Cisco Workload Optimization Manager Release 2.0: Setup and Use Cases

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Introduction

Cisco® Workload Optimization Manager exists because data center and cloud environments are increasingly complex and beyond human capacity to manage at scale. IDC predicts that by 2020, 50 percent of the Global 2000 companies will depend for most of their business on their capability to create digitally enhanced products, services, and experiences. Those that fail will be competing for smaller and smaller shares of their markets. With digitization across industries, IT must move faster while still providing predictable performance and reducing costs.

Workload Optimization Manager continuously analyzes workload consumption, costs, and compliance constraints and automatically allocates resources in real time. It helps ensure performance by giving workloads the resources they need when they need them. When fully automated, the self-managing platform promotes a continuous state of health in the environment by making placement, scaling, and capacity decisions in real time. It empowers data center and cloud operators to focus on innovation: on bringing new products and services to market that promote digital transformation.

This document guides you through the setup and installation of Workload Optimization Manager and describes the main use cases so that you can quickly get the most out of this Cisco solution.

Cisco Workload Optimization Manager use cases

There are three primary use cases for Workload Optimization Manager:

- **Data center modernization:** Planning a migration or modernization project is typically a long and difficult process. Use real-time analysis of the current environment to quickly model any changes to it. For example, you can use built-in Cisco UCS templates to help model a migration from older Cisco UCS blades to Cisco UCS M4 or M5 platform blades.
- **Data center optimization:** Optimize existing data center resources—helping ensure performance while increasing efficiency. Most customers find they can recover orphaned resources as well as reduce operationally inefficient alerting and root-cause analysis operations.
- **Hybrid cloud optimization:** Optimize workloads in on-premises and public cloud environments. In the cloud, customers typically overprovision by choosing the next largest instance size, effectively overprovisioning twice: once in the on-premises environment and then again when migrating to the public cloud. Workload Optimization Manager right-sizes public cloud instances and then continuously monitors and adjusts resources as demand fluctuates.

Data center modernization

Two types of data center modernization projects are relevant here: Cisco UCS refresh planning and hardware migration planning. In both cases, Workload Optimization Manager looks at real-time workload demand in the environment and then provides answers to these questions: How much hardware do I need to buy? When should I buy it?

Workload Optimization Manager has continuous full-stack visibility into the data center environment. Customers can model changes to the environment, and within minutes the software determines how much hardware is needed and how workloads can be distributed across the new hardware for optimal performance and efficiency.

Workload Optimization Manager also has built-in templates for Cisco UCS and Cisco HyperFlex servers that are offered through Cisco SmartPlays. You can use these templates when running plans to calculate future capacity requirements. Customer can run their plan to migrate from an older-generation computing platform to newer-generation platform (for example, from Cisco UCS M2, M3, or M4 platform servers to the M5 platform).

Note: The Cisco SmartPlay bundles may change, but these changes will not necessarily be reflected in the Workload Optimization Manager templates for this version. Before running plans, contact your support representative to be sure you have the correct template settings. Plans make calculations based on resource allocations that are specified in these templates. If you don't have the latest template settings, your plans may not reflect the true values in the SmartPlay bundles.

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Data center optimization

Workload Optimization Manager presents you with the placement, scaling, and provisioning decisions you need to keep your environment in its desired state, with performance assured. You can perform these actions manually (with one click), Workload Optimization Manager can perform the actions on command (for example, based on a change-management process), or Workload Optimization Manager can perform actions automatically as events arise.

Hybrid cloud optimization

If you're operating a hybrid cloud—some workloads on your premises and some in a public cloud--Workload Optimization Manager helps ensure that both environments are optimized for performance and efficiency. The data center is optimized in the cloud, and workloads are sized for AWS instances or Microsoft Azure virtual machines based on real-time consumption. They are placed in the correct cloud and region based on price. All business, compliance, and data sovereignty constraints can be defined in the software, helping ensure that decisions continuously abide by them.

Workload Optimization Manager uses the billing reports from your cloud service providers to build a picture of your overall spending. The data includes all costs that the service provider includes in the billing report. Workload Optimization Manager parses these reports into the formats it uses for cost-breakdown charts.

Workload Optimization Manager calculates expenses from the templates that are in use in the cloud environment. The expense data includes the costs for computing resources. Workload Optimization Manager collects these costs for each template and calculates the cost per hour, average cost per virtual machine, overall monthly cost, and overall yearly cost.

Minimum requirements

You can run Workload Optimization Manager on a host that meets the minimum requirements listed in Table 1.

Table 1. Minimum requirements for Cisco Workload Optimization Manager

Supported hypervisors	Storage requirements	Memory	CPUs
VMware vCenter Versions 4.0, 5.0, or 6.0 running with VMware ESXi 3.0, 4.0, 5.0, or 6.0	150 GB or more disk storage and swap space to match the RAM allocation (for example, 150 GB + 16 GB = 166 GB)	16 GB	2 virtual CPUs (vCPUs); 4 vCPUs preferred
Microsoft Hyper-V as bundled with Microsoft Windows 2016, 2008 R2, Hyper-V Server 2012, or Hyper-V Server 2012 R2	150 GB or more disk storage		

The minimum requirements depend on the size of your environment's inventory. The more data stores, hosts, virtual machines, and applications you have, the more resources you will need to run the installation effectively. Also note that other management software may recommend that you run the Workload Optimization Manager virtual machine with fewer resources. Be sure to provide enough resources for Workload Optimization Manager, using the guidelines in Table 1.

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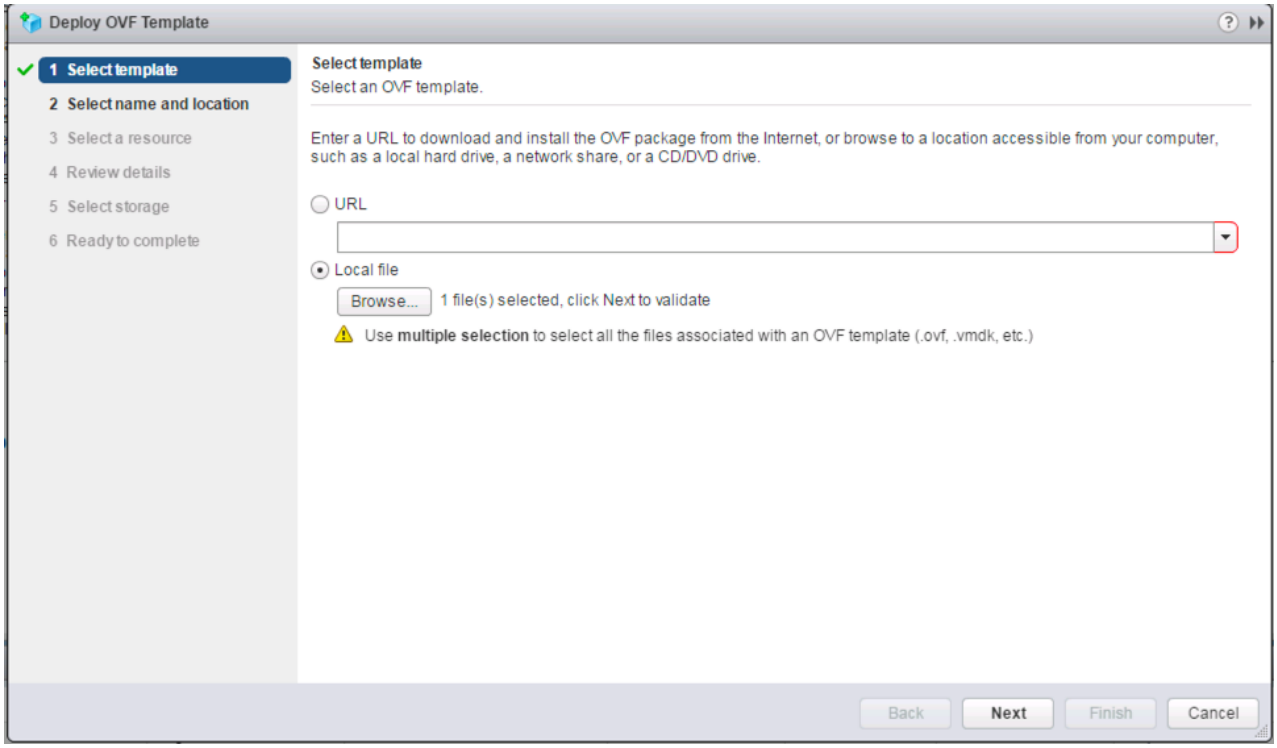
Cisco Workload Optimization Manager setup

To install and configure Workload Optimization Manager, download the VMware Open Virtualization Format (OVF) image or Hyper-V Appliance image of Workload Optimization Manager from https://software.cisco.com/download/home/286321574/type/286317011/release/2.0.0?i=!pp.

Installing Cisco Workload Optimization Manager

To install Workload Optimization Manager, complete the steps listed here.

1. Through the VMware vSphere client, connect to VMware vCenter, which is installed on your management network
2. Right-click and choose Deploy OVA Template. On the Select Template page, select Local File and click Browse to navigate to the location of the downloaded OVA file.



3. Select the OVA file and click Next.
4. On the Select Name and Location page, select the name and location of Workload Optimization Manager and click Next.
5. On the Select a Resource page, select Host/Cluster and click Next.

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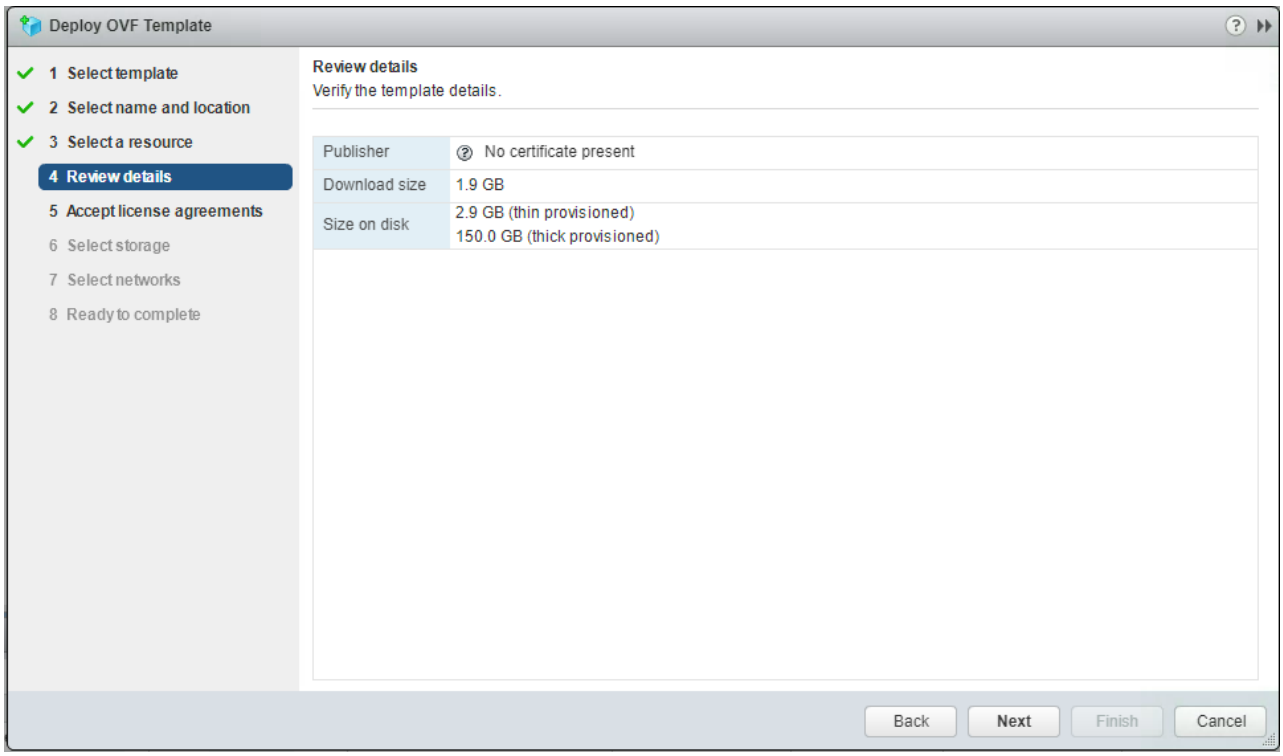
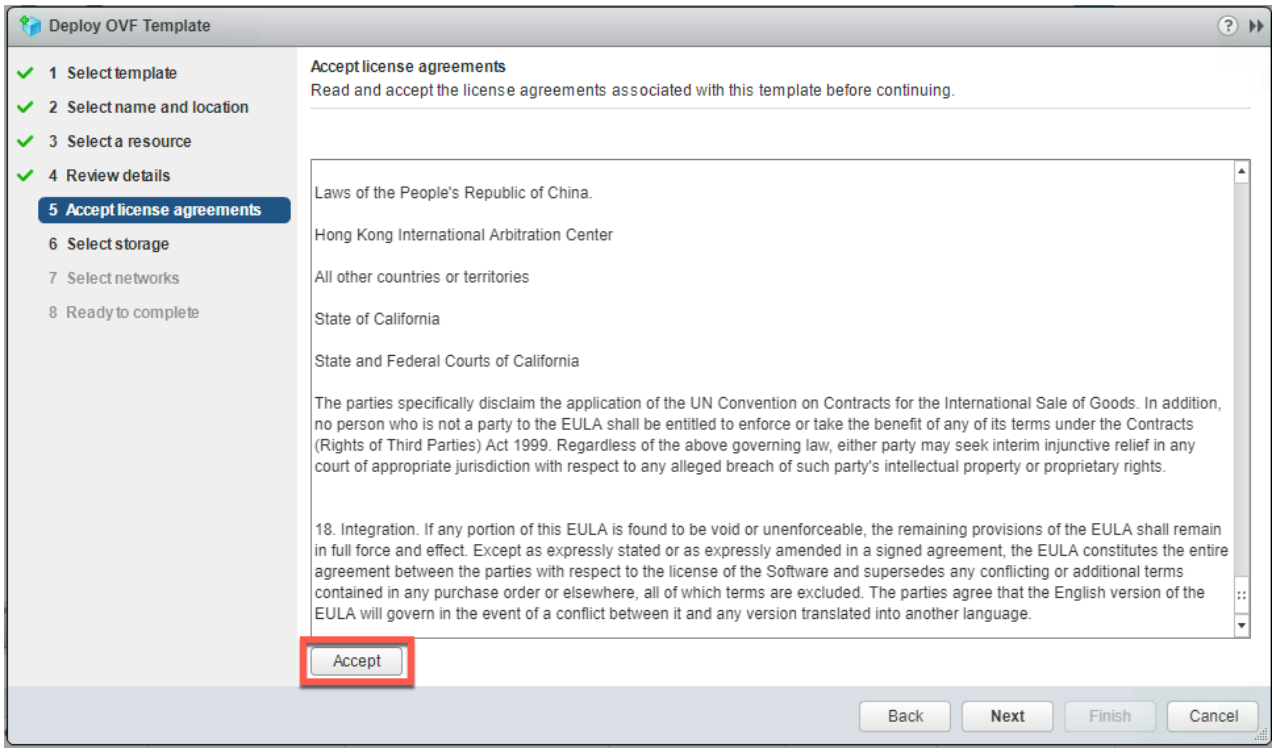
6. On the Review Details page, verify the information and click Next.



7. On the Accept License Agreements page, click Accept to accept the end-user license agreement (EULA). Then click Next.



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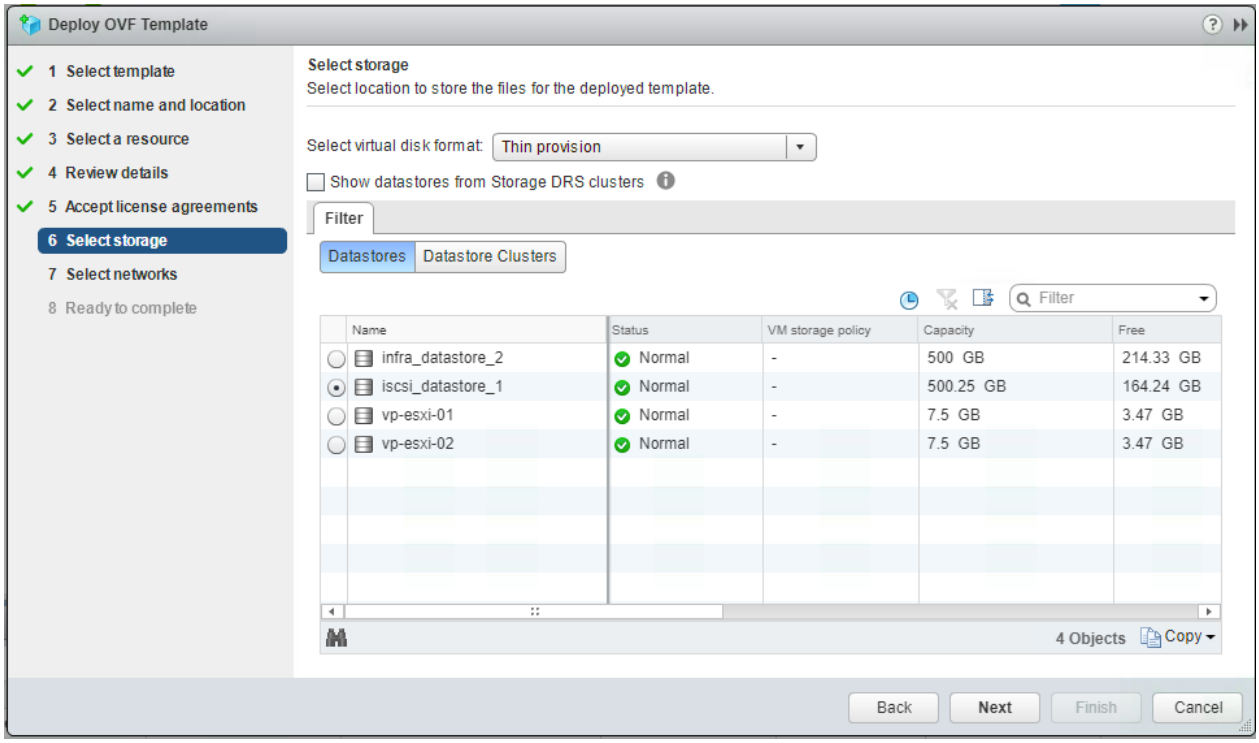
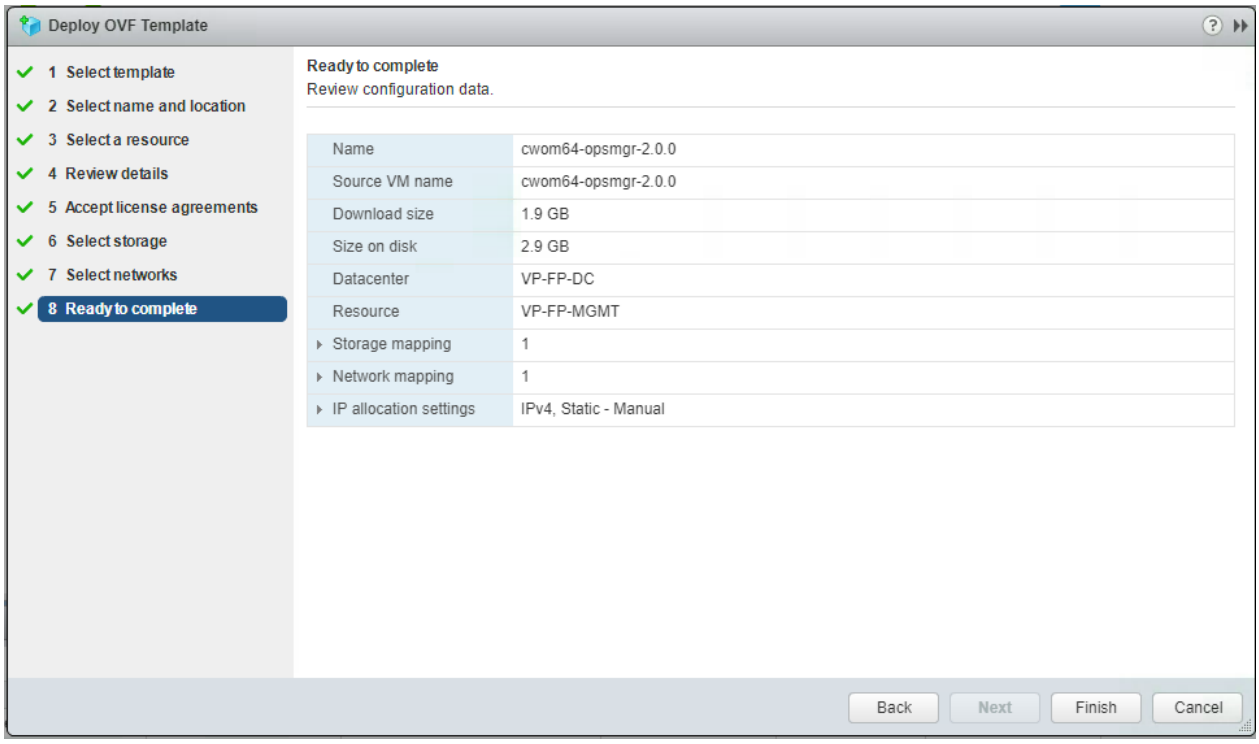
8. On the Select Storage page, choose Thin Provision as the virtual disk format and then select your data stores.



9. On the Select Networks page, select your virtual network and click Next.
10. On the Ready to Complete page, review your configuration and click Finish to deploy Workload Optimization Manager.



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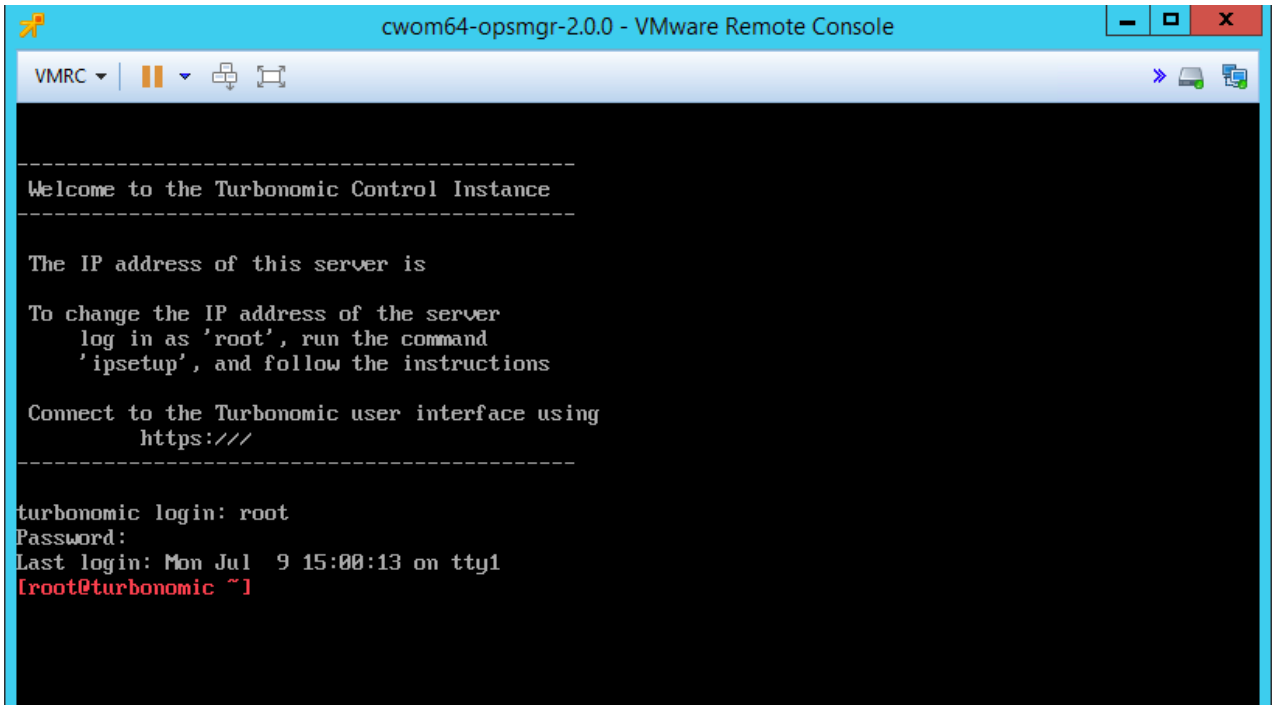
Specifying a static IP address

Many installations use Dynamic Host Configuration Protocol (DHCP) for dynamic IP address allocation. You can also specify a static address though the virtual machine's IP configuration. Workload Optimization Manager includes a script to assist you with this process. As the root user, run **ipsetup** from the command line.

To manually specify a static IP address, follow the steps listed here.

1. Launch the Workload Optimization Manager virtual machine and open a console window.
2. Use the default login root and the password **vmturbo**.



3. After login, enter **ipsetup** to assign the IP address. The system will open the IP assignment wizard. Respond to the prompts as listed here:
   a. Do you want to use DHCP or set a static IP (DHCP/static): **static**
   b. Please enter the IP address for this machine: **<IP address from the out-of-band (OOB) management network>**
   c. Please enter the network mask for this machine: **<sunbet mask of OOB management network>**
   d. Please enter the gateway address for this machine: **<gateway of OOB management network>**
   e. Enter DNS server(s) IP address for the machine (separated from each other by a space): **<Domain Name Server (DNS) IP address>**
   f. Enter domain name for this machine: **<domain name of the Workload Optimization Manager>**
   g. Do you sure you want to use these settings? (y/n): **y**
   h. Do you want to configure proxy server? (y/n): **n**
   i. Do you want to restart network the network now? (y/n): **y**

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```
 The IP address of this server is

 To change the IP address of the server
     log in as 'root', run the command
     'ipsetup', and follow the instructions

 Connect to the Turbonomic user interface using
          https:///
--------------------------------------------

turbonomic login: root
Password:
Last login: Mon Jul  9 15:00:13 on tty1
[root@turbonomic ~] ipsetup

Do you want to use DHCP or set a static IP (dhcp/static) :: static
Please enter the IP Address for this machine :: 10.1.118.56
Please enter the network mask for this machine :: 255.255.255.0
Please enter the Gateway address for this machine :: 10.1.118.1
Enter DNS Server(s) IP Address for this machine (separated from each other by a space) :: 10.1.118.4
1
Enter Domain Name for this machine :: cwom.flexpod.cisco.com

--------
These are the settings that will be committed.
The IP Address is 10.1.118.56
The Netmask is 255.255.255.0
The Gateway is 10.1.118.1
Configured DNS Server's IP Address is:
DNS 1: 10.1.118.41
The Domain is: cwom.flexpod.cisco.com
--------
Are you sure you want to use these settings? (y/n) :: y

Do you want to configure a proxy server? (y/n) :: n

Do you want to restart the network now? (y/n) :: y
```

4. To verify the network information, enter **ifconfig eth0**. Then close the console connection.

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Configuring the Network Time Protocol server

You need to synchronize the clock on the Workload Optimization Manager server with the devices on the same network. You need to specify the time server (or servers) that Workload Optimization Manager uses to synchronize its clock. You should also set the system clock to your current time zone.

Workload Optimization Manager regularly runs data maintenance processes. To reduce the impact on performance, it runs these processes at night. To help ensure that these processes run at the proper local time, you should synchronize the virtual machine with your local time zone. Workload Optimization Manager includes a script to assist you with this process. As the root user, run **timesync** from the command line.

To configure the Network Time Protocol (NTP) server manually, follow the steps listed here.

1. Using the Secure Shell (SSH) user created during the installation process, open a console window to the Workload Optimization Manager virtual machine.
2. Run the **vi /etc/chrony.conf** command. This opens the configuration file for chrony.
3. Replace the time servers found at the bottom of the file with your time servers.

```
# Enable kernel RTC synchronization.
rtcsync

# In first three updates step the system clock instead of slew
# if the adjustment is larger than 10 seconds.
makestep 10 3

# Allow NTP client access from local network.
#allow 192.168/16

# Listen for commands only on localhost.
bindcmdaddress 127.0.0.1
bindcmdaddress ::1

# Serve time even if not synchronized to any NTP server.
#local stratum 10
server 0.centos.pool.ntp.org iburst

keyfile /etc/chrony.keys

# Specify the key used as password for chronyc.
commandkey 1
```

4. Run the **systemctl restart chronyd** command. This command restarts the chrony service.

Opening ports

To use Workload Optimization Manager in your environment, you should open the following ports:

- 80: Incoming browser connections over HTTP
- 443: Incoming browser connections over HTTPS

For the browser connection with the server, you should use either port 80 or 443.

Note: Various targets that you use with Workload Optimization Manager may require you to open ports on those target servers to allow communications with Workload Optimization Manager.

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License installation and first-time login

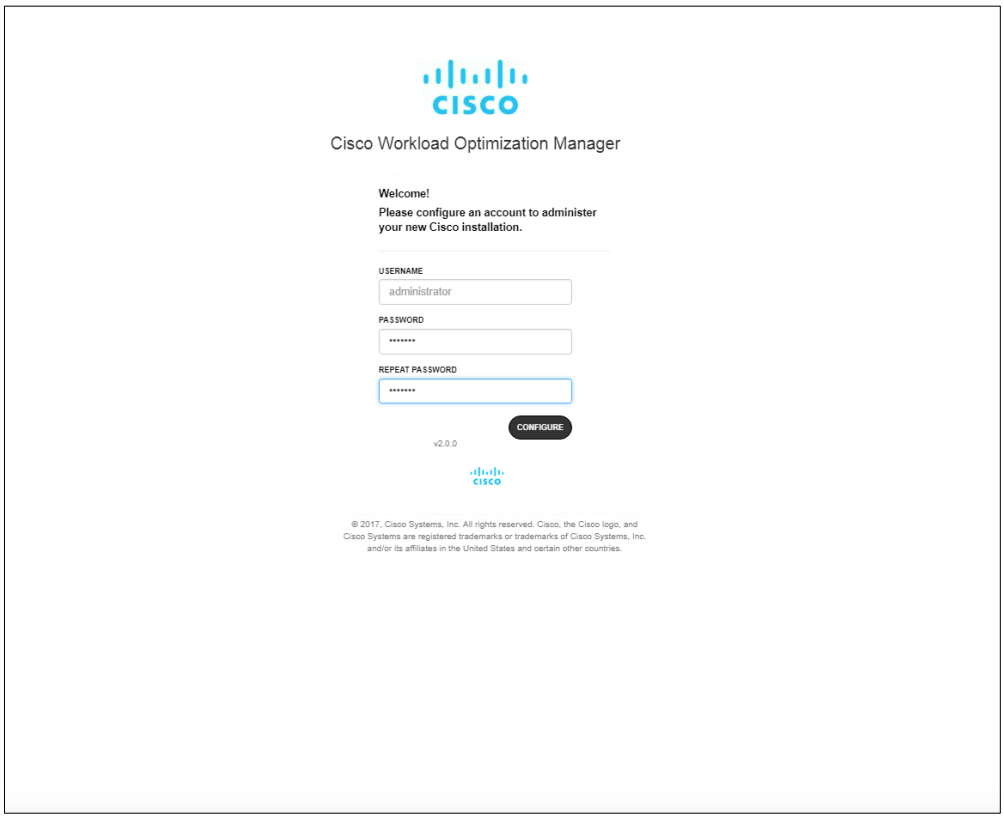
To use Workload Optimization Manager, open a Web browser to the IP address of the installed virtual machine.

When you run Workload Optimization Manager for the first time, you will see a wizard that directs you to install your license.

- If you have already received a license, choose “I have a license for full product” and continue with the wizard. Copy and paste your license key information (sent to you in a separate email) into the license window. Then complete the wizard.
- If you want to try out the full-featured product for 60 days, choose “I would like to request a 60-day trial.” When you continue, the wizard displays a form that you can fill out to request a license. Cisco will send you an email message with the license data. Copy and paste your license key information into the license window and then complete the wizard. The trial license is not a built-in product, but Cisco channel partners or the Cisco sales team can help you get it.

You can also apply or change a license outside the wizard interface. Log in to Workload Optimization Manager and display the Admin view. Then click License Configuration and copy and paste your license key information in the license window.

1. Connect to your Workload Optimization Manager server through a web browser.
2. Log in to Workload Optimization Manager. By default, you can use the following credentials:
3. Username: **administrator**
4. As you perform the initial login, you will be prompted to change the password for the administrator account. To continue, provide a new password for this account.



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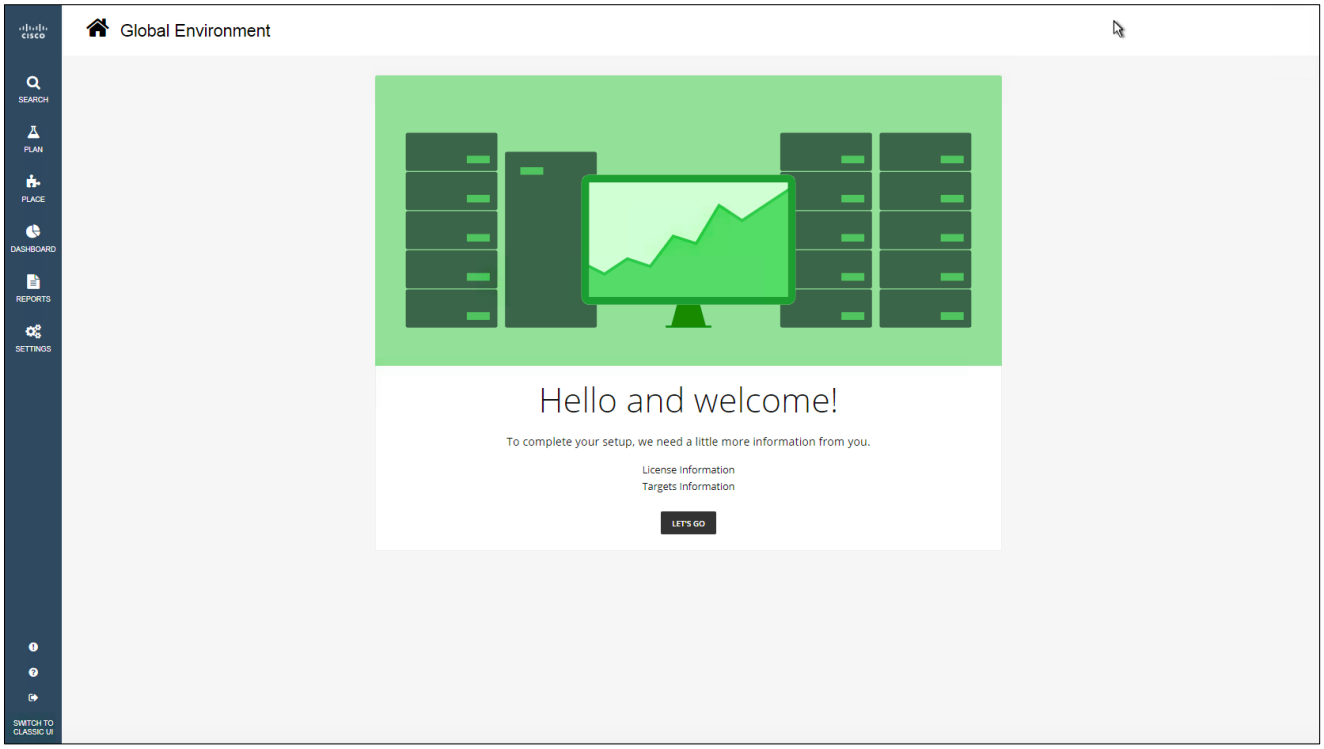
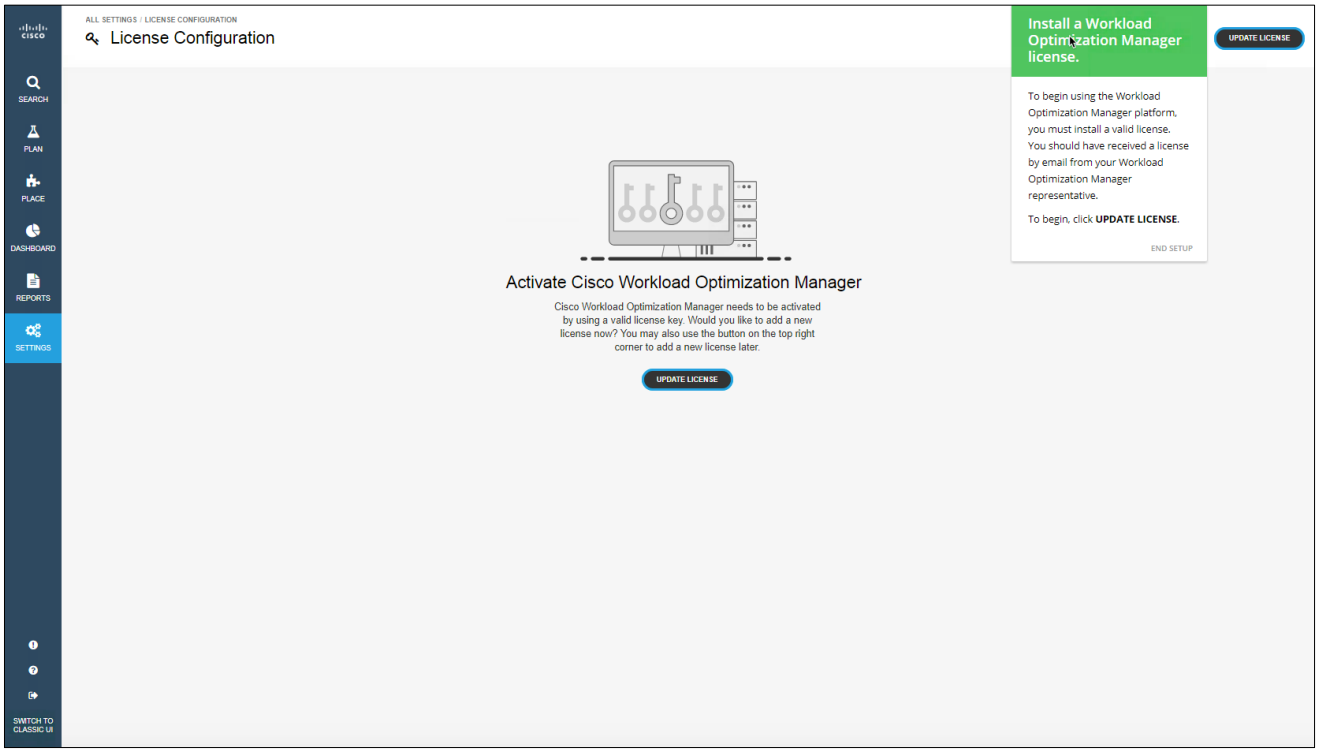
The wizard for license installation, target configuration, and email setup will open.



5. Under License Information and Targets Information, click Let's Go.



6. If you have already received a license, click on "click to browse"

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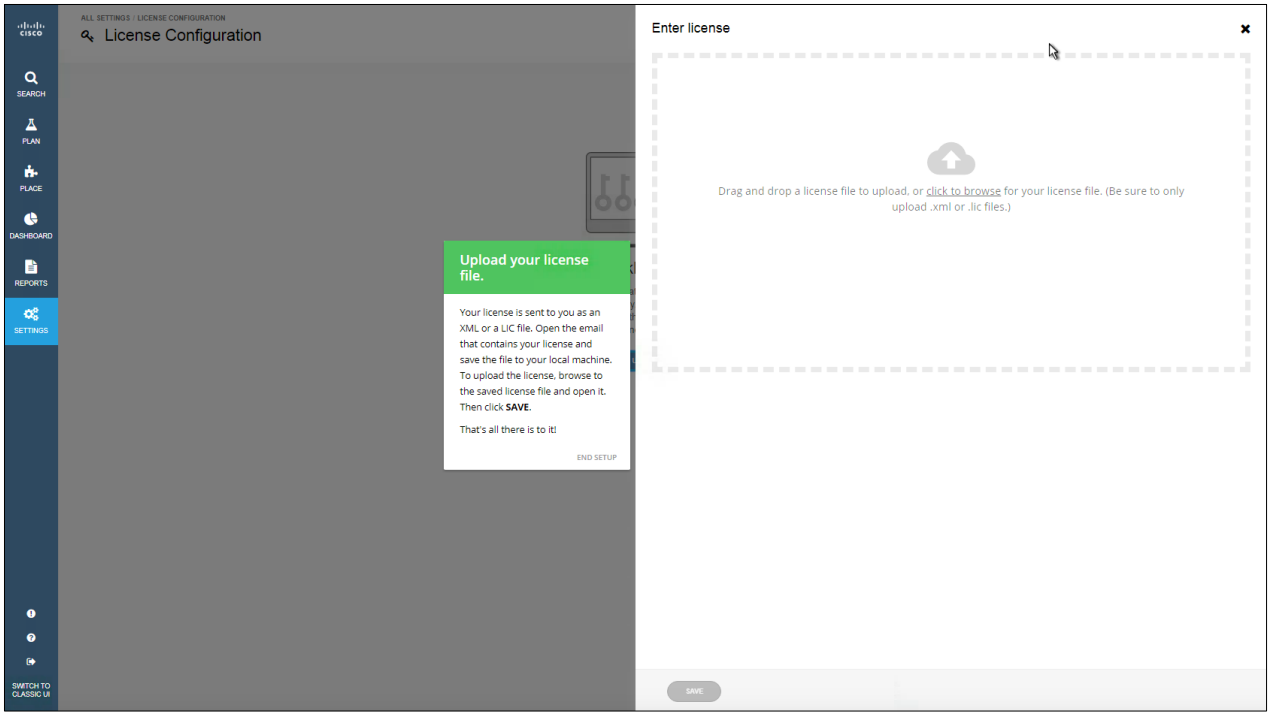
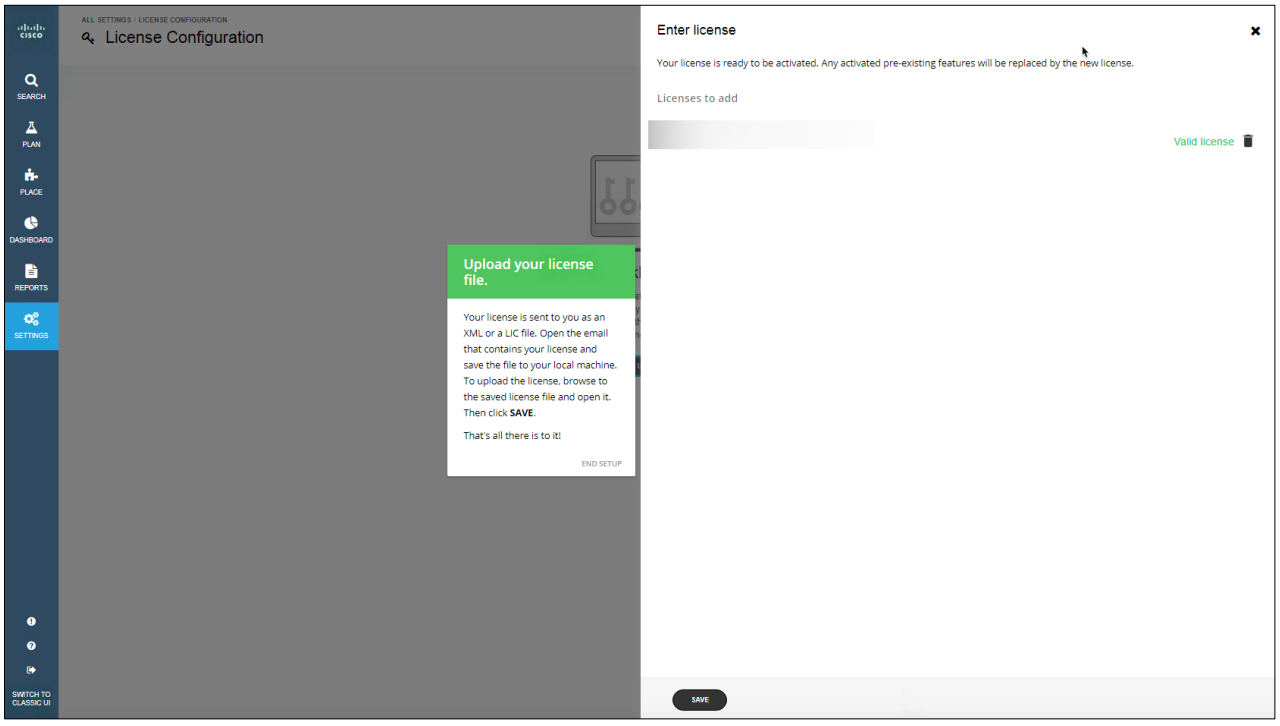
7. Browse to the license file or drag and drop the license file.



8. Click Save.



9. After the license validation process succeeds, click Save.

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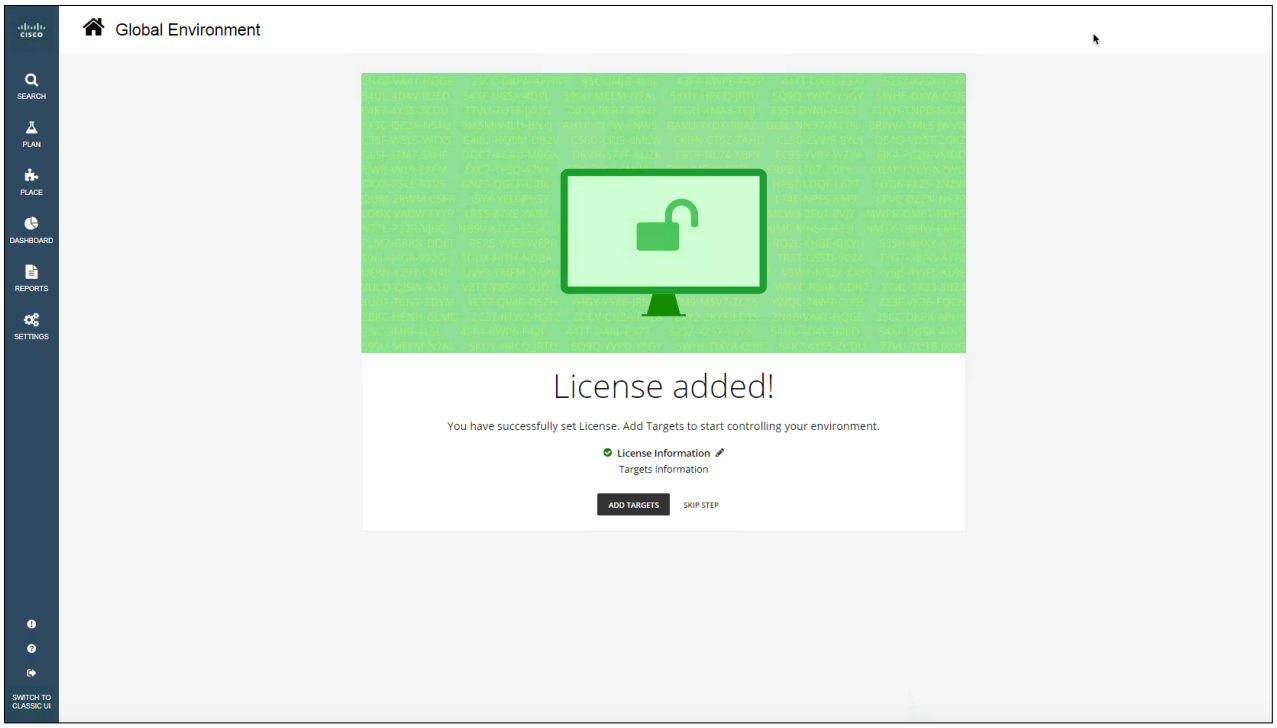
Target integration

A target is a service that performs management in your virtual environment. Workload Optimization Manager uses targets to monitor workloads and to perform actions in your environment. The target configuration specifies the ports that Workload Optimization Manager uses to connect with these services. You must install Workload Optimization Manager on a network that has access to the specific services that you want to set up as targets.

For each target, Workload Optimization Manager communicates with the service through the management protocol that it exposes: the representational state transfer (REST) API, Storage Management Initiative Specification (SMI-S), XML, or some other management transport mechanism. Workload Optimization Manager uses this communication to discover the managed entities, monitor resource use, and perform actions.

Use the steps that follow to configure target integration.

1. Click Add Targets to go to the Target Configurations page.



2. In your top-right corner, click Add Target.
3. Under Choose Target Category, select Hypervisor and Cloud Management.
4. Select your hypervisor type: for example, vCenter.

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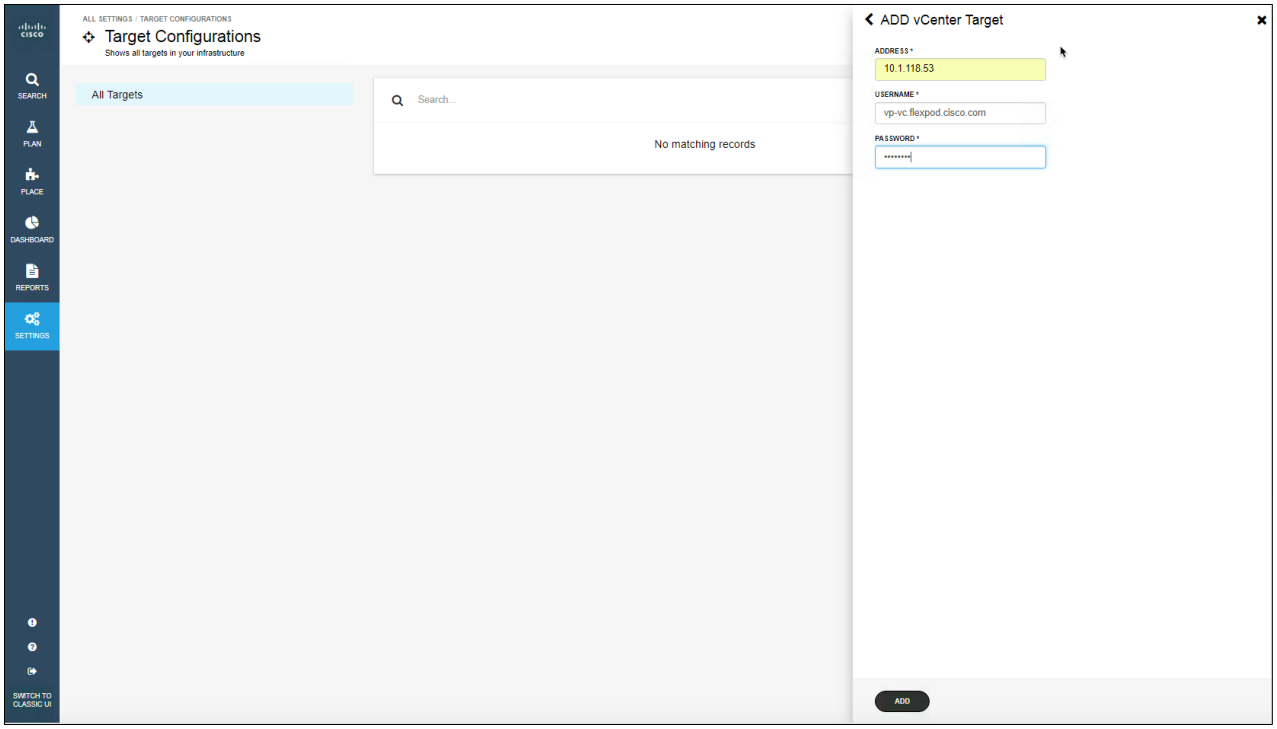
5. Enter your vCenter credentials.



6. Click Add.
7. Click Settings and select Target Configuration.

You are now ready to add targets.

Adding a hypervisor target

A hypervisor is a service that creates and run virtual machines, providing them with computing and storage resources. When you connect Workload Optimization Manager to hypervisor targets in your environment, Workload Optimization Manager controls your environment, helping ensure application performance and use resources as efficiently as possible.

One of the first steps in any Workload Optimization Manager deployment is to connect to the hypervisors within your environment. After connection, Workload Optimization Manager discovers the virtual machines, the physical machines that host the virtual machines, the data stores that provide storage resources to the physical machines, and the virtual data stores that provide storage resources to the virtual machines.

VMware vCenter Server provides a centralized management platform for VMware hypervisors. To manage your VMware environment with Workload Optimization Manager, you specify a vCenter Server instance as a target. Workload Optimization Manager discovers the associated infrastructure and performs intelligent workload management.

Prerequisites

- A server user account that Workload Optimization Manager can use to connect to your vCenter Server and perform actions

To add the vCenter as the target, follow the steps presented here.

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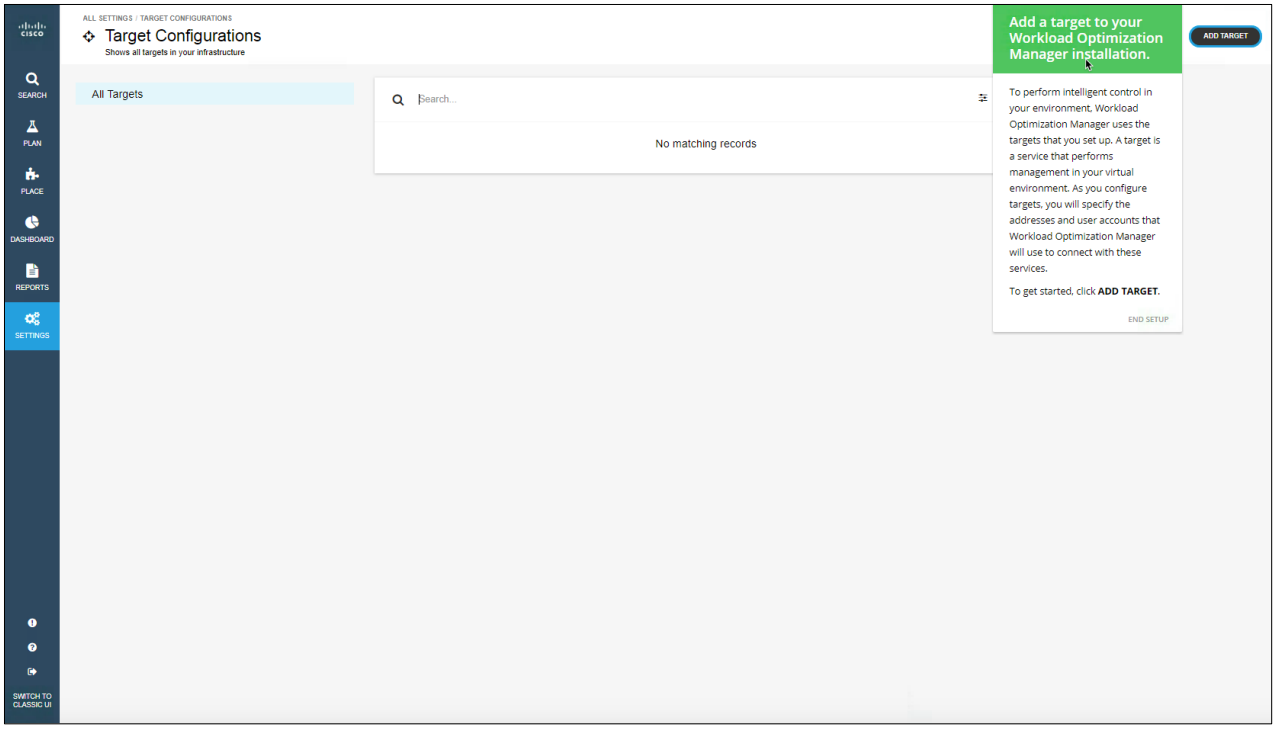
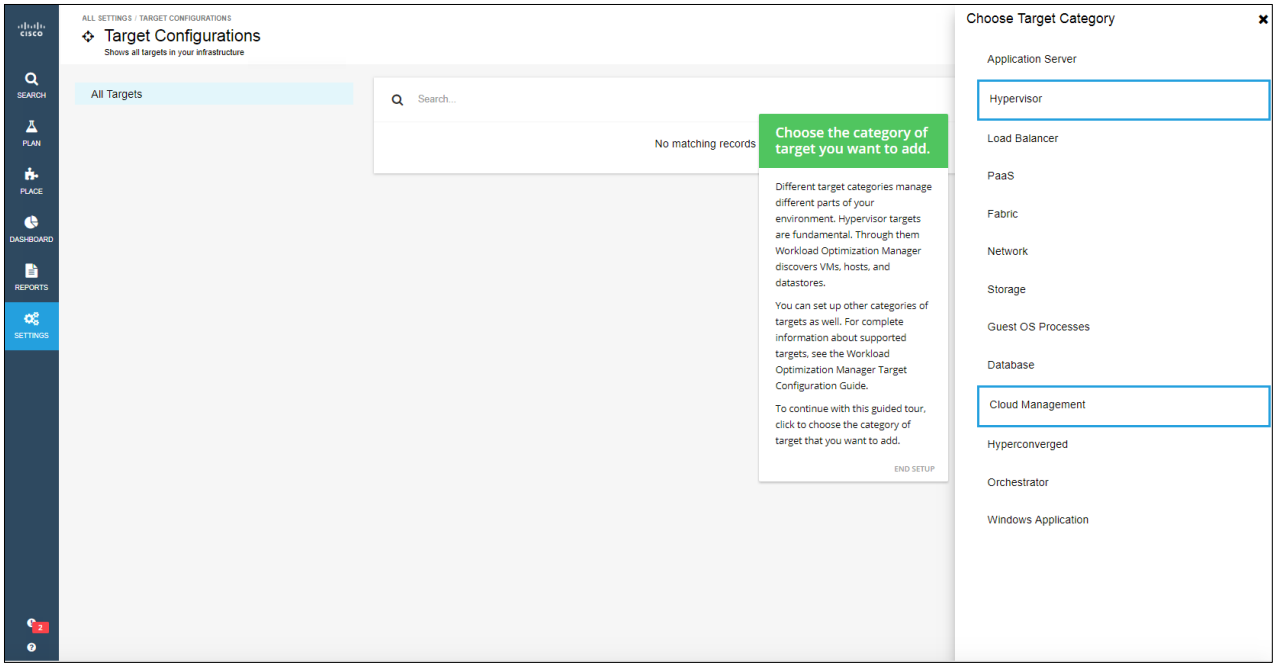
1. Click Add Target.



2. In the Choose Target Category menu, choose Hypervisor and select vCenter to add it as a target in Workload Optimization Manager.
3. Provide your vCenter account login credentials.



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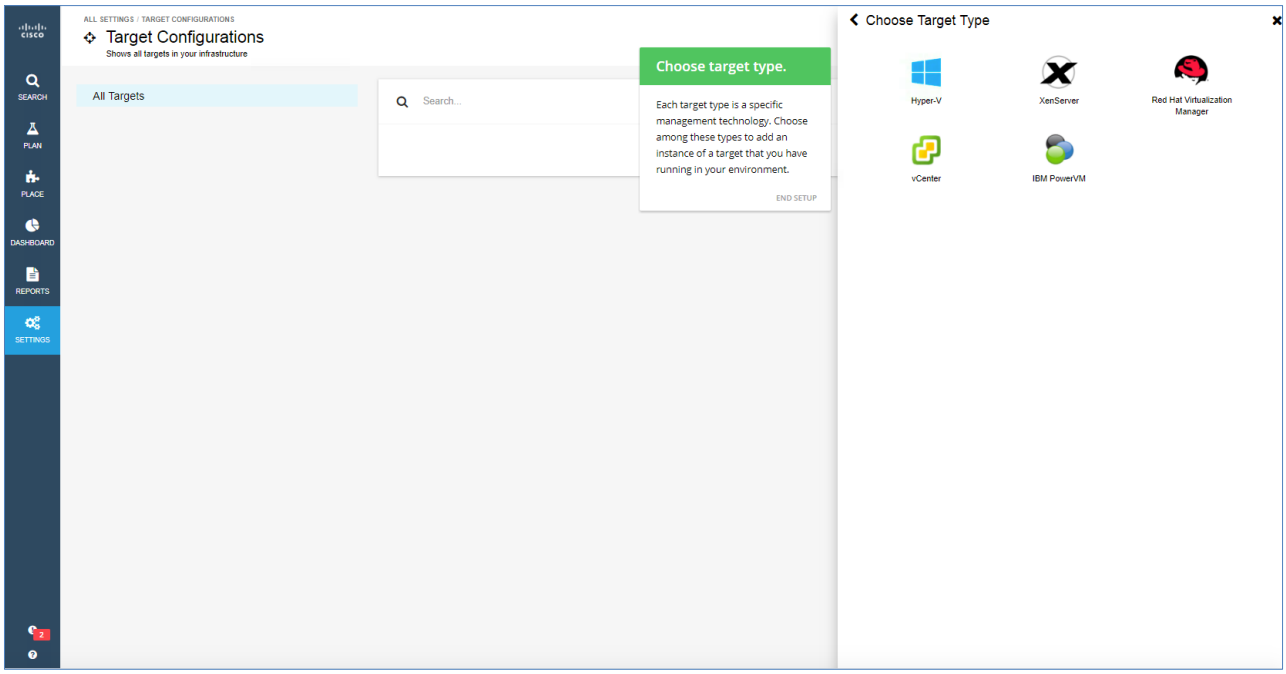
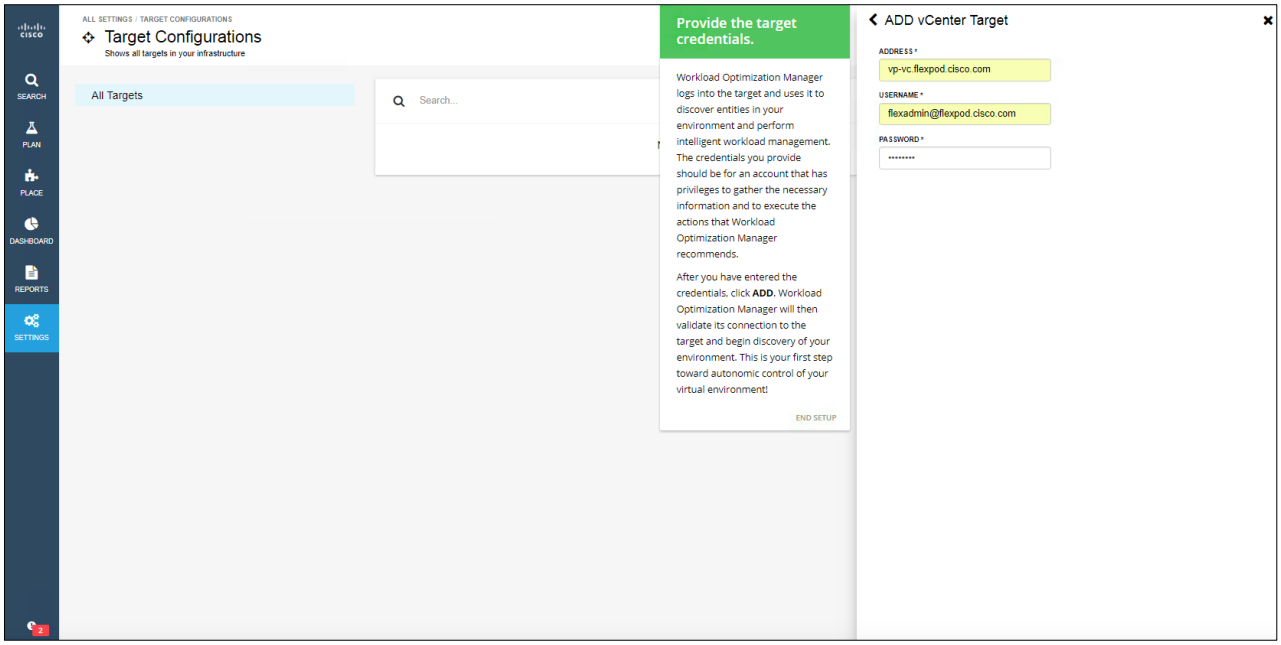
4. Select your target type and enter your login credentials to add the target. For instance, select vCenter to add a VMware vCenter account.





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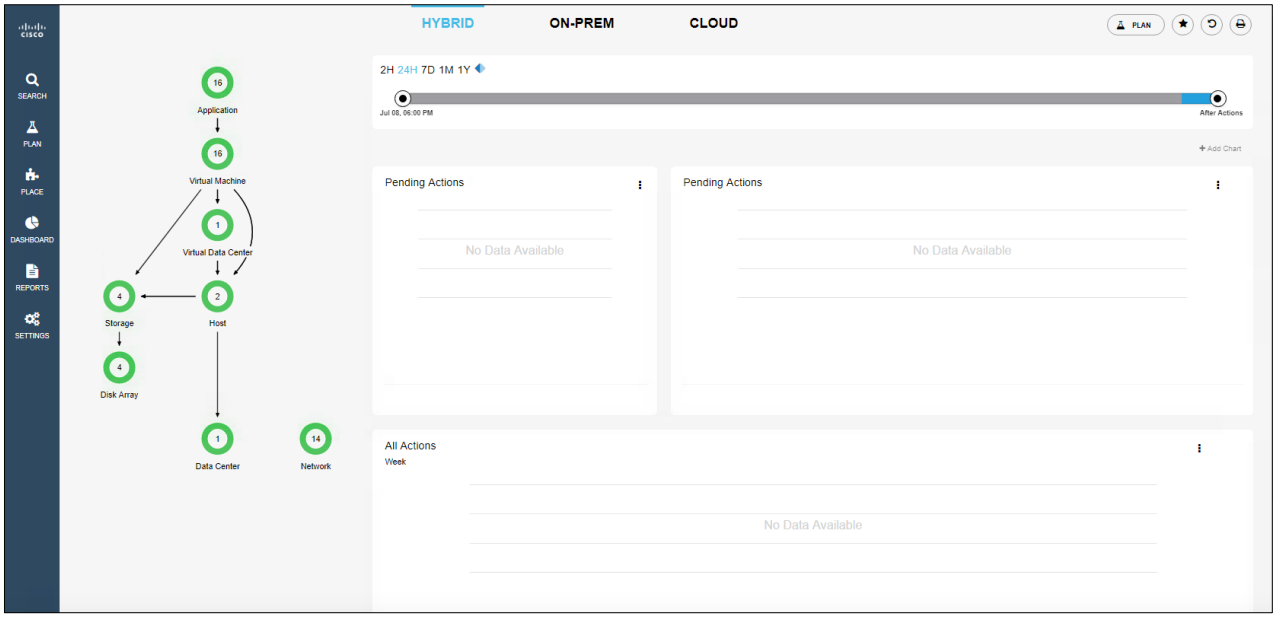
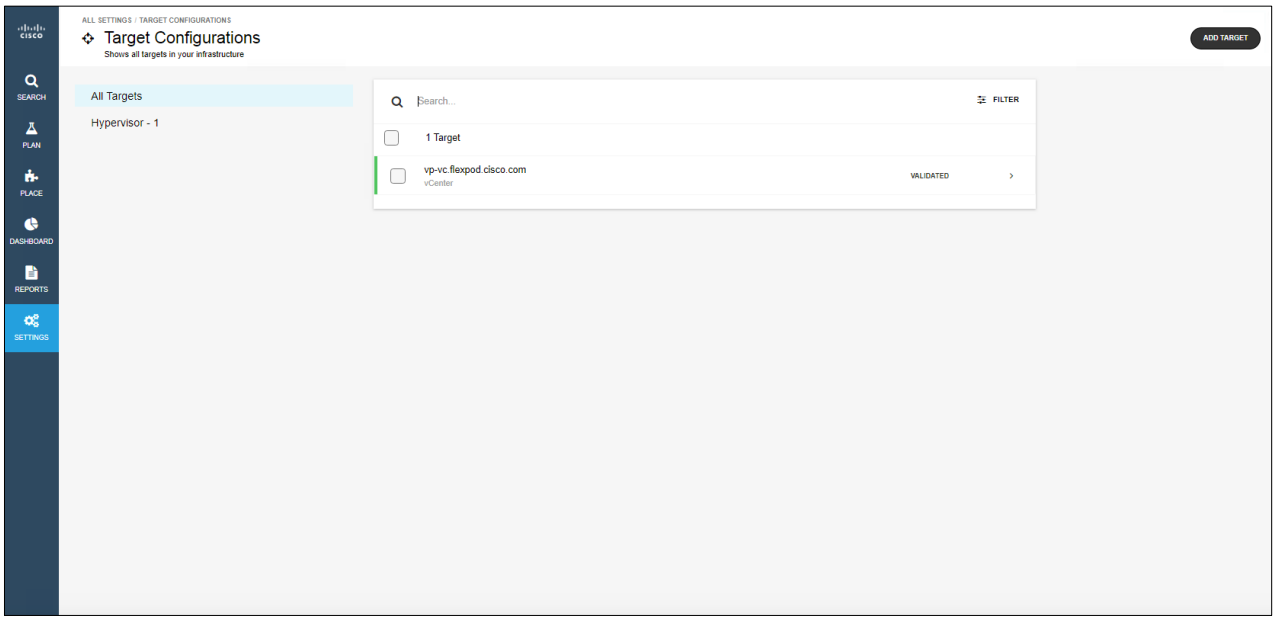
5. Click the Add button. The target will be added. The system will give you an option to take a quick tour before you start. If you are new to Workload Optimization Manager, take the tour; otherwise, click Skip. After the target has been added, the system will display a topology view.



6. To check the details for the added target, click Settings and then the Target Configuration tab.



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Adding a Cisco UCS Manager target

Cisco UCS® Manager is a management solution that participates in server, fabric, and storage provisioning; device discovery; inventory; configuration; diagnostics; monitoring; fault detection; auditing; and statistics collection. The Cisco Unified Computing System™ (Cisco UCS) integrates all these resources in a scalable multi-chassis platform to converge administration onto a single point. Managing these various entities with Workload Optimization Manager enables automation at the hardware level, including automated provisioning of hosts.

Workload Optimization Manager and Cisco UCS together enable elastic computing with cloud economics:

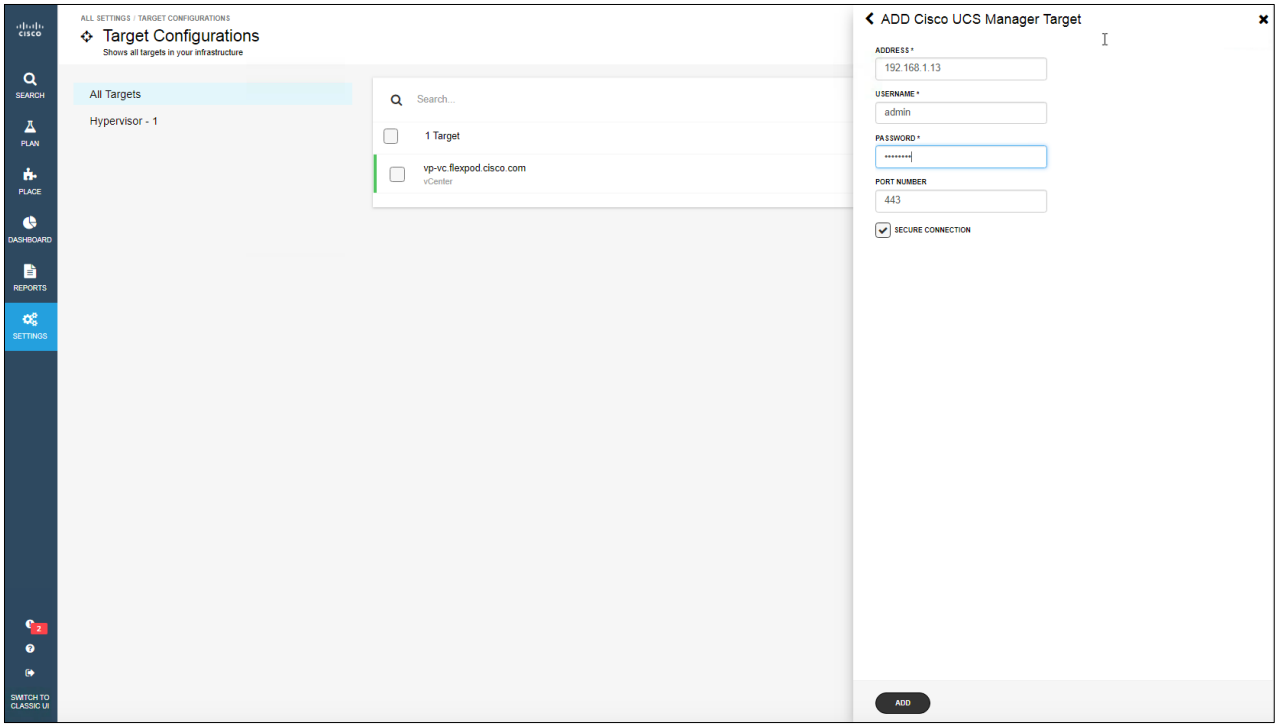
- Workloads are scaled and placed on Cisco UCS blades based on real-time consumption.
- Workload Optimization Manager recommends when to provision or suspend Cisco UCS blades.
- ·Workload Optimization Manager recommends when to add or remove ports.
- Workload optimization can be fully automated on your premises or in a hybrid environment.

Prerequisites

- A service account that Workload Optimization Manager can use to connect to Cisco UCS Manager

Follow the steps here to add Cisco UCS Manager as a target.

1. Click Add Target to add the next target.
2. In the Choose Target Category menu, click Fabric and select Cisco UCS Manager to add it as a target in Workload Optimization Manager.
3. Provide your Cisco UCS Manager account login credentials.



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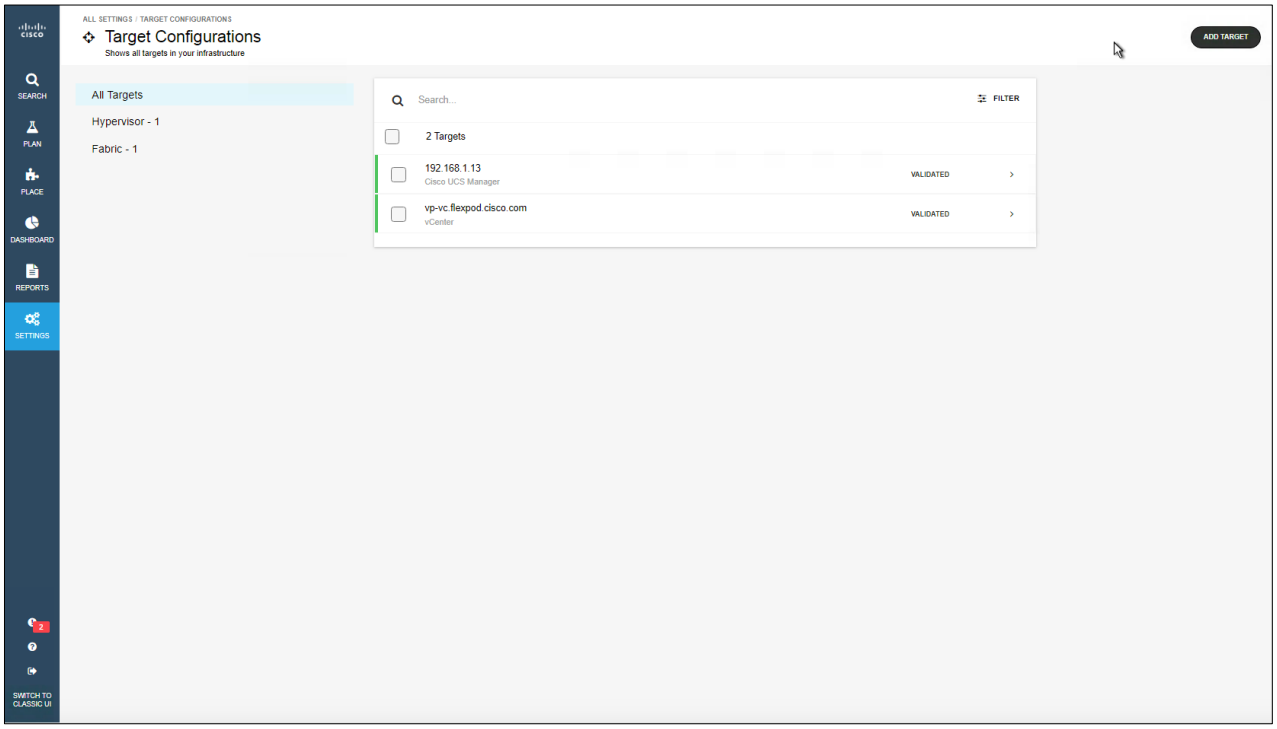
4. Click Add.



Adding a storage target

Storage managers provide management and distribution of data storage across disk arrays. Storage managers can support thin provisioning, deduplication, and high-availability architectures. Workload Optimization Manager monitors resource use across the storage system to optimize placement and provisioning of volumes and disk arrays and to help manage storage controller resources.

Workload Optimization Manager supports the following storage manager targets:

- NetApp (cluster mode [C-mode] and 7-mode) using NetApp Data ONTAP 8.0 or later
- EMC VMAX using SMI-S 8.1 or later
- EMC VNX (Celera) using VNX Control Station
- EMC VNX (Clarion) using SMI-S 4.6.0
- EMC VPLEX Local Architecture with 1:1 mapping of virtual volumes and logical unit numbers (LUNs)
- EMC XtremIO XMS 4.0 or later
- Pure Storage F-series and M-series arrays
- HP 3PAR InForm OS 3.2.2 or later, 3PAR SMI-S, and 3PAR WSAPI
- Dell Compellent Enterprise Manager 2014-2016R3 using Dell Compellent SMI-S
- HDS (Embedded) with VSP, HUS VM, G600, G800, and G1000
- HDS (Shared) with HUS110, HUS 130, and HUS 150
- HDS Tuning Manager 9

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The entities that Workload Optimization Manager discovers through storage manager targets include:

- Storage controllers (NetApp controllers and filers and VNX processors)
- Disk arrays (aggregates, clustered aggregates, storage pools, and RAID groups)
- Data stores (volumes or LUNs)

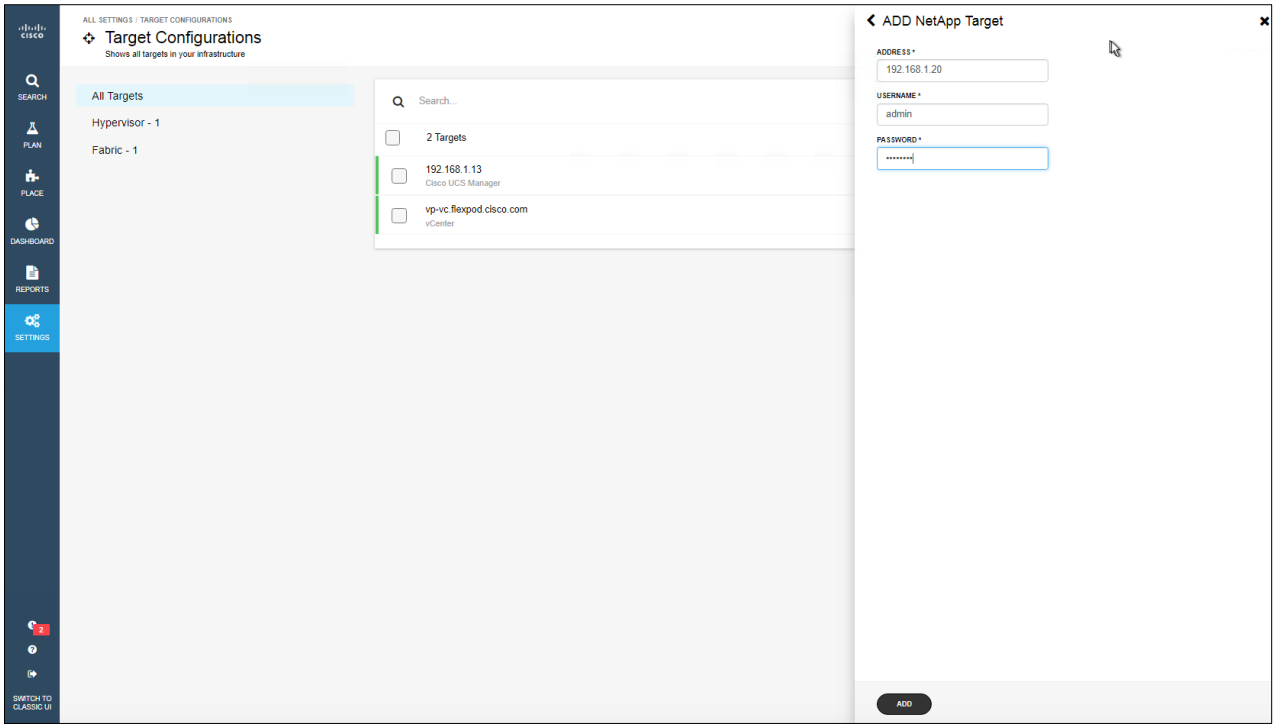
The storage control module adds support for NetApp filers running the Data ONTAP operating system. NetApp storage controllers are storage virtual machines that manage storage arrays: vFilers for 7-mode and vServers for C-mode. Workload Optimization Manager connects to these storage controllers to support NetApp targets in 7-mode and C-mode.

Prerequisites

- Storage controller module license
- Transport Layer Security (TLS) enabled
- A service account that Workload Optimization Manager can use to connect to the NetApp target

Use the following steps to add a storage target in Workload Optimization Manager.

1. For the target type, select Storage. Then select the target: for example, the NetApp storage controller.
2. Provide your login credentials to add the storage in Cisco Workload Optimization Manager.



3. Click Add.

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Cisco UCS Director and Cisco Workload Optimization Manager solution

Workload Optimization Manager supports orchestrator targets. You can set Cisco UCS Director as the target to perform actions. The orchestration action assigns workflows that perform multiple actions to make changes in your environment. Workload Optimization Manager discovers workflows that you have defined in the orchestrator. You can then set up automation policy that maps workflows to actions. If the action mode is Manual or Automatic, when Workload Optimization Manager recommends the action, it will direct the orchestrator to use the mapped workflow to perform it.

Adding the Cisco UCS Director target

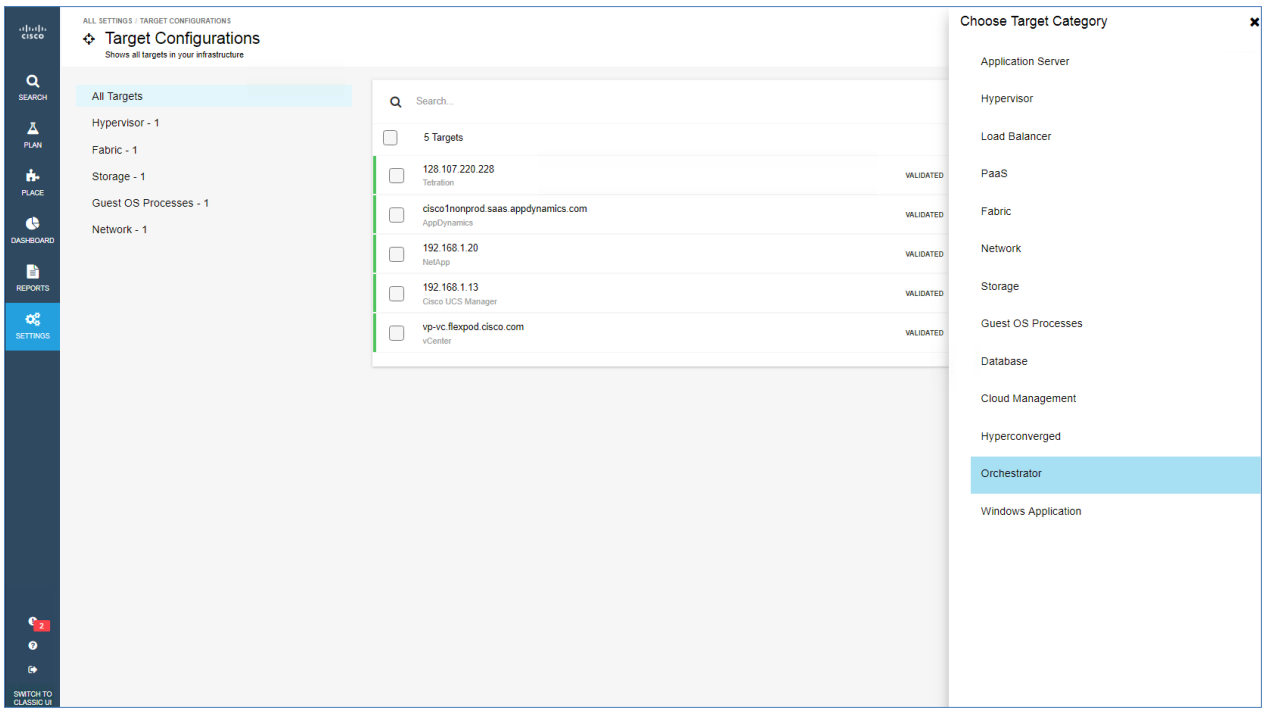
Workload Optimization Manager supports dynamic processing of Cisco UCS Director workflows, enabling provisioning, resizing, and decommissioning of entities in a Cisco UCS environment.

Prerequisites

- Cisco UCS Director 5.0 or later
- Cisco UCS Director user account with administrator permissions
- Cisco UCS Director workflow configuration

Use the following steps to add Cisco UCS Director as target.

1. Click Add Target to add the next target
2. For the target type, select Orchestrator.



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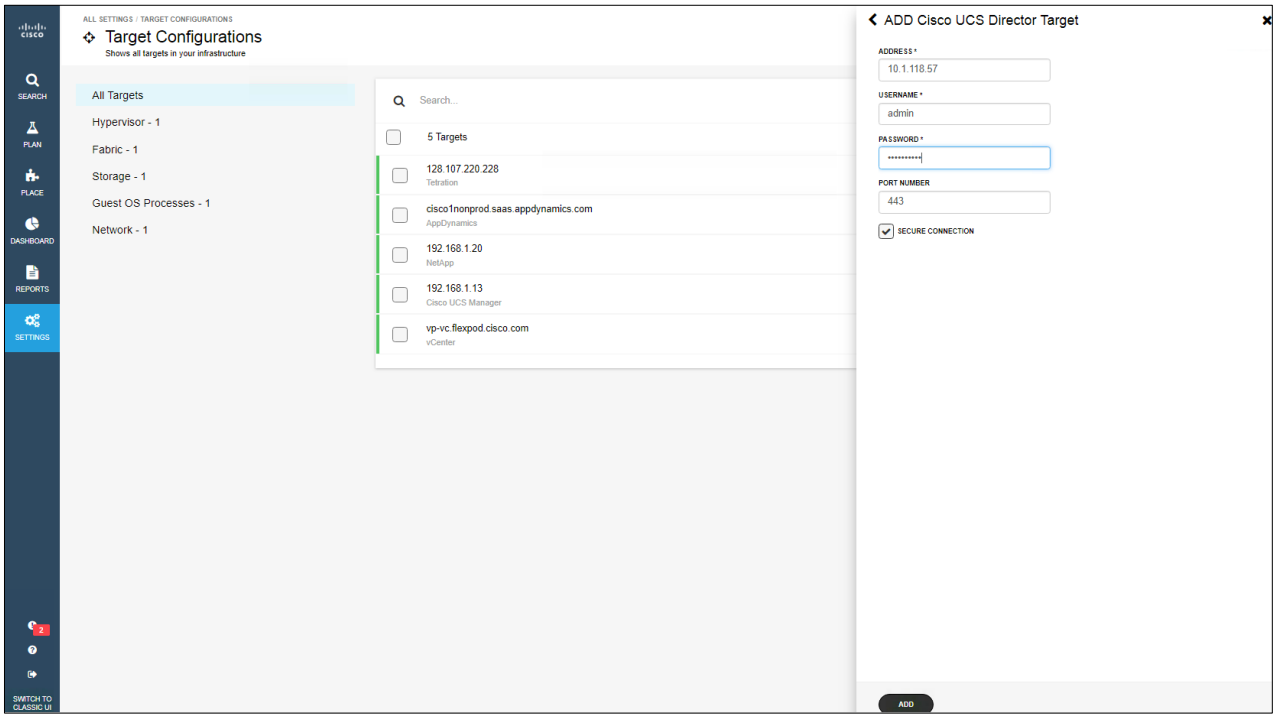
3. Click Cisco UCS Director.
4. Provide your Cisco UCS Director login credentials to add Cisco UCS Director in Workload Optimization Manager.



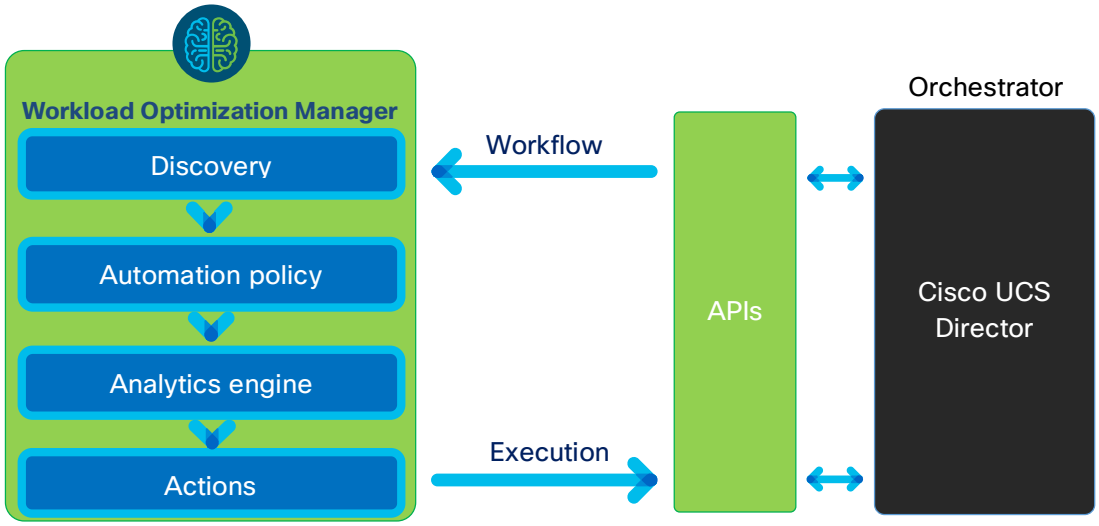
5. Click Add.

You can confirm your targets by viewing the details for all targets.

Architectural overview

Figure 1 illustrates the Cisco UCS Director and Workload Optimization Manager workflow.

Figure 1. Cisco UCS Director and Workload Optimization Manager workflow



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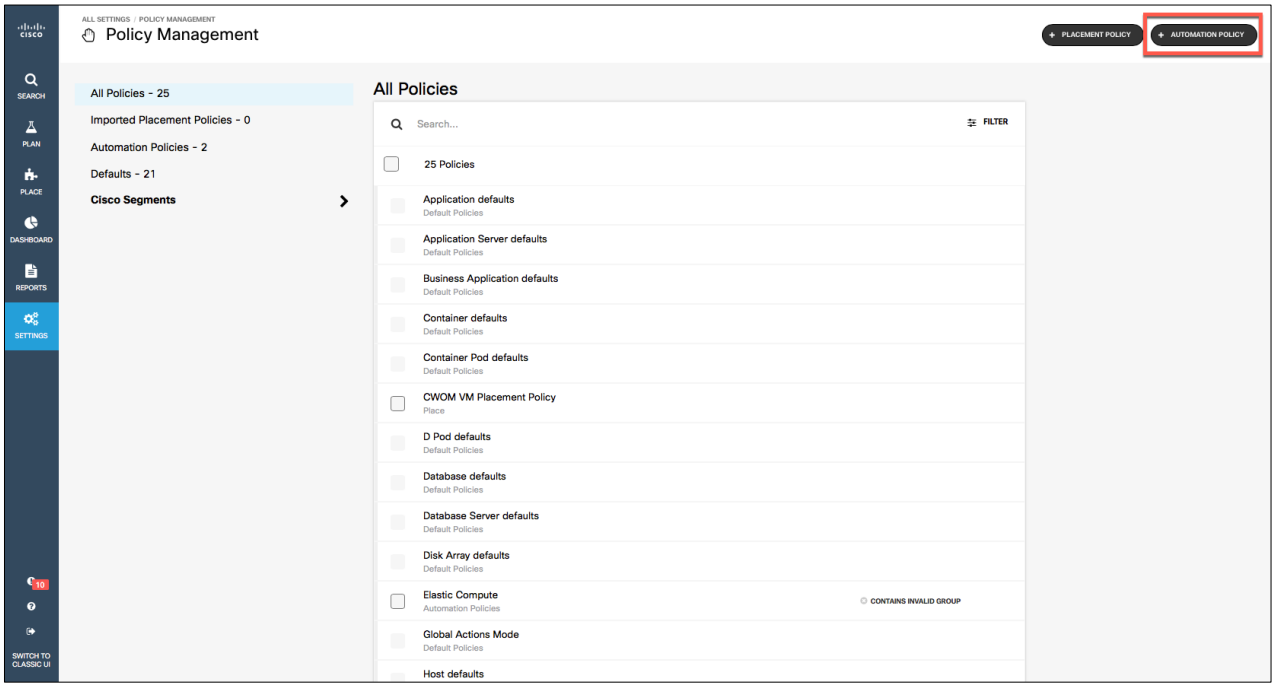
Action orchestration specifies whether Workload Optimization Manager will perform an action, or whether it will pass the action request to an orchestrator that will process a complete workflow to effect the change in your environment. In this way, you can integrate supported orchestrators to perform actions for specific scopes of entities in your environment.

This section explains how to link orchestration workflows to automation policies. Cisco UCS Director is already configured as an orchestration target (it was configured earlier in the target integration process). This section assumes that you have configured the workflow on that target in such a way that Workload Optimization Manager can discover the workflow and map it to actions.

1. Click Settings and then click Select Policies.
2. At the top right, click Automation Policy.



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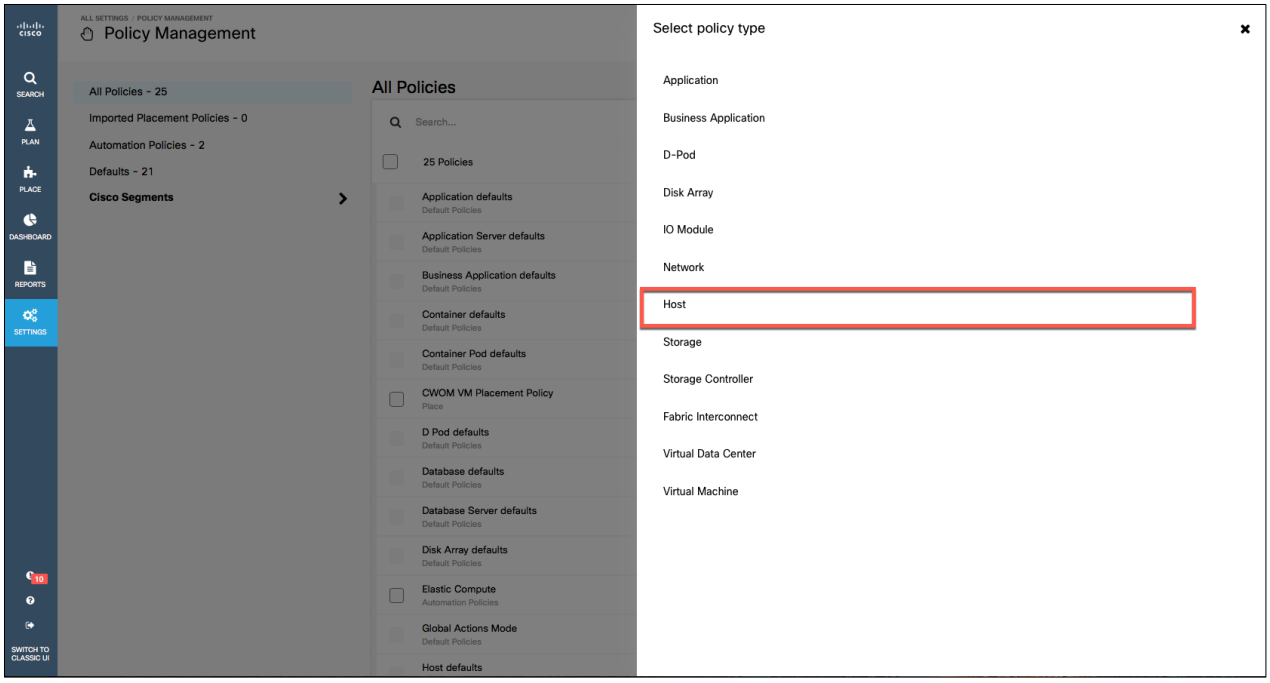
3. For the policy type, select Host.



4. Enter a policy name: for example, **Elastic Compute**.
5. Click Scope and select your host group; then click Select.
6. Click Action Automation and then click Add Action.
7. From the drop-down menu, choose the action type (Provision, Terminate, Suspend, or Start) and then the action mode (Manual, Automated, Recommend, or Disabled).
8. Click Action Orchestration.
9. Select the action type (Provision, Terminate, Suspend, or Start).
10. As the target to run in the orchestrator, select UCS Director.
11. Click Link Workflow and select your workflow in Cisco UCS Director.

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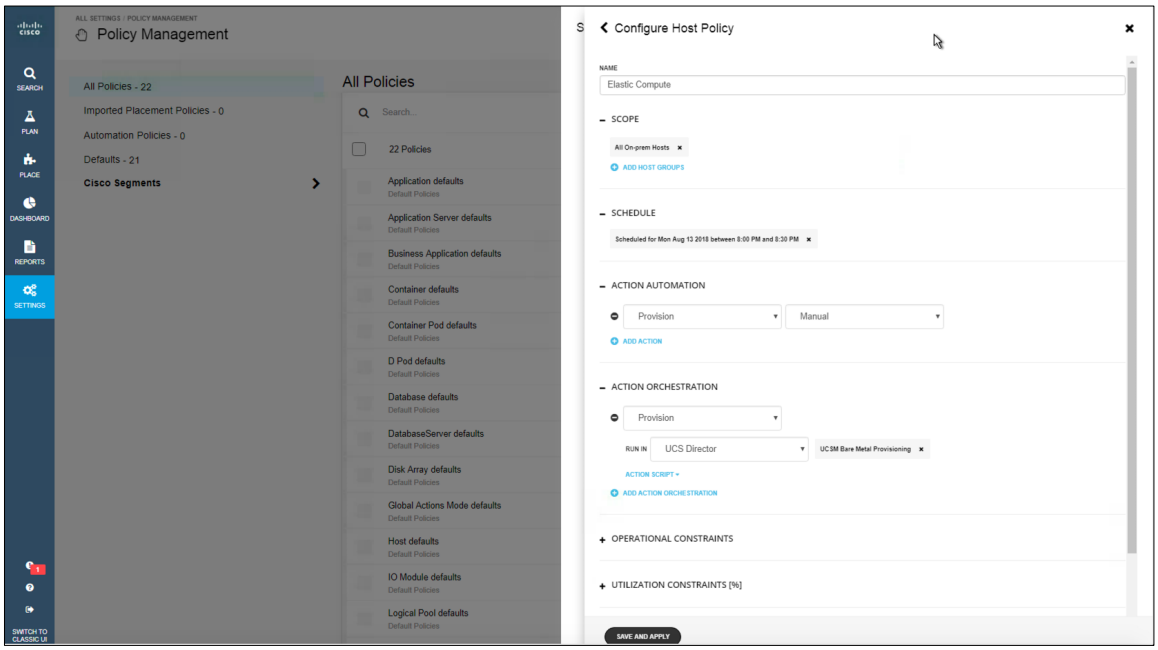
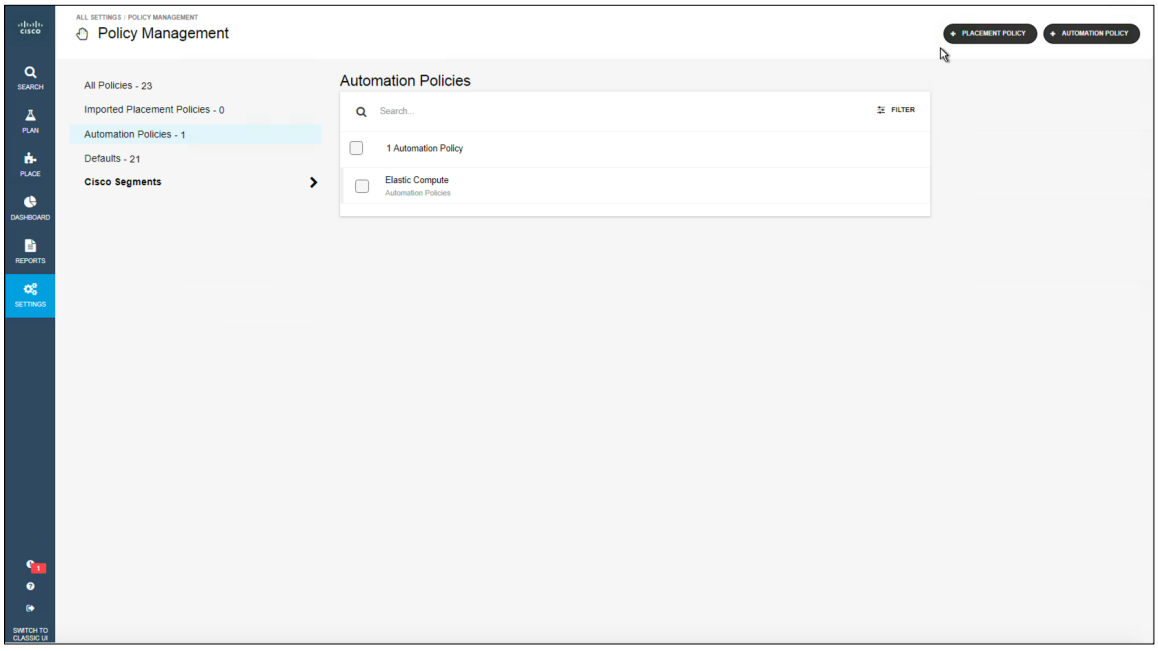


12. Click Save and Apply.
13. Click Automation Policies and confirm your policy you created.



Conclusion

With Cisco Workload Optimization Manager, data center operators can deliver differentiated performance while making the best use of the environment. When used in combination with Cisco UCS Manager and Cisco UCS Director, it can help organizations achieve elastic computing with cloud economics. Full automation can empower data center operators to focus on innovation: to deliver new products and services that enable the digitization of their organization and provide competitive advantage for their business.

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Cisco Workload Optimization Manager Main Features

This section describes some of the main features of Workload Optimization Manager.

View your global environment and see the details that matter to you

When you launch Workload Optimization Manager, the homepage is the first view you see (Figure 21). From the homepage, you can:

- Use the Supply Chain Navigator to inspect lists of entities: Click an entity tier in the navigator to see a list of those entities. For example, click Virtual Machine to see a list of all virtual machines in your environment.
- Choose a view to see overviews of your environment:
  - Hybrid: See all the actions that are pending for the entire environment, both on your premises and in the cloud.
  - On-Prem: See details about the on-premises environment. Notice that Supply Chain excludes cloud entities and shows only the entities that are on the premises.
  - Cloud: See details about the cloud environment, including pending actions, a list of your cloud accounts by cost, the locations of cloud data centers that you are using, estimated costs, and other cost-related information.
- Navigate to other areas of Workload Optimization Manager:
  - Search: Set the session scope to drill down to detail about your environment.
  - Plan: Run what-if scenarios or plan migrations to the cloud.
  - Place: Use Workload Optimization Manager to calculate the best placement for workloads and implement the placement at the time you specify.
  - Dashboard: Set up custom views with charts that focus on specific information about your environment.
  - Reports: Generate reports and manage subscriptions to those reports.
  - Settings: Configure Workload Optimization Manager to set up business rules and policies, configure targets, define groups, and perform other administrative tasks.
- Whenever you are in a Workload Optimization Manager session, you can always click the Cisco Home icon to return to the homepage.

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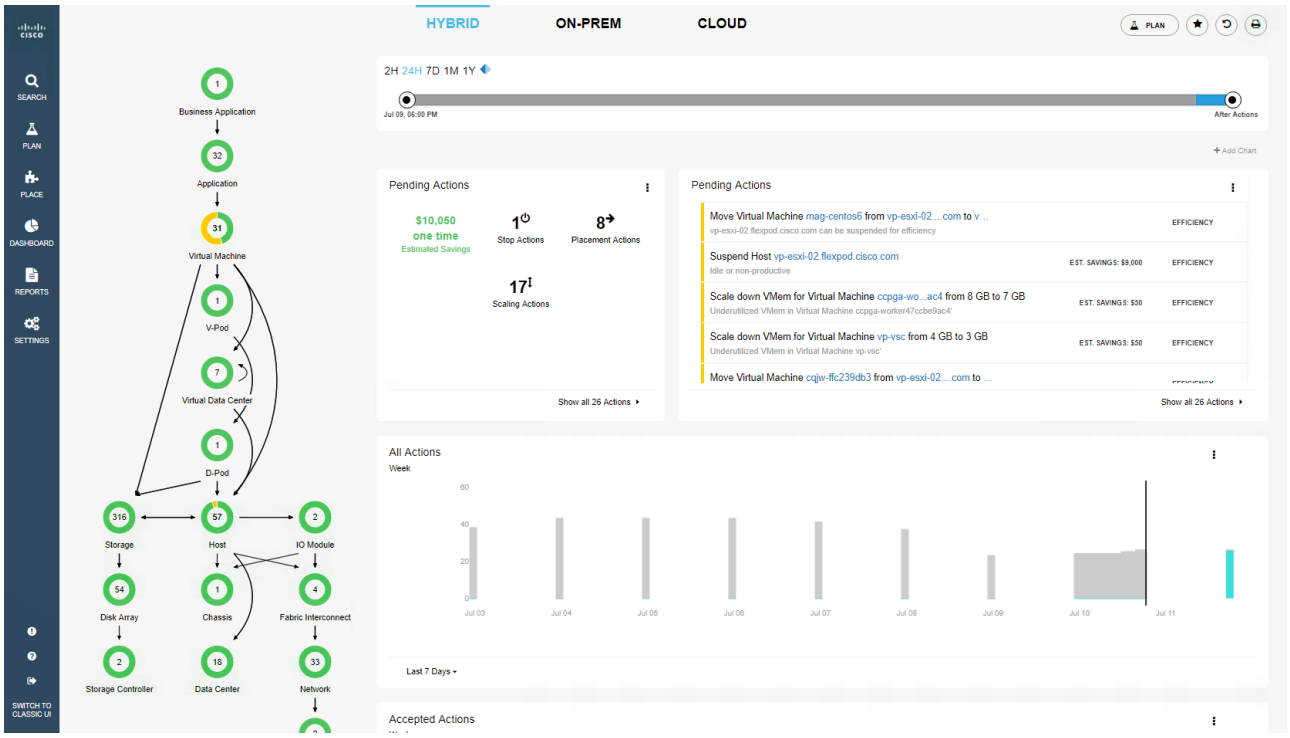
Figure 2. Navigating Cisco Workload Optimization Manager



Automate actions

Visibility into the entities that exist in your environment and the relationships among them is the foundation of Workload Optimization Manager's core value: real-time decision automation in the data center and cloud. To make the right placement, scaling, and capacity decisions, the platform needs to understand the entire environment. Workload Optimization Manager models your environment as a market of buyers and sellers linked together in a supply chain. This supply chain represents the flow of resources from the data center, through the physical tiers of your environment, to the virtual tier and to the cloud. By managing relationships between these buyers and sellers, Workload Optimization Manager provides closed-loop management of resources, from the data center through to the application. You see the supply chain and use detail across entities, and the platform sees what needs to be done to achieve continuous health in the environment.

You can define the level of automation by the action type and at multiple levels of detail: for example, you can automate actions for individual virtual machines, for a cluster, or for a data center.

The Actions list shows the actions that Workload Optimization Manager currently recommends. You can select actions to perform, and you can expand action items to see more details.

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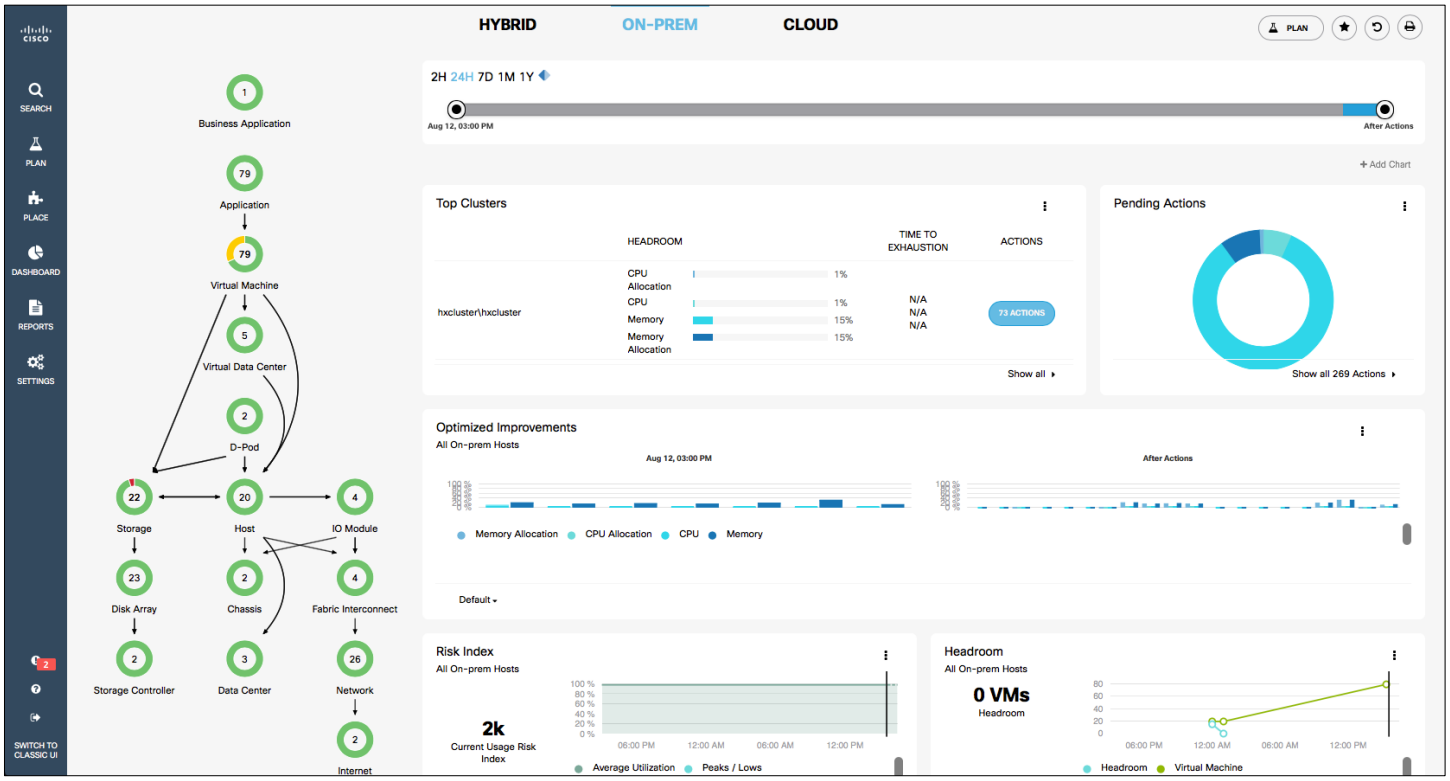
To perform actions, follow the steps listed here.

1. From the homepage, select your cloud.
2. Click Show all > Pending Actions



3. You can perform some actions just by selecting the check box, but some actions you can't perform by default. To implement these actions, you need to turn on the options.
4. You can perform any action based on your automation level. Select the check box for "Scale down VMem for Virtual Machine" to resize the virtual machine memory.
5. Open the drop-down menu to see the virtual machine recommendation. The virtual machine memory is underutilized.

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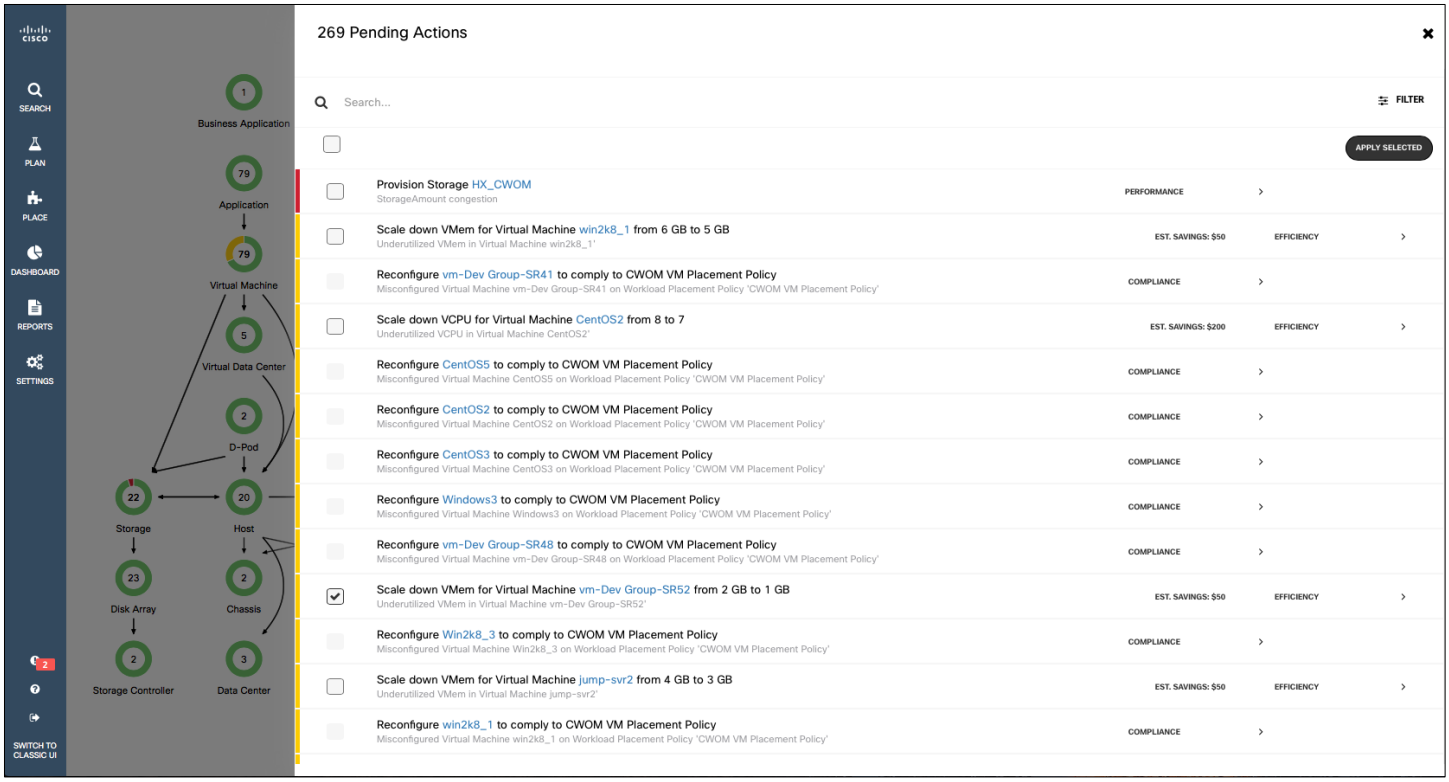
6. Select the check box to apply the Workload Optimization Manager recommendation.



7. Click Apply Selected.
8. You can view the VMware vCenter screen to see the resized workload and recently performed tasks.

Workload Optimization Manager actions can be implemented manually (with a mouse click) by an operator, on command (for example, based on a change management process), or automatically as events arise. Users can define the level of automation by action type and at multiple levels of detail: for example, you can automate actions for individual virtual machines, for a cluster, or for a data center.

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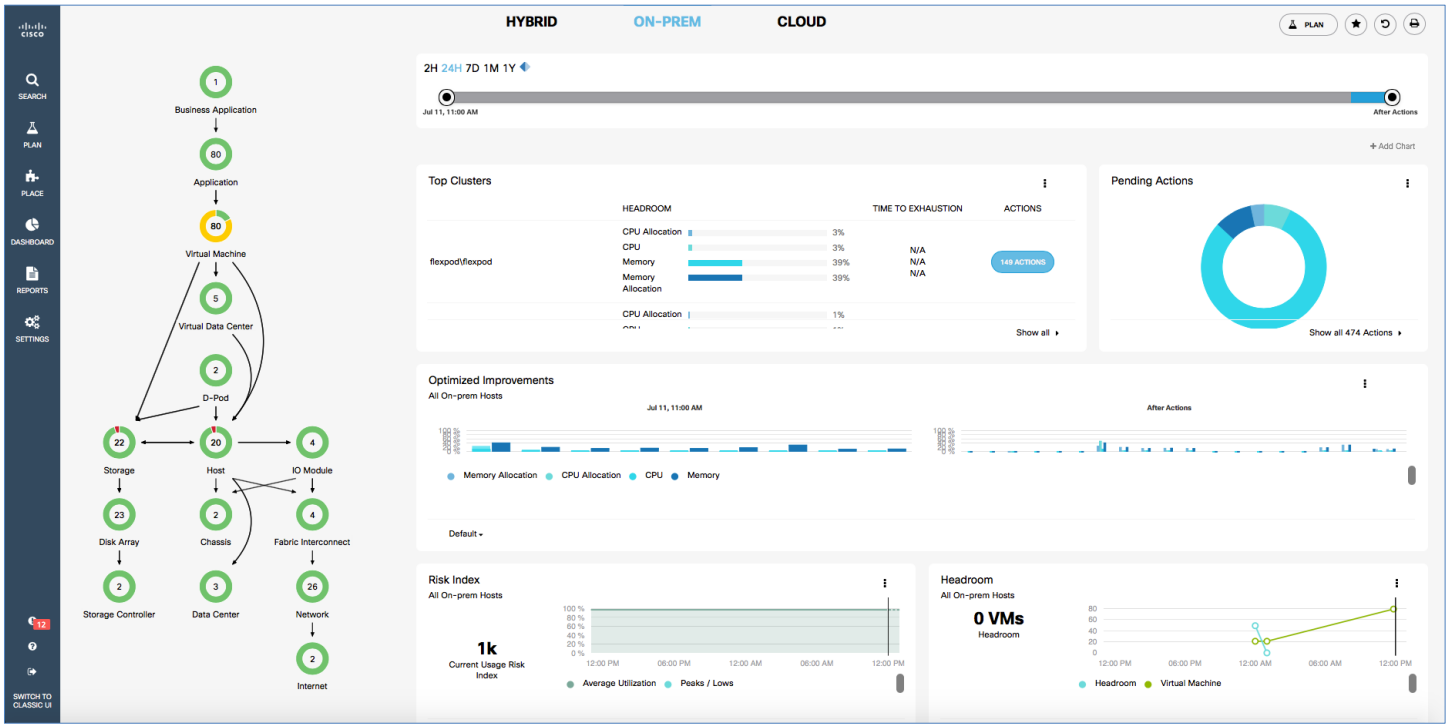
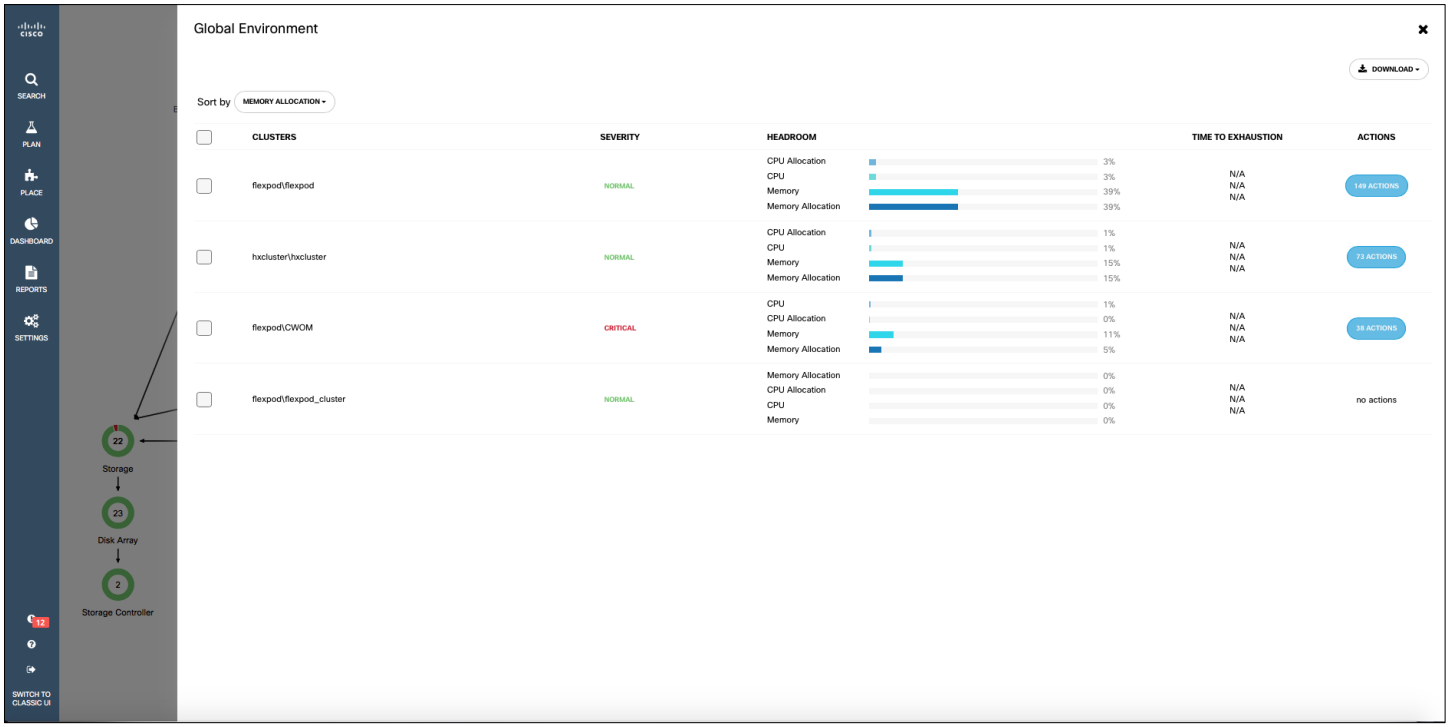
To implement an action, follow the steps provided here.

1. In the homepage menu, select your environment: Hybrid, On-Prem, or Cloud.



2. Click Show all > System to see all the actions of all the clusters.



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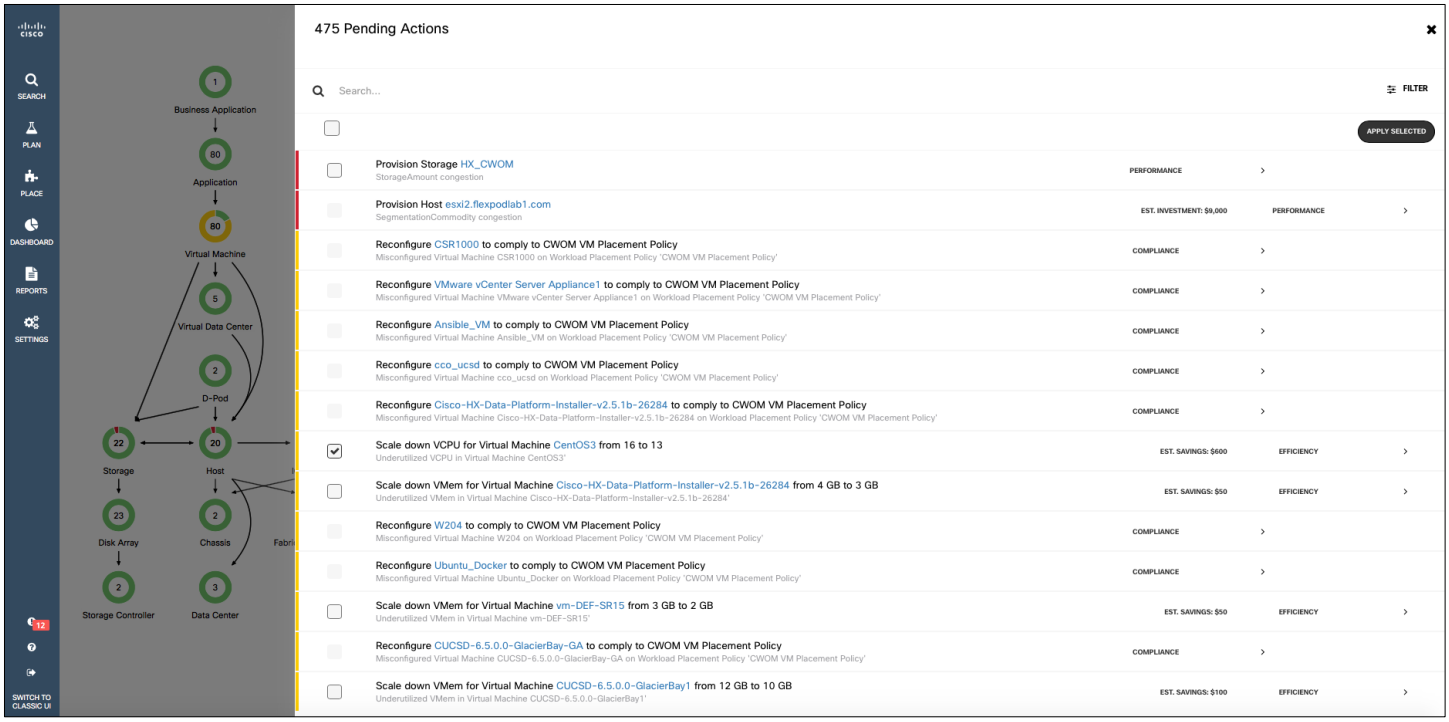
3. Select the check the box for the action you want to implement and then click Apply Selected.



4. The action will be implemented

Establish policies and service-level agreements

Typically, in data center environments, tiers of resources are made available for various groups. By creating policies to match applications to the appropriate resources, organizations can help ensure that lower-tier applications are not using costly resources. Workload Optimization Manager provides the capability to create and customize policies, enabling you to set the way that Workload Optimization Manager analyzes resource allocation, displays resource status, and displays or performs actions.

- **Groups:** Groups assemble collections of resources for Workload Optimization Manager to monitor and manage.
- **User Management:** As an administrator, you can specify accounts that grant specific users access to Workload Optimization Manager.
- **Budget and Costs:** A budget group specifies the monthly expenditure you want to devote to keeping workload on the public cloud.
- **Updates:** You can check the Workload Optimization Manager release details and the availability of more recent releases.
- **Maintenance Options:** You can configure HTTP proxy, export state, configuration files, and logging levels.
- **Templates:** You can view a variety of templates, including virtual machine, Cisco UCS, and public cloud templates.
- **Email and Trap Notifications:** Workload Optimization Manager is designed to manage your environment in real time. If conditions arise in your environment that prevent Workload Optimization Manager from collecting the data it needs or from implementing control actions on the entities in your environment, then it posts notifications to the user interface to alert you about the problems. If Workload Optimization Manager control is especially critical for certain scopes in your environment, you can set up email and Simple Network Management Protocol (SNMP) trap notifications to alert you to any issues that arise within those scopes.
- **License:** You can view the total number host licenses, license features in use, and license expiration dates.

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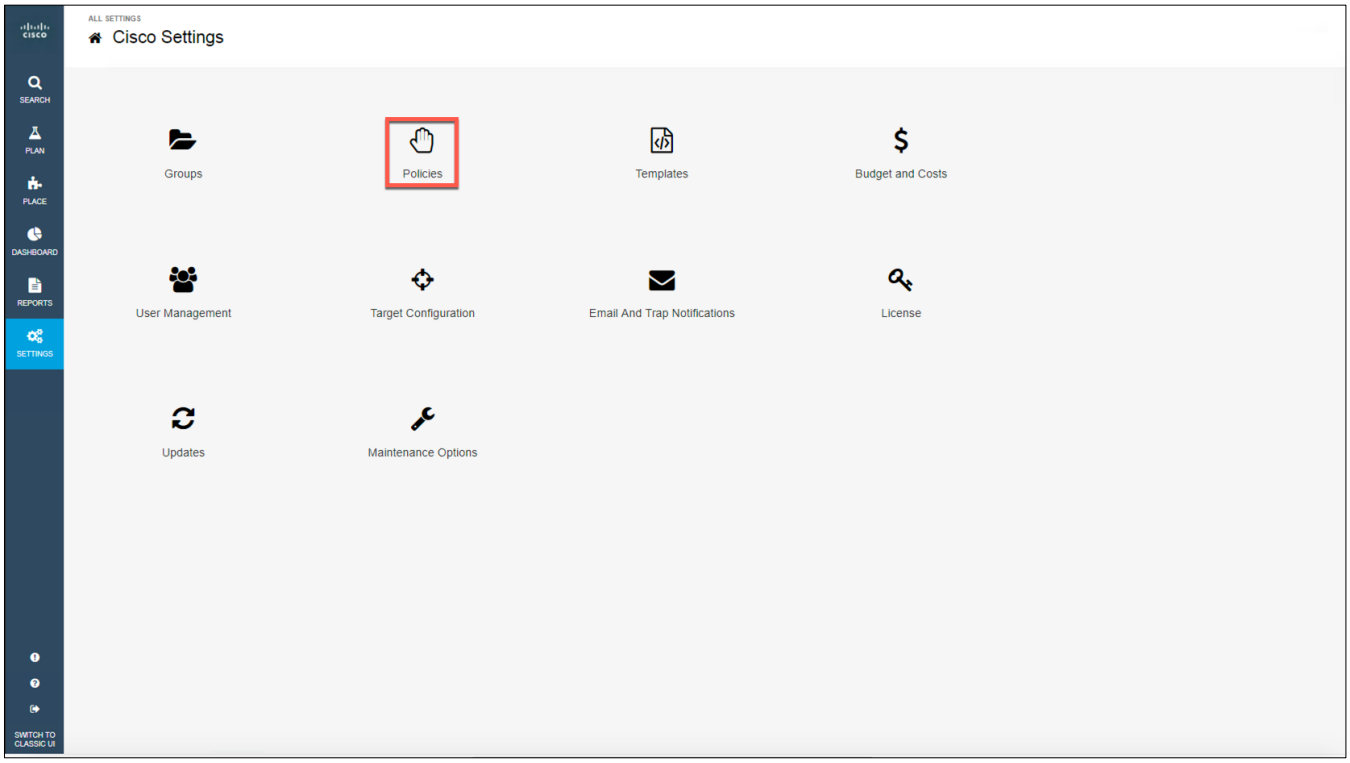
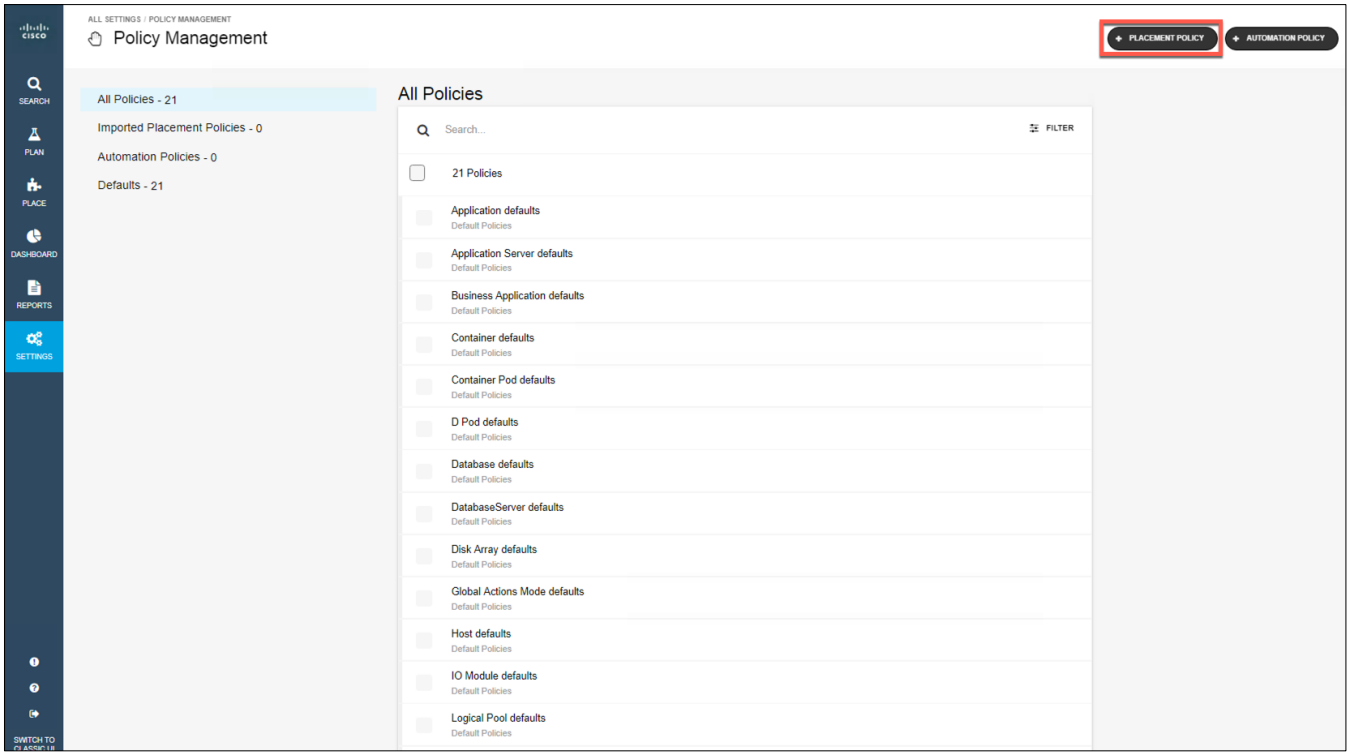
Follow the steps shown here to set up policies and service-level agreements (SLAs).

1. Click Settings and then select Policies.



2. At the top right, click Placement Policy.



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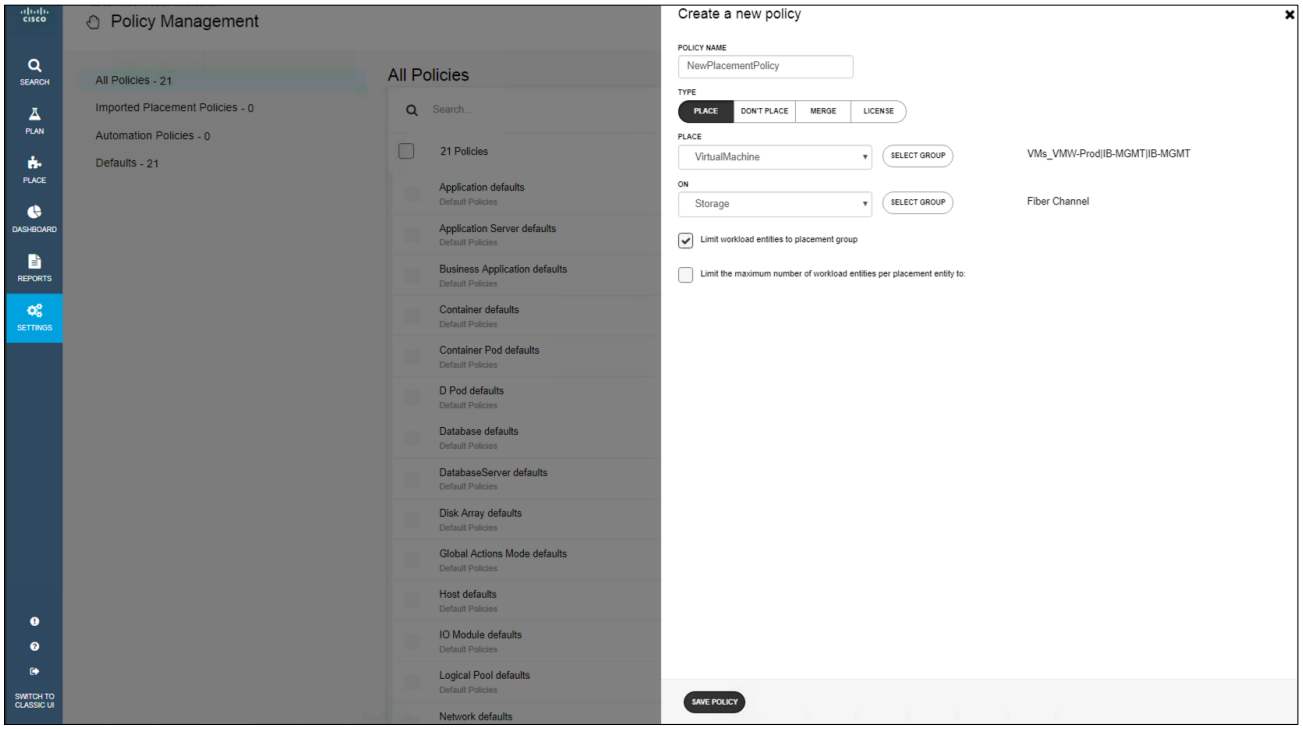
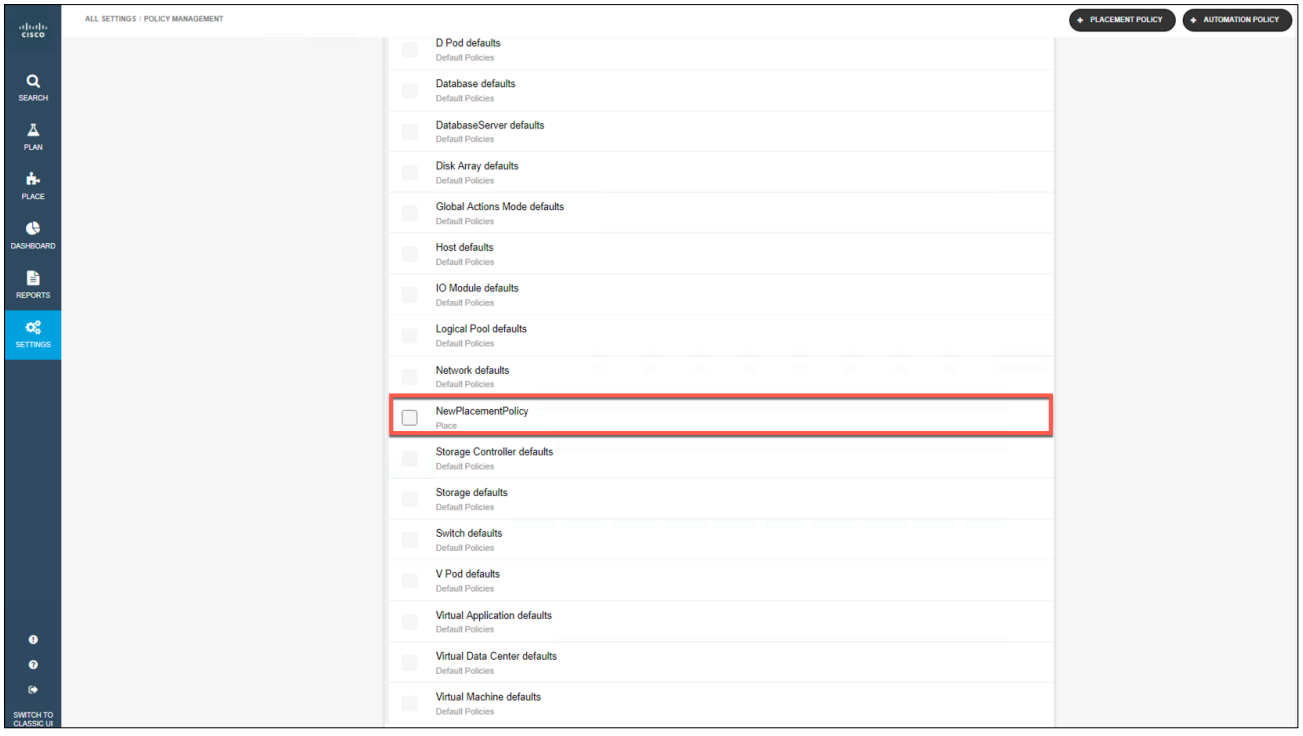
3. Enter a name for your new policy: for example, **NewPlacementPolicy**.
4. Select the type of the policy.
5. For the placement, choose your consumer type (application, virtual machine, container, container pod, or storage).
6. Select the workload group.



7. Click Save and confirm your policy under All Policies.



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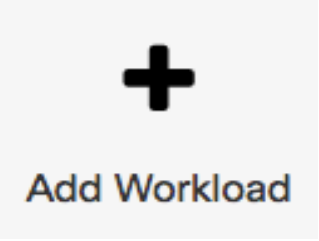
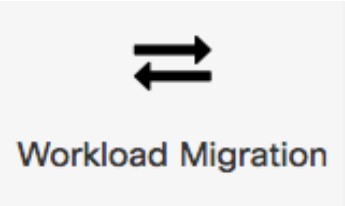
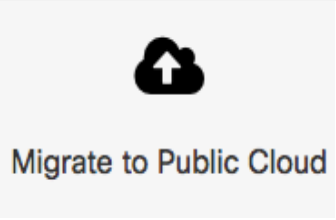
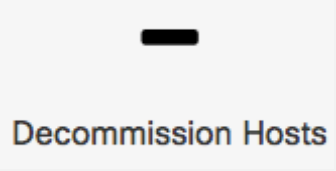
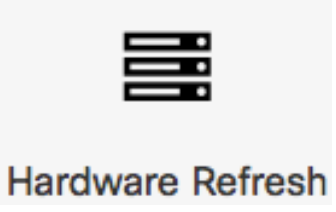
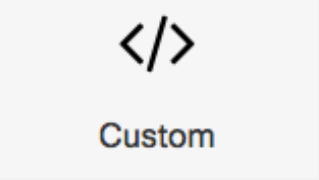
Plan for the future

Workload Optimization Manager can simulate certain scenarios in the environment before the changes are implemented. It uses the same underlying common data model (the supply chain market) for both real-time performance assurance and simulation. This unique capability helps ensure that simulations can be performed seamlessly in the environment and that real-time workload resource demands and infrastructure resource availability are taken into account.

Workload Optimization Manager provides workflows to create the types of plans listed in Table 3.

Table 2. Plan types in Cisco Workload Optimization Manager

Plan type	Description
	Adding workloads increase the demands that you place on your environment's infrastructure. You can set up a plan to add new workloads based on individual virtual machines or groups of virtual machines in your environment or based on templates.
	You can choose groups of workloads to migrate to a public cloud. Workload Optimization Manager chooses the appropriate cloud templates to support the virtual machines in your cloud account, and it chooses the best regions to host these virtual machines. The plan shows two results: migration to templates that match your current virtual machine resources, and migration to the smallest templates that can assure performance of your applications without overprovisioning your cloud virtual machines. The plan shows the costs you would see in your cloud account for both sets of results.
	Simulate migration to the public cloud to see whether you have enough resources to move your workload from one provider group to another. For example, assume that you want to decommission one data center and move its entire workload to a different data center. Does the target data center have enough physical resources to support the workload you plan to move? Where should that workload be placed? Use this plan to calculate the effect such a change would have on your overall infrastructure.
	If your environment includes underutilized hardware, you can use a plan to see whether you can decommission hosts or storage.
	Choose hosts or storage that you want to replace with different hardware. For example, assume that you are planning to upgrade the hosts in a cluster. How many hosts do you need to deploy and still assure the performance of your applications? Create templates to represent the upgraded hosts and let the plan figure out how many hosts you really need.
	The other plan types get you started on the setup for certain common types of scenarios. With a custom plan, you skip directly to the plan configuration and set up whatever type of scenario you want.

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Alleviate Pressure	Use this plan to identify the workload to move from a cluster that is running “hot,” or that has excessive workload. It shows you the least amount of changes you should make to reduce pressure on the hot cluster.
Optimize Cloud	For cloud environments, see how to get the greatest savings possible while still assuring performance for all your workloads. For example, this plan identifies opportunities to move workloads into reserved-instance purchase plans and ways to reduce allocated resources without affecting application performance.

Cisco Workload Optimization Manager Plan Management

The Plan Management page is your starting point for creating new plans, viewing saved plans, and deleting saved plans that you don't need anymore.

- **View saved plans:** After you create and run a plan, Workload Optimization Manager saves it. You can return to the saved plan to review the results, or you can change its configuration and run it again.
- **Delete saved plans:** To delete a saved plan, select the plan's check box and then click the Delete button.
- **Configure nightly plans:** Workload Optimization Manager runs nightly plans to calculate headroom for the clusters in your on-premises environment. For each cluster plan, you can set the virtual machine template that you want to use in these calculations.

To run a plan scenario, Workload Optimization Manager creates a snapshot copy of your real-time market and modifies that snapshot according to the scenario. It then uses its Economic Scheduling Engine feature to perform analysis on the plan market. A scenario can modify the snapshot market by changing the workload, adding or removing hardware resources, or eliminating constraints such as cluster boundaries or placement policies.

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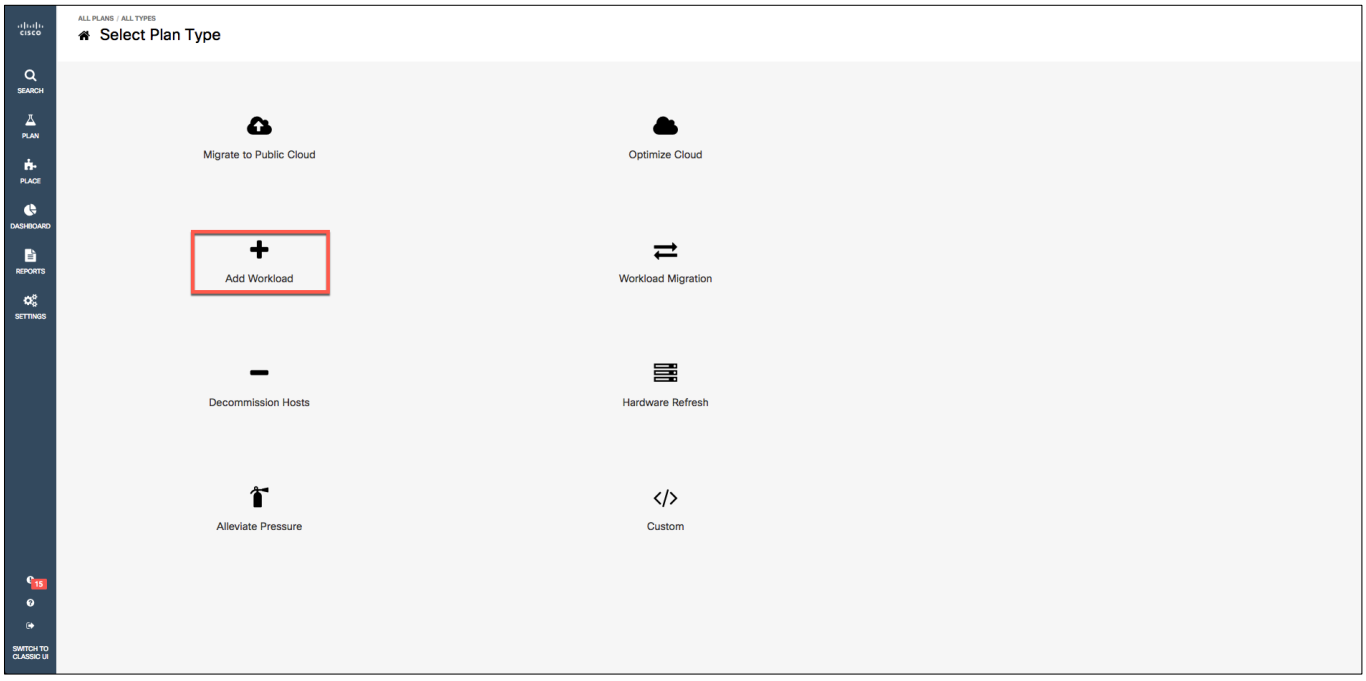
Add Workload Plan Type Example

The following steps provide a planning example using the Add Workload plan type.

1. On the left side of the window, click Plan.
2. Click Create Plan.

3. Select Add Workload. You could also select another option: Migrate to Public Cloud, Migrate Workload, Decommission Hosts, or Hardware Refresh. You could also select another option to specify your own planning requirements.



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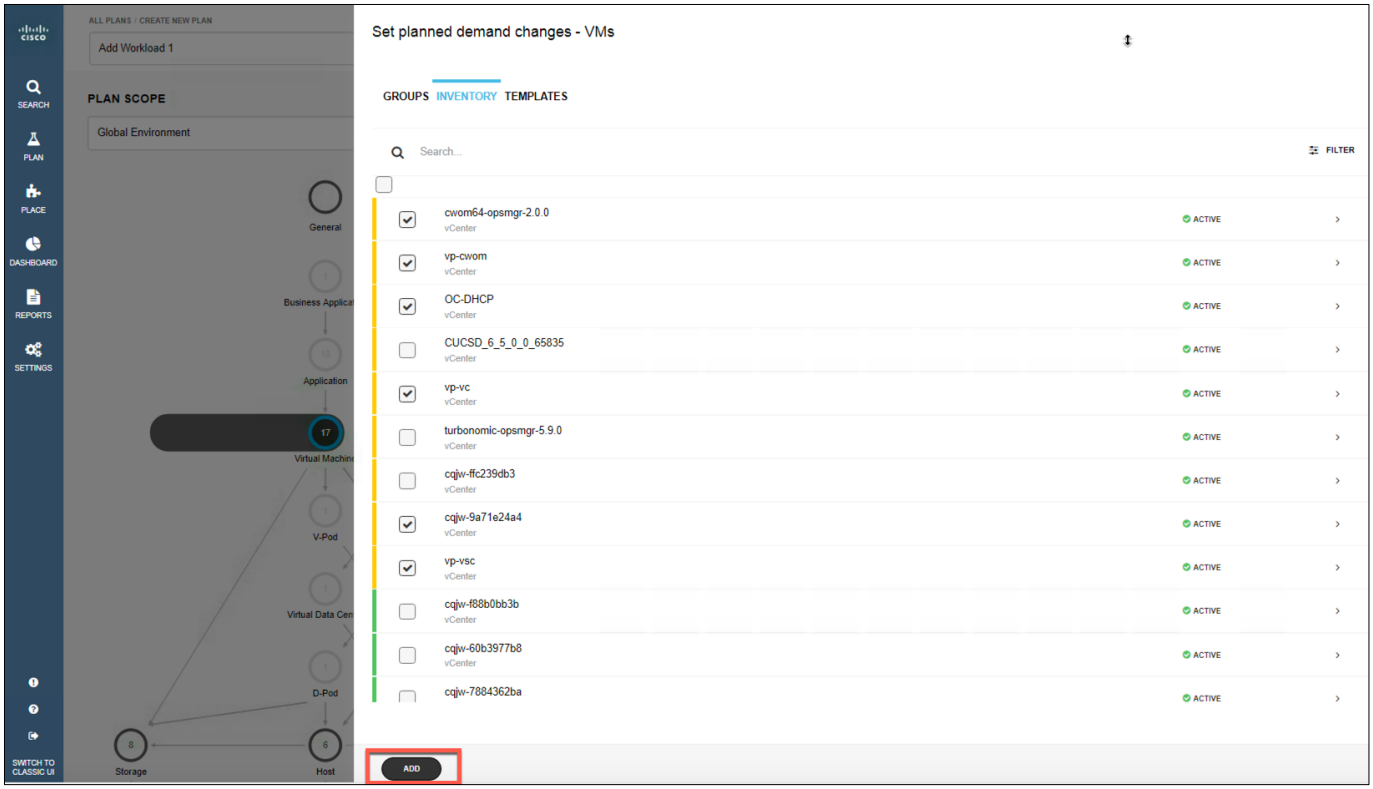
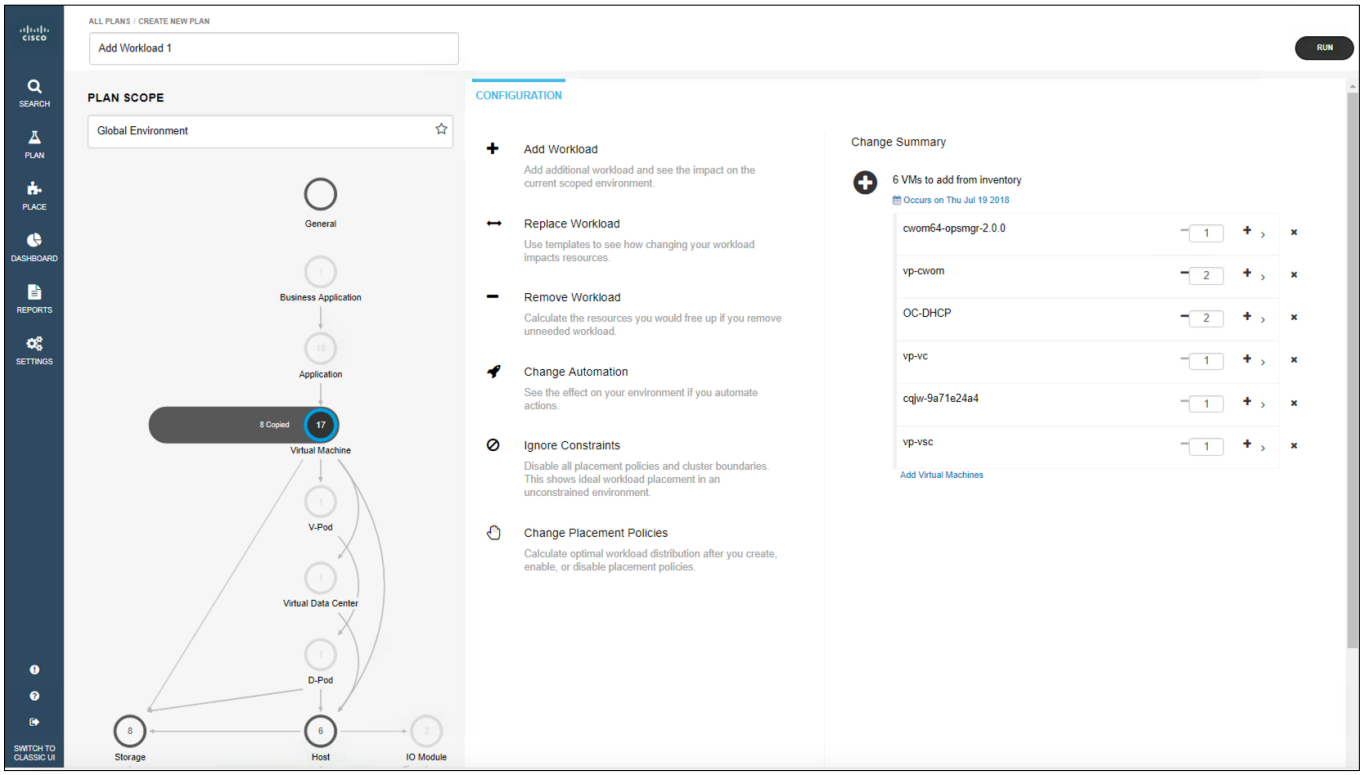
4. Select the workload you are planning to run: Groups, Inventory, or Template. Then click Add.



5. Change your workload size as needed by clicking the + (plus) or – (minus) button.



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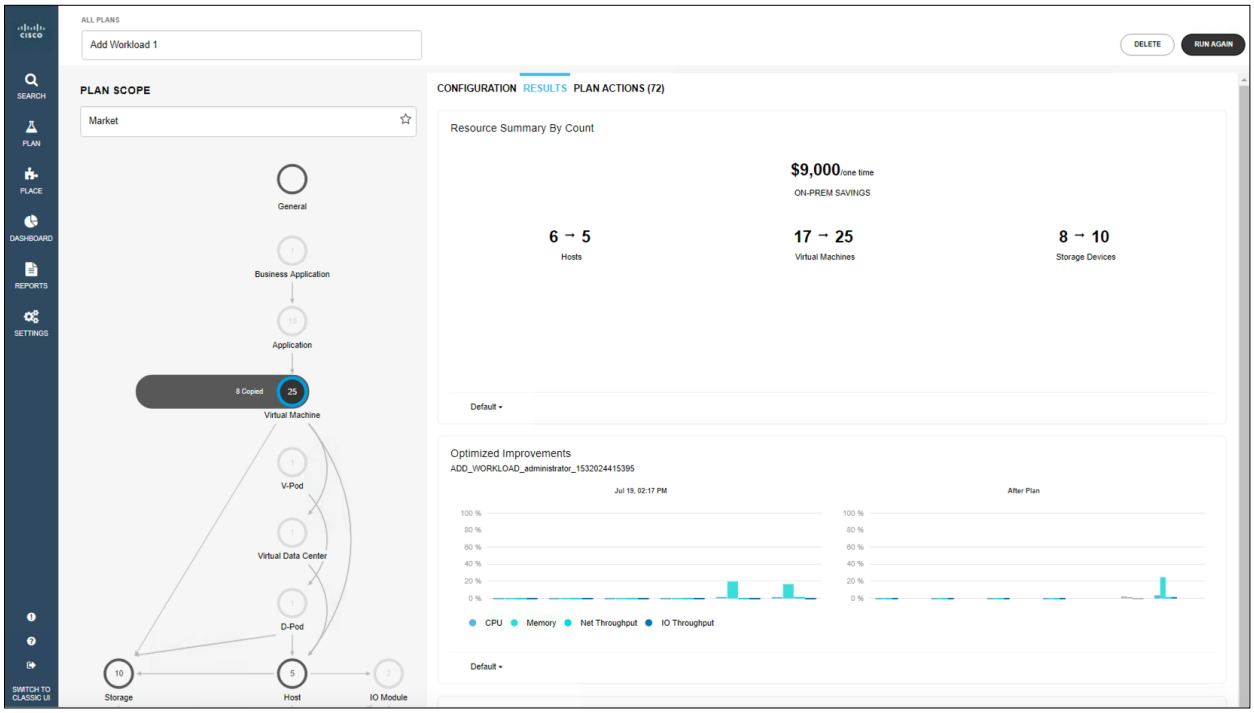
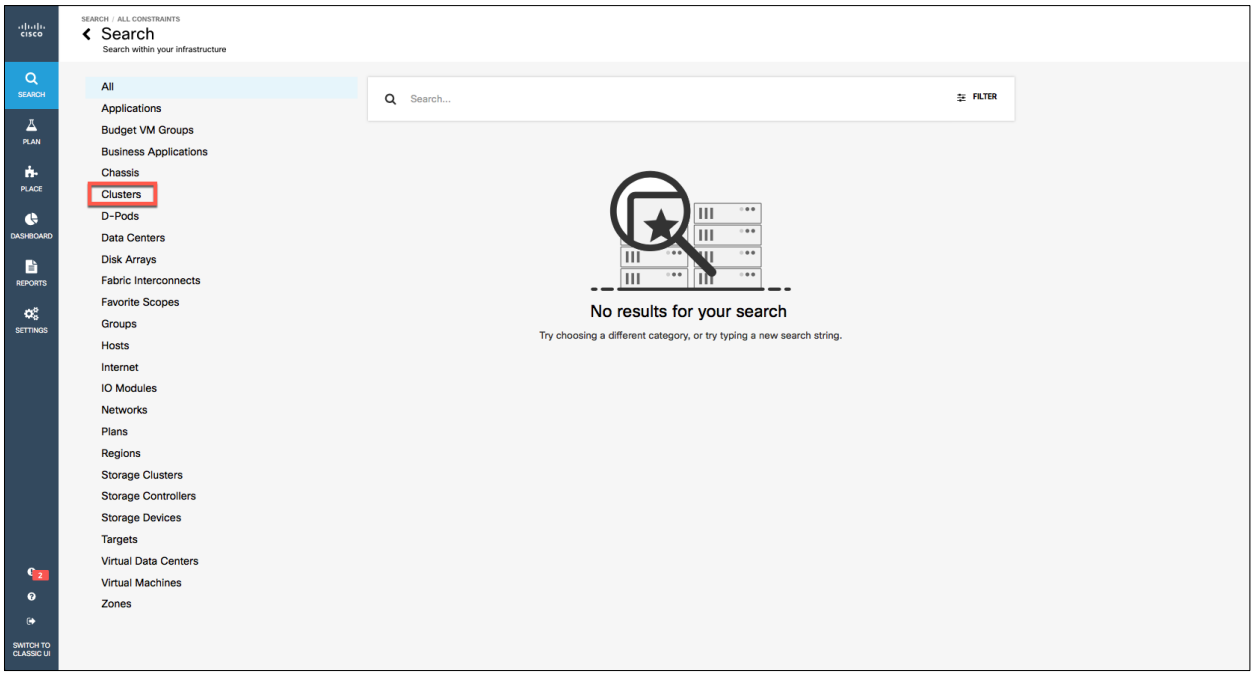
6. Click Run.
7. Review the resources you will need to add the workload.



Hardware Refresh Plan Example

To plan for a hardware refresh to support existing workloads, follow the steps shown here.

1. On the left side of the window, click the Search tab.
2. Select your criteria: clusters, groups, hosts, data centers, etc.



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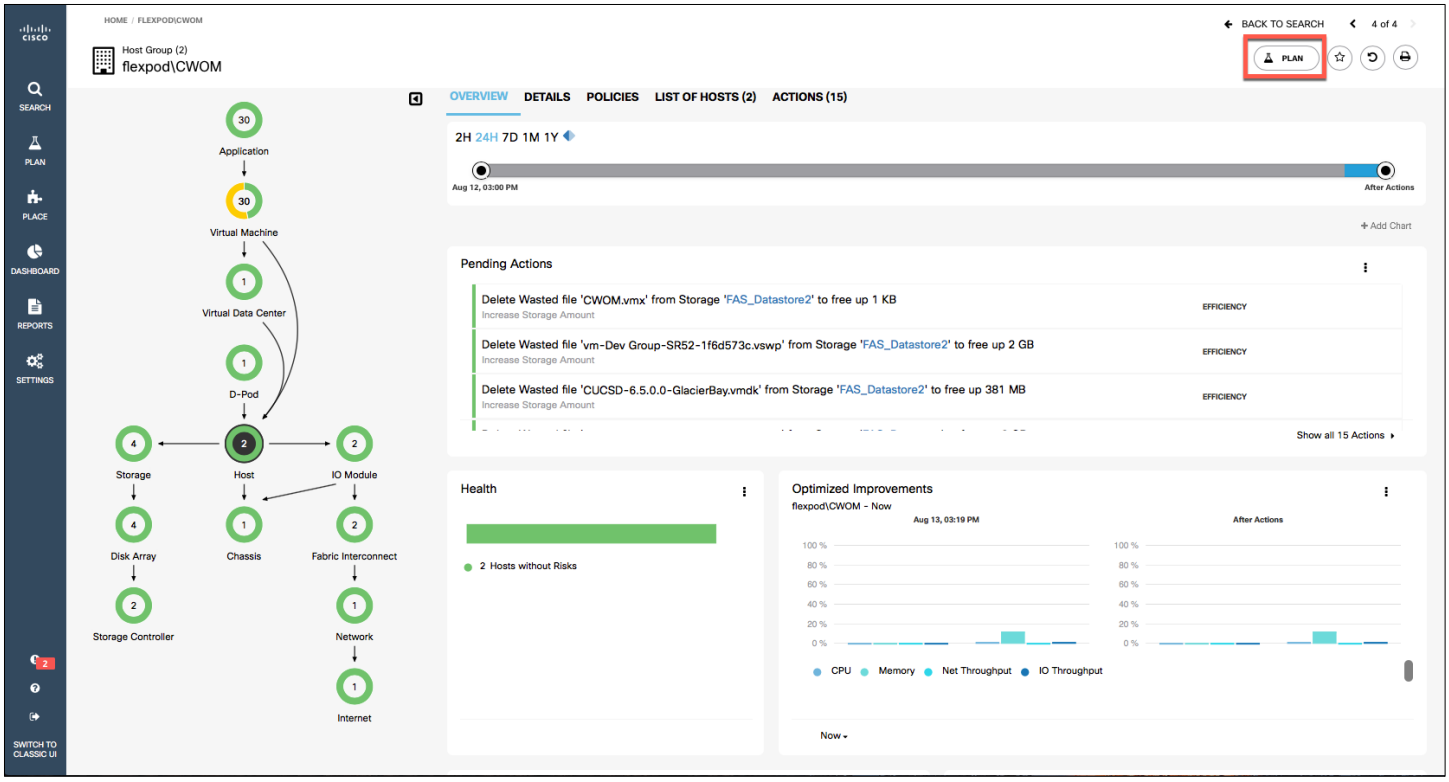
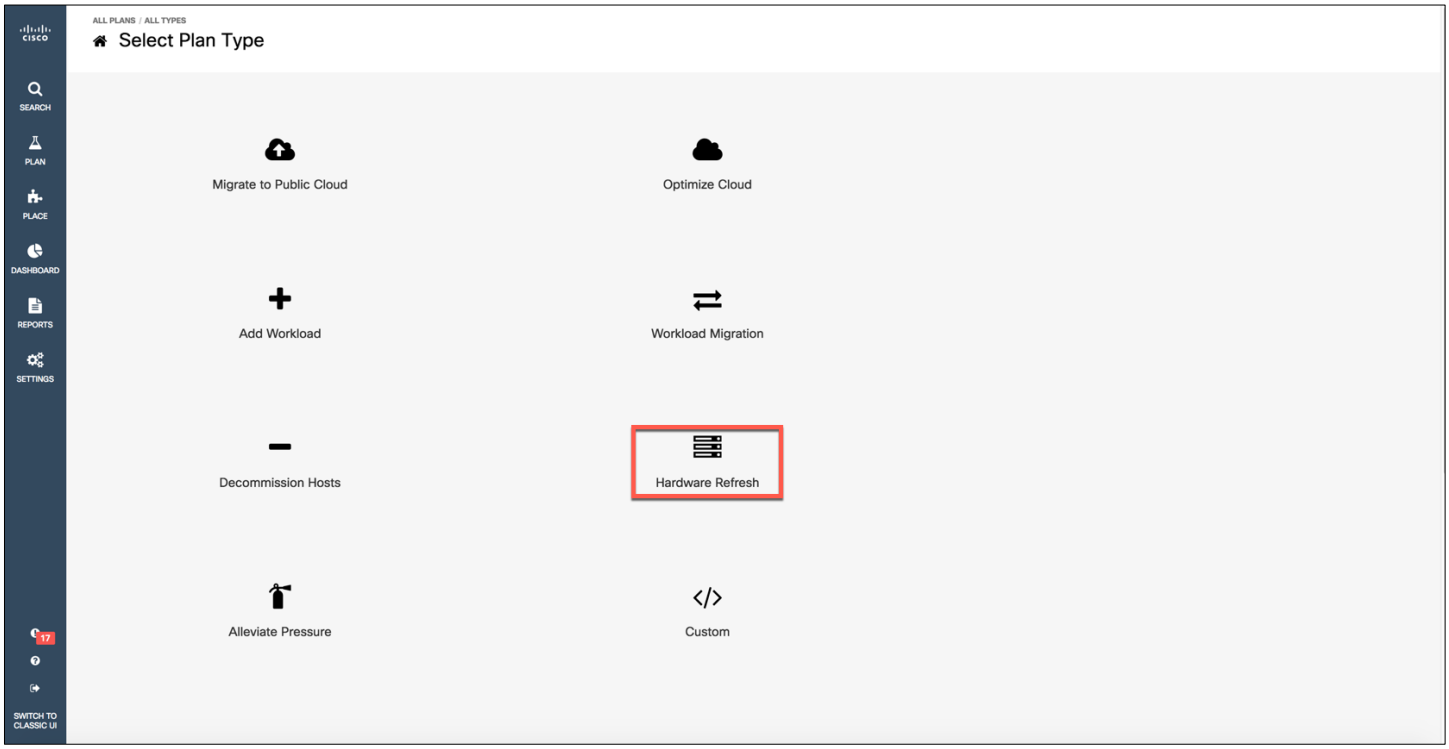
3. For instance, select your cluster. In the right-top corner, click Plan.



4. Select Hardware Refresh.



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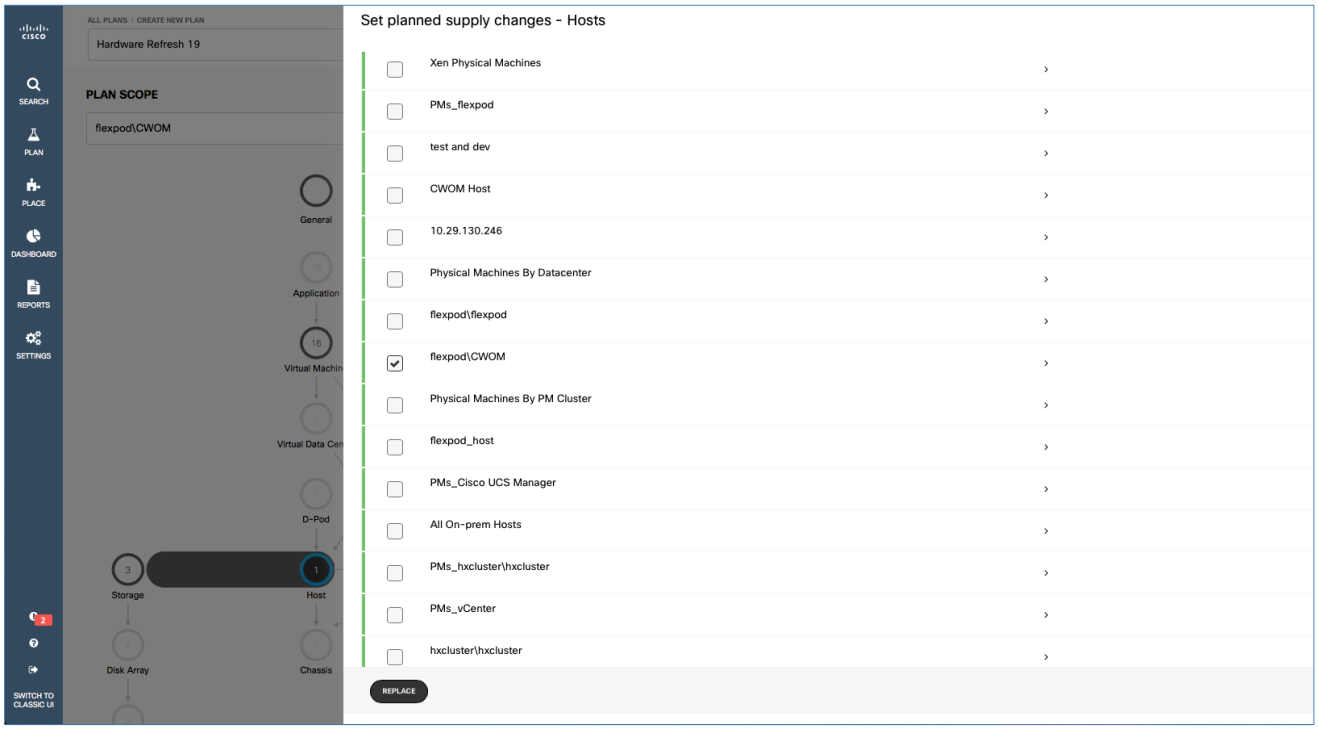
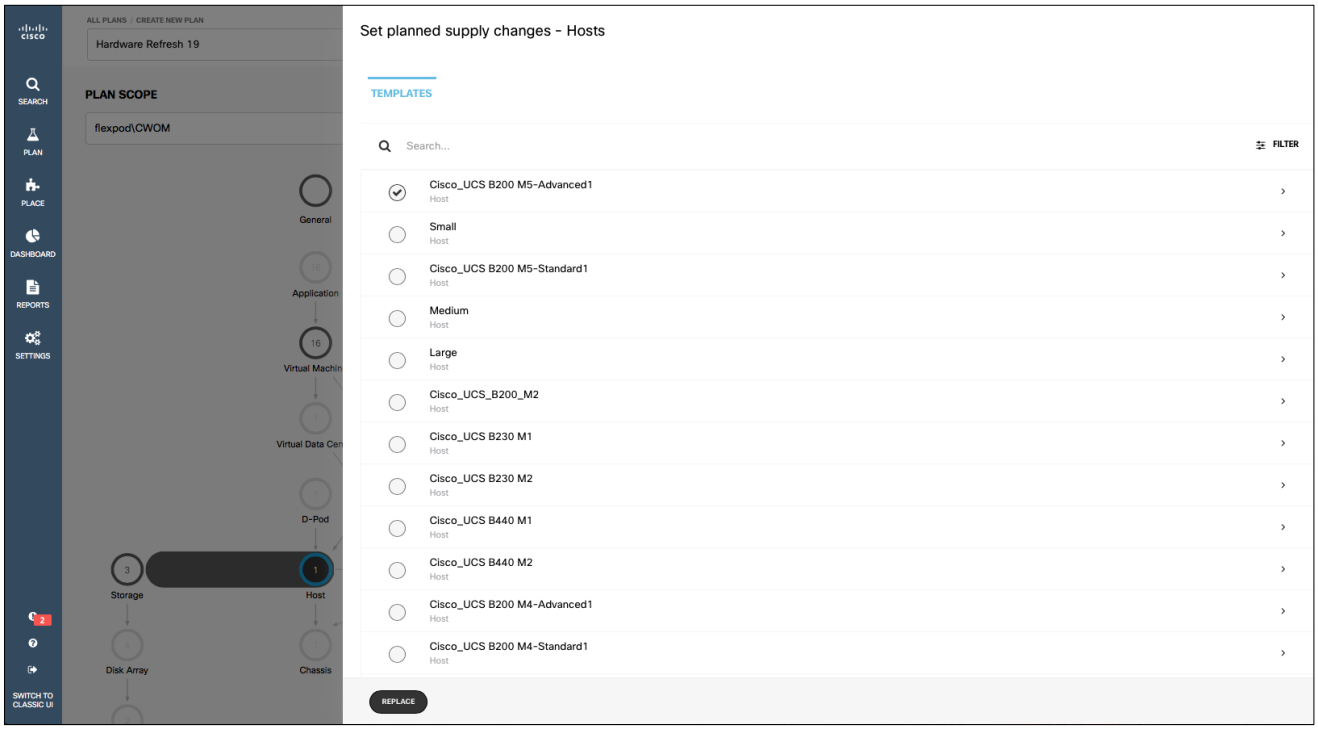
5. Click Groups.
6. Under Groups, select your cluster.



7. Click Replace.
8. Under Templates, select your host template: for instance, Cisco UCS B200 M5-Advanced1. Workload Optimization Manager has a number of Cisco UCS configuration templates available by default. Choose a template based on your requirements.



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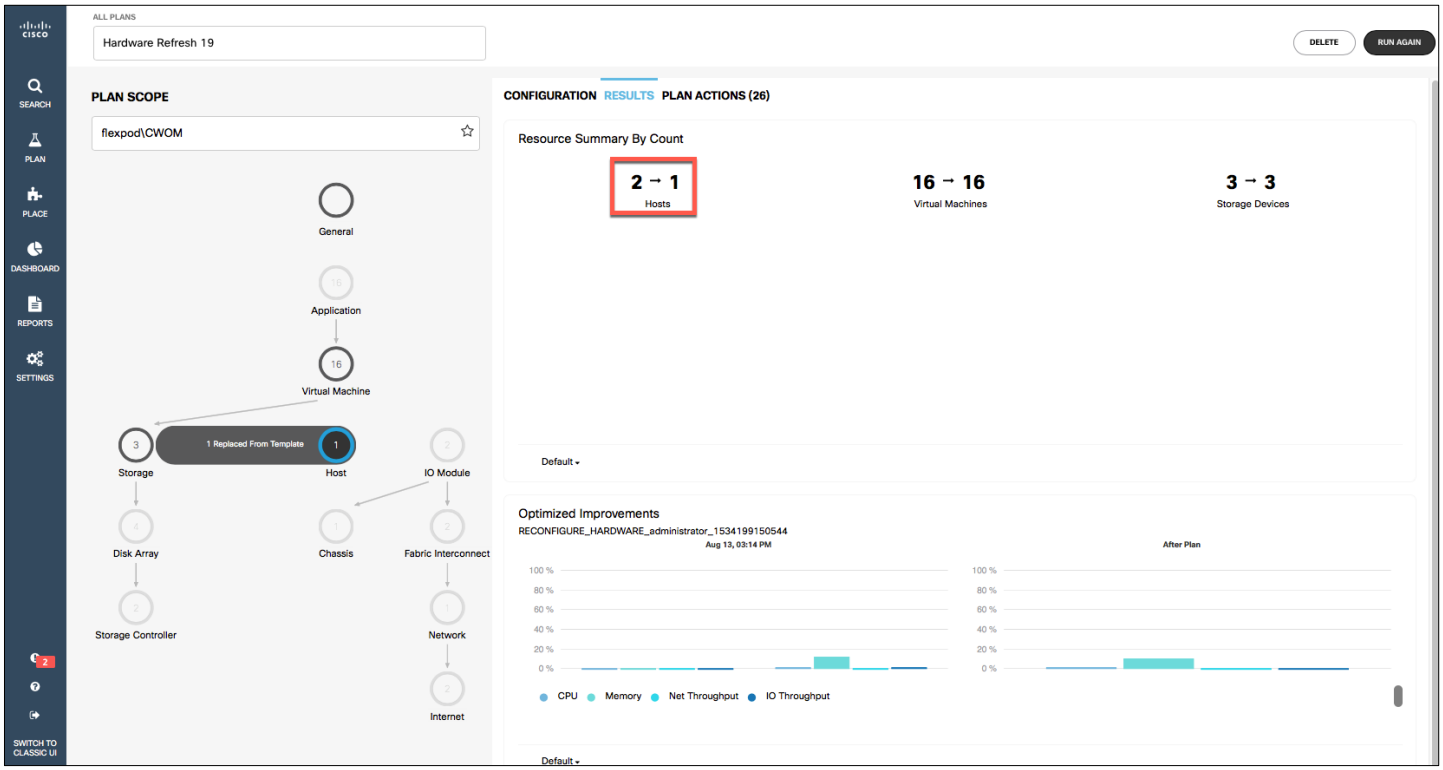
9. Click Replace.
10. Click Run.



The system shows you the requirements for the hardware: in this case, one Cisco UCS B200 M5 Blade Server. The system ran your actual demands against the required hardware and the actual representation of your data center. You can use this plan to modernize your data center and save costs.

Migrate to Cloud Example

To migrate a workload to the public cloud, follow the steps shown here.

1. On the left side of the window, click Plan.
2. Click Create Plan.
3. Select Migrate to Public Cloud.
4. Select the workload that you want to migrate to the public cloud; it can be in virtual machine groups or individual virtual machines.
5. Click Next.

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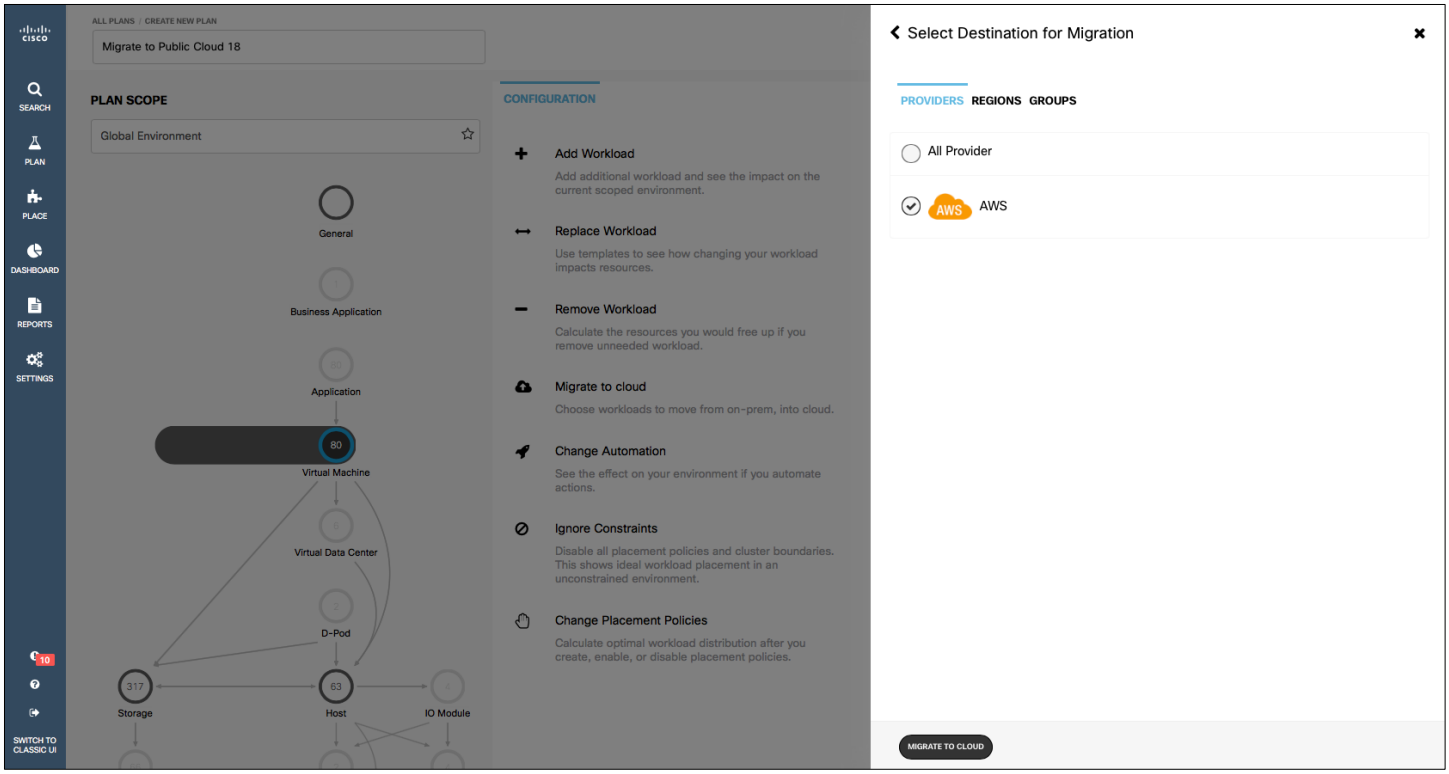
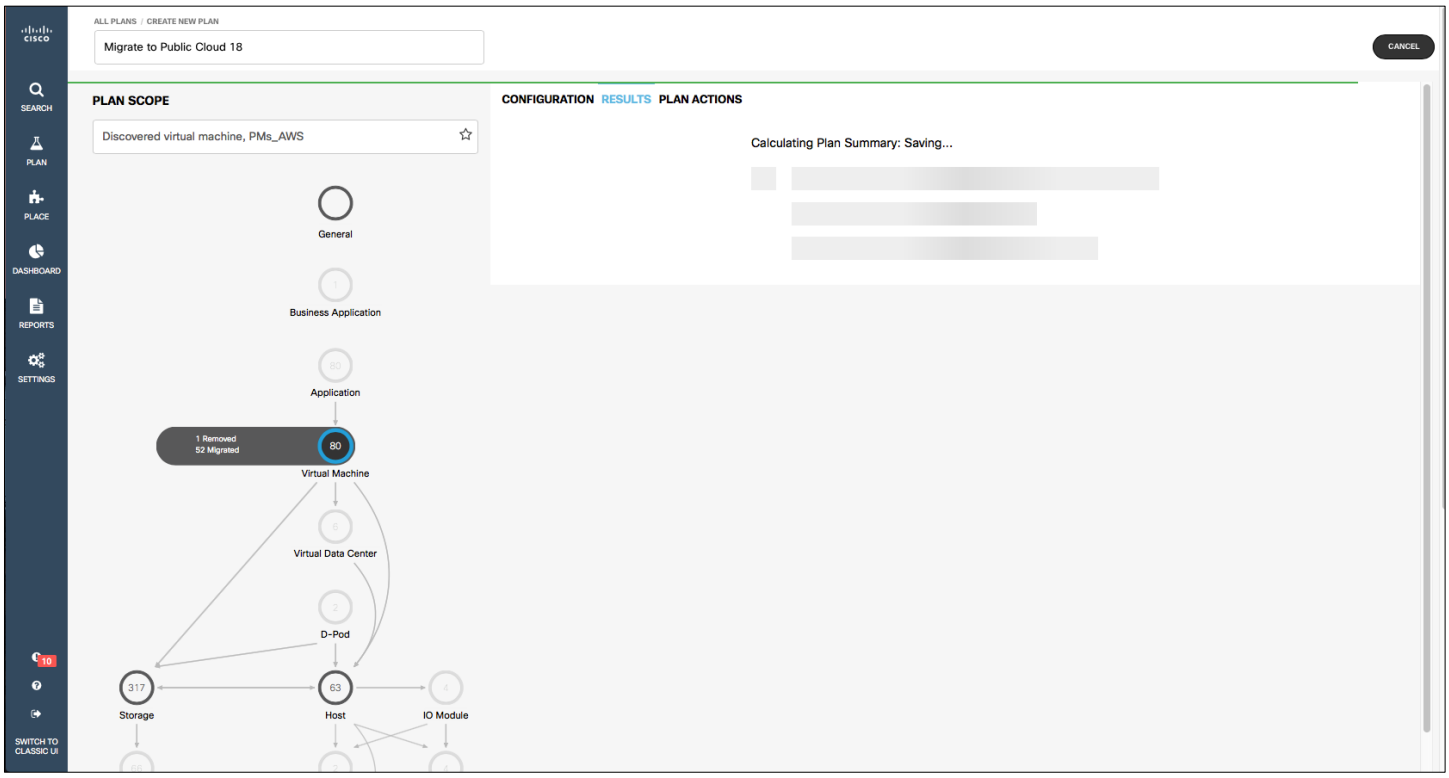
6. Select the destination for the migration: for example, AWS.



7. Click Migrate to Cloud.



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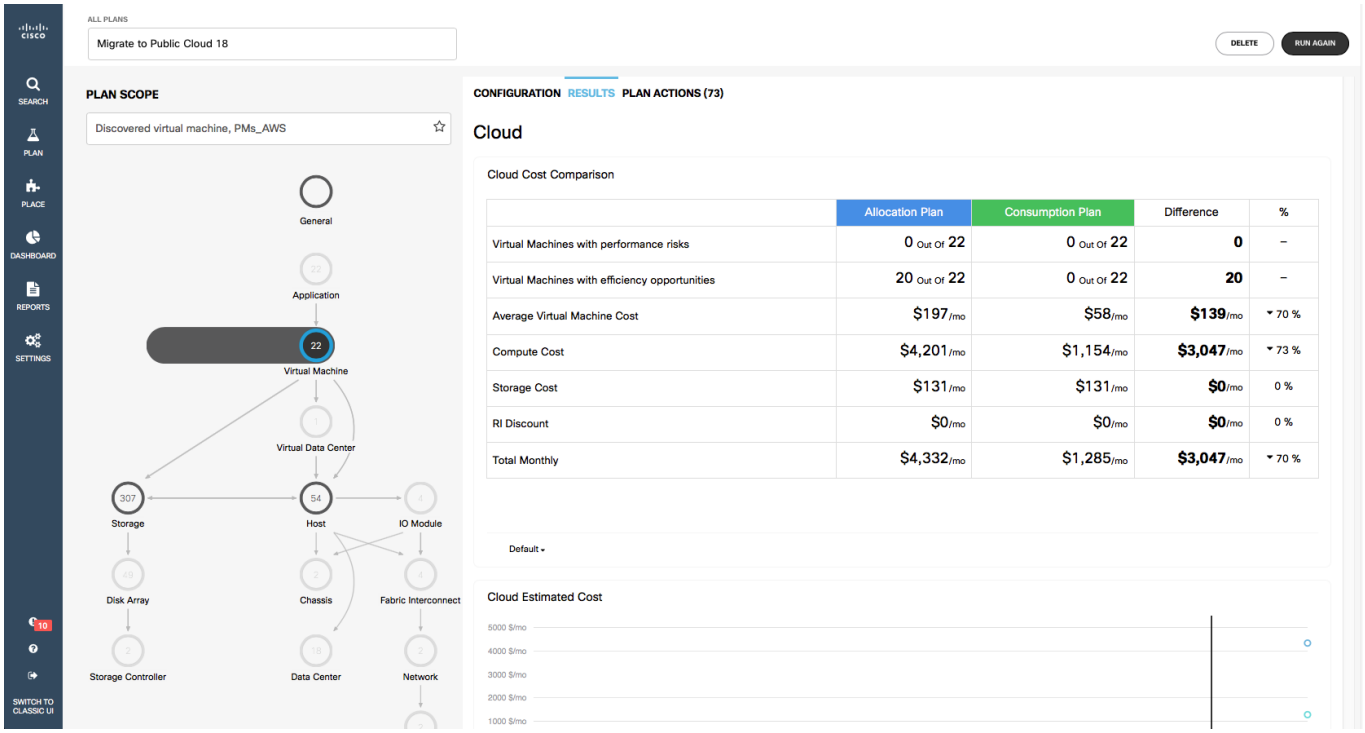
Workload Optimization Manager will show you the actual cost based on utilization.

Workload Optimization Manager includes a special plan to simulate migration of an on-premises workload to the cloud. This plan focuses on optimizing your costs in the cloud by choosing the best templates (most appropriate computing resources) and best regions to host your workloads (Figure 22).

Figure 3. Cisco Workload Optimization Manager includes a plan to simulate an on-premises workload to the cloud



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Cisco AppDynamics and Cisco Workflow Optimization Manager solution

Increasingly in today's organizations, applications are the business. They are also more dynamic and complex than ever before: parsed into services and microservices, deployed across hybrid and multicloud estates, modernized and migrated. Application and infrastructure teams face many challenges as they attempt to deliver exceptional digital experiences.

Application performance relies on two factors:

- Whether applications are well written and designed
- Whether applications get the resources they need, when they need them

Cisco AppDynamics suite overview

The Cisco AppDynamics® suite of application and business performance monitoring solutions helps ensure that every part the application ecosystem—infrastructure, individual services, and business outcomes—is optimized for performance, cost efficiency, and quality of service. Your application and IT infrastructure teams gain the skills and knowledge needed to deliver visibility across your network, data center, security, and applications. This superior level of insight allows them to watch every line of code and understand its impact on user experience and application performance while providing real-time insight into your digital business.

Cisco Workload Optimization Manager overview

Workload Optimization Manager is a real-time decision engine that promotes continuous health in your IT environment. This intelligent software continuously analyzes workload consumption, costs, and compliance constraints and automatically allocates resources in real time to help ensure that your applications have the resources they need, when they need them.

Adding a Cisco AppDynamics target

Workload Optimization Manager supports workload management of the application infrastructure monitored by AppDynamics through the addition of an AppDynamics instance to Workload Optimization Manager as a target.

Workload Optimization Manager integration with AppDynamics provides a full-stack view of your environment, from application to physical hardware. With information obtained from AppDynamics, Workload Optimization Manager can make recommendations and take actions to help ensure both performance and drive efficiency with the full knowledge of the demands of each individual application.

In its default configuration, the AppDynamics target collects up to 1100 AppDynamics nodes within the default collection period when a proxy is used, and up to 5000 nodes when no proxy is used. Larger AppDynamics environments can be expected to take longer than one cycle to collect complete data.

Prerequisites

- Software as a service (SaaS) or on-premises installation of AppDynamics Version 4.1 or later
- A valid AppDynamics user account

For all types of application instances, the service account must have the read-only user role. To monitor database instances, this user must also have the database monitoring user role.

If an application is monitored by AppDynamics, do not add it as a separate Workload Optimization Manager application target.

To add an AppDynamics instance as a target, follow the steps presented here.

1. Click Add Target to add the next target.
2. In the Choose Target Category menu, click Guest OS Processes and select AppDynamics to add it as a target in Workload Optimization Manager.

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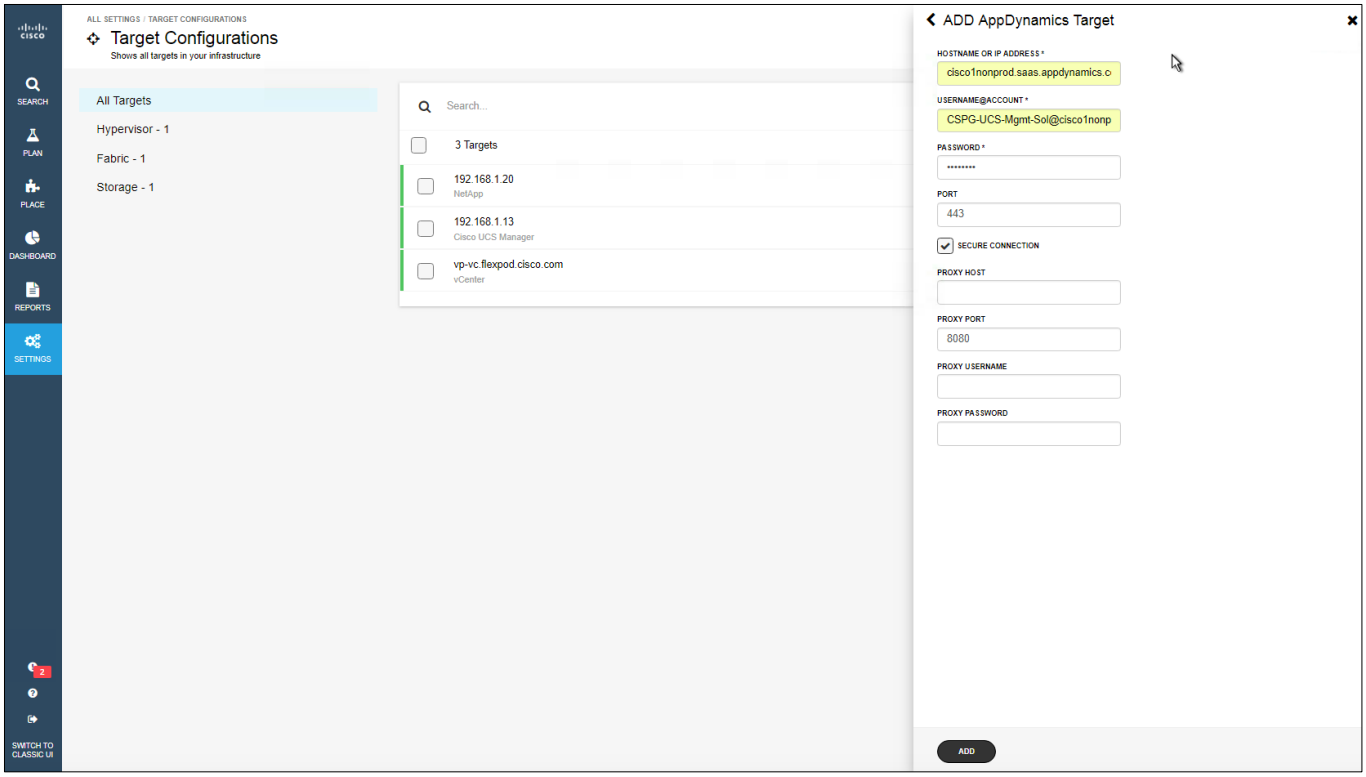
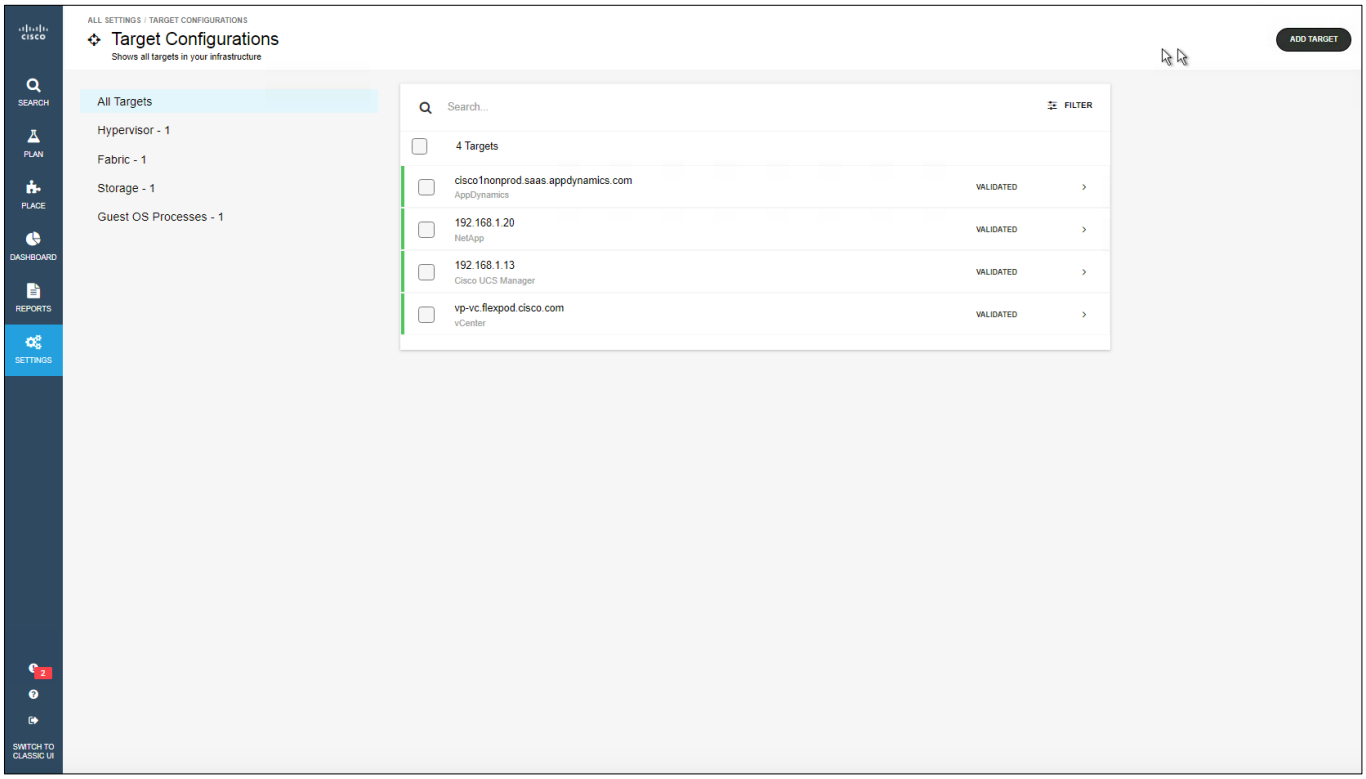
3. Provide your AppDynamics account login credentials.



4. Click Add.



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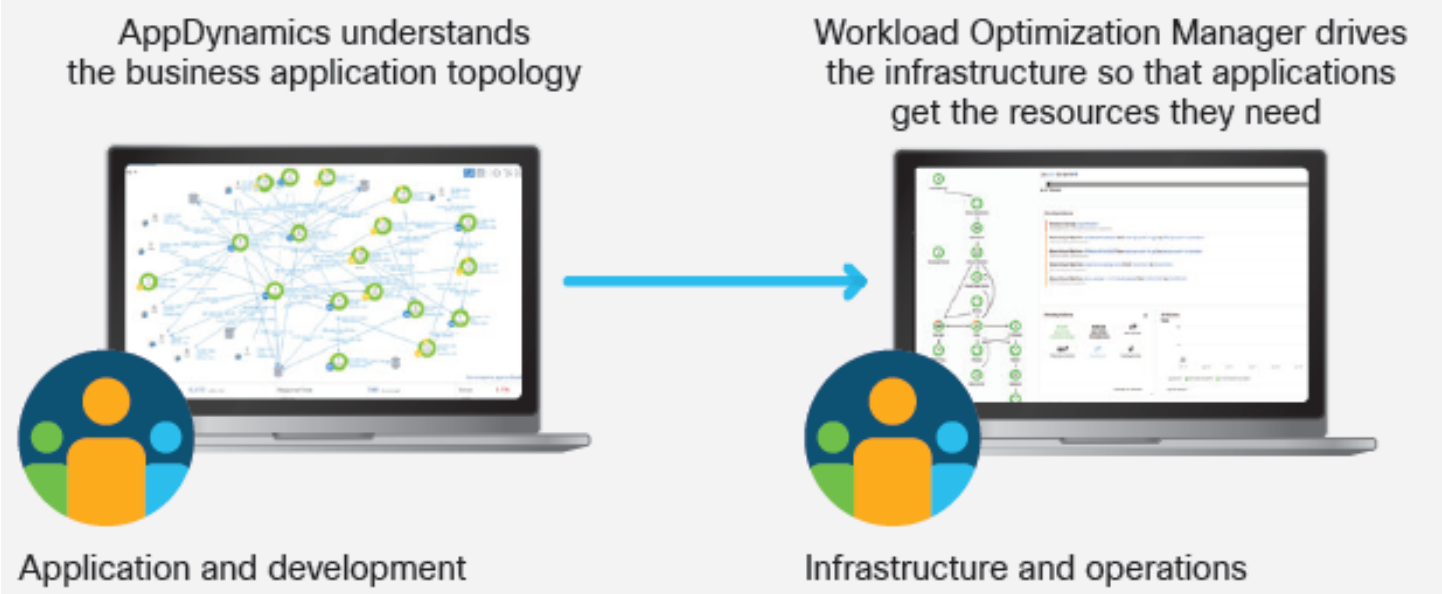
Solution overview

Cisco AppDynamics understands your business application topology and how it uses IT resources. Cisco Workload Optimization Manager takes this information and connects it to your data center stack. Workload Optimization Manager orchestrates and drives actions in your IT environment to help ensure that application components get the computing, storage, and network resources they need for workload placement, capacity, and scaling. Together, these intelligent tools replace sizing guesswork with real-time analytics and modeling so that you know how much infrastructure you need to allow your applications and business to keep pace with demand (Figure 4).

Figure 4. The Cisco Workload Optimization Manager and Cisco AppDynamics platforms work together to help applications get the resources they need to perform at peak efficiency



Main benefits

Figure 5 lists the main benefits of the AppDynamics and Workload Optimization Manager solution.

Figure 5. Benefits of Cisco AppDynamics and Cisco Workload Optimization Manager solution

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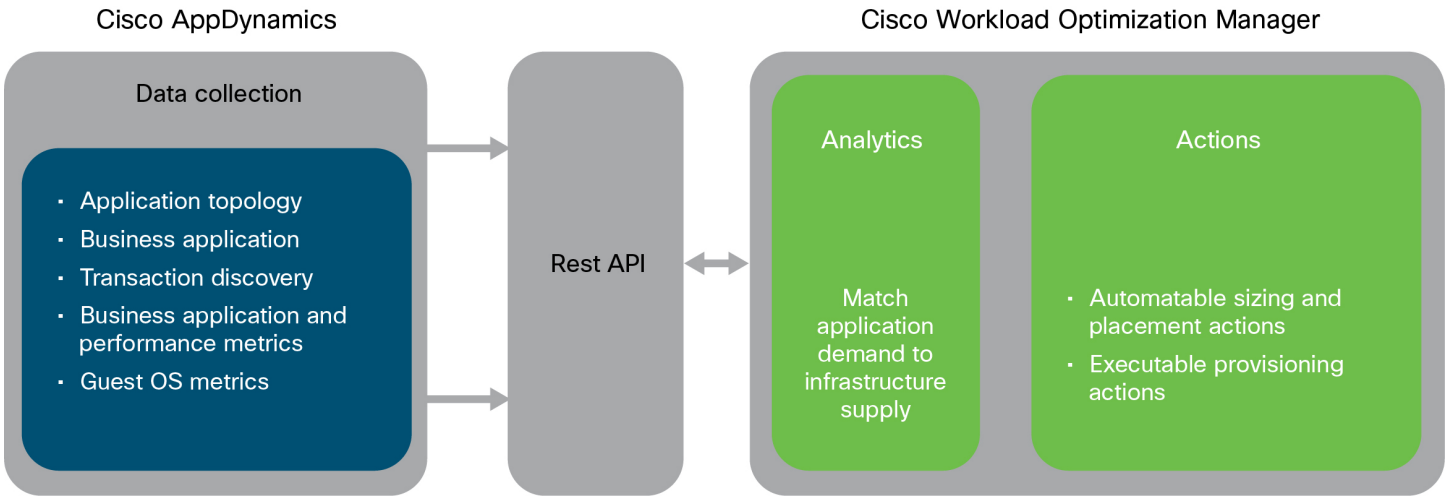
Help ensure application performance	Show the value of IT to the business	Bridge the application-infrastructure gap	Accelerate application migration
Eliminate application performance risk due to infrastructure without overprovisioning.	Resource decisions in the infrastructure are directly tied to the performance of business-critical applications.	Full-stack automation elevates teams, and full-stack visibility provides a common understanding of application dependencies.	Reduce the risk of application migration projects with a holistic understanding of the application topology and the data center stack.

Architectural overview

Application metrics affect sizing, placement, and capacity actions across the stack, as summarized in Figure 6.

Figure 6. Cisco AppDynamics and Cisco Workload Optimization Manager solution architecture



Conclusion

No matter how you deploy your applications, Cisco solutions can help you deliver cost-efficient quality of service (QoS). Our powerful, intelligent solutions can automatically scale workloads, storage, and databases in real time to help ensure performance and free your IT staff to focus on other initiatives. If IT control is a concern, your teams can automate the software's decisions according to their level of comfort: recommend (view only), manual (select and apply), or automated (implemented in real time by software). Whether you need to run your applications on your premises, in a public cloud (such as Amazon AWS or Microsoft Azure), or across a hybrid environment, our solutions can help you get started on the journey to consistent application performance and more efficient IT operations.

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Cisco Tetration Analytics and Cisco Workload Optimization Manager solution

Application architectures have changed dramatically over the years, but networks have remained relatively static. With the adoption of distributed architectures, containerization, microservices, and workload mobility technologies, communication patterns between application components are more dynamic and the network is more critical than ever. Now, 76 percent of data center traffic is east-west, creating new challenges that your organization must address:

- Your applications have multiple components that need to communicate to perform. How do you help ensure that your distributed applications don't congest the network?
- The process of migrating applications risks downtime. How do you help ensure that dependent workloads are migrated together? How do you reduce costs in the cloud as you also do so in hybrid cloud deployments?

These are difficult problems to solve, especially as cloud workloads are projected to more than triple (grow 3.2-fold), and workload density for cloud servers is projected to increase from 7.3 to 11.0 between 2015 and 2020 (Cisco Global Cloud Index).

The challenges of managing today's environment are too complex not to turn over to software.

Today's modern applications are distributed, relying on your network more than ever for performance. Interdependent workloads communicating across hosts, clusters, data centers, and clouds create new challenges in ensuring that workloads get the network, computing, and storage resources they need, when they need them. This is a problem that software can solve.

The Cisco Tetration Analytics™ and Cisco Workload Optimization Manager solution supports real-time distributed application fluidity by helping ensure performance while increasing efficiency. With this joint solution doing what it does best, your staff members can focus on what they do best: innovating and creative problem solving.

Adding a Cisco Tetration target

Workload Optimization Manager can connect to Cisco Tetration to gather information about east-west traffic between virtual machines, hosts, and storage. Using this information, Workload Optimization Manager can build virtual pods (V-Pods) to manage performance related to network traffic. With these V-Pods, Workload Optimization Manager can reduce network latency through enhanced flow analysis and keep virtual machines close together on the network if they communicate frequently with each other.

To get the most benefit from information that Cisco Tetration Analytics provides, you must also add any hypervisor targets that correspond to the virtual machines using Cisco Tetration Analytics. For example, if the virtual machines to be monitored reside in a vCenter environment, add that vCenter as a hypervisor target.

Prerequisites

- A Cisco Tetration Analytics data collector
- An API key with the flow inventory query permission that Workload Optimization Manager can use to connect to the data collector

Use the following steps to add Cisco Tetration Analytics as the target in Workload Optimization Manager.

1. Click Add Target to add the next target.
2. In the Choose Target Category menu, click Network and select Tetration to add it as a target in Workload Optimization Manager.
3. Provide your Cisco Tetration Analytics account login credentials:

   Address: The IP address of the Cisco Tetration Analytics server

   Username: The API key that Workload Optimization Manager will use to connect to the Cisco Tetration Analytics server

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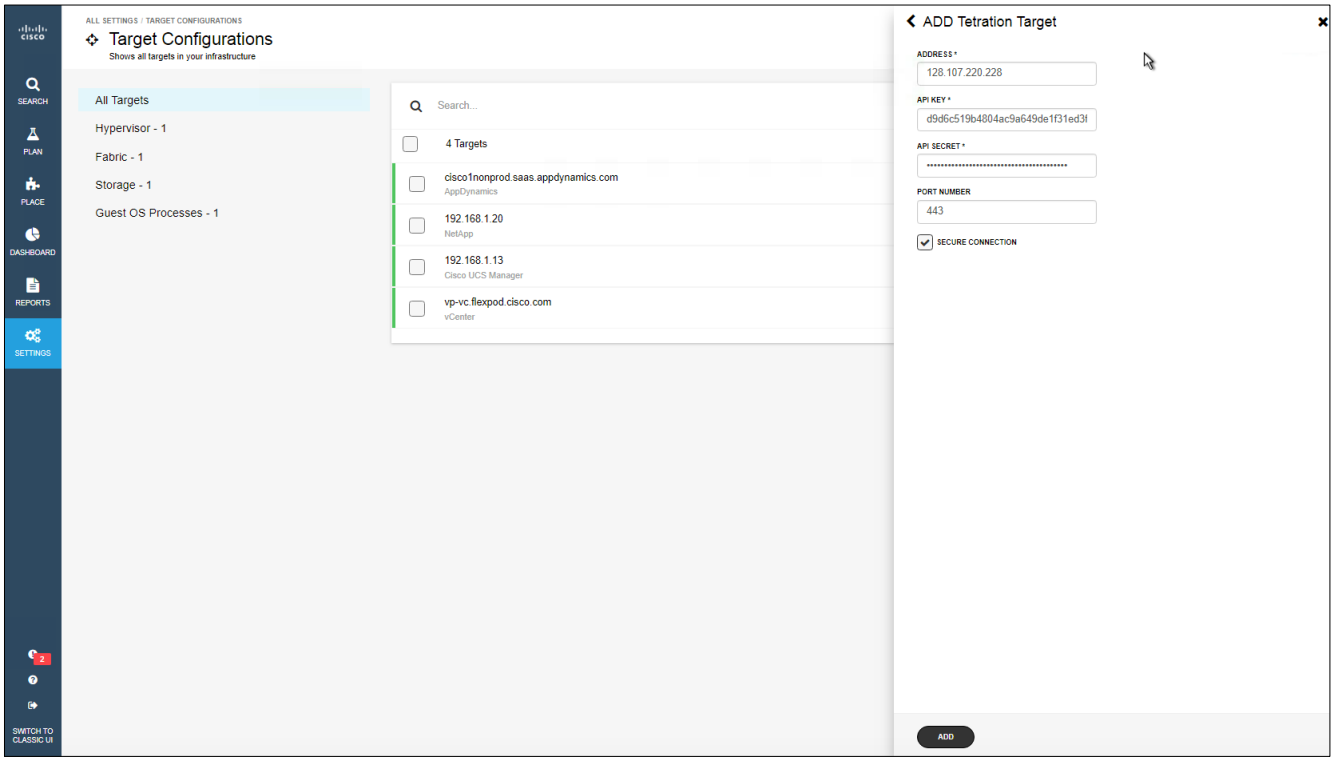
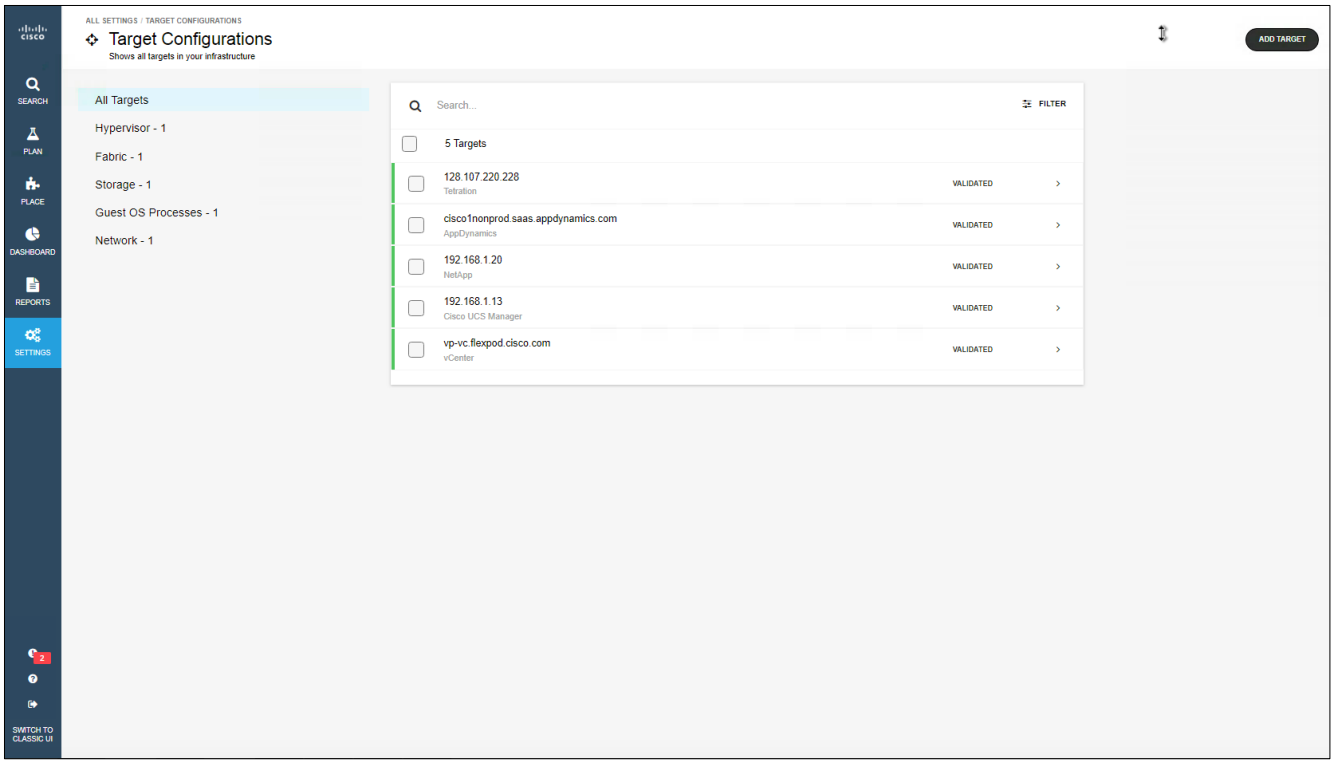
Password: The API secret for the API key that Workload Optimization Manager will use to connect to the Cisco Tetration Analytics server



4. Click Add.



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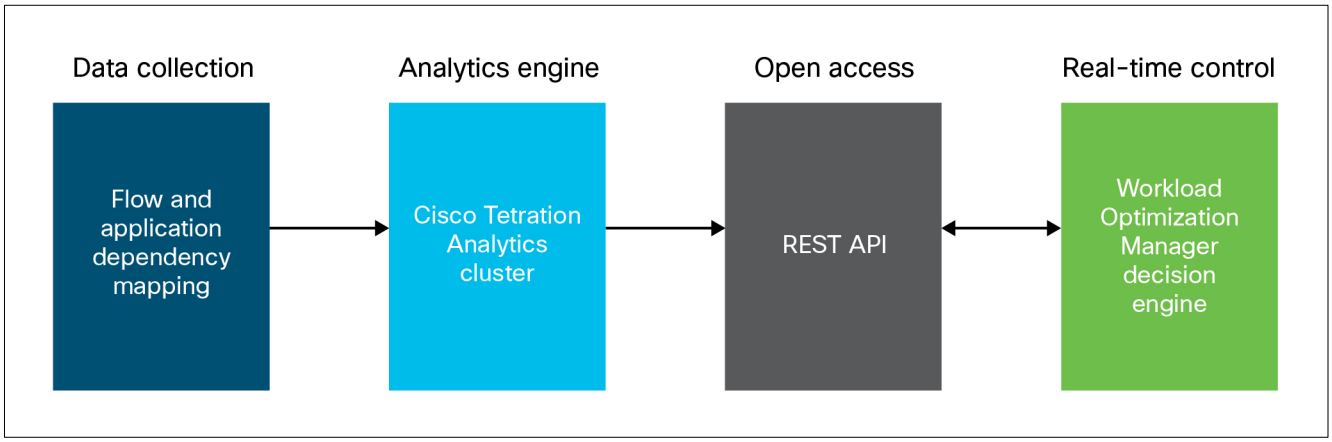
Architectural overview

Workload Optimization Manager accesses Cisco Tetration Analytics data through REST APIs. It uses telemetry data to make resource allocation decisions in real time (Figure 7).

Figure 7. Cisco Tetration Analytics and Cisco Workload Optimization Manager solution



Solution use cases

Table 3 shows common uses for the Cisco Tetration Analytics and Workload Optimization Manager solution.

Table 3. Solution use cases

	What	How
Use case 1	Intent-based networking for distributed applications reduces east-west latency.	Using Cisco Tetration Analytics telemetry data, Workload Optimization Manager reduces network latency between endpoints by localizing "chatty" workloads without risking host congestion in network, computing, or storage resources.
Use case 2	Distributed application fluidity helps ensure performance while reducing costs in hybrid clouds.	Workload Optimization Manager uses Cisco Tetration Analytics application dependency mapping to fluidly migrate dependent workloads across clusters, data centers, and clouds, helping ensure application performance while reducing costs.

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Solution overview

Figures 8 through 14 provide an overview of the solution.

Figure 8. Cisco Workload Optimization Manager maps the data center stack to its supply chain market model and uses Cisco Tetration Analytics to gain a deep understanding of the communication patterns and relationships between workloads

Cisco Tetration Analytics software sensors

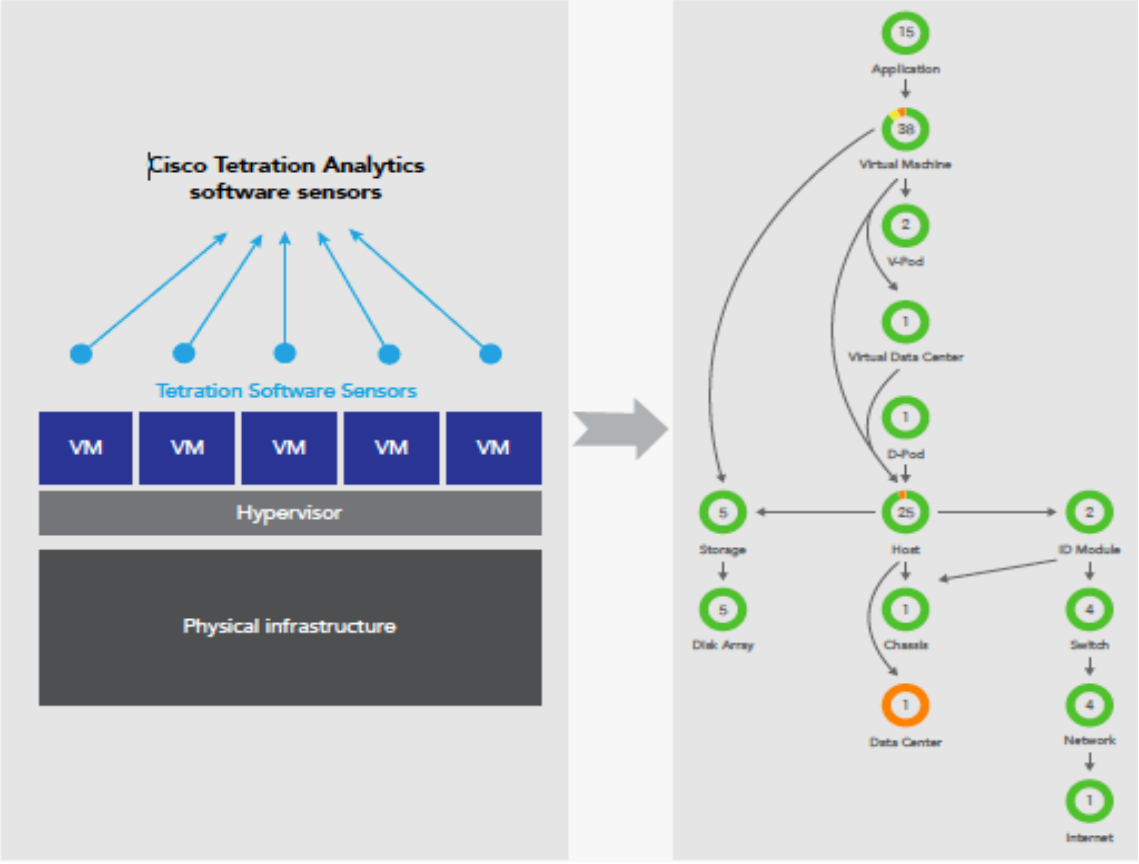

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Figure 9. Cisco Tetration Analytics data collection tells Cisco Workload Optimization Manager the relationship between endpoints

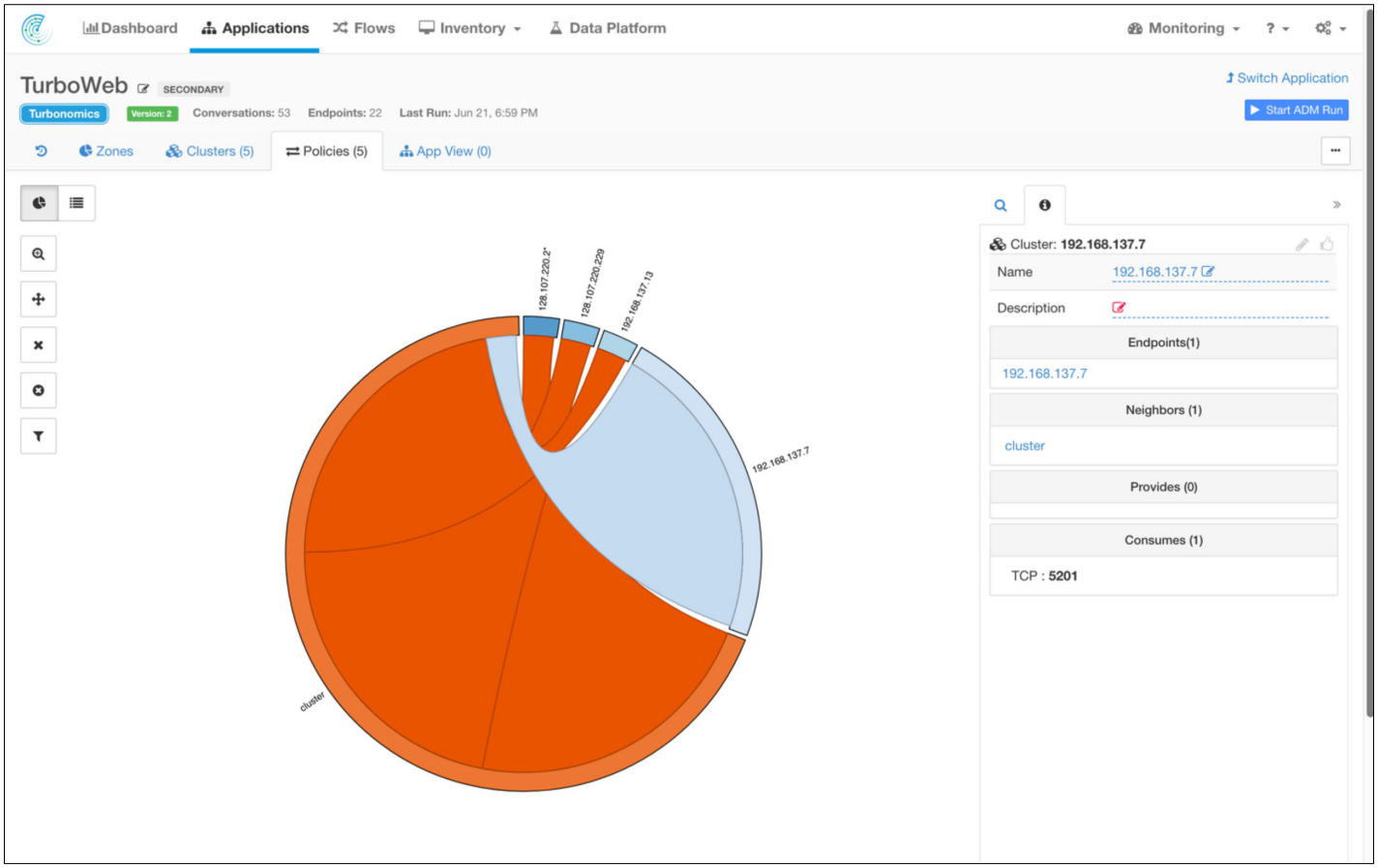

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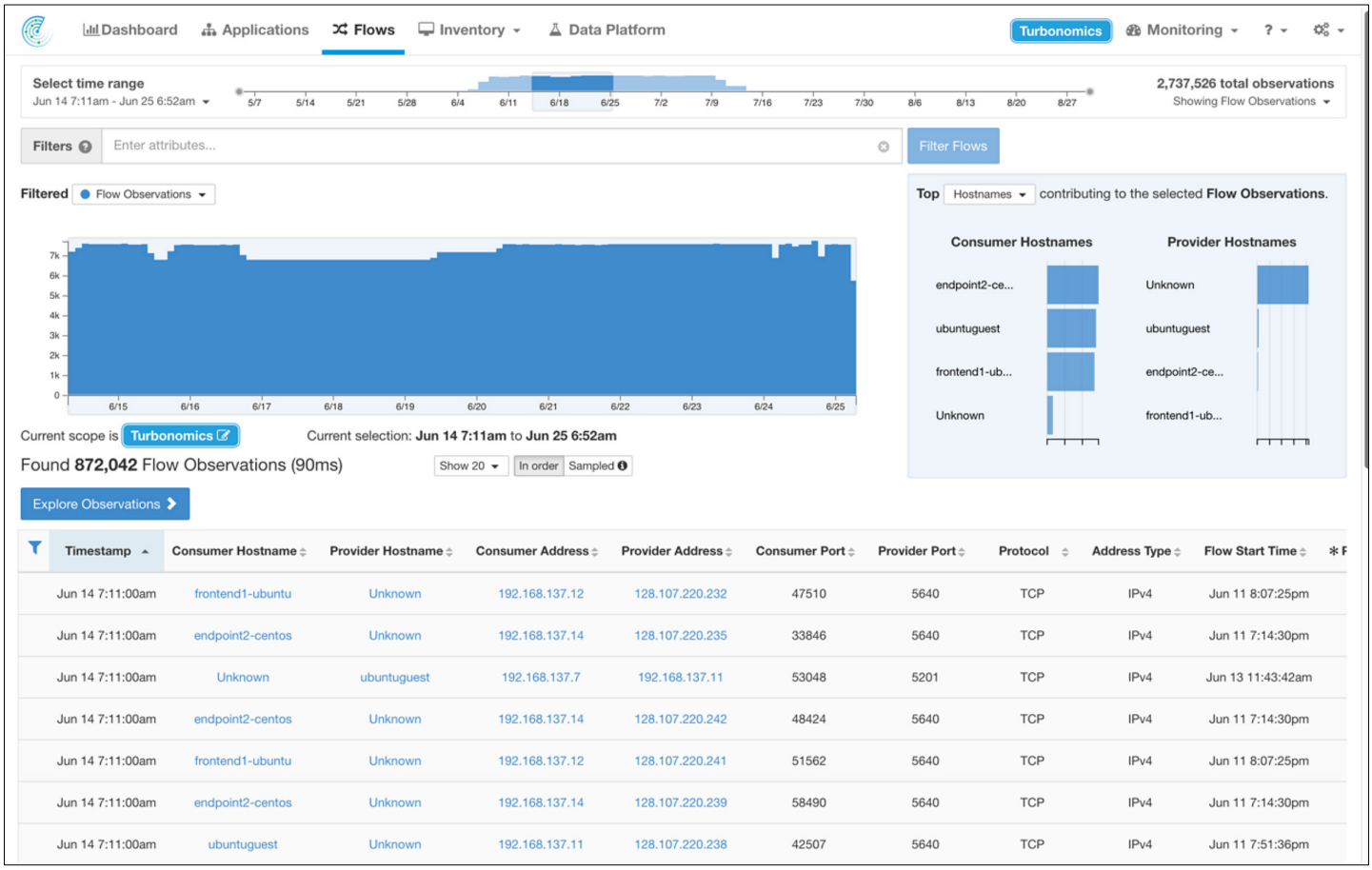
Figure 10. Cisco Tetration Analytics monitors the flow patterns between workloads, and Cisco Workload Optimization Manager uses the flow data as a dimension that influences workload placement



Timestamp	Consumer Hostname	Provider Hostname	Consumer Address	Provider Address	Consumer Port	Provider Port	Protocol	Address Type	Flow Start Time
Jun 14 7:11:00am	frontend1-ubuntu	Unknown	192.168.137.12	128.107.220.232	47510	5640	TCP	IPv4	Jun 11 8:07:25pm
Jun 14 7:11:00am	endpoint2-centos	Unknown	192.168.137.14	128.107.220.235	33846	5640	TCP	IPv4	Jun 11 7:14:30pm
Jun 14 7:11:00am	Unknown	ubuntuguest	192.168.137.7	192.168.137.11	53048	5201	TCP	IPv4	Jun 13 11:43:42am
Jun 14 7:11:00am	endpoint2-centos	Unknown	192.168.137.14	128.107.220.242	48424	5640	TCP	IPv4	Jun 11 7:14:30pm
Jun 14 7:11:00am	frontend1-ubuntu	Unknown	192.168.137.12	128.107.220.241	51562	5640	TCP	IPv4	Jun 11 8:07:25pm
Jun 14 7:11:00am	endpoint2-centos	Unknown	192.168.137.14	128.107.220.239	58490	5640	TCP	IPv4	Jun 11 7:14:30pm
Jun 14 7:11:00am	ubuntuguest	Unknown	192.168.137.11	128.107.220.238	42507	5640	TCP	IPv4	Jun 11 7:51:36pm

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Figure 11. Using Cisco Tetration Analytics, the Cisco Workload Optimization Manager analysis engine understands cross-host east-west traffic; in this example, utilization is 100 percent

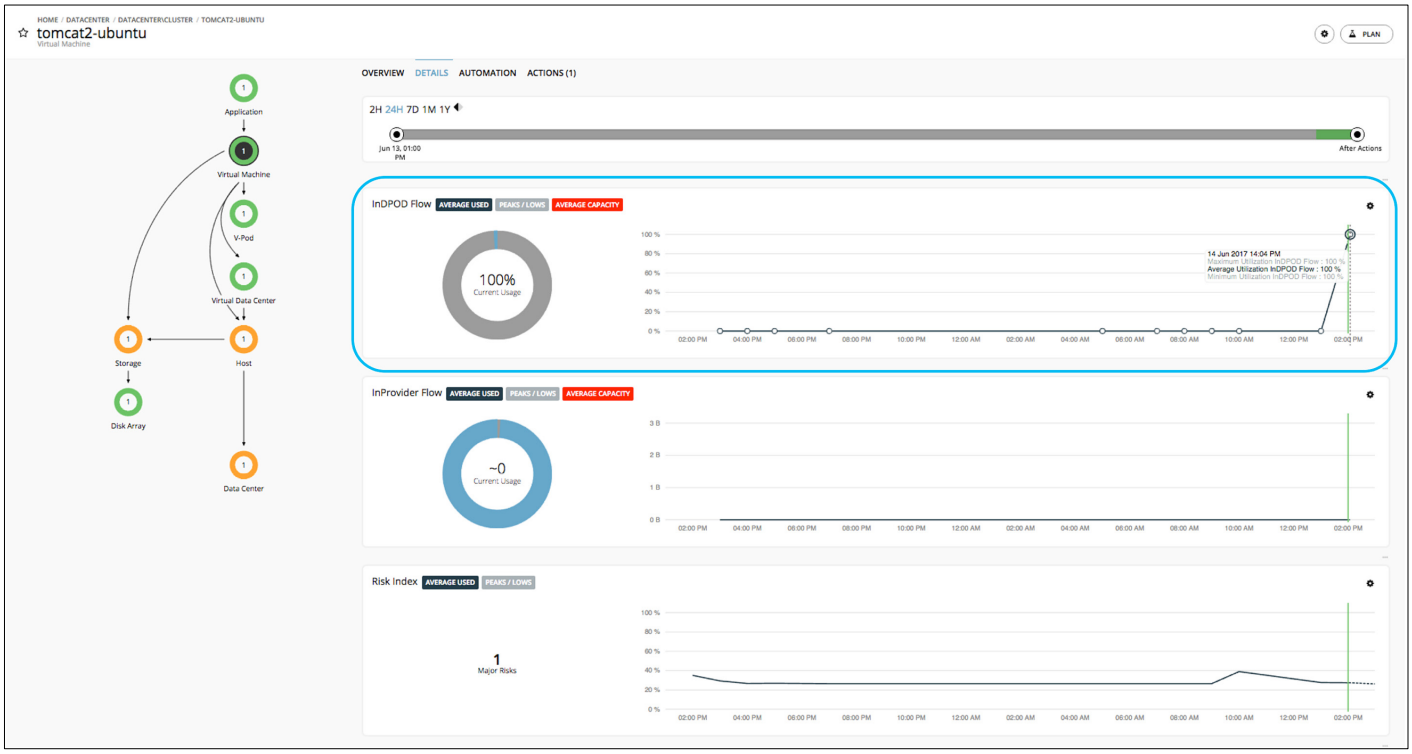

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Figure 12. Understanding of the relationship between workloads and the network, Cisco Workload Optimization Manager recommends moving a specific virtual machine, tomcat2-ubuntu, to another host to prevent network congestion on the current host

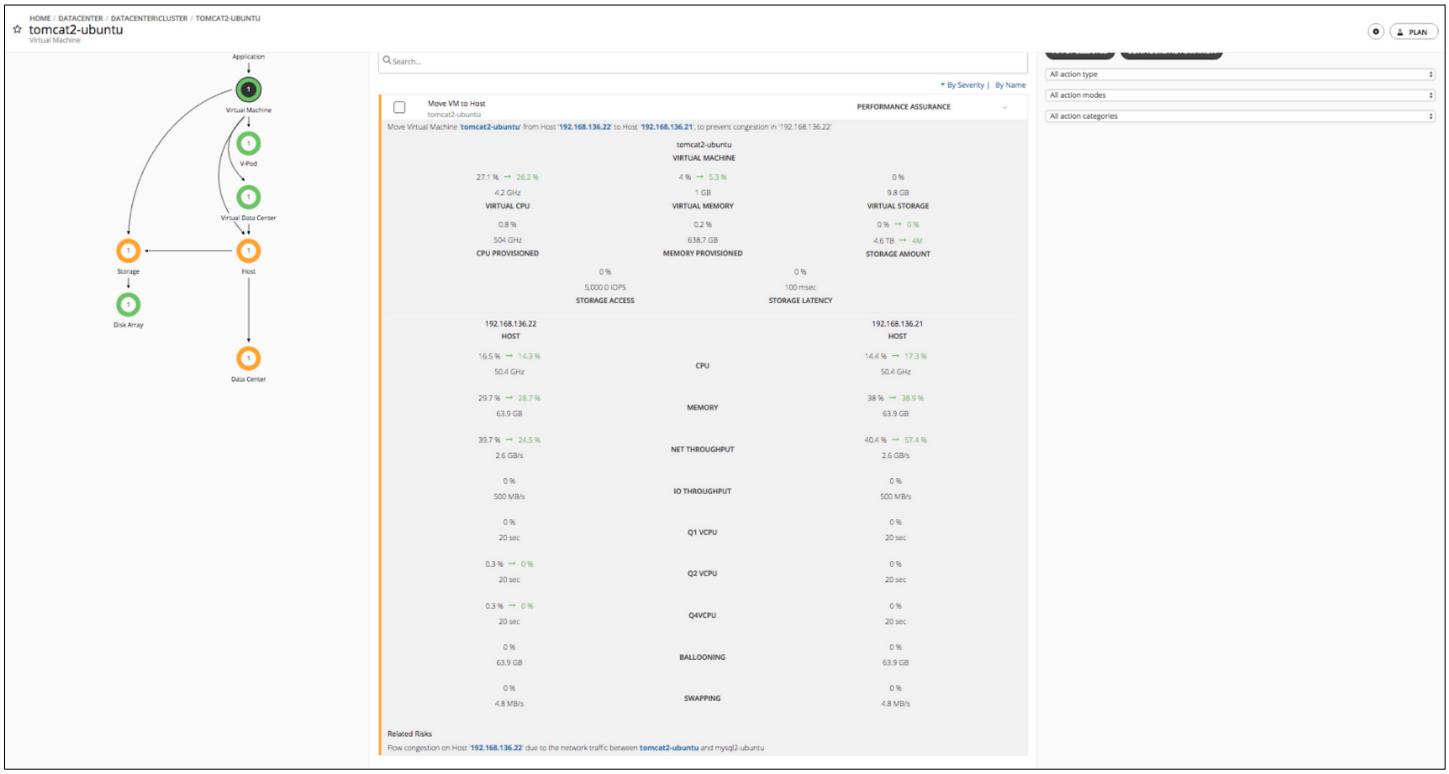

Figure 13. The user can implement recommended actions directly from the user interface by selecting the actions and clicking Apply Selected, or, if the solution is fully automated, these actions will be performed in real time

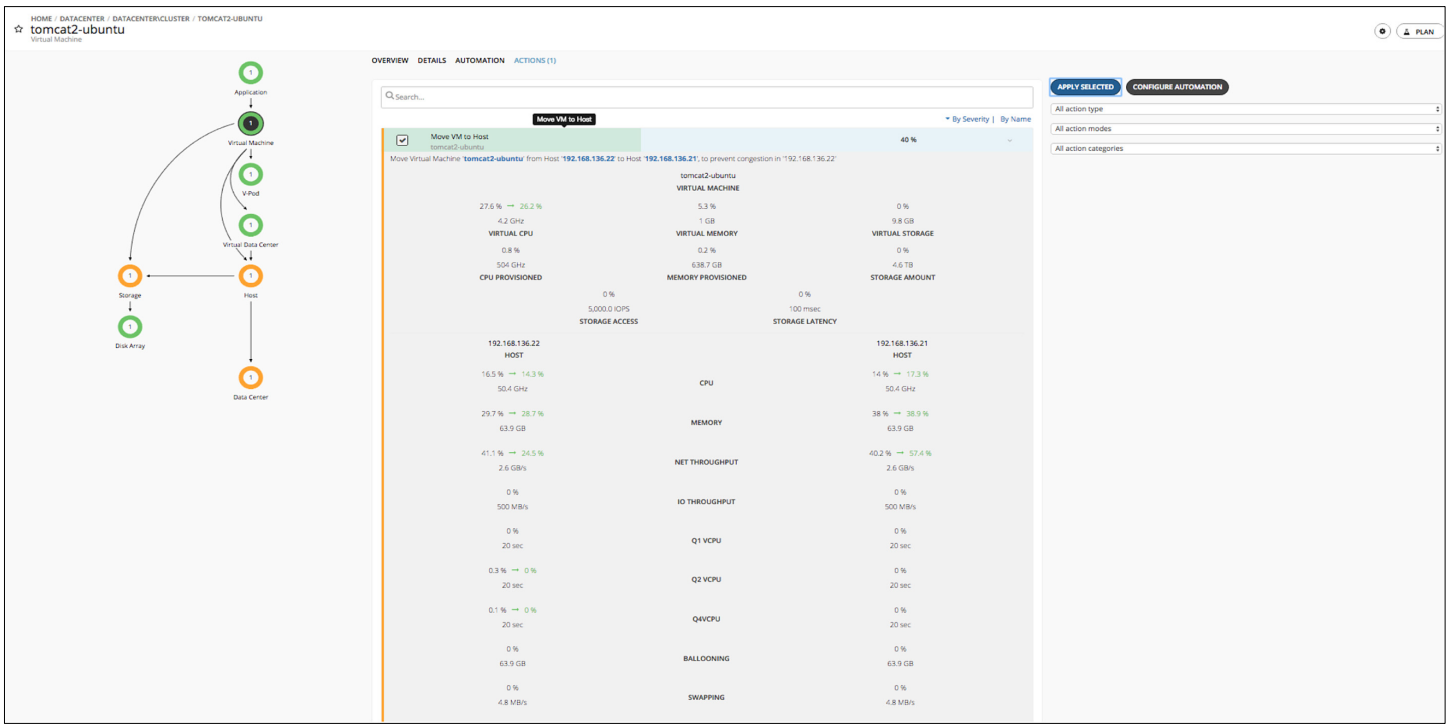

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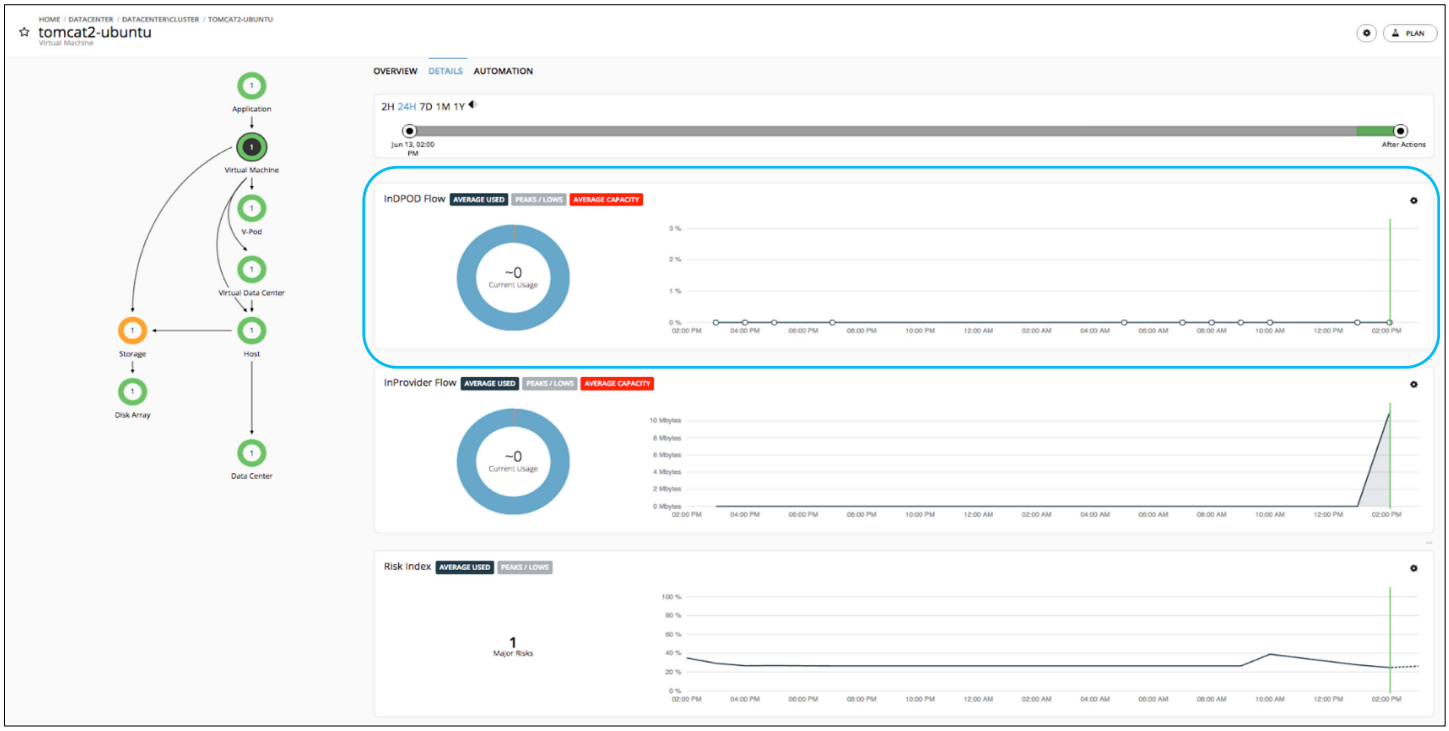
Figure 14. Performing the actions that Cisco Workload Optimization Manager recommends helps avoid network congestion risks



Main benefits of the solution

The Cisco Tetration Analytics and Workload Optimization Manager solution offers these benefits:

- Software manages software. Your staff can focus on innovation for the business.
- It reduces east-west latency in distributed applications.
- You can monitor real-time computing, network, and storage utilization across the stack.
- You gain a holistic understanding of workloads and their interdependencies and relationships to the network and data center or cloud stack.
- You can fully automate workload placement decisions for real-time performance assurance.

Conclusion

The Workload Optimization Manager decision engine uses the deep insights from the Cisco Tetration Analytics platform to automate decisions about optimal workload placement and scaling in a virtualized environment. This combined solution delivers self-managing workloads that reduce latency in distributed applications. The solution will continue to address additional use cases in the future to solve emerging customer requirements.

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Cisco HyperFlex and Cisco Workload Optimization Manager solution

IT automation has been evolving now for decades. From manual resource management to scripting and, more recently, orchestration, every advancement has been about saving time and increasing agility and speed while simultaneously enhancing performance and efficiency. With each advancement, software has taken increasing control, but with an IT worker still at the helm. But what if you could free IT teams from the processes of managing infrastructure and resource availability? What if, instead, they could spend their time solving business challenges?

The next wave of IT automation is here: where workloads self-manage and IT runs lean and fast. Cisco HyperFlex™ systems deliver flexible and scalable enterprise-class hyperconverged solutions that simplify infrastructure management. Workload Optimization Manager automatically and continuously adjusts infrastructure resources to meet dynamic application demand, helping create a perpetual state of health in the IT environment. It prevents the resource contention that causes applications to run slowly, and it frees IT teams from having to address sudden, unexpected network resource shortages. Together, Cisco HyperFlex systems and Workload Optimization Manager give customers the decision automation they need to deliver predictable application performance while enabling IT agility.

Cisco HyperFlex systems combine software-defined computing in the form of Cisco UCS servers and software-defined storage with the powerful Cisco HyperFlex HX Data Platform software. Together, these elements comprise an adaptive infrastructure that seamlessly integrates with your IT environment and provides a unified pool of resources to power applications that meet your changing business needs. When integrated with Workload Optimization Manager, this infrastructure adapts automatically and intelligently, promoting continuous application health.

Together, Cisco HyperFlex systems and Workload Optimization Manager deliver self-managing workloads that dynamically adjust to changing resource needs by automating specific actions:

- Workload placement (initially and continuously)
- Workload sizing
- Workload provisioning
- Resizing of virtual storage
- Provisioning or suspension of virtual storage (for example, data stores)

Workload Optimization Manager can also make recommendations for:

- Provisioning or suspension of Cisco HyperFlex computing-only nodes
- Provisioning or suspension of Cisco HyperFlex node (physical storage)

The infrastructure becomes as elastic as it is high performing, adjusted in real time by intelligent software to meet application demand and enabling IT staff to focus on service delivery to developers, line-of-business end users, and customers.

Cisco HyperFlex systems provide a hyperconverged platform that combines the networking and computing power of Cisco UCS with the storage capabilities of the HX Data Platform.

With the additional, refined storage information provided by the Cisco HyperFlex platform, Workload Optimization Manager identifies the desired state and recommends actions using the joint computing and storage information, providing valuable insight into the interconnected nature of your environment.

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Adding a Cisco HyperFlex systems target

For Workload Optimization Manager to make the best-informed decisions, you must also add the computing node and any associated hypervisors. The Cisco HyperFlex environment types include the following:

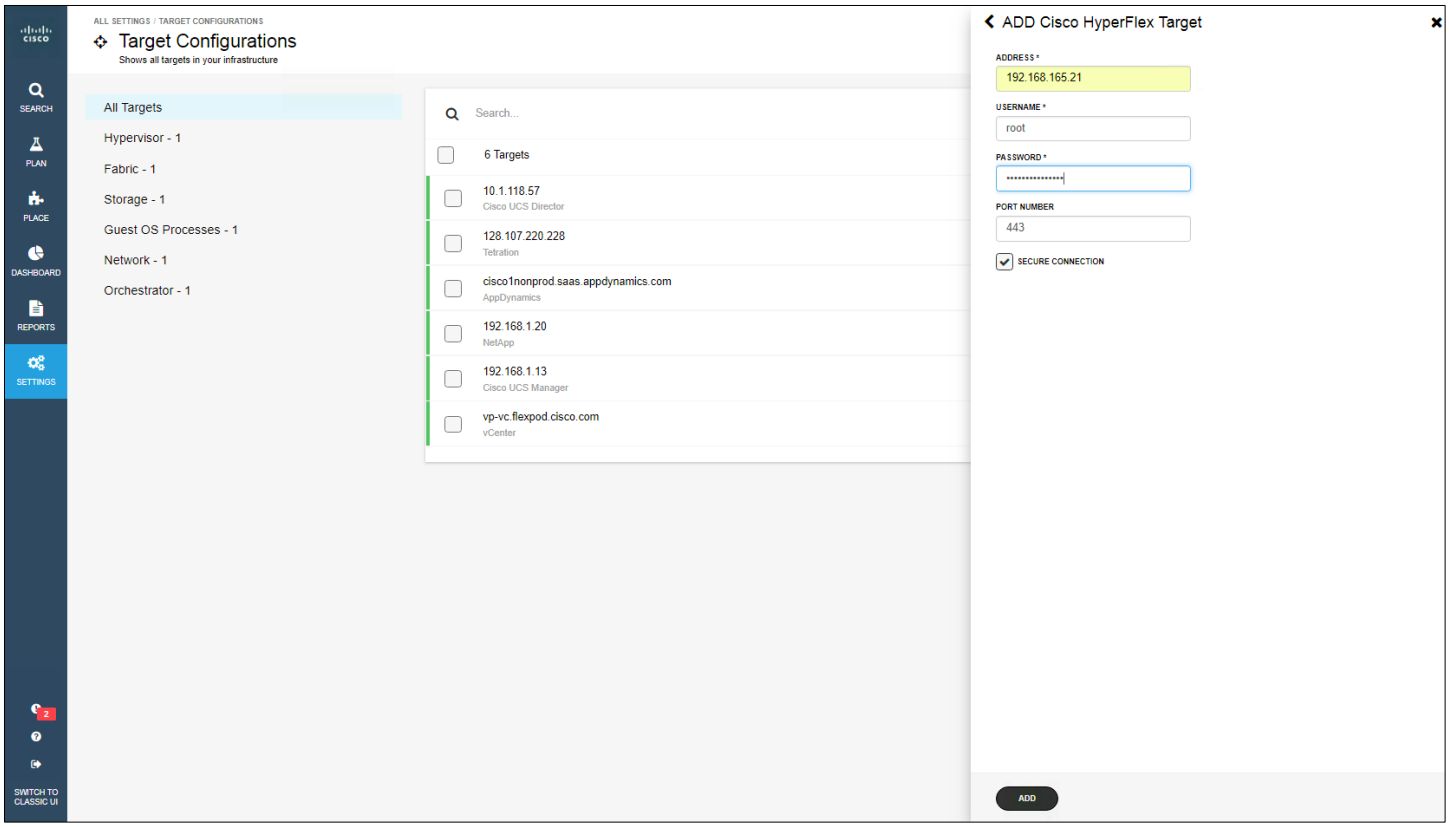
- Converged (Cisco HyperFlex HX-Series) nodes: A combination of the cluster's storage devices are converged into a single multitier, object-based data store.
- Computing nodes: Cisco UCS B-Series Blade Servers or C-Series Rack Servers make up the computing resources of the cluster and typically are managed by a hypervisor.
- Controller virtual machines: Each Cisco HyperFlex node includes a controller virtual machine that intercepts and handles all I/O from associated virtual machines. Workload Optimization Manager will not recommend actions for these virtual machines.

Prerequisites

A service account on the controller virtual machine that Workload Optimization Manager can use to connect to the Cisco HyperFlex environment

Use the following steps to add a Cisco HyperFlex system as target in Workload Optimization Manager.

1. Click Add Target to add the next target.
2. In the Choose Target Category menu, click Hyperconverged and select Cisco HyperFlex to add it as a target in Workload Optimization Manager.



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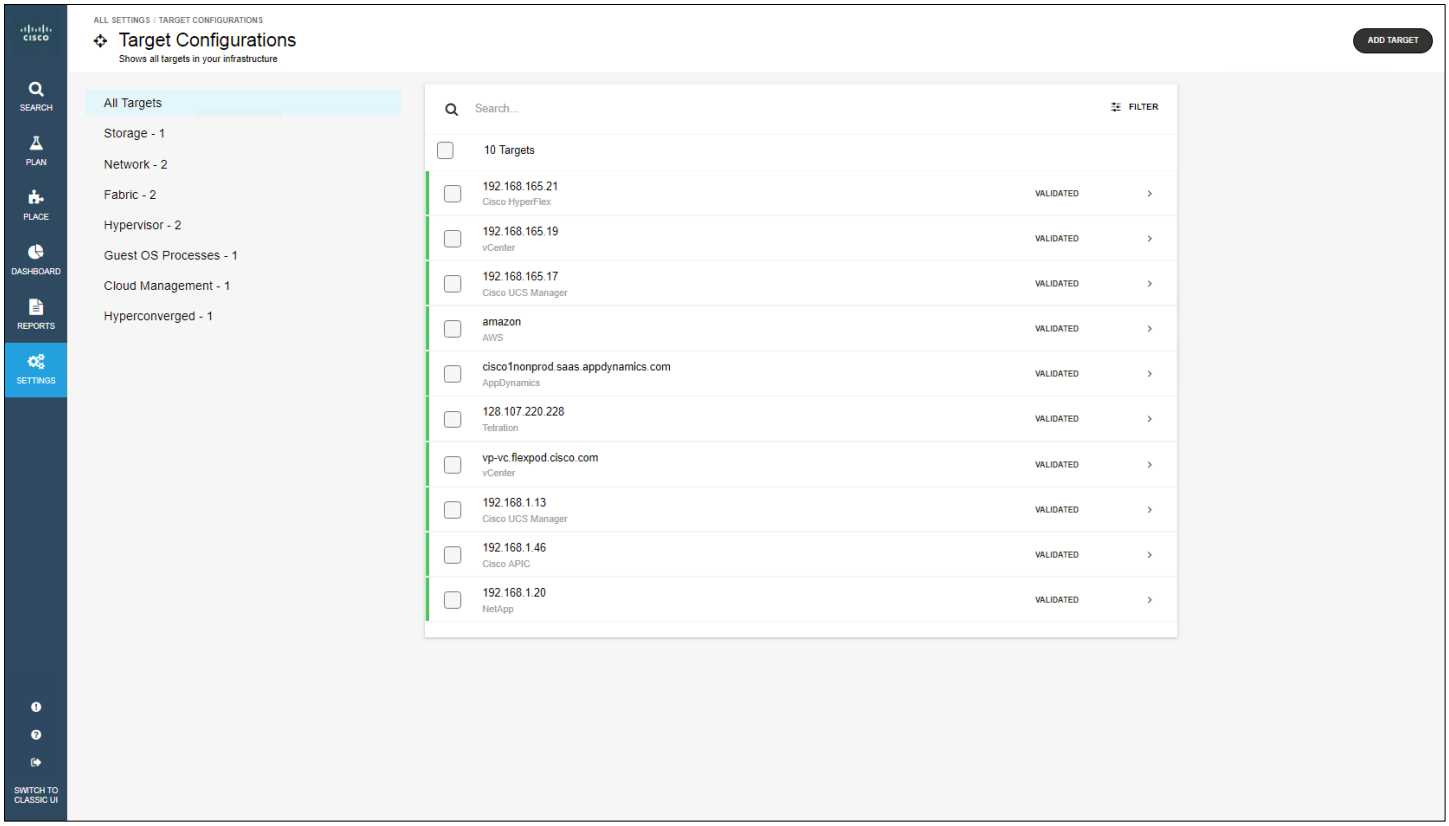
3. Click Add.



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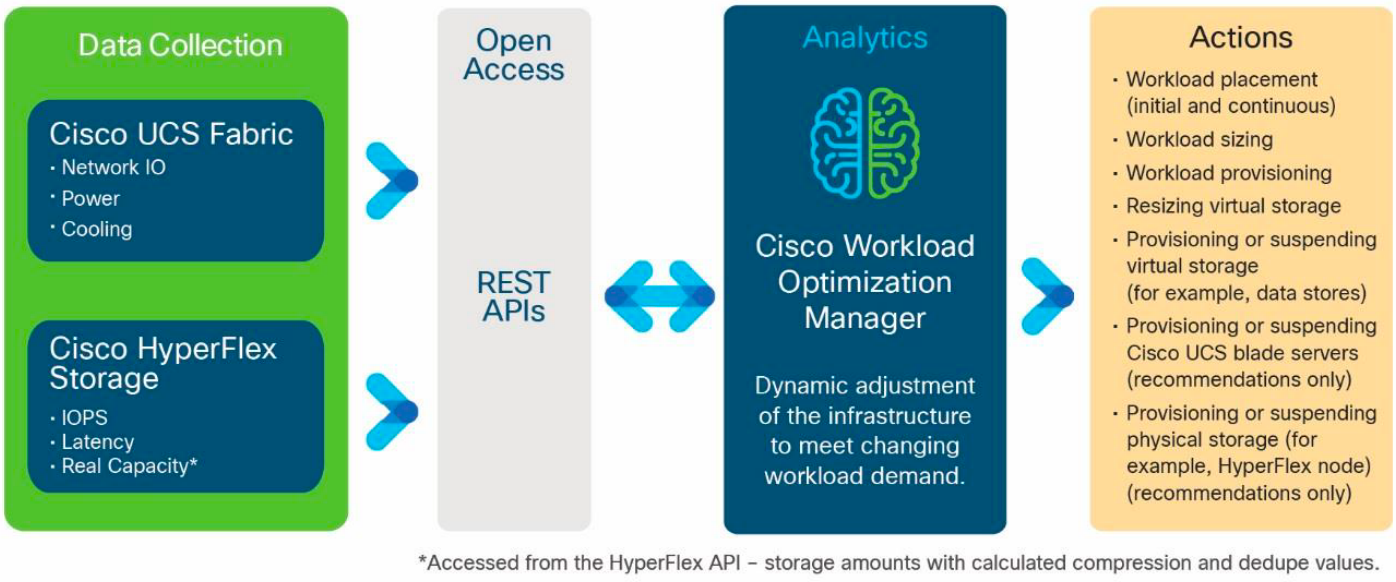
Integrated solution architecture

Workload Optimization Manager and Cisco HyperFlex systems are tightly integrated to help ensure predictable application performance on elastic hyperconverged infrastructure. Workload Optimization Manager uses APIs to collect data and understand the IT environment. It then analyzes the data to determine the specific actions required to maintain health continuously in the environment (Figure 15).

Figure 15. Cisco Workload Optimization Manager and Cisco HyperFlex solution architecture



Solution use cases

There are four main use cases for the Workload Optimization Manager and Cisco HyperFlex solution:

- Supercluster optimization
- Intelligent independent scaling of computing and storage resources
- Enhancement of elasticity with multicloud control
- Modernization at the pace of your business

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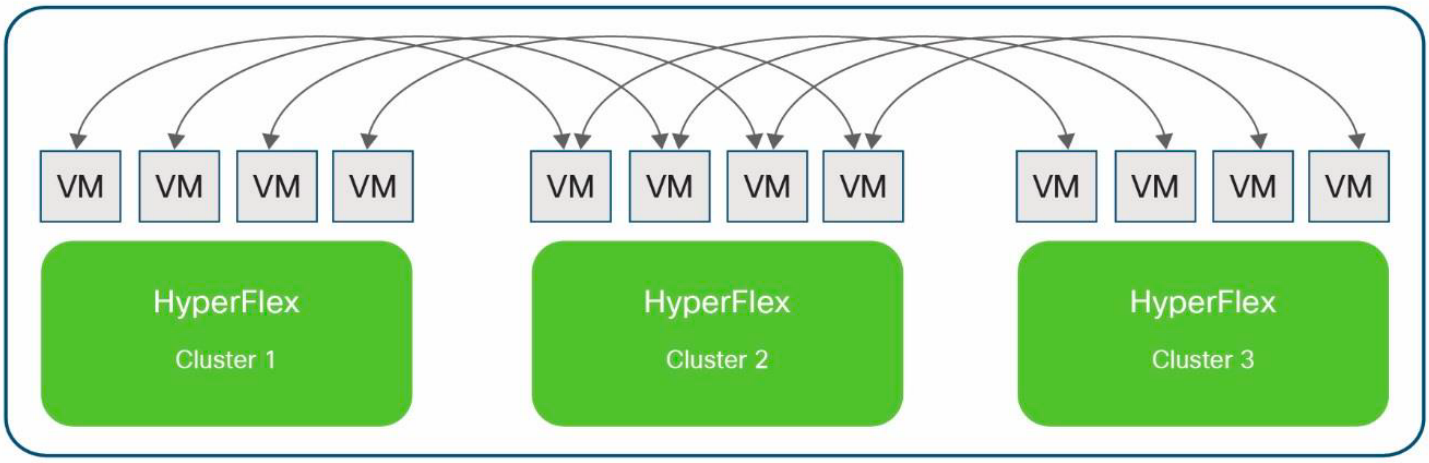
Supercluster optimization

Infrastructure silos have traditionally been employed to simplify management. But they also decrease efficiency and increase performance risk, creating situations in which workloads contend for resources on a heavily loaded cluster while resources are available on a lightly loaded cluster. Flattening the infrastructure avoids these performance risks, but only when software helps ensure the performance of the increasingly complex and distributed applications that infrastructure supports.

With the help of Workload Optimization Manager, customers with multiple Cisco HyperFlex clusters can achieve predictable performance while flattening their infrastructure. Cisco HyperFlex systems support a limited number of nodes in a cluster (64 nodes, as of the Release 3.0), which has traditionally meant that certain workloads are dedicated to certain clusters.

With Workload Optimization Manager, the platform continuously analyzes workload consumption across Cisco HyperFlex systems and Cisco UCS, as well as across resources that are not proprietary to Cisco. It determines when, where, and how to move or resize existing workloads to either mitigate resource contention or increase efficiency, maintaining continuous health across clusters (Figure 16).

Figure 16. Cisco Workload Optimization Manager continuously analyzes workload consumption across Cisco HyperFlex clusters, implementing real-time workload placement, sizing, and capacity decisions to promote continuous health Cisco HyperFlex platform



In some situations, however, dedicated infrastructure is needed not to simplify management but to help ensure implementation of justifiable policies that make sense for the business, such as data sovereignty, business continuity, and software licensing policies. In such cases, Workload Optimization Manager automatically ingests these policies and makes sure that the actions it takes to optimize performance and increase efficiency always abide by those constraints (Figure 17). Policies also can be defined in the Workload Optimization Manager user interface. But again, with software in control, infrastructure silos are implemented only to meet specific business requirements, not IT's operational needs.

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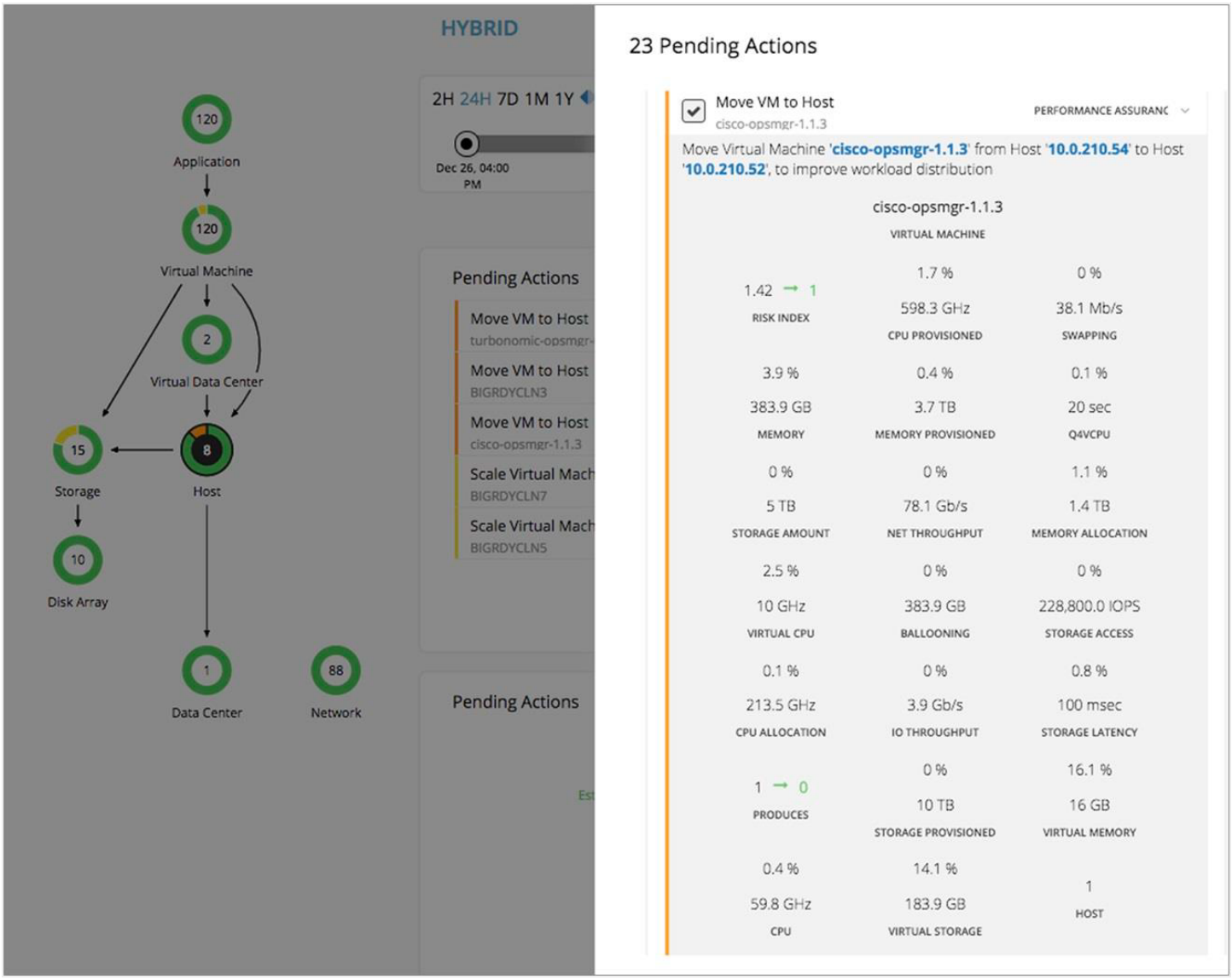
Figure 17. Cisco Workload Optimization Manager provides a specific action to move the virtual machine cisco-opsmgr-1.1.3 from host 10.0.210.54 to host 10.0.210.5 to help ensure workload performance



With the integration of Workload Optimization Manager and Cisco HyperFlex systems, workloads dynamically use the underlying infrastructure based on application resource needs in real time. Workload Optimization Manager implements workload-placement and sizing actions through VMware vCenter, but the tight integration of vCenter with Cisco HyperFlex systems (and Cisco UCS) helps ensure that the workloads continuously optimize the use of the underlying computing and storage resources.

Intelligent independent scaling of computing and storage resources

Workloads come in all shapes, sizes, and levels of complexity. Hyperconverged solutions let users scale easily by adding nodes to the cluster, but this approach also adds costs in the form of additional software licenses. Cisco HyperFlex systems are unique in that they give customers the flexibility to scale computing and storage resources independent of the software stack by seamlessly integrating Cisco UCS computing-only nodes and external storage. Customers thus gain cost benefits when customizing their systems to meet their unique requirements. Workload Optimization Manager provides additional benefits by scaling these resources based on real-time workload consumption, providing intelligent elasticity in Cisco HyperFlex clusters that preempts performance degradation (Figure 18).

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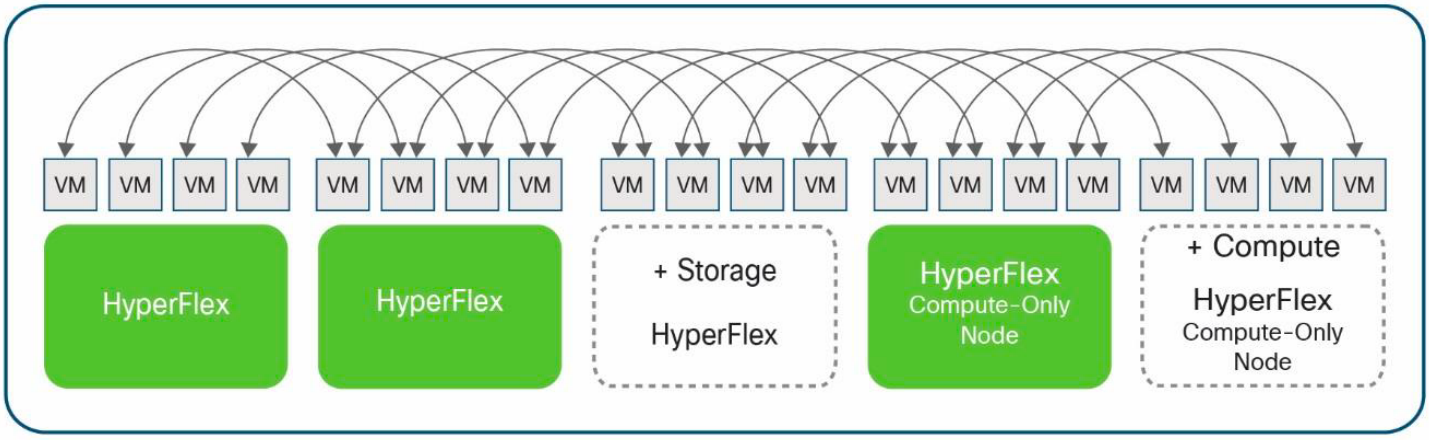
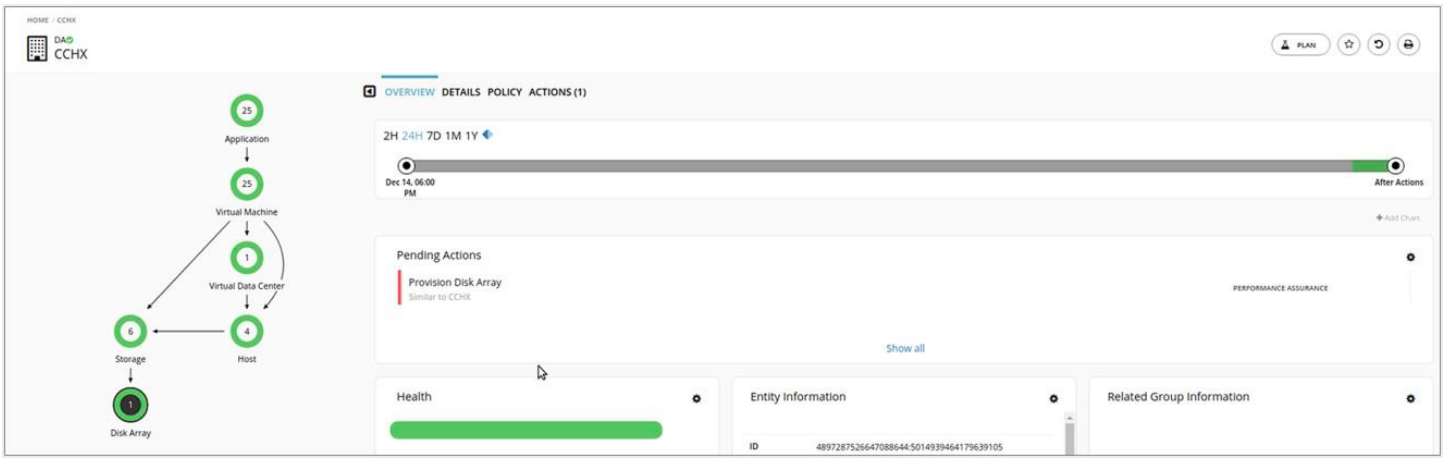
Figure 18. Cisco Workload Optimization Manager provides preemptive actions to provision additional storage and computing resources, mitigating performance degradation caused by lack of resources



At the virtualization layer—connected through the VMware vSphere APIs— Workload Optimization Manager understands when workloads need more storage or computing resources and will allocate more or less, based on real-time resource needs. Workload Optimization Manager also understands resource availability within Cisco HyperFlex clusters through the Cisco HyperFlex API. When existing cluster nodes cannot support the current demand, Workload Optimization Manager recommends the provisioning of more computing or storage resources, according to the specific needs. Users can then add Cisco UCS computing-only nodes, if more computing alone is required, or another Cisco HyperFlex node, if linear scaling of computing and storage resources is required. Likewise, when demand subsides, Workload Optimization Manager recommends suspension of specific servers or hosts that are no longer required. Customers thus can prevent performance degradation that would have occurred had the necessary infrastructure been unavailable (Figure 19).

Figure 19. Cisco Workload Optimization Manager provides the action to provision a new disk array similar to CCHX (a Cisco HyperFlex node) to help ensure performance



Enhancement of elasticity with multicloud control

Most organizations today use public cloud resources as part of an overall multicloud strategy. The easy-to-deploy pay-as-you-go model is well suited for short-lived workloads and as a safeguard against sudden spikes in demand. For example, for online tax services or e-commerce sites, which experience seasonal spikes in demand, the elasticity of public clouds can help at peak times.

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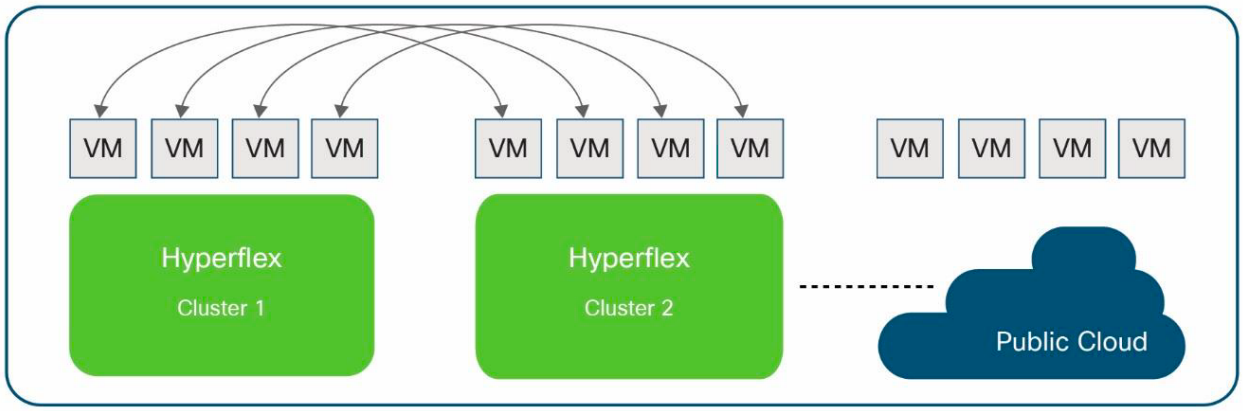
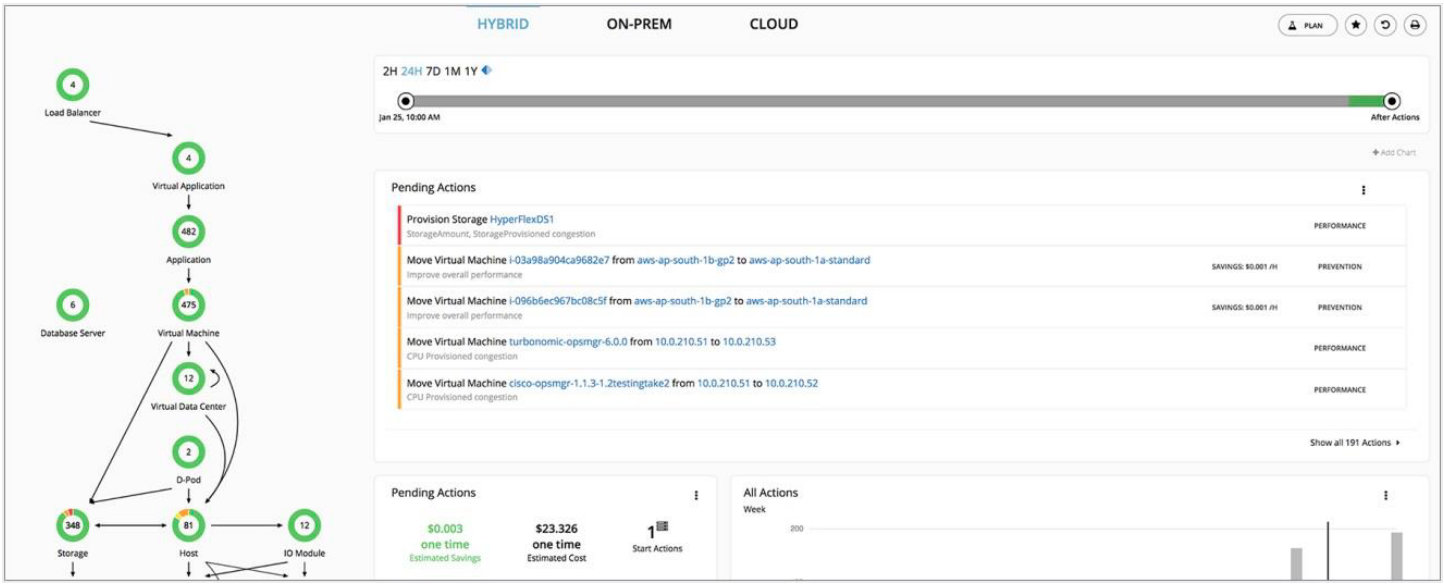
Throughout the rest of the year, however, these same organizations benefit from their own highly predictable and efficient data centers (Figure 20).

Figure 20. Cisco HyperFlex systems enhance flexibility in the public cloud



With Workload Optimization Manager, customers make the most of their investments in Cisco HyperFlex systems, helping ensure performance and achieving elasticity on their premises, and also efficiently using public cloud resources when needed. The unified platform controls both on-premises and public-cloud environments (Figure 21). Workload Optimization Manager currently supports Amazon Web Services (AWS) and Microsoft Azure environments and is adding support for other providers.

Figure 21. Cisco Workload Optimization Manager provides a global view of hybrid infrastructure, in this case Cisco HyperFlex and AWS Cloud, with specific actions for both environments



The Cisco HyperFlex and Workload Optimization Manager solution provides a number of additional benefits:

- Controls cloud assets to deliver service levels
  - Automatically scales workloads, storage, and databases in real time to help ensure performance
  - Tracks, reports, and identifies trends in computing, storage, and database consumption metrics (CPU, memory, I/O operations per second [IOPS], latency, and database throughput unit [DTU] statistics) across regions and zones

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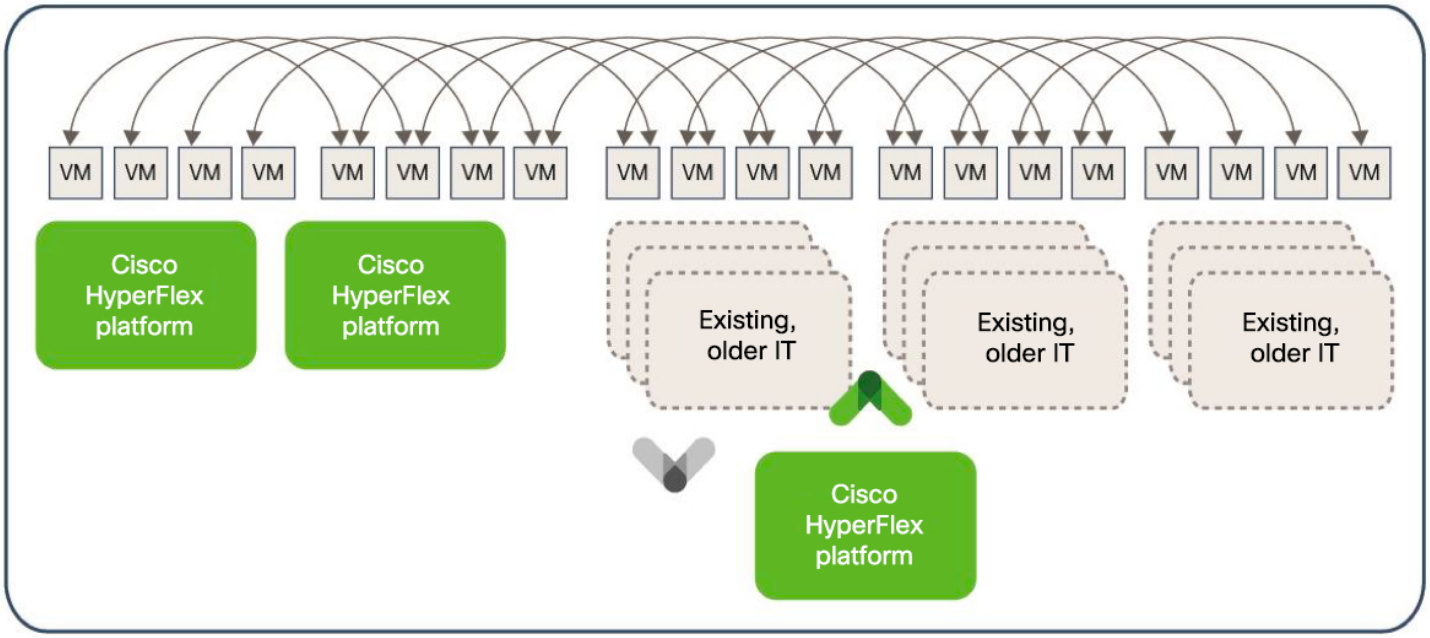
- Reduces public cloud costs
  - Continuously optimizes reserved-instance recommendations in concert with resizing automation to increase the elasticity and cost savings that you want and expect from the cloud
  - Automatically scales down Azure virtual machines or AWS instances, storage tiers, and database tiers, reducing costs without affecting performance
  - Identifies ghost and unattached storage instances
  - Suspends or terminates unused instances
  - Projects the actual cost of workloads by projecting computing, licensing (OS), IP address, and storage costs
  - Aggregates monthly bills across services, regions, accounts, specific workloads, and lines of business; tracks bills in a single view against a defined budget; and projects future monthly bills

Modernization at the pace of your business

Cisco HyperFlex systems and Workload Optimization Manager seamlessly integrate with the data center you have today so that you can modernize at the pace of your business. In addition to helping ensure the performance of workloads across your heterogeneous environment, Workload Optimization Manager provides capacity management capabilities that allow you to quickly model "what-if" scenarios as your business grows and as you retire older infrastructure (Figure 22).

Figure 22. Use Cisco Workload Optimization Manager to model infrastructure and workload growth scenarios to determine quickly how much infrastructure you will need and when you will need it



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For more information

For additional information about Cisco Workload Optimization Manager, see https://www.cisco.com/c/en/us/support/servers-unified-computing/workload-optimization-manager/tsd-products-support-series-home.html.

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