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Lab Overview - HOL-1801-01-CMP
vRealize Suite Standard: Cloud Planning and Optimization
Lab Guidance

Note: It will take more than 90 minutes to complete this lab. You should expect to only finish 2-3 of the modules during your time. The modules are independent of each other so you can start at the beginning of any module and proceed from there. You can use the Table of Contents to access any module of your choosing.

The Table of Contents can be accessed in the upper right-hand corner of the Lab Manual.

See how you can gain insights into your infrastructure costs and compare the costs of running workloads in your private cloud with running them in select public clouds. Also learn how you can optimize compute resource utilization and improve planning and forecasting. In this lab, we will demonstrate how vRealize Operations and vRealize Business for Cloud improve operational efficiency by increasing capacity utilization and resource reclamation, allowing for better consumption tracking and visibility into the cost of resources, and streamlining capacity planning and forecasting.

Lab Module List:

**Module 1 - Business alignment with insights into infrastructure costs for private cloud** (60 minutes) (Basic)

This module covers the steps of using real-time reporting data from vRealize Business for Cloud (vRBC) to make meaningful decisions on running your business efficiently. In this module, we will experience how vRealize Business for Cloud compares the cost of public and private cloud options, as well as the underlying cost drivers of each option. You will also interact with the solution by redefining prices and observing how these changes impact the cloud cost. At the end of this module you will be able to leverage the information vRBC provides to make fact-based decisions regarding your data center.

**Module 2 - Cost transparency and comparison of costs across private and public clouds** (30 minutes) (Basic)

You can gain insights into your infrastructure and compare the costs of running workloads in your private cloud versus select public clouds. You can also optimize compute resource utilization and improve planning and forecasting. vRealize Operations and vRealize Business for Cloud improve operational efficiency by increasing capacity utilization and resource reclamation. Experience better consumption tracking, visibility into the cost of resources, and streamlined capacity planning and forecasting.

**Module 3 - Capacity management: Alerting, reclamation, right sizing, capacity trending, costing, and capacity correlation** (60 minutes) (Basic)
In this module, we will identify objects which are experiencing health issues or are at risk of running out of resources. Using alerts and analysis tools, vRealize Operations will indicate which virtual machines are stressed due to resource constraints and what procedure would be used to modify the constrained resource. Generated alerts in vRealize Operations Manager appear in the alert lists. You use the alert lists to investigate, resolve, and begin troubleshooting problems in your environment.

**Module 4 - vSphere capacity planning projects based on demand and consumption** (30 minutes) (Basic)

Review any planned changes within the environment and understand how those changes may impact capacity. Create a project plan to understand the impact of adding additional resources and workloads.

**Module 5 - Infrastructure compliance with vSphere, PCI and HIPAA Hardening Guides** (30 minutes) (Basic)

In this module you will learn how to ensure compliance of a vSphere environment and how to define a compliance standard for custom standards. You will also ensure that host objects comply with alert-based compliance rules and how to customize a policy to enable **vSphere Hardening Guide** alerts. Also you will investigate how industry standard compliances like PCI and HIPPA can be used to monitor a vSphere environment.

**Lab Captains:**

- **Module 1 - Mark Plaza, Senior Systems Engineer, United States**
- **Module 2 - Mark Plaza, Senior Systems Engineer, United States**
- **Module 3 - Mark Plaza, Senior Systems Engineer, United States**
- **Module 4 - Tiago Baeta, Staff Systems Engineer, Brazil**
- **Module 5 - Tiago Baeta, Staff Systems Engineer, Brazil**

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

[http://docs.hol.vmware.com](http://docs.hol.vmware.com)

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

Location of the Main Console

1. The area in the RED box contains the Main Console. The Lab Manual is on the tab to the Right of the Main Console.
2. A particular lab may have additional consoles found on separate tabs in the upper left. You will be directed to open another specific console if needed.
3. Your lab starts with 90 minutes on the timer. The lab can not be saved. All your work must be done during the lab session. But you can click the EXTEND to increase your time. If you are at a VMware event, you can extend your lab time twice, for up to 30 minutes. Each click gives you an additional 15 minutes. Outside of VMware events, you can extend your lab time up to 9 hours and 30 minutes. Each click gives you an additional hour.

Alternate Methods of Keyboard Data Entry

During this module, you will input text into the Main Console. Besides directly typing it in, there are two very helpful methods of entering data which make it easier to enter complex data.
Click and Drag Lab Manual Content Into Console Active Window

You can also click and drag text and Command Line Interface (CLI) commands directly from the Lab Manual into the active window in the Main Console.

Accessing the Online International Keyboard

You can also use the Online International Keyboard found in the Main Console.

1. Click on the Keyboard Icon found on the Windows Quick Launch Task Bar.
Click once in active console window

1. Click once in the active console window.
2. Click on the **Shift** key.

Click on the @ key

1. Click on the "@ key".

Notice the @ sign entered in the active console window.
Activation Prompt or Watermark

When you first start your lab, you may notice a watermark on the desktop indicating that Windows is not activated.

One of the major benefits of virtualization is that virtual machines can be moved and run on any platform. The Hands-on Labs utilizes this benefit and we are able to run the labs out of multiple datacenters. However, these datacenters may not have identical processors, which triggers a Microsoft activation check through the Internet.

Rest assured, VMware and the Hands-on Labs are in full compliance with Microsoft licensing requirements. The lab that you are using is a self-contained pod and does not have full access to the Internet, which is required for Windows to verify the activation. Without full access to the Internet, this automated process fails and you see this watermark.

This cosmetic issue has no effect on your lab.

Look at the lower right portion of the screen
Please check to see that your lab is finished all the startup routines and is ready for you to start. If you see anything other than "Ready", please wait a few minutes. If after 5 minutes your lab has not changed to "Ready", please ask for assistance.
Module 1 - Business alignment with insights into infrastructure costs for private cloud (60 mins)
Introduction to Business Alignment

This module covers the steps of using real-time reporting data from vRealize Business for Cloud (vRBC) to make meaningful decisions on running your business efficiently.

In this module, we will experience how in vRealize Business for Cloud we can understand and compare the cost of public and private cloud options, as well as the underlying cost drivers of each option.

You will also interact with the solution by redefining prices and observing how these changes impact the cloud cost. At the end of this module you will be able to leverage the information vRBC provides to make fact-based decisions regarding your data center.
vRealize Suite - Cloud Management Platform (CMP)

There are several VMware bundles and editions that make up the vRealize Suite.

Here is the complete set of products available:

- vRealize Automation (vRA)
- vRealize Operations Manager (vROPS)
- vRealize Business for Cloud (vRBC)
- vRealize Log Insight (vRLI)

The infrastructure components we will focus on for this lab are:

- vRealize Operations Manager (vROPS)
- vRealize Business for Cloud (vRBC)

vRealize Suite - More Details

**vRealize Suite – a CMP Platform**

What is the vRealize Suite?

VMware vRealize Suite is a cloud management platform purpose-built for the hybrid cloud. It provides a comprehensive management stack for IT services on vSphere and other hypervisors, physical infrastructure and external clouds, all with a unified management experience.
The vRealize Suite is targeted at customers who are interested in managing a significant amount of resources residing outside of the vSphere environment, including other virtualization platforms as well as public cloud computing platforms.

**vRealize Operations Manager**

vRealize Operations is available in three standalone editions.

- Standard - per CPU and per 25 pack
- Advanced - per CPU and per 25 pack
- Enterprise - per 25 pack

The per CPU licensing refers to licensing on a per host basis. The 25 pack licensing model refers to VMs and OSIs (operating system instances, in the case of physical servers and endpoints being managed/monitored).

The 25 pack licensing model would require that the customer purchase additional licenses (25 pack) when they expand their environment beyond their current licensing.
vRealize Business for Cloud is available in two editions, Standard and Advanced.

- vRealize Business for Cloud Standard is available as part of vRealize Suite Standard edition.
- vRealize Business for Cloud Advanced is part of vRealize Suite (Advanced and Enterprise) and is also available as a standalone product.
Costs, Metering and Consumption

In this module we will understand private cloud expenses along with IT cost metering and consumption.

Start the Firefox Browser

1. Click on the "Firefox icon" in the System tray to start the browser window.

vRealize Operations Lab Links

1. Click the link "vRealize Operations Manager - Live Instance"
Log In

Login with the following credentials.

**Note** that vRealize Business for Cloud (vRBC) now has UI integration with vRealize Operations Manager (vROPS) and uses the integrated Identity Manager to authenticate.

1. Select VMware Identity Manager from the drop down.
2. Select Redirect
Identity Manager Authentication

Be sure to login with the correct user account.

1. Userid = hol and Password = VMware1!
2. Use the correct domain of CORP.LOCAL. If you need to change the domain select that option
3. Select Sign In
Main Dashboards

The **Overview** dashboard provides Business Insight, Cloud Operations and Cloud Planning.

1. Select **Home** Button
2. Click on **Business Management**
3. Select **Launchpad**
Gain Screen Space in vRealize Operations

1. Open the Firefox menu found in the upper right hand corner.
2. Click the "-" twice to set the display to 80%. This will provide you more viewing space while still allowing you to read the text.

Private Cloud (vSphere)

Let's explore the Private Cloud (vSphere) - Expenses section.

1. Click on Private Cloud (vSphere) menu item.
Understanding the Expenses Overview Dashboard

**Private Cloud (vSphere)** is a dashboard in which the expenses are categorized into Hardware, Storage on Demand, Licensing, Maintenance, Labor, Network, Facilities, and Additional Costs.

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

**Private Cloud (vSphere)** displays projected cost of private cloud for the current month and the trend of total cost over time. For all the expenses, vRealize Business for Cloud displays the monthly trend of the cost variations, the actual expense, and a chart that represents the actual expense and the reference cost of the expense.

1. **Scroll** down to see all of the Private Cloud expenses categories.

We can manually edit monthly cost of all the eight expense types from the current month onwards.

2. **Click on Edit Expenses** icon to edit the monthly cost per category.
Using the **Hardware** tab as an example, we can view, add, edit, or delete the cost of each server group, based on their configuration and the purchase date of a batch server running in our cloud environment. After we update the server hardware cost, vRealize Business for Cloud updates the total monthly cost and average monthly cost for each server group.

We can modify the costs over all 8 categories. The Hardware group is just an example.

For purpose of this module, we will not make changes to any of the default costs.

Let's move forward and understand the showback area.

1. Click on **Back to Expenses**.
Showback consists of providing IT management with an analysis of the IT costs due to each department without actually cross-charging those costs.

Let's explore vRBC Showback.

1. Expand Showback
1. Click on **Showback Statement**.

The **Showback Statement** provides information about the business units and services, the projected monthly charge, and budget values for our environment.

We can define a business unit through vCenter, vRealize Automation, or vCloud Director Instances as vRBC Connections.

**Monthly Budget:** Displays the total monthly budget for the month along with charge projection.

**Month to Date Charge:** Displays the total charge value for the months.

**Projected Monthly Charge:** Displays the monthly charge values.

**Private Cloud Reclamation:** Displays the charge on oversized, powered off and idle virtual machines. This information is based on vRealize Operations Manager and vRealize Automation integration which helps to identify the amount of resources that can be reclaimed and provisioned to other objects in our environment or amount of potential savings that can be done in each month.

We can click on each value to see information about which virtual machines are related to the specific charge and know the recommendations to make the best use of the resources.

Let's see more detail information about Idle VM:
2. Click on $value for Idle VMs.

Note: The value amounts here could be different than your lab.

Showback Statement: Idle VMs - Savings Report

1. Here we can see all the potential **reclaimable** virtual machines that are idle.

Data Center Optimization
vRBC provides visibility into each of the data centers to visualize the cost of used and remaining capacity of the data centers. The cost is calculated based on the percentage values collected from vRealize Operations Manager. The cost is classified into compute cost and storage cost.

1. Scroll the bar to see all options.
2. Expand the What-If Analysis and Click on Data Center Optimization.

**Data Center Optimization Area**

We can see the **Used Capacity** and **Remaining Capacity** costs per data center and **Compute, Storage, and Labor Costs** of each data center. The data can be used to help you understand and optimize the data center utilization.

1. **Mouse over** on the data center diagram to see more details about the **Used Capacity**.
Module Conclusion

You have completed Module 1: Business alignment with insights into infrastructure costs for Private Cloud

You should now have an understanding of:

• Comparing the cost of public and private cloud options
• Interacting with vRealize Business for Cloud
• Leveraging vRealize Business to make fact-based decisions regarding your data center

Proceed to the next module

Evaluate vRealize Suite Standard

Would you like to see how vRealize Suite Standard could help better manager your applications and infrastructure? Request a free 60-day evaluation here to try it out in your own environment.

How to End Lab

If you wish to conclude your lab at this time click on the END button. This will terminate your lab and all progress. Do this only if you wish to NOT proceed with the other modules.
Module 2 - Cost transparency and comparison of costs across private and public clouds (30 mins)
Navigation Basics in vRealize Business for Cloud

In this module you will learn how to navigate the vRBC web interface

Check the Lab is Ready

Before we start this next section, please first check the lab is Ready.
If it is not, you may need to wait a few minutes until the status shows the lab is Ready.

Open Firefox Browser from Windows Quick Launch Task Bar

1. Click on the Firefox Icon on the Windows Quick Launch Task Bar.
Select Live vRealize Operations Manager

1. Click the "vRealize Operations Manager - Live Instance" link.

Log In

vRealize Operations is integrated with VMware Identity Manager which we will use for this lab.
One of the major reasons for the change to vIDM is not only the reduced footprint and ability to easily scale, it’s also the added functionality. vIDM now brings a slew of new features, including:

- OTB 3rd party SAML Token Support
- OTB Smart Card Support
- Multi-factor authentication
- Login Auditing
- Major Scalability Improvements
- HA support (configured by wizard)

In addition, the vIDM identity stack supports many authentication protocols and methods (some of which were previously not supported):

- Username/password
- Kerberos
- SAML Authentication
- Smart Card / Certificate
- RSA SecurID
- RADIUS
- RSA Adaptive Authentication

1. Click the drop down and select "VMware Identity Manager"
2. Click "REDIRECT"
Identity Manager Authentication

1. Userid = hol and Password = VMware1!
2. Use the correct domain of **CORP.LOCAL**. If you need to change the domain select that option
3. Select **Sign In**

Be sure to login with the correct user account.
Business Management Home Page

Navigate to vRealize Business Management Overview Dashboard.

1. Select **Home** Tab
2. Click on **Business Management**
3. Select **Overview**

The vRealize Business for Cloud, Business Management screen has been designed to be consistent with the vSphere Web Client to make for a familiar experience.

This Overview page yields high level information across the entire environment, which will show us operational and costing information.

**Set Browser Zoom Level**
The lab environment has a default resolution of 1024x768. To minimize the need for extensive scrolling within the vRealize user interface, please adjust the zoom level in Firefox.

1. Open the **Firefox Menu** drop down.
2. Set the desired zoom level. Typically 80-90% is sufficient to provide adequate screen space for your lab environment. Also making use of the full-screen option is recommended.

### Status of Capacity and Infrastructure Utilization

![Diagram showing infrastructure overview, top datacenters, and infrastructure utilization]

Here we are looking more closely at the Operational Information included on the Overview page.

1. Total number of VMs and how they are distributed across Clouds.
2. Capacity status at a Datacenter level.
3. Utilization status at a Datacenter level.

*Note: Since the HOL runs in an isolated environment your numbers may vary but we have included a similar screenshot within vRealize Business for Cloud.*
Understand the Total Cost of the Cloud Infrastructure

Here we are looking more closely at the Costing Information included on the Overview page.

1. Total cost of VMs and how those costs are distributed across Clouds.
2. Cost breakdown by Business Unit.
3. Cost vs Price trend information.

Note: Since the HOL runs in an isolated environment your numbers may vary but we have included a similar screenshot within vRealize Business for Cloud.

Expenses - Private Cloud (vSphere)
Under Expenses notice that we have the option to look at expenses incurred by our Private Cloud. If we click on **Private Cloud (vSphere)** under Expenses, we can see costing information as it relates to our vSphere environment. If we **scroll down** on the page, we can see more detailed costing information with Cost Drivers broken down by resource.

**Operational Analysis - Private Cloud (vSphere)**

We can also look at Operational Expenses in our Private Cloud environment. If we click on **Private Cloud (vSphere)** under Operational Analysis, can see operational information broken down by resource. If we expand the dropdown box for **3 Servers**, we can see additional host details.
Navigate to Private Cloud Consumption

We can also look at Private Cloud Costing information. Click on **Pricing and Charges** under Consumption.

**Private Cloud Pricing and Charges**
Navigate to the Pricing and Charges page. Here we can view Pricing, Charges, and Business Unit information for our Private Cloud.

1. Select Pricing and Charges, Pricing

**Comparing Private and Public Cloud Costs**

Let's take a look at Cloud Comparison. Example: Let's compare a group of VM's to plan our Private Cloud costs and compare those costs to Amazon Web Services and Microsoft Azure pricing.

1. Select What-If Analysis, **Migration**
Comparing Private and Public Cloud Costs...continued

Next step you will need to select your vm's to do a costs comparison.

1. Select **Import VM's (not shown)**
2. Click on "**Select All**"
3. Click on **Done**

The system will now show you details for your **Private Cloud (vSphere), Amazon Web Services, and Microsoft Azure**
Navigate to Reports

Reporting is available in vRealize Business for Cloud also. Simply scroll down to the Report section and click on the desired report. It will generate the report in PDF format for you to download.
Cloud Comparison

vRealize Business not only helps companies better understand the cost of their private cloud offerings, it also helps compare those costs to similarly configured offerings available from public cloud vendors like Amazon Web Services or Microsoft Azure. With this information, administrators can make more confident decisions about when to leverage public cloud resources versus delivering services internally.

Cloud Comparison

1. Navigate to the Home, Launchpad
2. Select Cloud Comparison.
Cloud Comparison

The screen capture shows a sample comparison of virtual machines between your Private Cloud, AWS and Amazon Web Services.

Note: The numeric values may be different in your lab from what is shown in the screenshot.
Let compare a specific set of vm's from the **Human Resources** business unit.

Click on **Import VM's** (not shown)

1. Select **Human Resources, Select All**
2. Click on **Done**.
Compare VMs on Different Cloud Providers

Note: The value amounts here could be different than your lab.

1. Select Manage Cloud Providers.
Cloud providers can be added by drag and dropping them into the comparison section.

1. Click on VMC and drop it onto Microsoft Azure to have it replaced.
2. Click on Done to review the information.
Compare Data Centers

We can compare the costs of multiple data centers in the same fashion. This can help you determine which data center to deploy our virtual machine(s) into. You can do so by selecting **Manage Data Centers** but note that this lab environment has limited resources so you will only see one DC.

You have reached the end of the module, please close any open web browsers.
Module Conclusion

You have completed "Module 2 - Cost transparency and comparison of costs across private and public clouds." You should now be familiar with comparing cloud instance costs and utilization within vRealize Business for Cloud.

Proceed to any module below which interests you most.

- **Module 3 - Capacity Management: Alerting, Reclamation, Right Sizing, Capacity Trending, Costing, and Capacity Correlation** (60 mins)
- **Module 4 - vSphere capacity planning projects based on demand and consumption** (30 mins)
- **Module 5 - Compliance of infrastructure with the vSphere hardening guide** (30 mins)

Evaluate vRealize Suite Standard

Would you like to see how vRealize Suite Standard could help better manager your applications and infrastructure? Request a free 60-day evaluation [here](#) to try it out in your own environment.

How to End Lab

If you wish to conclude your lab at this time click on the **END** button. This will terminate your lab and all progress. Do this only if you wish to **NOT** proceed with the other modules.
Module 3 - Capacity Management: Alerting, Reclamation, Right Sizing, Capacity Trending, Costing, and Capacity Correlation (60 mins)
Introduction to Capacity at Risk

In this module, we will identify objects which are experiencing health issues or are at risk of running out of resources. Using alerts and analysis tools, vRealize Operations will indicate which virtual machines are stressed due to resource constraints and what procedure would be used to modify the constrained resource. Generated alerts in vRealize Operations Manager appear in the alert lists. You use the alert lists to investigate, resolve, and begin troubleshooting problems in your environment.

In this scenario, you will investigate and resolve a virtual machine which has unexpected high memory usage causing an alert. We will first describe the main badges which appear on the Summary screen.

**Health Badge - Immediate Issues**

The Health widget is the status of the health-related alerts for the objects it is configured to monitor in vRealize Operations Manager. Health alerts usually require immediate attention. You can create one or more Health widgets for different objects that you add to your custom dashboards.

**Risk Badge - Future Issues**

The Risk widget is the status of the risk-related alerts for the objects it is configured to monitor. Risk alerts in vRealize Operations Manager usually indicate that you should investigate problems in the near future.

**Efficiency Badge - Optimization Opportunities**

The Efficiency widget is the status of the efficiency-related alerts for the objects it is configured to monitor. Efficiency alerts in vRealize Operations Manager usually indicate
that you can reclaim resources. You can create one or more Efficiency widgets for objects that you add to your custom dashboards.

Alerts

![Alerts List]

The Alerts list is all the alerts generated in vRealize Operations Manager. The alerts notify you when a problem occurs in your environment. You use the alert list to determine the state of your environment and to begin resolving the problems. There can be alerts pertaining to Health, Risk or Efficiency. In this example we note a VM that has generated an alert (Risk Badge) for high memory usage.
1. Select the **Alert** name for detailed information
1. The **Alert** Information will show you when the alert was triggered and if it is still active.
2. It will also show you what triggered the condition. In this case it was memory stress above 50%.
3. The **Run Action** button will show you what actions you can take to resolve the problem.
Workload Balancing and Placement

Within a virtualized environment, even with the best planning, the distribution of the workloads between hosts, clusters and data centers can get out of balance. Being out of balance itself is not a problem as long each workload can obtain the resources it needs without causing contention. Contention exists when the workload on a specific host requests more resources than are available. Resource contention is one of the most critical issues in any virtualized environment. When contention occurs, applications slow down and your users are affected.

Distributed Resource Scheduler (DRS) is a proven vSphere feature that moves virtual machines (VMs) within a cluster (between hosts) to ensure virtual machines are always running on a host with adequate resources to support it.

vRealize Operations Manager can move virtual machines between clusters to ensure the clusters are balanced in the environment, which in the end helps DRS. vRealize Operations Manager's Rebalance Container action allows you to balance workloads between the clusters in your data center or custom data centers by providing you move recommendations. These move recommendations come in the form of a rebalance action plan. The plan lists move recommendations and provides a reason on why to move it (CPU or memory imbalance).

Up until now two different methodologies have been employed to mitigate the risk of contention, with varied results. New to vRealize Operations and vSphere is Predictive DRS, a capability that can be used to minimize resource contention proactively.

Predictive DRS uses a combination of DRS and vRealize Operations Manager to predict future demand and determine when and where hot spots will occur. When future hot spots are found, Predictive DRS moves the workloads before contention occurs.

Launch the HVM vRealize Operations Manager Console

Open the Firefox Browser from Windows Quick Launch Task Bar

1. Click on the Firefox Icon on the Windows Quick Launch Task Bar.
vRealize Operations Lab Links

1. Click the link "vRealize Operations Manager - Historical Instance"
Log In

Login with the local admin credentials.

1. Select **Local Users** from the drop down.
2. ID = admin ; Password = VMware1! and Click **LOG IN**
Set Browser Zoom Level

The lab environment has a default resolution of 1024x768. To minimize the need for extensive scrolling within the vRealize Operations user interface, please adjust the zoom level in Firefox.

1. Open the Firefox Menu drop down.
2. Set the desired zoom level. Typically 80-90% is sufficient to provide adequate screen space for your lab environment. Also making use of the full-screen option is recommended.

Workload Rebalancing

In the following steps and video, you will learn how to remediate a cluster based resource constraint by rebalancing virtual machines between clusters using the Rebalance Container Action.

Note: It is important to balance between clusters configured for workloads of similar priority or importance to your organization.

For example, you would not want to balance workloads in a test/dev environment with your production, mission critical applications; this could cause unexpected behavior within the production environment.

Due to the significant amount of resources required to simulate an out of balanced cluster, which would negativity affect the lab as a whole, we have chosen to walk you through how to access the Workload Balancing within vRealize Operations Manager.
Accessing the Workload Utilization Dashboard

1. Click on the **HOME** button.
2. Click on **Workload Balance**
The Workload Utilization

The Workload Distribution widget divides objects into 3 categories:

1. **Underutilized**
2. **Optimal**
3. **Overutilized**
Drill into an Overutilized Resource

1. In the **Cluster Compute Resource** section (may require you to scroll), hover over the **lab-auto** cluster in the **Overutilized** area.
2. Click **Details**.
Cluster Details

1. Click the **Analysis** tab, and **Capacity Remaining**.
2. You can see details on why the cluster is constrained, and that **Capacity Remaining** is in a critical state.

Notice capacity is monitored by Disk, Memory, and CPU. In this case the **Memory** is the "most constrained" resource.
Identify the Datacenter for lab-auto cluster

1. Click **Home**.
2. Click **Environment**.
3. Select **vSphere Host and Clusters**.
1. Expand the **Host and Clusters, "VC Lab" vCenter, and "lab-dc" datacenter**. Let's take a look at the resource levels for this datacenter.
2. Click on the **lab-dc** object
3. Click the **More** icon to display All options for this data center.

### All Metrics

1. Select the **Analysis** tab
2. Note that the **Capacity Remaining** and **Time Remaining** are displaying resource constraints in the environment.

3. Before we initiate a rebalance action to redistribute compute resources, the policy needs to be modified to enable this feature. Click the **policy** associated with the datacenter.

---

**Modify the Policy**

1. Select **Policy Library**.
2. Click **vSphere Solution's Default Policy**.
3. Click the **pencil** to begin editing the policy.
Change the Workload Balance Configuration

The default workload balance configuration is set to **Conservative**. While this is a good setting for dynamic environments, it may not always balance the environment adequately.

1. Select **Workload Automaton**.
2. Click on the lock on **Balance Workloads** to unlock.
3. Click on the middle option to set the configuration to **Moderate Balance**. This setting offers a good mix of movement and balance while minimizing the impact of moving virtual machines.
4. Click **Save** (not shown)
1. Click **Home** button.
2. Select **Workload Balance**.
3. Select **lab-dc** Datacenter object
4. Click on the **Rebalance** action. (option is only available for a data center or a custom datacenter)

**Note:** Since this is a controlled lab environment the "Rebalance Clusters" feature **cannot** be improved and is disabled. Take some time to review what other information is available in this dashboard. The next page shows an example of what the rebalance action looks like.
Review Rebalance Container Action

Here is an example of what the Rebalance Container action overview provides. Details on what systems will be moved to restore balance to your clusters and what this action will address.

You can see more details on this through this video: [https://youtu.be/w5Pgs_8aazI](https://youtu.be/w5Pgs_8aazI)

Predictive DRS

What Drives Predictive DRS (pDRS)

- Many workloads have predictable resource utilization trends
- 3 Important Data Points
  - What each VM is going to do today
  - What VMs are on each host
  - How big each host is

“Will any of my hosts struggle to serve my workloads in the next hour?”

- DRS pro-actively prepares for increased demand before demand occurs
- Faster balancing and better performance from VMs!!

Resource contention is one of the most critical issues in any virtualized environment. When contention occurs, applications slow down and your users are affected. Up until now two different methodologies have been employed to mitigate the risk of
contention, with varied results. But now I want to introduce you to the new “game changing” method available from VMware: **Predictive DRS**!

How does Predictive DRS work? It starts by leveraging one of the core functions of vRealize Operations, Dynamic Thresholds, which understand the behaviors of all workloads throughout the day. vRealize Operations Manager collects hundreds of metrics across numerous types of objects (hosts, datastores, virtual machines, and other objects) every day. Each night vRealize Operations Manager runs Dynamic Threshold calculations using sophisticated analytics to create a band of what is “normal” for each metric/object combination. The band has an upper and lower bound of normal for each metric associated with object. For example, if there is a simple application server virtual machine, vRealize Operations Manager will show the virtual machine does not use a lot of CPU early in the morning. However, at 8 AM, when people start logging into the system, the CPU load will spike very high. It will then taper off around noon as people go to lunch, and then back up again for the rest of the day until people go home. And don’t forget about the nightly reports which run at 2AM and spike CPU.

The great thing about Dynamic Thresholds is that they are tailored to each individual virtual machine and application. There is nothing you need to do; the analytical engine in vRealize Operations takes care of everything.

Once vRealize Operations Manager has calculated its Dynamic Thresholds we have 3 fundamental data points:

- How many resources is each virtual machine going to need throughout the day
- What virtual machines are on running on what hosts?
- How big is each host?

Once we have those we can ask the most important contention mitigation question of all, “**Will any of my hosts struggle to serve my workloads today**”? If the answer is “Yes” then let’s move a few virtual machines around to avoid that future contentious situation. In a nutshell, this is how Predictive DRS works.

### Which method should you use?

By combining DRS capabilities of vSphere 6.5 with historical trends, KPIs and analytics from vRealize Operations Manager, users can get three ways for avoiding/resolving resource contention.

1. **Reactive**: The vSphere Distributed Resource Scheduler (DRS) capability resolves unexpected resource demand by moving VMs within a cluster when contention begins.
2. **Balance**: By combining vSphere DRS and vRealize Operations Work Load Placement (WLP) capabilities, VI admins can balance utilization by moving VMs between clusters, thereby mitigating resource contention risk.
3. **Predictive:** In Predictive DRS, resource utilization trends from vRealize Operations Manager are sent to vSphere 6.5 DRS. This predictive demand of workloads is incorporated into DRS algorithms to provide faster balancing and better performance between clusters before contention occurs.

The SDDC virtual infrastructure (VI) teams will ultimately use a combination of these three approaches to avoid and resolve contention in their data centers, and Predictive DRS is a powerful addition to the toolbox for VI teams looking to optimize resource utilization and minimize business impact from resource contention.
Finding Resources to Reclaim

In this course we will use vRealize Operations Manager to determine if there are resources that can be reclaimed in the environment.

Launch the HVM vRealize Operations Manager Console

Open Firefox Browser from Windows Quick Launch Task Bar

1. Click on the Firefox Icon on the Windows Quick Launch Task Bar.

vRealize Operations Lab Links

1. Click the link "vRealize Operations Manager - Historical Instance"
Login with the local admin credentials.

1. Select **Local Users** from the drop down.
2. ID = admin ; Password = VMware1! and Click **LOG IN**
Set Browser Zoom Level

The lab environment has a default resolution of 1024x768. To minimize the need for extensive scrolling within the vRealize Operations user interface, please adjust the zoom level in Firefox.

1. Open the **Firefox Menu** drop down.
2. Set the desired zoom level. Typically 80-90% is sufficient to provide adequate screen space for your lab environment. Also making use of the full-screen option is recommended.

Search for Cluster

In this module we are going to focus on the cluster named **lab-clus1**. This cluster has the potential to have virtual machines that are sized inappropriately for their workload. While examining the cluster for potentially resizing virtual machines to reclaim compute capacity, we will also be looking for old snapshots in the cluster and idle or powered off virtual machines.

1. In the Search Bar on the upper right corner, type **lab-auto** and hit Enter.
You are transitioned to the Summary tab for lab-auto. This view provides details on the configuration, performance, utilization and any alert conditions triggered. Summary is a great place to determine the status of an object and associated child objects.

1. Click the More icon to display All Metrics for lab-auto cluster.
1. Select the **Analysis** tab.

Your view will transition to the **Workload** badge. The **Workload** badge is often the first place to look when determining whether to reclaim capacity. Although the badge is primarily focused on demand or consumption over the past 5 minutes, it does provide a quick view into overall activity and whether the object is a possible candidate for right-sizing. Remember the goal for right-sizing an environment is improving efficiency to maximize the financial investment in infrastructure resources.

2. Additionally you can look at **Workload Trend** over the past 180 days to help you understand overall utilization of configured resources for the cluster.

3. Let’s drill down deeper...To examine reclaimable capacity recommendations, click **Reclaimable Capacity** tab.
Identify Reclaimable Cluster Capacity

In the **Reclaimable Capacity Breakdown** panel you can see that CPU, memory and disk space are available to be reclaimed. These resources have already been allocated to virtual machines, but vRealize Operations Manager has found that they are not being used efficiently. Inefficient usage occurs when:

- Virtual machines are allocated more resources than they need (Oversized).
- Virtual machines are powered on, but not being used (Idle).
- Virtual machines are powered off most of the time.
- Snapshots have been taken but are very old.

1. In this cluster, we can see that there is available memory from Oversized and Idle virtual machines. We can reclaim this memory by resizing or removing the vms's. So, where do we start?
2. Click the **Virtual Machine Reclaimable Capacity** link under Further Analysis section.

**Note:** Virtual Machine Reclaimable Capacity is an example of a vROPS View. Views are the basic building block of a report. Aside from the Analysis tab and reports, Views can also be added to dashboards. Views are an excellent way to provide relevant information in an easily digestible format.
Identify Reclaimable Virtual Machine Capacity

This view provides more information about the virtual machines that have reclaimable resources. Scroll to the bottom. Now we can see what virtual machines may have extra CPU, memory and/or storage along with the Total Reclaimable Waste. We can also see if there are old snapshots of the virtual machine and the Power State.

General Recommendations:

- Snapshots should not run in an environment for longer than 24-72 hours and will continue to grow in size the longer they are kept. This could result in storage space issues or performance issues.
- Configuring a virtual machine with more virtual CPUs than its workload may cause slight increased resource usage, potentially impacting performance on very heavily loaded systems.
- Memory on a virtual machine should be sized properly. If under-sized, the virtual machine may experience memory thrashing.
Let's focus on finding virtual machines with overprovisioned CPU.

1. Scroll and find **ops-1001 vm**

We now see that **ops-1001** may be overprovisioned on CPU by 2 vCPUs. Let's view more detailed information about the vm's CPU usage and talk to the server/application owner before taking any action. This data is a great starting point for a resource conversation. It is important to keep in mind that the reclaimable resources do not take into account operating system and application minimum configuration requirements.

Let's gather a few more details for that conversation.

2. Click on the **ops-1001** virtual machine link.
Navigate to Virtual Machine

1. The link will redirect you to the virtual machine ops-1001 (top left corner)
2. Select the Analysis.

Review Virtual Machine Reclaimable Capacity

1. Make sure the Reclaimable Capacity tab is selected.
2. Now we can see that not only is this virtual machine oversized for memory, but also CPU and disk space. This should give us sufficient information to either take action or discuss resizing the virtual machine with the server/application owner.
Old Snapshots

Let's go back and review the Reclaimable Capacity report to identify old Snapshot Data. In this case, we will check a cluster for old snapshots.

1. In the Search Bar on the upper right corner, type **lab-ops** and hit Enter.

Old Snapshots...continued

We are back to the Virtual Machine Reclaimable Capacity view that we were previously reviewing. It lists the virtual machines which reside within this cluster. Let's sort the columns by **Old Snapshot**.

1. Click on the Analysis
2. Click on the **Reclaimable Capacity** tab
3. Select **Virtual Machine Reclaimable Capacity** View/Report

**Note:** Your VM information may differ slightly from the screenshot.

**Reclaimable Capacity Report - Old Snapshots**

1. Now we are seeing virtual machines which reside on this cluster. Let's sort the data of **Old Snapshot** by double clicking the column.
2. VM's IIS-WEBAPP1 and VRA-WIN2K12-T2 should have their snapshots cleaned up to recover diskspace and prevent performance issues.
Powered Off Virtual Machines

From the same report we can also identify virtual machines that are powered off.

1. Double click the Power State column and scroll through the list. There are many virtual machines that are assigned resources and are no longer in use and may be deleted.

You have reached the end of the module, please close any open web browsers.
Module Conclusion

You have completed **Module 3 - Capacity Management: Alerting, Reclamation, Right Sizing, Capacity Trending, Costing, and Capacity Correlation.**

You should now have an understanding of:

- Identifying Capacity Risks
- Capacity Alerting
- Planning for Capacity Changes
- Workload Balancing and Predictive DRS
- Reclaiming Resources

Feel free to proceed to any module below which interests you most:

**Module 4 - vSphere capacity planning projects based on demand and consumption**

**Module 5 - Compliance of infrastructure with the vSphere hardening guide**

**Evaluate vRealize Suite Standard**

Would you like to see how vRealize Suite Standard could help better manager your applications and infrastructure? Request a free 60-day evaluation [here](#) or scan the QR-Code to try it out in your own environment.

**How to End Lab**

If you wish to conclude your lab at this time click on the **END** button. This will terminate your lab and all progress. Do this only if you wish to **NOT** proceed with the other modules.
Module 4 - vSphere capacity planning projects based on demand and consumption (30 mins)
Introduction to Capacity Planning

vRealize Operations Manager not only alerts on potential resource constraints before they become a problem, it also allows you to review any planned changes within the environment and understand how those changes may impact capacity.

Capacity planning also provides a way to "lock in" planned project capacity so that it will be considered in capacity analysis. In some cases, new hardware or additional capacity may be required and the projects within capacity planning can be designed to consider those situations as well.

In this module, we will be guided through creating a capacity project to understand the impact of adding additional resources and workloads.
Demand and Consumption Analysis

If already in vRealize Operations - Historical Instance(HVM)

1. If you are already logged into the vRealize Operations - Historical Instance(HVM), click the Home tab and skip to the Search for Virtual Machine win-apptier3 step. Otherwise, please proceed to the next step.

Open Firefox Browser from Windows Quick Launch TaskBar

1. Click on the Firefox Icon on the Windows Quick Launch Task Bar.
Log In to vRealize Operations Manager - if prompted

1. If prompted, **Login** to vRealize Operations Manager with the following credentials:
2. Click the **Login** button.

User name: Admin

Password: VMware1!
Set Browser Zoom Level

The lab environment has a default resolution of 1024x768. To minimize the need for extensive scrolling within the vRealize Operations user interface, please adjust the zoom level in Firefox.

1. **Open the Firefox Menu drop down.**
2. Set the desired zoom level. Typically 80-90% is sufficient to provide adequate screen space for vRealize Operations in the lab environment. Also making use of the full-screen option is recommended.

Gray Health Status

Occasionally the vRealize Operations Historical Instance (HVM) does not initialize properly in a lab environment. **If you see a gray circle in the Home Dashboard, navigate to the desktop.** Otherwise, skip the Restart HVM Services Script step.

Restart HVM Services Script
Search for Virtual Machine win-apptier4

We will now explore the option of adding new hardware to mitigate the capacity risk we identified previously with lab-clus1 and the associated child hosts and virtual machines. We will take into consideration additional demand.

1. Click on the search Icon on the top right of the screen.

2. In the Search bar, type win-apptier4.

3. Click the virtual machine win-apptier4 to view the details for this virtual machine.
1. Click on **All Metrics** menu option for win-apptier4.
For the All Metrics Options you can see all metrics related to the selected object.

You can see the **CPU | Ready (%)** is in yellow, that means there is some abnormal for this metric. Let's to analyze this metric...

1. Expand the CPU tree.
2. Double click on CPU | Usage (%).
3. You may analyze the CPU behavior on the timeline and check when the CPU hits 100%.

This may help you to understand changes or new installations on the VM and start the issue troubleshooting.

Let's see review the Alerts for this Virtual Machine and check the impacts for this Alert.
Review the Alerts

1. Click on **Summary** tab for Alert Review.

We can now see risk alerts on the virtual machine **win-app-tier4**.

**Virtual Machine has continuous high CPU usage causing stress**

2. Click the **more...** tab to show more tab options.
1. On the **Environment** tab, scroll down to review the health of the objects related to **win-apptier4**. Stop scrolling when you can see **Cluster Compute Resource** and **Host System**.

For the most part, things look healthy, however we know the virtual machine **win-apptier4** is likely experiencing CPU Stress due to an application or OS condition.

Let's take a look at this cluster and the associated hosts again.

2. Notice the default Badge for this screen is the **Health** Badge. So the Object status colors here are associated to the Health Badge.
3. **Hover** over the green, highlighted **Host System** (the only host not grayed out). This is the parent host for **win-apptier4**.

4. Notice the **Time Remaining** and **Capacity Remaining** are "Critical" for this host.

**Badge Risk Changing**

As we identifying there is a Risk issue for the Hosts, we may change the Badge Status for Risk, and then understand where are the risks for our Datacenter.

1. Click on the **Capacity Remaining** Badge for Badge color Status changing.
2. **Hover** over the red, highlighted **Host System** (the only host not grayed out). This is the parent host for **win-apptier4**.

3. Notice the **Time Remaining** and **Capacity Remaining** keep "Critical" for this host.

Let’s do the same for Compute Resource Cluster...

**Analyze Cluster Health**

For this step we will look at the resources for **lab-ops**. We mentioned that there was risk for a capacity shortfall. Over the next few steps, you will walk through how to address that situation.

1. Hover over the red highlighted **Cluster Compute Resource**.
2. Notice **Time and Capacity Remaining** are Critical.
3. **Click** the highlighted red **Cluster Compute Resource** badge for **lab-ops** to drill into the cluster details. Occasionally a second double-click is required. If the double click does not take you to the details for **lab-ops**, use the search function
in the title bar of the user interface. Be sure to select the item from Cluster Compute Resource.
Planning Capacity Changes

Drill Into Cluster Details

1. After double-clicking on the **cluster** badge, you should now be viewing the **lab-ops** cluster details;

   Even though the health-related badges are green, they represent the state of the host or cluster at this point in time. As we have seen, **Time Remaining** is identifying future risk. How many new hosts should we add to deal with this constraint? What will happen if we add another virtual machine to the cluster? Over the next several steps, we will create a new project to add capacity and demand in order to answer these questions.

2. Click the **Projects** tab.
Create a New Project

Projects help users model their planning ideas.

1. By default, the Projects tab will display the most constrained capacity container to help you decide what types of projects you will need to create. In this case, Memory Consumed is the most constrained;
2. Click on the green plus icon to add a project.
A **planned project** can be used to understand how changes will impact the capacity forecast.

A **committed project** will impact the capacity analysis and can be used to "lock in" resources for a project until the changes are implemented. With a committed project you can ensure that project resources will be available.

1. *(Optional)* Click on the maximize icon to get a better view;
2. Enter **Add Capacity and VM Demand** as your project name;
3. Set Status to **Planned**;
4. Click **Scenarios**.

**Note:** Setting the Status to **Committed** changes how Capacity Remaining and Time Remaining are calculated for this object. Changes will be reflected on the Projects graph and the Capacity Remaining and Time Remaining tabs.
Add Capacity Scenario

You can create many scenarios within a project, first we will create additional capacity by adding a host.

1. Double click or drag **add Host System** to the scenario workspace;

We can now specify the scenario details, such as **Scenario Name**, **Scenario Description**, **Implementation Time and Date** and the specifics of the changes.

2. Set the **Implementation Date** to **two weeks** from today;

You can either define the host configuration yourself, or even better you can use an existing host system as a model for your scenario.

3. **Increase** the number of hosts to 3;

4. Click the **Populate metrics from** button.
Copy Host Configuration from Another Host

1. Use the drop down to display available hosts to copy metric values;
2. Double-click w2-sm-c4b1-mgmt.local;
3. Click OK (not shown).
Save Scenario

The capacity values for the new host are now pre-populated based on `w2-sm-c4b1-mgmt.local`. At this point, you are only adding a single host. How will this impact your Memory Consumption?

1. Review the Metrics for the added capacity (you may need to scroll down);
2. Click the Save project and continue editing button.
Because this lab is using HVM (Historical View Mode), the data is captured at a specific point in time. Depending on today's date and the Implementation Date, you may or may not see your scenario in the graph (as shown in the screenshot). In order to see your scenario update the date range:

1. Click the **Date** icon;
2. Modify the **Date Range**;

From: *<Today's Date>*

To: *<1 month out>*

3. Click **Go**.
1. The *Add Capacity* scenario is now annotated on the trend line and you can see the impact on *Memory Allocation*. Capacity now exceeds demand (hover over the graph area after the project small green box), the graph no longer shows the red demand trend line. In this project, three hosts will be enough to address the capacity shortfall.

Next, we will model adding virtual machines to the cluster before the new host is added. Projects allows you to gauge the impact of adding demand to determine when additional capacity is required. For this example, you can use the model to determine how additional demand impacts the projected shortfall on the cluster before and after a host is added.
1. Double-click or drag **add Virtual Machine** to the scenario workspace;
2. Set the **Implementation Date** to one week from today (make sure it is set to a date before the *Add Capacity* scenario);
3. Click the **Populate metrics from** button.
Use Pre-Defined Virtual Machine Configuration

1. For **Copy metric values from a pre-defined profile**, use the drop down arrow to select **AVERAGE**.
2. Click **OK**.
Review Added Virtual Machine Impact

1. **Increase** the number of VMs to 4;
2. **Scroll down** to view the pre-populated values from the Average profile;
3. **Save project and continue editing**;
4. The **Add Virtual Machine** scenario is now annotated on the trend line and you can see the impact of both the additional virtual machines and added host capacity for **Memory Allocation**. Notice that we still have memory constraints when we add the new virtual machines (1.2), but this constraint will be removed when the new host is added (1.1);
5. Click **Save**.
Add Project to Chart

Now that we have created the *Add Capacity and VM Demand* project, we will need to add the project to the chart bar to see the effect on resources in the chart.

You have the option to drag and drop or add the project.

1. **Drag and drop** or click on the **green circle plus icon** to add the project to the chart.

The chart will update to reflect the project changes you modeled.
Review Chart with Project

**Note:** Multiple projects can be added to the chart at the same time. Charting multiple projects is very useful for gaining a better understanding of the total impact, as well as how the project timing will influence resource availability. In this example, we implemented the additional virtual machine demand before adding new capacity.

Reminder: If you do not see your scenarios, you will need to modify the **Date Range** - See section "Change Date Displayed".

You have reached the end of the module, please close any open web browsers.
Conclusion

In this module you learned:

- What are the metrics responsible for resource demand and consumption for a particular VM;
- How to check the health alerts of a VM to know what is the particular resource under constraint;
- How to analyze the impact of this constraint in the VM's cluster by looking at the risk badge;
- How to create capacity projects to analyze the impact of adding new resources and workloads.

Congratulation on completing "Module 4 - vSphere capacity planning projects based on demand and consumption".

If you are looking for additional information on "Planning the Capacity for Your Managed Environment Using vRealize Operations Manager", try one of these:

- Click on this link
- Or go to https://tinyurl.com/y8zy2l2b
- Or use your smart device to scan the QRC Code.

Proceed to any module below which interests you most.

- Module 1 - Business alignment with insights into infrastructure costs for private cloud (60 minutes) (Advanced)
- Module 2 - Cost transparency and comparison of costs across private and public clouds (30 minutes) (Advanced)
- Module 3 - Capacity Management: Alerting, Reclamation, Right Sizing, Capacity Trending, Costing, and Capacity Correlation (60 minutes) (Advanced)
- Module 5 - Compliance of infrastructure with the vSphere hardening guide, PCI and HIPAA (30 minutes) (Advanced)
Evaluate vRealize Suite Standard

Would you like to see how vRealize Suite Standard could help better manage your applications and infrastructure? Request a free 60-day evaluation [here](#) to try it out in your own environment!

How to End Lab

If you wish to conclude your lab at this time click on the **END** button. This will terminate your lab and all progress. Do this only if you wish to **NOT** proceed with the other modules.
Module 5 - Infrastructure compliance with vSphere, PCI and HIPAA Hardening Guides (30 mins)
Introduction to vSphere Compliance

Compliance is used to monitor the vCenter Server instances, hosts, virtual machines, distributed port groups, and distributed switches in your environment to ensure that the settings on your objects meet the defined standards.

vRealize Operations Manager includes alerts for VMware vSphere Hardening Guide versions 6.0 and 5.5. vRealize Operations Manager generates compliance alerts when symptoms trigger on your vCenter Server instances, hosts, virtual machines, distributed port groups, and distributed switches.

To enforce compliance on virtual machines, vRealize Operations Manager includes several compliance risk profiles. You apply the risk profiles to groups of virtual machines based on whether you must ensure a high, medium, or low level of security in your environment.

All the compliance standards in vRealize Operations Manager, including any standards that you define, are based on alert definitions.

You can find the vSphere Hardening Guides at http://www.vmware.com/security/hardening-guides.html.

In this module you will learn:

- How to ensure compliance of a vSphere environment
- How to define a compliance standard for custom standards
- How ensure host objects comply with alert-based compliance rules
- How to customize a policy to enable vSphere Hardening Guide alerts
- How industry standard compliances like PCI and HIPPA can be used to monitor a vSphere environment
Ensuring compliance of vSphere 6.0 objects

As the virtual infrastructure administrator for your company, you must ensure that your vSphere 6.0 objects comply with the compliance rules in the vSphere Hardening Guide. You use the compliance alerts in vRealize Operations Manager to monitor your objects for violations to your compliance standards. When a compliance alert triggers on your vCenter Server instance, hosts, virtual machines, distributed port groups, or distributed switches, you investigate the compliance violation. You must resolve the violation so that the violated object continues to meet industry security standards.

To enforce and report on the compliance of your vSphere 6.0 objects, you enable the compliance rules in the vSphere Hardening Guide. Then, you enable the appropriate alerts, and apply a risk profile to your virtual machines. After vRealize Operations Manager collects the compliance data from your objects, you resolve any rule violations that occurred, and create a report of the compliance results for your manager and the compliance team.

In this lesson you will learn:

- How to enable compliance rules in vRealize Operations
- How to enable compliance alert definitions in the default policy
- How to view the symptom set in the alert definition
- How to run a compliance report on a vCenter Server instance
### Logging into vRealize Operation Manager

**vRealize Operations Live Credentials**

- **Server**: vrops-01a
- **User**: admin
- **Password**: VMware1!

1. Click on the Firefox icon in the Windows Taskbar;
2. By default, the homepage should point to the lab links. Click on the "vRealize Operations Manager - Live Instance" link on the homepage or click on the icon in the bookmark toolbar;
3. Log in with the user "Admin" and the password "VMware1!".
Enabling compliance rules in vRealize Operations

1. Click on the "Administration" tab;
2. Make sure the "Solutions" tab on the left menu is select, if not click on it to select;
3. Click on the "VMware vSphere" solution to select it (you may have to scroll);
4. Click on the "Configure" icon;
5. In the "Manage Solution" dialog box, click "DEFINE MONITORING GOALS".
6. On the "Define Monitoring Goals" window scroll all the way down and select "Yes" for "Enable vSphere Hardening Guide Alerts";
7. Click "SAVE" and a success confirmation pop-up should appear (not shown). Click OK;
8. Back in the "Manage Solution" window click on the "SAVE SETTINGS" button;
9. Click on the "CLOSE" button.
Enabling compliance alert definitions in the default policy

1. Click on the "Administration" tab;
2. Click on the tab "Policies" in the left menu;
3. Click on the "Policy Library" tab;
4. Click on the "Default Policy" from the list;
5. Click on the "Edit Selected Policy" icon;
6. In the "Edit Monitoring Policy" window click on the "Alert / Symptom Definitions" in the left menu;
7. In the filter box type "hardening" and hit ENTER;
8. From the "Alert Definitions" window select "vCenter is violating VMware vSphere Hardening Guide" (you may have to scroll down or adjust the columns size);
9. On the column "State" choose "Local" with the green check mark and click on the SAVE button (not shown).
Viewing the symptom set in the alert definition

1. Click on the "Alerts" tab;
2. Expand the "Alert Settings" tab and click "Alert Definitions" in the left menu;
3. In the filter box type "hardening" and hit ENTER;
4. Click on the "vCenter is violating vSphere Hardening Guide" from the list (you may have to scroll);
5. In the lower pane, locate the alert "Impact", "Criticality", and "Symptoms" set (you may have to scroll);
6. Scroll through the symptom set and examine the symptoms, which can trigger an alert, for the host (you may have to scroll);
7. Below the symptom set, examine the "Recommendation" to fix the problem if this alert triggers on your host (you may have to scroll);
8. You could click the link to the "VMware vSphere Hardening Guide" and a Web page would open to the list of "VMware vSphere Security Hardening Guides" at http://www.vmware.com/security/hardening-guides.html but since we do not have Internet access the page will not load (you may have to scroll).
Running a compliance report on a vCenter Server instance

Generate the report

1. Click on the "Dashboards" tab;
2. Click on the "Reports" in the left menu;
3. Click on the tab "Report Templates" if it is not selected yet;
4. In the filter box type "hardening" and hit ENTER;
5. Select "VMware vSphere Hardening Guide - Non-compliance Report" report template;
6. Click on the icon "Run template".
Analyze the report

1. On the window that pops-up, browse through the inventory select "vcsa-01a adapter" and click "OK";
2. Wait for a few seconds for the report to run and click on the link "Generated reports";
3. On the "Generated Reports" tab select the first generated report, "VMware vSphere Hardening Guide - Non-compliance Report" and on the "Download" column click on the icon to "Download as PDF";
4. Choose "Open" and click "OK" to examine the content in the report.

The non-compliance report appears for the host, and includes the date and time that you ran the report. It also identifies the user who ran the report. The report displays the noncompliant rules that ran on the object and its descendants. In the report, you can see the criticality and status of the alert, the object name, and the type on which the alert triggered.
Define a compliance standard for custom standards

As a virtual infrastructure administrator, you are responsible for the vCenter Server instances, hosts, virtual machines, distributed port groups, and distributed switches in your environment. To ensure the compliance of your vSphere objects, you create a compliance standard based on an alert definition. In vRealize Operations Manager, you can configure an alert definition to use as a compliance standard. When you create an alert definition as a compliance standard, you add all the relevant symptom definitions to the alert definition. Each symptom is a rule in the compliance standards. For most alert definitions, you must avoid adding too many symptoms to the alert definition.

vRealize Operations Manager includes alerts for VMware vSphere Hardening Guide versions 6.0 and 5.5.


In this scenario, the alert notifies you when SSH is not running on the host.

In this module you learn:

- How to configure basic information for the Host Compliance Standard
- Add Symptoms to the Host Compliance Standard

Configure Basic Information for the Host Compliance Standard

If you are not logged in vRealize Operations live instance please get back to [Logging into vRealize Operation Manager](#) before proceed.

To create an alert definition that is also a compliance standard, you first configure the name, base object type, and the alert impact.

The name of the alert is the name of the standard on the Compliance tab.
1. Click on the "Alerts" tab;
2. Click on the "Add" icon to add a new "Alert Definition";
3. In the Alert Definition Workspace, type the name "HOL Host Compliance Standards" and an optional description for the definition (not shown);
4. Click "Base Object Type", type "Host System" and press ENTER to select "Host System" under "vCenter Adapter" in the drop-down menu (not shown);
5. Click "Alert Impact" and select "Risk" in the "Impact" drop-down list;
6. Select "Symptom Based" in the "Criticality" drop-down list;
7. Choose "1" for both "Wait Cycle" and "Cancel Cycle".
1. In the "Alert Definition Workspace", type the name "HOL Host Compliance Standards" and an optional description for the definition (not shown);
2. Click "Base Object Type", type "Host System" and press ENTER to select "Host System" under "vCenter Adapter" in the drop-down menu (not shown);
3. Click "Alert Impact" and select "Risk" in the "Impact" drop-down list;
4. If it is not already selected, select "Symptom Based" in the "Criticality" drop-down list;
5. For the "Alert Type and Subtype:" expand "Virtualization/Hypervisor" and select "Compliance";
6. Choose "1" for both "Wait Cycle" and "Cancel Cycle".
Add Recommendations to the Host Compliance Standard

1. Click "Add Recommendations";
2. Click on the "Add" icon to add a new recommendation;
3. In the "New Recommendation" window type "Turn on the SSH service" for the name of the recommendation. If you have a local runbook, you can provide a link to your local instructions;
4. Click "SAVE".
5. Type "SSH" and press "ENTER" to filter the recently created recommendation and select it (not shown). Drag and drop it to the workspace (not shown);
6. Click "SAVE".

If the symptom condition becomes true, the symptom is triggered and the compliance alert is generated for the object. Because the alert definition includes the subtype named Compliance, the generated alert appears as a compliance standard on the Compliance tab.
Infrastructure Compliance with PCI DSS 3.2 and HIPAA Standards

The PCI (Payment Card Industry) Security Standards addresses the growing threat to consumer payment information. Companies and organizations that accept, process, or receive payments should adopt it as soon as possible to prevent, detect and respond to the cyber attacks that can lead to breaches. The vRealize Operations compliance pack for PCI provides Alerts, Policies, and Reports to validate the vSphere resources against the PCI DSS 3.2 standards.

HIPAA (Health Insurance Portability and Accountability Act of 1996) provides data privacy and security provisions for safeguarding the medical information. The vRealize Operations Compliance Pack for HIPAA provides Alerts, Policies, and Reports to validate the vSphere resources against the HIPAA standards.

The configurations of the following resources are validated using this content:

- vCenter servers
- ESXi hosts
- Virtual machines
- Distributed port groups
- Distributed virtual switches

In this lesson you will learn:

- How to configure the vRealize Compliance Pack for PCI DSS and the vRealize Compliance Pack for HIPAA.
- How to run compliance reports and see compliance reports and dashboards for vSphere objects.

Enabling the vRealize Operations Compliance Alerts

Note that the vRealize Operations Compliance Packs for PCI DSS and HIPAA have already been installed in this lab. By default, the compliance alerts are not enabled in any policies so you will need to enable the alerts the vRealize Operations Manager policy(ies). The alerts will drive the compliance reports, views and dashboards within vRealize Operations. Typically, organizations that are subject to PCI or HIPAA regulations will have specific environments within their enterprises where they are handling the credit card information or patient data. In that case, they would want to add only the infrastructure that will be subject to the regulations into groups within vRealize Operations Manager and then enable the compliance alerts only for those groups.

In this lab environment, all infrastructure uses the policy named "Hands On Lab Policy" so we will enable the compliance alerts for that policy.
Edit the Hands On Lab Policy

To enable (or disable) alerts in vRealize Operations, the effective policy must be edited.

1. Click on the Administration tab
2. Click on the tab Policies in the left menu
3. Click on the Policy Library tab
4. Click on the Hands On Lab policy from the list to select it
5. Click on the Edit Selected Policy icon to edit the policy

Edit Alert Definitions
A policy in vRealize Operations Manager controls many aspects of how objects are analyzed. One of the policy categories is for enabling/disabling alerts and symptoms as well as overriding threshold values for numerical symptoms.

1. Click **6. Alert / Symptom Definitions** to select that policy section

Because of the relatively low desktop resolution in the lab, it will be easier to see the important columns in the alert table if we remove some of the unnecessary columns.

2. Toggle the switch to enable column visibility selection
3. Click the boxes to de-select the **Actionable Definitions, Automate** and **Adapter Type** columns
4. Click **OK** to save the setting

### Resize and Search for PCI Alerts

Resize the Alert Definitions section and the Name column width for better visibility then filter the list to show PCI DSS alert definitions.

1. Hover over the column separator until the cursor changes then click and drag to the right so you can see the full names of the alert definitions
2. Hover over the bottom edge of the Alert Definitions box until the cursor changes then click and drag the edge down to show more rows in the table
3. Click the double arrow to show more menu items
4. Type **pci dss** in the filter box and press the **Enter** key
You will see a list of all alerts that contain "pci dss" in their name. These alert definitions were all added by the PCI DSS compliance pack when it was installed during the lab configuration.

Select The PCI DSS Alerts

1. Notice that all of the PCI DSS alerts are disabled - a state that is inherited from the parent policy

To enable these alerts, you will need to first select all of them:

2. Click the first alert definition in the list

3. While holding down the Shift key, click the last alert definition in the list

Notice that the selected alert definition rows have a grey background indicating that they are selected.
Enable the PCI DSS Alerts

With the alerts selected, they can be bulk-updated. To override the inherited state of these alerts:

1. Click *Actions*
2. Click *State*
3. Click *Enable*
4. Notice that the State for each definition changes to enabled (green check mark) and shows that the state is overridden locally in this policy.

Search For And Select the HIPAA Alerts

Now let's repeat the process to select the HIPAA alerts.

1. Click the double arrow to show more menu items
2. Type `hipaa` in the filter box and press the Enter key
3. Click the first alert definition in the list
4. While holding down the Shift key, click the last alert definition in the list

Enable the HIPAA Alerts And Save the Policy

![Image of alert definition selection and enabling]

With the alerts selected, they can be bulk-updated. To override the inherited state of these alerts:

1. Click Actions
2. Click State
3. Click Enable
4. Notice that the State for each definition changes to enabled (green check mark) and shows that the state is overridden locally in this policy.

Running the PCI DSS and HIPAA Non-compliance Reports for vSphere objects

Now that the alerts are enabled, we can run the non-compliant reports to see which conditions are out of compliance.
Search for the vSphere World Object

The non-compliance reports can be run at any level in the inventory hierarchy. We will use the top-level so the report picks up all vSphere objects in the environment. If you only wanted to run the reports against a specific cluster (for example) you could select the cluster and then proceed with the next step.

1. Click the search magnifying glass (not shown) to open the global search box
2. In the search box, type `vsphere world`
3. Click the object in the resulting search results

Expand the Tab Group

TheReports tab is not one of the main tabs shown by default. To see it:

1. Click `more...`

Select the Reports Tab

1. Click `Reports` to open the reports window
Filter for the PCI Non-compliance Report and Run It

To find the PCI non-compliance report in the list of templates and run/generate the report:

1. In the filter field, type `pci` and press the Enter key
2. In the filtered list of report templates, click on the name of the template to select it
3. Click the Run Report icon to generate the report

Wait For the Report Generation to Complete

It will take several seconds for the report to be generated.

1. Wait until you see a value in the Last run column
2. Click the Generated reports link so see a list of the instances of this report that have been run in the past (including the one you just ran)
Launch the PDF Report

Reports in vRealize Operations Manager can be configured to be generated in PDF and/or CSV format. The default is for both formats to be created.

To view a PDF version of the non-compliance report:

1. Click the **PDF** icon

Allow Firefox to Open the PDF Report

Accept the default behavior for Firefox to open the report in the PDF reader that is included in the lab pod.

1. Click **OK**
View the Report

View the resulting PCI DSS non-compliance report for the lab environment. You will see some object types that don't have any entries (meaning that their configuration is compliant with the standards) and other objects that do have entries that detail the configuration(s) that are out of compliance.

Run the HIPAA Non-Compliance Report

You can repeat the steps to filter for, run and view the HIPAA non-compliance report. Feel free to skip to the next step if you don't want to repeat the process.

1. In the filter field, type **HIPAA** and press the **Enter** key
2. In the filtered list of report templates, click on the name of the template to select it
3. Click the **Run Report** icon to generate the report

Review PCI and HIPAA Alerts

In addition to non-compliance reports, vRealize Operations manager also includes alerts to notify users when infrastructure objects are out of compliance with the standards. These are the alerts that we enabled in the policy at the beginning of this section and are what drives the reports and the compliance dashboard (which we will review next).
Find and View a PCI DSS Alert for a Virtual Machine

1. Click the **Alerts** tab
2. In the filter field, type **pci** and press the **Enter** key to view alerts that contain "pci" in their name
3. Click the **arrow** to expand the **Virtual Machine ...** alert to see all of the VMs that have this alert active
4. Click the first alert in the list
5. View the alert details including which rules are out of compliance and
6. A hyperlink to an external web page with recommendations for fixing the non-compliant configurations
Find and View a HIPAA Alert for a Host

To view the HIPAA non-compliance alerts:

1. In the filter field, type **hipaa** and press the **Enter** key to view alerts that contain "hipaa" in their name.
2. Click the **arrow** to expand the **ESXi Host is ...** alert to see all of the hosts that have this alert active.
3. Click the first alert in the list.
4. View the alert details including which rules are out of compliance and.
5. A hyperlink to an external web page with recommendations for fixing the non-compliant configurations.

Non-Compliance Results From the Object Perspective

While the reports and alerts are more global in scope, vRealize Operations Manager also lists non-compliance issues in a couple of places for each object when the compliance packs are installed.
Navigate to the Host Object

From the alert detail window that is open from the previous step, we can navigate to the impacted object. You could also just browse to an object or search for one within vRealize Operations Manager.

1. Click the **host name** shown in the Alert Information or Symptoms sections of the alert details window to navigate to that host

Note: Your host may be different than what is shown. That is fine - go ahead and click the name.
View Compliance Alerts on the Object Summary Page

The Summary page for objects shows various information about the object including any active alerts on the object. In this view, alerts are only shown for the selected Badge type. The default is for Health alerts but compliance alerts are in the Risk category. To see the compliance alerts for the host object:

1. Click the Risk badge to show Risk alert types
2. Notice the compliance alerts in the alert list

The Object Compliance Page

vRealize Operations Manager also has a compliance dashboard for vSphere Objects. On the Compliance page you can see the posture for the object across all compliance-related content.
Expand the Tab Group

1. Click more... to expand the tab group

Select the Analysis Tab

The Compliance page is on the Analysis tab.

1. Click Analysis to open the tab

View the Compliance Page
The Compliance Page shows an overall compliance score that is an average of the compliance percentage score for each compliance standard. The individual standard scores are calculated as a percentage of rules that are in compliance for the standard. Then the overall compliance score is calculated as an average of those standard scores.

1. Click the arrow if necessary until you see the Compliance page
2. Click Compliance to open the page
3. Note the percentage compliance for each standard, and
4. The overall compliance score for the object
5. The page also shows a trend of the score over time (in our case the compliance alerts were just enabled so there is no historical value)
6. For more details on which rules are out of compliance, click one of the standards
7. The individual rules within in the standard that you just clicked
8. You can also click any of the links in the Further Analysis section to see vRealize Operations views that are related to standards compliance

This concludes the section on PCI DSS and HIPAA compliance assessment, alerting and reporting within vRealize Operations Manager.
Conclusion

In this module we learned:

- How vRealize Operations can help in ensuring infrastructure compliance
- How to ensure compliance in vSphere 6.0 objects
- How industry compliance standards like HIPPA and PCI works in vRealize Operations

Congratulation on completing "Compliance of infrastructure with the vSphere Hardening Guide, PCI and HIPAA"

If you are looking for additional information on "Compliance of infrastructure with the vSphere Hardening Guide, PCI and HIPAA", try one of these:

- Click on this link
- Or go to https://tinyurl.com/yc9rj65h
- Or use your smart device to scan the QRC Code.

Proceed to any other lab module below which interests you most.

- **Module 1 - Business alignment with insights into infrastructure costs for private cloud** (60 mins) (Basic)
- **Module 2 - Cost transparency and comparison of costs across private and public clouds** (30 mins) (Basic)
- **Module 3 - Capacity Management: Alerting, Reclamation, Right Sizing, Capacity Trending, Costing, and Capacity Correlation** (60 mins) (Basic)
- **Module 4 - vSphere capacity planning projects based on demand and consumption** (30 mins) (Basic)
Evaluate vRealize Suite Standard

Would you like to see how vRealize Suite Standard could help better manage your applications and infrastructure? Request a free 60-day evaluation [here](#) to try it out in your own environment.

**How to End Lab**

If you wish to conclude your lab at this time click on the **END** button. This will terminate your lab and all progress. Do this only if you wish to **NOT** proceed with the other modules.
Conclusion

Thank you for participating in the VMware Hands-on Labs. Be sure to visit http://hol.vmware.com/ to continue your lab experience online.

Lab SKU: HOL-1801-01-CMP

Version: 20180524-224936