



HOL-2401-01-CMP  
Getting Started (Basic)

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## Lab Overview - HOL-2401-01-CMP - Aria Operations - Getting Started (Basic)

### Lab Description

[2]

Want to know the fastest way to get value from Aria Operations? Take this lab to get quick insight into capacity, troubleshooting, security, and efficiency.

### 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 - Maximize Your Value with Aria Operations](#) (15 minutes) (Basic)
- [Module 2 - Gaining Insights Into your Capacity](#) (15 minutes) (Basic)
- [Module 4 - Mastering Monitoring and Troubleshooting Essentials](#) (30 minutes) (Basic)
- [Module 5 - Running a Safe and Compliant Cloud](#) (30 minutes) (Basic)
- [Module 7 - Understand your Cloud Costs and Save Money](#) (30 minutes) (Basic)
- [Module 10 - Generating Reports for Cost, Capacity, Compliance and More](#) (15 minutes) (Basic)

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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>

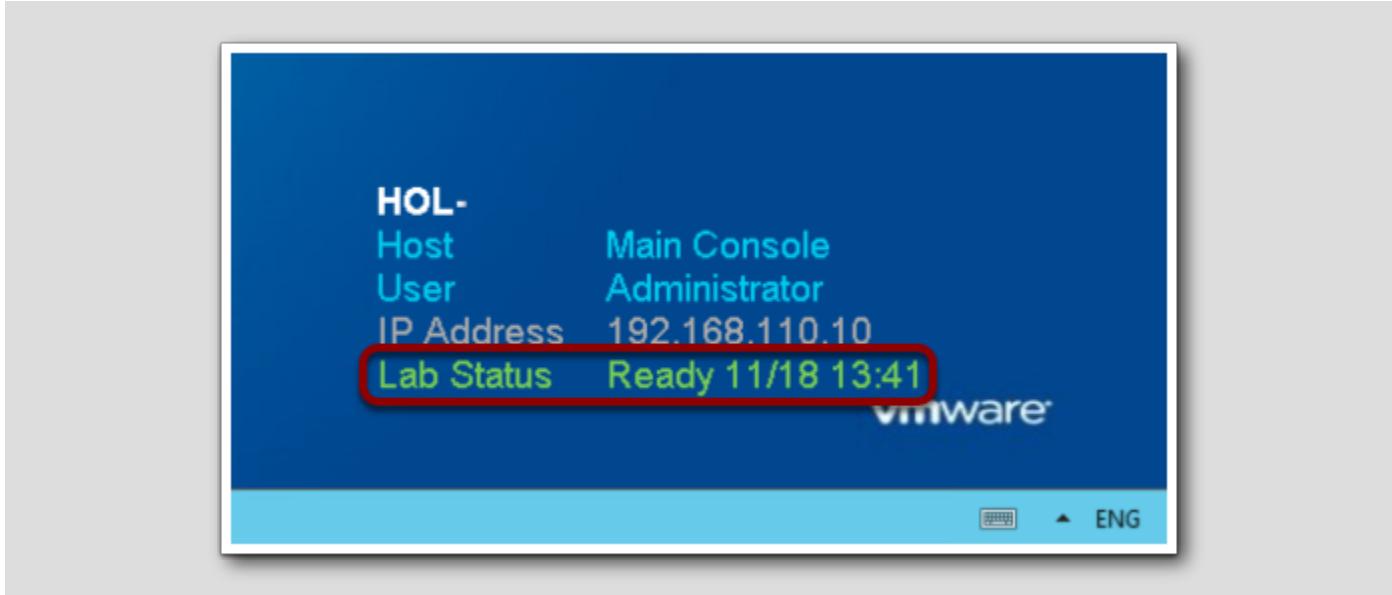
### First time using Hands-on Labs?

[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?



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 -Maximixe Your Value with Aria Operations (15 minutes) Basic

### Introduction

[7]

Welcome to the VMware Aria Operations - Getting Started Hands-on Lab.

VMware Aria Operations delivers intelligent operations management with application-to-storage visibility across physical, virtual, and cloud infrastructures. Using policy-based automation, operations teams can automate key processes and improve IT efficiency.

Using data collected from system resources (objects), Aria Operations identifies issues in any monitored system component, often before the customer notices a problem. Aria Operations also frequently suggests corrective actions you can take to fix the problem right away. For more challenging problems, Aria Operations offers rich analytical tools that allow you to review and manipulate object data to reveal hidden issues, investigate complex technical problems, identify trends, or drill down to gauge the health of a single object.

In this exercise, we will log in to Aria Operations, review the user interface, and reference topics covered in later modules in this lab along with other labs in the series.

### Log in to Aria Operations

[8]

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

### Open the Firefox Browser from the Windows Task Bar

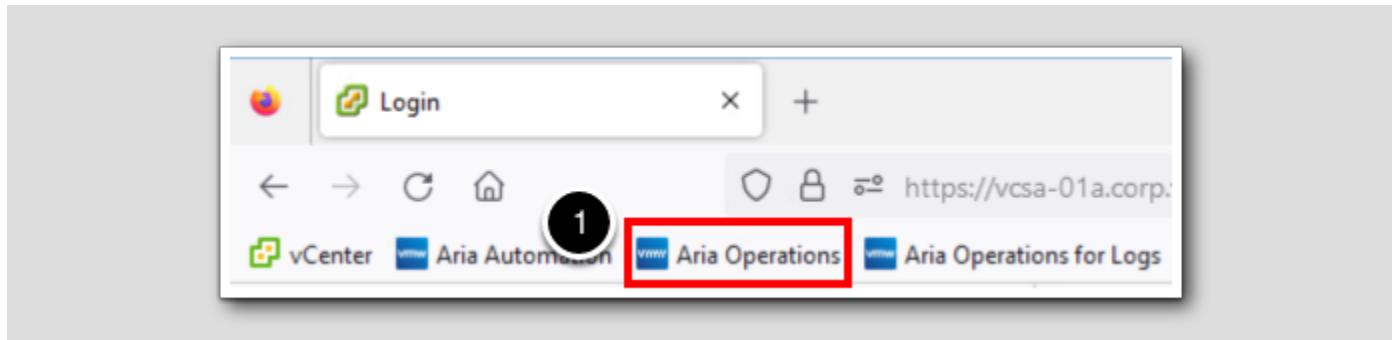
[9]



If the browser is not already open, launch Firefox.

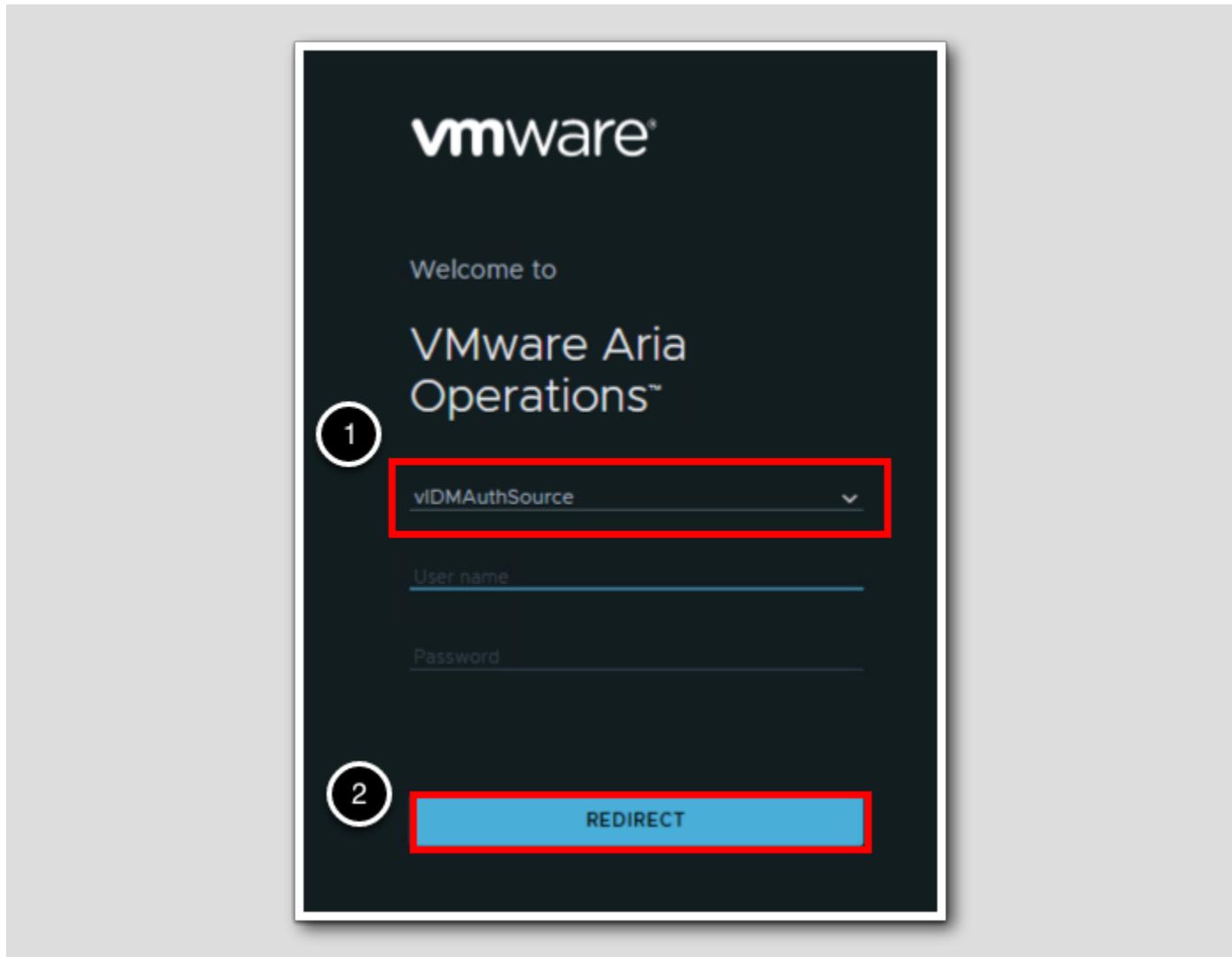
1. Click the Firefox icon in the Windows Quick Launch Task Bar at the bottom of the screen.

## Navigate to Aria Operations



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

## Log in to Aria Operations

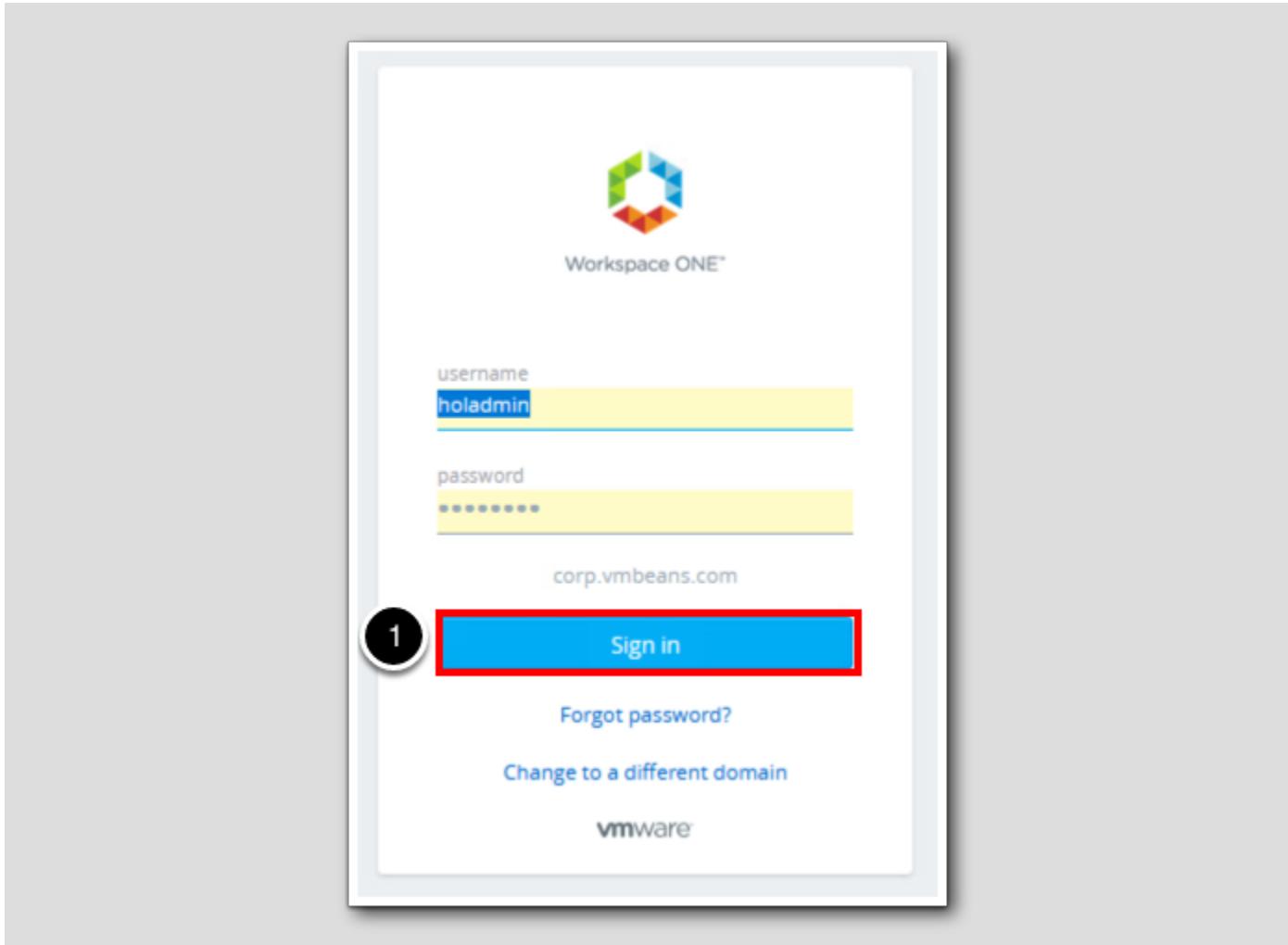


Aria Operations is integrated with VMware Workspace ONE Assist (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

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



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.

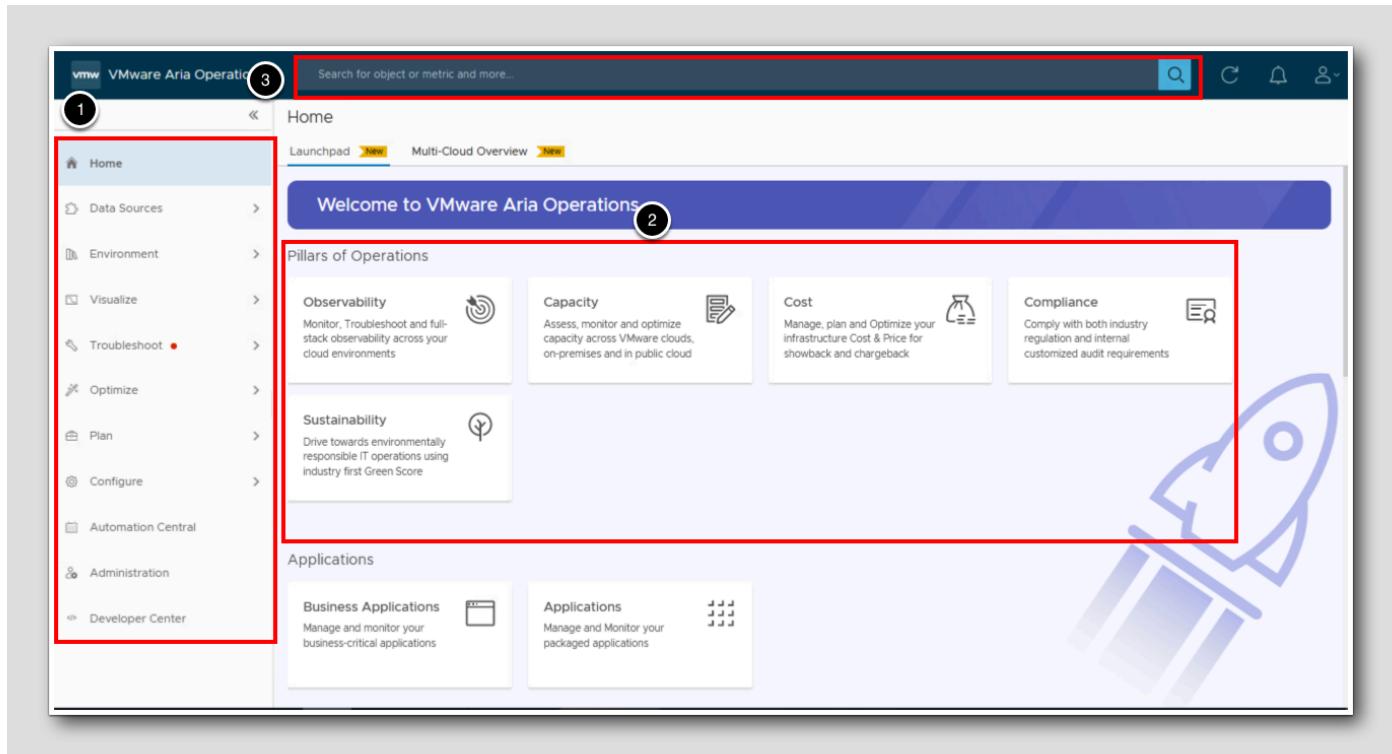
1. Click Sign in

## Introduction to the Aria Operations Home Page

The enhanced user interface makes vRealize Operations even simpler to use, featuring a use case and persona-based Quick Start page to help us quickly perform operational tasks.

After logging in to VMware Aria Operations, we will be taken to the Home screen.

## Aria Operations Home Screen

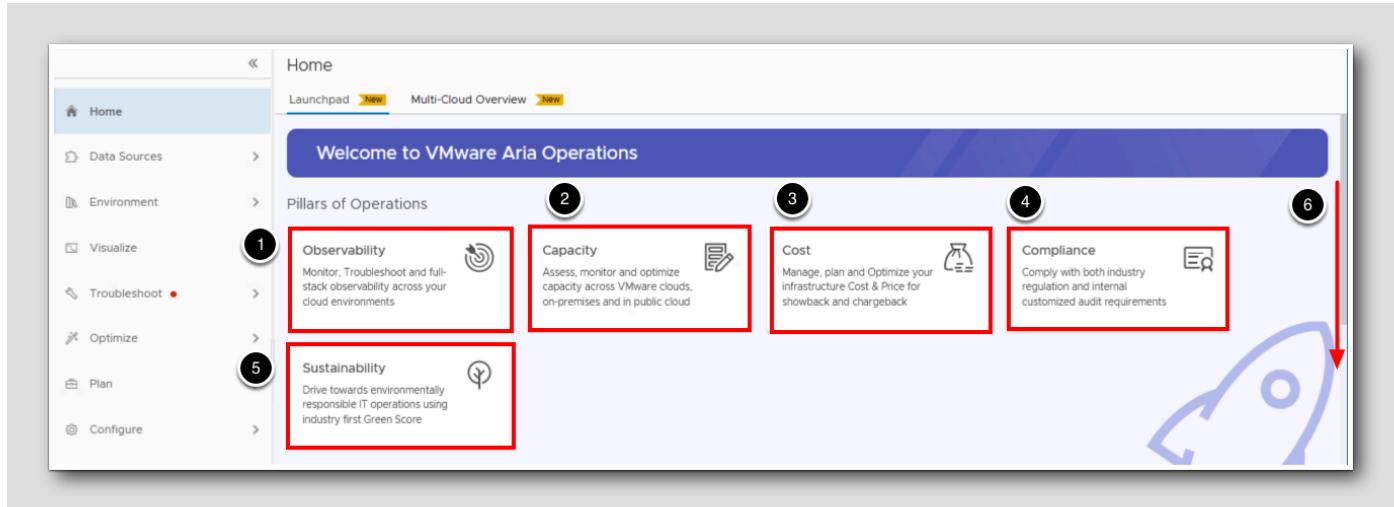


The Aria Operations Home screen includes several components.

1. The left side navigation menu is used to navigate through the various sections of Aria Operations. The menu can be collapsed using the >> icon if needed.
2. The Launchpad tab of the main window, featuring several tiles starting with the 5 Pillars of Operations. We will review each of these pillars in this exercise.
3. The top bar including a search field for quick navigation. We will review the search field later in this module.

Let's review each of the Pillars of Operations now.

## Pillars of Operations

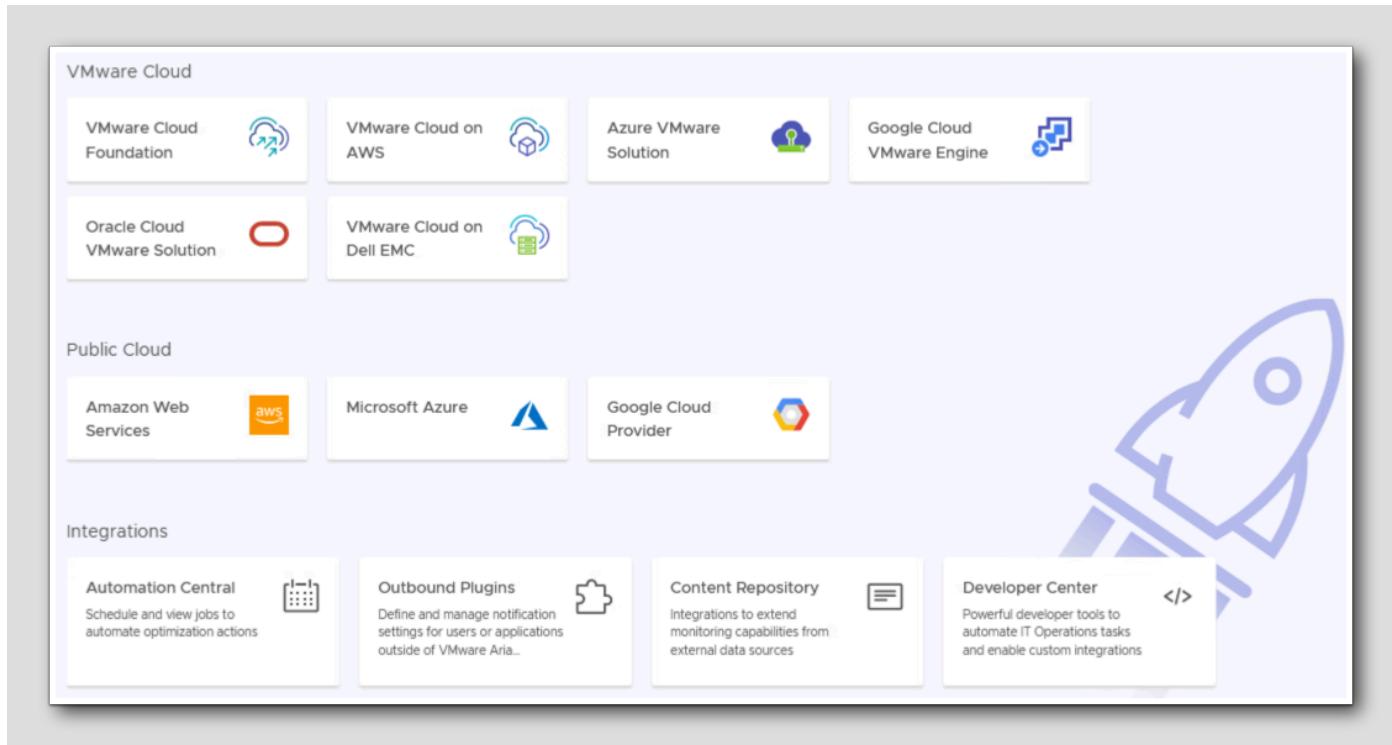


The Aria Operations Pillars of Operations represent several groups of functionality.

Note: if you click on any of the tiles you will be taken to a page with more detail. To return to this Launchpad tab on the home screen, you can click Home in the navigation menu on the left.

1. **Observability** includes monitoring and troubleshooting components to assist with identifying and solving issues in the environment. These components are covered starting in module 4 of this lab, and in later labs in the series.
2. **Capacity** includes rightsizing and reclamation options for optimizing the existing environment, as well as capacity management tools to assist in determining future capacity needs. These components are covered starting in module 2 of this lab, and in later labs in the series.
3. **Cost** includes tools for determining the cost of running the environment, as well as rate cards and the ability to determine the cost of actions such as adding workloads or migrating to new environments. These components are covered starting in module 3 of this lab, and in later labs in the series.
4. **Compliance** includes options for applying pre-configured or customized compliance standards to the environment, and monitoring against those standards. These components are covered in module 5 of this lab.
5. **Sustainability** provides the VMware Green Score for your environment, allowing you to determine the environmental impact of changes. This tile is covered in a separate lab in this series - HOL-2401-91-SDC - Level Up your Environmental Sustainability with VMware Aria.
6. Use the scrollbar to scroll down to see more of the Launchpad.

## Additional Launchpad Sections



As we scroll down through the Launchpad, we will see additional categories including:

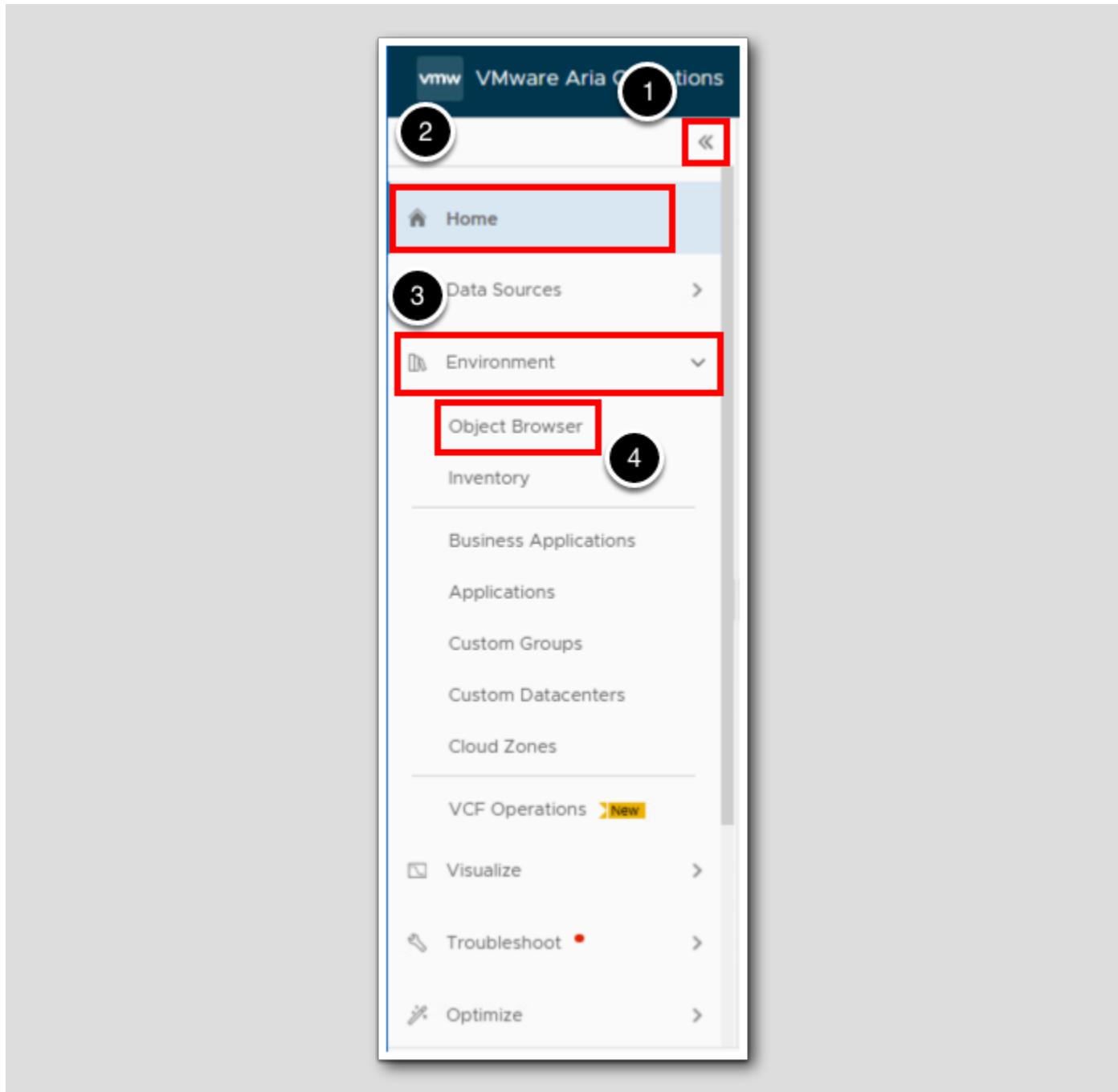
- Application monitoring and management
- Infrastructure monitoring and management
- VMware Cloud and Public Cloud options
- Integrations, including options for scheduled automation and extensibility to allow Aria Operations to monitor more than the default vSphere environment.

Several of these categories are covered in later labs in this series.

## Using the Aria Operations Navigation Menu

The navigation menu on the left side of the VMware Aria Operations interface will be used throughout the labs in this series. Let's review this navigation menu now.

## Navigation Menu



The navigation menu includes several categories for easy access to all of the Aria Operations functionality.

1. To collapse the navigation menu, click the << icon at the top. To expand the menu again, click the >> icon.
2. You can return to the VMware Aria Operations Launchpad at any time by clicking Home in the navigation menu.
3. The menu is divided into several categories. You can expand each category by clicking on the > next to the category name, or on the name itself. Click on Environment to expand this category.
4. Click Object Browser

## Object Browser

[19]

The screenshot illustrates the VMware Aria Operations interface. The left sidebar is expanded, showing the 'Data Sources' section with 'Environment' selected. The main area displays the 'Object Browser' with a tree structure. The first level includes 'Environments' and 'vSphere'. Under 'vSphere', there are 'vSphere Hosts and Clusters', 'vSphere World', and 'Management'. 'vSphere World' is expanded, showing 'vcsa-01a.corp.vmbeans.com' and 'RegionA01'. 'RegionA01' is expanded, showing 'Development', 'HOL Infrastructure', 'Namespaces', 'Templates', 'vCLS', 'Workloads', and 'Discovered virtual machine'. 'Management' is expanded, showing 'Workload1', 'Namespaces', 'esx-03a.corp.vmbeans...', and 'esx-04a.corp.vmbeans...'. The bottom of the tree view has a button labeled '4' with a red border around it. The right side of the interface shows a summary for the selected host, 'esx-05a.corp.vmbeans.com', which is 'Powered On'. It provides details such as Model (VMware, Inc. VMware7,1), Version (8.0.0, 20513097), CPU (4 Cores, 8.38 GHz), and Memory (16 GB). Below this, there is a 'Time Remaining' section showing '0 Days' and a 'Utilization' section displaying CPU Usage (37.37 %), Memory Usage (88.86 %), Memory Balloon (0 KB), Storage Total IOPS (169.47), and Storage Total Throughput (1.44 MBps).

The Object Browser is a collection of all objects discovered and monitored by VMware Aria Operations. You can navigate this inventory in a tree view similar to the one found in the vSphere Client.

1. Under vSphere World, click the > next to `vcsa-01a.corp.vmbeans.com` to expand the inventory.
2. Click the > next to the RegionA01 data center to expand the inventory again. Note that this list will include vSphere clusters as well as virtual machine folders.
3. Click the > next to Workload1 to expand the inventory for this vSphere cluster.
4. Click on one of the esx hosts (`esx-05a.corp.vmbeans.com` in this example.) This will open the object view for this host. We will review the object detail later in this exercise.
5. In the left navigation menu, click on **Environment** to collapse this category.

## Administration

The screenshot shows the VMware Aria Operations Launchpad. On the left, there is a navigation menu with the following items:

- Home
- Data Sources
- Environment
- Visualize
- Troubleshoot
- Optimize
- Plan
- Configure
- 1 Automation Central**
- Administration** (highlighted with a red box)
- Developer Center

The main content area is titled "Administration". It contains several management options:

- Access Control**: Create, remove and manage permissions for users, roles and groups.
- Authentication Sources**: Define connections to external authentication sources like LDAP and vIDM.
- Log Forwarding**: Configure self-monitoring logging and specify targets for outbound logs.
- Cluster Management**: Manage the VMware Aria Operations clusters and nodes.
- Orphaned Content**: Find, assign, take ownership or discard content created by deleted users.
- Physical Data Centers [New]**: Manage physical data centers and associated cloud accounts.
- Audit**: Generate an audit report.
- Recent Tasks**: Review recent activity across the system.
- Cost Reference Database**: The reference database supplies default values for cost calculations.
- Support Logs**: Browse, search and find across all the product's logs.

1. In the navigation menu, click on **Administration**.

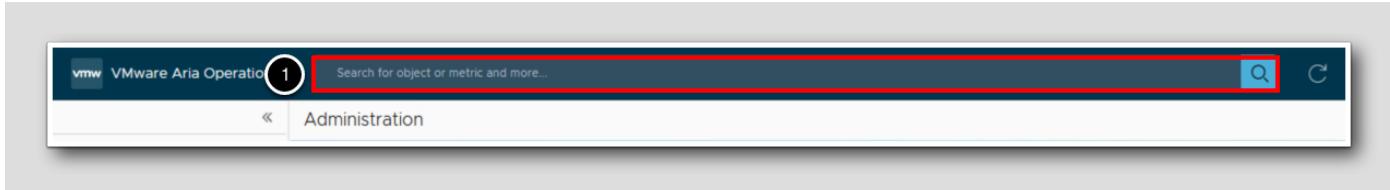
The Administration section allows for management and customization of several options for VMware Aria Operations, ranging from access and certificate management, to management of the Aria Operations nodes themselves, to configuration and customization of capacity and cost calculations. We will not be reviewing each of these sections in detail, but some exercises in this lab series do leverage Administration settings.

## Using the Search Bar and Object Detail

We have already explored the Aria Operations Launchpad and navigation menu. But what happens if we need to locate an object quickly in the inventory and you do not know where it is? Well just like in VMware vCenter, there is a search feature in VMware Aria Operations.

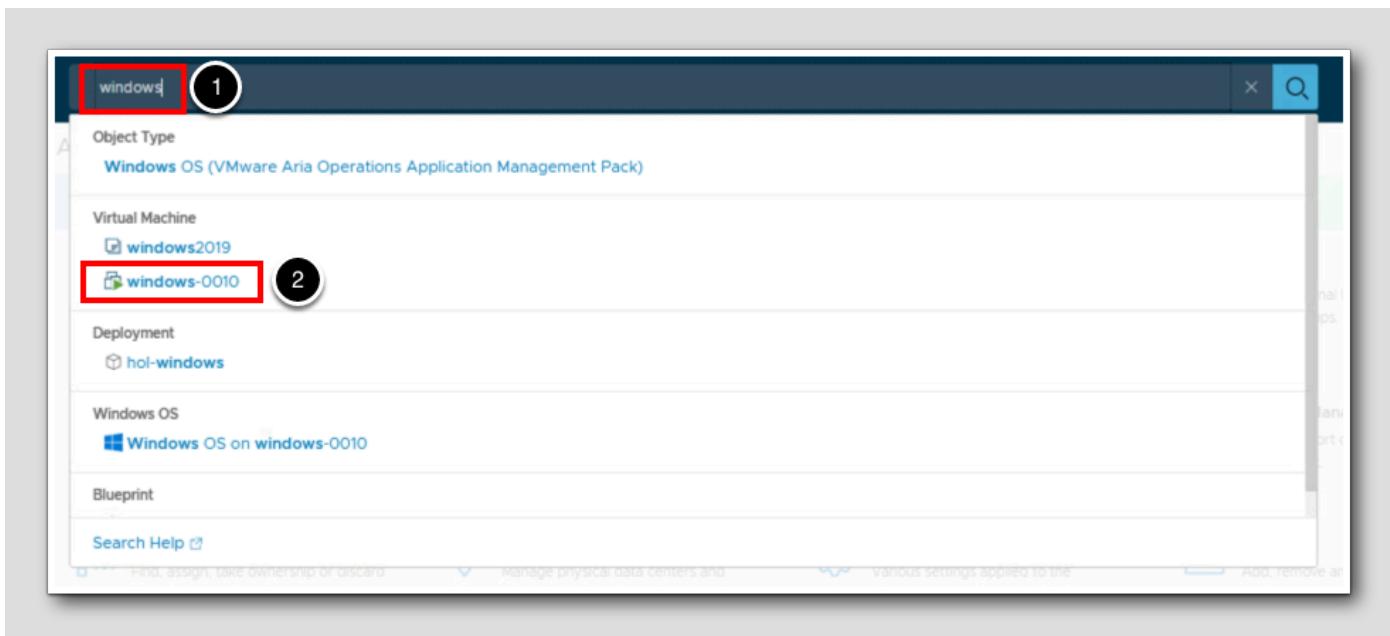
The search bar is the fastest place to start when you know the name of an object that you want to dig into.

## The Global Search Feature



1. The search field is at the top of the Aria Operations interface. Using this field we can quickly search for objects in the Aria Operations inventory.

## Perform a Search



1. Type windows into the search field, but do not press Enter.

Note that several types of objects are displayed as possible options. In this list, we can see:

- A Windows OS monitoring object
- A running Windows virtual machine, as well as a VM template
- A Windows deployment managed by Aria Automation
- A Windows guest OS object discovered by Aria Operations on the running Windows VM

The search field can be used to quickly navigate to any of these components, or other components in the Aria Operations inventory. But we will view the running VM next.

2. Click on windows-0010.

## Object Detail Page

[24]

The object detail page includes detailed information on the object in the Aria Operations inventory (in this case, the windows-0010 VM.) We could have navigated through the Object Browser to find this VM, but the search field allows us to locate it quickly.

1. Click the << to collapse the left navigation menu.

## Object Detail Page (Continued)

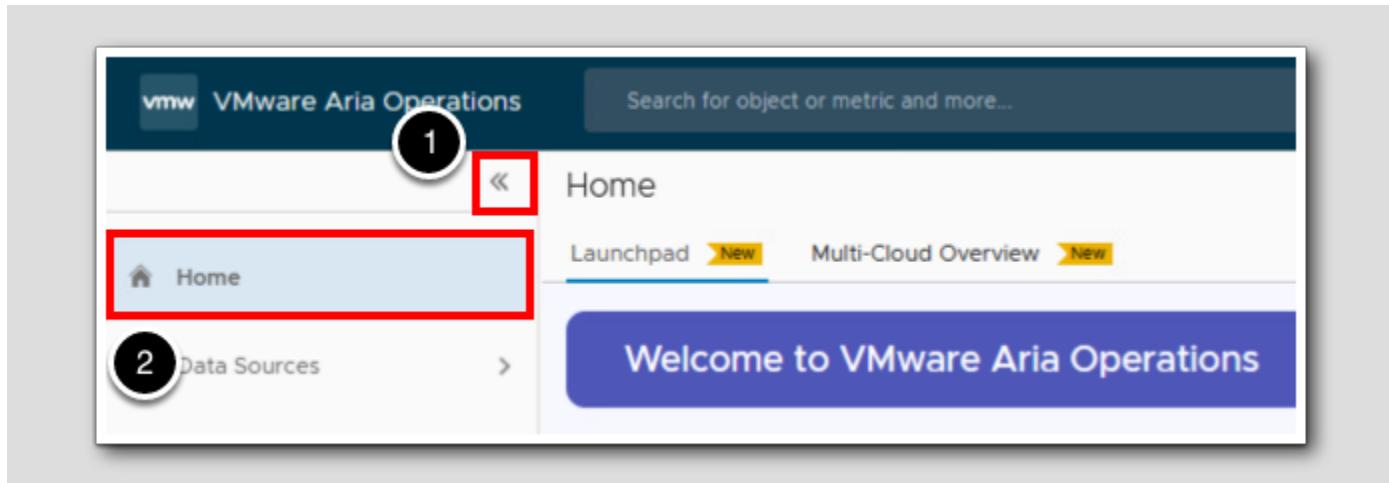
The screenshot shows the vSphere Object Detail Page for a virtual machine named "windows-0010".

- Object Browser:** On the left, a tree view of the vSphere environment showing various objects like Datastore, Windows OS, Virtual Machine, etc. The "windows-0010" VM is selected and highlighted.
- Summary Tab:** The main content area displays summary information for the selected VM:
  - Status:** Powered On
  - IP Address:** 192.168.110.121
  - Number of virtual CPUs:** 2
  - Memory:** 4 GB
  - Disk Space:** 40 GB
  - VMware tools:** Tools Version 12.0.6, Running
- Troubleshoot:** A section showing active alerts categorized by severity (Critical, Immediate, Warning, Info) and capacity remaining (49% of 19.23 GB).
- VSphere Solution's Default Policy:** A section showing policy details.

1. The Object Browser view allows for visibility into the entire environment. By navigating this view you can view additional information on which infrastructure resources this VM is using, which objects it contains, as well as the health of each. This can be useful in troubleshooting issues that may be impacting this VM.
2. The Summary tab for this object shows several tiles providing base information about the VM, the status of alerts related to this VM, and information on capacity remaining based on existing utilization.

You can scroll down through the Summary tab to view additional information, or click any of the other tabs to view more detail for this object. Several of these tabs will be covered in later modules in this lab, as well as later labs in the series.

## Navigate to Launchpad



1. Click the >> above the left navigation menu to expand the menu.
2. Click **Home** to return to the VMware Aria Operations Launchpad.

Again, the navigation menu can be used to move to any section in Aria Operations quickly, or to return to this Home screen.

## Conclusion

In this module, we started to explore the VMware Aria Operations interface using the basic navigation functions. We introduced the Search function which gave us the ability to search and quickly locate the objects in the inventory. By reviewing each of the different functions of the VMware Aria Operations interface we can see how comprehensive a toolset it can be for managing our virtual infrastructure.

## You've finished the module

Congratulations on completing the lab module.

If you are looking for additional information, visit the [VMware Aria Operations: Journey to Success](#) guide on the [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 - Gaining Insights into your Capacity (15 minutes) Basic

### Introduction

[30]

Managing and estimating available capacity in a dynamic virtualized environment can be a challenge. Aria Operations provides several out-of-the-box dashboards that provide additional insights into available capacity as well as estimates of time remaining based on observed growth in the environment.

In this module, we will begin to review some of the preconfigured capacity dashboards in Aria Operations.

### Log in to Aria Operations

[31]

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

### Open the Firefox Browser from the Windows Task Bar

[32]

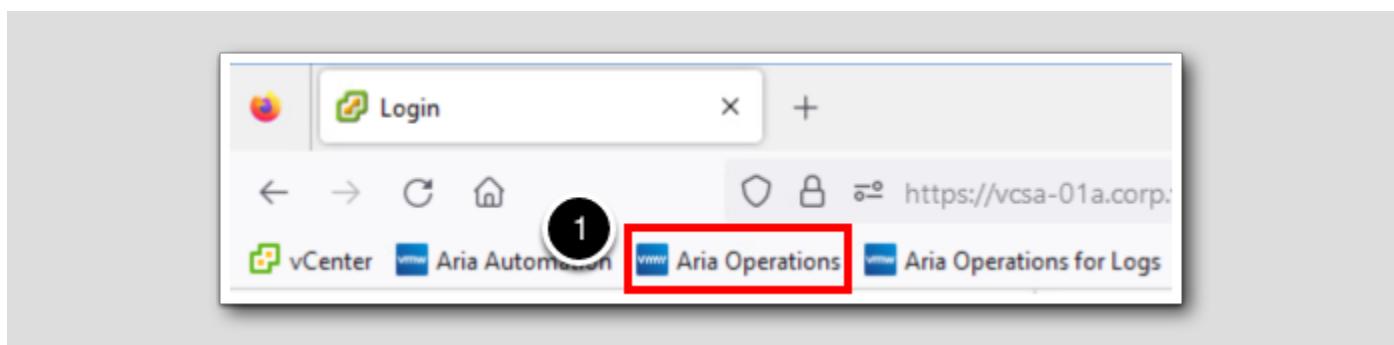


If the browser is not already open, launch Firefox.

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

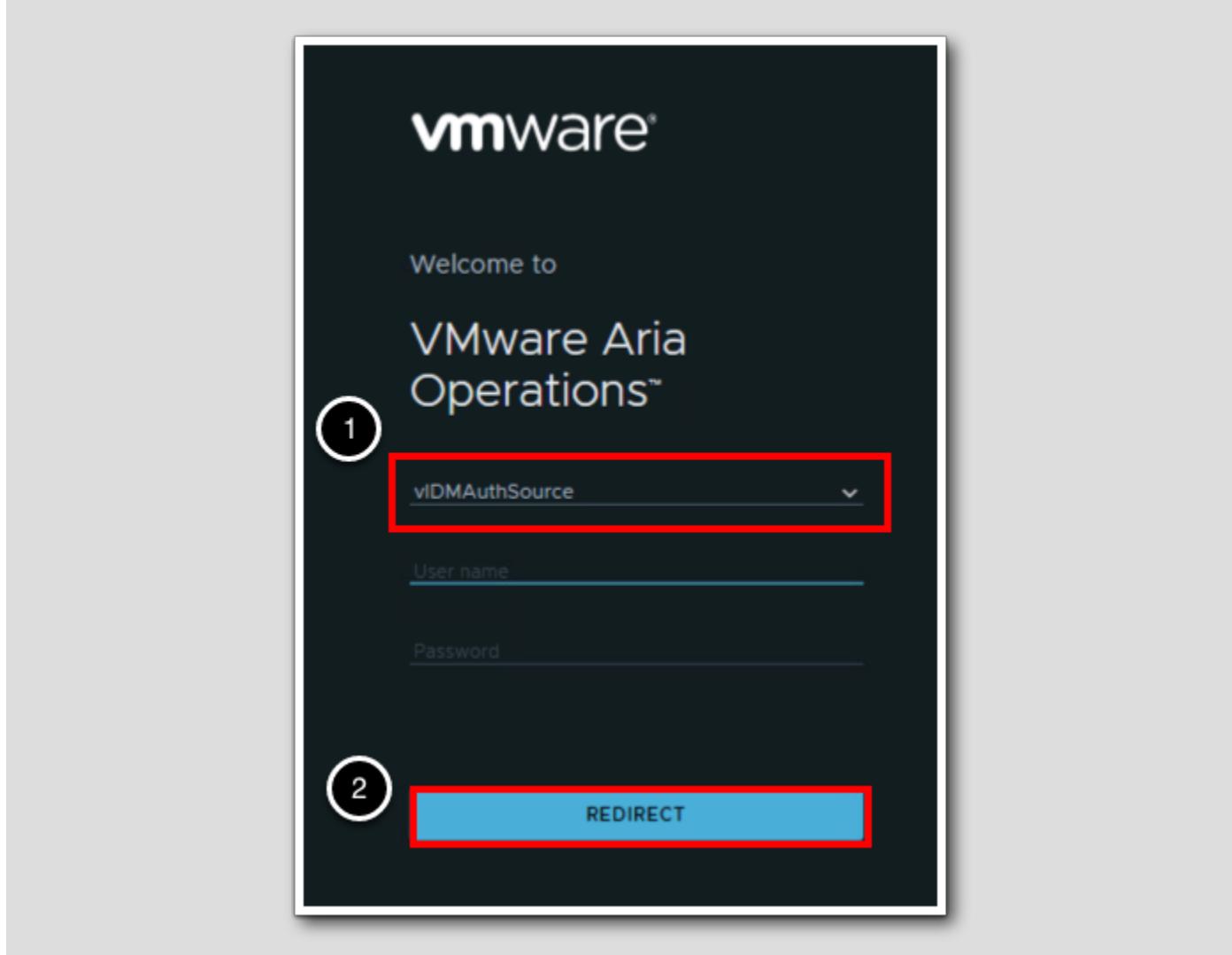
### Navigate to Aria Operations

[33]



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

## Log in to Aria Operations

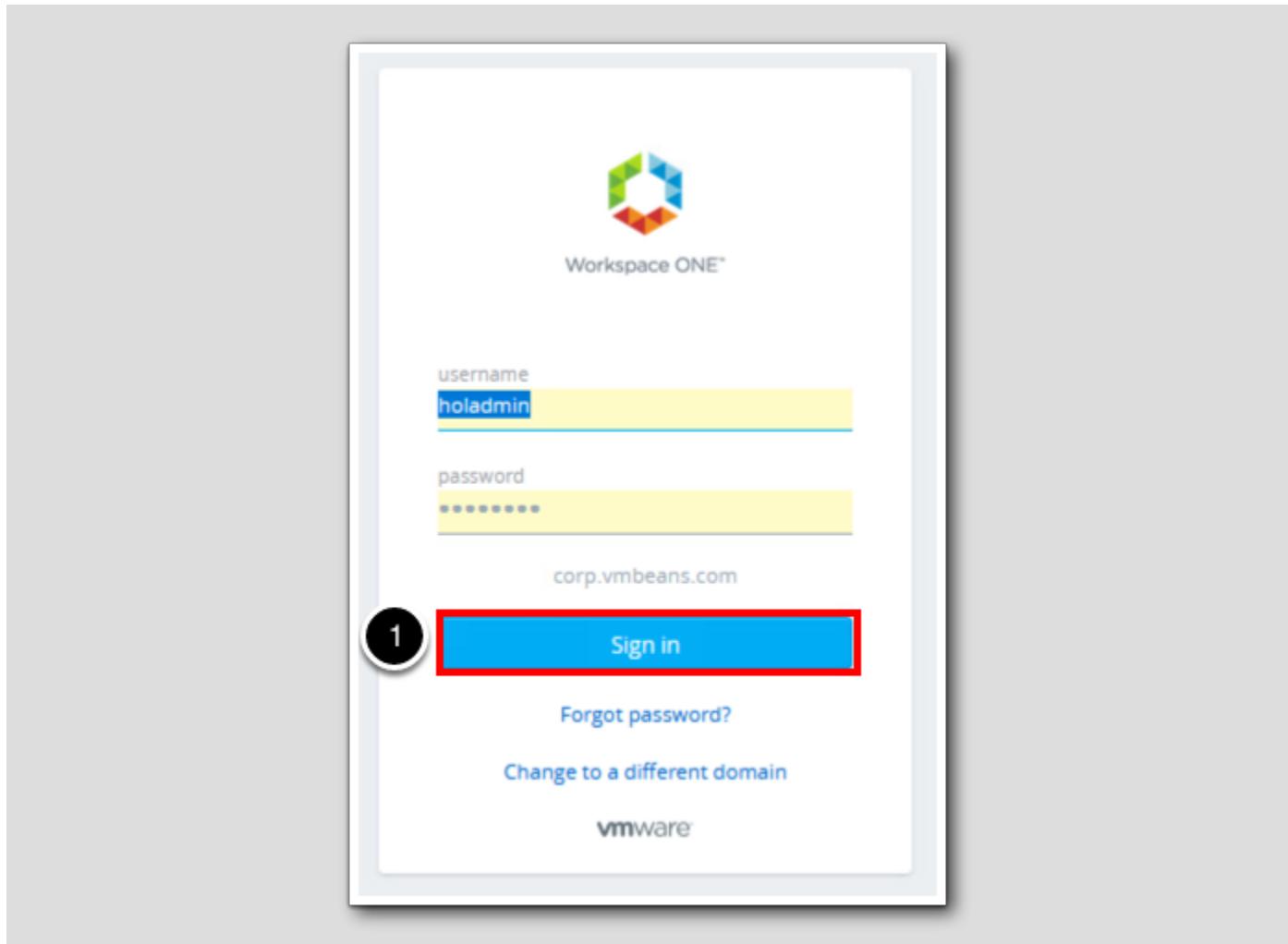


Aria Operations is integrated with VMware Workspace ONE Assist (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

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



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

## Capacity Dashboards Overview

Capacity quantifies the resources used, resources remaining, and opportunities to reclaim unused resources. Projections of the demand provide a proactive view of capacity. The **Capacity Dashboards** display capacity in terms of time remaining before capacity is projected to run out, the amount of capacity remaining, the number of VMs that might fit in the remaining capacity, and reclaimable resources that can increase the available capacity.

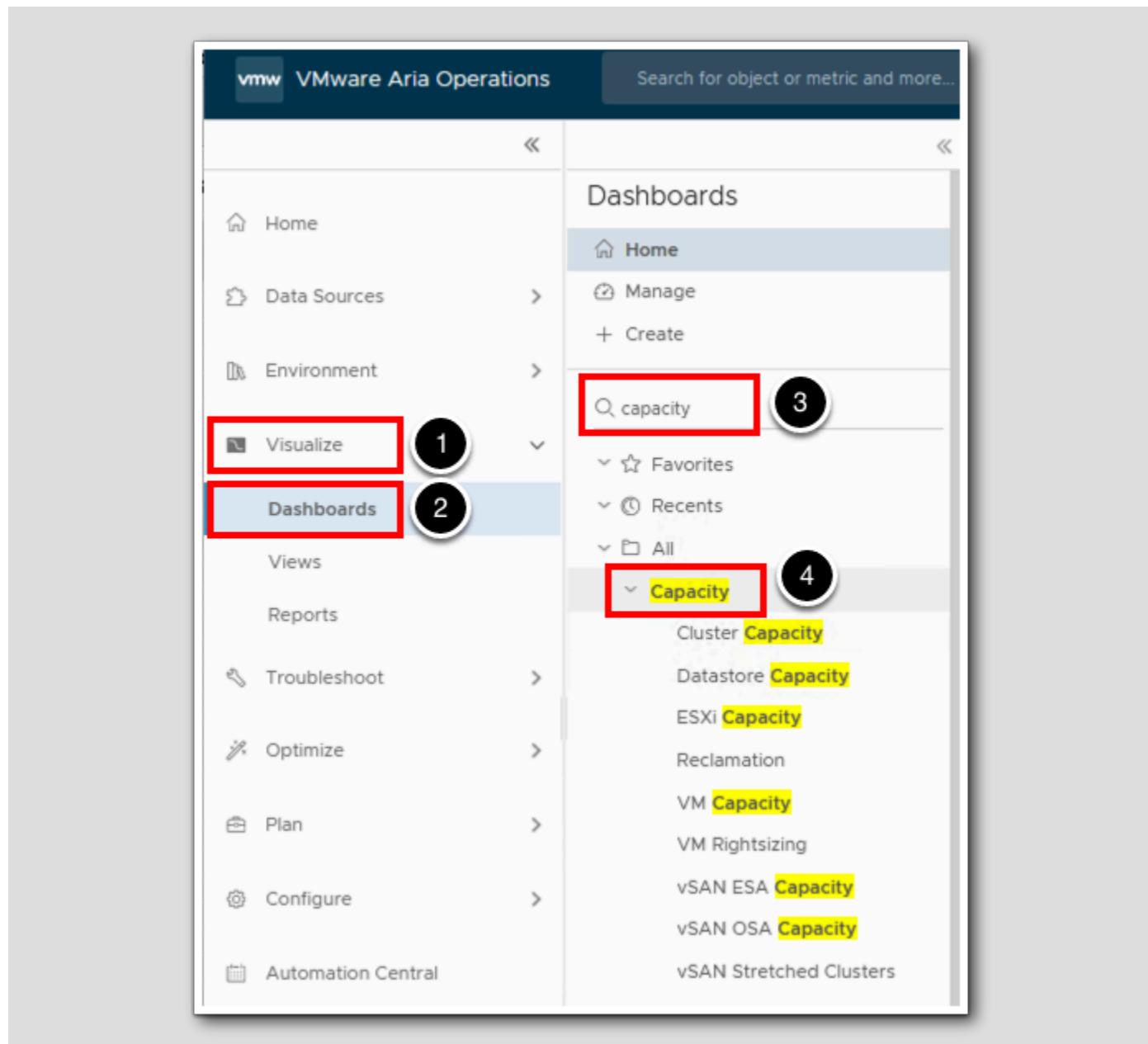
Capacity management is about balancing demand and supply. It is about meeting demand with the lowest possible cost.

There are currently nine **Capacity Dashboards** included in VMware Aria Operations. Below is a list and brief description of each one:

- **Cluster Capacity Dashboard** -- The Cluster Capacity dashboard includes the ESXi host and resource pools as they impact cluster capacity.
- **Datastore Capacity Dashboard** -- The Datastore Capacity dashboard complements out of the box capacity pages and dashboards. It focuses on storage, provides an overall picture, and highlights the datastores that need attention.
- **ESXi Capacity Dashboard** -- The ESXi Capacity dashboard supports the Cluster Capacity dashboard and is also required for the non-clustered ESXi hosts.
- **VM Capacity Dashboard** -- The VM Capacity dashboard helps you analyze the capacity of all VMs with the ability to analyze each VM.
- **Reclamation Dashboard** -- The Reclamation dashboard helps you manage various types of reclamation that can be carried out on VMs and datastore. It is designed for both the Capacity team and the Operations team.
- **vSAN Capacity Dashboard** -- The vSAN Capacity dashboard complements the vSphere Cluster Capacity dashboard by displaying capacity related to vSAN. To manage vSAN capacity, use both dashboards.
- **vSAN Stretched Clusters** -- The vSAN Stretched Clusters dashboard provides an overview of the cluster resources used across vSAN fault domains. Using the stretched clusters dashboard, you can monitor the resource consumption at the site level for Preferred Sites and Secondary Sites. You can create custom dashboards for specific vSAN stretched cluster metrics.
- **vSAN ESA Capacity Dashboard** -- The vSAN ESA (Express Architecture) Capacity dashboard provides an overview of the capacity available across all the vSAN clusters. The dashboard displays the time remaining before capacity is projected to run out, the amount of capacity remaining, the number of vSAN clusters that might fit in the remaining capacity, and reclaimable resources that can increase the available capacity.
- **vSAN OSA Capacity Dashboard** -- The vSAN OSA (Original Storage Architecture) Capacity dashboard provides an overview of the capacity available across all the vSAN clusters. The dashboard displays the time remaining before capacity is projected to run out, the amount of capacity remaining, the number of vSAN clusters that might fit in the remaining capacity, and reclaimable resources that can increase the available capacity.

Due to the time and resources allotted for this Hands-On Lab, we won't individually review these dashboards, but we will identify where these dashboards are located to provide an opportunity for further research as time allows.

## How to locate the Capacity Dashboards



To locate the Capacity Dashboards, do the following from the Home Screen:

1. Select Visualize.
2. Select Dashboards.
3. In the Dashboard search field, type capacity.
4. Select the down arrow next to Capacity to review the various available dashboards.

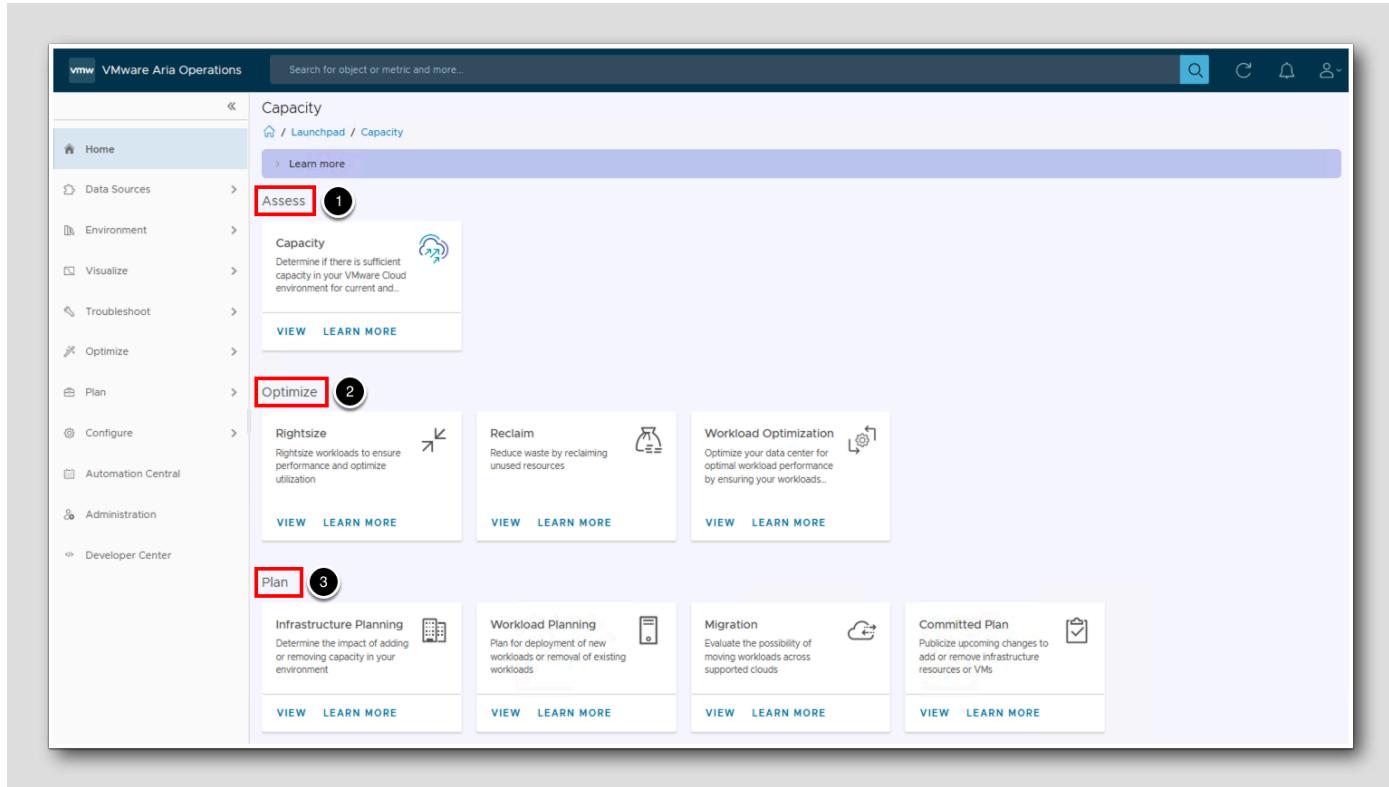
## Capacity Pillar of Aria Operations Overview

The screenshot shows the VMware Aria Operations interface. On the left is a navigation sidebar with options like Home, Data Sources, Environment, Visualize, Troubleshoot, Optimize, Plan, Configure, Automation Central, Administration, and Developer Center. The 'Home' option is highlighted with a red box and a circled '1'. The main content area features a 'Welcome to VMware Aria Operations' banner. Below it is the 'Pillars of Operations' section, which includes five cards: Observability, Capacity, Cost, Compliance, and Sustainability. The 'Capacity' card is highlighted with a red box and a circled '2'. To the right of the pillars is a large graphic of a rocket launching. At the bottom, there are icons for vSphere, vSAN, NSX, Horizon, and Kubernetes.

The Capacity Pillar in Aria Operations is designed to assess workload status and how much capacity is remaining in data centers across your environment. To access the Capacity Pillar, do the following:

1. Select Home.
2. Select Capacity in the Pillars of Operations window frame.

## Capacity Launchpad Overview



In the Capacity Launchpad window, there are three main components: **Assess**, **Optimize**, and **Plan**. We won't review each component in-depth in this lab, but below is a general overview of each:

1. **Assess** -- Use this component to determine if there is sufficient capacity in your VMware Cloud environment for current and future workloads.
2. **Optimize** -- Use this component to optimize your data center for optimal workload performance by ensuring your workloads have the resources they need (includes the **Rightsize** and **Reclaim** features).
3. **Plan** -- Use this component to plan for the addition/removal of capacity or workloads in the environment, as well as evaluate the possibility of moving workloads across supported clouds.

## Open the Assess Capacity Component

The screenshot shows the VMware Aria Operations interface. On the left is a navigation sidebar with various tabs like Home, Data Sources, Environment, Visualize, Troubleshoot, Optimize, Plan, Configure, Automation Central, Administration, and Developer Center. The 'Assess' tab is currently selected. Under 'Assess', there's a 'Capacity' section with a brief description and two buttons: 'VIEW' and 'LEARN MORE'. A red box highlights the 'VIEW' button. Below this are sections for 'Optimize' (Rightsize, Reclaim, Workload Optimization) and 'Plan' (Infrastructure Planning, Workload Planning, Migration, Committed Plan). Each section has its own 'VIEW' and 'LEARN MORE' buttons. A circled '1' is visible on the far left.

In the lab, we will focus on the **Assess Capacity** Component to determine if we need to add additional resources to our current environment.

1. In the Capacity Launchpad window under the **Assess** section, click **View**.

## Assess Capacity - Select a Datacenter

The screenshot shows the VMware Aria Operations interface. The left sidebar has a 'Capacity' section selected. The main area is titled 'Capacity' and says 'Select datacenter or ADD NEW CUSTOM DATACENTER'. It shows two datacenters: 'RegionAO1' and 'RegionAO2'. Both are marked as 'Critical' with a red status indicator. Each datacenter card shows '0 Days Remaining' and 'US\$31 Cost Savings' with a 'Not Optimized' button. A red box highlights 'RegionAO1' and a circled '1' is above it, likely indicating a notification.

Capacity

Select datacenter or [ADD NEW CUSTOM DATACENTER](#)

Critical ②

RegionAO1  
0 Days Remaining  
US\$31 Cost Savings [Not Optimized](#)

RegionAO1  
0 Days Remaining  
US\$31 Cost Savings [Not Optimized](#)

Home

Data Sources

Environment

Visualize

Troubleshoot •

Optimize

Capacity

Reclaim

Workload Placement

Rightsize

Compliance

Plan

Configure

Automation Central

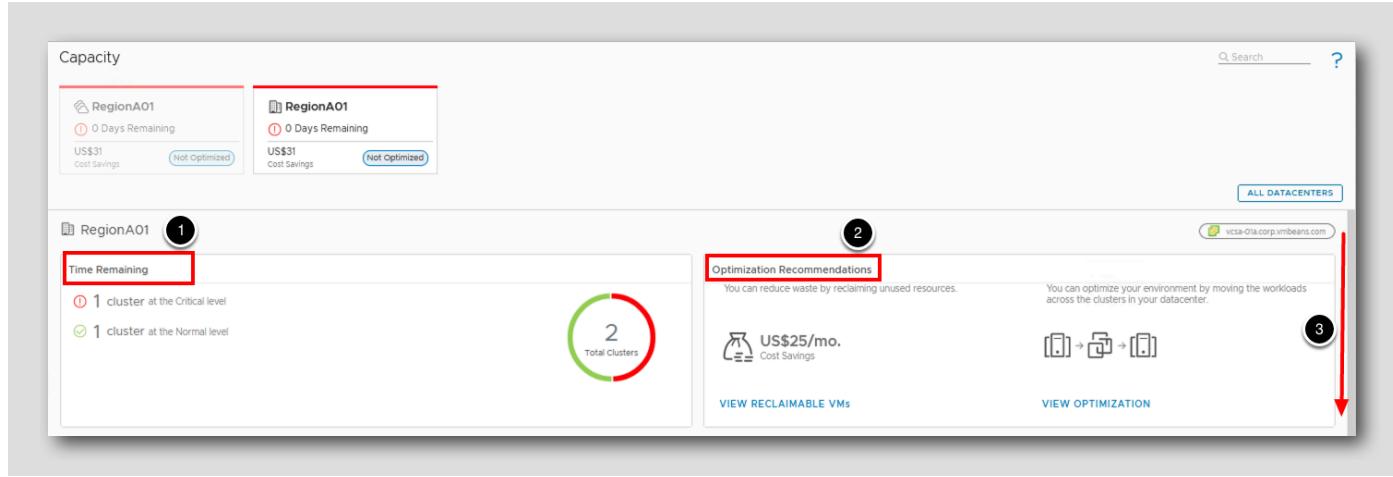
Administration

Developer Center

- In the **Assess Capacity** window, select the **RegionA01** datacenter (notice the "buildings" icon to the left of the name) as this will be the one we analyze in the lab.

## Datacenter Capacity Time Remaining and Optimization Recommendations

[42]



The first two components in the Datacenter Capacity window are Time Remaining and Optimization Recommendations. Below are brief overviews of both:

- Time Remaining** -- using advanced calculations, VMware Aria Operations determines if any additional resources need to be added to maintain the current state of the environment. **Note:** Depending upon the available resources of the lab, we may see different results than what is shown in this example.
- Optimization Recommendations** -- this component identifies available resources that could be reclaimed and provides an associated cost savings estimate. **Note:** Depending upon the available resources of the lab, we may see different results than what is shown in this example.
- Use the slide bar on the right side to scroll down and see other options which are discussed on our next page.

## Datacenter Capacity Cluster Utilization



As we scroll down further on the Datacenter Capacity page, notice the Cluster Utilization widget and how it provides a graphical chart estimating the time remaining of current resources (at current rate of growth). Additionally, the chart shows a history of resources for the past month and a forecast of resources for the next three months. Several options can be explored in this widget by doing the following:

1. Change the Sort By selection (defaults to **Most Constrained**) -- in addition to Most Constrained, we can also sort by CPU Demand, Memory Demand, and Disk Space Demand.
2. This widget shows the capacity data for each vSphere cluster in the datacenter. We can change our selection in this area by selecting another cluster. In the current lab, we have two clusters to choose from.
3. The vertical dotted line represents today. Everything to the right of the dotted line represents a trend based on the data Aria Operations has collected previously from the environment.
4. Change the resource selection across the top of the menu (change view between CPU, Memory, and Disk Space).
5. Change the Show History For or Show Forecast For options.
6. Click on the **How is the criticality determined?** link to see what policy the object is using to determine criticality thresholds.
7. **Recommendations** (not shown in image) -- scroll further down and see any recommendations Aria Operations makes for the current cluster.
8. **RUN SCENARIO** (not shown in image) -- located at bottom of this page. This feature is covered in detail in the "Getting More Out of Aria Operations" lab and is outside the scope of this labs overview.

## Conclusion

In this module, we introduced capacity management and monitoring options available in Aria Operations.

### You've finished the module

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 4 - Mastering Monitoring and Troubleshooting Essentials (30 minutes) Basic

### Introduction

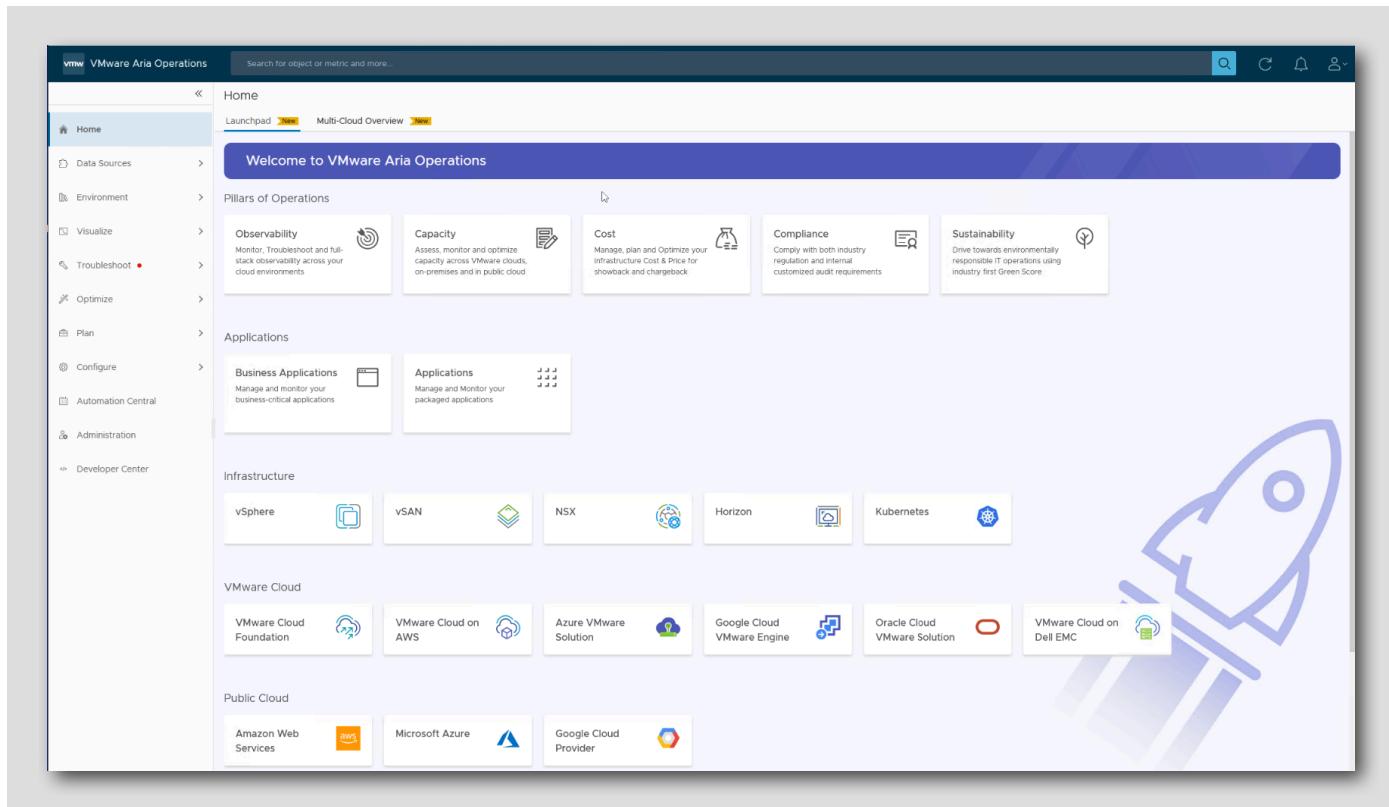
[47]

The screenshot shows the VMware Aria Operations interface. On the left is a navigation sidebar with options like Home, Data Sources, Environment, Visualize, Troubleshoot, Optimize, Plan, Configure, Automation Central, Administration, and Developer Center. The main area features a "Welcome to VMware Aria Operations" banner. Below it are sections for Pillars of Operations (Observability, Capacity, Cost, Compliance, Sustainability), Applications (Business Applications, Applications), Infrastructure (vSphere, vSAN, NSX, Horizon, Kubernetes), VMware Cloud (VMware Cloud Foundation, VMware Cloud on AWS, Azure VMware Solution, Google Cloud VMware Engine, Oracle Cloud VMware Solution, VMware Cloud on Dell EMC), and Public Cloud (Amazon Web Services, Microsoft Azure, Google Cloud Provider). A large rocket ship graphic is on the right side of the screen.

Aria Operations gives administrators in depth reporting and alerting capabilities. With the ability to create customized alerts designed for specific objects, applications or systems, administrators can eliminate the noise of an environment and instead focus on what's important. Let's take a look at the basic alerting capabilities with more advanced topics covered in additional Labs.

This Module contains the following lessons:

- Introduction to Alert Components
- Working with Alerts



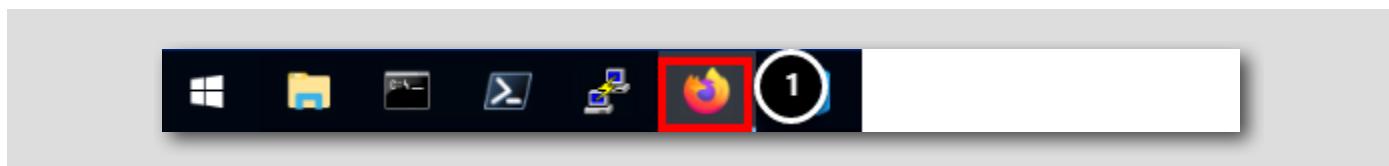
## Log in to Aria Operations

[48]

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

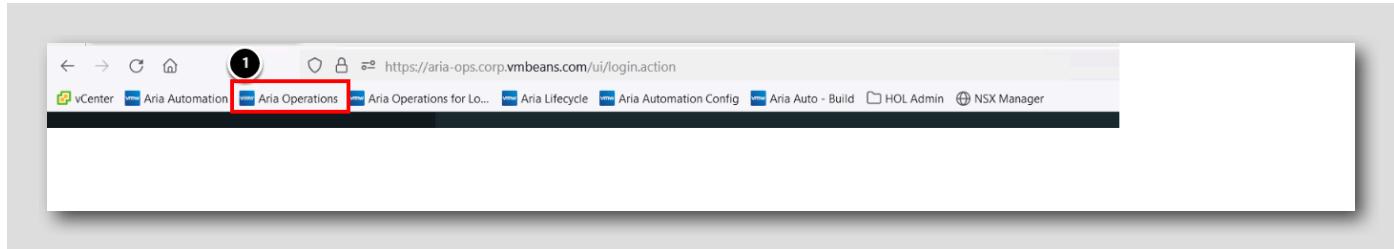
[49]



If the browser is not already open, launch Firefox.

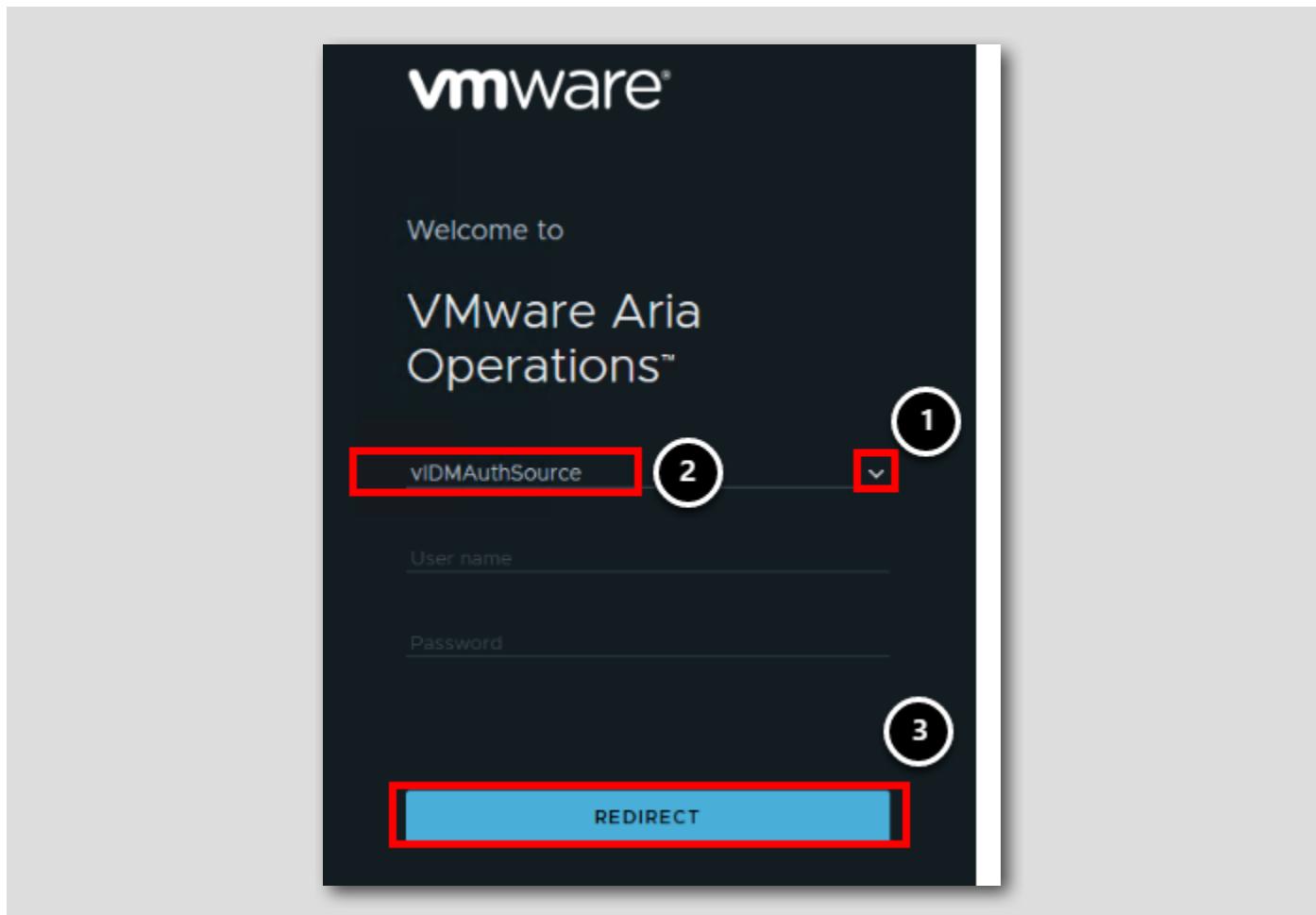
1. Click the Firefox icon on the Windows Quick Launch Task Bar at the bottom of the screen

## Log in to Aria Operations



1. Click on the Aria Operations Favorites link from the Favorites Bookmark in the Chrome Browser.

## Sign In

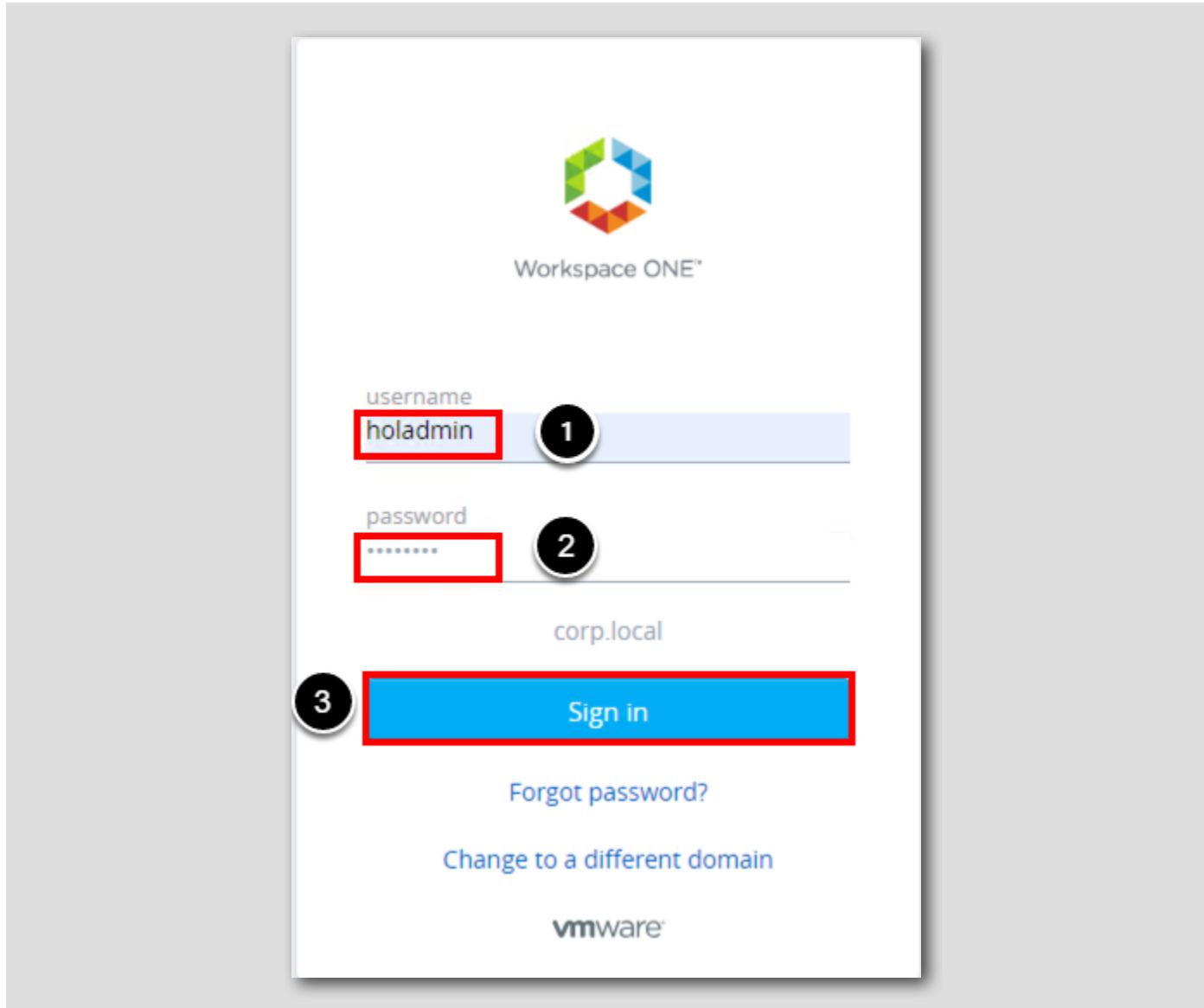


Aria Operations is integrated with VMware Identity Manager which we will use for user authentication in this lab. VMware Identity Manager is listed as vIDMAuthSource in our live lab environment.

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



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.

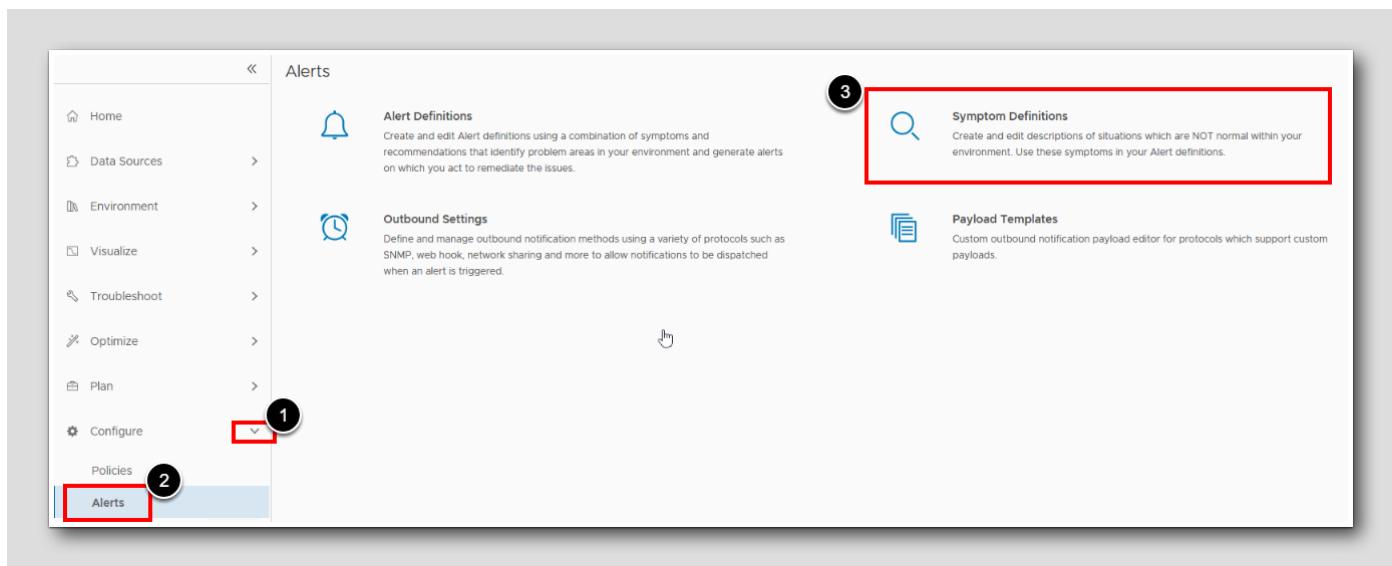
1. username: **holadmin**
2. password: **VMware1!**
3. Click **Sign in**

## Introduction To Alert Components

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 predefined content to provide a dynamic, effective, and scalable approach for identifying and resolving issues in your environment.

For this lesson, we will start by exploring a Symptom Definition. Symptom Definitions enable Aria Operations to identify problems with objects in your environment. These Symptom Definitions can be used to build alerts in our environment. Let's get started.

## Locating Alert Configuration



Symptom Definitions are conditions that evaluate the state of your environment that, if met, trigger a symptom which can result in a generated alert. Symptom definitions can be created using attributes such as metrics, 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.

Let's explore existing symptom definitions

1. Click on the chevron toe expand **Configure**.
2. Click the **Alerts** tab.
3. Click **Symptom Definitions**.

## What is a Symptom

Name	Criticality	Object Type	Metric Name	Operator	Value	Defined By	Last Modified	Modified By
: Aborted connection count is high on MySQL	<span style="color: yellow;">⚠️</span>	MySQL	Aborted connection count	is greater than	100	VMware Aria ...	6/16/23 10:3...	admin
: Active connection count is high on Nginx	<span style="color: yellow;">⚠️</span>	Nginx	HTTP Status Info/Active conne...	is greater than	100	VMware Aria ...	6/16/23 10:3...	admin
: Active flows has exceeded 80% of flows lim...	<span style="color: yellow;">⚠️</span>	Velo Cloud Gat...	NAT/Active Flows (%)	is greater than	70	VMware Aria ...	6/16/23 10:3...	admin
: Active flows has exceeded 90% of flows lim...	<span style="color: red;">❗️</span>	Velo Cloud Gat...	NAT/Active Flows (%)	is greater than	90	VMware Aria ...	6/16/23 10:3...	admin
: Active tunnel count percentage is less than ...	<span style="color: yellow;">⚠️</span>	Velo Cloud Gat...	Summary/Active Tunnels Coun...	is less than	90	VMware Aria ...	6/16/23 10:3...	admin
: Active tunnel count percentage is more tha...	<span style="color: yellow;">⚠️</span>	Velo Cloud Gat...	Summary/Active Tunnels Coun...	is greater than	80	VMware Aria ...	6/16/23 10:3...	admin

Symptoms are conditions that indicate problems in your environment. You define symptoms that you add to alert definitions so that you know when a problem occurs with your monitored objects.

As data is collected from your monitored objects, the data is compared to the defined symptom condition. If the condition is true, then the symptom is triggered.

You can define symptoms based on metrics and super metrics, properties, message events, fault events, and metric events.

Defined symptoms in your environment are managed in the Symptom Definitions. When the symptoms that are added to an alert definition are triggered, they contribute to a generated alert.

## Metrics and Properties

	Name ↑	Criticality	Object Type	Metric Name	Operator	Value	Defined By	Last Modified	Modified By
<input type="checkbox"/>	: Aborted connection count is high on MySQL	⚠️	MySQL	Aborted connection count	is greater than	100	VMware Aria ...	6/16/23 10:3...	admin
<input type="checkbox"/>	: Active connection count is high on Nginx	⚠️	Nginx	HTTP Status Info/Active conne...	is greater than	100	VMware Aria ...	6/16/23 10:3...	admin
<input type="checkbox"/>	: Active flows has exceeded 80% of flows lim...	⚠️	Velo Cloud Gat...	NAT/Active Flows (%)	is greater than	70	VMware Aria ...	6/16/23 10:3...	admin
<input type="checkbox"/>	: Active flows has exceeded 90% of flows lim...	⚠️	Velo Cloud Gat...	NAT/Active Flows (%)	is greater than	90	VMware Aria ...	6/16/23 10:3...	admin
<input type="checkbox"/>	: Active tunnel count percentage is less than ...	⚠️	Velo Cloud Gat...	Summary/Active Tunnels Coun...	is less than	90	VMware Aria ...	6/16/23 10:3...	admin
<input type="checkbox"/>	: Active tunnel count percentage is more tha...	⚠️	Velo Cloud Gat...	Summary/Active Tunnels Coun...	is greater than	80	VMware Aria ...	6/16/23 10:3...	admin

Metric and super metric symptoms are based on the operational or performance values that VMware Aria Operations collects from target objects in your environment. You can configure the symptoms to evaluate static thresholds or dynamic thresholds.

You define symptoms based on metrics so that you can create alert definitions that let you know when the performance of an object in your environment is adversely affected.

### Static Thresholds

Metric symptoms that are based on a static threshold compare the currently collected metric value against the fixed value you configure in the symptom definition.

For example, you can configure a static metric symptom where, when the virtual machine CPU workload is greater than 90, a critical symptom is triggered.

### Dynamic Thresholds

Metric symptoms that are based on dynamic thresholds compare the currently collected metric value against the trend identified by VMware Aria Operations , evaluating whether the current value is above, below, or generally outside the trend.

For example, you can configure a dynamic metric symptom where, when the virtual machine CPU workload is above the trended normal value, a critical symptom is triggered.

## Message Events

The screenshot shows the 'Symptom Definitions' page in the VMware Aria Operations interface. The 'Message Event' tab is highlighted with a red box. Below the tabs, there are buttons for 'ADD' and '...'. The main area displays a table of symptoms:

	Name ↑	Adapter Type	Object Type
<input type="checkbox"/>	: A certificate has expired.	NSX-T	NSX-T
<input type="checkbox"/>	: A certificate is about to expire.	NSX-T	NSX-T
<input type="checkbox"/>	: A certificate is approaching expiration.	NSX-T	NSX-T
<input type="checkbox"/>	: A DNS forwarder is down.	NSX-T	NSX-T
<input type="checkbox"/>	: A license has expired.	NSX-T	NSX-T
<input type="checkbox"/>	: A license is about to expire.	NSX-T	NSX-T

Message event symptoms are based on events received as messages from a component of VMware Aria Operations or from an external monitored system through the system's REST API. You define symptoms based on message events to include in alert definitions that use these symptoms. When the configured symptom condition is true, the symptom is triggered.

The adapters for the external monitored systems and the REST API are inbound channels for collecting events from external sources. Adapters and the REST server both run in the VMware Aria Operations system. The external system sends the messages, and VMware Aria Operations collects them.

You can create message event symptoms for the supported event types. The following list is of supported event types with example events.

**System Performance Degradation** - This message event type corresponds to the EVENT\_CLASS\_SYSTEM and EVENT\_SUBCLASS\_PERFORM\_DEGRADATION type and subtype in the VMware Aria Operations API SDK.

**Change** - The VMware adapter sends a change event when the CPU limit for a virtual machine is changed from unlimited to 2 GHz. You can create a symptom to detect CPU contention issues as a result of this configuration change. This message event type corresponds to the EVENT\_CLASS\_CHANGE and EVENT\_SUBCLASS\_CHANGE type and subtype in the VMware Aria Operations API SDK.

**Environment Down** - The VMware Aria Operations adapter sends an environment down event when the collector component is not communicating with the other components. You can create a symptom that is used for internal health monitoring. This message event type corresponds to the EVENT\_CLASS\_ENVIRONMENT and EVENT\_SUBCLASS\_DOWN type and subtype in the VMware Aria Operations API SDK.

**Notification** - This message event type corresponds to the EVENT\_CLASS\_NOTIFICATION and EVENT\_SUBCLASS\_EXTEVENT type and subtype in the VMware Aria Operations API SDK.

## Faults

Name	Adapter Type	Object Type	Fault
A fatal memory error occurred	vCenter	Host System	Memory
A fatal PCIe error occurred	vCenter	Host System	PCI-E dev
A recoverable memory error occurred	vCenter	Host System	Memory
A recoverable PCIe error occurred	vCenter	Host System	PCI-E dev
Baseboard Management Controller sensor health is red	vCenter	Host System	Hardware
Baseboard Management Controller sensor health is yellow	vCenter	Host System	Hardware

Fault symptoms are based on events published by monitored systems. VMware Aria Operations correlates a subset of these events and delivers them as faults. Faults are intended to signify events in the monitored systems that affect the availability of objects in your environment. You define symptoms based on faults to include in alert definitions that use these symptoms. When the configured symptom condition is true, the symptom is triggered.

You can create fault symptoms for the supported published faults. Some object types have multiple fault definitions from which to choose, while others have no fault definitions.

If the adapter published fault definitions for an object type, you can select one or more fault events for a given fault while you define the symptom. The symptom is triggered if the fault is active because of any of the chosen events. If you do not select a fault event, the symptom is triggered if the fault is active because of a fault event.

## Metric Event

Name	Adapter Type	Metric Event
Hard threshold above event	All Adapter Types	
Hard threshold below event	All Adapter Types	
Hard threshold equal event	All Adapter Types	
Hard threshold not equal event	All Adapter Types	

Metric event symptoms are based on events communicated from a monitored system where the selected metric violates a threshold in a specified manner. The external system manages the threshold, not VMware Aria Operations.

Metric event symptoms are based on conditions reported for selected metrics by an external monitored system, as compared to metric symptoms, which are based on thresholds that VMware Aria Operations is actively monitoring.

The metric event thresholds, which determine whether the metric is above, below, equal to, or not equal to the threshold set on the monitored system, represent the type and subtype combination that is specified in the incoming metric event.

## Examine a definition

[60]

Name	Adapter Type	Object Type	Event Type	Operator	Event Message
<input checked="" type="checkbox"/> A DNS forwarder is down.	NSX-T	NSX-T	Notification	Matches reg...	DNS forwarder (?s).* is not runnin...
<input type="checkbox"/> DNS lookup failed for Manager n...	NSX-T	NSX-T	Notification	Matches reg...	DNS lookup failed for Manager n...

1. In the filter search field, type DNS and press enter
2. Locate the definition "A DNS forwarder is down" and click the 3 dots
3. Select Edit (Not Shown)

## Symptom Definition Syntax

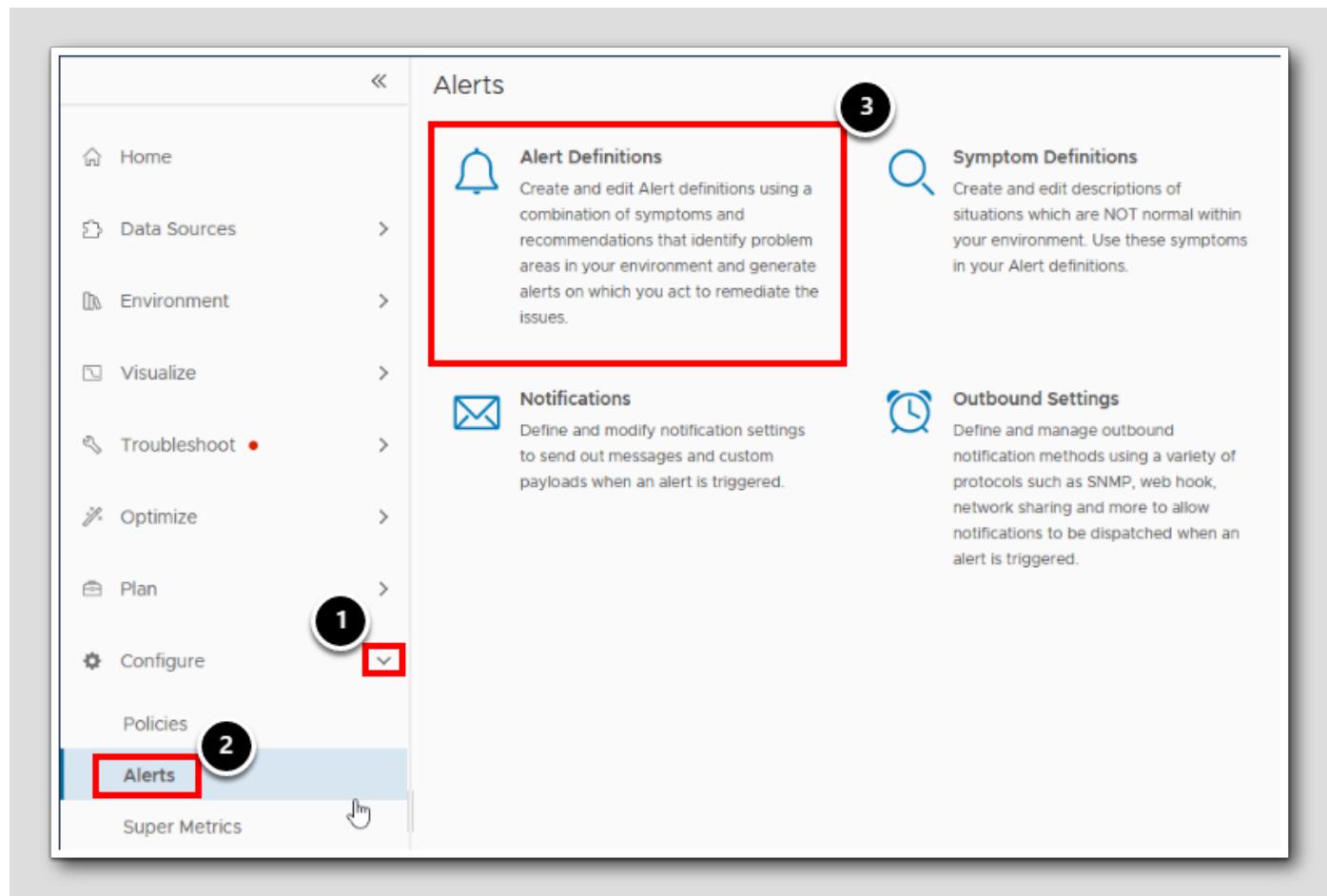
[61]

Symptoms are conditions that indicate problems in your environment. You define symptoms that you add to alert definitions so that you know when a problem occurs with your monitored objects.

As data is collected from your monitored objects, the data is compared to the defined symptom condition. If the condition is true, then the symptom is triggered.

1. Notice our Condition selection: **Matches Regular Expression**
2. Notice our Value Expression Value: DNS forwarder (?s).\* is not running. This is impacting the identified DNS Forwarder that is currently enabled.(?s).\*
3. Notice our Trigger Condition: **Immediate Criticality**
4. Notice the Object this alert definition is associated with
5. Click **Cancel** (Not Shown)

## Examining Alert Definitions



Let's now examine what these Symptom Definitions are used for when creating alerts to monitor our environment.

1. Click on the chevron next to Configure (Optional)
2. Click on **Alerts**
3. Click on **Alert Definitions**

## Open DNS Alert Definition

The screenshot shows the 'Alert Definitions' page in a web-based interface. At the top, there are 'ADD' and '...' buttons. A search bar on the right contains the text 'DNS', which is also highlighted with a red box. Below the search bar is a table with the following columns: Name, Adapter Type, Object Type, Alert Type, Alert Subtype, and Criticality. There are five rows in the table:

Name	Adapter Type	Object Type	Alert Type	Alert Subtype	Criticality
A DNS forwarder is down.	NSX-T	NSX-T	Application	Performance	!
DNS lookup failed for Manager node's FQDN.	NSX-T	NSX-T	Application	Performance	!
One DNS forwarder upstream server has timed out.	NSX-T	NSX-T	Application	Performance	!
Reverse DNS lookup failed for Manager node's IP addr...	NSX-T	NSX-T	Application	Performance	!

Sticking with our DNS example, Let's examine how our DNS forwarder is down symptom definition is being used to create an Alert definition.

1. In the filter search field, type DNS and press enter
2. Click the 3 dots next to the existing Alert Definition A DNS forwarder is down
3. Click Edit (Not Shown)

## Base Object Types of an Alert

Edit Alert Definition      NSX-T

Home / Alerts / Alert Definitions

1 - Alert      2 - Symptoms / Conditions

Name: A DNS forwarder is down.

Description: A DNS forwarder is down.

Base Object Type: NSX-T

Advanced Settings (2)      Impact (1)      Criticality (3)

Alert Type & Subtype: NSX-T

Wait Cycle: 1

Cancel Cycle: 1

1      2      3

When defining an Alert Definition we need to select the object type that this Alert will cover. These object types are all the objects that Aria Operations can monitor and collect data for. This includes VMware components as well as non-VMware components which allows Aria Operations to serve as the monitoring hub for your entire datacenter.

1. Click the **down carrot** next to the **NSX-T Base Object Type**
2. Click the **chevron** next to **NSX-T** to minimize the menu
3. Scroll down the list and view some of the object types available in this lab.
4. Click the **down carrot** used in step 1 to close this menu (not shown)

Note: In your environment, this list could be much more extensive based on what additional components, management packs and application monitors you have added to VMware Aria Operations.

## View Symptoms/Conditions for an Alert

Edit Alert Definition NSX-T

Home / Alerts / Alert Definitions

1 - Alert 2 - Symptoms / Conditions

Name A DNS forwarder is down.

Description A DNS forwarder is down.

Base Object Type NSX-T

Advanced Settings

Impact Health

Criticality Immediate

Alert Type & Subtype Application : Performance

Wait Cycle 1

Cancel Cycle 1

The screenshot shows the 'Edit Alert Definition' page for NSX-T. The 'Alert' tab is active (labeled 1). The 'Symptoms / Conditions' tab is highlighted with a red box and labeled 2. The alert name is 'A DNS forwarder is down.' and the description is also 'A DNS forwarder is down.' The base object type is 'NSX-T'. Under 'Advanced Settings', impact is set to 'Health', criticality to 'Immediate', and alert type to 'Application : Performance'. Wait and cancel cycles are both set to 1.

In VMware Aria Operations, there are some important definitions that help to clarify how alerts work. Let's go over some of these items that you see here in the screenshot.

**Impact:** Impact refers to the type of alert that needs to be addressed, the options are Health, Risk or Efficiency

**Criticality:** Criticality refers to how severe the alert is and ranges from Informational to Critical

**Alert Type & Subtype:** This refers to which type of alert should be generated, is it a performance alarm or a hardware alarm.

**Wait Cycle** refers to how many collection cycles the alert must be detected before the alert triggers. A default collection cycle is 5 minutes but can be adjusted.

**Cancel Cycle** like the Wait Cycle refers to how many collection cycles the definition must be cleared before the alert is removed.

1. Click on Symptoms / Conditions

## Associating Symptom Definitions

[66]

The screenshot shows the 'Edit Alert Definition' interface with the 'NSX-T' tab selected. The 'Symptoms / Conditions' tab is active. In the 'Symptoms' section, a condition for a DNS forwarder being down is selected. An arrow points from this section to the 'Conditions' tab in the top navigation bar. The 'Conditions' tab is also highlighted with a red box around the 'DNS' search input field. A third red box highlights the first item in the list of symptoms.

Symptom Name	Event Message	Criticality
> A DNS forwarder is down.	DNS forwarder (?s).* is not running...	!
> DNS lookup failed for Manager nod...	DNS lookup failed for Manager nod...	!
> One DNS forwarder upstream serv...	DNS forwarder (?s).* did not receiv...	!
> Reverse DNS lookup failed for Man...	Reverse DNS lookup failed for Man...	!

When creating an alert definition, we first need to decide what symptoms the alert will trigger from. We spent time going over the different types of symptom and condition definitions earlier in the lab and here is where we consume them.

An Alert may have one or more conditions or symptoms that need to be met in order to be triggered. By selecting one or more symptoms and tying them together to either all be true or any one of them be true, we're able to handle multi symptom alerts using logical 'And' and 'Or' operations. Let's take a look at how that works in the User Interface.

1. Click the down arrow and change our symptom list to Message Events
2. In the search Field, type DNS

Here we see the Alert Symptom we've been working with in our previous steps. To associate the symptom you simply drag the item over to the center screen. Once this is complete, this Alert now will trigger if the conditions are met as outlined by our symptom.

Additional symptoms can be added and tied together so that either all the conditions must be met, or only a single one.

## Recommendations

[67]

Description ↑	Action	Defined By	Modified By
1. Invoke the NSX CLI command 'get dns-forwarders status' to verify if the DNS forwarder is in down state. 2. Check /var/log/syslog to see if there are errors reported. 3. Collect a support bundle and contact the NSX support team.		NSX-T	admin
1. Assign correct FQDNs to all Manager nodes and verify the DNS ...		NSX-T	admin
1. Assign correct FQDNs to all Manager nodes and verify the DNS ...		NSX-T	admin
1. Check /var/log/nsx-idps/nsx-idps.log and /var/log/nsx-syslog.lo...		NSX-T	admin
1. Check /var/log/nsx-syslog.log to see if there are errors report...		NSX-T	admin
1. Check if there are any connectivity to LDAP server lost alarms. ...		NSX-T	admin
1. Check route redistribution policies and routes received from all		NSX-T	admin

Recommendations are created by the administrator and consist of simple text instructions, links to internal and external resources like knowledge base articles or more complex actions such as powering off or modifying a virtual machine.

The power here is that standardized instructions or actions can be associated with alerts allowing end users to know what to do with an alert, but also automate remediation in response to an alert.

These Recommendations can either be created ahead of time or as part of the workflow when creating this Alert.

1. Click on Recommendations

Note: While outside of the scope of this lab, there are additional modules and labs that delve into automated workflow remediation using Aria Operations Manager.

## Policies

The screenshot shows a software interface titled 'Edit Alert Definition' with a 'NSX-T' button. Below the title, there's a breadcrumb navigation: Home / Alerts / Alert Definitions. There are four tabs at the top: '1 - Alert', '2 - Symptoms / Conditions', '3 - Recommendations', and '4 - Policies'. The '4 - Policies' tab is highlighted with a red box. Below the tabs, a message says 'Select which policies you would like to activate this alert in. You may also customize thresholds per policy.' A checkbox labeled 'vSphere Solution's Default Policy (May 12, 2023 10:12:11 AM)' is checked and also has a red box around it.

Policies are simply a way to designating where this Alert should be active. Rather than have an alert (and its recommendation) apply in your entire environment, Policies allow you to create subsets of infrastructure. We'll cover this and many of the other aspects of creating these alerts in later labs and modules.

1. Click on Policies
2. Identify the Policy this Alert Definition is applied to
3. Click Cancel (Not Shown)

## Lesson End

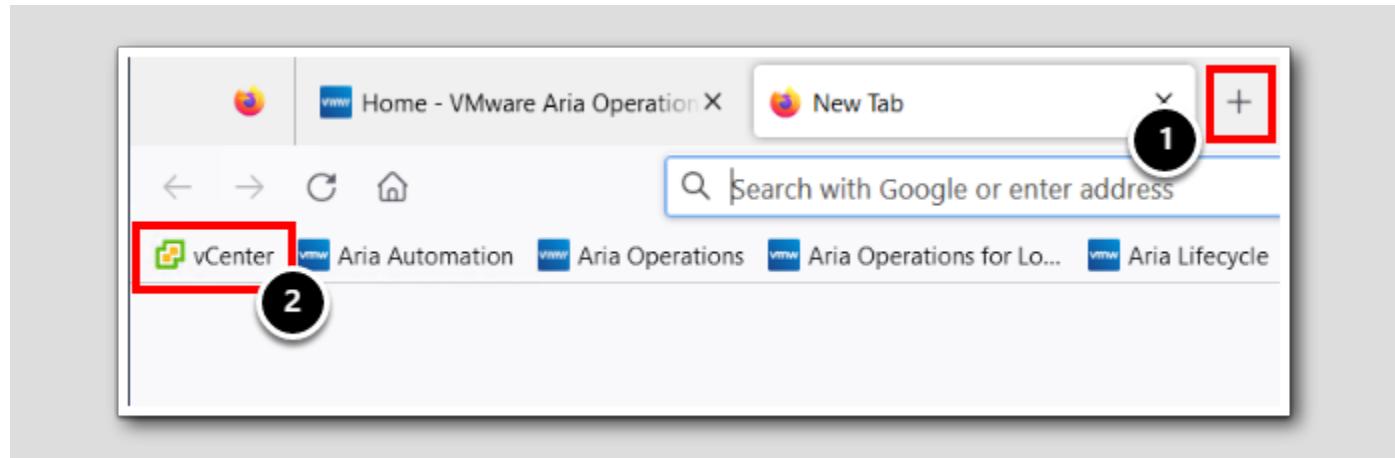
In this lesson, we briefly looked over the major components of an Alert Symptom, Alert Definition, An Alert Definition and a Policy. These topics will be covered in greater detail in later labs and modules including how to create custom entries for all of these items.

## Working with Alerts

In the previous lab, we looked at the components that go into an alert and how they can be generated from a high level point of view. In later modules we'll expand more on creating custom alerts.

In this lab, we will focus on working with Alerts that have already been generated and triggered. Let's get started.

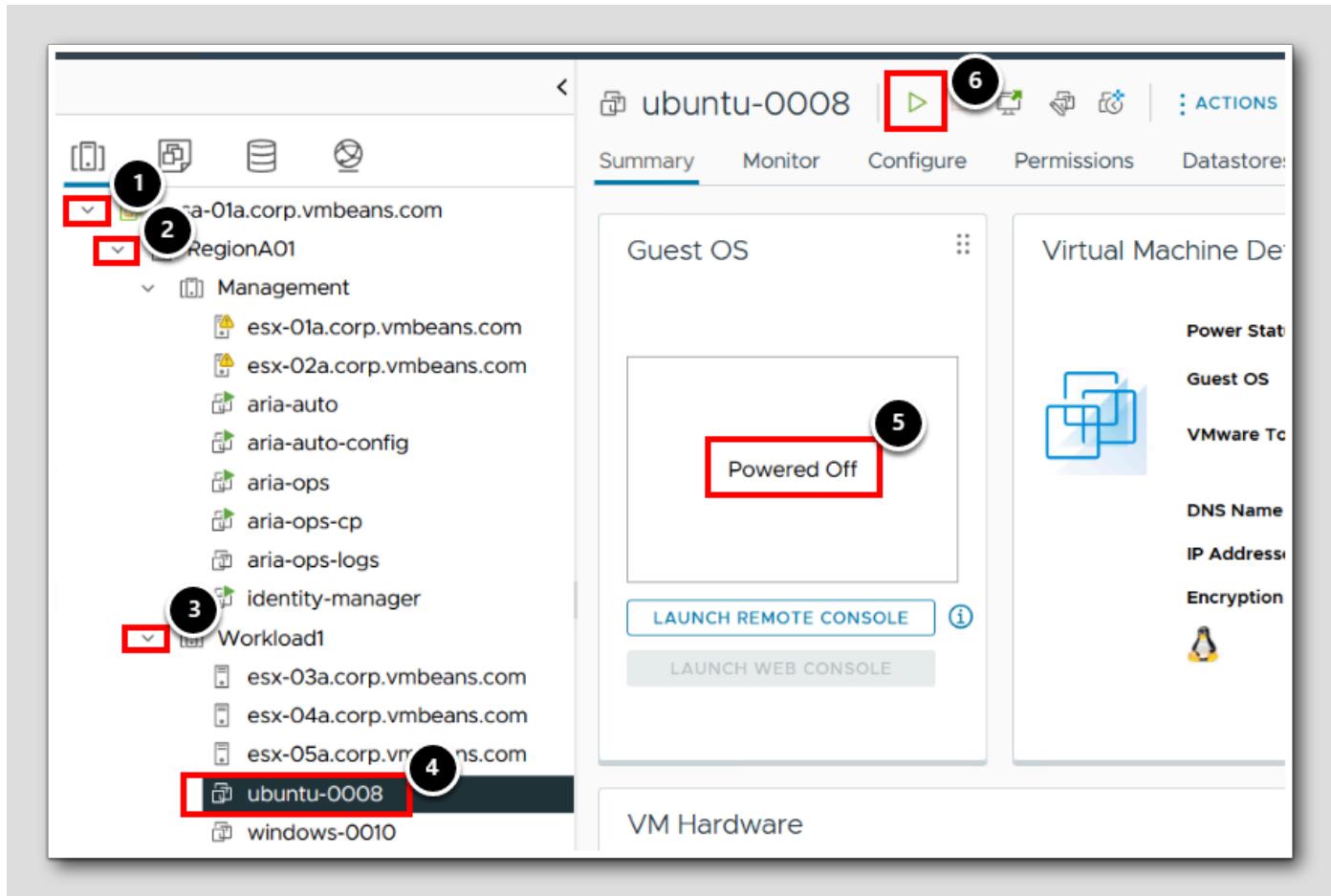
## Ubuntu VM Status



We first need to check on the status of the Ubuntu VM we want to work with for this alert. Let's log into the vCenter to check on the status of the VM.

1. Click the plus sign to open a new tab in our browser.
2. Click on the vCenter item on the hotbar.

## Power on Ubuntu VM

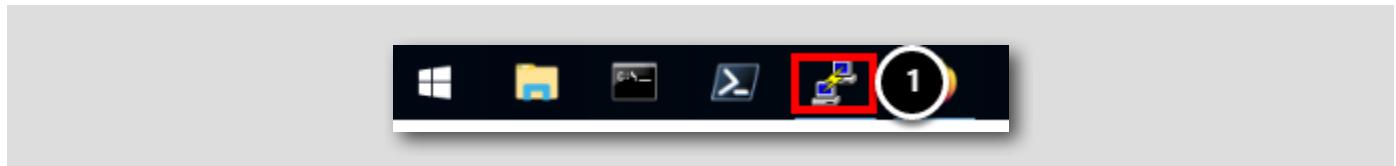


Once you have logged into the virtual center we need to locate our subject virtual machine and check its status.

1. Click the chevron next to the virtual center `vcsa-01a.corp.vmbeans.com`.
- 2.click the chevron next to the virtual datacenter `RegionA01`.
- 3.click the chevron next to b
- 4.Click on `ubuntu-0008`.
- 5.Check the status of the VM.
- 6.If powered off, press the green play key to power the VM on.

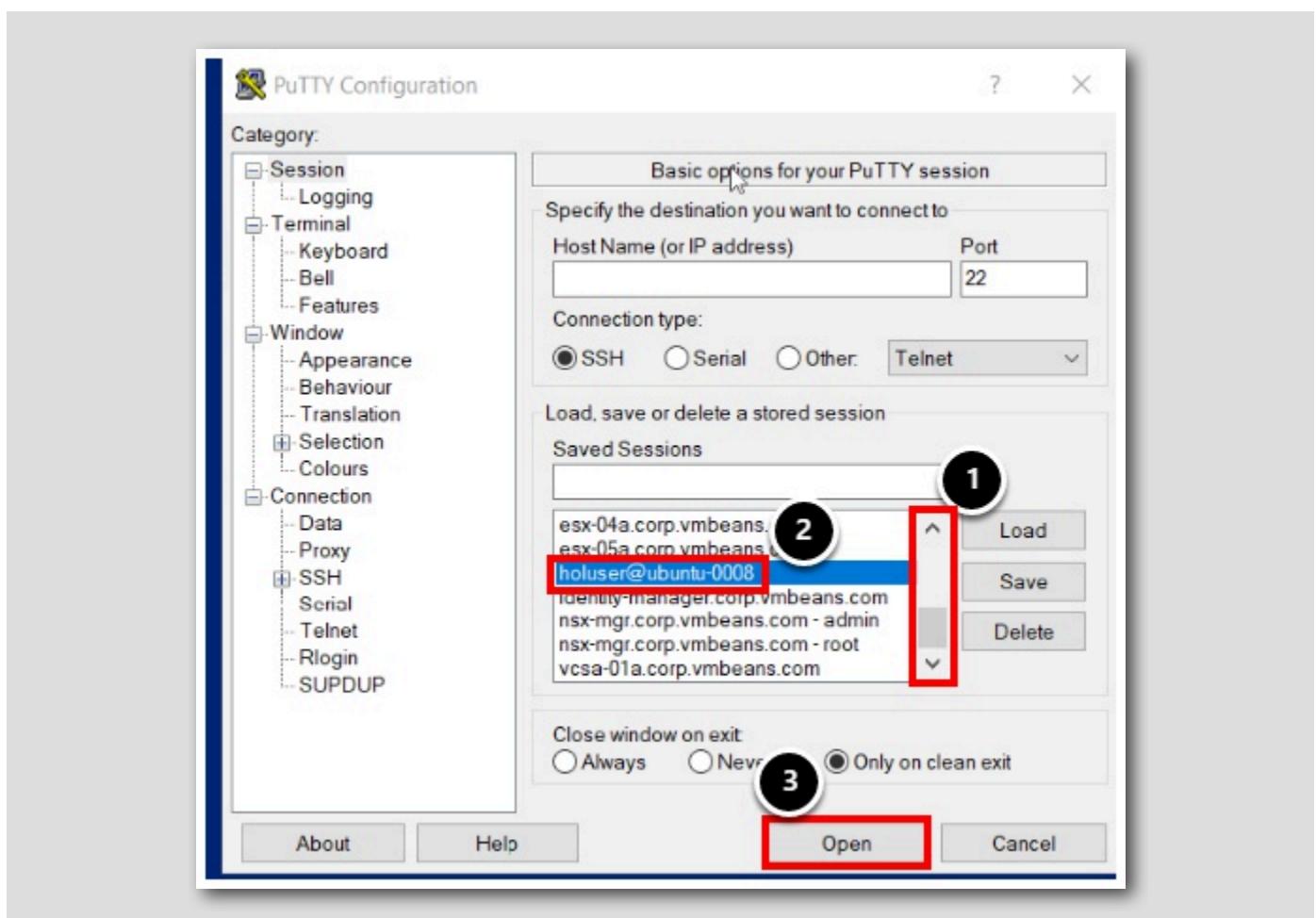
Note: The VM may take a few moments to power on and fully boot up.

## PuTTY to ubuntu-0008 VM



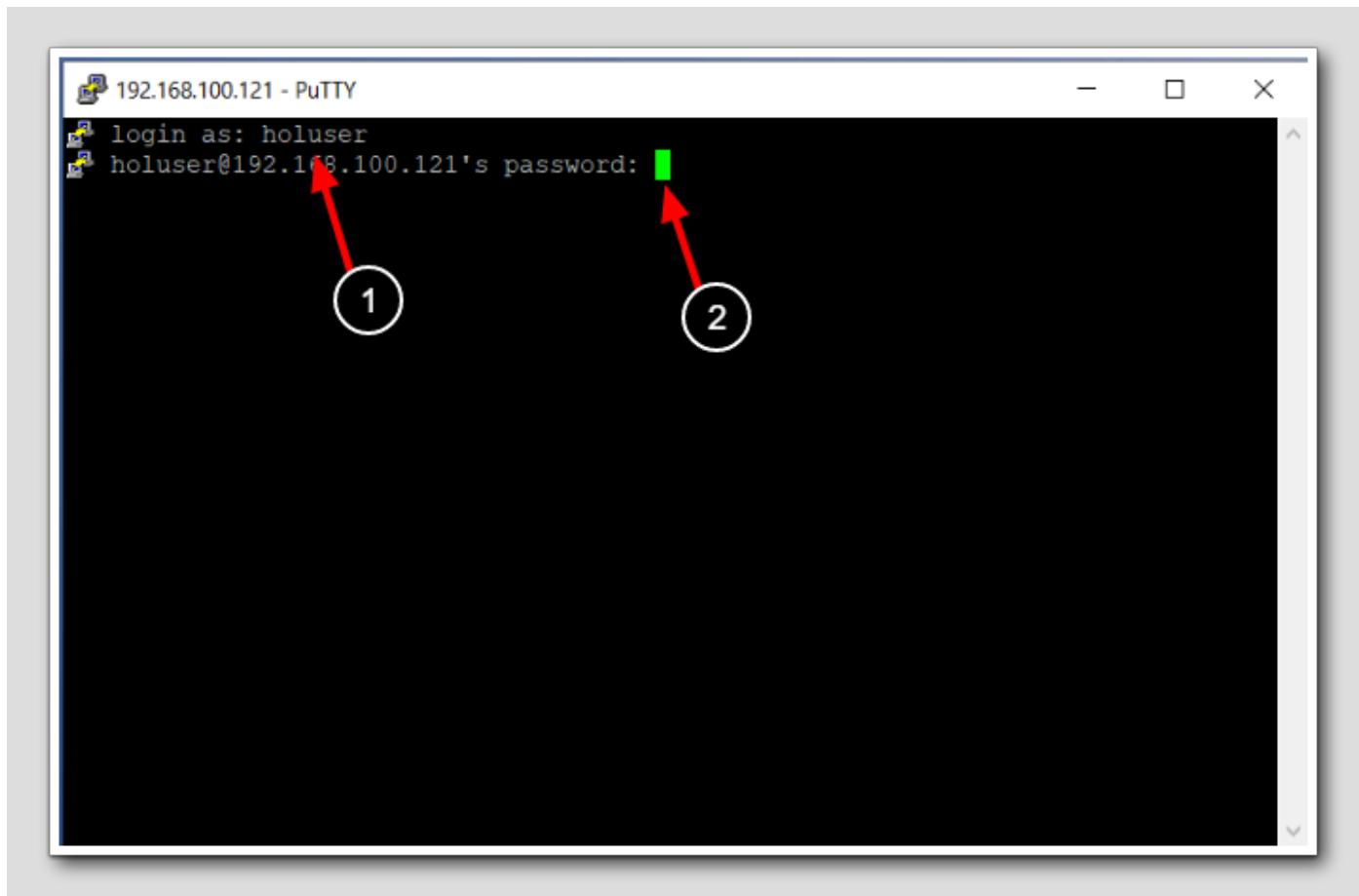
1. Click on the PuTTY icon in System tray.

## Start PuTTY Session



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

### Authenticate SSH Session (Optional)



The Virtual Machine should automatically authenticate and log in but if it does not, use the following steps to authenticate and log into the virtual machine.

1. Enter the username **holuser** and press enter.
2. Enter the password **VMware1!** and press enter.

## Run CPU Load

The screenshot shows a terminal window titled "holuser@ubuntu-0008: ~". The window displays system information and a command to generate CPU load.

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

System information as of Mon 26 Jun 2023 06:32:35 PM UTC

System load: 0.89          Processes: 236
Usage of /: 36.4% of 7.81GB Users logged in: 0
Memory usage: 21%          IPv4 address for ens160: 192.168.110.120
Swap usage: 0%

* Super-optimized for small spaces - read how we shrank the memory
  footprint of MicroK8s to make it the smallest full K8s around.

https://ubuntu.com/blog/microk8s-memory-optimisation

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: Tue Jun 20 00:10:16 2023 from 192.168.1.10
holuser@ubuntu-0008:~$ cat /dev/zero > /dev/null
```

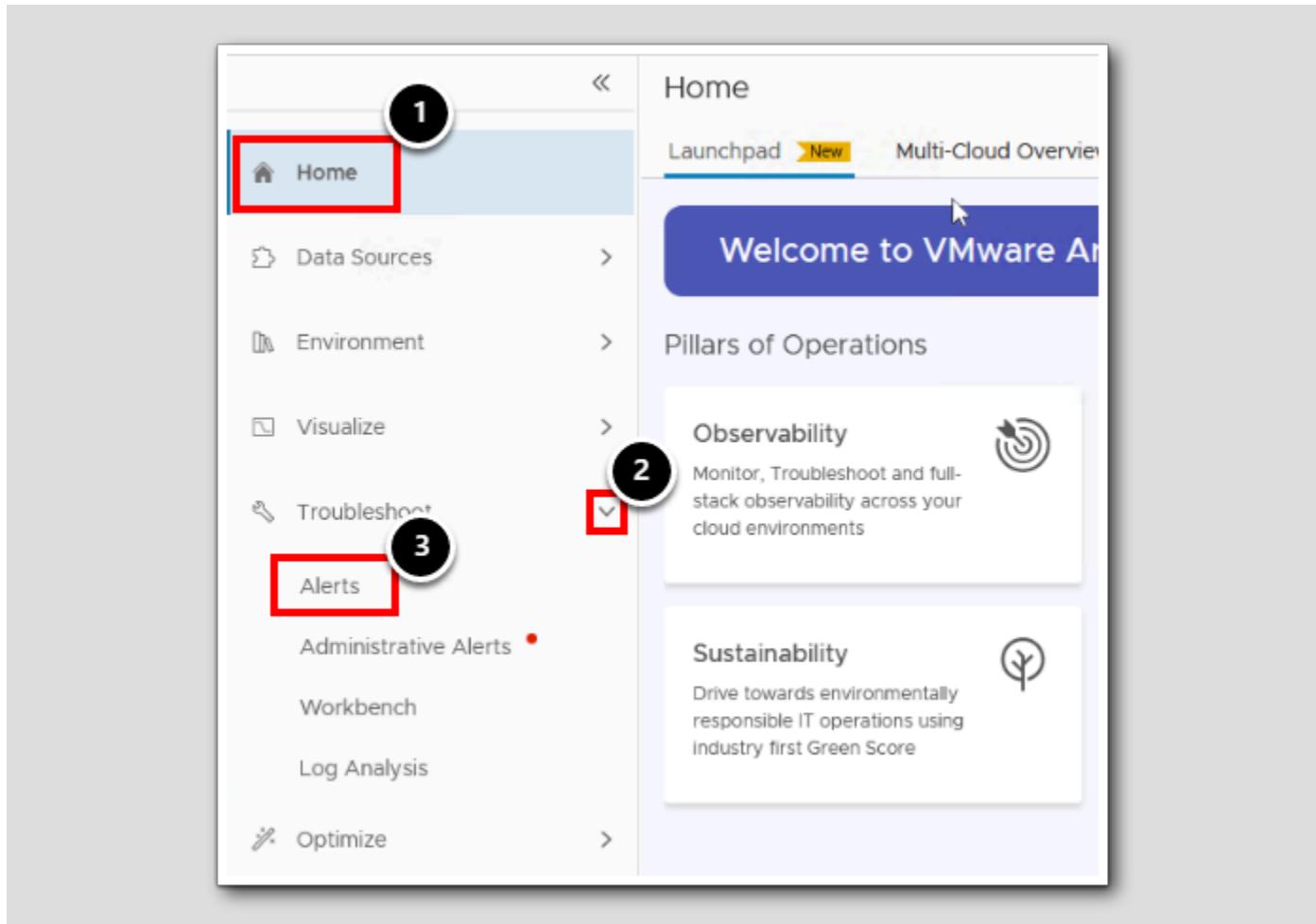
A red box highlights the command `cat /dev/zero > /dev/null`. A circular callout with the number "1" is positioned above the red box.

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.
2. Return to Aria Operations (Not Shown)

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

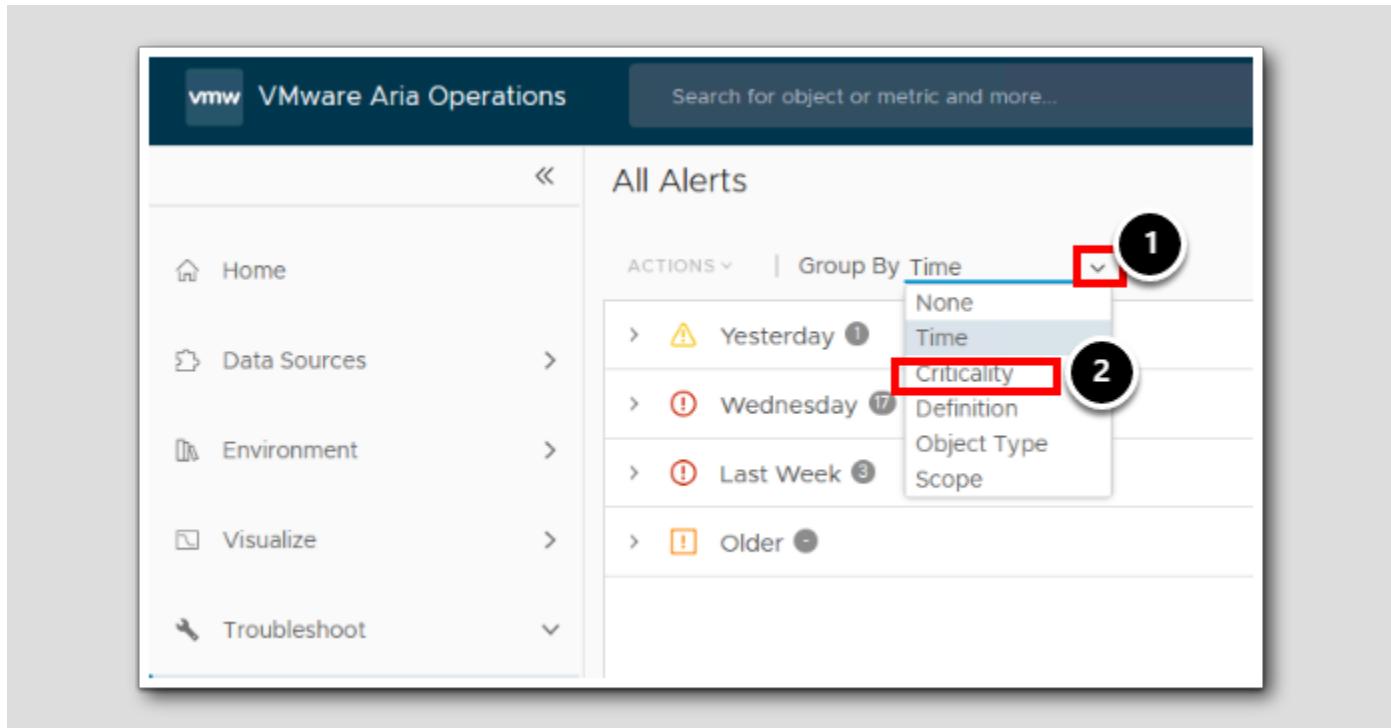
## Locate Alerts



Let's get started by first locating the Alerts section of VMware Aria Operations.

1. Click on **Home**
2. Click and expand the chevron next to **Troubleshoot**
3. Click on **Alerts**

## Alert Grouping



Alerts by default are grouped together by Time. There are additional options that can be used including Criticality, Definition, Object Type and Scope.

Let's change the grouping and view our alerts based on Criticality.

1. Click the down carrot
2. Select Criticality

## Viewing Alerts

The screenshot shows the 'All Alerts' page in vRealize Operations. At the top, there's a search bar and a refresh button (labeled '1'). Below that, there are filter options: 'ACTIONS' and 'Group By Criticality'. The criticality dropdown is set to 'Critical' (labeled '2'). The alert list shows two entries for 'Module 4 High CPU Alert'. The first entry is for 'ubuntu-0008' and the second for 'linux-dev-0011'. Both alerts are listed under the 'Created On' column, with times 10:04 AM and 9:59 AM respectively. The status is 'Active' (labeled '3'). The alert type is 'Application' and the subtype is 'Performance' with a priority of 'Very High'. There are also sections for 'Immediate' and 'Warning' alerts.

Let's dive into what the Alerts look like by opening a Critical level alert. It may take a few moments for the "Module 4 High CPU Alert" to appear. If you are not seeing it please click the refresh button every few minutes.

1. Click the chevron and expand the Critical group of alerts
- 2.(Optional) Click the refresh button until Module 4 High CPU Alert appears
- 3.locate and click on the Module 4 High CPU Alert for Virtual Machine ubuntu-0008

Note:

## Alert Details

The screenshot shows the Aria Operations interface for managing alerts. On the left, a sidebar lists 'All Alerts' with a 'Critical' section containing two entries for 'Module 4 High CPU Alert'. The main pane displays the details for the first alert. At the top right, there are tabs for 'Application' and 'Performance'. Below the tabs, a status indicator says 'Status: Active'. The 'Alert Details' tab is selected, showing the alert's name ('ubuntu-0008'), its criticality ('Module 4 High CPU Alert'), and the start time ('Started on: 10:04:01 AM'). There are also 'Related Alerts' and 'Potential Evidence' tabs. A 'Recommendations' section is highlighted with a red box, containing the text 'Ensure you've stopped the HOL CPU High Alert' and a blue 'POWER OFF VM' button. A black circle labeled '1' points to the chevron icon next to the symptom description. Another black circle labeled '2' points to the 'POWER OFF VM' button. The 'Alert Basis' section shows a graph titled 'ubuntu-0008 - CPUUsage (%)' with a red shaded area indicating usage above a threshold of 90%. A legend indicates '1. Self - Virtual Machine'. The 'Symptoms' section shows a expanded critical symptom: 'The (Critical) symptom Module 4 High CPU has been observed on ubuntu-0008' with a note 'Usage (%) 99.335 > Threshold (%) 90'. A 'TROUBLESHOOT WITH LOGS' button is also present.

Each Alert provides in-depth information to assist in not just knowing an alert was triggered, but why it was triggered. Additionally, as we examine the symptoms that were triggered we also see the ability to troubleshoot with logs. This helps us correlate log events to the performance metrics and alarms we see in Aria Operations.

In our recommendation field we see instructions to ensure we've powered off our HOL alert as well as a power off VM action.

Notes can also be added to an Alert allowing for additional information to be added to an alert.

1. Click the chevron to expand the symptom
2. Locate and View recommendation. We'll return here later.

## Potential Evidence

The screenshot shows the vCenter Operations interface for a 'Module 4 High CPU Alert' (ubuntu-0008) that started at 10:04:01 AM. The 'Potential Evidence' tab is selected (marked with a red box and number 1). The interface includes tabs for 'Alert Details', 'Related Alerts', and 'Potential Evidence'. At the top right, there are 'Application' and 'Performance' buttons, with 'Performance' being the active tab (marked with a black circle and number 2).

**Related Scope:** Datastore (RegionA01-SCSI01-COMP), Virtual Machine (ubuntu-0008), Deployment (hol-ubuntu), vSphere Distributed F (VM-RegionA01-vDS-COMP), Host System (esx-05a.corp.vmbeans.com), Virtual Machine Fold, Workloads.

**Events:** esx-05a.corp.vmbeans.com, Hardware Sensor Status: Processor Green, Memory Green, Fan Green, Voltage Green, Temperature Green, Power Green, System Board Green, Battery Green, Storage Green, Other Green. (9:00:26 AM)

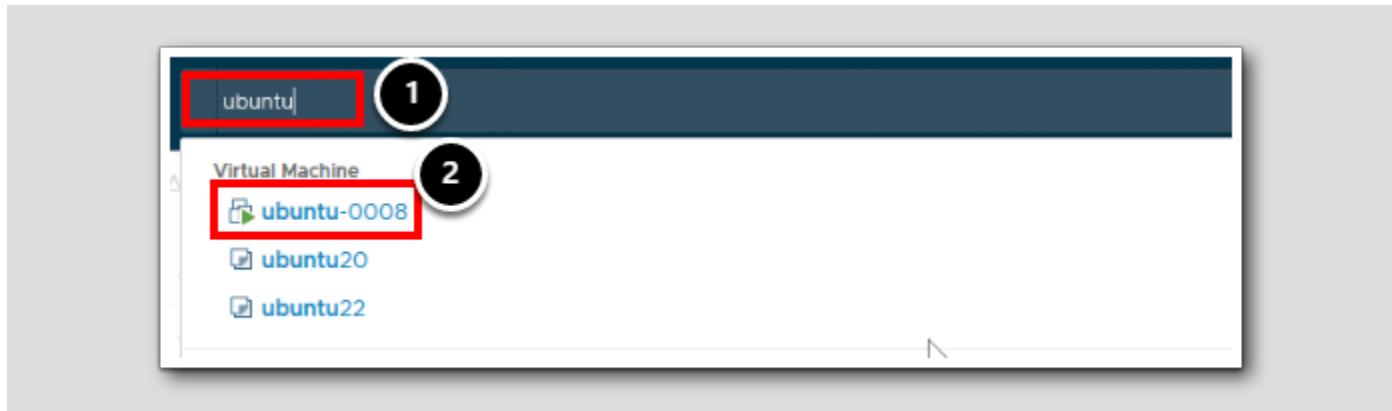
**Property Changes:** No property changes were found in this time range and scope.

**Anomalous Metrics:**

Potential evidence shows us the impacted events, property changes and anomalous metrics that correspond to this High CPU Alert. While not covered in this module, we can start a troubleshooting workbench session from here as well as examine all the data presented to us. We'll cover this in another lab and module.

1. Click on Potential Evidence
2. Click and drag downward the scroll bar

## Locate Ubuntu-0008



1. In the search field near the top of the page, type ubuntu
2. Select ubuntu-0008

## View Active Alerts

Active Alerts		
<span style="color: red;">!</span>	Critical	Self 1 All 1
<span style="color: orange;">!</span>	Immediate	Self 0 All 0
<span style="color: yellow;">!</span>	Warning	Self 0 All 0
<span style="color: blue;">i</span>	Info	Self 0 All 0

Here we see the detailed metrics for our ubuntu-0008 Virtual Machine. Focus in on the Active Alerts section and notice we have 1 Critical Active Alert. In addition to viewing the active alerts, we also can manage the alert by assigning it to personal to investigate.

1. Click Alerts

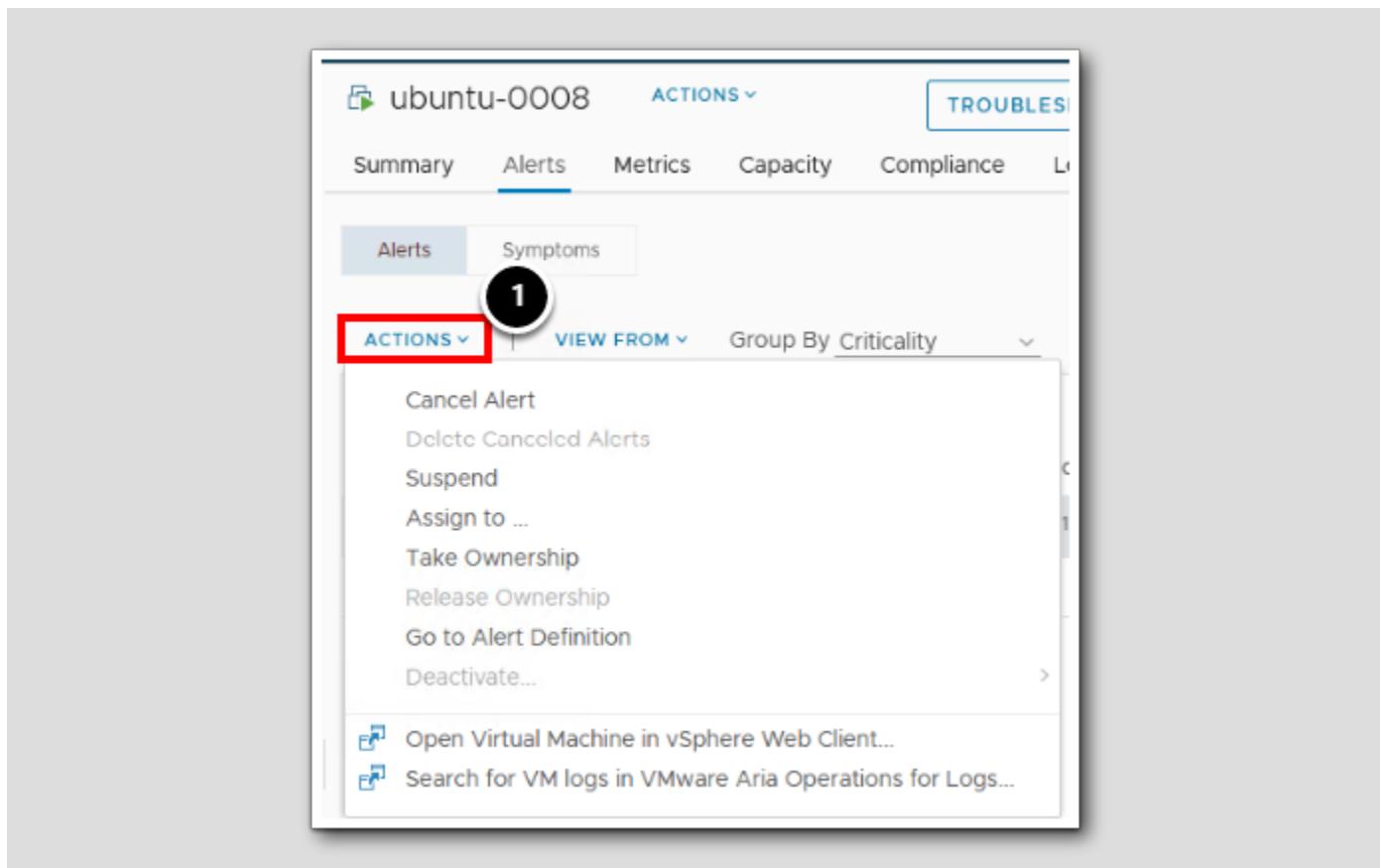
## Alert Management

The screenshot shows the vSphere Client interface for managing alerts on a host named "ubuntu-0008". The "Alerts" tab is selected. Step 1 highlights the chevron icon next to the "Critical" alert level. Step 2 highlights the "Actions" dropdown menu. Step 3 highlights the specific alert entry for "Module 4 High CPU Alert".

Criticality	Alert	Created On	Status	Alert Type
Critical	Module 4 High CPU Alert	10:04 AM	!	Application

1. Click the chevron next to Critical
2. Select our alert, "Module 4 High CPU"
3. Click the drop down for Actions

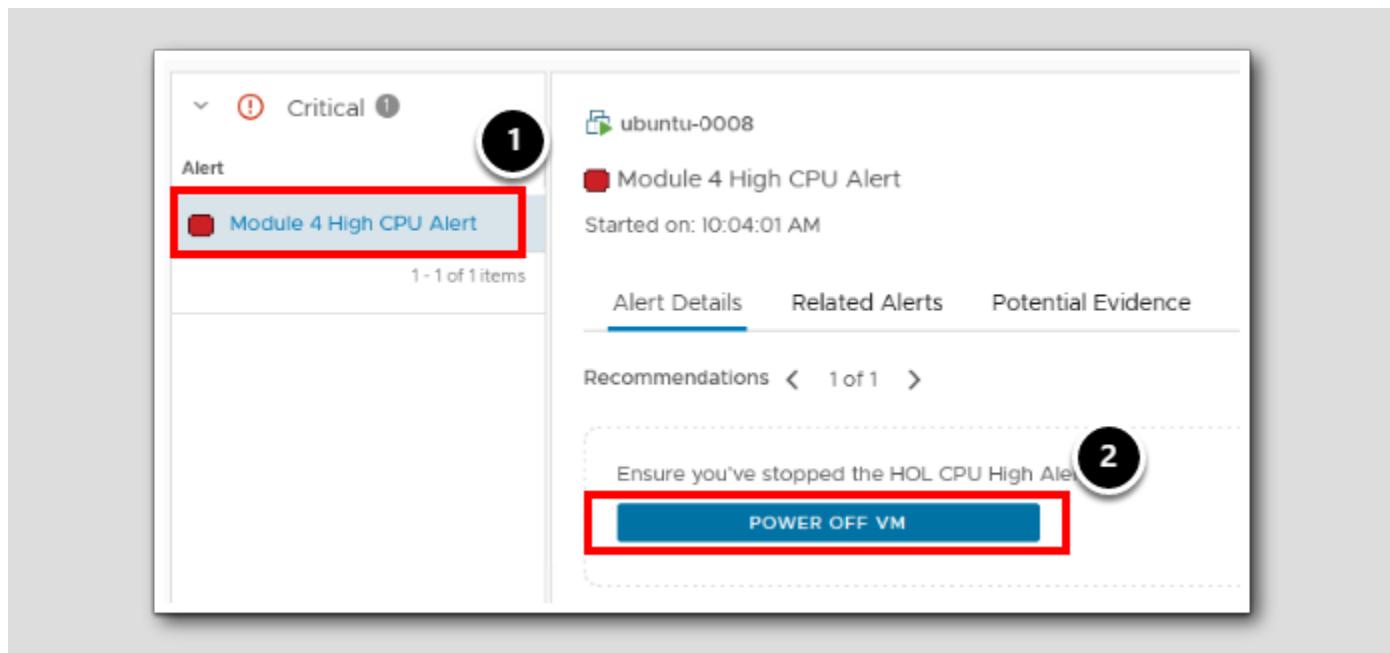
## Alert Options



Here we see that with this alert, we have the ability to assign ownership, take ownership, release ownership and cancel the alert. This allows for an administrator to have full life cycle control over an Alert. While outside of the scope of this lesson, additional modules will cover Alert lifecycle management.

1. Click the **Actions** button again to close the menu.

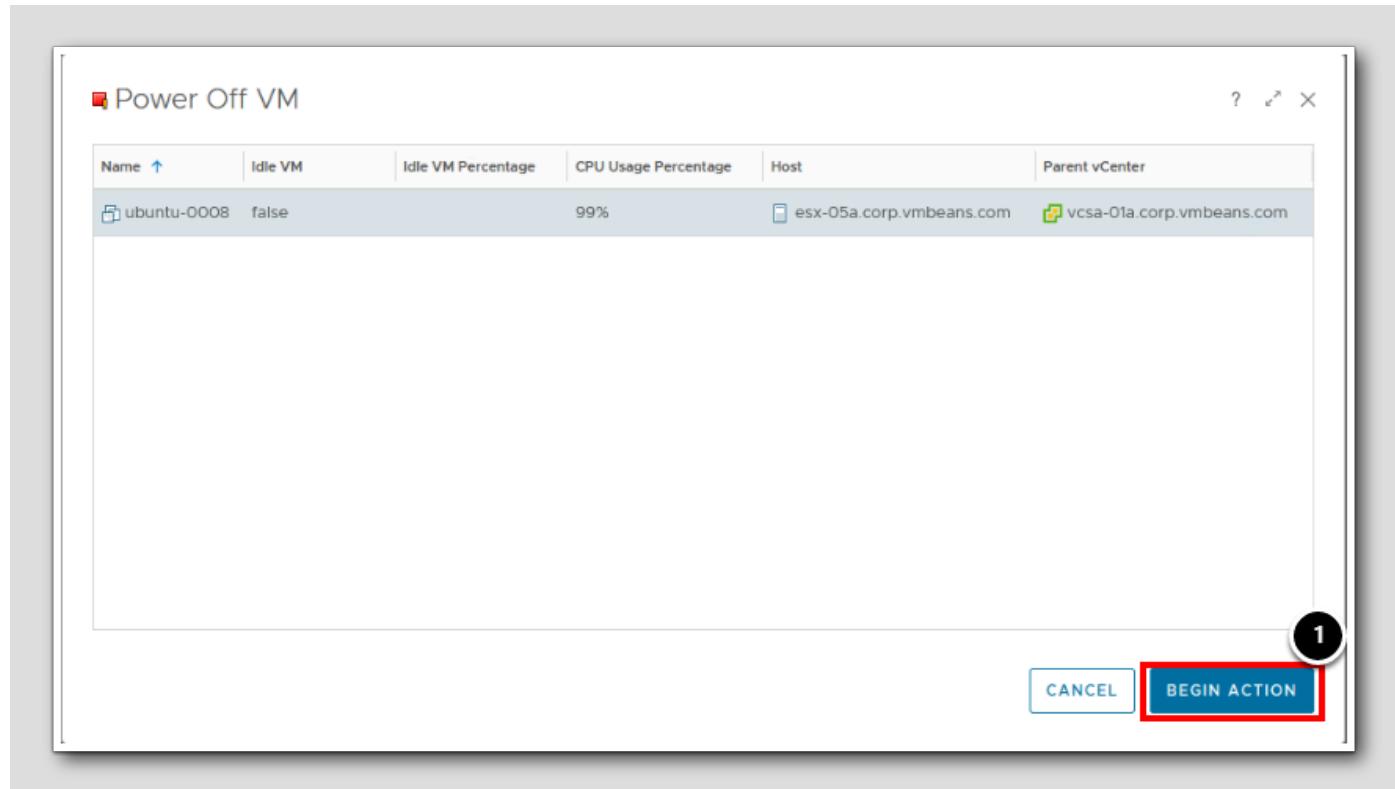
## Powering Off our Virtual Machine



Earlier we viewed the recommendation for this alert included the Power off VM action. Let's go ahead and explore how that looks while also cleaning up our Alert.

1. Click on the Module 4 High CPU Alert
2. Click the POWER OFF VM action

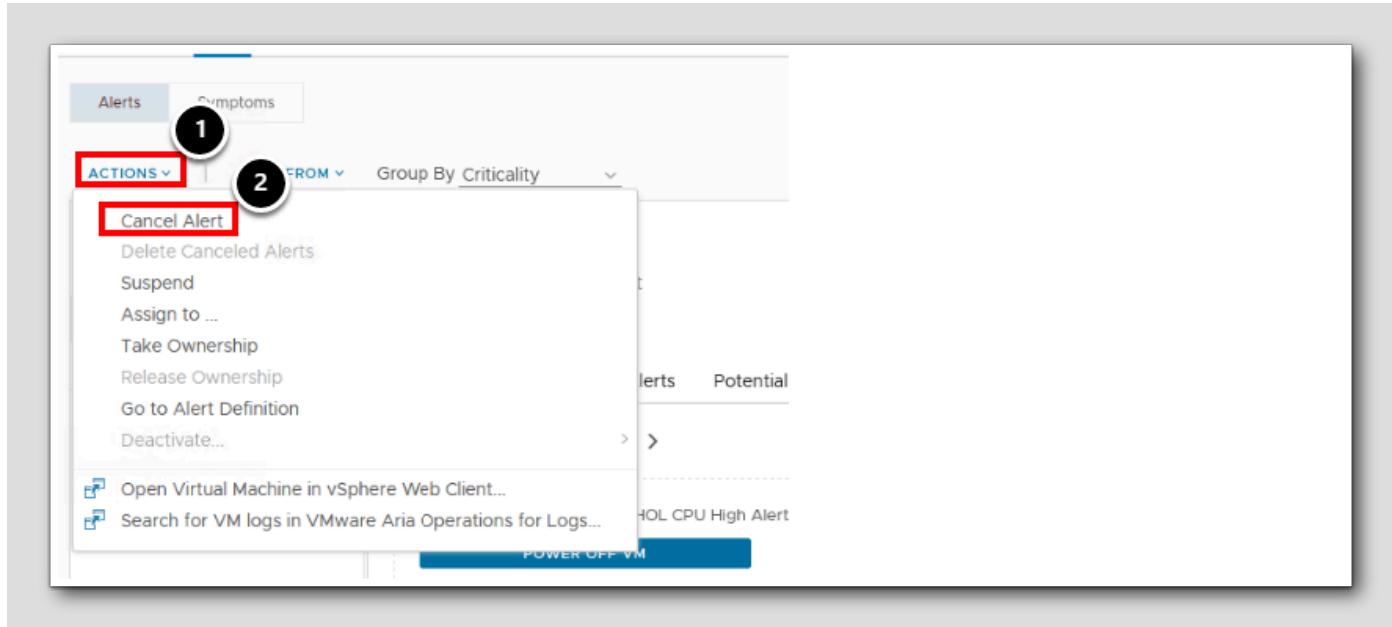
## Begin Action



Earlier we viewed the recommendation for this alert included the Power off VM action. Let's go ahead and explore how that looks while also cleaning up our Alert.

1. Click BEGIN ACTION
2. Click OK on the confirmation screen (not shown)

## Cancel Alert



While we've powered off our Virtual Machine, let's go ahead and cancel the alert.

1. Click Actions
2. Select Cancel Alert
3. Click YES to confirm the action then OK to confirm the alert was cancelled(not shown)

## Lesson End

In this lesson, we briefly looked at alerts in VMware Aria Operations and how to interact with them. We briefly touched on recommendations, actions, potential evidence and our Alert Basis criteria. Lastly we took the action our alert recommended and powered off the Virtual Machine and canceled the alert.

Creating, Working with and handling Alerts is covered in greater detail in later modules and labs but for now, you've seen the basis for working with alerts.

## Conclusion

In this module, we explored the Aria Operations Manager alerting capability. We learned about the components that make up an Alert as well as actions that you can perform with Alerts.

## You've finished the module

Congratulations on completing the lab module.

If you are looking for additional information, visit the [Aria Operations Manager Documentation](#).

From here you can:

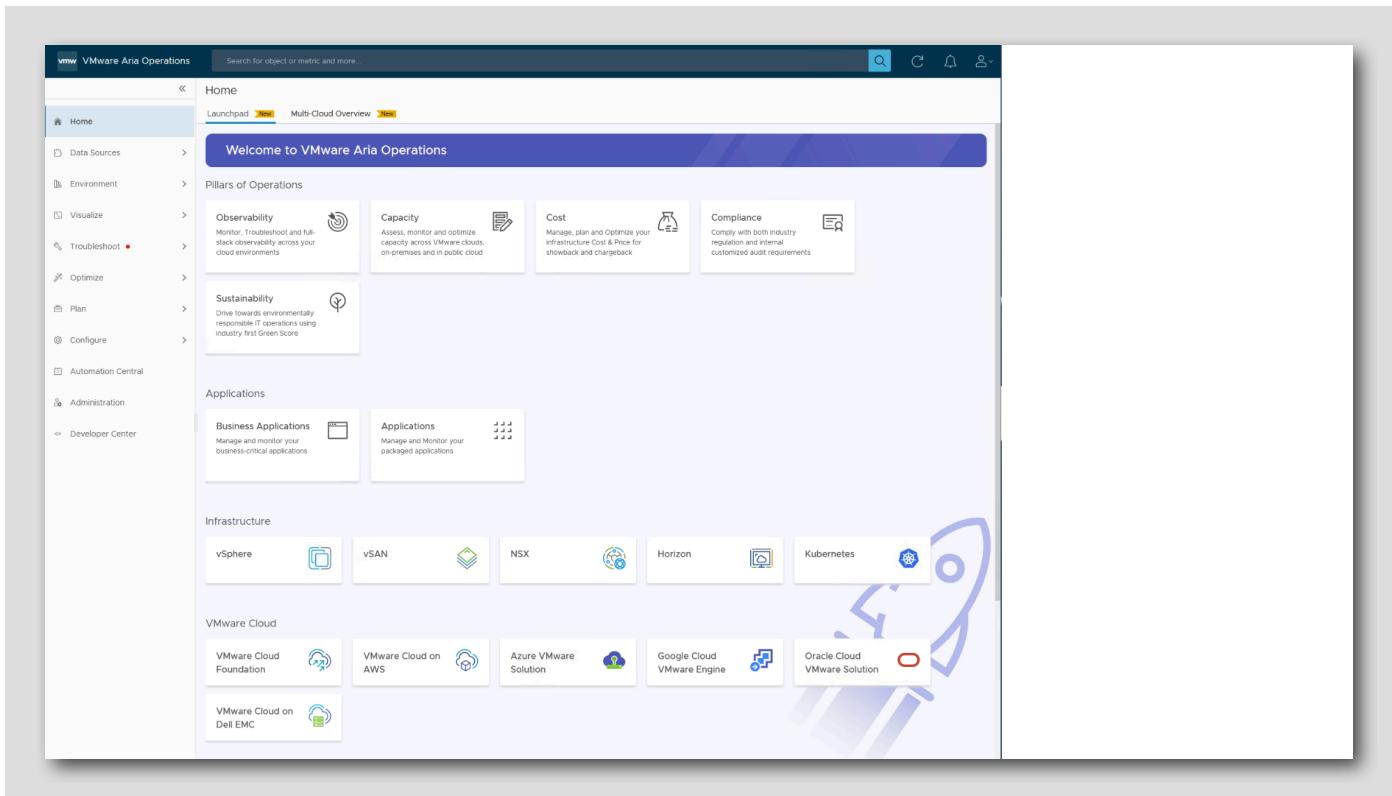
1. Click to advance to the next page and continue with the next lab module
2. Open the TABLE OF CONTENTS to jump to any module or lesson in this lab manual
3. End your lab and come back and start it again in the future

## Module 5 - Running a Safe and Compliant Cloud (30 minutes) Basic

### Introduction

The screenshot shows the VMware Aria Operations interface. On the left is a navigation sidebar with categories like Home, Data Sources, Environment, Visualize, Troubleshoot, Optimize, Plan, Configure, Automation Central, Administration, and Developer Center. The main content area features a "Welcome to VMware Aria Operations" banner. Below it are sections for Pillars of Operations (Observability, Capacity, Cost, Compliance, Sustainability), Applications (Business Applications, Applications), Infrastructure (vSphere, vSAN, NSX, Horizon, Kubernetes), and VMware Cloud (VMware Cloud Foundation, VMware Cloud on AWS, Azure VMware Solution, Google Cloud VMware Engine, Oracle Cloud VMware Solution, VMware Cloud on Dell EMC). A large blue rocket icon is overlaid on the bottom right of the interface.

Aria Operations gives administrators advanced capabilities like managing and reporting on VMware environments. One of these capabilities allows administrators to validate the environment configuration against industry benchmarks such as PCI-DSS, HIPPA or DISA. In this module, we'll work on Creating assessments, generating reports and alerts, assigning alerts to users and creating custom benchmarks. Let's get started.



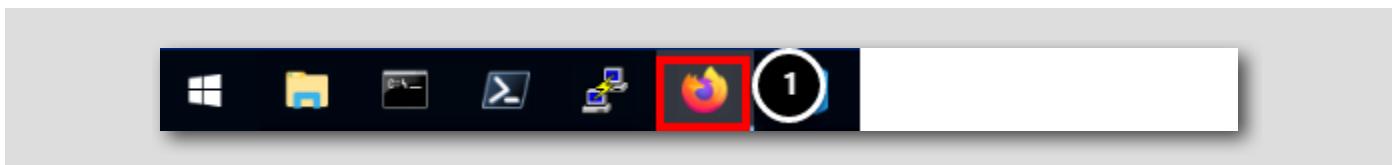
## Log in to Aria Operations

[94]

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

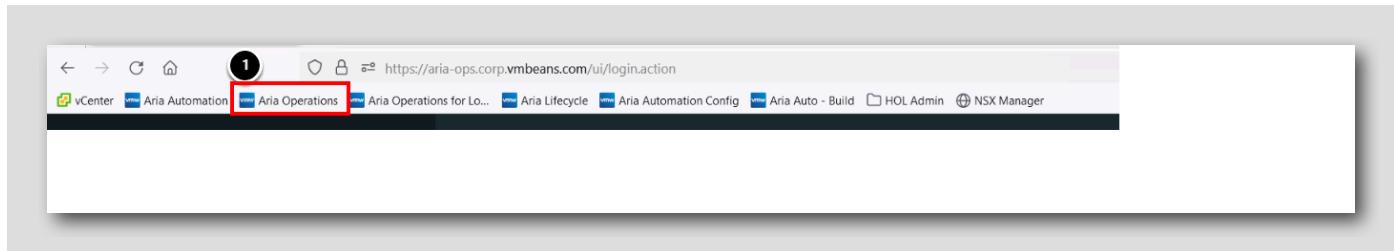
[95]



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



1. Click on the Aria Operations Favorites link from the Favorites Bookmark in the Chrome Browser.

## Sign In

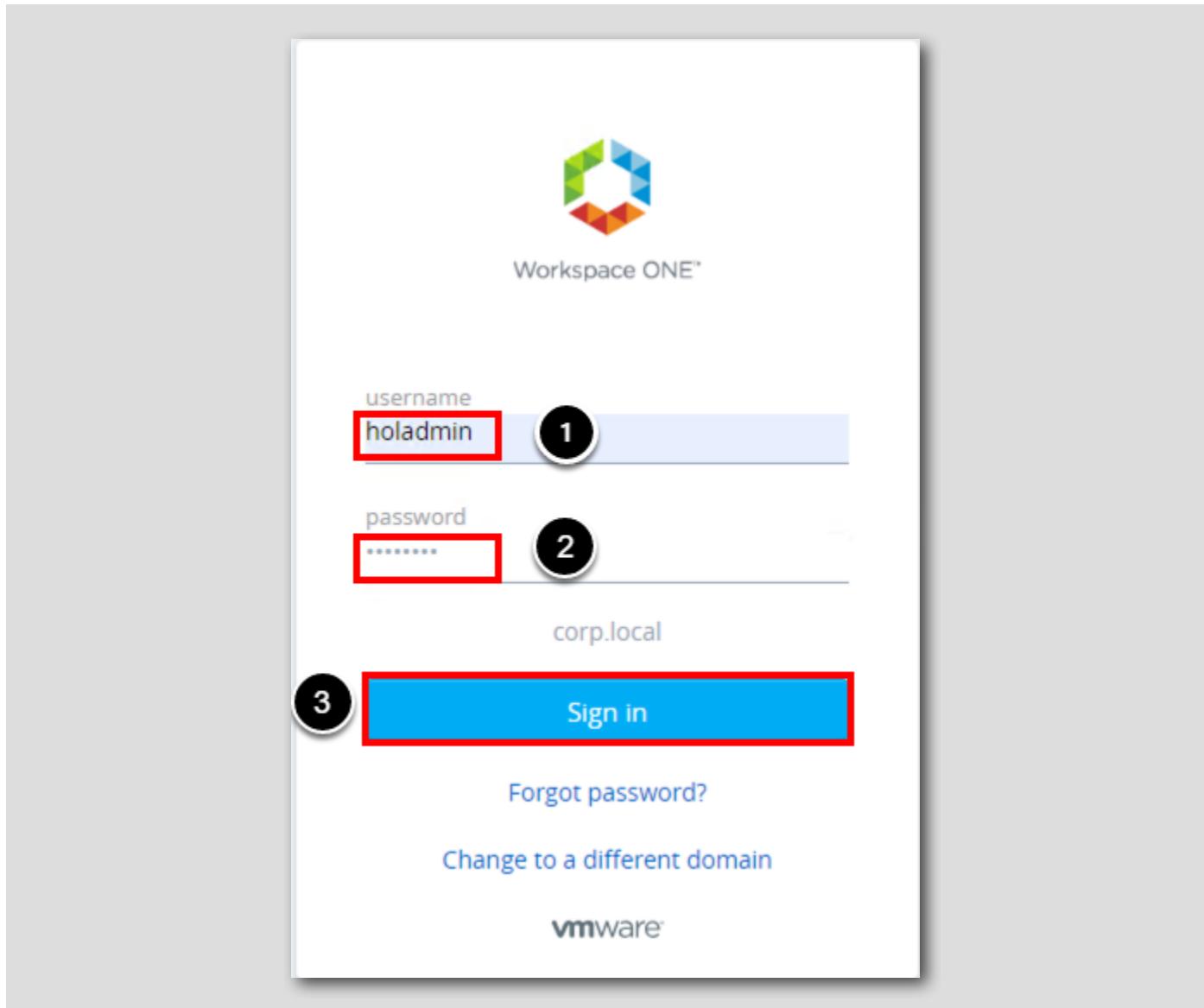


Aria Operations is integrated with VMware Identity Manager which we will use for user authentication in this lab. VMware Identity Manager is listed as vIDMAuthSource in our live lab environment.

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



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**

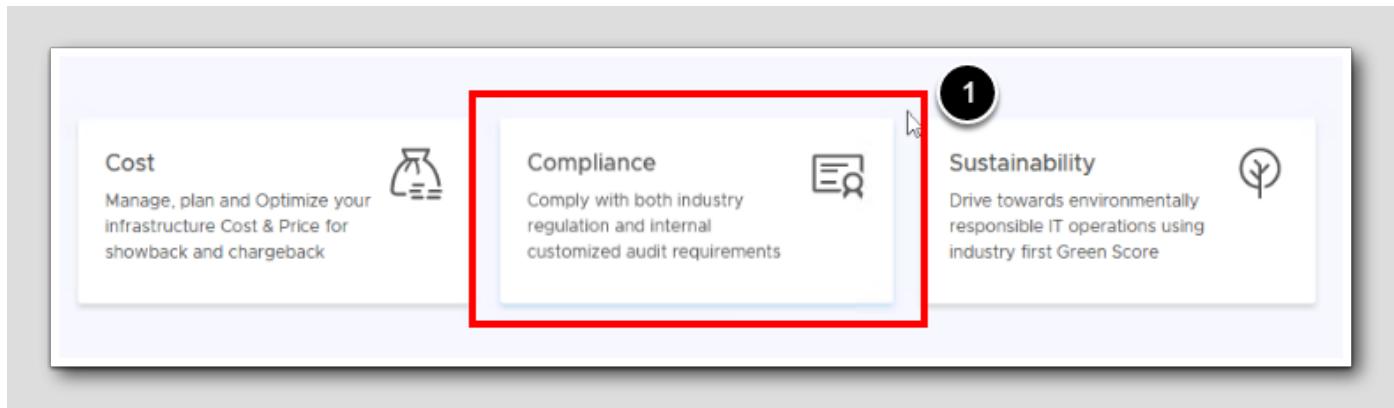
## Introduction to Compliance

Aria Operations empowers IT professionals to audit, report and ultimately remediate VMware environments according to an industry accepted compliance standard. In addition to Industry and private compliance standards, we can create custom compliance reports that may more closely suit your organizations needs.

For this lesson we'll first take a look at some of the built-in compliance packs with Aria Operations and how to enable their use. This will allow us to create reports and identify areas where remediation of our environment may be needed.

In this lesson, we'll go through the process of taking existing compliance standards and creating a new custom standard as well.

## Locating The Compliance Area



In a brand new deployment of Aria Operations, the compliance modules must be activated before they can be used. Multiple compliance packs can be enabled at the same time allowing for organizations to have differing compliance standards depending on their needs.

1. Click on Compliance in the upper right center of the User Interface.

## Overview of Compliance Workflow

The screenshot shows the 'Compliance' section of the VMware interface. At the top, there's a purple header bar with the text 'Learn more'. Below it, the 'Compliance Workflow' section is divided into two main categories: 'Monitor & Remediate' and 'Custom Compliance'. Each category has a brief description and two buttons: 'VIEW' and 'LEARN MORE'. Under 'VMware Benchmarks', there are four cards: 'vSphere Security Guide' (with a square icon), 'vSAN Security Guide' (with a green diamond icon), 'NSX Security Guide' (with a blue gear icon), and 'VMware Sovereign Cloud' (with a blue cloud icon). In the 'Regulatory Benchmarks' section, there are four cards: 'CIS Compliance' (with a blue 'CIS' logo), 'DISA Compliance' (with a yellow seal icon, highlighted by a red box and a circled '1'), 'FISMA Compliance' (with a white seal icon), and 'HIPAA Compliance' (with a blue caduceus icon). A large black number '1' is placed above the 'DISA Compliance' card.

Aria Operations supports multiple VMware and industry regulatory benchmarks each designed to identify best practices, standards and industry regulations. From here we can see Benchmarks for both VMware as well as common Industry Benchmarks. Let's take a look at the DISA Compliance Benchmark.

1. Click on DISA Compliance.

## Benchmark Overview

**Compliance**

Home / Launchpad / Compliance / DISA Compliance

**DISA Security Standards**  
Version: 8.12.0.21594425

[Activate from Repository](#)

Overview      **Control Set** 1

VMware Aria Operations Compliance Pack for DISA extends the SDDC compliance capabilities of VMware Aria Operations to:

- Alert definitions for vCenter, ESXi Host, Virtual Machine, Distributed Virtual Switch, and Distributed Port group
- Policy to enable or disable the DISA alerts
- A report to generate a Non-Compliance report for DISA

Each compliance benchmark will come with a description of what is monitored and what the benchmark delivers within Aria Operations. Let's take a look at the components that this benchmark applies to.

1. Click on the Control Set tab.

## Viewing what is validated

Overview      **Control Set**

Find content available with this benchmark by selecting an object type from the list below or by searching for particular content

Object Type
Virtual Machine
<b>Host System</b>
Distributed Virtual Switch
Distributed Virtual Port Group
vCenter

1

**Alert Description: ESXi Host is violating DISA**

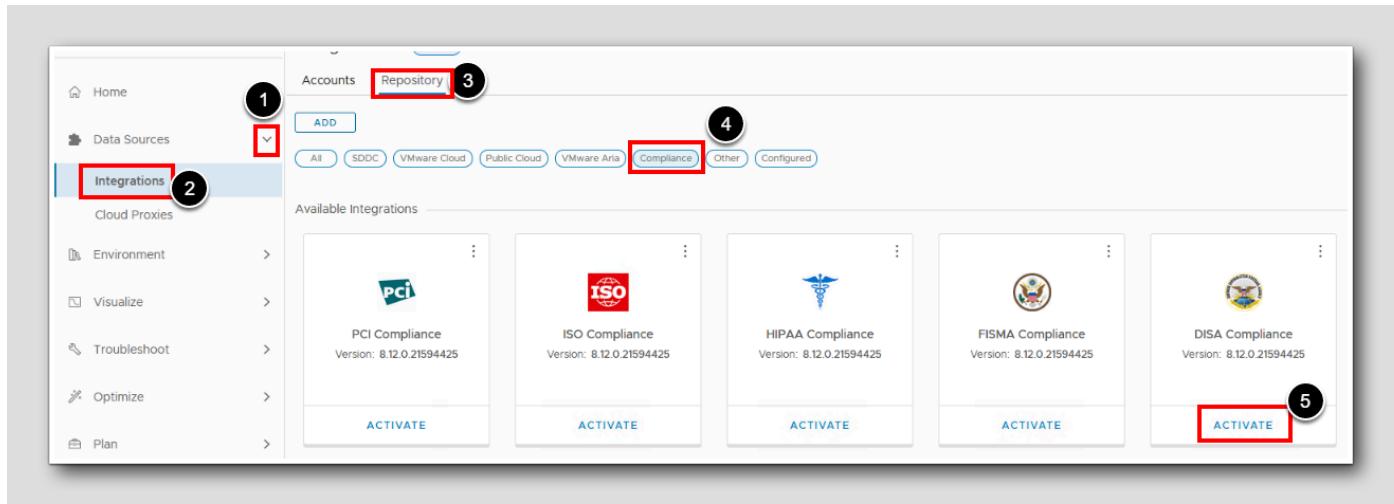
Symptom Name
ESXI-06-000002 Access to DCUI is not set to allow trusted users to override lockdown mode
ESXI-06-000004 Remote logging for ESXi hosts is not configured
ESXI-06-000005 Count of maximum failed login attempts is not set
ESXI-06-000006 Time after which a locked account is automatically unlocked is not configured
ESXI-06-100031 Password policy for password complexity is not set

The control set shows what symptoms or check list items the benchmark is validating. Notice the DISA benchmark we are viewing here is broken up into sections covering virtual machines, hosts, switches and vCenters covering all aspects of a VMware environment.

1. Click on Host System to more closely analyze some of the monitored values and settings.

## Activating DISA Compliance

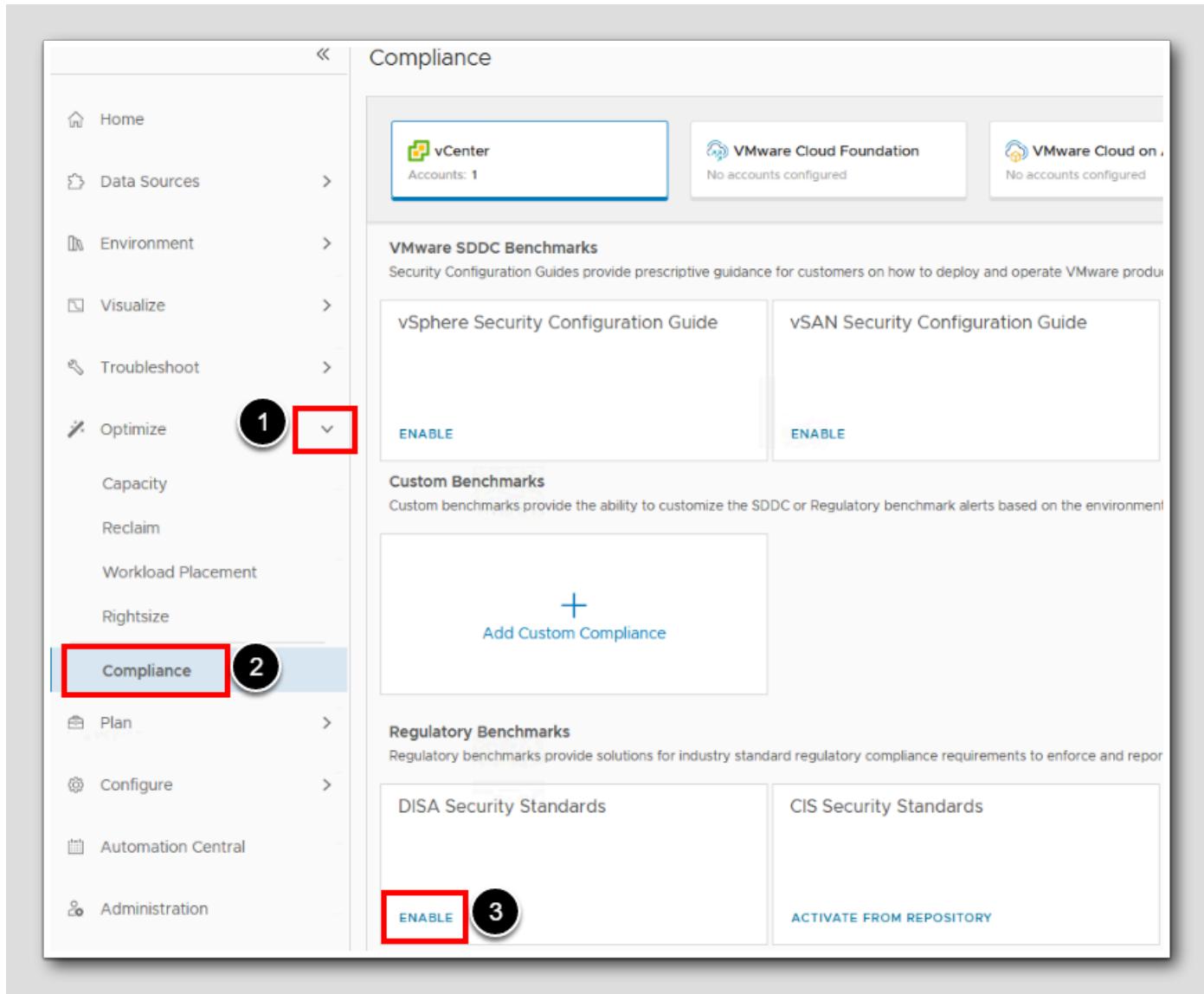
[104]



To activate the DISA Compliance benchmark, we need to go over to the Repository of Aria Operations. Here all modules covering external software, hardware and services are installed and activated as modules within Aria Operations. This allows third parties to create modules to interact with Aria Operations in a much more streamlined manner than waiting for each VMware release. Let's activate the DISA benchmark now.

1. Click on the chevron next to Data Sources.
2. Click Integrations.
3. Click on Repository.
4. Click on Compliance filter to only view compliance tiles
5. Locate the DISA Compliance tile and click Activate.
6. Click Yes on confirmation window to activate the DISA Compliance benchmark (Not shown here.)

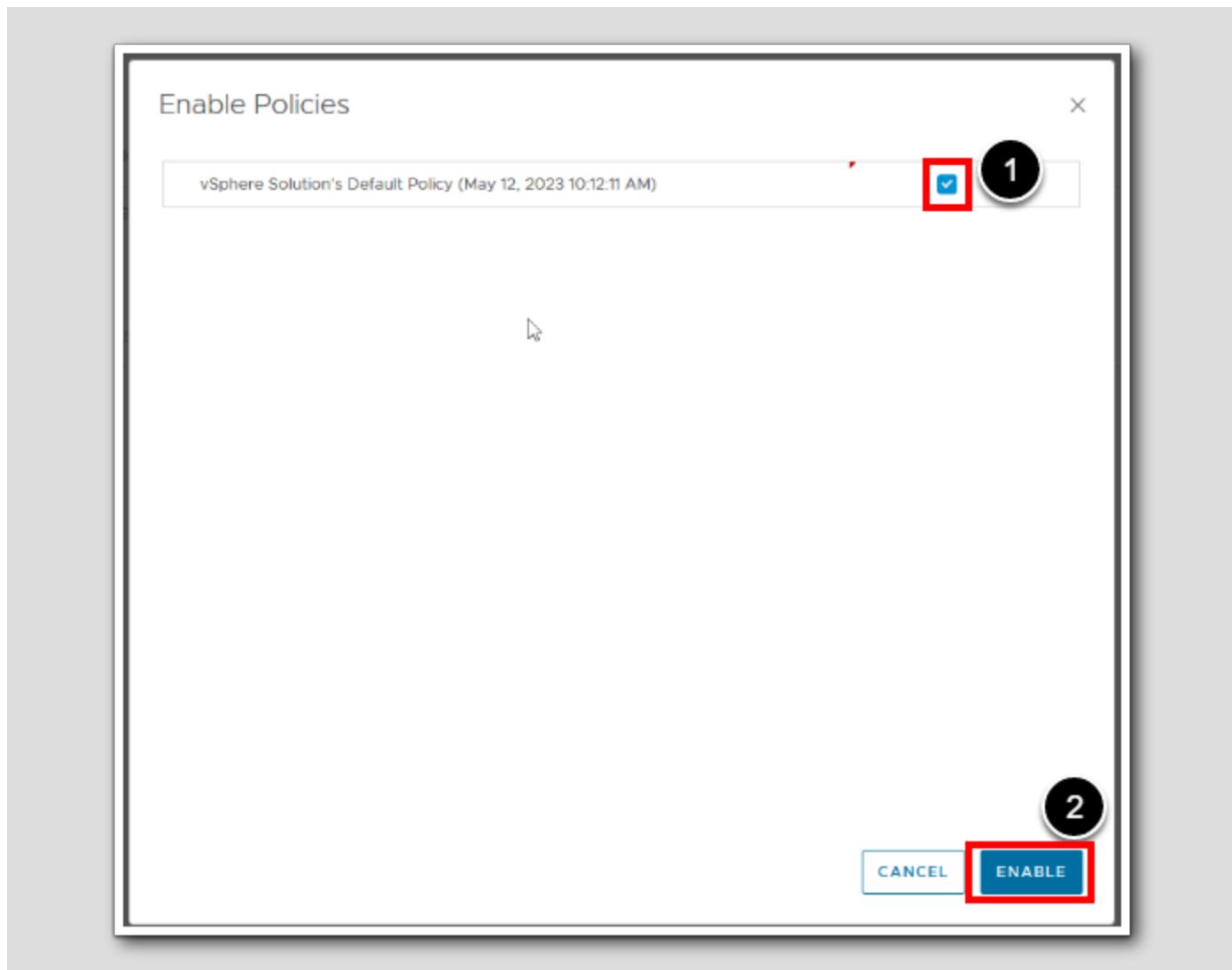
## Enable DISA for vCenter



In an Aria Operations environment, we can enable benchmarks for specific environments, be they on-premise data centers or a VMware Cloud on AWS environment. Let's enable the DISA benchmark for our on-premise vCenter environment.

1. Click on the chevron next to Optimize.
2. Click on Compliance.
3. Locate the DISA Security Standards tile and click ENABLE.

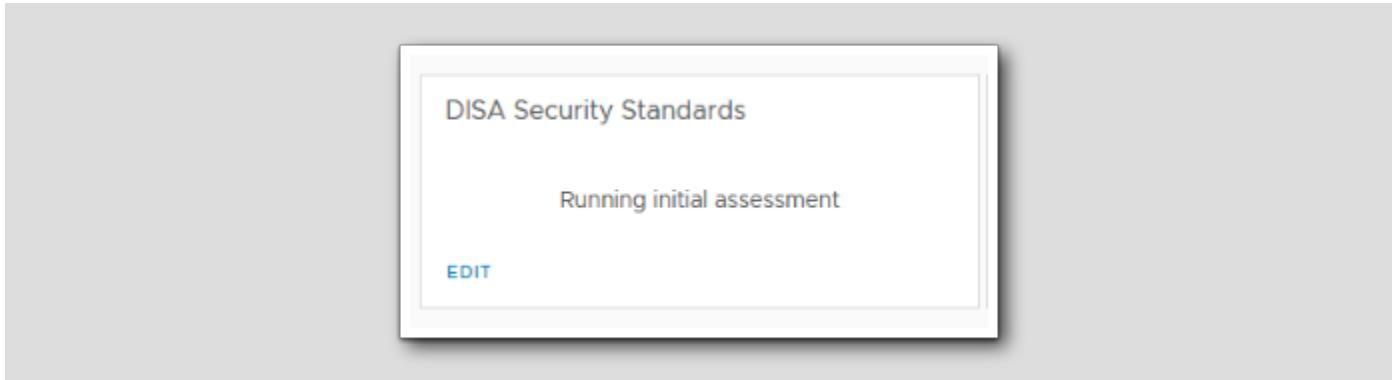
## Choose DISA Policy for vSphere



Aria Operations can manage multiple vCenter environments but we may only want to monitor for DISA compliance on one of them. This Enable policy screen allows you to select the policies you wish to enable DISA for.

1. Tick the checkbox next to the vSphere Solution's Default Policy section
2. Click ENABLE

## Running Initial Assessment



Once the DISA Benchmark has been enabled for our default vSphere policy, you will see the UI update to indicate that the initial assessment has started. Depending on the environment size this initial assessment can take some time but in our lab it should only take around 5-10 minutes.

## Lesson Ends

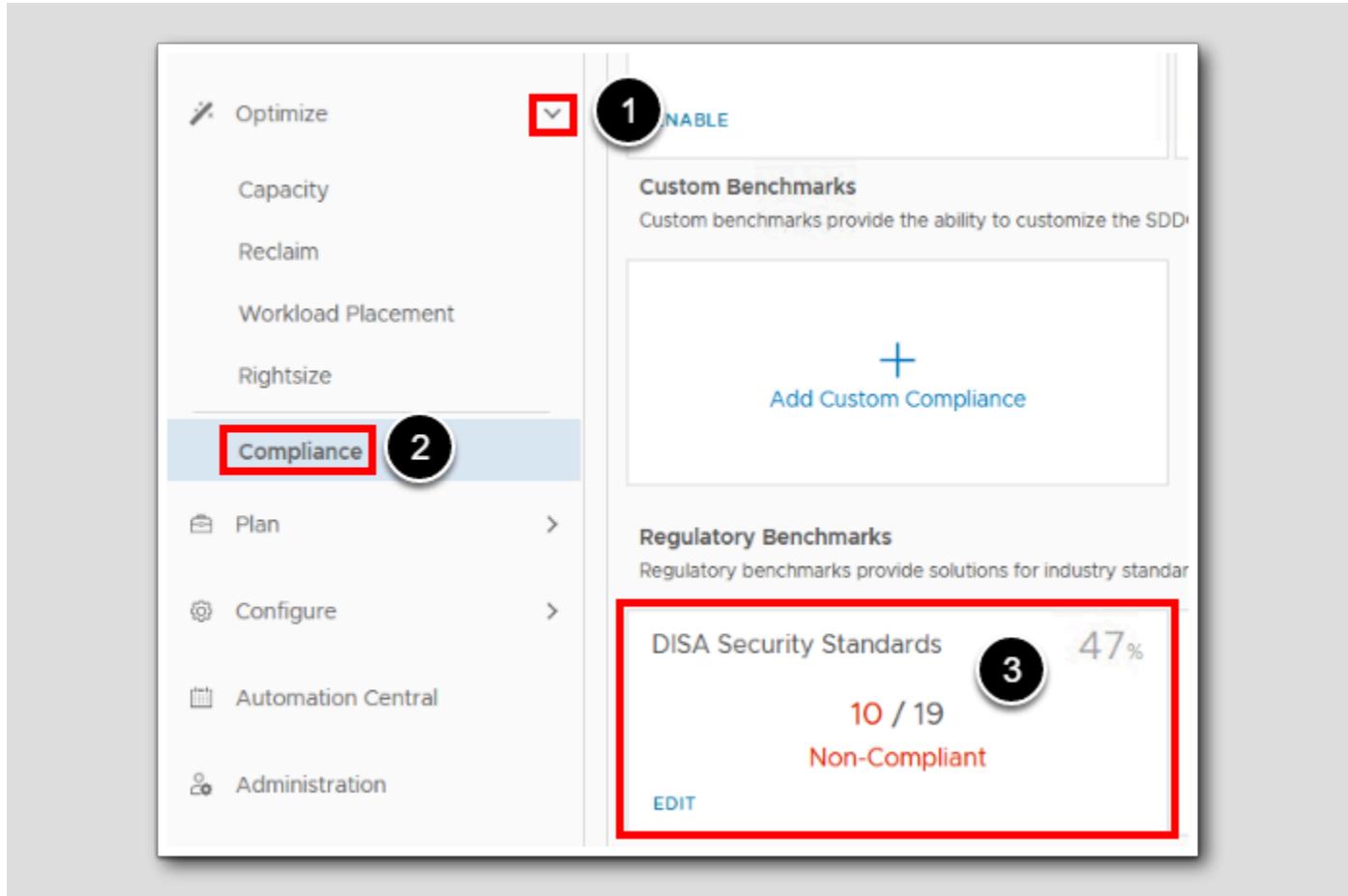
This concludes the introduction to the compliance benchmarks for this module. In later lessons, we will evaluate the report and create actions to remedy findings.

## Viewing Compliance Reports

In our first lesson, we learned how Aria Operations enables administrators to benchmark VMware environments against Industry standard frameworks to monitor compliance and best practices. We enabled the DISA Benchmark and ran the initial assessment against our default vSphere Profile.

In this lesson, we will view the completed assessment and navigate the compliance report to learn what within our environment may need attention. Let's get started.

## Locate Compliance Report



Building on the previous lesson, let's view the outcome of our initial assessment of our vSphere environment using the DISA benchmark.

If you are logging in for the first time, Go back to the first lesson and Enable the DISA Compliance Benchmark.

1. Click on the chevron next to Optimize
2. Click on Compliance
3. Click on the DISA Security Standards Benchmark tile

## View Compliance Report

The screenshot shows the VMware vSphere Compliance Report interface. At the top left, there's a summary card for DISA Security Standards: "47%" completion, "10 / 19" total items, and "Non-Compliant". Below this is a larger section for "DISA Security Standards" with a donut chart showing 47% compliance (green) and 53% non-compliance (red). A legend indicates 9 compliant and 10 non-compliant items. To the right is a "Compliance Alerts List" section. A dropdown menu under "ACTIONS" is open, with "Group By Object Type" selected (circled with a red box and labeled 1). Other options in the dropdown include "None", "Time", "Criticality", "Definition", and "Object Type" (which has a red arrow pointing to it from below, labeled 2).

DISA Security Standards

47%

10 / 19

Non-Compliant

DISA Security Standards

Compliance 47%

● Compliant 9

● Non-Compliant 10

Object Breakdown

Object Type	Count
vSphere Distributed Port Group	4
Host System	5
vCenter Server	0
Virtual Machine	7
vSphere Distributed Switch	1

Compliance Alerts List

ACTIONS ▾ Group By Object Type ▾

- None
- Time
- Criticality
- Definition
- Object Type

1

2

The compliance reports are very easy to understand and break VMware components into 2 categories, compliant and non-compliant. The percentage of compliance is easily identified as well as an object breakdown identifying where we have issues.

Alerts are grouped by multiple categories but the default is Time. Let's change our view from the default Time to a view that shows us impacted objects.

1. Click the down chevron next to **Group By**.
2. Select **Object Type**.

## Investigating Objects

[112]

Compliance Alerts List			
Group By <u>Object Type</u> ▾			
<input checked="" type="checkbox"/> Host System <span>?</span>			
Criticality	Alert	Triggered On	Updated On
	ESXi Host is violating DISA	esx-04a.corp.vmbeans.com	11:27 AM
	ESXi Host is violating DISA	esx-03a.corp.vmbeans.com	11:27 AM
	ESXi Host is violating DISA	esx-01a.corp.vmbeans.com	11:27 AM
	ESXi Host is violating DISA	esx-02a.corp.vmbeans.com	11:27 AM
	ESXi Host is violating DISA	esx-05a.corp.vmbeans.com	11:27 AM

Let's start by viewing the Host Systems that are violating the DISA benchmark. In the above image, please note I have shrunk the size of the columns to make viewing easier so you're screen may differ slightly.

When we expand the Host Systems object we see information pertaining to the hypervisor, the alert type, last update time and the criticality of the violation. Let's open up one of the hosts to view more detail.

1. Click the chevron next to **Host System** to expand the list.
2. Click on the host **esx-04a.corp.vmbeans.com**

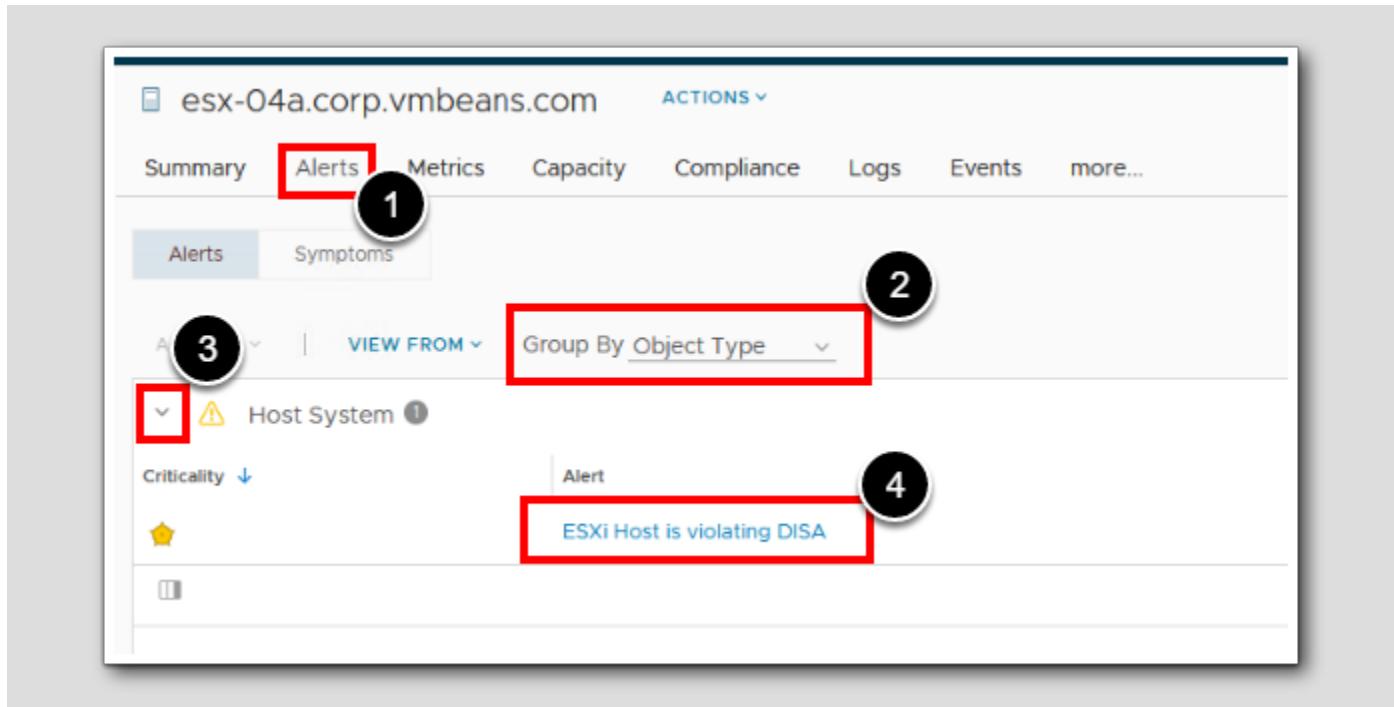
## Viewing Alerts

The screenshot shows the 'Active Compliance Alerts' interface. On the left, a list of 'Violated Rules' is shown under the heading 'Symptom'. One rule, 'ESXI-06-000041 Timeout to automatically terminate idle sessions is not configured', is highlighted with a red box and numbered 1. To the right, a detailed view of this alert is displayed. It includes the host name 'esx-04a.corp.vmbeans.com' (2), the alert ID 'ESXI-06-000041 Timeout to automatically terminate idle sessions is not configured' (2), the creation time 'Created On: 11/27/47 AM' (2), the 'Information' section which states 'Shell interactive timeout (UserVars.ESXi\$shellInteractiveTimeOut) 0 = Threshold 0' (3), and the 'Details' section showing a table with 'Time Changed' (down arrow) and 'Property Value' (5/28/23 11:27 AM 0) (4). The entire 'Information' and 'Details' sections are also highlighted with a red box.

When we open a host not in compliance, we are presented with a list of all the violated rules. Each listing details the symptom, time the alert was generated as well as the detailed information or metric the Benchmark is looking for. Let's open up on of the violations.

1. Click on the Alert ESXI-06-000041 Timeout... to view the alert.
2. Identify the detailed alert description.
3. Identify the Information identifying the TimeOut Threshold is not set.
4. Identify the last changed details that can identify if a value was changed to cause the violation(this date may vary depending on when you run this lab).

## Taking Ownership of Alerts



Now that we've identified our host has configurations that violate the DISA policy, let's view the alert and assign it to a user for remediation.

1. Click on the **Alerts** tab for this hypervisor.
2. Under alerts, click the down chevron to group alerts by **Object Type**.
3. Click the **chevron** to expand the host system.
4. Click on the Alert name **ESXi Host is violating DISA**.

## Adding Notes to Alerts

The screenshot shows the 'Alert Details' tab selected in the vSphere Web Client. The main content area displays a list of recommendations:

Fix the DiSA Hardening Guide Rules Violations for vSphere for the ESXi Host according to the recommendations available at [Defense Information Systems Agency](#).

**Alert Basis**

1 Self - Host System any

**Symptoms**

- The **Warning** symptom ESXI-06-000042 Timeout for the ESXi Shell and SSH services is not set has been observed on esx-04a.corp.vmbeans.com (Self)
  - Shell timeout (UserVars.ESXiShellTimeOut) 0 = Threshold 0
- The **Warning** symptom ESXI-06-000036 The system must deactivate ESXi Shell unless needed for diagnostics or troubleshooting, has been observed on esx-04a.corp.vmbeans.com (Self)
  - Running "true" = "true"
- The **Warning** symptom ESXI-06-000036 The system must deactivate ESXi Shell, has been observed on esx-04a.corp.vmbeans.com (Self)
  - Policy "on" != "off"
- The **Warning** symptom ESXI-06-200035 SSH service is running has been observed on esx-04a.corp.vmbeans.com (Self)
  - Running "true" = "true"
- The **Warning** symptom ESXI-06-000043 Timeout value for DCUI is not configured has been observed on esx-04a.corp.vmbeans.com (Self)
  - DCUI timeout 0 < Threshold 600
- The **Warning** symptom VCWN-06-000022 Non-compliant SSH service startup policy has been observed on esx-04a.corp.vmbeans.com (Self)
  - Policy "on" != "off"
- The **Warning** symptom ESXI-06-000037 Active directory is not used for local user authentication has been observed on esx-04a.corp.vmbeans.com (Self)
  - Enable active directory authentication "false" != "true"
- The **Warning** symptom ESXI-06-000054 Bidirection CHAP authentication is not enabled has been observed on esx-04a.corp.vmbeans.com (Self)
  - Enable mutual chap authentication "false" != "true"
- The **Warning** symptom ESXI-06-000041 Timeout to automatically terminate idle sessions is not configured has been observed on esx-04a.corp.vmbeans.com (Self)
  - Shell interactive timeout (UserVars.ESXiShellInteractiveTimeOut) 0 = Threshold 0

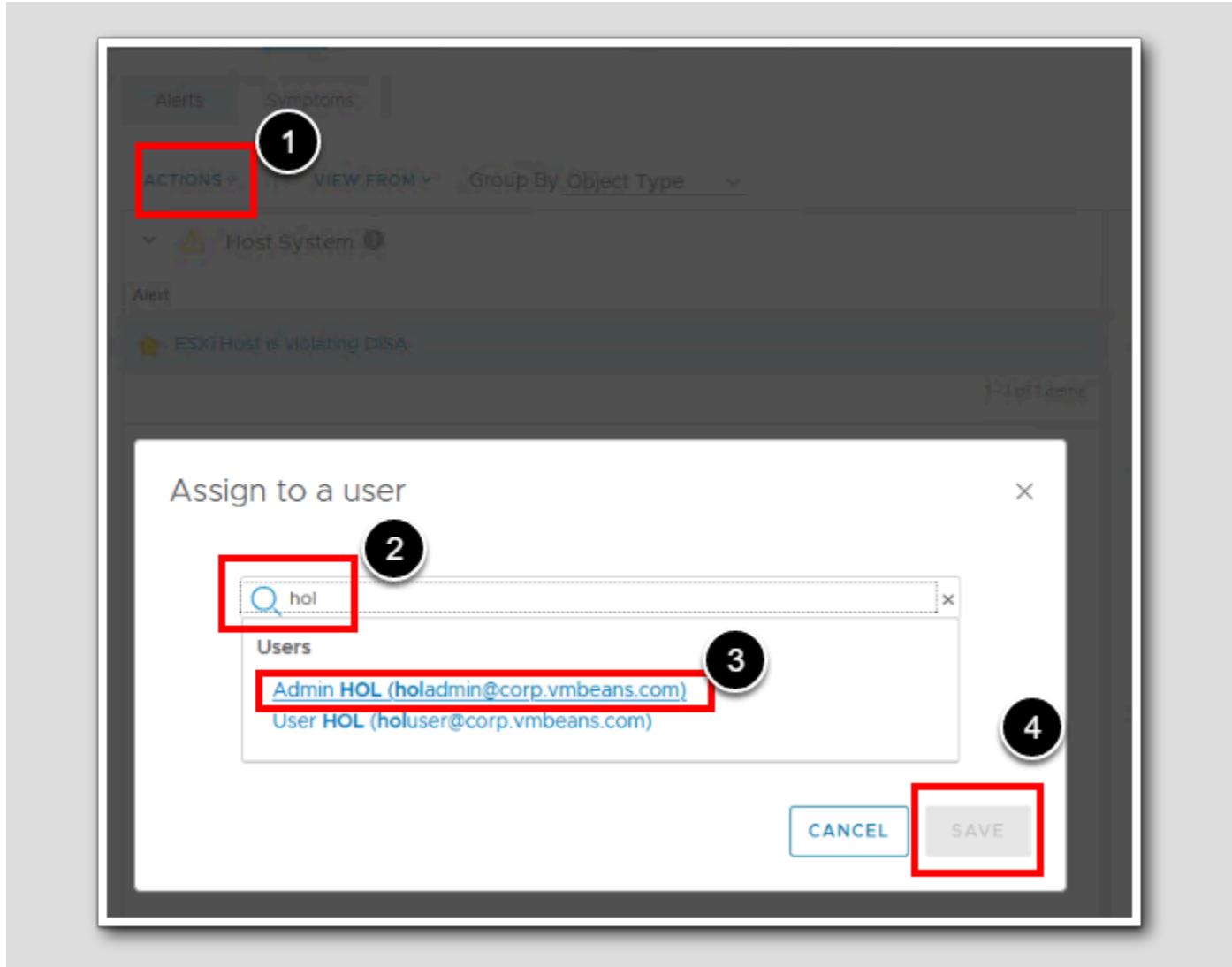
**Notes**

1. Leave a note...  
2. SUBMIT CLEAR

The alert details give us a nice comprehensive view of every alert on our hypervisor. As an auditor, it may be useful to add notes to an alert to provide context. Once an alert is assigned to an administrator for remediation, having this extra context may be required to successfully address the alert. Let's add a quick note here.

1. Type into the notes field **SSH should be our priority**.
2. Click **SUBMIT**.

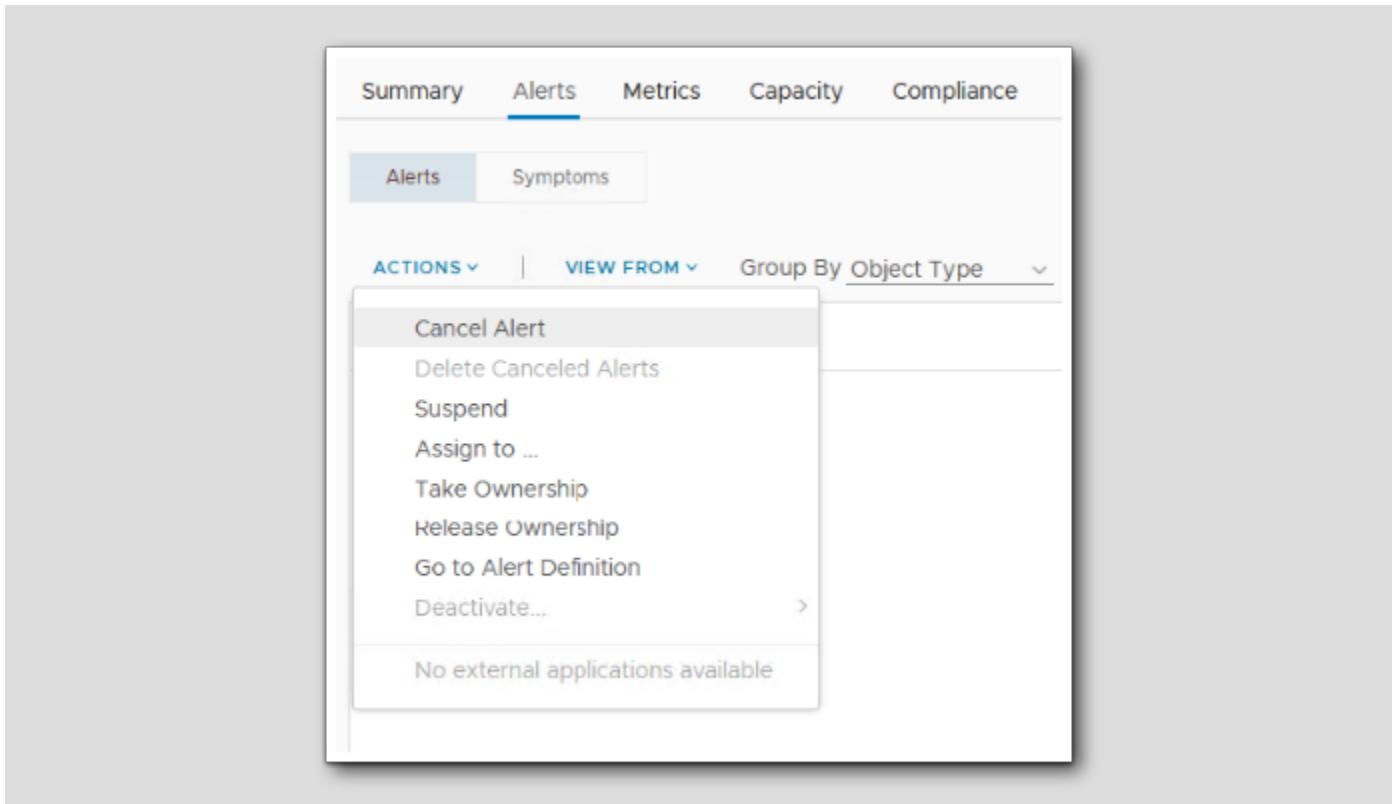
## Assigning Ownership of Alerts



Assigning ownership of alerts allows for administrators to identify they've seen the alert and can take actions including adding additional notes. Let's assign the alert to our holadmin user.

1. Click on Actions and select Assign To (not shown)
- 2.type hol and wait for auto-complete to populate users.
- 3.Click on the holadmin user.
- 4.Click on SAVE.

## Changing Ownership and Acknowledging Alerts



In addition to assigning ownership of an alert, users can perform actions such as canceling an alert, suspending the alert, take ownership or release ownership of the alert. This allows for users to share and interact with the alert allowing for multiple parties to work with alerts and their remediation.

## End of lesson

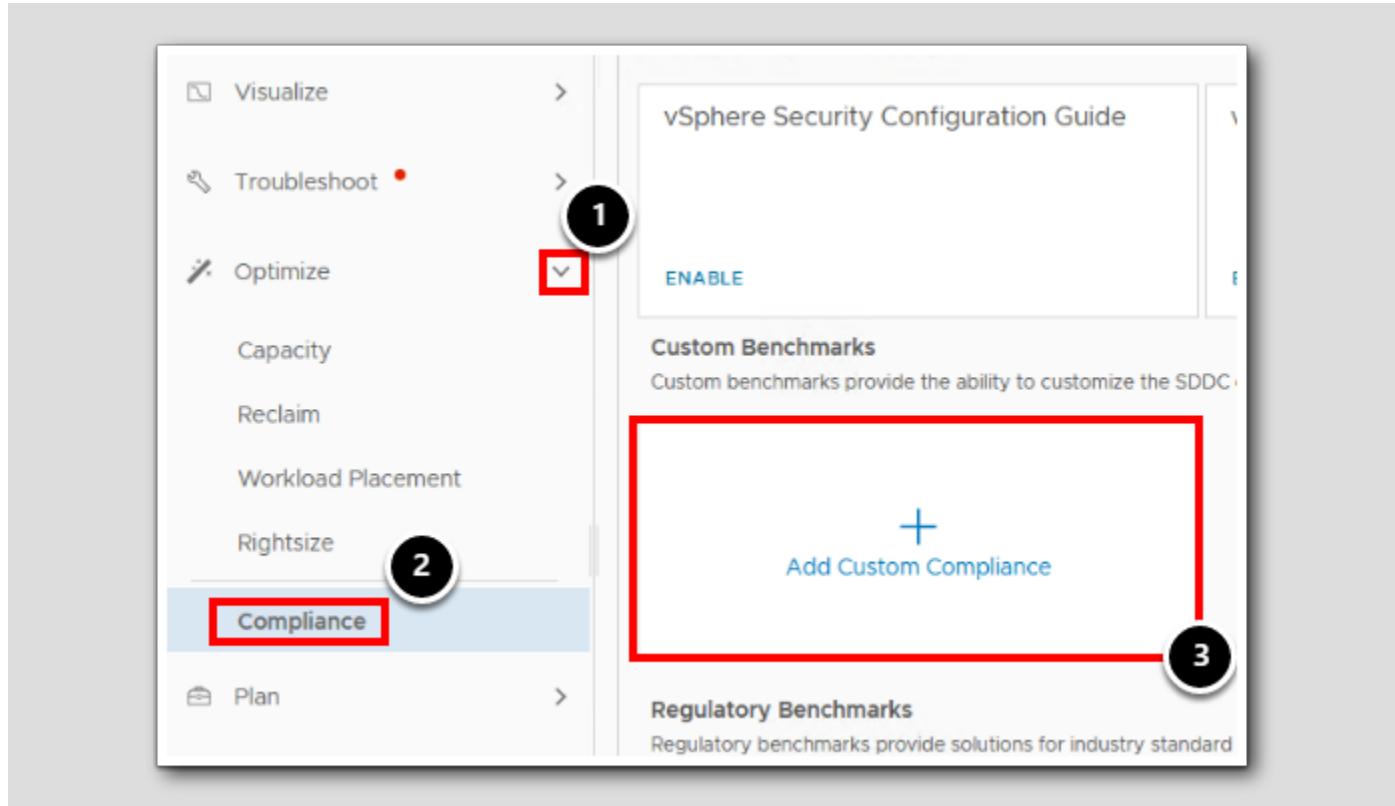
In this lesson, we looked at viewing Compliance reports, interacting with the alert to create notes and assign ownership of the alert to a user.

## Creating Custom Compliance Benchmarks

Industry or organizational benchmarks provide a standard framework to measure an environment against when working with compliance. Many times however, organization may want to implement a custom benchmark or carve out exceptions to existing benchmarks.

In this lesson, we'll take a look at how to create a customer benchmark and apply it to our vCenter environment. Let's get started.

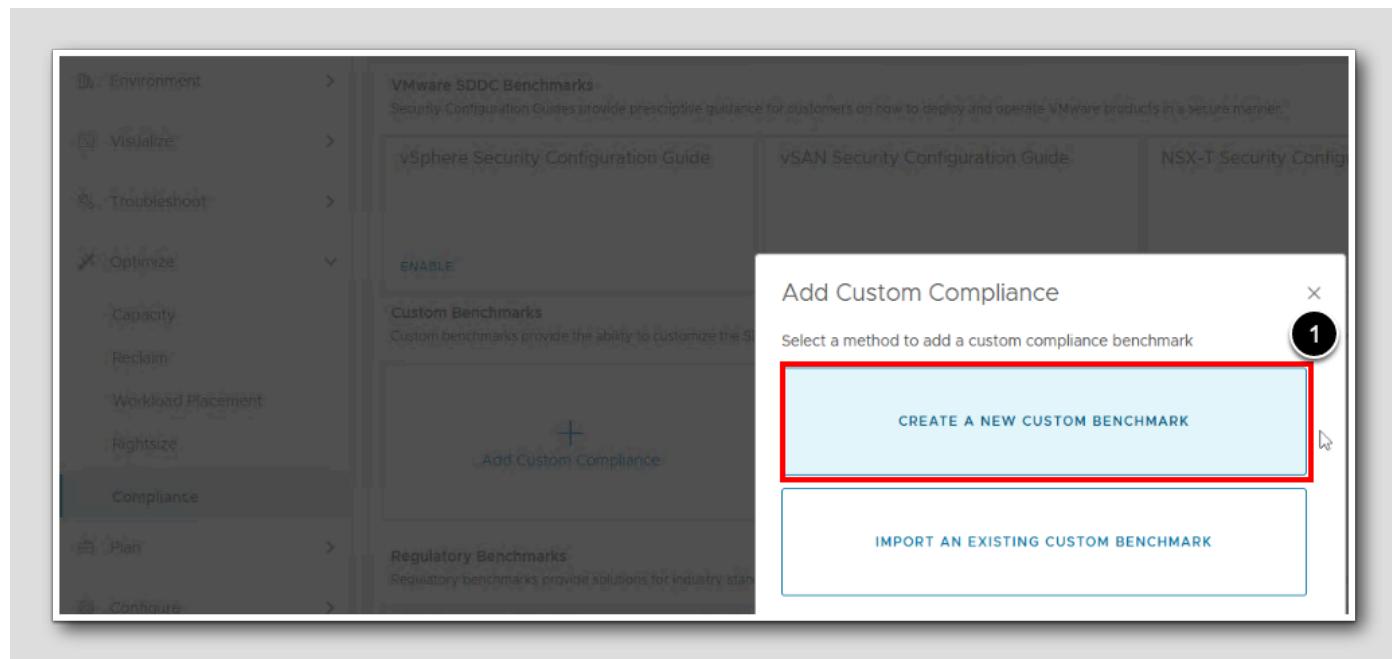
## Creating a Custom Benchmark



A custom compliance benchmark allows businesses and organizations to create a standard benchmark that suits their individual needs. These can be modified from existing benchmarks or created entirely from scratch. Let's take a look at how we do this.

1. Click the chevron next to Optimize.
2. Click Compliance.
3. Locate and Click on Add Custom Compliance.

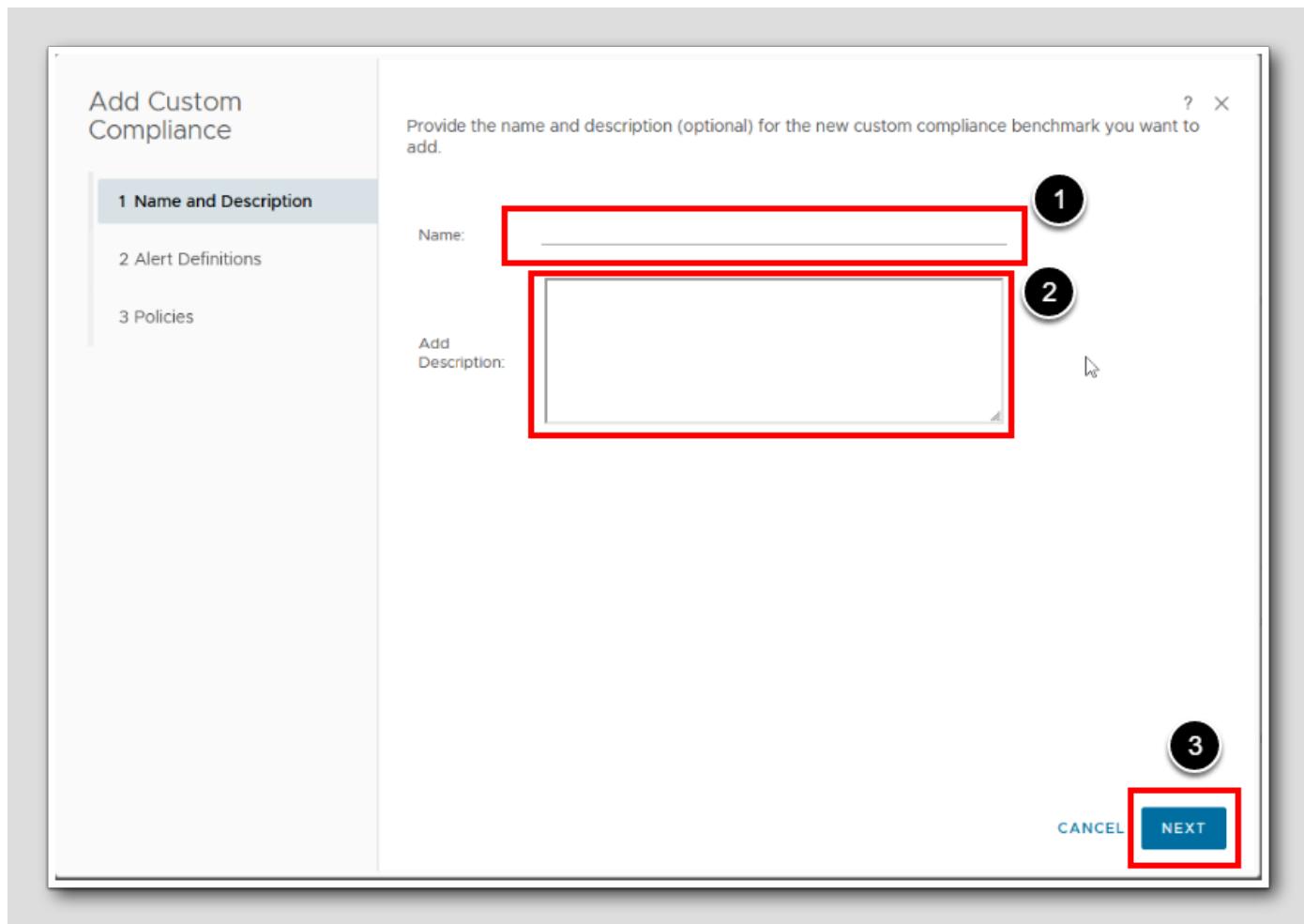
## Chose our Custom Compliance



Aria Operations allows us to either create a new custom benchmark or to import an existing one. Let's create a new custom benchmark.

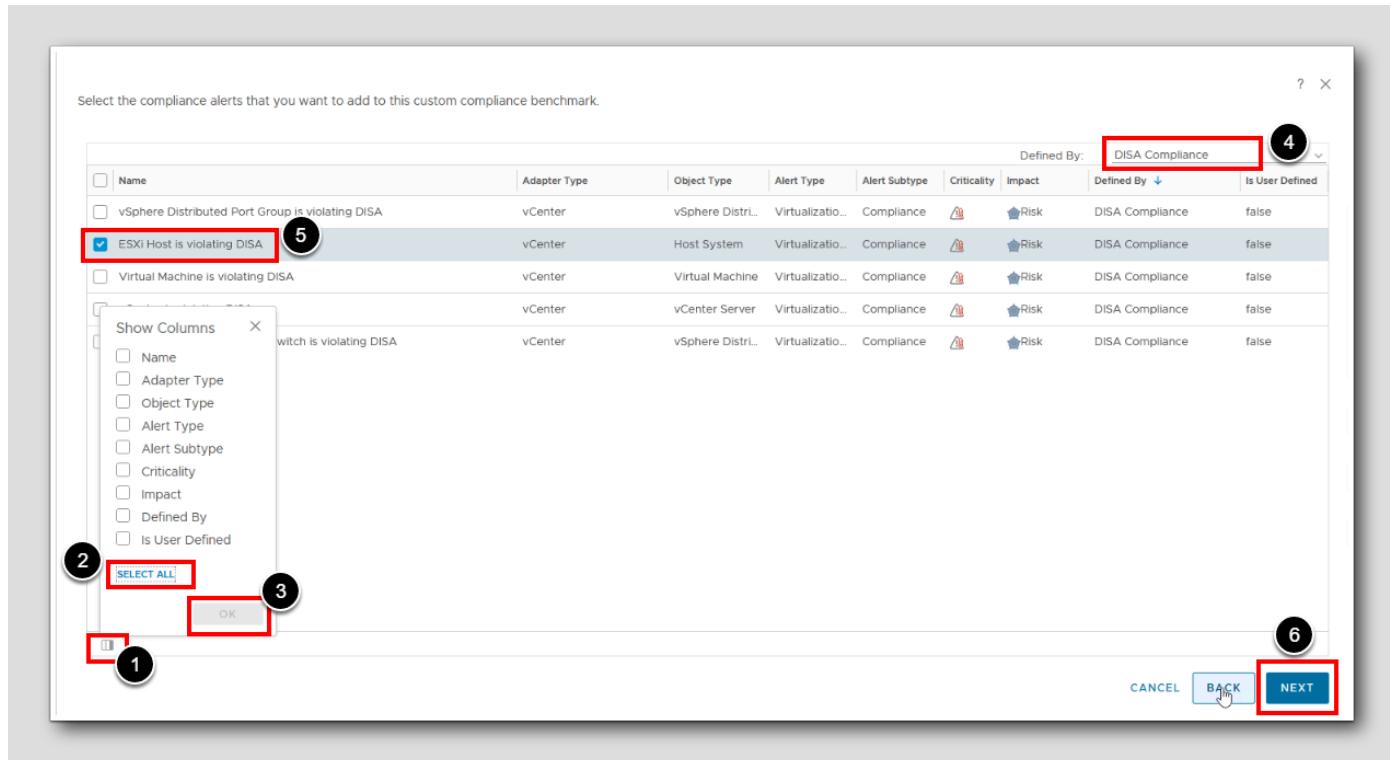
1. Click on CREATE A NEW CUSTOM BENCHMARK.

## Naming our Benchmark



1. Type HOL Custom Benchmark.
2. Type This benchmark is a custom subset of the DISA benchmark
3. Click on NEXT

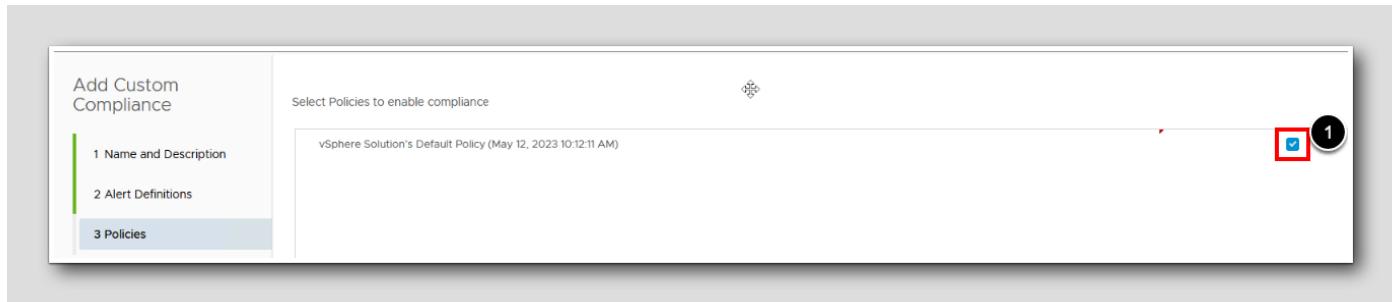
## Selecting the Alert Definitions



We want to create a compliance definition that only is concerned about our ESXi hosts. This removes any reporting or compliance for anything other than our ESXi hosts.

1. Click on the Show Columns Filter.
2. Click Select All.
3. Click OK
4. Under Defined By, select DISA Compliance
5. Check the box next to ESXi Host is violating DISA
6. Click Next

## Select Policies



As in our previous exercise, a benchmark can be selectively applied to VMware environments even within the same vCenter.

1. Check the box next to vSphere Solution's Default Policy
2. Click Finish (not shown)

## End of Lesson

In this lesson, we explored creating a custom Benchmark from a subset of the DISA Benchmark. Once applied to our vCenter, the initial assessment will run with reporting, alerting, ownership and metrics like standard built-in benchmarks available within Aria Operations. Utilizing these custom benchmarks, administrators can pinpoint only the items that need their attention to meet compliance for their business needs.

## Conclusion

In this module, we explored the Aria Operations Manager compliance benchmark capability. Using this capability, administrators can monitor and determine their environments compliance against Industry and Organizational benchmarks such as HIPPA, DISA or PCI-DSS. Assigning alerts, adding notes and creating custom benchmarks gives administrators great flexibility in maintaining compliance in a complex VMware environment.

## You've finished the module

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 7 - Understand your Cloud Costs and Save Money (30 minutes) Basic

### Introduction

[129]

IT Staff are often asked how much a Virtual Machine (VM) "costs" an organization. With Virtual Machine Costing in Aria Operations, we can track how much we are paying for CPU, Memory, and Disk/Storage resources on each VM. Additionally, with the Out-of-the-box (OOTB) dashboards, we can see not only specific VM costs, but also track total costs across our datacenter(s).

In this lab, we will briefly show how to set the currency in Aria Operations, how to access some of the more common (OOTB) dashboards used for costing and provide a general overview of each.

### Log in to Aria Operations

[130]

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

### Open the Firefox Browser from the Windows Task Bar

[131]

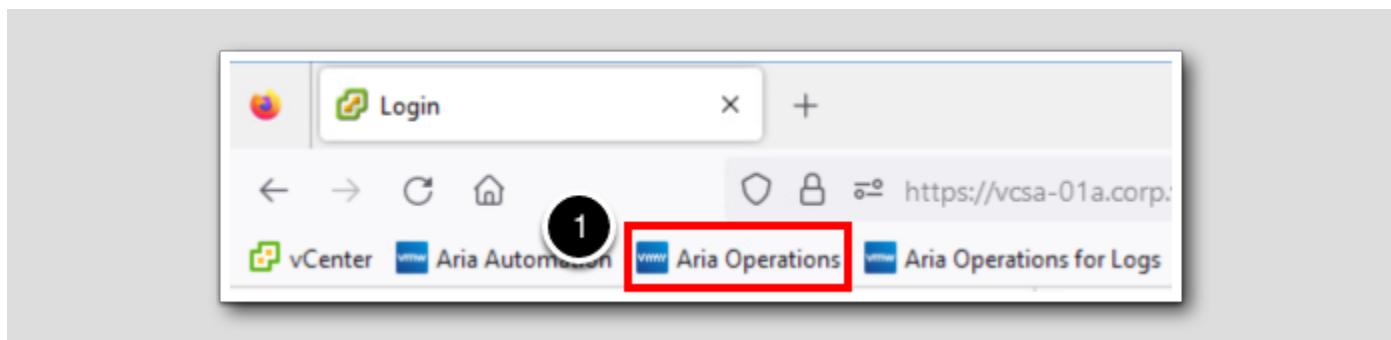


If the browser is not already open, launch Firefox.

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

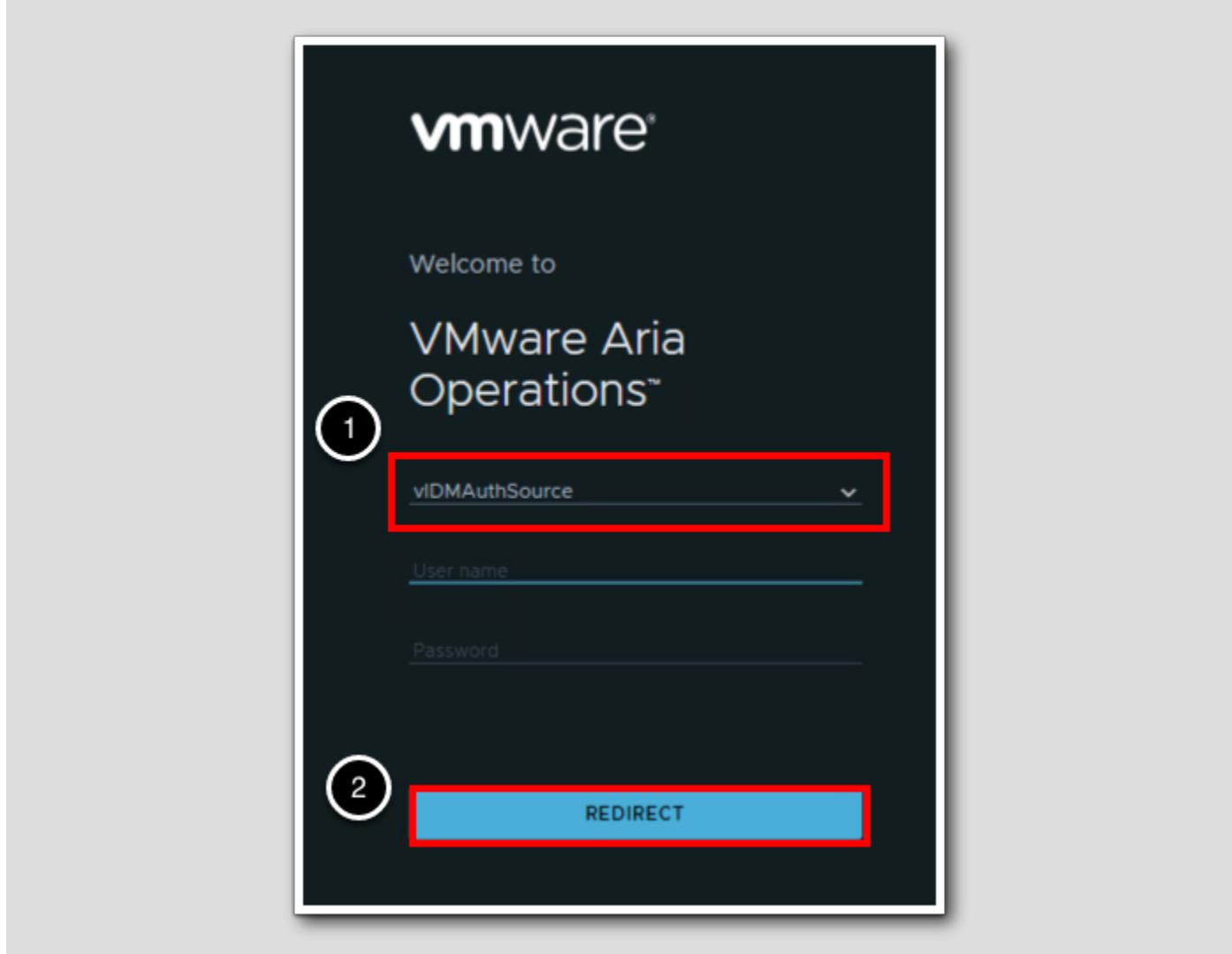
### Navigate to Aria Operations

[132]



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

## Log in to Aria Operations

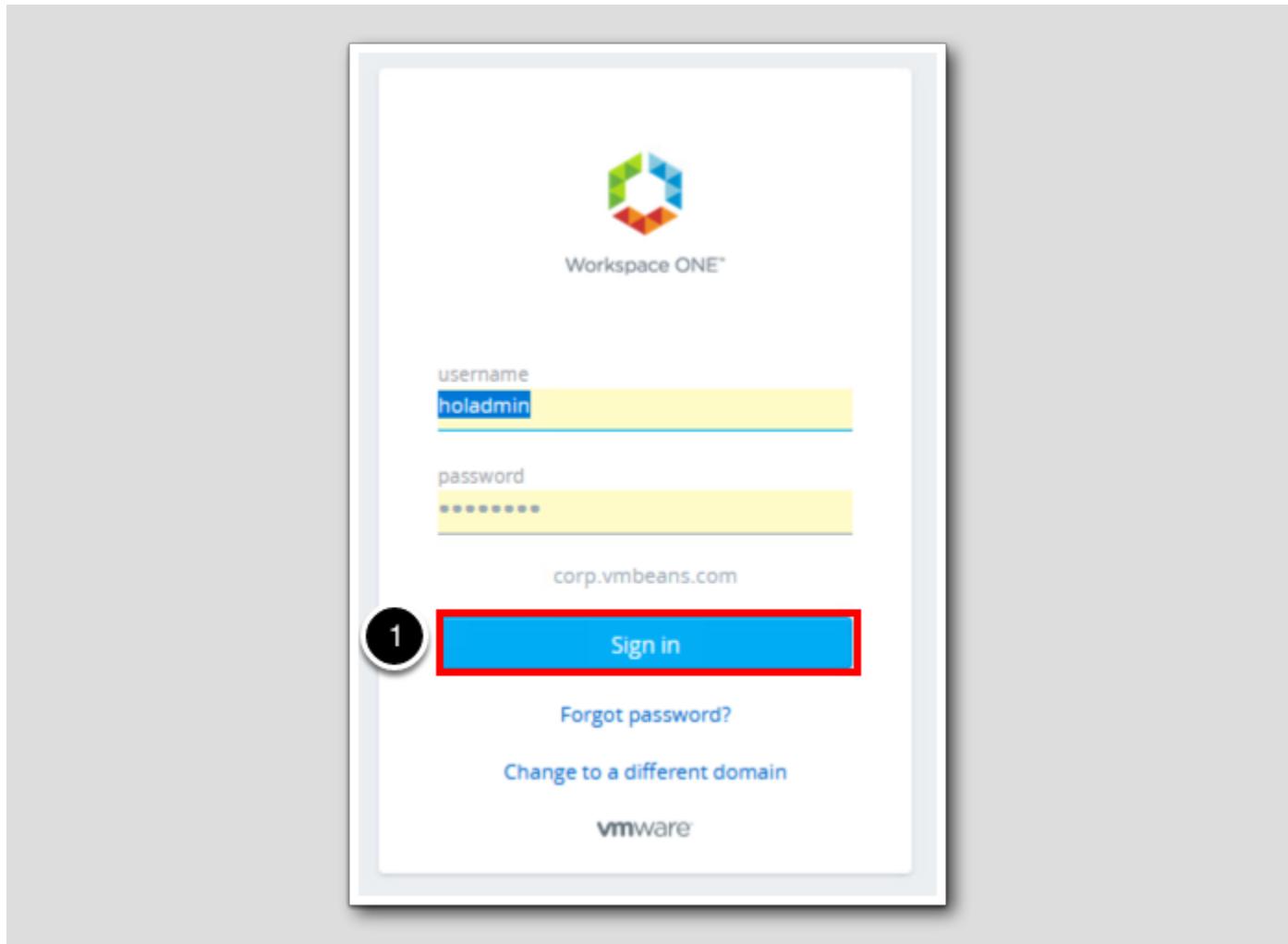


Aria Operations is integrated with VMware Workspace ONE Assist (also known as VMware Identity Manager) in this lab. This integration is listed as vIDMAuthSource in our live lab environment.

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



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

## Virtual Machine (VM) Costing with Aria Operations

In this exercise, we will review VM costing in VMware Aria Operations and some of the methods for reviewing the overall cost as well as the cost of reclaiming and rightsizing.

## Acknowledge the Currency Warning

The screenshot shows the VMware Aria Operations interface. On the left is a navigation sidebar with options like Home, Data Sources, and Environment. The main area has a search bar at the top. Below it is a blue banner with the text "Welcome to VMware Aria Operations". Underneath the banner, a message reads: "⚠ To view cost figures in VMware Aria Operations, you must choose a currency in Global Settings. You can also dismiss this message without making a selection." This message is highlighted with a red rectangular box. At the bottom right of the message box is a link labeled "Actions...".

The first step is to inform Aria Operations which currency we will use for our calculations.

If the currency has not been set in the environment, a banner like the one above appears noting we must choose a currency in Global Settings. (Note: The currency has already been configured in the lab environment, so we will not see this option). The next few pages are informational regarding how to set the currency but will not be performed in our lab.

## Access the Currency Setting

The screenshot shows the "Administration" section of the VMware Aria Operations interface. On the left is a sidebar with "Administration" selected, indicated by a red box and a circled "1". Other options in the sidebar include Home, Data Sources, Environment, Visualize, Troubleshoot, Optimize, Plan, Configure, Automation Central, and Developer Center. The main area contains several management tasks arranged in a grid. One task, "Global Settings", is highlighted with a red box and a circled "2". Other tasks shown include Access Control, Authentication Sources, Certificates, Licensing, Log Forwarding, Cluster Management, Collection Status, Orphaned Content, Physical Data Centers (with a "NEW" badge), Audit, Recent Tasks, Dynamic Thresholds, Cost Calculation, Support Logs, Redescribe, and Support Bundles.

If the currency was not set in the environment, we would follow the below steps to access this setting for configuration. Again, this has already been configured in the lab environment, but the screenshots and steps show the process that was taken during the configuration.

To access the Currency settings in Aria Operations, first we must navigate to the Global Settings menu:

1. In the sidebar menu, click Administration.
2. In the Administration screen, click Global Settings.

## Cost/Price Menu

[138]

The screenshot shows the VMware Aria Operations interface. The left sidebar is titled "Administration" and contains several menu items: Home, Data Sources, Environment, Visualize, Troubleshoot, Optimize, Plan, Configure, Automation Central, and Developer Center. The "Administration" item is currently selected and highlighted in blue. The main content area is titled "Global Settings" and shows the path "/ Administration / Global Settings". Below this is a search bar. The main content pane is titled "Cost/Price" and contains the following sections: "Data Retention" (with "Cost/Price" highlighted by a red box and circled with a number 1), "User Access", "Reclamation", and "System Settings". To the right of these sections are two toggle switches: "Show Cost Savings" (activated) and "Cost Calculation" (activated). The "Cost Calculation" section includes a dropdown menu set to "9:00 PM". At the bottom of the "Cost/Price" section is a "Currency" field which is empty and has a "SET CURRENCY" link next to it, also highlighted with a red box and circled with a number 2.

In the Global Settings menu:

1. Click on Cost/Price to open the Cost/Price Settings.
2. Note the value of Currency is set to US\$ in our lab. If the currency had not been set, this value would be replaced with a Set Currency link as displayed in the image.

## Set Currency

## Set Currency

X

To receive benefits of the VMware Aria Operations cost engine, you must select a currency. Note that this is a permanent action and cannot be modified. If you do not select a currency now, VMware Aria Operations cannot provide cost figures, and this message will be displayed again when you log in the next time.

 Type to filter...

Tanzanian Shilling (TZS) TSh

Ukrainian Hryvnia (UAH) ₴

Ugandan Shilling (UGX) USh

✓ US Dollar (USD) US\$ 1

Uruguayan Peso (UYU) \$

Uzbekistan Som (UZS) soʻm

Venezuelan Bolívar (VEF) VEF

Vietnamese Dong (VND) ₫

Vanuatu Vatu (VUV) VT

Samoan Tala (WST) WS\$ 2 ⚠ I understand that once my currency is set it can NOT be changed again for this installation. 3

CANCEL

SET CURRENCY

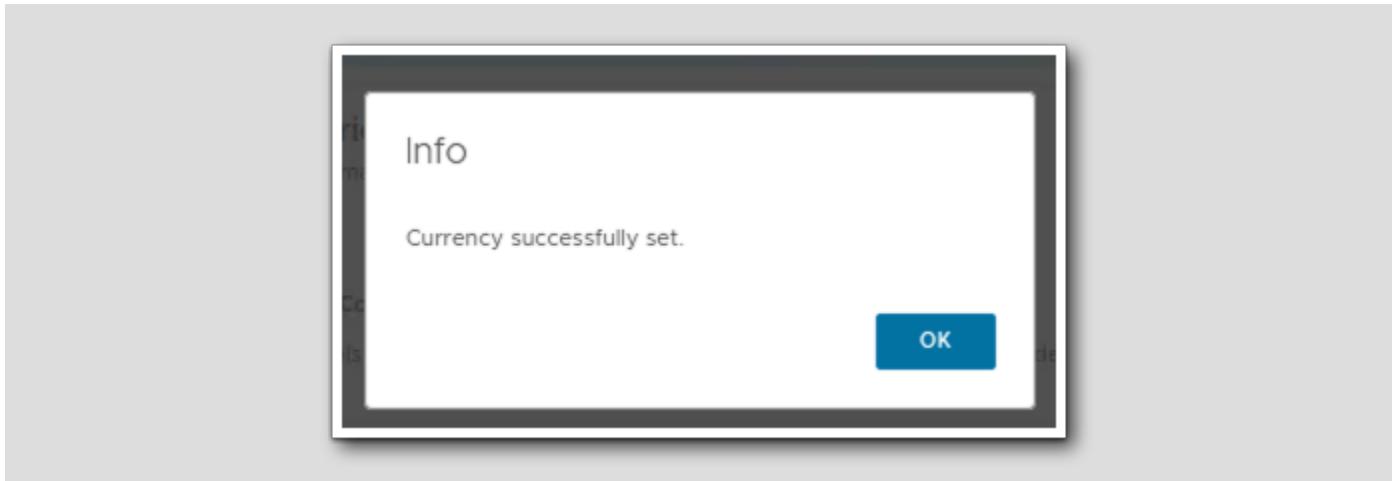
Since the Currency has already been set in our lab environment, these steps are included to show what the process for setting the currency would look like in an environment where it had not yet been configured. There is nothing to be done in the lab, so this is merely a point of reference. If the currency had not been set, we would perform the following steps from the **Set Currency** menu as shown in the image:

1. Select the currency of choice. For the lab environment, US Dollar (USD) US\$ was chosen.
2. Select the checkbox acknowledging the disclaimer **I understand that once my currency is set it can NOT be changed again for this installation.** Note: The process cannot be completed until this acknowledgement is checked.
3. Select the **SET CURRENCY** option.

Care should be taken when configuring the Currency Global Setting. Once the Currency has been set, it cannot be changed without a complete rebuild of VMware Aria Operations.

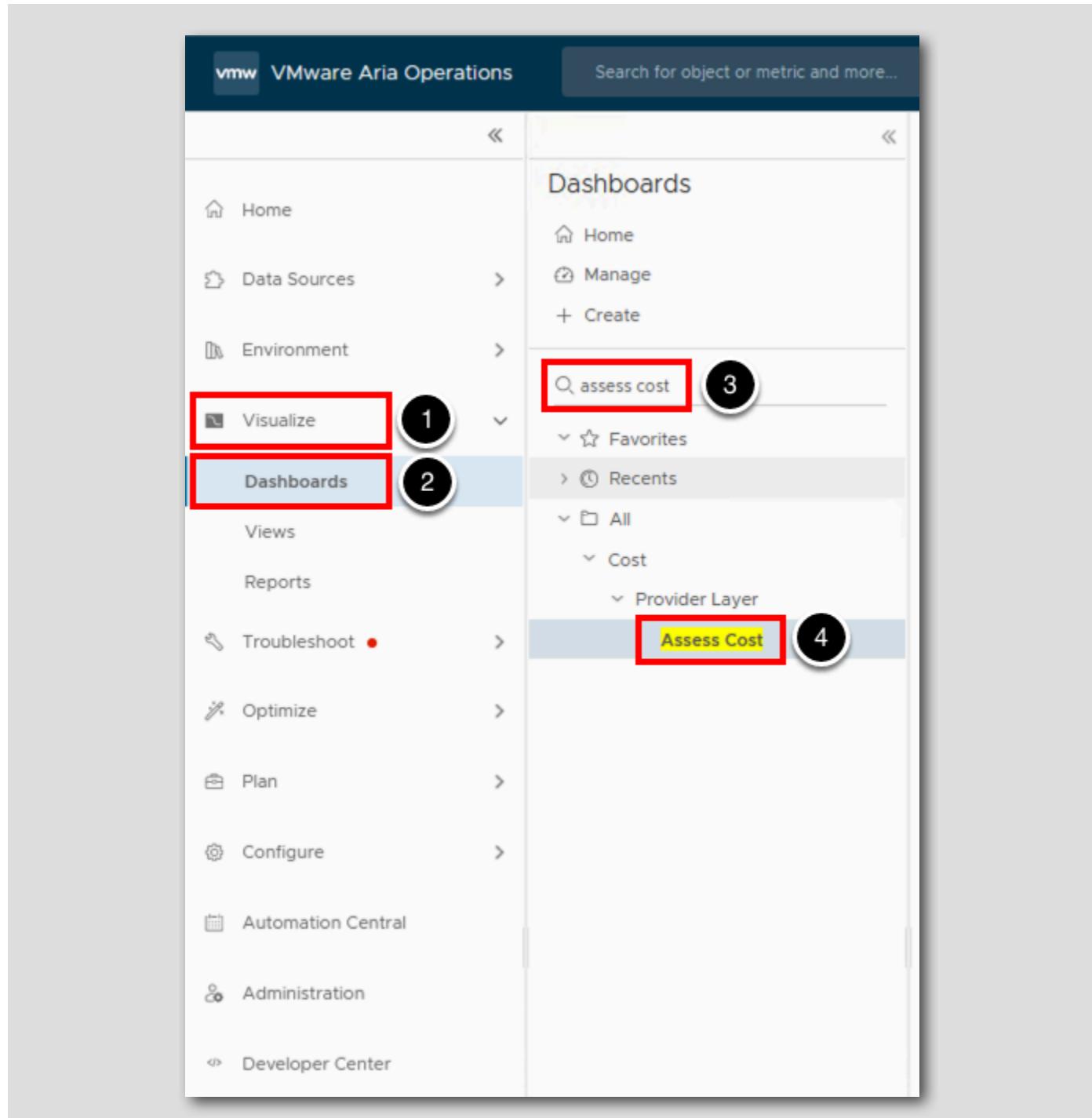
#### Currency Set Info Message

[140]



Once the **Set Currency** option has been completed, an informational message showing our currency had been set will appear as displayed in the image. These last few screenshots have been informational to show the Set Currency process, however there were no steps to do in this lab.

## Open the Cost Assess Dashboard



The Assess Cost dashboard provides an overview of the scale of our infrastructure in terms of physical capacity available.

To select the Assess Cost dashboard, do the following:

1. From the navigation menu on the left, select Visualize.
2. Select Dashboards.
3. In the search bar type assess cost.
4. Select the Assess Cost dashboard.

## Review the Assess Cost Dashboard

[142]

**Total Inventory and Costs**

Datacenters	vSphere Hosts	vSphere Clusters	CPU Sockets	Total Cost of Ownership	Potential Cost Saving Opportunity
1	5	2	5	\$2,460 US\$/Mo...	\$478 US\$/Mo...

**Datacenter Resource Cost**

Name	VMS	Hosts	Clusters	Total Cost of Clusters	Datastores	Total Cost of Datastores	Monthly Direct Cost	Reclaimable vCPUs	Reclaimable Memory	Reclaimable Disk Spa
RegionA01	10	5	2	2,343 US\$/Month	7	83.32 US\$/Month	33.81 US\$/Month	0 vCPUs	0 KB	0 GB
Total	10	5	2	2,343 US\$/Month	7	83.32 US\$/Month	33.81 US\$/Month	0 vCPUs	0 KB	0 GB

**Top Most Expensive Clusters**

Monthly Cluster Total Cost	Objects	Hosts	Datastores	Virtual Machines
1,407.2	Workload1	3	4	2
935.8	Management	2	4	8

**Top Least Expensive Clusters**

Monthly Cluster Total Cost	Objects	Hosts	Datastores	Virtual Machines
935.8	Management	2	4	8
1,407.2	Workload1	3	4	2

As noted earlier, the Assess Cost dashboard provides an overview of the scale of our infrastructure in terms of physical capacity available. The lab environment is minimal, so we won't see the depth of cost savings listed that we would normally see in a Production environment.

The image shown is a screenshot of the initial Assess Cost dashboard in the lab environment. For larger production environments, this dashboard would provide much more data. Some items of note are the following:

1. Total Cost of Ownership
2. Potential Cost Saving Opportunities
3. In the lab, Drag the scrollbar over in the "Datacenter Resource Cost" pane to see all the reporting information (such as Total Cost of Clusters, Total Cost of Datastores, etc.).
4. Scroll down further to see **Top Most Expensive Clusters** and **Top Least Expensive Clusters** in the environment.

Open the Total Cost of Ownership Dashboard

[143]

The screenshot shows the VMware Aria Operations interface. On the left, a sidebar lists various navigation options: Home, Data Sources, Environment, Visualize (highlighted with a red box and numbered 1), Dashboards (highlighted with a red box and numbered 2), Views, Reports, Troubleshoot, Optimize, Plan, Configure, Automation Central, Administration, and Developer Center. The 'Dashboards' option is currently selected. On the right, a main panel titled 'Dashboards' displays a search bar containing 'total' (highlighted with a red box and numbered 3). Below the search bar, the results list includes 'Home', 'Manage', 'Create', 'Favorites', 'Recents', 'All', 'Cost', and 'Cost Optimization'. Under 'Cost Optimization', the 'Total Cost of Ownership' dashboard is highlighted with a yellow box and numbered 4.

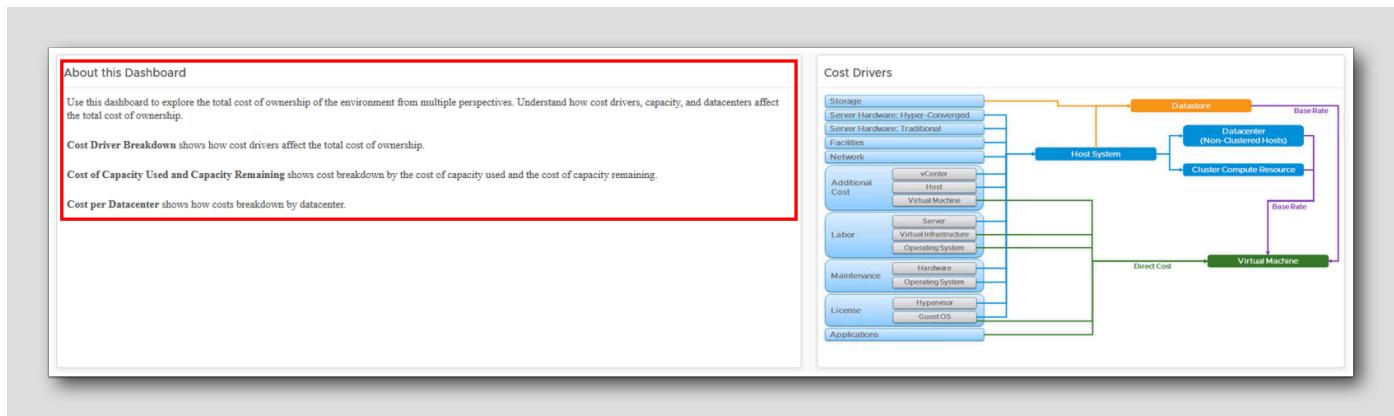
The Total Cost of Ownership dashboard helps us to understand the total cost of ownership of our environment from multiple perspectives. We can use this dashboard to learn how cost drivers, capacity, and data centers affect the total cost of ownership.

To select the Total Cost of Ownership dashboard, do the following:

1. From the navigation menu on the left, select **Visualize**.
2. Select **Dashboards**.
3. In the search bar type **total**.
4. Select the **Total Cost of Ownership** dashboard.

## About the Total Cost of Ownership Dashboard

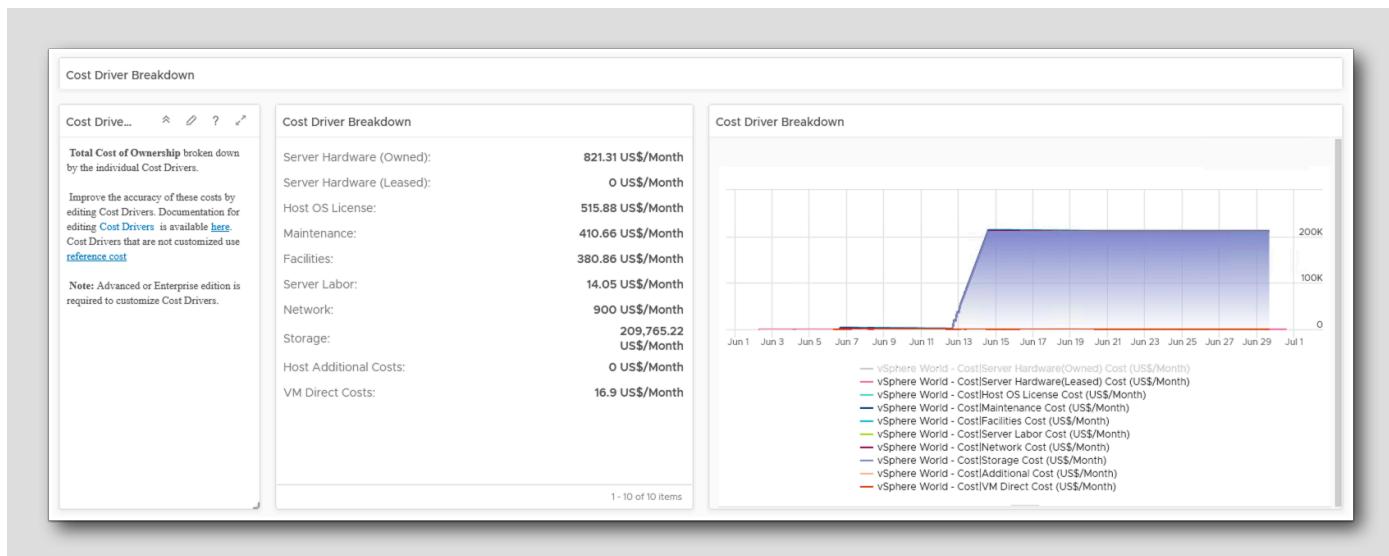
[144]



As noted earlier, the Total Cost of Ownership dashboard helps us to understand the total cost of ownership of our environment from multiple perspectives. The lab environment is minimal, so we won't see the depth of information we would normally see in a Production environment.

This dashboard is comprised of multiple widgets as shown in the screenshot. In this overview, we will show each one over the next few pages. As we navigate this dashboard, we will need to scroll down using the slider bar on the right side of the screen (not shown) to view all the available widgets.

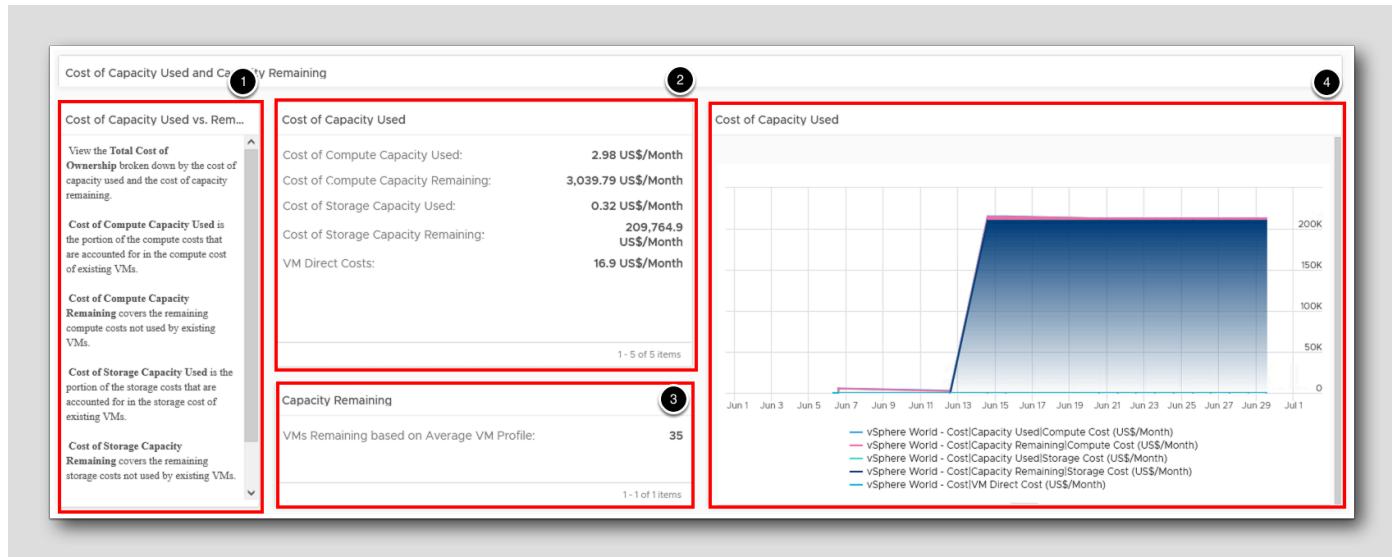
## Cost Driver Breakdown



The first widget in the Total Cost of Ownership dashboard is **Cost Driver Breakdown**. This widget shows how cost drivers affect the total cost of ownership. As noted in the reference pane, to customize the Cost Drivers that are impacting this widget requires Advanced or Enterprise editions of Aria Operations.

**Note:** Modifying Cost Drivers requires Advanced or Enterprise editions of Aria Operations. We will review how to modify the cost drivers later in this module.

## Cost of Capacity Used and Capacity Remaining



Scrolling further down in the Total Cost of Ownership dashboard we see the **Cost of Capacity Used and Capacity Remaining** widgets. These widgets show cost breakdown by the cost of capacity used and the cost of capacity remaining.

These widgets are comprised of several components:

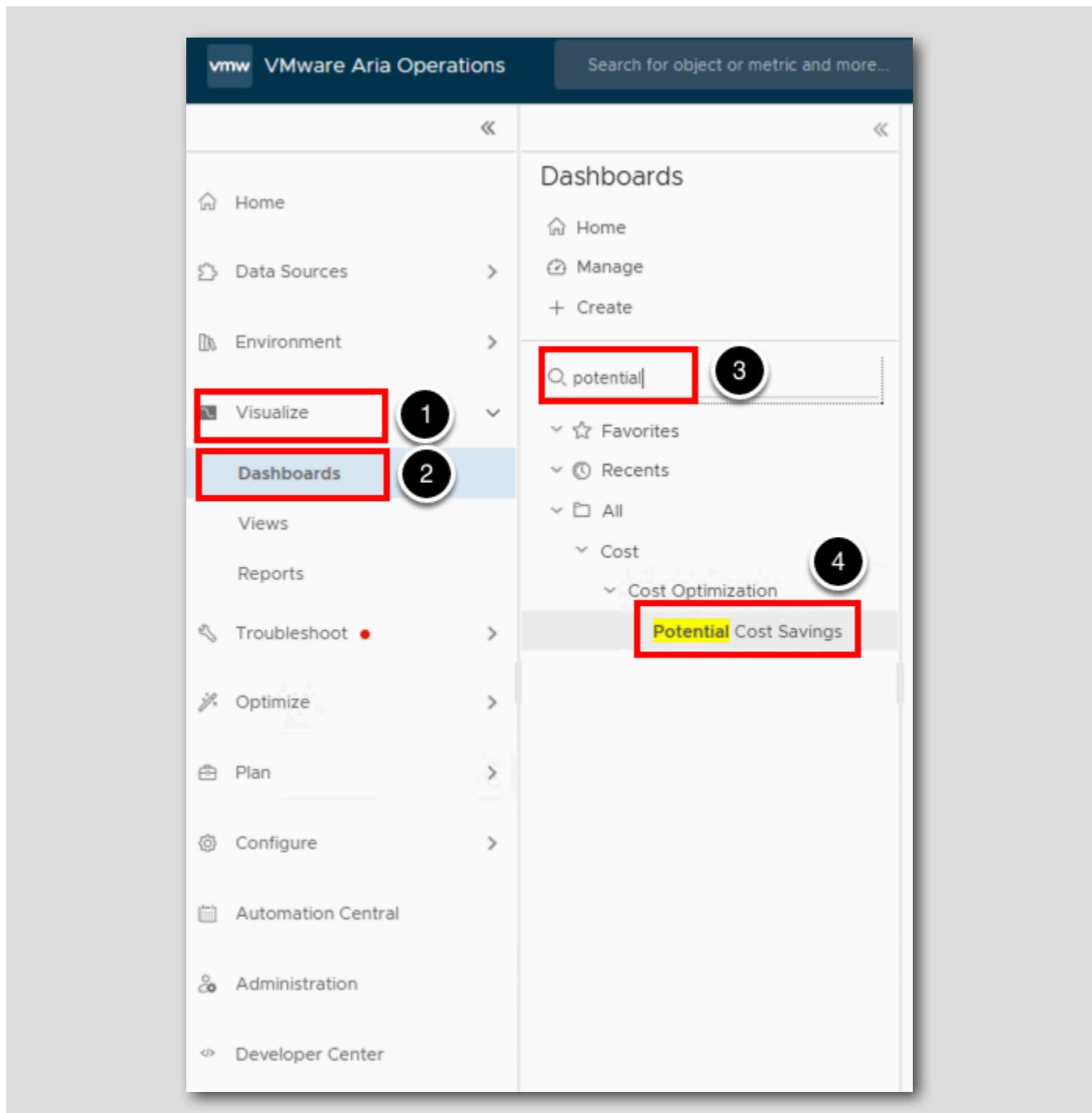
1. **Cost of Capacity Used vs. Remaining Capacity** -- definitions of each component in the widgets.
2. **Cost of Capacity Used** -- identifies compute and storage costs of existing VMs as well as costs remaining (not being used by VMs) for both components.
3. **Capacity Remaining** -- estimated number of VMs that could be added to the environment based upon current capacity averages.
4. **Cost of Capacity Used** -- graphical chart identifying capacity and storage costs of existing VMs as well as costs remaining (unused by current VMs). Note: Clicking on individual costs below the chart allows us to hide/unhide specific items to be displayed in the chart.
5. **Cost per Datacenter** (not shown in the image) -- access this widget by scrolling further down in the dashboard. This identifies the total costs (currently running VMs) running in a datacenter and can be used to identify potential outliers where datacenter costs are higher than other datacenters with similar equipment and which may require follow-up.

## Cost per Datacenter



Scrolling further down in the Total Cost of Ownership dashboard we see the Cost per Datacenter widget. This widget identifies the total costs (currently running VMs) in a datacenter and can be used to identify potential outliers where datacenter costs are higher than other datacenters and which may require follow-up to assist with controlling costs.

## Open the Potential Cost Savings Dashboard



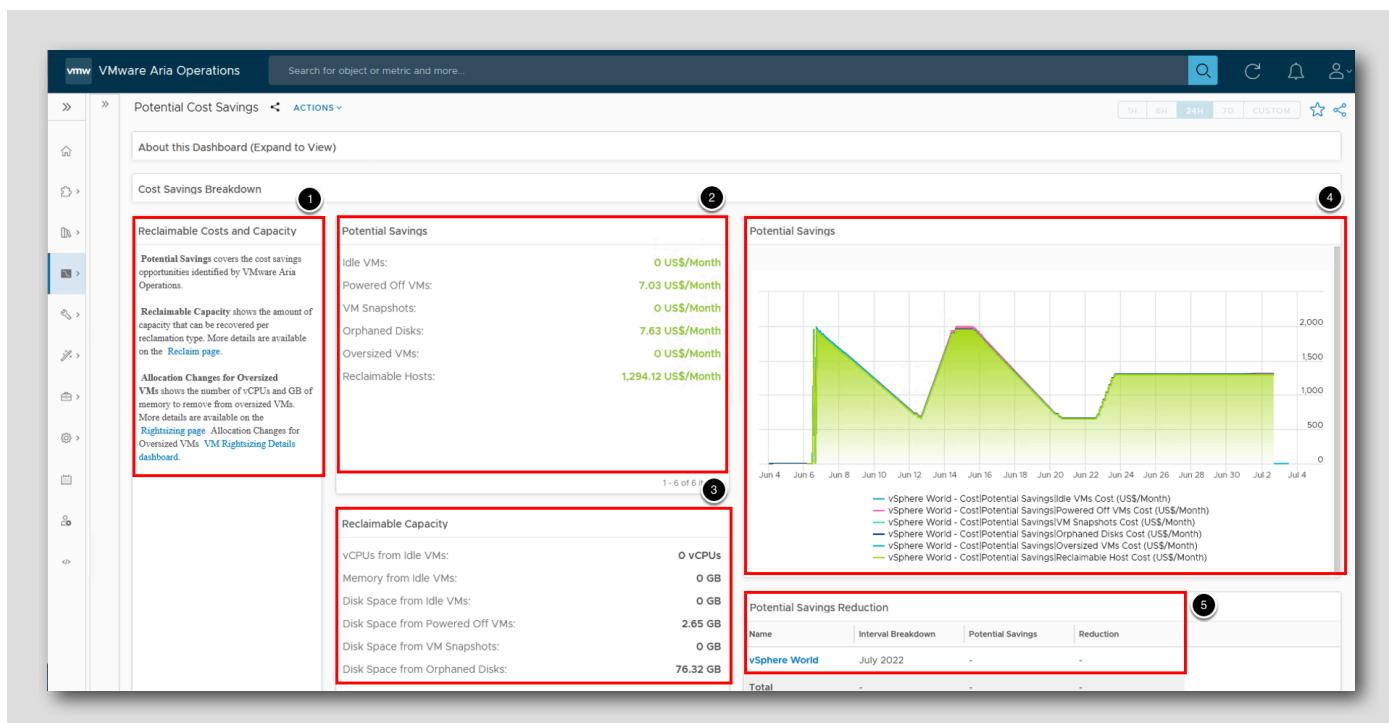
The Potential Cost Savings dashboard helps us to measure the cost savings as reported by VMware Aria Operations. We can evaluate the potential savings to track recommendations and improve cost efficiency over time. The dashboard shows both cost savings and capacity savings for idle VMs, powered off VMs, VM snapshots, orphaned disks, oversized VMs, and reclaimable hosts.

To access the Potential Savings dashboard, do the following:

1. From the navigation menu on the left, select Visualize.
2. Select Dashboards.
3. In the search bar type potential.
4. Select the Potential Cost Savings dashboard.

## Review the Potential Cost Savings Dashboard

[149]



This dashboard is comprised of multiple widgets as shown in the image. In this overview, we will show each one over the next few pages. As we navigate this dashboard, we will need to scroll down using the slider bar on the right side of the screen (not shown) to view all the available widgets.

Reviewing the Potential Cost Savings dashboard, we first see the **Cost Savings Breakdown** widget. This widget displays potential savings and reclaimable capacity opportunities identified by VMware Aria Operations for idle VMs, powered off VMs, VM snapshots, orphaned disks, oversized VMs, and reclaimable hosts.

This widget is comprised of several metrics:

1. Reclaimable Costs and Capacity -- definitions of each metric in the widget.
2. Potential Savings -- currency savings for identified Idle VMs, Powered Off VMs, VM Snapshots, Orphaned Disks, etc.
3. Reclaimable Capacity -- provides the metric details for the reclaimable vCPU, reclaimable memory, and reclaimable disk space.
4. Potential Savings -- graphical chart depicting savings of each identified metric. Note: Clicking on individual costs below the chart allows us to hide/unhide specific items to be displayed in the chart.
5. Potential Savings Reduction

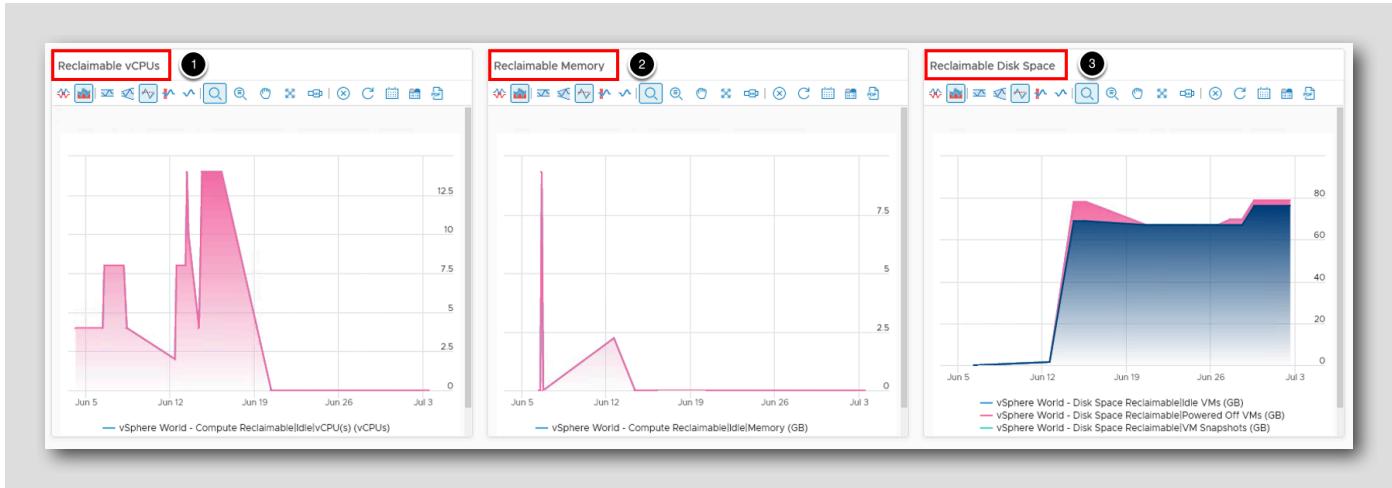
## Allocation Changes for Oversized VMs

[150]

The screenshot shows a card titled "Allocation Changes for Oversized VMs". It contains two data points: "vCPUs to Remove: 12 vCPUs" and "Memory to Remove: 27 GB". At the bottom of the card, it says "1 - 2 of 2 items".

Scrolling down further in the Potential Cost Savings Dashboard, we have the **Allocation Changes for Oversized VMs** metric. If we have any VMs that are oversized (consistently not using allocated resources), VMware Aria Operations will report the total number of vCPUs and/or Memory that could be removed from VMs in the environment. Depending upon the current state of the lab, we may or may not have any totals identified.

## Reclaimable Widget

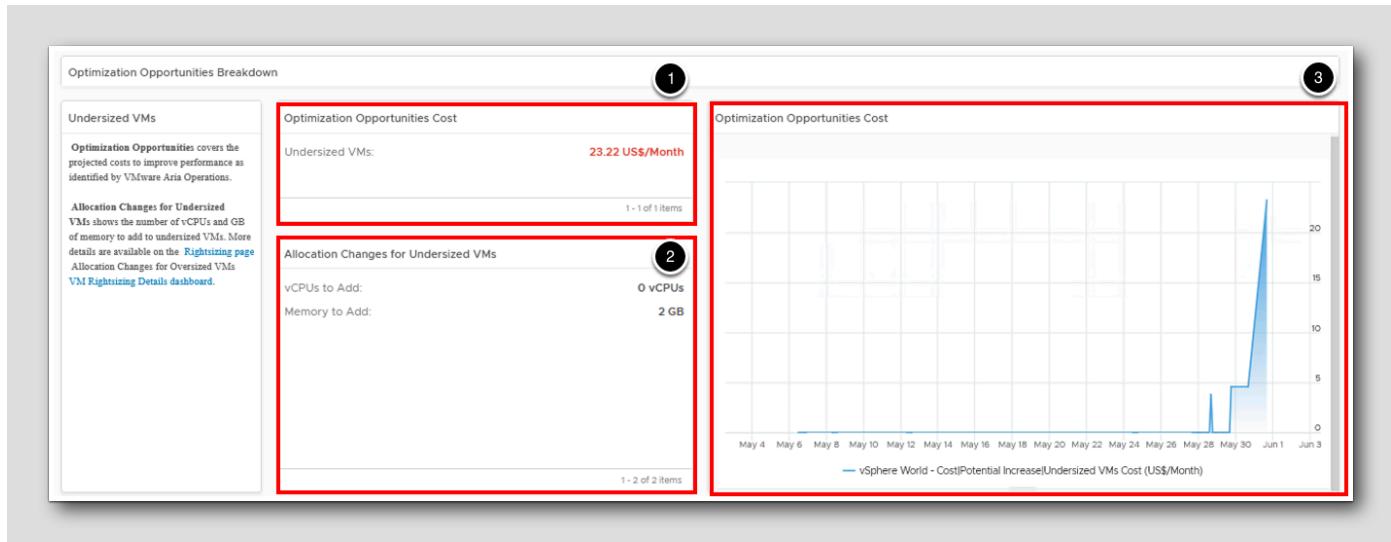


Scrolling down further in the Potential Cost Savings Dashboard, we have the Reclaimable widget. This widget provides the metric details for the following:

1. **Reclaimable vCPUs** -- total number of vCPUs identified to reclaim over the past 30 days.
2. **Reclaimable Memory** -- total Memory identified to reclaim over the past 30 days.
3. **Reclaimable Disk Space** -- total amount of Disk Space (GB) identified to reclaim over the past 30 days.

**Note:** Clicking on individual items below each chart allows us to hide/unhide specific items to be displayed in the chart. Depending upon the current state of the lab, we may or may not have any totals identified.

## Optimization Opportunities Breakdown

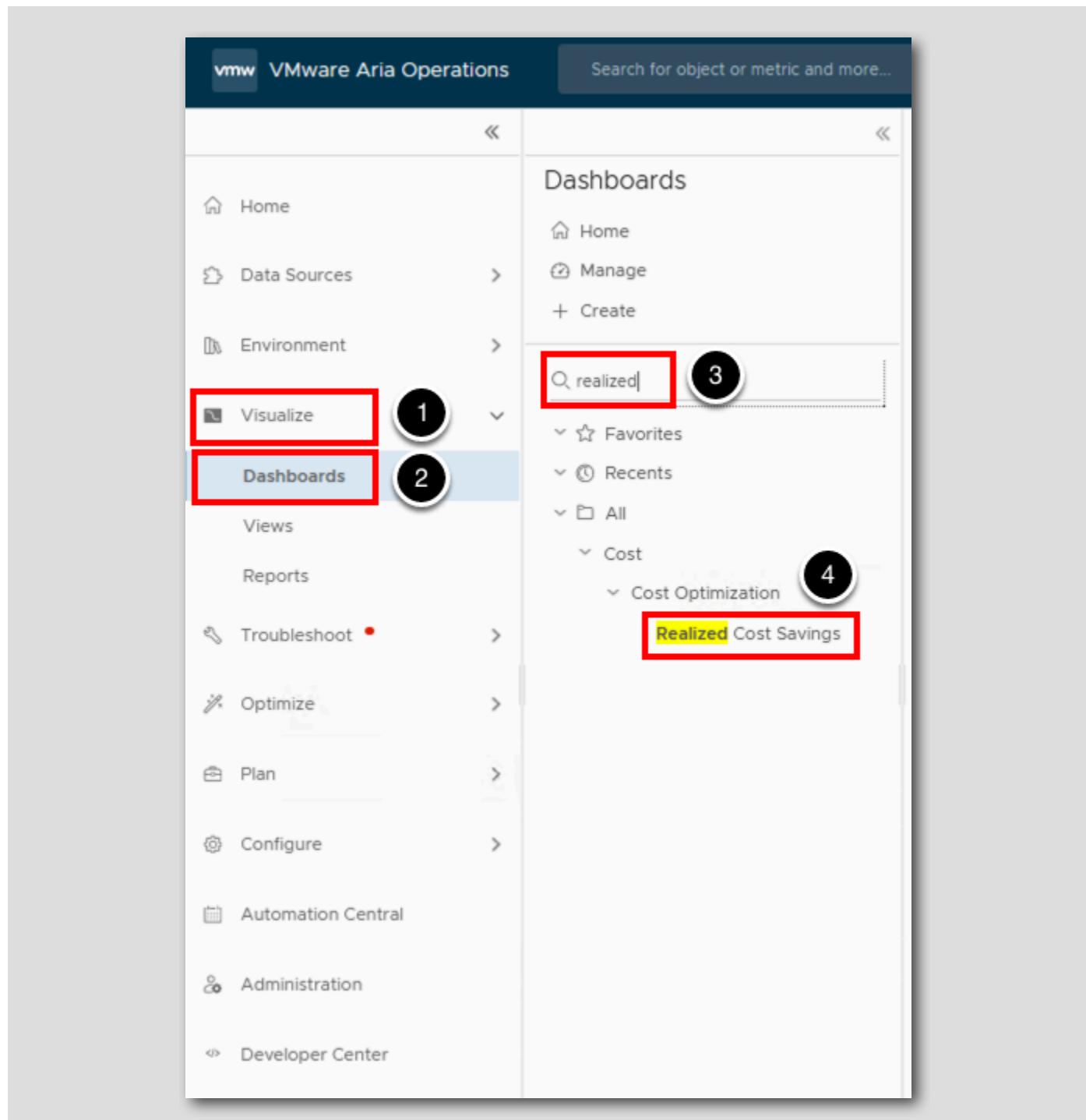


Scrolling down to the bottom of the Potential Cost Savings Dashboard, we have the **Optimization Opportunities Breakdown** widget. This widget covers the projected costs to improve performance as identified by VMware Aria Operations. This widget provides the metric details for the following:

1. Optimization Opportunities Cost -- currency cost to increase resources for Undersized VMs in the environment.
2. Allocation Changes for Undersized VMs -- total number of vCPUs or Memory to add to the environment.
3. Optimization Opportunities Cost -- graphical interface identifying cost increases/decreases over the past 30 days. Note: Clicking on individual costs below the chart allows us to hide/unhide specific items to be displayed in the chart.

**Note:** Depending upon the current state of the lab, we may or may not have any totals identified.

## Open the Realized Cost Savings Dashboard



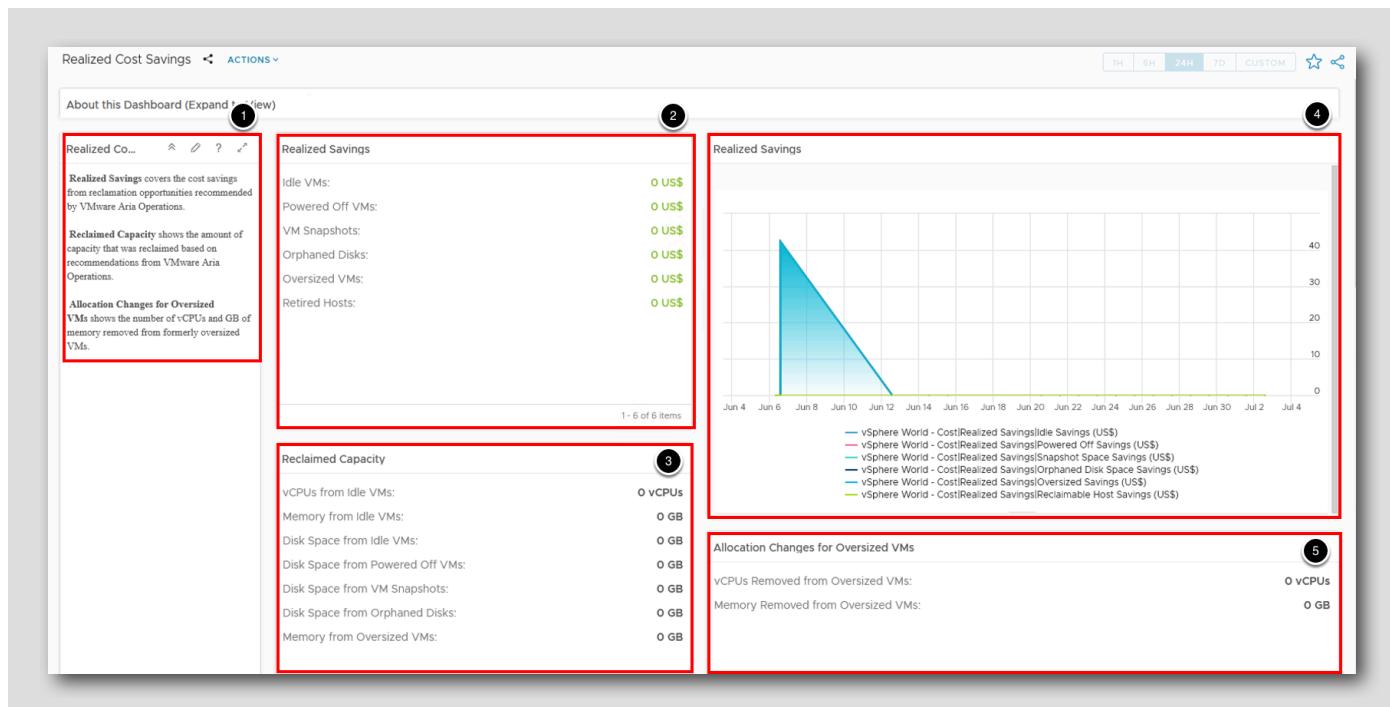
The Realized Cost Savings Dashboard helps us to quantify the realized cost savings from actions performed that are related to recommendations provided by VMware Aria Operations. We can analyze the realized savings to track improvements to cost efficiency over time. Realized savings covers powered off VMs that were flagged as idle, deleted VMs that were flagged as idle or powered off, deleted snapshots that were flagged as reclaimable, deleted disks that were flagged as orphaned, oversized VMs that were rightsized, and deleted hosts that were flagged as reclaimable.

To access the Realized Savings dashboard, do the following:

1. From the navigation menu on the left, select Visualize.
2. Select Dashboards.
3. In the search bar type realized.
4. Select the Realized Cost Savings dashboard.

## Review of Realized Cost Savings Dashboard

[154]



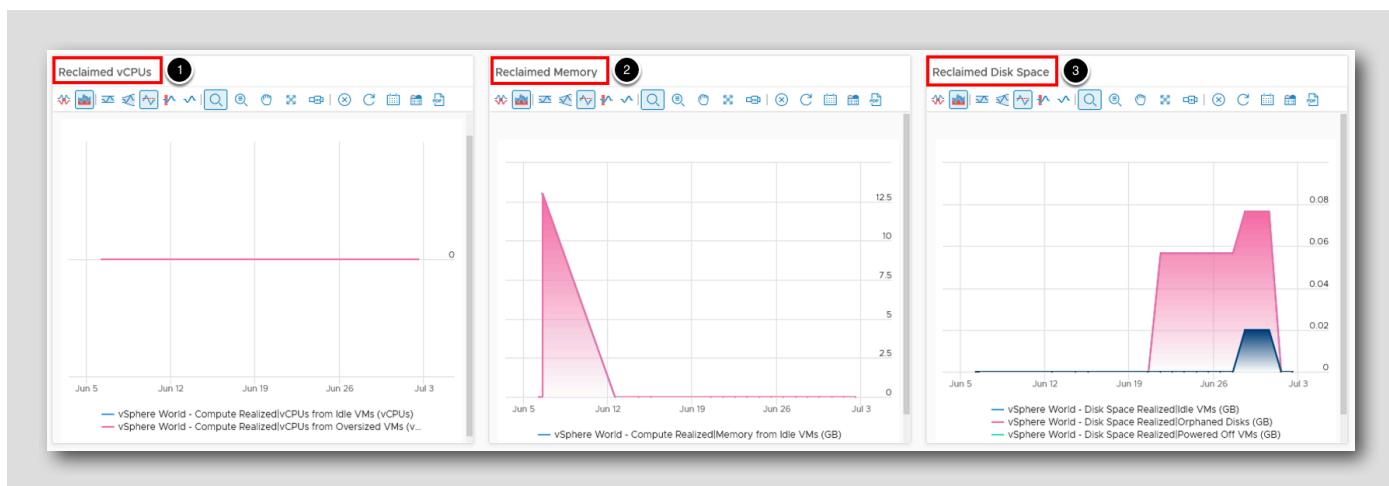
This dashboard is comprised of multiple widgets as shown in the image. In this overview, we will show each one over the next few pages. As we navigate this dashboard, we will need to scroll down using the slider bar on the right side of the screen (not shown) in order to view all the available widgets.

Reviewing the Realized Cost Savings dashboard we first see the **Realized Savings** widget. This widget is comprised of several metrics:

1. **Realized Costs Savings and Capacity** -- definitions of each metric in the widget.
2. **Realized Savings** -- currency savings from reclamation opportunities recommended by VMware Aria Operations.
3. **Reclaimed Capacity** -- provides the metric details for previously reclaimed vCPU/memory from Idle VMs, Disk Space from Powered Off VMs/Snapshots/Orphaned Disks, and Memory reclaimed from Oversized VMs.
4. **Realized Savings** -- graphical chart depicting reclaimed savings of each identified metric. Note: Clicking on individual costs below the chart allows us to hide/unhide specific items to be displayed in the chart.
5. **Allocation Changes for Oversized VMs** -- shows the number of vCPUs and GB of memory removed from formerly oversized VMs.

## Reclaimed Widget

[155]



Scrolling down further in the Realized Cost Savings Dashboard, we have the Reclaimed widget. This widget provides the metric details for the following:

1. **Reclaimed vCPUs** -- total number of vCPUs reclaimed over the past 30 days based on recommendations from VMware Aria Operations.
2. **Reclaimed Memory** -- total Memory reclaimed over the past 30 days based on recommendations from VMware Aria Operations.
3. **Reclaimed Disk Space** -- total amount of Disk Space (GB) reclaimed over the past 30 days based on recommendations from VMware Aria Operations.

**Note:** Clicking on individual items below each chart allows us to hide/unhide specific items to be displayed in the chart. Depending upon the current state of the lab, we may or may not have any totals identified.

## Cost of Deleted VMs

[156]

The screenshot shows a dashboard titled "Cost of Deleted VMs" with four main sections:

- Cost of Deleted VMs in Past 30 Days** (Item 1): Shows a table with one item: "Cost of Deleted VMs" = 0 US\$. A red box highlights this section.
- Cost of Deleted VMs by Cluster (30 Days)** (Item 3): Shows a message: "No data to display". A red box highlights this section.
- Cost of Deleted VMs (Year to Date)** (Item 2): Shows a table with one item: "Cost of Deleted VMs" = 8.74 US\$. A red box highlights this section.
- Cost of Deleted VMs by Cluster (Year to Date)** (Item 4): A bar chart comparing two clusters:
 

Region	Cost of Deleted VMs
RegionA01-COMP01	6
RegionB01-COMP01	2.75

Scrolling down to the bottom of the Realized Cost Savings Dashboard, we have the Cost of Deleted VMs widget. This widget provides the metric details for the following:

1. Cost of Deleted VMs in Past 30 days -- currency cost for deleted VMs over the past 30 days.
2. Cost of Deleted VMs (Year to Date) -- currency cost for deleted VMs during the current calendar year.
3. Cost of Deleted VMs by Cluster (30 Days) -- graphical interface identifying currency cost for deleted VMs over the past 30 days on per cluster basis.
4. Cost of Deleted VMs by Cluster (Year to Date) -- graphical interface identifying currency cost for deleted VMs during the current calendar year.

**Note:** Depending upon the current state of the lab, we may or may not have any totals identified.

## Cost Drivers and More

[157]

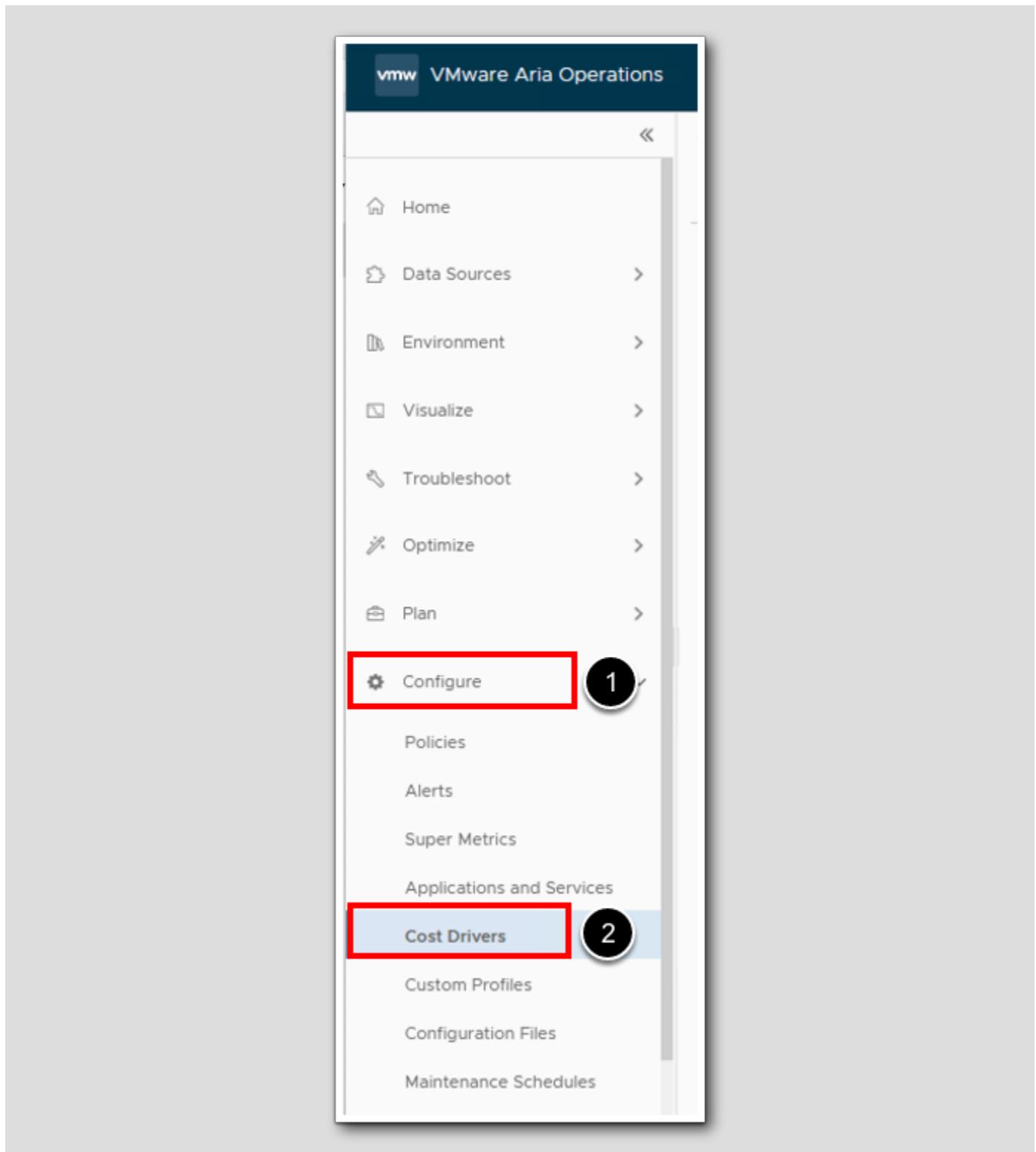
Cost Drivers are the aspect that contributes to the expense of our business operations. Cost drivers provide a link between a pool of costs. To provide a granular cost visibility and to track our expenses of virtual machines accurately in a private cloud, VMware Aria Operations has identified eight key cost drivers. We can see the total projected expense on our private cloud accounts for the current month and the trend of cost over time and is reflected in the dashboards we previously viewed in this module.

According to the industry standard, VMware Aria Operations maintains a reference cost for these cost drivers. This reference cost helps us calculate the cost of our setup, but might not be accurate. For example, we might have received some special discounts during a bulk purchase or we might have an ELA with VMware that might not match the socket-based pricing available in the reference database. To get accurate values, we can modify the reference cost of cost drivers in VMware Aria Operations, which overrides the values in the reference database. Based on our inputs, VMware Aria Operations recalculates the total amount for the private cloud expenses. After we add a private cloud into VMware Aria Operations, VMware Aria Operations automatically discovers one or more vCenter Servers that are part of our Private Cloud. In addition, it also retrieves the inventory details from each vCenter Server. The details include:

- Associated clusters: Count and names
- ESXi hosts: Count, model, configuration, and so on.
- Datastores: Count, storage, type, capacity
- VMs: Count, OS type, tags, configuration, utilization

Based on these configuration and utilizations of inventory, and the available reference cost, VMware Aria Operations calculates the estimated monthly cost of each cost driver. The total cost of our private cloud is the sum of all these cost driver expenses.

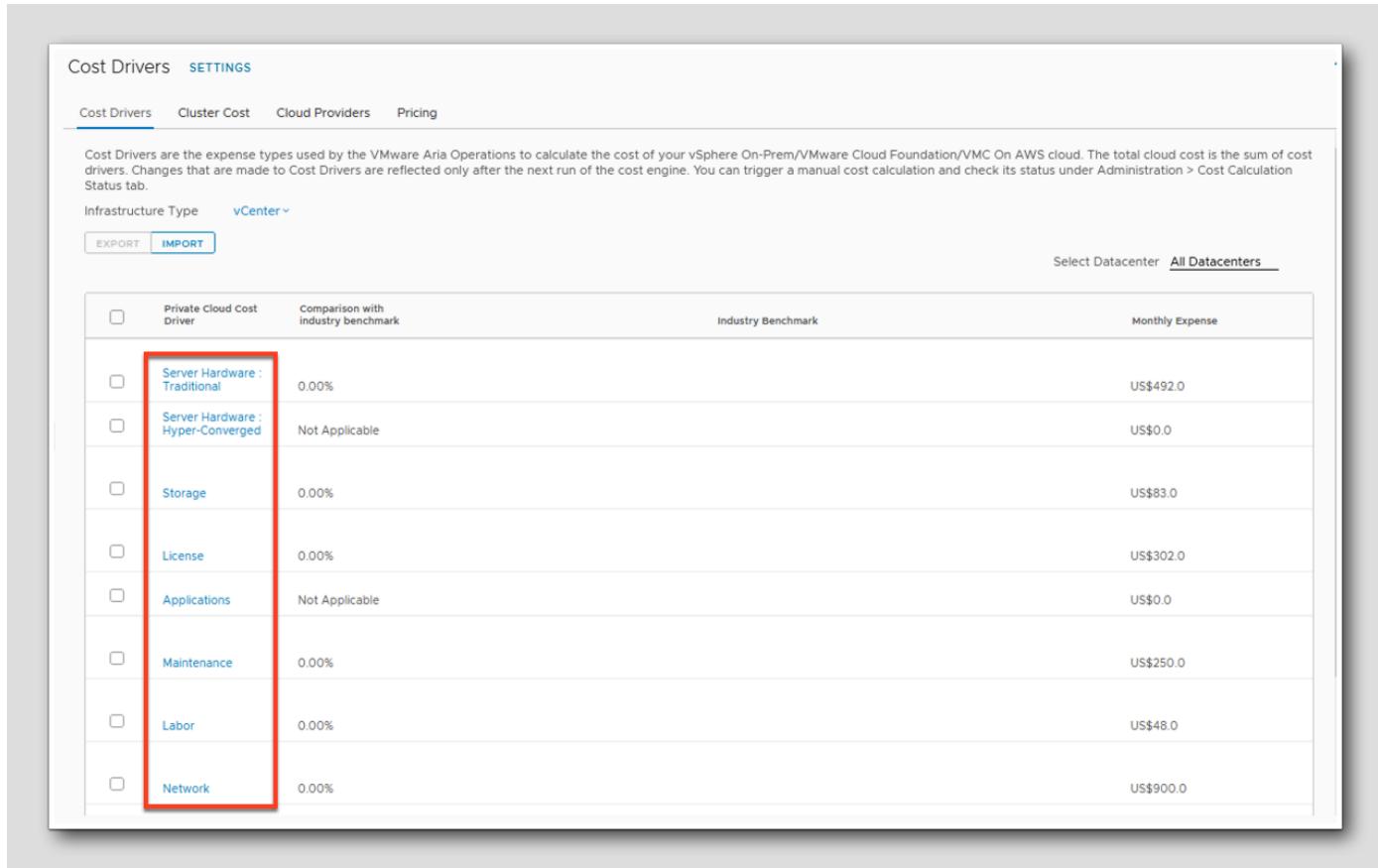
We can modify the expense of our data center. These costs can be in terms of the percentage value or unit rate, and might not always be in terms of the overall cost. Based on our inputs, the final amount of expense is calculated. If we do not provide inputs regarding expenses, the default values are taken from the reference database.



To modify Cost Drivers and input data that more accurately reflects our environment, from the Main Menu select:

## 1. Configure

### 2. Cost Drivers



The screenshot shows the 'Cost Drivers' pane in VMware Aria Operations. The 'Cost Drivers' tab is selected. The interface includes tabs for 'Cost Drivers' (selected), 'Cluster Cost', 'Cloud Providers', and 'Pricing'. Below these tabs is a note about cost drivers and a status message. The 'Infrastructure Type' is set to 'vCenter'. There are 'EXPORT' and 'IMPORT' buttons. A dropdown for 'Select Datacenter' is set to 'All Datacenters'. The main area displays a table of cost drivers:

Private Cloud Cost Driver	Comparison with Industry Benchmark	Industry Benchmark	Monthly Expense
Server Hardware : Traditional	0.00%		US\$492.0
Server Hardware : Hyper-Converged	Not Applicable		US\$0.0
Storage	0.00%		US\$83.0
License	0.00%		US\$302.0
Applications	Not Applicable		US\$0.0
Maintenance	0.00%		US\$250.0
Labor	0.00%		US\$48.0
Network	0.00%		US\$900.0

In the Cost Drivers pane, notice the various components we can edit in the environment such as **Hardware: Traditional, Storage, Network, etc.**

The screenshot shows the 'Cost Drivers' section of the VMware Aria Operations interface. The 'Server Hardware : Traditional' component is selected and highlighted with a red box and a circled number 1. The table lists various cost drivers with their respective values and industry benchmarks.

Cost Driver	Comparison with Industry Benchmark	Industry Benchmark	Monthly Expense
Server Hardware : Traditional	0.00%		US\$821.0
Server Hardware : Hyper-Converged	Not Applicable		US\$0.0
Storage	0.00%		US\$209.77K
License	0.00%		US\$516.0
Applications	Not Applicable		US\$0.0
Maintenance	0.00%		US\$411.0
Labor	0.00%		US\$31.0

We can edit any of the components listed in the Cost Drivers Settings, but for this lab, let's edit the first component listed by clicking on the component name:

### 1. Server Hardware: Traditional

The screenshot shows the 'Server Hardware : Traditional' component details page. The 'Edit Mode' is set to 'Edit for All Datacenters'. The summary shows a total cost of US\$821.0 for 5 servers. The table below lists server configurations and their costs.

Server Group Description	No. of Servers	Monthly Cost
> VMware, Inc. VMware Virtual Platform Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 8GB RAM	1	US\$98.47
> VMware, Inc. VMware7.1Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 2 Sockets 24GB RAM	4	US\$722.84
Total		US\$821.31

After we have opened the **Server Hardware : Traditional** component we can select the arrows next to each server model and review our current cost settings for each hardware model in our environment.

**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

Server Group Description	No. of Servers	Monthly Cost
VMware, Inc. VMware Virtual Platform Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 8GB RAM	1	US\$98.47

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 )

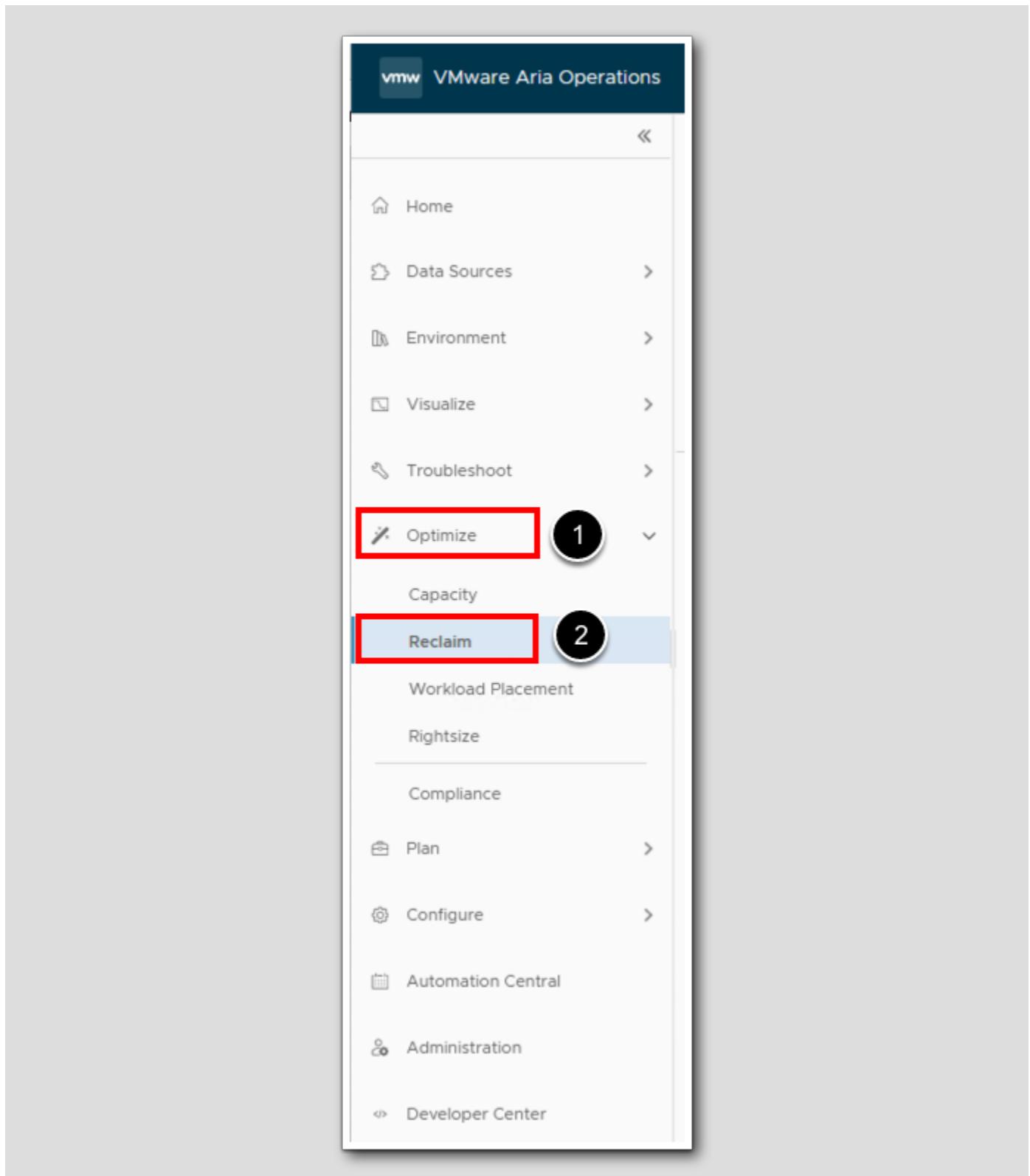
Number of Servers	Purchase Date	Purchase Type	Cost Per Server	Purchase Cost	Monthly Cost	Remove
1 Server(s)	01/01/2022	Owned	US\$ 5908.21	US\$5.91K	US\$98.47	NA

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

To edit the Cost Per Server do the following:

1. Click in the Cost Per Server field and change the numbers if desired. (Note: As a point of reference, when this manual was compiled, the Cost Per Server was \$5908.21)

In the lab, feel free to change the pricing of the various components and then return to the previous dashboards to note how the changes are reflected in the different metrics we previously monitored.



In VMware Aria Operations we can track the cost savings using reclamation suggestions. Using the reclamation option, we can view the cost, capacity, and allocation metrics related to individual data centers. The metrics provide an estimate of the potential savings achieved through VMware Aria Operations.

We can track the realized cost savings and actual capacity reclaimed for data centers, in the following scenarios.

- Reclaim the cost for Idle VMs by deleting the VM.
- Reclaim the cost for Powered off VMs by deleting the VM.
- Reclaim the cost for Idle VMs by powering off the VM.
- Reclaim the cost for snapshots VMs by deleting the snapshot.
- Reclaim the cost for orphaned disks by deleting the orphaned disk space.
- Reclaim the cost by removing vCPU and Memory from an oversized VM.
- Reclaim the cost by removing a host from the vCenter.

To view Realized Cost Savings Reclamation Suggestions, from the Main Menu select:

1. Optimize
2. Reclaim

The screenshot shows the VMware Aria Operations interface with the title "Reclaim" and "SETTINGS". A search bar at the top right says "Search for object or metric and more...". On the left, there's a vertical navigation menu with icons for Home, Datacenter, Cluster, Host, VM, Network, Storage, and Log. The "Datacenter" icon is highlighted.

The main pane displays two datacenter entries:

- RegionA01**: Status: "Normal" (with a red notification dot). Details: ">> 1 Year Remaining" (green checkmark), "US\$15 Cost Savings" (blue button labeled "Optimized").
- RegionB01**: Status: "Unknown" (red notification dot). Details: "Time Remaining Not Available" (grey question mark), "Cost Savings" (blue button labeled "Unknown").

In the Reclaim pane, notice it identifies attached Datacenters and an overview of their current cost savings situation. We have a very small lab, so we may or may not have any cost savings at the time of our review, but we will walk through the various options available

so as to demonstrate how this feature could be used in a Production environment to easily identify potential cost savings.

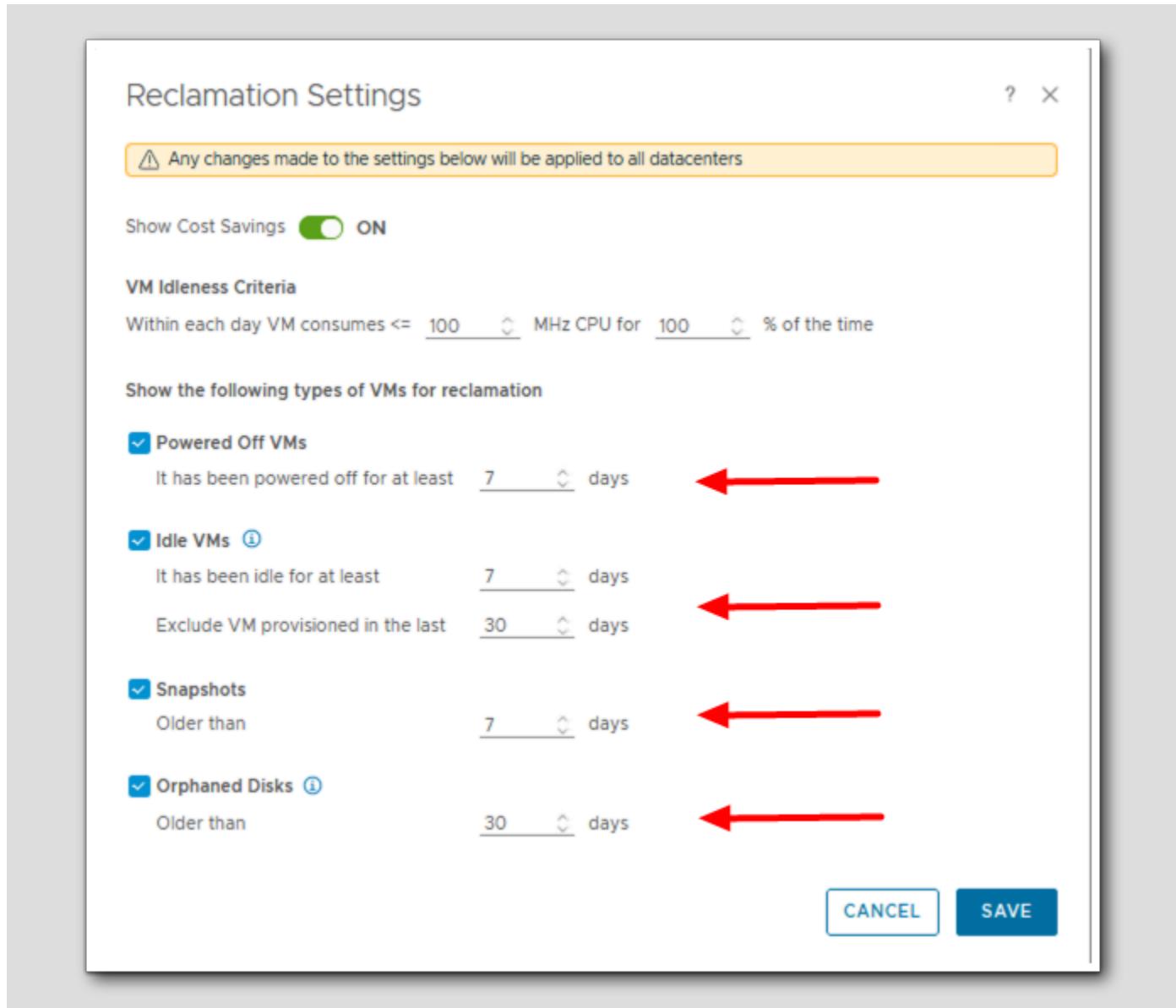
The screenshot shows the VMware Aria Operations interface with the title "Reclaim". A red box highlights the "SETTINGS" button, which has a red arrow pointing to it from the left. The main content area displays two regions: "RegionA01" and "RegionB01".

**RegionA01:**  
Status: > 1 Year Remaining  
Cost Savings: US\$15 (Optimized)

**RegionB01:**  
Status: Time Remaining Not Available  
Cost Savings: ? (Unknown)

The sidebar on the left contains navigation icons for Home, Datacenters, Workload, Metrics, Settings, Reports, and Help.

In the lab, select the option to edit the Reclaim settings. In this example, we are not changing any settings, but we can open it and see what is available for editing.



The Reclamation Settings dialogue box will appear, and we can notice the options that could be edited. For instance, the screenshot shows the default settings, but notice in the lab how you can change the settings on Powered Off VMs, Idle VMs, Snapshots and Orphaned Disks.

If you made any changes in your lab, select the SAVE option, otherwise select CANCEL.

VMware Aria Operations

Search for object or metric and more...

Reclaim [SETTINGS](#)

Select datacenter or [ADD NEW CUSTOM DATACENTER](#)

Normal 1

**RegionA01**

> 1 Year Remaining

US\$15 Cost Savings [Optimized](#)

Unknown 1

**RegionB01**

Time Remaining Not Available

? Cost Savings [Unknown](#)



Home

Data Sources

Environment

Visualize

Troubleshoot

Optimize

Capacity

Reclaim

Workload Placement

Rightsize

Compliance

Plan

Configure

Automation Central

Administration

After cancelling/saving our changes in the Reclaim Settings, select the RegionA01 datacenter in the Reclaim pane.

The screenshot shows the VMware Aria Operations interface with the 'Reclaim' tab selected. In the main pane, it highlights 'RegionA01' with a green checkmark indicating '> 1 Year Remaining' and a cost savings of 'US\$15'. Below this, it lists '2 VMs With Reclaimable Resources' and '17 Orphaned Disks To Reclaim', both with cost savings of 'US\$15/mo'. On the right, a table shows 'Total Reclaimable Capacity' for CPU (0 vCPUs), Memory (0 KB), and Disk Space (78.98 GB). At the bottom, tabs for 'Powered Off VMs', 'Idle VMs', 'Snapshots', and 'Orphaned Disks' are visible, with 'Orphaned Disks' highlighted in red. Buttons for 'SCHEDULE ACTION', 'DELETE VM(S)', 'EXCLUDE VM(S)', and 'EXPORT ALL' are present, along with a search bar and a note about calculated based on Allocation and Demand.

Unfortunately, this is likely where you will see a limitation in this lab, as we do not have a large environment to show potential cost savings related to all available components (Powered Off VMs, Idle VMs, Snapshots, and Orphaned Disks). If any of these are present at the time of our lab, we will see some cost savings listed. If no reclaim savings are in the lab at the time, we will likely see \$0 Savings. If any savings are available at the time of the lab, we will see them listed under the tabs (highlighted in RED). Click on the various tabs to become familiar with the available options and note any data that may be present at the time.

The screenshot shows the VMware Aria Operations interface. On the left, there is a navigation sidebar with the following items:

- Home
- Data Sources
- Environment
- Visualize** (highlighted with a red box and numbered 1)
- Dashboards** (highlighted with a red box and numbered 2)
- Views
- Reports
- Troubleshoot
- Optimize
- Plan
- Configure
- Automation Central
- Administration
- Developer Center

The main content area is titled "Dashboards" and contains the following search results:

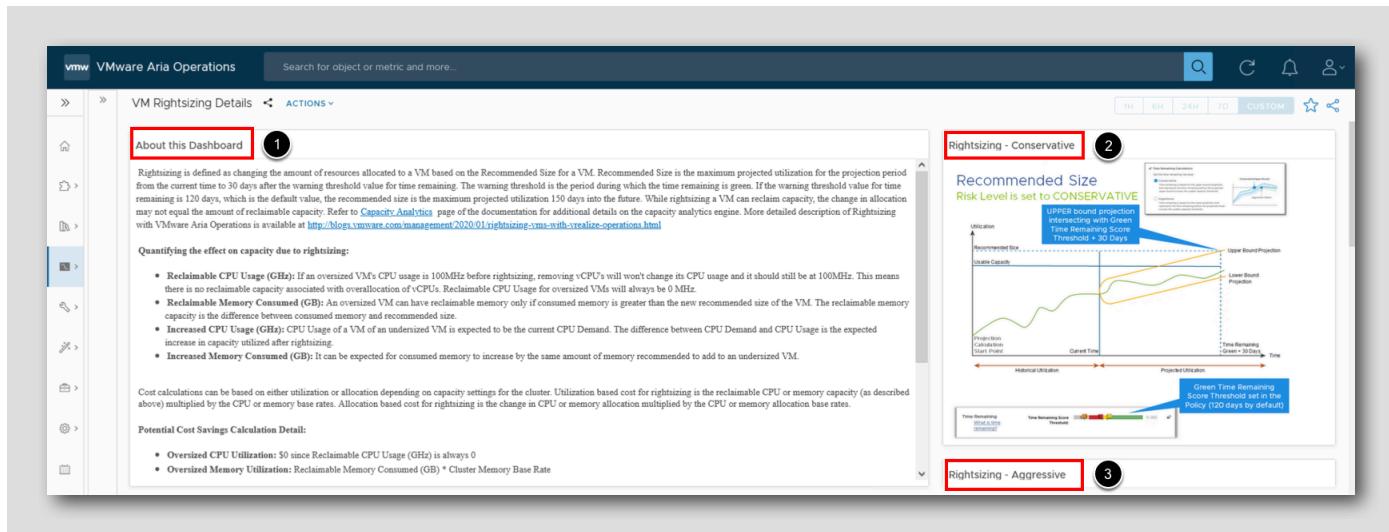
- Home
- Manage
- Create
- vm rightsizing** (highlighted with a red box and numbered 3)
- Favorites
- Recents
- All
  - Capacity
    - VM Rightsizing** (highlighted with a yellow box and numbered 4)
  - Cost
    - Cost Optimization
      - VM Rightsizing Details** (highlighted with a red box)

Rightsizing is defined as changing the amount of resources allocated to a VM based on the Recommended Size for a VM. Recommended Size is the maximum projected utilization for the projection period from the current time to 30 days after the warning threshold value for time remaining. The warning threshold is the period during which the time remaining is green. If the warning threshold value for time remaining is 120 days, which is the default value, the recommended size is the maximum projected utilization.

150 days into the future. While rightsizing a VM can reclaim capacity, the change in allocation may not equal the amount of reclaimable capacity.

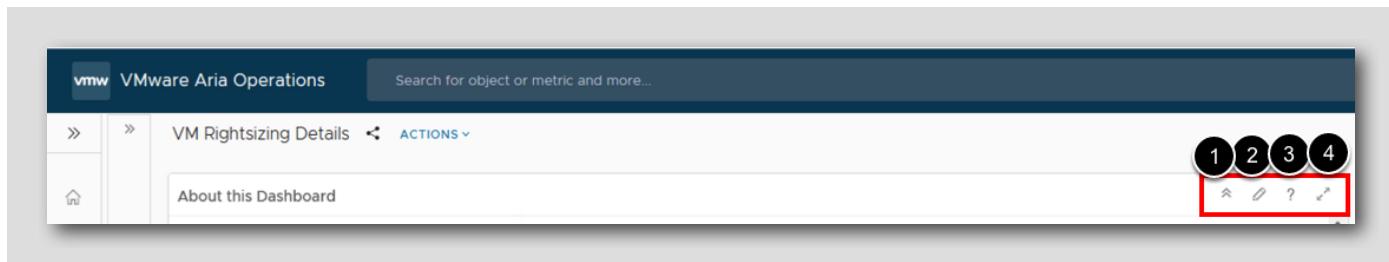
To access the VM Rightsizing Details dashboard, do the following:

1. From the **Main Menu**, select **Visualize**.
2. Select **Dashboards**.
3. In the search bar type **vm rightsizing**.
4. Select the **VM Rightsizing Details** dashboard (under **Cost Optimization**)



Reviewing the VM Rightsizing Details dashboard we see several "read me" sections including:

1. **About this Dashboard** -- definitions and details of the various metrics included in this dashboard.
2. **Rightsizing - Conservative** -- graphical explanation of the conservative rightsizing setting.
3. **Rightsizing - Aggressive** -- graphical explanation of the aggressive rightsizing setting.



As we select one of the previously mentioned "read me" sections, a menu appears on the right side of each title bar. There are four icons available which allows us to do the following:

1. Collapse or Expand the widgets
2. Edit the widgets
3. Help for the widget

#### 4. Maximize the widget

**Select Cluster, Datacenter, or World Object**

Name	Object Type
vSphere World	vSphere World
<b>RegionA01</b>	Datacenter
Workload1	Cluster Compute Re...
Management	Cluster Compute Re...

**Select an Undersized VM to View Recommendations**

Name	Potential Cost Increase	Configured vCPU	vCPU(s) to Add	Increased CPU Usage	Configured Memory	Memory to Add	Increased Memory Cons...	VM
<b>windows-0008</b>	4.66 US\$	2	0	0.0019 GHz	4 GB	1 GB	1 GB	4 D
<b>ubuntu-0004</b>	4.6 US\$	1	0	0.0006 GHz	1 GB	1 GB	1 GB	4 D
Total	9.27 US\$	3	0	0.0025 GHz	5 GB	2 GB	2 GB	-

In the Select Cluster, Datacenter, or World Object widget, do the following:

1. Select the RegionA01 Datacenter
2. Notice if there are any VMs identified as Undersized and the recommendations from VMware Aria Operations (Note: Based upon the current state of the lab, you may or may not see any recommendations). In the provided screenshot, the 'RegionA01' Datacenter is selected.
3. Notice in the provided screenshot how VMware Aria Operations recommends adding memory to two VMs as shown in the Memory to Add column.

Select an Undersized VM to View Recommendations

Name	Potential Cost Increase	Configured vCPU	vCPU(s) to Add	Increased CPU Usage	Configured Memory	Memory to Add	Increased Memory Cons...	VM...
windows-0008	4.66 US\$	2	0	0.0019 GHz	4 GB	1GB	1GB	4 D
ubuntu-0004	4.6 US\$	1	0	0.0006 GHz	1GB	1GB	1GB	4 D
Total	9.27 US\$	3	0	0.0025 GHz	5 GB	2 GB	2 GB	-

In the lab, if there are some **Undersized VMs** select one of them and notice how it impacts other widgets further down. (**Note:** do NOT click on the highlighted/linked VM name as this takes us to Object Details for that VM...to select a VM in this list, click somewhere on the whitespace in the line and that will populate other widgets in this dashboard).

Select an Oversized VM to View Recommendations

Name	Potential Cost Savings	Configured vCPU	vCPU(s) to Remove	Reclaimable CPU Usage	Configured Memory	Memory to Remove	Reclaimable Memory Co...	VM...
aria-auto	6.35 US\$	12	6	0 GHz	48 GB	4 GB	1.65 GB	27 I
aria-ops	3.64 US\$	4	2	0 GHz	16 GB	4 GB	0.95 GB	27 I
identity-manager	3.45 US\$	6	2	0 GHz	10 GB	2 GB	0.9 GB	27 I
aria-auto-config	2.35 US\$	4	2	0 GHz	8 GB	4 GB	0.61 GB	27 I
aria-ops-cp	0.84 US\$	2	0	0 GHz	8 GB	3 GB	0.22 GB	21 D
Total	16.63 US\$	32	14	0 GHz	98 GB	17 GB	4.32 GB	-

In the lab, if there are some **Oversized VMs** in the **Select an Oversized VM to View Recommendations** widget, select one of them and notice how it impacts other widgets further down. (**Note:** do NOT click on the highlighted/linked VM name as this takes us to Object Details for that VM...to select a VM in this list, click somewhere on the whitespace in the line and that will populate other widgets in this dashboard).

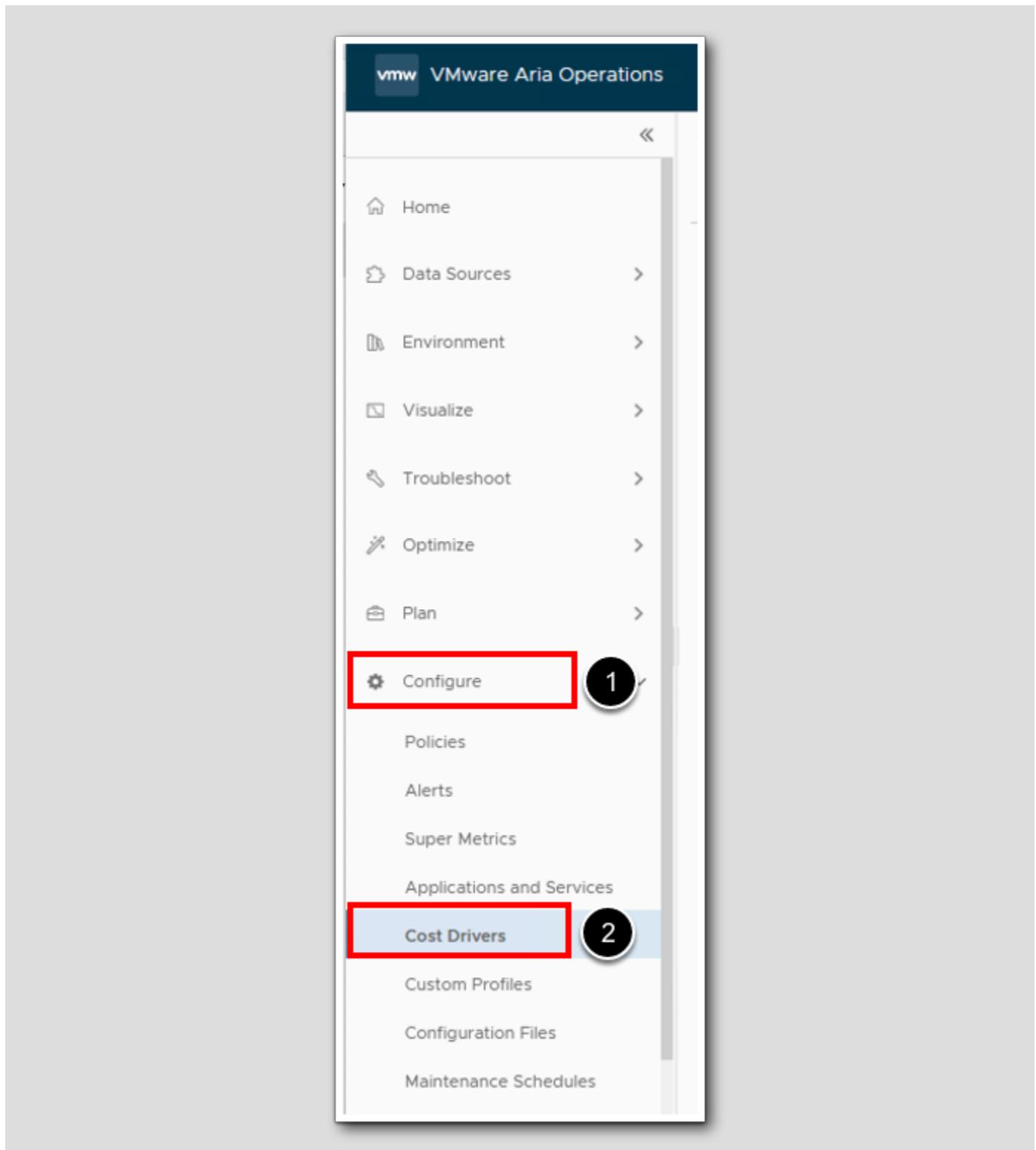
The screenshot displays the vRealize Operations Management Pack interface for a selected VM. The interface is divided into several sections:

- VM Status** (Section 1): Shows projected cost (\$271.21 US\$/Month) and VM Tools status (Guest Tools Running, Unmanaged).
- Undersized Details**: A table showing metrics like Is Undersized (0), Potential Cost Increase (?), vCPUs to Add (0), and Potential CPU Usage Increase (?).
- Oversized Details** (Section 2): A table showing metrics like Is Oversized? (1), Potential Cost Savings (\$6.35 US\$), vCPUs to Remove (6), and Memory to Remove (4 GB).
- VM CPU Configuration** (Section 3): Shows vCPUs (12), Sockets (12), Cores per Socket (1), and configuration flags (vCPU Hot Add Enabled: false, vCPU Hot Remove Enabled: false).
- VM Memory Configuration** (Section 4): Shows Guest Memory Not Collecting (0), Memory (48 GB), and Memory Hot Add Enabled (false).
- CPU Demand MHz (95th Percentile)** (Section 5): A table showing CPU demand for 'aria-auto' (6.42 GHz, 6.42 GHz, 6.15 GHz).
- CPU Workload % (95th Percentile)** (Section 6): A table showing CPU workload for 'aria-auto' (25.68%, 25.68%, 24.47%).

If we selected an **Oversized VM** the following widgets are now populated with data:

1. **VM Status** -- Provides reported projected monthly cost and VM Tools status of the selected VM.
2. **Oversized Details** -- Provides further details regarding resources to remove from the selected VM.
3. **CPU Configuration** -- Current CPU Configuration and if Hot Add/Remove are enabled on the selected VM.
4. **Memory Configuration** -- Current Memory Configuration and if Hot Add is enabled on the selected VM.
5. **CPU Demand MHz (95th Percentile)**
6. **CPU Workload % (95th Percentile)**

**Note:** As noted before, depending upon the current configuration of the lab environment, we may not see any VMs identified as **Oversized**. If there are no VMs identified, please review the provided screenshots.



**Cost Drivers** [SETTINGS](#)

Cost Drivers are the expense types used by the VMware Aria Operations to calculate the cost of your vSphere On-Prem/VMware Cloud Foundation/VMC On AWS cloud. The total cloud cost is the sum of cost drivers. Changes that are made to Cost Drivers are reflected only after the next run of the cost engine. You can trigger a manual cost calculation and check its status under Administration > Cost Calculation Status tab.

Infrastructure Type [vCenter](#)

[EXPORT](#) [IMPORT](#)

Select Datacenter [All Datacenters](#)

<input type="checkbox"/> 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
<input type="checkbox"/> Storage	0.00%		US\$83.0
<input type="checkbox"/> License	0.00%		US\$302.0
<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\$48.0
<input type="checkbox"/> Network	0.00%		US\$900.0

Cost Drivers

Cost Drivers are the expense types used by the VMware Aria Operations to calculate the cost of your vSphere On-Prem/VMware Cloud Foundation/VMC On AWS cloud. The total cloud cost is the sum of cost drivers. Changes that are made to Cost Drivers are reflected only after the next run of the cost engine. You can trigger a manual cost calculation and check its status under Administration > Cost Calculation Status tab.

Infrastructure Type: vCenter

	Private Cloud Cost Driver	Comparison with Industry Benchmark	Industry Benchmark	Monthly Expense
<input type="checkbox"/>	Server Hardware : Traditional	0.00%		US\$821.0
<input type="checkbox"/>	Server Hardware : Hyper-Converged	Not Applicable		US\$0.0
<input type="checkbox"/>	Storage	0.00%		US\$209.77K
<input type="checkbox"/>	License	0.00%		US\$516.0
<input type="checkbox"/>	Applications	Not Applicable		US\$0.0
<input type="checkbox"/>	Maintenance	0.00%		US\$411.0
<input type="checkbox"/>	Labor	0.00%		US\$31.0

Cost Drivers

<< 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  Edit for specific Datacenter

Server Group Description	No. of Servers	Monthly Cost
> VMware, Inc. VMware Virtual Platform Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 8GB RAM	1	US\$98.47
> VMware, Inc. VMware7,1Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 2 Sockets 24GB RAM	4	US\$722.84
Total		US\$821.31

**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**

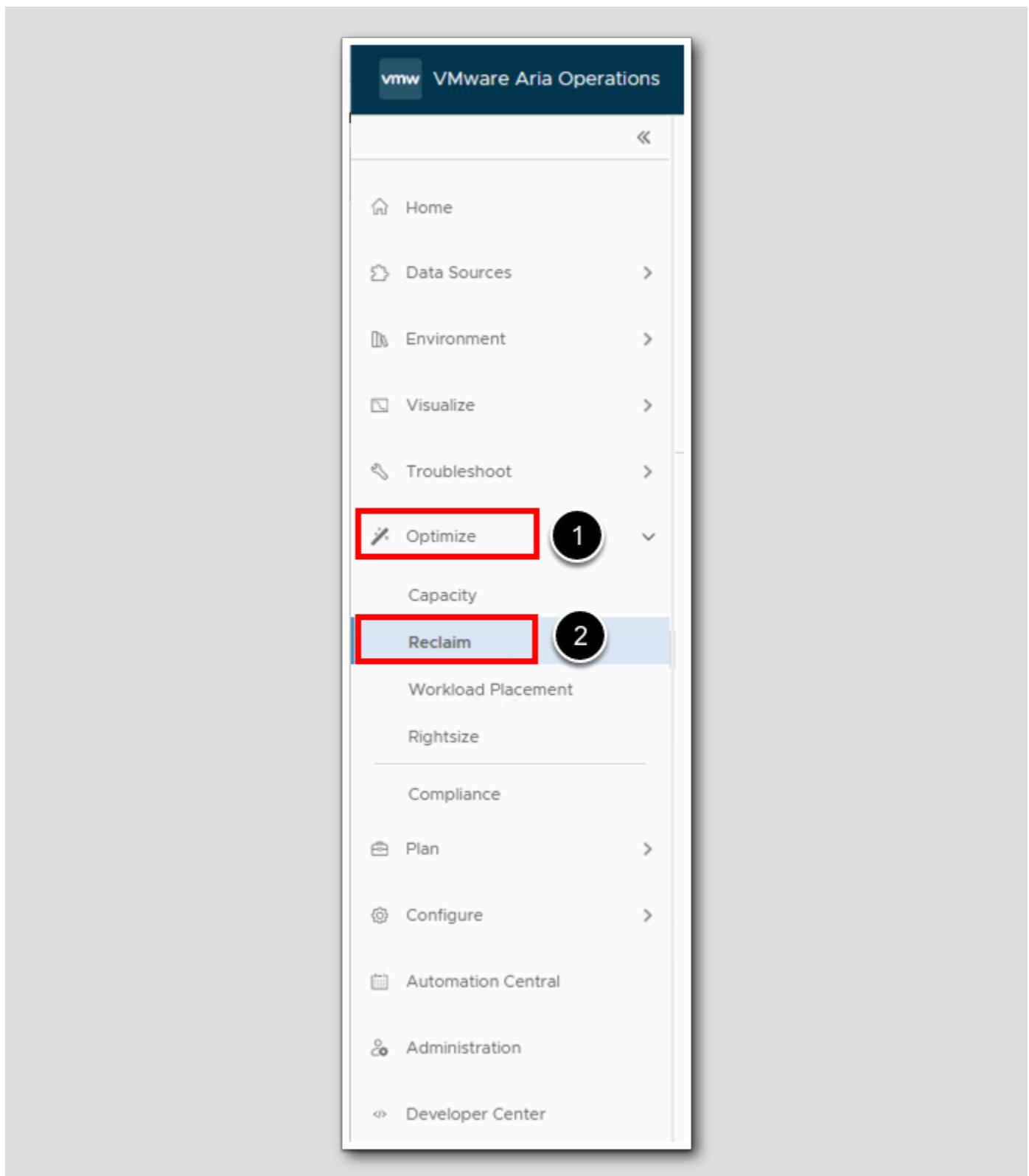
US\$821.0 5 Total Number of Servers

Server Group Description	No. of Servers	Monthly Cost
VMware, Inc. VMware Virtual Platform Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz 2.1GHz 1 Sockets 8GB RAM	1	US\$98.47

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	Purchase Cost	Monthly Cost	Remove
1 Server(s)	01/01/2022	Owned	US\$ 5908.21	US\$5.91K	US\$98.47	NA

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



The screenshot shows the VMware Aria Operations interface. The top navigation bar includes the VMware logo and the title "VMware Aria Operations". A search bar is located on the right side of the header. The main content area is titled "Reclaim" and features a "SETTINGS" tab. A sidebar on the left contains various icons and labels: a house icon for "Normal", a folder icon for "Unknown", a pencil icon for "Edit", a calendar icon, a user icon, and a double-angle bracket icon. The "Normal" section displays a card for "RegionA01" with a green checkmark indicating "> 1 Year Remaining", a cost of "US\$15", "Cost Savings", and an "Optimized" status. The "Unknown" section displays a card for "RegionB01" with a question mark icon indicating "Time Remaining Not Available", a question mark icon for "Cost Savings", and an "Unknown" status.

The screenshot shows the VMware Aria Operations interface. The top navigation bar includes the VMware logo, the title "VMware Aria Operations", and a search bar. On the left, there is a sidebar with various icons and labels: Home, Datacenter, Region, Organization, and Cluster. The main content area is titled "Reclaim" and features a "SETTINGS" button, which is highlighted with a red box and a red arrow pointing to it. Below this, there is a section for "Select datacenter or ADD NEW CUSTOM DATACENTER". Under "Normal", there is a card for "RegionA01" showing a green checkmark icon, the text "> 1 Year Remaining", a cost of "US\$15", "Cost Savings", and a status of "Optimized". Under "Unknown", there is a card for "RegionB01" showing a question mark icon, the text "Time Remaining Not Available", a question mark icon, "Cost Savings", and a status of "Unknown".

## Reclamation Settings

⚠ Any changes made to the settings below will be applied to all datacenters

Show Cost Savings  ON

**VM Idleness Criteria**

Within each day VM consumes <=  MHz CPU for  % of the time

Show the following types of VMs for reclamation

Powered Off VMs  
It has been powered off for at least  days ←

Idle VMs ⓘ  
It has been idle for at least  days ←  
Exclude VM provisioned in the last  days ←

Snapshots  
Older than  days ←

Orphaned Disks ⓘ  
Older than  days ←

**CANCEL** **SAVE**

The screenshot shows a 'Reclamation Settings' dialog box. At the top, a warning message states: '⚠ Any changes made to the settings below will be applied to all datacenters'. Below this, there's a toggle switch labeled 'Show Cost Savings' which is set to 'ON'. The main section is titled 'VM Idleness Criteria' with the sub-instruction: 'Within each day VM consumes <= [input field] MHz CPU for [input field] % of the time'. Under 'Show the following types of VMs for reclamation', there are four categories with checkboxes: 'Powered Off VMs', 'Idle VMs', 'Snapshots', and 'Orphaned Disks'. Each category has a 'days' input field next to it. Red arrows point from the bottom of the page towards the 'days' input fields for each criterion, specifically pointing to the '7' and '30' values.

VMware Aria Operations

Search for object or metric and more...

Reclaim [SETTINGS](#)

Select datacenter or [ADD NEW CUSTOM DATACENTER](#)

Normal 1

**RegionA01**

> 1 Year Remaining

US\$15 Cost Savings Optimized

Unknown 1

**RegionB01**

Time Remaining Not Available

? Cost Savings Unknown

Home

Data Sources

Environment

Visualize

Troubleshoot

Optimize

Capacity

Reclaim

Workload Placement

Rightsize

Compliance

Plan

Configure

Automation Central

Administration



The screenshot shows the VMware Aria Operations interface for the 'Reclaim' feature. The top navigation bar includes the VMware logo, 'VMware Aria Operations', a search bar, and user icons.

**RegionA01 Summary:**

- Status: Optimized
- Cost Savings: US\$15
- Time Remaining: > 1 Year Remaining

**RegionB01 Summary:**

- Status: Unknown
- Time Remaining: Not Available

**RegionA01 Details:**

How much you can potentially save.

- US\$15/mo. Cost Savings
- 2 VMs With Redeemable Resources
- 17 Orphaned Disks To Reclaim

Total Reclaimable Capacity

Resource	Reclaimable Capacity	% Reclaimable
CPU	0 vCPUs	0%
Memory	0 KB	0%
Disk Space	78.98 GB	~10%

Duration older than:  Search

Calculated based on: Allocation Demand

SCHEDULE ACTION | DELETE VM(S) | EXCLUDE VM(S) | EXPORT ALL

RegionA01-COMP01 US\$7/mo. 2.65 GB

SHOW EXCLUDED VMS

The screenshot shows the VMware Aria Operations interface. On the left, there is a navigation sidebar with the following items:

- Home
- Data Sources
- Environment
- Visualize** (highlighted with a red box and numbered 1)
- Dashboards** (highlighted with a red box and numbered 2)
- Views
- Reports
- Troubleshoot
- Optimize
- Plan
- Configure
- Automation Central
- Administration
- Developer Center

The main content area is titled "Dashboards" and contains the following search results:

- Home
- Manage
- Create
- vm rightsizing** (highlighted with a red box and numbered 3)
- Favorites
- Recents
- All
  - Capacity
    - VM Rightsizing** (highlighted with a yellow box and numbered 4)
  - Cost
    - Cost Optimization
      - VM Rightsizing Details** (highlighted with a yellow box and numbered 4)

**About this Dashboard** 1

Rightsizing is defined as changing the amount of resources allocated to a VM based on the Recommended Size for a VM. Recommended Size is the maximum projected utilization for the projection period from the current time to 30 days after the warning threshold value for time remaining. The warning threshold is the period during which the time remaining is green. If the warning threshold value for time remaining is 120 days, which is the default value, the recommended size is the maximum projected utilization 150 days into the future. While rightsizing a VM can reclaim capacity, the change in allocation may not equal the amount of reclaimable capacity. Refer to [Capacity Analytics](#) page of the documentation for additional details on the capacity analytics engine. More detailed description of Rightsizing with VMware Aria Operations is available at <http://blogs.vmware.com/management/2020/01/rightsizing-vms-with-vmware-operations.html>

**Quantifying the effect on capacity due to rightsizing:**

- **Reclaimable CPU Usage (GHz):** If an oversized VM's CPU usage is 100MHz before rightsizing, removing vCPUs will not change its CPU usage and it should still be at 100MHz. This means there is no reclaimable capacity associated with overallocation of vCPUs.
- **Reclaimable Memory Consumed (GB):** An oversized VM can have reclaimable memory only if consumed memory is greater than the new recommended size of the VM. The reclaimable memory capacity is the difference between consumed and recommended size.
- **Increased CPU Usage (GHz):** CPU Usage of a VM of an undersized VM is expected to be the current CPU Demand. The difference between CPU Demand and CPU Usage is the expected increase in capacity utilized after rightsizing.
- **Increased Memory Consumed (GB):** It can be expected for consumed memory to increase by the same amount of memory recommended to add to an undersized VM.

Cost calculations can be based on either utilization or allocation depending on capacity settings for the cluster. Utilization based cost for rightsizing is the reclaimable CPU or memory capacity (as described above) multiplied by the CPU or memory base rates. Allocation based cost for rightsizing is the change in CPU or memory allocation multiplied by the CPU or memory allocation base rates.

**Potential Cost Savings Calculation Detail:**

- **Oversized CPU Utilization:** \$0 since Reclaimable CPU Usage (GHz) is always 0
- **Oversized Memory Utilization:** Reclaimable Memory Consumed (GB) \* Cluster Memory Base Rate

**Rightsizing - Conservative** 2

**Rightsizing - Aggressive** 3

1 2 3 4

**VM Rightsizing Details**

**About this Dashboard**

Rightsizing is defined as changing the amount of resources allocated to a VM based on the Recommended Size for a VM. Recommended Size is the maximum projected utilization for the projection period from the current time to 30 days after the warning threshold value for time remaining. The warning threshold is the period during which the time remaining is green. If the warning threshold value for time remaining is 120 days, which is the default value, the recommended size is the maximum projected utilization 150 days into the future. While rightsizing a VM can reclaim capacity, the change in allocation may not equal the amount of reclaimable capacity. Refer to [Capacity Analytics](#) page of the documentation for additional details on the capacity analytics engine. More detailed description of Rightsizing with VMware Aria Operations is available at <http://blob.vsphere.com/management/2020/01/rightsizing-vms-with-vmware-operations.html>

**Quantifying the effect on capacity due to rightsizing:**

- Reclaimable CPU Usage (GHz): If an oversized VM's CPU usage is 100MHz before rightsizing, removing vCPU's will not change its CPU usage and it should still be at 100MHz. This means there is no reclaimable capacity associated with overallocation of vCPUs.
- Reclaimable Memory Consumed (GB): An oversized VM can have reclaimable memory only if consumed memory is greater than the new recommended size of the VM. The reclaimable memory capacity is the difference between consumed memory and recommended size.
- Increased CPU Usage (GHz): CPU Usage of a VM of an undersized VM is expected to be the current CPU Demand. The difference between CPU Demand and CPU Usage is the expected increase in capacity utilized after rightsizing.
- Increased Memory Consumed (GB): It can be expected for consumed memory to increase by the same amount of memory recommended to add to an undersized VM.

**Potential Cost Savings: Calculation Detail:**

- Oversized CPU Utilization: \$0 since Reclaimable CPU Usage (GHz) is always 0
- Oversized Memory Utilization: Reclaimable Memory Consumed (GB) \* Cluster Memory Base Rate

**Select Cluster, Datacenter, or World Object** (1)

Name	Object Type
vSphere World	vSphere World
RegionA01	Datacenter
Workload1	Cluster Compute Re...
Management	Cluster Compute Re...

**Select an Undersized VM to View Recommendations** (2)

Name	Potential Cost Increase	Configured vCPU	vCPU(s) to Add	Increased CPU Usage	Configured Memory	Memory to Add	Increased Memory Cons...	VM
windows-0008	4.66 US\$	2	0	0.0019 GHz	4 GB	1 GB	1 GB	4 D
ubuntu-0004	4.6 US\$	1	0	0.0006 GHz	1 GB	1 GB	1 GB	4 D
Total	9.27 US\$	3	0	0.0025 GHz	5 GB	2 GB	2 GB	-

**Rightsizing - Conservative**

**Rightsizing - Aggressive** (3)

**Select an Undersized VM to View Recommendations**

Name	Potential Cost Increase	Configured vCPU	vCPU(s) to Add	Increased CPU Usage	Configured Memory	Memory to Add	Increased Memory Cons...	VM
windows-0008	4.66 US\$	2	0	0.0019 GHz	4 GB	1 GB	1 GB	4 D
ubuntu-0004	4.6 US\$	1	0	0.0006 GHz	1 GB	1 GB	1 GB	4 D
Total	9.27 US\$	3	0	0.0025 GHz	5 GB	2 GB	2 GB	-

Select an Oversized VM to View Recommendations

Name	Potential Cost Savings	Configured vCPU	vCPU(s) to Remove	Reclaimable CPU Usage	Configured Memory	Memory to Remove	Reclaimable Memory Co...	VM...
aria-auto	6.35 US\$	12	6	0 GHz	48 GB	4 GB	1.65 GB	27 I
aria-ops	3.64 US\$	4	2	0 GHz	16 GB	4 GB	0.95 GB	27 I
identity-manager	3.45 US\$	6	2	0 GHz	10 GB	2 GB	0.9 GB	27 I
aria-auto-config	2.35 US\$	4	2	0 GHz	8 GB	4 GB	0.61 GB	27 I
aria-ops-cp	0.84 US\$	2	0	0 GHz	8 GB	3 GB	0.22 GB	21 D
Total	16.63 US\$	32	14	0 GHz	98 GB	17 GB	4.32 GB	-

VM Status 1

Name:	aria-auto
Projected Cost this Month:	271.21 US\$/Month
VM Tools Running Status:	<span style="color: green;">Guest Tools Running</span>
VM Tools Version Status:	<span style="color: green;">Guest Tools Unmanaged</span>
VM Tools Version:	12.1.5

VM CPU Configuration 3

vCPUs:	12
Sockets:	12
Cores per Socket:	1
vCPU Hot Add Enabled?:	false
vCPU Hot Remove Enabled?:	false

VM Memory Configuration 4

Guest Memory Not Collecting:	0
Memory:	48 GB
Memory Hot Add Enabled?:	false

Undersized Details

Is Undersized:	0
Potential Cost Increase:	?
vCPUs to Add:	0
Potential CPU Usage Increase:	?
Memory to Add:	0 GB

Oversized Details 2

Is Oversized?:	1
Potential Cost Savings:	6.35 US\$
vCPUs to Remove:	6
Memory to Remove:	4 GB
Potential Memory Consumed Reclaimable:	1.65 GB

CPU Demand MHz (95th Percentile) 5

Name	99th Percentile (1 Day)	95th Percentile (1 Week)	95th Percentile
aria-auto	6.42 GHz	6.42 GHz	6.15 GHz

CPU Workload % (95th Percentile) 6

Name	99th Percentile (1 Day)	95th Percentile (1 Week)	95th Percentile
aria-auto	25.68 %	25.68 %	24.47 %

## Cost Drivers Overview

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## Modifying Cost Drivers

[159]

## Cost Drivers Settings

[160]

Access the Cost Drivers Component: Server Hardware

[161]

Expand the Cost Drivers Component: Server Hardware

[162]

Edit the Cost Drivers Component: Server Hardware

[163]

Realized Cost Savings Reclamation Suggestions

[164]

Reclaim pane - view attached datacenters

[165]

Edit Reclaim Settings

[166]

Reclamation Settings

[167]

Reclaim - Select a datacenter

[168]

View Reclaim options for selected datacenter

[169]

Costing for Oversized and Undersized VMs -- Access the Cost Optimization VM Rightsizing Details Dashboard

[170]

Review the VM Rightsizing Details Dashboard

[171]

Section and Widget focus settings

[172]

## Select Cluster, Datacenter, or World Object Widget

## Select an Undersized VM to View Recommendations Widget

## VM Rightsizing Widgets - Undersized VMs

The screenshot shows the VMware Aria Operations interface with the following sections highlighted:

- VM Status (1):** Displays projected cost (\$26.85 US\$/Month) and VM Tools status (Guest Tools Running).
- Undersized Details (2):** Shows potential cost increase (\$4.66 US\$) and memory usage (0.0019 GHz, 1 GB).
- VM CPU Configuration (3):** Lists vCPUs (2), Sockets (2), Cores per Socket (1), and vCPU Hot Add/Remove settings.
- VM Memory Configuration (4):** Shows guest memory not collecting (1), memory (4 GB), and memory hot add enabled (false).
- CPU Demand MHz (95th Percentile) (5):** Lists windows-0008 with values 97.11 MHz, 93.79 MHz, and 92.64 MHz.
- CPU Workload % (95th Percentile) (6):** Lists windows-0008 with values 2.28%, 2.23%, and 2.21%.
- Memory Utilization GB (95th Percentile):** Lists windows-0008 with values 4 GB, 4 GB, and 3.69 GB.

If we selected an **Undersized VM** the following widgets are now populated with data:

1. VM Status -- Provides reported projected monthly cost and VM Tools status of the selected VM.
2. Undersized Details -- Provides further details regarding resources to add to the selected VM.
3. CPU Configuration -- Current CPU Configuration and if Hot Add/Remove are enabled on the selected VM.
4. Memory Configuration -- Current Memory Configuration and if Hot Add is enabled on the selected VM.
5. CPU Demand MHz (95th Percentile)
6. CPU Workload % (95th Percentile)

Note: As noted before, depending upon the current configuration of the lab environment, we may not see any VMs identified as Undersized. If there are no VMs identified, please review the provided screenshots.

## Select an Oversized VM to View Recommendations Widget

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### VM Rightsizing Widgets - Oversized VMs

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## Conclusion

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In this module, we discussed how to set the currency in Aria Operations. Additionally, we covered how Virtual Machine Costing in Aria Operations allows us to track how much we are paying for CPU, Memory, and Disk/Storage resources on a per VM basis. Finally, we covered a general overview of specific Out-of-the-box (OOTB) dashboards and how they allow us to see not only specific VM costs but also track total costs across our datacenter(s).

### You've finished the module

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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 - Generating Reports for Cost, Capacity, Compliance and More (30 minutes) Basic

### Introduction

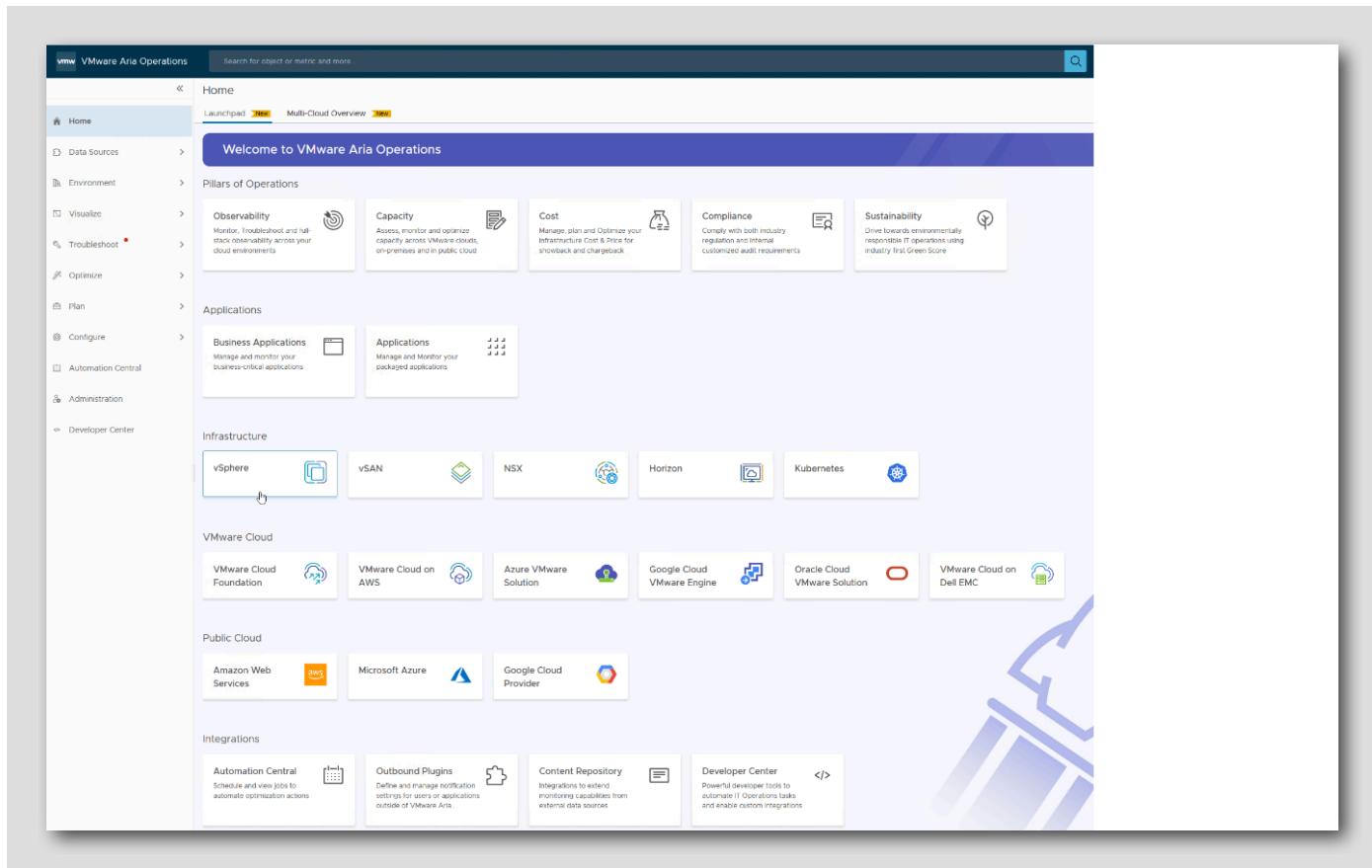
[181]

The screenshot shows the VMware Aria Operations interface. On the left is a navigation sidebar with categories like Home, Data Sources, Environment, Visualize, Troubleshoot, Optimize, Plan, Configure, Automation Central, Administration, and Developer Center. The main content area has several sections: 'Pillars of Operations' (Observability, Capacity, Cost, Compliance, Sustainability), 'Applications' (Business Applications, Applications), 'Infrastructure' (vSphere, vSAN, NSX, Horizon, Kubernetes), 'VMware Cloud' (VMware Cloud Foundation, VMware Cloud on AWS, Azure VMware Solution, Google Cloud VMware Engine, Oracle Cloud VMware Solution, VMware Cloud on Dell EMC), 'Public Cloud' (Amazon Web Services, Microsoft Azure, Google Cloud Provider), and 'Integrations' (Automation Central, Outbound Plugins, Content Repository, Developer Center). A search bar at the top is labeled 'Search for object or metric and more.'

VMware Aria Operations contains extensive capabilities around reporting in multiple formats including emails, dashboards and executive reports. In this module we will work through creating custom reports, views and dashboards. Let's get started.

This Module contains the following lessons:

- Introduction to Reports
- Generate Basic Reports



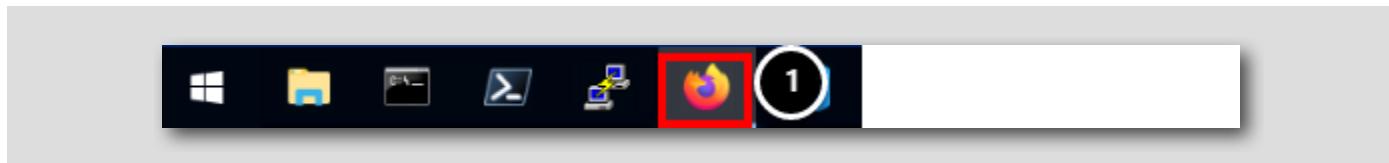
## Log in to Aria Operations

[182]

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

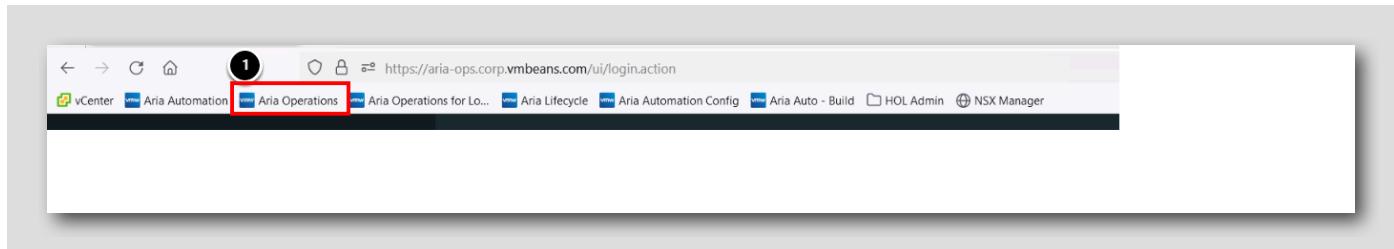
[183]



If the browser is not already open, launch Firefox.

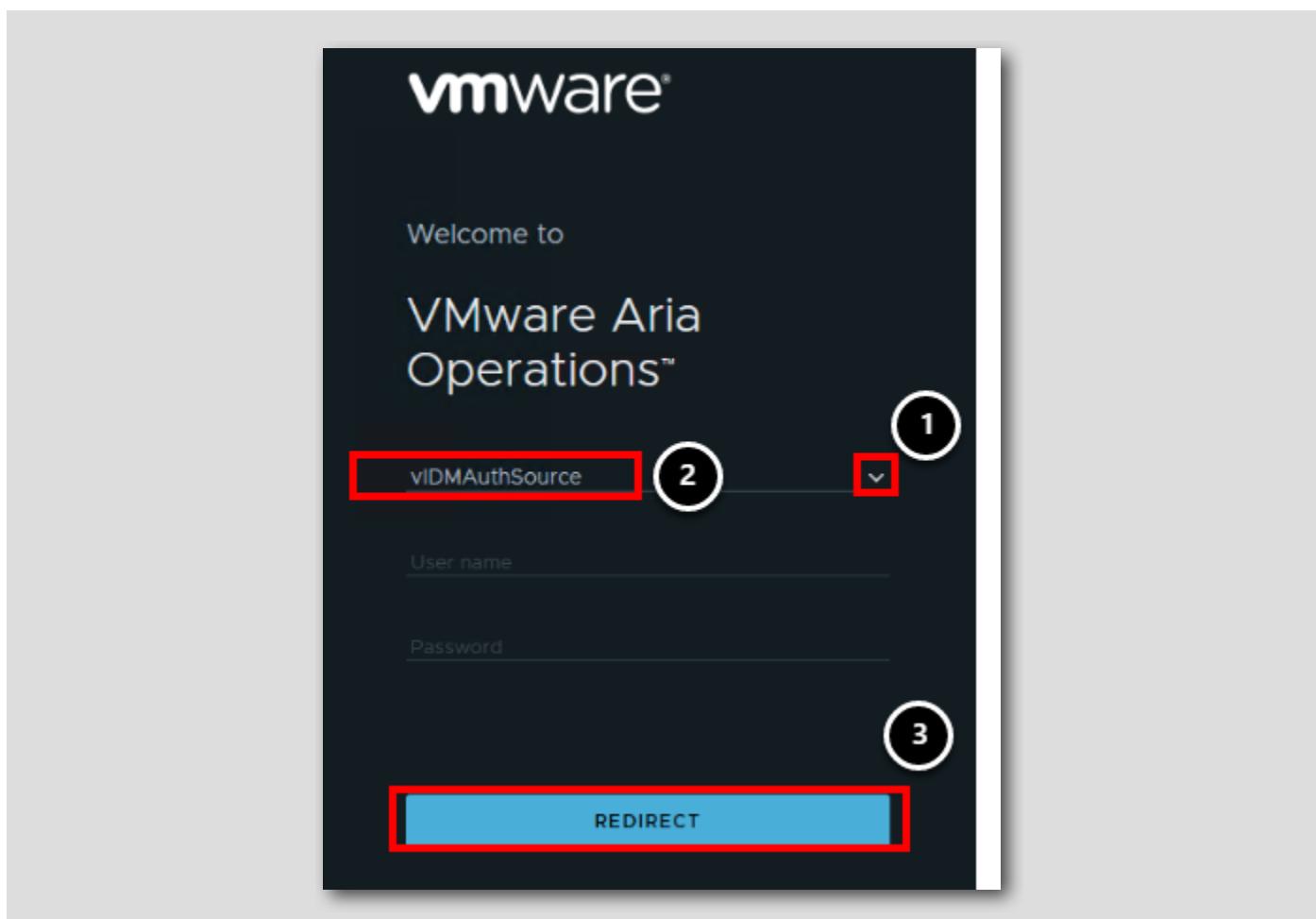
1. Click the Firefox icon on the Windows Quick Launch Task Bar at the bottom of the screen

## Log in to Aria Operations



1. Click on the Aria Operations Favorites link from the Favorites Bookmark in the Chrome Browser.

## Sign In

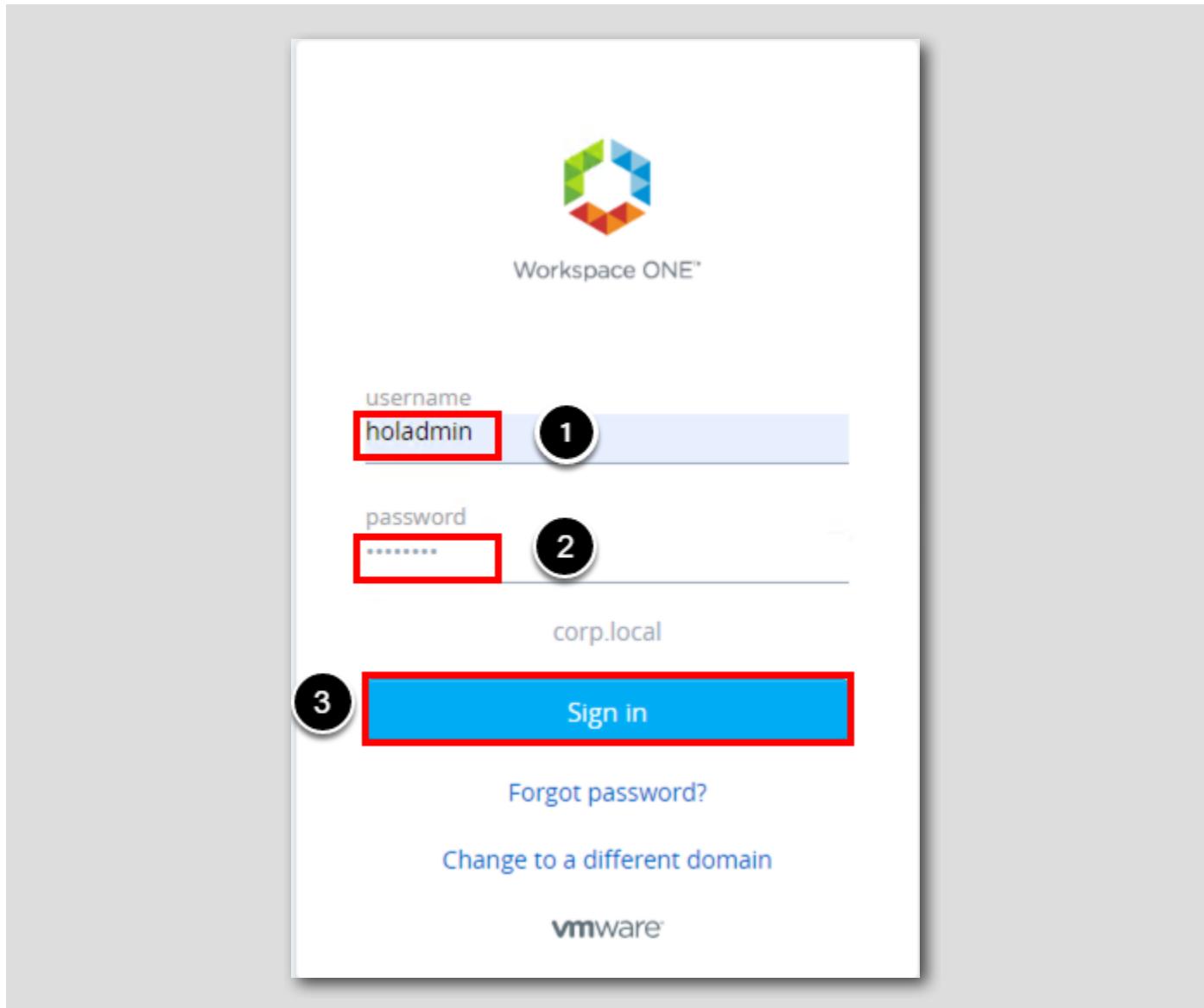


Aria Operations is integrated with VMware Identity Manager which we will use for user authentication in this lab. VMware Identity Manager is listed as vIDMAuthSource in our live lab environment.

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



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.

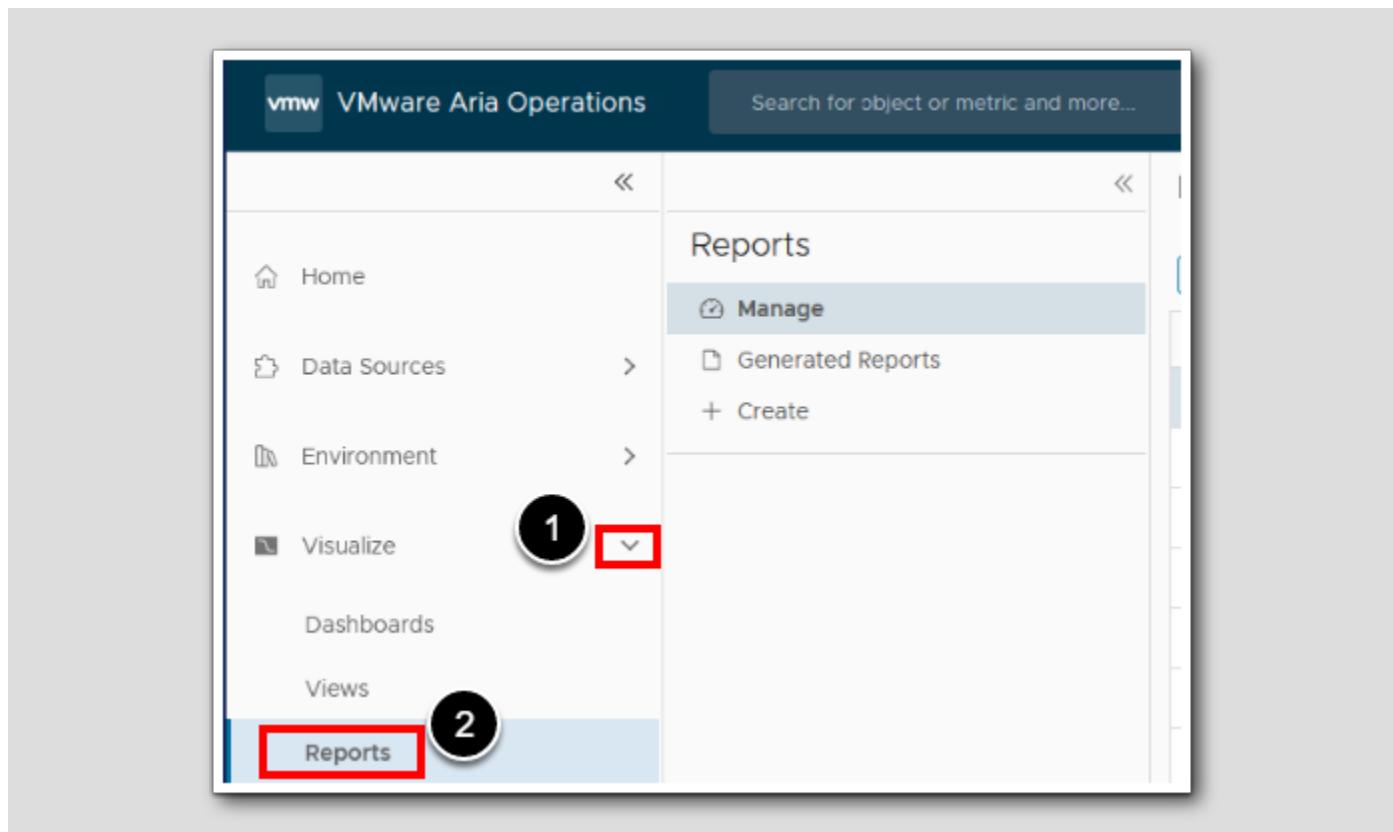
1. username: **holadmin**
2. password: **VMware1!**
3. Click **Sign in**

## Introduction to Reports

In this lesson, we will Introduce Reporting in Aria Operations. A report is a scheduled snapshot of views and dashboards in your environment. Your report can represent objects and metrics and include formatting such as a table of contents, cover page, headers and footers.

With the VMware Aria Operations reporting functions, you can generate a report to capture details related to current or predicted resource needs. Reports can be downloaded and shared in a variety of formats including PDF files, CSV files and Emails. Let's get started.

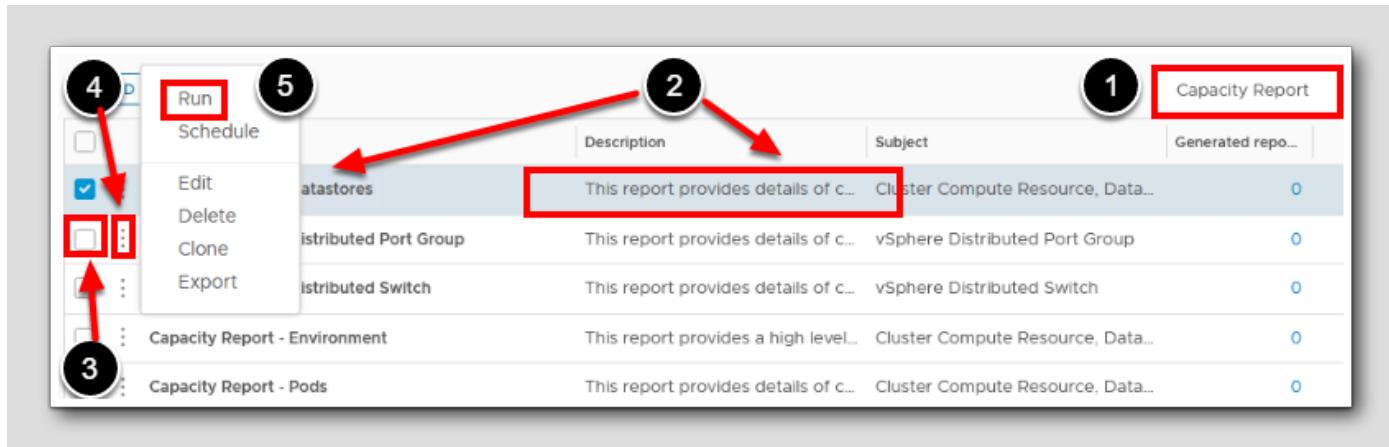
## Locating Reports



1. Click on the chevron next to **Visualize**.

2. Click on **Reports**.

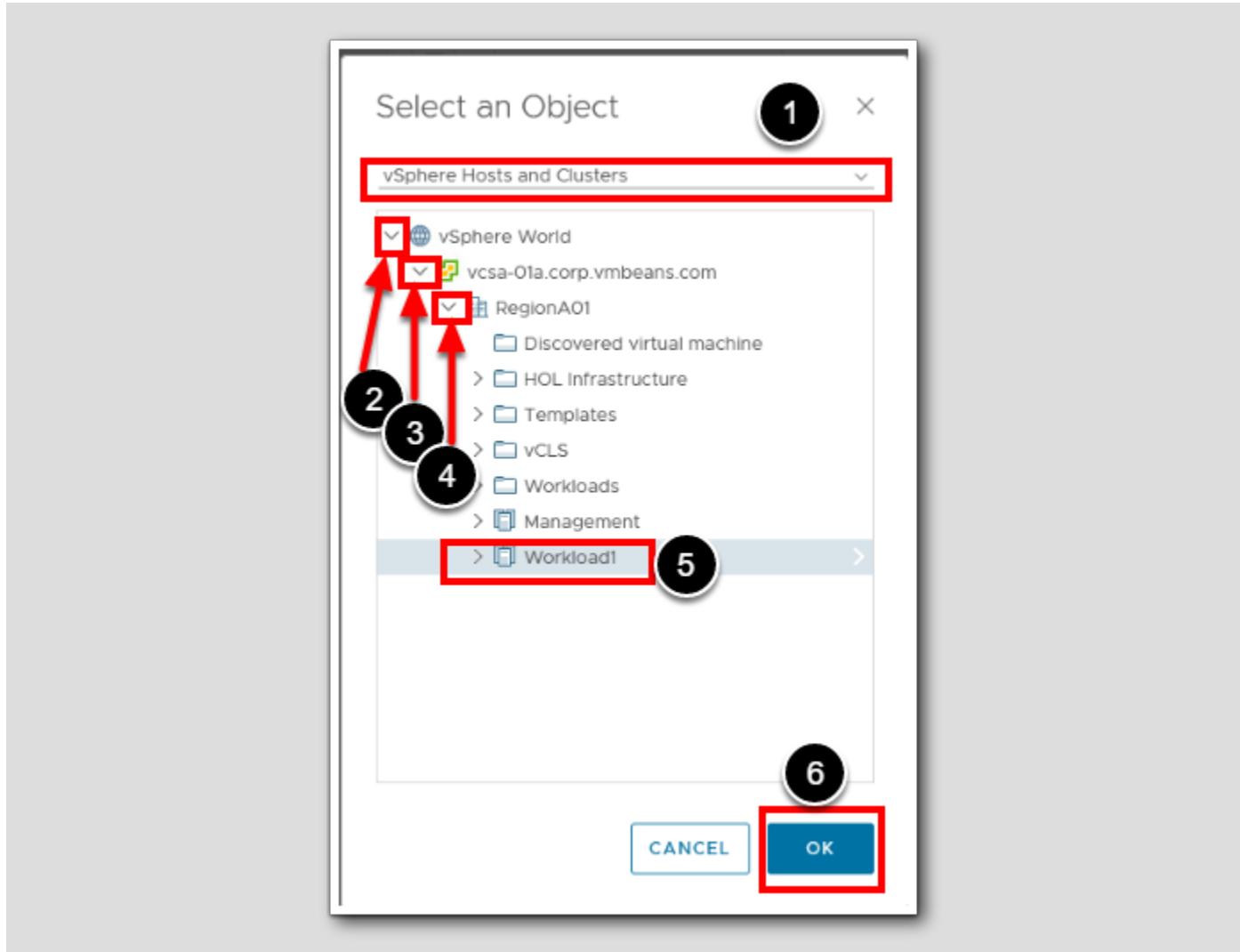
## Understanding Reports



In Aria Operations, Reports are a point in time view of metrics, objects and dashboards within your environment. Where dashboards can be dynamic, interactive and responsive to user views and inputs, reports only display information based on the time they are executed. Let's generate a report and view the output.

1. In the search field, type **Capacity Report** and press enter
2. Locate the **Capacity Report - Datastores** report
3. Select the check box next to the report titled **Capacity Report - Datastores**.
4. Notice the Subject of the report is the **Cluster Compute Resource**.
5. Click on the 3-dot action menu.
6. Select **Run**.

## Selecting the Compute Resource



1. The vSphere Hosts and Clusters should be selected by default, if not please select it.
2. Click the chevron to expand the vSphere World.
3. Click the chevron to expand the vcsa-01a.corp.vmbeans.com vCenter.
4. Click the chevron to expand the RegionA01 Virtual Datacenter.
5. Select the **Workload1** Cluster.
6. Click OK.

## Open Generated Report

Name	Description	Subject	Generated reports	Schedules	Last Modified	Last run	Modified By
Capacity Report - Datastores	This report provides details of c...	Cluster Compute Resource, ...	1		0 5/6/23 12:38 PM	17 seconds ago	admin

The User Interface will update after a few moments and display the status of the report we just started. Let's take a look at some of the information displayed then open our report.

- Under the **Generated Reports** column, we're shown the number of reports that have been created using the template we picked.
- Under the **Schedules** column, we're shown any existing scheduled run times for the report.
- Under the **Last Modified** column, we're shown the date the report template was last changed, this is not the same as when it was last run.
- Under the **Last Run** column, we're shown when then report was most recently generated.
- Click on the blue number under **Generated Reports** to open the generated report.

## Delete or Download and View Report

ACTIONS	Completion Date/Time	Report Name	Subject	Owner	Executed for	Status	Download
	8 minutes ago	Capacity Report - Datastores	Cluster Compute Reso...	holadmin@corp.vmbea...	Workload1	Completed	

In a large environment, many administrators will use tools other than the UI to interact and view information from Aria Operations. To facilitate this, every object is given a unique identifier allowing for programmatic access. When we opened this generated report, we're automatically shown the unique identifier. Let's take a look at the identifier and also download and view our report.

- In our search bar, we see that the UUID has automatically been displayed.
- Click on the PDF icon to download and view the generated report. Note that it should automatically open in your browser.

## Finished with this lab

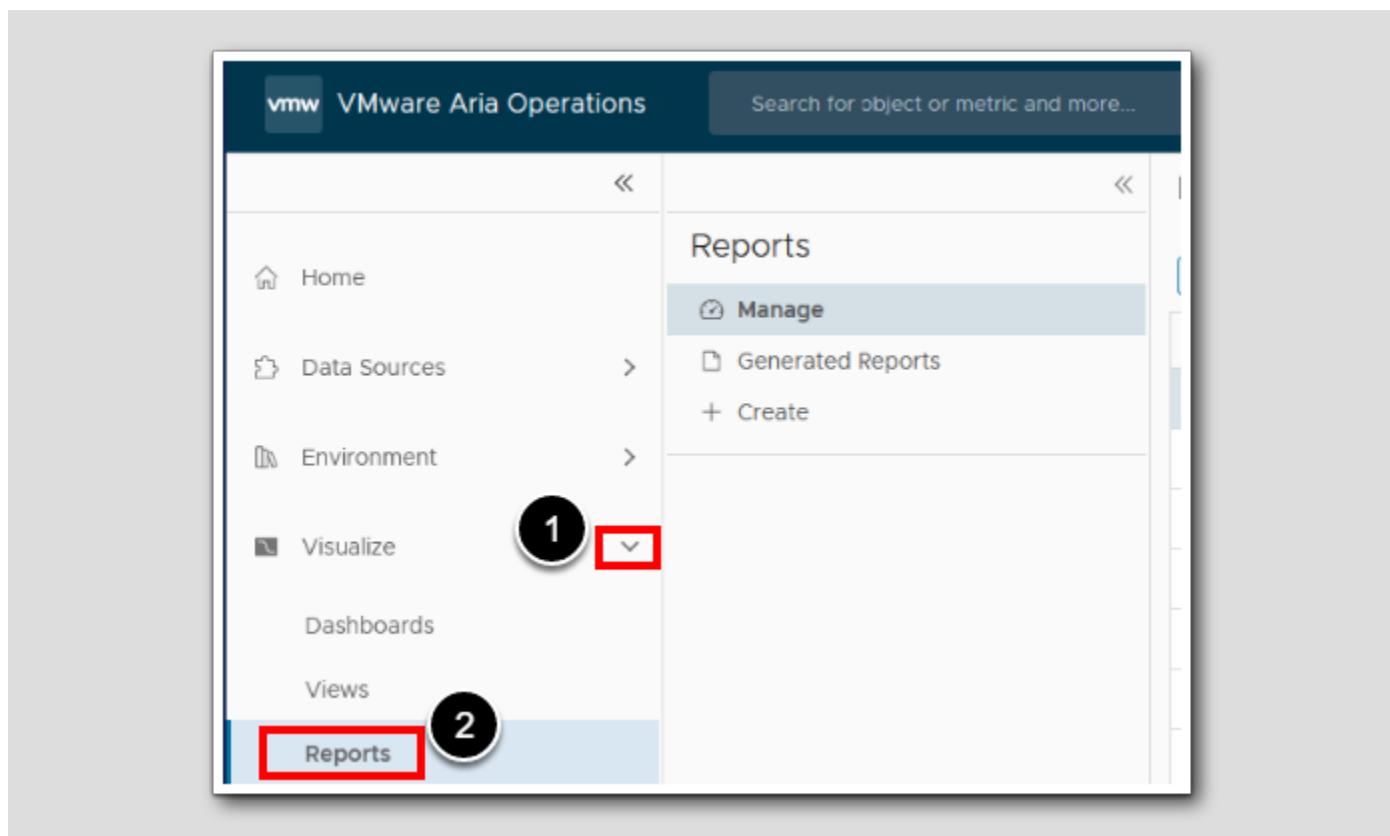
In this lab we had a brief introduction to Reports and Views in VMware Aria Operations. In follow up labs we'll explore creating views and reports and using them to create deliverable documents within your organization .

## Generate Basic Reports

VMware Aria Operations contains extensive capabilities around reporting. From CSV files to executive summaries, VMware Aria Operations contains the tools to gain deep insights into your VMware environment.

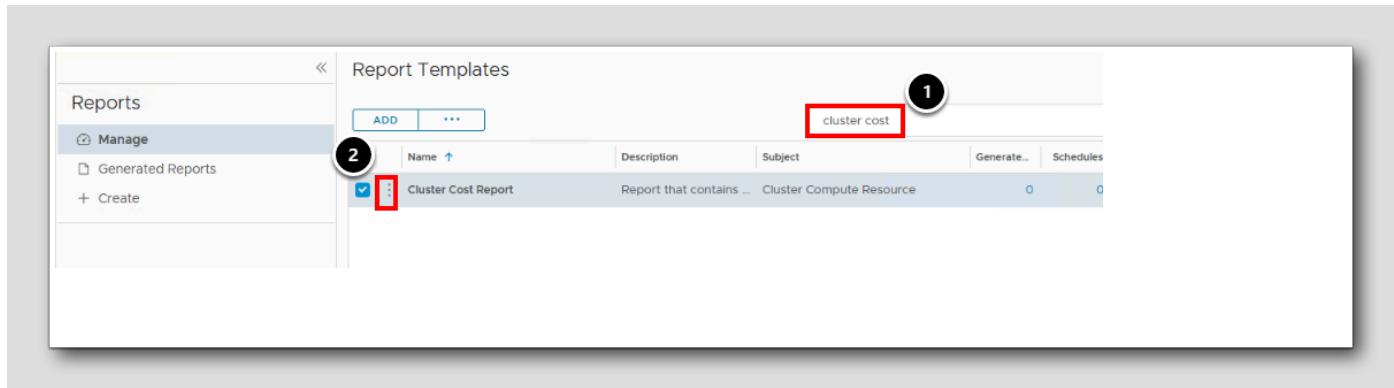
In this lab, we'll generate reports showing the cost and cost drivers in our environment as well as an overall capacity and utilization report. Let's get started.

### Locate Reports



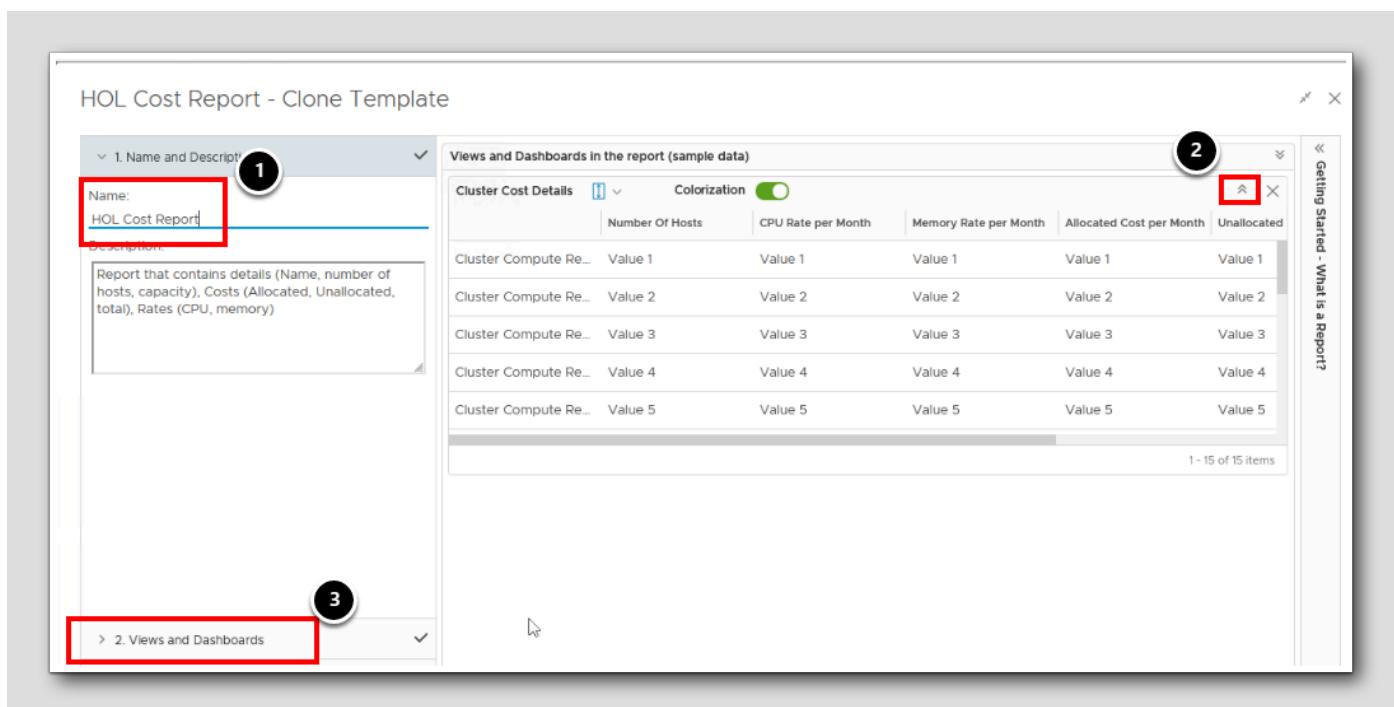
1. Click on the chevron next to Visualize.
2. Click on Reports.

## Locate Cluster Cost Report



1. In the search field, type Cluster Cost
2. Click the 3-dots next to Cluster Cost Report
3. Click Clone (Not Shown)

## Examine Existing Report



Reports consist of pregenerated Views and Dashboards that can be combined to create deliverable reports. Views are representations of data available within Aria Operations and can be as simple or complex as the administrator needs. Views are covered in more depth in HOL-2402 but for now, we will work with basic preformed views.

We see in this report that we're displaying the cost metrics across multiple categories for hosts in our environment. Let's add on an additional view to this cost report.

1. Rename the report to HOL Cost Report
2. Click on the double chevron to expand the View information
3. Click on Views and Dashboards

## Customize the Report

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HOL Cost Report - Edit Report Template

Views and Dashboards in the report (sample data)

	Number Of Hosts	CPU Rate per Month	Memory Rate per Month	Allocated Cost per Month
Cluster Compute Re...	Value 1	Value 1	Value 1	Value 1
Cluster Compute Re...	Value 2	Value 2	Value 2	Value 2
Cluster Compute Re...	Value 3	Value 3	Value 3	Value 3
Cluster Compute Re...	Value 4	Value 4	Value 4	Value 4
Cluster Compute Re...	Value 5	Value 5	Value 5	Value 5

1 - 15 of 15 items

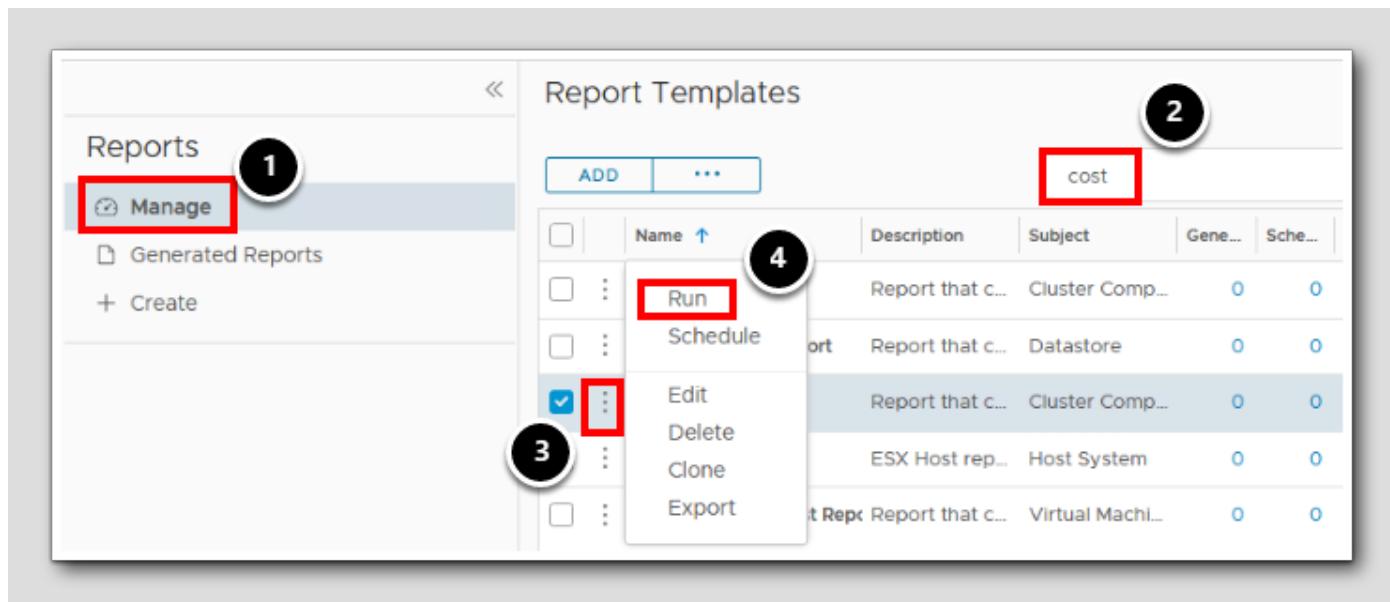
Compute Cost Drivers

	Summary
Hardware	Sum Value 1
License	Sum Value 2

1 - 2 of 2 items

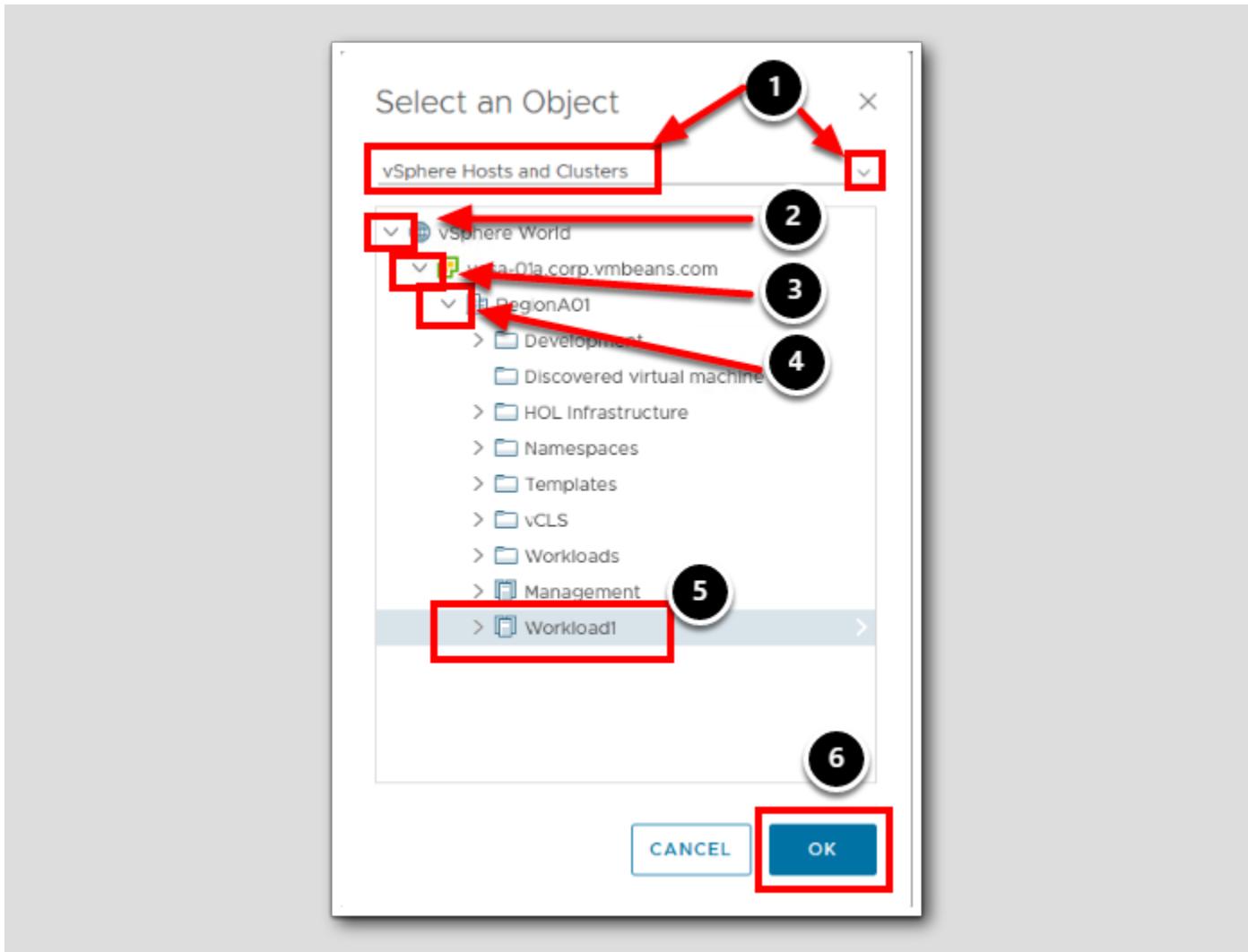
1. Type **compute cost** in the views filter field and press enter
2. double click or drag to the right pane the **Compute Cost Drivers** view
3. Click **Save** (Not Shown)

## Run The New Report



1. Click on **Manage**
2. Clear our existing filter and type **Cost**
3. Click the **3 dots** next to our HOL Cost Report
4. Select **Run**

## Select our Clusters



1. Click the down carrot and ensure we have selected vSphere Hosts and Clusters
2. Click the down carrot to expand vSphere World
3. Click the down carrot to expand vcsa-01a.corp.vmbeans.com
4. Click on Workload1
5. Click OK

## Locate Capacity Report

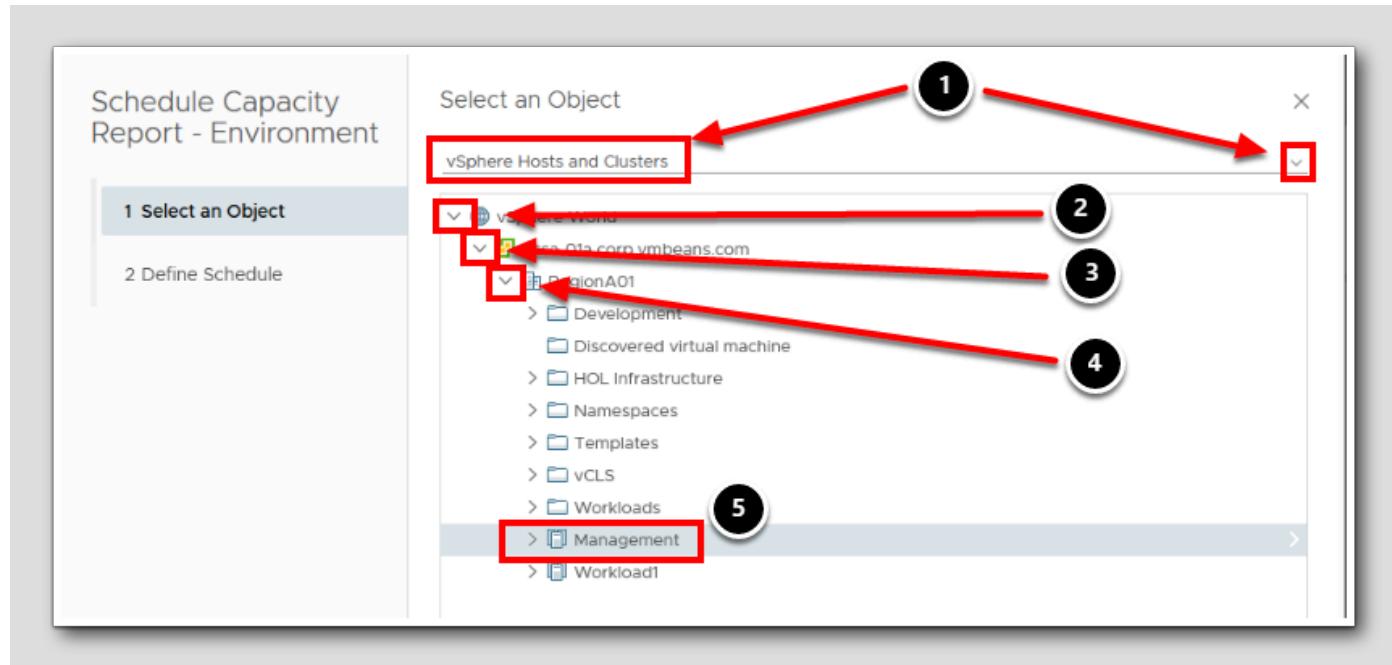
The screenshot shows the 'Report Templates' page in the vSphere interface. On the left, there's a sidebar with 'Reports' and a 'Manage' button (Step 1). The main area is titled 'Report Templates' with an 'ADD' button and a filter field containing 'capacity' (Step 2). A list of report templates is shown, including 'Capacity Report - Environment' (Step 3), which has a three-dot menu icon next to it.

	Name ↑	Description	Subject	Generate...	Schedules
<input type="checkbox"/>	[VOA] Optimize Capacity			0	0
<input type="checkbox"/>	Capacity Report - Datastores	This report provides...	Cluster Compute Re...	0	0
<input type="checkbox"/>	Capacity Report - Distributed Port Gr	This report provides...	vSphere Distributed...	0	0
<input type="checkbox"/>	Capacity Report - Distributed Switch	This report provides...	vSphere Distributed...	0	0
<input type="checkbox"/>	Capacity Report - Environment	This report provides...	Cluster Compute Re...	0	0
<input type="checkbox"/>	Capacity Report - Pods	This report provides...	Cluster Compute Re...	0	0

While the Cost metrics report runs, let's go ahead and schedule a capacity report to also run daily. This will show you how you can run reports both at an immediate point in time as well as on a scheduled basis.

1. Click back on **Manage** under Reports (Optional)
2. In the filter field, clear any existing entry and enter **capacity**
3. Locate the **Capacity Report - Environment** and click the 3 dots
4. Click **Schedule** (not shown)

## Select A Cluster



1. Click the down carrot and ensure we have selected vSphere Hosts and Clusters
2. Click the down carrot to expand vSphere World
3. Click the down carrot to expand vcsa-01a.corp.vmbeans.com
4. Click on Management
5. Click Next (not shown)

## Schedule A Time

Define Schedule

Set the recurrence and publishing criteria for this report

**1**

Recurrence

Time zone: (GMT -08:00) Pacific Time (US & Canada)

Start hour: 8 00 AM

Start date: 7/13/23

Weekly

Every 1 weeks on:

Sunday Monday Tuesday Wednesday  
Thursday Friday Saturday

**2**

Publishing

**⚠** There are no SMTP servers defined.

Email report

Email addresses: Separate addresses with a comma or a semicolon. Cc Bcc

Select an outbound rule: --Select--

**⚠** There are no external locations defined, [click here](#) to configure a new external location.

Save to external location

Select a location: --Select--

Relative Path: Import relative path to upload.

**3**

CANCEL BACK FINISH

The screenshot shows the 'Define Schedule' dialog box. The 'Recurrence' section is highlighted with a red box and labeled '1'. It contains fields for Time zone, Start hour, Start date, and a weekly recurrence rule. Below it is a 'Recurrence:' section with checkboxes for days of the week, also highlighted with a red box and labeled '2'. The 'Publishing' section follows, containing fields for Email report, Email addresses, and Select an outbound rule, with a warning message about SMTP servers. Below that is another warning about external locations, followed by Save to external location, Select a location, and Relative Path fields. At the bottom are CANCEL, BACK, and FINISH buttons, with FINISH highlighted by a red box and labeled '3'.

1. Select the Pacific Time Zone by clicking on the down carrot
2. Click the checkbox next to each day
3. Click on **Finish**

Note: In addition to generating our reports, we can email them using a defined SMTP server or have the report placed on a drive connected to Aria Operations.

## Run Capacity Report

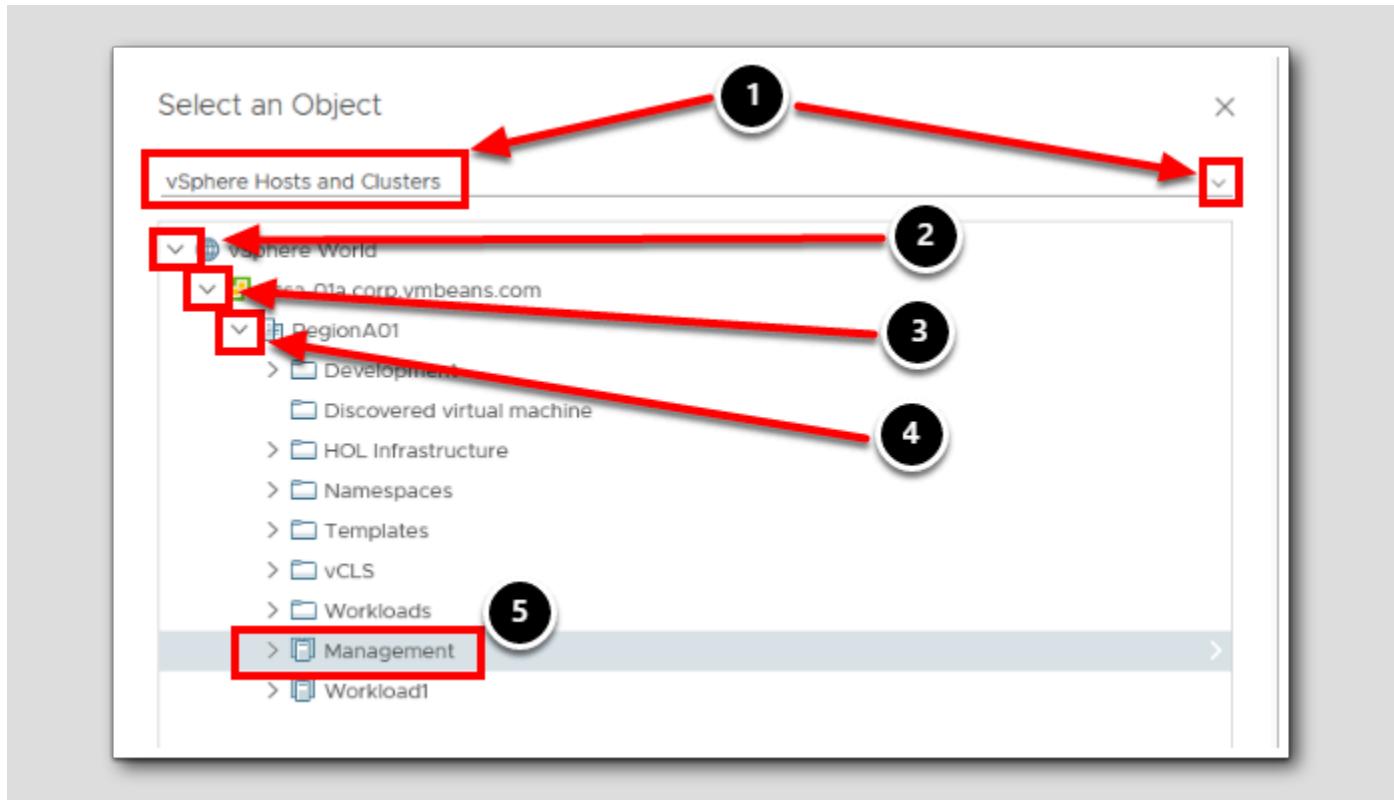
[204]

	Name ↑	Description	Subject	Generate...	Schedules
<input type="checkbox"/>	[VOA] Optimize Capacity	This report provides...	Cluster Compute Re...	0	0
<input type="checkbox"/>	Capacity Report - Datastores	This report provides...	vSphere Distributed...	0	0
<input type="checkbox"/>	Capacity Report - Distributed Port Gr	This report provides...	vSphere Distributed...	0	0
<input type="checkbox"/>	Capacity Report - Distributed Switch	This report provides...	vSphere Distributed...	0	0
<input type="checkbox"/>	Capacity Report - Environment	This report provides...	Cluster Compute Re...	0	0
<input type="checkbox"/>	Capacity Report - Pods	This report provides...	Cluster Compute Re...	0	0

Now that we have scheduled our report to run daily, let's manually run the report so we have an example of how the process works.

1. Click back on **Manage** under Reports
2. In the filter field, clear any existing entry and enter **capacity**
3. Locate the **Capacity Report - Environment** and click the 3 dots
4. Click **Run** (not shown)

## Select A Cluster



1. Click the **down** carrot and ensure we have selected vSphere Hosts and Clusters
2. Click the **down** carrot to expand vSphere World
3. Click the **down** carrot to expand vcsa-01a.corp.vmbeans.com
4. Click on **Management**
5. Click OK (not shown)

## Open Reports

The screenshot shows the 'Reports' section in VMware Aria Operations. On the left, there's a sidebar with 'Manage' and 'Generated Reports' (which is highlighted with a red box and a circled '1'). The main area is titled 'Generated Reports' and contains a table with two rows. The first row has a checkbox, a timestamp ('58 seconds ago'), a report name ('Capacity Report - Environment'), and a 'Download' button with a PDF icon (highlighted with a red box and circled '3'). The second row has a similar structure. At the top of the main area, there's a search bar ('Type here to apply filters') and a filter icon.

After a few moments, the report will be run and will be accessible from the Generated Reports section. From here you have the ability to download the report results as either a PDF or CSV file.

1. Click on **Generated Reports**
2. Clear any existing filter fields and type either **Capacity** or **Cost** to filter down (Optional)
3. Click on the PDF icon next to either our reports to open the PDF file in your browser (not shown)

Note: The generated reports do not overwrite other reports of the same type. Instead you are presented a list of all the reports and can sort and filter based on Completion date and time.

## Conclusion

In this lab, we introduced you to creating a report in VMware Aria Operations focusing on Cluster Cost as well as scheduling a report focusing on capacity. We introduced Views and how you can clone existing reports and add existing views to start customization of your report.

In later modules and labs we will go into more detail explaining how to create custom Views giving you complete control over your reports.

## Conclusion

In this module, we created and schedule some basic reports in our VMware Aria Operations environment by using existing views and dashboards. In later modules, we will explore how to create custom views to use with your dashboards and reports.

## You've finished Module 8

Congratulations on completing the lab module.

If you are looking for additional general information on Aria Operations 8.12, 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 8.12 - Documentation:** <https://docs.vmware.com/en/VMware-Aria-Operations/8.12/Using-Operations/GUID-BDF72F44-EACD-4121-99FB-8D6DE42645D9.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

## Conclusion

### Learning Path Next Steps!

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