

HOL-2601-19-VCF-L



# Cost Optimization, Showback and Chargeback Using VCF Operations

HOL-2601-19-VCF-L

## Table of Contents

<b>Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)</b>	
Lab Guidance	4
<b>Module 1 - Basic Cost Overview (30 minutes) Beginner</b>	5
Cost Engine and Cost Allocation Process	5
Overview of Cost Drivers	6
Cost Driver Based Cost	8
Showback (Cost) & Chargeback (Price)	8
Conclusion	8
<b>Module 2 - Understanding Currency (15 minutes) Beginner</b>	9
Login to VCF Operations	9
Navigate to Global Settings	12
Review the Currency Setting	13
Navigate to Edit Currency	14
Navigate to Object Universe	15
Navigate to the Currency Change Timeline	15
Logout	16
Conclusion	16
<b>Module 3 - Understanding Out-of-the-Box Cost Dashboards (30 minutes) Beginner</b>	16
Login to VCF Operations	17
Cost Dashboards Overview	18
Assess Cost Dashboard	21
Total Cost of Ownership Dashboard	22
Potential Cost Savings Dashboard	25
Realized Cost Savings Dashboard	29
Logout	32
Conclusion	32
<b>Module 4 - Cost Drivers (30 minutes) Intermediate</b>	32
Login to VCF Operations	33
What is a Cost Driver?	34
Examining Private Cloud Cost Drivers	35
Examining Software Licensing	41
Conclusion	45
Logout	45
<b>Module 5 - Showback (15 minutes) Intermediate</b>	45
Login to VCF Operations	46
Showback Main Page	48
Showback (VM Cost) Dashboard	50
Logout	56
Conclusion	56
<b>Module 6 - Price Cards- VC Pricing (30 minutes) Intermediate</b>	56
Login to VCF Operations	56
Locating Policy Definition	59
Exploring VC Pricing	61
Conclusion	66
Logout	66

<b>Module 7 - Price Cards - Provider Pricing (30 min) Advanced</b>	<b>67</b>
Login to VCF Operations	67
Provider Pricing	68
Conclusion	80
Logout	80
<b>Module 8 - Chargeback and Billing (30 min) Advanced</b>	<b>80</b>
Login to VCF Operations	81
New Chargeback	82
Billing	86
Billing in the Consumption Interface - Quick Preview	92
Conclusion	93
Logout	94

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

Explore VMware Cloud Foundation Operations 9.0, focusing on cost optimization, showback, and chargeback. We will gain hands-on experience with managing and analyzing cloud costs, including understanding cost drivers, setting up price cards, and generating bills. This lab enhances our ability to track, analyze, and manage expenses across our VMware Cloud Foundation environment.

### Lab Guidance

Welcome! This lab is available for you to repeat as many times as you want. Use the Table of Contents in the upper right-hand corner of the Lab Manual to jump ahead to any module.

Module	Title	Length	Level
1	Cost Overview	15 min	Beginner
2	Understanding Currency	15 min	Beginner
3	Understanding Out-of-the-Box Cost Dashboards	30 min	Beginner
4	Cost Drivers	30 min	Intermediate
5	Showback	15 min	Intermediate
6	Price Cards - VC Pricing	30 min	Intermediate
7	Price Cards - Provider Pricing	30 min	Intermediate
8	Chargeback and Billing	30 min	Advanced

### Lab Authors:

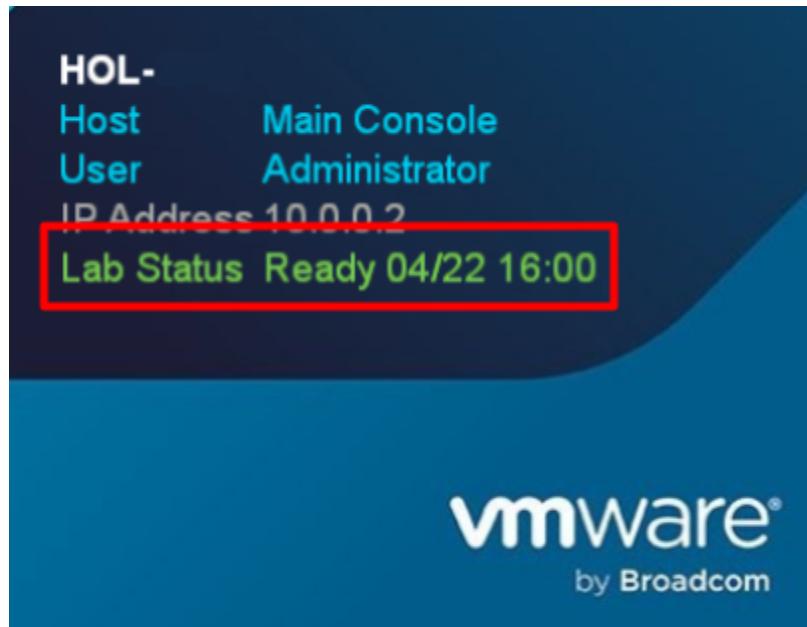
- Module 1 - Eirini Spanou, Account Solutions Architect, UK
- Module 2 - Eirini Spanou, Account Solutions Architect, UK
- Module 3 - Eirini Spanou, Account Solutions Architect, UK
- Module 4 - William De Marigny, Staff Technical Adoption Manager, USA
- Module 5 - William De Marigny, Staff Technical Adoption Manager, USA
- Module 6 - William De Marigny, Staff Technical Adoption Manager, USA
- Module 7 - William De Marigny, Staff Technical Adoption Manager, USA
- Module 8 - Thomas Kopton, Solutions Architect, Germany

### Lab Principals:

- Christopher Lewis, Lead VCF Specialist Solutions Architect, UK
- Katherine Skilling, Senior Architect, Professional Services, UK

### First time using Hands-on Labs?

If this is your first time taking a lab you can review the [VMware Learning Platform interface](#) before proceeding.



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 - Basic Cost Overview (30 minutes) Beginner

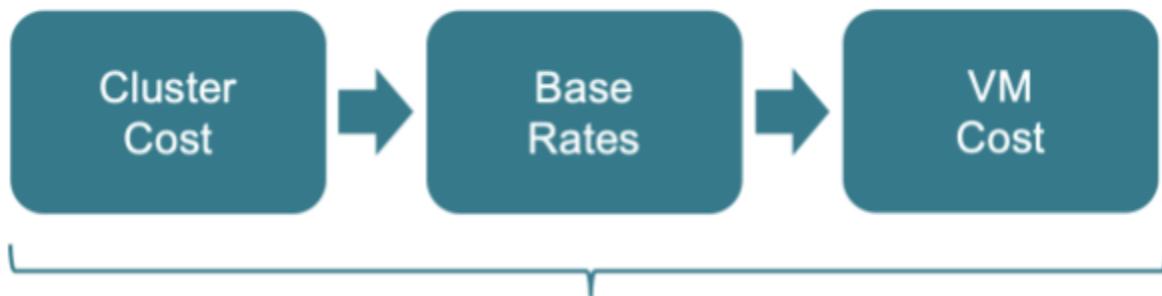
In this module, we will introduce concepts and nomenclature related to VCF Operations Cost.

VCF Operations supports costing for VMware Cloud accounts like vCenter, VMware Cloud Foundation, VMware Cloud on AWS (VMC), Azure VMware Solution, Oracle Cloud VMware Solution, and Google Cloud VMware Engine. We can track expenses for a single virtual machine (VM), and how these expenses contribute to the overall cost associated with our VMware Cloud accounts.

### Cost Engine and Cost Allocation Process

The Cost Engine in VCF Operations starts calculating costs as soon as the Currency is set under Global Settings.

The Cost Engine subsequently discovers ESXi Hosts, assigns a cost to them, sums them up into Cluster Cost and then calculates CPU/Memory/Disk Base Rates, which are used to calculate VM Cost.



### Cost Allocation Process

## Overview of Cost Drivers

### Cost Drivers

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, VCF Operations has identified various 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.

### Cost Reference Database

According to the industry standard, VCF Operations maintains a reference cost for these cost drivers. These reference costs help calculate the cost of our setup, but they might not be accurate. For example, we might have received some special discounts during a bulk purchase 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 VCF Operations, which overrides the values in the reference database. Based on our inputs, VCF Operations recalculates the total amount for the private cloud expenses.

### Private Cloud Cost

After we add a private cloud into VCF Operations, VCF 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 configurations and utilizations of inventory, and the available reference cost, VCF 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.

### Infrastructure Type

We have the option to select the infrastructure type as either vCenter or VMC on AWS; based on our selection, the cost drivers are displayed on the Cost Drivers page. We can add or edit the cost drivers as per our requirement.

For the **vCenter infrastructure type**, the following private cloud cost drivers are applicable:

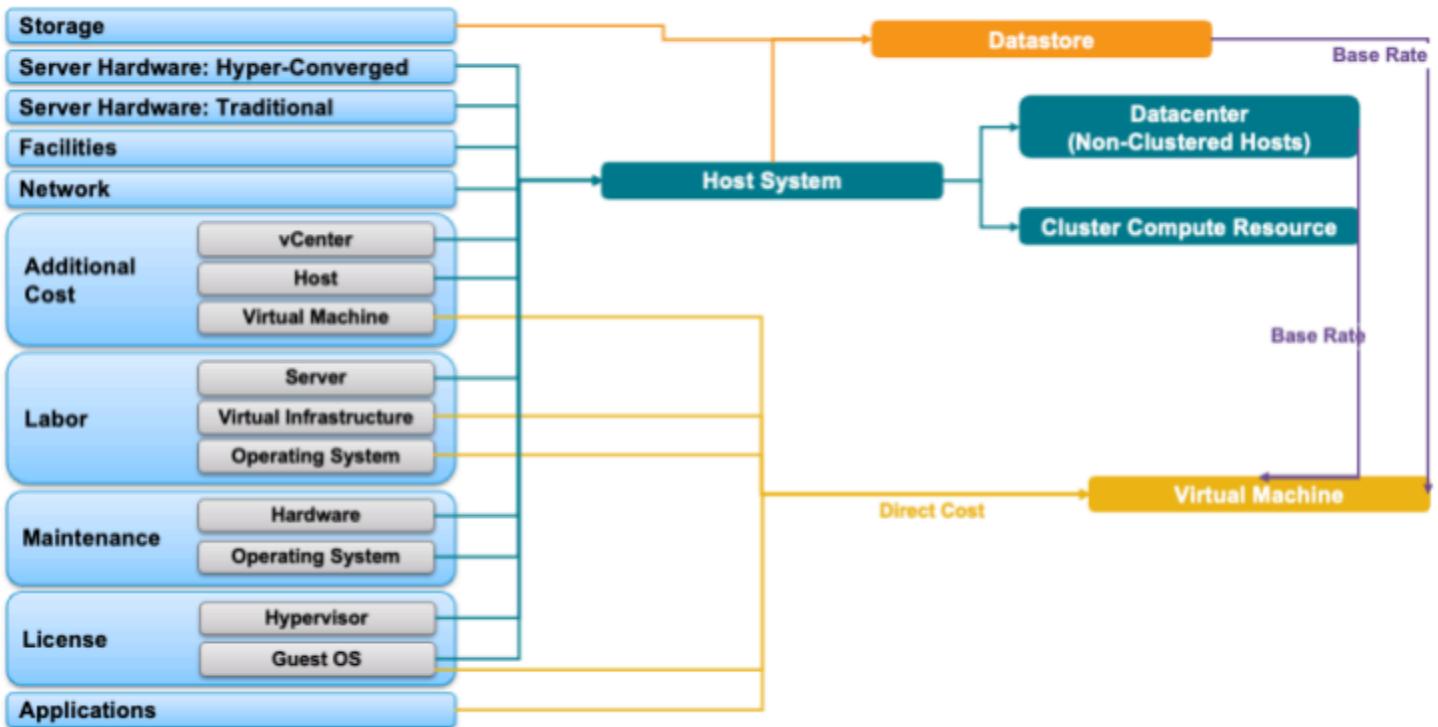
- Server Hardware : Traditional
- Server Hardware : Hyper - Converged
- Storage
- License
- Applications
- Maintenance
- Labor
- Network
- Facilities
- Additional Cost

For the **VMC on AWS infrastructure type**, the following private cloud cost drivers are applicable:

- License
- Additional Cost

All other costs from VMC that are not directly attributed to specific hosts like load balancer and other costs are grouped under the "Additional" cost driver and equally distributed among all hosts.

## VM Cost Based on Cost Drivers



Cost Drivers have a direct impact on how VCF Operations calculates current operating costs, Potential Savings, as well as the Realized Savings. The above diagram shows each Cost Driver (within light blue boxes), where they go, and what they influence.

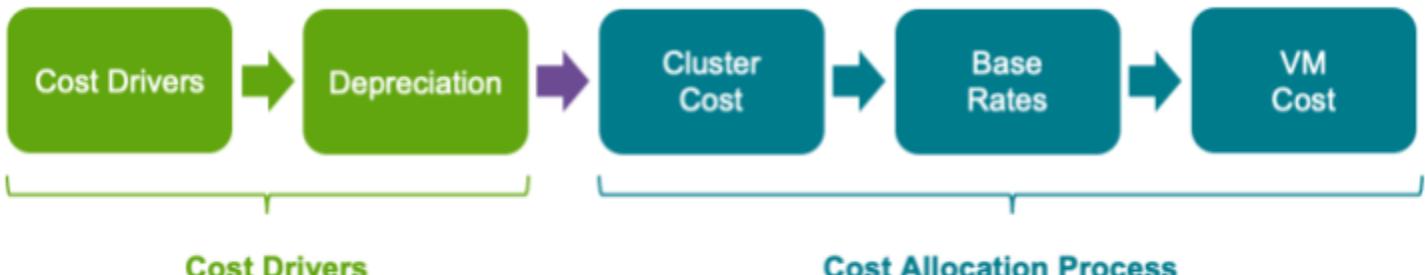
- From top to bottom, as we can see, Storage Costs (orange paths) go into the Datastore bucket.
- Server Hardware, Facilities, Network, etc. (dark blue paths) go into the Host System bucket.

The Datastores and Host Systems are used to determine the "Base Rate" (purple paths) of a VM running on them.

- There are also a few direct costs (yellow paths) like the Virtual Machine Additional Cost, the GuestOS License Cost and Application costs which are directly applied to the cost of the VM.

Together, the Base Rates and the Direct Costs provide the specific VM costs.

## Cost Driver Based Cost



As we have already discussed, in the Cost Allocation Process, the cluster cost feeds into the base rates which then drive VM cost.

For Cost Driver Based Cost, cost drivers are added in the mix, meaning that when we use cost drivers, we apply depreciation, and then that feeds into our cluster cost which forms part of the Cost Allocation Process.

If our environment is on VMware Cloud on X, rate card based cost is used instead of cost driver based cost, because there are no transparent cost drivers for that type of infrastructure.

## Showback (Cost) & Chargeback (Price)

Having the ability to determine how much it costs to run the various resources in our environment so that we can determine the appropriate price to charge anyone who is using them is a key component to "running IT as a business".

VCF Operations enables us to do this with its Showback (Cost) and Chargeback (Price) capabilities, which allow us to report both the cost and the price of our VMs. Showback (Cost) and Chargeback (Price) are closely related, so let's take a moment to define them.

### Showback (Cost)

The goal with Showback is to quantify how much it costs our IT department to run VMs in our cloud.

- Cost is the amount of money we spend to run a VM in our cloud based on either utilization or allocation.
- These costs are reflected in a Showback Report that we use to show management or internal departments how much their VMs cost to run in our cloud.

Showback doesn't necessarily mean that we are going to give the user a bill. It has more to do with trying to influence user behavior by saying, "this is how much it is costing the company to run this VM, so try to be a sensible consumer of our resources and minimize your cost as much as possible." Showback serves educational purposes and is not enforced.

### Chargeback (Price)

The goal with Chargeback is to create a bill to charge a customer for running their VMs in our cloud.

- Price is how much we charge our customer for a VM based on either cost or allocation. The price of a VM may not be the same as what it costs to run, e.g., upcharge or profit.
- These prices are reflected in a Chargeback Report that we present to the user as a bill.

## Conclusion

In this module, we introduced and explained concepts relating to VCF Operations Cost, such as the Cost Engine and the Cost Allocation Process, Base Rates, Cost Drivers, Cost Driver Based Cost, Rate Card Based Cost as well as Showback and Chargeback.

From here you can:

- Take this quick survey to provide feedback about your experience with VCF 9.0
- Continue with the next lab module.
- Click [vlp:table-of-contents]Show Table of Contents] to jump to any module or lesson in this lab.
- End your lab and return in the future.

## Module 2 - Understanding Currency (15 minutes) Beginner

The first step in configuring VCF Operations to support costing is to configure the currency the system should use. Arguably, this should be one of the first configuration items that we set when deploying VCF Operations, irrespective of whether we are interested in VM cost.

In this module, we will be reviewing where to find and edit the currency setting and where to find the currency change timeline.

If the currency has not been set in VCF Operations, a yellow banner will appear at the top of the GUI noting that we must choose a currency in Global Settings. The currency has already been configured in the lab environment.

In previous versions of VCF Operations (prior to VCF 9.0), setting the Currency was a one time operation, meaning that once set, the only way to change it was to rebuild the environment! That is no longer the case with VCF 9.0.

## Login to VCF Operations

In the following few pages, we will walk through the process for logging in to VCF Operations.

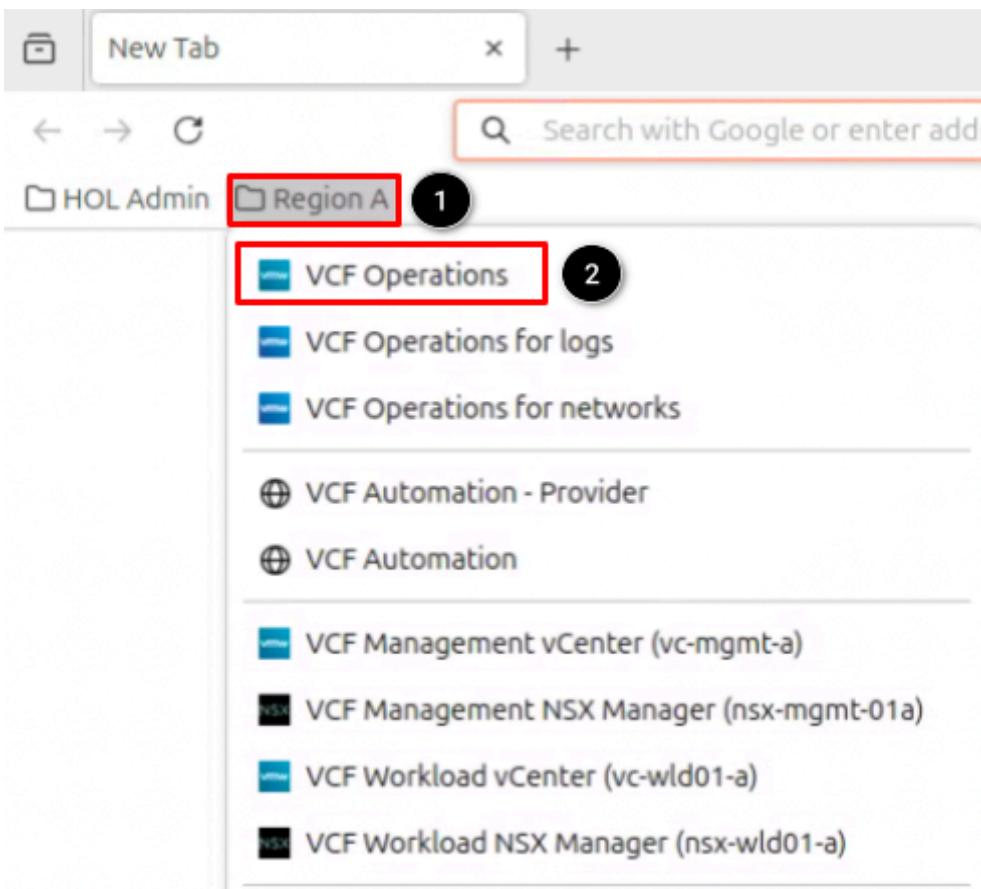
### Start Firefox



Open the Firefox Browser from the Linux Task Bar.

1. Click on the Firefox icon to open the browser.

### Open VCF Operations Console



Once Firefox has loaded:

1. Click on the **Region A** bookmark folder.
2. Click **VCF Operations**.

## Login to VCF Operations Console

VMware Cloud Foundation

Operations™

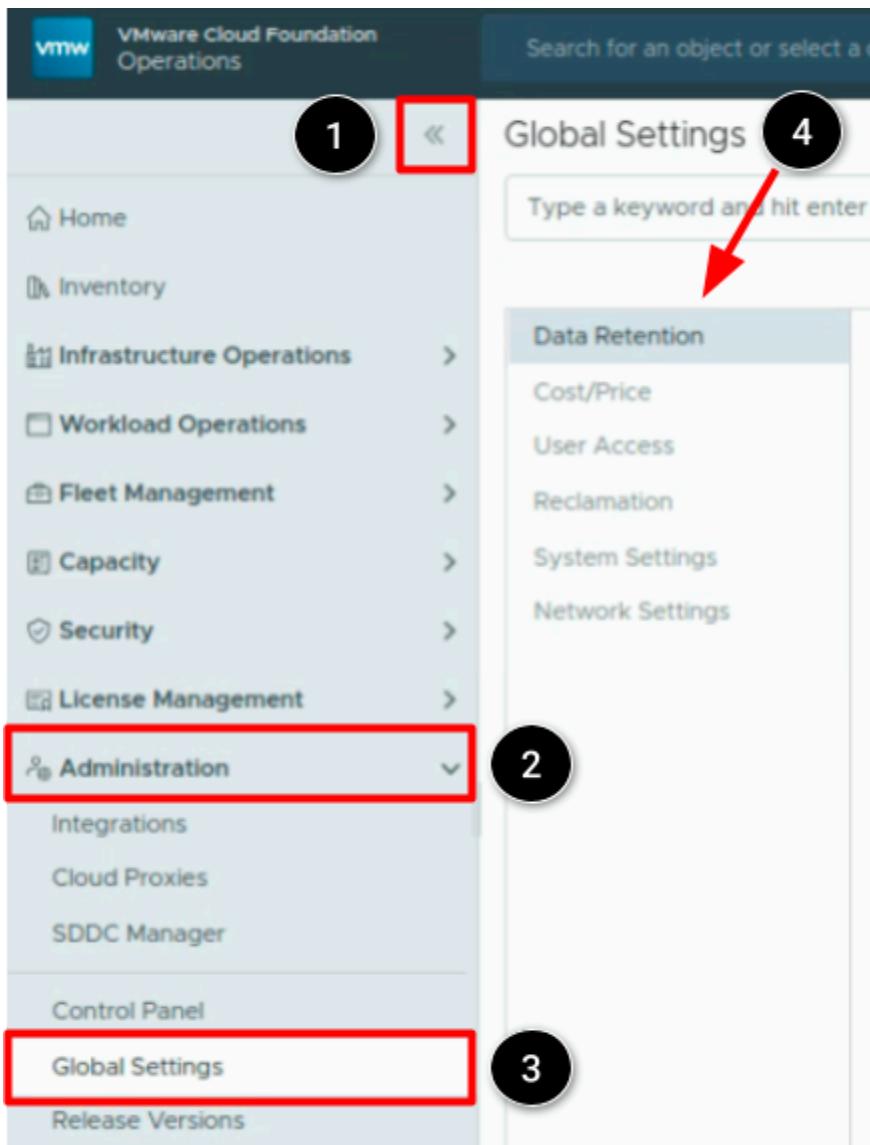
The screenshot shows the VMware Cloud Foundation Operations login interface. It includes the following fields:

- Login Method \***: A dropdown menu with "Local Account" selected, circled as step 1.
- Username \***: An input field containing "admin", circled as step 2.
- Password \***: An input field showing redacted text, circled as step 3.
- LOG IN**: A blue button at the bottom left, circled as step 4.

The credentials for **admin** should already be cached in the browser window.

At the VCF Operations login prompt, select the login method and type in the following user and password information:

1. At the Login Method dropdown, select **Local Account**.
2. At the username field, type **admin**.
3. At the password field, type **VMware123!VMware123!**
4. Click **LOG IN**.

**Navigate to Global Settings**

At the VCF Operations Home page:

1. **OPTIONAL** Click on >> to expand the left hand side menu, if not already expanded.
2. Click on **Administration**.
3. Click on **Global Settings**.
4. Observe the Global Settings Categories.

The Global Settings determine how VCF Operations retains data, keeps connection sessions open, and other settings. These are system settings that affect all users. Some of these settings are not editable. The global settings are grouped into these categories:

- Data Retention
- Cost/Price
- User Access
- Reclamation
- System Settings
- Network Settings

## Review the Currency Setting

The screenshot shows the 'Cost/Price' settings page. On the left sidebar, 'Cost/Price' is highlighted with a red box and circled with a black number 1. The main content area has three sections: 'Show Cost Savings' (with an 'Activated' toggle switch), 'Currency' (showing '(USD) US\$' and an 'EDIT CURRENCY' button circled with a black number 3), and 'Cost Calculation' (with an 'Activated' toggle switch and a dropdown menu set to '9:00 PM'). A red arrow points from step 2 to the 'EDIT CURRENCY' button.

**Cost/Price**

View and manage cost and price calculations related system settings.

**Show Cost Savings**

Controls whether to show Cost savings in all pages under 'Optimize'.

**Currency**

This is the currency used for cost calculation. The default value is empty.

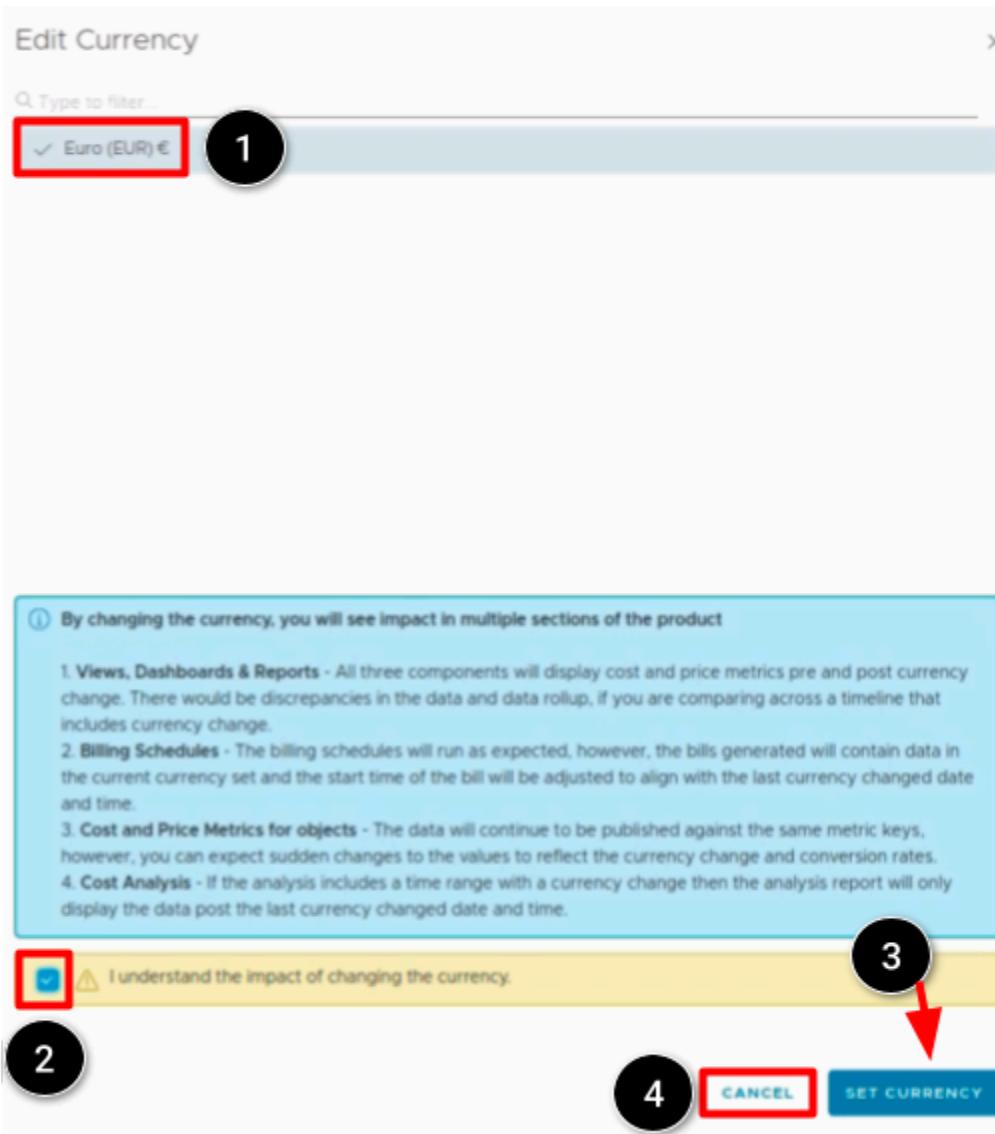
**Cost Calculation**

Host time to calculate the costs for objects.

(USD) US\$ **EDIT CURRENCY**

In the Global Settings Categories:

1. Click on **Cost/Price**.
2. Observe that the currency is set to US Dollars in our environment and that there exists the option to **EDIT CURRENCY**.
3. Click on **EDIT CURRENCY**.

**Navigate to Edit Currency**

We are now presented with the screen to edit the currency for cost calculation. For demonstration purposes:

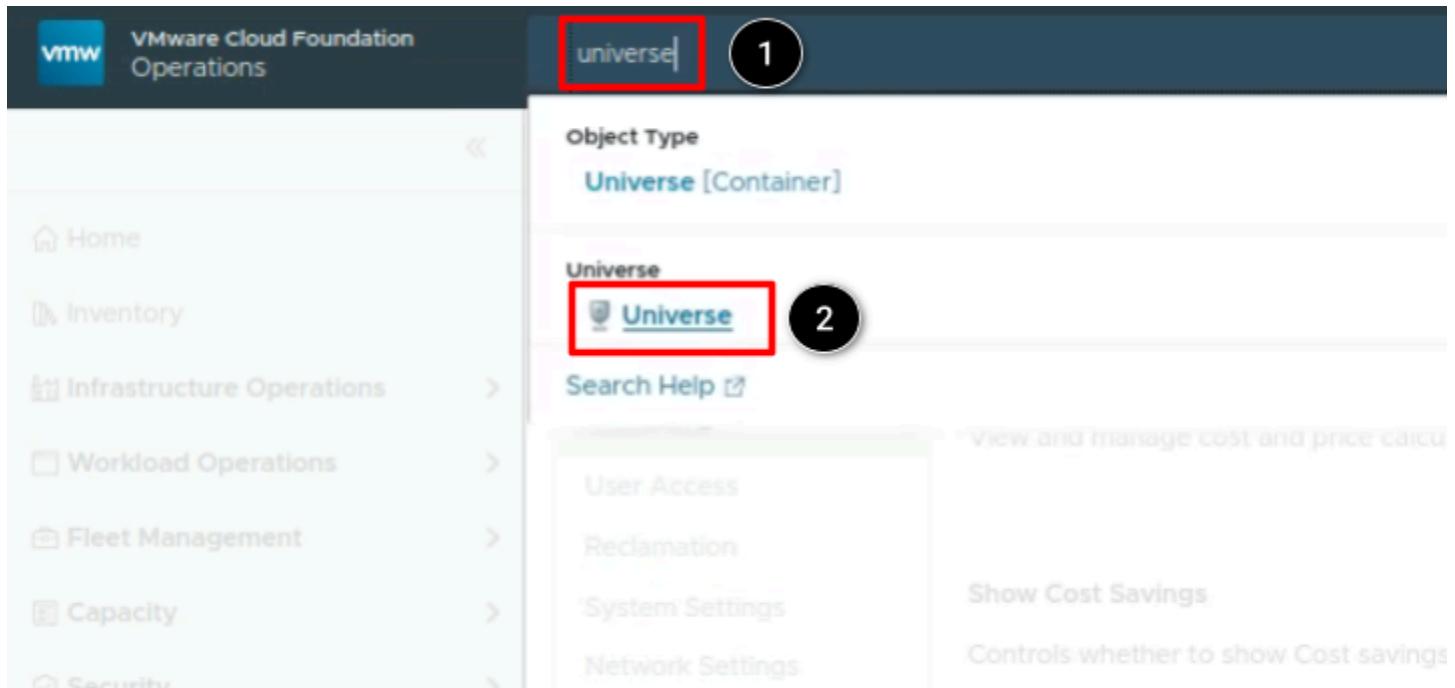
1. Click on the currency type search field and type EUR to change the currency from US Dollars to Euros.
2. Click on the **checkbox** in the yellow box agreeing that we understand the impact of changing the currency.
3. With the new currency type selected and the checkbox ticked, observe that the **SET CURRENCY** button is now enabled.
4. Click on **CANCEL** as we will not be editing the currency.

It is worth highlighting that, by editing the currency, we will see impact in multiple sections of VCF Operations:

- **Views, Dashboards, and Reports:** all three will display data with the old and new currency and there will be discrepancies if we compare data across a timeline that includes currency change.
- **Billing Schedules:** these will get updated if the currency is changed between billing cycles. New scheduled bills are generated with the new currency and the currency change date as the start date. We must manually generate a bill for the timeline before that for the older currency. In the case of Tenant Bills, if the provider generates the bill during the currency change period, tenants will see multiple bills.
- **Cost and Price Metrics for objects:** those collected after the update will display the new currency value. Older metrics that are already published continue to display the old currency value.

- **Cost Analysis:** the analysis report only displays data with the new currency, if the analysis includes a time range with a currency change.

## Navigate to Object Universe

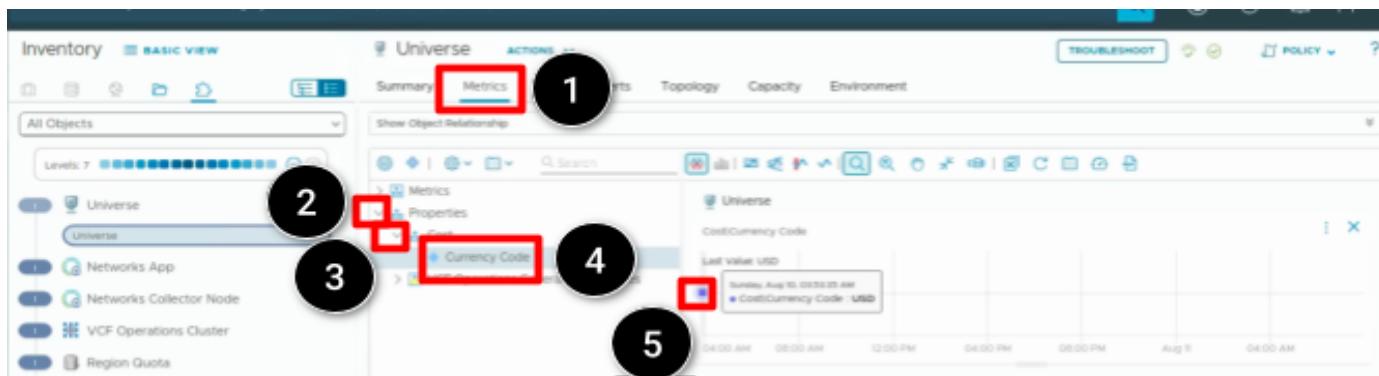


To view the Currency Change Timeline after editing the currency, we could navigate to the Currency Code property under the Universe object type.

To navigate to object Universe:

1. In the search bar at the top of the GUI, type **universe**.
2. Click on **Universe** under the Universe object type.

## Navigate to the Currency Change Timeline



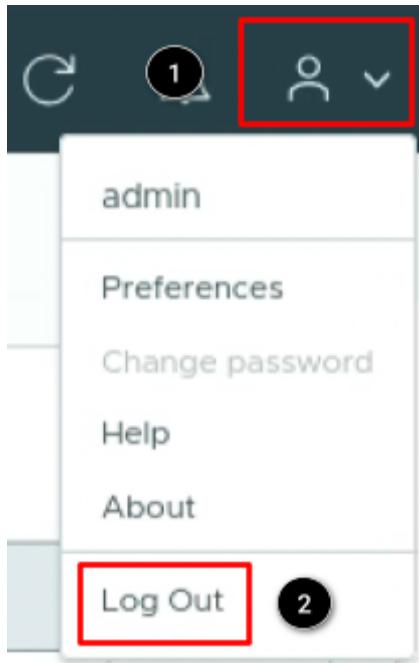
With object Universe selected:

1. Click on the **Metrics** tab.
2. Click on > next to Properties (or double click on **Properties**) to expand the item.
3. Click on > next to Cost (or double click on **Cost**) to expand the item.

4. Double click on **Currency Code**.
5. Hover over the **purple square** within the Currency Change Timeline and observe the timestamp associated with it.

In this case, the Currency Change Timeline depicts the point in time when currency was initially set to USD. Please note that the data depicted as part of this timeline might vary when you are going through the lab.

## Logout



To Log out of VCF Operations:

1. Click the **User icon** to open the settings menu.
2. Click **Log Out**.

## Conclusion

In this module, we familiarised ourselves with the concept of currency. We explored where we can find and edit the currency setting in VCF Operations, we highlighted the impact of editing the currency and navigated to the currency change timeline.

From here you can:

- Take this quick survey to provide feedback about your experience with VCF 9.0
- Continue with the next lab module.
- Click [vlp:table-of-contents]Show Table of Contents] to jump to any module or lesson in this lab.
- End your lab and return in the future.

## Module 3 - Understanding Out-of-the-Box Cost Dashboards (30 minutes) Beginner

In this module, we will explore the predefined Cost Dashboards in VCF Operations and familiarise ourselves with a subset of those.

The dashboards in the cost category cater to cloud administrators who are responsible for managing the expenses related to their cloud infrastructure. Using Cost Dashboards, we can compare the cost of VMware Cloud infrastructure with other cloud platforms. We can analyze the cloud comparison results and identify the opportunities to manage our cloud resources efficiently.

## Login to VCF Operations

In the following few pages, we will walk through the process for logging in to VCF Operations.

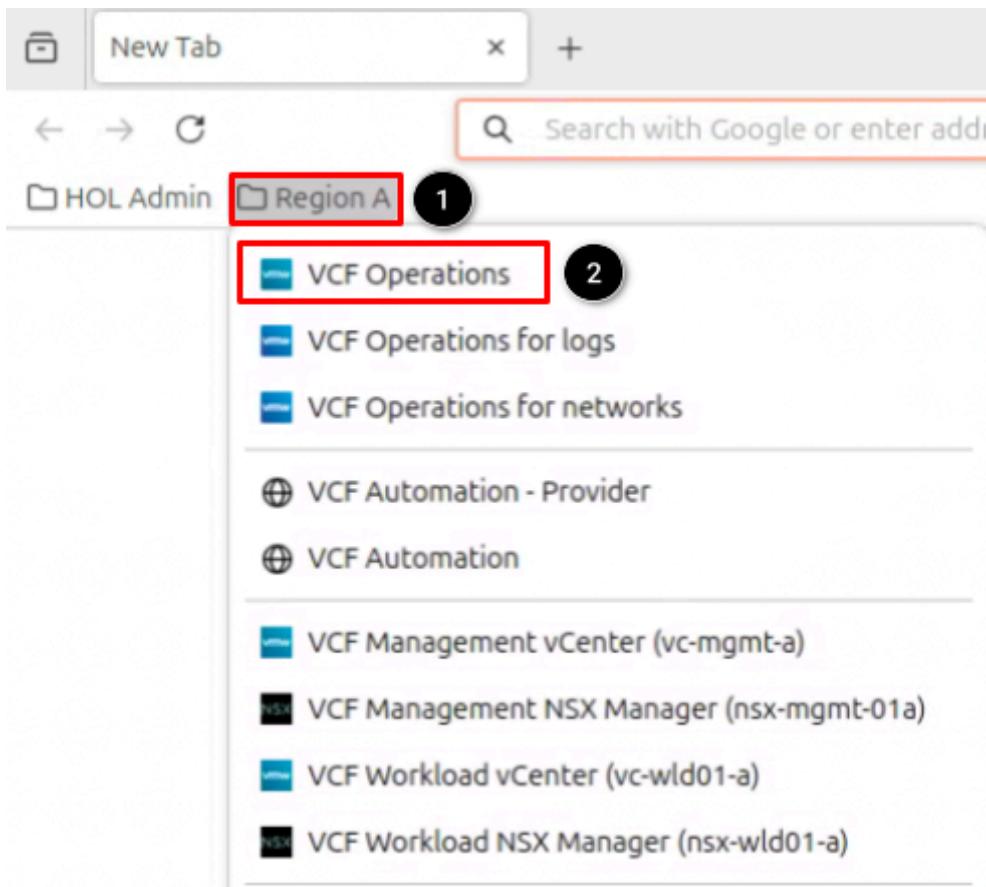
### Start Firefox



Open the Firefox Browser from the Linux Task Bar.

1. Click on the Firefox icon to open the browser.

### Open VCF Operations Console



Once Firefox has loaded:

1. Click on the **Region A** bookmark folder.
2. Click **VCF Operations**.

**Login to VCF Operations Console**

# VMware Cloud Foundation Operations™

The screenshot shows the VMware Cloud Foundation Operations login interface. It includes the following elements:

- Login Method \***: A dropdown menu with "Local Account" selected, highlighted by a red box and circle 1.
- Username \***: An input field containing "admin", highlighted by a red box and circle 2.
- Password \***: An input field showing redacted text, highlighted by a red box and circle 3.
- LOG IN**: A blue button with white text, highlighted by a red box and circle 4.

The credentials for **admin** should already be cached in the browser window.

At the VCF Operations login prompt, select the login method and type in the following user and password information:

1. At the Login Method dropdown, select **Local Account**.
2. At the username field, type **admin**.
3. At the password field, type **VMware123!VMware123**.
4. Click **LOG IN**.

## Cost Dashboards Overview

### Out-Of-The-Box Cost Dashboards

The predefined Cost Dashboards can be grouped into the following categories:

- Provider Layer Dashboards
- Consumer Layer Dashboards
- Cost Optimization Dashboards

### Provider Layer Dashboards

The Provider Layer Dashboards of VCF Operations helps us to know how a customer can analyze the Return on Investment for the virtual infrastructure used in the customer's environment.

The available dashboards for providers are:

- Assess Cost Dashboard
- Base Rate Analysis Dashboard
- Business Applications Cost versus Price Dashboard
- Datacenter Cost Drivers Dashboard

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

- Reclaimable Hosts Dashboard
- Server Hardware Depreciation Dashboard
- VM Cost versus Price Dashboard

### Consumer Layer Dashboards

The Consumer Layer Dashboards of VCF Operations helps us to know how a customer can do a deeper analysis of the Return on Investment from the consumer perspective.

The available dashboards for consumers are:

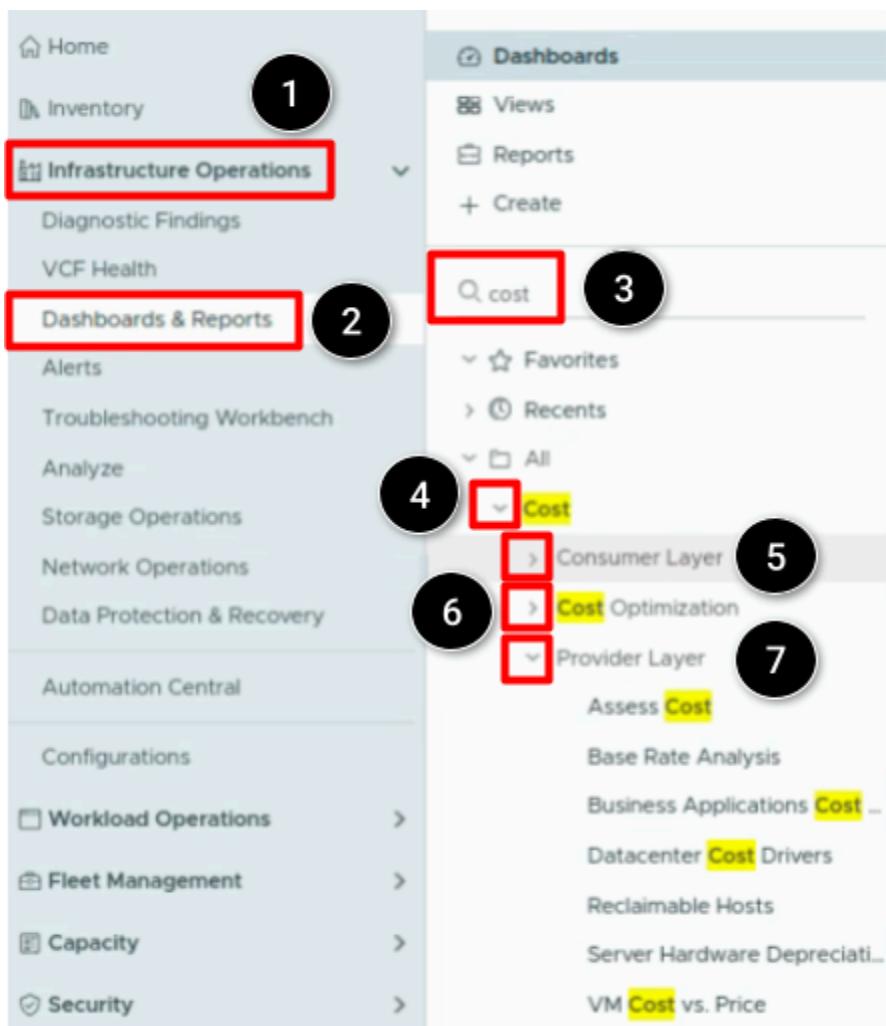
- Chargeback (VM Price) Dashboard
- Showback (Business Application Cost) Dashboard
- Showback (VM Cost) Dashboard
- Showback (vSphere Pod Cost) Dashboard

### Cost Optimization Dashboards

The Cost Optimization Dashboards are as follows:

- Cost Optimization Dashboard
- Potential Cost Savings Dashboard
- Realized Cost Savings Dashboard
- Total Cost of Ownership Dashboard
- VM Rightsizing Details Dashboard

## How to Locate the Cost Dashboards



To locate the out-of-the-box Cost Dashboards, from the Home Screen:

1. Click on **Infrastructure Operations**.
2. Click on **Dashboards & Reports**.
3. In the Dashboards search field, type “**cost**”.
4. Click on the **chevron** next to **Cost** to review the available dashboard categories.
5. Click on the **chevron** next to **Consumer Layer** to review the dashboards included in this category. The expanded list is not shown in the screenshot.
6. Click on the **chevron** next to **Cost Optimization** to review the dashboards included in this category. The expanded list is not shown in the screenshot.
7. Click on the **chevron** next to **Provider Layer** to review the dashboards included in this category.

## Assess Cost Dashboard

### Navigate to the Assess Cost Dashboard

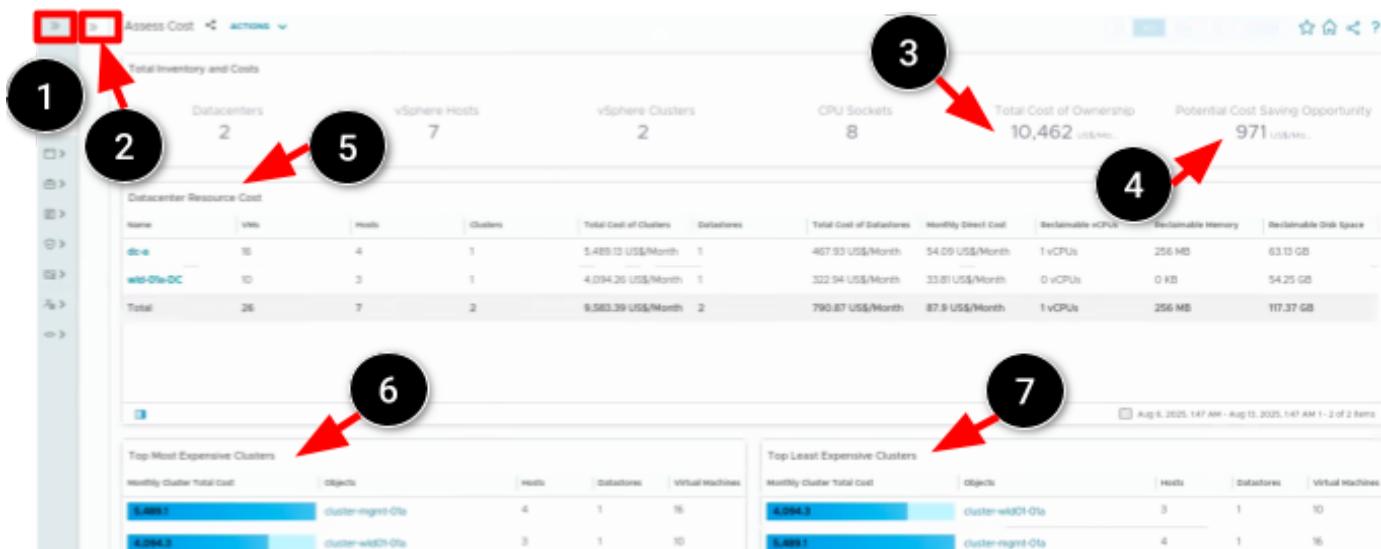


We will be reviewing our first cost-related dashboard, the Assess Cost Dashboard.

To navigate to the Assess Cost dashboard:

1. Under Provider Layer, click on **Assess Cost**.

### Review the Assess Cost Dashboard



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

1. Click << to minimize the Navigation menu.

2. Click << to minimize the Dashboards menu.

3. In the **Total Inventory and Costs** section, which presents a high level picture of our infrastructure like number of Datacenters, vSphere Hosts, vSphere Clusters and CPU Sockets, observe that we are presented with data on **Total Cost of Ownership** per month for the infrastructure.

4. In the **Total Inventory and Costs** section, observe that we are also presented with data on **Potential Cost Saving Opportunity** per month for the infrastructure.

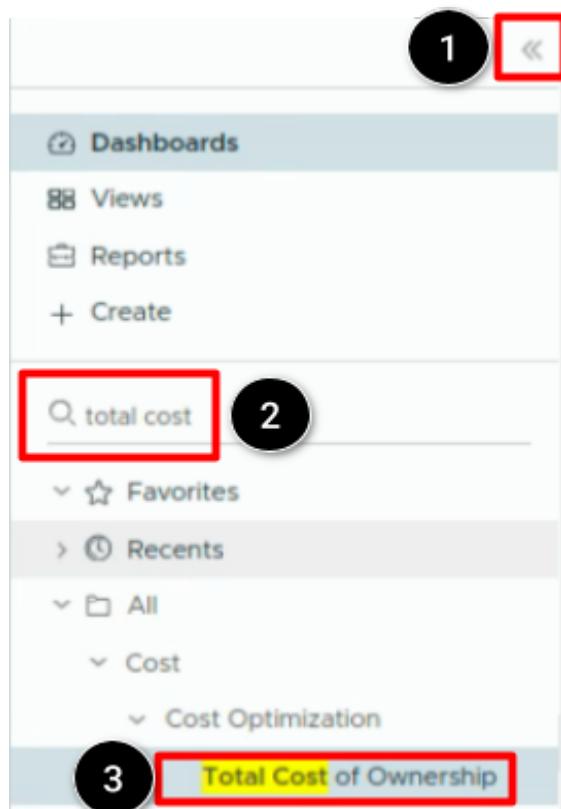
5. In the **Datacenter Resource Cost** section, observe that we can view the details of the division of infrastructure investments across all data centers. The dashboard provides the magnitude of each data center in terms of the number of physical servers, clusters, virtual machines and datastores, and presents Total Cost of Clusters and Total Cost of Datastores per data center.

6. In the **Top Most Expensive Clusters** section, the dashboard displays the top most costly clusters forming part of our infrastructure, so that we have visibility of the investment across clusters of different quality offered across all vCenter Servers.

7. In the **Top Least Expensive Clusters** section, the dashboard displays the top least costly clusters forming part of our infrastructure.

## Total Cost of Ownership Dashboard

### Navigate to the Total Cost of Ownership Dashboard



1. Click >> to expand the Dashboards menu.
2. In the Dashboards search field, type “**total cost**”.
3. Under Cost Optimization, click on **Total Cost of Ownership**.

## Review the Total Cost of Ownership Dashboard

The screenshot shows the 'Total Cost of Ownership' dashboard. A red box highlights the 'Actions' button in the top right corner. A large black circle with the number '1' is placed over the 'Cost Driver Breakdown' section. Below it, a detailed diagram illustrates the cost drivers for a virtual machine. It starts with 'Compute' and 'Network' costs, which further break down into 'Processor', 'Memory', 'Storage', 'Network', and 'Virtual Machine' costs. These are influenced by 'Cost Drivers' like 'Server Hardware (Owned)', 'Host OS License', 'Facilities', 'Server Labor', 'Network', 'Storage', 'Host Additional Costs', and 'VM Direct Costs'. The total cost is calculated as the sum of these individual components.

The Total Cost of Ownership Dashboard helps us 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.

1. Click << to minimize the Dashboards menu.

This dashboard consists of multiple widgets. 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.

Please note that the lab environment represents a small footprint, so we do not expect to see the depth of information we would normally see in a Production environment.

## Cost Driver Breakdown

The screenshot shows the 'Cost Driver Breakdown' section of the dashboard. A red box highlights the 'Actions' button in the top right corner. A large black circle with the number '1' is placed over the first table. The table lists various cost drivers and their monthly costs:

Cost Driver	Cost (\$/Month)
Server Hardware (Owned)	1,860.56 US\$/Month
Server Hardware (Leased)	0 US\$/Month
Host OS License	3,507.06 US\$/Month
Maintenance	1,138.11 US\$/Month
Facilities	539.32 US\$/Month
Server Labor	19.67 US\$/Month
Network	2,520 US\$/Month
Storage	790.87 US\$/Month
Host Additional Costs	0 US\$/Month
VM Direct Costs	87.9 US\$/Month

Below this table is a horizontal bar chart showing the cumulative cost across different categories. A red arrow points to the vertical scrollbar on the right side of the dashboard interface.

1. Use the **sidebar** on the right hand side to scroll down, so that the **Cost Driver Breakdown** section is visible.

This set of widgets show how cost drivers affect the total cost of ownership, i.e., total cost of ownership is broken down by the individual cost drivers.

Improving the accuracy of the costs within this set of widgets can be achieved by editing the cost drivers. We will review how to modify cost drivers in a subsequent module in this lab.

## Cost of Capacity Used and Capacity Remaining



**[NOT SHOWN]** Use the **sidebar** on the right hand side to scroll down, so that the **Cost of Capacity Used and Capacity Remaining** section is visible.

This set of widgets includes:

1. **Cost of Capacity Used vs. Remaining Capacity** - includes definitions of each component in the widgets:
  - a. Total Cost of Ownership
  - b. Cost of Compute Capacity Used
  - c. Cost of Compute Capacity Remaining
  - d. Cost of Storage Capacity Used
  - e. Cost of Storage Capacity Remaining
  - f. VM Direct Costs
2. **Cost of Capacity Used** - identifies compute and storage costs of existing VMs as well as costs remaining (unused by VMs) for both components.
3. **Capacity Remaining** - estimated number of VMs that could be added to the environment based upon current capacity averages (average VM profile).
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 cost lines below the chart allows us to hide/unhide specific items to be displayed in the chart.

## Cost per Datacenter



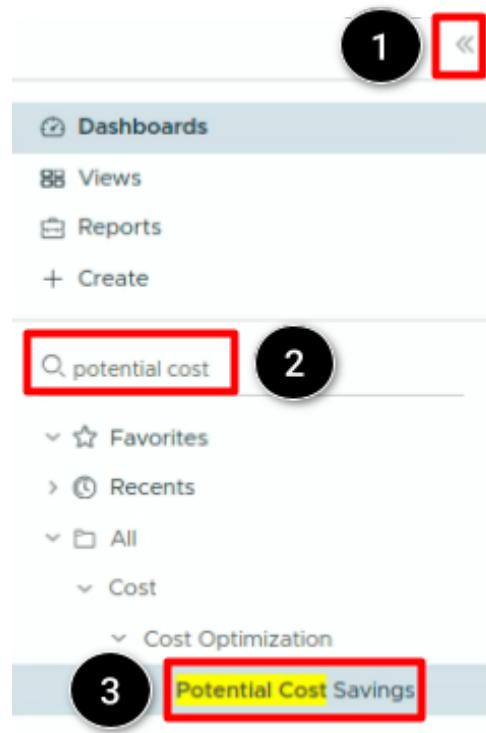
**[NOT SHOWN]** Use the **sidebar** on the right hand side to scroll down, so that the **Cost per Datacenter** section is visible.

As we have two Datacenters configured in this lab, we are presented with two entries in this set of widgets, which includes:

1. **Cost per Datacenter** - identifies the total cost (currently running VMs) in a datacenter. This 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.
2. **Cost per Datacenter** - graphical chart showing the trend over time of how the cost per data center has changed. The cost per datacenter would be affected by adding/removing more capacity, adjusting cost drivers or hosting more workloads.

## Potential Cost Savings Dashboard

### Navigate to the Potential Cost Savings Dashboard



1. Click >> to expand the Dashboards menu.
2. In the Dashboards search field, type “**potential cost**”.
3. Under Cost Optimization, click on **Potential Cost Savings**.

### Review the Potential Cost Savings Dashboard

The screenshot shows the main content area of the Potential Cost Savings dashboard. 
 1. A red box highlights the 'About this Dashboard (Expand to View)' link at the top left. 
 2. A red box highlights the 'Actions' dropdown menu icon at the top right.

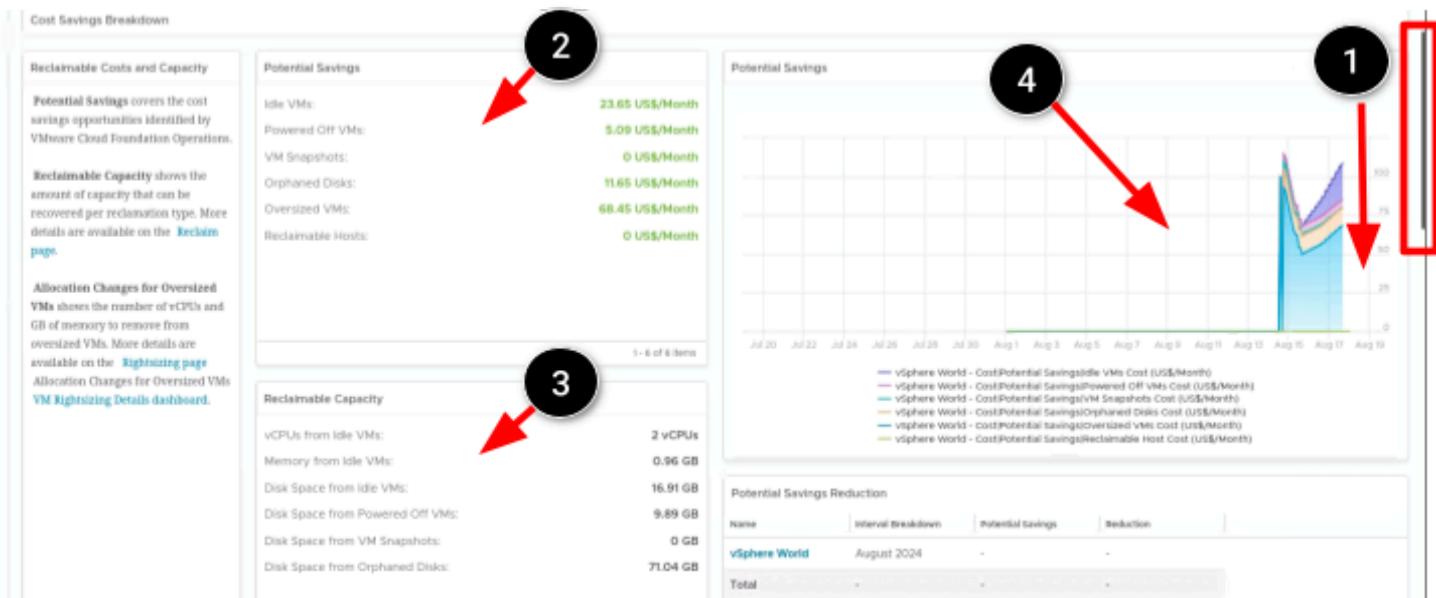
## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

The Potential Cost Savings Dashboard helps us measure the cost saving as reported by VCF 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.

1. Click << to minimize the Dashboards menu.
2. Click the **chevron** to expand the About this Dashboard section.

This dashboard consists of multiple widgets. 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 Savings Breakdown - Part 1



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 VCF Operations for:

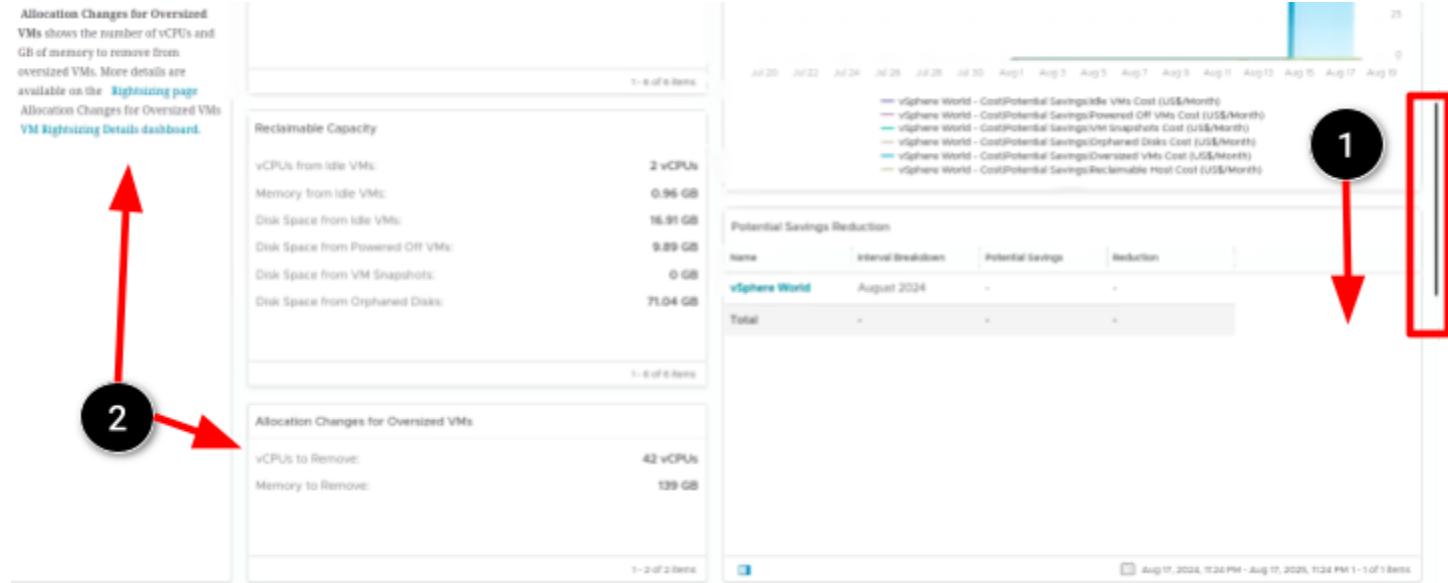
- idle VMs
- powered off VMs
- VM snapshots
- orphaned disks
- oversized VMs
- reclaimable hosts

1. Use the **sidebar** on the right hand side to scroll down, so that the **Cost Savings Breakdown** section is visible.
2. **Potential Savings** - currency savings for identified idle VMs, powered off VMs, VM snapshots, orphaned disks, oversized VMs, and reclaimable hosts.
3. **Reclaimable Capacity** - amount of capacity that can be recovered per reclamation type, i.e., vCPUs, memory and disk space for idle VMs and disk space for powered off VMs, VM snapshots and orphaned disks.
4. **Potential Savings** - graphical chart depicting savings for each category of cost savings opportunities. Note: Clicking on individual cost lines below the chart allows us to hide/unhide specific items to be displayed in the chart.

Note that, in this instantiation of our lab environment, the highest potential savings opportunity comes from Oversized VMs, which represents potential savings of 68.45 USD per month. The second highest potential savings opportunity comes from Idle VMs, where we could potentially save 23.65 USD per month. In relation to reclaimable capacity, the disk space from orphaned disks at 71.04 GB stands out as a significant capacity reclamation opportunity.

Due to the nature of the Hands-on Labs environment, potential savings and reclaimable capacity data might vary from the above screenshot.

## Cost Savings Breakdown - Part 2



1. Use the **sidebar** on the right hand side to scroll down, so that the **Allocation Changes for Oversized VMs** section is visible.
2. **Allocation Changes for Oversized VMs** - as part of the **Cost Savings Breakdown** widget, we can also see the Allocation Changes for Oversized VMs, which shows the number of vCPUs and GB of memory to remove from oversized VMs.

## Reclaimable vCPUs, Memory and Disk Space



[NOT SHOWN] Use the **sidebar** on the right hand side to scroll down, so that the **Reclaimable** sections are visible. These depict the metric details for reclaimable vCPUs, reclaimable memory, and reclaimable disk space.

The available graphs are:

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 lines below the chart allows us to hide/unhide specific items to be displayed in the chart.

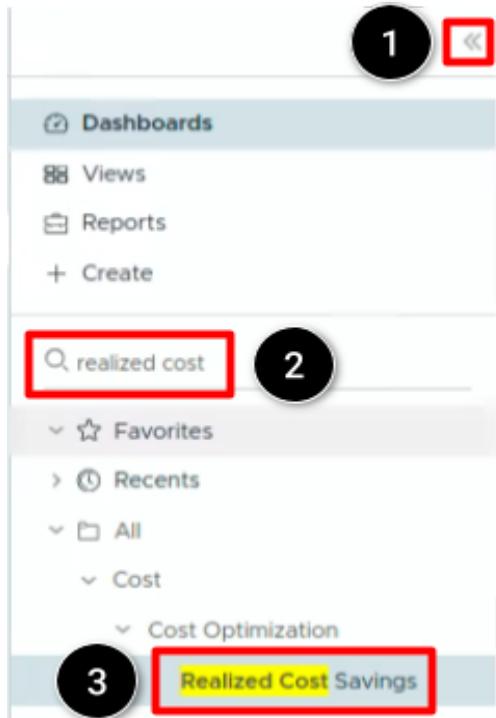
## Optimization Opportunities Breakdown



**[NOT SHOWN]** Use the **sidebar** on the right hand side to scroll down, so that the **Optimization Opportunities Breakdown** section is visible. This section covers the projected costs to improve performance for undersized VMs as identified by VCF Operations. It also shows the number of vCPUs and GB of memory to add to undersized VMs.

1. **Optimization Opportunities Cost** - covers the projected costs to improve performance.
2. **Allocation Changes for Undersized VMs** - shows the number of vCPUs and GB of memory to add to undersized VMs.
3. **Optimization Opportunities Cost** - graphical chart showing cost increases/decreases over the past 30 days.

Due to the nature of the Hands-on Labs environment, optimization opportunities and associated data might vary from the above screenshot.

**Realized Cost Savings Dashboard****Navigate to the Realized Cost Savings Dashboard**

1. Click >> to expand the Dashboards menu, if not already expanded.
2. In the Dashboards search field, type “**realized cost**”.
3. Under Cost Optimization, click on **Realized Cost Savings**.

**Review the Realized Cost Savings Dashboard**

The **Realized Cost Savings Dashboard** helps us quantify the realized cost savings from actions performed that are related to recommendations provided by VCF 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.

1. Click << to minimize the Dashboards menu.
2. Click the **chevron** to expand the About this Dashboard section.

This dashboard consists of multiple widgets. 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.

**Realized Cost Savings and Capacity Reclaimed**

**[NOT SHOWN]** Use the **sidebar** on the right hand side to scroll down, so that the **Realized Cost Savings and Capacity Reclaimed** sections are visible.

The available widgets are:

1. **Realized Costs Savings and Capacity Reclaimed** - definitions of each metric in the section.
2. **Realized Savings** - currency savings from reclamation opportunities recommended by VCF Operations.
3. **Realized Savings** - graphical chart depicting realized savings per reclamation category. Note: Clicking on individual costs below the Realized Savings chart would allow us to hide/unhide specific items to be displayed in the chart.
4. **Reclaimed Capacity** - shows the amount of capacity reclaimed in terms of vCPUs/Memory from Idle VMs, Disk Space from Idle VMs/Powered Off VMs/Snapshots/Orphaned Disks, and Memory from Oversized VMs.
5. **Allocation Changes for Oversized VMs** - shows the number of vCPUs and GB of memory removed from formerly Oversized VMs.

Note that, in this instantiation of our lab environment, the highest realized savings come from Oversized VMs, representing savings of 118.89 USD per month. In relation to reclaimed capacity, the memory from Oversized VMs at 45.66 GB stands out as the main category.

Due to the nature of the Hands-on Labs environment, potential savings and reclaimable capacity data might vary from the above screenshot.

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

### Reclaimed vCPUs, Memory and Disk Space



**[NOT SHOWN]** Use the **sidebar** on the right hand side to scroll down, so that the **Reclaimed** sections are visible. These depict the metric details for reclaimed vCPUs, reclaimed memory, and reclaimed disk space based on recommendations from VCF Operations.

The available graphs are:

1. **Reclaimed vCPUs** - total number of vCPUs reclaimed over the past 30 days.
2. **Reclaimed Memory** - total Memory (GB) reclaimed over the past 30 days.
3. **Reclaimed Disk Space** - total amount of Disk Space (GB) reclaimed over the past 30 days.

## Cost of Deleted VMs



**[NOT SHOWN]** Use the **sidebar** on the right hand side to scroll down, so that the **Cost of Deleted VMs** section is visible. This section shows the cost of all deleted VMs in the past 30 days, shows the cost of all deleted VMs (by cluster) for the past 30 days, and shows the year-to-date cost of all deleted VMs.

The available widgets are:

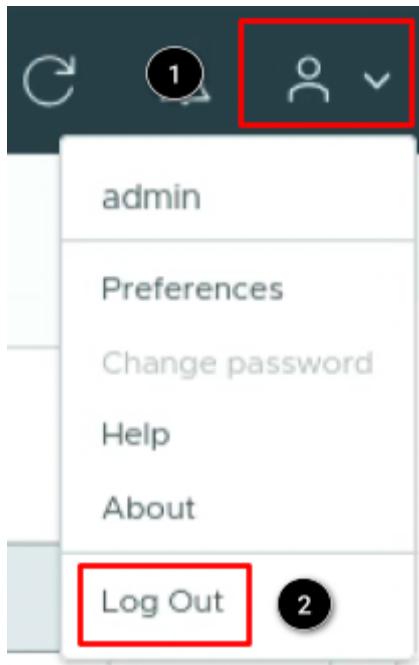
1. **Cost of Deleted VMs** - definitions of each metric in the section.
2. **Cost of Deleted VMs in Past 30 days** - currency cost for deleted VMs over the past 30 days.
3. **Cost of Deleted VMs (Year to Date)** - currency cost for deleted VMs during the current calendar year.

4. **Cost of Deleted VMs by Cluster (30 Days)** - graph showing currency cost for deleted VMs over the past 30 days on a per cluster basis.
5. **Cost of Deleted VMs by Cluster (Year to Date)** - graph showing currency cost for deleted VMs during the current calendar year on a per cluster basis.

Note that, in this instantiation of our lab environment, there exist 2 clusters: cluster-mgmt-01a and cluster-wld01-01a. Out of these 2 clusters, cluster-mgmt-01a is the main contributor to the cost of deleted VMs in the past 30 days as well as throughout the year to date.

Due to the nature of the Hands-on Labs environment, cost of deleted VMs data might vary from the above.

## Logout



To Log out of VCF Operations:

1. Click the **User icon** to open the settings menu.
2. Click **Log Out**.

## Conclusion

In this module, we introduced the pre-defined Cost Dashboards in VCF Operations and delved deeper into the following:

- Assess Cost Dashboard
- Total Cost of Ownership Dashboard
- Potential Cost Savings Dashboard
- Realized Cost Savings Dashboard

From here you can:

- Take this quick survey to provide feedback about your experience with VCF 9.0
- Continue with the next lab module.
- Click [vlp:table-of-contents]Show Table of Contents] to jump to any module or lesson in this lab.
- End your lab and return in the future.

## Module 4 - Cost Drivers (30 minutes) Intermediate

Determining the costs of today's modern private clouds is difficult without an ability to account for each aspect of the service in question. A Virtual Machine for example is made up of servers, storage, networking, software and OS licenses and power fan facility costs. Combining each of these cost drivers into a single repeatable cost is something HyperScalers have done when showing their value.

Now with VMware Cloud Foundation Operations, VMware customers can take advantage of the same capability with enhancements to the existing cost driver tracking mechanisms allowing private cloud consumers to be able to compare features, cost and capabilities with HyperScalers on an even field. Let's take a look.

### Login to VCF Operations

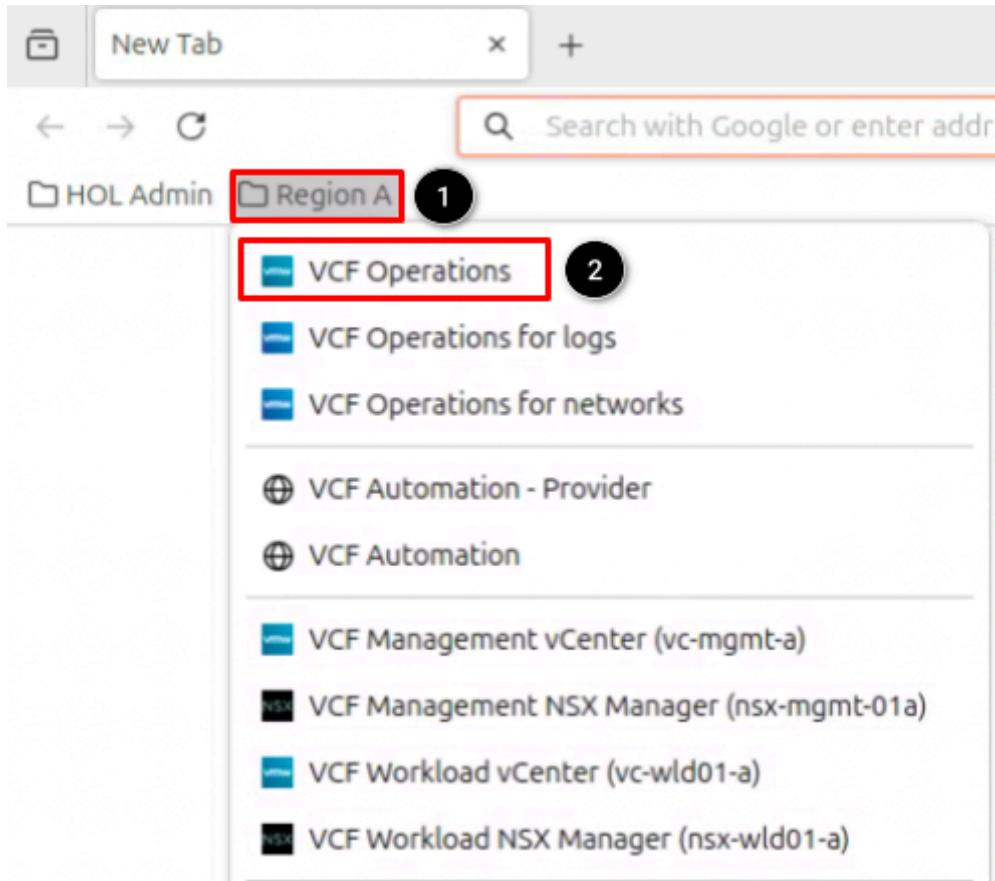
In the following few pages, we will walk through the process for logging in to VCF Operations.

#### Start Firefox



Open the Firefox Browser from the Linux Task Bar.

1. Click on the Firefox icon to open the browser.

**Open VCF Operations Console**

Once Firefox has loaded:

1. Click on the **Region A** bookmark folder.
2. Click **VCF Operations**.

**Login to VCF Operations Console**

# VMware Cloud Foundation Operations™

The screenshot shows the VMware Cloud Foundation Operations login interface. It includes the following fields:

- Login Method \***: A dropdown menu with "Local Account" selected, highlighted with a red border and marked with a circled "1".
- Username \***: An input field containing "admin", highlighted with a red border and marked with a circled "2".
- Password \***: An input field showing redacted text, highlighted with a red border and marked with a circled "3".
- LOG IN**: A blue button with white text, highlighted with a red border and marked with a circled "4".

The credentials for **admin** should already be cached in the browser window.

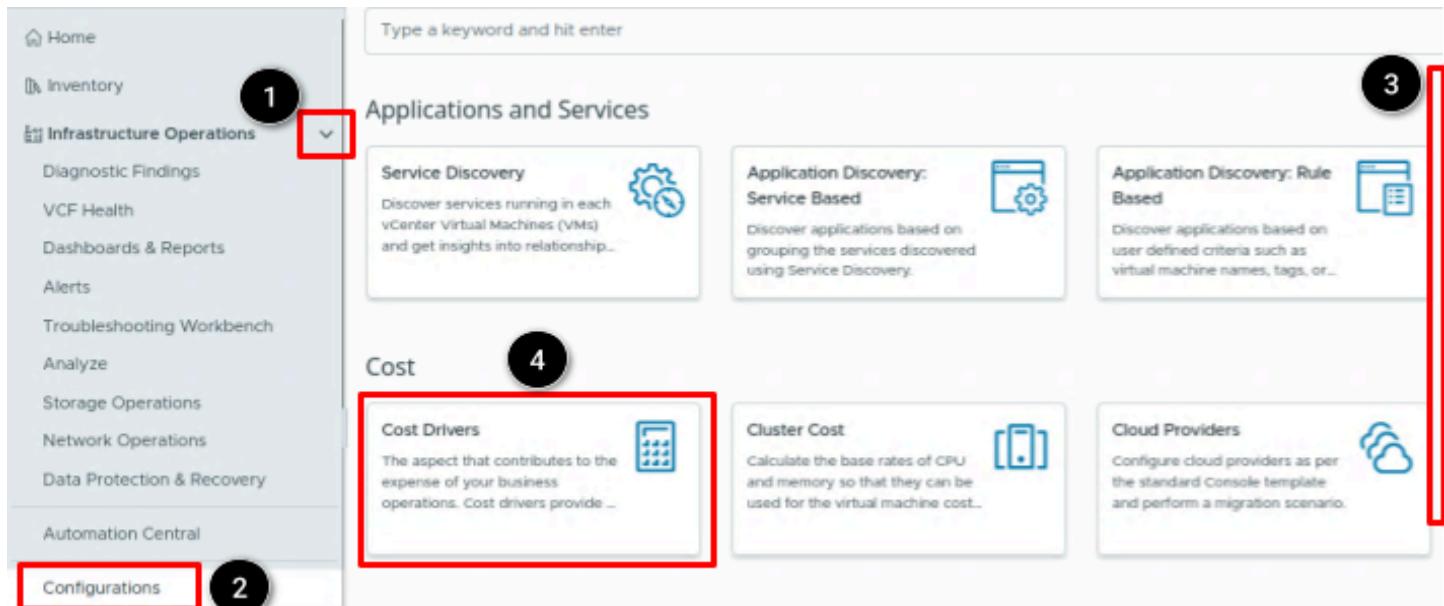
At the VCF Operations login prompt, select the login method and type in the following user and password information:

1. At the Login Method dropdown, select **Local Account**.
2. At the username field, type **admin**.
3. At the password field, type **VMware123!VMware123!**
4. Click **LOG IN**.

## What is a Cost Driver?

A Cost Driver in VMware Cloud Foundation Operations refers to the elements or factors that contribute to the overall expense of running our virtual infrastructure. These drivers help us understand and categorize where costs are incurred within our cloud environment. By identifying and managing these cost drivers, we can gain granular visibility into our expenses, optimize resource utilization, and make informed financial decisions. In this module, we will explore the various types of cost drivers and how they are used to calculate the cost of our private cloud setup.

## Locating Cost Drivers



Cost driver configurations are a dedicated section of the VMware Cloud Foundation Operations application and can be accessed from Infrastructure Operations. Let's navigate there quickly so we can examine the controls. To access and manage cost driver configurations, you'll need to utilize the VMware Cloud Foundation Operations application. Specifically, these configurations are nested under the "Infrastructure Operations" section within the application. We will now proceed to navigate to this particular area to thoroughly inspect the available controls and settings. This will allow for a comprehensive understanding of how cost drivers are defined, measured, and optimized within your cloud environment, ultimately enabling more effective resource allocation and financial planning.

1. Click the down arrow under **Infrastructure Operations**.
2. Click on **Configurations**.
3. Scroll down on the right hand side until we see the **Cost** section.
4. Click on **Cost Drivers**.

## Examining Private Cloud Cost Drivers

The decision to replace servers is often a complex one, involving a balance between performance needs, operational costs, and financial implications. As hardware ages, its performance may decline, leading to slower processing times, increased energy consumption, and a higher risk of failures. These factors can translate into higher operational expenditures and decreased productivity.

However, the financial impact of replacing servers prematurely, before their useful life for accounting purposes has expired, can be substantial. For instance, if a server with a five-year depreciation schedule is replaced after only three years, the remaining two years of depreciation expense would need to be accounted for. Therefore, businesses strive to extract as much utility and value as possible from their IT infrastructure before committing to costly upgrades or replacements, and the first step to achieve this is to properly track and account for server depreciation. VMware Cloud Foundation Operations allows businesses and administrators to account for this in an easy to understand manner, let's take a look.

**Locate Settings**

Cost Drivers **SETTINGS**

Configurations / Cost Drivers

Cost Drivers Cluster Cost Cloud Providers

The first step in tracking our depreciation is to understand the server's location and infrastructure type as that can directly impact the model of depreciation we utilize in a later step.

1. Click on SETTINGS.

**Server Depreciation Settings**

Cost Settings - Financial Accounting Model

Infrastructure Type: vCenter

Depreciation years: 5

Depreciation model: Straight Line

vCenter

- vCenter
- VMC on AWS
- Azure VMware Solution
- Google Cloud
- VMware Engine
- VMware Cloud on Dell EMC
- Oracle Cloud
- VMware Solution

CANCEL SAVE

A depreciation model tracks an asset's value decrease over a given period of time. Let's briefly explain the two methods VMware Cloud Foundation offers for tracking depreciation. A server depreciation model is a vital financial tool that tracks a server's diminishing value over its useful life, crucial for accurate operational cost allocation. This accounting practice allows businesses to:

- **Allocate Costs Accurately:** Spread the server's purchase cost over its useful life, matching expenses with revenue for precise profitability and departmental cost assessment.
- **Reflect Asset Value Realistically:** Account for the natural decline in a server's market value due to technological evolution and aging, ensuring financial statements accurately reflect current asset worth.
- **Improve Financial Planning and Forecasting:** Forecast future hardware capital expenditures, manage cash flow, and make informed technology upgrade decisions for long-term strategic planning.

Essentially, it's a systematic way to track asset value decrease. Understanding these models is especially important for IT infrastructure within environments like VMware Cloud Foundation, which offers two primary depreciation methods to suit different financial strategies

Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)  
and reporting needs. Let's quickly define some of the models you have to pick from.

**Straight-Line Depreciation:** Spreads cost evenly over useful life.

Formula:  $(\text{Cost} - \text{Salvage Value}) / \text{Useful Life}$ .

Example: \$10,000 server, \$1,000 salvage, 5 years = \$1,800/year.

**Double Declining Balance (DDB) Depreciation:** Accelerated method; more depreciation early on. Ignores salvage initially but stops at salvage value.

Formula:  $(2 / \text{Useful Life}) * \text{Beginning Book Value}$ .

Example: \$10,000 server, 5 years: Year 1 = \$4,000 ( $\$10,000 * 0.4$ ), Year 2 = \$2,400 ( $\$6,000 * 0.4$ ).

**Max of Double Depreciation:** Chooses the higher of DDB or straight-line depreciation for a period, often used to guarantee minimum depreciation or switch methods later.

1. Here we can select the **Infrastructure Type**, I've copied the dropdown so you can see that we support a vast array of infrastructure hosting options.
2. The number of **years** we want to depreciate the hardware over, different organizations have different standards so we provide the ability to customize this to meet your needs.
3. Here we select the **Depreciation model** we want to use. We briefly described the two models above.
4. Click **CANCEL**.

## Exploring Cost Drivers

The screenshot shows the 'Cost Drivers' section of the VMware Cloud Foundation interface. At the top, there are tabs for 'Cost Drivers', 'Cluster Cost', and 'Cloud Providers'. The 'Cost Drivers' tab is selected.

Below the tabs, a descriptive text explains that Cost Drivers are expense types used by the VCF Operations to calculate the cost of your vSphere On-Prem/VMware Cloud Foundation/VMC On AWS cloud. It notes that the total cloud cost is the sum of cost drivers and that changes are reflected after the next run of the cost engine.

The main area displays a table of cost drivers:

	Private Cloud Cost Driver	Monthly Expense
<input type="checkbox"/>	<a href="#">Server Hardware : Traditional</a>	-
<input type="checkbox"/>	<a href="#">Server Hardware : Hyper-Converged</a>	US\$2.45K
<input type="checkbox"/>	<a href="#">Storage</a>	-
<input type="checkbox"/>	<a href="#">License</a>	US\$14.27K
<input type="checkbox"/>	<a href="#">Applications</a>	-
<input type="checkbox"/>	<a href="#">Maintenance</a>	US\$1.23K
<input type="checkbox"/>	<a href="#">Labor</a>	US\$129.0
<input type="checkbox"/>	<a href="#">Network</a>	US\$2.52K

Several UI elements are highlighted with red boxes and numbered circles:

1. A red box surrounds the 'EXPORT' and 'IMPORT' buttons under the 'Infrastructure Type' heading.
2. A red box surrounds the dropdown menu for 'vCenter' which includes 'vCenter' and 'VMC on AWS'.
3. A red box surrounds the 'Select Datacenter' dropdown menu, which shows 'All Datacenters'.
4. A red box surrounds the 'wld-01a-DC' entry in the expanded datacenter list.
5. A red box surrounds the 'Server Hardware : Hyper-Converged' row in the table.

Here we see the Cost drivers that are available for users to modify directly in the user interface or via an imported .CSV file. For larger more complex environments, exporting the cost drivers and editing them in a CSV format will be recommended but not required. We'll focus on the Server Hardware: Hyper-Converged but you can explore the Server Hardware: Traditional and Storage costs outside of this module.

1. Our first point of focus is the **Import/Export** feature allowing users to modify cost drivers in a .CSV file. For larger environments, exporting and working directly from the CSV may save time.
2. Next, we see the **dropdown** allowing us to manage cost drivers for both On-prem **vCenter** and **VMC on AWS** environments.
3. **Click** the dropdown to see available **Datacenters** to control Cost Drivers from. This shows that we can have multiple cost drivers per Datacenter allowing administrators to account for varying costs.
4. **Select wld-01a-DC**
5. **Click on Server Hardware: Hyper-Converged.**

## Server Hardware: Hyper-Converged

The screenshot shows the 'Server Hardware: Hyper-Converged' page. At the top, there are three navigation tabs: 'Cost Drivers', 'Cluster Cost', and 'Cloud Providers'. Below the tabs, a link '[<< Back To Cost Drivers](#)' is visible. The main title 'Server Hardware : Hyper-Converged' is centered above a descriptive text: '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.' Three specific areas are highlighted with red boxes and numbered 1, 2, and 3:

- 1**: The 'Edit Mode' dropdown menu, which contains two options: 'Edit for All Datacenters' (selected) and 'Edit for specific Datacenter'.
- 2**: The 'Summary' section, which displays the total cost as 'US\$1.56K'.
- 3**: The 'Total Number of Servers' section, which displays the count as '7'.

Upon initially opening our Cost Driver for Hyper-Converged servers, we see 3 very important areas we'll focus on first, let's get started.

1. The ability to edit cost drivers across all DC's or for specific DC's. Customers often have multiple generations of servers or servers with different builds so being able to calculate costs on a per cluster (and host basis as we'll see later) is powerful and gives flexibility for administrators to properly account for hardware costs..
2. The summary costs for our servers is a dynamic number that is generated based on inputs provided by administrators or from base level costs set by default by VMware Cloud Foundation Operations.
3. The total number of servers that are covered by this Cost Metric. In our lab we have 7 hosts that are accounted for with Cost Drivers via the default and custom entries.

Let's scroll down, and view the rest of our screen.

## Examining A Server's Cost

Server Hardware Cost by Server Configuration

Server Group Description	No. of Servers	Monthly Cost
VMware, Inc. VMware20,1 Intel(R) Xeon(R) Gold 6448Y 2.1GHz 1 Sockets 96GB RAM Disk capacity 8x 483GB SSD Disk cache 4x 96GB SSD	1	US\$886.82

You have altogether **1 Server(s)** in this group out of which **0** Server(s) are customized for purchase date, purchase type, cost per server or compute percentage.  
**1 Server(s)** and any new server(s) with identical configuration will use values under the highlighted row.  
Reference values are ( Purchase Date : 1/1/2024, Purchase Type : Owned, Reference cost : US\$53.21K , Compute Percentage : 73.22 )

One key thing to remember is that here we are only calculating the server cost itself, not the application, OS, storage or network costs. We'll take a look at another Cost metric here shortly but for the moment, let's examine our Hyper-Converged host.

VMware Cloud Foundation operations receives an inventory of hosts from the Virtual Centers connected to it and breaks them down by cluster and host type. Examining the 5 server types you'll notice they each have slight differences, be it Memory, CPU type or Storage. This can lead to a large list of nearly identical servers, but we can account for this with the provided tools.

Let's examine our first server and go over what each of the fields represents.

1. **Expand** the carrot next to our first Hyper-Converged Server.
2. Servers are automatically organized into known categories based on their hardware configuration with the server count easily displayed (in this case a single server.). In this example, we have a single host that matches the specification of: VMware, Inc. VMware20,1 Intel(R) Xeon(R) Gold 6448Y 2.1GHz 1 Sockets 96GB RAM Disk capacity 8x 483GB SSD Disk cache 4x 96GB SSD
3. Select the **purchase date** of the server. This can be important because Cloud Foundation Operations takes into account depreciation of the server (covered in another module) so it needs to know when the server was purchased. Additionally, you may add hosts that match the configuration at a later date and thus it needs to have the correct purchase date. We'll examine how to do this in a later step.
4. We can pick **Owned or Leased** for our servers which dictates how we account for the follow up metric 'Cost Per Server'
  - **Owned** : Ownership of asset (servers) lies with you and the 'Cost per Server' entered will be amortized monthly based on selected depreciation model.
  - **Leased**: Ownership of asset (servers) does not belong to you and 'Cost per Server' entered will apply as monthly rental directly, no depreciation logic involved.
5. The **Cost Per Server** is entered here and is used to calculate the purchase cost or the monthly cost.
6. The **Compute Percentage** is a little complicated so let's dive into it briefly. A Virtual Machines cost is typically divided into several cost driver categories, such as:
  - Compute (CPU + Memory)
  - Storage
  - Network
  - Licensing
  - Overhead

The Compute Percentage metric defines how much of the total VM cost is attributed to CPU and memory usage or allocation. For example:

If the total cost per VM is \$100/month and Compute % is set to 60%, then \$60/month is considered the cost of CPU and memory.

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

7. The **Purchase Cost** of the server is displayed here along with the Monthly cost which is the calculated monthly price as dictated by the depreciation algorithm we explored earlier in the module.
8. Finally, let's click on **+ Add Cost Per Server**.

### Customizing a Server's Cost

Server Group Description	No. of Servers	Monthly Cost
VMware, Inc. VMware20.1 Intel(R) Xeon(R) Gold 6448Y 2.1GHz 1 Sockets 96GB RAM Disk capacity 8x 483GB SSD Disk cache 4x 96GB SSD	1	US\$886.82

You have altogether 1 Server(s) in this group out of which 0 Server(s) are customized for purchase date, purchase type, cost per server or compute percentage.  
1 Server(s) and any new server(s) with identical configuration will use values under the highlighted row.  
Reference values are ( Purchase Date : 01/01/2024, Purchase Type : Owned, Reference cost : US\$53.21K , Compute Percentage : 73.22 )

Number of Servers	Purchase Date	Purchase Type	Cost Per Server	Compute Percentage (%)	Purchase Cost	Monthly Cost	Remove
<b>Select Server(s) for customization</b>	01/01/2024	Owned	US\$ 53209	73.22	US\$53.21K	US\$886.82	
1 Server(s)		Owned	US\$ 53209	73.22	US\$53.21K	US\$886.82	NA

+ ADD cost  
**Select Server(s) for customization** selected to assign custom purchase cost  
 esx-01a.site-a.vcf.lab  
OK

Infrastructure owners will purchase the hardware they need to meet workloads demands but over time, these workload demands may increase requiring additional servers to be purchased. From a cost perspective, we need to be able to account for different depreciation timelines and possible cost increases of hardware over time.

To account for this, Cloud Foundation Operations allows administrators to create custom entries under otherwise identical server families allowing us to have servers that are identically configured from a RAM, Disk, and CPU perspective but that have different purchase dates, purchase types and purchase prices. Let's examine how we create these custom entries.

1. Click on **Select Server for Customization**.
  - o As Cloud Foundation Operations groups and organizes hosts based on their hardware configuration, all hosts matching a given configuration will be lumped into a single cost driver record. We have the ability to select a server or group of servers and create a new cost driver for them.
2. Identical to our existing default configuration, we now have the ability to specify the specific cost drivers for this new entry.
  - o Purchase Dates
  - o Purchase Types (Leased or Owned)
  - o Costs per Server
  - o Compute Percentage
3. As we are only exploring how this mechanism works, we'll clean up this temporary entry. Click the **trashcan** to remove this entry.
4. Click on **Back to Cost Drivers** near the top of the page, we will need to scroll up to the top of the page (not shown here).

## Examining Software Licensing

### Software Licensing Cost Drivers

<input type="checkbox"/>	Private Cloud Cost Driver	Monthly Expense
<input type="checkbox"/>	<a href="#">Server Hardware : Traditional</a>	-
<input type="checkbox"/>	<a href="#">Server Hardware : Hyper-Converged</a>	US\$2.45K
<input type="checkbox"/>	<a href="#">Storage</a>	-
<input type="checkbox"/>	<a href="#">License</a>	US\$14.27K
<input type="checkbox"/>	<a href="#">Applications</a>	-

1

Cost drivers for physical servers have been a key area of focus. We've shown how we can allow for precise allocation of server hardware expenses. This foundational understanding can be readily extended to other critical physical infrastructure components. Storage arrays, for instance, incur costs related to their capacity, performance, and the underlying power consumption. Similarly, network devices, including switches, routers, and firewalls, have cost drivers tied to their port density, throughput capabilities, and the specialized functions they provide. Analyzing these elements enables a comprehensive view of infrastructure costs.

Transitioning from hardware, it's important we explore the operational differences of software licenses and how we track their costs. Unlike physical assets, software licenses introduce a different set of considerations for cost management. These often involve complex licensing models, such as per-user, per-processor, concurrent user, or subscription-based agreements.

Understanding the specific terms and conditions of each license, including renewal cycles, maintenance agreements, and compliance requirements, is paramount. This shift from tangible hardware to intangible software necessitates a nuanced approach to cost driver analysis and optimization. Let's take a look.

1. Click on **License**.

## Understanding How Licenses are Tracked

The screenshot shows the 'Cost Drivers' section of the VMware interface. At the top, there are tabs for 'Cost Drivers', 'Cluster Cost', and 'Cloud Providers'. Below the tabs, a link to 'Cost Drivers' is shown. A blue link 'Edit Mode' is followed by two radio button options: 'Edit for All Datacenters' (selected) and 'Edit for specific Datacenter'. An 'Infrastructure Type' dropdown is set to 'vCenter'. In the 'Summary' box, it shows a total monthly cost of 'US\$3.88K' and '34' total VMs. A red box highlights the 'CUSTOMIZE LICENSE ASSIGNMENT' button at the bottom of the summary box.

**Cost Drivers** SETTINGS

Configurations / Cost Drivers

Cost Drivers Cluster Cost Cloud Providers

[<< Back To Cost Drivers](#)

# License

You can view the license cost of each VM that is computed based on one of the following license type:

- Per-socket license cost
- Enterprise License Agreement (ELA) cost
- Desktop licensing cost
- Per-core license cost
- Per-TiB license cost

**Note:**  
License cost for VMware Software is based on either per core (for ESXi versions 8.0 and above) or per socket (for ESXi versions

Edit Mode	<input checked="" type="radio"/> Edit for All Datacenters <input type="radio"/> Edit for specific Datacenter
Infrastructure Type	vCenter

**Summary**

US\$3.88K      34

Total Monthly Cost      Total VMs

1

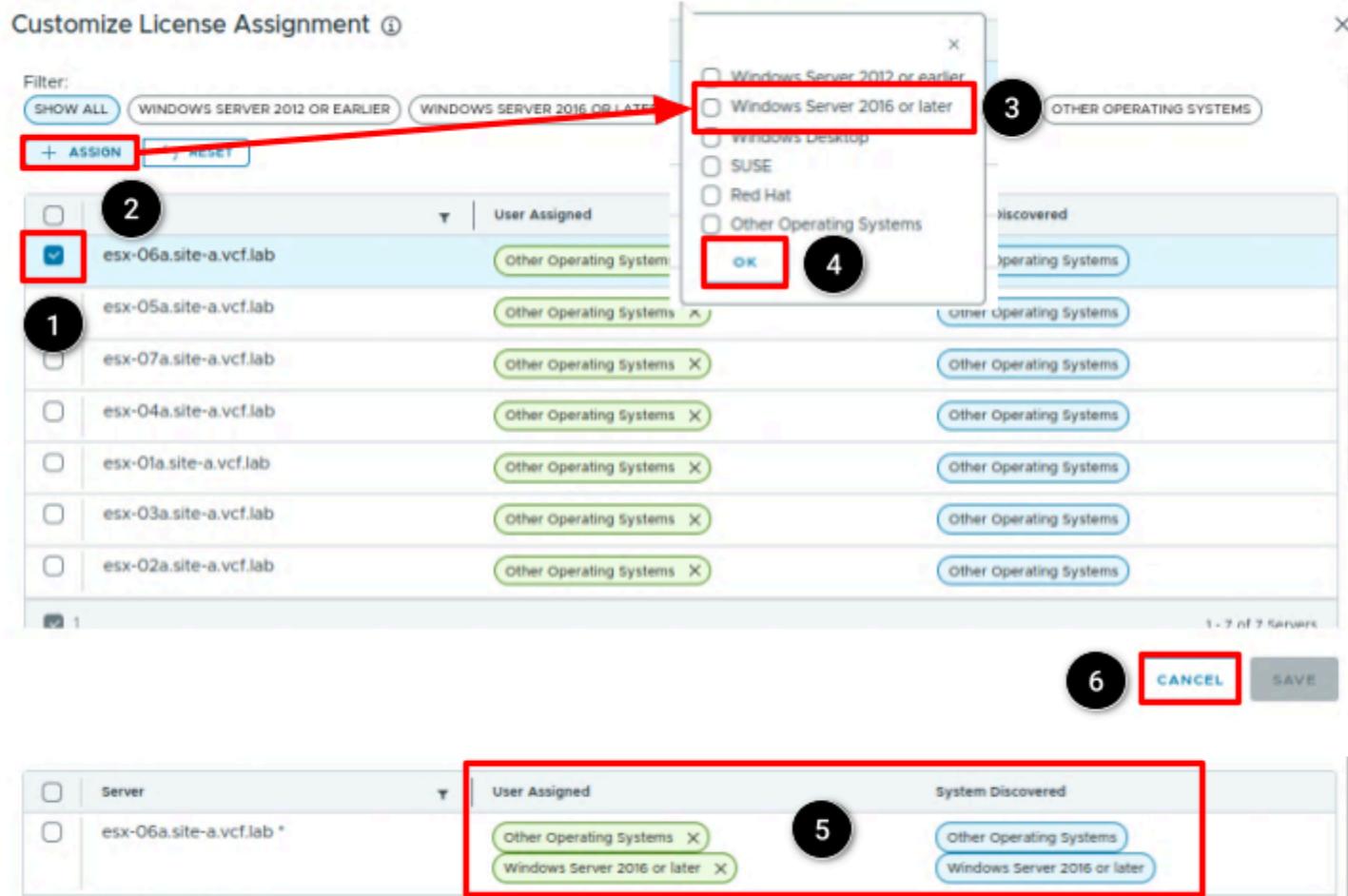
**CUSTOMIZE LICENSE ASSIGNMENT**

On the initial license screen we see important information pertaining to the license tracking capabilities users may utilize. The 3 most common license types are per-socket, Enterprise License Agreement Cost and per-Core licensing. As we saw with our server hardware, users have the ability to specify costs for all Datacenters or specify costs on a per Datacenter basis. This can account for different agreements or license situations a customer may have.

Often customers will purchase a combination of licenses and assign them to hosts in an effort to 'jail' or isolate OS or Application types to specific hosts. A common use case for this is Oracle licenses or Windows Datacenter Licenses, let's examine how users can assign license types to hosts.

1. Click on **CUSTOMIZE LICENSE ASSIGNMENT**.

## Customizing License Assignment



I've consolidated different menu screens here in an effort to have this process be easier to visualize on one screen. By default VMware Cloud Foundation Operations is only going to keep track of ESXi hosts, as such if we are assigning licenses to VM's or other workloads we track them by where they physically reside, in this case the ESXi hosts.

Let's go through the exercise of assigning a Windows Server 2016 or later license to an ESXi host. We'll examine how we can modify the values for the Server 2016 tag later in the module.

1. Click the **checkbox** next to **esx-06a.site-a.vcf.lab**.
2. Click on **+ ASSIGN**.
3. This will open a new window, **Select Windows Server 2016 or Later**.
4. Click **OK**.
5. Notice that our selected ESXi host now has the Windows Server 2016 or Later license assigned to it.
6. Click **CANCEL** to return to the previous screen.

## Viewing and Editing License Costs

The screenshot shows the 'CUSTOMIZE LICENSE ASSIGNMENT' section. At the top, there's a summary box with 'Total Monthly Cost: US\$14.27K' (circled 4) and 'Total VMs: 33'. Below this is a table of license assignments:

Name	VMS	Sockets	Cores	TB	Charged By	Total Cost
VMware vSAN Add-on	0	0	-	0.00	Per TIB	-
<b>VMware Cloud Foundation</b> (circled 2)	7	30	480	0.00	Per Core	US\$14.0K
VMware vSphere Foundation	0	0	-	0.00	Per Core	-

Below the table, there's an 'EDIT FOR INDIVIDUAL SERVERS' section with fields for 'Monthly cost of VMware Cloud Foundation Per Core' (29.17, circled 3) and 'Percentage of VMware Cloud Foundation cost allocated to vSAN' (Reference Cost: US\$ 29.17, Reference Percentage: 8%).

A blue 'SAVE' button (circled 6) is at the bottom left, and a vertical scroll bar (circled 5) is on the right.

Now that we've viewed how we assign license types to hosts, let's actually look at one of the built-in license types, in this case VMware Cloud Foundation. We'll edit the cost per core here and see how that impacts pricing but note that some licenses have different license charged by types (vSAN for example.)

1. **Scroll down** until you see **VMware Cloud Foundation**.
2. **Click the Carrot** to expand the **VMware Cloud Foundation** section.
3. Update the **pricing per core** from the value inputted here to **\$50**.
4. Pay attention to the cost listed under **Summary**.
5. Scroll down until you see **SAVE**.
6. Press **SAVE** and **Scroll back up** and notice the price has updated to reflect your updates on per-core pricing.

## Choosing Between ELA and Per Core for Windows

The screenshot shows the 'Edit for Individual Servers' dialog for 'Windows Server 2016 or later'. It includes a table for customizing server costs (circled 5) and a list of options below:

- Select Server(s) for customization:** Per Core (circled 4), US\$ 4.50.
- Number of servers:** 0 Server(s).
- ADD COST PER SERVER:** + ADD COST PER SERVER (circled 2).
- SAVE** button (circled 6).
- EDIT FOR INDIVIDUAL SERVERS** button (circled 3).
- Monthly cost of Windows Server 2016 or later Per Core:** 4.50 (Reference Cost: US\$ 4.50).
- Monthly cost of Windows Server 2016 or later ELA:** 0.

A vertical scroll bar (circled 1) is on the right.

Finally, we come to where we can modify the Windows Server 2016 or Later OS option we worked with earlier in the lab. We can see here that we have the option to choose between ELA pricing per Core or a negotiated ELA price. A key feature is that users may also edit for individual servers allowing them to have a mix of Pricing options. Let's take a look at how we do this.

1. **Scroll Down** until you see Windows Server 2016 or Later.
2. **Expand** Server 2016 or Later.
3. Click on **EDIT FOR INDIVIDUAL SERVERS**.
4. Click on **ADD COST PER SERVER**.
5. Notice that we now have the ability to tag individual servers with a unique price structure.
6. Click the **X**.

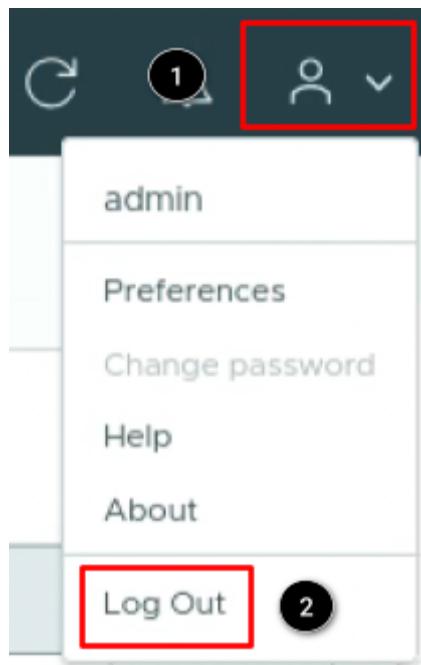
## Conclusion

In this module, we explored the Cost Drivers capabilities of VMware Cloud Foundation Operations and how users can utilize the feature to accurately assign prices to the infrastructure necessary to host a VMware private cloud. Later modules will explore pricing and chargeback and how they can consume these Cost Drivers allowing administrators to present the true cost of running a workload in a VMware environment.

From here you can:

- Take this quick survey to provide feedback about your experience with VCF 9.0
- Continue with the next lab module.
- Click [vlp:table-of-contents]Show Table of Contents] to jump to any module or lesson in this lab.
- End your lab and return in the future.

## Logout



To Log out of VCF Operations:

1. Click the **User icon** to open the settings menu.
2. Click **Log Out**.

## Module 5 - Showback (15 minutes) Intermediate

As IT admins and savvy users of VCF Operations, our goal with Showback is to quantify how much it costs our IT department to run VMs in our cloud. Cost is the amount of money we spend to run a VM in our cloud based on either utilization or allocation.

In this module, we will show how to navigate to the main Showback page in VCF Operations and we will explore the Showback (VM Cost) Dashboard and how it can be leveraged to gain insights into the cost breakdown, potential savings, and trends related to the VMs within a selected group.

## Login to VCF Operations

In the following few pages, we will walk through the process for logging in to VCF Operations.

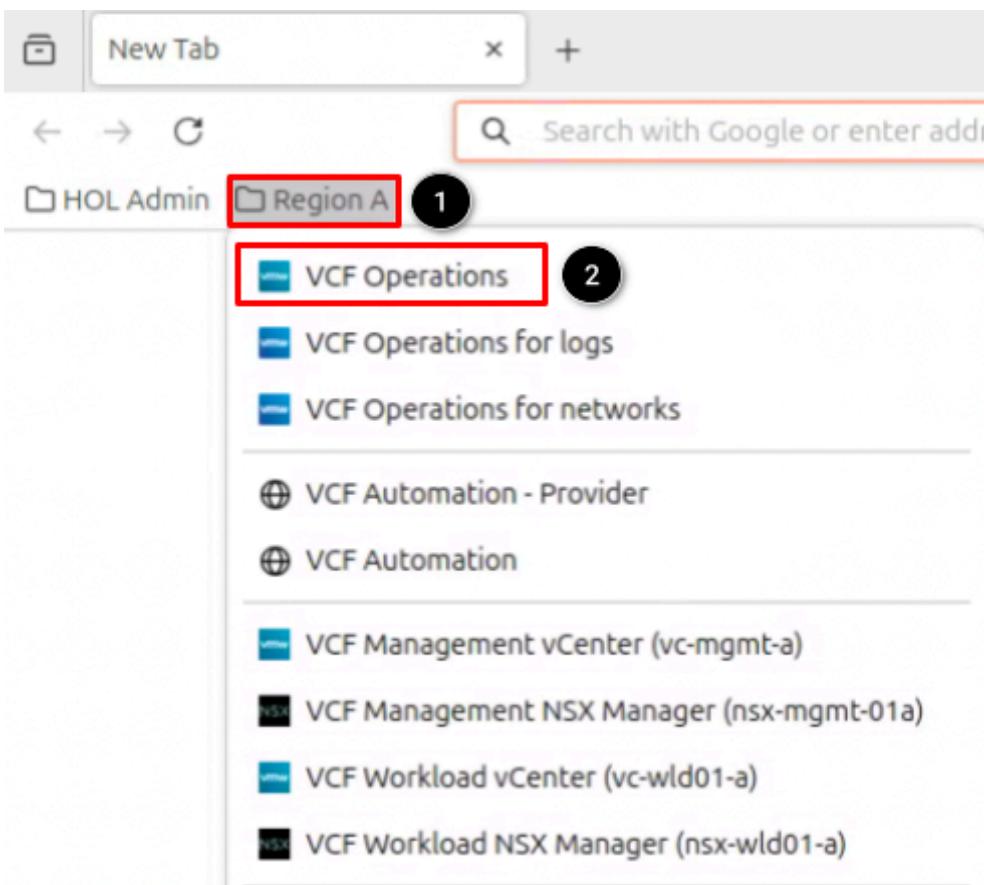
### Start Firefox



Open the Firefox Browser from the Linux Task Bar.

1. Click on the Firefox icon to open the browser.

### Open VCF Operations Console



Once Firefox has loaded:

1. Click on the **Region A** bookmark folder.
2. Click **VCF Operations**.

## Login to VCF Operations Console

### VMware Cloud Foundation

### Operations™

The screenshot shows the VMware Cloud Foundation Operations login interface. It includes the following fields:

- Login Method \***: A dropdown menu with "Local Account" selected, circled with a red border and labeled "1".
- Username \***: An input field containing "admin", circled with a red border and labeled "2".
- Password \***: An input field showing redacted text, circled with a red border and labeled "3".
- LOG IN**: A blue button with white text, circled with a red border and labeled "4".

The credentials for **admin** should already be cached in the browser window.

At the VCF Operations login prompt, select the login method and type in the following user and password information:

1. At the Login Method dropdown, select **Local Account**.
2. At the username field, type **admin**.
3. At the password field, type **VMware123!VMware123!**
4. Click **LOG IN**.

## Showback Main Page

### Navigate to Showback Main Page

The screenshot shows the VMware Cloud Foundation Operations interface. On the left, there's a navigation menu with sections like Home, Inventory, Infrastructure Operations, Workload Operations, Fleet Management, Capacity (highlighted with a red box and circle 1), and Cost (highlighted with a red box and circle 2). Under Capacity, there are sub-options: Assess, Optimize, Plan, and Cost. The Cost option is selected. In the center, there's a main content area titled 'Cost' with tabs: Overview, Analysis, Optimize, Showback (highlighted with a red box and circle 3), Chargeback, and Bills. Below the tabs, there are four sub-tabs: ORGANIZATIONS (highlighted with a red box and circle 4), PROJECTS, VIRTUAL MACHINES, and CONTAINERS. The main table is titled 'Organizations' and displays one row for 'hol-all-apps' with columns: Name, Total Cost (MTD), CPU (Cost), Memory (Cost), Storage (Cost), and Additional Cost. The values are: hol-all-apps, 452.41, 8,529.72, 796.12, 168, and 6.87 respectively.

Name	Total Cost (MTD)	CPU (Cost)	Memory (Cost)	Storage (Cost)	Additional Cost
hol-all-apps	452.41	8,529.72	796.12	168	6.87

1. From the navigation menu on the left, click on **Capacity**.
2. Under Capacity, click on **Cost**.
3. Click on the **Showback** tab.
4. Click on **ORGANIZATIONS**.

This view allows us to consume Showback data on an organization, project, VM or container level. Organizations and projects are grouping constructs created in VMware Cloud Foundation Automation (VCFA). VCFA allows us to create organizations that could represent a company or division within a company. Then, under those organizations, users can create projects to further create separation and tenancy. A classic example? The multi-national company Coca-Cola is the global parent and the HR organization wants to run their own IT project. Within HR, they have multiple projects each with owners, resources and budgets that they must maintain and meet. Let's take a closer look at what is shown to us under Organizations.

## Explore Showback Organizations



Under the Organizations tab, we have 3 main areas of focus: Organizations, Regions and Namespaces. We've already covered what the overall organization is, but let's discuss the other two.

- **Regions:** Regions represent geographical locations or logical subdivisions within a cloud environment. They allow for the grouping of resources and infrastructure based on physical proximity or administrative boundaries.
  - **Namespace:** Namespaces provide logical isolation for resources (compute, storage, networking, access control) within a shared cluster. Essentially, a VCF namespace is a virtual cluster within a physical one, managing shared resources, isolation, and multi-tenancy for diverse workloads.
1. Use the **sidebar** on the right hand side to scroll down to explore the **Organization**, **Project** and **Namespace** windows (not all shown).

With a basic understanding of Organizations, Regions and Namespaces, let's examine the Showback information presented for each class of resources.

- **Total Cost (MTD):** This metric refers to the Month-to-Date total cost, meaning the sum of all costs from the first day of the current calendar month up to, but not including, the current date.
- **CPU (Cost):** This refers to the cost incurred by the organization for the CPU resources utilized or allocated by its virtual machines and containers. This cost is calculated based on the cost drivers defined within VCF Operations.
- **Memory (Cost):** This refers to the cost incurred by the organization for the Memory resources utilized or allocated by its virtual machines and containers. This cost is calculated based on the cost drivers defined within VCF Operations.
- **Storage (Cost):** This refers to the cost incurred by the organization for the Storage resources utilized or allocated by its virtual machines and containers. This cost is calculated based on the cost drivers defined within VCF Operations.
- **Additional Cost:** This refers to any surcharge or one-time costs associated with virtual machines and containers. This cost is calculated based on the cost drivers defined within VCF Operations.

These metrics and the Cost Trends are displayed for Organizations, Regions and Namespaces giving users an in-depth analysis of their costs.

## Explore Showback Projects

The screenshot shows the 'Cost' section of the VCF Operations interface. At the top, there are tabs for Overview, Analyze, Optimize, Showback (which is currently selected), Chargeback, and Bills. Below these, there are four sub-tabs: ORGANIZATIONS, PROJECTS (which is highlighted with a red box and has a circled '1' over it), VIRTUAL MACHINES, and CONTAINERS. The main content area is titled 'Organizations' and displays a table with one row. The table columns are Name, Total Cost (MTD), CPU (Cost), Memory (Cost), Storage (Cost), and Additional Cost. The single organization listed is 'hol-all-apps' with values: 452.41, 8,529.72, 796.12, 168, and 6.87 respectively.

1. Click on **PROJECTS**.
2. Use the **sidebar** on the right hand side to scroll down to explore the **Organization, Project and Namespace** windows (not shown).

The Projects tab is our next stop and it displays the same information that we viewed under Organizations, but replaces Regions with Projects. As discussed earlier, one or more projects can be assigned to an organization each with one or more Namespaces. Once again, the Organization, Projects and Namespaces display our costs for ease of viewing.

- **Total Cost (MTD):** This metric refers to the Month-to-Date total cost, meaning the sum of all costs from the first day of the current calendar month up to, but not including, the current date.
- **CPU (Cost):** This refers to the cost incurred by the organization for the CPU resources utilized or allocated by its virtual machines and containers. This cost is calculated based on the cost drivers defined within VCF Operations.
- **Memory (Cost):** This refers to the cost incurred by the organization for the Memory resources utilized or allocated by its virtual machines and containers. This cost is calculated based on the cost drivers defined within VCF Operations.
- **Storage (Cost):** This refers to the cost incurred by the organization for the Storage resources utilized or allocated by its virtual machines and containers. This cost is calculated based on the cost drivers defined within VCF Operations.
- **Additional Cost:** This refers to any surcharge or one-time costs associated with virtual machines and containers. This cost is calculated based on the cost drivers defined within VCF Operations.

We've stayed at a high level within the Organization, Project and Namespace level up until now, but we can also drill down to individual Virtual Machines and Containers and view their costs. Let's take a look.

## Showback (VM Cost) Dashboard

The Showback (VM Cost) Dashboard is a pre-built dashboard designed to track and analyze virtual machine (VM) costs. It provides a quick Showback of the cost associated with the VMs in a group, allowing for quick assessment. Based on the Showback, cost accuracy can be improved by editing the cost drivers, although cost driver customization is available only in the Advanced or Enterprise edition of VCF Operations. Cost drivers that are not customized use reference cost.

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

Overall, this dashboard provides comprehensive information on VM costs, including total costs, cost distribution by resource groups or subscriptions, top VM costs and cost trends over time. Its purpose is to help us identify areas of high costs, optimize spending, and enable informed decision-making to enhance cost efficiency and resource allocation.

### Navigate to Showback (VM Cost) Dashboard

The screenshot shows the VMware Cloud Foundation Operations Cost Dashboard under the 'Cost' tab. The 'Showback' tab is selected. A red box highlights the 'VIRTUAL MACHINES' tab in the navigation bar, which is circled with number 1. A red box also highlights the 'About this Dashboard (Expand to View)' section, which is circled with number 2. A red box highlights the 'Navigation' menu icon on the left, which is circled with number 3.

- Under the Showback tab, click on **VIRTUAL MACHINES**.
- Click on the double chevron to expand the section **About this Dashboard (Expand to View)**.
- Click on the <> to minimize the **Navigation** menu on the left.

This section provides us with tips on how to use the dashboard and interact with its widgets. The set of widgets includes:

- Select a Group** - select an object in the widget to view the cost of the group.
- Cost Summary (This Month)** - shows the month to date cost, potential savings, and projected cost of the group.
- VM Cost Distribution (Top 100)** - shows the most expensive VMs in the group.
- Potential Savings (Top 10)** - shows the VMs ranked by their potential savings.
- Members of the Group (Select to View Trend)** - shows the cost and configuration of each VM in the selected group.
- Cost Trend of Selected VM** - shows the trend of the VMs cost over time.

Due to the dynamic nature of the Hands-on Labs environment, VM cost data might vary from what is presented in the following screenshots.

### Select a Group - vSphere World

The screenshot shows the 'Select a Group' section of the dashboard. A red arrow points to the 'vSphere World' entry in the list, which is circled with number 2. To the right are four widgets: 'Cost Summary (This Month)', 'VM Cost Distribution (Top 100)', 'Members of the Group (Select to View Trend)', and 'Potential Savings (Top 10)'. The 'Potential Savings (Top 10)' chart is circled with number 1.

- Use the **sidebar** on the right hand side to scroll down, so that the **Select a Group** section is visible.
- Observe that, in this widget, the **vSphere World** group is selected.

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

The vSphere World group is a high-level representation of our vSphere environment offering a holistic view of VM cost across our virtual infrastructure. If we would like to focus our attention to a more targeted group of VMs, we could, for instance, present VM cost data in this dashboard from a cluster perspective.

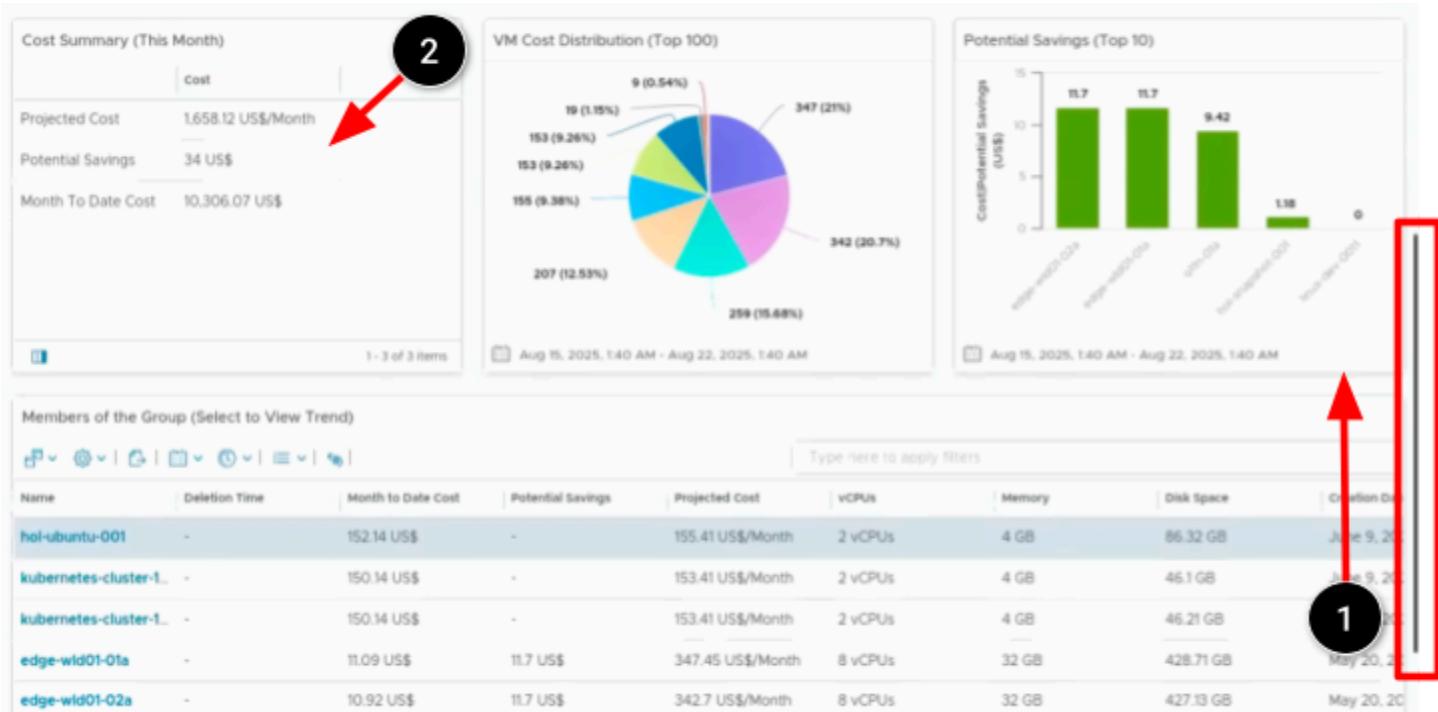
### Select a Group - Workload Domain Cluster

Name	Object Type
wld-components	Virtual Machine Folder
templates	Virtual Machine Folder
Discovered virtual machine	Virtual Machine Folder
supervisor	Virtual Machine Folder
Workloads	Virtual Machine Folder
templates	Virtual Machine Folder
Organization	Organization
vSAN Datastores	Environment
Non vSAN Datastores	Environment
VCF Workload World	Environment
VCF Management World	Environment
Operating System World	Environment
wld-01a-DC	Datacenter
dc-a	Datacenter
cluster-mgmt-01a	Cluster Compute Resource
cluster-wld01-01a	Cluster Compute Resource

1 - 24 of 24 items

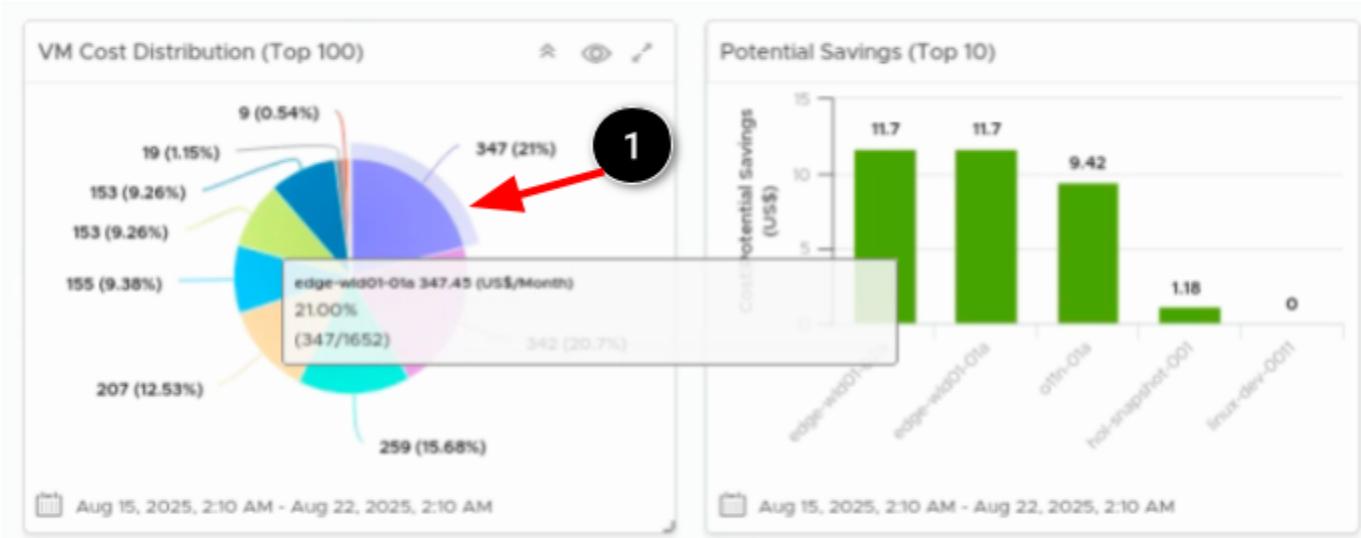
1. Use the **sidebar** on the right hand side of the Select a Group widget, so that the **cluster-wld01-01a** group is visible.
2. Click on **cluster-wld01-01a**.

Now that we have selected the group corresponding to our VCF workload domain cluster, cluster-wld01-01a, the dashboard data in the other widgets have been updated to reflect that.

**Cost Summary (This Month)**

1. Use the **sidebar** on the right hand side to scroll up, so that the **Cost Summary (This Month)** widget is visible.
2. Observe that the **Cost Summary (This Month)** widget presents a summary of the cost associated with the selected group, i.e., cluster-wld01-01a, for the current month.

The Cost Summary (This Month) widget provides an overview of the month-to-date cost, potential savings, and projected cost for the group. This summary gives us a quick snapshot of the financial aspects of the selected group.

**VM Cost Distribution (Top 100)**

1. In the **VM Cost Distribution (Top 100)** widget, hover over the biggest slice of the pie chart to easily identify the VM with the highest project cost in the group. Observe that this VM is named edge-wld01-01a, its projected cost amounts to 347.45 US\$ per month and this cost contributes 21% to the group's overall projected cost.

The VM Cost Distribution (Top 100) widget provides a breakdown of the top 100 most expensive VMs based on projected cost within the selected group, in this case, cluster-wld01-01a. It helps us identify the VMs that are incurring the highest costs. By analyzing this information, we can focus on optimizing the resources and configurations of these high-cost VMs to reduce expenses. Hovering over or clicking on a slice of the pie chart gives us an overview of that specific object.

## Potential Savings (Top 10)



- In the **Potential Savings (Top 10) widget**, hover over the highest bar(s) to easily identify the VM(s) with the highest potential savings in the group. Observe that the top spot is occupied by two VMs, namely edge-wld01-01a and edge-wld01-02a. Remember that edge-wld01-01a is also the VM in the group with the highest projected cost.

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

**Members of the Group (Select to View Trend)**

1. [NOT SHOWN] Use the **sidebar** on the right hand side to scroll down, so that the **Members of the Group (Select to View Trend)** and **Cost Trend of Selected VM** widgets are visible.
2. In the **Members of the Group (Select to View Trend)** widget, click on the row for the **hol-ubuntu-001** VM (not directly on the member name).
3. Click on the **double chevron** to expand the view of the **Cost Trend of Selected VM** widget.

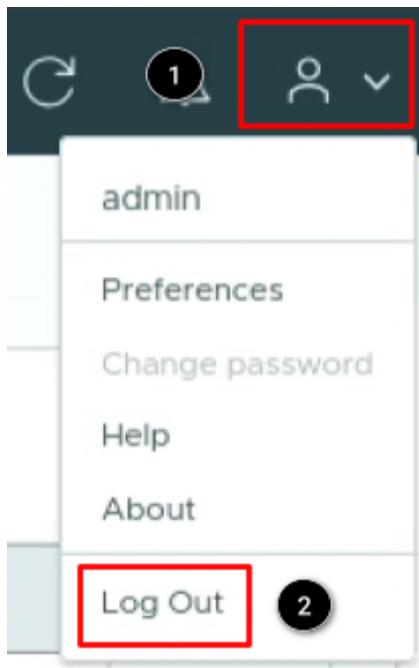
The Members of the Group (Select to View Trend) widget shows a detailed breakdown of each VM within the selected group. It displays the cost and configuration (vCPU, memory, disk space, guest OS) information of individual VMs. We can click on a specific member to access additional information about its cost trend and performance over time, which is depicted in the next widget.

**Cost Trend of Selected VM**

1. In the **Cost Trend of Selected VM** widget, observe that the cost trend graph for the **hol-ubuntu-001** VM is depicting projected cost, month-to-date cost and potential savings. In this case, there are no potential savings identified for this VM.

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

## Logout



To Log out of VCF Operations:

1. Click the **User icon** to open the settings menu.
2. Click **Log Out**.

## Conclusion

In this module, we navigated to the main Showback page, we discussed Organizations, Projects and Namespaces and familiarized ourselves with the Showback (VM Cost) Dashboard and how it can be used to gain insights into the cost breakdown, potential savings, and trends related to the VMs within a selected group.

From here you can:

- Take this quick survey to provide feedback about your experience with VCF 9.0
- Continue with the next lab module.
- Click [vlp:table-of-contents]Show Table of Contents] to jump to any module or lesson in this lab.
- End your lab and return in the future.

## Module 6 - Price Cards- VC Pricing (30 minutes) Intermediate

Price cards within VMware Cloud Foundation Operations serve as a mechanism for defining the price on resource consumption for virtualized workloads. These price cards allow users to make informed decisions regarding workload placement, configuration and lifecycle. Most commonly used in public cloud environments, this feature has been a staple of VMware for some time. Let's take a look at the flexibility and capabilities.

## Login to VCF Operations

In the following few pages, we will walk through the process for logging in to VCF Operations.

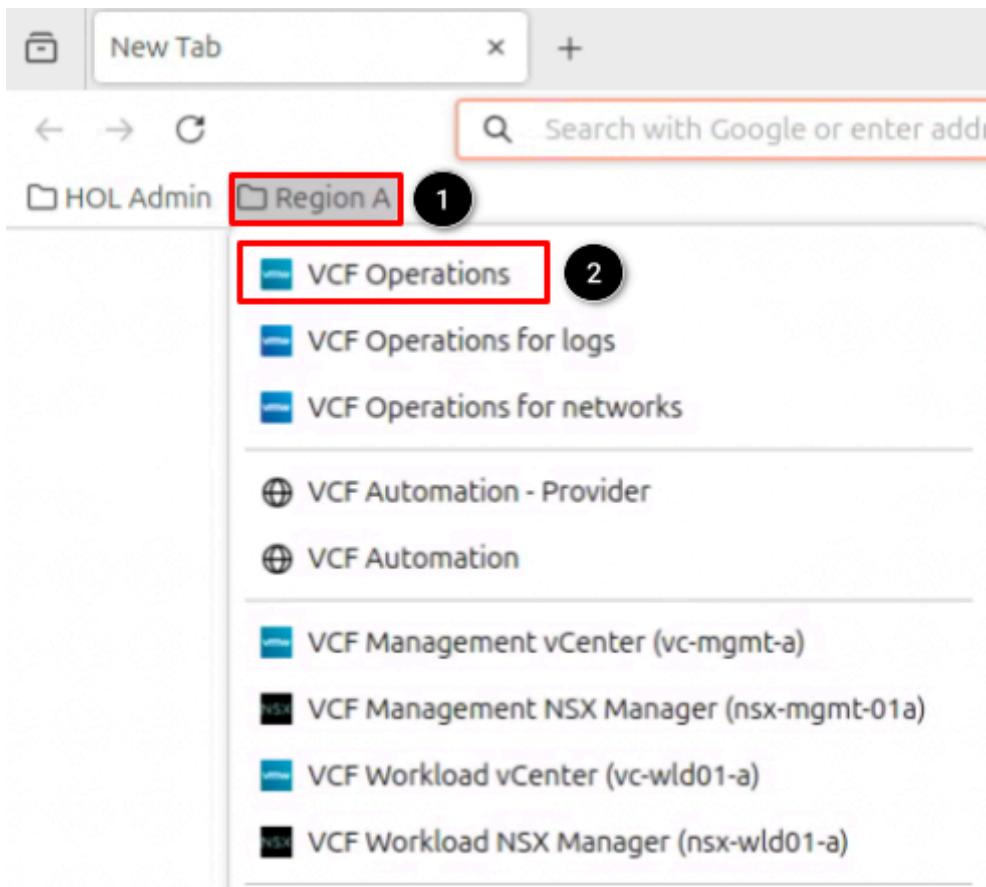
### Start Firefox



Open the Firefox Browser from the Linux Task Bar.

1. Click on the Firefox icon to open the browser.

### Open VCF Operations Console



Once Firefox has loaded:

1. Click on the **Region A** bookmark folder.
2. Click **VCF Operations**.

**Login to VCF Operations Console**

# VMware Cloud Foundation Operations™

Login Method \*

Local Account 1

Username \*

admin 2

Password \*

\*\*\*\*\* 3

**LOG IN** 4

The credentials for **admin** should already be cached in the browser window.

At the VCF Operations login prompt, select the login method and type in the following user and password information:

1. At the Login Method dropdown, select **Local Account**.
2. At the username field, type **admin**.
3. At the password field, type **VMware123!VMware123**.
4. Click **LOG IN**.

## Locating Policy Definition

The screenshot shows the VMware Cloud Foundation Operations interface. On the left, a sidebar lists various operational modules: Home, Inventory, Infrastructure Operations (with a dropdown arrow), Diagnostic Findings, VCF Health, Dashboards & Reports, Alerts, Troubleshooting Workbench, Analyze, Storage Operations, Network Operations, Data Protection & Recovery, Automation Central, and Configurations. The 'Configurations' link is highlighted with a red box. In the main content area, under the 'Configurations' heading, there is a search bar with the placeholder 'Type a keyword and hit enter'. Below it, the 'Policies' section is shown with two cards: 'Policy Definition' (highlighted with a red box) and 'Policy Assignment'. The 'Alerts' section follows, featuring 'Alert Definitions' and 'Symptom Definitions'. At the bottom, there are links for 'Notifications' and 'Outbound Settings'.

The first step in creating a price card is first defining the policy that will consume the price card. VMware Cloud Foundation Operations allows you to create multiple policies (many of these are covered in other labs and modules) which empowers cloud administrators by allowing for different policy, reporting, pricing, alerting and configuration settings for different resources in a VMware vCenter. We'll take a look at one of the two different scenarios in this module, local Virtual Center pricing. Provider pricing will be covered in a follow up module.

## Choose a Policy to Edit

Policy definitions allow administrators to create rules around how data and objects are interpreted and controlled in a VMware environment. While most users can meet their needs using only the default policy, more advanced users can create additional policies with different governing rules and data practices. Some of the items that can be controlled from Policies include:

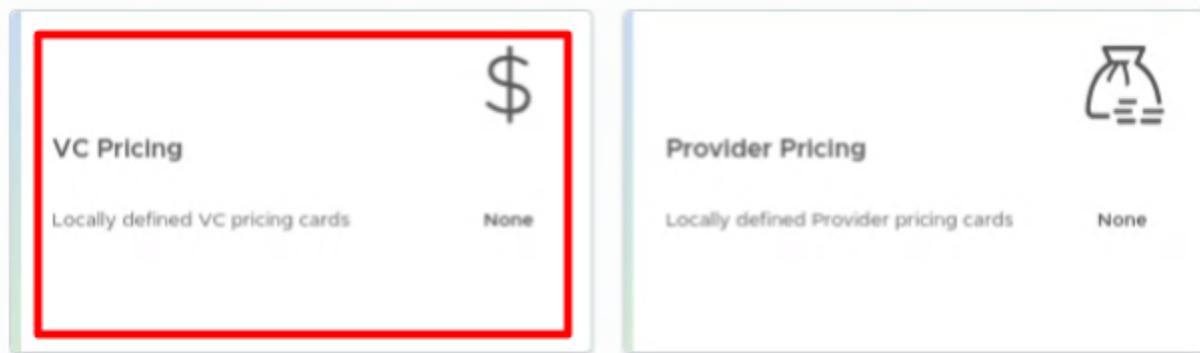
- **Reporting:** Policies dictate how data is reported for different resources, allowing for customized reports based on specific needs.
- **Pricing:** They determine how price cards are applied to resources, enabling varied pricing models for different services or departments.
- **Alerting:** Policies define the alerting mechanisms for resources, ensuring that appropriate notifications are triggered based on defined thresholds or events.
- **Configuration Settings:** They manage configuration settings for resources, allowing for consistent and automated application of desired configurations.

By utilizing policy definitions, cloud administrators can implement distinct rules for different resources, leading to more efficient and tailored management of their VMware Cloud Foundation environment. This feature is covered in greater detail in another lab but for now, this basic explanation will serve our needs.

We will be working with the default policy for this module as it is currently active and assigned to our resources.

1. **Click on Default Policy.**
2. **Click on Edit Policy.**

## Exploring VC Pricing



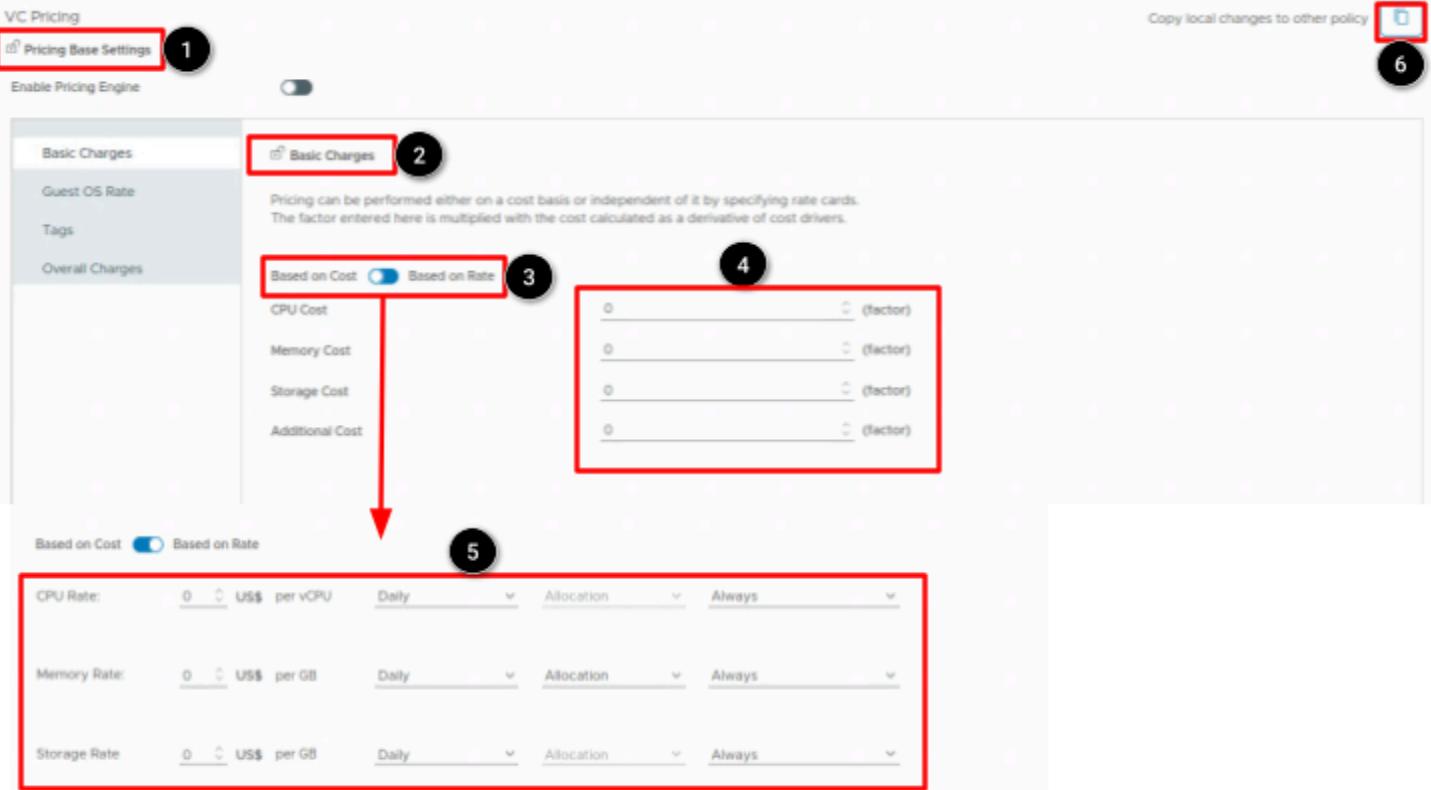
VMware Cloud Foundation Operations enables vCenter-level pricing for granular cost control. This allows customized pricing for vCenters, supporting tailored cost models for different departments or workloads. Benefits include accurate showback/chargeback and incentives for resource optimization, leading to better financial accountability and efficient cloud resource management.

The pricing card can be cost-based or rate-based and you can customize the cost-based pricing card and rate-based pricing card as per your requirements. After configuring the pricing card, you can assign it to one or more vCenter or Clusters based on your pricing strategy.

Let's take a look.

1. **Scroll down** until you see the VC Pricing Tile (Not Shown.)
2. **Click on the VC Pricing tile.**

## Configure Basic Charges



We have a lot going on here on this screen but we'll try and break it down section by section. VC pricing by default is locked and the ability to unlock and change its values is controlled via user permissions. Once you unlock the base settings we're presented with multiple options including Basic Charges, Guest OS Rate, Tags and Overall Charges.

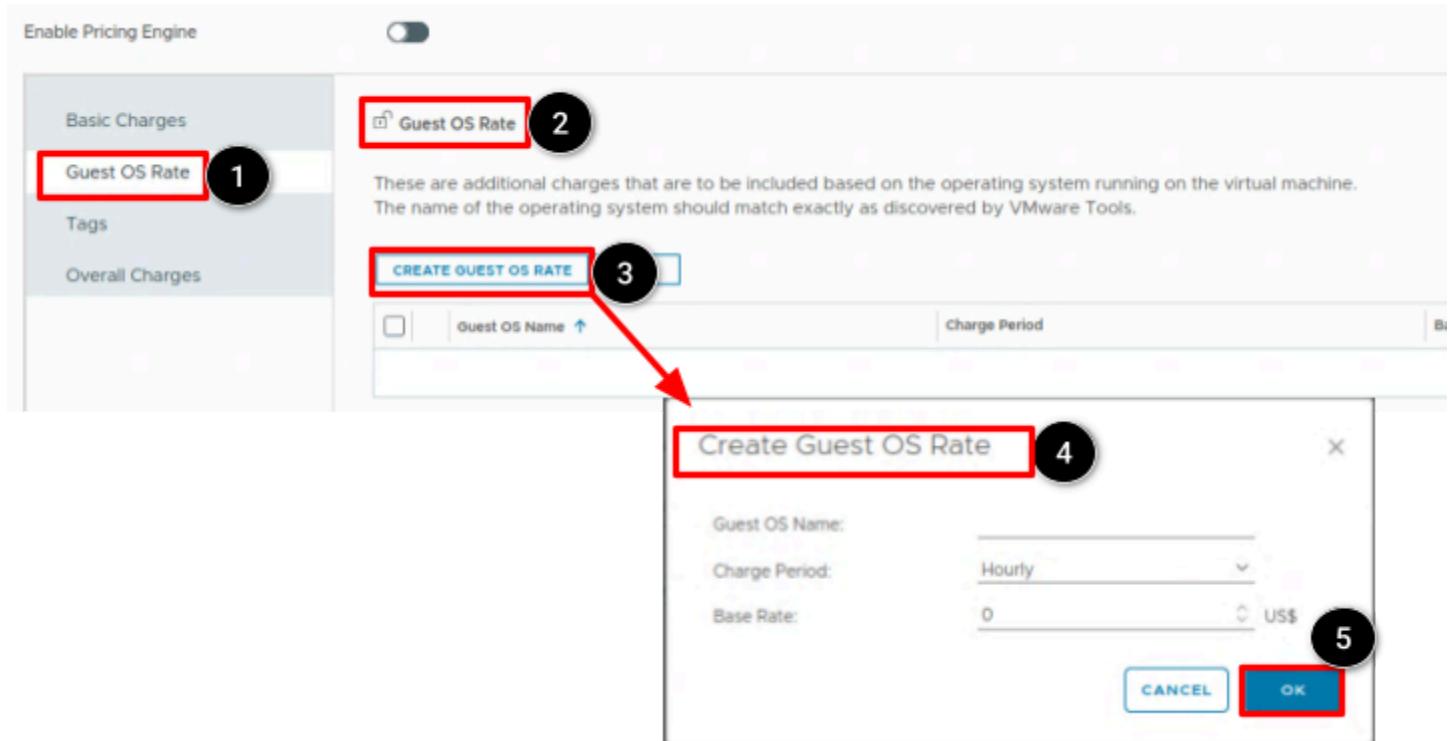
One important distinction is the difference between Cost and Rate when working with the VC pricing. Earlier we explored creating and entering cost metrics to track our hardware and software cost. When we're using the 'Based on Cost' option we specify a factor that is multiplied by the cost calculated as a derivative of cost drivers.

Put more simply, if the calculated cost factor to host a CPU in our Datacenter is \$10 USD, and we enter a CPU Cost factor of 10, then the pricing will be charged at \$100 USD (simple example.)

This is in comparison to Rate based charges which allows you to specify costs in a more granular fashion based on usage, allocation, power status and how often something is charged. Let's take a look at how this works.

1. Click the lock icon to edit the Pricing Base settings.
2. Click the lock icon to edit the Base Charges settings.
3. Choose to use **Cost or Rate** (leave on Rate for now).
4. Notice that we have the ability to specify the rate for CPU, Memory, Storage and Additional Costs. These factors will be multiplied by our Cost Drivers created earlier.
5. Change the toggle to **Based on Rate**. Now we can enter rates based on the following:
  - o **CPU Rate:** The CPU Rate per vCPU, the charging period, and how to charge for the resources.
  - o **Memory Rate:** The memory rate per GB, the charging period, and how to charge for the resources.
  - o **Storage Rate:** The storage rate per GB, the charging period, and how to charge for the resources.
6. Finally in the upper right hand corner, we see a button that allows us to copy data to a new policy. This can be very useful when an administrator needs to create a new VC pricing card and make small adjustments based on local conditions.

## Configure Guest OS Rates



The cost of hosting a Virtual Machines is more than just the hardware, it's also the Guest Operating System charge. We can account for this by using the Guest OS Rate and create listings for different Operating Systems. This is not a pre-defined list of Operating Systems but an open framework allowing you to simply name an OS, its rate and the charge period. One use-case for this could be bundling applications into the OS charge so you could create Server 2022 + SQL for example.

1. Click on **Guest OS Rate**
2. Click the **lock** icon to enable editing Guest OS Rate
3. Click on **Create Guest Rate**
4. Supply the following information:
  - o **Guest OS Name:** Enter a guest OS name.
  - o **Charge Period:** The Charge Period indicates the frequency of charging.
  - o **Base Rate:** Enter a base rate.
5. Click **OK** if you entered valid information, otherwise click CANCEL.

## Configure Tags

The screenshot shows the 'Ratecard' configuration interface. The 'Tags' section is highlighted with a red box. A callout labeled 1 points to the 'Tags' button. Callout 2 points to the 'Recurring charges' section, which describes how tag-based charges can be used for value-added services like antivirus or disaster recovery. Callout 3 points to the 'Add Recurring Tag' dialog, which includes fields for Tag Category, Tag Value, Base Rate, Charge Period, and Charge On Power State. Callout 4 points to the 'Add One Time Tag' dialog, which includes fields for Tag Category, Tag Value, and Base Rate. Callout 5 points to the 'Add Rate Factor Tag' dialog, which includes fields for Tag Category, Tag Value, Charge Applies To, and Rate Factor.

Tags are a feature that allows administrators to add software or capabilities to a ratecard that can be added to Virtual Machines. The example given is Anti-Virus or SQL that can be either a 1-time charge, Recurring charge or a Rate-factor adjustment. So for example, provisioning a Virtual Machine and adding MSSQL for the user could be accounted for by applying a recurring tag for MSSQL.

Let's examine each Tag type in more detail.

1. **Click on Tags**
2. **Click on the lock** to open up editing Tags
3. Recurring Charges: Recurring charges represent repeating charges such as monthly license fees for antivirus software. Click Add Recurring Tag and enter the following details:
  - o **Tag Category:** Enter a tag key.
  - o **Tag Value:** Enter a tag value.
  - o **Base Rate:** Enter a base rate.
  - o **Charge Period:** The Charge Period indicates the frequency of charging.
  - o **Charge Based on Power State:** This decides whether the charge should be applied based on the power state of the VM.
  - o The tags that you add appear in the table below. To edit or delete the entries, click the vertical ellipses and select the desired option.
4. One Time Tag: Tag-based one-time charges can be used to represent incidental charges such as charges for addressing a support ticket or charges for applying an operating systems patch. Click Add One Time Tag and enter the following details:
  - o **Tag Category:** Enter a tag key.
  - o **Tag Value:** Enter a tag value.
  - o **Base Rate:** Enter a base rate.
  - o The tags that you add appear in the table below. To edit or delete the entries, click the vertical ellipses and select the desired option.
5. Rate Factor Tag: Rate factors are multiplication factors applied to already calculated charges. For example, to add a 50% premium on storage, set a rate factor of 1.5 to storage charge. Click Rate Factor Tag and enter the following details:

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

- **Tag Category:** Enter a tag key.
- **Tag Value:** Enter a tag value.
- **Charge Applies To:** Select what the charge applies to.
- **Rate Factor:** Enter a valid number. For example, if you want to increase the price of CPU which has a tag 'Tag1-Value1' by 20% then select CPU Charge from the Charge Applies To drop-down list and enter 1.2 in Rate Factor.
- The tags that you add appear in the table below. To edit or delete the entries, click the vertical ellipses and select the desired option.

## Configure Overall Charges

The screenshot shows the 'Configurations / Policy Definition' section of the vSphere Web Client. Under 'VC Pricing', the 'Pricing Base Settings' tab is selected. The 'Enable Pricing Engine' toggle is turned off. On the left, under 'Tags', the 'Overall Charges' item is highlighted with a red box and labeled '1'. A lock icon next to it is highlighted with a red box and labeled '2'. The 'Overall Charges' section contains three items: 'VM setup charges', 'Recurring charges', and 'Charge Period', all highlighted with red boxes and labeled '3'. To the right, there are two input fields for charges and a dropdown menu for 'Charge Period' with options: Daily (selected), Hourly, Daily, Weekly, and Monthly. The 'Daily' option is highlighted with a red box and labeled '4'. At the bottom, the 'SAVE' button is highlighted with a red box and labeled '5'.

The last area of our VC Pricing policy is Overall Charges which can be thought of as flat rate charges applied to all workloads that match this policy. This allows for flat fee blanket charges to be applied on either a one-time or recurring basis. Let's take a look.

1. **Click on Overall Charges.**
2. **Click on the lock icon to unlock editing for Overall Charges.**
3. We have 2 charge types and one charge period we can control here, let's examine what they are

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

- a. **VM Setup Charges** - A flat fee that can be assessed as part of a VMs deployment (power state does not matter)
  - b. **Recurring Charges** - As the name implies, this is a recurring charge added to the cost of a Virtual Machine. The configuration or power state does not impact this charge being applied, it will always be applied.
  - c. Finally we have the **charge period** which dictates how often the above recurring charges are applied. The default selection is daily but options exist for hourly, daily, weekly and monthly.
4. Click the **dropdown** for Charge Period to view our options for Charge Periods.
  5. Click **CANCEL** to close our window.

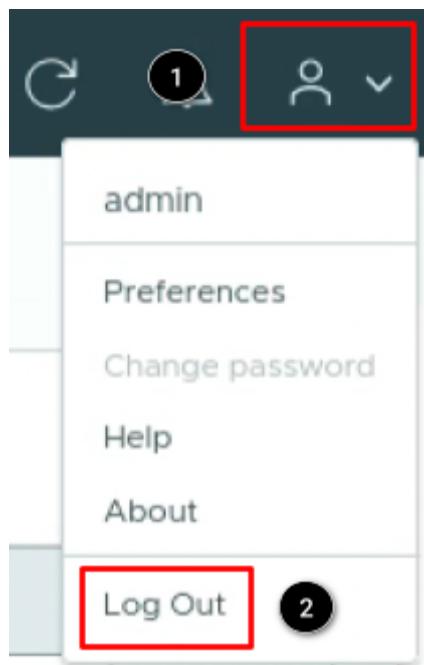
## Conclusion

In this module we explored the process of creating VC provider cards enabling an infrastructure owner to track, price and monitor the internal price of running a Virtual Machine workload on a VMware Private Cloud environment policy. In the next module, we'll explore the Provider Pricing function and how it enables providers to present 'Public Cloud' style pricing to end users to consume.

From here you can:

- Take this quick survey to provide feedback about your experience with VCF 9.0
- Continue with the next lab module.
- Click [vlp:table-of-contents]Show Table of Contents] to jump to any module or lesson in this lab.
- End your lab and return in the future.

## Logout



To Log out of VCF Operations:

3. Click the **User icon** to open the settings menu.
4. Click **Log Out**.

## Module 7 - Price Cards - Provider Pricing (30 min) Advanced

### Login to VCF Operations

In the following few pages, we will walk through the process for logging in to VCF Operations.

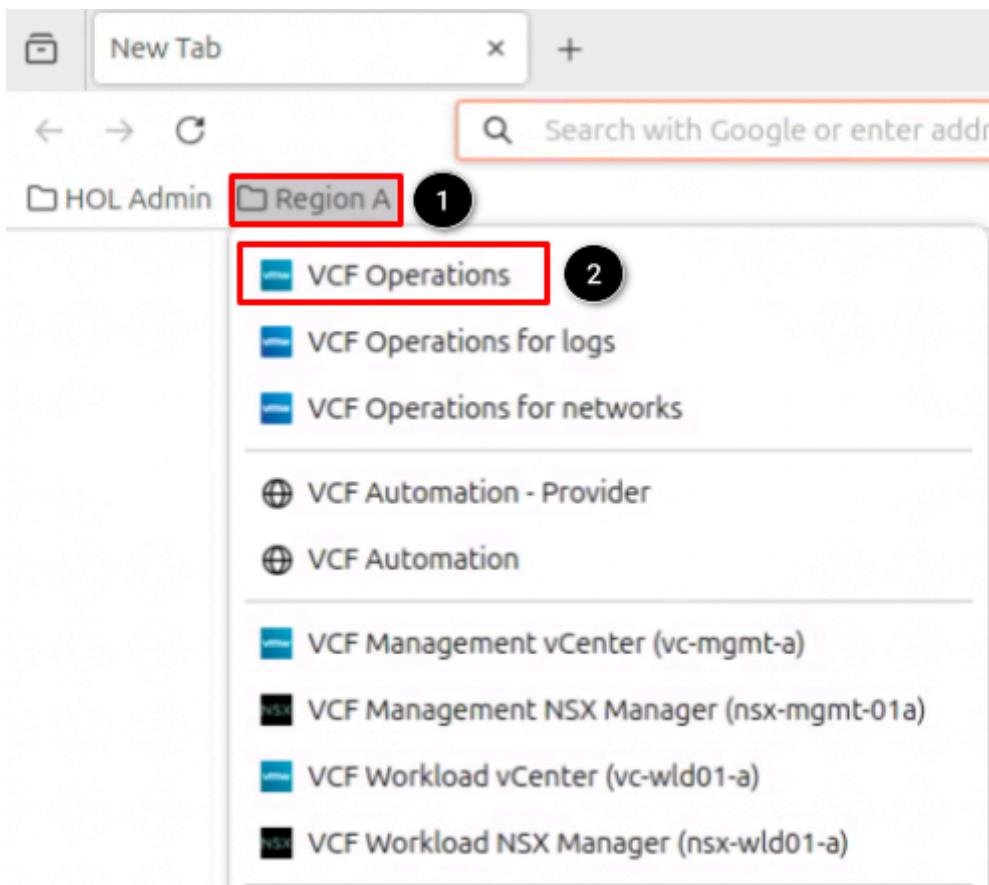
#### Start Firefox



Open the Firefox Browser from the Linux Task Bar.

1. Click on the Firefox icon to open the browser.

#### Open VCF Operations Console



Once Firefox has loaded:

1. Click on the **Region A** bookmark folder.
2. Click **VCF Operations**.

**Login to VCF Operations Console**

# VMware Cloud Foundation Operations™

The screenshot shows the VMware Cloud Foundation Operations login interface. It includes the following fields and a button:

- Login Method \***: A dropdown menu with "Local Account" selected, highlighted by a red box and circled with number 1.
- Username \***: An input field containing "admin", highlighted by a red box and circled with number 2.
- Password \***: An input field showing redacted text, highlighted by a red box and circled with number 3.
- LOG IN**: A blue button with white text, highlighted by a red box and circled with number 4.

The credentials for **admin** should already be cached in the browser window.

At the VCF Operations login prompt, select the login method and type in the following user and password information.

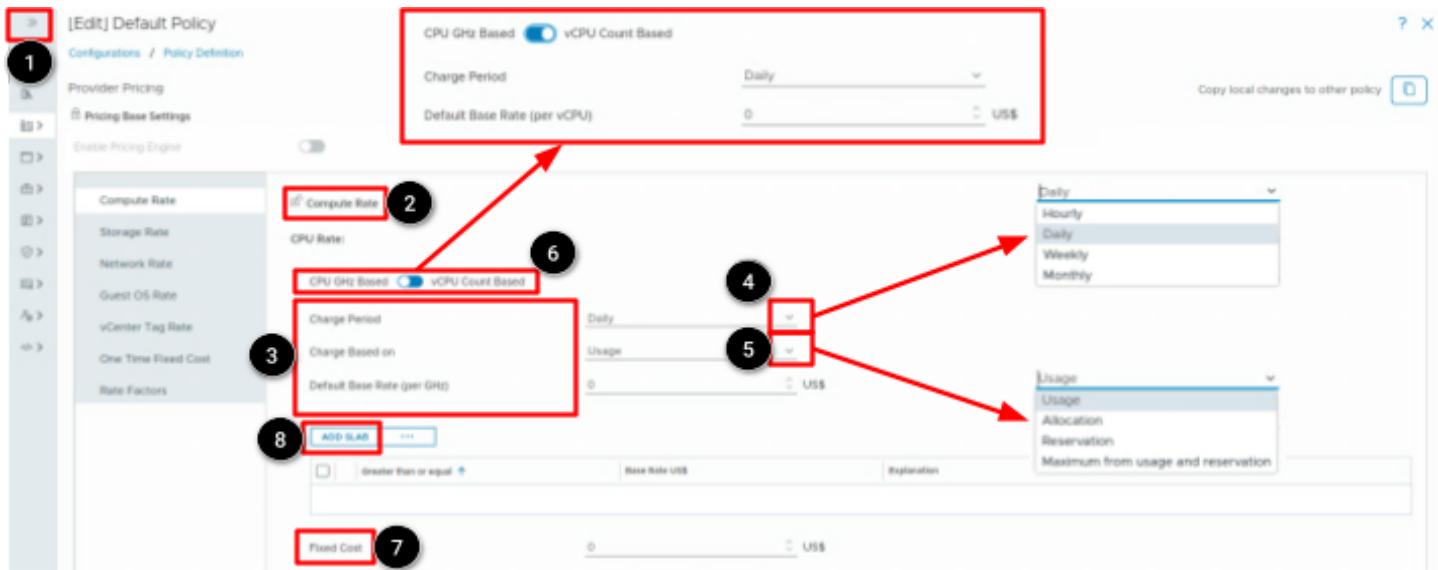
1. At the Login Method dropdown, select **Local Account**.
2. At the username field, type **admin**.
3. At the password field, type **VMware123!VMware123**.
4. Click **LOG IN**.

## Provider Pricing

In the previous module, we explored VC pricing, which can be thought of as the pricing the infrastructure owner tracks and charges when determining how much it must account for to host and provide Virtual Machine services. Once the infrastructure owner knows how much it costs to host a Virtual Machine, they now need the ability to provide, track and charge for that Virtual Machine to an external consumer. This is where the Provider Pricing function of our policy comes into play. Here we're able to specify a range of charges, similar to what we did for VC pricing but this time, aimed towards charging end-users consuming the VC resources. Let's take a look.

1. **Click on Provider Pricing**.

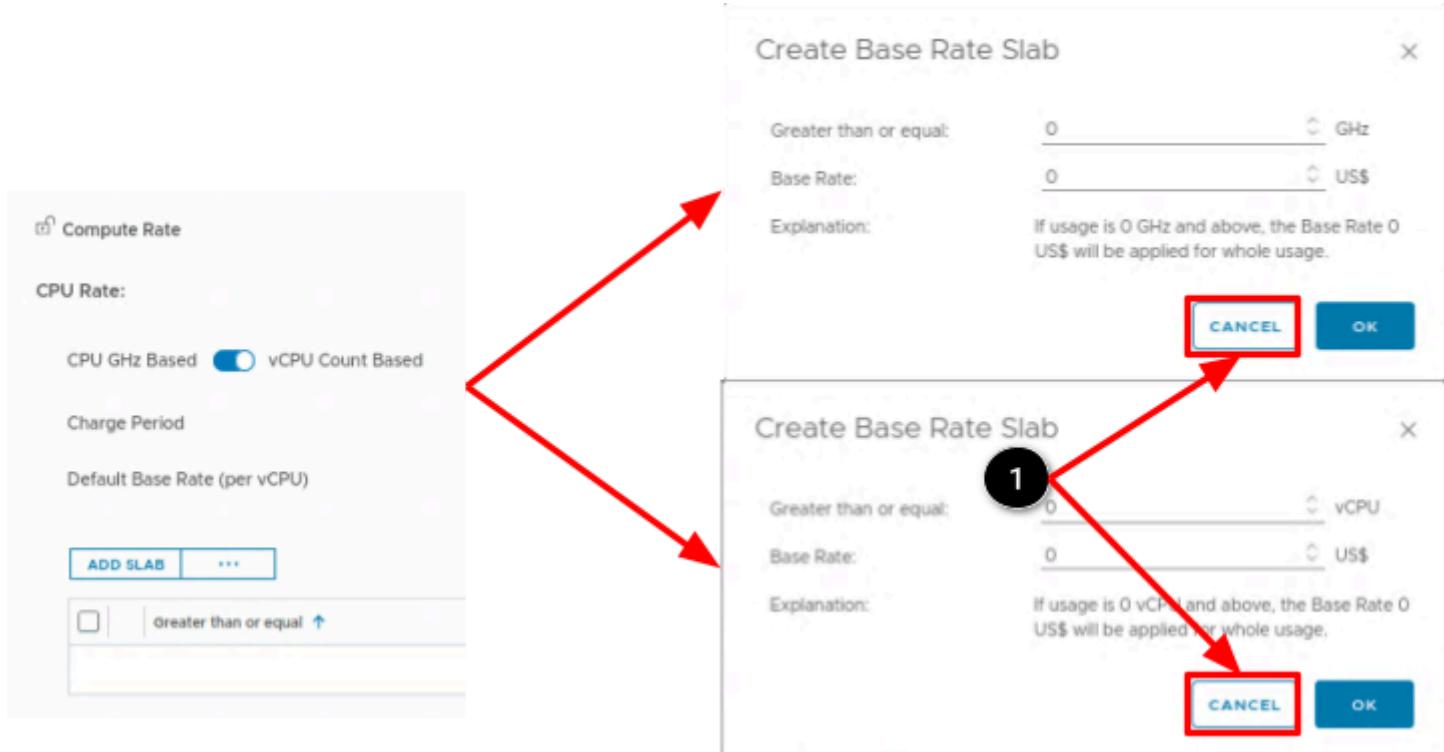
## Exploring Compute Rate



Our first focus is the Compute Rate which encompasses multiple factors comprising CPU, Memory and the reservation state of the previous two resources. When we worked with VC pricing, our focus was centered on tracking consumption based on a factor of the hardware cost that was entered in manually or set up automatically from VMware Operations. This accounted for the cost to host a workload but didn't account for the consumption of end users. Let's examine how we can monitor and account for end user consumption of Compute resources.

1. Click the double carrot to maximize viewable space.
2. Click the lock to unlock editing **Compute Rate**.
3. Our first 3 control points are Charge period, Charge Based on and Default Base Rate. Let's expand on these.
  - o The charge period details how often we should be charging for the consumption or allocation of a compute resource.
  - o The charge based on option details the tracking mechanism used with different methods have different behaviors based on customer usage of the Compute resources. For example, tracking by Usage means a powered off VM wouldn't incur charges, but tracking via Allocation would mean simply creating the VM would incur charges.
  - o Finally we have the Default Base Rate (per Ghz) which allows you to charge per Ghz. We'll examine a later option that changes this method from Core Frequency based to vCPU count.
4. Click the drop-down to see the **Charge period** options. Options range from hourly to monthly.
5. Click the drop-down to see the options for consumption charging. Let's examine these options a bit more as they bear a deeper explanation.
  - o Usage: This describes a method for tracking Virtual Machine Activity, an idle machine will be charged less than an active one.
  - o Allocation: This describes a method for billing just by creating the Virtual Machine. Resources being assigned to a machine active or not triggers billing.
  - o Reservation: This method describes a method for tracking and billing resources based on if the resources are reserved (guaranteed) or not.
  - o Maximum from Usage and Reservation: This is a combination method that tracks the maximum from Usage and Reservation to provide a billing and tracking metric.
6. Click the toggle to change from '**CPU GHz Based**' tracking to '**vCPU Count Based**'.
  - o When we toggle this change, we see that our tracking and billing options change. In many ways this is a simpler billing model as we only care about how many vCPU are assigned to a Virtual Machine and what our charge period is.
7. At the bottom we have our Fixed Cost. This is a flat rate cost that is not dependent on GHz or vCPU, it's simply a flat rate charged per Virtual Machine.
8. Click on **ADD SLAB**.

## Exploring Compute Slabs



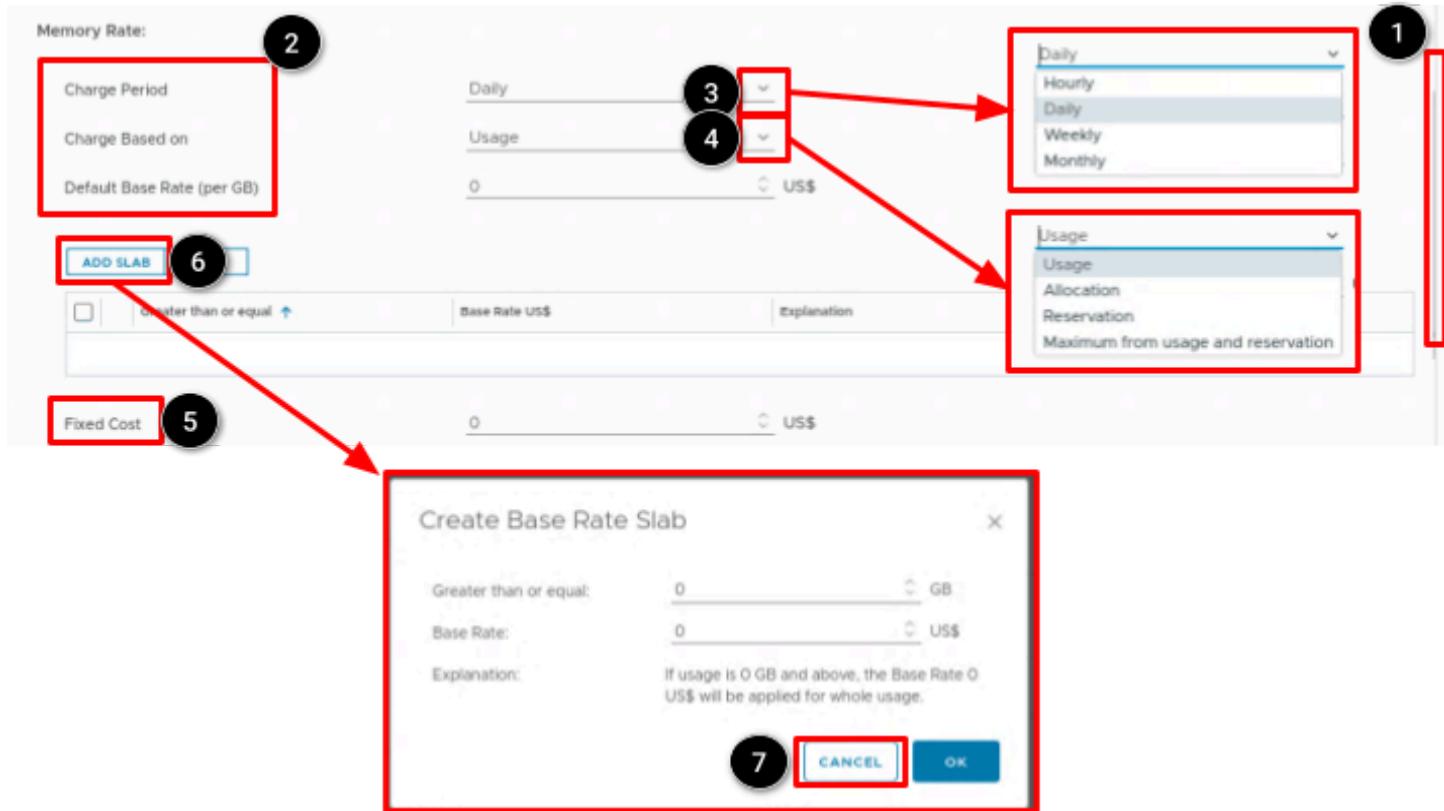
Slabs are used in Provider Pricing within VMware Cloud Foundation Operations to define tiered or granular pricing for compute resources (CPU and Memory). They allow administrators to set different rates based on the quantity or allocation of resources.

For example, you could define a "slab" where the first 10 vCPUs are charged at one rate, and any vCPUs beyond that are charged at a different (typically lower) rate. This allows for flexible pricing models that cater to different consumption levels or service tiers.

In this image, we can see that depending on your selection of CPU GHz Based or vCPU Based Count accounting, your Rate slab will change.

1. Click **CANCEL**.

## Exploring Memory Rate



Our memory rate operates in a similar fashion to the CPU we examined in the previous screen. One key difference is that there is no concept of Memory speed vs Amount allocated as with CPU. As many of the options are the same options with CPU, we'll quickly go over the window.

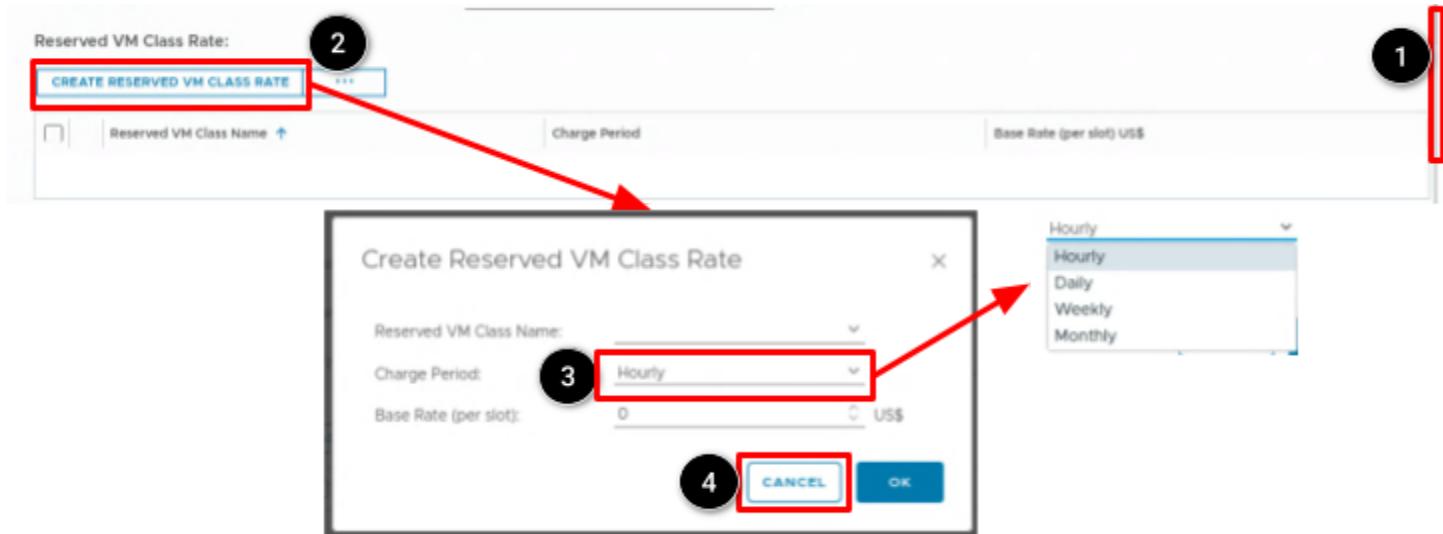
1. **Scroll** down until you see **Memory Rate**.
2. Again we see Charge period, Charge Based on and Default Base Rate. Let's expand on these.
  - o The charge period details how often we should be charging for the consumption or allocation of a compute resource.
  - o The charge based on option details the tracking mechanism used with different methods have different behaviors based on customer usage of the Compute resources. For example, tracking by Usage means a powered off VM wouldn't incur charges, but tracking via Allocation would mean simply creating the VM would incur charges.
  - o Finally we have the Default Base Rate (per GB) which allows you to charge per GB of RAM.
3. **Click the drop-down** to see the **Charge period** options. Options range from hourly to monthly.
4. **Click the drop-down** to see the options for consumption charging. Let's examine these options a bit more as they bear a deeper explanation.
  - o **Usage:** This describes a method for tracking Virtual Machine Activity, an idle machine will be charged less than an active one.
  - o **Allocation:** This describes a method for billing just by creating the Virtual Machine. Resources being assigned to a machine active or not triggers billing.
  - o **Reservation:** This method describes a method for tracking and billing resources based on if the resources are reserved (guaranteed) or not.
  - o **Maximum from Usage and Reservation:** This is a combination method that tracks the maximum from Usage and Reservation to provide a billing and tracking metric.
5. At the bottom we have our **Fixed Cost**. This is a flat rate cost that is not dependent on any of our previous selections, it's simply a flat rate charged per Virtual Machine.
6. **Click on ADD SLAB.**
  - o As with the CPU slab, memory slab rate allows administrators to create tiers of charges once memory assign exceeds or equals a given amount.

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

For example, you could define a "slab" where the first 10 GB's of memory are charged at one rate, and any memory beyond that is charged at a different (typically higher) rate. This allows for flexible pricing models that cater to different consumption levels or service tiers.

7. Click CANCEL.

### Explore Reserved VM Class Rate

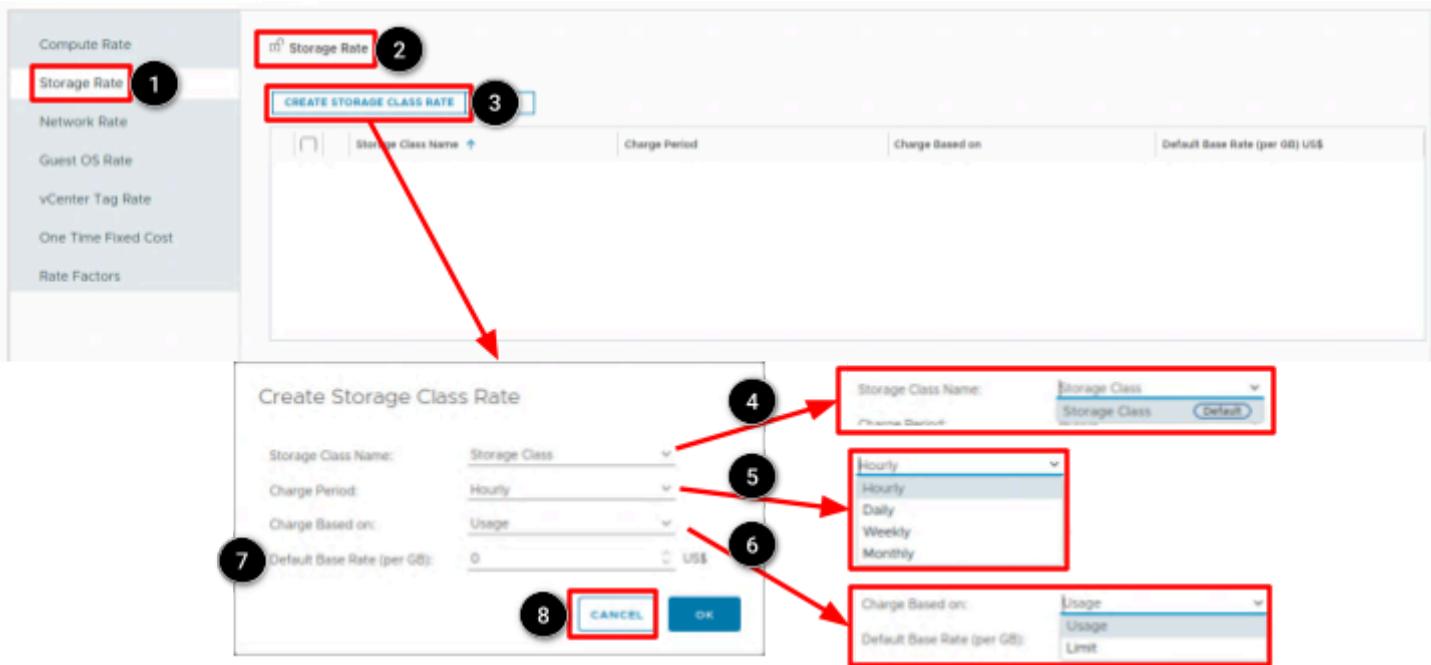


The Reserved VM Class Rate in VMware Cloud Foundation Operations Provider Pricing allows administrators to define a specific pricing model for Virtual Machines that are designated as part of a "reserved" class. This typically applies to VMs that have guaranteed resources or are part of a specific service tier.

This feature enables providers to offer differentiated pricing for VMs that require a higher level of resource assurance or commitment compared to standard, on-demand VMs. It's a way to reflect the value of guaranteed availability or reserved capacity in the overall billing. Let's examine how the pricing model works.

1. Scroll down until you see **Reserved VM Class Rate**.
2. Click on **CREATE RESERVED VM CLASS RATE**.
  - o Reserved VM Class Name: Provided by selecting an existing name or typing in a new one.
  - o Charge Period: Provided by selecting from the drop down menu
  - o Base Rate (per slot): A "slot" is a predefined, guaranteed compute resource unit (vCPU, memory, storage) for a Reserved VM Class. This rate is crucial to reserved VM pricing, charging a fixed amount per reserved capacity unit regardless of actual consumption, reflecting the cost of dedicated, readily available resources.
3. Click on the **Dropdown for Charge Period** and observe the options.
4. Click **CANCEL**.

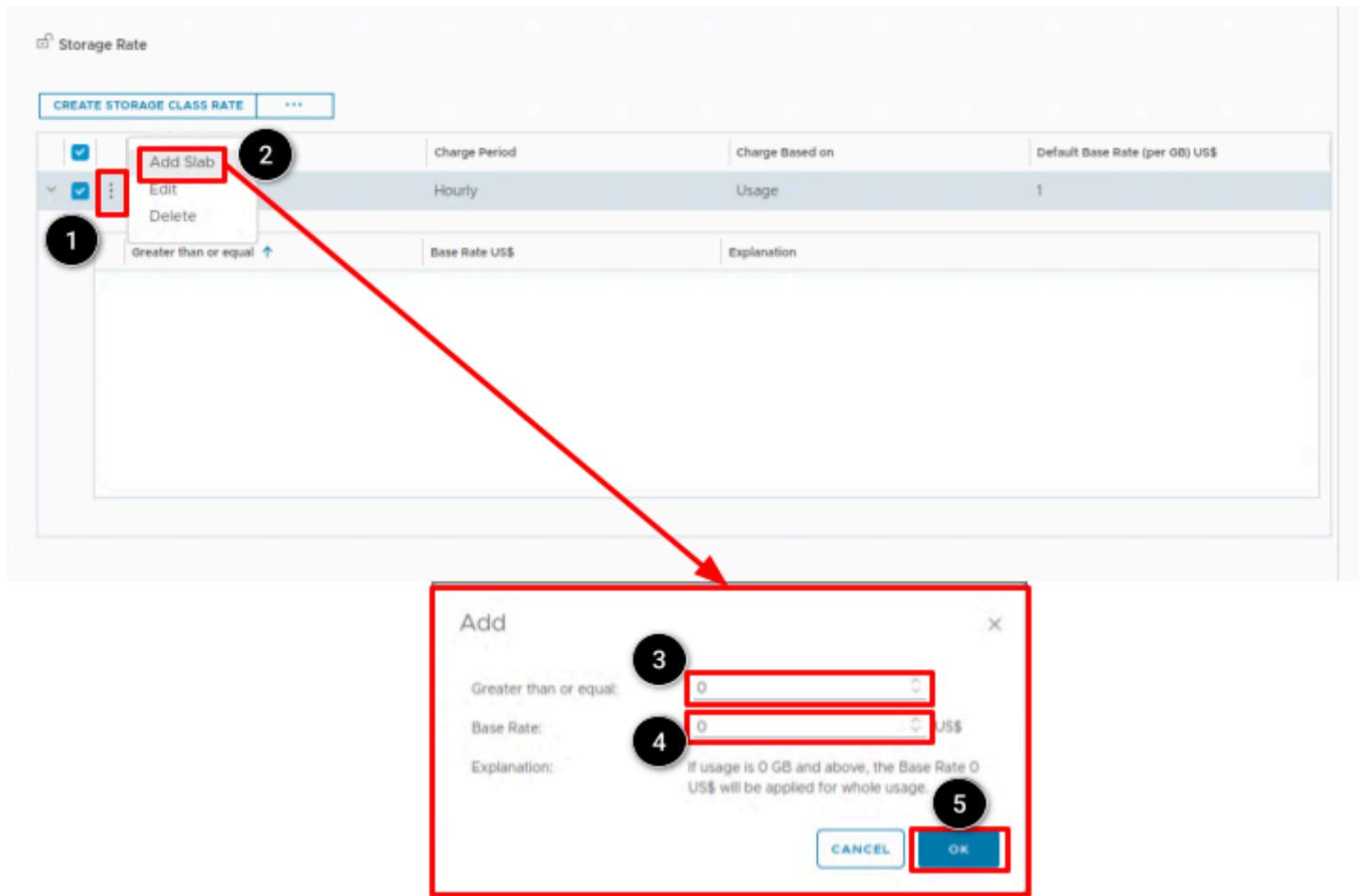
## Exploring Storage Rate



Tracking consumption of storage is an important function because storage costs can be considerable and must be accounted for in order to properly account for resource utilization. Customers may consume different amounts and tiers of storage within a single Virtual Machine with vastly different costs and prices. Let's take a look at how Provider Pricing allows administrators to create storage rate cards.

1. **Click on Storage Rates.**
2. **Click the lock to unlock the Storage Rate Card.**
3. By default, there are no Storage Class Rates, **Click CREATE STORAGE CLASS RATE** to see what is involved.
4. **Select the Storage Class** you wish to create a rate for. We only have the default option listed here.
5. **Select the Charge Period**, be it Hourly, Daily, Weekly or Monthly.
6. **Select the Charge Based on** Option with options being Usage or Limit
  - o Usage is a simple capacity measurement, how much storage is the workload consuming
  - o
7. To demonstrate the Storage Slab feature, let's **enter \$1**.
8. **Click OK.**

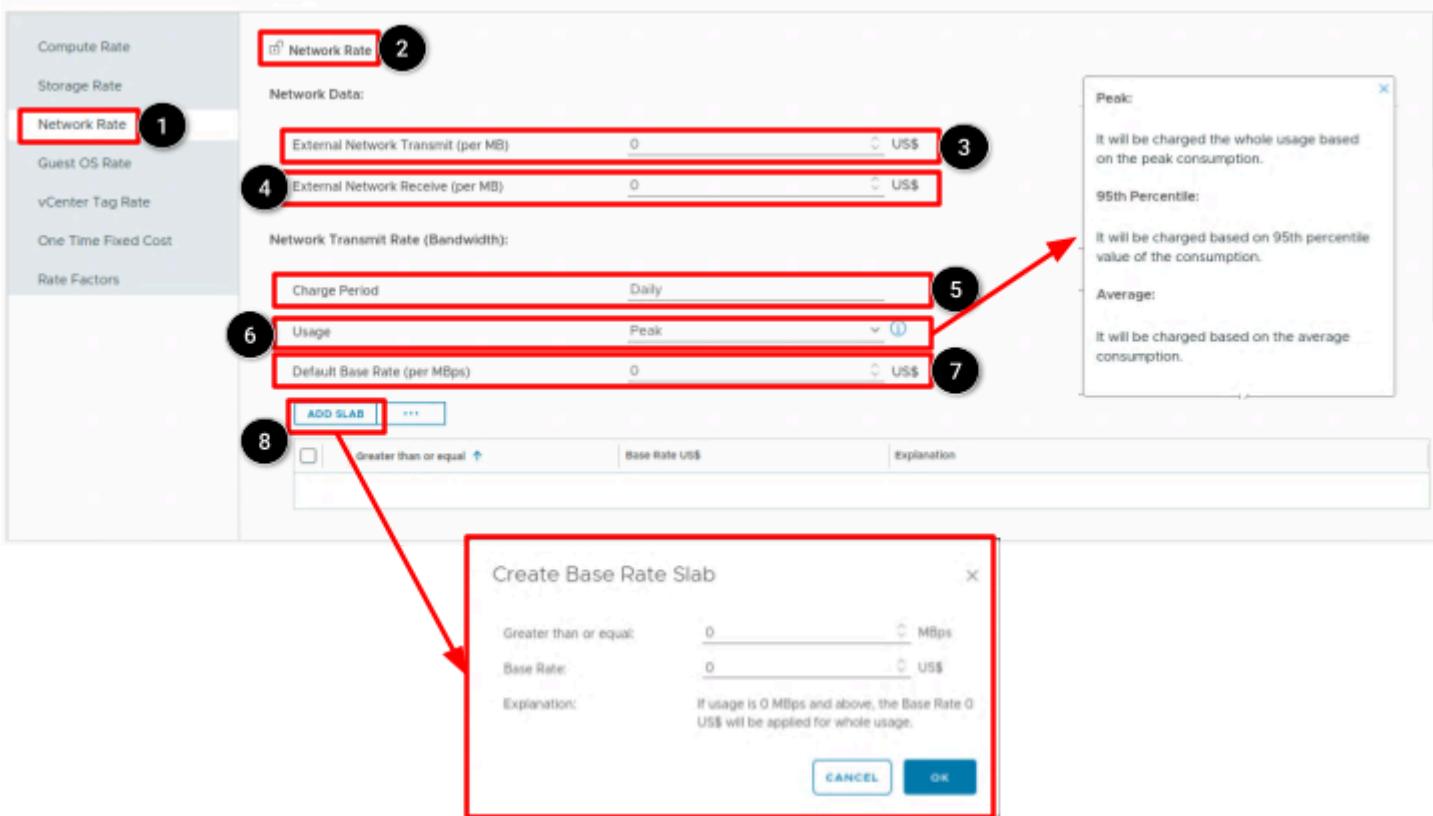
## Exploring Storage Slabs



Slab pricing by default will not be a populated option unless you have created a storage class rate. This makes sense as you can't have a Slab rate offering a discount or price increase if you're not already charging for resources to begin with. We'll quickly examine the slab feature as it operates exactly the same as RAM and CPU we've examined earlier.

1. Click the **3-dots** to open our Slab menu.
2. Select **Add Slab**.
3. In this step we can select the amount of storage we want to start applying our discount or additive expense to.
4. In this step, we specify the new charge rate once the previous storage amount (in GB) is met by the Virtual Machines consumption.
5. Click **OK** if you entered any data, otherwise click **cancel**.

## Exploring Network Rate



One key aspect of hosting Virtual Infrastructure is Network utilization both inbound and outbound. Many customers focus entirely on the RAM, Disk and CPU cost of a cloud virtual machine but forget to account for inbound and outbound charges. These charges can be broken down into 2 categories, External Inbound and Outbound traffic and Internal Inbound and Outbound traffic. The common practice is to not charge for inbound traffic but only charge for outbound traffic, a practice that VMware Cloud Foundation Operations allows to be set up, let's take a look.

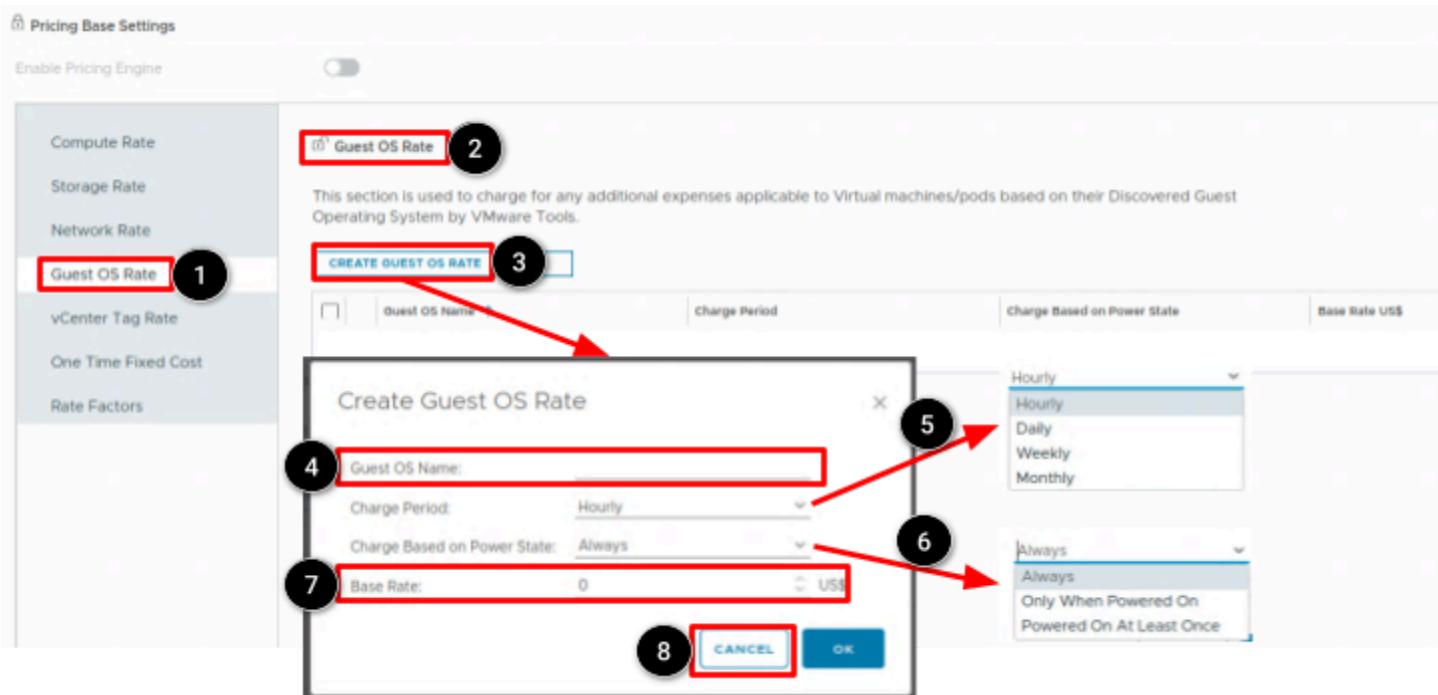
1. Click on Network Rate.
2. Click the lock to unlock editing the Network Rate.
3. Here we can enter a price per MB for external traffic Transmits, this can be thought of as the data out to the external world.
4. Here we can enter a price per MB for external traffic Received, this can be thought of as the data inbound to the Virtual Machine from the external world.

Our next section covers Internal traffic leaving and entering the Virtual Machine. Depending on your environment, there are use cases where you may need to charge for and account for inbound or outbound traffic within the cloud environment. Again this is an additional charge on top of the Inbound and Outbound charge for external internet traffic.

5. By default traffic is charged on a daily basis
6. Usage is determined by utilizing either Peak, 95th Percentile or Average
7. Here we can enter the price per Mbps (MegaByte per Second) we will charge the end user
8. Identically to our other areas, we have the ability to create slab prices that change depending on observed and entered levels. As before, you would enter a value greater than or equal to (in Mbps) and the new pricing to apply if that rate is met.

We're only covering the Network Transmit rate for internal traffic but the Network Receive rate section is exactly the same so we won't cover it here in this module.

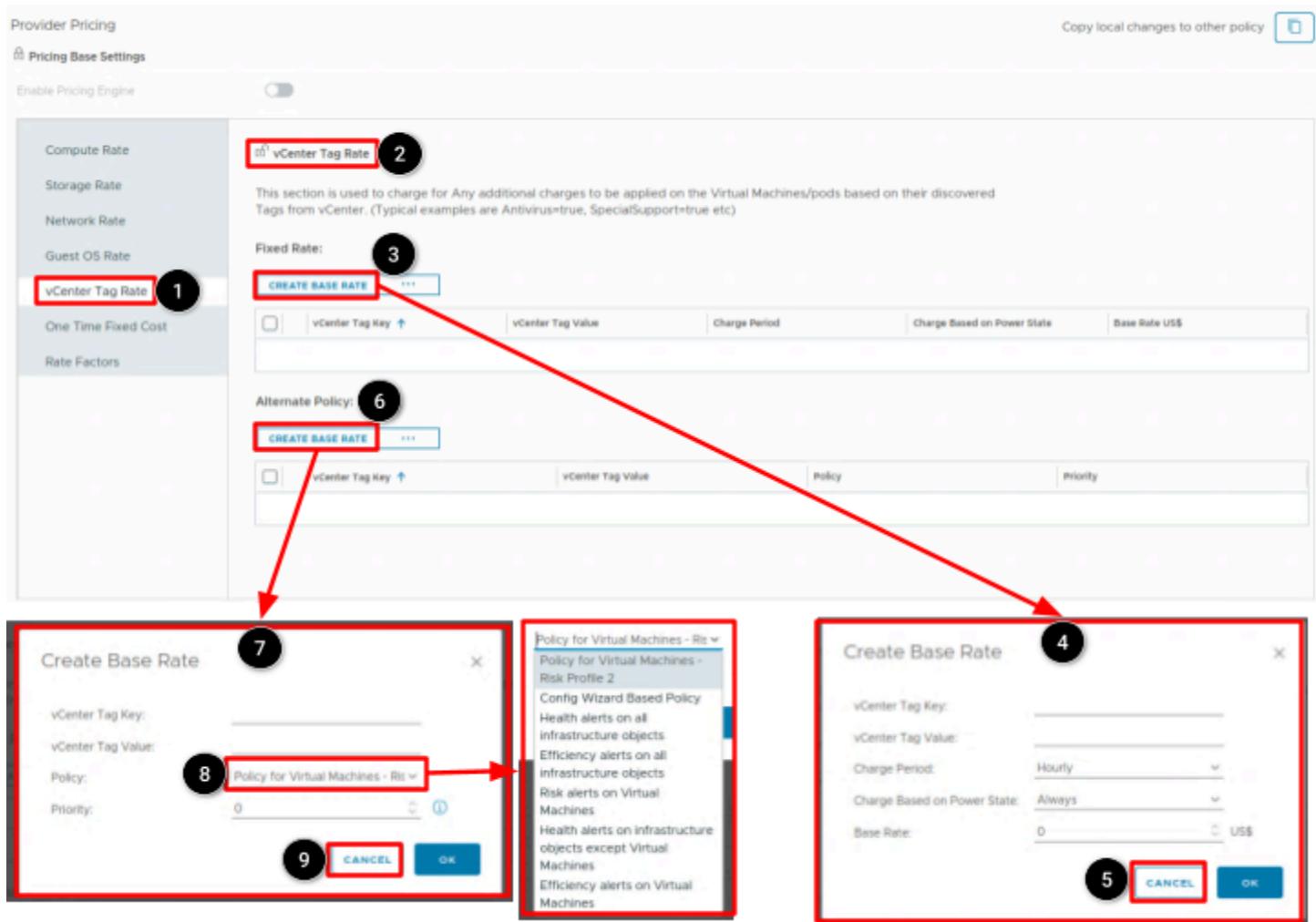
## Exploring Guest OS Rates



We've focused on physical resource allocation and utilization up until this point but we also need to account for the operating system and its charges. VMware Cloud Foundation Operations gives us a simple yet effective mechanism for creating GuestOS rates with different billing periods and power state definitions, let's take a look.

1. Click on **Guest OS Rate**.
2. Click on the lock to unlock editing **Guest OS Rate**.
3. Click on **Create Guest Rate**.
4. Here we provide the Name of the Guest OS we wish to create a rate card for.
5. Here we select the charge period for our GuestOS. Our options are Hourly, Daily, Weekly and Monthly.
6. Here we can select options to charge based on Power State. Our options are Always charge, Only charge when the VM is powered on or Charge if the VM is powered on at least once.
7. Here we can input the rate we wish to charge. The actual charge will be calculated based on the charge period and VM power state option we selected above.
8. Click **CANCEL** to close our **Guest OS Rate** card.

## Exploring vCenter Tag Rates



One powerful feature that VMware Cloud Foundation Operations allows administrators to utilize is vCenter tags and policy which allows for secondary applications to be installed and tracked and costs associated with them. The example given in the UI above is a tag for "AntiVirus" that we can create a Base Rate for. As with the OS licenses, we have the ability to vary the charge period and power state. Let's take a look.

1. **Click on vCenter Tag Rate.**
2. **Click on the lock to unlock vCenter Tag Rate.**
3. **Click on Create Base Rate.**
4. Here we create our Key Tag and its Value and associate our charge profile to it, Lets examine the inputs.
  - o vCenterTag Key: This corresponds to the Name given to the vCenter Tag. Example: "Database."
  - o vCenter Tag Value: This corresponds to the value of the vCenter Tag. Example: "SQL."
  - o Similar to other base rates, we need to select out Charge period, Options Include Hourly, Daily, Weekly, Monthly.
  - o Here we can select options to charge based on Power State. Our options are Always charge, Only charge when the VM is powered on or Charge if the VM is powered on at least once.
  - o Here we can input the rate we wish to charge. The actual charge will be calculated based on the charge period and VM power state option we selected above.
5. **Click Cancel** to return to the previous screen.
6. **Click on Create Base Rate under Alternate Policy.**
  - o The alternate policy allows administrators to create specific policy rules to address customer configurations. A good example of this would be the ability to charge an additional fee for vCPU for any Virtual Machine with SQL Server

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

installed. This can best be thought of as a surcharge that applies on top of the Base Rate defined that is triggered based on a vCenter Tag.

7. There are many built-in policy definitions we can utilize but we can also create custom definitions (not covered in this module.)
8. When done examining the policy options, **Click Cancel**.

## Exploring One Time Fixed Costs

The screenshot shows the 'Provider Pricing' configuration screen. On the left sidebar, 'One Time Fixed Cost' is highlighted with a red box and labeled '1'. In the main area, a section titled 'One Time Fixed Cost' is shown with a lock icon, labeled '2'. A red box highlights the 'One Time Fixed Cost' input field, which contains '0' and 'US\$', with a label '3'. Below this, a 'vCenter Tag' table has a 'CREATE VCENTER TAG' button highlighted with a red box and labeled '4'. A red arrow points from the 'CREATE VCENTER TAG' button to a modal dialog box titled 'Create vCenter Tag' (labeled '5'). The modal contains fields for 'vCenter Tag Key' (empty), 'vCenter Tag Value' (empty), and 'One Time Fixed Cost' (set to '0' with 'US\$'), both of which are highlighted with red boxes. At the bottom of the modal are 'CANCEL' and 'OK' buttons, with 'CANCEL' highlighted with a red box and labeled '6'.

Fixed costs are a simple way for administrators to cover one time fixed costs associated with deploying Virtual Machines or other resources in the VMware Cloud Foundation Private Cloud. As the description mentions, these can be used to cover installation costs or Engineer labor on a per Virtual Machine basis. Let's explore how combining the vCenter Tag mechanism with this one time fixed cost allows administrators to create easily tracked one time costs.

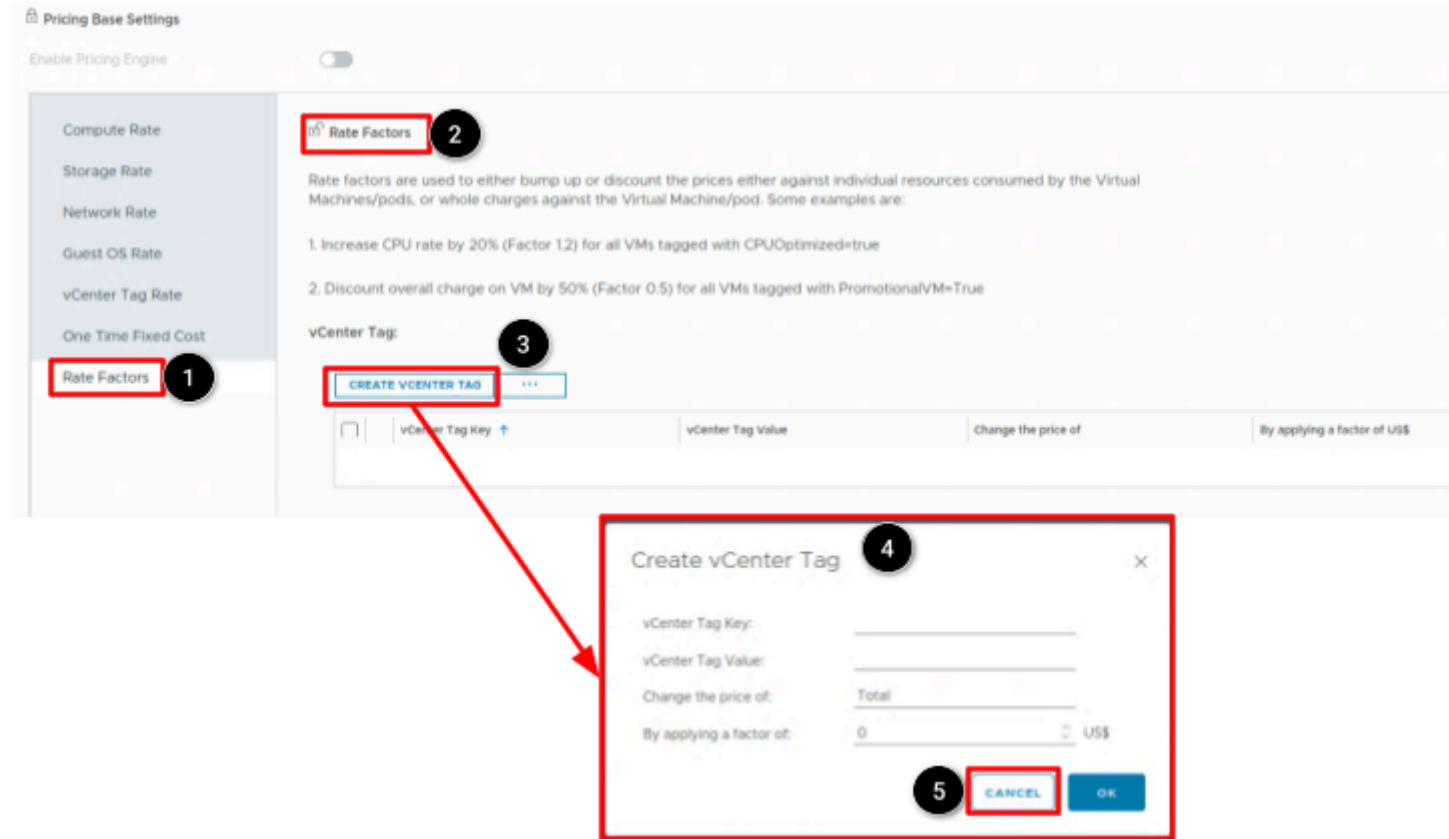
1. **Click on One Time Fixed Costs.**
2. **Click the lock to unlock editing One Time Fixed Costs.**
3. Here we can specify a one time fixed cost for VM creation. If we want to have a more dynamic system we can create a vCenter Tag.
4. **Click on Create vCenter Tag.**
5. Here we can create a vCenter Tag that allows for multiple one time charges in a more dynamic manner than a single VM creation charge.
  - o vCenterTag Key: This corresponds to the Name given to the vCenter Tag. Example: "DC-Hosting."
  - o vCenter Tag Value: This corresponds to the value of the vCenter Tag. Example: "Orlando."

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

- Here we can input the rate we wish to charge. There is no charge period or power state calculations here, it's simply a flat charge applied once.

### 6. Click Cancel.

## Exploring Rate Factors



Our final area of focus is the Rate Factor, which can best be thought of as adding a surcharge to the total charge or a discount to the total charge. Administrators can utilize this function to incentivize behavior from their customers by discounting Virtual Machines configured in certain ways or utilizing software they want to encourage. Let's take a quick look at how this works.

1. **Click on Rate Factors.**
2. **Click the lock to unlock editing Rate Factors.**
3. **Click on Create vCenter Tag.**
4. When creating our vCenter tag, the process is nearly identical to previous examples, let's take a look.
  - vCenterTag Key: This corresponds to the Name given to the vCenter Tag. Example: "Hosting-Discount."
  - vCenter Tag Value: This corresponds to the value of the vCenter Tag. Example: "50%."
  - The next value is not actually modifiable, we are only able to adjust the total price.
  - Here we apply the rate factor adjustment. A 50% discount would be created by using 0.5 while a 20% surcharge would be created by entering 1.2
5. **Click Cancel.**

As our Rate Factor modifies the total price of the Virtual Machine, it is the last thing that is modified and applied to the Virtual Machines cost.

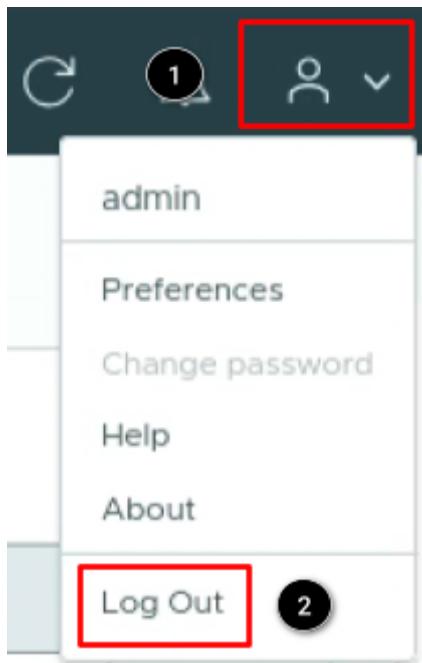
## Conclusion

In this module, we examined the Provider Pricing functionality and explored the different methods administrators have to create, present and charge rates to end users provisioning Virtual Machines. With these methods and rate configurations, administrators can create public cloud style rate cards and fully account for hosting and maintaining their VMware infrastructure while providing up front cost estimates to end users.

From here you can:

- Take this quick survey to provide feedback about your experience with VCF 9.0
- Continue with the next lab module.
- Click [vlp:table-of-contents]Show Table of Contents] to jump to any module or lesson in this lab.
- End your lab and return in the future.

## Logout



To Log out of VCF Operations:

5. Click the **User icon** to open the settings menu.
6. Click **Log Out**.

## Module 8 - Chargeback and Billing (30 min) Advanced

Over recent releases, chargeback and billing capabilities in VMware Cloud Foundation (VCF) Operations have evolved from a simple pricing tool into a robust, integrated solution. What started as a basic way to track service usage has developed into a comprehensive Tenant App, empowering service providers to monetize a wide range of services and offering tenants greater visibility and transparency.

With the integration of Tenant App features into Aria Operations 8.x, both providers and customers started to benefit from a unified, streamlined experience. VCF Operations 9.0 represents a significant step forward, making chargeback management simpler and more powerful than ever—setting the stage for even greater enhancements in future versions.

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

In this module, we will learn how VMware Cloud Foundation 9 Operations streamlines and simplifies cloud management for both service providers and tenants. We'll explore how the unified operations console consolidates key cost management tasks - such as showback, chargeback and billing - into a single interface.

### Login to VCF Operations

In the following few pages, we will walk through the process for logging in to VCF Operations.

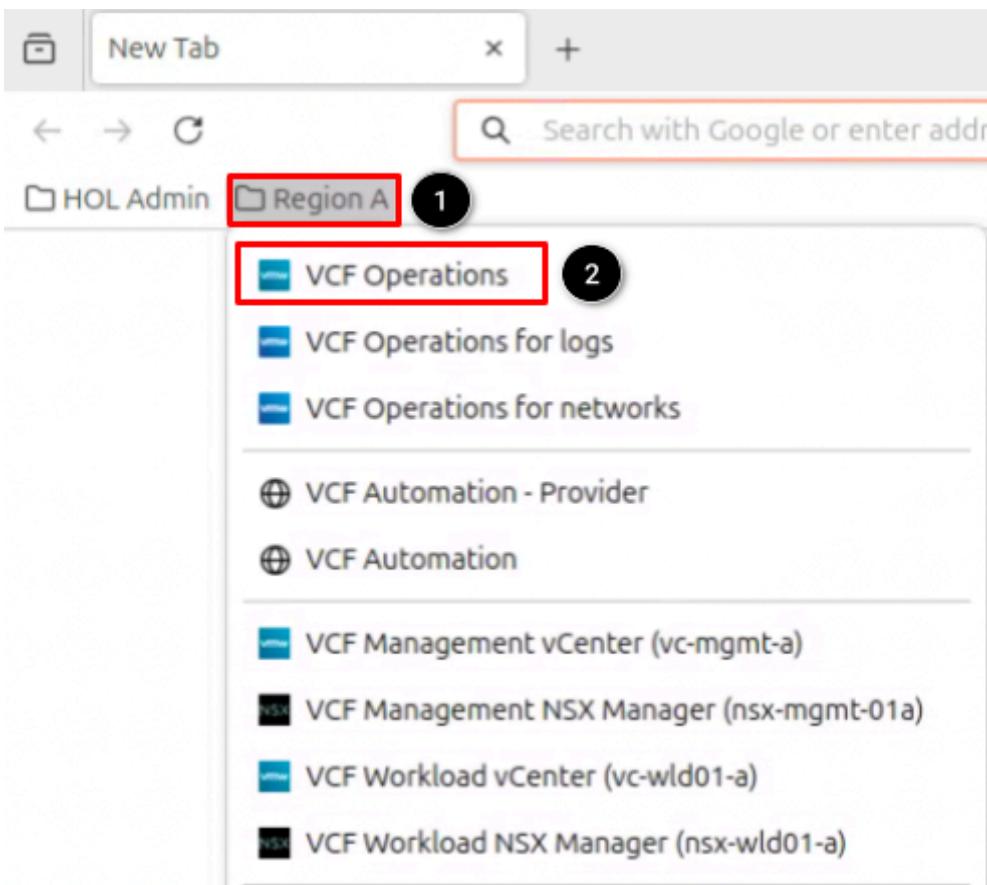
#### Start Firefox



Open the Firefox Browser from the Linux Task Bar.

1. Click on the Firefox icon to open the browser.

#### Open VCF Operations Console



Once Firefox has loaded:

1. Click on the **Region A** bookmark folder.
2. Click **VCF Operations**.

## Login to VCF Operations Console

# VMware Cloud Foundation Operations™

The screenshot shows the VCF Operations login interface. It includes a dropdown menu for 'Login Method' set to 'Local Account' (marked with a red box and number 1), a 'Username' field containing 'admin' (marked with a red box and number 2), a 'Password' field with redacted content (marked with a red box and number 3), and a blue 'LOG IN' button (marked with a black circle and number 4). A note below the form states: 'The credentials for **admin** should already be cached in the browser window.'

The credentials for **admin** should already be cached in the browser window.

At the VCF Operations login prompt, select the login method and type in the following user and password information.

1. At the Login Method dropdown, select **Local Account**.
2. At the username field, type **admin**.
3. At the password field, type **VMware123!VMware123**.
4. Click **LOG IN**.

## New Chargeback

First, we navigate to the new Cost page in VCF Operations 9.

The screenshot shows the VMware Cloud Foundation Operations interface. On the left, there's a navigation sidebar with links like Home, Inventory, Infrastructure Operations, Workload Operations, Fleet Management, Capacity (highlighted with a red box), Cost (highlighted with a red box), and Green Score. A dropdown arrow next to Capacity has a number '1' over it. A dropdown arrow next to Cost has a number '2' over it. At the top right, there's a search bar and tabs for Overview, Analysis, Optimize, Showback, and Chargeback (highlighted with a red box). A circular badge with the number '3' is positioned to the right of the Chargeback tab. Below the tabs, there are three buttons: OVERVIEW (selected), ORGANIZATIONS, and PROJECTS. The main content area has a 'Summary' section showing 1 Organization, 1 Region Quotas, 1 VKS Clusters, 3 VMs, and 0 Pods. It also displays financial data: 0.00 US\$ Ongoing Price (Month To Date) and 270.59 US\$ Cost of Ownership (Month To Date). To the right, there's a 'Capacity Overview' section with a chart showing 0 MHz Reserved out of 39.616 GHz Unreserved.

1. Click on **Capacity**.
2. Click on **Cost**. This is the new control center for everything related to costs in a private cloud based on VCF 9.
3. Click on **Chargeback**.

## Chargeback Overview

Providers can now access detailed pricing and chargeback insights through the enhanced chargeback dashboards available under Cost Management. These dashboards offer visibility into costs from multiple management perspectives:

- **Overview:** Presents a high-level summary of chargeback data—including cost and price—across organizations, region quotas, and running VMs
- **Organizations:** Displays chargeback breakdowns for each organization and their corresponding region quotas.
- **Projects:** Offers a comprehensive view of cost and pricing across all projects in VCF Automation, with additional insights into associated namespaces and deployments.

These dashboards make it easier to track and analyze resource usage costs at every level of the environment. From here we will also be accessing the new Billing capabilities in VCF Operations.

## Cost

Overview   Analysis   Optimize   Showback   **Chargeback**   Bills

**OVERVIEW**   1 ORGANIZATIONS   PROJECTS

**Summary**   2

2	4	21	0
Region Quotas	VKS Clusters	VMs	Pods

1258.62 US\$	466.94 US\$
Ongoing Price (Month To Date)	Cost of Ownership (Month To Date)

**Capacity Overview**   3



CPU 195.193 GHz  
0 MHz Reserved  
195.193 GHz Unreserved



Memory 1.417 TB  
0 MB Reserved  
1.417 TB Unreserved

**Organizations Details**   4

Name	Number of Region Quotas	Number of VMs	Number of Running VMs	Total Cost
ProviderConsumptionOrg	0	0	0	0 US\$
acme-finance	1	11	11	195.25 US\$
acme-sales	1	10	10	271.69 US\$

- Click on **OVERVIEW**.

Please note that in this brand-new HOL environment, we don't yet have all the components in place to showcase all the new and exciting features in the lab. For this reason, the following dashboards and widgets in the lab may display little to no data, whereas the screenshots in the manual show an environment that is already more fully populated.

- The **Summary** widget shows the Total Number of Organizations that we're providing service to, as well as any region quotas, total number of VMs, VKS cluster and Pods, as well as total and ongoing costs.
- The **Capacity Overview** gives us a quick insight into the key resource numbers.
- And finally the **Organizations Details** section shows detailed information per organization in our VCF environment.

## Organizations

The Organizations dashboard shows detailed chargeback summaries for each organization along with their respective regional quotas.

**Cost**

Overview   Analysis   Optimize   Showback   **Chargeback**   Bills

OVERVIEW   **ORGANIZATIONS**   Projects   1

**Organizations** 2

Name	Total Cost (MTD)	Total Price (MTD)	CPU (Cost)	CPU (Price)	Memory (Cost)	Memory (Price)
acme-finance	195.25	46.84	990.66	26.4	917.43	13.24
acme-sales	271.69	57.95	898.91	24	1,694.05	25.24
ProviderConsumptionO...	0	?	0	?	0	?

1 - 3 of 3 items

**Organization Cost vs Price Trend** 5

Total Cost (MTD)   Total Price (MTD)

acme-finance

Jun 1, 2025, 12:00 AM - Jun 13, 2025, 10:47 AM

**Region Quotas** 3

Name	Total Cost (MTD)	Total Price (MTD)	CPU (Cost)	CPU (Price)	Memory (Cost)	Memory (Price)
acme-finance_us-west	904.69	46.84	189.43	316.8	611.62	13.24

1 - 1 of 1 items

**Namespaces** 4

Name	Total Cost (MTD)	Total Price (MTD)	CPU (Cost)	CPU (Price)	Memory (Cost)	Memory (Price)
sandbox-hj5cr	857.76	204.04	450.3	144	286.7	13.24
staging-bq8fh	1,485.2	284.04	540.36	172.8	630.73	13.24

1 - 2 of 2 items

**Region Quota Cost vs Price Trend**

Total Cost (MTD)   Total Price (MTD)

acme-finance

- Click on **ORGANIZATIONS**.

Please note that in this brand-new HOL environment, we don't yet have all the components in place to showcase all the new and exciting features in the lab. For this reason, the following dashboards and widgets in the lab will display little to no data, whereas the screenshots in the manual show an environment that is already more fully populated.

- We will select the Organization we would like to inspect from the **Organizations List**.
- The **Region Quotas** will show the quotas data for the selected organization.
- Organizations will have namespaces and the Namespaces list will show the details of them for the selected organization.
- The trend diagrams are designed to show the history and **trends of costs vs. prices**.

## Projects

The Projects dashboard provides a holistic overview of costs and pricing for all projects within VCF Automation, along with detailed insights into related namespaces and deployments.

These dashboards simplify the process of monitoring and analyzing resource usage expenses at every layer of the environment.

## Cost

OVERVIEW ORGANIZATIONS PROJECTS 1

Name	Total Cost (MTD)	Total Price (MTD)	CPU (Cost)	CPU (Price)	Memory (Cost)
ProviderConsumptionOrg	0	?	0	?	0
acme-finance	195.25	46.84	990.66	26.4	917.43
acme-sales	271.69	57.95	898.91	24	1,694.05

1 - 3 of 3 items

Name	Total Cost (MTD)	Total Price (MTD)	CPU (Cost)	CPU (Price)	Memory (Cost)
financial-app	2,342.96	488.07	990.66	316.8	917.43

2

Jun 1 Jun 3 Jun 5 Jun 7 Jun 9 Jun 11 Jun 13

Total Cost (MTD) Total Price (MTD)

Jun 1, 2025, 12:00 AM - Jun 13, 2025, 10:54 AM

Project Cost vs Price Trend

1. Click on **PROJECTS**.

Please note that in this brand-new HOL environment, we don't yet have all the components in place to showcase all the new and exciting features in the lab. For this reason, the following dashboards and widgets in the lab will display little to no data, whereas the screenshots in the manual show an environment that is already more fully populated.

2. As in the previous tab, here we will select the Organization we would like to inspect from the **Organizations List**.
3. In this tab we focus on the **Projects** within the selected organization, showing the details, history and the trends.

## Billing

The billing capability is fundamental to effective financial management, providing tools to effortlessly generate and schedule invoices for our tenants. It simplifies the traditionally complex billing process by automating tasks and minimizing errors, ensuring every transaction is handled with consistency and precision.

**Bills Overview**

Cost

Overview Analysis Optimize Showback Chargeback **Bills** 1

**GENERATE BILL** ... Type here to apply filters

	Name	Object Type	Object Name	Selected Policy	Billing Date	Start Date
<input type="checkbox"/>	Custom Bill	VCFA Organizati...	acme-finance	Historical Policies	6/10/25 1:08 PM	6/1/25 12:00 AM
<input type="checkbox"/>	test	Region Quota	acme-sales_us...	Default Policy	6/10/25 10:47 AM	6/2/25 12:00 AM
<input type="checkbox"/>	Monthly Organiz...	VCFA Organizati...	acme-finance	Historical Policies	5/26/25 3:03 PM	4/1/25 12:00 AM
<input type="checkbox"/>	Monthly Organiz...	VCFA Organizati...	acme-finance	Historical Policies	5/25/25 8:33 PM	4/1/25 12:00 AM
<input type="checkbox"/>	Monthly Bill	VCFA Organizati...	acme-finance	Historical Policies	5/25/25 8:13 PM	4/1/25 12:00 AM
<input type="checkbox"/>	Monthly Tenant ...	VCFA Organizati...	acme-finance	Historical Policies	5/25/25 4:38 PM	4/1/25 12:00 AM
<input type="checkbox"/>	OnDemand 1	VCFA Organizati...	acme-sales	Historical Policies	5/15/25 6:36 PM	5/1/25 12:00 AM
<input type="checkbox"/>	Monthly	VCFA Organizati...	acme-finance	Historical Policies	5/14/25 4:38 PM	4/1/25 12:00 AM
<input type="checkbox"/>	Monthly	VCFA Organizati...	acme-sales	Historical Policies	5/14/25 4:38 PM	4/1/25 12:00 AM
<input type="checkbox"/>	OnDemand Sale...	VCFA Organizati...	acme-sales	Historical Policies	5/7/25 5:17 PM	4/1/25 12:00 AM
<input type="checkbox"/>	Monthly Tenant ...	VCFA Organizati...	acme-finance	Historical Policies	4/25/25 4:38 PM	3/15/25 9:46 AM
<input type="checkbox"/>	acme-sales	Region Quota	acme-sales_us...	Default Policy	4/16/25 3:11 PM	4/1/25 12:00 AM
<input type="checkbox"/>	acme-finance	Region Quota	acme-finance_u...	Default Policy	4/16/25 1:59 PM	4/1/25 12:00 AM

Please note that in this brand-new HOL environment, we don't yet have all the components in place to showcase all the new and exciting features in the lab. For this reason, the following dashboards and widgets in the lab will display little to no data, whereas the screenshots in the manual show an environment that is already more fully populated.

1. Click on **Bills**.
2. This list will show all **generated bills** in our private cloud. From here we will be able to create new bills. Please note that the screenshot will differ from what you see in the lab.

**Bills Details**

**Cost**

Overview   Analysis   Optimize   Showback   Chargeback   Bills

**GENERATE BILL**   ...

Type here to apply filters

Name	
<input checked="" type="checkbox"/> Custom Bill	1
<input type="checkbox"/> test	
<input type="checkbox"/> Monthly Organization Bill - ACME	
<input type="checkbox"/> Monthly Organization Bill	
<input type="checkbox"/> Monthly Bill	
<input type="checkbox"/> Monthly Tenant Bill	
<input type="checkbox"/> OnDemand 1	
<input type="checkbox"/> Monthly	
<input type="checkbox"/> Monthly	
<input type="checkbox"/> OnDemand Sales Bill April	
<input type="checkbox"/> Monthly Tenant Bill	
<input type="checkbox"/> acme-sales	
<input type="checkbox"/> acme-finance	

**Custom Bill**   2

Bill Name	Custom Bill
Description	
Selected Policy	Historical Policies
Billing Date	6/10/25 1:08 PM
Billing Period	6/1/25 12:00 AM - 6/10/25 12:00 AM
Resource Name	acme-finance
Total Price	421.53

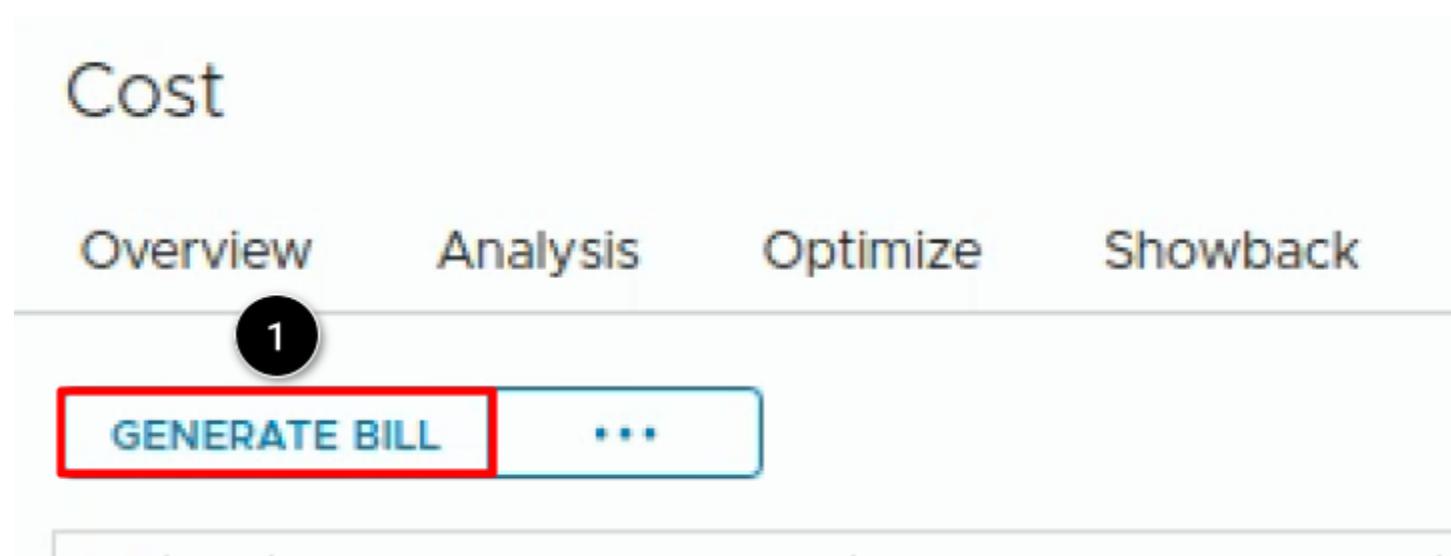
**SHOW EMPTY** ⓘ

<b>Bill summary for acme-finance</b> 3									
Resource Type	VCFA Organization								
Total Price	421.53								
<table border="1"> <thead> <tr> <th>Name</th> <th>Price</th> </tr> </thead> <tbody> <tr> <td>Storage Policies</td> <td>61.42</td> </tr> <tr> <td>Memory</td> <td>122.51</td> </tr> <tr> <td>vCPU</td> <td>237.60</td> </tr> </tbody> </table>		Name	Price	Storage Policies	61.42	Memory	122.51	vCPU	237.60
Name	Price								
Storage Policies	61.42								
Memory	122.51								
vCPU	237.60								

Please note that in this brand-new HOL environment, we don't yet have all the components in place to showcase all the new and exciting features in the lab. For this reason, the following dashboards and widgets in the lab will display little to no data, whereas the screenshots in the manual show an environment that is already more fully populated.

1. When we click on one of the **generated bills** we will see (in the screenshot only):
2. The **overall price** included in this bill.
3. **Details** of the overall price.

## Generating a New Bill



1. Click on **GENERATE BILL**.

**New Bill Details Settings**

## Generate Bill

Cost / Generate Bill

Details

Name	HOL-Bill	1
Description		
Start date	7/1/25	2
End date	7/23/25	3

The dates are provided in UTC timezone.  
The selected Billing period is from 6/30/25 5:00 PM to 7/22/25 5:00 PM.

✓ Advanced Settings

Pricing Enabled Policy

PREVIOUS    **NEXT**    CREATE    CANCEL

4

5

1. Set the **Name** to HOL-Bill or whatever we want it to be.
2. Set the **Start date** to the beginning of this or the previous month.
3. Set the **End date** to the current day.
4. Expand the **Advanced Settings**. We will not change anything here, this is just for our information. If we want to generate a bill using a specific policy, then select a policy from the list. Only the policies that have Provider pricing configured will appear in

## Cost Optimization, Showback and Chargeback Using VCF Operations (HOL-2601-19-VCF-L)

the list. It is not mandatory to select a policy from the list. If we do not select any policy, then the bills will be calculated based on Provider pricing configurations present in the default policy.

5. Click on **NEXT**.

### New Bill Select Objects

Generate Bill

Cost / Generate Bill

Details

Select Object

Drag Region Quotas or Organizations to generate bills

Region Quota  Organization

hol-all-apps

Organization

hol-all-apps

Drop resource here

1

2

3

4

PREVIOUS

NEXT

CREATE

CANCEL

1. Switch the object type to **Organization**.  
2. **Drag and drop** the hol-all-apps Organization to the selected objects list on the left.  
3. **Ensure** that the selected **organization** shows up in the list.  
4. Click on **CREATE**.

## Review the New Bill

The screenshot shows the 'Cost' tab selected in the navigation bar. The 'Bills' section displays a list of bills. The first bill in the list, 'Showcase Org Bill 03', is highlighted with a red box and circled with a black number 1. The details for this bill are expanded, showing fields like Bill Name, Description, Selected Policy, Billing Date, Billing Period, Resource Name, and Total Price. Below this, there's a 'SHOW EMPTY' button and a 'Bill summary for showcase-all-apps\_us-west-region' section. This summary includes Resource Type (Region Quota), Total Price (173.55), and a detailed breakdown of usage by resource type: Network Receive (6.71), Memory (146.49), Network Transmit (0.00), and CPU (20.35). Further down are sections for Chargeback Resource Details (NSX Project) and another Bill summary for showcase-all-apps.

Please note: This brand-new HOL environment doesn't have all components in place to showcase every new and exciting feature. Therefore, the bill we just created will not display meaningful data. The application or organization for which the bill was created needs to run for some time to enable cost calculation and metric collection.

To demonstrate the intended outcome, we are using a screenshot from a different, long-running environment, which will not match what you see in the HOL.

1. Clicking the Bill's name will open its details page.
2. The details page will display the total price and a breakdown of that price.

## Billing in the Consumption Interface - Quick Preview

The Bills section in VCF Automation 9 provides tenants with a transparent, itemized overview of their monthly billing information, sourced directly from VCF Operations. It presents detailed billing periods, related projects, and total charges, allowing tenants to monitor their infrastructure usage and expenses over time. This seamless integration promotes financial transparency and equips tenant administrators with the insights needed for internal budgeting, forecasting, and chargeback verification - all within the same platform they use to manage their services.

In the corresponding HOL and Module focusing on VCF Automation we will learn more about the new features. The next step shows a quick preview of what is included in VCF Automation 9.

## Billing in VCF Automation

The screenshot shows the VMware Cloud Foundation Operations interface. The top navigation bar includes the VMware logo, 'VMware Cloud Foundation', 'Automation', and tabs for 'Overview', 'Build & Deploy', 'Manage & Govern', 'Orchestrate', 'Administrator' (which is selected), and 'Inbox'. On the left, a sidebar menu lists 'Bills', 'Access Control', 'Connections' (with 'Integrations' and 'Identity Providers' sub-options), 'Certificates & Secrets' (with 'Certificate Management' and 'Secrets' sub-options), 'Configuration' (with 'Settings' and 'Notifications' sub-options), and 'Activity' (with 'Audit Log' sub-option). The main content area is titled 'Bills' and displays an overview of all expenses incurred for resource usage across the organization. A search bar at the top right says 'Type here to apply filter'. Below the search bar is a table with columns 'Name' and 'Description'. The table contains several rows: 'Custom Bill', 'Monthly Organization Bill - ACME' (selected and highlighted in blue), 'Monthly Organization Bill', 'Monthly Bill', 'Monthly Tenant Bill', 'Monthly', 'Monthly Tenant Bill', and 'acme-finance'. To the right of this table is a detailed view of the selected bill: 'Monthly Organization Bill - ACME'. It includes fields for 'Bill Name' (Monthly Organization Bill - ACME), 'Description' (empty), 'Billing Date' (5/26/25 3:03 PM), 'Billing Period' (4/1/25 12:00 AM - 5/1/25 12:00 AM), 'Resource Name' (acme-finance), and 'Total Price' (23440.09). Below this is a 'Bill summary for acme-finance' table with 'Resource Type' (VCFA Organization) and 'Total Price' (23440.09). At the bottom is a table showing resource costs: Storage Policies (14010.05), Memory (8956.71), vCPU (442.54), CPU (5.80), and VM Creation (25.00).

This screenshot shows the Bills which have been generated in VCF Operations in the Consumption interface of the VCF based private cloud provided by VCF Automation.

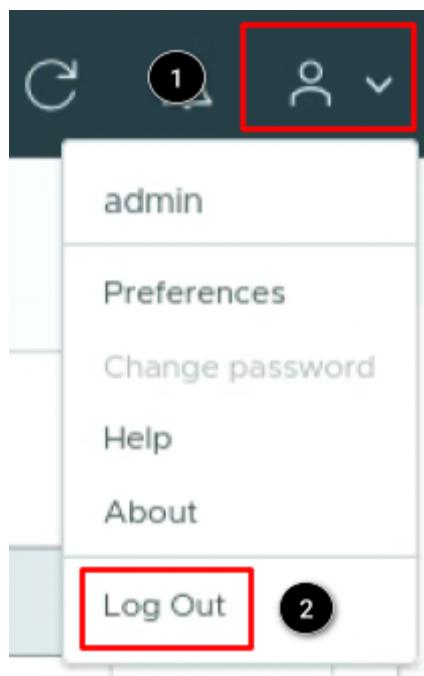
## Conclusion

In this module, we explored the new chargeback and billing features introduced in VCF Operations 9. We learned how to navigate the updated Cost pages, gaining hands-on experience with enhanced dashboards that provide detailed insights into chargeback and billing across organizations, projects, and regions. These tools offer greater visibility and transparency, making it easier to track, analyze, and manage expenses at every level of the environment. Additionally, we discovered how the new billing capabilities streamline invoice generation and financial management, ensuring accuracy and efficiency. While the lab environment may not yet display fully populated data, the screenshots and guided steps have demonstrated the powerful new functionality now available in VCF Operations 9.

From here you can:

- Take this quick survey to provide feedback about your experience with VCF 9.0
- Click [vlp:table-of-contents]Show Table of Contents] to jump to any module or lesson in this lab.
- End your lab and return in the future.

**Logout**



To Log out of VCF Operations:

1. Click the **User icon** to open the settings menu.
2. Click **Log Out**.

End of Lab Manual (06/25)

Copyright © 2025 Broadcom. All rights reserved.

The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries. For more information, go to [www.broadcom.com](http://www.broadcom.com). All trademarks, trade names, service marks, and logos referenced herein belong to their respective companies. Broadcom reserves the right to make changes without further notice to any products or data herein to improve reliability, function, or design. Information furnished by Broadcom is believed to be accurate and reliable. However, Broadcom does not assume any liability arising out of the application or use of this information, nor the application or use of any product or circuit described herein, neither does it convey any license under its patent rights nor the rights of others.  
Item No: 51227-vcf-wp-hands-on-labs-manual-2025, Jan-25