifying glass will zoom **only** in the chart box you are working in while the magnifying glass with the box in it will zoom all charts when you zoom in on any chart.

Zoom one

[457]

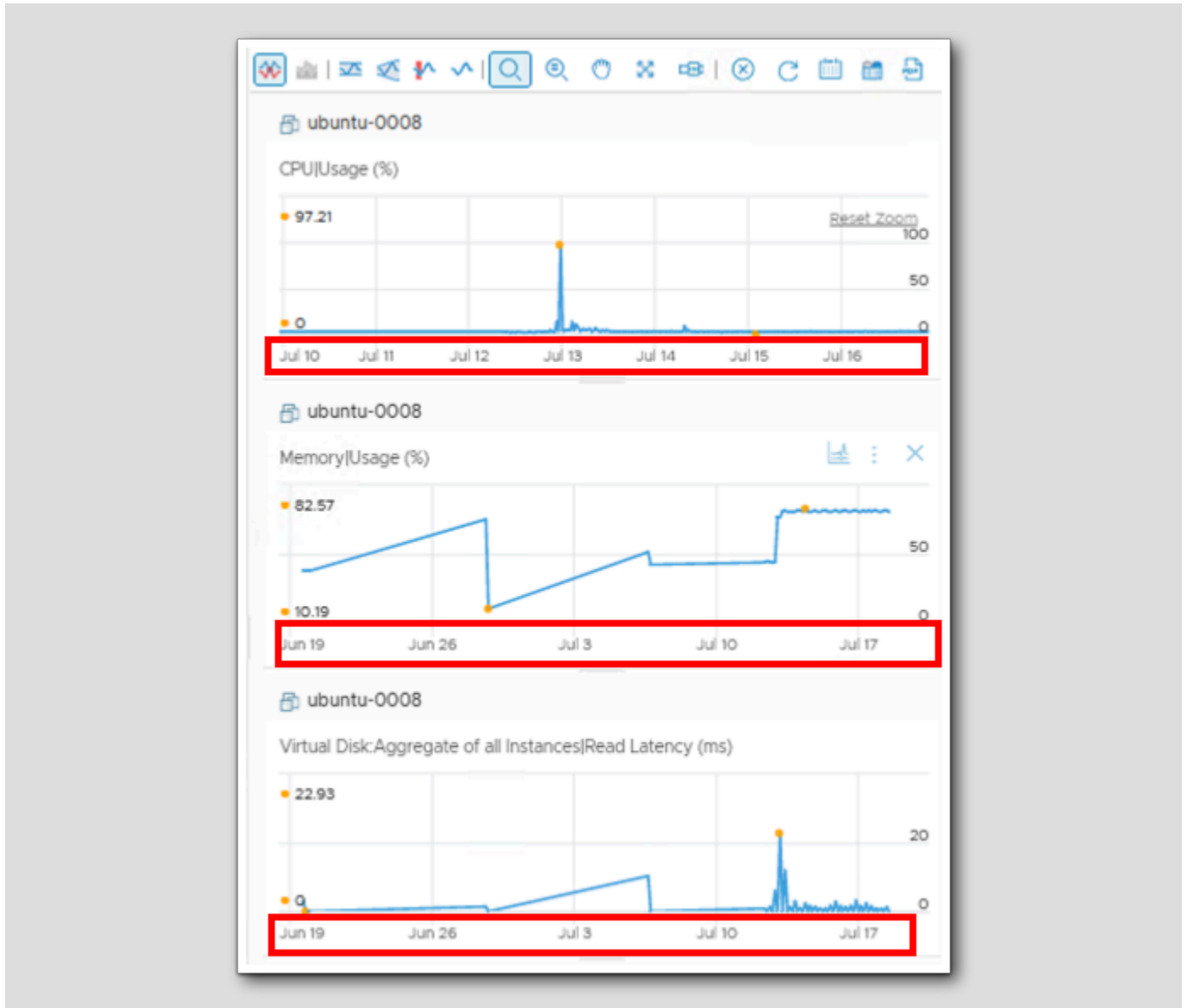


1. In the CPUUsage (%) chart, left click and drag a box around a spike in the chart like the red box shown above.

Your chart may look different due to the lab environment being created when you start this lab

CPU timeline

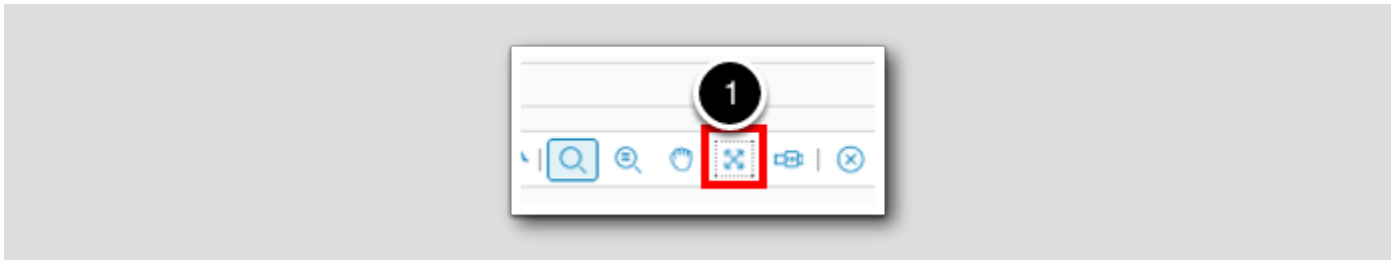
[458]



Notice that only the CPUUsage (%) chart's timeline has changed. Use the blank magnifying glass to zoom in on one chart at a time.

Zoom all

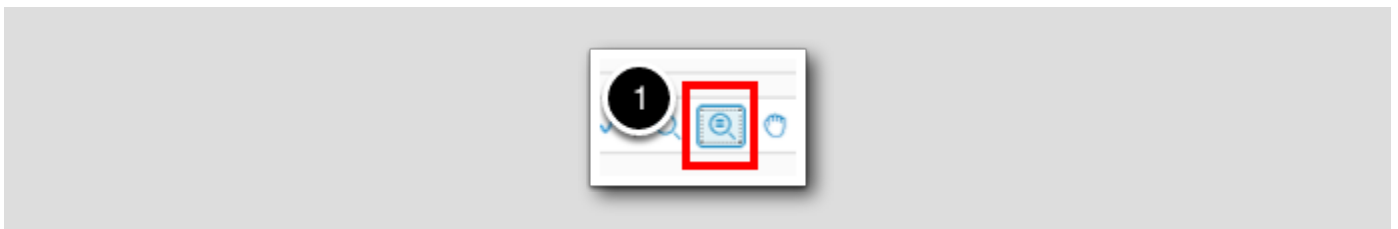
[459]



1. Click the Reset Zoom icon to un-zoom the CPU Usage (%) chart.

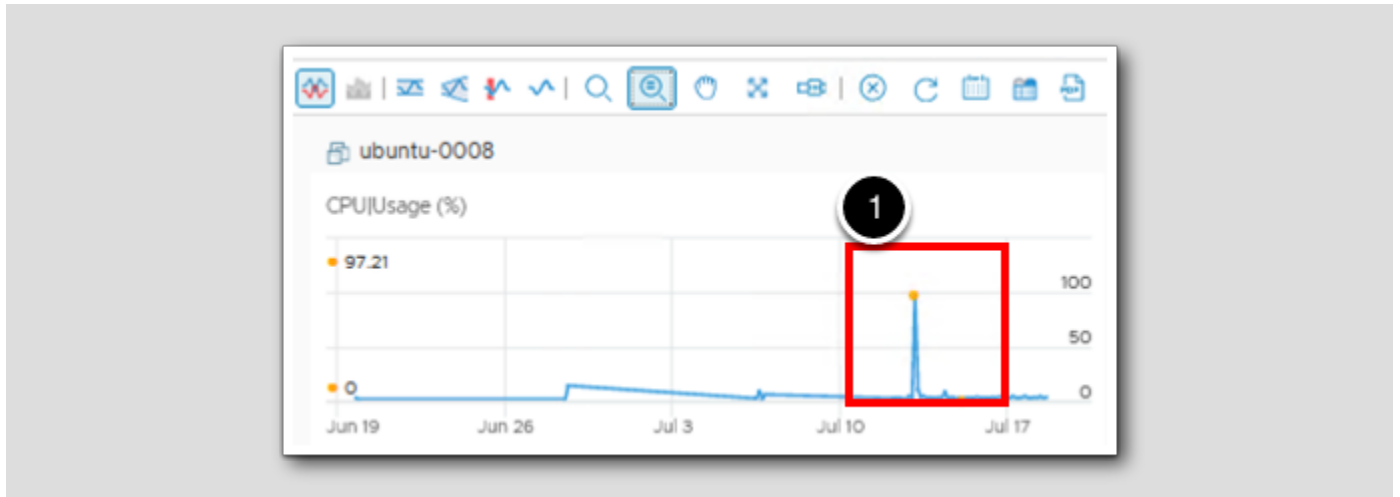
Zoom All Charts

[460]



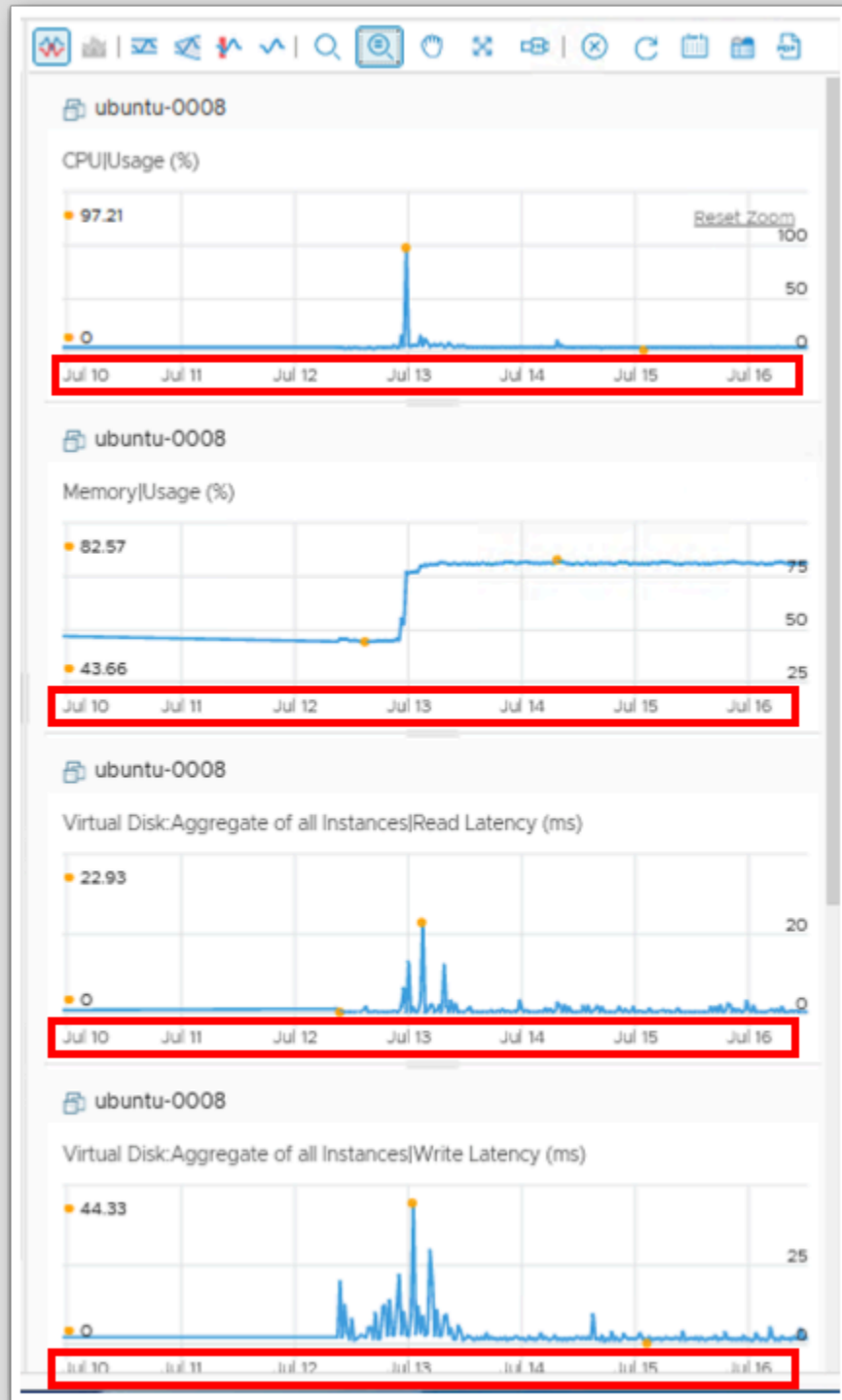
1. Click on the Zoom All Charts icon.

Zoom in on CPU again



1. In the CPUUsage (%) chart, left click and drag a box around the same spike from the step above.

All charts timeline change

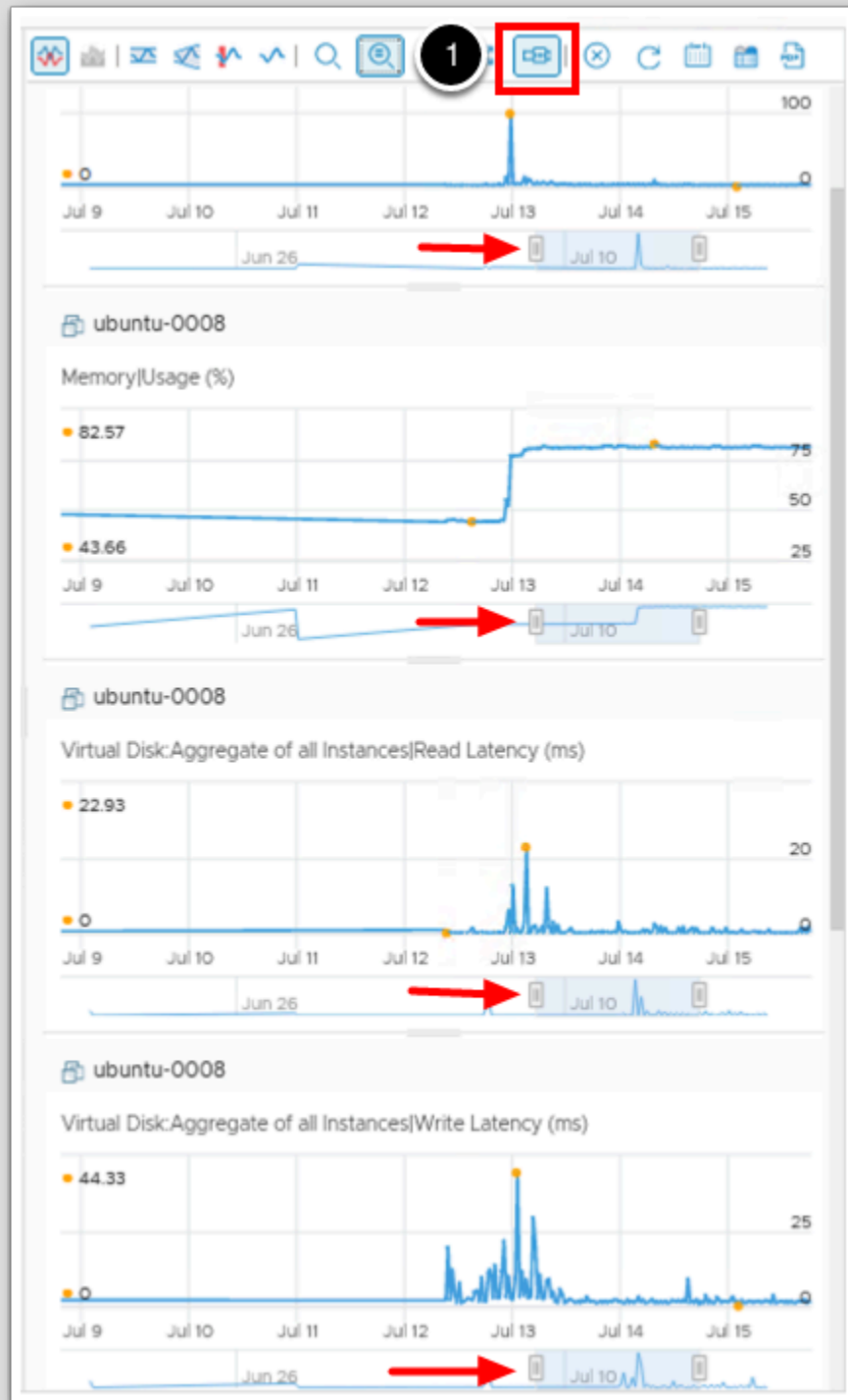


You will not only notice that all charts have had their timelines zoomed into the same timeframe, but that there is a commonality across the charts at the same time period. Using the Zoom All Charts feature is a quick way to identify issues during a specific event time.

Chart Navigator

[463]

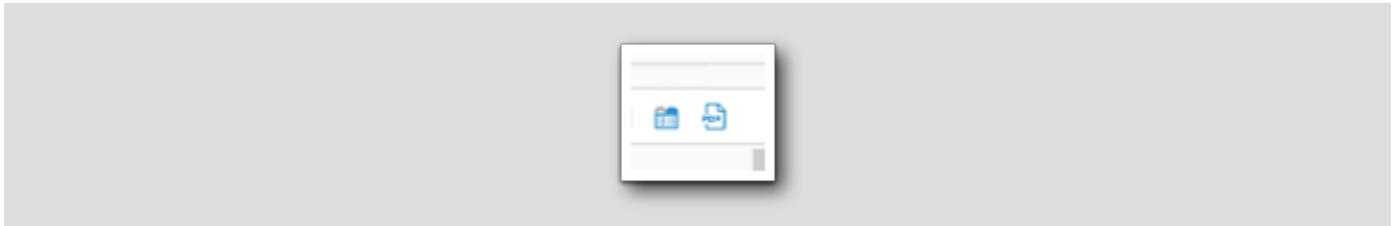
Chart Navigator will enable a slide bar under each chart and provides another way to adjust the timeline of your charts. Chart Navigator is also affected by the Zoom icons. If you have Zoom All Charts selected then all charts will change when you adjust the Chart Navigator slidebars.



1. Click on the **Chart Navigator** icon and test adjusting the chart timelines with both **Zoom the view** or the **Zoom All Charts** icons selected.

Generate Dashboard and Save as a PDF

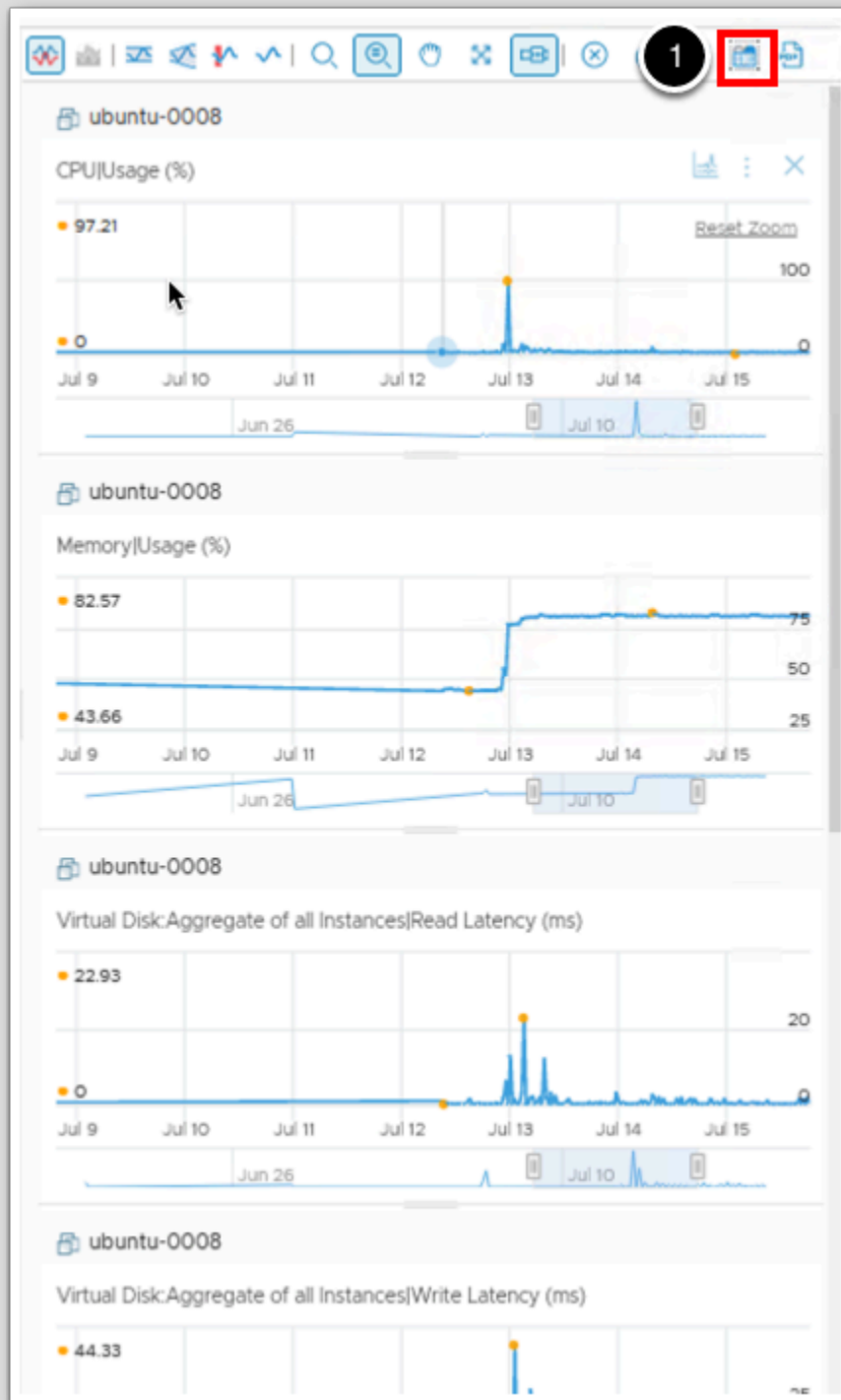
[464]



The last two icons we will discuss in this exercise are the Generate Dashboard and Save as a PDF. The chart list that this lesson walked you through is a good place to start troubleshooting a VM and how to get an idea of it's general health. It may be nice to just make a dashboard of it instead of manually building it out every time. Save to PDF will generate a PDF of the current chart data presented.

Generate Dashboard

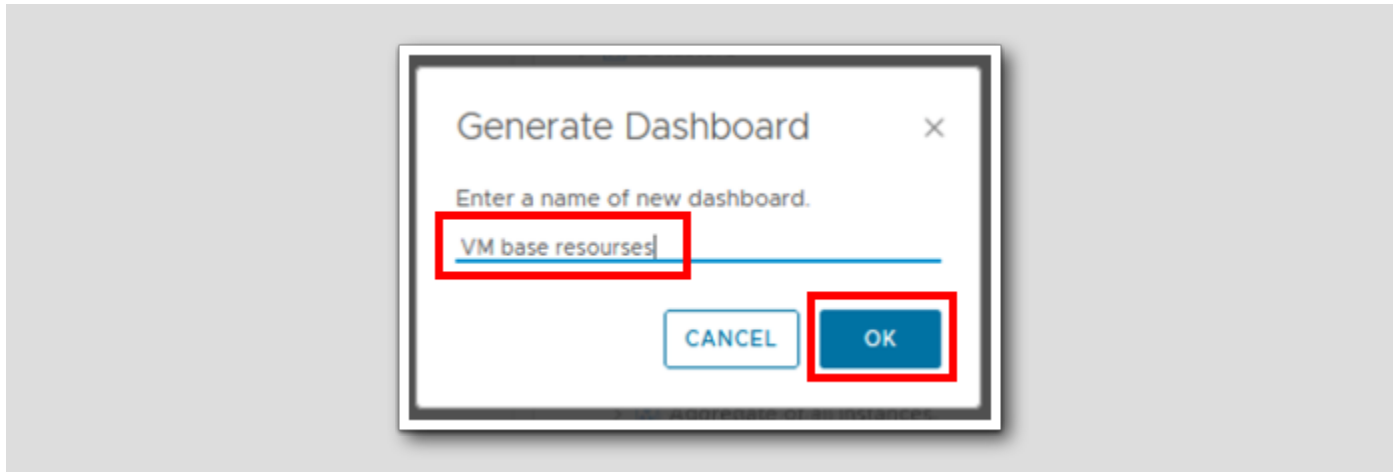
[465]



1. Click the Generate Dashboard icon.

Name the dashboard

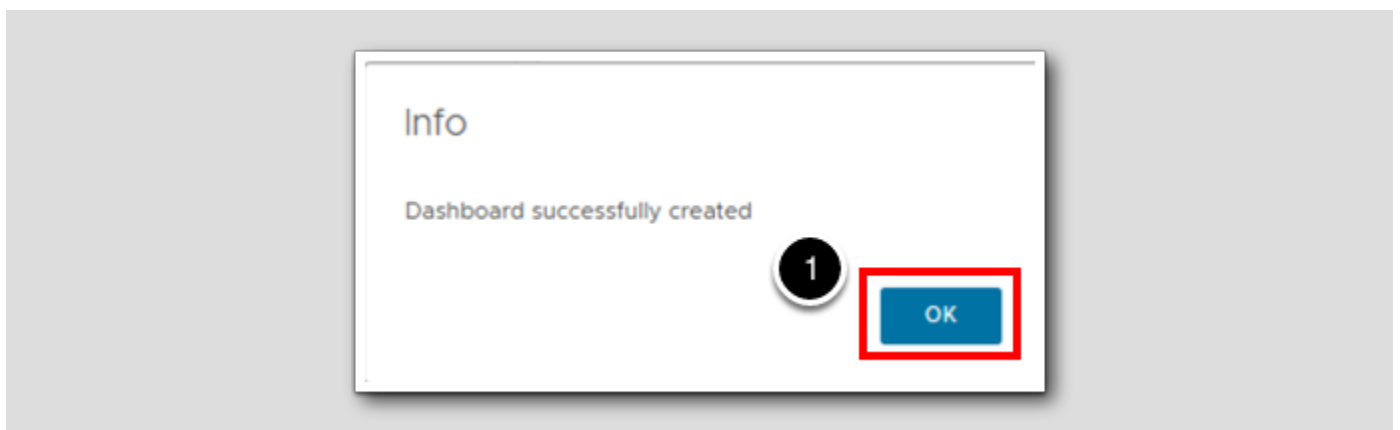
[466]



1. Enter VM base resources for the name

That was easy

[467]



1. Click OK.

View the dashboard

The screenshot displays the VMware Aria Operations interface. On the left, the 'Visualize' menu item is highlighted with a red box and a circled '2', and its 'Dashboards' sub-item is also highlighted. A circled '1' points to a dropdown arrow next to the 'Visualize' menu. The main area shows a dashboard for 'VM base resources' with three stacked line charts for 'ubuntu-0008': CPUUsage (%), MemoryUsage (%), and Virtual Disk:Aggregate of all Instances|Read Latency (ms).

1. Click on > next to Visualize.
2. Click on Dashboards.

Notice that the newly created dashboard automatically shows up under Recents.

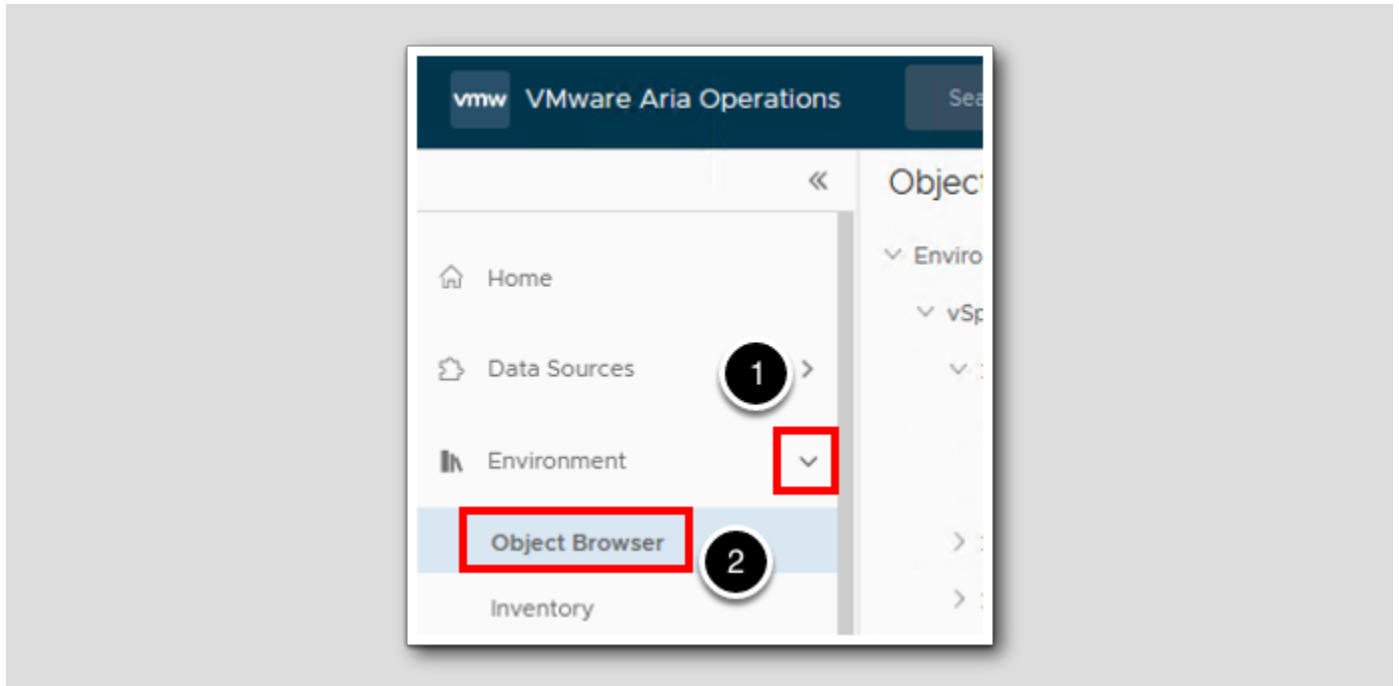
Stacking Charts

In this lesson we will highlight the ability to stack multiple charts into one chart with a color key defining individual charts.

Comparing CPUs

[470]

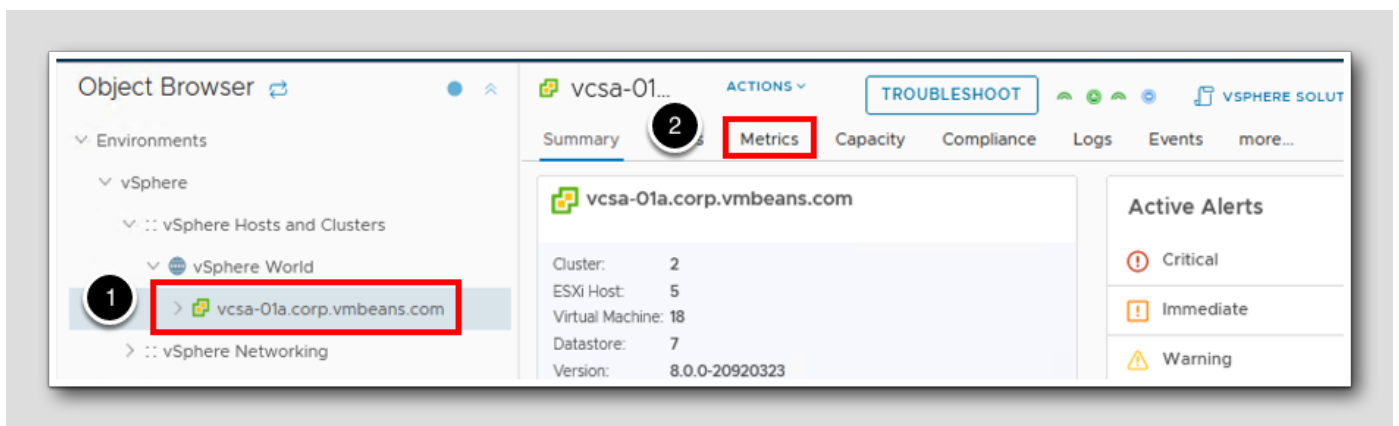
In this lesson we will build out charts from different host CPU usage and stack the charts for comparison.



1. Click > to expand Environment.
2. Click Object Browser.

vSphere Hosts and Clusters

[471]

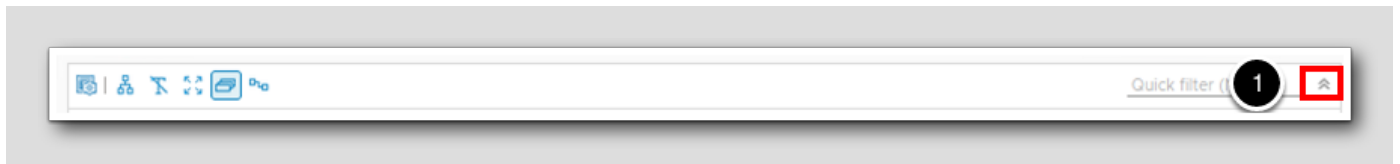


The Object Browser should have expanded the vSphere environment down to the vCenter `vcsa-01a.corp.vmbeans.com`. If it did not, click each > to expand down to `vcsa-01a.corp.vmbeans.com`.

1. Click on `vcsa-01a.corp.vmbeans.com`.
2. Click on **Metrics**.

Make sure Object Relationship window is minimized

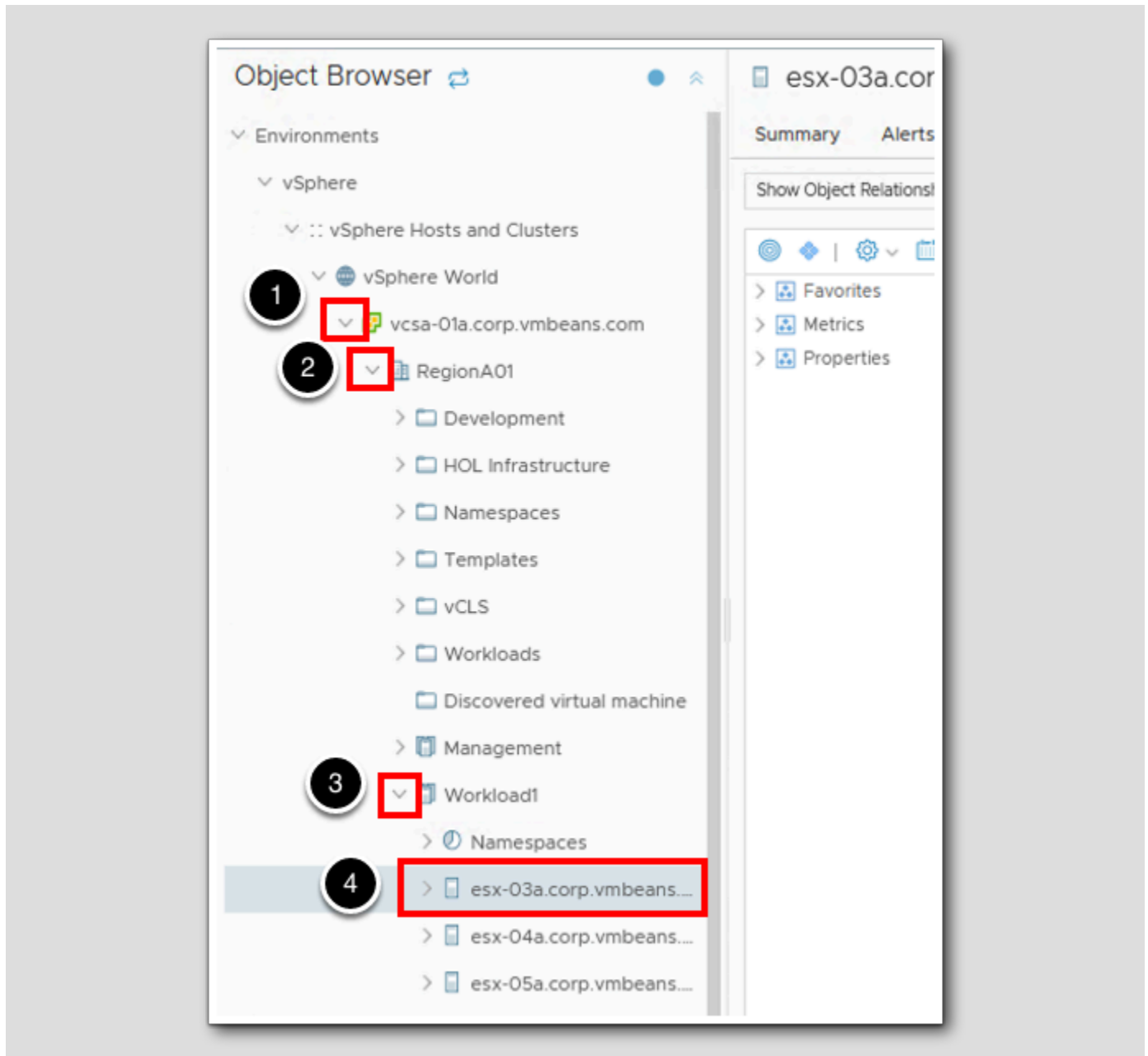
[472]



If the Object Relationship isn't minimized, minimize it so there's more real-estate for our Charts.

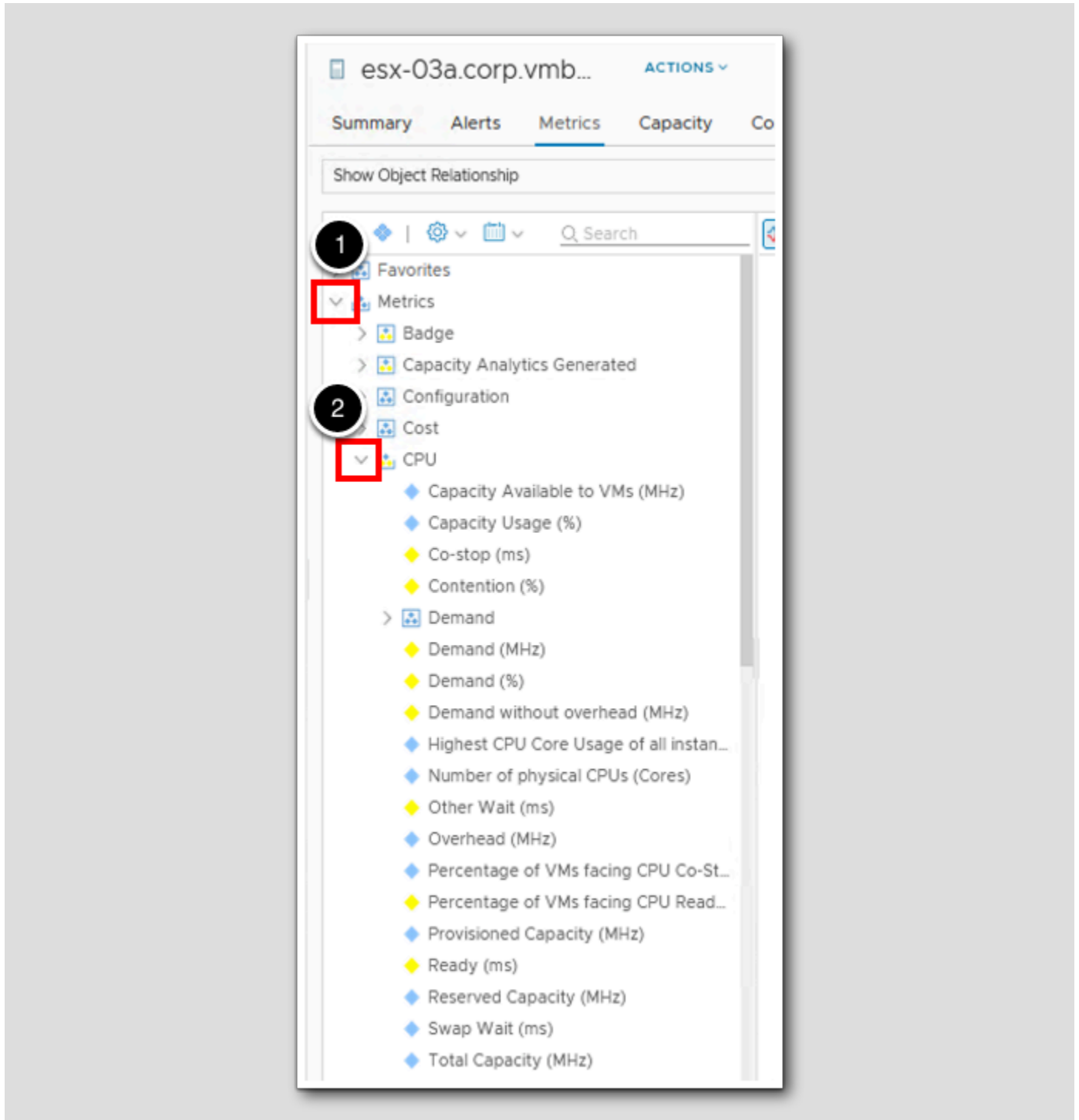
1. Click on the **double chevron**.

Get workload cluster ESX host details



1. Click > to expand vcsa-01a.corp.vmbeans.com.
2. Click > to expand RegionA01.
3. Click > to expand Workload1.
4. Click on esx-03a.corp.vmbeans.com.

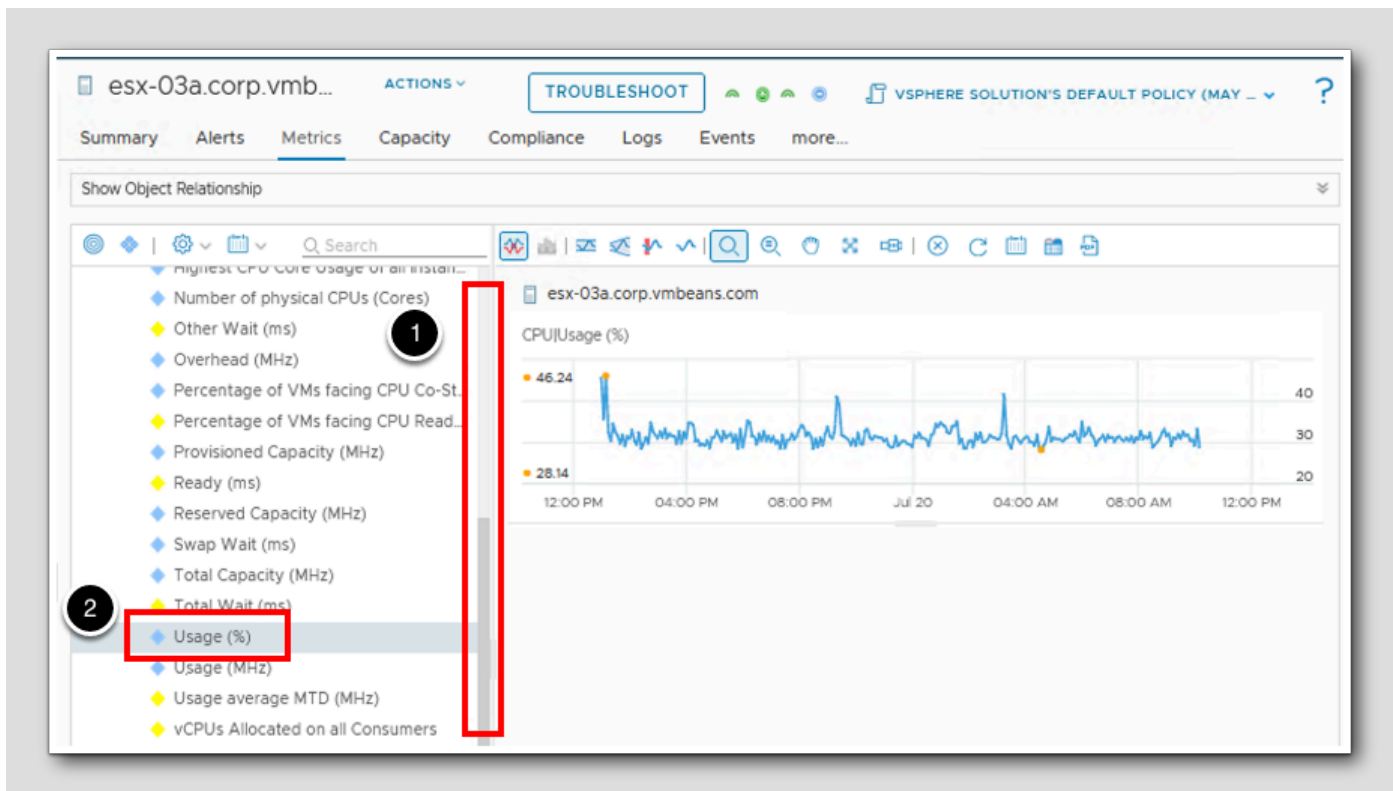
Add host CPU Usage%



1. Click > to expand Metrics.
2. Click > to expand the CPU Metric list.

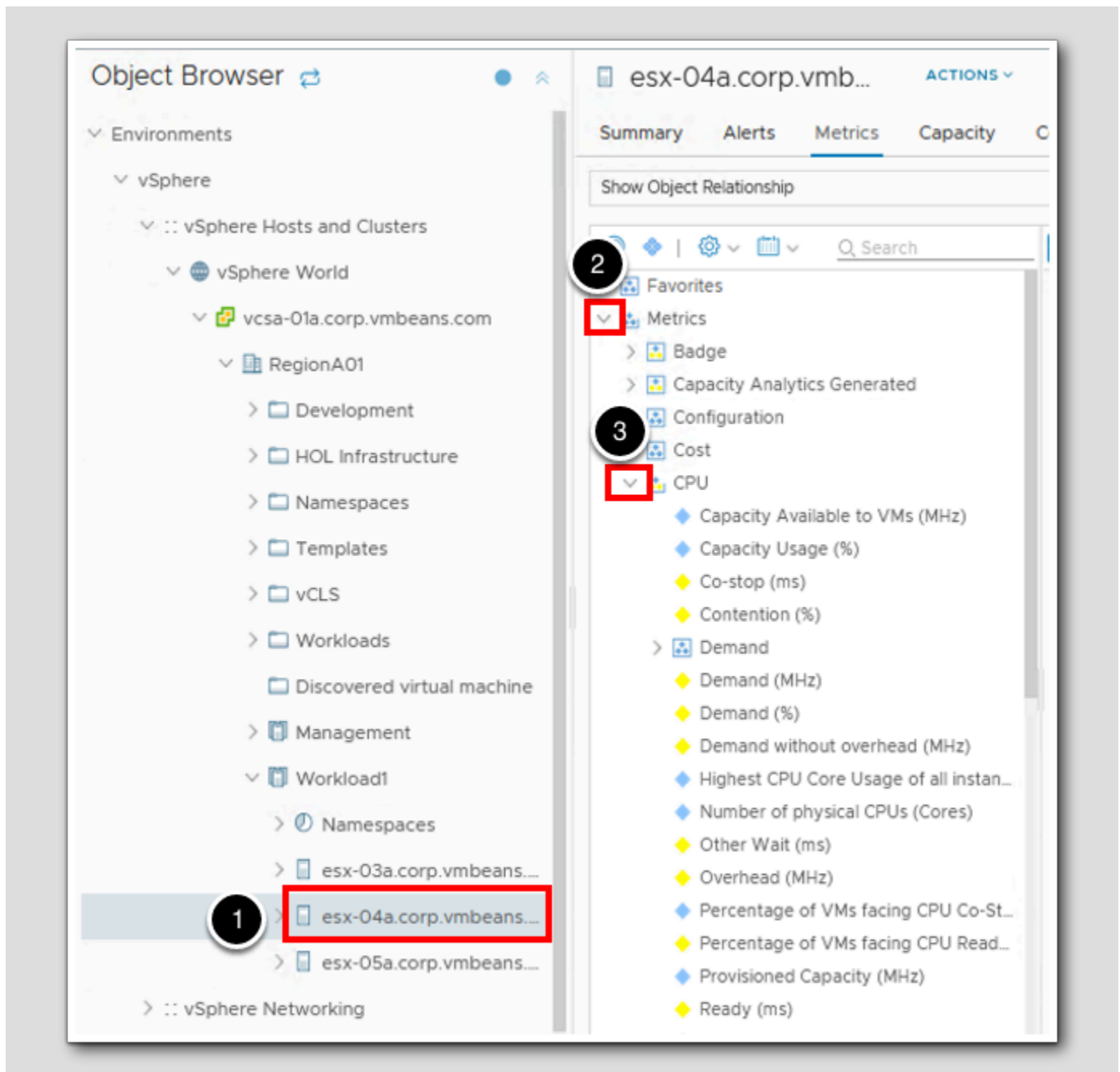
Add host CPU Usage (%) continued

[475]



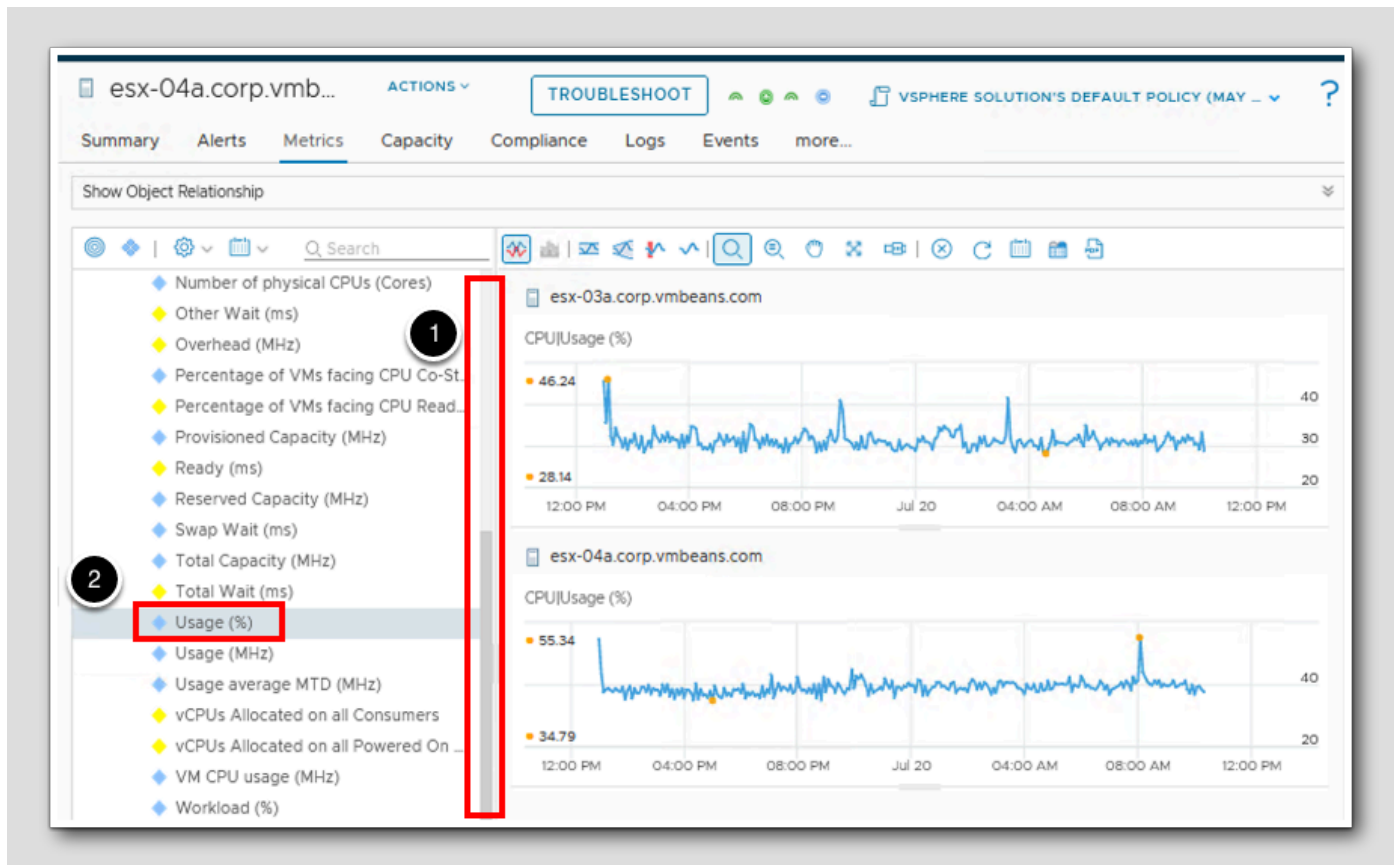
1. Scroll down until you see Usage (%).
2. Double click Usage (%).

Grab another host's CPU Usage (%)



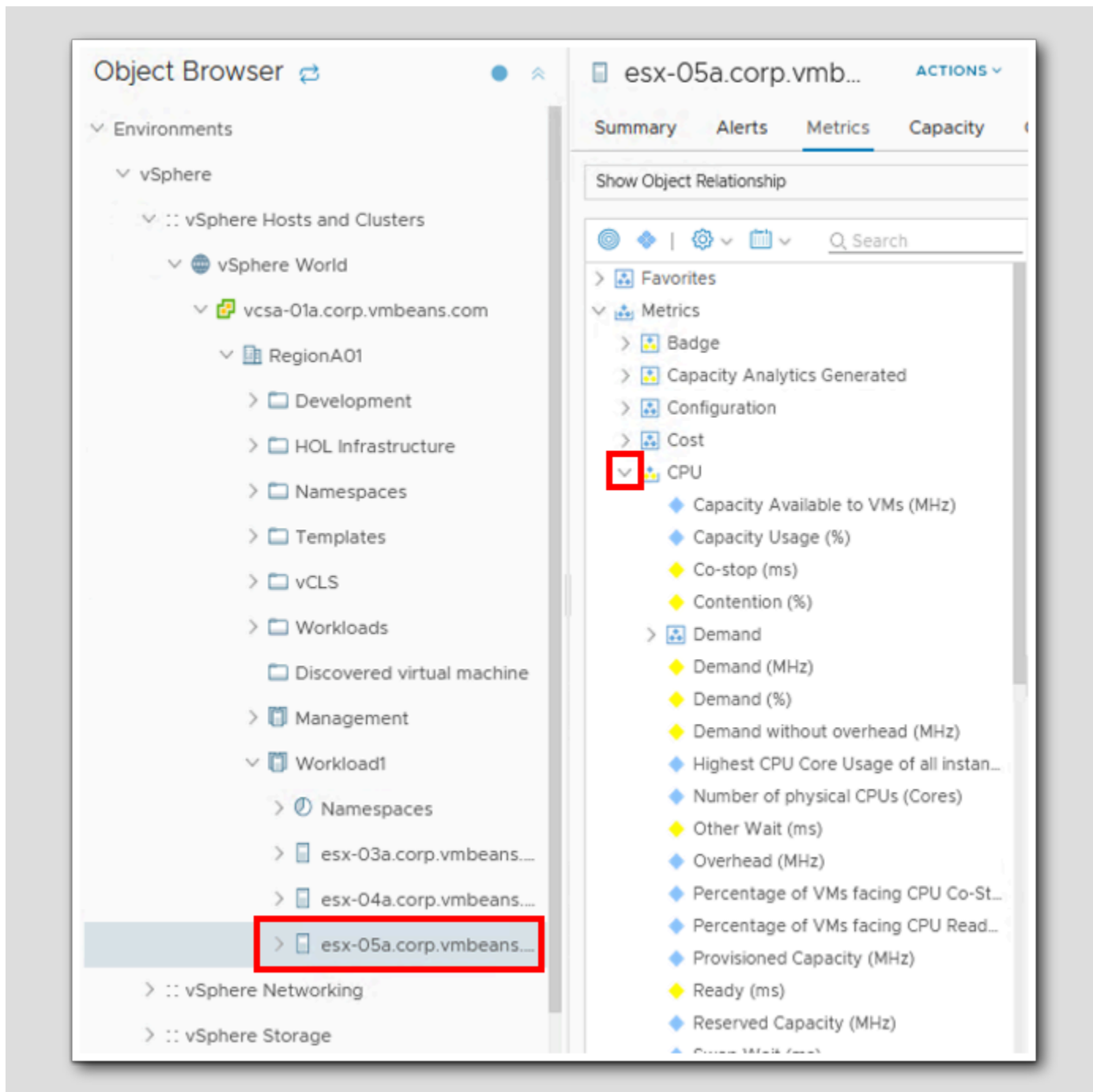
1. Click on esx-04a.corp.vmb....
2. Click > to expand Metrics.
3. Click > to expand CPU.

Grab another host's CPU Usage (%) continued



1. Scroll down until you see Usage (%).
2. Double click Usage (%).

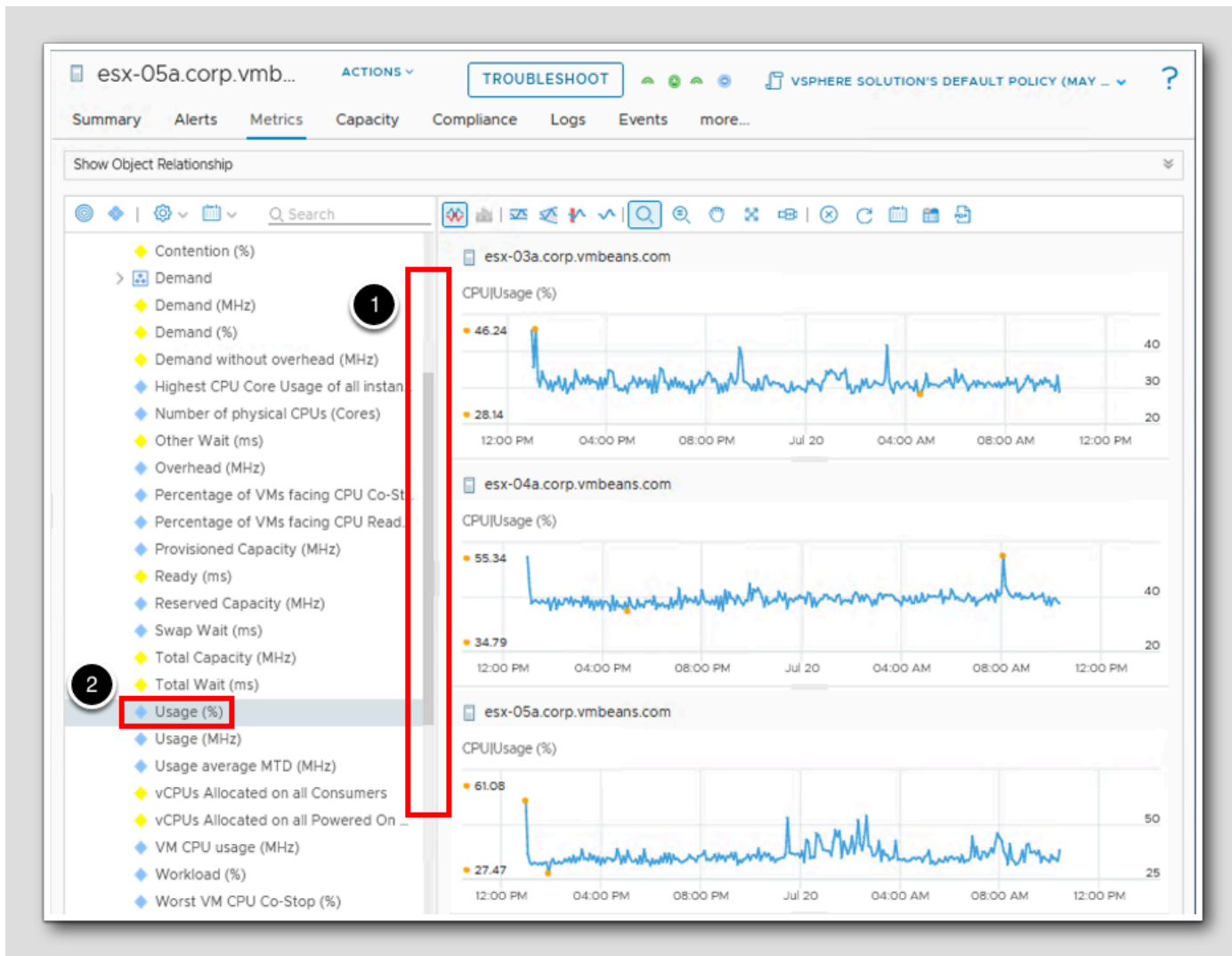
Add a third host's CPU Usage (%)



1. Click on esx-05a.corp.vmbeans.com.
2. Click > to expand Metrics.
3. Click > to expand CPU.

Add a third host's CPU Usage (%) continued

[479]



1. Scroll down until you see Usage (%).
2. Double click Usage (%).

We have now built out a Chart view of three different hosts and compare CPU Usage (%) but it's a little difficult to truly compare at a macro layer. Let's stack these charts to make that a little easier.

Split Charts icon

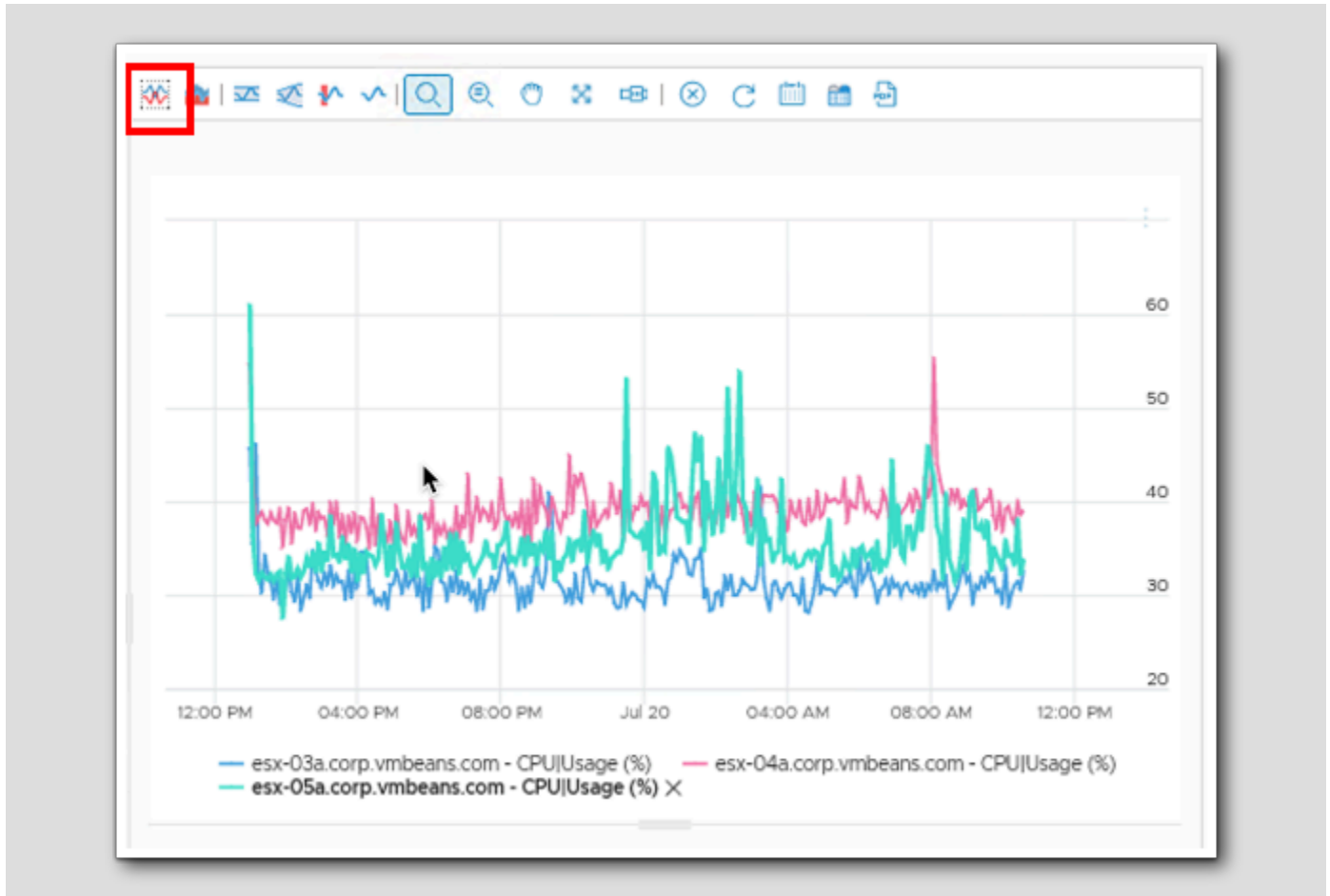
[480]



This icon at the top of the charts list is called the Split Charts icon and is enabled by default. When enabled, each metric gets its own chart. Unchecking it will combine all charts into one chart and can provide a much easier view to compare metrics.

Un-split the Host CPU charts

[481]



1. Click on the Split Charts icon to disable it.

We have now stacked the charts and we can read them relative to each-other giving us a comparison of CPU Usage (%) for each of the ESX hosts from minute to minute. Notice each host automatically gets it's own color explained in the key below the graph.

This concludes this lesson

Conclusion

[482]

Metrics use is a powerful way to build a custom window into the performance of a resource. We hope this lesson has shown how to build a multi chart view, and the options provided with that view, that can be used to troubleshoot the infrastructure.

You've finished Module 8

Congratulations on completing the lab module.

If you are looking for additional general information on Aria Operations 8.4, try one of these:

- **VMware Product Public Page -Aria Operations:** <https://www.vmware.com/products/aria-operations.html>
- **Aria Operations 8.12 - Release Notes:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/rn/vmware-aria-operations-812-release-notes/index.html>
- **Aria Operations - Documentation:** <https://docs.vmware.com/en/VMware-Aria-Operations/index.html>
- **VMware Cloud Management Blog - What's New in Aria Operations 8.12 and Cloud:** <https://blogs.vmware.com/management/2023/04/whats-new-in-vmware-aria-operations-8-12.html>

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 9 - Advanced Troubleshooting Techniques (15 minutes) Intermediate

Introduction

[485]

The Troubleshooting Workbench is where you perform advanced troubleshooting tasks on an alert that triggered on an object. You can investigate both known and unknown issues in VMware Aria Operations. It was specifically designed to focus in and out of an object to quickly identify if there is an issue with a specific object or, by providing the ability to zoom out the scope, to see if there is a systemic issue within the infrastructure.

Log in to Aria Operations

[486]

We will log in to a live instance of Aria Operations running in this lab.

Open the Firefox Browser from the Windows Task Bar

[487]

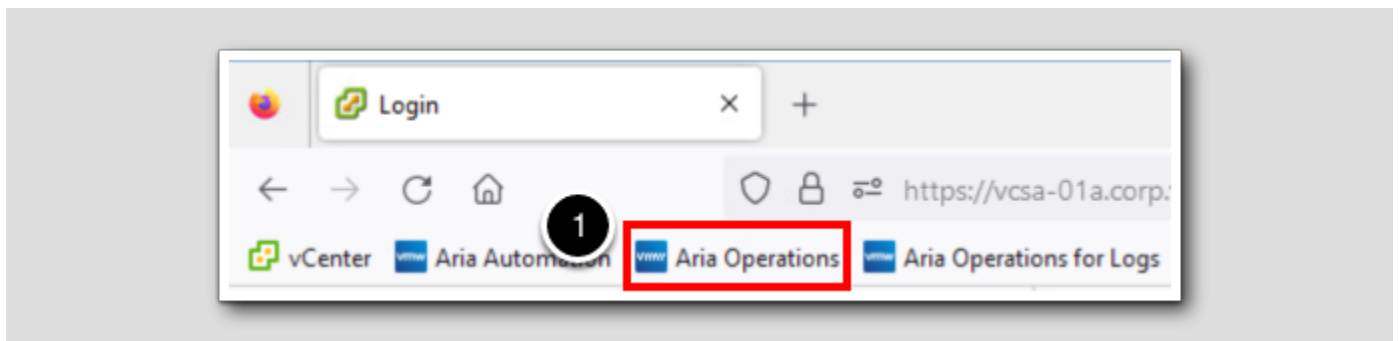


If the browser is not already open, launch Firefox.

1. Click the Firefox icon in the Windows Quick Launch Task Bar at the bottom of the screen.

Navigate to Aria Operations

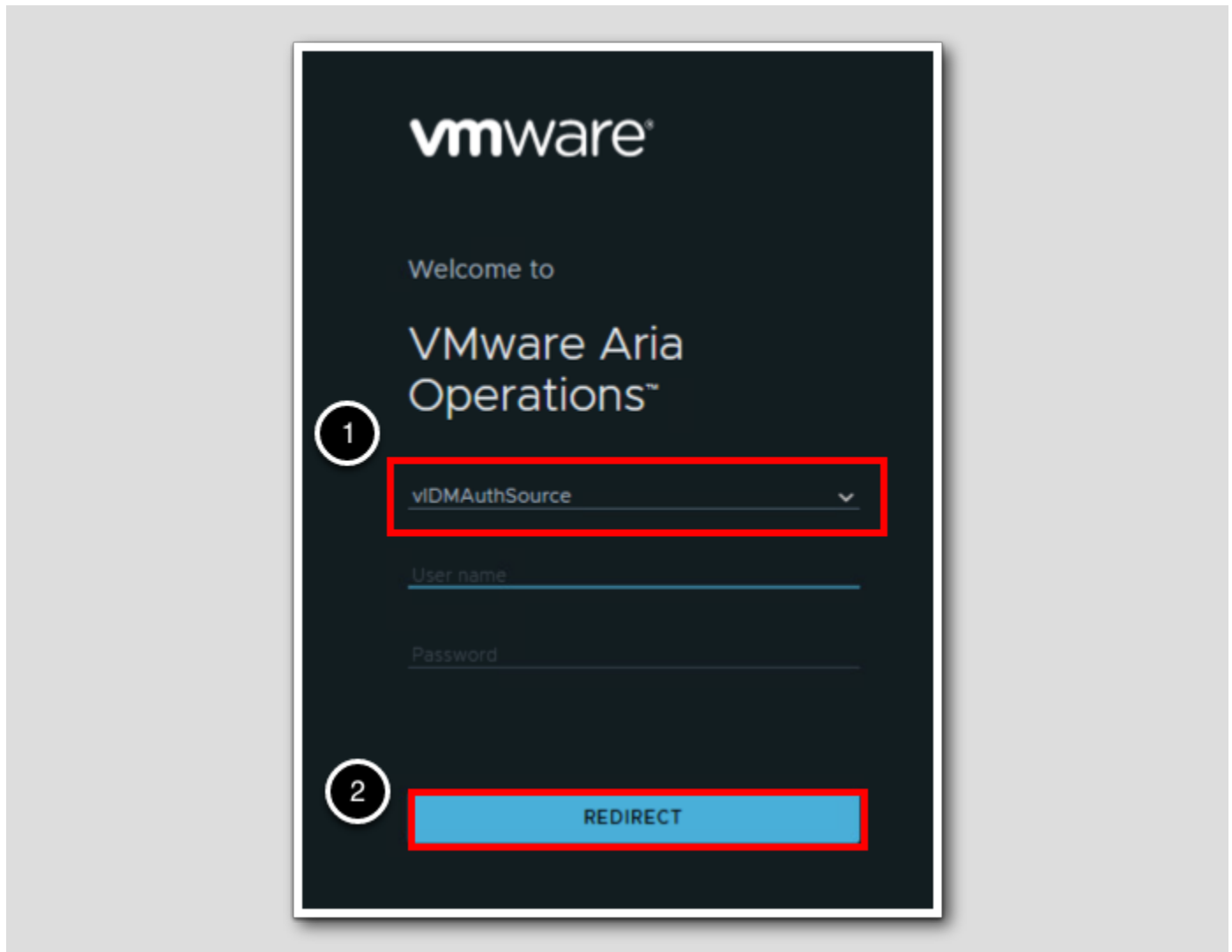
[488]



1. Click the Aria Operations bookmark in the bookmarks toolbar.

Log in to Aria Operations

[489]



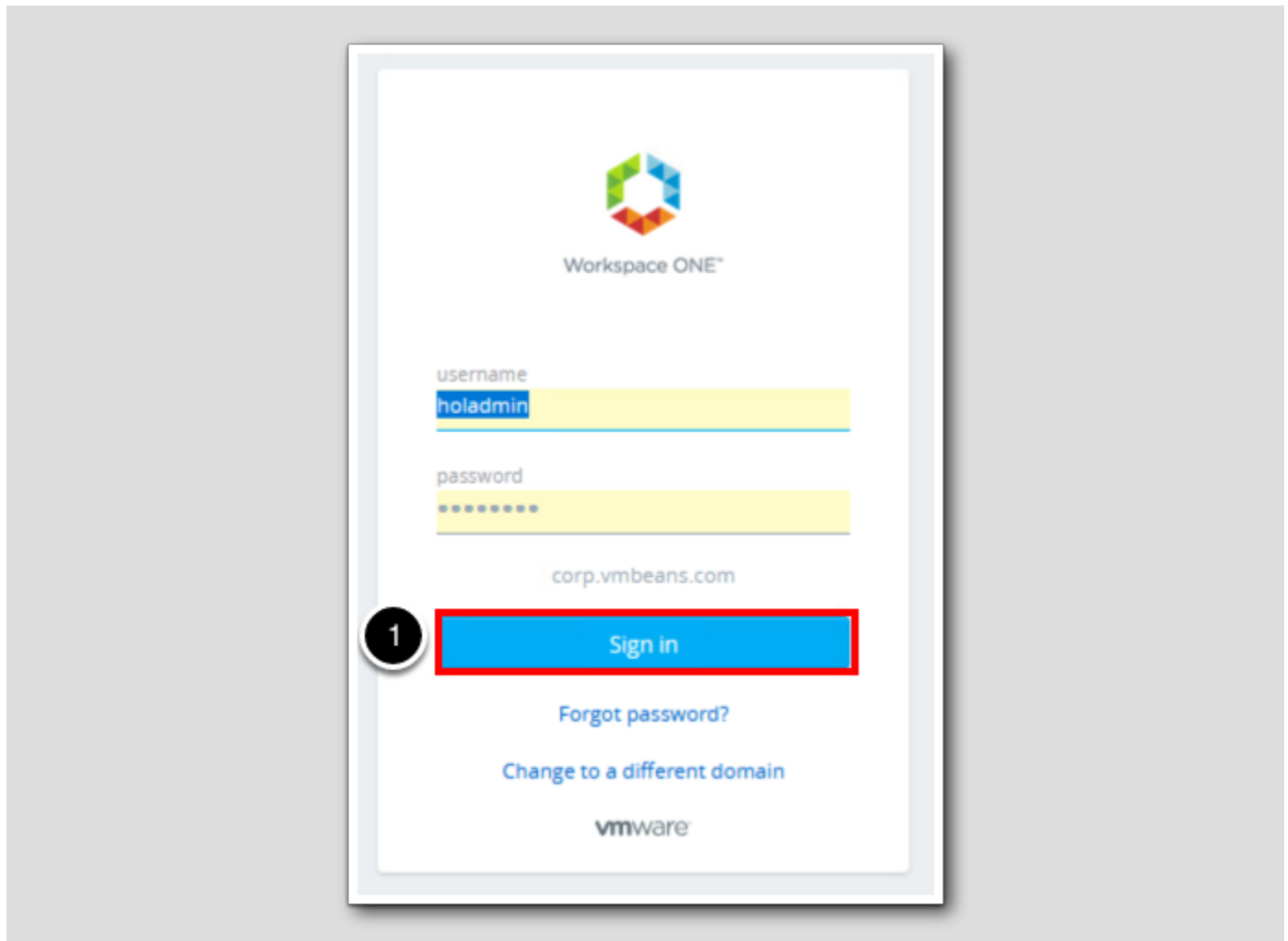
Aria Operations is integrated with VMware Workspace ONE Access (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

vIDMAuthSource may be pre-selected as the default identity source. If it is not, then you will need to select it.

1. Click the **drop-down arrow** and select vIDMAuthSource if it is not already selected.
2. Click **REDIRECT** to be taken to the authentication page.

VMware Identity Manager Login

[490]



VMware Identity Manager acts as the identity provider for the Active Directory authentication source in this lab.

Credentials for the default user, holadmin, have already been provided.

1. Click **Sign in**.

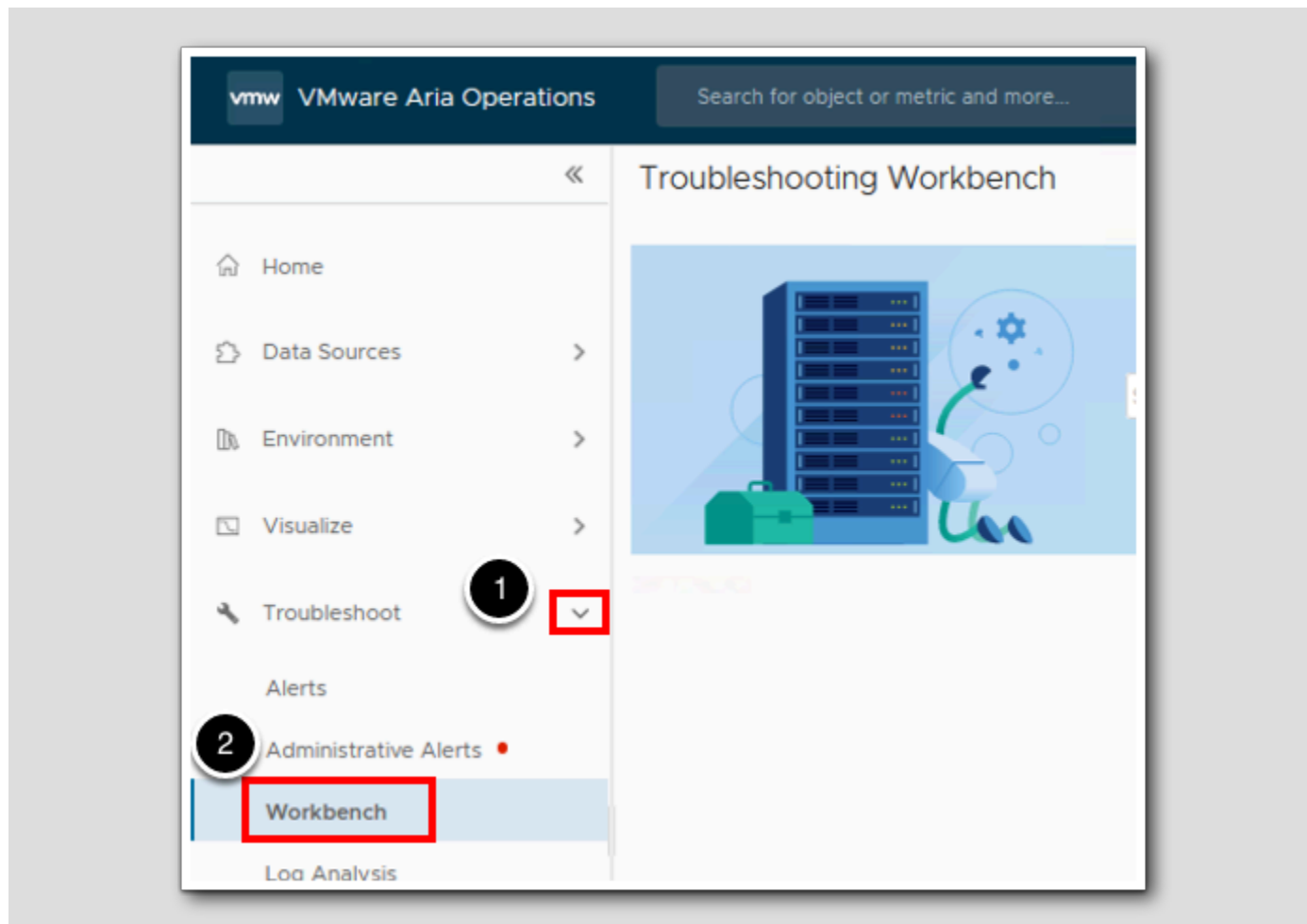
Introduction to Workbench

[491]

Workbench is a purpose built interface that allows for quick reference of not only a troubled resource but it's subordinate and parent objects. This allows a perfect window to assess if there is a problem with an individual resource or if there is a systemic issue happening.

Open Workbench

[492]

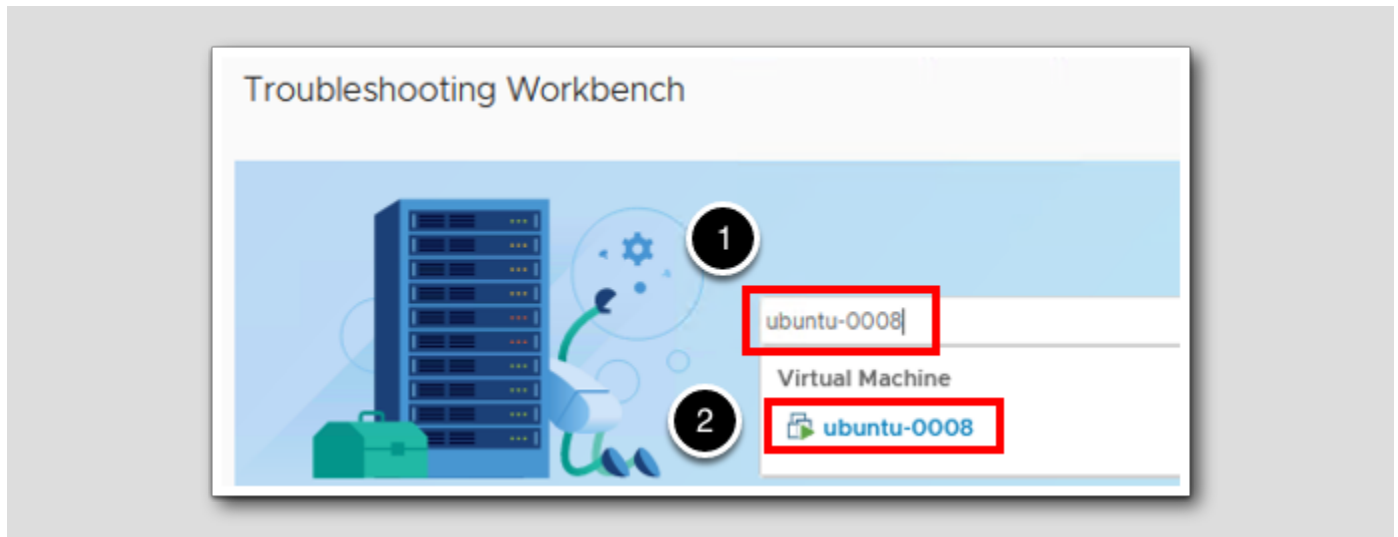


1. Click > next to Troubleshoot.
2. Click on Workbench.

Search for your subject

[493]

In this lesson we will start our troubleshooting at the VM layer, as if a complaint came in about VM performance, and expand our scope from there.



1. In the search bar type `ubuntu-0008`.
2. Click on `ubuntu-0008`.

Troubleshooting Workbench construct

[494]

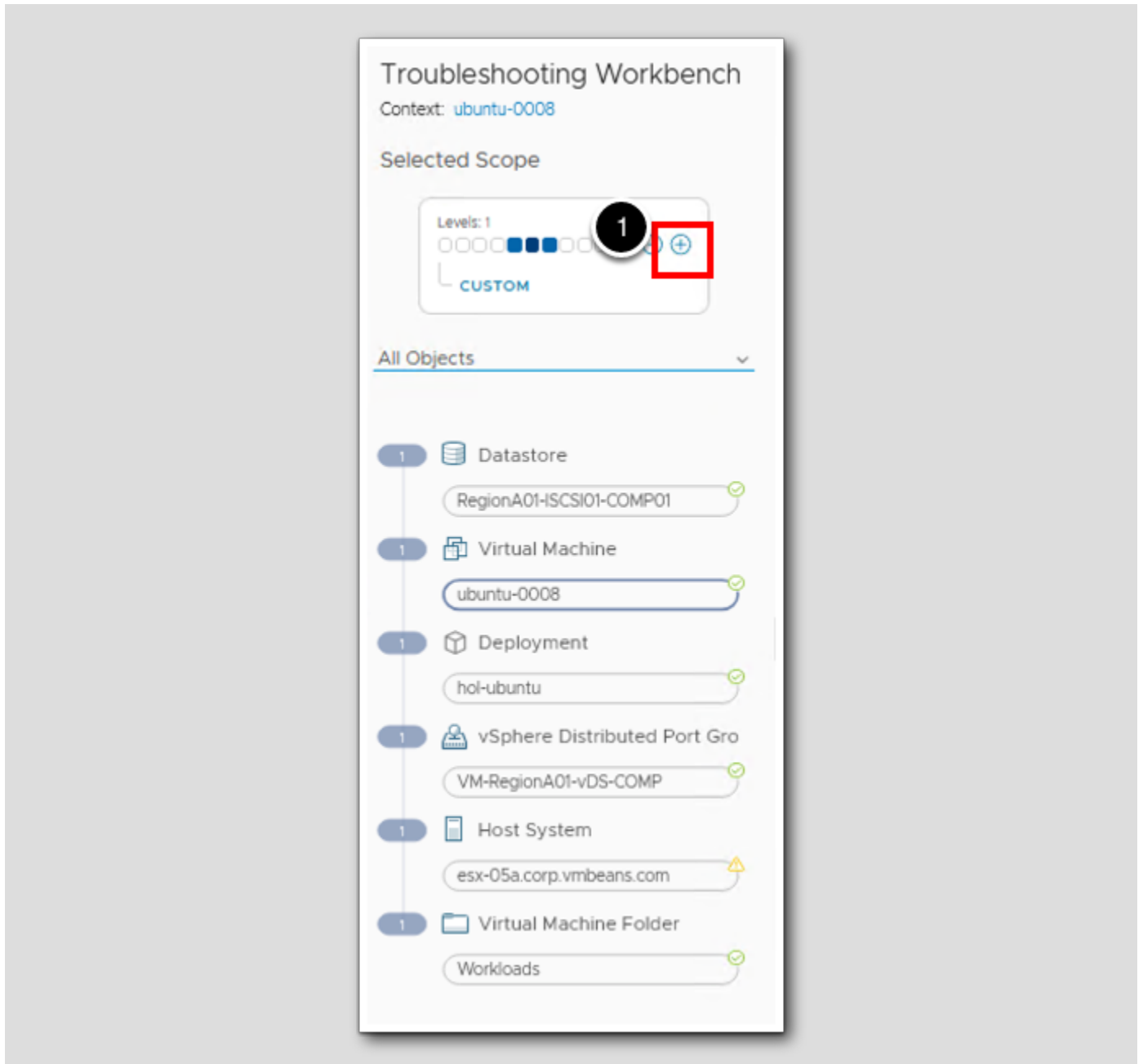
Let's take a look at how the Troubleshooting Workbench was purpose built to troubleshoot a problem in your infrastructure. The dashboard allows for a user to quickly switch from troubleshooting a specific object to pan out and troubleshoot a systemic issue in one page.

Scope

[495]

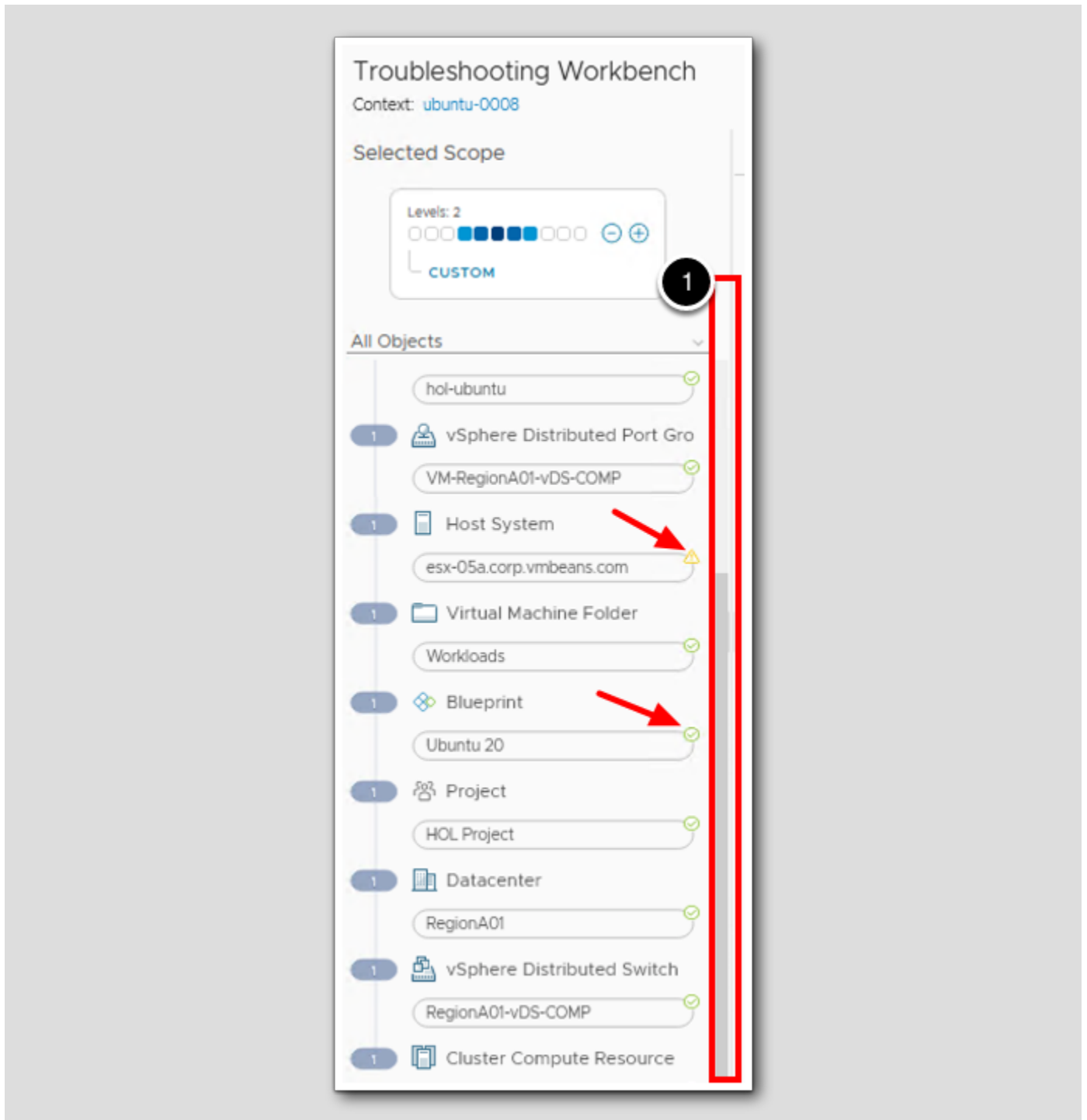
You look for potential evidences of a problem within a specific scope and time range. The Selected Scope control on the left of the Troubleshooting Workbench page is where you vary the scope. You can vary the scope in the following ways:

- You can select only the object that you are investigating, or include several upstream and downstream relationships by increasing the scope. As you increase the scope, more objects are displayed in the inventory tree.



1. Click on the + icon to expand the scope one more layer of parent and child objects.

One more layer

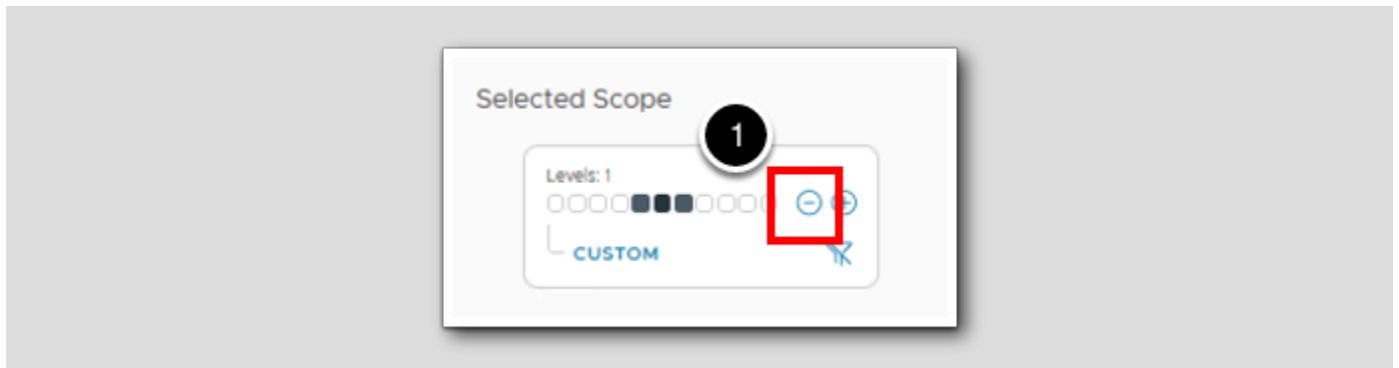


1. Scroll down to the bottom of the Scope window.

Notice that have expanded the scope to include Blueprint, Project, Datacenter, vSphere Distributed Switch and Cluster Compute Resource. On the right hand side notice the green checkmarks and the yellow exclamation points. As you zoom your Scope out you can quickly identify issues higher up in the stack that may be contributing to the issue at hand.

Collapse back down

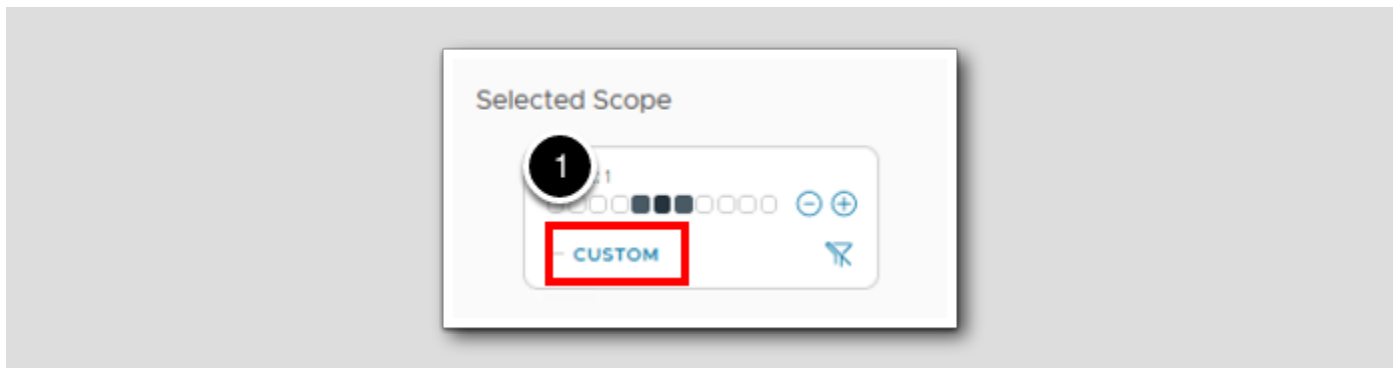
[497]



1. Click - to collapse the Scope back down to one level above and one level below.

Custom

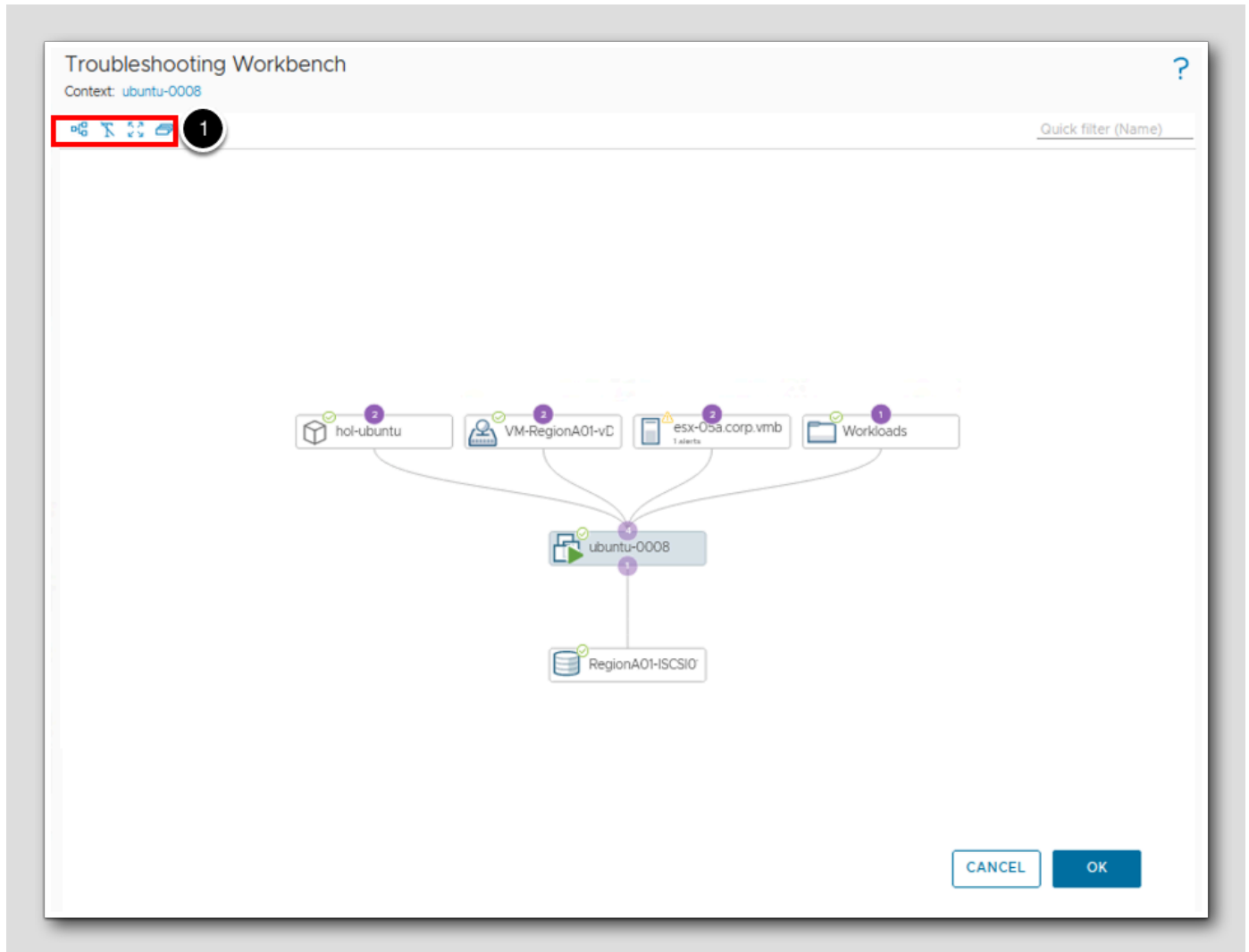
[498]



1. Click CUSTOM.

Custom Scope

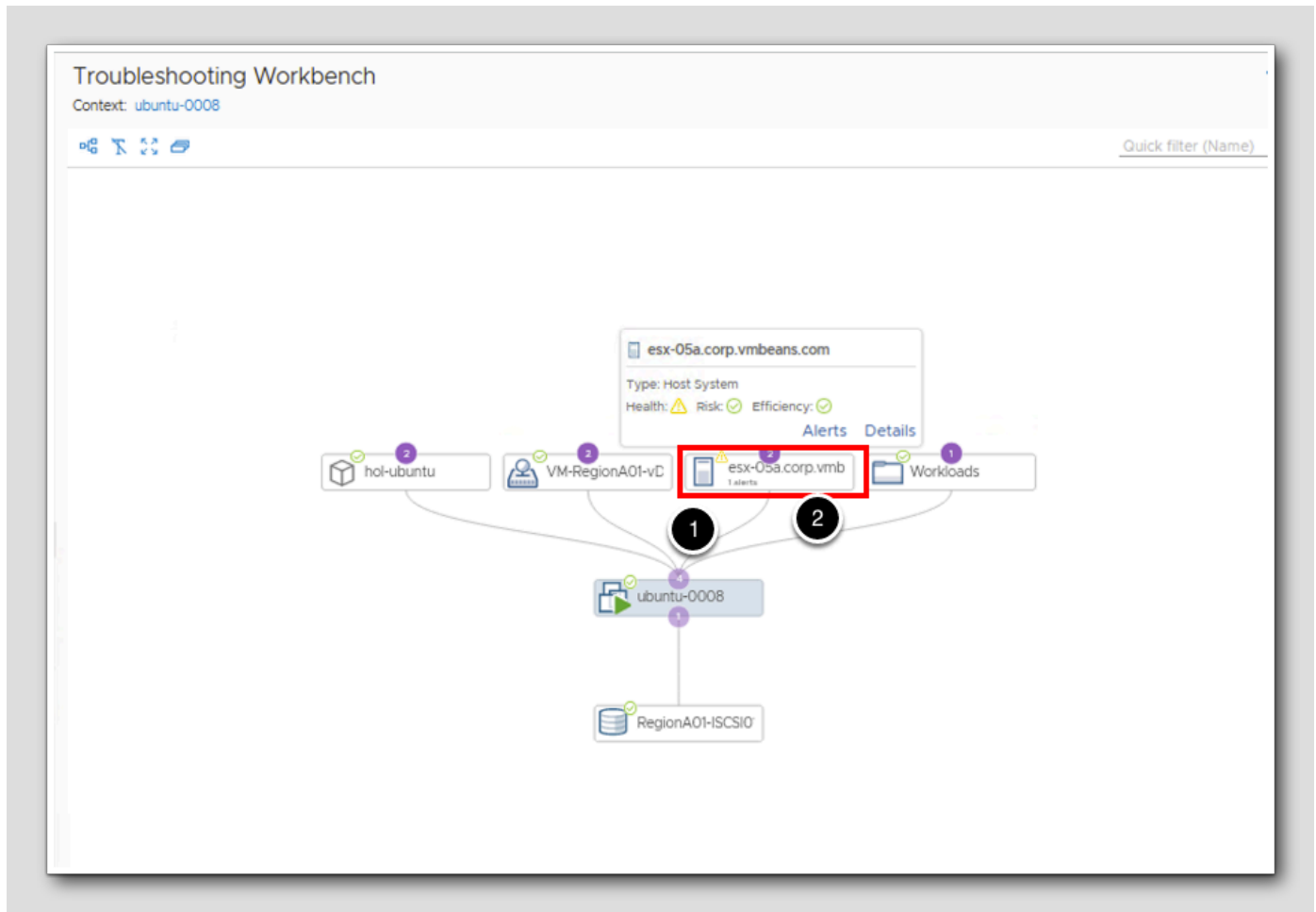
You can select a custom scope to include objects of your choice. Clicking Custom will open an interactive window where you use the pointer to visually rearrange your objects, view relationships and add peers to modify the relationships. To see details about the object, place the pointer for a few seconds above the object. You can reset a custom scope to start all over again.



1. Click on the Custom Scope icons to see how you can manipulate the visual display of the custom view

Hover for details

[500]

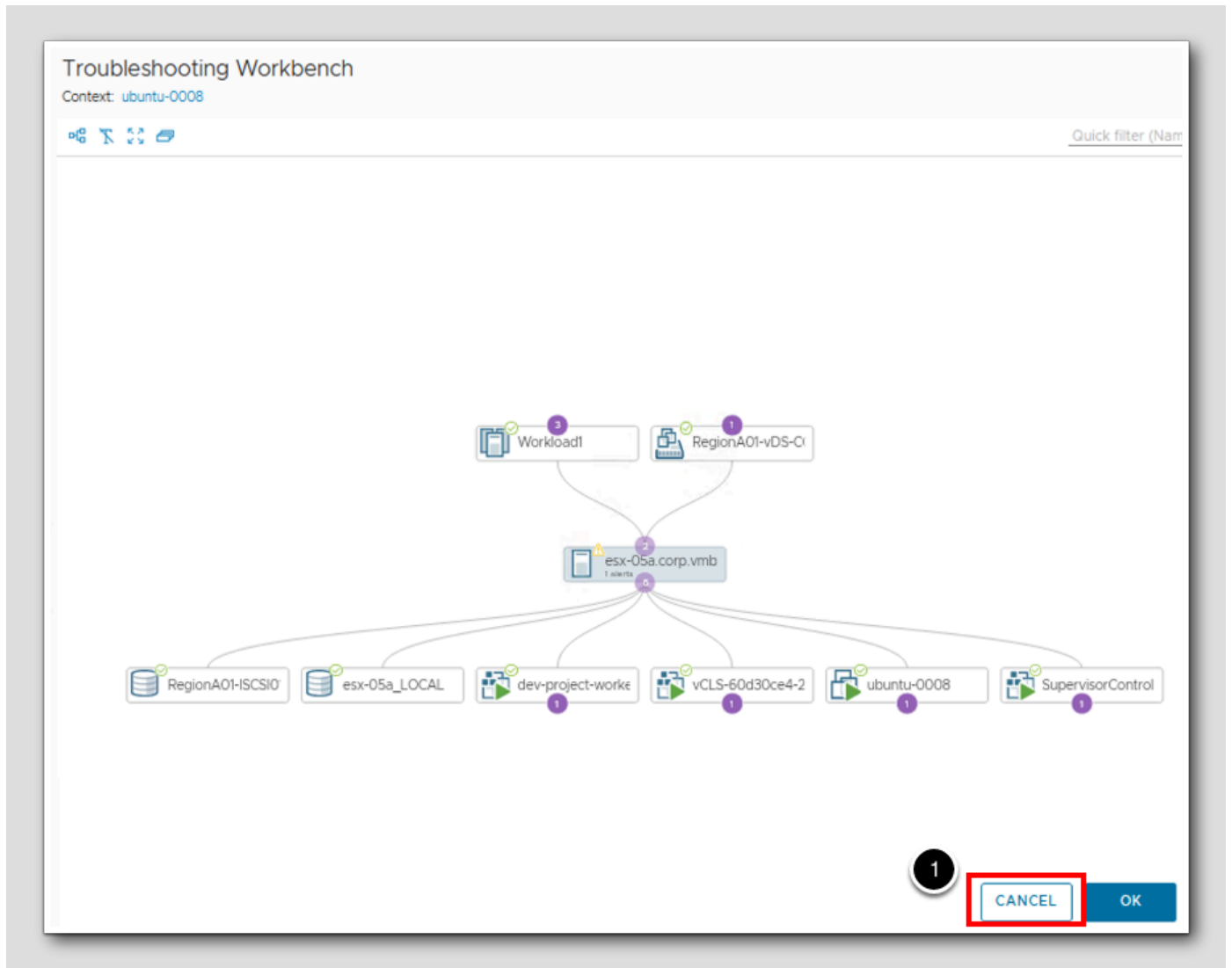


1. Hover over `esx-05a.corp.vmbeans.com` to bring up the information window and notice the Health indicator is yellow.
2. Double click on `esx-05a.corp.vmbeans.com` to focus on that object.

Switch Focus

[501]

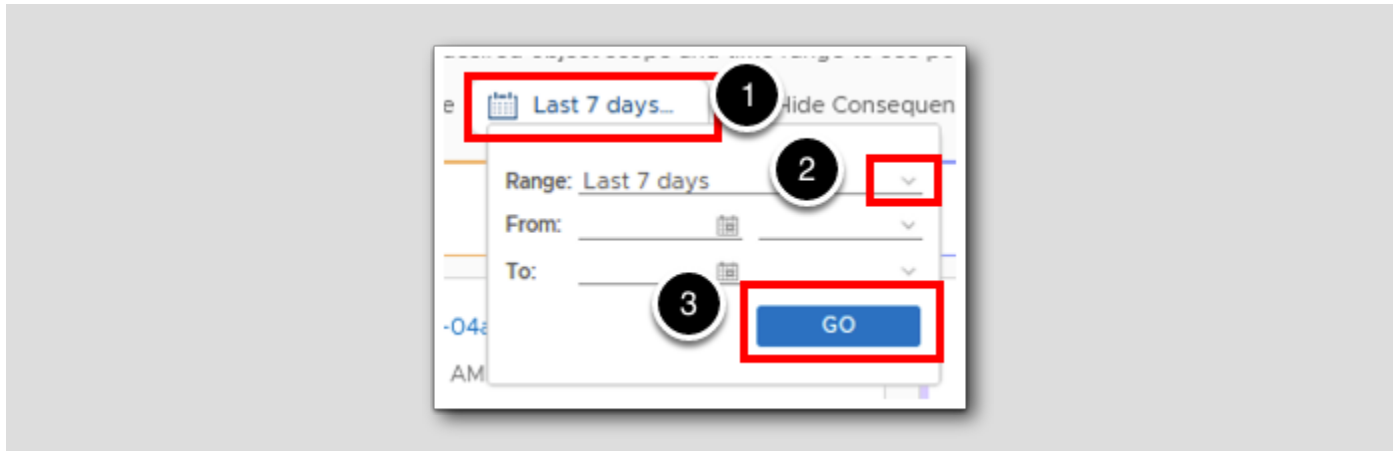
Double clicking on an object in the Custom view will quickly show the relationship of that object. This can be used to navigate the dependency structure to highlight root cause quickly.



Click CANCEL to return to the Troubleshooting Workbench.

Time Range

[502]

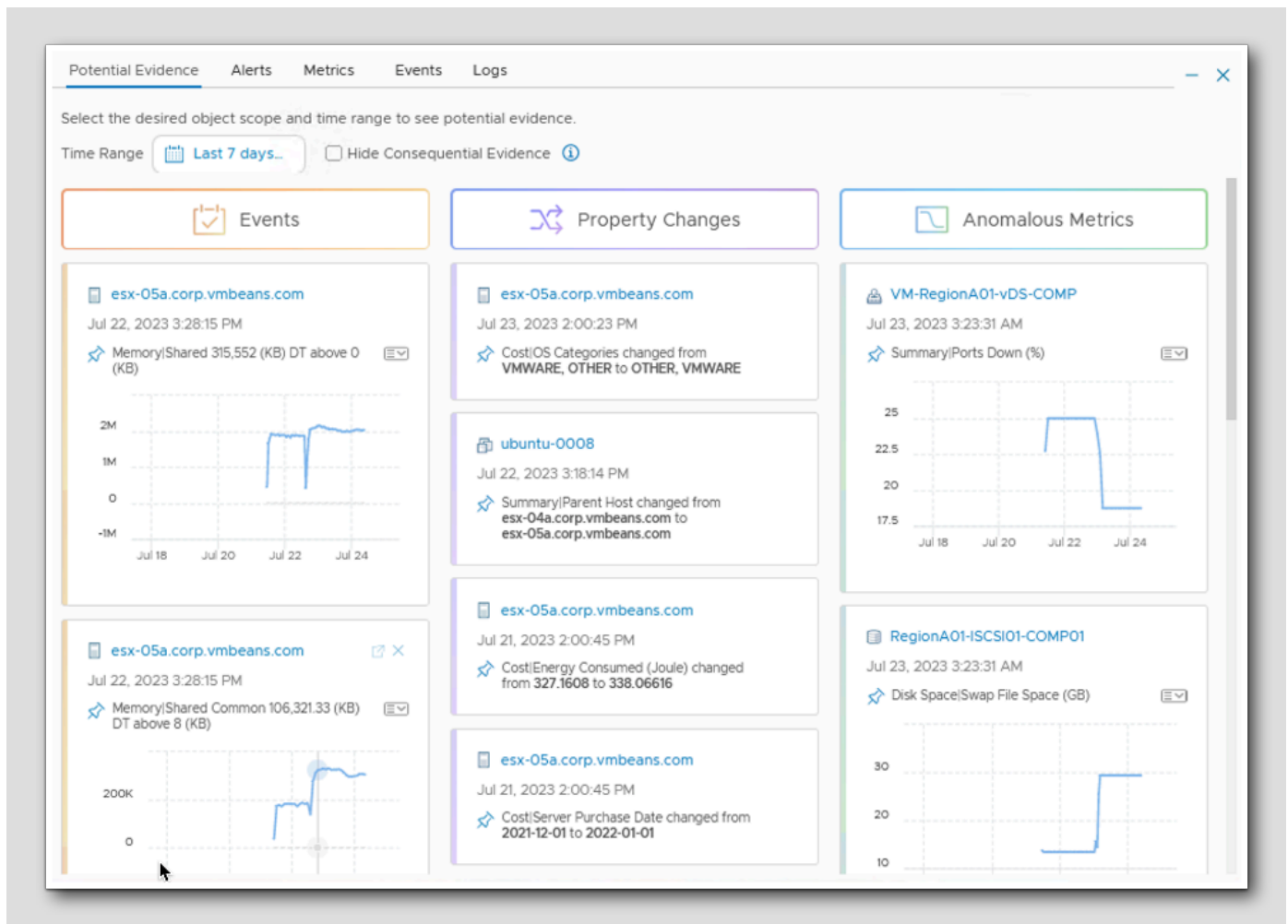


1. Click on the Time Range field.
2. Click > at the end of the Range field.
3. Select Last 7 days.
4. Click GO.

Potential Evidence

[503]

The potential evidences are based on Events, Property Changes, and Anomalous Metrics which are displayed on the right of the Troubleshooting Workbench change in the Potential Evidence tab. Information in these sections is displayed as cards. This is a purpose built collection of data points to highlight critical details of an object that will quickly identify problem areas.



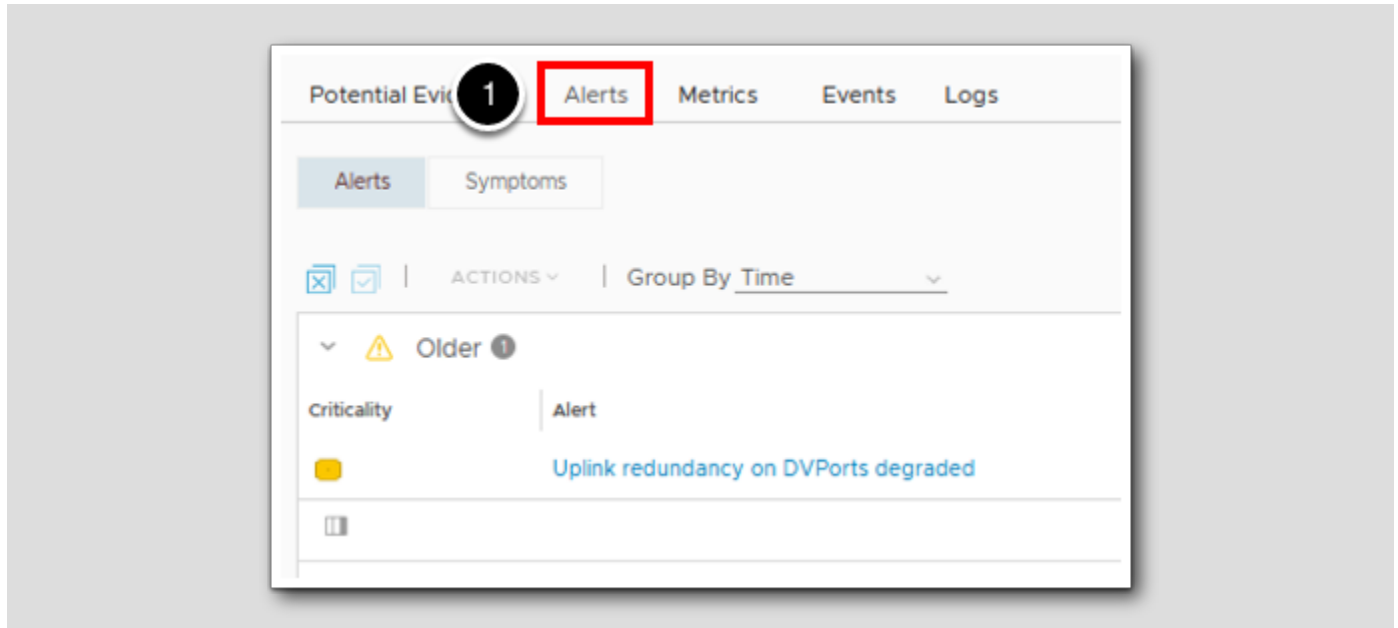
Three main pillars of Events, Property changes and Anomalous Metrics are highlighted and driven by the Scope that is defined. Note that many of the events shown are on the parent object, the host, esx-05a.corp.vmbeans.com. The Potential Evidence window will automatically adjust as you zoom the Scope in and out to help identify critical data or issues.

- **Events** - Displays events, based on a change in the metrics. Events for metrics that have breached the usual behavior, and major events that have occurred within the selected scope and time are displayed. The cards are based on dynamic thresholds for a metric, which is calculated based on historical and incoming data.
- **Property Changes** - Displays important configuration changes that occurred within the selected scope and time. Both single and multiple property changes are displayed. For multiple property changes, you can view the latest and previous changes.
- **Anomalous Metrics** - Metrics which have shown drastic changes within the selected scope and time. Ranks the results based on the degree of change. The most recent anomalous metric based on a time-sliced comparison in the current time range is given the highest weightage.

Alerts and Symptoms

[504]

The Alerts tab is also dependent on the Scope level that is defined so you can quickly include or exclude Alerts and Symptoms allowing for a faster identification of root cause.



1. Click on Alerts to show what alerts have been triggered within the scope defined.

Symptoms

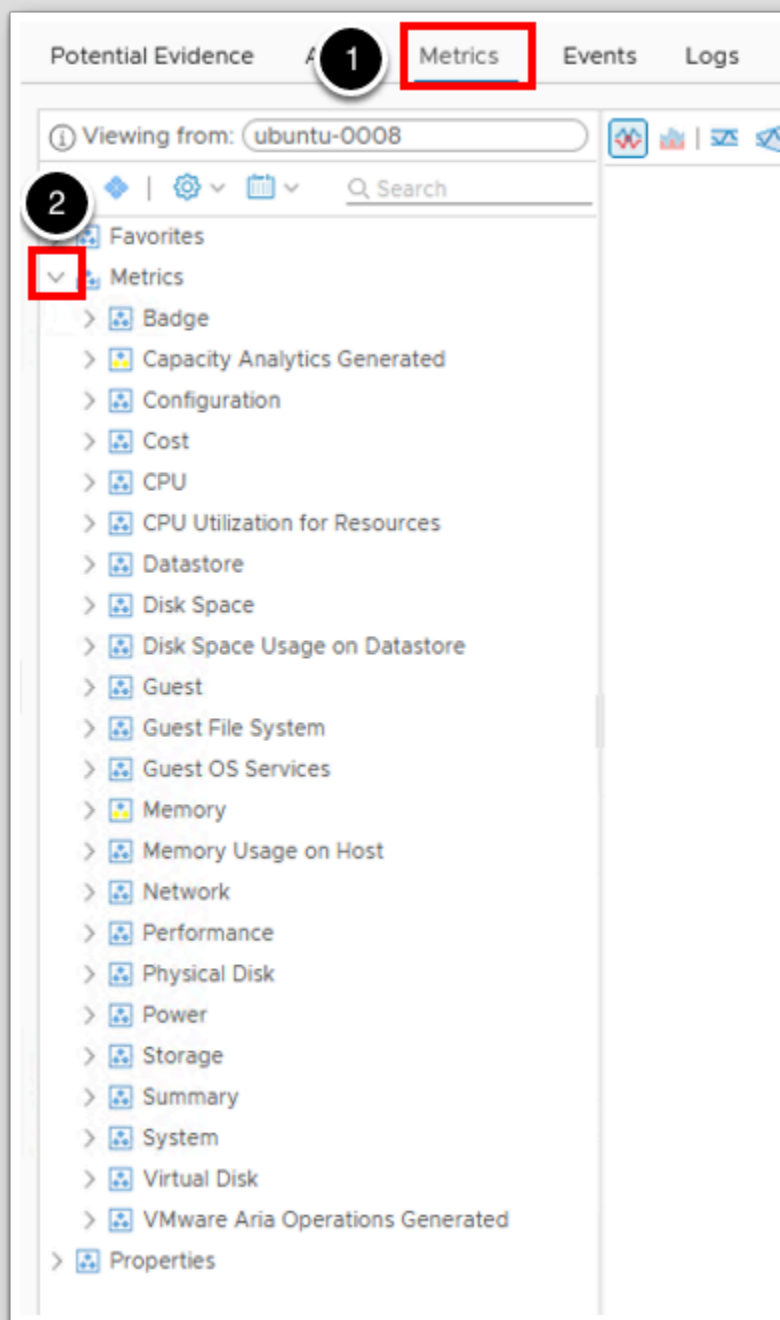
The screenshot shows the Troubleshooting Workbench interface for context 'ubuntu-0008'. The 'Selected Scope' section shows 'Levels: 2' with a '+' button highlighted by a red box and a '2' callout. The 'Alerts' tab is selected, and the 'Symptoms' sub-tab is highlighted by a red box and a '1' callout. The main area displays a table of symptoms:

Criticality ↓	Symptom	Status
🔴	Time remaining is critically low	💡
🔴	Capacity remaining is critically low	💡
🔴	Workload is critically high	💡
🔴	Cluster Compute Resource Capacity Remaining Percentage is critically low	💡
🔴	Workload is critically high	💡
🔴	Virtual machine memory demand exceeds configured memory limit	💡
🔴	Cluster Compute Resource Workload is critically high	💡
🔴	Cluster memory workload at Critical level	💡
🔴	Cluster Compute Resource Time Remaining is critically low	💡
🔴	Host memory workload at Critical level	💡
🔴	Time remaining is critically low	💡
🟡	Cluster Compute Resource Capacity Remaining Percentage is moderately low	💡

1. Click on Symptoms.
2. Click on + to expand the Scope to Levels: 2 and notice that the list of critical Symptoms has grown.

Metrics

There was a deep dive into how to build a Metrics list in the previous module but as you can see the Troubleshooting Workbench puts the hierarchy of the focused object at your fingertips.



1. Click on **Metrics**.
2. Click > next to the **Metrics** list, notice you have the metrics list for a VM.

Quickly switch to the host that the VM is on

The screenshot displays the VMware Troubleshooting Workbench interface. On the left, the 'All Objects' list shows a hierarchy of objects. A red box highlights the 'Host System' object, 'esx-05a.corp.vmbeans.com', with a circled '1' next to it. On the right, the 'Metrics' view is active, showing a list of metrics for the selected host. A red box highlights the expandable chevron icon next to the 'Metrics' header, with a circled '2' next to it.

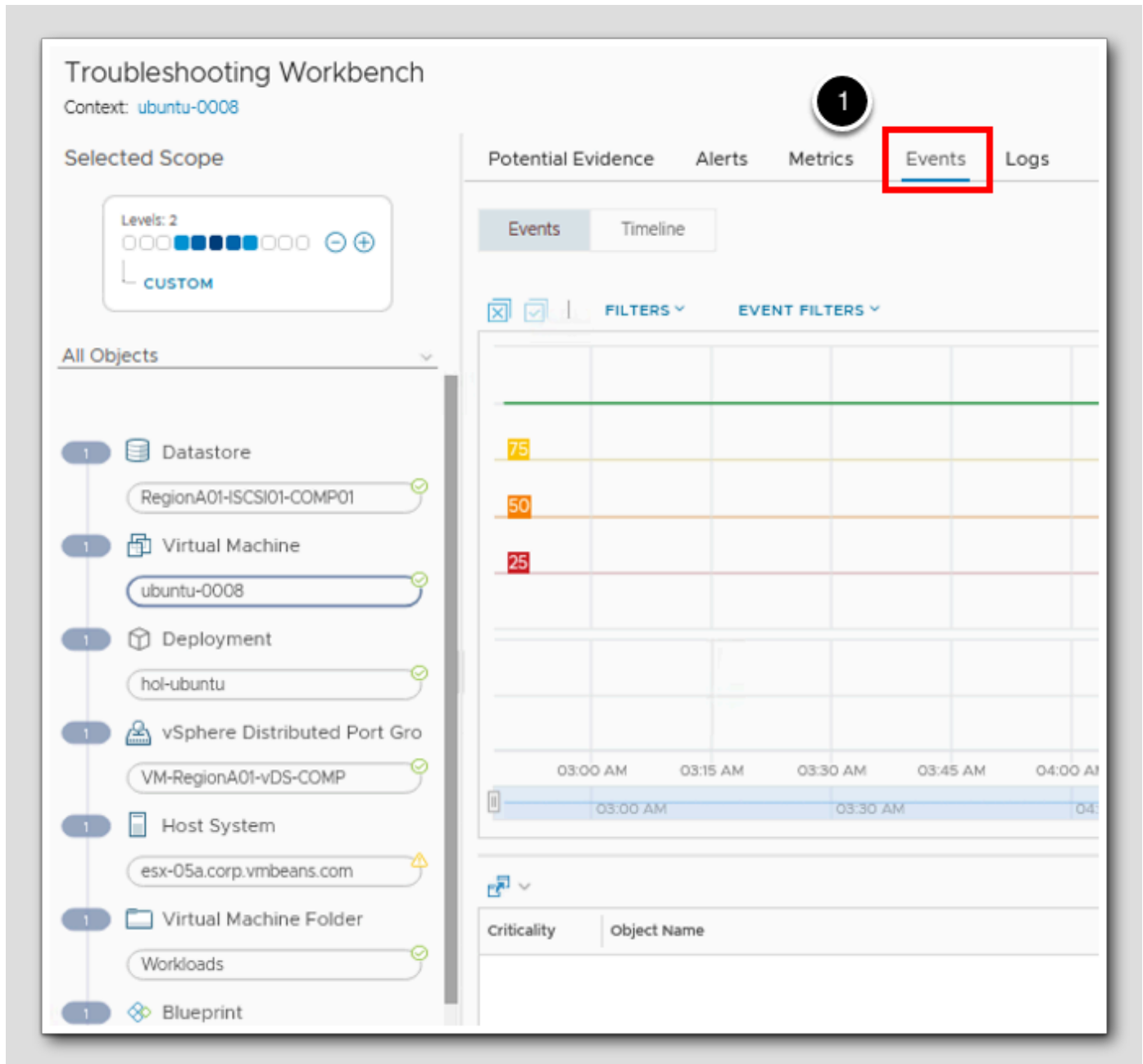
1. Click on esx-05a.corp.vmbeans.com to quickly switch to the VMs host.

2. Click > next to Metrics to show the metrics list for a host.

As you can see the Troubleshooting Workbench eliminates time trying to find resources that are applicable to the issue at hand.

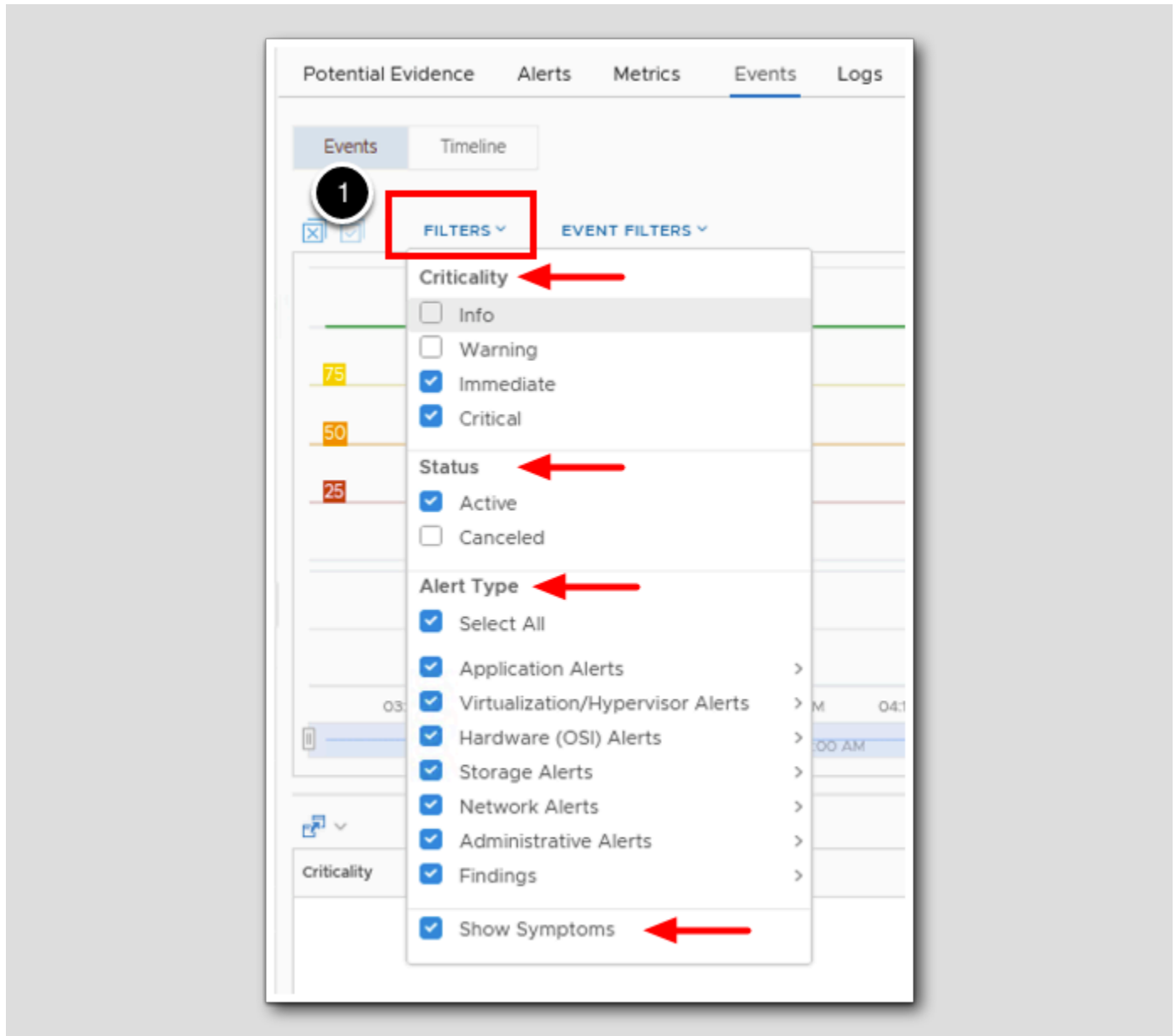
Events and Timeline

[508]



1. Click on **Events** to show all relevant events within the defined Scope.

Event Filters

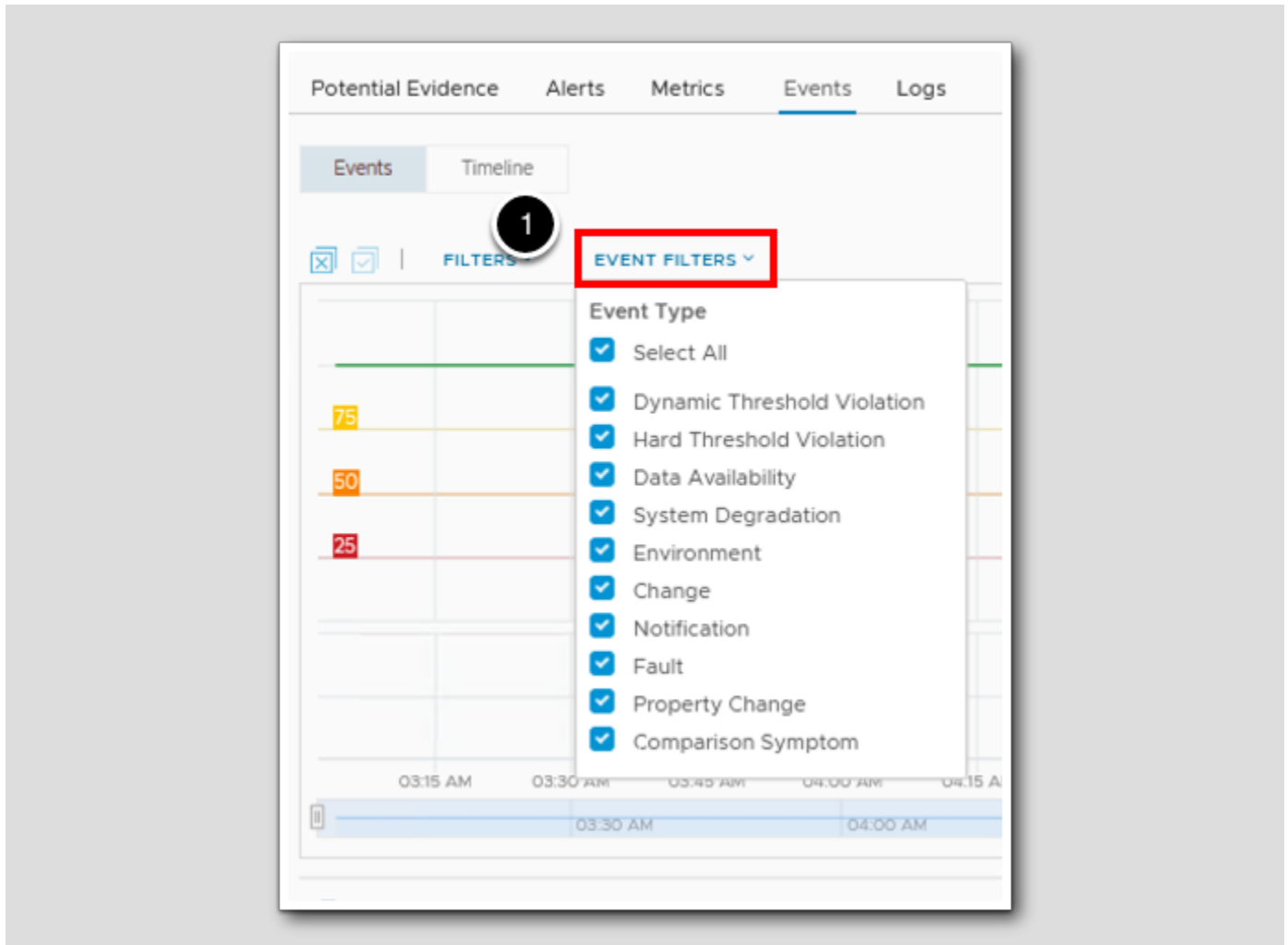


1. Click on FILTERS.

1. Notice how you can filter on Criticality, Status and Alert Type to focus your troubleshooting efforts. The last Checkbox provides the ability to show or hide Symptoms.

Event Filters

[510]

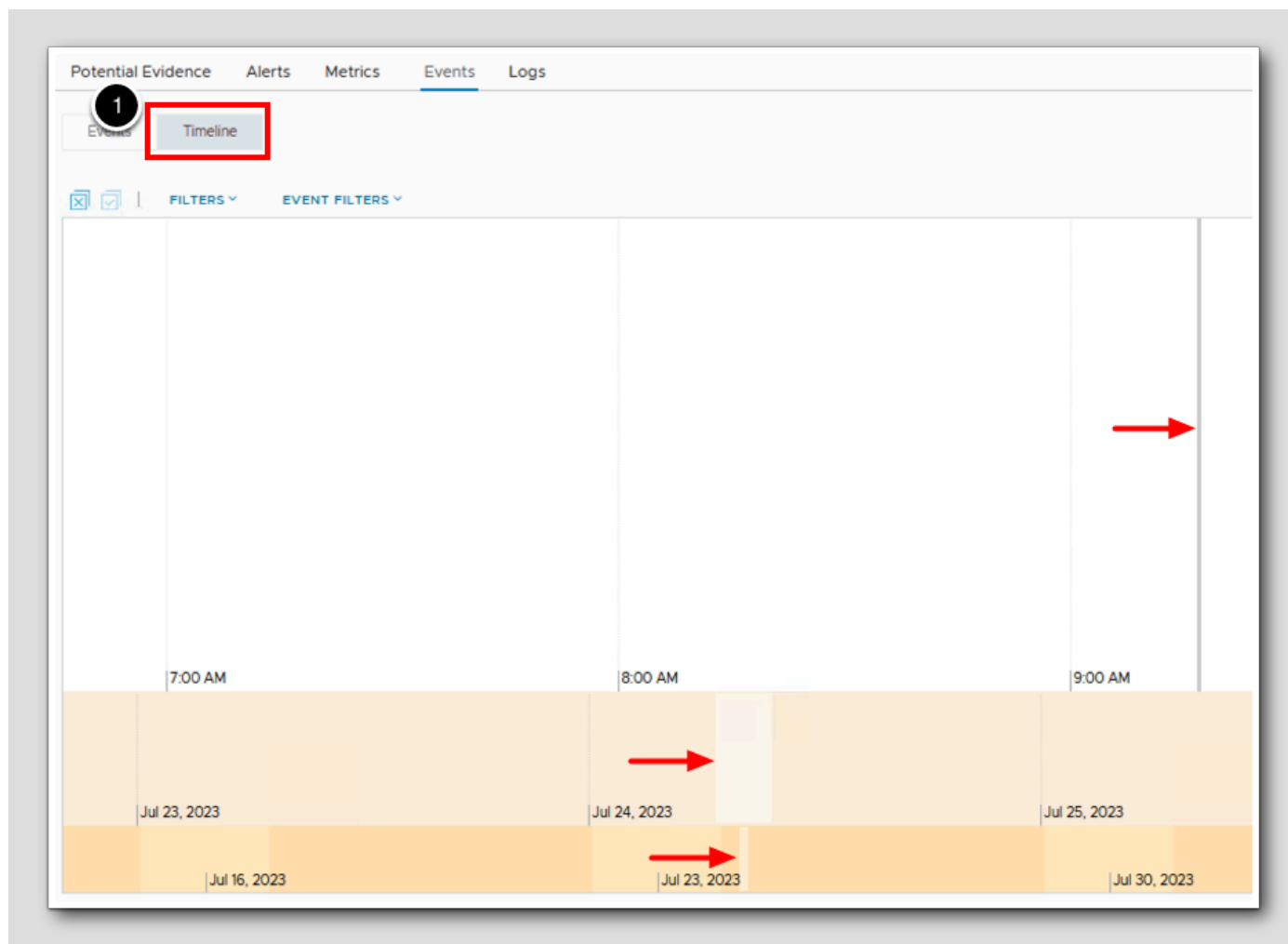


1. Click on **EVENT FILTERS** to show how you can narrow down the Events that are shown giving the ability to only show what's relevant for this troubleshooting session.

Timeline

[511]

The Timeline graph is formatted, from bottom to top, Weekly, Daily and then Hourly.



1. Click on **Timeline** to show events based on the Timeline map below. If we had events to show they would show up on each of the Weekly, Daily and Hourly timelines based on the event time.

Logs

[512]

The Logs tab is also driven by the Selected Scope level and will include appropriate logs for the related objects within that scope.

Lesson End

[513]

You have completed the last lesson in this module. You should now have an understanding of how to use the Troubleshooting Workbench and how the Scope and structure of the Workbench can help quickly identify root cause of an issue.

Conclusion

[514]

In this module, we reviewed the Troubleshooting Workbench and how it is purpose built to focus troubleshooting efforts and resources to quickly identify root cause.

You've finished the module

[515]

Congratulations on completing the lab module.

For more information on getting started with Aria Operations, see the [VMware Aria Operations: Journey to Success](#) guide at the [VMware Apps & Cloud Management Tech Zone](#).

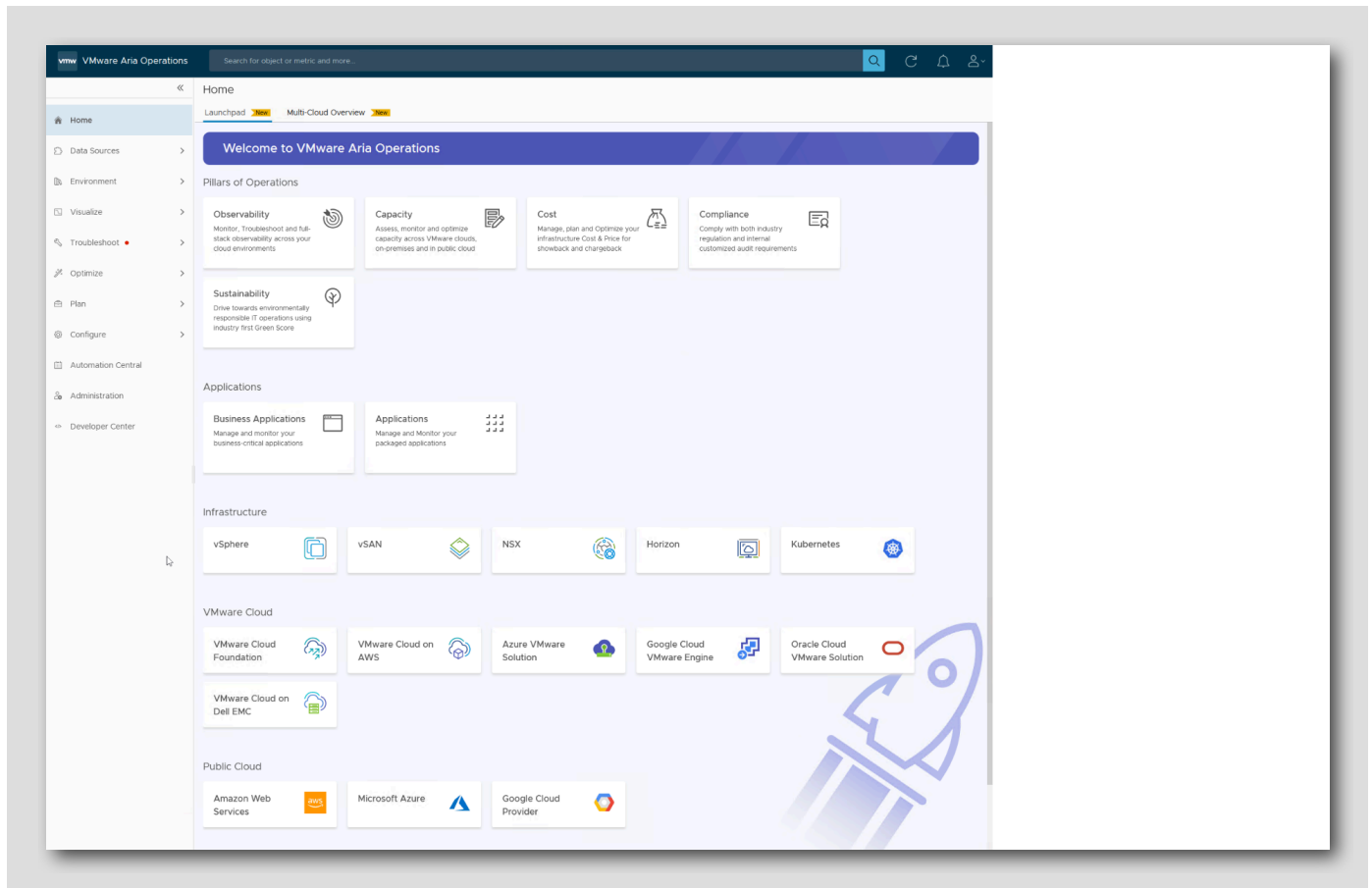
From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

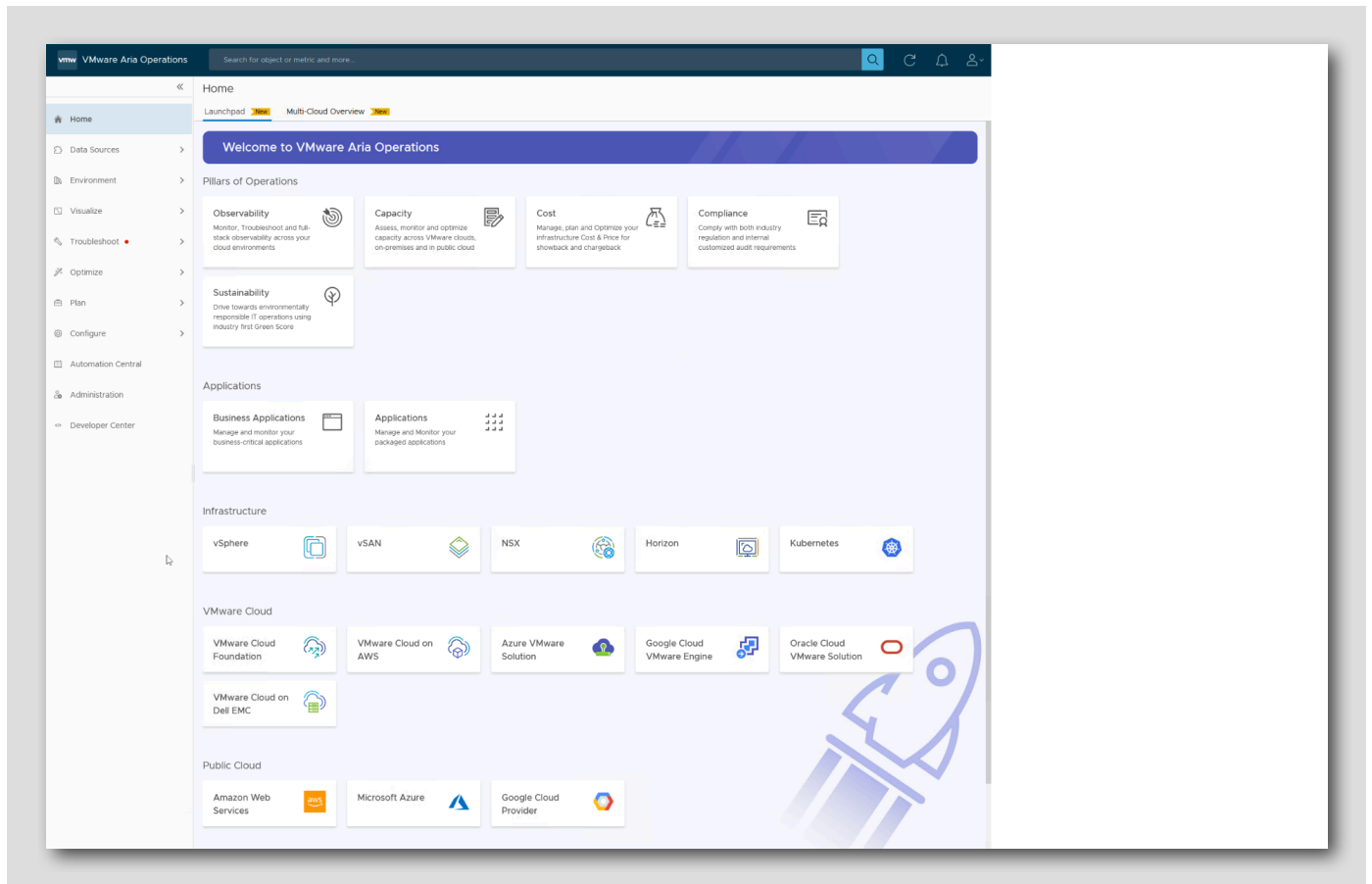
Module 10 - Save Time by Automating Remediation (15 minutes) Basic

Introduction

[517]



Aria Operations gives administrators the ability to schedule automated actions within their Operations Manager environment. From Right-sizing a Virtual machine to other more complex actions, Automation Central gives Administrators flexibility to execute complex actions and workflows. Let's take a look.



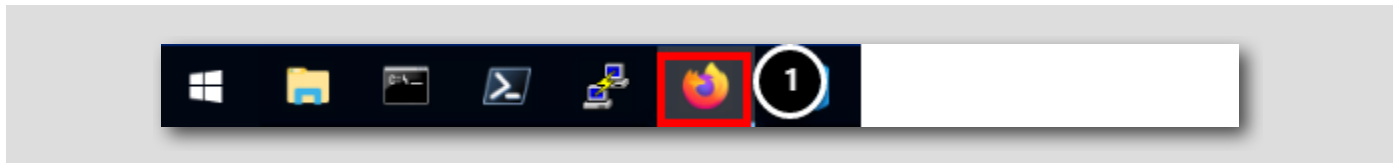
Log in to Aria Operations

[518]

We will log in to a live instance of Aria Operations running in our lab.

Open the Firefox Browser from Windows Quick Launch Task Bar

[519]

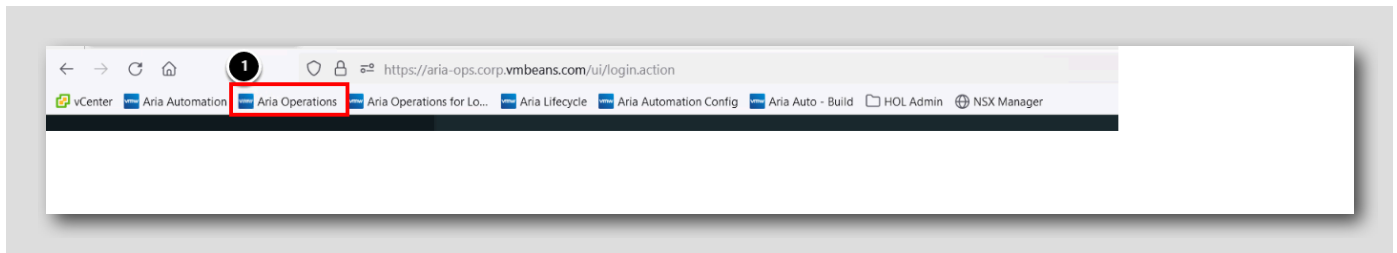


If the browser is not already open, launch Firefox.

1. Click the Firefox icon on the Windows Quick Launch Task Bar at the bottom of the screen

Log in to Aria Operations

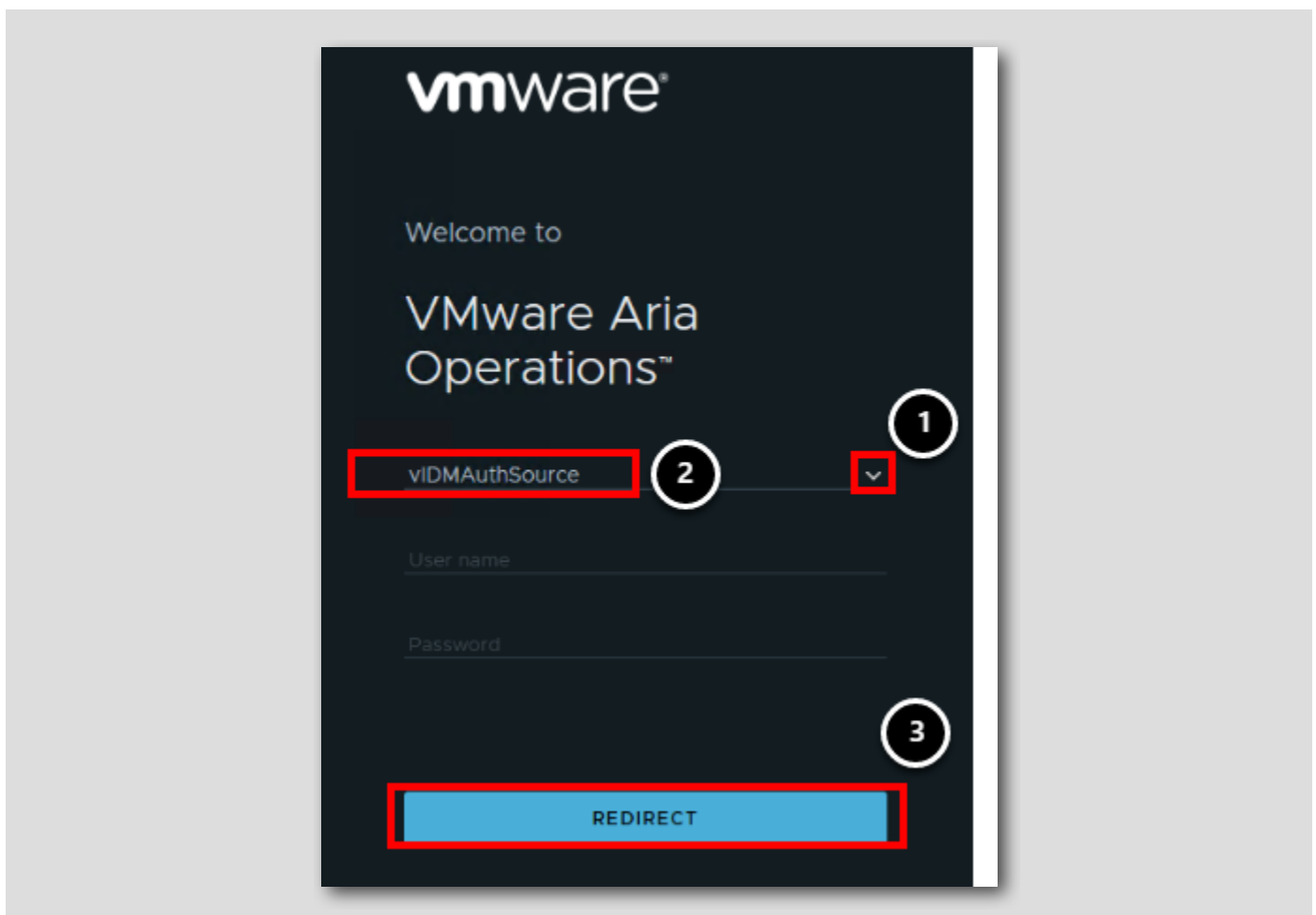
[520]



1. Click on the Aria Operations Favorites link from the Favorites Bookmark in the Chrome Browser.

Sign In

[521]



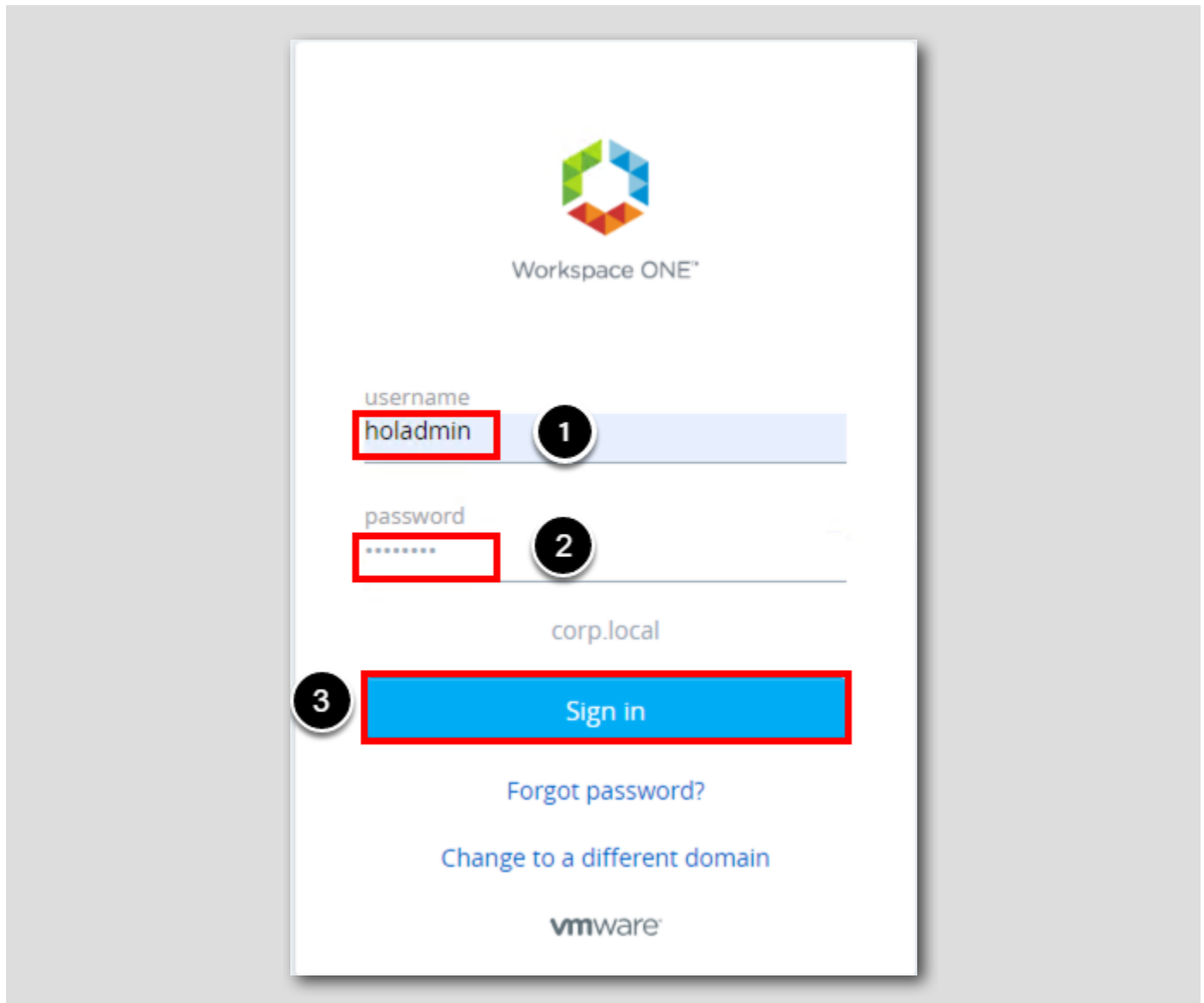
Aria Operations is integrated with VMware Identity Manager which we will use for user authentication in this lab. VMware Identity Manager is listed as `vidMAuthSource` in our live lab environment.

`vidMAuthSource` may not be pre-selected as the identity source. However, if it is not, you will need to choose it.

1. Click the drop-down arrow
2. Select `vidMAuthSource` from the dropdown menu
3. Click `REDIRECT` to take you to the authentication page

VMware Identity Manager Login

[522]



For this Aria Operations instance, the lab uses VMware Identity Manager as the identity provider for the Active Directory authentication source.

Type in the following user and password information.

1. username: holadmin
2. password: VMware1!
3. Click Sign in

Introduction to Automation Central

[523]

Automation Central is a feature in Aria Operations (available in the Advanced, Enterprise and Cloud editions) that allows you to create one-time or recurring jobs to automate optimization actions such as reclaiming or rightsizing VMs. Once you set up recurring jobs, you can track and obtain reports on them. You can customize jobs so that they only run based on certain parameters. For example, if you choose to delete a snapshot as an action, you can specify how old the snapshot must be before it is deleted.

View reclamation and rightsizing reports through the Report Tab.

1. Click **Report**
2. Click **Reclamation** to view the reclamation report. The reclamation report displays graphical and numerical data on the total cost savings, CPUs reclaimed, memory reclaimed and storage reclaimed for different time periods
3. Click the **Rightsizing** reporting to view the rightsizing report. The rightsizing reports displays graphical and numerical data on the CPUs downsized, memory downsized, CPU oversized, and memory upsized for different time periods

Note: For each job, you also have the ability to view and change the scope of the reporting as well as the date range. For date ranges, you can pick the last 4 quarters or last quarter.

Navigate to Automation Central

[524]

The screenshot displays the VMware Aria Operations Automation Central interface. The left sidebar contains navigation options, with 'Automation Central' highlighted by a red box and a '2' in a circle. The main content area shows a calendar for July 2023. A job entry 'Delete Snapshots' is visible on July 28th at 11:00 PM. A red box and a '1' in a circle highlight the 'Home' button in the sidebar.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

1. From the Quick Start (Home) page:
2. Click **Automation Central** in the navigation bar

Schedule Tab

[525]

The screenshot displays the VMware Aria Operations interface. On the left, the navigation bar includes 'Automation Central', which is highlighted with a red box and a '2' callout. The main content area shows the 'Automation Central' page with a 'Schedule' tab selected. A '1' callout points to the navigation arrows above the calendar. The calendar for August 2023 shows a 'Delete Snapshots' job scheduled for 11:00 PM on the 30th, 6th, 13th, 20th, and 27th.

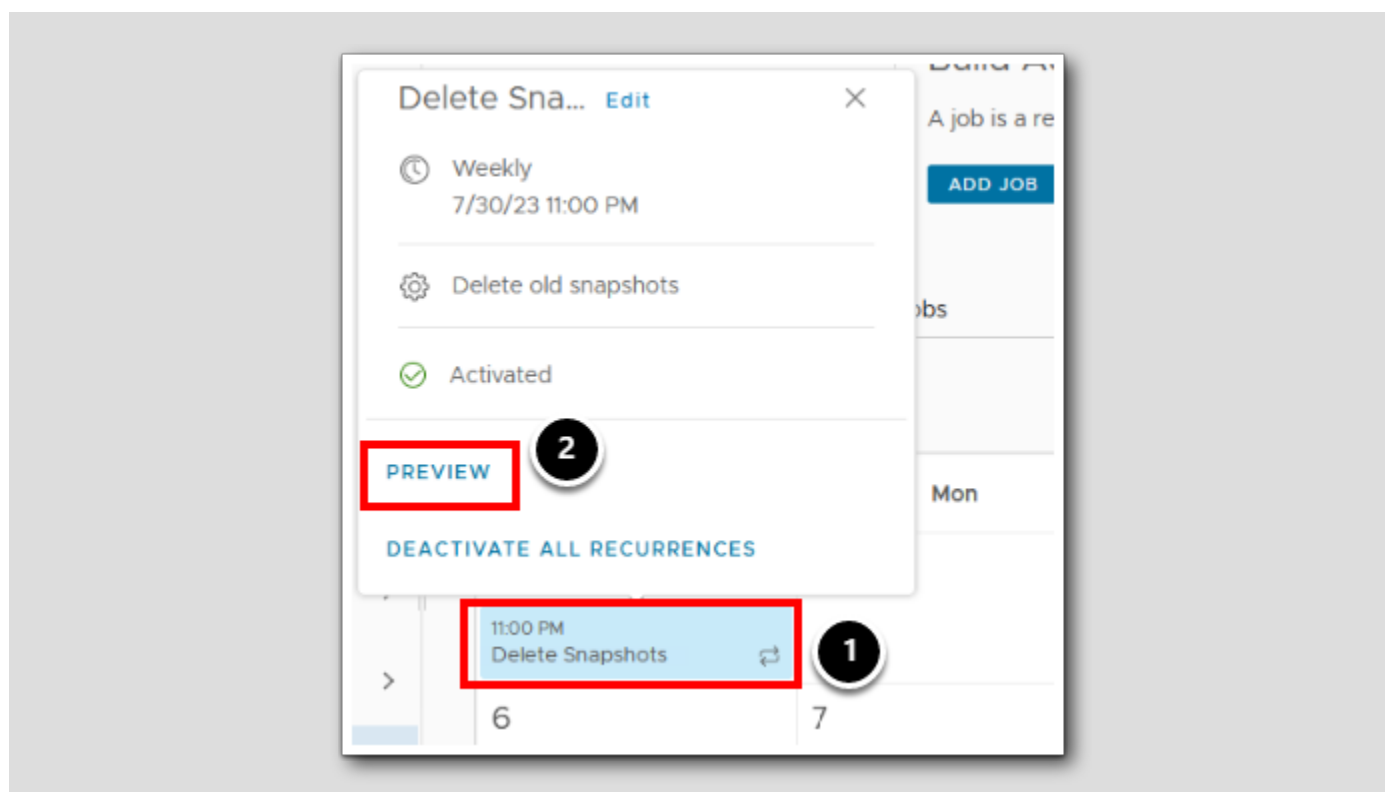
Sun	Mon	Tue	Wed
30 11:00 PM Delete Snapshots ↻	31	1	2
6 11:00 PM Delete Snapshots ↻	7	8	9
13 11:00 PM Delete Snapshots ↻	14	15	16
20 11:00 PM Delete Snapshots ↻	21	22	23
27	28	29	30

In the Automation Central page, you will see a list of upcoming jobs and a calendar under the Schedule tab. The calendar displays all the jobs that are scheduled for the current month. You can move between months to see more scheduled jobs.

1. Click the **Left/Right arrows** to view any jobs in the current month
2. Click on **Automation Central** to revert back to the current month (optional)

Examine An Existing Job

[526]



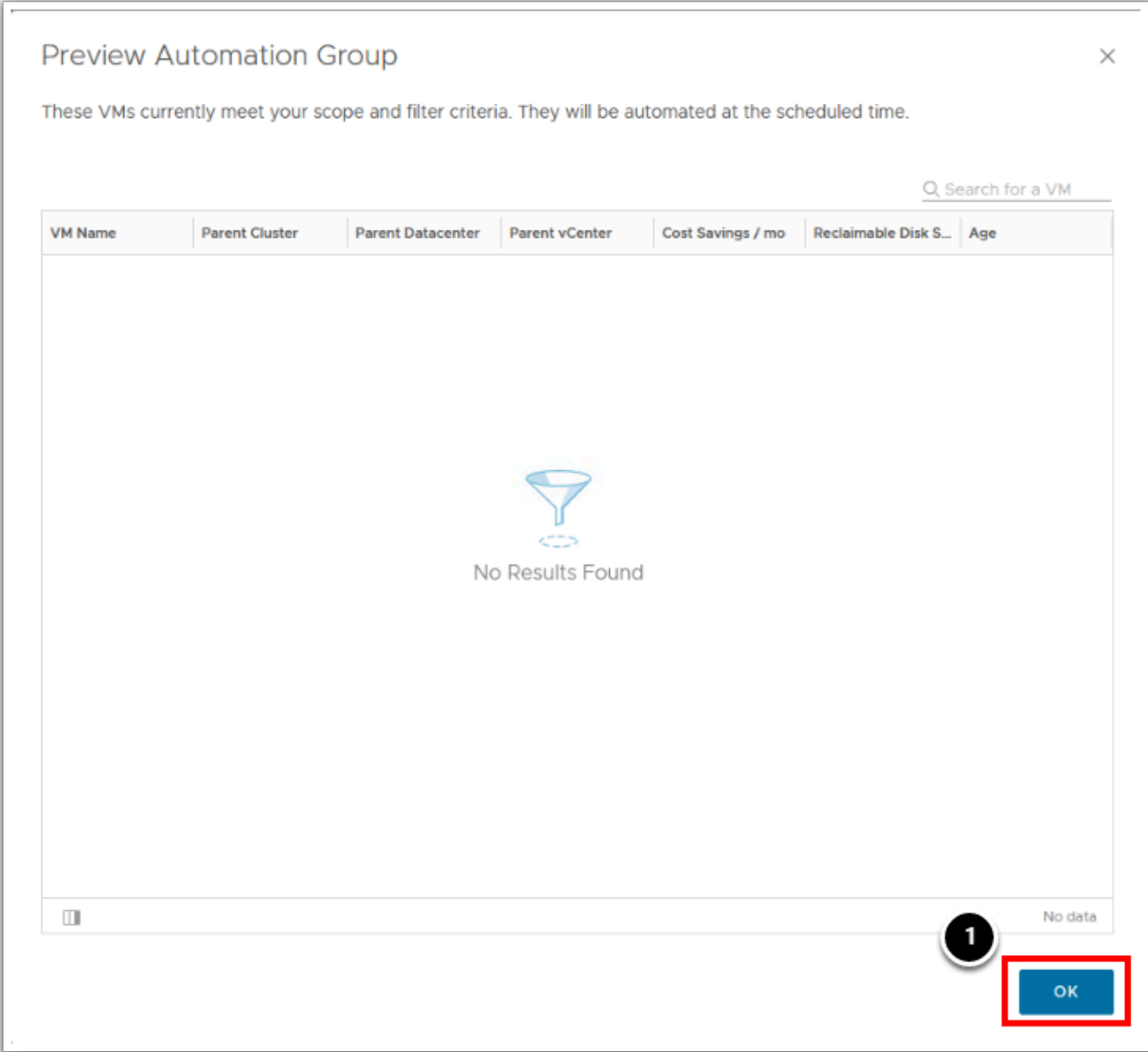
Jobs can be viewed by clicking on them in the calendar view which brings up a limited information page as seen here. We're given the schedule of the job, what actions are being executed as well as it's activated or deactivated status.

One key feature is the ability to view the scope of objects impacted by the job. Let's take a look.

1. Click on any of the **Delete Snapshots** scheduled jobs.
2. Click on **Preview**

Preview Automation Group

[527]



Preview Automation Group

These VMs currently meet your scope and filter criteria. They will be automated at the scheduled time.

Search for a VM

VM Name	Parent Cluster	Parent Datacenter	Parent vCenter	Cost Savings / mo	Reclaimable Disk S...	Age
---------	----------------	-------------------	----------------	-------------------	-----------------------	-----

No Results Found

No data

1

OK

Our lab does not contain any Virtual Machines with snapshots older than 7 days, but in your environment you may have many Virtual Machines that do. In this preview screen, we would see the Virtual Machine as well as relevant information listed allowing you to easily identify impacted Virtual Machines.

1. Click OK to close the preview widow

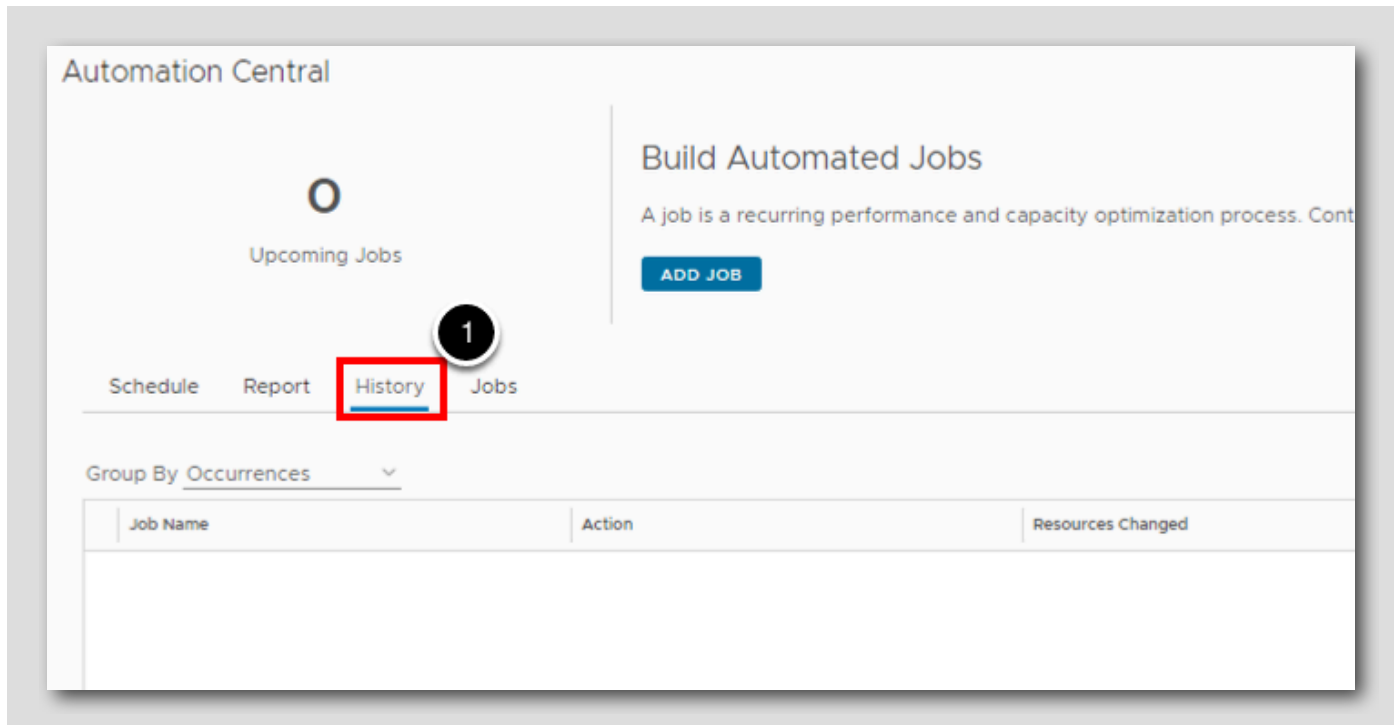
View a Report of Jobs

[528]

The screenshot shows the 'Automation Central' interface. At the top, there's a 'Build Automated Jobs' section with an 'ADD JOB' button. Below that, a navigation bar includes 'Schedule', 'Report' (highlighted with a red box and a '1' badge), and 'Jobs'. The main content area is titled 'Job Reporting' and contains a 'Reclamation Report' section. On the left of this section, 'Reclamation' (with a '2' badge) and 'Rightsizing' (with a '3' badge) are listed, with 'Reclamation' highlighted by a red box. The report itself shows four metrics: '0 US\$ Cost Savings', '0 vCPUs CPU Reclaimed', '0 GB Memory Reclaimed', and '0 GB Storage Reclaimed'. On the right side of the report, there are dropdown menus for 'View Scope: All' and 'View Date: Last 4 Quarters'.

View Job History

[529]

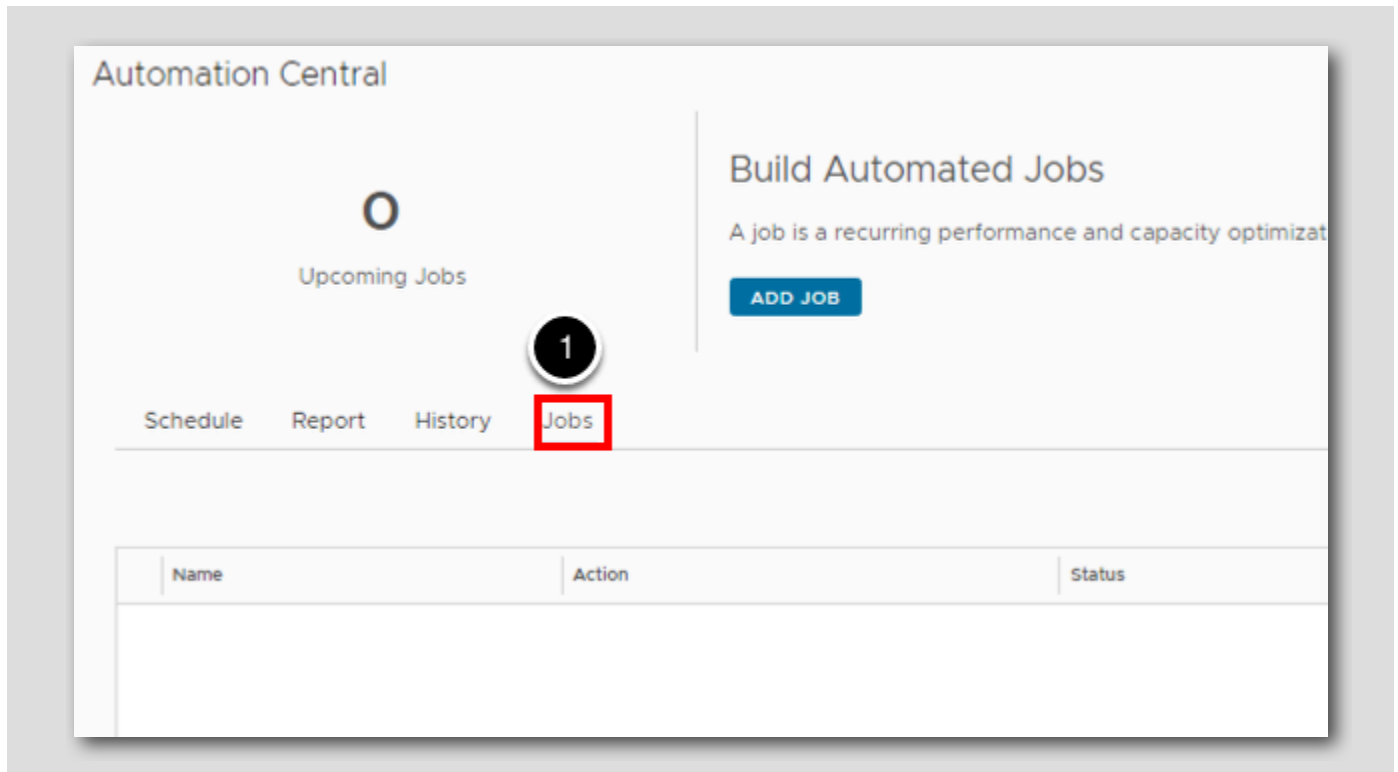


You can also view the history of configured jobs which have run.

1. Click the **History** tab above the calendar to see the job name, and job details in a tabular format. Since this is a lab environment, we will not have any jobs to view.

View Configured Jobs

[530]



The Jobs tab is where you see a list of configured jobs.

1. Click **Jobs** to view any configured jobs

For each job, clicking the ellipses icon brings up a menu from where you can edit, delete, clone or disable the job. If a job that you created is not visible in the list, check the All Filters option to see if the job is filtered out. Since this is a lab environment, we will not have any jobs to view.

That concludes this short lab giving you a brief introduction to automation central. In the following labs, we'll work to schedule some actions.

Creating a job from a Virtual Machine Rightsizing Report

[531]

One of the most common tasks is to create Job from Reclaim or Rightsizing reports. You can create an automation job based on the recommendation provided by VMware Aria Operations Manager in the Reclaim or Rightsizing pages.

In this exercise we'll work on creating a task to rightsize our Virtual Machines on a scheduled basis. Let's get started.

Locate Rightsizing Page

The screenshot displays the VMware vSphere Rightsizing interface. On the left, the navigation menu includes 'Home', 'Data Sources', 'Environment', 'Visualize', 'Troubleshoot', 'Optimize', 'Capacity', 'Reclaim', 'Workload Placement', 'Rightsize', 'Compliance', 'Plan', and 'Configure'. The 'Rightsize' option is highlighted with a red box and a circled '3'. The 'Optimize' option has a red box and a circled '2' next to its dropdown arrow. The 'Home' option has a red box and a circled '1' next to its icon.

The main content area is titled 'Rightsize' and shows two 'RegionA01' cards. Each card indicates '> 1 Year Remaining' and 'US\$0 Cost Savings' with a 'Not Optimized' button. Below these, a section for 'RegionA01' shows 'Oversized VMs' with a table of recommended reductions:

Resource	Recommended Reduction
CPU	14 vCPUs
Memory	11 GB

At the bottom, there are tabs for 'Oversized VMs' and 'Undersized VMs', and buttons for 'SCHEDULE ACTION', 'RESIZE VM(S)', 'EXCLUDE VM(S)', and 'EXPORT ALL'.

We will use the Rightsizing page to create a Scheduled Job that appears in Automation Central.

1. If you are not already on the Home page, click **Home** from the top menu.
2. Click the chevron next to **Optimize**.
3. Click **Rightsize**.

The Rightsizing Page

The screenshot shows the VMware Rightsizing interface. At the top, there are two 'RegionA01' datacenter cards, both showing '0 Days Remaining' and 'US\$31 Cost Savings' with a 'Not Optimized' button. A red box highlights the right card, with a red arrow and a circled '1' pointing to it. Below this, the 'RegionA01' section shows 'Oversized VMs' (7 VMs To Downsize) and 'Undersized VMs' (1 VMs To Upsize). A search bar is visible. Below the VMs, there are buttons for 'SCHEDULE ACTION', 'RESIZE VM(S)', 'EXCLUDE VM(S)', and 'EXPORT ALL'. A table lists VMs under 'Workload1' with columns for VM Name, Allocated CPU, Recommended CPU Reduction, Allocated Memory, and Recommended Memory Reduction. The 'windows-0010' VM is selected with a checkmark. A red box highlights the 'SCHEDULE ACTION' button, with a red arrow and a circled '5' pointing to it. Other annotations include a circled '2' on the 'Oversized VMs' tab, a circled '3' on the 'Workload1' chevron, and a circled '4' on the 'windows-0010' checkmark.

From the Rightsizing page, perform the following:

1. Make sure **RegionA01** is selected as the Datacenter if it is not already. Note that there are two datacenters with that name - one is from vCenter and the other from Aria Automation. Be sure to select the datacenter with the "buildings" icon, not the one with the "clouds" icon. Also note that the values you see for cost savings may be different or may show a question mark (?) depending on how long your particular Hands On Lab pod has been running.
2. Scroll down to select the **Oversized VMs** subcategory.
3. Click the chevron next to **Workload1** in order to view Virtual Machines.
4. Check the box next to **windows-0010**.
5. From the menu above the Virtual Machine, click on **Schedule Action**.

Creating a Scheduled Job

[534]

Create Scheduled Job Resize Oversized VMs ✕

1 VMs Selected **0 vCPUs** vCPU Reclaimable **2 GB** Memory Reclaimable

Job name
Resize Virtual Machine 1

Job Description
Resize Virtual Machine 2

Start Date
7/21/23 3

Time Of Day
Start Time: 12:00 AM 4 Time zone: Browser

Receive Updates on Job via Email

No Email notification plugin available 5

6 ⚠ I understand that workloads may be interrupted because some VMs must be restarted during the resize.

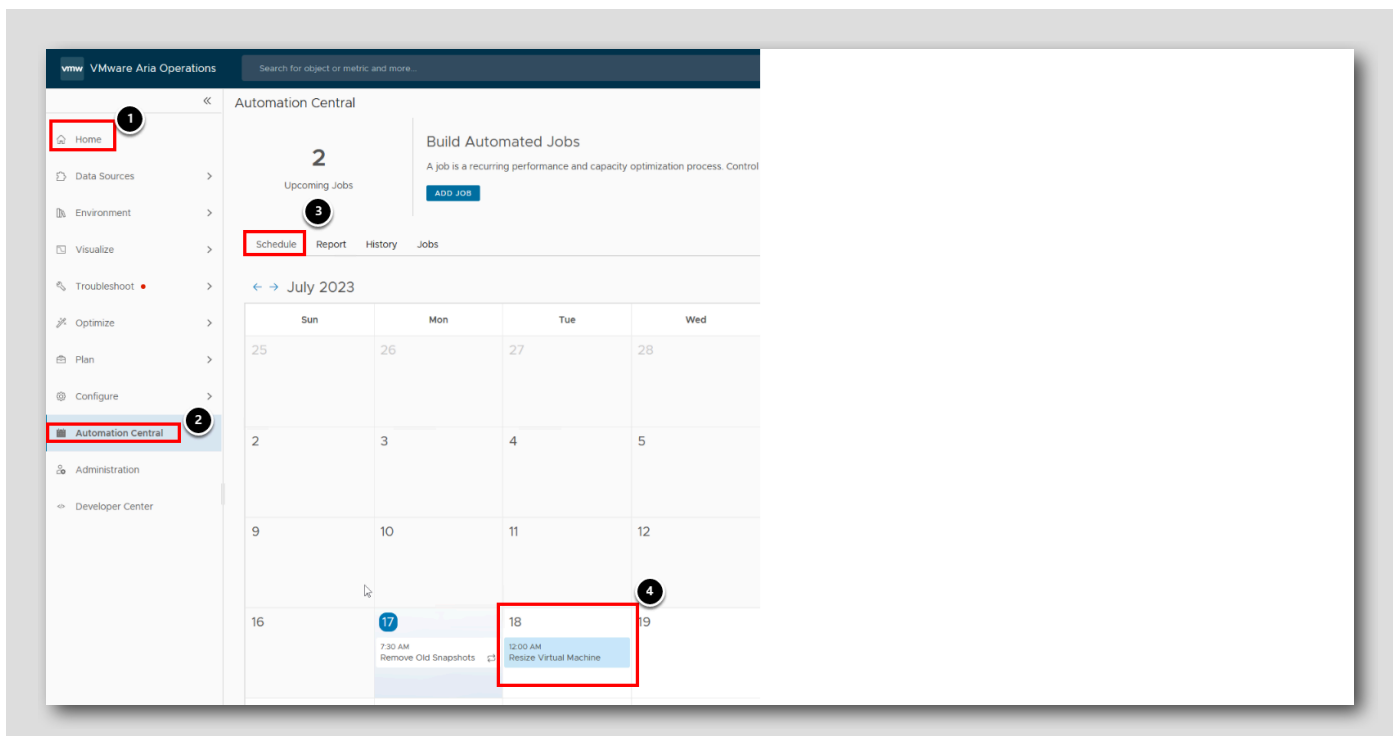
CANCEL CREATE

From the Create Scheduled Job window, perform the following:

1. Under **Job Name**, enter **Resize virtual Machine**
2. Under **Job Description**, enter **Resize virtual Machine**.
3. Under **Start Date**, select the nearest upcoming Friday.
4. Select **12:00 AM** for a Start Time
5. Click the box to verify the workloads will be interrupted in order to complete this action.
6. Click **Create** to complete.

Viewing Your Scheduled Job

[535]



Now when you navigate back to Automation Central from the left hand navigation pane, your scheduled job will appear in the Schedule and we will be able to view it from Automation Central.

1. Click on **Home** to take you back to the main screen.
2. Click **Automation Central** from the left hand navigation pane.
3. Click on **Schedule** to ensure you are viewing the scheduled jobs.
4. Located the **Resize Virtual Machine** task that we created.

Note: Depending on the date you picked, you will see a different screen than the July 18th 2023 pictured above.

That concludes this short lab on creating a scheduled task within automation central using the Rightsizing functions within Aria Operations.

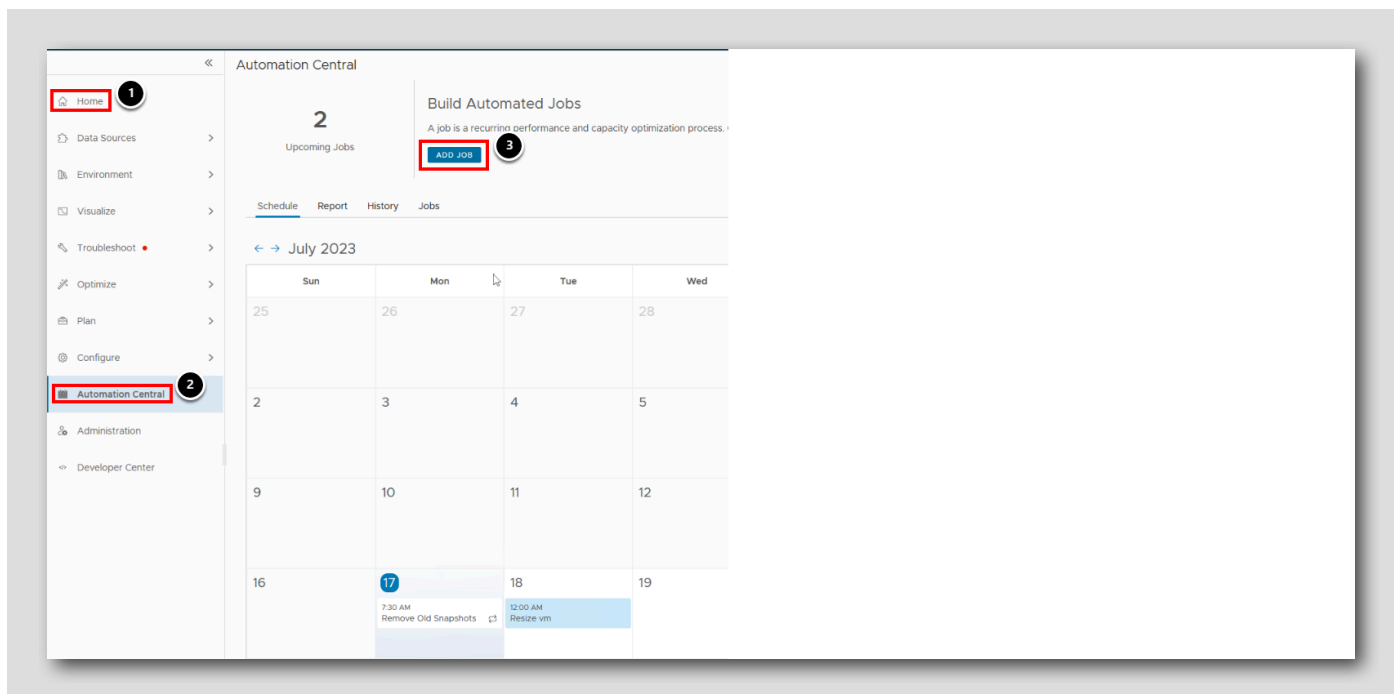
Setting Up Recurring jobs

[536]

In this lab, we'll work on setting up a recurring job similar to the one already scheduled so you can see the process of picking your job, the task and schedule. Let's get started

Adding a new Job

[537]



If you clicked away from the previous lab screen please return to Automation Central using Steps 1 & 2, otherwise proceed to Step 3.

1. Click the **Home** at the top
2. Click on **Automation Central** to open the main window
3. From above the calendar, click on **Add Job**

Creating a Job

[538]

Create New Job

1 - Select Action 2 - Select Scope 3 - Filter Criteria

Name Weekly Reboot (1)

Description Scheduled weekly reboots of Virtual Machines (2)

Action Configuration

Reclaim

- Delete old snapshots
- Delete idle VMs
- Power off idle VMs
- Delete powered off VMs

Rightsize

- Downsize oversized VMs
- Scale-up undersized VMs

Other Additional Actions (3)

Adapter Type vCenter (4)

Object Type Virtual Machine (5)

Action Reboot Guest OS For VM (6)

We are going to create a job that will reboot Virtual Machines on a weekly basis.

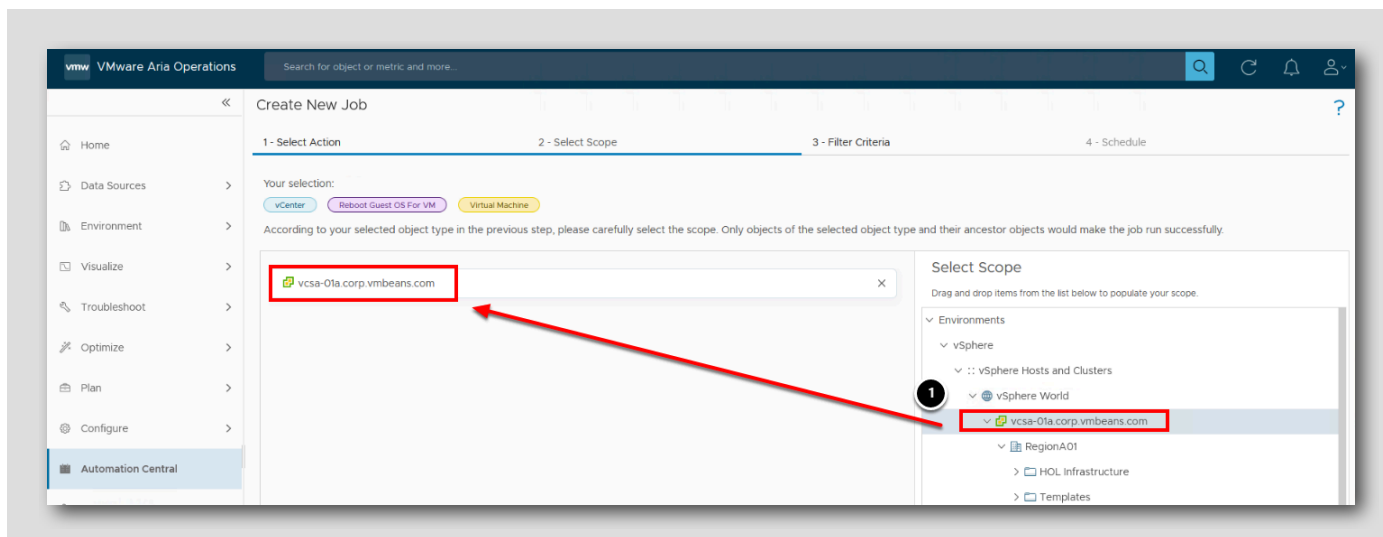
From the Create Job window that opens, perform the following:

1. In the Name field, use **Weekly Reboot**.
2. In the Description field, enter **Scheduled weekly reboots of Virtual Machines**.
3. Under Other, select the **Additional Actions**.
4. Select **vCenter** for our adapter type.
5. Select **Virtual Machine** for our object type.
6. Select **Reboot Guest OS For VM** as our action.
7. Click **Next** to continue (Not Shown)

Note: Aria Operations is a modular program that allows you to connect additional workflow orchestration programs, such as VMware Aria Orchestrator to expand the capabilities of your environment. While we will not explore this functionality here in this lab, Orchestrator gives you the ability to create custom complex workflows built specifically for your environments that we can schedule within Aria Operations.

Select Scope

[539]

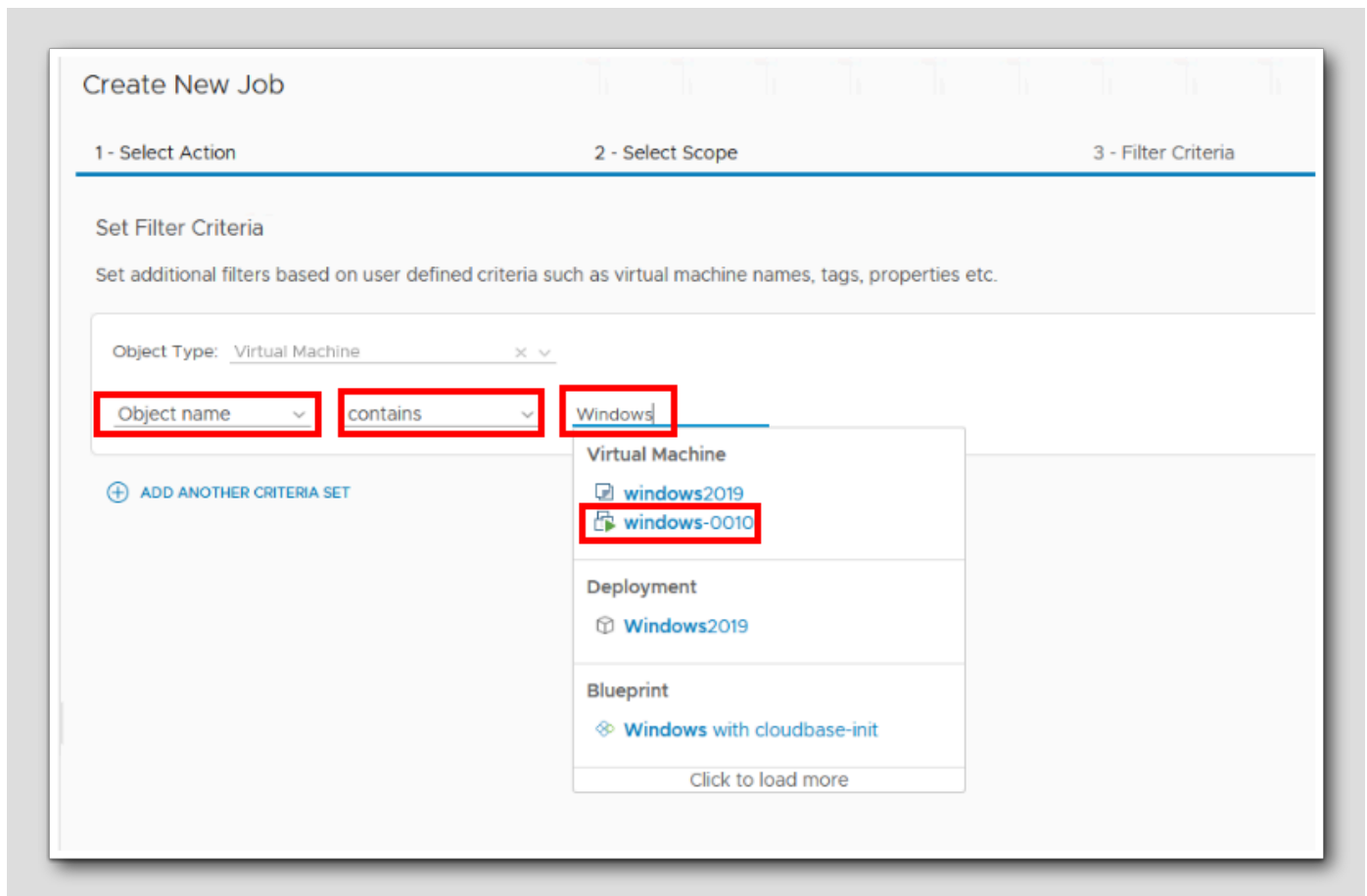


The scope section is where we determine over how large an area we want this Job to run. We can select every virtual center in our environment or we can pick a singular Virtual Center.

1. Locate **vcsa-01a.corp.vmbeans.com** and drag it into the left hand scope selection screen.
2. Click **Next** (Not Shown)

Filter Criteria

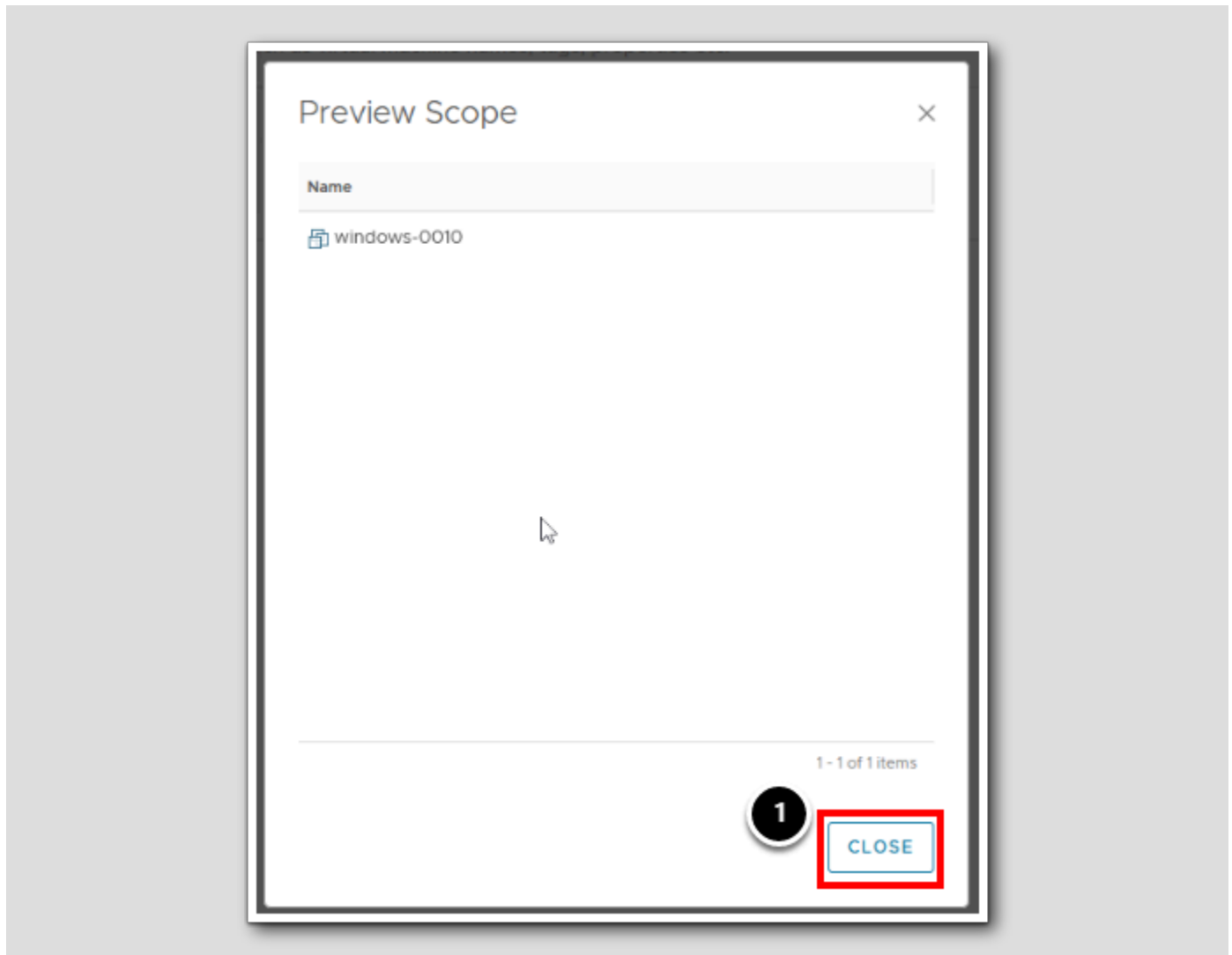
[540]



Once we've selected the Scope of our environment, we need to filter down to the objects we want to schedule this job against. In this window you will have the option to create filtering criteria using multiple options such as Tags, Object Names, Properties, Relationships or Metrics matched with REGEX expressions. For this exercise we will pick a simple Object Name criteria.

1. Select Object Name.
2. Select Contains.
3. Type **Windows** .
4. Select the **windows-0010** Virtual Machine.

Preview Scope



In a complex environment when setting the search and filter criteria it can be useful to preview what objects result from your query. Click on the **Preview Scope** button in the lower right hand corner of the screen will yield the above image. Here we can see that the singular Virtual Machine we picked is the scope that will be used but in a more complex environment this list may contain many more objects.

1. Click **Close** to return to the **Filter Criteria** page
2. Click **Next** in the lower left of the **Filter Criteria** page (Not Shown.)

Schedule Interface

[542]

The screenshot shows the 'Create New Job' interface, divided into three sections: '1 - Select Action', '2 - Select Scope', and '3 - Filter Criteria'. The interface includes several input fields and dropdown menus, with red boxes and arrows highlighting specific elements, numbered 1 through 7.

- 1**: Start Date (7/17/23)
- 2**: Time zone (Browser)
- 3**: Start Time (8:55 AM)
- 4**: Recurrence (Daily)
- 5**: End (5)
- 6**: After (6)
- 7**: 100 Occurrences

Additional details in the interface include:

- Run Every**: 7 Day(s)
- End**: 5
- After**: 6
- Occurrences**: 100 (with a note: Enter between 1 - 999 occurrences)
- Notifications**: Receive status notifications including job success, job failure, and a reminder email 2 hours before this job is scheduled to run.
- Receive Updates on Job via Email
- No Email Outbound plugin available

The last option is to create the schedule itself. We will run this every Friday at 8:55 AM and end after 100 occurrences.

1. Select the Start Date (your start date will vary depending on when you take this lab)
2. Select Browser for the timezone.
3. From the Start Time, select 8:55 AM.
4. From Recurrence, select Daily.
5. Enter 7 for the Run Every number of Days field
6. Select the option **After** for our end date
7. Enter 100 for our Occurrences
8. Click **Create** (not shown)

Note: While a simple schedule, the schedule gives us the ability to select differing time zones, recurrence schedules, days of the week and end dates. Feel free to edit the fields from what we selected above to see what options are available to you.

This concludes the lab for creating a recurring job using Aura Automation Central.

Conclusion

[543]

In this module, we explored the new Automation Central and used the scheduled job function to schedule regular tasks. We were able to create tasks from the Rightsizing page and from Automation Central's main interface.

You've finished the module

[544]

Congratulations on completing the lab module.

If you are looking for additional information, visit the [Aria Operations Manager Documentation](#).

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 12 - Achieve Optimal Performance with Rightsizing (45 minutes) Advanced

Introduction

[546]

Rightsizing, identifying and fixing issues with oversized and undersized VMs, optimizes resource allocation. It maximizes performance efficiency, reduces costs, and ensures seamless alignment with requirements. With well-defined policies and automation, Rightsizing becomes a proactive practice for Aria Operation practitioners.

In this *Achieve Optimal Performance with Rightsizing* exercise, we will take a closer look at;

- Using Rightsizing based on Aria Operations Recommendations
- Configure Policies:
 - Criticality Thresholds
 - Risk Level (Conservative vs. Aggressive)
 - Business Hours
- Automate Rightsizing

Log in to Aria Operations

[547]

To begin this exercise, we will log in to Aria Operations. If you are not currently logged into any instance of Aria Operations, continue to the next page, but if you are already logged into Aria Operations, click [here](#) to skip ahead.

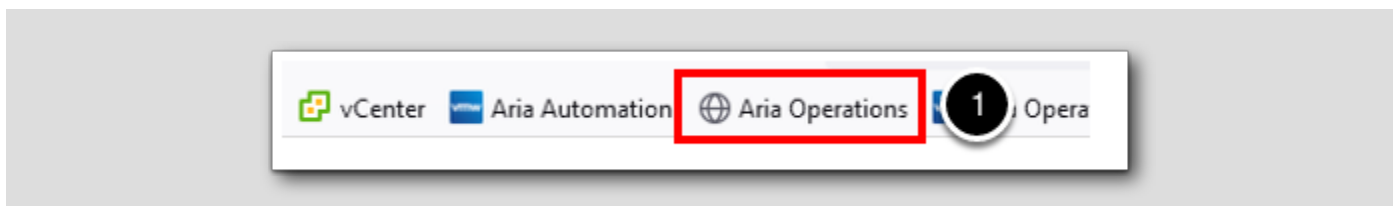
Open the Firefox Browser from Windows Quick Launch Task Bar

[548]



If your browser isn't already open, launch Firefox

1. Click the **Firefox** icon on the Windows Quick Launch Task Bar

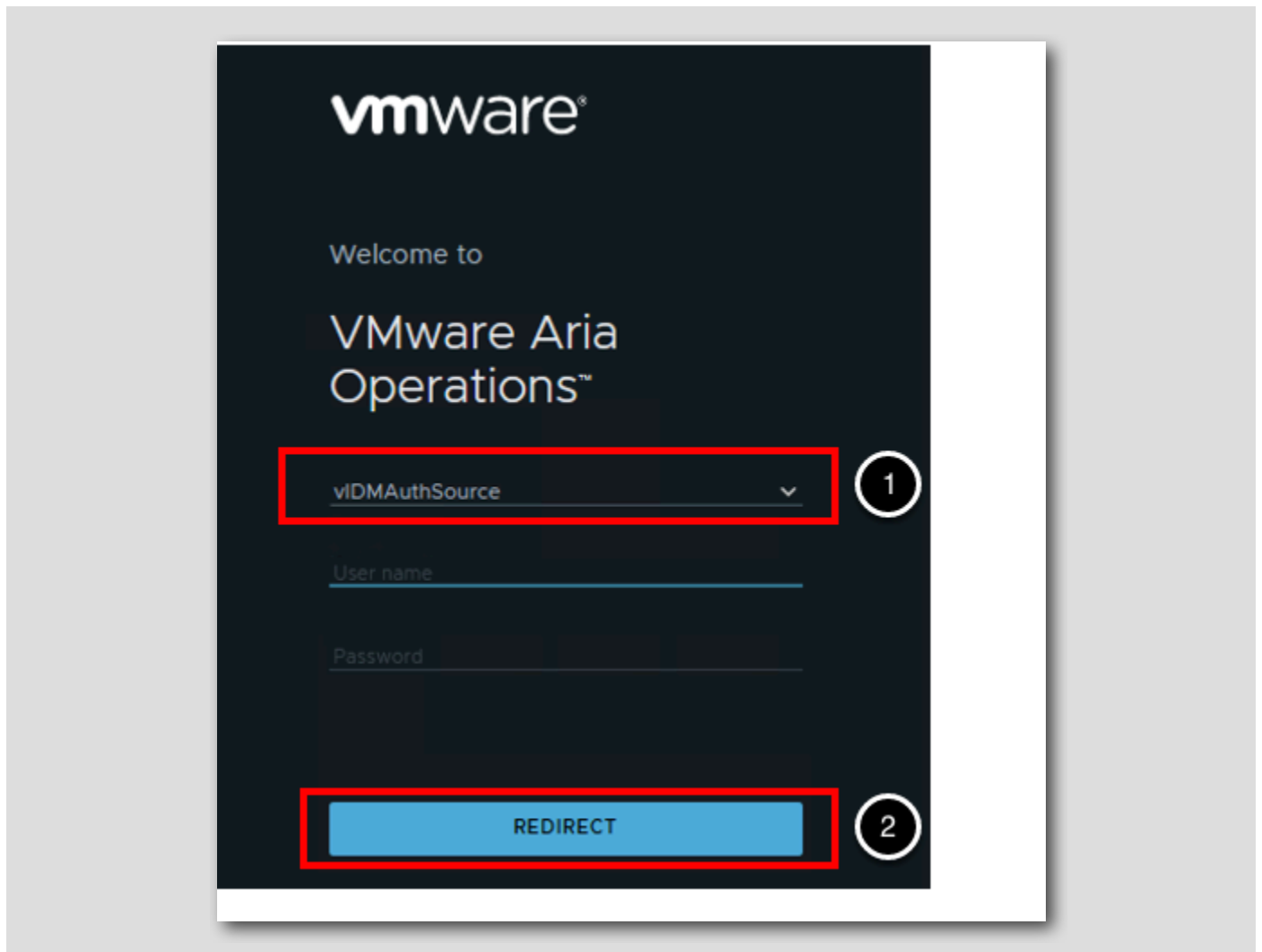


The browser Bookmarks Bar has links to the different applications that are running in the lab.

1. Click the Aria Operations Bookmark

Log in to Aria Operations

[549]



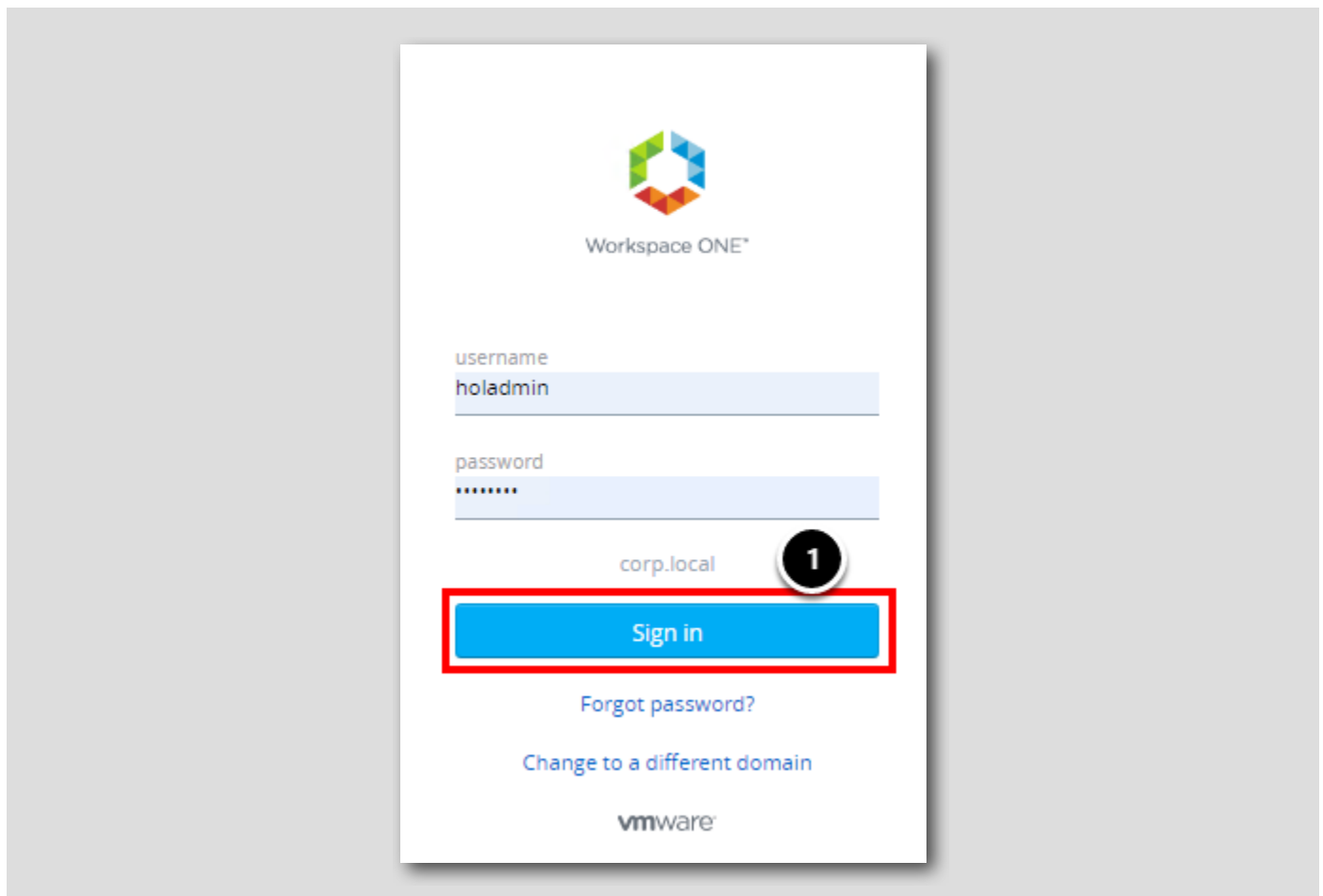
Aria Operations is integrated with VMware Identity Manager which we will use for user authentication in this lab.

VIDMAuthSource (VMware Identity Manager) should be pre-selected as the identity source. However, if it is not you will choose it.

1. Click the drop-down arrow if VIDMAuthSource is not selected.
2. Click REDIRECT to be taken to the authentication page.

VMware Identity Manager Login

[550]



At the Workspace ONE login screen, use these credentials:

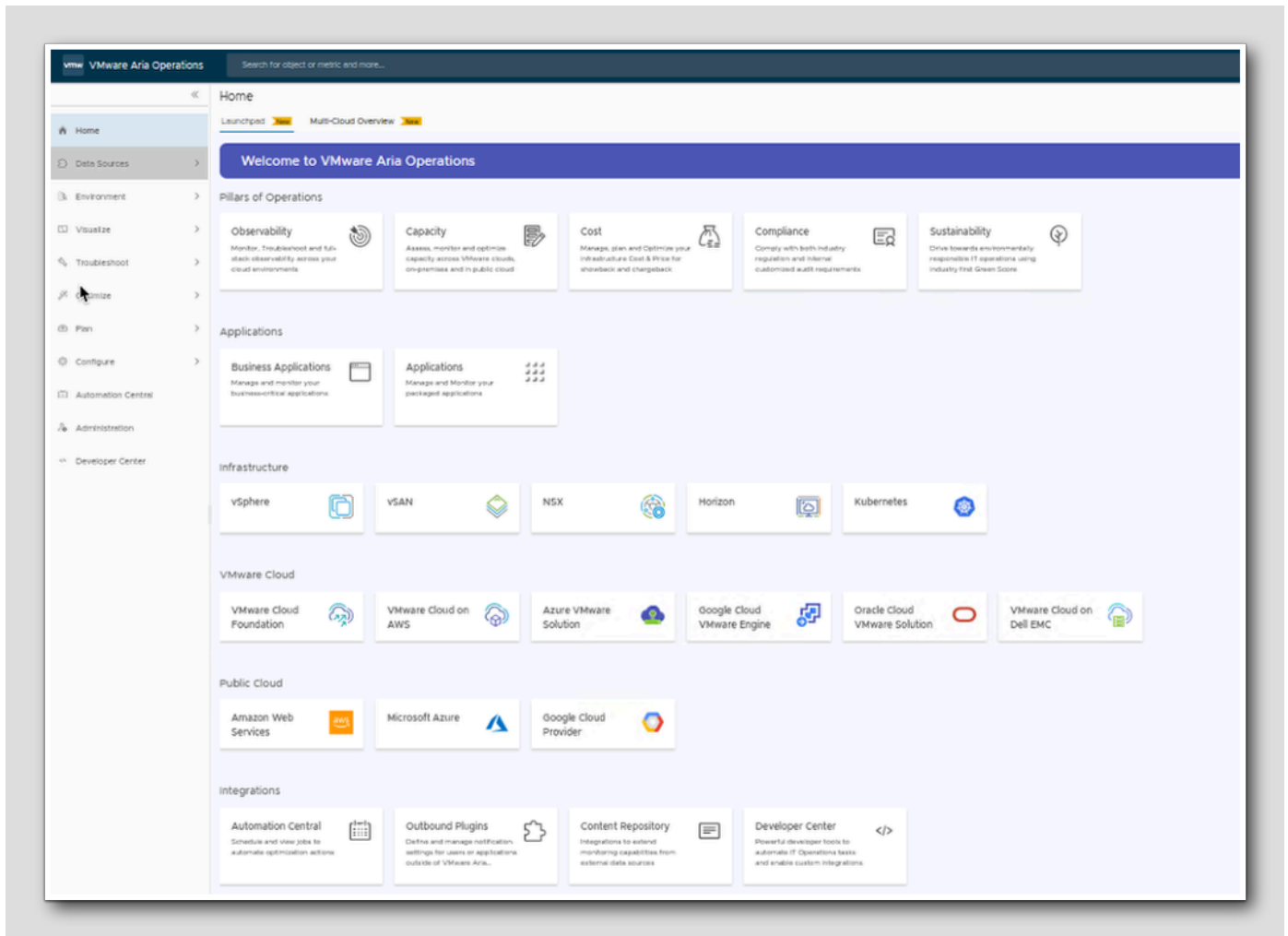
username: holadmin

password: VMware!

1. Click Sign in

Aria Operations Home Screen

[55]



You should be at the Aria Operations Home screen and ready to start the module.

Oversized and Undersized VMs using Rightsizing

[552]

In this part of the module, we will go through Rightsizing, schedule the rightsizing, and use the Automation Central to create a recurring schedule without requiring manual intervention

Before rightsizing

[553]

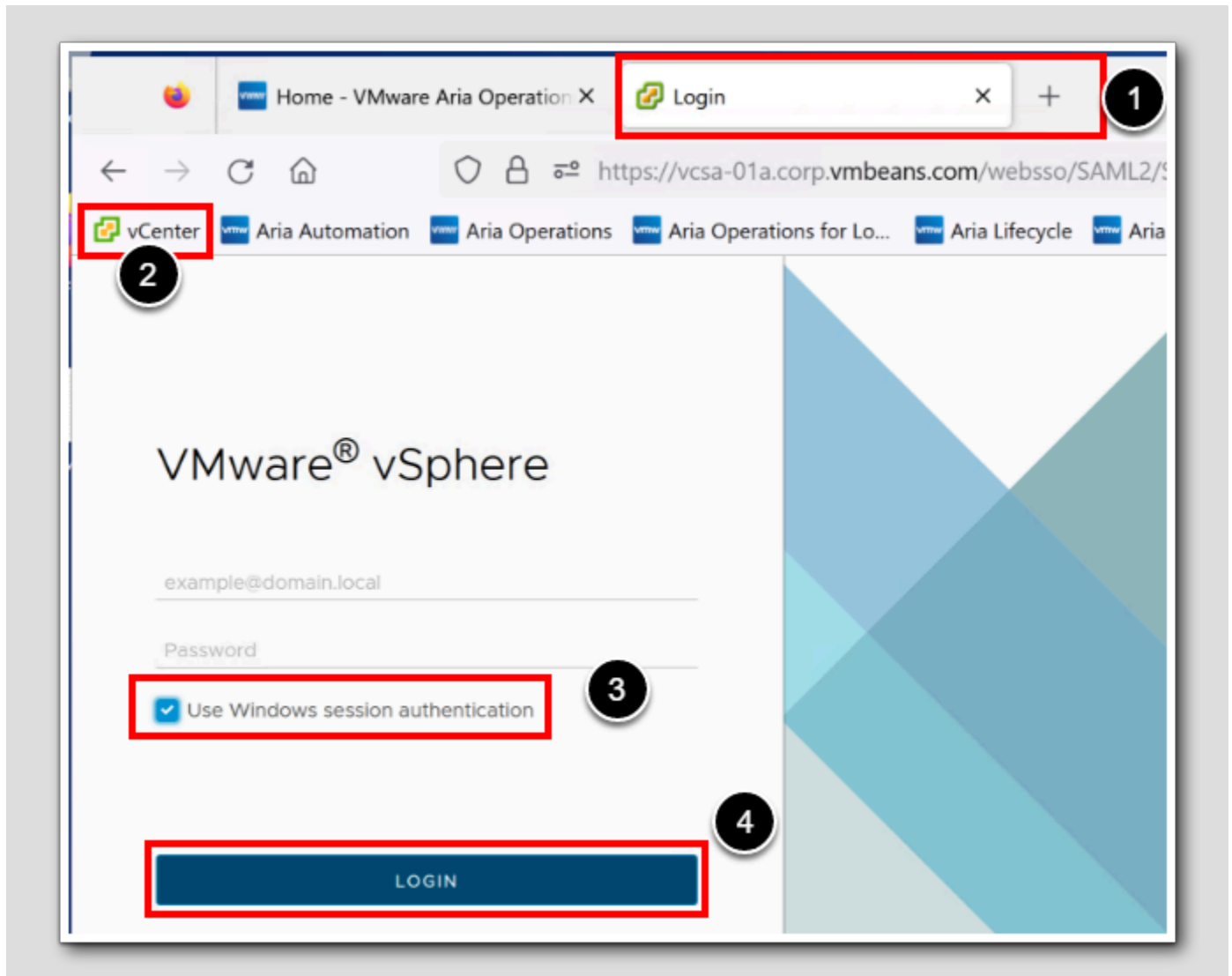
Server	vCPU	Mem	New vCPU	New Mem	Result
linux-dev-0010	1	1GB	4	16 GB (Gigabyte)	<i>Oversized</i>
linux-dev-0011	1	1GB	1 (same)	4 MB (Megabyte)	<i>Undersized</i>

In order to examine the impact of undersized and oversized virtual machines (VMs), we will access the vSphere environment and deliberately modify the configurations of selected developer servers to reflect improper sizing based on the table provided above.

Let's proceed with the task at hand.

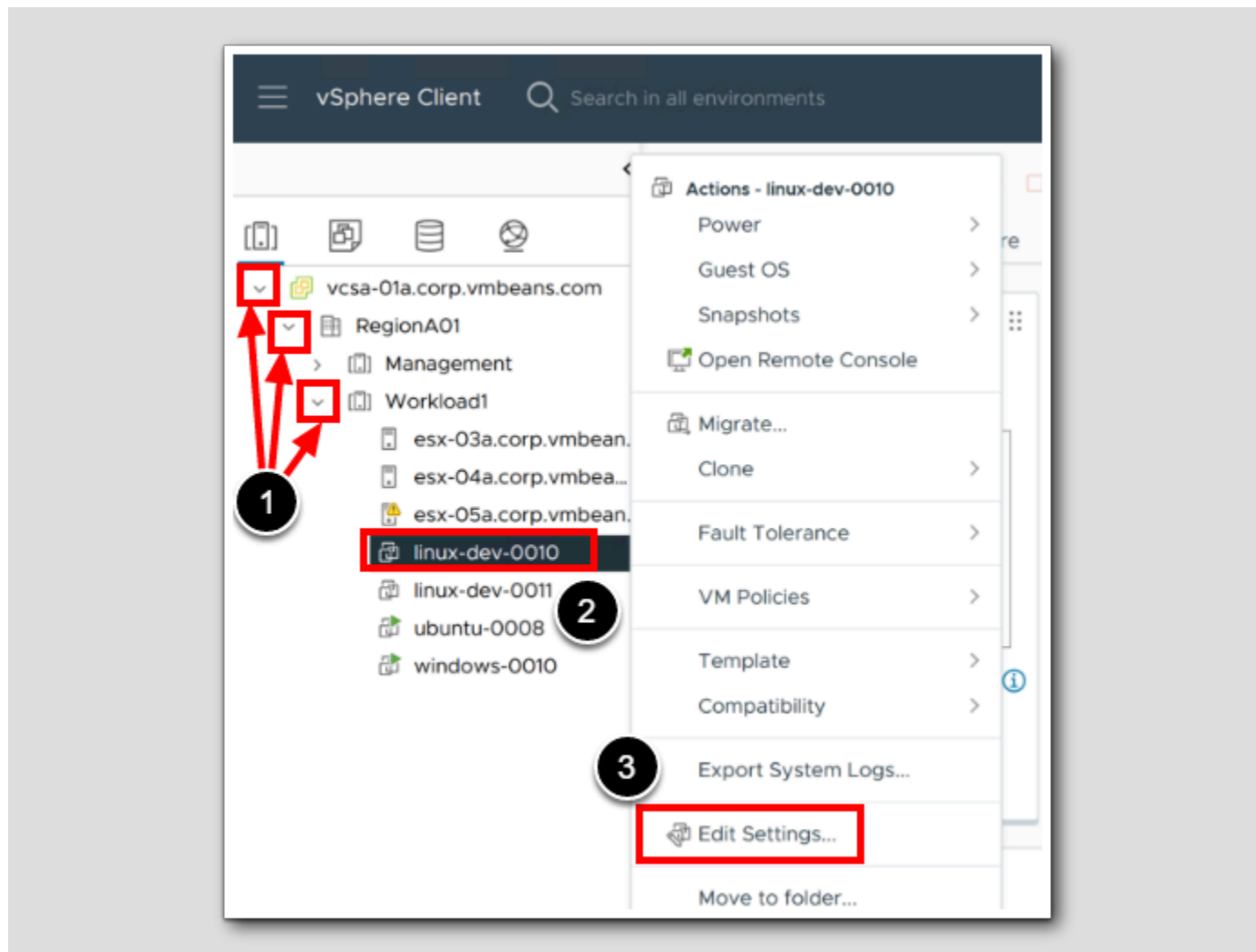
Starting vCenter

[554]



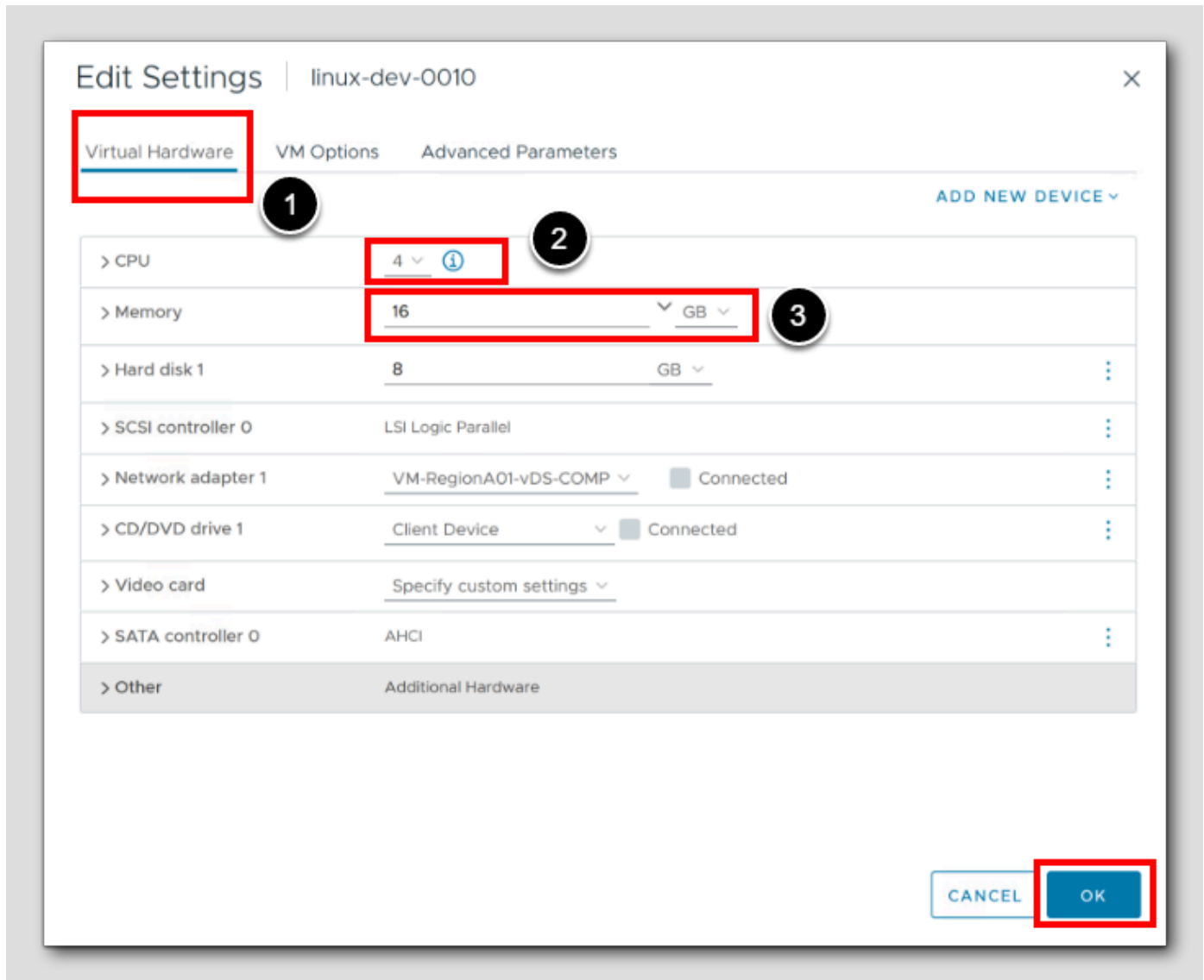
1. Start a new TAB by clicking '+'
2. On the toolbar, Click on vCenter
3. Select Use Windows session authentication
4. Click LOGIN

Edit settings



1. In the directory tree, click on the '>' and expand all the way down to the cluster **Workload1**.
2. Right-click **linux-dev-0010**.
3. Choose **Edit settings**.

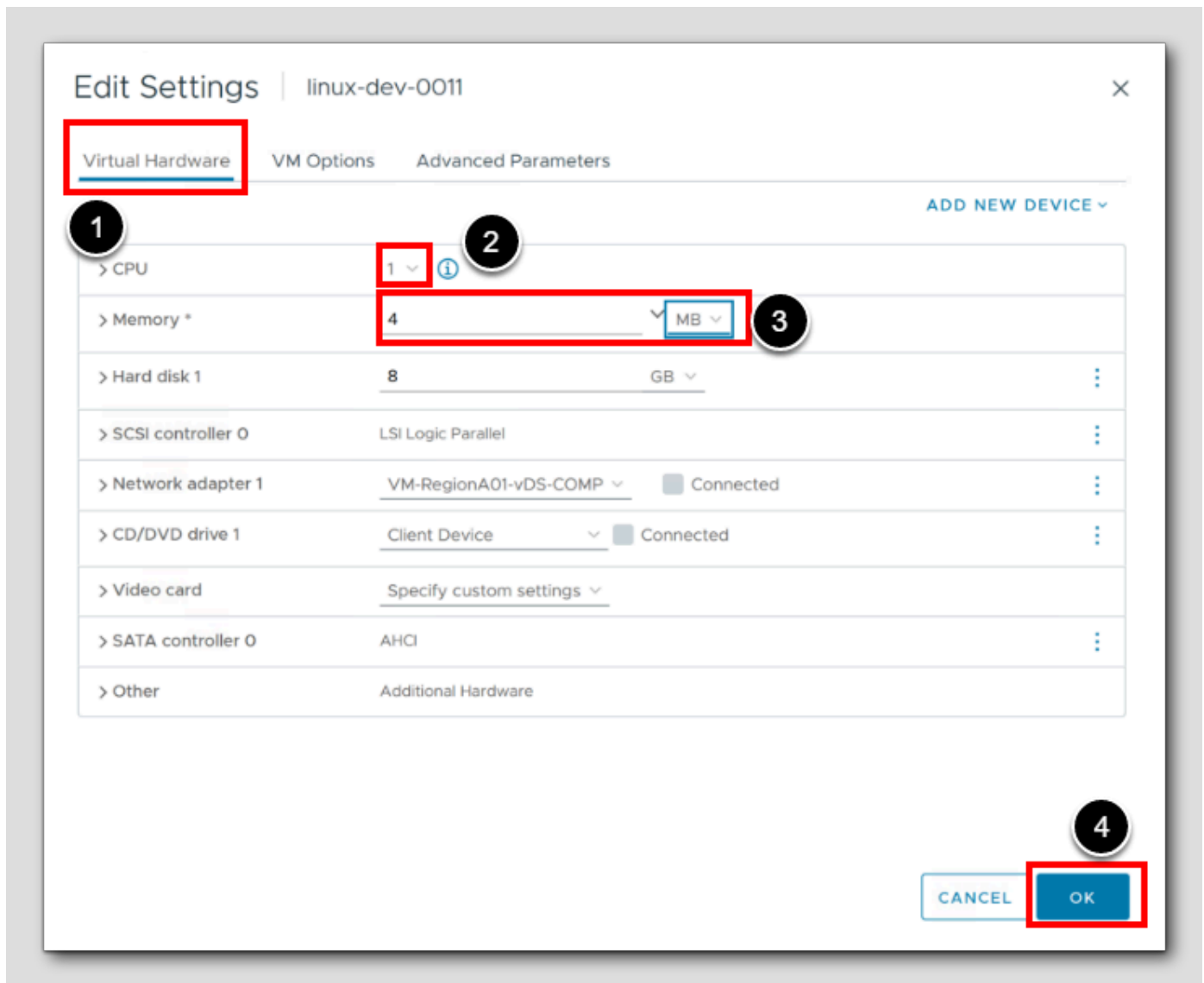
Oversizing a developer server



1. In the Edit Settings, if not already selected, select **Virtual Hardware**.
2. Give this VM too many virtual CPUs, behind CPU, **select 4**.
3. Give this VM too much memory for a simple Ubuntu server, behind Memory, **type 16**, let's make sure we **select GB** (Gigabyte).
4. Click **OK**.

Undersizing the other developer server

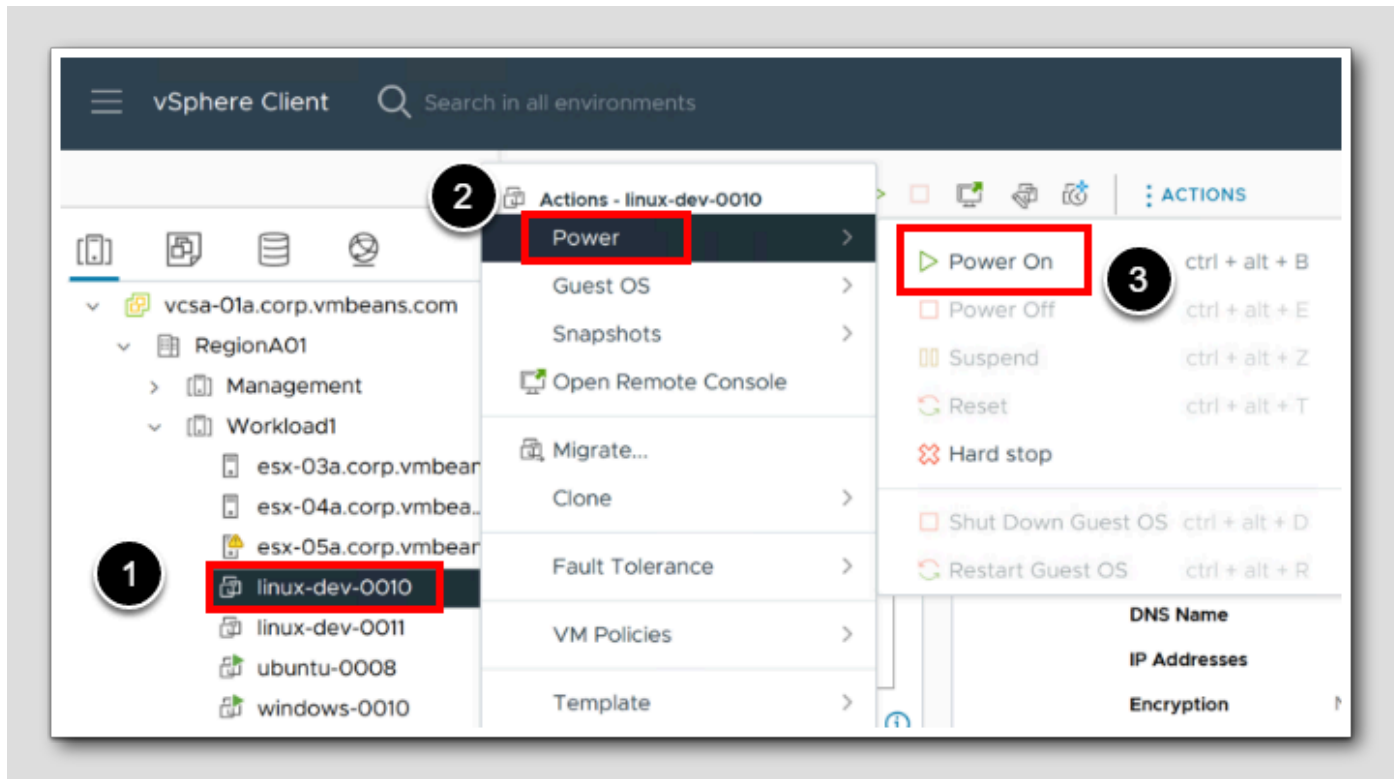
[557]



We are going to deprive the Ubuntu server VM for memory. The Virtual Machine may not even start with just 4MB of memory which is our evil intention. To edit the settings for the second developer server, right-click *linux-dev-0011* and choose **Edit Settings** (not shown)

1. In the Edit Settings, if not already selected, select **Virtual Hardware**.
2. If not already set, Give this VM just one virtual CPUs, behind CPU, **select 1**.
3. behind Memory, **type 4**, let's make sure we **select MB** (Megabyte).
4. Click **OK**.

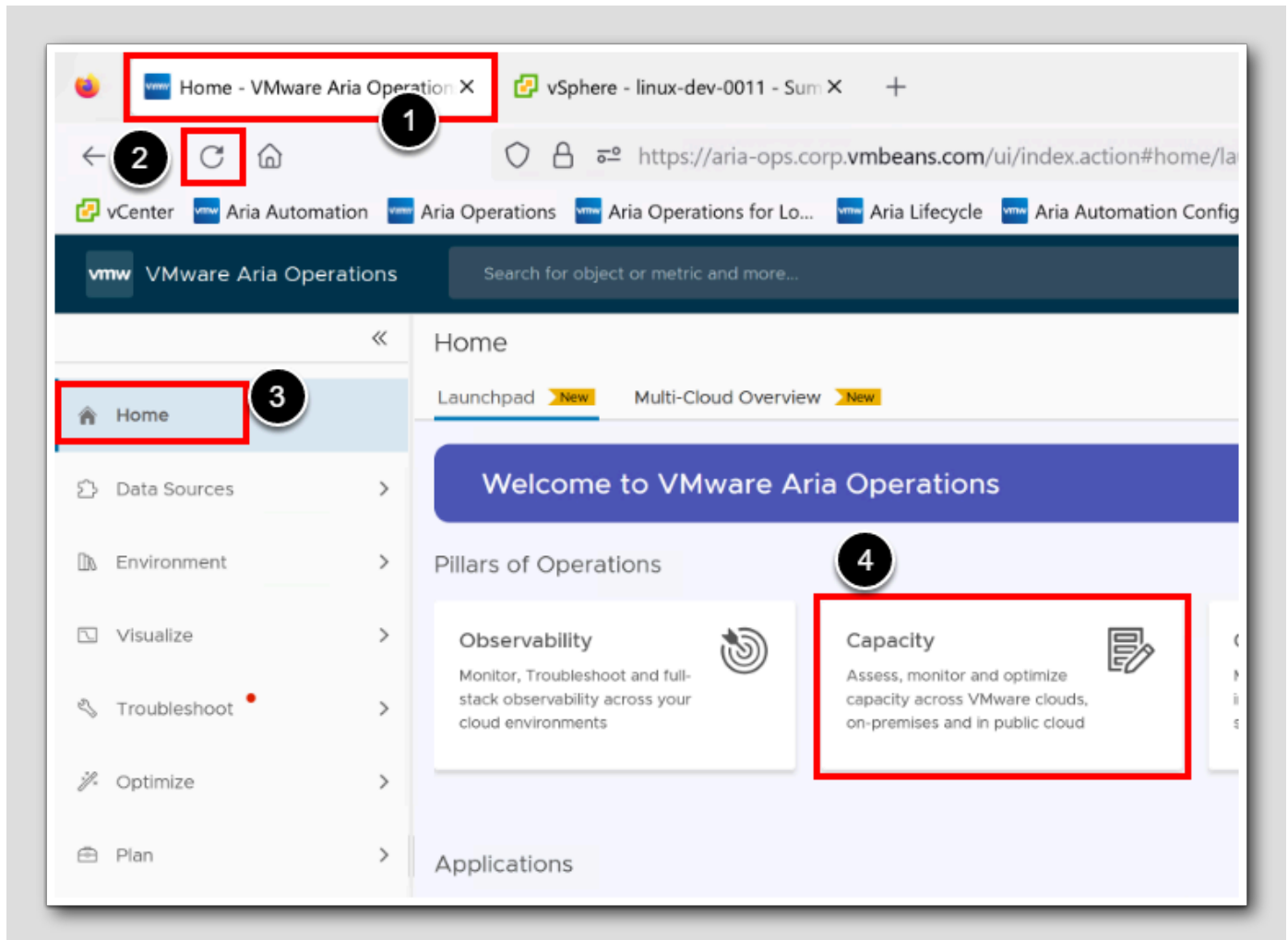
Start both VMs



1. Right click the VM linux-dev.0010.
2. Click Power.
3. Choose Power On.

NOTE: Repeat this step for the other developer server linux-dev-0011

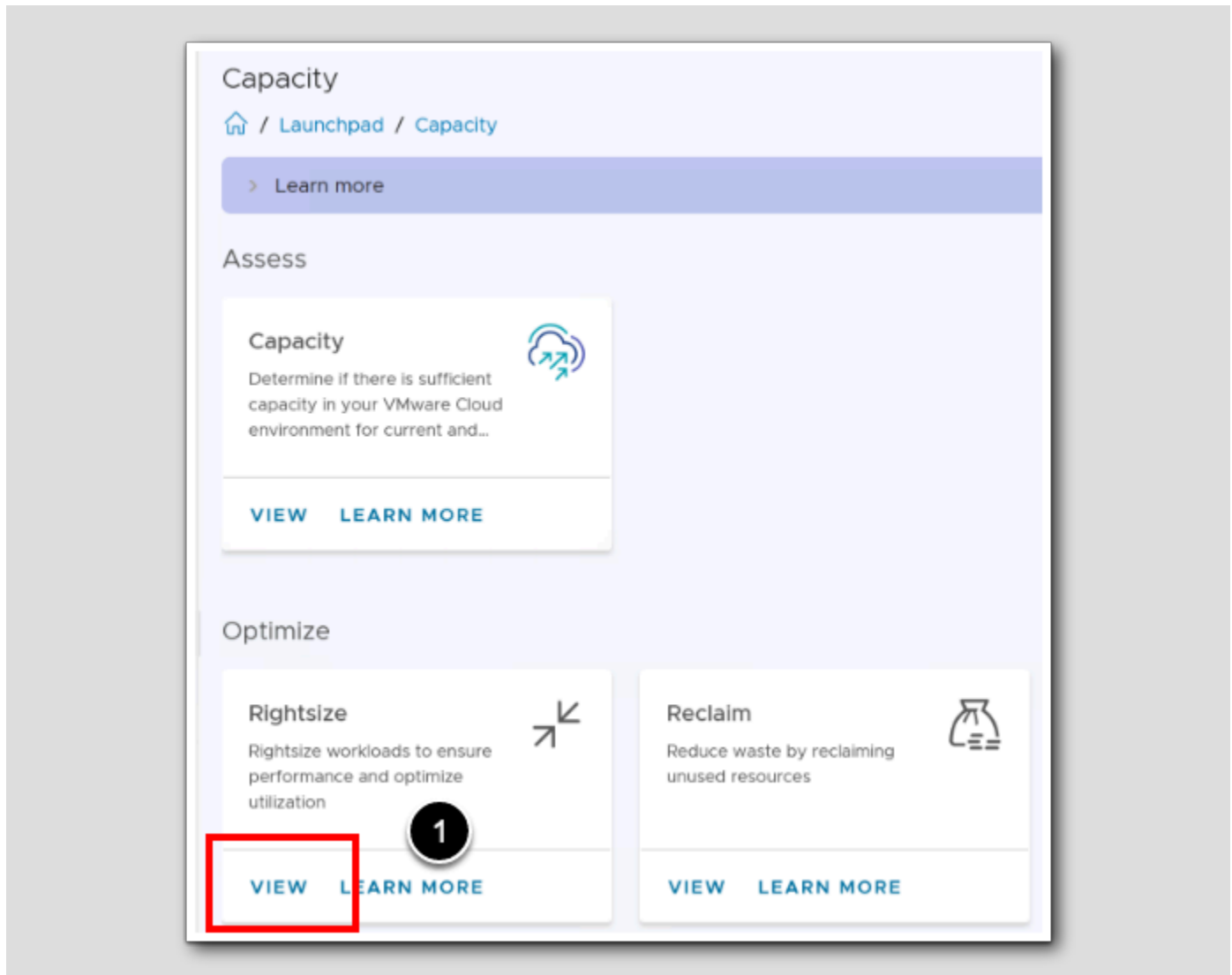
Back to Aria Operations



1. Go back to Aria Operations, In FireFox Browser select the **Aria Operations** TAB.
2. To make sure we're still logged in, and the UI has been refreshed since last collection cycle, on the toolbar, click the **Refresh** button.
3. If not already selected, Click **Home**.
4. To access the Rightsizing, that is a part of capacity planning, Click **Capacity**.

Open RightSizing

[560]



1. In the Capacity page, Under Optimize, Under Rightsize, Click VIEW.

A faster navigation

The screenshot displays the VMware Aria Operations interface. The left-hand navigation menu is expanded, showing the 'Optimize' section (1) and the 'Rightsize' option (2) highlighted. The main content area is titled 'Rightsize' and shows two cards for 'RegionA01', both indicating '0 Days Remaining' and 'Not Optimized' status. Below this, a section for 'RegionA01' lists 'Oversized VMs' with a table of resources.

Resource	Recommended Red
CPU	14 vCPUs
Memory	26 GB

TIP: A much faster way to navigate to the Rightsize page

1. In the Left toolbar, behind *Optimize* expand the section, Click on the '>' Arrow
2. Click on **Rightsize**

NOTE: It's not necessary to perform these two steps now.

Sizing overview

The screenshot displays the VMware vSphere Rightsize interface. At the top, there is a search bar and a refresh button (circled in red and labeled '2'). Below the search bar, there are two 'RegionA01' datacenter cards, with the second one circled in red and labeled '1'. The main content area is yellow and shows 'Oversized VMs' (8 VMs to Downsize) and 'Undersized VMs' (1 VMs To Upsize). The oversized VMs table shows CPU and Memory resources with recommended reductions. The undersized VMs table shows CPU and Memory resources with recommended increases.

Oversized VMs			
Resource	Recommended Reduction	% Reduction	
CPU	14 vCPUs		
Memory	26 GB		

Undersized VMs			
Resource	Recommended Increase	% Increase	
CPU	0 vCPUs		
Memory	1 GB		

1. If no datacenters are selected, select the RegionA01 Datacenter.
2. The view could be a little different from what you see in this Lab, but to be sure we are up to date, click the Aria Operations refresh button.

In the highlighted section in our view, we see that I have 8 VMs that are oversized, and from those 8 VMs we can reduce with 14 vCPUs and 26 GB of RAM, meaning that we would give back just that in wasted resources that have never been used. This is really powerful, because in the same view we see one VMs that lacks memory to be performing well. So we have 1 VM which needs an increase of 1 GB (Gigabyte) memory

Which workloads are oversized

VM Name	Allocated CPU	Recommended CPU Reduction	Allocated Memory ↓	Recommended Memory Reduct...
linux-dev-0010	4 vCPUs	2 vCPUs	16 GB	8 GB
Windows-0010	2 vCPUs	0 vCPUs	4 GB	2 GB

1. Select Oversized VMs.
2. For now, we will ignore the Management Cluster. Expand the workload cluster **Workload1**, click '>'.
3. The Oversized VMs with their VM name and recommended Reduction are shown, Select all the workloads.
4. Click **RESIZE VM(s)**.

Editing resize

Resize VMs

Review the suggested sizes and make adjustments as necessary.

VM Name	Decrease CPU From	To	Decrease Memory Size From	To
windows-0010	2 vCPUs	2 vCPUs	4 GB	3 GB
linux-dev-0010	4 vCPUs	2 vCPUs	16 GB	9 GB

1 - 2 of 2 items

You have selected 2 VM(s) to free-up the following resources:

- CPU: 2 vCPUs
- Memory: 10 GB

I understand that workloads may be interrupted because some VMs must be restarted during the resize.

CANCEL **RESIZE VM(S)**

The Resize VM(S) workspace appears. The table displays suggested reductions for vCPU and memory. Click the edit icons to accomplish to changes you wish.

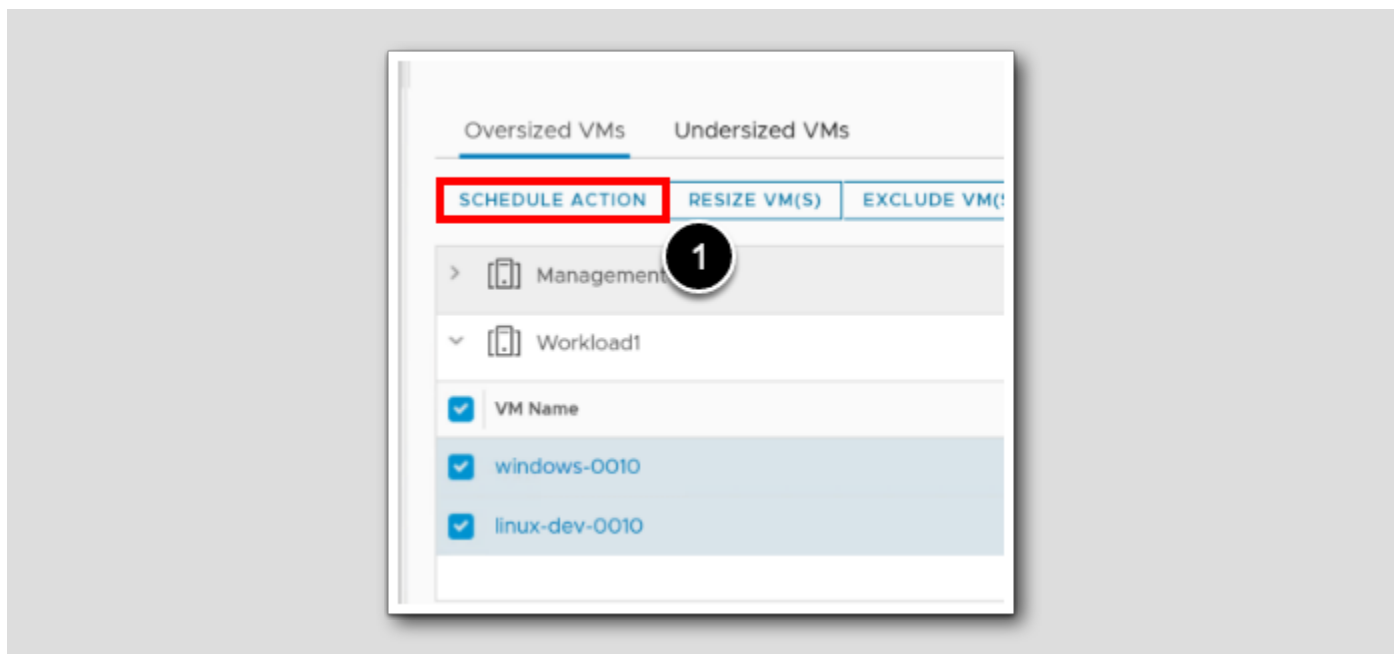
1. Change Memory to 3.
2. Change CPU to 9.
3. Check the *'I understand that workloads may be interrupted because some VMs must be restarted during the resize.'*

Many customers are often hesitant to make significant alterations to their virtual machines (VMs) and prefer a more cautious approach. The Recommended Size feature has been purposefully designed to adopt a conservative stance in its suggestions. For VMs that are oversized, the Recommended Size is limited to a maximum of 50% of their current configuration. This gradual approach aims to guide VMs toward their optimal size without proposing drastic changes, such as reducing the number of virtual CPUs from 32 to just 1.

4. STOP! For now, we will actually not perform the resizing manually, so just Click **Cancel**

Opening the Scheduling

[565]



As part of our commitment to Self-Driving Operations, we are taking an additional measure to enhance Rightsizing. To ensure minimal disruption for the careful consideration of Aria Operations' recommendations, we've scheduled the rightsizing for two production servers tomorrow at 10:00 PM, by the end of the regular working hours.

1. Click **SCHEDULE ACTION**.

Create Scheduled Job

[566]

Create Scheduled Job Resize Oversized VMs ×

2 VMs Selected **2 vCPUs** vCPU Reclaimable **10 GB** Memory Reclaimable

Job name
Resize my two oversized VMs 1

Job Description
Rightsizing for two production servers tomorrow at 10:00 PM 2

Start Date
7/24/23 3

Time Of Day

Start Time 10:00 PM 4 **Time zone** (GMT +01:00) Amst 5

Receive updates on Job via Email

No Email Outbound plugin available

⚠ I understand that workloads may be interrupted because some VMs must be restarted during the resize.

CANCEL CREATE

1. Fill in Job Name `Resize my two oversized VMs`.
2. Fill in the Job description `Rightsizing for two production servers tomorrow at 10:00 PM`.
3. Make sure you select a Start Date that is `tomorrow`, at the time of writing the date was 23rd July 2023, so I've picked the date to be `7/24/23` (meaning 24th July 2023).
4. Select Start Time `10:00 PM`.
5. Just leave the Timezone, or let's select our closest Timezone. At the time of writing `GMT+1 (Nordics)` was selected.
6. Check *'I understand that workloads may be interrupted because some VMs must be restarted during the resize.'*
7. Click `CREATE`.

Automation Central results

The screenshot displays the VMware Aria Operations interface. On the left, the navigation menu has 'Automation Central' highlighted with a red box and a '1' in a circle. The main content area shows 'Automation Central' with a '1' in a circle above 'Upcoming Jobs'. Below this, there are tabs for 'Schedule', 'Report', 'History', and 'Jobs', with 'Jobs' highlighted by a red box and a '2' in a circle. A calendar for July 2023 is shown, with a job 'Resize my two oversized VMs' scheduled for July 24th at 1:00 PM. The job is highlighted in yellow.

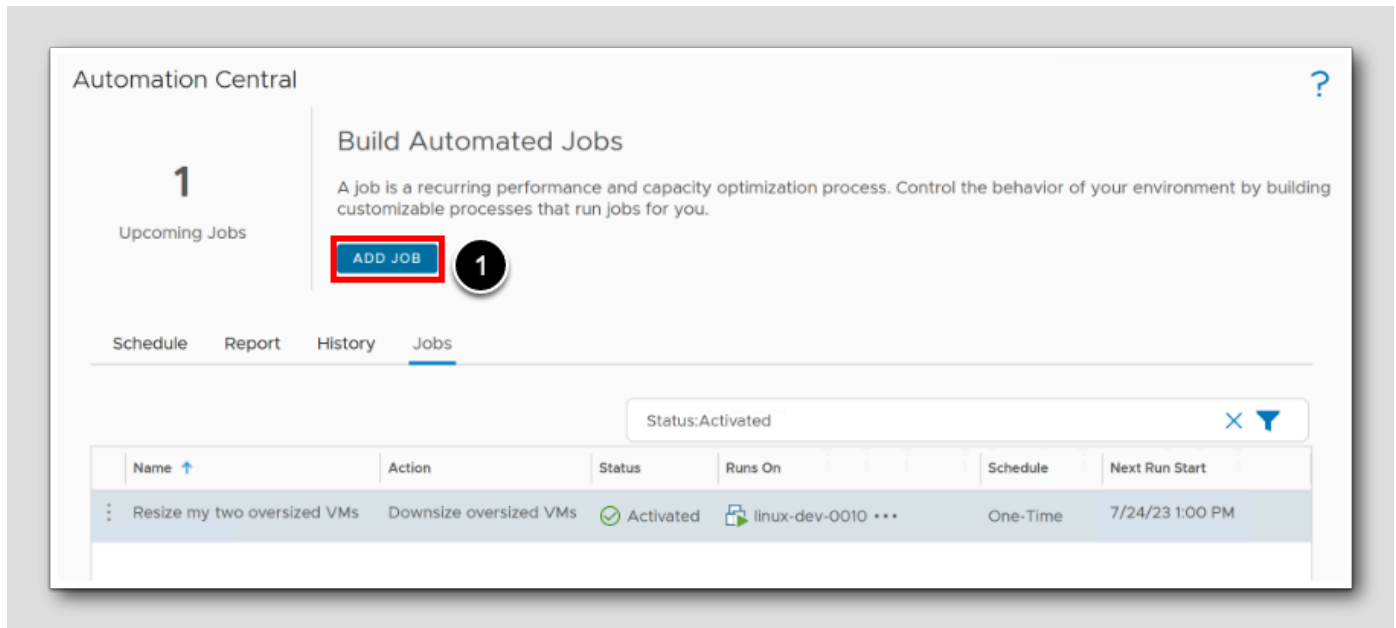
1. In the left navigator, click Automation Central.

Notice that our newly scheduled job occurs the day after today. Also Notice that since we selected a totally different timezone, it translates to 01:00 p.m. local time (Palo Alto, USA).

2. In Automation Central, Click Jobs.

One-Time Job review

[568]



Automation Central

Build Automated Jobs

A job is a recurring performance and capacity optimization process. Control the behavior of your environment by building customizable processes that run jobs for you.

1
Upcoming Jobs

ADD JOB **1**

Schedule Report History **Jobs**

Status: Activated

Name ↑	Action	Status	Runs On	Schedule	Next Run Start
⋮ Resize my two oversized VMs	Downsize oversized VMs	✔ Activated	linux-dev-0010 ...	One-Time	7/24/23 1:00 PM

Based on the information available in our Automation Central listing, a scheduled one-time job is set for tomorrow. In alignment with our commitment to automatic self-driving operations, we aim to execute this task on a recurring schedule without requiring manual intervention.

1. Proceed by clicking **ADD JOB**.

Create Job from Automation Central

[569]

Create New Job

1 - Select Action 2 - Select Scope 3 - Filter Criteria 4 - Schedule

Name (1)

Description (2)

Action Configuration

Reclaim

- Delete old snapshots
- Delete idle VMs
- Power off idle VMs
- Delete powered off VMs (3)

Rightsize

- Downsize oversized VMs (3)
- Scale-up undersized VMs

Other

- Additional Actions (7)

Rightsize Resource Type

- vCPUs (4)
- Memory (4)

Limit Downsizing Amount

- Default Recommendation (5)
- 50% of Default Recommendation

⚠ I understand that workloads may be interrupted because some VMs must be restarted during the resize. (6)

(7)

We will now establish an automated job to schedule actions seamlessly.

1. Specify a name for the job. This will be displayed in the calendar. Type **Weekly Downsize**
2. Provide a description for the job. Type **Downsize all oversized resources on a weekly basis**
3. Action Configuration, Behind *Rightsize*, Select **Downsize oversized VMs**
4. Behind the *Rightsize Resource Type*, select both **vCPU** and **Memory**
5. Under the *Limit Downsizing Amount*, Select **Default Recommendation**.

We discussed the *downsizing limit amount* previously, and we should of course apply extra care in a production environment, but since this is a test environment we can ignore the 50% of default recommendation and do max downsizing each time.

6. Check '*I understand that workloads may be interrupted because some VMs must be restarted during the resize.*'
7. Click **NEXT**

VMware Aria Operations does not check if the VM hot add/remove setting is enabled. If the VM power off is not allowed, then the action will fail. Note: If the number of resources for a job is ten or less, then the job runs at once. If the number of resources is more than ten, then the jobs run in groups of ten, in parallel.

Select Scope

The screenshot shows the 'Create New Job' wizard in the vSphere interface, specifically the '2 - Select Scope' step. The wizard has four steps: 1 - Select Action, 2 - Select Scope, 3 - Filter Criteria, and 4 - Schedule. The 'Virtual Machine' option is selected under the 'vCenter' category. A message states: 'Please carefully select the scope. Only Virtual Machines and their ancestor objects would make the job run successfully.'

The 'Select Scope' section contains a search bar with 'Workload1' entered and a list of objects to be selected. The objects are organized in a tree structure under 'vSphere World':

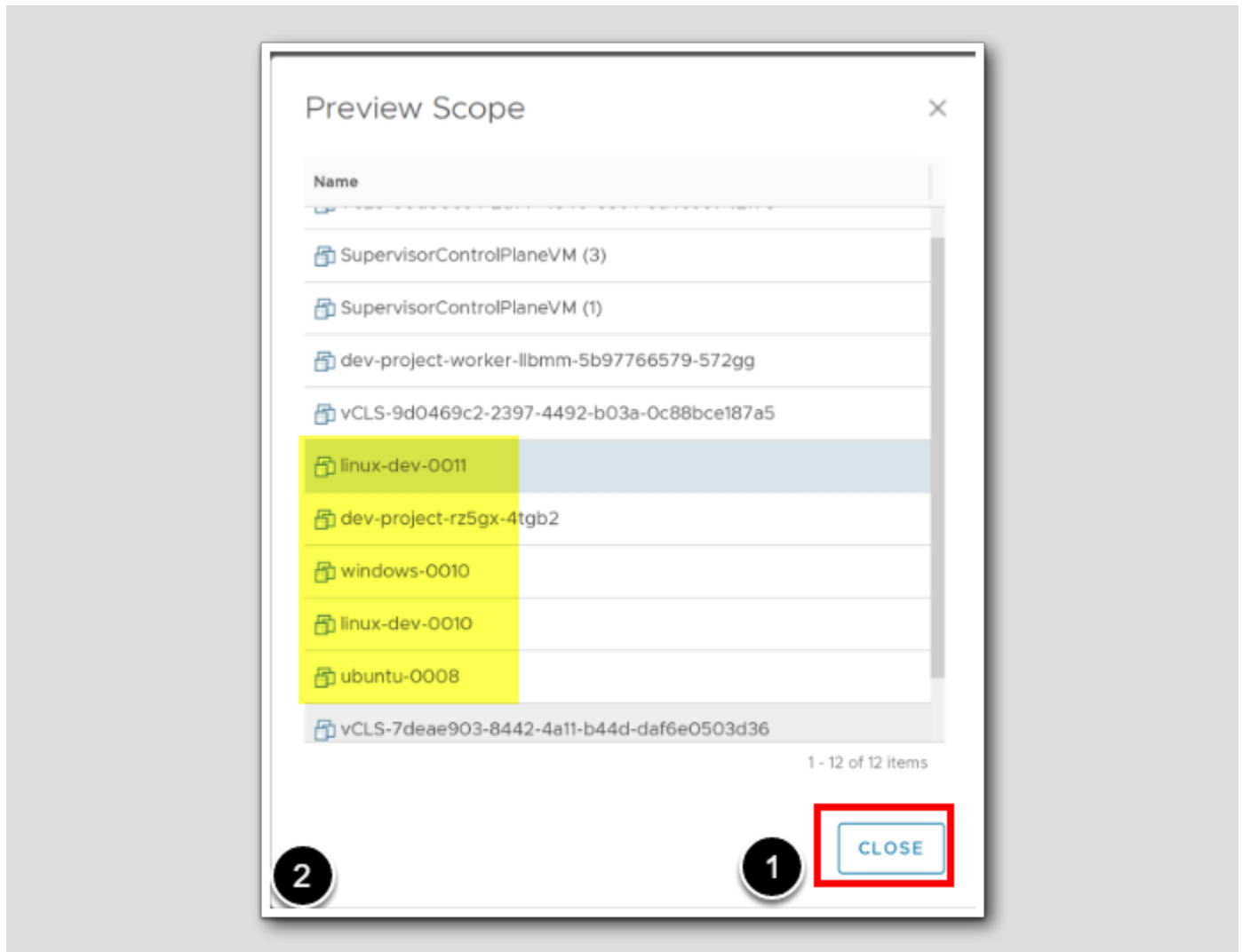
- vSphere World
 - vcsa-01a.corp.vmbeans.com (expanded)
 - RegionA01 (expanded)
 - Development
 - HOL Infrastructure
 - Namespaces
 - Templates
 - vCLS
 - Workloads
 - Discovered virtual machine
 - Management
 - Workload1 (selected)

Numbered callouts indicate the following actions:

- Expand the vCenter `vcsa-01a.corp.vmbeans.com`
- Expand the datacenter `RegionA01`
- Drag and Drop the cluster `Workload1`
- Click `PREVIEW SCOPE`

1. Expand the vCenter `vcsa-01a.corp.vmbeans.com`
2. Expand the datacenter `RegionA01`
3. Drag and Drop the cluster `Workload1`
4. Click `PREVIEW SCOPE`

Preview Scope



I can see my windows and linux servers that I'd like to resize each week, but also some other resources I do not manage. In the next step we will filter out these.

1. Click Close
2. To go to the Filter Criteria which is the next step, Click Next (NOT SHOWN)

Adding a criteria for Windows

Create New Job ?

1 - Select Action 2 - Select Scope 3 - Filter Criteria 4 - Schedule

Set Filter Criteria

Set additional filters based on user defined criteria such as virtual machine names, tags, properties etc.

Object Type: x v

1 v

2 v

3 v

4 v

5

1. Select Properties
2. Select Guest OS from vCenter
3. Select Contains
4. Type Windows
5. To add another criteria for Ubuntu, Click on ADD ANOTHER CRITERIA SET

Add criteria for Ubuntu

Create New Job

1 - Select Action 2 - Select Scope 3 - Filter Criteria 4 - Schedule

Set Filter Criteria

Set additional filters based on user defined criteria such as virtual machine names, tags, properties etc.

REMOVE CRITERIA

Object Type: Virtual Machine

Properties |Guest OS from vCenter contains Windows

Or

REMOVE CRITERIA

Object Type: Virtual Machine

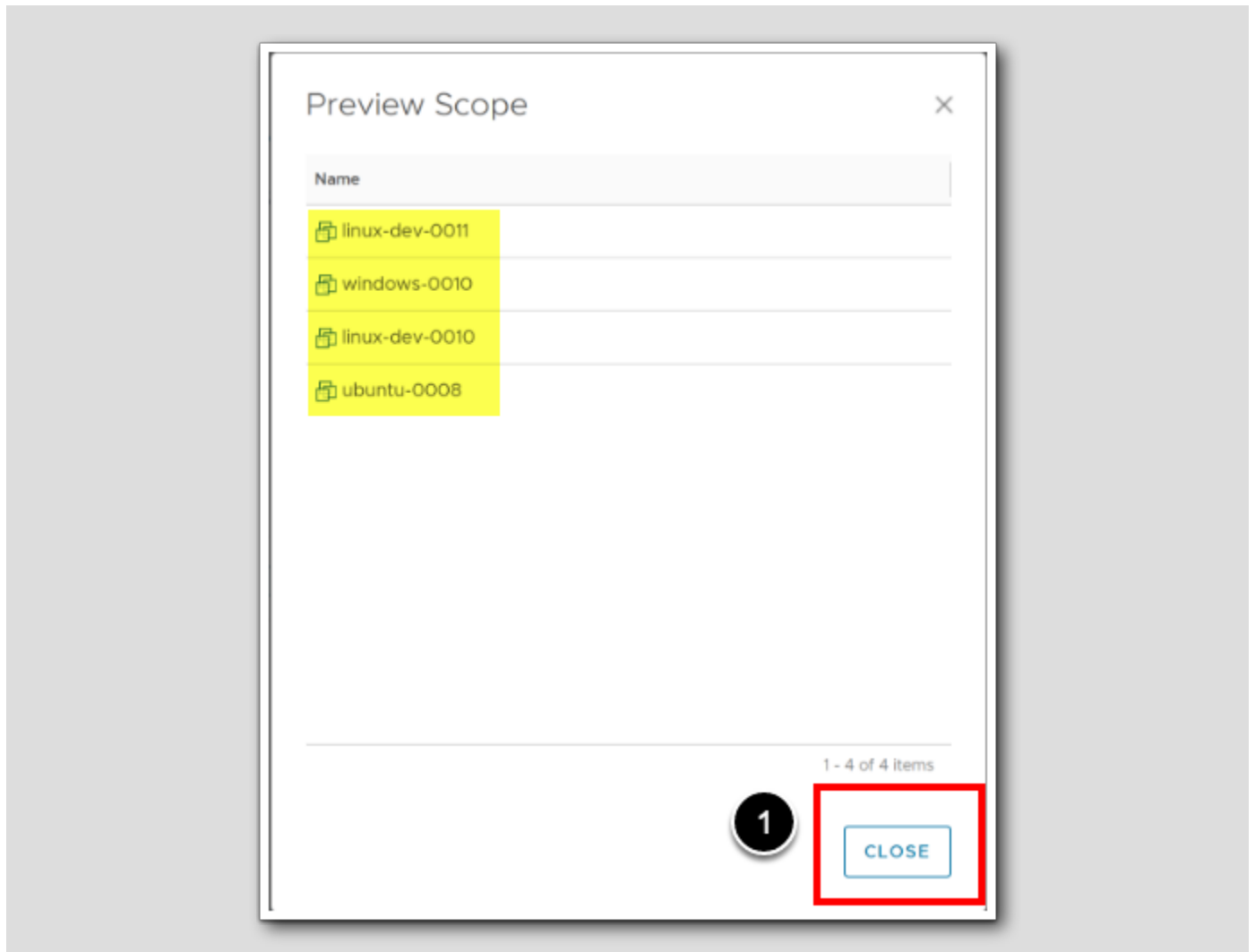
1 Properties 2 |Guest OS from vCenter 3 contains 4 Ubuntu

ADD ANOTHER CRITERIA SET

PREVIOUS NEXT CREATE CANCEL PREVIEW SCOPE

1. Select Properties
2. Select Guest OS from vCenter
3. Select Contains
4. Type Ubuntu
5. Click PREVIEW SCOPE

Preview Scope



We have successfully implemented Criteria filters that Single out Windows or Ubuntu machines. This facilitates the resizing process specifically for the VMs under our administration.

1. Click Close
2. When you return to the Create New Job Wizard, Click NEXT (not shown)

The screenshot shows the 'Create New Job' configuration page with the following settings and callouts:

- 1:** Start Date: 7/25/23 (calendar icon highlighted)
- 2:** Time zone: Host
- 3:** Start Time: 10:00 PM
- 4:** Recurrence: Weekly
- 5:** Run Every: 1 Week(s)
- 6:** On (Days of the week): Sa (Saturday selected)
- 7:** Notifications: No Email Outbound plugin available

Buttons at the bottom: PREVIOUS, NEXT, CREATE (highlighted), CANCEL, PREVIEW SCOPE.

1. Select the Start date two days from now. Click the calendar icon and select 2 days from now
2. Set the Time Zone to Host
3. Set the start time to 10:00 p.m.
4. Under Recurrence select Weekly
5. Under Run Every, select 1 Week(s)
6. Behind On (Days of the Week) Deselect Su Sunday, and Select Sa for Saturday
7. We're finally done, Click Create

Review the results

[576]

Automation Central

2
Upcoming Jobs

Build Automated Jobs

A job is a recurring performance and capacity optimization process. Control the behavior of your environment by building jobs.

ADD JOB

Schedule Report History Jobs

1

Name ↑	Action	Status	Runs On	Schedule	Next Run Start
⋮ Resize my two oversized VMs	Downsize oversized VMs	✓ Activated	linux-dev-0010 ...	One-Time	7/24/23 1:00 PM
⋮ Weekly Downsize	Downsize oversized VMs	✓ Activated	Workload1 ...	↻ Weekly, every 1 weeks on Saturday	7/29/23 3:00 PM

Status: Active

We observe that we have two upcoming jobs. Review the Schedule for these two Jobs (highlighted)

1. Click Schedule

Review Schedule Calendar

Automation Central

Build Automated Jobs

A job is a recurring performance and capacity optimization process. Control the behavior of your environment by building customizable processes that run jobs for you.

2 Upcoming Jobs

ADD JOB

Schedule Report History Jobs

1 January 2024 Synchronize time with: Browser GMT-07:00

Sun	Mon	Tue	Wed	Thu	Fri	Sat
31	1	2	3	4	5	6 3:00 PM Weekly Do... ↻
7	8	9	10	11	12	13 3:00 PM Weekly Do... ↻
14	15	16	17	18	19	20 3:00 PM Weekly Do... ↻
21	22	23	24	25	26	27 3:00 PM Weekly Do... ↻
28	29	30	31	1	2	3 3:00 PM Weekly Do... ↻

1. From the calendar page, choose an upcoming month. Click the left '<-' and right '->' arrows to go to January (2024)

As you can see from the calendar, the job is scheduled to do resizing every Saturday at 10 p.m.

Rightsizing Calendar Summary

[578]

We are going to create Automated Jobs in Automation Central. By building Automated Jobs with a recurring performance and capacity optimization process, we say goodbye to waste, and welcome cost savings. Your intelligent and cost-effective Aria Operations operates in the background to ensure the effortless execution of all tasks and processes.

Undersized, the lack of resources

[579]

The screenshot shows the VMware Aria Operations interface for rightsizing VMs. The sidebar on the left has the 'Rightsize' option selected. The main area displays two 'RegionA01' cards, each indicating '0 Days Remaining' and 'US\$0 Cost Savings' (Not Optimized). Below these, there are sections for 'Oversized VMs' (8 VMs To Downsize) and 'Undersized VMs' (1 VMs To Upsize). A table under 'Oversized VMs' shows resource usage and recommended reductions: CPU (14 vCPUs, 14% reduction) and Memory (26 GB, 26% reduction). Action buttons include 'SCHEDULE ACTION', 'RESIZE VM(S)', 'EXCLUDE VM(S)', and 'EXPORT ALL'. A dropdown menu shows 'Workload1' and a table lists VMs with columns for 'VM Name', 'Allocated CPU', and 'Recommended CPU Increase'. The VM 'linux-dev-001' is highlighted with 1 vCPU allocated and 0 vCPU recommended increase.

VM Name	Allocated CPU	Recommended CPU Increase
linux-dev-001	1 vCPUs	0 vCPUs

In our rightsizing strategy, we must also consider the increasing demands of our workloads. Being proactive in resizing undersized servers improves their efficiency and ensures a better user experience.

Let's not forget our undersized server that has been struggling for too long. It deserves immediate attention, and we should resize it manually right away.

1. Expand **Optimize**
2. Click **Rightsize**
3. Click **Undersized VMs**
4. Expand the cluster **Workload1**
5. Select the undersized VM **linux-dev-0011**
6. Click **Resize VM(s)**

Resize VMs

Resize VMs

Review the suggested sizes and make adjustments as necessary.

VM Name	Increase CPUs From	To	Increase Memory Size From	To
linux-dev-0011	1 vCPUs	1 vCPUs	4 MB	1 MB

1

You have selected 1 VM(s) to rightsize, by adding the following resources:

CPU: 0 vCPUs

Memory: 1 GB

2

I understand that workloads may be interrupted because some VMs must be restarted during the resize.

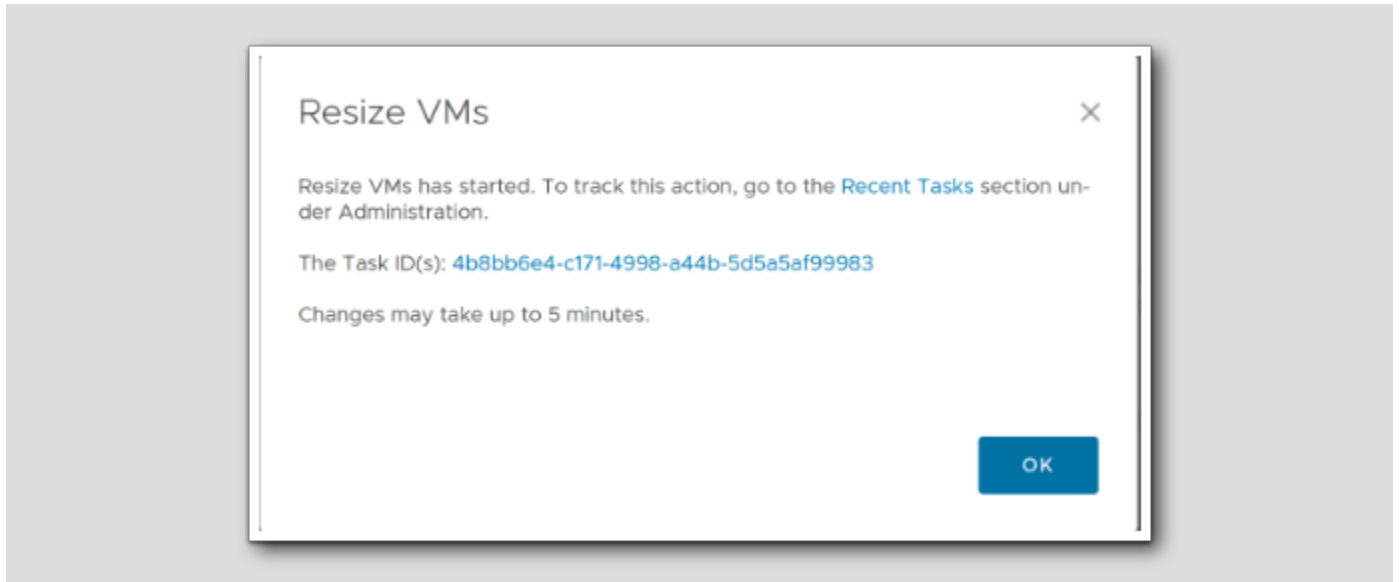
3

CANCEL RESIZE VM(S)

1. Leave all recommendations from Aria Operations
2. Check the 'I understand that workloads may be interrupted because some VMs must be restarted during the resize.'
3. Click RESIZE VM(s)

Go to Recent Tasks

[581]



1. Click the Task ID

Failed task and Requirements

[582]

The screenshot displays the 'Recent Tasks' interface in VMware Aria Operations. A task named 'Set CPU Count and Me...' is shown with a status of 'Failed'. The details pane for this task shows a list of messages, with the final message being an error: 'Unable to shut down or power off vm. VMware Tools is not installed.' A red circle with the number '1' and two red arrows points to the 'Failed' status in the task list and the corresponding error message in the details pane.

Task	Status	Started Time	Completed T...	Automated	Object Name	Object Type	Event Source	Source Type	Submitted By	Task ID
Set CPU Count and Me...	Failed	7:04 AM	7:04 AM	No	linux-dev-...	Virtual Ma...		viDMAuth...	holadmin...	4b8bb6e

Object Name	Object Type	Status
linux-dev-0...	Virtual Machine	Failed

Severity	Time	Message
Informat...	2023-07-23 07:04:10.0...	Params: CPUMemoryReconfigureParam{cpuParam=CPUParam{value=1} memoryParam=MemoryParam{value=1024} com.Integrien.adapter.vmware.actions.reconfigurevm.cpumemoryvalue.} ReconfigureParam{isPowerOffAllowed=true, shutdownWaitSecs=300, snapshotRequired=false} MethodParam{targetResourceId='8809f0bd-a009-4112-81a3-f824815f2862', mOR='vm-18028', isValid=true}
Informat...	2023-07-23 07:04:10.0...	Cpu modification request matches current value
Informat...	2023-07-23 07:04:10.0...	Current Memory (MB) value: 4
Informat...	2023-07-23 07:04:10.0...	Requesting increase Memory (MB) value to 1024
Informat...	2023-07-23 07:04:10.1...	Power off required and allowed
Error	2023-07-23 07:04:10.1...	Unable to shut down or power off vm. VMware Tools is not installed.

1. We can see that the resizing from Aria Operations **failed** with an error; *"Unable to shut down or power off vm. VMware Tools not installed"*

The Shutdown VM action requires that VMware Tools is installed and running on the target virtual machines. If you ran the action on more than one object, then VMware Tools was not installed, or installed but not running, on at least one of the virtual machines.

Since this is a requirement for Aria Operations to run Actions on virtual machines in a vCenter, we need to resolve the issue by ensuring that VMware Tools is installed and running on the affected virtual machines in the vCenter Server instance that manages the virtual machine that failed to run the action.

This will enable you to perform actions on the virtual machines using Aria Operations without any further issues related to VMware Tools requirements.

Configure Policy Settings

[583]

Aria Operations continuously collects data on CPU, memory, storage, and other metrics to assess workload status. The analytics behind

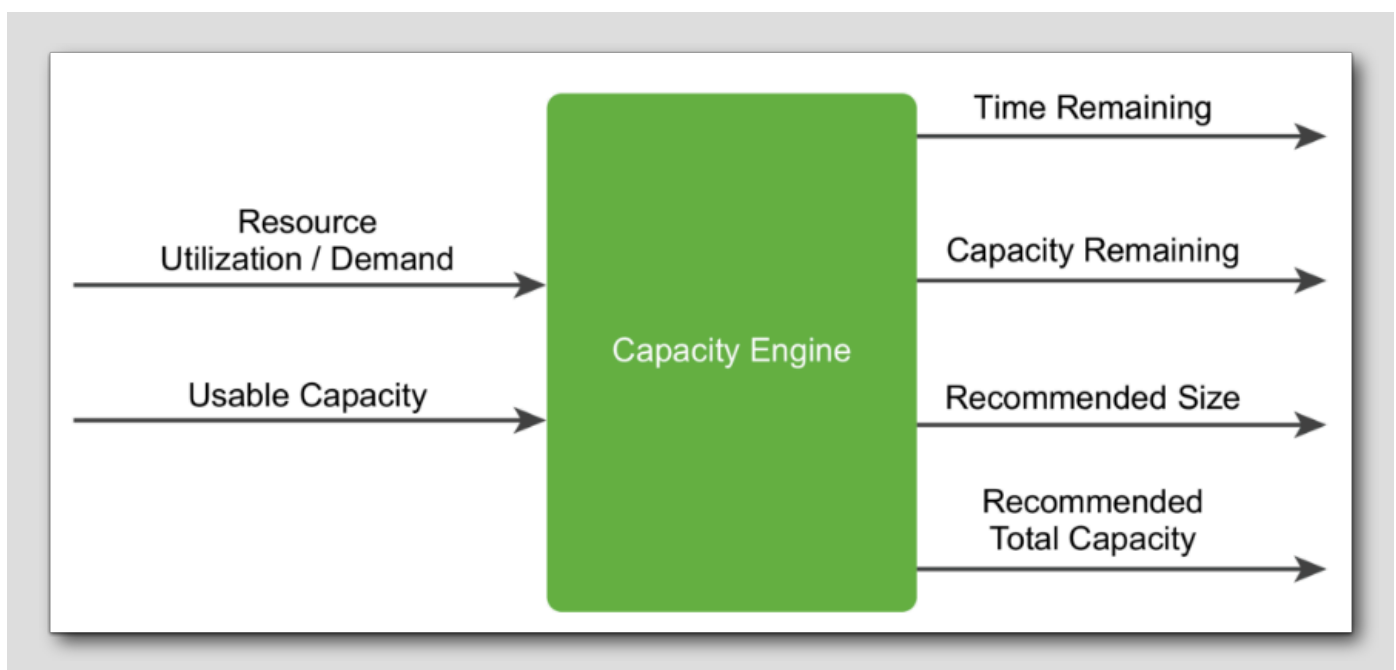
rightsizing leverage historical data, statistical models, and machine learning to ensure accurate recommendations without compromising system performance. Aria Operations identifies **oversized** VMs (overallocated resources) and **undersized** VMs (insufficient resources). We can customize recommendations and take action to implement the resizing changes in the policies. We will delve into

- Criticality Thresholds
- Business Hours
- Risk Level (Conservative vs. Aggressive)

Let's get to work.

Recommended Size Calculation

[584]



The capacity engine analyzes historical utilization and projects future workload by using real-time predictive capacity analytics, which is based on an industry-standard statistical analysis model of demand behavior. As shown in the figure, the engine takes the Demand and Usable Capacity metrics as input and generates the output metrics, which are Time Remaining, Capacity Remaining, Recommended Size, and Recommended Total Capacity.

Recommended Size (optimal resource configuration)

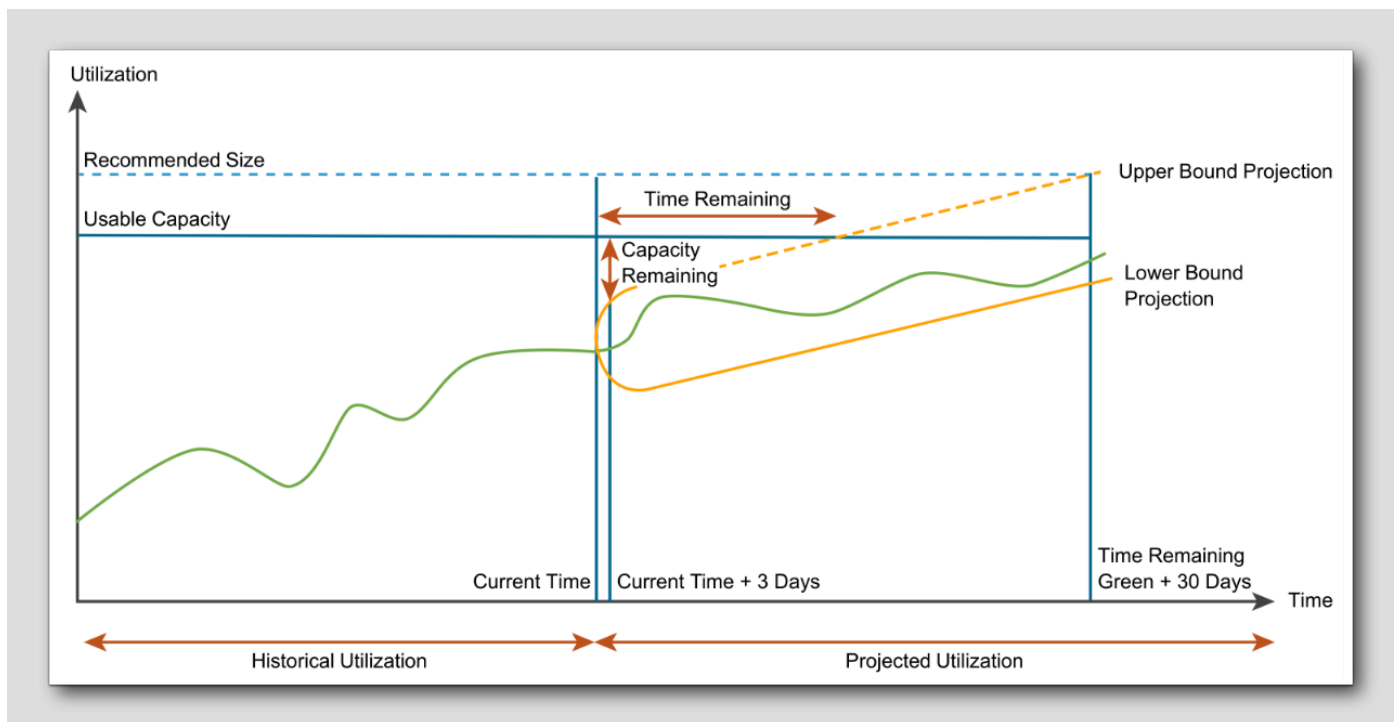
Determined by projecting utilization for a specific period. It extends 30 days beyond the warning threshold, which is the green period for time remaining. The recommended size does not include HA settings. By default, if the warning threshold is set at 120 days, the recommended size reflects the maximum projected utilization 150 days ahead. To maintain conservative recommendations, VMware Aria Operations imposes caps on the recommended size generated by the capacity engine.

Oversized: Aria Operations limits oversized recommendations to 50% of the current allocation. For instance, if a virtual machine with 8 vCPUs historically only used up to 10% CPU, the recommendation is capped at reclaiming 4 vCPUs rather than 7.

Undersized: Aria Operations limits undersized recommendations to 100% of the current allocation. For example, if a virtual machine with 4 vCPUs consistently experiences high resource utilization, the recommendation is capped at adding 4 vCPUs instead of suggesting 8.

Projection - Conservative Risk

[585]

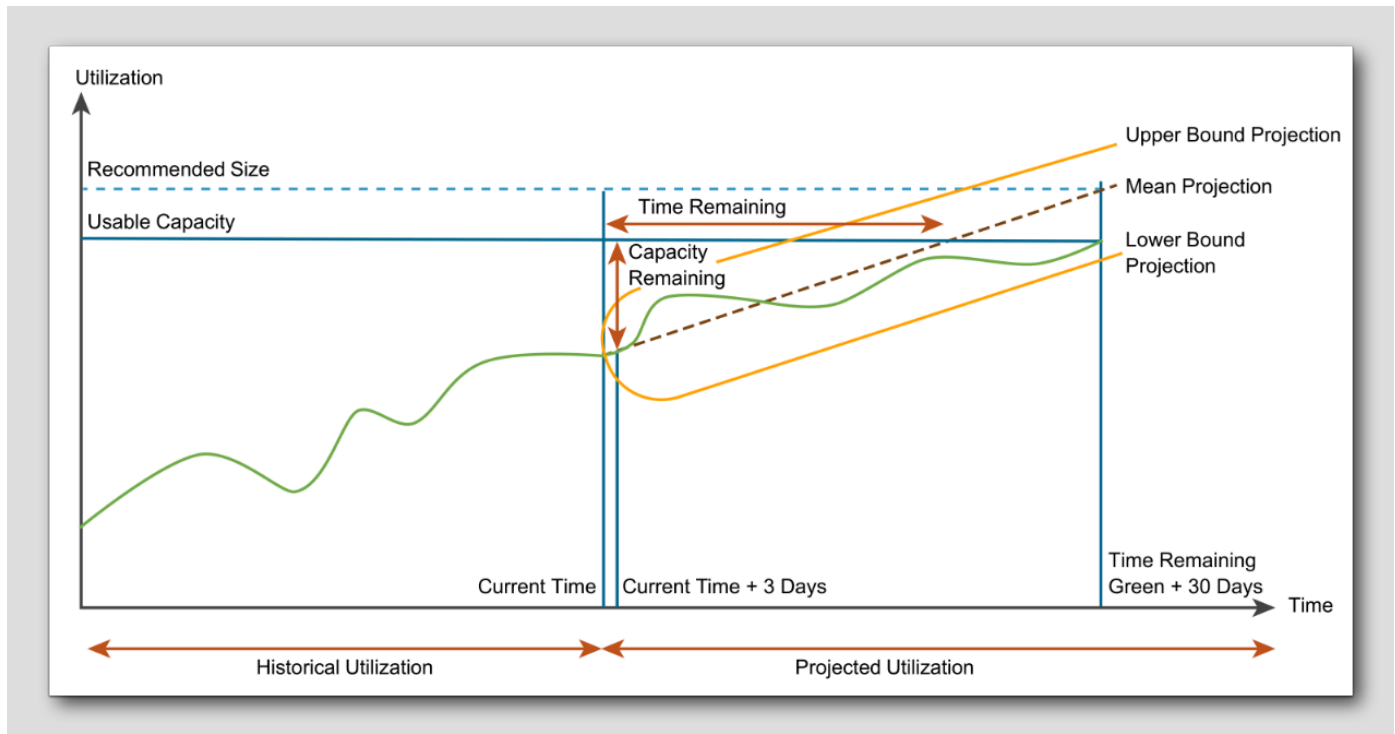


Conservative Risk Level

In Aria Operations, capacity calculations can be adjusted based on the desired risk level, allowing you to customize the level of conservatism in capacity planning. The figure shows the capacity calculations for a conservative risk level. The Conservative Risk Level parameter influences the capacity engine's recommended resource size, and you can modify it in the policy settings to match your desired level of conservatism

Projection - Aggressive risk

[586]

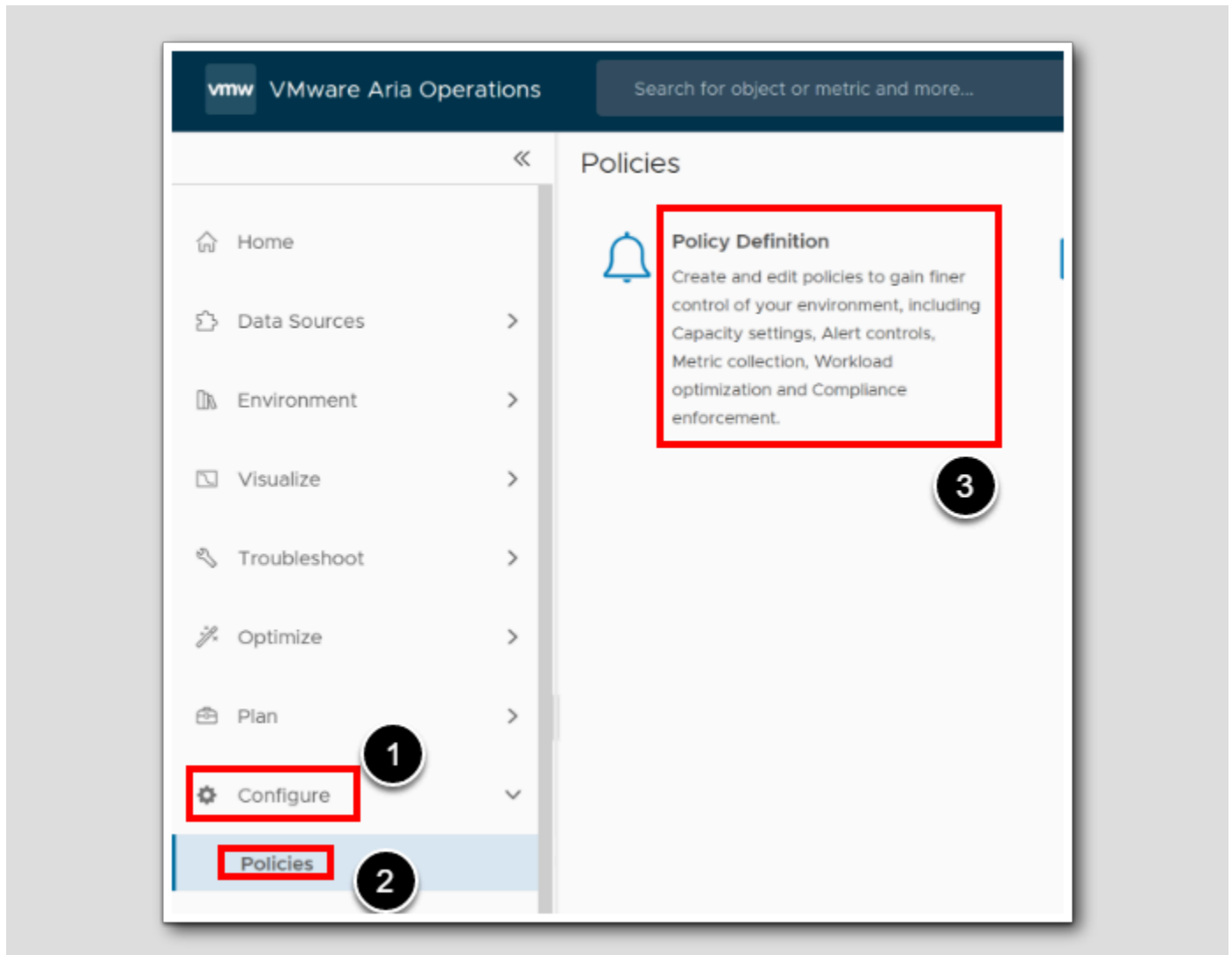


Aggressive Risk Level

Capacity calculations at an aggressive risk level aim to maximize resource utilization and minimize overhead. This setting assumes a higher tolerance for risk and allows for more aggressive allocation of resources. It may result in higher consolidation ratios and tighter resource utilization. The aggressive risk level settings can be adjusted in the Capacity policy settings, where you can specify the desired level of aggressiveness.

Go To policy

[587]



1. Click Configure
2. Click Policies
3. Click Policies Definition

Edit Policy definition

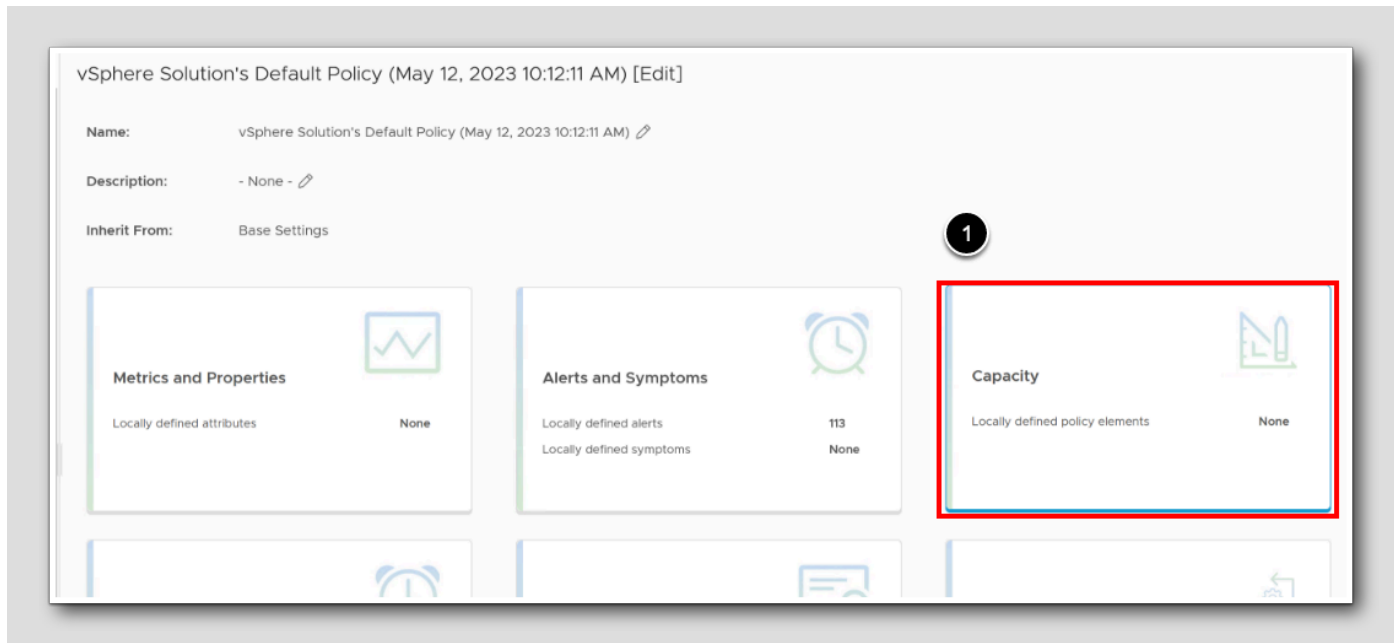
The screenshot shows the VMware Policy Definition interface. At the top, there is a breadcrumb navigation: Home / Policies / Policy Definition. Below this is an 'ADD' button and an ellipsis menu (three dots) highlighted with a red box and a circled '2'. A dropdown menu is open from the ellipsis menu, with the 'Edit' option highlighted by a red box and a circled '3'. The menu also includes 'Delete', 'Set Default Policy', 'Import', 'Export', and 'Reorder Policies'. Below the menu is a table of policies. The table has columns for 'Name', 'Status', and 'Priority'. The last row, 'vSphere Solution's Default Policy (May 12, 2023 10:12:11 AM)', is highlighted with a red box and a circled '1'. The 'Status' column for this row shows 'Active' with a green checkmark, and the 'Priority' column shows 'D'.

Name	Status	Priority
Bas...	Inactive	
> Bas...	Inactive	
Bas...	Inactive	
HOL Policy	Inactive	
NSX-T Security Configuration Guide	Inactive	
Policy for Virtual Machines - Risk Profile 1	Inactive	
Policy for Virtual Machines - Risk Profile 2	Inactive	
Policy for Virtual Machines - Risk Profile 3	Inactive	
vSAN Security Configuration Policy	Inactive	
vSphere Security Configuration Guide	Inactive	
vSphere Solution's Default Policy (May 12, 2023 10:12:11 AM)	Active	D

We are going to edit the default policy, but normally you would have multiple policies for multiple purposes.

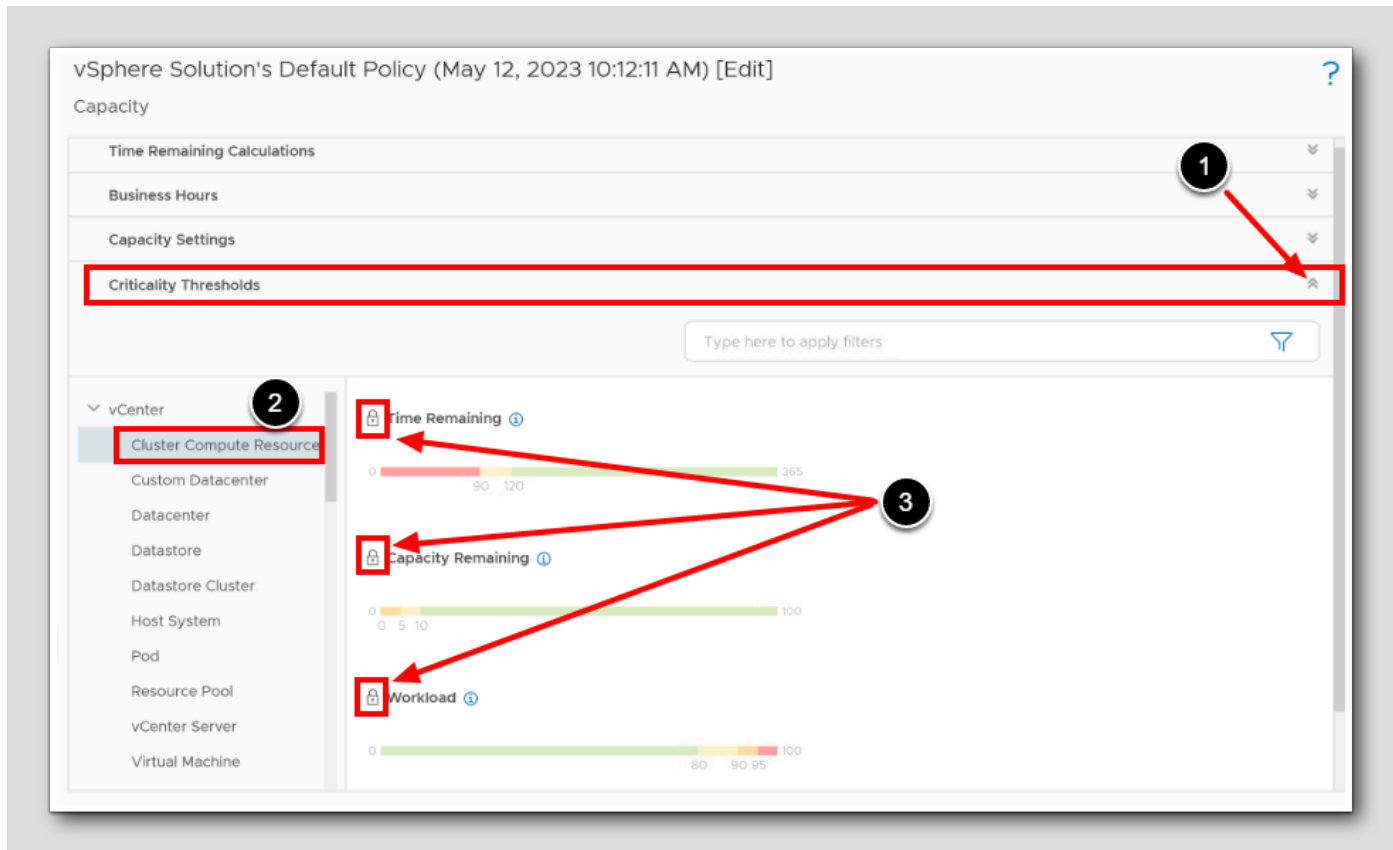
1. In the policy list, find and highlight the **Status Active** and **Priority Default (D)**
2. Click the **ellipsis menu**
3. Choose **Edit**

Go to Capacity



1. Click Capacity

Criticality Thresholds



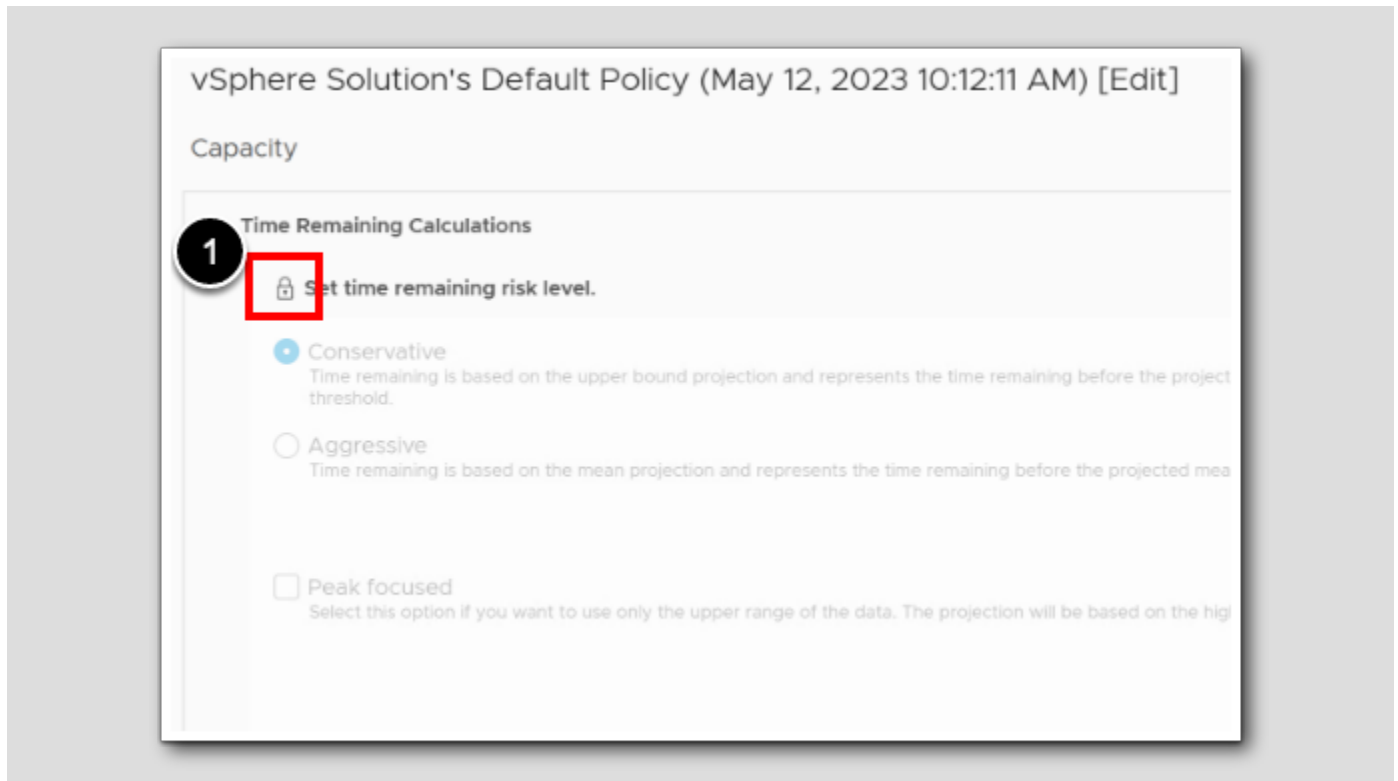
Criticality Thresholds allows us to define when an alert should be triggered for a particular symptom based on the severity of a condition. The default is 30 days for yellow (warning) and 10 days for red (critical). When it comes to Rightsizing, the Time Remaining Criticality Threshold is used to control how much of the projected demand to consider when projecting the Recommended Size. The Recommended Size is determined by considering the peak projected demand between now and 30 days beyond the Time Remaining Criticality Threshold. Since the default warning threshold is 30 days, that means Recommended Size also defaults to 60 days in the future (30 days from the Time Remaining Criticality Threshold + 30 days).

The Recommended Size projection considers peak demand within 30 days beyond the Criticality Threshold. We adjust appropriate values as needed for our Rightsizing frequency, and set it to a value that gives us enough lead time to rightsize our VMs.

1. While you still have the policy open in Edit mode, **expand Criticality Thresholds**
2. Select **Cluster Compute Resource**
3. To unlock and override parent policy settings, click **each of the padLocks**

Open the Time Remaining risk level

[59]



The capacity settings for host systems, virtual machines, and other object types that you select appears in the workspace.

1. To open the settings, Click on the padlock

Conservative Risk Level

Capacity

Time Remaining Calculations

Set time remaining risk level.

Conservative **1**

Time remaining is based on the upper bound projection and represents the time remaining before the projected upper bound crosses the usable capacity threshold.

Aggressive

Time remaining is based on the mean projection and represents the time remaining before the projected mean crosses the usable capacity threshold.

Peak focused **2**

Select this option if you want to use only the upper range of the data. The projection will be based on the high utilization points.

Conservativeness Level

Levels: 3

You can set the risk level for the time that is remaining when the forecasted total need of a metric reaches usable capacity.

1. To use the option for production and mission-critical workloads, select **Conservative**.
2. **Peak focused**: Select this option if you want to use only the upper range of the data.
3. **Conservativeness Strength**: You can tune the level of conservativeness from 1-5, with level 1 being the least conservative and level 5 being the most conservative. By default, the level of conservativeness is set to 3. Leave this at 3

The **upper bound** will vary based on the level of conservativeness that you choose. Modifying the level of conservativeness will make the projection bounds narrower or wider. Higher the level, the wider the bounds and more conservative the projections for the **Recommended Size**.

Aggressive Risk Level

Capacity

Time Remaining Calculations

Set time remaining risk level.

1 **Conservative**
Time remaining is based on the upper bound projection and represents the time remaining before the projected upper bound crosses the usable capacity threshold.

Aggressive
Time remaining is based on the mean projection and represents the time remaining before the projected mean crosses the usable capacity threshold.

2 **Peak focused**
Select this option if you want to use only the upper range of the data. The projection will be based on the high utilization points.

Now

Historical Utilization
Aggressive (Mean)
Usable Capacity
Projection

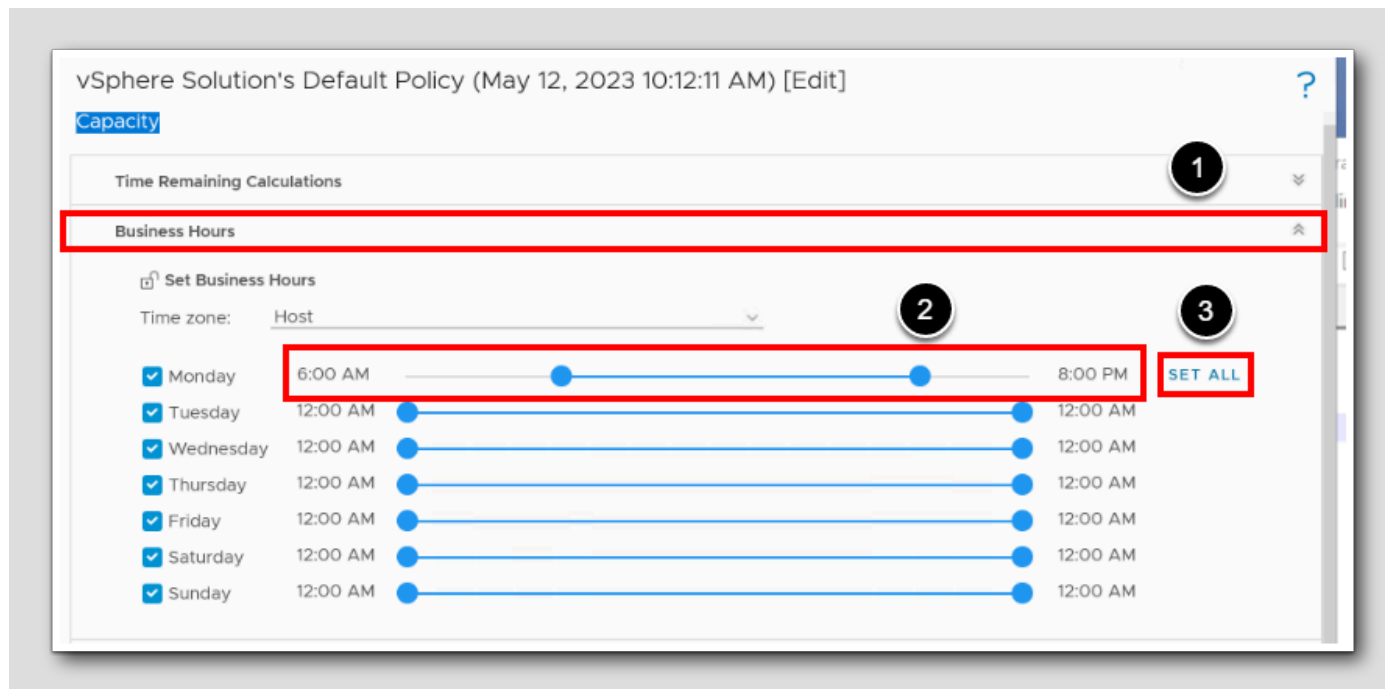
Conservativeness Level

Levels: 3

We will set the risk level for the time that is remaining when the forecasted total need of a metric reaches usable capacity.

1. For non-critical workloads, select **Aggressive**.
2. Unselect **Peak focused**

Set business hours



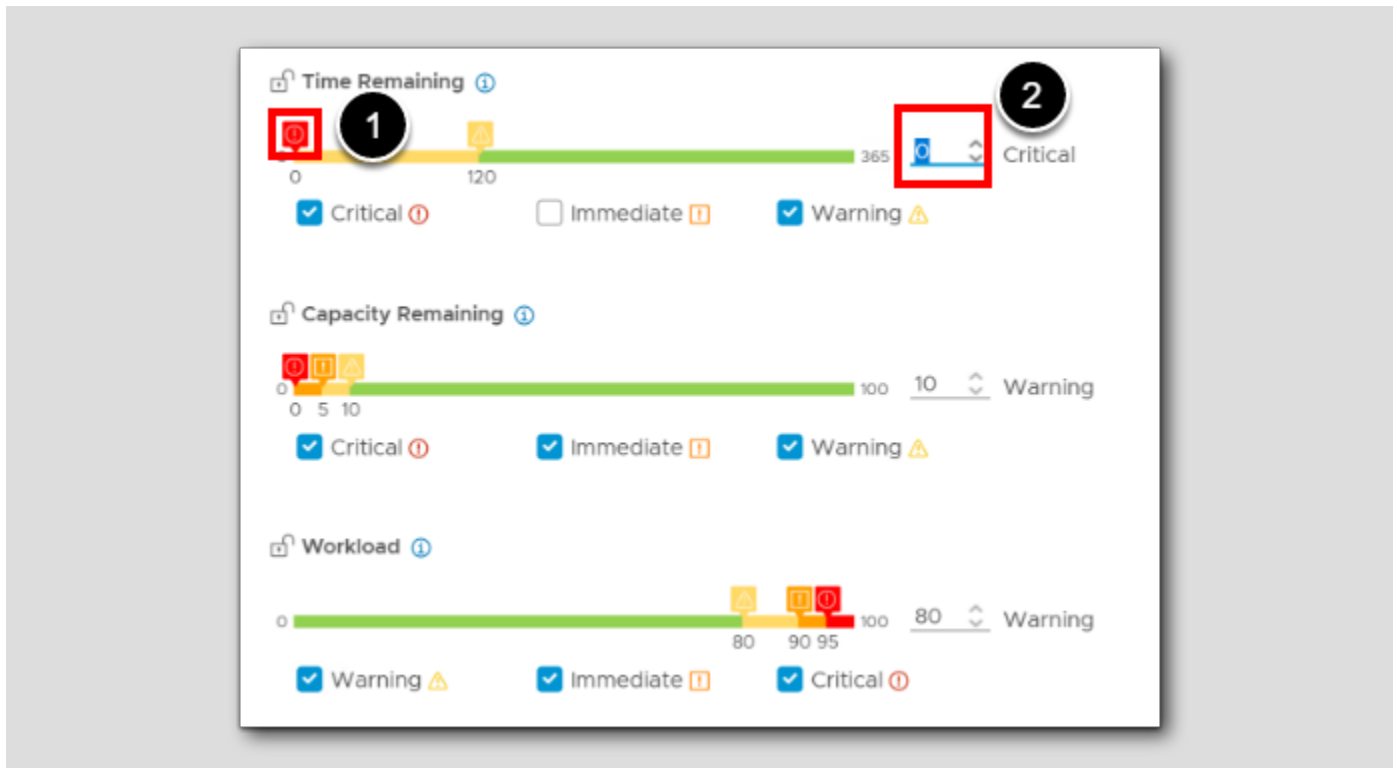
Business Hours Schedule

Configure business hours for enhanced capacity analysis and projections in VMware Aria Operations. Non-business hour activities on VMs, such as OS upgrades or virus scans, can skew perceived idleness. By setting business hours, off-hour metrics can be effectively analyzed for inventory, compliance, and troubleshooting. Analysis and recommendations for reclamation and rightsizing consider only these hours, ignoring post-business hour spikes. Policies allow different objects to have varied business hours, which are reflected in capacity charts. After you specify business hours, the capacity forecast for the object will be based on the business hours and not 24 hours.

1. Expand **Business Hours**
2. Under Monday, set the business hours from **6 a.m.** (06:00) to **8 p.m.** (20:00)
3. Click **Set All**

Set Time Remaining Threshold

[595]



Time Remaining is how many days you have until the utilization projection crosses the usable capacity threshold. **Capacity Remaining** is the % of usable capacity not consumed. **Workload** is the immediate % of capacity consumed of the most constrained of several key resource containers. Since workload changes every collection cycle, you can set how many cycles it takes to trigger or clear an alert.

1. Under Time Remaining, Click the red Critical slider
2. Set the value to 0

Saving and Exiting

[596]

vSphere Solution's Default Policy (May 12, 2023 10:12:11 AM) [Edit]

Capacity

Time Remaining Calculations

Set time remaining risk level.

Conservative
Time remaining is based on the upper bound projection and represents the time remaining before the projected upper bound crosses the usable capacity threshold.

Aggressive
Time remaining is based on the mean projection and represents the time remaining before the projected mean crosses the usable capacity threshold.

Peak focused
Select this option if you want to use only the upper range of the data. The projection will be based on the high utilization points.

Conservativeness Level

Levels: 5

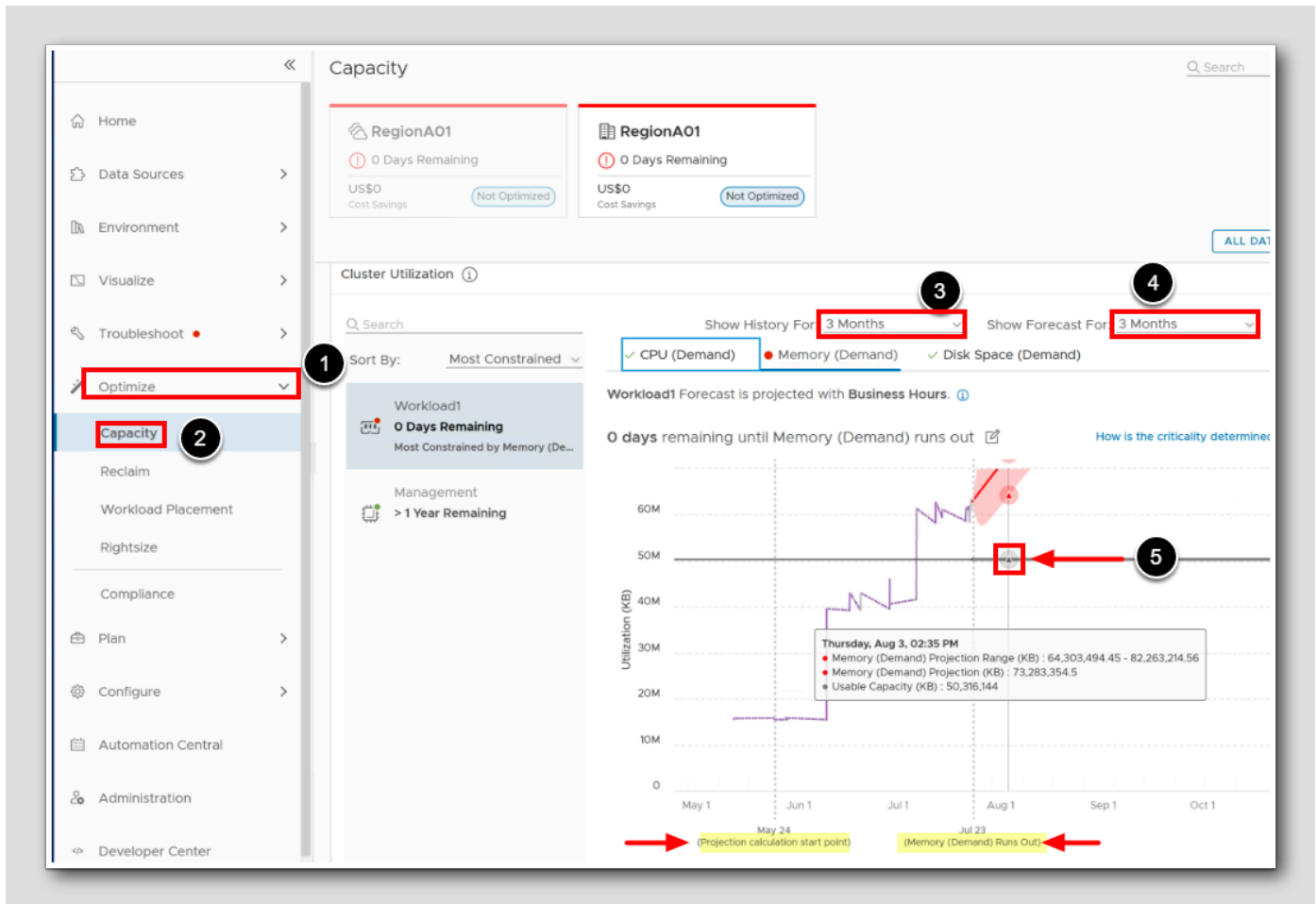
SAVE CANCEL

1

The screenshot shows a graph with 'Historical Utilization' (blue line), 'Aggressive (Mean)' (red dashed line), 'Usable Capacity' (black dashed line), and 'Projection' (red solid line). A vertical line labeled 'Now' is positioned at the intersection of the 'Aggressive (Mean)' line and the 'Usable Capacity' line. The 'SAVE' button is highlighted with a red box, and a circled '1' is placed above it.

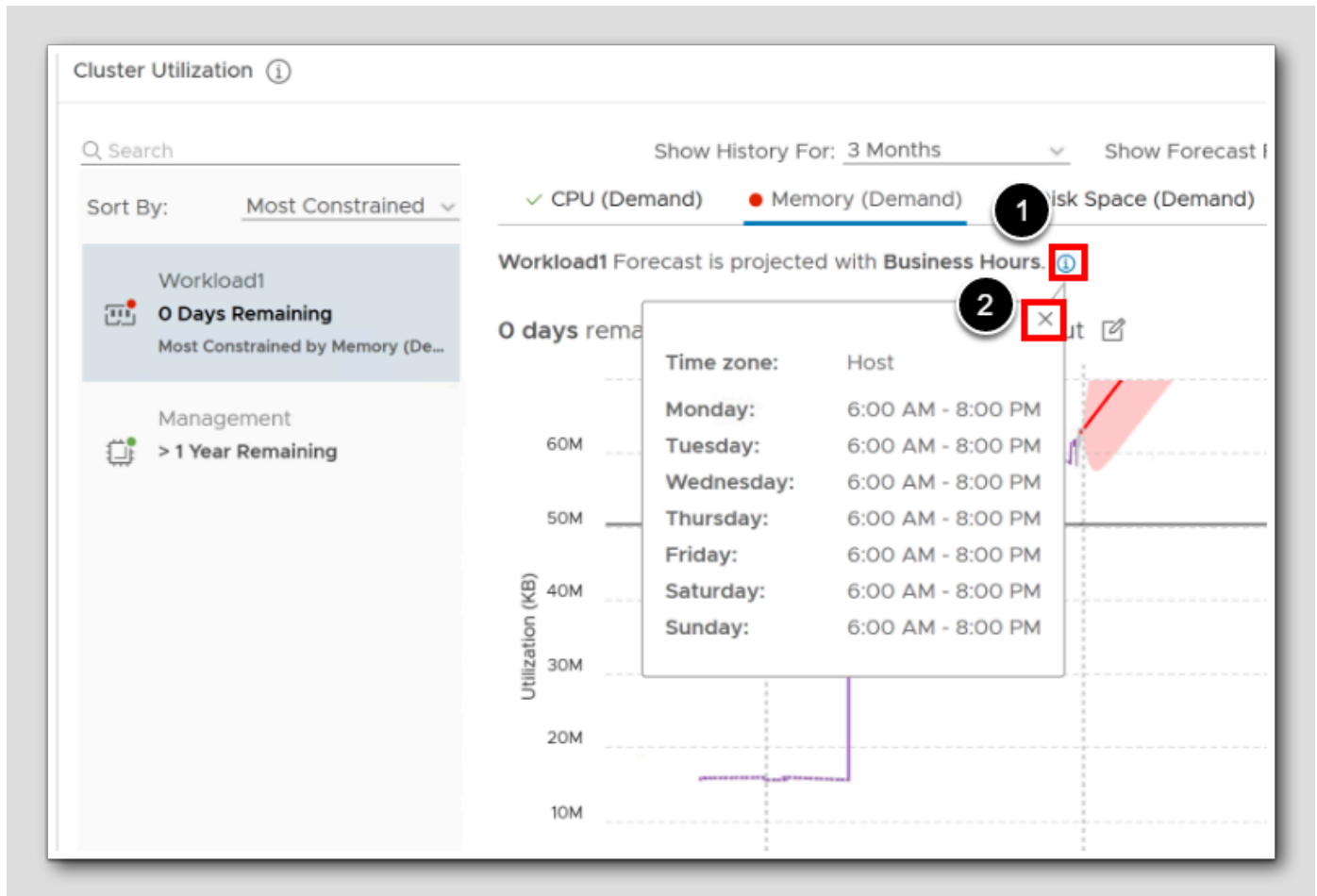
1. To save and exit, Click Save

Cluster Utilization



1. Go to the Capacity settings and see what has happened there, click Optimize
2. Click Capacity
3. Behind 'Show History for', Select 3 months
4. Behind 'Show Forecast for', Select 3 months
 - Notice the Projection Calculation Start Point and When memory runs out
5. Hover the Usable Capacity line.
 - Notice the values for 3. August 2023.

Checking the business hours

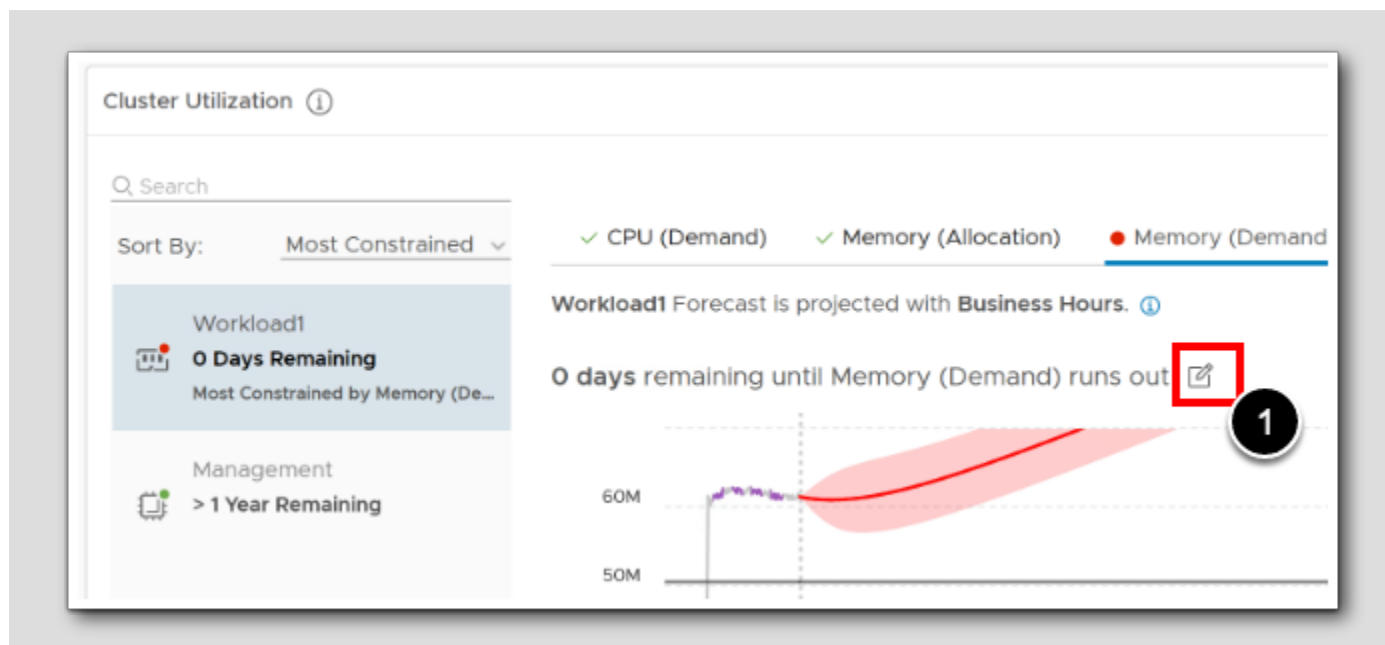


1. Behind business hours, Click the information button (i)

Notice that the previously values entered in our policy for the business hours are shown

2. To close the business hours preview, Click the 'X'

Quick-edit relevant Policy Settings



1. Behind the x days remaining until Memory (Demand) runs out, click the Edit Icon

Risk Level and criticality threshold

[600]

Cluster Time Remaining Settings


Affected Policy: vSphere Solution's Default Policy (May 12, 2023 10:12:11 AM)

Criticality Threshold

⚠ Applying these changes affects all clusters in the policy.

Set the time remaining thresholds.

Critical Threshold Warning Threshold Days

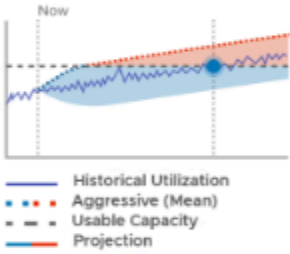


Risk Level

⚠ Applying these changes affects all objects in the policy.

Set time remaining risk level.

- Conservative
Time remaining is based on the upper bound projection and represents the time remaining before the projected upper bound crosses the usable capacity threshold.
- Aggressive
Time remaining is based on the mean projection and represents the time remaining before the projected mean crosses the usable capacity threshold.
- Peak focused
Select this option if you want to use only the upper range of the data. The projection will be based on the high utilization points.



Conservativeness Level: Levels: 3

Allocation Model

⚠ Applying these changes affects all clusters in the policy.

Set overcommit ratio, to enable Allocation Model

1 CANCEL SAVE

From this pop-up page you can also edit everything related to the policy directly without going into the Configure>policies section.

1. Click **Cancel** to exit

Summary

[601]

Aria Operations analytics behind rightsizing leverage historical data, statistical models and machine learning to ensure accurate recommendations for **Oversized** VMs (overallocated resources) and **Undersized** VMs (insufficient resources).

We customized the relevant changes in the policies for Rightsizing.

Conclusion

[602]

Mastering Rightsizing in Aria Operations is essential for efficient resource management and optimization.

With appropriate risk levels and business hours, you unlock your infrastructure's full potential while minimizing risks. Achieve optimal performance by Rightsizing VMs based on Aria Operations' recommendations. Automate Rightsizing for streamlined efficiency and configure Policy Settings with Criticality Thresholds, Risk Level, and Business Hours for effective resource utilization. We looked into:

- Rightsizing VMs based on Aria Operations Recommendations.
- Automation central to Automate Rightsizing
- Configured the Policy Settings with Criticality Thresholds, Risk Level (Conservative vs. Aggressive) , and Business Hours

You've finished Module 12

[603]

Congratulations on completing the lab module.

If you are looking for additional general information on Aria Operations, try one of these:

- **VMware Product Public Page - Aria Operations:** <https://www.vmware.com/products/aria-operations.html>
- **Aria Operations - Documentation:** <https://docs.vmware.com/en/VMware-Aria-Operations/index.html>
- **Aria Operations - Rightsizing:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Configuring-Operations/GUID-871D6B56-52AE-49C2-9B64-B36BE2BE8F4F.html>

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 13 - Enabling Chargeback for Your Business (30 minutes) Advanced

Introduction

[605]

In VMware Aria Operations, financial management we are going to focus on the Chargeback mechanism. Key activities include setting up Pricing Rate Cards and utilizing the associated dashboards.

There are two crucial processes in Aria Operations' financial management: Showback and Chargeback.

- **Showback** in Aria Operations gives an overview of the costs involved in operating IT infrastructure, such as the cost to run a VM. It's about the visibility and accountability of the actual expenses incurred in providing these resources. It's the cost to the IT department to provide the services.
- **Chargeback**, on the other hand, is about how much the IT department, as an internal service provider, charges back to the business units (the consumers) for using those resources. It's essentially the "price tag" for the use of IT resources.

Simply put; A report showing the 'cost' can be seen as showback (e.g., the cost to run a VM on the infrastructure), while a report showing the 'price' is chargeback (e.g., what you're charging the consumer for using a VM in your infrastructure).

Log in to Aria Operations

[606]

We will log in to a live instance of Aria Operations running in this lab.

Open the Firefox Browser from the Windows Task Bar

[607]

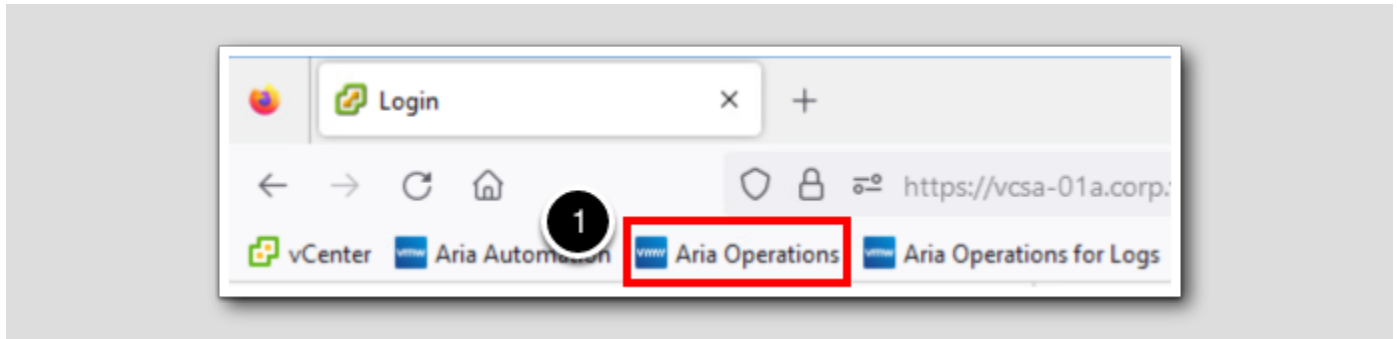


If the browser is not already open, launch **Firefox**.

1. Click the **Firefox** icon in the Windows Quick Launch Task Bar at the bottom of the screen.

Navigate to Aria Operations

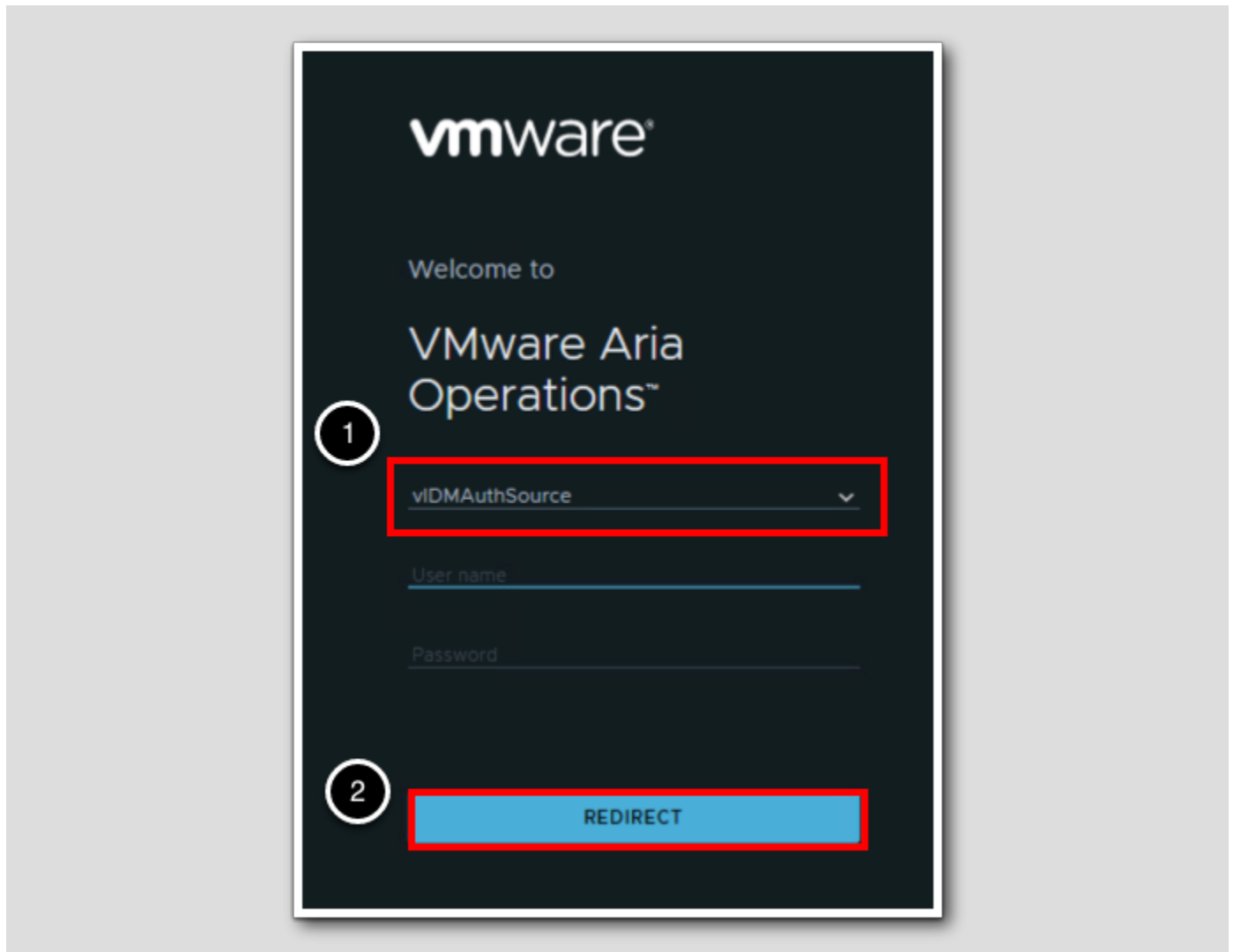
[608]



1. Click the Aria Operations bookmark in the bookmarks toolbar.

Log in to Aria Operations

[609]



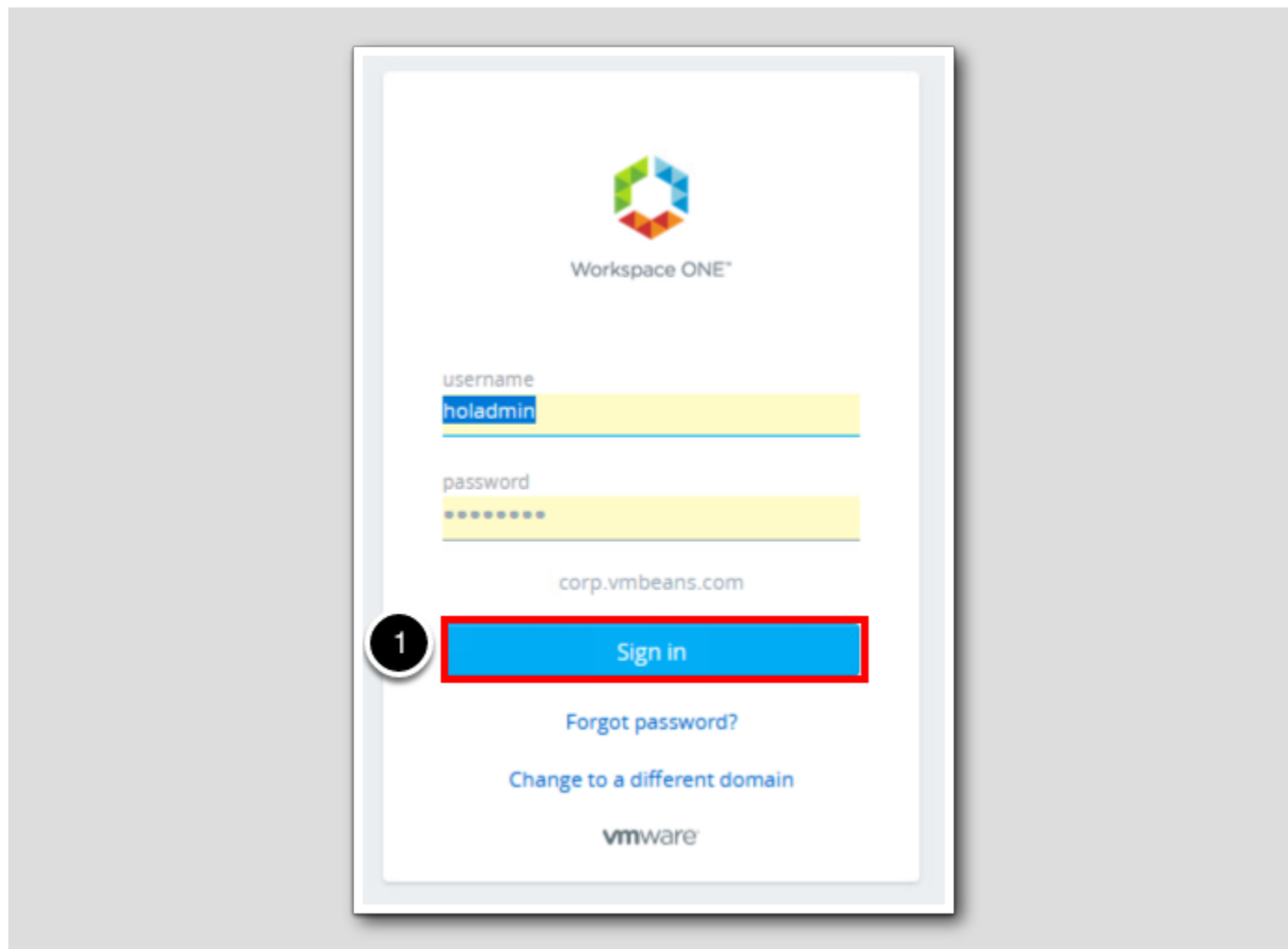
Aria Operations is integrated with VMware Workspace ONE Assist (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

vIDMAuthSource may be pre-selected as the default identity source. If it is not, then you will need to select it.

1. Click the **drop-down arrow** and select vIDMAuthSource if it is not already selected.
2. Click **REDIRECT** to be taken to the authentication page.

VMware Identity Manager Login

[610]



VMware Identity Manager acts as the identity provider for the Active Directory authentication source in this lab.

Credentials for the default user, holadmin, have already been provided.

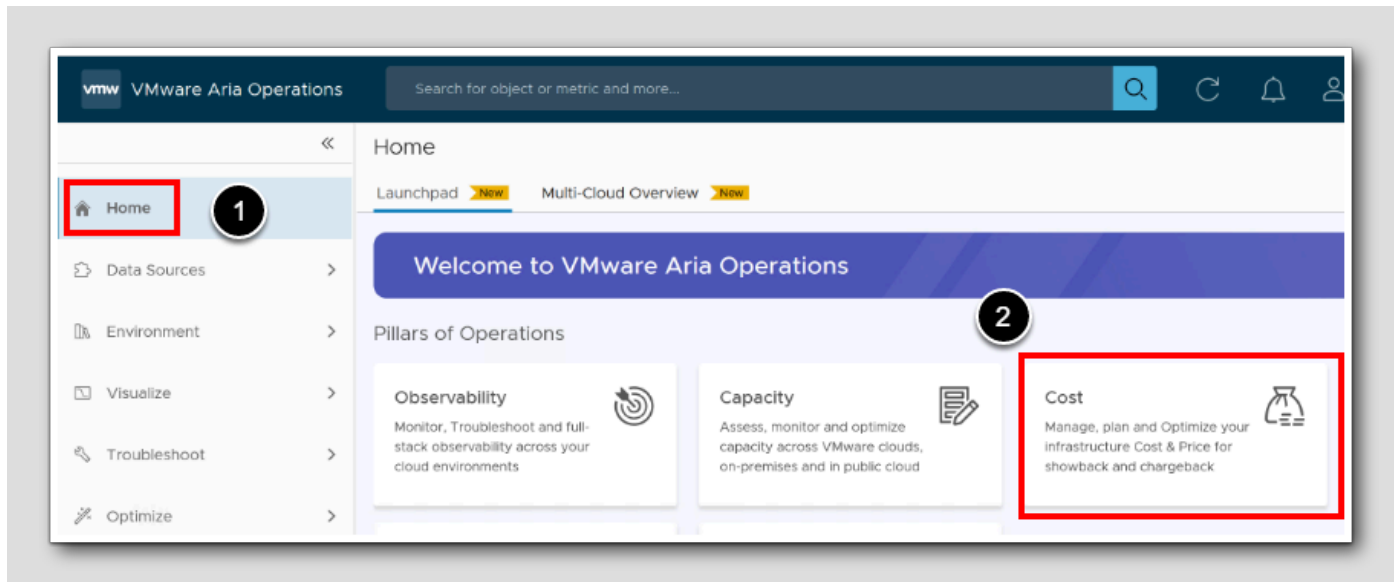
1. Click Sign in

Rate Cards/Pricing

[611]

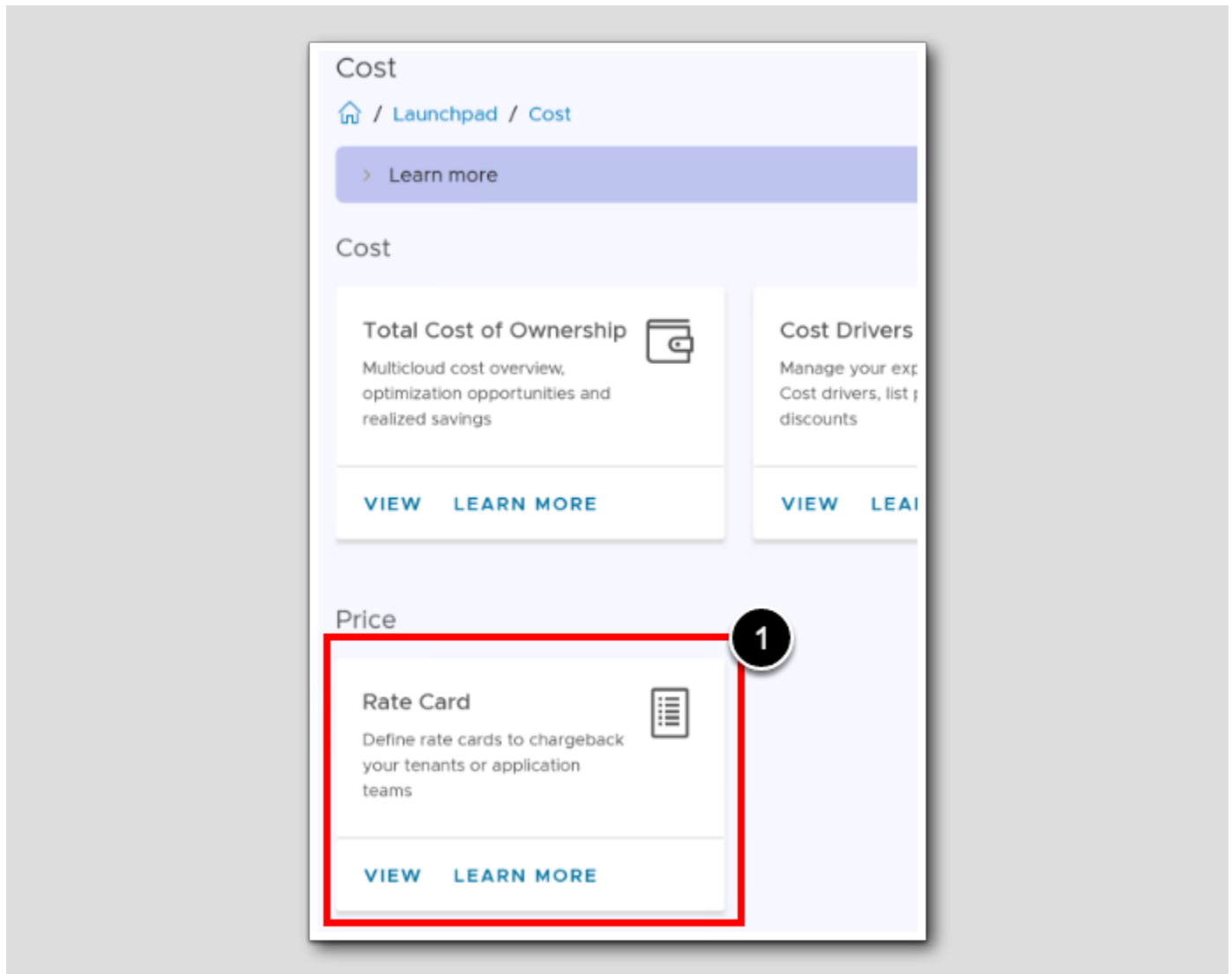
In this segment, we'll focus on the fundamental role of rate cards. Rate cards play a vital part in translating resource usage into actionable costs by assigning financial values to resources. The foundation of our cost data is the real-time metrics collected through continuous monitoring by Aria Operations. To illustrate this process, let's explore how to create a rate card.

Go to price Rate Card



1. Click Home.
2. Click Cost.

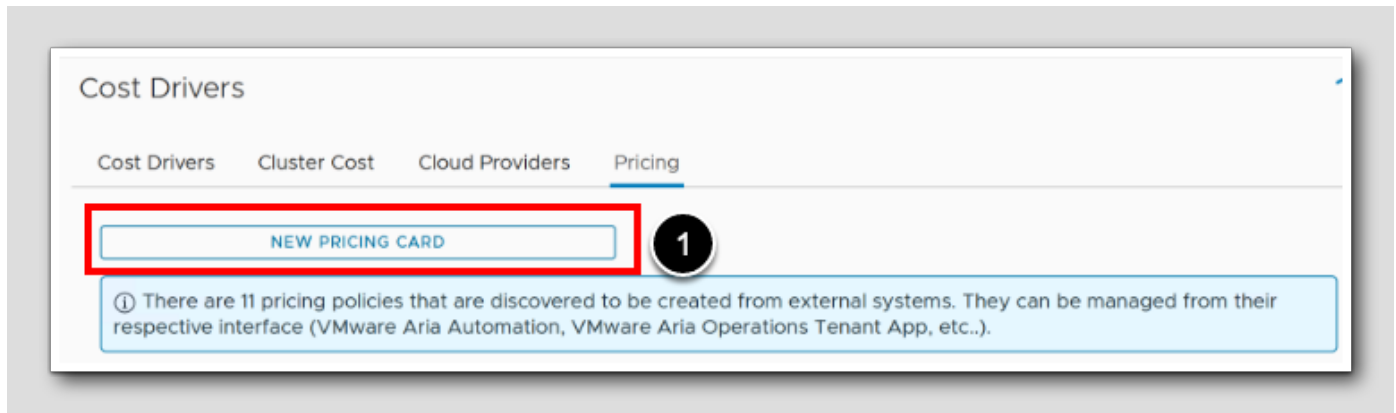
Price Rate Card



1. On the Cost page under the Price heading, click **VIEW** on the Rate Card.

New Pricing card

[614]



A rate card is a document that outlines the pricing structure of the company services we offer. The purpose of a rate card is to provide "clients" or "consumers" with a clear understanding of the costs associated with specific services. By adding a Price Card we can produce a Provider-Price, that will be the Consumer-Cost.

1. To get started, Click **NEW PRICING CARD**.

Pricing, Name and Description

[615]

Add New Pricing Card

Name and Description

Basic Charges

Guest OSs

Tags

Overall Charges

Assignments

Name and Description

Name: *

Description:

Default for unassigned workloads?

CANCEL NEXT

The pricing card can be cost-based or rate-based. We will customize the cost-based pricing card as per our requirement. Then we will assign the pricing card to our vCenter rather than to our Clusters, but maybe companies would have another pricing strategy in real life. This Default pricing card will apply to all vCenter resources which do not have a direct cost policy assigned to them.

1. Enter the Name: Default Workloads.
2. Enter a Description: Rate card for NON- Aria Automation workloads.
3. Select Default for Unassigned Workloads.
4. Click Next.

Pricing, Basic Charges

Add New Pricing Card

Basic Charges

Cost or Rate based?: Cost Rate

CPU Cost: 1.2 (factor) 1

Memory Cost: 1.2 (factor) 2

Storage Cost: 1 (factor) 3

Additional Cost: 1.25 (factor) 4

CANCEL BACK NEXT 5

The factor entered here is multiplied with the cost calculated as a derivative of cost drivers.

1. CPU costs are fair, so we will add a factor: 1.1.
2. Our Company got really high memory costs, so we will add a factor: 1.2.
3. Our storage costs are very low, so we will add a factor: 1.
4. Any Additional Cost, for example a DRaaS (Disaster Recover as a Service) we add a factor: 1.25.
5. Click **Next**.

Pricing, Adding Linux Expenses

Add New Pricing Card

Guest OSs ⓘ

Guest OS Name:

Base Rate: US\$

Charging Period:

Guest OS Name	Rate	Charging Period
No Data Available		

The scarcity of Linux knowledge within our organization results in higher costs associated with Linux expertise due to the need for additional time and resources allocated by our administrators to research and resolve Ubuntu-related issues, resulting in increased expenses (assumed \$100/day)

Currently we have just two OS types, "Microsoft Windows Server 2019 (64-bit)" and "Ubuntu Linux (64-bit)". Note: These are the Names from vCenter, meaning how vCenter perceives the OS names.

1. Enter the exact Guest OS Name **Ubuntu Linux (64-bit)** .
2. Enter Base Rate: 100.
3. Enter Charging Period: **Daily**.
4. Click **Save** *[Don't click next yet]*.

Pricing, Adding Windows expenses

Add New Pricing Card

Guest OSs

Guest OS Name: Microsoft Windows Server 2019

Base Rate: US\$ 5

Charging Period: Daily

SAVE

Guest OS Name	Rate	Charging Period
⋮ Ubuntu Linux (64-bit)	US\$100	Daily

CANCEL **BACK** **NEXT**

The abundance of Windows knowledge within our organization results in a rather low costs associated with Windows expertise resulting in lower expenses (assumed to conservative \$5/day)

1. Enter the exact Guest OS Name **Microsoft Windows Server 2019 (64-bit)**.
2. Enter Base Rate: **5**.
3. Enter Charging Period: **Daily**.
4. Click **SAVE**.
5. Click **NEXT**.

Pricing, Tags

The screenshot shows the 'Add New Pricing Card' interface. On the left is a sidebar with navigation options: Name and Description, Basic Charges, Guest OSs, Tags (selected), Overall Charges, and Assignments. The main form is titled 'Tags' and contains the following fields:

- Tag Category: (1)
- Tag Value: (2)
- Charging Method: (3)
- Base Rate: (4)
- (5)

Below the form is a table with the following structure:

Tag	Rate	Charging Method
No Data Available		

VMs tagged with "oracle" or "mssql" under a tag category "db" is going to indicate that a rather expensive database is running on top of the VM. This is resulting in a higher expense for installation, meaning a one-time expense. For Oracle Databases this expense is \$500 and for Microsoft MS SQL it is \$100.

1. Under Tag Category, Type **db**.
2. Tag value, type **oracle**.
3. Charging method, Choose **One Time**.
4. Base Rate type **500**.
5. Click **SAVE**.

Note: actually no VMs are tagged *db:oracle* or *db:mssql* in vSphere at the moment, but in the future VM's could be tagged in vSphere by the application owners

Pricing, MSSQL Tag

Add New Pricing Card

Tags ⓘ

Tag Category: db

Tag Value: mssql

Charging Method: One Time

Base Rate: US\$ 50

SAVE

Tag	Rate	Charging Method
db:oracle	US\$500 Once	One Time

CANCEL **BACK** **NEXT**

1. Under Tag Category, Type db.
2. Tag value, type mssql.
3. Charging method, Choose One Time.
4. Base Rate type 50.
5. Click SAVE.
6. Click NEXT.

Pricing, flat charges

The screenshot shows the 'Add New Pricing Card' interface. On the left is a navigation menu with the following items: Name and Description, Basic Charges, Guest OSs, Tags, Overall Charges (highlighted), and Assignments. The main area is titled 'Overall Charges' and contains two sections: 'VM setup charges' and 'Recurring'. The 'VM setup charges' section shows 'USD 100' with a circular callout '1' pointing to the input field. The 'Recurring' section shows 'USD 10' with a circular callout '2' pointing to the input field, and 'Monthly' with a circular callout '3' pointing to the dropdown menu. At the bottom right, there are three buttons: 'CANCEL', 'BACK', and 'NEXT', with a circular callout '4' pointing to the 'NEXT' button. The 'NEXT' button is highlighted with a red box.

These Overall Charges are flat charges that are applied to all VMs that match this policy. We charge \$100 extra to set up a VM, and a little extra \$10 monthly.

1. Under VM Setup charges, type 100.
2. Under Recurring type 10.
3. Choose **Monthly**.
4. Click **Next**.

Pricing, Assignments

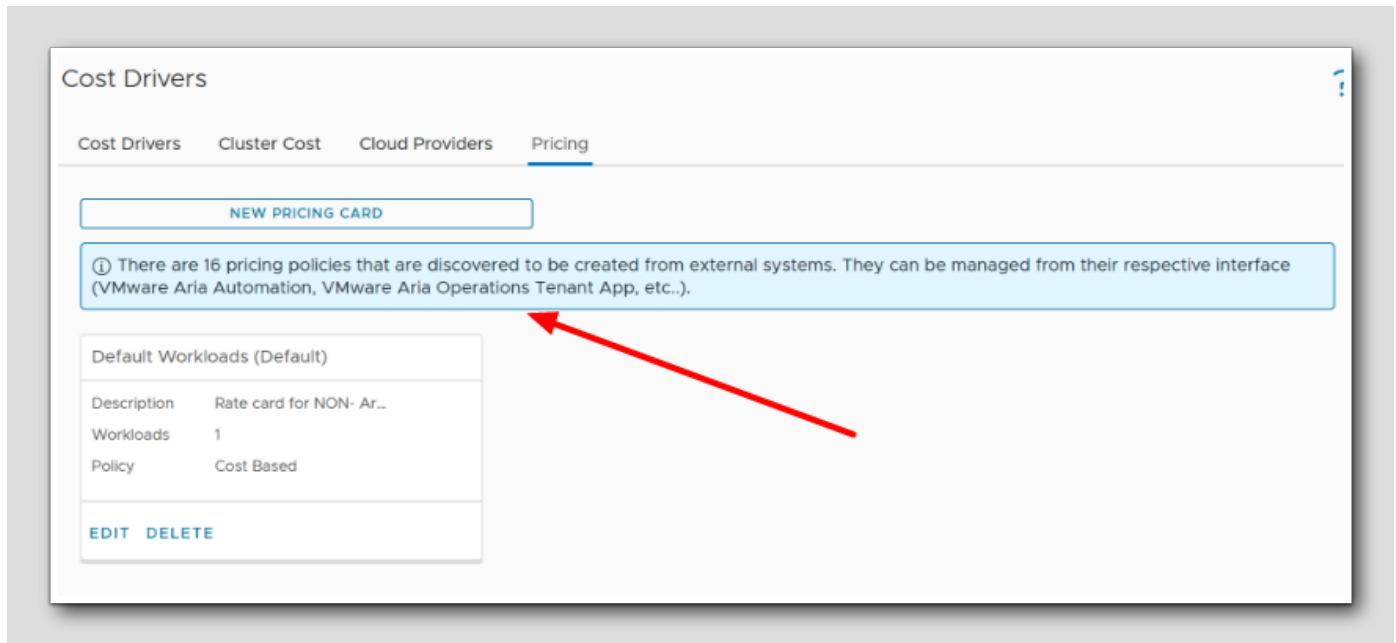
Name	Type
vcsa-01a.corp.vmbeans.com	vCenter

Almost Done! We can assign the new pricing card to vCenters or Clusters. We will assign our pricing to *anything* in our vCenter.

1. Under Policy Assigned to, select vCenter.
2. Select the vCenter we want to apply the pricing card vcsa-01a.corp.vmbeans.com.
3. Click ADD.
4. Click FINISH.

Pricing Card Result

[623]



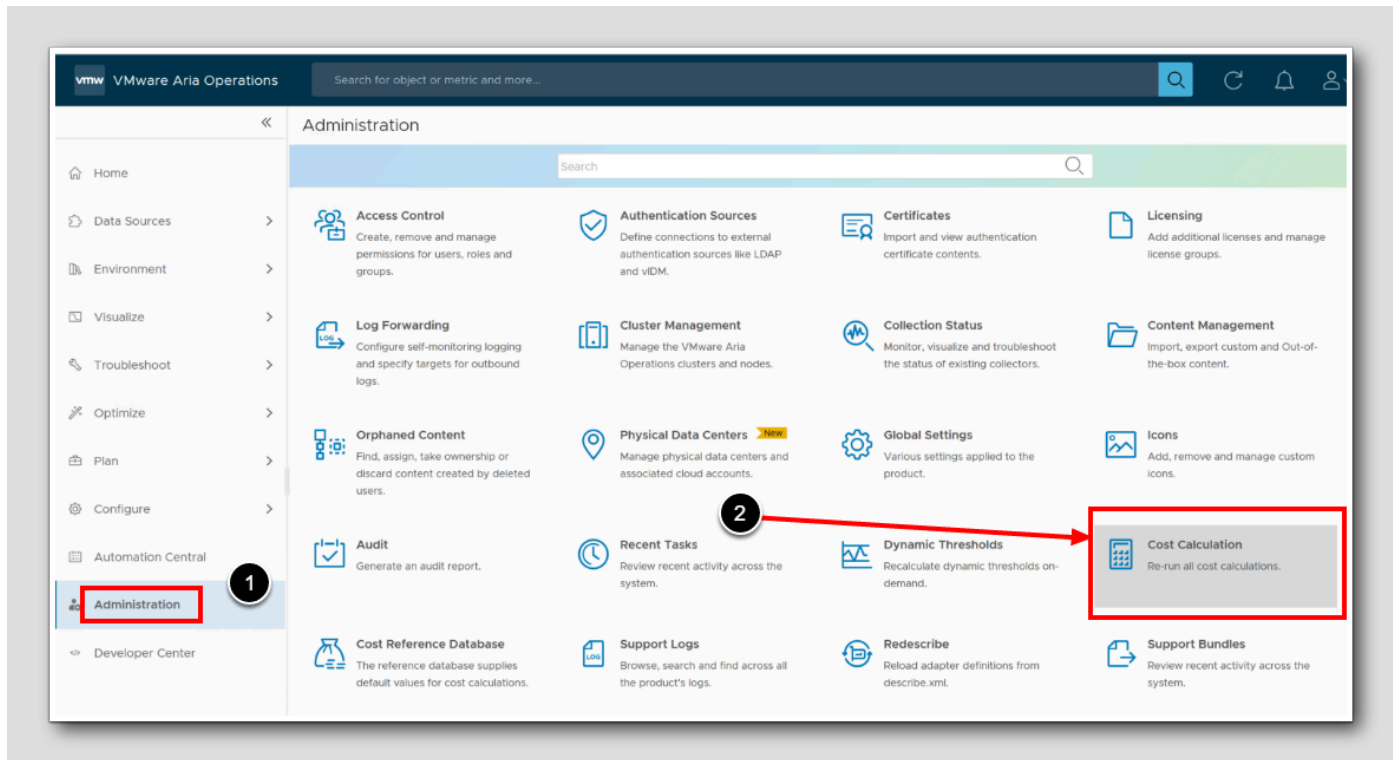
The screenshot displays the 'Cost Drivers' interface with the 'Pricing' tab selected. At the top, there is a 'NEW PRICING CARD' button. Below it, a blue notification box contains the text: 'There are 16 pricing policies that are discovered to be created from external systems. They can be managed from their respective interface (VMware Aria Automation, VMware Aria Operations Tenant App, etc..).'. A red arrow points from this notification box to a table below. The table is titled 'Default Workloads (Default)' and contains the following data:

Description	Rate card for NON- Ar...
Workloads	1
Policy	Cost Based

Below the table are 'EDIT' and 'DELETE' buttons.

Notice that there are pricing policies other than our policy coming from workloads deployed by Aria Automation. These Pricing cards or Rate cards for those workloads are all handled by Aria Automation. We did just set up one that will be working for anything else.

Cost Calculation

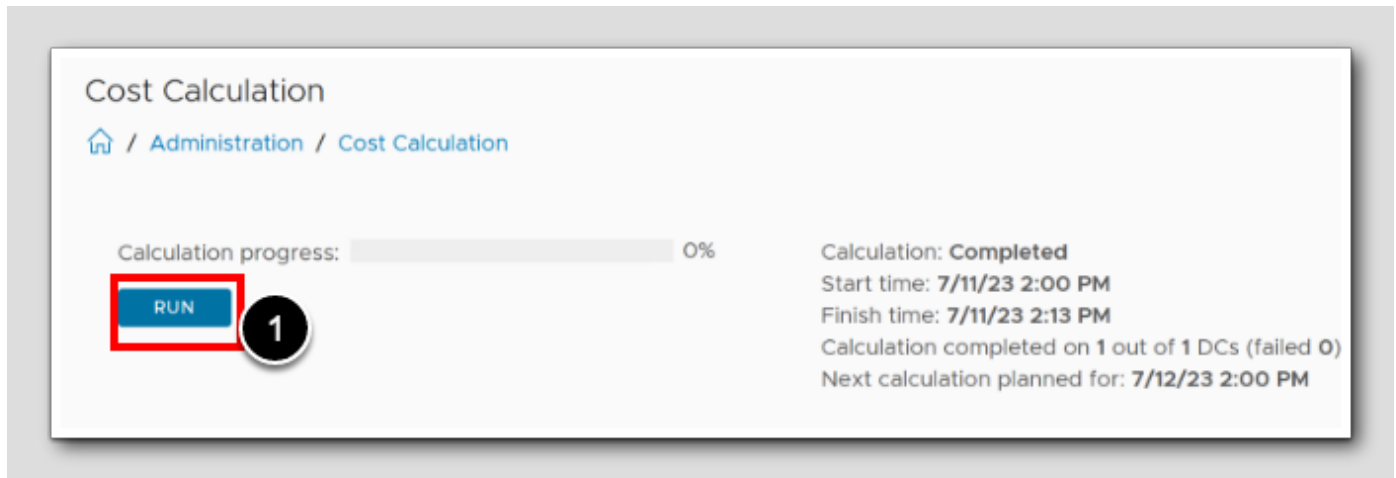


When we do changes in pricing, it is necessary to run a new manual cost calculation to see the impact of changes immediately, rather than waiting for the next automatic calculation cycle.

1. Click **Administration**.
2. Click **Cost Calculation**.

Running a manual Cost Calculation

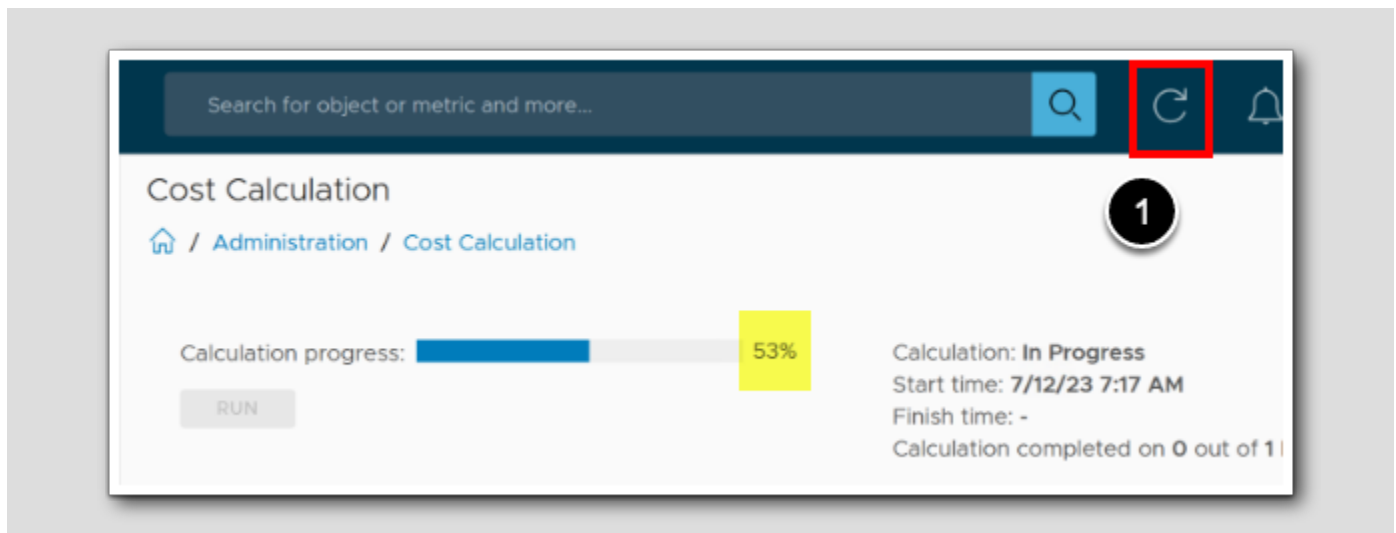
[625]



1. To run a new manual Cost Calculation, Click RUN.

Cost calculation results

[626]



1. To refresh the progress of the calculation, click the refresh button on top.

Note: You don't have to wait for it to finish.

Chargeback

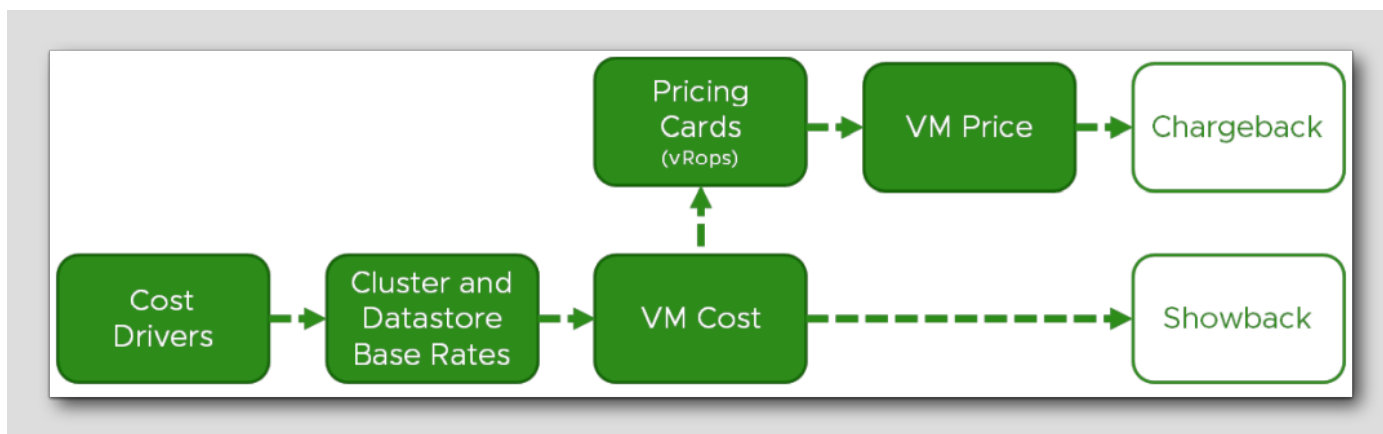
[627]

Quantifying costs and implementing showback practices are vital in cloud-based IT environments. Let's have a look.

1. From the Cost page, under the Showback/Chargeback heading, Click **Chargeback**

Price and Chargeback

[628]

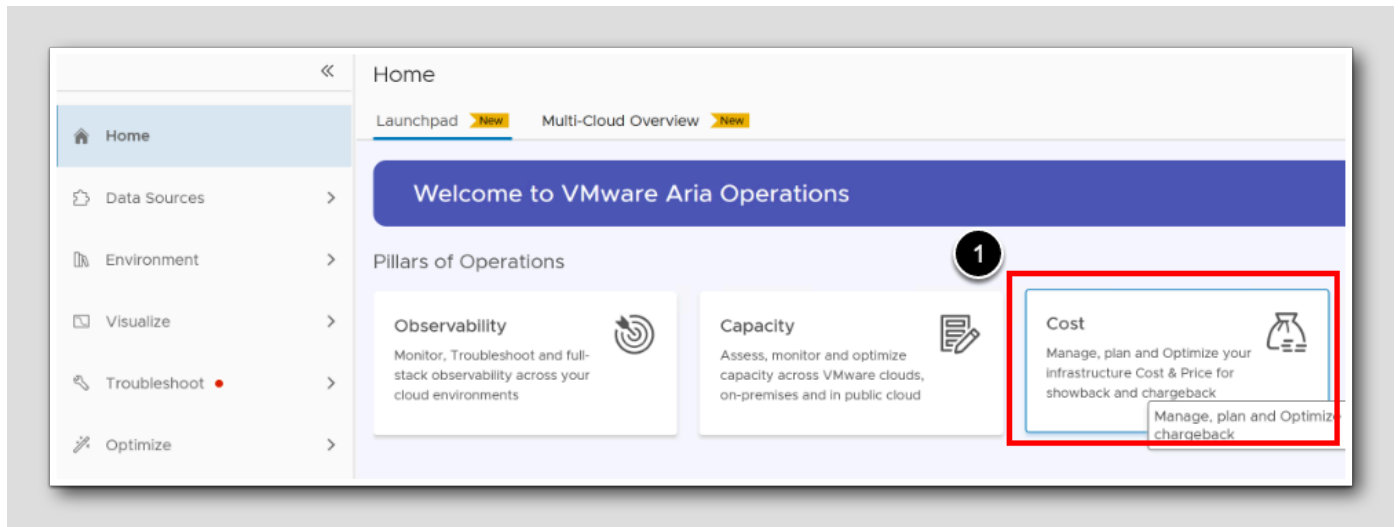


Accurately determining prices and implementing chargeback processes are crucial for billing customers based on their virtual machine (VM) usage, including any additional fees or upcharges. This promotes transparency and enables customers to understand the costs associated with their services.

Price: Price represents the amount charged to customers for utilizing a VM. The price of a VM most often differ from its actual operational costs, as additional charges or profit margins (upcharge) is included. Price considerations are specific to VMs, and customers are typically billed on a monthly basis.

Chargeback: Involves generating a bill for customers based on the determined price for their VM usage. The bill should include a breakdown of the charges associated with each VM, reflecting the price per month. Chargeback aims to provide customers with an accurate representation of the costs incurred for their VMs and promotes transparency in billing practices.

Go to Cost



1. From the Home page Click Cost

Start Chargeback

[630]

The screenshot displays the VMware Cloud Foundation Cost Management interface. At the top, the breadcrumb navigation shows 'Launchpad / Cost'. Below this is a 'Learn more' link. The main content is organized into three sections: 'Cost', 'Price', and 'Showback/Chargeback'. The 'Cost' section contains four cards: 'Total Cost of Ownership', 'Cost Drivers', 'Cost Analysis', and 'Cost Optimization'. The 'Price' section contains one card: 'Rate Card'. The 'Showback/Chargeback' section contains four cards: 'Showback - Virtual Machine Cost', 'Showback - Container Cost', 'Chargeback', and 'ROI Analysis'. The 'Chargeback' card is highlighted with a red border, and a circled '1' is placed above it, indicating the first step in the process.

Cost
Home / Launchpad / Cost
[Learn more](#)

Cost

- Total Cost of Ownership**
Multicloud cost overview, optimization opportunities and realized savings
[VIEW](#) [LEARN MORE](#)
- Cost Drivers**
Manage your expenses using Cost drivers, list prices and discounts
[VIEW](#) [LEARN MORE](#)
- Cost Analysis**
Analyse cost and price metrics for your objects, groups, applications, tenants etc.
[VIEW](#) [LEARN MORE](#)
- Cost Optimization**
Get quantified Cost optimization recommendations and savings
[VIEW](#) [LEARN MORE](#)

Price

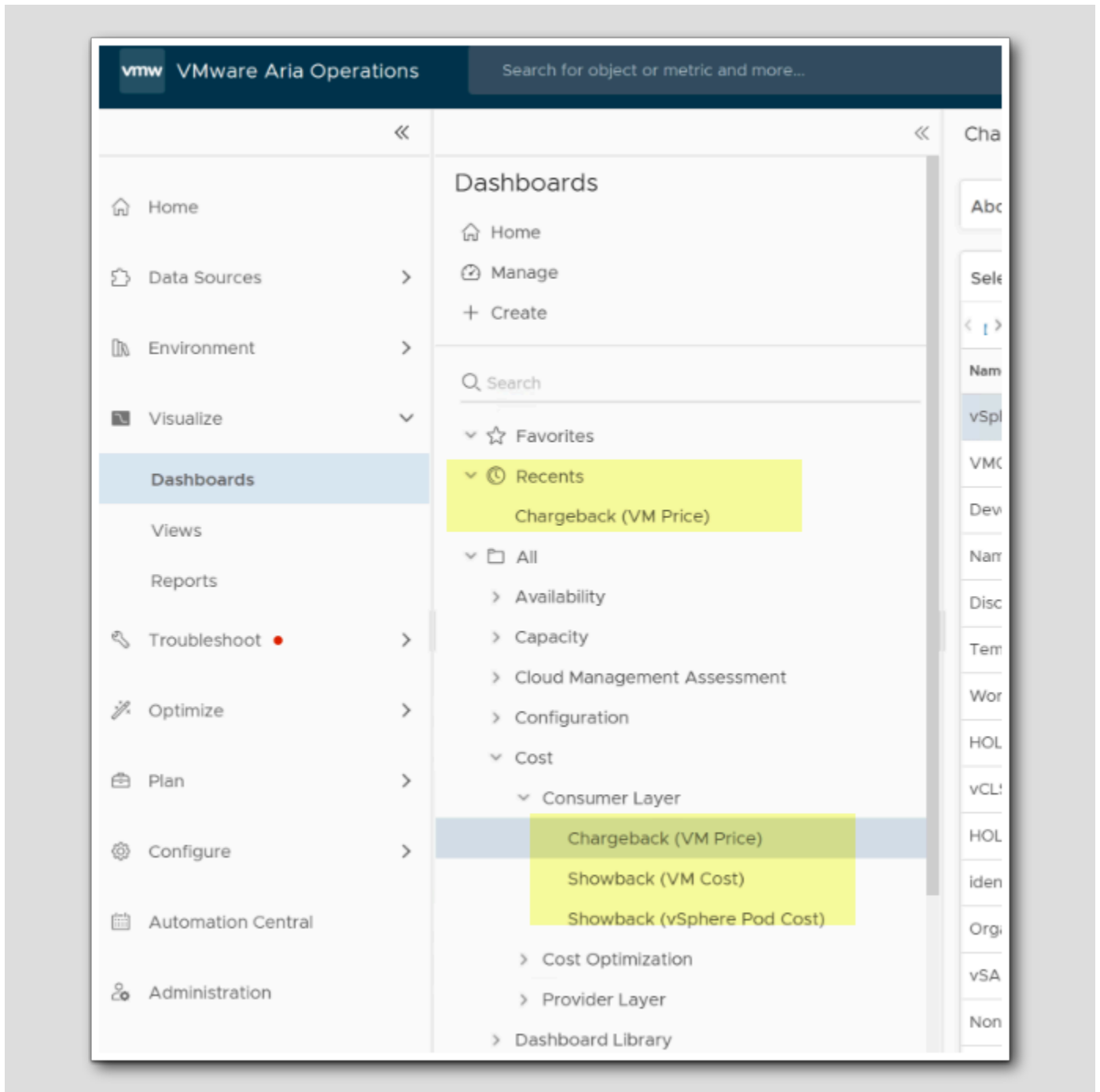
- Rate Card**
Define rate cards to chargeback your tenants or application teams
[VIEW](#) [LEARN MORE](#)

Showback/Chargeback

- Showback - Virtual Machine Cost**
- Showback - Container Cost**
- Chargeback**
- ROI Analysis**

Finding Chargeback (VM Price)

[631]

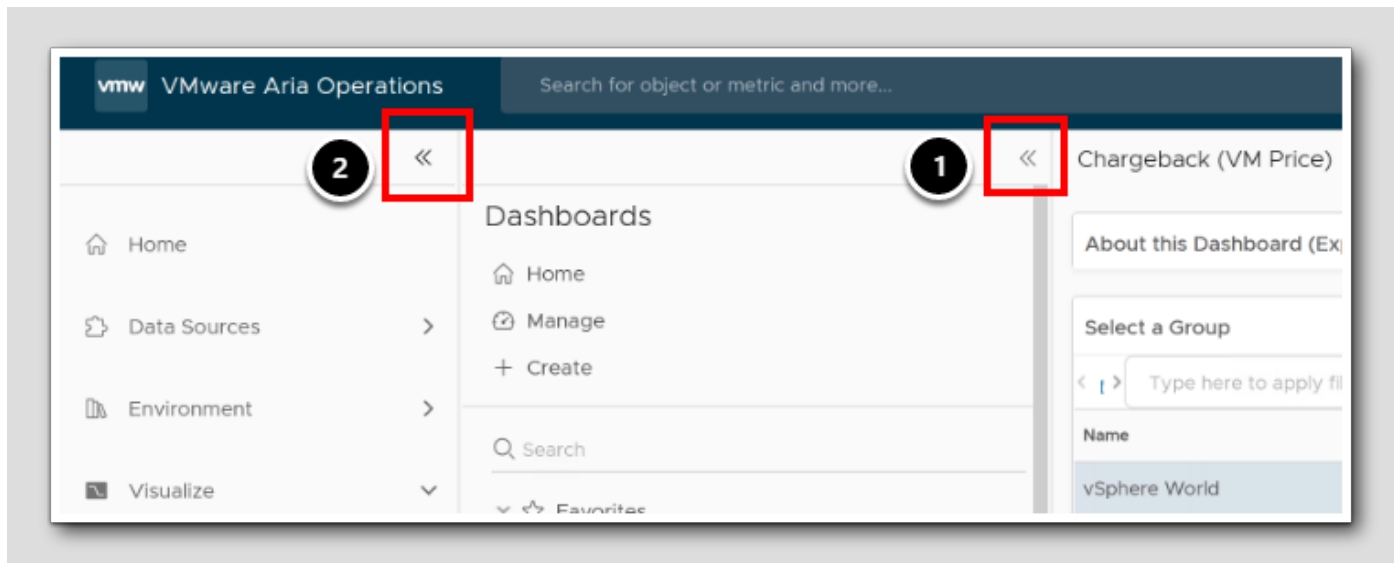


For a later reference, to start the dashboard *Chargeback (VM Price)*, navigate through the dashboard menu by clicking *Visualize>Dashboards>All>Cost>Consumer Layer> Chargeback (VM Price)* as shown highlighted in the navigator in the picture. Note: As soon as the dashboard is accessed, it is added to the *Recents* list for easy access, as highlighted.

Also notice the other Consumer Layer Cost dashboards, and that we have a Provider Layer.

Make room for viewing

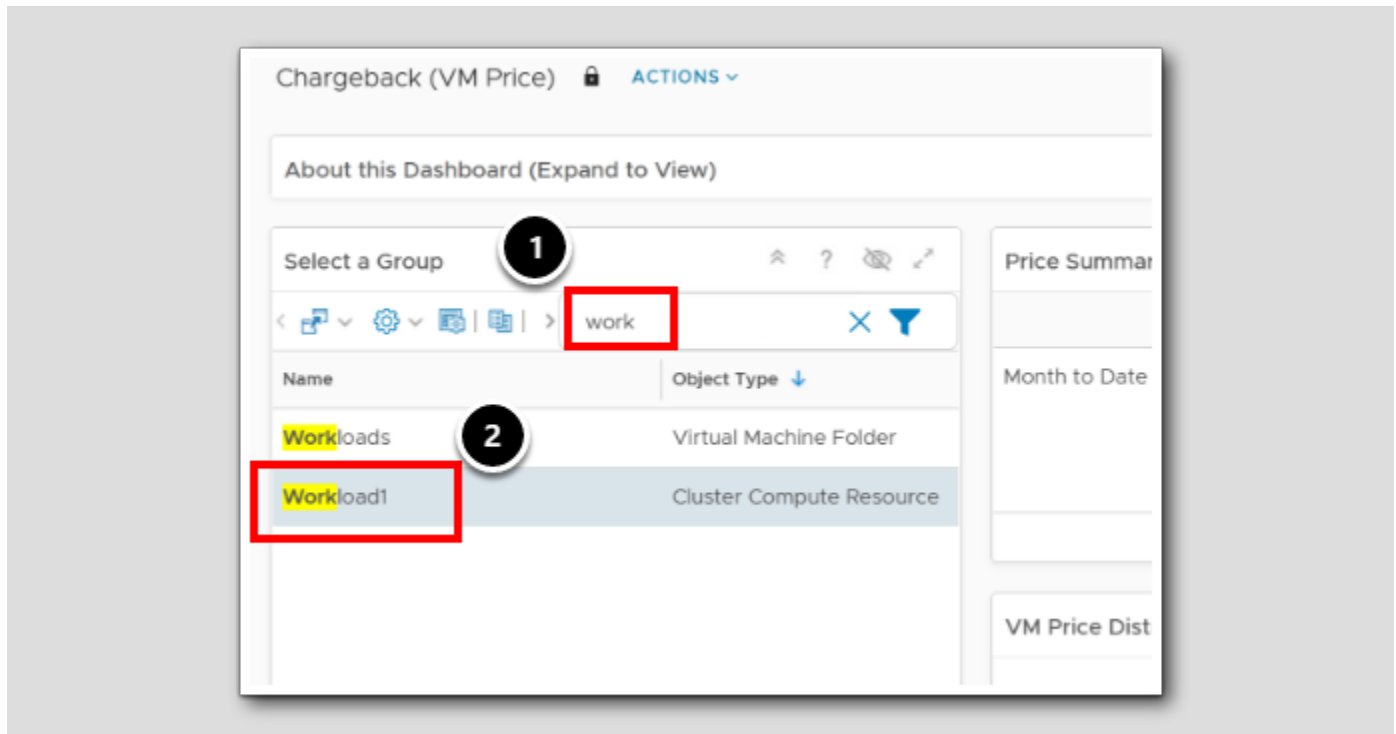
[632]



To fully utilize the screen, let's get rid of the navigators, so we can do a full detailed walk-through of the Chargeback dashboard.

1. To Collapse the Dashboards navigator on the outer side Click on <<
2. To Collapse the Aria Operations Navigator, on the inner side Click on <<

Selecting the group



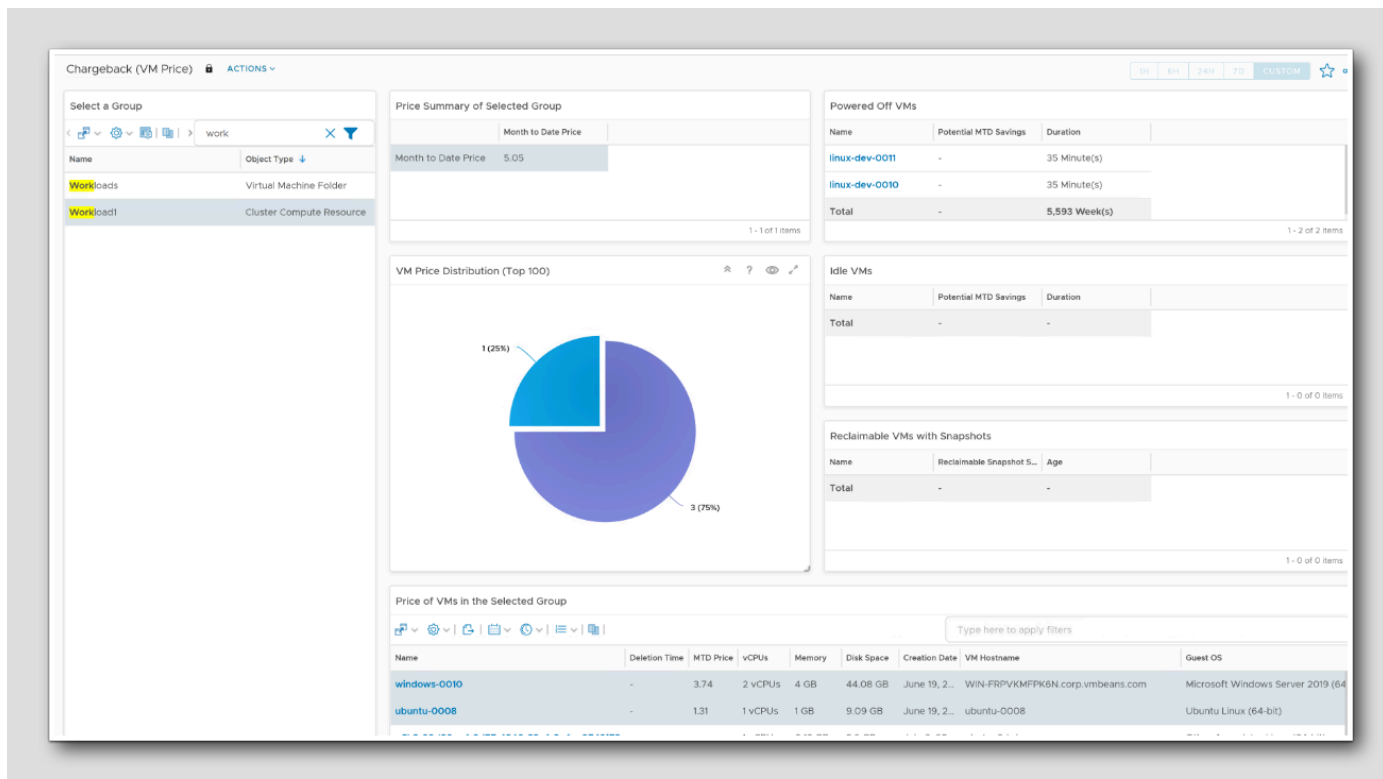
We will ignore our management cluster, and only select the workload cluster. This is the cluster containing the VMs that we will use for pricing and charge the consumer for.

1. In the Chargeback (VM Price) dashboard, under Select a Group, in the search field **type work** and press ENTER
2. Select **Workload1**

In Aria Operations you can use the *Custom Groups* to find vSphere Objects, such as departments or business units via Tags or names, and make these groups show up on this selection list. Then the price of hardware, software, services and shared services would be applied to the business unit in which they are used, making departments or business units responsible for their usage.

Chargeback (VM Price) - Dashboard Overview

[634]

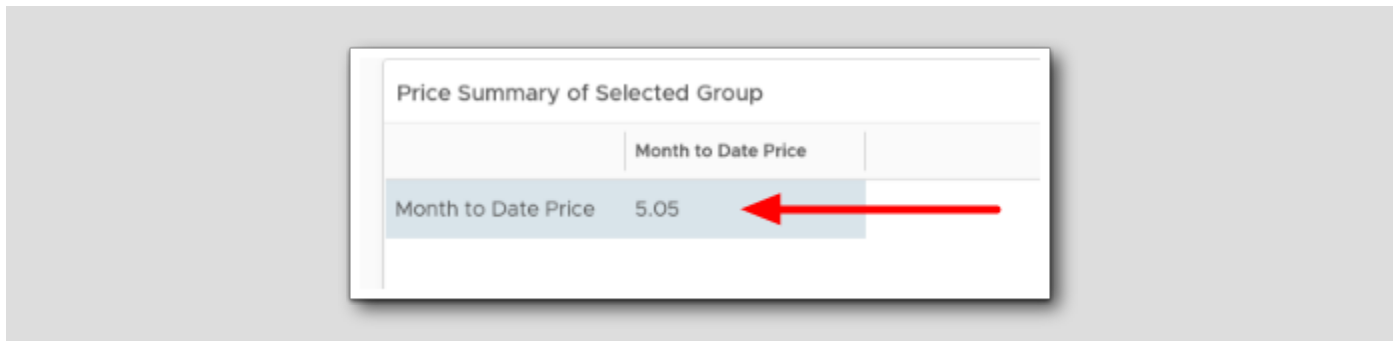


The chargeback VM price dashboard lets you know how much you must spend to run a VM on behalf of your customer. In Aria Operations, we configure the cost drivers and let the system automatically determine how much a VM costs based on your infrastructure requirement. Cost Drivers cover server hardware, storage, licenses, application, maintenance, labor, network, facilities, and additional costs configured within Aria Operations. See the previous [Costing and Cost Drivers](#).

Price is what you charge your customer for running their VM. The price of a VM can be based on the cost of the VM or based on a rate card that you define. See the previous [Rate Cards/Pricing](#), Prices can include up charges, service charges, and others.

Month to date price

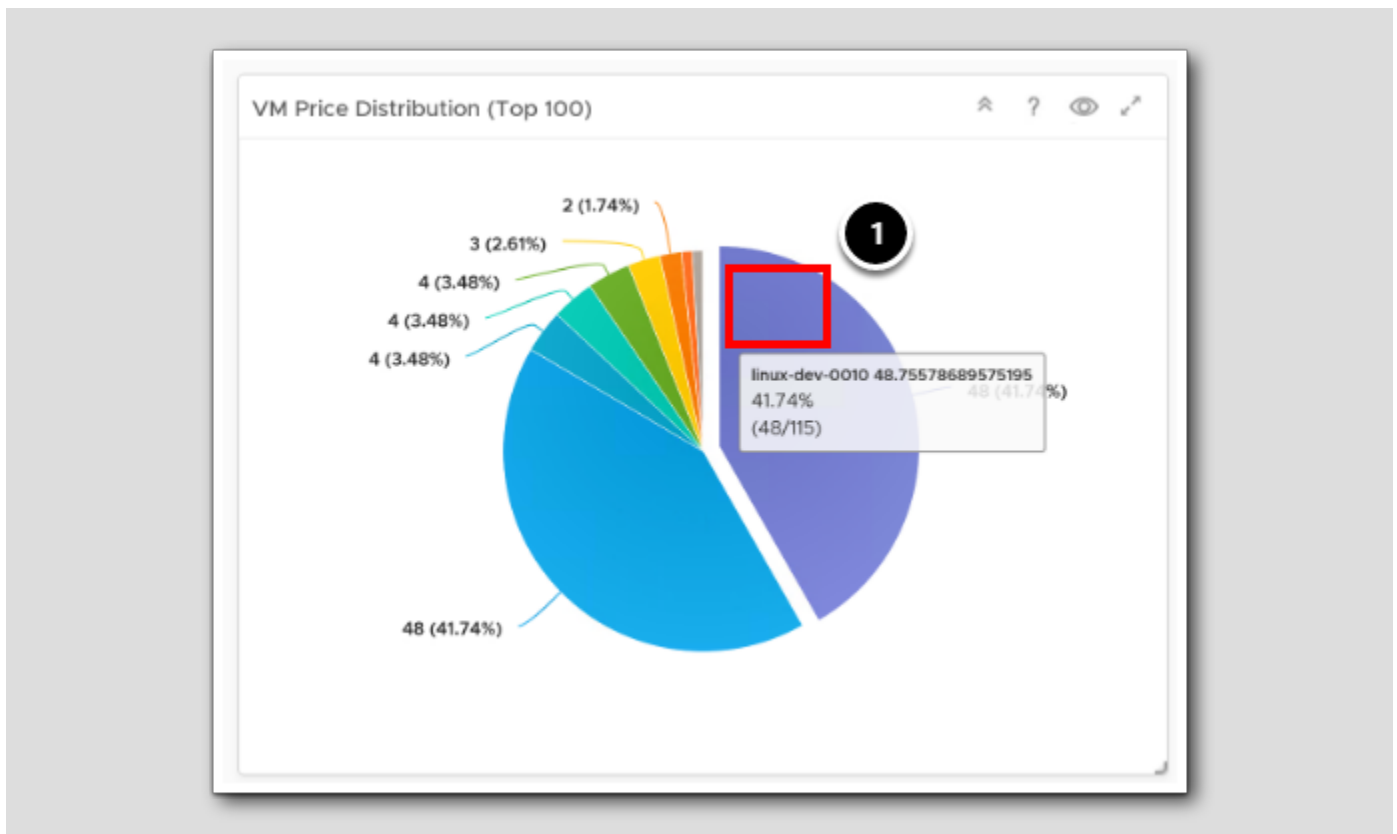
[635]



Price Summary of Selected Group shows the month to date price of the group. Month-to-date (MTD) Price calculates the price from the time from the first day of the current month to the last completed business day before the current date not including the current date.

Price distribution

[636]



VM Price Distribution (Top 100) shows the most expensive VMs in the group we have selected (Workload1). To Single out or identify expensive servers we can click on the pie chart on the larger slices to reveal the price percentage.

1. Click one of the larger slices in the pie chart

As expected, this server runs on Linux. Recall our previous adjustments to the Pricing Rate Cards, particularly when we factored in the Linux-related expenses in [Pricing, Adding Linux Expenses](#)

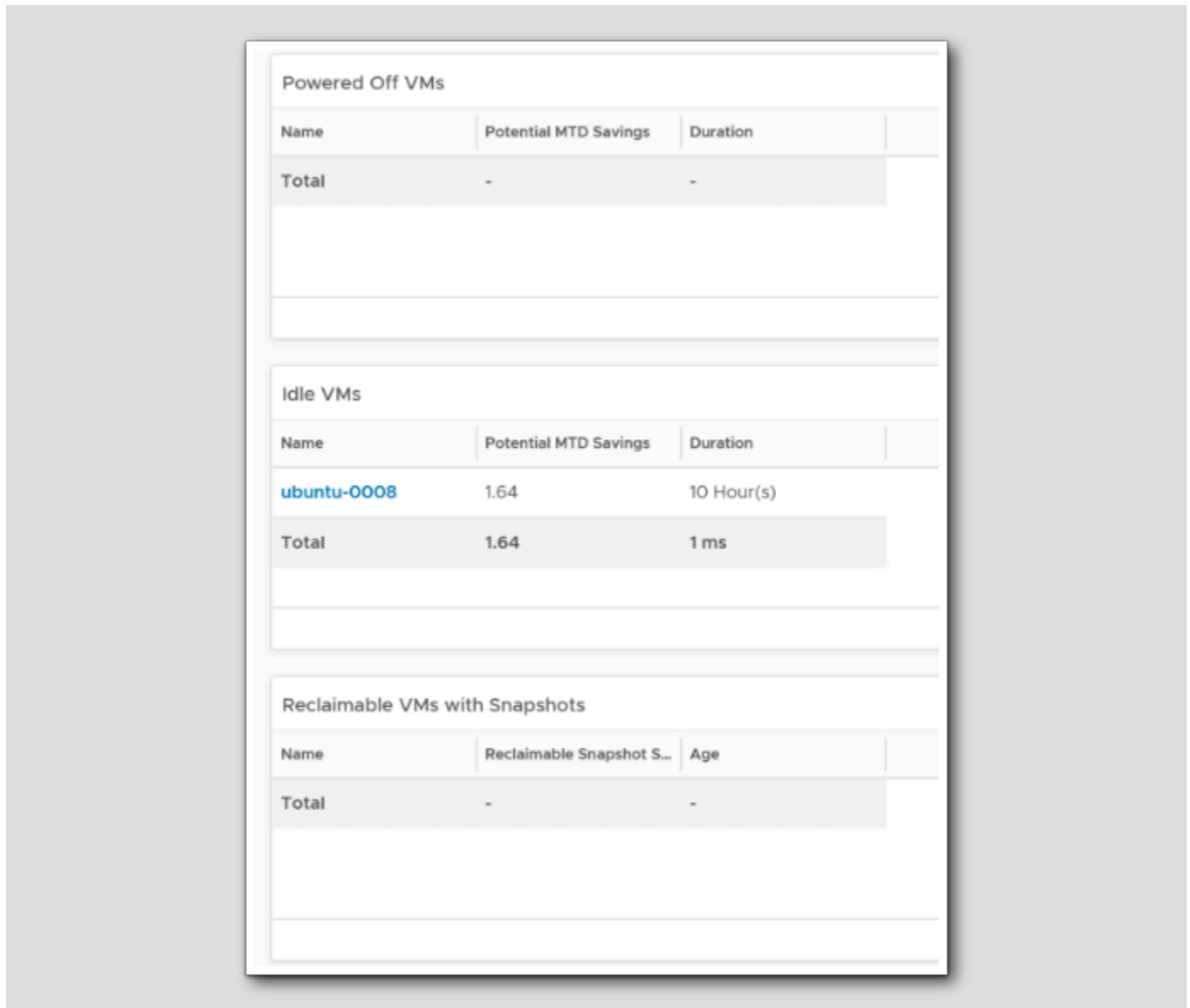
Note: The data in the Lab we see here, will differ a lot depending on how long the environment have been running. We will probably just have few values compared to what we see in the figure or in real life environments, since less servers have been online. Don't worry if your data does not show the same as the image. In your own environment there will probably be more serious values.

Based on a **real life practical example**, we've found that our third largest priced server is a Web server, representing 3.32% of the total pricing structure. This serves as a starting point for further inquiries. We aim to determine why this specific server from our consumer perspective has such a cost. Is the provider's charge excessive? Does the server genuinely consume 3.32% of resources, leading to the elevated cost, which then impacts the price?".

Probing a server's price/cost is fundamental for delivering and receiving optimal value for both provider and consumer.

- **Efficiency:** Assuring provider costs match the value of the service.
- **Resource Allocation:** Optimizing what the provider offers and the consumer receives.
- **Transparency:** A clear billing strengthens the trust between provider and consumer.
- **Insights:** Highlighting areas for improvements.
- **Strategy:** Inform about the future provider decisions.

Reclaimable resources



The screenshot displays three tables from the VMware vSphere interface, each showing reclaimable resources. The first table, 'Powered Off VMs', has columns for Name, Potential MTD Savings, and Duration, with a total of 0. The second table, 'Idle VMs', has columns for Name, Potential MTD Savings, and Duration, showing one VM named 'ubuntu-0008' with 1.64 in savings and 10 hours in duration, and a total of 1.64 in savings and 1 ms in duration. The third table, 'Reclaimable VMs with Snapshots', has columns for Name, Reclaimable Snapshot S..., and Age, with a total of 0.

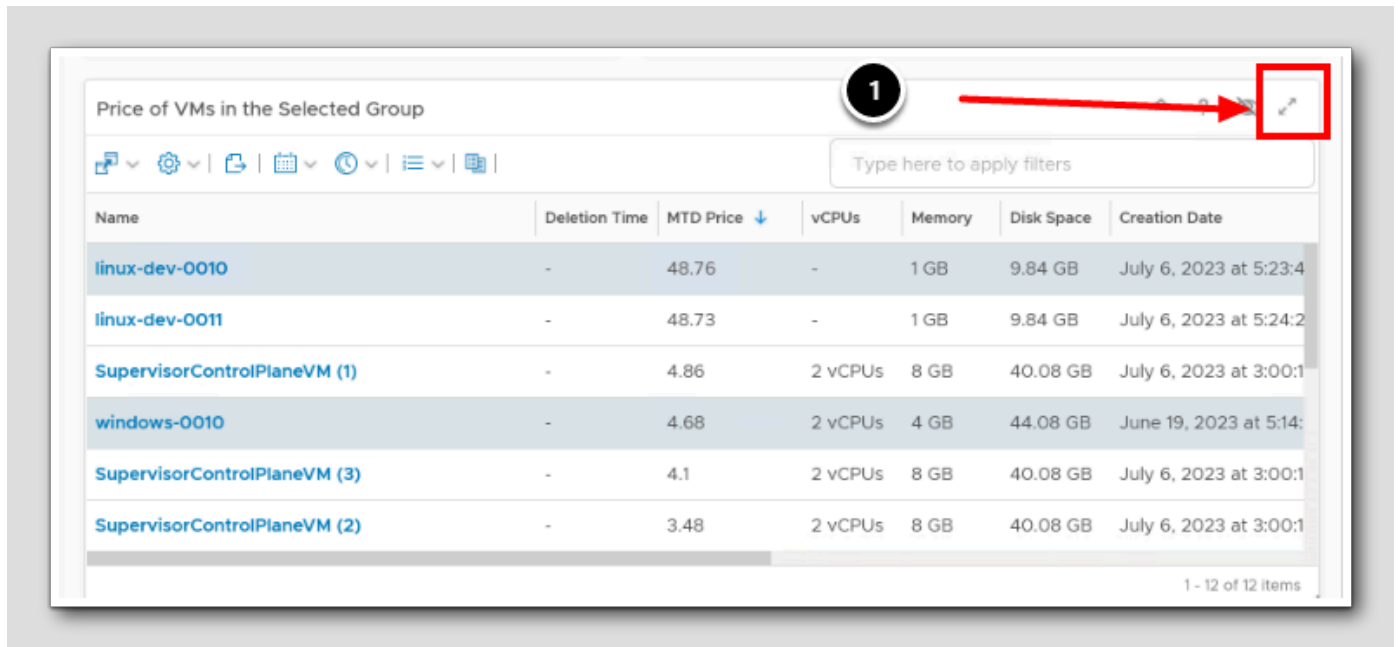
Powered Off VMs		
Name	Potential MTD Savings	Duration
Total	-	-

Idle VMs		
Name	Potential MTD Savings	Duration
ubuntu-0008	1.64	10 Hour(s)
Total	1.64	1 ms

Reclaimable VMs with Snapshots		
Name	Reclaimable Snapshot S...	Age
Total	-	-

- Powered Off VMs shows reclaimable VMs and their potential savings.
- Idle VMs shows reclaimable VMs and their potential savings.
- VMs with Snapshots shows reclaimable snapshots and their age.

Price of VMs, Overview



Price of VMs in the Selected Group

Type here to apply filters

Name	Deletion Time	MTD Price ↓	vCPUs	Memory	Disk Space	Creation Date
linux-dev-0010	-	48.76	-	1 GB	9.84 GB	July 6, 2023 at 5:23:4
linux-dev-0011	-	48.73	-	1 GB	9.84 GB	July 6, 2023 at 5:24:2
SupervisorControlPlaneVM (1)	-	4.86	2 vCPUs	8 GB	40.08 GB	July 6, 2023 at 3:00:1
windows-0010	-	4.68	2 vCPUs	4 GB	44.08 GB	June 19, 2023 at 5:14:
SupervisorControlPlaneVM (3)	-	4.1	2 vCPUs	8 GB	40.08 GB	July 6, 2023 at 3:00:1
SupervisorControlPlaneVM (2)	-	3.48	2 vCPUs	8 GB	40.08 GB	July 6, 2023 at 3:00:1

1 - 12 of 12 items

If we scroll all the way to the bottom of the page, we will see the the price and configuration of each VM in the selected group.

1. Click the Maximize button

Price of VMs, details

Chargeback (VM Price) ACTIONS

Price of VMs in the Selected Group

Type here to apply filters

Name	Deletion Time	MTD Price ↓	vCPUs	Memory	Disk Space	Creation Date	VM Hostname	Guest OS
linux-dev-0010	-	48.76	-	1 GB	9.84 GB	July 6, 2023 ...	base-linux-cli	Ubuntu Linux (64-bit)
linux-dev-0011	-	48.73	-	1 GB	9.84 GB	July 6, 2023 ...	base-linux-cli	Ubuntu Linux (64-bit)
SupervisorControlPlaneVM (1)	-	4.86	2 vCPUs	8 GB	40.08 GB	July 6, 2023 ...	421f08c67b623c...	VMware Photon OS (64-bit)
windows-0010	-	4.68	2 vCPUs	4 GB	44.08 GB	June 19, 202...	WIN-FRPVKMFP...	Microsoft Windows Server 2019 (64-bit)
SupervisorControlPlaneVM (3)	-	4.1	2 vCPUs	8 GB	40.08 GB	July 6, 2023 ...	421fae39289e15f...	VMware Photon OS (64-bit)
SupervisorControlPlaneVM (2)	-	3.48	2 vCPUs	8 GB	40.08 GB	July 6, 2023 ...	421f4b3350973d...	VMware Photon OS (64-bit)
dev-project-rz5gx-4tgb2	-	2.65	2 vCPUs	4 GB	24.08 GB	July 6, 2023 ...	dev-project-rz5g...	VMware Photon OS (64-bit)
dev-project-worker-llbmm-5b97766579...	-	1.81	2 vCPUs	4 GB	24.08 GB	July 6, 2023 ...	dev-project-work...	VMware Photon OS (64-bit)
ubuntu-0008	-	1.64	1 vCPUs	1 GB	9.09 GB	June 19, 202...	ubuntu-0008	Ubuntu Linux (64-bit)
vCLS-9d0469c2-2397-4492-b03a-0c88...	-	0.51	1 vCPUs	0.12 GB	2.2 GB	July 6, 2023 ...	photon3-hdcs	Other 4.x or later Linux (64-bit)
vCLS-60d30ce4-2d77-4340-83c4-8a4ce...	-	0.51	1 vCPUs	0.12 GB	2.2 GB	July 6, 2023 ...	photon3-hdcs	Other 4.x or later Linux (64-bit)
vCLS-7deae903-8442-4a11-b44d-daf6e0...	-	0.51	1 vCPUs	0.12 GB	2.2 GB	July 6, 2023 ...	photon3-hdcs	Other 4.x or later Linux (64-bit)
Total	-	122.24	16 vCPUs	39.38 GB	247.87 GB	-	-	-

1. To sort on the Month to date price, click once or twice on the column header **MTD Price**

The arrow should point down, showing a descending sort from highest to lowest MTD Price

2. To get back to the Chargeback main dashboard, click the **minimize button**

Note: The lab data varies based on the environment's runtime. You might see fewer or other values here than in actual scenarios due to fewer or more active VMs. Don't be concerned if your data differs from the provided image; real-world environments typically show more substantial values.

Price of VMs, practical example

Chargeback (VM Price) 🔒 ACTIONS ▼ 1H 6H 24H 7D CUSTOM ☆

Price of VMs in the Selected Group ? 👁 ✂

Type here to apply filters

Name	Deletion Time	MTD Price ↑	vCPUs	Memory	Disk Space
sc2-nested-nas	-	435.05	2 vCPUs	16 GB	2,108.78 GB
nsx-us-intelligence	-	495.48	16 vCPUs	64 GB	3,824.5 GB
nsx-intelligence-em...	-	511.35	16 vCPUs	64 GB	3,824.44 GB
nsx-intelligence-pks	-	511.35	16 vCPUs	64 GB	1,912.11 GB
VRNI-FieldDemo-Pla...	-	620.75	-	64 GB	1,144.63 GB
VRNI-FieldDemo-Pla...	-	621.45	-	64 GB	6,144.79 GB
VRNI-FieldDemo-Pla...	-	621.91	-	64 GB	6,208.71 GB
sc2-backup-proxy01	-	655.54	4 vCPUs	24 GB	3,112.06 GB
share	-	658.24	4 vCPUs	16 GB	3,228.65 GB
wdc-backup-proxy01	-	1,427.74	4 vCPUs	24 GB	7,386.2 GB
Total	-	90,670.64	5,951 vCPUs	20,544.59 GB	479,881.07 GB

2901 - 2916 of 2916 items < 1 2 3 4 5 ... 59 >

In this **real-world scenario**, we identified a server named "share" with fewer vCPUs and RAM than another production servers. This difference raises questions about its higher cost despite having fewer allocated resources. Investigating server costs ensures both provider and consumer get maximum value. The higher cost might come from what the provider offers compared to what the customer gets, and it could mean that the "share" server might have special charges (eg. for services) on its **pricing card**. Again, transparency is important for the trust between the provider and consumer.

Observe the **total price** as well as the aggregate values for vCPUs, Memory, and disk space utilized.

Closing Comments

When we set up Pricing Rate Cards, the price is reflected in our Chargeback dashboard.

By utilizing the Chargeback dashboard we gain comprehensive insights into the Price breakdown, potential savings related to each of the VMs, and we might raise questions about price vs. allocated resources or why certain servers costs more due to different pricing defined in our pricing cards.

Conclusion

[643]

Upon completing this module, we've enriched our technical understanding of VMware Aria Operations, particularly its use of **Chargeback** to foster financial transparency and clarity. This knowledge could guide us in shaping a more conscious IT ecosystem inspired with responsibility and accountability. We've come to understand that Chargeback is a process of translating 'costs' into 'prices' for the resources used by different business units. Ultimately, it boils down to cost transparency (Showback) and price accountability (Chargeback).

You've finished Module 13

[644]

Congratulations on completing the lab module. If you are looking for additional information on Aria Operations, try one of these:

- **VMware Product Public Page - Aria Operations:** <https://www.vmware.com/products/aria-operations.html>
- **Aria Operations - Documentation:** <https://docs.vmware.com/en/VMware-Aria-Operations/index.html>
- **Best Practices:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Best-Practices.pdf>
- **Architecture Guide:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Reference-Architecture-Operations.pdf>
- **Aria Operations 8.12 Release Notes:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/rn/vmware-aria-operations-812-release-notes/index.html>
- **Analysis of Price Metrics:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Configuring-Operations/GUID-253E7142-A50A-47A1-B389-99063454ABD3.html?hWord=N4IghgNiBclMIAswCcDmBTARmAxgaxAF8g>
- **Consumer Layer:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Configuring-Operations/GUID-667D0E19-9CC9-48CC-A44A-0A0C1AB59500.html?hWord=N4IghgNiBclMIAswCcDmBTARmAxgaxAF8g>
- **Chargeback VM Price Dashboard:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Configuring-Operations/GUID-020468AF-8884-4B9B-9ED1-6DE1BCC946AD.html>

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 14 - Plan for Your Future Capacity Needs (30 minutes) Intermediate

Introduction

[646]

Optimize Capacity with a What-If Scenario

A scenario is a situational model to determine a detailed estimation of the resources we must have available in the environment to incorporate upcoming changes. We define scenarios that can potentially add resources to actual data centers. Aria Operations models the scenario and calculates whether the desired workload can fit in the targeted data center. We can save multiple scenarios for comparison or review.

Using the **What-If** tool, we can plan for an increase or decrease in workload or capacity requirements in the virtual infrastructure. To evaluate the demand and supply for capacity on the system objects, and to assess the potential risk to the current capacity, we can create scenarios for adding and removing workloads. We can also determine how much capacity is required to make a migration work. We can run one scenario or group scenarios and run them cumulatively.

Log in to Aria Operations

[647]

We will log in to a live instance of Aria Operations running in this lab.

Open the Firefox Browser from the Windows Task Bar

[648]

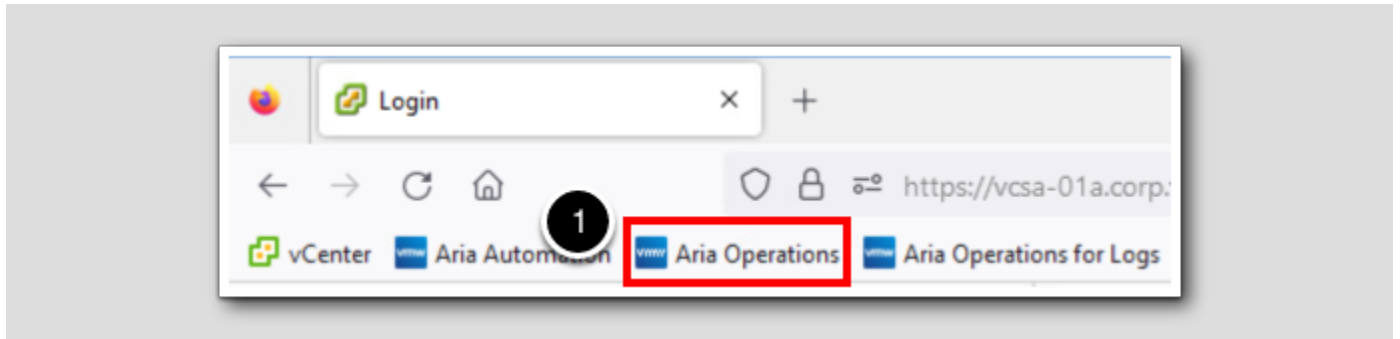


If the browser is not already open, launch **Firefox**.

1. Click the **Firefox** icon in the Windows Quick Launch Task Bar at the bottom of the screen.

Navigate to Aria Operations

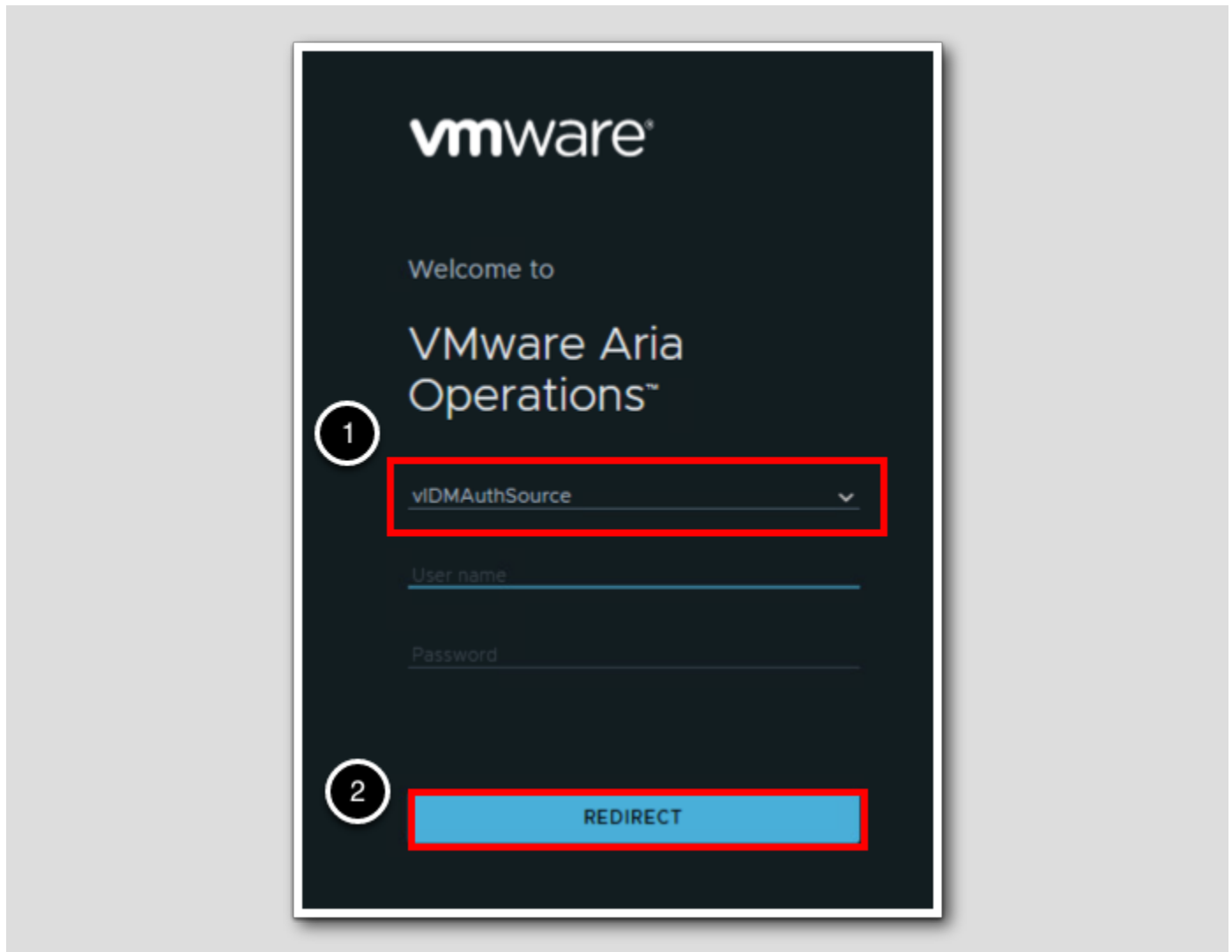
[649]



1. Click the Aria Operations bookmark in the bookmarks toolbar.

Log in to Aria Operations

[650]



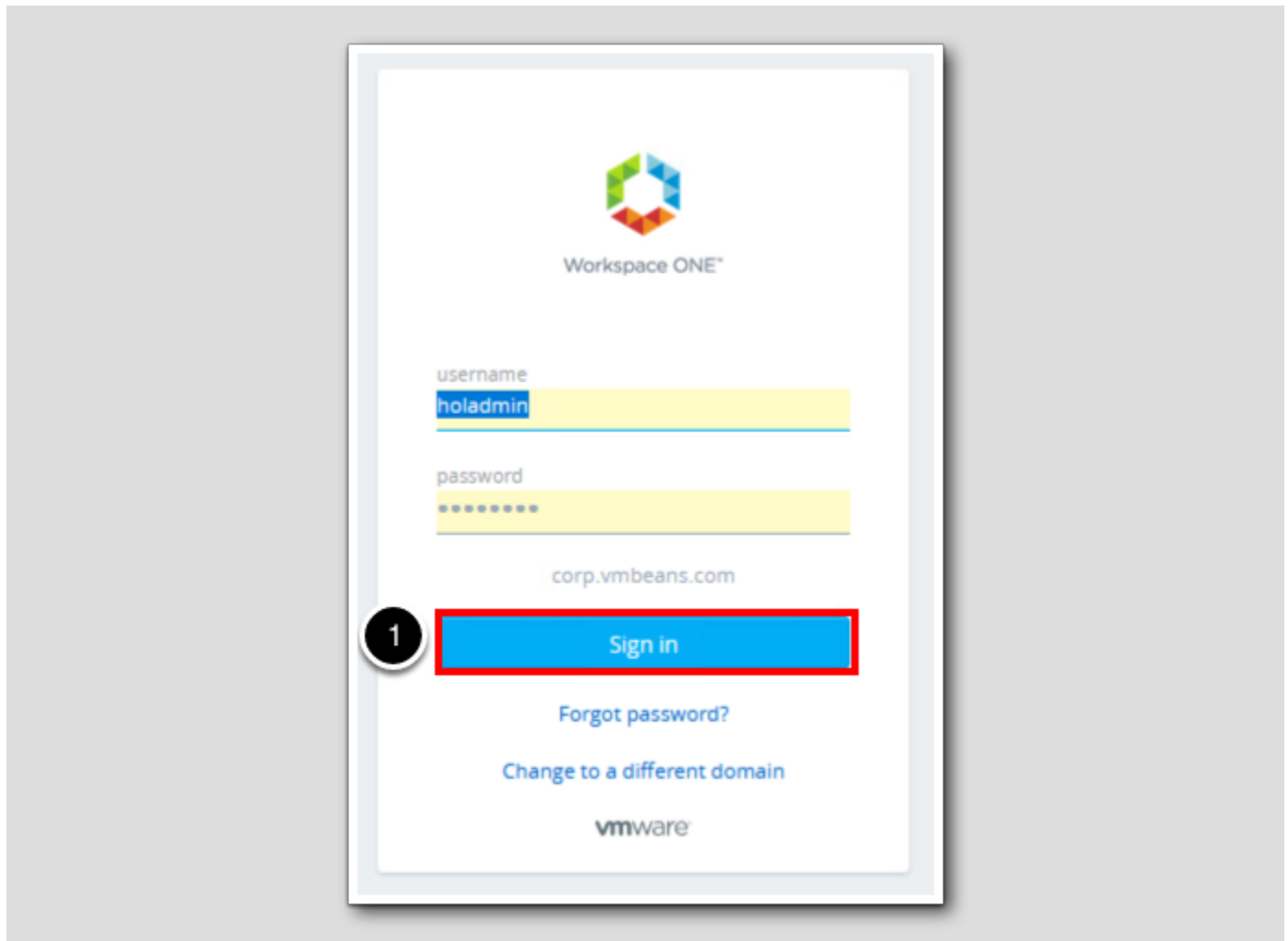
Aria Operations is integrated with VMware Workspace ONE Assist (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

vIDMAuthSource may be pre-selected as the default identity source. If it is not, then you will need to select it.

1. Click the **drop-down arrow** and select vIDMAuthSource if it is not already selected.
2. Click **REDIRECT** to be taken to the authentication page.

VMware Identity Manager Login

[651]



VMware Identity Manager acts as the identity provider for the Active Directory authentication source in this lab.

Credentials for the default user, holadmin, have already been provided.

1. Click Sign in

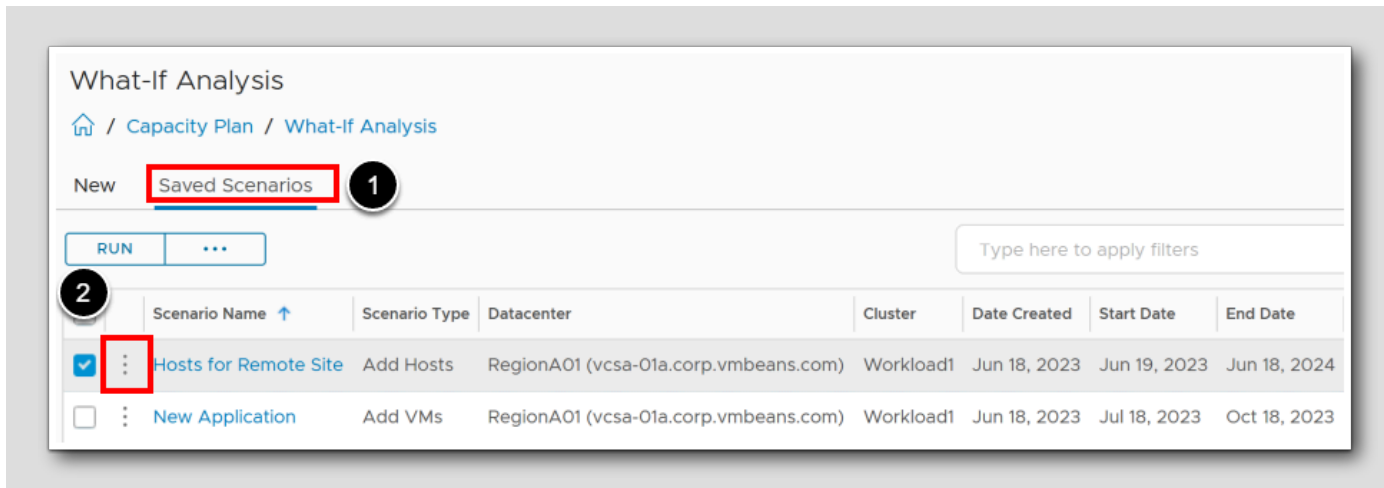
Optimize Capacity with What-If Scenarios and Costs

[652]

Let's take a look at the What-If analysis in Aria Operations.

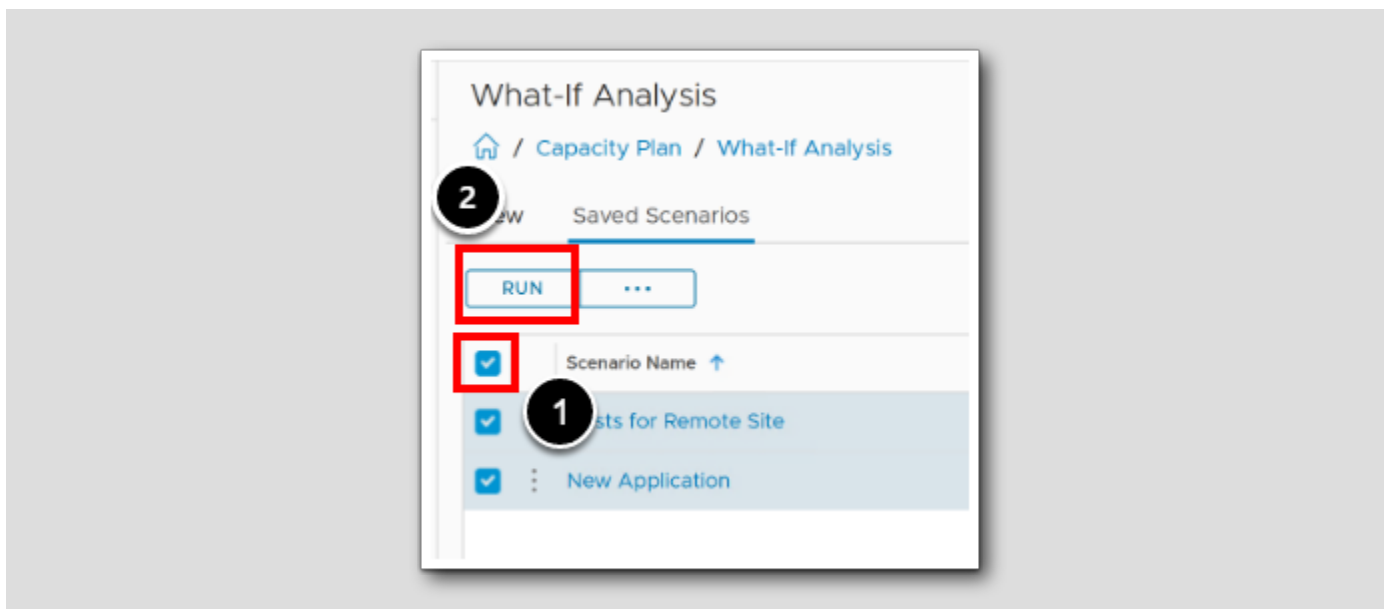
Since **Memory** is going to be a problem, let's add a couple of additional hosts to the Hosts for Remote Site scenario.

3. Scroll back up to the top
4. Scroll back up to the top, Click X



We need to add another host to the Remote Site due to the Memory **bottleneck** and rerun the multiple scenario

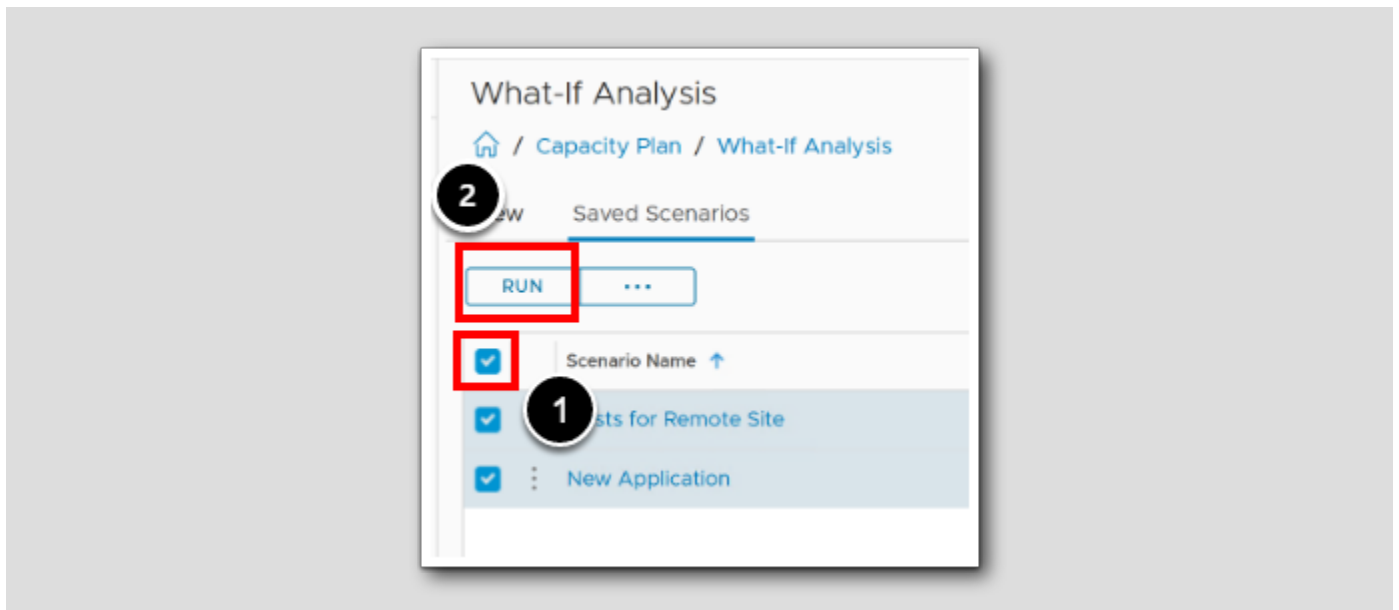
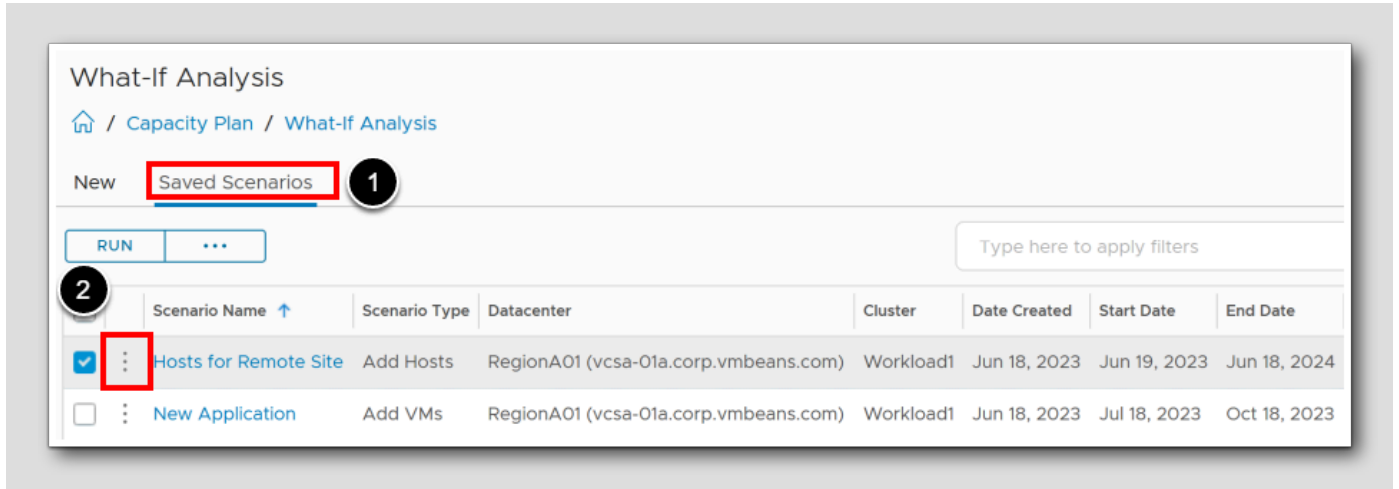
1. Click Saved Scenarios
2. Left of *Hosts for Remote site*, Click the 3-dotted "hamburger icon" and choose **Edit**



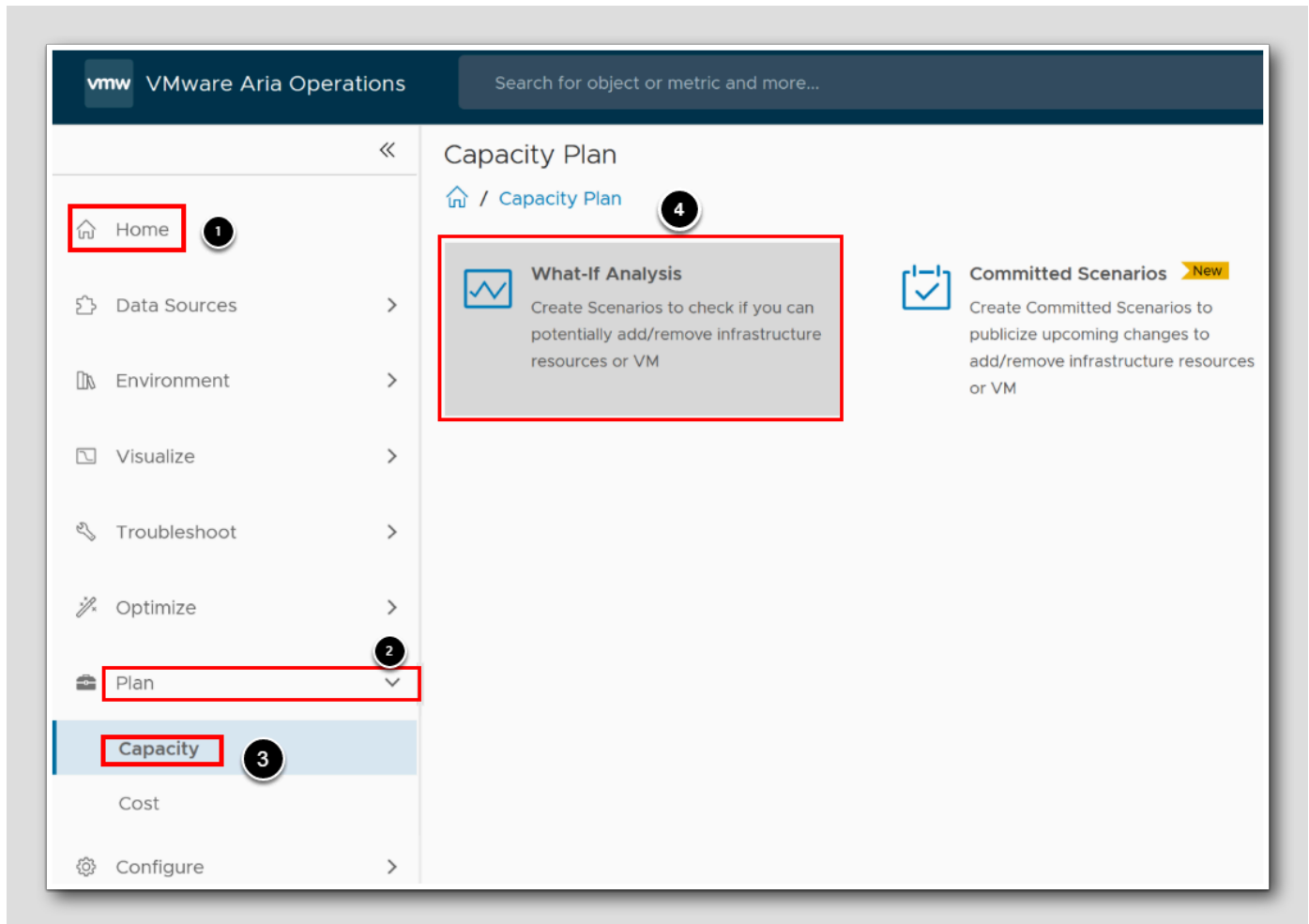
1. Back in the What-If Analysis *Saved Scenarios*, Select both scenarios by clicking the header **check box**
2. Click **RUN**

Make note of the **Total Cost**: This shows the cost of running the hosts to our Private Cloud for a year based on default industry costing populated in Aria Operations. The default costs in Aria Operations can be adjusted to our company's actual purchase costs. Don't close the window jus yet.

NOTE: Keep in mind, images may differ due to our Lab environment.

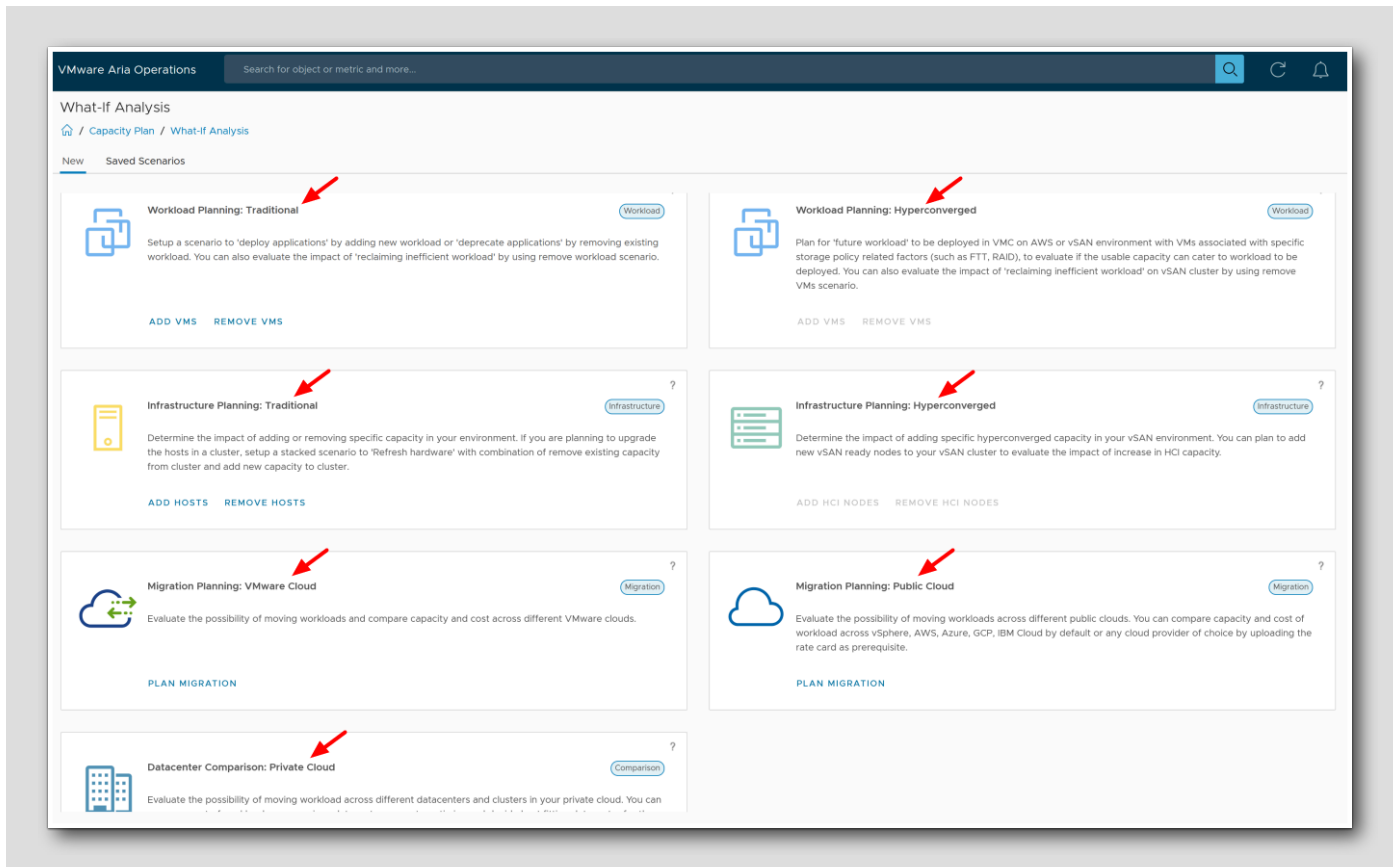


The What-If Analysis



1. Click Home
2. Click Plan
3. Click Capacity
4. Click What-If Analysis

What-If Analysis Overview Tab



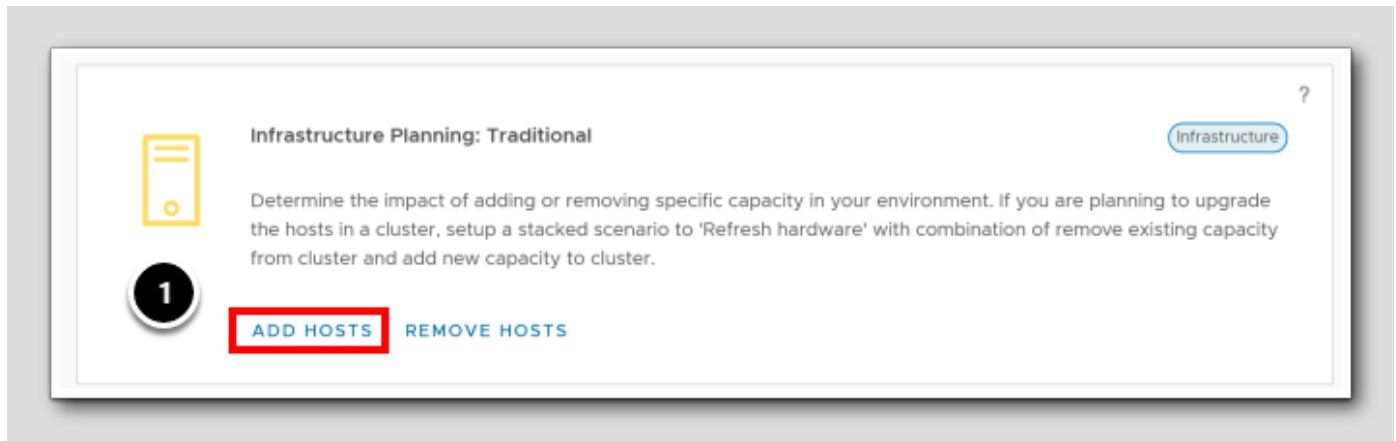
The **Overview** tab of the **What-If** analysis page has the following panes.

Each pane lets us run **What-If** scenarios to optimize capacity based on workload, physical infrastructure, HCI nodes, or migration to the cloud.

- **Workload Planning: Traditional** - Setup a scenario to 'deploy applications' by adding new workloads or 'deprecate applications' by removing existing workloads. We can also evaluate the impact of 'reclaiming inefficient workloads' by using the remove workload scenario.
- **Infrastructure Planning: Traditional** - Determine the impact of adding or removing specific capacity in our environment. If we're planning to upgrade the hosts in a cluster, setup a stacked scenario to 'Refresh hardware' with combination of remove existing capacity from cluster and add new capacity to cluster.
- **Migration Planning: VMware Cloud** - Evaluate the possibility of moving workloads and compare capacity and cost across different VMware clouds. We can compare capacity and cost of workload across VMware Cloud for AWS(Amazon Web Services), AVS(Azure VMware Solution), GCVE(Google Compute VMware Engine), VMware Cloud on Dell EMC, and OCVS (Oracle Cloud VMware Solution)
- **Datacenter Comparison: Private Cloud** - Evaluate the possibility of moving workloads across different datacenters and clusters in the private cloud. We can compare cost of workloads across various datacenters so as to optimize and decide best fitting datacenter for the workload under consideration.
- **Workload Planning: Hyperconverged** - Plan for 'future workloads' to be deployed on vSAN environment with virtual machines associated with specific storage policy related factors, such as Failures to Tolerate (FTT) and RAID level, to evaluate if the usable capacity can cater to workloads to be deployed. We can also evaluate the impact of 'reclaiming inefficient workloads' on vSAN cluster by using remove virtual machines scenario.
- **Infrastructure Planning: Hyperconverged Infrastructure** - Determine the impact of adding or removing specific hyperconverged capacity to the vSAN environment. We can plan to add new vSAN ready nodes to the vSAN cluster to evaluate the impact of increase in HCI capacity.
- **Migration Planning: Public Cloud Migration** - Evaluate the possibility of moving workloads across different public clouds. We can compare capacity and cost of workloads across vSphere, AWS, Azure, GCP, IBM Cloud by default or any cloud provider of choice by uploading the rate card as prerequisite.

What-If Analysis - Infrastructure Planning: Traditional

[655]



Infrastructure Planning for traditional environments enables us to forecast successfully the impact of adding capacity to the environment or removing capacity from the environment. By trying various scenarios, we can arrive at an optimum configuration. Once we select the **Infrastructure Planning: Traditional** pane, we can choose where we want to locate the additional capacity or from where we can remove the existing capacity.

In this lab, we will create a new scenario to add capacity to the Remote Site: **RegionAO1**, and we will run this new scenario with the required VMs needed for the New Application.

1. From the **What-If Analysis** page, click **ADD HOSTS** in the pane titled **Infrastructure Planning: Traditional**

Add Hosts

Create Infrastructure Planning: Traditional

Capacity Plan / What-If Analysis / Add Capacity

Scenario Name **1** Hosts for Remote Site

Location Where would you like to add capacity?
2 RegionA01 (vcsa-01a.corp.vmbeans.com) ▶ Workload1

Server Details **3** Server type
 SELECT SERVER

Number of servers to add 1

Date Start Date 6/18/23 End Date (optional) 6/18/24
 Specify an end date if the workload in this scenarios is temporary. Our engine is able to make projections up to a maximum of one year from the current date.

RUN SCENARIO SAVE CANCEL

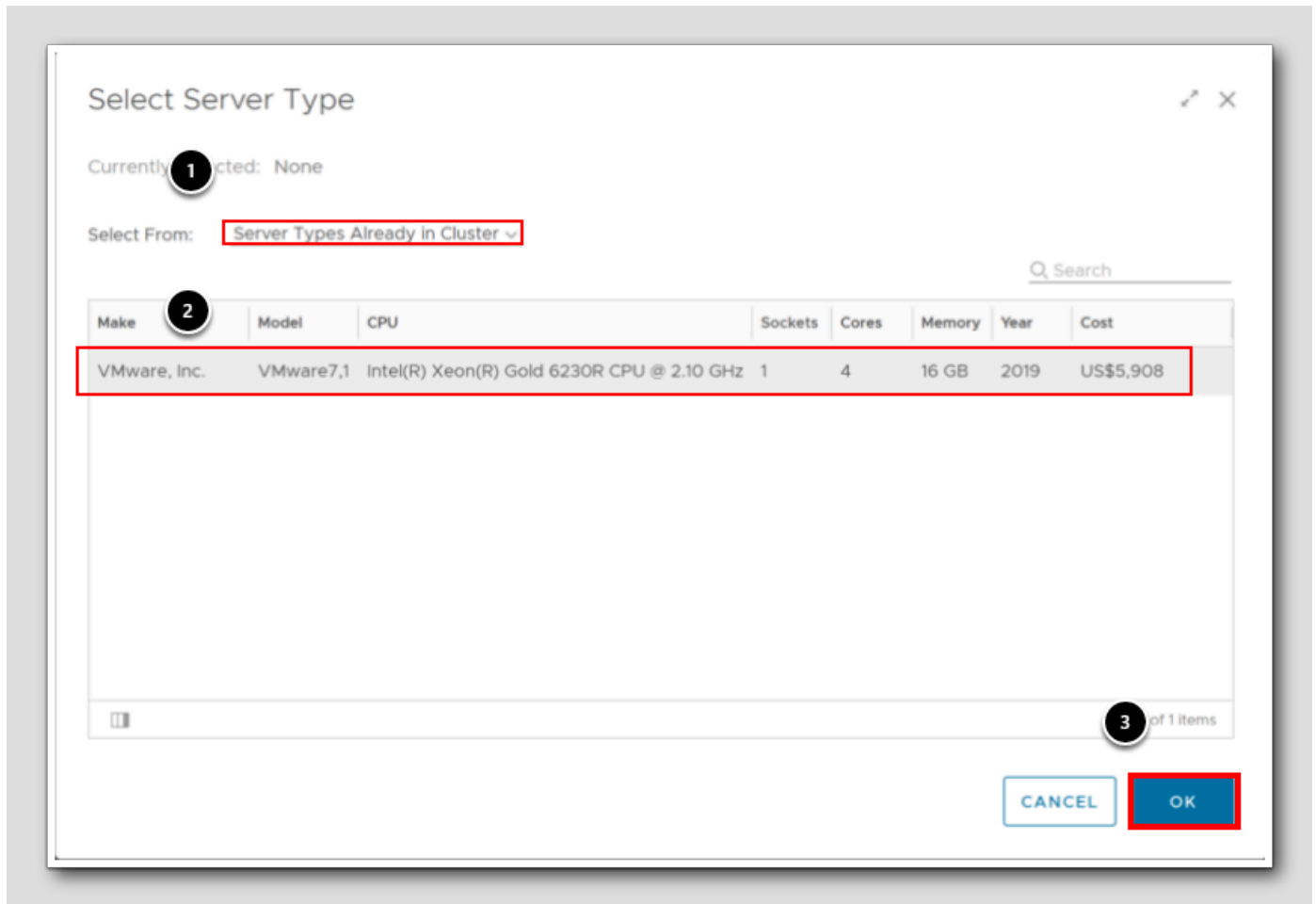
When selecting the profile to add capacity, we have two options:

- Select a server type from a list of commercially available servers. We can select from a list of 1) server types already in the cluster or 2) all server types approved for purchase
- Configure a custom server manually by specifying CPU attributes, memory, and cost

In this exercise, we will add a server type already in the cluster:

1. Enter the SCENARIO NAME as: **Hosts for Remote Site**
2. In *LOCATION*, click drop down to select **RegionA01 (vcsa-01a.corp.vmbeans.com)**, and click drop down to select **Workload 1**
3. In *SERVER DETAILS*, click **SELECT SERVER**

Select Server Type



1. In Select From, select Server Types Already in Cluster
2. Select the VMware, Inc. VMware Virtual Platform server type
3. Click OK

Run Scenario

Specification

Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz, 2.1 GHz,
1 Sockets, 4 Cores, 16 GB RAM

2019

US\$5,908

1

End Date (optional)

8/1/24

Specify an end date if the workload in this scenarios is temporary. Our engine is able to make projections up to a maximum of one year from the current date.

3

2

8/17/23

TODAY

8/17/23

30 31 1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31 1 2
3 4 5 6 7 8 9

S M T W T F S

< August 2023 >

8/17/23

8/1/24

RUN SCENARIO SAVE CANCEL

1. In *Number of servers to add*, leave the default at 1

2. In *DATE*, in *Start date*, Change the date from today's date to 2 weeks in the future.

In this exercise, we will project the scenario with *end date* approximately 12 months from today's date.

3. Click **RUN SCENARIO**

Results: Add Hosts

The screenshot shows the 'Infrastructure Planning: Traditional' interface. At the top, there's a breadcrumb trail: Home / Capacity Plan / What-If Analysis / Add Capacity. Below this, the page title is 'Results: Add Hosts'. The main content area is divided into two sections: 'Hosts for Remote Site' and 'Scenario Results'.

Hosts for Remote Site: This section contains a form for configuring a scenario. The 'Scenario' is 'Add Hosts' and the 'Date' is 'Aug 13, 2023 to Aug 13, 2024'. Under 'Add Capacity to:', there are dropdown menus for 'RegionA01 (vcse-01a.corp.vmbx)' and 'Workload1'. The 'Number of Servers' is set to '1' and the server type is 'VMware, Inc. VMware7,1'. There are 'EDIT', 'SAVE', and 'X' buttons in the top right of this section. A red arrow points from a callout '2' to the 'X' button, and another red arrow points from a callout '1' to the 'SAVE' button.

Scenario Results: This section displays the impact of adding hosts. A message states: 'After adding hosts your time remaining will still be 0 days' with a red arrow pointing to the text. Below this, the 'Total Cost' is 'US\$5,908', also with a red arrow. There are two charts: 'CPU (Demand)*' and 'Memory (Demand)*'. The CPU chart shows 'Available Capacity: 7.93 GHz of 25.14 GHz' and 'With Added Capacity: +8.38 GHz, 16.32 GHz of 33.52 GHz'. The Memory chart shows 'Available Capacity: -269.02 GB of 47.99 GB' and 'With Added Capacity: +16 GB, 0 KB of 63.99 GB'. Red arrows point to the '0 days' text, the 'Total Cost', and the 'With Added Capacity' values in both charts.

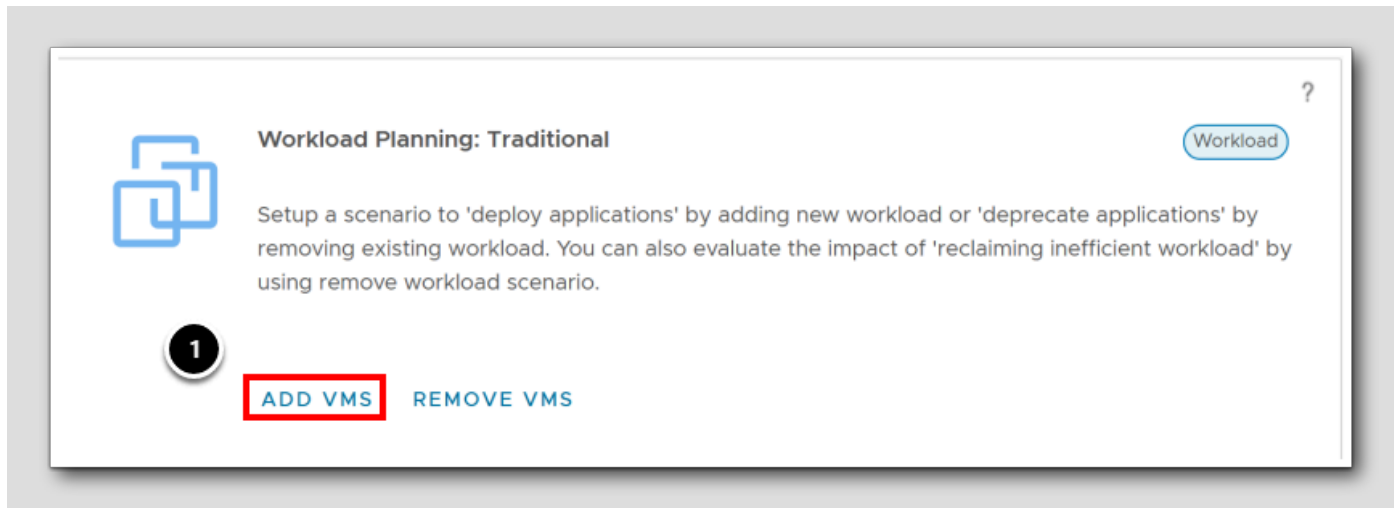
At the bottom of the 'Scenario Results' section, there is a 'COMMIT SCENARIO' button and a note: '*All capacity utilization numbers are projected peak values for forecasted period.'

The system displays immediately the impact on cluster size of the additional amount of CPU and memory, and shows the total cost of adding the specified capacity. The system also shows the extension of time remaining when adding new capacity before CPU or memory runs out. In this exercise, due to the different compute resources where this lab is running, the CPU or Memory, **Available** and **Added** capacity may vary from the figure above. We will now save this scenario to edit or run later. The list of saved scenarios is available on the **What-If Analysis** main page.

1. Click **SAVE**
2. Click "X" to close this scenario

What-If Analysis - Workload Planning: Traditional

[660]



We will now plan a new scenario of a future deployment of applications, by adding the application workloads (VMs).

1. From the What-If Analysis page, in the pane titled *Workload Planning: Traditional*, click **ADD VMS**.

Add VMs

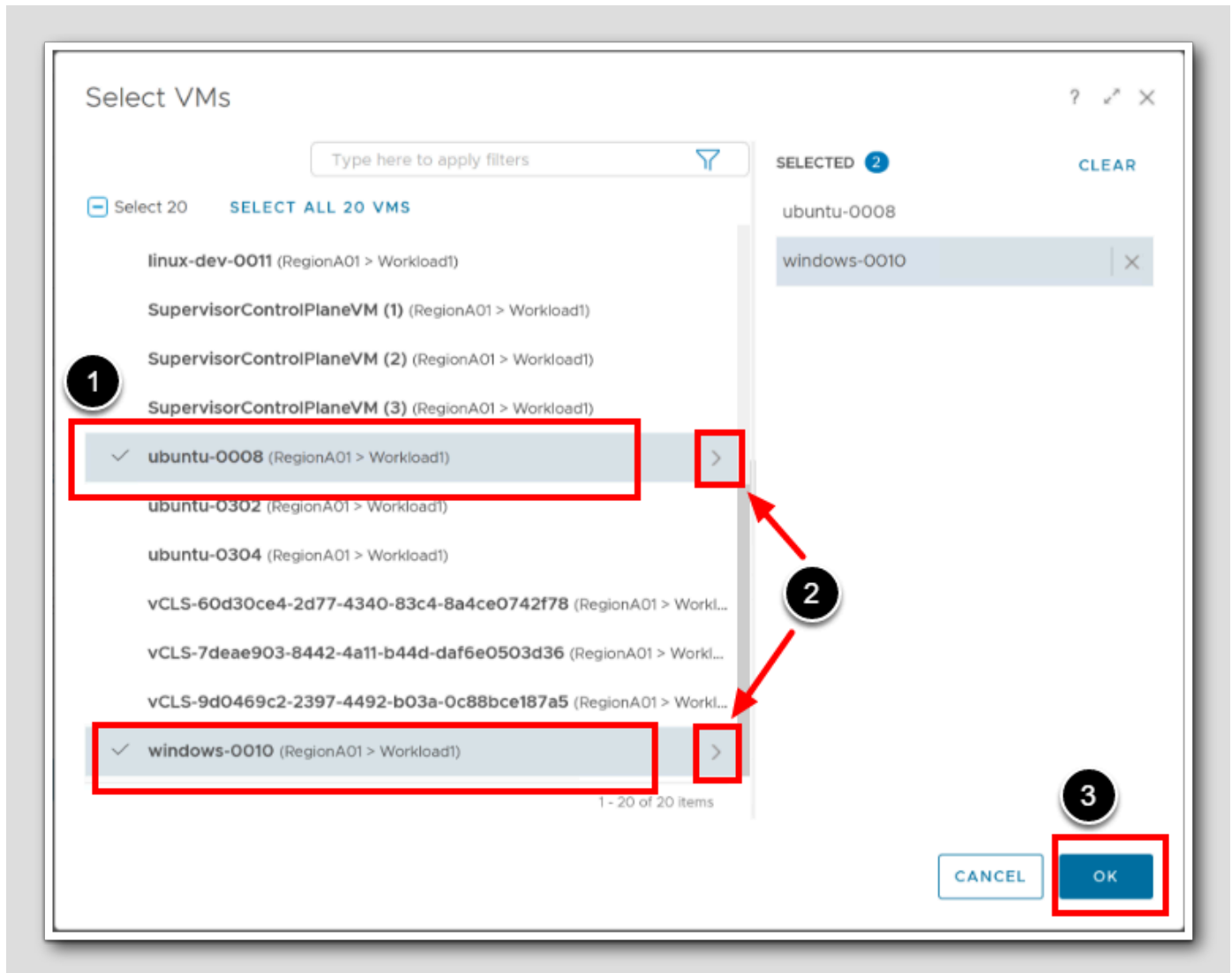
When selecting the profile of our workload, we have two options:

- Configure the workload manually by specifying virtual CPUs, memory, storage, and expected use percentage. We have the further option to click **Advanced Configuration** and specify more precise characteristics for our workload.
- Use an existing virtual machine or templates, importing all the attributes of the selected virtual machine to our workload scenario. The system allows us to specify how many copies of each selected virtual machine we want to add to the proposed workloads.

In this exercise, instead of guessing the size of our workload, we will Import from an existing VM:

1. Enter the SCENARIO NAME as: **New Application**
2. In LOCATION, click drop-down to select **RegionA01 (vcsa-01a.corp.vmbeans.com)**, and click the other drop-down to select **Workload1**
3. In *Application Profile*, select **Import from existing VM**
4. Lastly, click **SELECT VMS**

Select similar VM build



In this scenario, the existing two VMs (Linux and Windows) was built from the same VM Template that will be used to build our New Application VMs.

1. Select the **ubuntu-0008** and **windows-0010** VMs from the list. We can use *Ctrl+Select* to select both.
2. Click on the **>** arrow for the VMs to move the VMs into the selected list
3. Click OK

Enter how many VMs will be needed

VM Name	CPU (Demand)	CPU (Allocation)	Memory (Demand)	Memory (Allocation)	Disk Space	Quantity
windows-0010	110.4 MHz	2 vCPU	1.87 GB	4 GB	22.5 GB	2
ubuntu-0008	79.33 MHz	1 vCPU	516.94 MB	1 GB	5.34 GB	10

The number of selected VMs defaults to 1 so we will need to change this to make it accommodate the power needed for our application.

1. Click on the **Edit** pencil icon in the Quantity section and update it to **2** for the windows server windows-0010
2. Click on the **Edit** pencil icon in the Quantity section and update it to **10** for the Linux server ubuntu-0008

Enter the Date Range and Run Scenario

The screenshot shows a configuration window for a workload scenario. At the top, resource requirements are listed: 3 MHz, 1 vCPU, 516.94 MB, and 1 GB. Below this, there are fields for 'Start Date' and 'End Date (optional)'. A calendar for August 2023 is open, with the date 8/31/23 selected. A callout box labeled 'One Month ahead' points to the calendar. The 'Start Date' field contains '8/31/23' and the 'End Date (optional)' field contains '11/30/23'. At the bottom, there are three buttons: 'RUN SCENARIO', 'SAVE', and 'CANCEL'. The 'RUN SCENARIO' button is highlighted with a red box. Three numbered callouts (1, 2, 3) point to the calendar, the end date field, and the 'RUN SCENARIO' button respectively.

Next, we enter the start and end date for the period when we want the workload to be active. The default is: starting today and ending one year from today. The system can project scenarios ending up to one year from the current date. For this Exercise we will be installing the VMs one month from now and will be running until the end of the year

1. For **Start Date**, select a date approximately one month from today's date
2. For **End Date**, select the last date approximately 3 months from today's date.
3. Click **RUN SCENARIO**

Results: Add VMs

The screenshot shows the VMware Workload Planning interface. At the top, it says "Workload Planning: Traditional" and "Capacity Plan / What-If Analysis / Add Workload". Below this, it says "Results: Add VMs".

Under "New Application", there is a table with the following data:

Scenario	Add VMs	Total to be Added	12 VMs	CPU	Memory	Disk Space
Date	Sep 13, 2023 to Dec 14, 2023	Demand	1.26 GHz	9.29 GB	99.51 GB	
		Allocation	14 vCPU	18 GB	179.13 GB	

Below the table, it says "Add VMs to: RegionA01 (vcsa-01a.corp.vmbi) Workload1 RUN SCENARIO".

At the bottom, there is a yellow warning banner that says: "The workload does not fit in Workload1 within your selected timeframe and would decrease your time remaining from 0 days to 0 days." Below this, there is a table showing the peak resource usage for Workload1:

Workload1	Demand	Peak CPU	Peak Memory	Peak Disk Space
		20.49 GHz	122.3 GB (Deficit)	474.91 GB (Deficit)

Red arrows in the screenshot point to the "SAVE" button in the top right corner and the "X" button next to it. Another red arrow points to the warning message in the yellow banner. A third red arrow points to the "Peak CPU" value, and two more red arrows point to the "Peak Memory" and "Peak Disk Space" values, which are both marked as "Deficit".

The system lets us know immediately if the proposed workload fits or does not fit in the suggested location, because of the memory and disk space deficit. In this case the Remote Site has no active hosts yet so the proposed workload **does not fit**. Aria Operations announces the outcome and provides the following information:

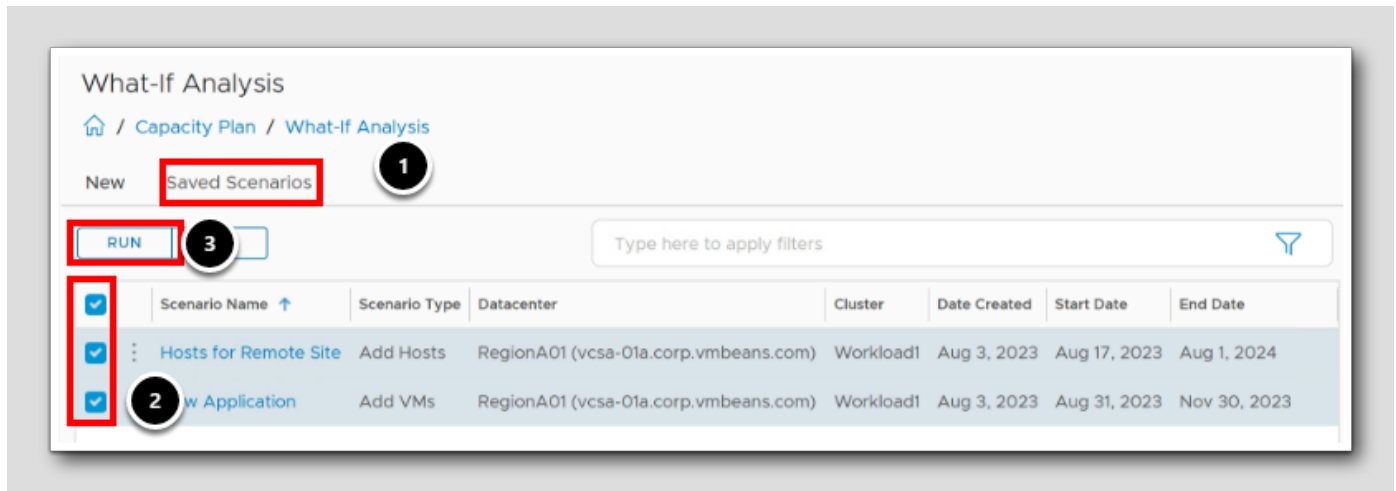
- How much the added workload reduces the *time remaining* for the target cluster
- The discrepancy between the space available in the target cluster and what the proposed workload requires

***We will need to run a **Multiple Scenario** to simulate the Host resource availability combined with the demand of the proposed VMs to accommodate room enough for our new Application.

We can now save the scenario to edit or run later on. A list of saved scenarios is available on the **What-If Analysis** main page.

1. As We did before, Click **SAVE**
2. Click "X" to close this scenario

Running Multiple Scenarios

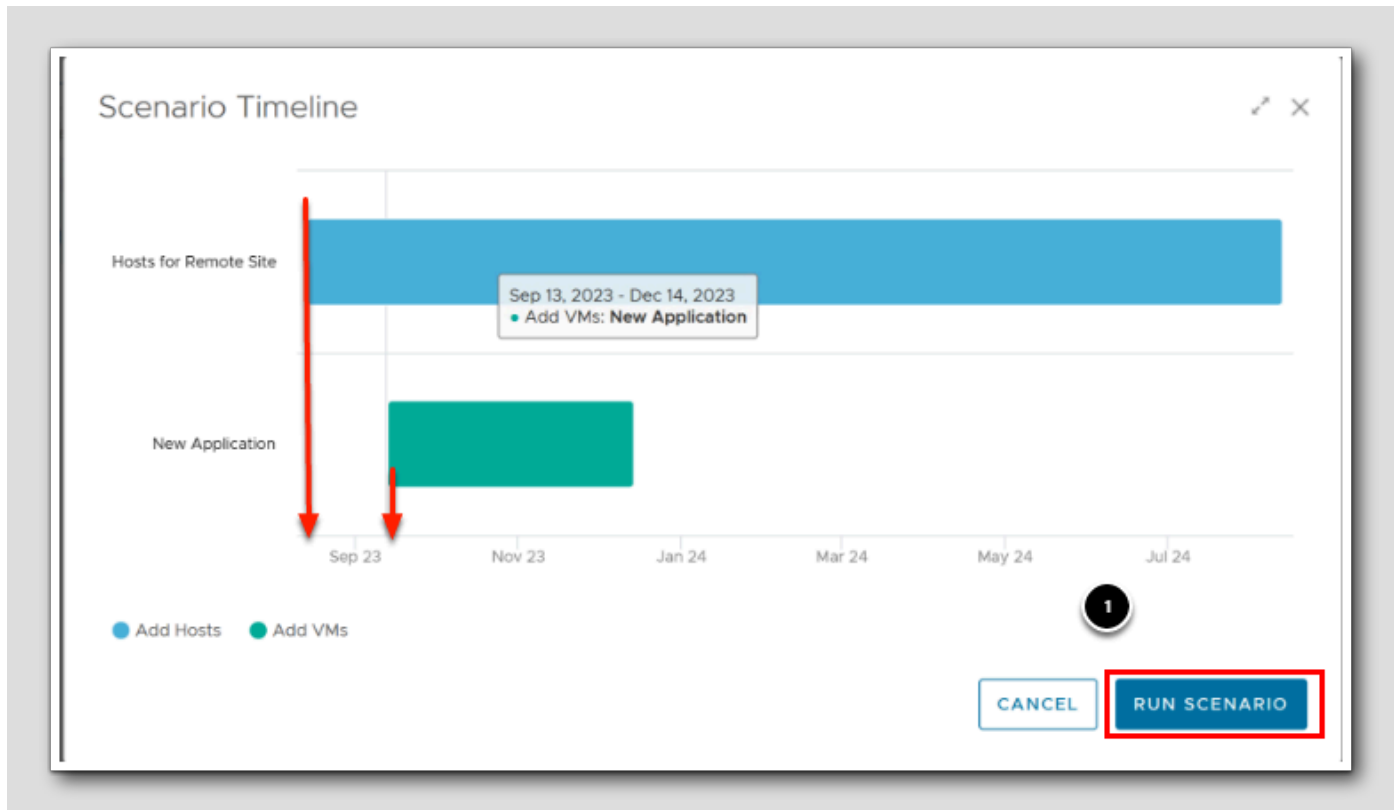


"Saved scenarios are listed under the 'Saved Scenarios' tab for later use, and can be run, edited, or deleted. 'Stacked Scenarios' let us run compatible scenarios together, for instance, planning hardware updates by removing old hosts and adding new ones. This lets us preview capacity after these changes. **Note:** only scenarios involving the same object can be combined. In this exercise, we'll run our scenarios together to predict our final capacity, as we add our New Application workloads and one host in Workload 1."

1. Click **Saved Scenarios**
2. Select the previously two created scenarios: **New Application** and **Hosts for Remote Site**
 - ***Note the disparate Scenario Start & End Date for each Scenario***
3. Click **RUN**

Scenario Timeline

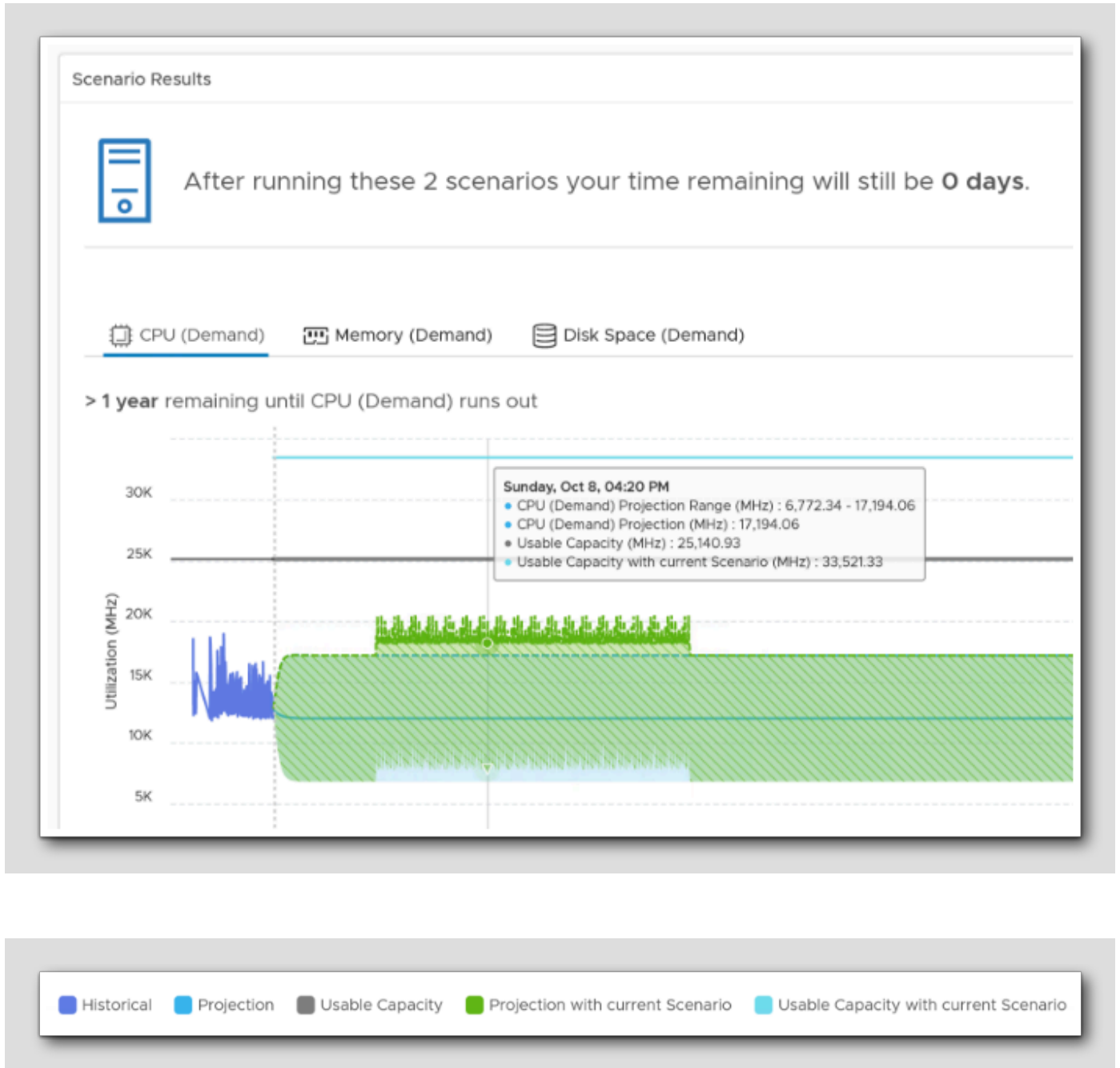
[667]



The *Scenario Timeline* indicates the projected **start and end dates** of the scenarios we previously configured. Adding the new application comes after we add hosts.

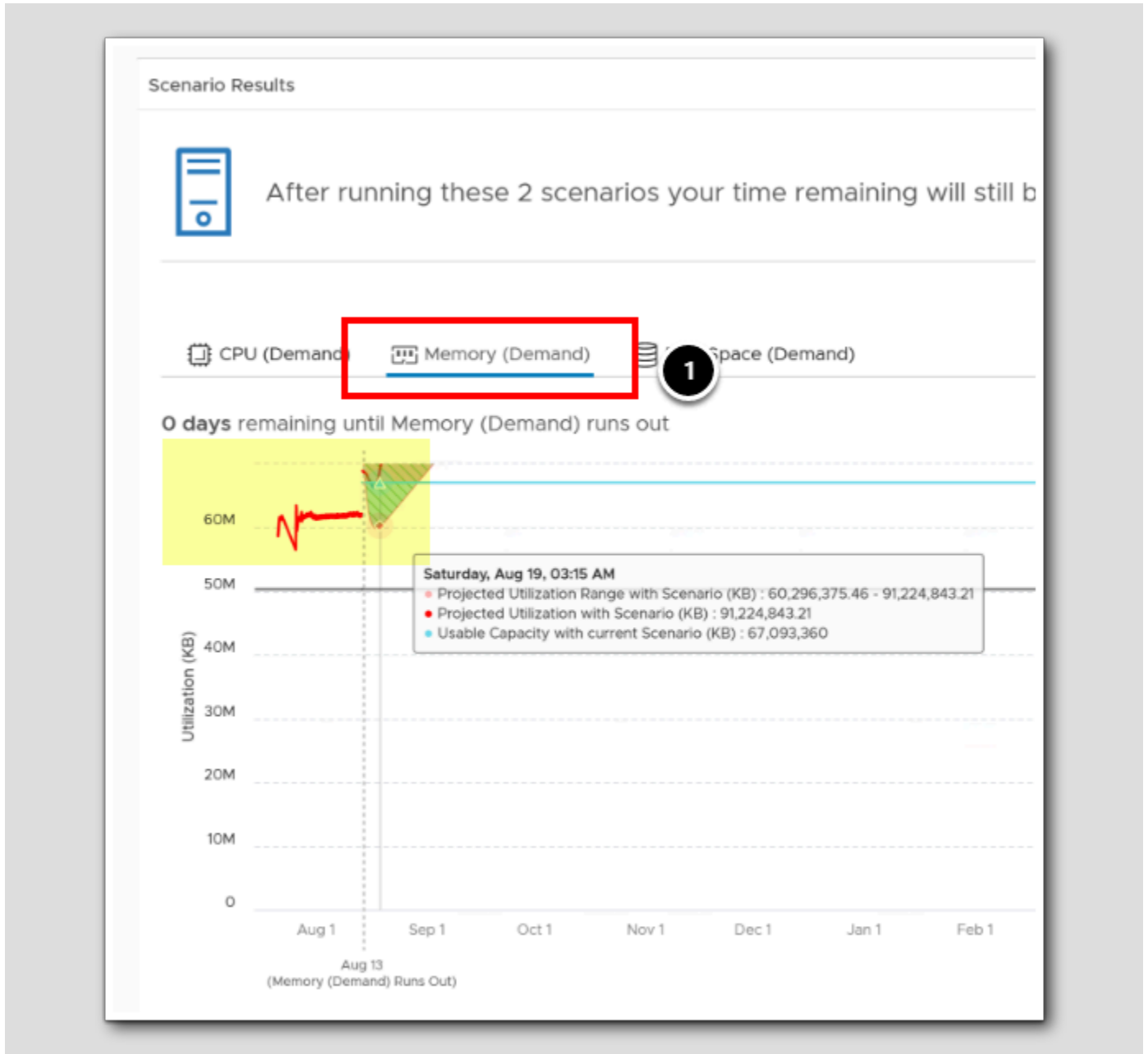
1. Click RUN SCENARIO

CPU demand Scenario Result



Immediately we see that even if we project a certain load, by adding several VMs, it does not exceed the Usable Capacity. Also notice that the CPU Usable capacity increases a lot from adding servers.

Memory Demand Scenario Result



On the previous page we saw that one host would be enough for CPU demand. But, let's check the Memory Demand.

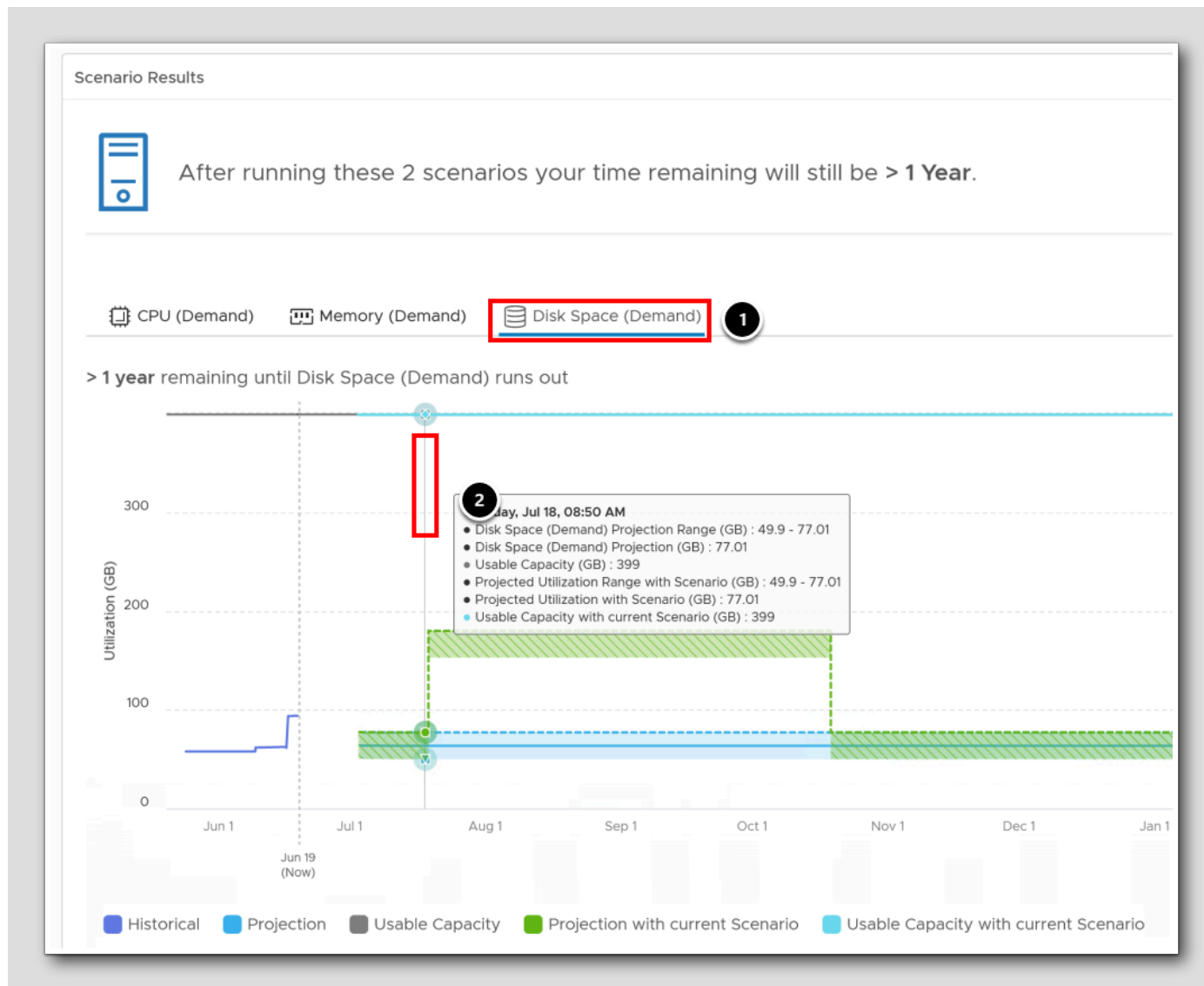
1. Click on **Memory (Demand)**

These curves are out of proportion. We notice an increase in the projection due to added VMs, the 'Usable Capacity With Current Scenario' shows a significant rise compared to 'Usable Capacity', but in this particular scenario, we predict memory issues both now and after the added capacity.

The plan is to integrate more than just 1 planned extra server, to make sure we accommodate the need for memory.

NOTE: Keep in mind, images may differ due to our Lab environment.

Disk Space Scenario Results



We had a bottleneck with **Memory**, we'll need the new host. Let's check **Disk Space**.

1. Click on **Disk Space**
2. Hover the mouse to see what date our scenario is projected

Note: Memory was a bottleneck; the new host is necessary. In this particular scenario, we're set with disk space, pre- and post-server addition, thanks to existing storage in this cluster.

NOTE: Keep in mind, images may differ due to our Lab environment.

Multiple Scenarios

Home / Capacity Plan / What-If Analysis / Stacked

Scenario Summary EDIT X

Scenarios Selected 2 [VIEW ON TIMELINE](#)

Run on Cluster RegionA01 Workload1

Scenario Results 3

After running these 2 scenarios your time remaining will still be **> 1 Year.**

CPU (Demand) Memory (Demand) Disk Space (Demand)

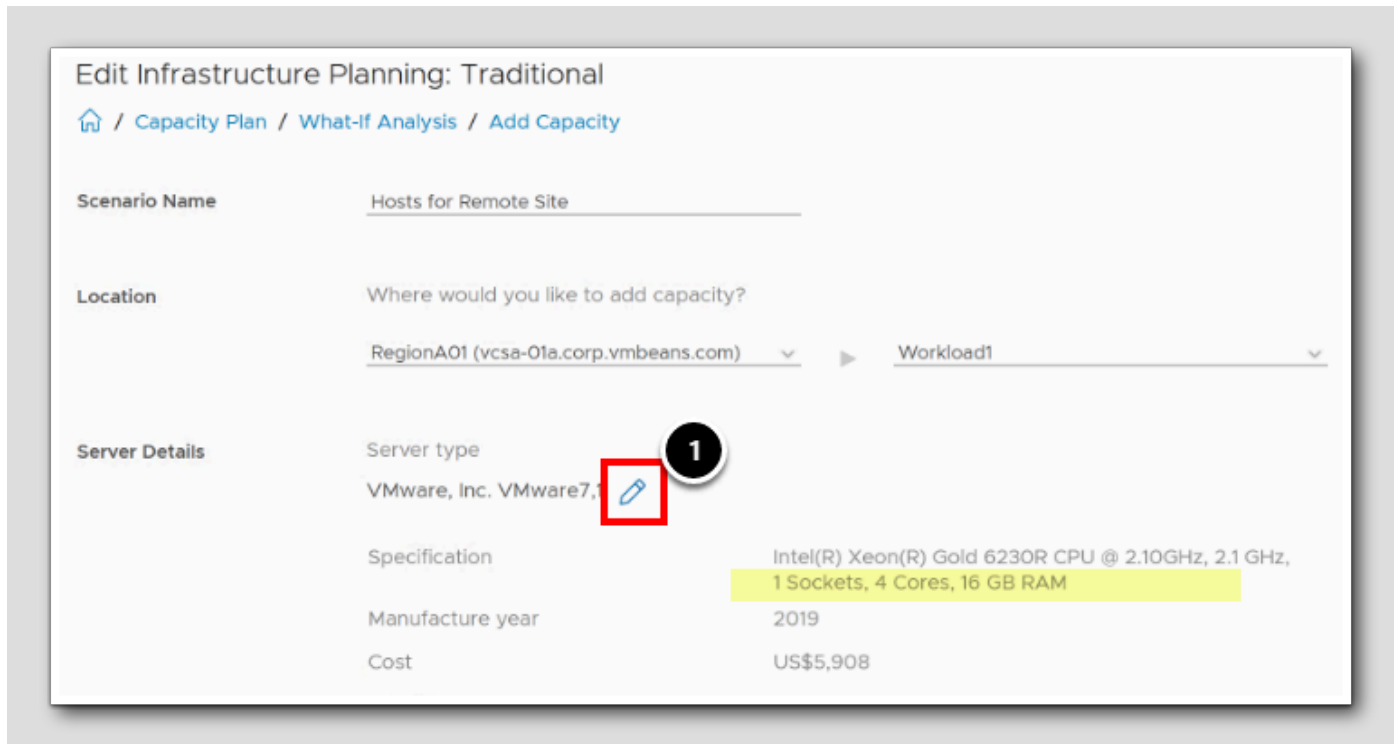
> 1 year remaining until Disk Space (Demand) runs out

300


Edit an existing Scenario

[671]

Adding a different server



The screenshot shows the 'Edit Infrastructure Planning: Traditional' interface. The breadcrumb navigation is: Home / Capacity Plan / What-If Analysis / Add Capacity. The 'Scenario Name' is 'Hosts for Remote Site'. The 'Location' is 'RegionA01 (vcsa-01a.corp.vmbeans.com)' and 'Workload1'. Under 'Server Details', the 'Server type' is 'VMware, Inc. VMware7,1' with a pencil icon highlighted by a red box and a circled '1'. The 'Specification' is 'Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz, 2.1 GHz, 1 Sockets, 4 Cores, 16 GB RAM'. The 'Manufacture year' is '2019' and the 'Cost' is 'US\$5,908'.

Field	Value
Scenario Name	Hosts for Remote Site
Location	RegionA01 (vcsa-01a.corp.vmbeans.com) ▶ Workload1
Server type	VMware, Inc. VMware7,1 
Specification	Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz, 2.1 GHz, 1 Sockets, 4 Cores, 16 GB RAM
Manufacture year	2019
Cost	US\$5,908

We have to admit that the small server we added did not meet our needs. We will now add a more resilient server to accommodate our memory problems for now and the future. Let's edit the server type.

1. Under the *Server Details*, Click the Pencil Icon

Select Server Type

Select Server Type

Currently Selected: **Lenovo ThinkServer RD440**, 2 Sockets, 8 Cores, 192 GB RAM

Select From: **All Server Types**

Search: **lenovo**

Make	Model	CPU	Sockets	Cores	Memory	Year	Cost
Lenovo	ThinkServer RD630 2595	Intel® Xeon® Processor ...	2	16	320 GB	2012	US\$35,881
Lenovo	PureFlex System x240	Intel® Xeon® Process	2	20	256 GB	2013	US\$11,694
Lenovo	ThinkServer RD440	Intel® Xeon® Processor ...	2	8	192 GB	2014	US\$9,996
Lenovo	ThinkServer RD340	Intel® Xeon® Processor ...	2	8	192 GB	2014	US\$19,888
Lenovo	ThinkServer RD340 70A...	Intel® Xeon® Processor ...	2	12	192 GB	2014	US\$18,999
Lenovo	ThinkServer RD540 70A...	Intel® Xeon® Processor ...	2	20	160 GB	2013	US\$11,999

1 - 20 of 667 items

CANCEL OK

1. Under Select from, from the drop-down list, choose **All Server Types**
2. In the *search** field, type **Lenovo**, and press ENTER
3. Sort the *Memory column* from high to low, by clicking the **column header** twice
4. Select the **Lenovo Thinkserver RD440**
5. Click **OK**

* We can search for other server vendors, for example Dell, Acer, HPE, IBM, or others that would fit our environment or purchasing agreements.

Changing amount and date

Server Details

Server type
Lenovo ThinkServer RD440

Specification
Intel® Xeon® Processor E5-2403 v2, 1.8
2 Sockets, 8 Cores, 192 GB RAM

Manufacture year
2014

Cost
US\$9,999

Number of servers to add
1

Date

Start Date
8/29/23

End Date (optional)
8/13/24

Specify an end date if the workload in this scenarios is temporary. Our engine is able to make projections up to a maximum of one year from the current date.

RUN SCENARIO **SAVE** **TODAY**

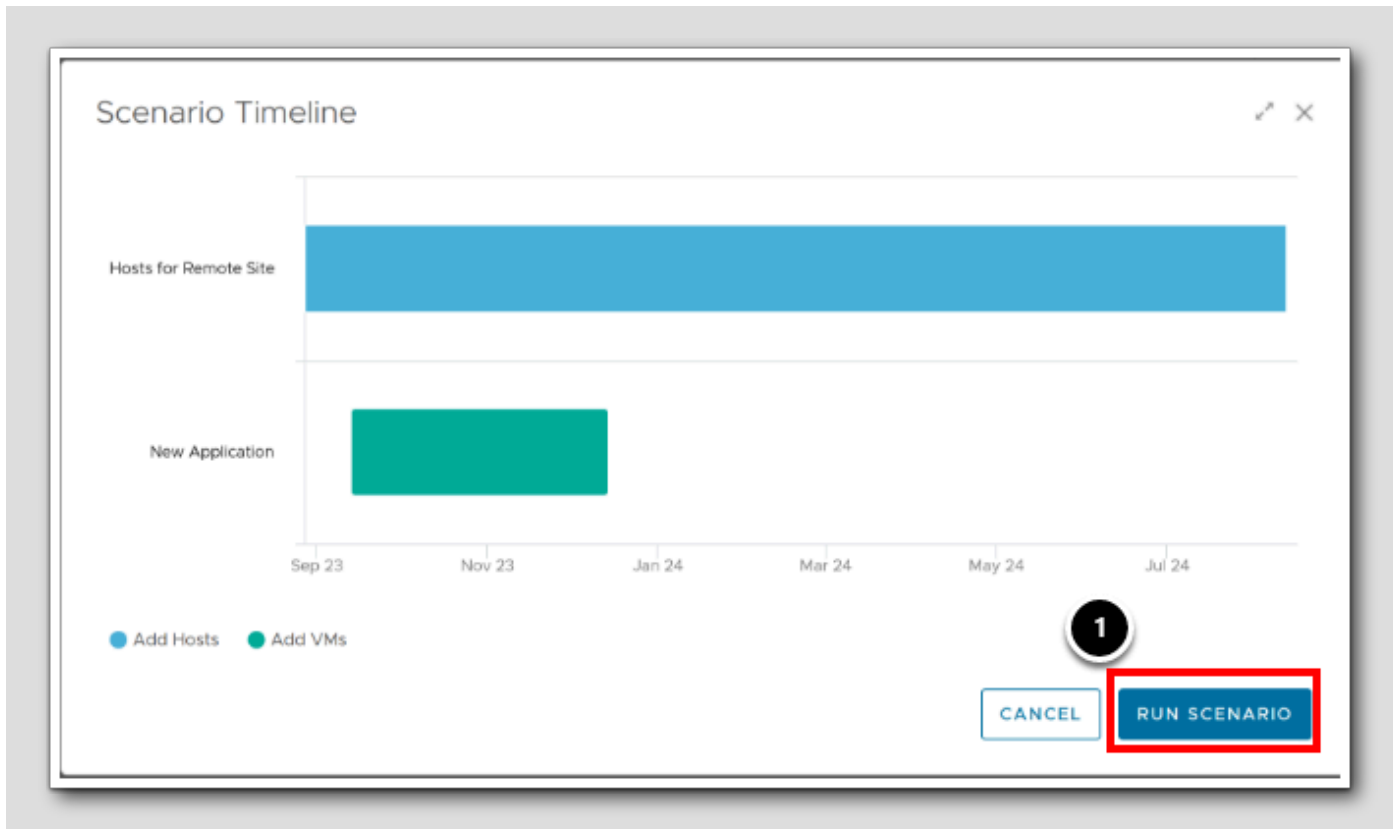
We will make a couple of small changes before we add server capacity.

1. From the Number of servers to add, type 1
2. Under Date, change the Start Date to be two weeks in the future
3. Click **SAVE** (almost hidden)

Using the new Datacenter Requirements

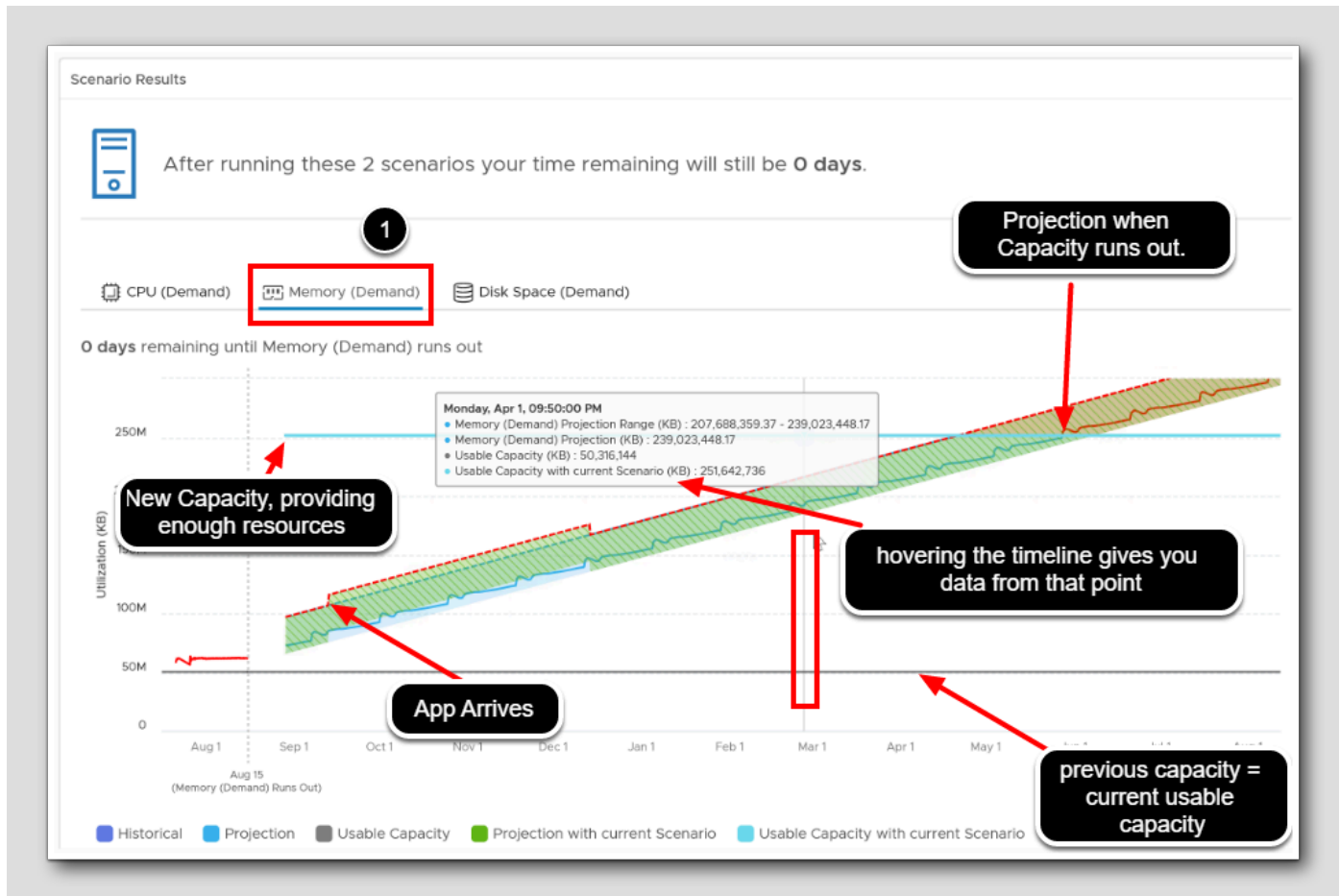
Scenario Timeline

[676]



1. Click RUN SCENARIO

Enough resources for the New Application

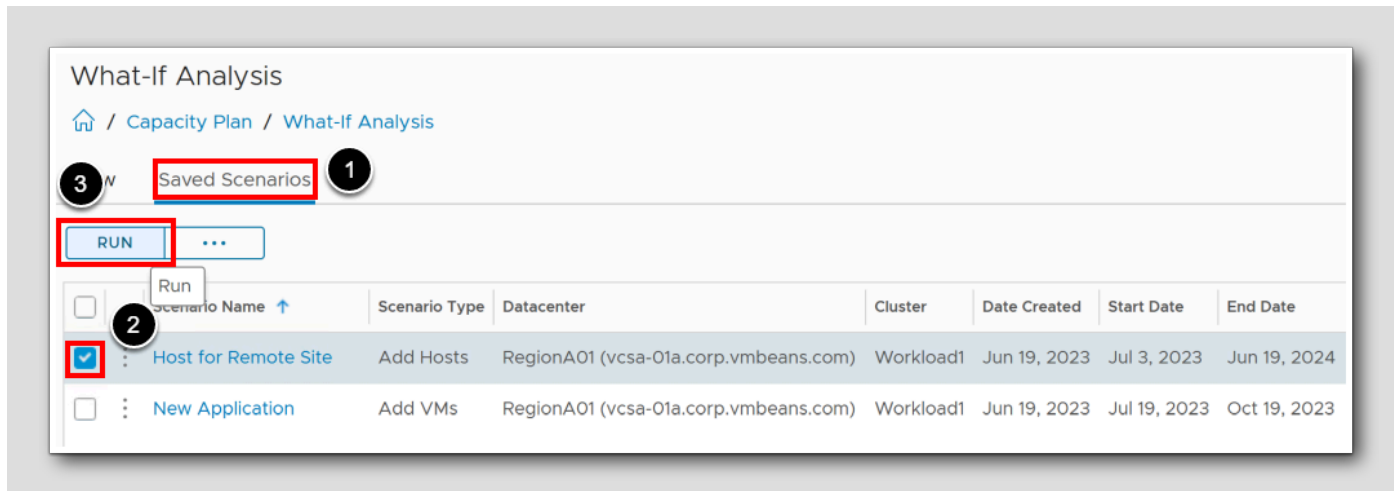


Let's go straight to the memory section to see if we have solved the memory problem

1. Select the Memory (Demand)
2. As we see from the image with annotations, we now have more than enough memory for our New Application.
3. To close the Multiple Scenarios, Scroll to the top and Click X (not shown)

NOTE: Keep in mind, images may differ due to our Lab environment.

Lets check what the cost of 1 Hosts will be in our Private Cloud



The screenshot shows the VMware What-If Analysis interface. At the top, there is a breadcrumb trail: Home / Capacity Plan / What-If Analysis. Below this, there is a 'Saved Scenarios' section with a 'RUN' button and a dropdown menu. A table of scenarios is displayed below, with the 'Host for Remote Site' scenario selected. The table has columns for Scenario Name, Scenario Type, Datacenter, Cluster, Date Created, Start Date, and End Date.

Scenario Name	Scenario Type	Datacenter	Cluster	Date Created	Start Date	End Date
Host for Remote Site	Add Hosts	RegionA01 (vcsa-01a.corp.vmbeans.com)	Workload1	Jun 19, 2023	Jul 3, 2023	Jun 19, 2024
New Application	Add VMs	RegionA01 (vcsa-01a.corp.vmbeans.com)	Workload1	Jun 19, 2023	Jul 19, 2023	Oct 19, 2023

1. Select Saved Scenarios
2. Select only the Hosts for Remote Site this time
3. Click RUN

Cost Results for Adding Hosts

Infrastructure Planning: Traditional

Home / Capacity Plan / What-If Analysis / Add Capacity


Results: Add Hosts

Hosts for Remote Site EDIT | SAVE * X


Scenario: Add Hosts


Date: Aug 29, 2023 to Aug 13, 2024

Add Capacity to: RegionA01 (vcsa-01a.corp.vmbi) ▶ Workload1 ▼


Number of Servers: 1 ▾ Lenovo ThinkServer RD440  RUN SCENARIO

Scenario Results COMMIT SCENARIO

 After adding hosts your time remaining will still be **0 days**

Total Cost: **US\$9,996** 


CPU (Demand)*



Available Capacity: 8.02 GHz of 25.14 GHz

With Added Capacity: +14.4 GHz, 22.42 GHz of 39.54 GHz

Memory (Demand)*



Available Capacity: -263.03 GB of 47.99 GB

With Added Capacity: +192 GB, 0 KB of 239.99 GB

About Committed Scenarios

Before we move on, take a moment to read through this:

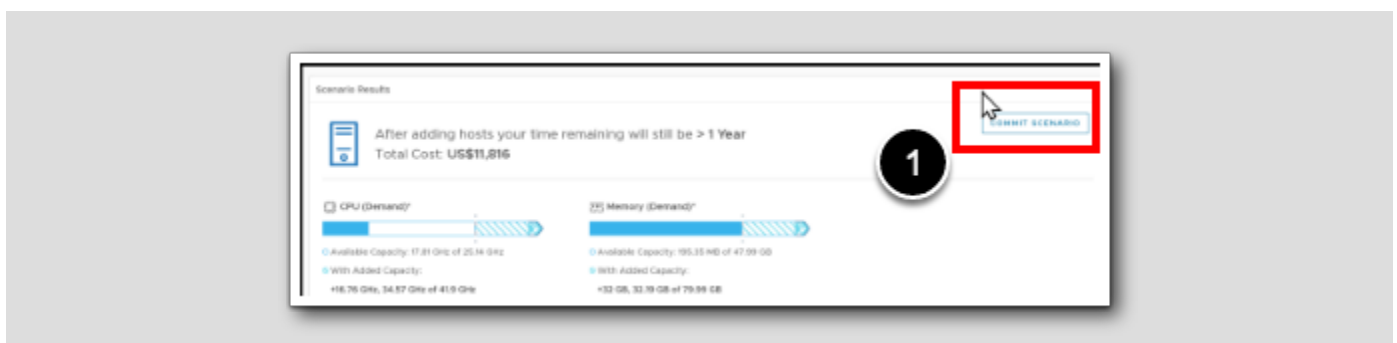
Committed Scenarios:

- When we're sure that we need to reserve capacity, we can commit the scenario to have VMware Aria Operations set aside resources for new, upcoming, or planned workloads.
- A committed scenario is a supposition about how the capacity and load change on our objects when we change the conditions in our virtual infrastructure environment.
- We do not have to implement the changes that our committed scenario represents. By committing a scenario, we can determine our capacity requirements before we implement the actual changes.

Why Create a Committed Scenario?

- In organizations which have separate capacity management and operations teams, committing a scenario helps stakeholders understand the current capacity and upcoming capacity requirements across the board.
- With committed scenarios, capacity is reserved and this prevents the operations team from performing adhoc resource increase on workloads, while the capacity manager is engaged in resource planning of new projects.
- Committed Scenarios also helps the team responsible for infrastructure expansion, as it provides actionable insights into future scenarios. In the event capacity becomes limited, it could be accounted for in the expansion

Committing our Scenario



We would like to commit our scenario and reserve capacity

1. Click the COMMIT SCENARIO button.

The Create Committed Scenario fly-out opens from the right hand side of the page.

Create Committed Scenario

Name

Cluster Workload1 2

Parameters	Value
Make	Lenovo
Model	ThinkServer RD440
Year	2014
CPU	Intel® Xeon® Processor E5-2403 v2, 1.8 GHz
Sockets	2
Cores	8

Start Date 3

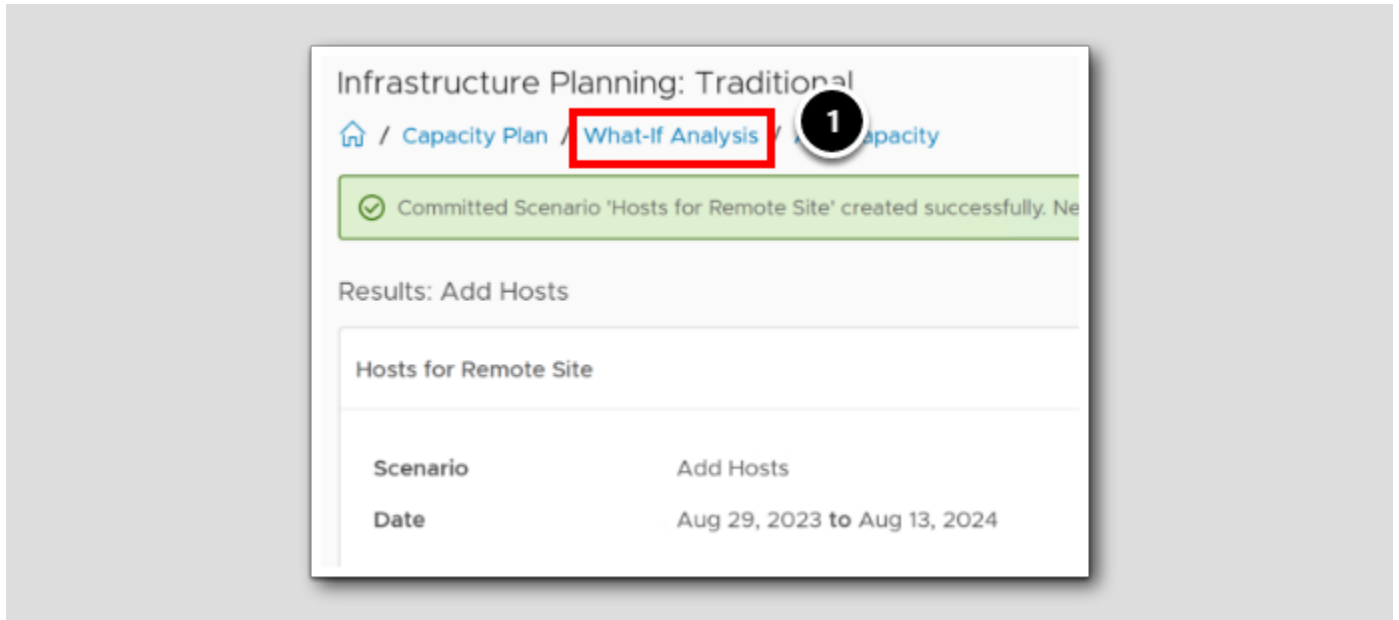
End Date 4

Specify an end date if the workload in this scenarios is temporary.

2. Add a name to the scenario we want to commit.
3. Provide an implementation date, a week from now (end date is optional)
4. Click SAVE.

Close

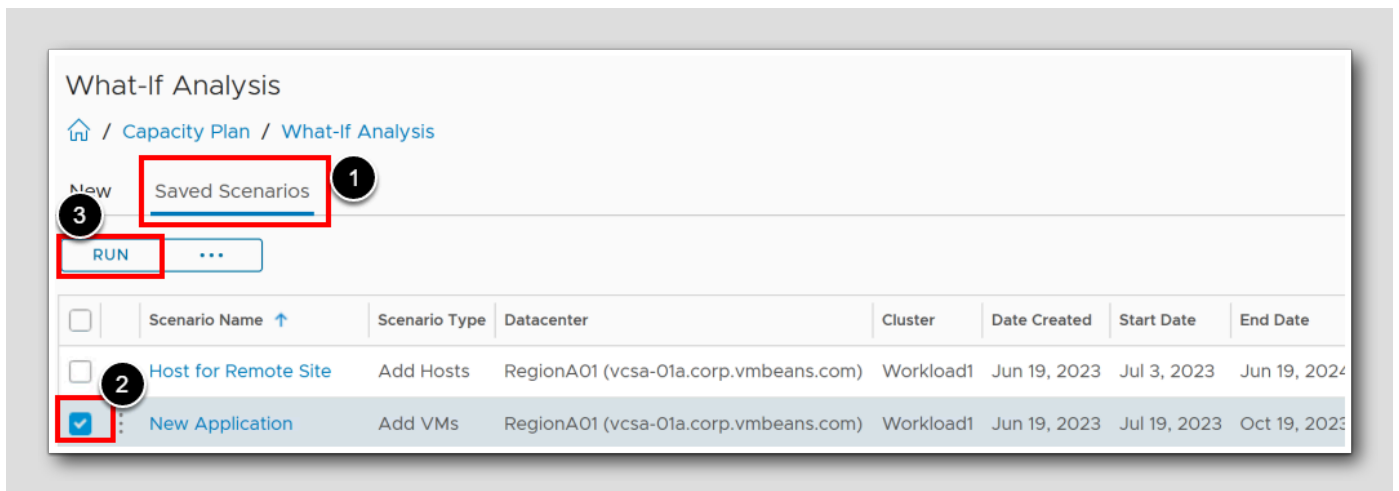
[682]



1. Click the Link to What-If Analysis

Where else could we put our New Application?

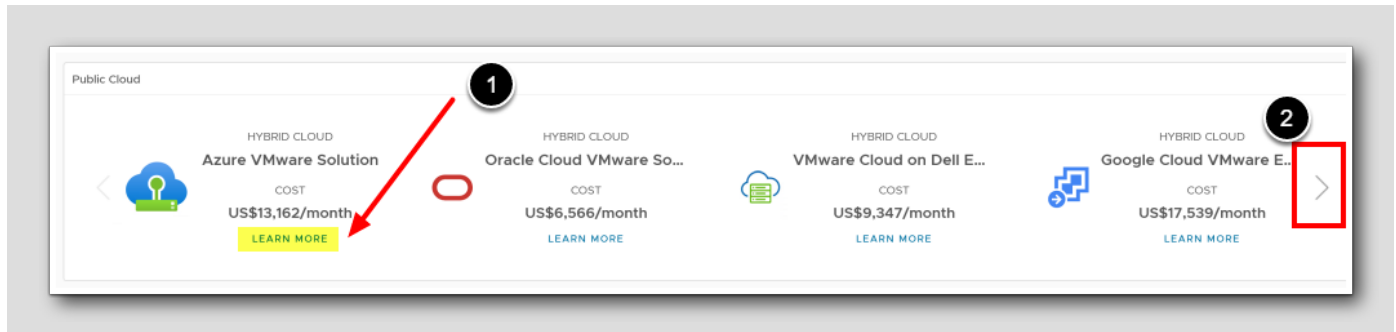
[683]



1. Select Saved Scenarios
2. In front of our application, Check the checkbox
3. Click Run

Public Cloud section for Add VMs

[684]



We can see the cost per month for different private and public clouds, and the Public Cloud section displays information which help us understand where our workload would fit, the associated costs, and the time remaining (Private Cloud) based on peak CPU, Memory, and Disk Space for demand and allocation model after we add VMs.

1. Without clicking, you could for a more detailed comparison click **Learn more**.
2. For more Public Cloud Options, click the **Scroll Right** button

NOTE: Keep in mind, images may differ due to our Lab environment.

This concludes this part of the module.

Conclusion

[685]

We have seen that when we're using the **What-If** tool, we can plan for an increase or decrease in workload or capacity requirements in the virtual infrastructure.

We can also determine how much capacity is required to make a migration work. We can run one scenario or group scenarios and run them cumulatively.

You've finished Module 14

[686]

Congratulations on completing the lab module.

If you are looking for additional general information on Aria Operations, try one of these:

- **VMware Product Public Page - Aria Operations:** <https://www.vmware.com/products/aria-operations.html>
- **Aria Operations - Documentation:** <https://docs.vmware.com/en/VMware-Aria-Operations/index.html>
- **Aria Operations - Cost Overview:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Configuring-Operations/GUID-79297017-77F1-40C3-930A-90CE5C388362.html>

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Module 15 - Application Monitoring (45 minutes) Intermediate

Introduction

[688]

Aria Operations monitors the availability of your processes, services, and applications. We can leverage the Telegraf agent to monitor the availability of multiple Linux processes and Windows services. Plus, Aria Operations Enterprise or Cloud customers can monitor the availability of their applications. **Linux process monitoring** can be configured to evaluate processes based on name, PID file, or via regular expressions for cases where processes may have a unique naming scheme. **Windows services** are configured via the service name.

Once Aria Operations has been configured to monitor these processes and services, it will begin collecting not only its status or running state, but also basic utilization metrics such as CPU and Memory Usage. Aria Operations can also alert you when a service or process goes down using pre-defined alerts.

Aria Operations supports native monitoring of applications using the Aria Operations Telegraf Agent. This works out of the box for most applications, but do check out the documentation first as there may be additional requirements for some applications.

In this module, we will explore and compare Discover Services and Monitor Applications.

Discover Services: Aria Operations can leverage the VMware Tools agent already installed and running on most virtual machines to discover and monitor processes and services, and to run basic OS commands and queries.

Monitor Applications: Aria Operations can deploy the an agent based on the open-source Telegraf agent to any managed virtual machines and can also collect metrics from customer-deployed open-source Telegraf agents.

You will typically get more property/configuration information from the Discover Services functionality but many more performance metrics from the Monitor Applications functionality.

Log in to Aria Operations

[689]

We will log in to a live instance of Aria Operations running in this lab.

Open the Firefox Browser from the Windows Task Bar

[690]

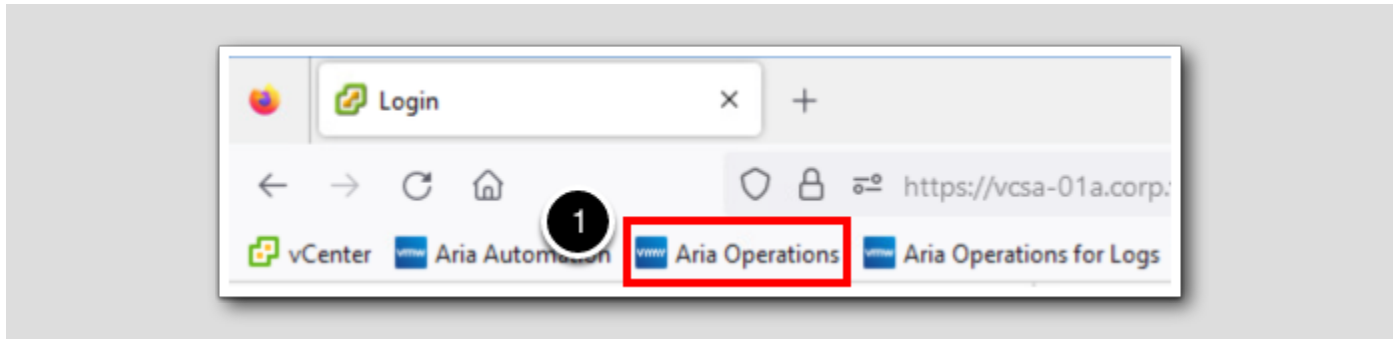


If the browser is not already open, launch Firefox.

1. Click the Firefox icon in the Windows Quick Launch Task Bar at the bottom of the screen.

Navigate to Aria Operations

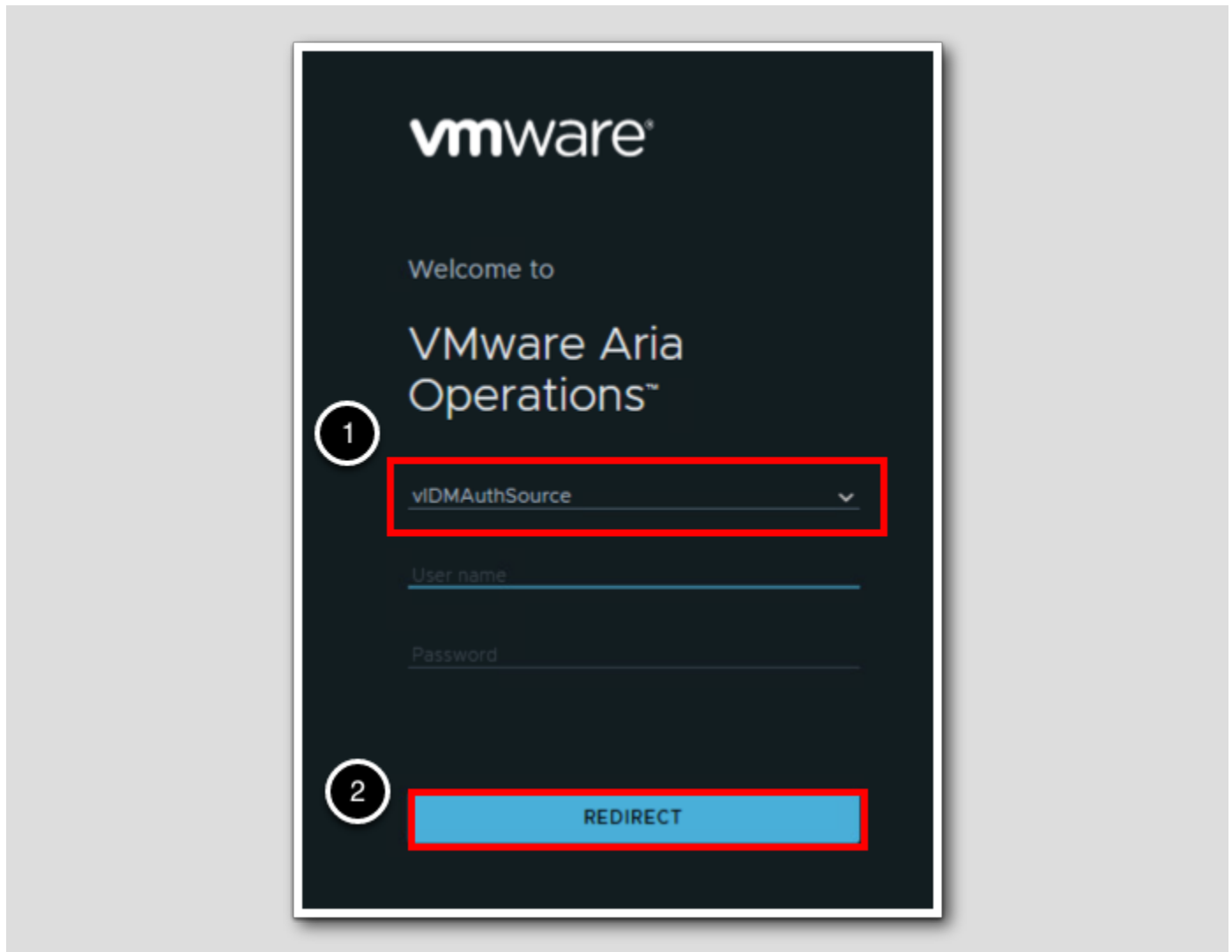
[691]



1. Click the Aria Operations bookmark in the bookmarks toolbar.

Log in to Aria Operations

[692]



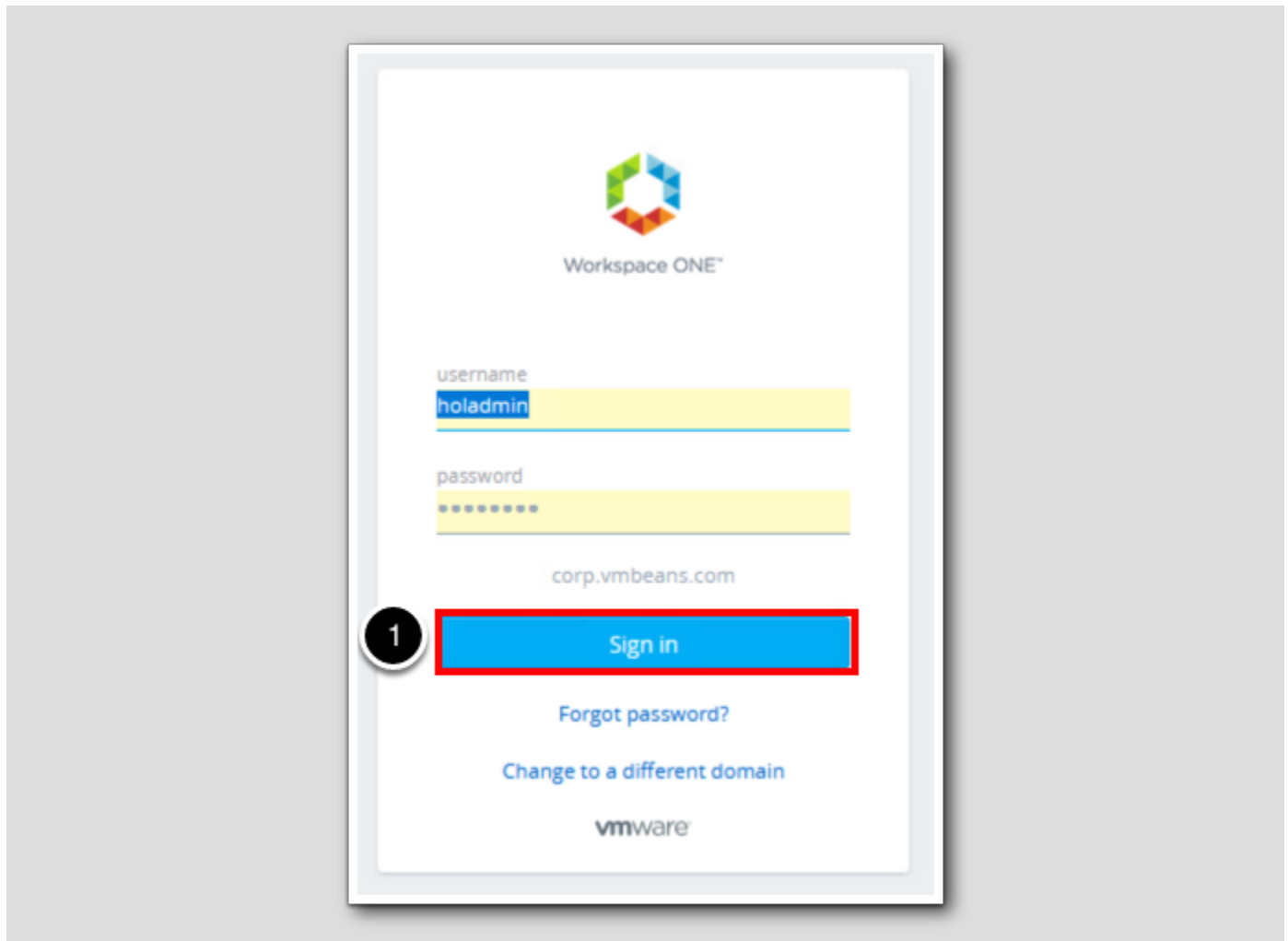
Aria Operations is integrated with VMware Workspace ONE Assist (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

vIDMAuthSource may be pre-selected as the default identity source. If it is not, then you will need to select it.

1. Click the **drop-down arrow** and select vIDMAuthSource if it is not already selected.
2. Click **REDIRECT** to be taken to the authentication page.

VMware Identity Manager Login

[693]



VMware Identity Manager acts as the identity provider for the Active Directory authentication source in this lab.

Credentials for the default user, holadmin, have already been provided.

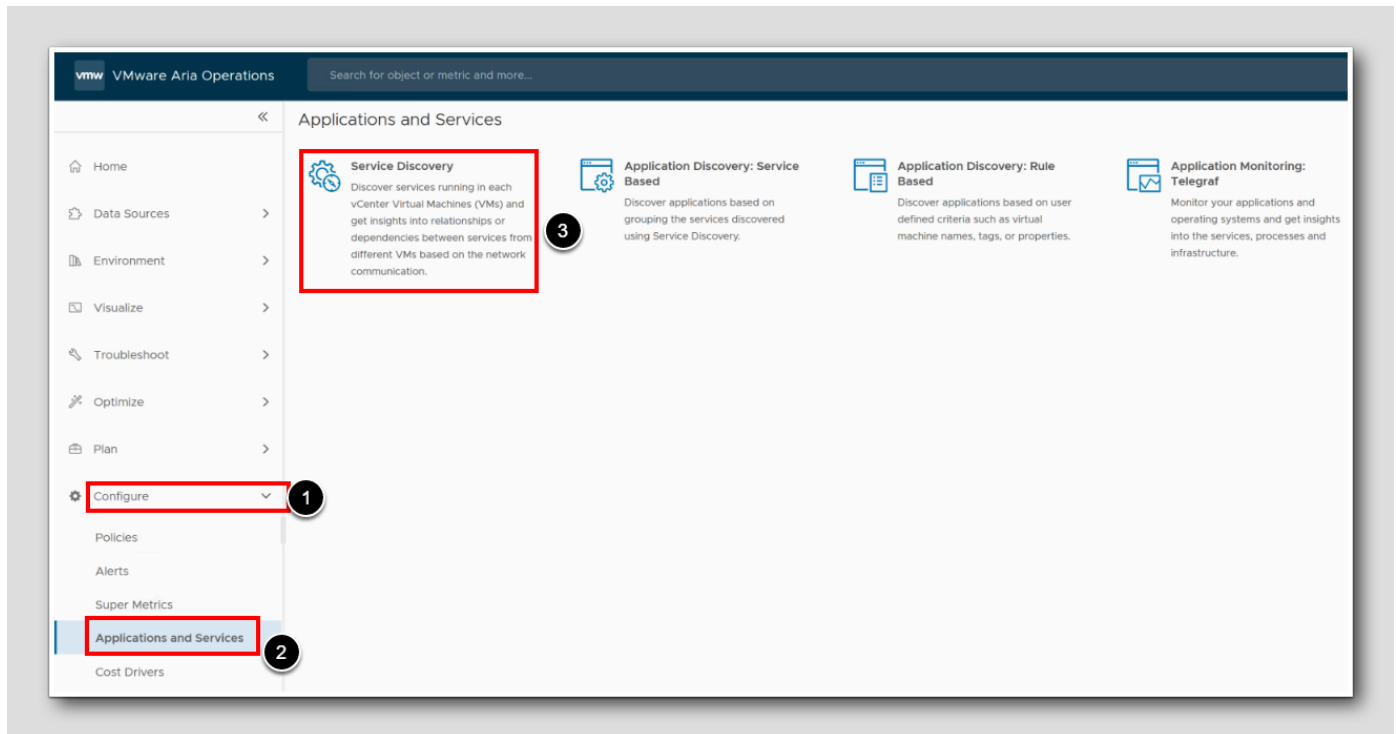
1. Click Sign in

Configure Service Discovery

[694]

To discover applications and services and their relationships and to access basic monitoring, you can either provide guest operating system credentials with appropriate privileges or use the credential-less approach to discover services.

Applications and services

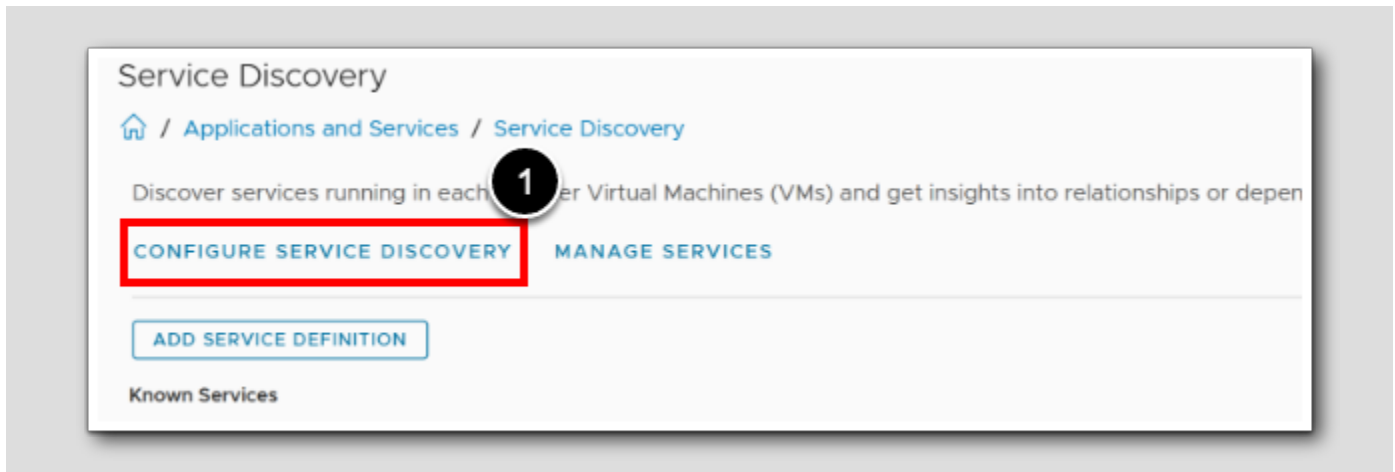


To access service discovery in Aria Operations

1. From the left menu, click **Configure**
2. Click **Applications and Services**
3. Click the **Service Discovery** tile to open Service Discovery

Configure Service Discovery

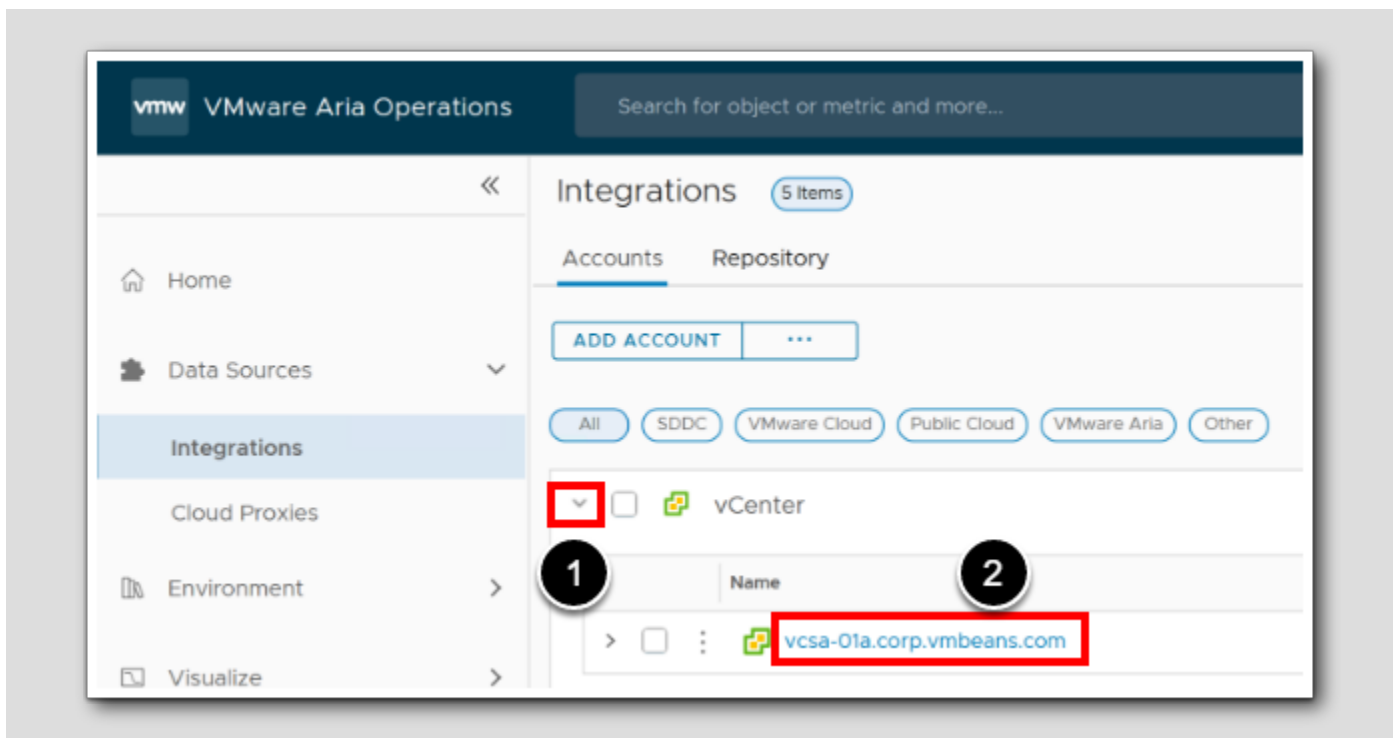
[696]



1. From the Service Discovery page, click the Configure Service Discovery option.

About the Service discovery

[697]



1. To expand the list of vCenter integrations from the Integrations page, click the > next to vCenter
2. Click the vCenter Server instance from the list: vcasa-01a.corp.vmbeans.com

Enabling Service Discovery

[698]

The screenshot shows the 'Service Discovery' configuration page in vCenter. At the top, there are three tabs: 'vCenter', 'vSAN', and 'Service Discovery', with the 'Service Discovery' tab highlighted and circled with a '1'. Below the tabs is a warning message: 'The Service Discovery works with specific versions of VMTools. For details, see KB78216'. The main text explains that the feature discovers services on virtual machines. The 'Service Discovery' toggle switch is turned on and circled with a '2'. Below it is an unchecked checkbox for 'Use alternate credentials'. The 'Enable Application Discovery' checkbox is checked and circled with a '3'. Below this are several input fields: 'Default Windows Username' with 'CORP\Administrator' (circled with '4'), 'Default Windows Password' with masked characters (circled with '5'), 'Default Linux Username' with 'holuser' (circled with '6'), and 'Default Linux Password' with masked characters (circled with '7'). There are also fields for 'Default SRM Username', 'Default SRM Password', and 'Guest User Mapping CSV Password(deprecated)', each with a visibility icon. At the bottom, there are 'SAVE' and 'CANCEL' buttons, with the 'SAVE' button circled with an '8'.

1. Select the **Service Discovery** tab.
2. To activate service discovery in this vCenter Server, activate the **Service Discovery** option.

Please Note: As Service Discovery is already set up, there's no need to change any settings. Simply click CANCEL. However, if Service Discovery was not enabled, you would need to complete all of these steps.

3. To activate application discovery in this vCenter Server, select the **Enable Application Discovery** check box.

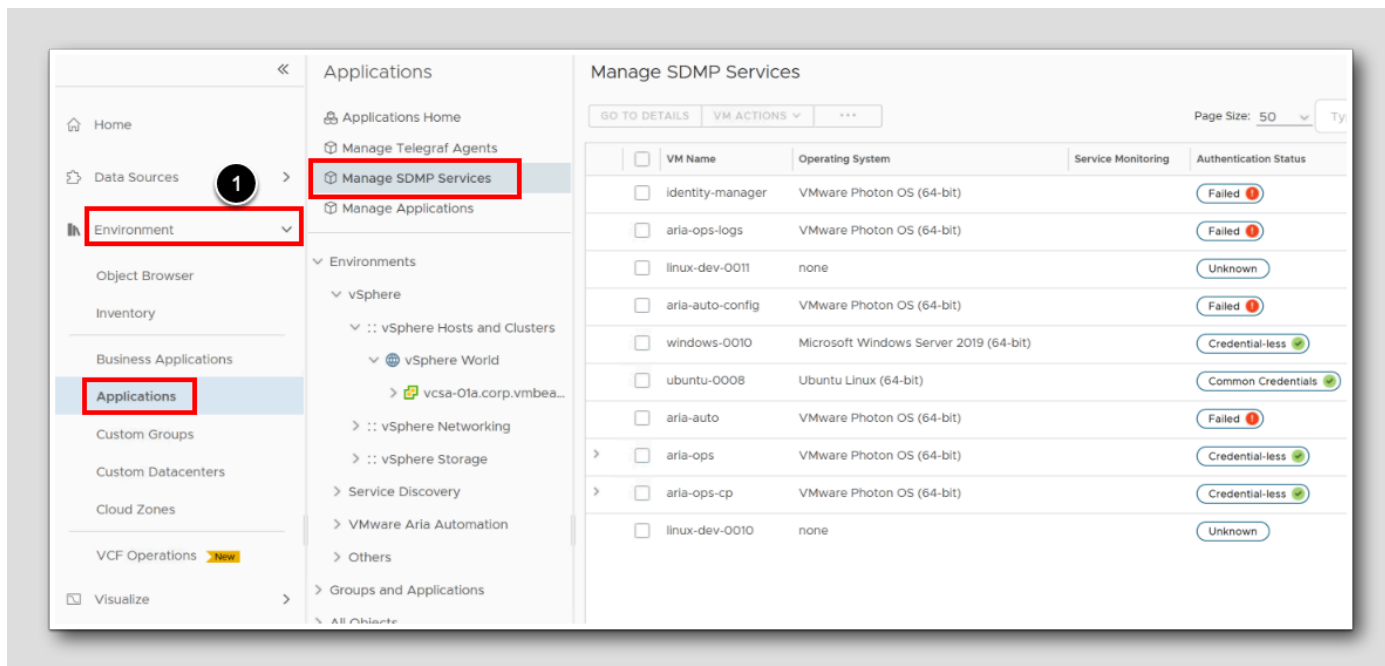
You can choose to add credentials by selecting the Use alternate credentials check box. Then you will be prompted to Click a plus sign and enter the details in the Manage Credentials dialog box, which include a credential name and a vCenter user name and password. In addition, enter the user name and password for Windows, Linux, and SRM and then click OK.

We are using the default user name and password

4. Enter a default user name for Windows, CORP\Administrator
5. Enter a default password for Windows, VMware1!
6. Enter a default user name for Linux, holuser
7. Enter a default password for Linux, VMware1!
8. Click **Save**

Manage SDMP Services

[699]



You can manage services supported by VMware Aria Operations on the specific VMs. The abbreviation SDMP, derives from the old vRealize Operations [Service Discovery Management Pack](#)

1. From the left menu, select **Environment**
2. Click **Applications**
3. From the Applications panel, select **Manage SDMP Services**

You can view specific details from the options in the data grid.

The Data grid

[700]

Services Discovered	Displays the names of discovered services. None, if services are not discovered on the VM.
Service Monitoring	Displays the current value of the VM's service monitoring setting. If set, services are discovered, and service performance metrics are calculated every 5 minutes. Otherwise, service discovery is performed every 24 hours.
Authentications Status	VM authentication status for service discovery. The possible values are: <ul style="list-style-type: none"> • Unknown • Failed • Guest Alias • Common Credentials • Credential-less
Power State	Power status of the VMs. The possible values are: <ul style="list-style-type: none"> • Powered On • Powered Off • Suspended • Unknown

The data we are looking at contains the name of the VM, and other specific details. We have highlighted a few here.

Activate Service monitoring

The screenshot shows the 'Manage SDMP Services' interface. A table lists various VMs with columns for VM Name, Operation, Service Monitoring, Authentication Status, and Power State. The 'ubuntu-0008' VM is selected, and the 'Activate Service Monitoring' option is highlighted in the context menu. A red box highlights the 'ubuntu-0008' VM name, and another red box highlights the 'Activate Service Monitoring' option in the context menu. A circled '1' is next to the VM name, and a circled '2' is next to the context menu icon.

<input type="checkbox"/>	VM Name	Op	Service Monitoring	Authentication Status	Power State
<input type="checkbox"/>	identity-manager	VM		Failed !	Powered On
<input type="checkbox"/>	aria-ops-logs	VMware Photon OS (64-bit)		Failed !	Powered On
<input type="checkbox"/>	linux-dev-0011	none		Unknown	Powered Off
<input type="checkbox"/>	aria-auto-config	VMware Photon OS (64-bit)		Failed !	Powered On
<input type="checkbox"/>	windows-0010	Microsoft Windows Server 2019 (64-bit)		Credential-less ✓	Powered On
<input checked="" type="checkbox"/>	ubuntu-0008	Ubuntu Linux (64-bit)		Common Credentials ✓	Powered On
<input type="checkbox"/>	aria-auto	VMware Photon OS (64-bit)		Failed !	Powered On
<input type="checkbox"/>	aria-ops	VMware Photon OS (64-bit)		Credential-less ✓	Powered On
<input type="checkbox"/>	aria-ops-cp	VMware Photon OS (64-bit)		Credential-less ✓	Powered On
<input type="checkbox"/>	linux-dev-0010	none		Unknown	Powered Off

Please note: On ubuntu-0008, the Service Discovery is already active. You can confirm this by looking for a green check-mark in the Service Monitoring column. Consequently, you may not need to follow the next steps in our current setup. However, they are included to demonstrate the usual procedure if needed.

1. Select the **ubuntu-008** VM from the list
2. Click the **Horizontal Ellipsis**
3. Click **Activate Service Monitoring**

When we click Activate Service Monitoring we activate frequent service discovery and service performance metrics calculation (every 5 minutes).

Note: If we select too many VMs, this could potentially result in vCenter Server degradation

Discovered Services

The screenshot displays the VMware Service Discovery interface. On the left is a navigation sidebar with the following items: Home, Data Sources, Environment, Visualize, Troubleshoot, Optimize, Plan, **Configure** (highlighted with a red box and a '1' in a circle), Policies, Alerts, Super Metrics, **Applications and Services** (highlighted with a red box and a '2' in a circle), Cost Drivers, Custom Profiles, Configuration Files, and Maintenance Schedules. The main content area is titled 'Service Discovery' and includes a breadcrumb path: / Applications and Services / Service Discovery. Below the breadcrumb, there is a description: 'Discover services running in each vCenter Virtual Machines (VMs) and get insights into relationships or dependencies between'. Two action links are present: 'CONFIGURE SERVICE DISCOVERY' and 'MANAGE SERVICES'. A button labeled 'ADD SERVICE DEFINITION' is also visible. The 'Known Services' section contains a grid of 12 service cards, each with a gear icon and a name: Active Directory, Apache HTTP (with a '1 virtual machines' badge), Apache Tomcat (with a '2 virtual machines' badge), Cassandra, Exchange Hub Transport Server, Exchange Mailbox Server, Exchange Server, Exchange Unified Messaging Server, MS-SQL DB, MySQL DB, Nginx, and Oracle DB.

You can view discovered services, the number of VMs on which each discovered service is running, and we will have a look at where You View the Discovered Services

1. From the left menu, click **Configure**
2. Click **Applications and Services**.
3. From the right panel, click the **Service Discovery** tile (not shown) to open Service Discovery and view the list of available services.

Discovered Services

After you have configured Service Discovery and the services are discovered, we will see a list of services that are discovered and the number of VMs that have the services running.

Known Services: We see a list of all the services supported and those that can be discovered.

Custom Services: It is possible to add a Custom Service by clicking *Add Service Definition* and use a process name or Regex. A Custom service can be discovered via Service Discovery if there is a permanent listening TCP port or if there is an established UDP connection.

Configure Telegraf Agent

[703]

About the Telegraf agent

[704]

The Telegraf agent is a versatile and efficient open-source data collector widely used in monitoring systems, including Aria Operations.

It serves as a lightweight and flexible agent that collects and reports metrics from various sources. Its plugin-driven architecture, lightweight nature, and flexibility in configuration make it a valuable component in monitoring and managing virtualized environments.

Since it is pretty efficient and customizable, it's also actively supported by a thriving community.

Open source Telegraf's source code is hosted on GitHub and InfluxData, the organization behind Telegraf, maintains an active community where users can access forums, ask questions, and get support for Telegraf. Stack Overflow, the popular Q&A platform for developers, has a dedicated Telegraf tag and Reddit's *r/Telegraf* subreddit hosts relevant sections and monitoring-focused forums.

We will take a look at how to install the Telegraf Agent easily using the Aria Operations User interface

Applications Home

The screenshot shows the VMware Aria Operations interface. In the left sidebar, 'Environment' is expanded (1) and 'Applications' is selected (2). In the main content area, 'Manage Telegraf Agents' is selected (3). The table below lists the agents:

VM Name	Operating System	Agent status	Last operation status
<input type="checkbox"/> aria-auto	VMware Photon O...	Not Installed	-
<input type="checkbox"/> aria-auto-config	VMware Photon O...	Not Installed	-
<input type="checkbox"/> aria-ops	VMware Photon O...	Not Installed	-
<input type="checkbox"/> aria-ops-cp	VMware Photon O...	Not Installed	-
<input type="checkbox"/> aria-ops-logs	VMware Photon O...	Not Installed	-
<input type="checkbox"/> identity-manager	VMware Photon O...	Not Installed	-
<input type="checkbox"/> linux-dev-0011	none	Not Installed	-
<input type="checkbox"/> linux-dev-0012	none	Not Installed	-
<input type="checkbox"/> ubuntu-0008	Ubuntu Linux (64-...	Not Installed	-
<input checked="" type="checkbox"/> windows-0010	Microsoft Window...	Agent Running	Install Success

Let's get to the *Manage Telegraf Agents* page to start installing a Telegraf agent on a Linux server.

1. Click Environment
2. Click Applications
3. Click **Manage Telegraf Agents**

Notice that a Telegraf agent is already installed on an Windows server in the environment. (arrow)

Installing

[706]

The screenshot shows the VMware Aria Automation console interface. On the left is a navigation sidebar with 'Applications' and 'Environments' sections. The main area is titled 'Manage Telegraf Agents' and contains a table of agents. The 'ubuntu-0008' agent is selected, and the 'Install' option is highlighted in the 'VM ACTIONS' menu.

VM Name	OS	Agent status	...
<input type="checkbox"/> aria-auto		Not Installed	
<input type="checkbox"/> aria-auto-config		Not Installed	
<input type="checkbox"/> aria-ops		Not Installed	
<input type="checkbox"/> aria-ops-cp	VMware Photon O...	Not Installed	
<input type="checkbox"/> aria-ops-logs	VMware Photon O...	Not Installed	
<input type="checkbox"/> identity-manager	VMware Photon O...	Not Installed	
<input type="checkbox"/> linux-dev-0011	none	Not Installed	
<input type="checkbox"/> linux-dev-0012	none	Not Installed	
<input checked="" type="checkbox"/> ubuntu-0008	Ubuntu Linux (64-...	Not Installed	Install, Uninstall, Update, Start, Stop
<input type="checkbox"/> windows-0010	Microsoft Window...	Agent Running	

1. Have a look for a powered On Linux Server, and Click the Ubuntu server `ubuntu-0008`
2. Click the **ellipse** menu
3. Choose **Install**

Common Username and password

The screenshot shows a 'Manage Agent' wizard window. On the left, a sidebar lists three steps: '1 Select an option', '2 Provide Credentials', and '3 Summary'. The main area is titled 'How do you want to provide VM Credentials?' and contains two radio button options. The first option, 'Common username & password', is selected and highlighted with a red box and a '1' in a circle. Below it is the text: 'Choose this option if you have a common username and password for all your selected VMs'. The second option, 'Enter virtual machine credentials', is unselected. Below it is the text: 'Choose this option if all your virtual machines have distinct username and passwords'. At the bottom right, there are two buttons: 'CANCEL' and 'NEXT'. The 'NEXT' button is highlighted with a red box and a '2' in a circle.

1. Select Common username & password

2. Click Next

Provide Credentials

Manage Agent

- 1 Select an option
- 2 Provide Credentials**
- 3 Summary

Provide Credentials [X]

Enter the common credential to be used for all the selected Virtual machines

Username: 1

Password: 2

i For Linux, root user or non-root users with specific privileges can install the agent.

i For Windows, Administrator or users of Administrators group with UAC deactivated can install the agent. For detailed documentation on required privileges, refer [here](#). If UAC is enabled, agents are only downloaded, not installed. User has to manually install the agent by running the pre-defined script as mentioned [here](#).

i For detailed prerequisites, refer [here](#).

Create run time user on linux virtual machines, with required permissions as part of agent installation.

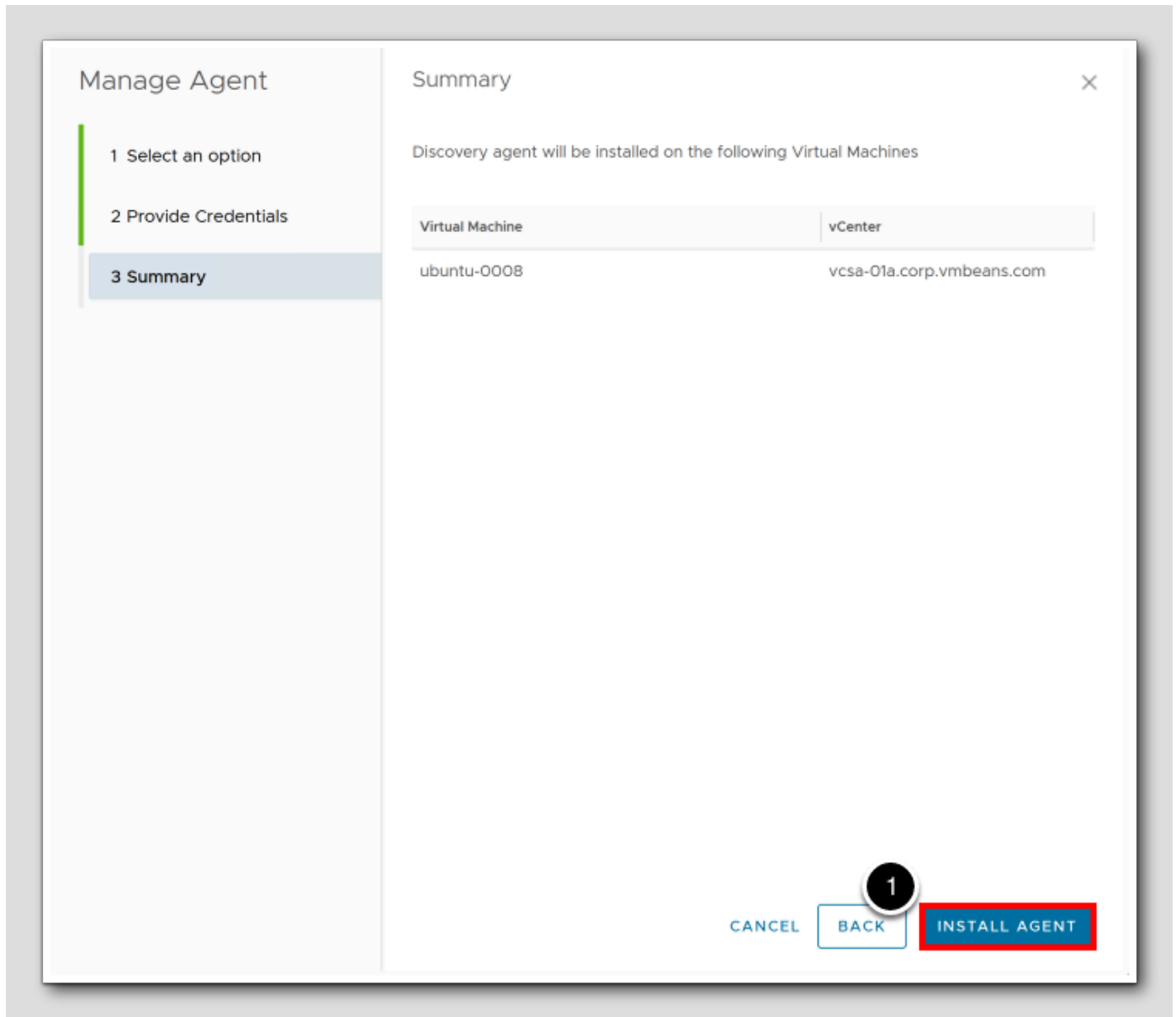
CANCEL BACK **NEXT** 3

Let's provide some credentials for the installation

1. Username, type root
2. Password, type VMware!
3. Leave the rest and click Next

Summary and confirm

[709]



1. Click INSTALL AGENT

Monitor the Installation

[710]

The screenshot displays the 'Manage Telegraf Agents' interface. At the top right, a red box highlights the Refresh button (a circular arrow icon). Below the header, there are navigation options like 'GO TO DETAILS' and 'VM ACTIONS', along with a 'Page Size: 50' dropdown and a search filter. The main table lists various VMs. The 'Last operation status' column for the 'ubuntu-0008' VM shows 'Install in Progress', with a red arrow pointing to this status. The 'windows-0010' VM shows 'Install Success'.

<input type="checkbox"/>	VM Name	Operating System	Agent status	Last operation status	VM State	Virtual IP Det...	Collector Group	Cloud Proxy	Agent Version	vCenter Name	Colle...	Colle...
<input type="checkbox"/>	aria-auto	VMware Photon O...	Not Installed	-	Powered On	-	-	192.168.110...	None	vcsa-01a.c...		
<input type="checkbox"/>	aria-auto-config	VMware Photon O...	Not Installed	-	Powered On	-	-	192.168.110...	None	vcsa-01a.c...		
<input type="checkbox"/>	aria-ops	VMware Photon O...	Not Installed	-	Powered On	-	-	192.168.110...	None	vcsa-01a.c...		
<input type="checkbox"/>	aria-ops-cp	VMware Photon O...	Not Installed	-	Powered On	-	-	192.168.110...	None	vcsa-01a.c...		
<input type="checkbox"/>	aria-ops-logs	VMware Photon O...	Not Installed	-	Powered On	-	-	192.168.110...	None	vcsa-01a.c...		
<input type="checkbox"/>	identity-manager	VMware Photon O...	Not Installed	-	Powered On	-	-	192.168.110...	None	vcsa-01a.c...		
<input type="checkbox"/>	linux-dev-0011	none	Not Installed	-	Powered Off	-	-	192.168.110...	None	vcsa-01a.c...		
<input type="checkbox"/>	linux-dev-0012	none	Not Installed	-	Powered Off	-	-	192.168.110...	None	vcsa-01a.c...		
<input type="checkbox"/>	ubuntu-0008	Ubuntu Linux (64-...	Not Installed	Install in Progress	Powered On	-	-	192.168.110...	None	vcsa-01a.c...		
> <input type="checkbox"/>	windows-0010	Microsoft Window...	Agent Running	Install Success	Powered On	-	-	192.168.110...	8.12.0.57	vcsa-01a.c...		

Please Note: Under the installation, the "Last Operations Status" column will show the changes. When the installation is done it will show *"Install Success"* as you can see indicated on the windows-0010 server column below (This image might differ from yours).

1. Use the Refresh button to monitor the status of the installation

Comments

[711]

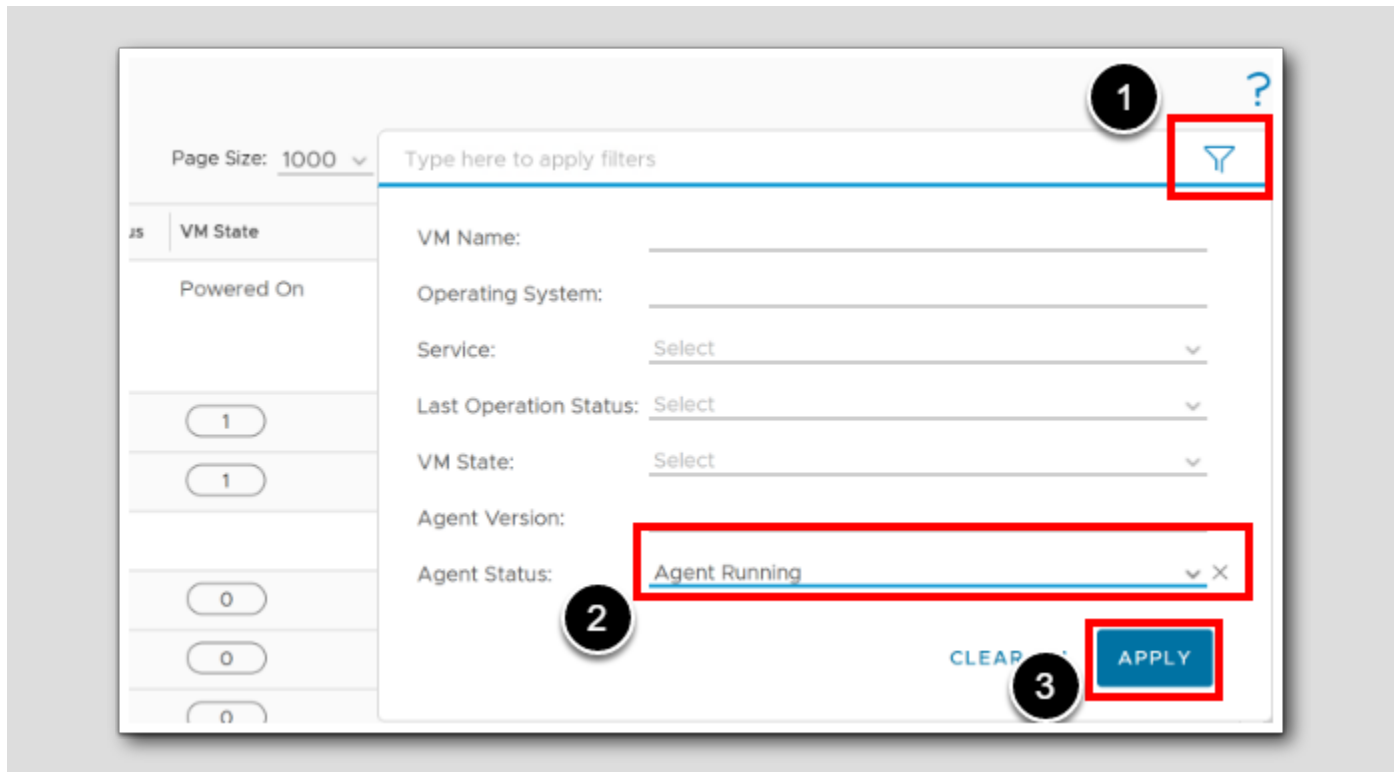
Using the GUI is a very simple way to install Telegraf Clients onto Virtual Machines for OS and Application monitoring.

Custom Monitoring Using Telegraf Agent

[712]

Filter on installed Agents

[713]



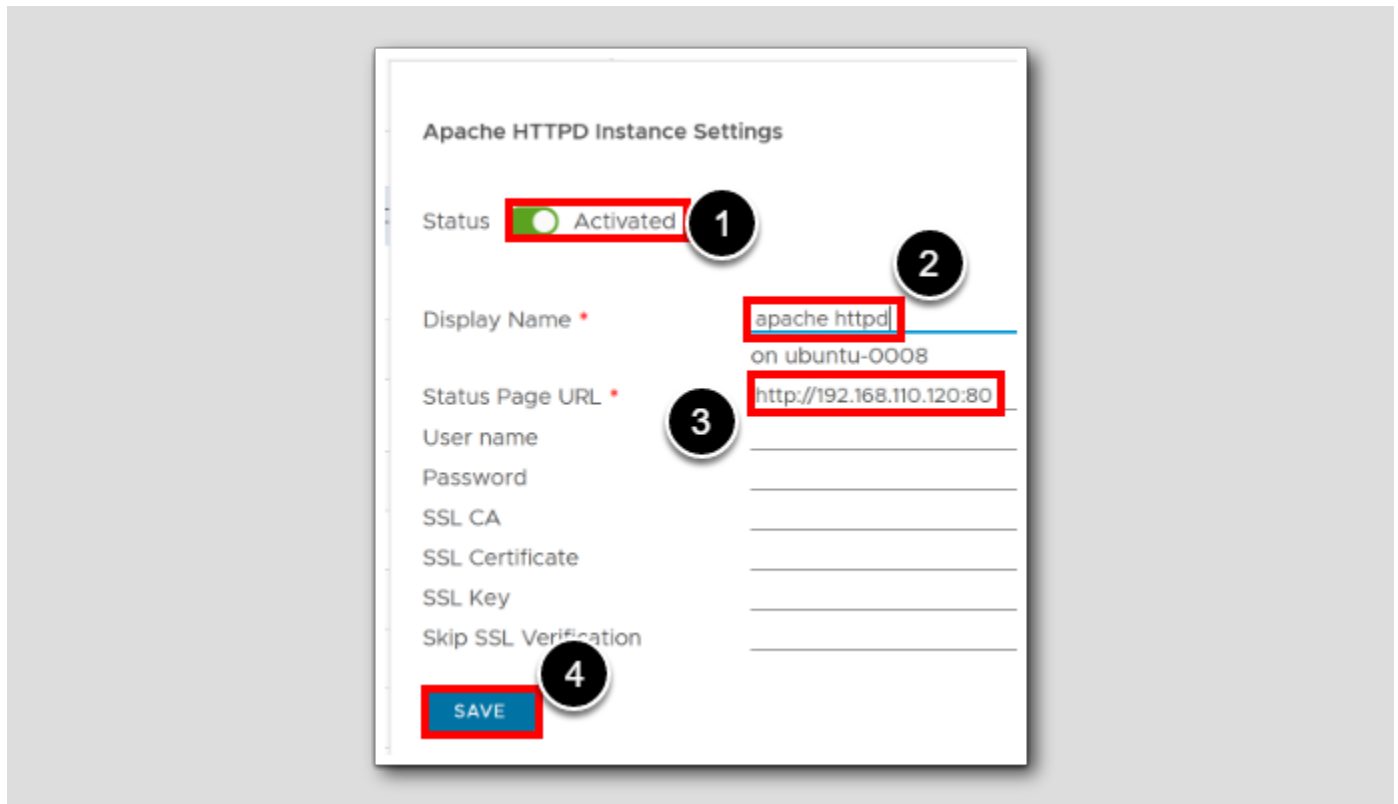
1. In the upper right corner click the Filter Icon
2. From the Agent Status, select Agent Running
3. Click Apply

Apache daemon service check

The screenshot shows the 'Manage Telegraf Agents' interface. At the top, there are buttons for 'GO TO DETAILS', 'VM ACTIONS', and a menu icon. Below this is a table of agents with columns: VM Name, Operating System, Agent status, Last operation st..., and VM State. The first agent is 'ubuntu-0008' with status 'Agent Runn...' and 'Powered On'. A red box highlights the expand icon (>) next to 'ubuntu-0008', labeled with a circled '1'. Below the table, the 'Services Discovered' section shows two services: 'Apache HTTPD' and 'Network Time Protocol'. A red box highlights the ellipsis icon (⋮) next to 'Apache HTTPD', labeled with a circled '2'. A red box highlights the 'Add' button, labeled with a circled '3'. Below this is the 'Custom Monitoring' section with six checks: 'Ping Check', 'UDP Check', 'TCP Check', 'HTTP Check', 'Custom Script', and 'Processes'. At the bottom, the second agent 'windows-0010' is partially visible.

1. Expand *ubuntu-008* by clicking the > icon
2. Click the ellipsis
3. Choose Add

Adding a Apache httpd check



The screenshot shows the 'Apache HTTPD Instance Settings' form. The form has the following fields and values:

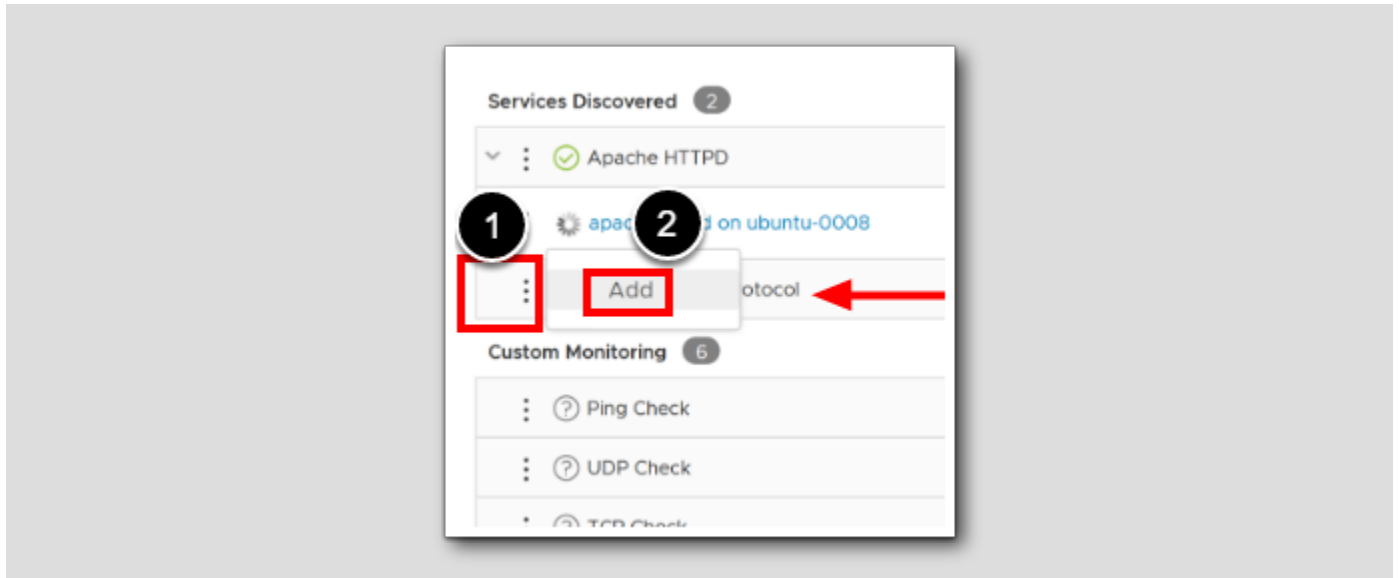
- Status: Activated (Callout 1)
- Display Name: apache httpd on ubuntu-0008 (Callout 2)
- Status Page URL: http://192.168.110.120:80 (Callout 3)
- User name: (empty)
- Password: (empty)
- SSL CA: (empty)
- SSL Certificate: (empty)
- SSL Key: (empty)
- Skip SSL Verification: (empty)
- SAVE button (Callout 4)

1. In the Apache HTTPD Instance Settings, set Status to **Activated**
2. Under Display Name, type **apache httpd**
3. Under Status Page URL enter the url for the apache server `http://192.168.110.120`
4. Click **SAVE**

Congratulations, you are now monitoring the Apache httpd process on the Linux server ubuntu-0008 !

NTP daemon check

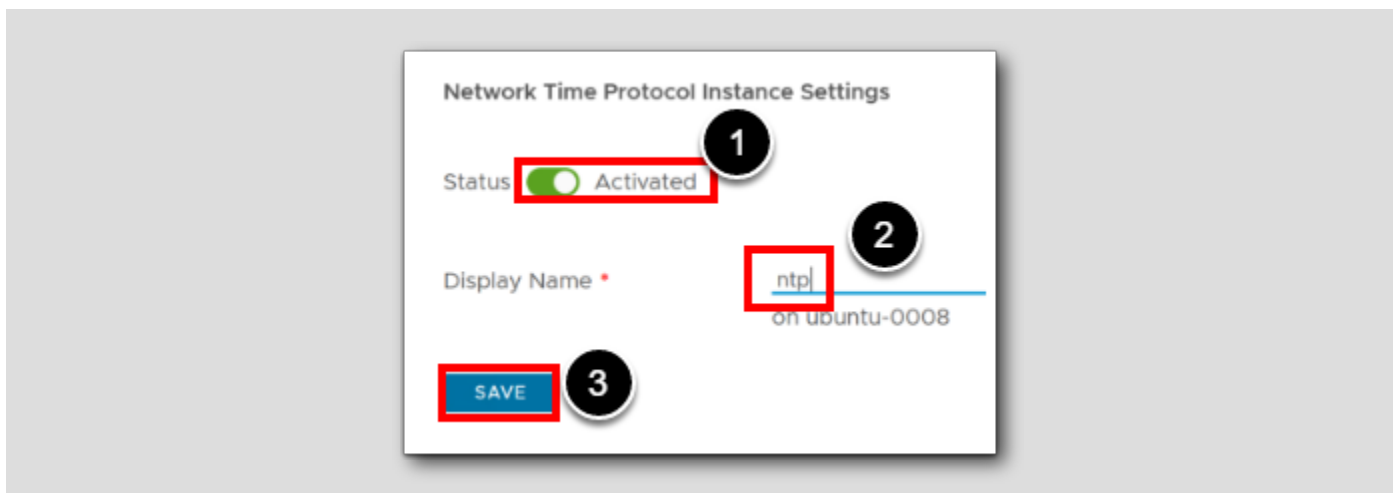
[716]



1. On the (?) *Network Time Protocol*, click the ellipsis
2. Choose Add

NTP instance settings

[717]

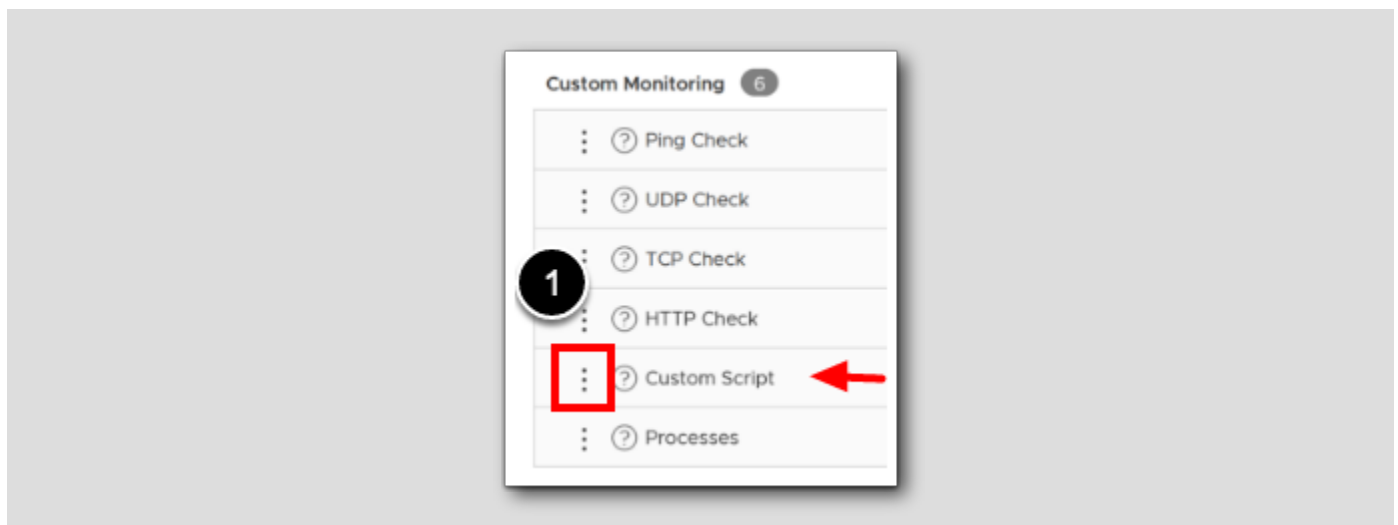


1. Under the Network Time Protocol Instance Settings, set Status to **Activated**
2. Set Display Name to `ntp`
3. Click **SAVE**

Congratulations, you are now monitoring the network Time Protocol (NTP) daemon process on the Linux server ubuntu-0008 !

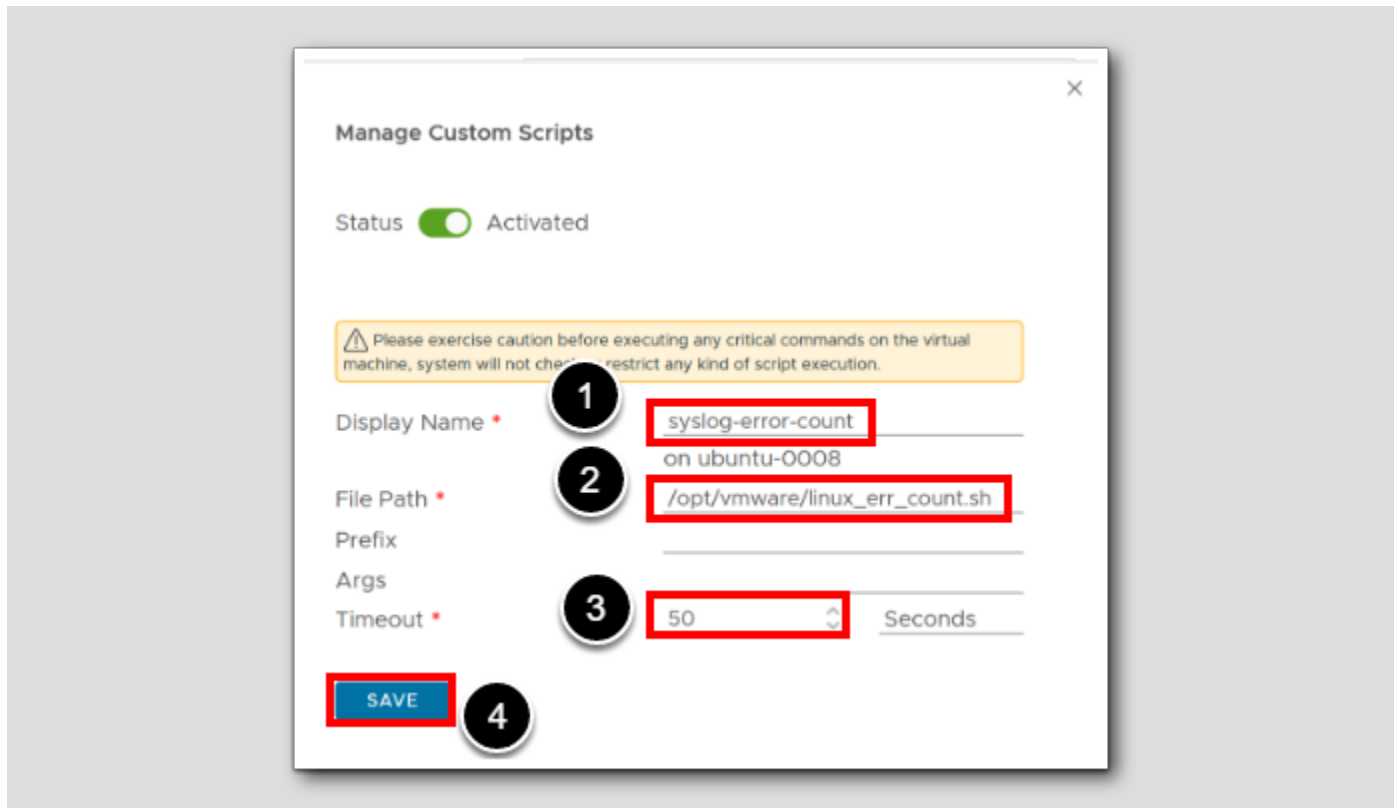
Custom monitoring

[718]



1. Under Custom Monitoring, behind (?) *Custom Script* Click the **ellipse**
2. Choose **Add** (not shown)

Adding the custom script



Under the Manage Custom Scripts we are going to add a script located on the Linux server ubuntu-0008, that will return a value back to Aria Operations that returns the Number of SYSLOG errors in the last 7 days. In other environments you would probably change that to 24 hours. See both scripts below

1. Set Display name to **syslog-error-count**
2. Set the File Path to **/opt/vmware/linux_err_count.sh**
3. Set the Timeout to 50 Seconds
4. Click **SAVE**

Here is the Linux script counting SYSLOG errors for the last 24 hours

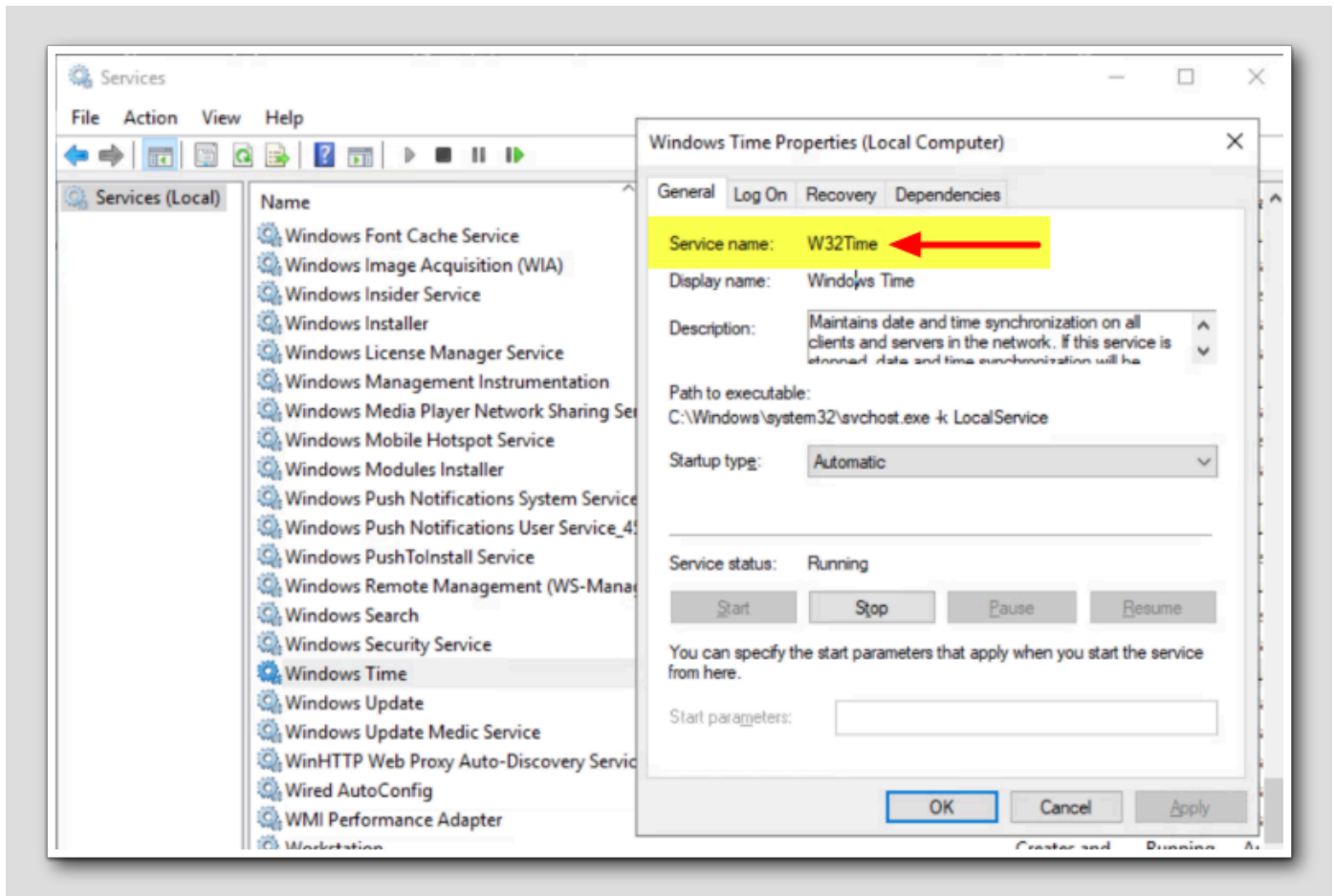
```
#!/usr/bin/bash
# Number of SYSLOG errors in the last 24 hours
error_count=$(grep -i "error" /var/log/syslog | grep "$(date --date='24 hours ago' '+%b %e')" | wc -l)
echo $error_count
```

Here is the Linux script counting SYSLOG errors for the last 7 days

```
#!/usr/bin/bash
# Number of SYSLOG errors in the last 7 days
error_count=$(grep -i "error" /var/log/syslog | grep "$(date --date='7 days ago' '+%b %e')" | wc -l)
echo $error_count
```

Monitoring any Windows service

[720]



On any windows server there might be necessary to monitor specific services, for example IIS service, DNS Service, SQL Service, etc.

All we need to know is the **Service Name** from the Windows Services Console (`Start>Run>services.msc`). In this example we will be checking a windows server for the **Windows Time** Service, where the service name is **W32Time** - the server we will be checking this on is **windows-0010**

Let's dive in.

Windows Service monitoring

The screenshot shows the 'Manage Telegraf Agents' interface. A table lists VMs: 'ubuntu-0008' and 'windows-0010'. The 'windows-0010' row is expanded. Below the table is a 'Custom Monitoring' section with options for Ping Check, UDP Check, TCP Check, HTTP Check, Custom Script, and Services. The 'Services' option is selected. A modal window 'Manage Service Activation' is open, showing the status 'Activated', display name 'time service on windows-0010', and service name 'W32Time'. A 'SAVE' button is visible.

1. This time, under the manage Telegraf Agents, Expand the Windows server windows-0010 by clicking the **expand icon** >
2. In front of (?) services, click the **Ellipse** and Choose **Add** (not shown)
3. Under the Manage Service Activation, make sure it is **Activated**
4. Behind Display Name type **time service**
5. Behind Service Name, type **W32Time**
6. Click **SAVE**

Congratulations, You are now monitoring the Time Service on the windows server windows-0010. Other important services could be IIS, MSSQL, DNS, Active Directory, etc.

Adding a remote ping check

The screenshot shows the 'Manage Telegraf Agents' interface. On the left, a table lists VMs: 'ubuntu-0008' and 'windows-0010'. Below the table, the 'Custom Monitoring' section is expanded, showing a list of checks: Ping Check, UDP Check, TCP Check, HTTP Check, Custom Script, and Services. The 'Ping Check' is highlighted with a red box and a circled '1'. On the right, the 'ICMP Check' configuration panel is shown. It has a 'Status' toggle set to 'Activated'. The 'Display Name' field contains 'appserver-ping on windows-0010' (circled '2'). The 'FQDN/IP' field contains '192.168.110.120' (circled '3'). The 'Count' field contains '1' (circled '4'). The 'Ping Interval' field contains '120' (circled '5'). The 'Timeout' field contains '45' (circled '6'). At the bottom of the panel is a blue 'SAVE' button (circled '7').

1. Under the *Manage Telegraf Agents*, In front of (?) *Ping Check*, click the Ellipse and then Choose Add (not shown)
2. Under the *Manage Service Activation*, Behind *Display Name* type `appserver-ping`
3. Behind *FQDN/IP*, type the IP address for the Linux Ubuntu-0008 server: `192.168.110.120`
4. Number of pings will be just one, behind *Count* type 1
5. We will ping only every other minute, behind *Ping Interval* type 120
6. If nothing has happened within 45 seconds, we have timed out, Behind *Timeout* type 45
7. Click **SAVE**

Congratulations, You have just added a ping coming initiated on the windows server windows-0010, that pings our important application server ubuntu-0008 every other minute.

Adding a remote HTTP check

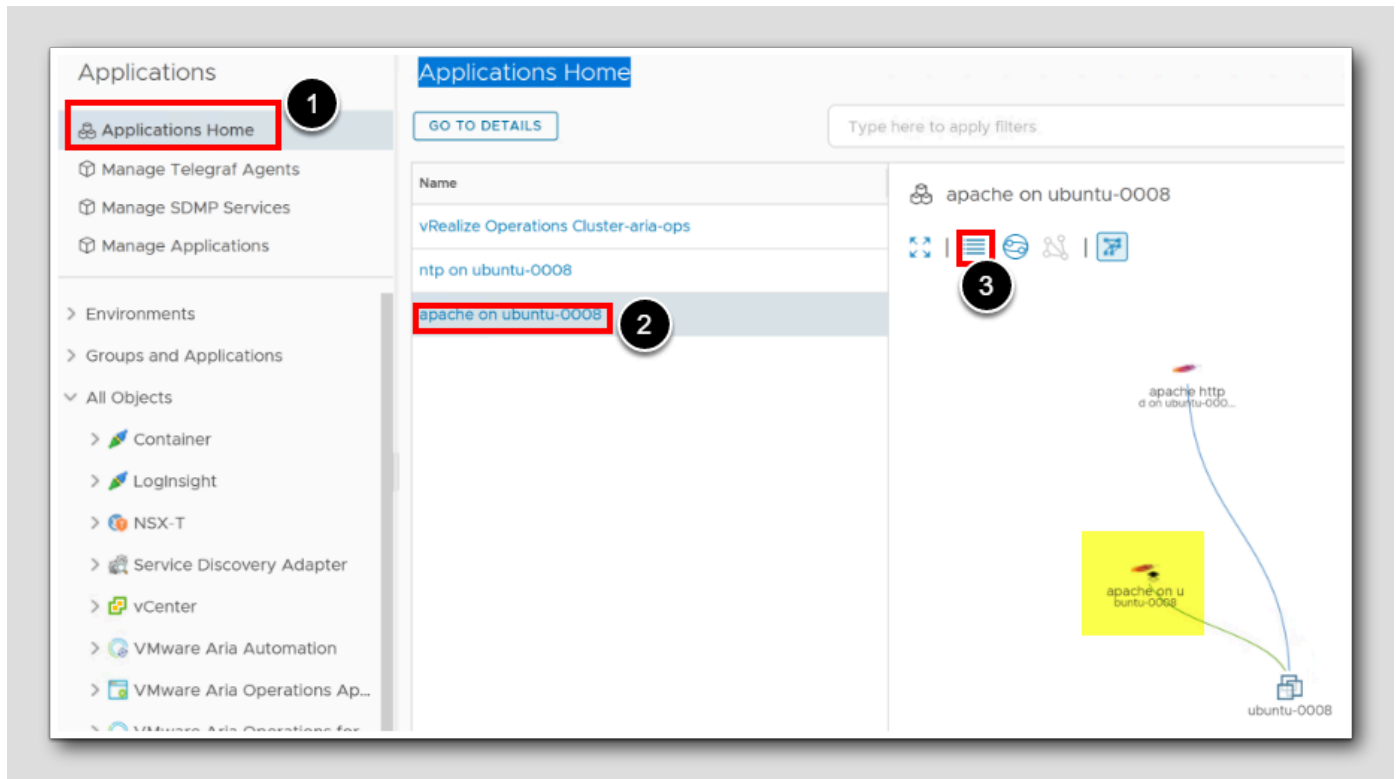
The screenshot shows the 'Manage Telegraf Agents' interface. On the left, a table lists VMs: 'ubuntu-0008' and 'windows-0010'. Below the table, the 'Custom Monitoring' section is expanded, showing a list of checks: Ping Check (1), UDP Check (0), TCP Check (0), HTTP Check (0), Custom Script (0), and Services (1). A red box highlights the 'HTTP Check' entry, and a circled '1' points to it. On the right, the 'HTTP Check' configuration popup is open. It shows the following settings: Status is 'Activated', Display Name is 'appserver-http', URL is 'http://192.168.110.120', Method is 'Get', and Response Timeout is '60'. Red boxes highlight these fields, and circled numbers 2 through 5 point to them. A 'SAVE' button is highlighted with a red box at the bottom of the popup.

Since our application server is very important we would like to see if we can contact it remotely in the network via a HTTP request to see if it's running OK.

1. Under the *Manage Telegraf Agents*, In front of (?) *HTTP Check*, click the **Ellipse** and then Choose **Add** (not shown)
2. Under the HTTP Check popup, Behind *Display Name* type **appserver-http**
3. Behind URL, type the URL address for the Linux Ubuntu-0008 web-server: **http://192.168.110.120**
4. Behind Method, type **Get**
5. If nothing has happened within 60 seconds, we have timed out, Behind Response Timeout type **60**
6. Click **SAVE**

Congratulations, You have just added a remote HTTP check initiated on the windows server windows-0010, that does a HTTP request towards our web application server ubuntu-0008.

Show me the apps



1. Under Applications click **Applications Home**
2. Under the listed application Names, click the name **apache on ubuntu-0008**

Hover the services and apps to see information about them (highlighted)

3. Click the **table view** icon

Application table view

The screenshot shows the 'Applications Home' interface. On the left, a list of applications is shown, with 'apache on ubuntu-0008' selected. A red box highlights the 'GO TO DETAILS' button, and a circled '1' indicates the first step. The main area displays a table with the following data:

Name	Object Type	Adapter Type
ubuntu-0008	Virtual Machine	vCenter
apache on ubuntu-0008	Apache HTTPD Application	VMware Aria Operations Application Management Pack
apache httpd on ubuntu-0008	Apache HTTPD	VMware Aria Operations Application Management Pack

Review the application or daemon in the table.

Our successful integration of Custom Monitoring functionalities, including but not limited to Operating System Monitoring, Windows Service Monitoring, Daemon/Process Monitoring, Application Monitoring, Custom Script Monitoring, and Remote Checks, it becomes imperative to effectively visualize and leverage the collected metrics. By creating intuitive and informative dashboards, or alternatively, the ability to navigate through the available metrics for analysis and utilization purposes. Let's jump right in.

1. Click GO TO DETAILS

Find the metrics

The screenshot displays the VMware vSphere interface. On the left, the 'Object Browser' shows a hierarchy of objects under 'Environment (All Objects)'. The 'Virtual Machine' object is highlighted with a red box and a '1' callout. Below it, the 'ubuntu-0008' sub-object is also highlighted with a red box. On the right, the 'Summary' page for 'apache on ubuntu-0008' is shown. The 'Metrics' tab is highlighted with a red box and a '2' callout. Below the tabs, there is a 'Recommended Actions' section with a list of objects and their counts. At the bottom, there is a table with columns for 'Name' and 'Alert'.

Name	Alert
Me	1
Apache HTTPD	1
Custom Script	1
Linux OS	1
Network Time Protocol	1
Datastore	1
Virtual Machine	1

1. From the Summary page, click on **Virtual Machine** and then click **ubuntu-0008**
2. Click on **Metrics**

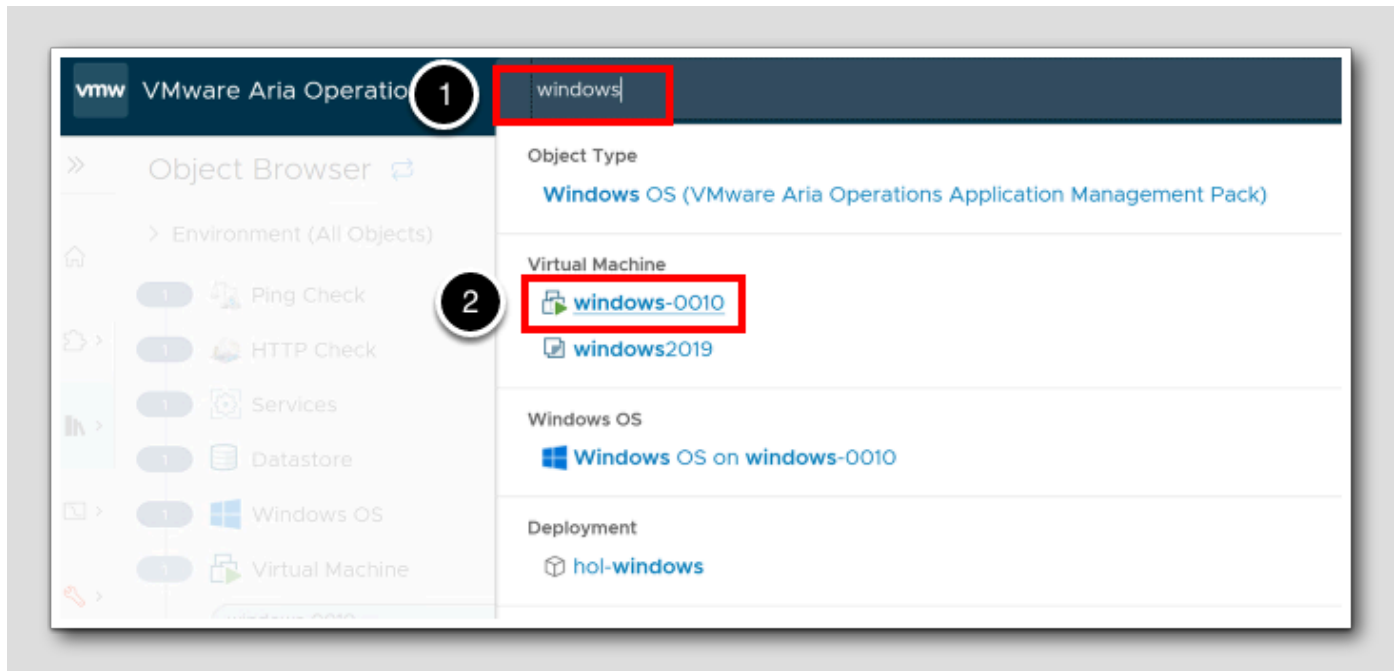
Show me the metrics

The screenshot displays the VMware vSphere interface for the VM 'ubuntu-0008'. The 'Metrics' tab is active, showing a hierarchical view of the VM's components. A red box highlights the 'Custom Script on ubuntu-0008' component, which is selected in the left-hand navigation pane. The 'syslog-error-count' metric is highlighted in the left pane, and its corresponding chart is displayed on the right. The chart shows a single data point at 0:00 on 04:20 AM. The interface also includes a 'TROUBLESHOOT' button and a 'VSPHERE SOLUTION'S DEFAULT POLICY (MAY ...)' dropdown menu.

1. Expand Linux OS (3)
2. Highlight Custom script by Clicking on Custom Script on ...
3. Expand Metrics
4. Expand Scripts
5. Double click on syslog-error-count

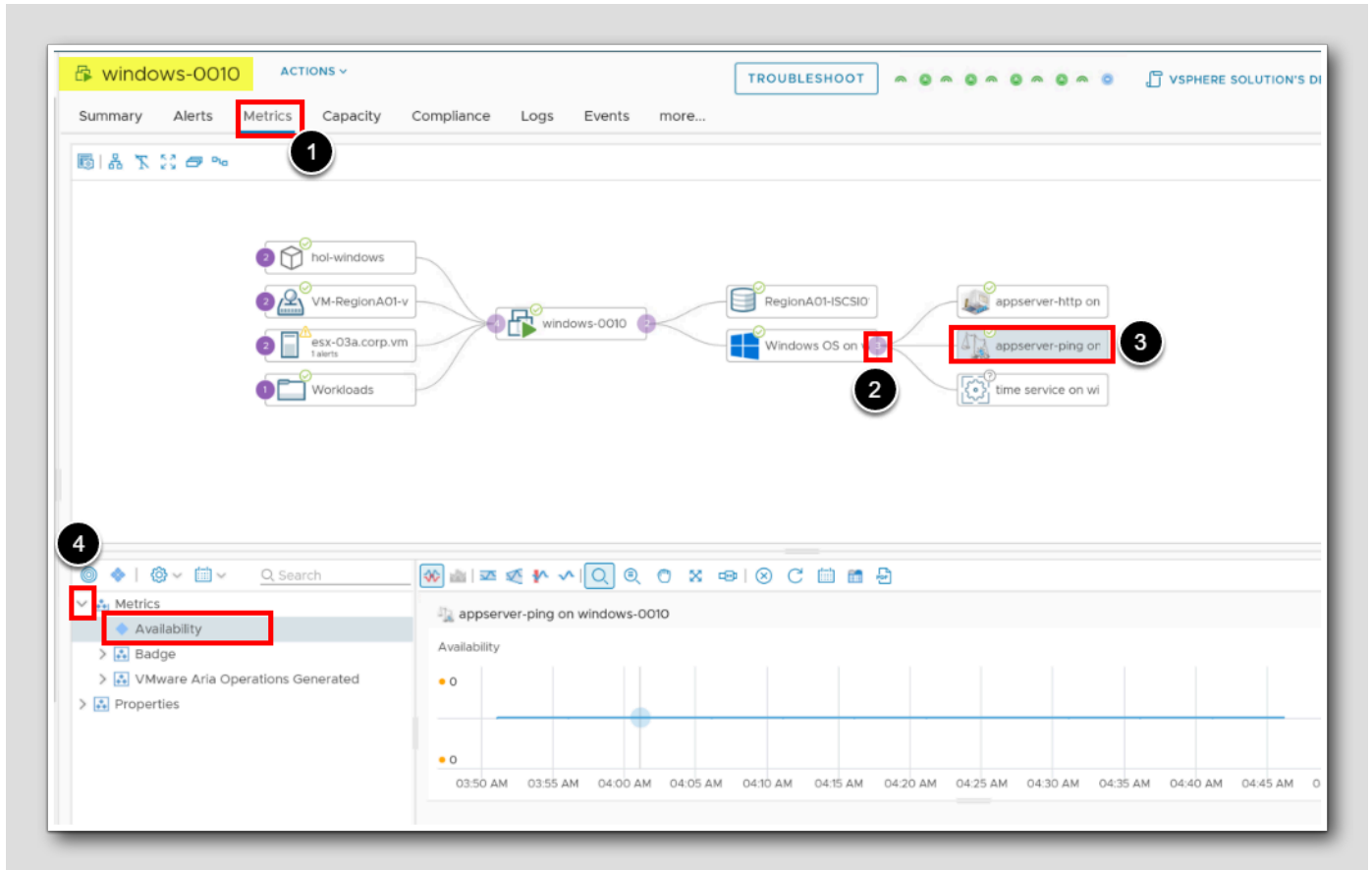
Note: Our custom script on ubuntu-0008 is constantly returning the number of SYSLOG errors. In this view we can monitor the trend of that metric of those errors to see if anything have changed in our environment.

The Ping check



1. At the top search field, type `windows`
2. Click on the virtual machine `windows-0010`

Show the ping availability

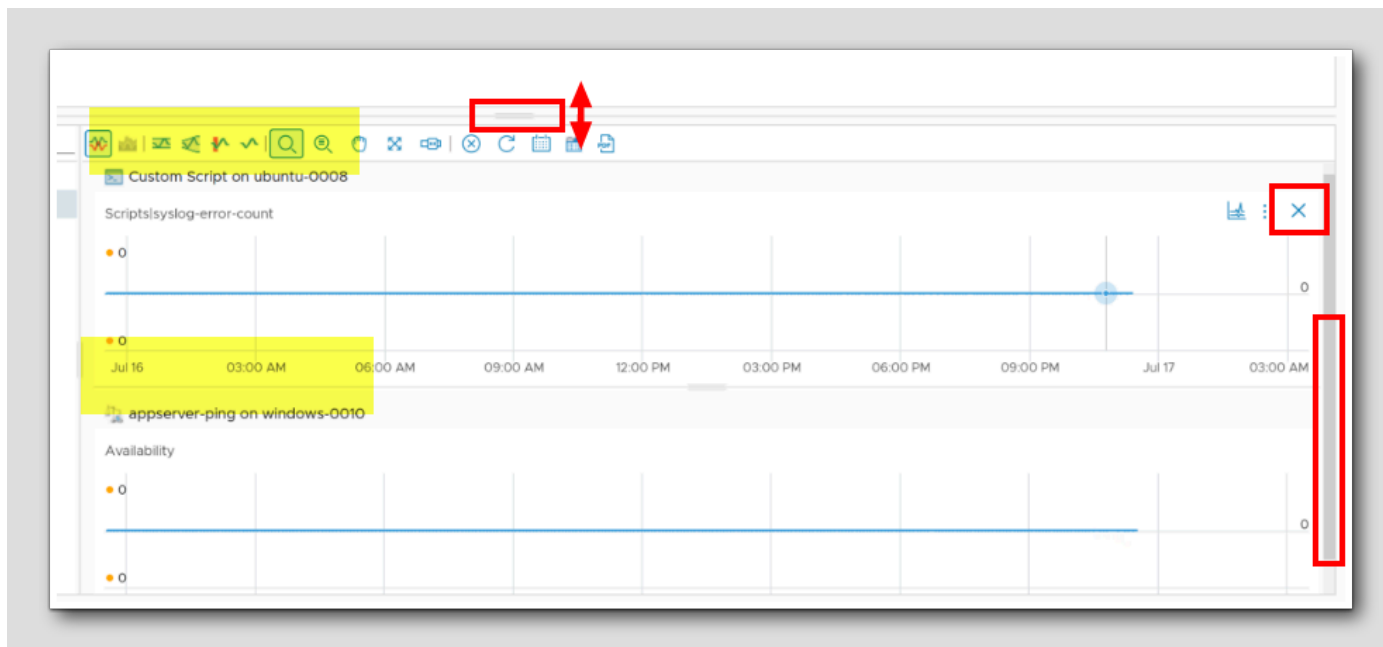


We are showing the object windows-0010 (highlighted)

1. If not already there, click **Metrics**
2. Expand **Windows OS on** (3)
3. Click on **appserver-ping on..**
4. **Expand Metrics**
5. Double-click **Availability** to add it to the view

Reviewing the metrics

[730]



We can observe that the metrics from both servers are displayed (highlighted). This can often prove useful when comparing and correlating various metrics from different servers.

1. Resize the metrics column by **clicking and dragging**
2. To walk through the metrics we have added, we can use the **scroll bar**
3. To remove the the *ubuntu-0008 custom script chart* click on the 'X'

Final remarks

[731]

Using the Telegraf Agent with Aria Operations by setting Telegraf to output data in a format that Aria Operations can ingest enhances Aria Operations and extends the capabilities, gives **Improved flexibility and scalability** in environments with many different systems, and **Consolidates Metrics from Different Sources** by collecting the metrics using Telegraf, and centralize these into Aria Operations. This allows for a unified view of your operations across different platforms and when we correlate events or identify patterns, we can broaden the scope and not just look at data in isolation.

Conclusion

[732]

In this module, we examined Aria Operations ability to monitor processes, services, and applications, leveraging the Telegraf agent for both Linux and Windows platforms. Aria Operations gathered crucial utilization metrics and initiated alerts for process or service downtime. Native application monitoring was facilitated via the Aria Operations Telegraf Agent, with additional requirements for some applications referenced in the documentation.

We explored the Discover Services and Monitor Applications functionalities. Discover Services employs the VMware Tools agent to monitor processes and services, while Monitor Applications utilizes an open-source Telegraf agent for metric collection from managed VMs. In summary, Discover Services offers more configuration information, whereas Monitor Applications provides a wider range of performance metrics. The choice between these functionalities depends on the specific objectives of your operations.

You've finished the module

[733]

Congratulations on completing this lab module.

If you are looking for additional information, please visit the [Aria Operations Documentation](#)

From here you can:

1. Click to advance to the next page and continue with the next lab module
2. Open the **TABLE OF CONTENTS** to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

Conclusion

Learning Path Next Steps!

[735]

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