



Turbonomic 7.21.1 Target Configuration Guide

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Target Configuration

A target is a service that performs management in your virtual environment. uses targets to monitor workload and to execute actions in your environment. Target Configuration specifies the ports uses to connect with these services. You must install on a network that has access to the specific services you want to set up as targets.

For each target, communicates with the service via the management protocol that it exposes — The REST API, SMI-S, XML, or some other management transport. uses this communication to discover the managed entities, monitor resource utilization, and execute actions.

You can assign instances of the following technologies as targets:

- Cloud Managers
 - Microsoft System Center 2012 Virtual Machine Manager and System Center 2012 R2 Virtual Machine Manager
 - Amazon AWS
 - Microsoft Azure
 - Microsoft Enterprise Agreement
- Fabric Managers
 - Cisco UCS 3.1+
 - HPE OneView 3.00.04+
- Guest OS Processes
 - AppDynamics 4.1+
 - AppInsights 4.1+
 - DynaTrace 1.1+
 - NewRelic 4.1+
- Hypervisors
 - Microsoft Hyper-V 2008 R2, Hyper-V 2012, and Hyper-V 2012 R2
 - VMware vCenter 5.1, 5.5, 6.0, 6.5, and 6.7
- Storage Managers
 - NetApp Cmode/7mode using ONTAP 8.0+ (excluding AFF and SolidFire)
 - EMC VMAX using SMI-S 8.1+
 - Pure Storage F-series and M-series arrays

- HPE 3PAR InForm OS 3.2.2+, 3PAR SMI-S, 3PAR WSAPI

Transport Layer Security Requirements

requires Transport Layer Security (TLS) version 1.2 to establish secure communications with targets. Most targets should have TLSv1.2 enabled. However, some targets might not have TLS enabled, or they might have enabled an earlier version. In that case, you will see handshake errors when tries to connect with the target service. When you go to the Target Configuration view, you will see a Validation Failed status for such targets.

If target validation fails because of TLS support, you might see validation errors with the following strings:

- `No appropriate protocol`

To correct this error, ensure that you have enabled the latest version of TLS that your target technology supports. If this does not resolve the issue, please contact Technical Support.
- `Certificates do not conform to algorithm constraints`

To correct this error, refer to the documentation for your target technology for instructions to generate a certification key with a length of 1024 or greater on your target server. If this does not resolve the issue, please contact Technical Support.

Adding and Removing Target Virtual Management Servers

The target services your installation will manage appear in the Target Configuration list. You can add, remove, and edit entries in this list. Note that the target service's account must be configured with privileges that support the activities you want to perform. For example, the following list shows how vCenter privileges correspond to activities can perform:

- **Read Only** — Enables monitoring and simulation (what-if scenarios) only
- **vCenter Administrator** — Enables monitoring, simulation (what-if scenarios), and automation functions
- **Enable Datastore Browse** — Enabling this property for the account gives the privileges it needs to enable its storage management functionality

Adding Targets

To add a target service, click the **Target Configuration** button, provide the requested information, and click **Apply** to validate those targets and start a new discovery.

Typical information you provide includes:

- **Target Type** — Choose among the supported VM Management technologies (Hypervisor, Cloud Management, Load Balancer, etc.)

After you choose the technology, then choose the specific target type for that technology. For example, for Hypervisor technology, the types you can choose include vCenter, RHEV, Hyper-V, and XenServer.
- **Hostname or IP address** — The address of the target service you want to add
- **User Name** — A valid account username for the target service
- **Password** — A password for the target service account

Editing and Removing Targets

To edit a target entry, select it in the list and then click **Edit**. The **Target Configuration Form** opens, where you can make your settings.

To remove a target, select the entry in the list and then click **Delete**.

Hypervisor Targets

A hypervisor is a service that creates and runs virtual machines (VMs), providing the VMs compute and storage resources. When you connect to hypervisor targets in your environment, controls your environment, assuring application performance while also utilizing resources as efficiently as possible.

One of the first steps in any deployment is to connect to the hypervisors within your environment. Once connected, discovers the VMs, the physical machines that host the VMs, the datastores that provide storage resources to the physical machines, and the virtual datastores that provide storage resources to the VMs.

Supply Chain

Each hypervisor requires a physical machine (host) and one or more datastores to provide compute and storage resources. Virtual machines (VMs) run on those physical resources, and the VMs in turn provide resources to applications.

At the bottom of the supply chain, physical machines consume resources from data centers.

If your environment includes SAN technologies such as disk arrays, then the storage consumes resources from that underlying technology. If you add these storage targets, then extends the supply chain analysis into the components that make up the disk array. For more information, see [Storage Manager Targets \(on page 40\)](#).

Actions

recommends actions for the hypervisor supply chain as follows.

NOTE:

This is a general list of actions for entities discovered for hypervisors. Detailed actions per target are described in each target section.

Entity Type	Action
Virtual Machines	<ul style="list-style-type: none"> Provision additional resources (VMem, VCPU) Move Virtual Machine Move Virtual Machine Storage Reconfigure Storage Reconfigure Virtual Machine
Physical Machines	<ul style="list-style-type: none"> Start Physical Machine Provision Physical Machine

Entity Type	Action
	<ul style="list-style-type: none"> Suspend Physical Machine
Storage	<ul style="list-style-type: none"> Start Storage Provision Storage Suspend Storage Move (only with Storage Targets configured) Resize (only with Storage Targets configured)
Consumer Virtual Datacenters	<ul style="list-style-type: none"> Resize Consumer vDC Provision Consumer vDC

Monitored Resources

monitors the following resources for the hypervisor supply chain:

Entity Type	Commodity
Virtual Machine	<ul style="list-style-type: none"> Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) Virtual Storage (VStorage) The utilization of the virtual storage capacity allocated for the VM Measured in Kilobytes (KB) Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)
Physical Machine	<ul style="list-style-type: none"> Memory (Mem) The utilization of the PM's memory reserved or in use Measured in Kilobytes (KB) CPU The utilization of the PM's CPU reserved or in use Measured in Megahertz (MHz) IO The utilization of the PM's IO adapters Measured in Kilobytes per second (KB/s)

Entity Type	Commodity
	<ul style="list-style-type: none"> <li data-bbox="396 233 1468 359">• Net The utilization of data through the PM's network adapters Measured in Kilobytes per second (KB/s) <li data-bbox="396 369 1468 495">• Swap The utilization of the PM's swap space Measured in Kilobytes (KB) <li data-bbox="396 506 1468 632">• Balloon The utilization of shared memory among VMs running on the host. ESX-only Measured in Kilobytes (KB) <li data-bbox="396 642 1468 810">• CPU Ready The utilization of the PM's allocated ready queue capacity (measured in Kbytes) that is in use, for 1, 2, and 4 CPU ready queues. ESX-only Measured in Megahertz (MHz)
Storage	<ul style="list-style-type: none"> <li data-bbox="396 842 1468 968">• Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) <li data-bbox="396 978 1468 1104">• Storage Provisioned The utilization of the datastore's capacity, including overprovisioning. Measured in Megabytes (MB) <li data-bbox="396 1115 1468 1241">• Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the datastore Measured in Operations per second <li data-bbox="396 1251 1468 1377">• Latency The utilization of latency on the datastore Measured in Milliseconds (ms)
Datacenter	<p data-bbox="418 1415 1468 1478">NOTE: For datacenter entities, does not monitor resources directly from the datacenter, but from the physical machines in the datacenter.</p> <ul style="list-style-type: none"> <li data-bbox="396 1514 1468 1640">• Memory (Mem) The utilization of the PM's memory reserved or in use Measured in Kilobytes (KB) <li data-bbox="396 1650 1468 1776">• CPU The utilization of the PM's CPU reserved or in use Measured in Megahertz (MHz) <li data-bbox="396 1787 1468 1913">• IO The utilization of the PM's IO adapters Measured in Kilobytes per second (KB/s)

Entity Type	Commodity
	<ul style="list-style-type: none"> <li data-bbox="396 233 1469 359"> <p>• Net</p> <p>The utilization of data through the PM's network adapters</p> <p>Measured in Kilobytes per second (KB/s)</p> <li data-bbox="396 369 1469 495"> <p>• Swap</p> <p>The utilization of the PM's swap space</p> <p>Measured in Kilobytes (KB)</p> <li data-bbox="396 506 1469 632"> <p>• Balloon</p> <p>The utilization of shared of memory among VMs running on the host. ESX-only</p> <p>Measured in Kilobytes (KB)</p> <li data-bbox="396 642 1469 810"> <p>• CPU Ready</p> <p>The utilization of the PM's allocated ready queue capacity (measured in Kbytes) that is in use, for 1, 2, and 4 CPU ready queues. ESX-only</p> <p>Measured in Kilobytes (KB)</p>
Provider Virtual Datacenter	<ul style="list-style-type: none"> <li data-bbox="396 842 1469 968"> <p>• Memory (Mem)</p> <p>The utilization of the Datacenter's memory reserved or in use</p> <p>Measured in Kilobytes (KB)</p> <li data-bbox="396 978 1469 1104"> <p>• CPU</p> <p>The utilization of the Datacenter's CPU reserved or in use</p> <p>Measured in Megahertz (MHz)</p> <li data-bbox="396 1115 1469 1241"> <p>• Storage</p> <p>The utilization of the storage attached to the Provider vDC.</p> <p>Measured in Kilobytes (KB)</p>
Consumer Virtual Datacenter	<ul style="list-style-type: none"> <li data-bbox="396 1276 1469 1402"> <p>• Memory (Mem)</p> <p>The utilization of the Datacenter's memory reserved or in use</p> <p>Measured in Kilobytes (KB)</p> <li data-bbox="396 1413 1469 1539"> <p>• CPU</p> <p>The utilization of the Datacenter's CPU reserved or in use</p> <p>Measured in Megahertz (MHz)</p> <li data-bbox="396 1549 1469 1675"> <p>• Storage</p> <p>The utilization of the storage attached to the Consumer vDC.</p> <p>Measured in Kilobytes (KB)</p>

Hyper-V

If you have a small number of Hyper-V hosts in your environment, you can add them individually as targets. Also, if you have deployed the Hyper-V hosts in a clustered domain (for example as a failover cluster), you can specify one Hyper-V host as a target and automatically add the other members of that cluster.

Note that for large Hyper-V environments, it's typical to manage the hosts via System Center Virtual Machine Manager (VMM). You can specify the VMM server as a target and will use it to discover and manage its child Hyper-V hosts. If you use VMM, you should not add individual Hyper-V hosts as targets. For information about adding VMM targets, see [Adding Virtual Machine Manager Targets \(on page 22\)](#).

NOTE:

Even if you manage Hyper-V using a VMM target, you must still configure remote management on each Hyper-V server. This Hyper-V topic includes instructions to configure remote management — see

BROKEN LINK!!! Enabling Windows Remote Management

For accurate SMB storage calculations, requires a VMM target.

Prerequisites

- Create a user account that can use to connect to your Hyper-V servers. See [Creating a Service User Account in Hyper-V \(on page 13\)](#)
- Configure remote management on each Hyper-V server. Refer to

BROKEN LINK!!! Enabling Windows Remote Management

- Your Hyper-V environment must not use Server Message Block (SMB) storage.

To manage SMB storage, requires a VMM target, and that VMM instance must manage the Hyper-V hypervisors and the SMB storage that they use.

Managing a Hyper-V plus SMB environment via Hyper-V targets will result in incorrect data collection for SMB storage.

Adding Hyper-V Targets

Once you've enabled remote management, you can add your Hyper-V hosts as targets. To add Hyper-V targets, select the **Hypervisors > Hyper-V** option on the Target Configuration page and provide the following information:

- Address

The FQDN of the Hyper-V host. If you're using the "Discover Host Cluster" below to add an entire cluster, enter the name of any one of the Hyper-V hosts in the cluster.

Note that you can enter an IP address for the host, but you must first configure an SPN on the host. recommends that you use the FQDN in this field.

- Port number

The port number for the remote management connection. The default HTTP port is 5985; the default HTTPS port is 5986.

- Secure connection

Select this option to use a secure connection (HTTPS). Make sure the required certificate is configured for use on the host.

- Full domain name
The full domain name of the cluster to which the host belongs.
- Discover Host Cluster
discovers and adds all Hyper-V hosts in the named cluster if this option is checked. Note that each server must be configured to allow remote management. You may find it helpful to configure WinRM using a GPO so new servers are configured automatically (see [BROKEN LINK!!! Enabling WinRM Via a GPO](#)).
- Username
The username of a user account can use to connect to the Hyper-V host. If you checked "Discover Host Cluster" in the field above, use an account that is valid for all Hyper-V hosts in that cluster.
- Password
Password for account used.

Exporting Hyper-V Virtual Machines

In Hyper-V environments, you must be sure that all VMs have unique IDs.

Hyper-V supports the export of a VM, so that you can create exact copies of it by importing those exported files. The `COPY` import type creates a new unique ID for the imported VM. When importing VMs in your environment, you should always use the `COPY` import type.

uses the unique ID to discover and track a VM. If your environment includes multiple VMs with the same ID, then discovery will assume they are the same VM. As a result, the counts for VMs will be incorrect.

Supported Actions

For each discovered entity within the hypervisor supply chain, can execute or recommend certain actions, as outlined below.

Entity Type	Can Be Automated	Recommendations Only
Virtual Machine	Start, Move, Suspend, Resize Down, Resize Up	Terminate, Provision, Reconfigure
Physical Machine	Start, Suspend	Terminate, Provision
Storage		Provision

Monitored Resources

monitors the following resources for the hypervisor supply chain:

Entity Type	Commodity
Virtual Machine	<ul style="list-style-type: none"> • Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) • Virtual CPU (VCPU)

Entity Type	Commodity
	<p>The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz)</p> <ul style="list-style-type: none"> Virtual Storage (VStorage) The utilization of the virtual storage capacity allocated for the VM Measured in Kilobytes (KB) Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)
Physical Machine	<ul style="list-style-type: none"> Memory (Mem) The utilization of the PM's memory reserved or in use Measured in Kilobytes (KB) CPU The utilization of the PM's CPU reserved or in use Measured in Megahertz (MHz) IO The utilization of the PM's IO adapters Measured in Kilobytes per second (KB/s) Net The utilization of data through the PM's network adapters Measured in Kilobytes per second (KB/s) Swap The utilization of the PM's swap space Measured in Kilobytes (KB)
Storage	<ul style="list-style-type: none"> Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) Storage Provisioned The utilization of the datastore's capacity, including overprovisioning. Measured in Megabytes (MB) Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the datastore Measured in Operations per second

Entity Type	Commodity
	<ul style="list-style-type: none"> Latency The utilization of latency on the datastore Measured in Milliseconds (ms)
Datacenter	<p>NOTE: For datacenter entities, does not monitor resources directly from the datacenter, but from the physical machines in the datacenter.</p> <ul style="list-style-type: none"> Memory (Mem) The utilization of the PM's memory reserved or in use Measured in Kilobytes (KB) CPU The utilization of the PM's CPU reserved or in use Measured in Megahertz (MHz) IO The utilization of the PM's IO adapters Measured in Kilobytes per second (KB/s) Net The utilization of data through the PM's network adapters Measured in Kilobytes per second (KB/s) Swap The utilization of the PM's swap space Measured in Kilobytes (KB) Balloon The utilization of shared of memory among VMs running on the host. ESX-only Measured in Kilobytes (KB) CPU Ready The utilization of the PM's allocated ready queue capacity (measured in Kbytes) that is in use, for 1, 2, and 4 CPU ready queues. ESX-only Measured in Kilobytes (KB)

Creating A Service User Account

The service account uses to connect to a Hyper-V host must be an Active Directory domain account. The account must have full access to the cluster. To create such an account, execute the following command at a PowerShell prompt:

```
Grant-ClusterAccess <domain>\<service_account> -Full
```

Additionally, the service account must have specific local access rights on each host. The easiest way to grant Operations Manager the access it requires is to add the domain account to the Local Administrators group on each Hyper-V server.

Some enterprises require that the service account does not grant full administrator rights. In that case, you can create a restricted service account on every Hyper-V host:

NOTE:

does not support Restricted User Accounts on Windows 2012 Hyper-V nodes.

1. Add the service account to each of the following local groups:

- WinRMRemoteWMIUsers__ (Or Remote Management Users)
- Hyper-V Administrators
- Performance Monitor Users

NOTE:

These groups are standard Windows Server 2012 security groups. If you are using an earlier version of Windows Server and do not see these groups, contact Support for assistance.

2. Grant permissions to the service account.

In the WMI Management console, grant the `Enable Account`, `Act as Operating System`, and `Remote Enable` permissions to the service account.

3. Configure the WinRM security descriptor to allow access by the service account:

- At a PowerShell prompt, execute `winrm configSDDL default`.
- In the "Permissions for Default" dialog box, grant the service account Read and Execute access.

vCenter Server

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

Prerequisites

- A user account can use to connect to your vCenter and execute actions (see [Creating a User Account In vCenter \(on page 18\)](#)).

General Considerations Before Target Addition

• Linked vCenters:

For linked vCenters, you must add each vCenter separately. communicates with each vCenter through a separate API endpoint, but aggregates the data from those vCenters and makes cross-vCenter actions possible.

• Restricting Access to Specific Clusters:

When you add a vCenter target, discovers all of the connected entities that are visible based on the account used to connect to the vCenter target. If there are clusters or other entities you want to exclude, you can do this by setting the role for the account to `No access` in the vSphere management client.

• Shared Datastores:

If you add more than one vCenter target that manages the same datastore, you may see conflicts in the metadata maintains for each vCenter. For example, datastore browsing may display a conflict between active and wasted files, or each vCenter may define the same datastore as a member of a different storage cluster. recommends that you do not add multiple vCenter targets that manage the same datastore.

- **VSAN Permissions:**

In order to enable VSAN support and discover groups based on storage profiles, you must ensure that the user role is assigned has the `Profile-driven storage view` permission enabled. This permission is *disabled* in the built-in `readonly` role.

Adding vCenter Targets

To add vCenter targets, select the **Hypervisors > vCenter** option on the Target Configuration page and provide the following information:

- **Address**
The name or IP address of the vCenter server.
- **Username/Password**
Credentials for the user account can use to connect to the vCenter Server. Include the domain if required (`<domain>\<username>`).

vCenter Post-Addition Imports

In addition to discovering entities managed by the hypervisor, also imports a wide range of vSphere settings, such as Host and Storage DRS rules, annotations, Resource Pools, and DRS HA settings (See [Other Information Imported From vCenter \(on page 19\)](#)).

VMware vSphere 6.0 introduced the ability to move VMs between vCenters. If you enabled this feature in your VMware environment, you can configure to include cross vCenter vMotions in its recommendations.

To configure to support cross vCenter vMotion recommendations, you must create a Workload Placement Policy that merges the datacenters on the different vCenters, and then another policy to merge the given clusters. Also note that the merged clusters must use the same network names in the different datacenters. To create a Merge Policy:

1. In the Policy Management Tab, select **Placement Policy**.
2. For `policy type`, select **Merge**.
3. For `MERGE`, choose the merge type, and click **Select**.

To merge datacenters choose Datacenter, to merge Host clusters choose Cluster, and for storage choose StorageCluster.

4. Choose the specific datacenters or clusters to merge in this policy, then click **Select**.
5. Click **Save Policy**.

NOTE:

Since can only execute vMotions between clusters that use the same switch type (VSS or VDS), make sure any clusters you merge use the same switch type. Although will not initiate VSS → VDS vMotions, vSphere may do so. If this happens, displays a compliance violation notification.

Supported Actions

For each discovered entity within the hypervisor supply chain, Operations Manager can execute or recommend certain actions, as outlined below.

Entity Type	Can Be Automated	Recommendations Only
Virtual Machine	Start, Move, Suspend, Storage Move, Resize Down, Resize Up	Terminate, Provision, Reconfigure

Entity Type	Can Be Automated	Recommendations Only
Physical Machine	Start, Suspend	Terminate, Provision
Storage		Provision

Monitored Resources

monitors the following resources for the hypervisor supply chain:

Entity Type	Commodity
Virtual Machine	<ul style="list-style-type: none"> Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) Virtual Storage (VStorage) The utilization of the virtual storage capacity allocated for the VM Measured in Kilobytes (KB) Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)
Physical Machine	<ul style="list-style-type: none"> Memory (Mem) The utilization of the PM's memory reserved or in use Measured in Kilobytes (KB) CPU The utilization of the PM's CPU reserved or in use Measured in Megahertz (MHz) IO The utilization of the PM's IO adapters Measured in Kilobytes per second (KB/s) Net The utilization of data through the PM's network adapters Measured in Kilobytes per second (KB/s) Swap The utilization of the PM's swap space

Entity Type	Commodity
	<p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> Balloon <p>The utilization of shared memory among VMs running on the host. ESX-only</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> CPU Ready <p>The utilization of the PM's allocated ready queue capacity (measured in Kbytes) that is in use, for 1, 2, and 4 CPU ready queues. ESX-only</p> <p>Measured in Megahertz (MHz)</p>
Storage	<ul style="list-style-type: none"> Storage Amount <p>The utilization of the datastore's capacity</p> <p>Measured in Megabytes (MB)</p> <ul style="list-style-type: none"> Storage Provisioned <p>The utilization of the datastore's capacity, including overprovisioning.</p> <p>Measured in Megabytes (MB)</p> <ul style="list-style-type: none"> Storage Access Operations Per Second (IOPS) <p>The summation of the read and write access operations per second on the datastore</p> <p>Measured in Operations per second</p> <ul style="list-style-type: none"> Latency <p>The utilization of latency on the datastore</p> <p>Measured in Milliseconds (ms)</p>
Datacenter	<p>NOTE: For datacenter entities, does not monitor resources directly from the datacenter, but from the physical machines in the datacenter.</p> <ul style="list-style-type: none"> Memory (Mem) <p>The utilization of the PM's memory reserved or in use</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> CPU <p>The utilization of the PM's CPU reserved or in use</p> <p>Measured in Megahertz (MHz)</p> <ul style="list-style-type: none"> IO <p>The utilization of the PM's IO adapters</p> <p>Measured in Kilobytes per second (KB/s)</p> <ul style="list-style-type: none"> Net <p>The utilization of data through the PM's network adapters</p> <p>Measured in Kilobytes per second (KB/s)</p> <ul style="list-style-type: none"> Swap <p>The utilization of the PM's swap space</p>

Entity Type	Commodity
	<p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> Balloon <p>The utilization of shared of memory among VMs running on the host. ESX-only</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> CPU Ready <p>The utilization of the PM's allocated ready queue capacity (measured in Kbytes) that is in use, for 1, 2, and 4 CPU ready queues. ESX-only</p> <p>Measured in Kilobytes (KB)</p>
Provider Virtual Datacenter	<ul style="list-style-type: none"> Memory (Mem) <p>The utilization of the Datacenter's memory reserved or in use</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> CPU <p>The utilization of the Datacenter's CPU reserved or in use</p> <p>Measured in Megahertz (MHz)</p> <ul style="list-style-type: none"> Storage <p>The utilization of the storage attached to the Provider vDC.</p> <p>Measured in Kilobytes (KB)</p>
Consumer Virtual Datacenter	<ul style="list-style-type: none"> Memory (Mem) <p>The utilization of the Datacenter's memory reserved or in use</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> CPU <p>The utilization of the Datacenter's CPU reserved or in use</p> <p>Measured in Megahertz (MHz)</p> <ul style="list-style-type: none"> Storage <p>The utilization of the storage attached to the Consumer vDC.</p> <p>Measured in Kilobytes (KB)</p>

Creating A Service User Account In vCenter

The service account you use must have specific permissions on the vCenter. The easiest way to grant the access it requires is to grant full administrator rights.

Some enterprises require that the service account does not grant full administrator rights. In that case, you can create a restricted service account that grants the following permissions to enable the required activities:

Activity	Required Privileges
Monitoring	Read-only for all entity types

Activity	Required Privileges
Recommend Actions	Read-only for all entity types
Wasted Storage Reporting	Datastore > Browse Datastore
Execute VM Move (vMotion)	Resource > Migrate Resource > Query Vmotion Resource > Modify Resource Pool Resource > Assign VM to Resource Pool
Execute VM Storage Move (svMotion)	Datastore > Allocate Space Datastore > Browse Datastore Resource > Assign VM to Resource Pool Resource > Migrate Resource > Modify Resource Pool Resource > Move Resource Pool Resource > Query VMotion Virtual Machine > Configuration > Change Resource Virtual Machine > Configuration > Swap File Placement
Execute VM Resize	Virtual Machine > Configuration > Change CPU Count Virtual Machine > Configuration > Change Resources Virtual Machine > Configuration > Memory Virtual Machine > Interaction > Reset Virtual Machine > Interaction > Power Off Virtual Machine > Interaction > Power On
Discover tags	Global > Global tags In addition, you must open ports 10443 and 7443 on the target server

Other Information Imported from vCenter

In addition to discovering entities managed by the vSphere hypervisors and their resources, :

- Imports any vSphere Host DRS rules when DRS is enabled, and displays them on the **Policy > Workload Placement** view under **Imported Placement Policies**. Imported rules are enabled by default, but you can disable specific rules if you want.

NOTE:

In vCenter environments, does not import DRS rules if DRS is disabled on the hypervisor. Further, if did import an enabled DRS rule, that somebody subsequently disables that DRS rule, then will discover that the rule was disabled and will remove the imported placement policy.

- Imports any custom annotations and displays related groupings in the **Inventory > Groups** tree view, under **VC Annotations**. The service account must enable the **Global > Global tag** privilege, and the target server must open ports 10443 and 7443.

- For vCenter Server versions 5.5 and later, discovers Virtual Machine Storage Profiles and displays them as groups anywhere that you can set scope. The groups appear under **VC Storage Profiles**. You can use these discovered storage profiles the same as any other groups — For example, to scope dashboards, or to set the scope for specific action policies.
- Discovers resource pools and displays them as folders in the Inventory tree and as components in the Supply Chain Navigator. If you have the Cloud Control Module license, manages resource pools as Virtual Datacenters (VDCs) and can recommend resize actions. Root resource pools appear as Provider VDCs in the supply chain, whereas child resource pools appear as Consumer VDCs.
- Imports vSphere HA cluster settings and translates them into CPU and memory utilization constraints. These are displayed as cluster-level overrides under **Folders** on the **Policy > Analysis > Host** view.

Cloud Management Targets

Cloud-based datacenters support scalability, resource pooling, multi-tenancy, and self-service management of virtual resources. supports the following cloud technologies:

- Microsoft Virtual Machine Manager (VMM)

Cloud infrastructures declare resource pools to serve business needs for multi-tenancy, authorized visibility into the infrastructure, and regional distribution of resources. These pools manage resources such as compute, storage, memory, and network bandwidth in ways that support the cloud's business requirements. discovers and manages these resource pools in relation to the whole datacenter. This enables to:

- Display cloud resources within each pool
- Analyze workload distribution across the entire datacenter
- Control the distribution of workload at each level of the cloud infrastructure

Private Cloud

A private cloud manages resources in pools to support multi-tenancy and self-service provisioning of virtual workloads. manages these resource pools in real time as demand fluctuates. This includes demand across resource pools, virtual datacenters (VDCs), and tenants.

On the private cloud, you can use to:

- Set up charge-back and show-back for private cloud or service-provider scenarios
- For service-providers, set up scoped views to limit exposure to the customer base
- Plan hardware requirements — the planning scenarios takes cloud architectures into account

Supply Chain

For private clouds, discovers resource partitions that are managed by the cloud manager, as well as the workload running on these partitions (the VMs and applications) and, where applicable, the supply that hosts workload (the physical machines and storage). represents these partitions as the following types of Virtual Datacenters (VDCs):

- Provider VDC

A collection of physical resources (PMs and datastores) within a private cloud. The cloud administrator has access to these resources, and defines the datacenter members. Administrators allocate Provider VDCs to manage resources that will be allocated to external customers through one or more Consumer VDCs.

- Consumer VDC

A collection of resources that are available for customers to perform self-service management of workload through the cloud. It is an environment customers can use to store, deploy, and operate virtual systems. Consumer VDCs use the resources supplied by a Provider VDC.

Actions

recommends actions for private cloud infrastructures as follows:

Entity Type	Action
Provider Virtual Datacenters	does not recommend actions to perform on a Provider VDC. Instead, it recommends actions to perform on the devices running in the datacenter.
Consumer Virtual Datacenters	<ul style="list-style-type: none"> • Resize Consumer vDC • Provision Consumer vDC

Monitored Resources

monitors the following private cloud infrastructure resources:

Entity Type	Commodity
Provider Virtual Datacenter	<ul style="list-style-type: none"> • Memory (Mem) The utilization of the Datacenter's memory reserved or in use Measured in Kilobytes (KB) • CPU The utilization of the Datacenter's CPU reserved or in use Measured in Megahertz (MHz) • Storage The utilization of the storage attached to the Provider vDC. Measured in Kilobytes (KB)
Consumer Virtual Datacenter	<ul style="list-style-type: none"> • Memory (Mem) The utilization of the Datacenter's memory reserved or in use Measured in Kilobytes (KB) • CPU The utilization of the Datacenter's CPU reserved or in use Measured in Megahertz (MHz) • Storage The utilization of the storage attached to the Consumer vDC.

Entity Type	Commodity
	Measured in Kilobytes (KB)

Virtual Machine Manager

In a VMM environment, the VMM management server processes commands and controls communications with the Hyper-V hosts. To manage VMM, you set the management server as a target. communicates with that target, and also with the Hyper-V hosts that the VMM server manages. For this reason, if you add a VMM target, you should not also add individual Hyper-V hosts as targets. You must grant access to the VMM management server, and also to all the associated Hyper-V machines.

Prerequisites

- VMM Dynamic Optimization disabled (recommended) or set to Low aggressiveness, with a frequency of at least 60 minutes.
- Configure remote management on the VMM management Hyper-V server. Refer to

BROKEN LINK!!! Enabling Windows Remote Management

- Apply necessary hot fixes on the VMM host

For example, if you are running VMM Server on a Windows Server version earlier than Windows Server 2012 R2, you must apply the hotfix referenced in the Microsoft Knowledge Base article #2842230 (<http://support.microsoft.com/kb/2842230>).

- Apply time synchronization

The VM that hosts must be synchronized with each target VMM management server. The Installation Guide includes instructions for synchronizing the clock on the server.

- PowerShell execution must be enabled on the VMM management server.
- Configure port access

WinRM uses ports 5985 and 5986 for standard and secure communications, respectively. The firewall on your VMM server must open these ports.

- Preexisting Hyper-V Targets

If any of the hosts that make up the VMM target were added separately as Hyper-V targets (and you do not plan to exclude these hosts), these targets must be deleted. Failure to do so will create duplicate entities in the market, which will negatively impact performance.

Adding VMM Targets

uses the address and credentials you provide to discover the VMM target. From the VMM target, gets the list of managed Hyper-V instances. It then uses that list to discover each Hyper-V instance. The Hyper-V credentials you provide must be valid for all of these machines.

will also import your Availability Sets, representing them as placement policies for the affected infrastructure.

To add VMM targets, select the **Cloud Management > VMM** option on the Target Configuration page, and provide the following information:

- The IP address or host name of the VMM management server
- Which port to use for the WSMAN connection

For a standard connection (HTTP) use 5985. For a secure connection (HTTPS) use 5986.

- Enable or disable a secure connection

If you enable a secure connection, then you must configure a certificate, and you must configure to communicate over HTTPS. For more information, see

BROKEN LINK!!! [Secure Setup for WSMAN](#)

Note that setting a secure connection for VMM does not also set secure connections for the underlying Hyper-V hosts. Any communications between and VMM will be secure. To configure secure connections to the underlying Hyper-V hosts, you must specify secure connections on each one.

- Full domain name for the user account

This domain name identifies the user account for Active Directory authentication.

- Login credentials for the Hyper-V servers that are managed by the VMM target (Optional)

must log into the Hyper-V servers that the VMM server manages. If you leave the Hyper-V credentials blank, then it will use the same credentials that VMM uses. If you provide Hyper-V credentials, then it will use that service account to log into every Hyper-V managed by the VMM.

Note that the service account uses to log into a Hyper-V host must satisfy certain requirements. For more information, see [Creating a Service User Account in Hyper-V \(on page 13\)](#).

- Hosts in the VMM target that you would like to exclude from .

will not discover or manage any hosts you enter in this field. These hosts do not participate in the market, and does not generate actions that involve these hosts. Enter multiple hosts in a comma-separated list. This field accepts both host names, and FQDNs (Fully Qualified Domain Names), and allows the use of the wildcard characters * and ?.

Microsoft VMM and Hyper-V VLANs

Windows Server Hyper-V provides support for VLANs on host and VM partitions. If your Hyper-V environment makes use of this VLAN support, then your VM moves must be sensitive to which hosts provide networking access to your defined VM networks. If a VM is a member of a given VM network, then any move of that VM must be to a host that has access to the same network.

For Hyper-V targets in a VMM environment, the Cloud Control Module is aware of the VM networks, and ensures that a move is to a host that provides connectivity over the given VM network. For example, if Host 1 and 2 provides connectivity to VM Network A, and Host 3 and 4 provide connectivity to VM Network B, will never recommend a VM with access to Network A, residing on Host 1, to move to Host 3. That would render the VM unable to communicate on Network A.

Configuring SMB 3.0 File Shares Discovery

With VMM, can discover SMB 3.0 shares as datastores, assuming these shares have been properly added to your VMM service center. When you add shares to your VMM environment, be sure to:

- Use the Fully Qualified Domain Name of the file server

As you the associated file server to your VMM environment (via the Add Storage Devices Wizard), be sure to specify the FQDN of the file server on the Specify Discovery Scope page of the wizard. Do not use the file server's IP address.

- Ensure that file server names are unique

Do not specify file servers with the same name, even if they belong to different domains. requires the file server names to be unique.

For information about setting up SMB 3.0 shares, please refer to your Microsoft documentation. For example, see [“How to Assign SMB 3.0 File Shares to Hyper-V Hosts and Clusters in VMM”](#).

Actions

recommends actions for the cloud target supply chain as follows.

Entity Type	Action
Virtual Machines	<ul style="list-style-type: none"> Provision additional resources (VMem, VCPU) Move Virtual Machine Move Virtual Machine Storage Reconfigure Storage Reconfigure Virtual Machine
Physical Machines	<ul style="list-style-type: none"> Start Physical Machine Provision Physical Machine Suspend Physical Machine
Consumer Virtual Datacenters	<ul style="list-style-type: none"> Resize Consumer vDC Provision Consumer vDC

Monitored Resources

monitors the following resources for the cloud target supply chain:

Entity Type	Commodity
Virtual Machine	<ul style="list-style-type: none"> Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) Virtual Storage (VStorage) The utilization of the virtual storage capacity allocated for the VM Measured in Kilobytes (KB) Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS Latency The utilization of latency allocated for the VStorage on the VM

Entity Type	Commodity
	Measured in milliseconds (ms)
Physical Machine	<ul style="list-style-type: none"> <li data-bbox="396 302 1474 428"> • Memory (Mem) The utilization of the PM's memory reserved or in use Measured in Kilobytes (KB) <li data-bbox="396 443 1474 569"> • CPU The utilization of the PM's CPU reserved or in use Measured in Megahertz (MHz) <li data-bbox="396 583 1474 709"> • IO The utilization of the PM's IO adapters Measured in Kilobytes per second (KB/s) <li data-bbox="396 724 1474 850"> • Net The utilization of data through the PM's network adapters Measured in Kilobytes per second (KB/s) <li data-bbox="396 865 1474 991"> • Swap The utilization of the PM's swap space Measured in Kilobytes (KB) <li data-bbox="396 1005 1474 1131"> • Balloon The utilization of shared memory among VMs running on the host. ESX-only Measured in Kilobytes (KB) <li data-bbox="396 1146 1474 1306"> • CPU Ready The utilization of the PM's allocated ready queue capacity (measured in Kbytes) that is in use, for 1, 2, and 4 CPU ready queues. ESX-only Measured in Megahertz (MHz)
Datacenter	<p data-bbox="418 1331 1479 1394">NOTE: For datacenter entities, does not monitor resources directly from the datacenter, but from the physical machines in the datacenter.</p> <ul style="list-style-type: none"> <li data-bbox="396 1430 1474 1556"> • Memory (Mem) The utilization of the PM's memory reserved or in use Measured in Kilobytes (KB) <li data-bbox="396 1570 1474 1696"> • CPU The utilization of the PM's CPU reserved or in use Measured in Megahertz (MHz) <li data-bbox="396 1711 1474 1837"> • IO The utilization of the PM's IO adapters Measured in Kilobytes per second (KB/s) <li data-bbox="396 1852 1474 1925"> • Net The utilization of data through the PM's network adapters

Entity Type	Commodity
	<p>Measured in Kilobytes per second (KB/s)</p> <ul style="list-style-type: none"> Swap <p>The utilization of the PM's swap space</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> Balloon <p>The utilization of shared of memory among VMs running on the host. ESX-only</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> CPU Ready <p>The utilization of the PM's allocated ready queue capacity (measured in Kbytes) that is in use, for 1, 2, and 4 CPU ready queues. ESX-only</p> <p>Measured in Kilobytes (KB)</p>
Provider Virtual Datacenter	<ul style="list-style-type: none"> Memory (Mem) <p>The utilization of the Datacenter's memory reserved or in use</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> CPU <p>The utilization of the Datacenter's CPU reserved or in use</p> <p>Measured in Megahertz (MHz)</p> <ul style="list-style-type: none"> Storage <p>The utilization of the storage attached to the Provider vDC.</p> <p>Measured in Kilobytes (KB)</p>
Consumer Virtual Datacenter	<ul style="list-style-type: none"> Memory (Mem) <p>The utilization of the Datacenter's memory reserved or in use</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> CPU <p>The utilization of the Datacenter's CPU reserved or in use</p> <p>Measured in Megahertz (MHz)</p> <ul style="list-style-type: none"> Storage <p>The utilization of the storage attached to the Consumer vDC.</p> <p>Measured in Kilobytes (KB)</p>

Public Cloud

The public cloud provides compute, storage, and other resources on demand. You can run all of your infrastructure on a public cloud, or you can set up a hybrid environment where you burst workload to the public cloud as needed. can analyze the performance of applications running on the public cloud, and provision more instances as demand requires.

For a hybrid environment, can provision copies of your application VMs on the public cloud to satisfy spikes in demand, and as demand falls off it can suspend those VMs if they're no longer needed.

With public cloud targets, you can use to:

- Scale VMs and Databases
- Change storage tiers
- Purchase VM Reservations
- Locate the most efficient workload placement within the hybrid environment, while assuring performance
- Detect unused storage volumes

Cloud-based datacenters support scalability, resource pooling, multi-tenancy, and self-service management of virtual resources. supports the following cloud technologies:

Supply Chain

For public clouds, discovers Regions and Zones, and adds them as Datacenter Entities. Regions and zones divide the public cloud into managed subsets. A region is typically associated with the geographic location of the cloud resources, and a zone is some division within the region. One region contains multiple zones.

Amazon Web Services

Amazon Web Services (AWS) provides a reliable and scalable infrastructure platform in the cloud. You gain access to this infrastructure through a subscription account with the appropriate organization API permissions. To specify an AWS target, you provide the credentials for that account and discovers the resources available to you through that account.

In order to discover RI utilization, you must provide with access to the S3 bucket that contains the AWS Cost and Usage report. Without this access, 's purchase and scale decisions will be made without consideration of this data.

Adding AWS Targets

For to manage an AWS account, you provide the Access Key credentials that you use to access that account. For information about getting an Access Key for an AWS account, see the Amazon Web Services documentation.

To add AWS targets, select **Cloud Management > AWS** on the Target Configuration page, and provide the following information:

- Address
The display name that will be used to identify the target in the Target List. This is for display in the UI only; it does not need to match any internal name.
- Access Key
Provide the **Access Key** for the account you want to manage.
- Secret Access Key
Provide the **Access Key Secret** for the account you want to manage.
- Proxy Host
The IP of your Proxy Host
- Proxy Port
The port required for the proxy above
- Cost and Usage Report Bucket

Name of the S3 bucket that contains the AWS Cost and Usage report.

- Cost and Usage Report Region

Region of the S3 bucket that contains the AWS Cost and Usage report.

- Cost and Usage Report Path

Path in the S3 bucket to the AWS Cost and Usage report.

- ARN Account ID

Shows the ARN that discovers for this target. You should never provide a value for this field.

NOTE:

supports logging in to AWS targets via AWS Identity and Access Management (IAM) with IAM Users or IAM Roles. To enable using IAM Roles, you must run the software on an EC2 instance in the AWS cloud, and you must have the instance run as the IAM Role, and connect to the AWS target accounts with the appropriate IAM Role. To perform these actions, please contact Technical Support.

Firewall and Proxy Access

To use AWS with a proxy or firewall, it must be configured to allow unrestricted access to the following URLs:

Functionality	AWS Endpoint
Price List	api.pricing.us-east-1.amazonaws.com
AWS Bill	{bucket-name}.s3.{region-containing-report}.amazonaws.com
CloudWatch	monitoring.{region-id}.amazonaws.com
CloudWatch Events	events.{region-id}.amazonaws.com
CloudWatch Logs	logs.{region-id}.amazonaws.com
EC2	ec2.{region-id}.amazonaws.com
Elastic Load Balancing	elasticloadbalancing.{region-id}.amazonaws.com
IAM	iam.amazonaws.com
Organizations	organizations.{region-id}.amazonaws.com
Relational Database Service (RDS)	rds.{region-id}.amazonaws.com
Resource Groups	resource-groups.{region-id}.amazonaws.com
Service Catalog	servicecatalog.{region-id}.amazonaws.com
S3	s3.{region-id}.amazonaws.com
Storage Gateway	storagegateway.{region-id}.amazonaws.com

Whitelisting AWS Regions

While discovering your AWS environment, if it fails to reach one or more AWS regions, then AWS discovery will fail for that target.

There may be policy decisions that prevent from reaching all AWS regions. For example, if you operate behind a firewall, you might not be able to reach all the regions that are available to your AWS account. In that case, you need to specify which regions you want to discover.

For information about how to specify the regions that you want to discover, contact your support representative.

Cost and Usage Report

In order for to display month-to-day spend, you must create a cost and usage report in AWS and store it in an S3 bucket.

For more information, see [Displaying AWS Spend In](#).

Enabling Collection of Memory Statistics

For to collect memory statistics in AWS, you must set up CloudWatch to enable the collection of these statistics on the VMs in your environment. For more information, see [Enabling Collection of Memory Statistics: AWS \(on page 82\)](#).

IAM Authentication

To connect to an AWS target via IAM, requires an IAM User for authentication. This user must have the following permissions:

NOTE:

recommends that you set up IAM access via an IAM group that has the necessary permissions. After you create this group, create a user that is a member of it and specify that user for to access your AWS environment. For more information on IAM Groups, see <http://docs.aws.amazon.com/IAM/latest/UserGuide/best-practices.html>.

The user account must have the following permissions.

For read access:

Use these permissions to gain insight into your environment, including utilization statistics and costs for workloads and services. can recommend actions, but this account cannot execute them.

- AmazonRDSReadOnlyAccess
- AmazonEC2ReadOnlyAccess
- AmazonS3ReadOnlyAccess
- organizations:List*
- organizations:Read*

For write access (Action Execution):

Use these permissions to automate actions based on analysis.

- AmazonRDSFullAccess
- AmazonEC2FullAccess
- AmazonS3ReadOnlyAccess
- kms:CreateGrant*
- organizations:List*
- organizations:Read*

also supports logging in to AWS targets via IAM Roles. To enable using Roles, you must run the software on an EC2 instance in the AWS cloud, and you must have the instance run as the IAM Role, and connect to the AWS target

accounts with the appropriate IAM Role. To perform these actions, see <https://greencircle.vmturbo.com/docs/DOC-5593-role-based-target-access>. For troubleshooting, contact Technical Support.

Actions

recommends actions for the cloud target supply chain as follows.

Entity Type	Action
Virtual Machines (Cloud)	<ul style="list-style-type: none"> Scale up to template (based on VMem / VCPU) Scale down to template (based on VMem / VCPU) Move Virtual Machine (intra-cloud) <p>NOTE: This is a destructive move- data / applications are not preserved. This action also requires both a merge policy and the moved VM to be a Linux VM with template configuration.</p>
Zone	<ul style="list-style-type: none"> Start VM on the Zone Suspend VM on the Zone

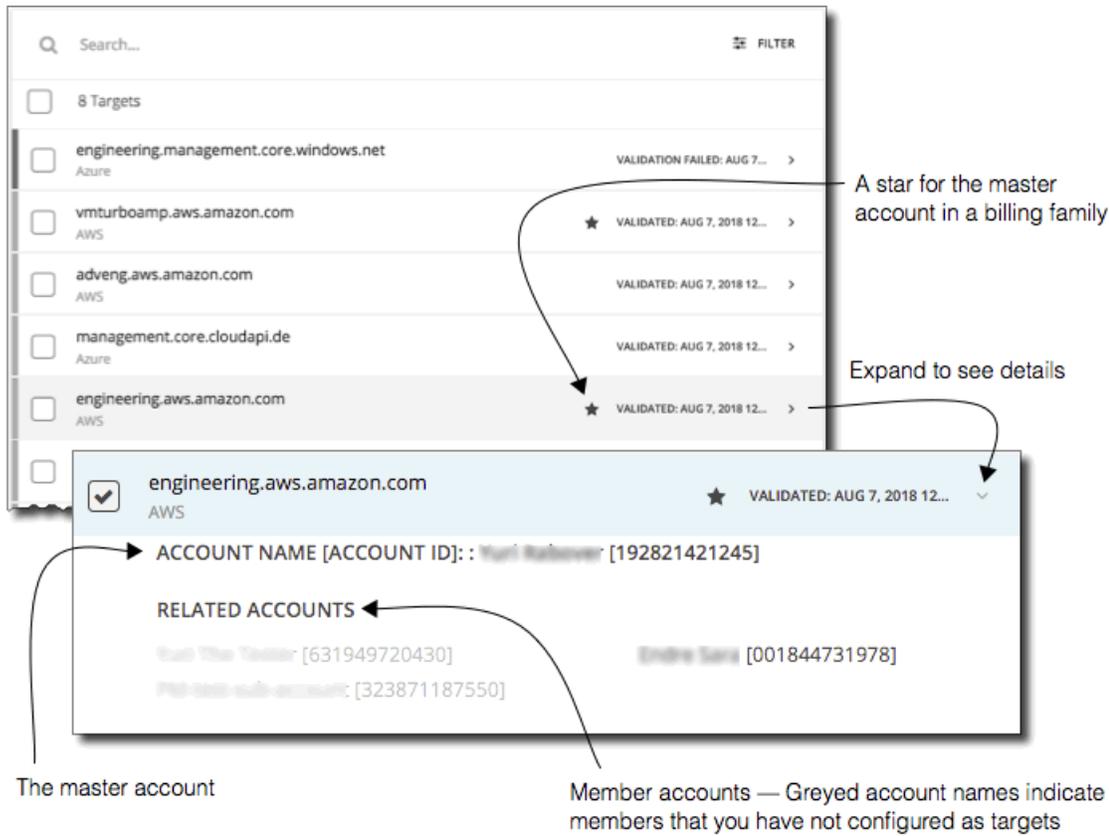
Monitored Resources

monitors the following resources for the cloud target supply chain:

Entity Type	Commodity
Virtual Machine (Cloud)	<ul style="list-style-type: none"> Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS Net Throughput Rate of message delivery over a port Measured in KB/s I/O Throughput The throughput to the underlying storage for the entity Measured in KB/s Latency

Entity Type	Commodity
	The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)
Database Server	<ul style="list-style-type: none"> <li data-bbox="462 388 1250 514"> • Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) <li data-bbox="462 525 1250 651"> • Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) <li data-bbox="462 661 1250 787"> • Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) <li data-bbox="462 798 1250 924"> • I/O Throughput The throughput to the underlying storage for the entity Measured in KB/s <li data-bbox="462 934 1250 1060"> • Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)

AWS Billing Families



As you configure AWS targets, discovers AWS accounts that are consolidated into *billing families*. A billing family has one *master* account, and zero or more *member* accounts. By recognizing billing families, more accurately calculates cloud investments and savings, and makes more accurate recommendations for RI coverage.

In the Targets user interface, master accounts appear in bold, with a star next to them. You can expand the account entry to see the related member accounts. If you expand the entry for a member account, then the related accounts includes the family master, indicated by a star.

For RI purchases, different accounts in a billing family can share the same RI resources. At the same time, accounts in other billing families cannot use those RIs. This adds flexibility to your RI coverage, while maintaining order over the billing.

In , if you enable Billing Family Recognition, then you can see the billing family master and member accounts in the Targets user interface, and can recommend proper RI purchases within the correct billing families.

To enable Billing Family Recognition, ensure the following as you configure your AWS targets:

- Use the proper role for each AWS target
 - To properly discover billing family information for a target, you must give credentials for an AWS role that includes the permission, `organizations:DescribeOrganization`. With that permission, can:
 - Discover master accounts and member accounts in different billing families
 - Display the account names in the user interface
 - Discover billing information for each family and account
 - Recommend RI actions that respect billing family boundaries
- Configure targets for the complete billing family

One billing family can consolidate a number of AWS accounts. For to include these accounts in its analysis, you must configure each one as a separate target. If you do not configure all the accounts in a billing family, then cannot discover complete billing information for that family, and its analysis will be based on incomplete information.

displays member accounts that have been configured as targets in regular text. For members that discovers but have not been configured as targets, displays their names in grayed text.

If you have enabled Billing Family Recognition, you should keep the following points in mind:

- Billing families can grow

regularly checks the membership of your billing families. If it discovers a new member account, it adds that account to the list of members. If you have already configured the account as a target, then includes the new member in its analysis of billing families. If the new member is not already a target, then lists the new member in grayed text.

- You can configure discounts per billing family

includes a feature to set a discount for a billing group, and to override that discount for specific template families within that scope. For more information, see "Cloud Discounts" in the *User Guide* and "Discount Override: AWS" in the *User Guide*.

- You might see master accounts that have no member accounts

AWS treats every account you create as a part of a billing family. Assume you created an account, but you had no reason to consolidate its billing with any other accounts. In that case, the account appears in the user interface as a master account, but it has no member accounts.

Microsoft Azure

Microsoft Azure is Microsoft's infrastructure platform for the public cloud. You gain access to this infrastructure through a service principal target. To specify an Azure target, you provide the credentials for that account and discovers the resources available to you through that account.

Azure service principal targets will automatically discover the subscriptions to which the service principal has been granted access in the Azure portal. This in turn will create a derived target for each subscription that inherits the authorization provided by the service principal (e.g. contributor). Derived subscription targets are not directly modifiable but otherwise behave like any other target that may be validated and the inventory discovered.

Prerequisites

- External access via Client/App ID
- Azure Resource Manager

NOTE:

will not discover Azure Classic virtual machines, as they do not utilize the Azure Resource Manager.

You must allow at least 30 minutes of discovery time for to allow full discovery of the Resource Group information.

NOTE:

In Azure environments, when you first configure an Azure target, under some circumstances the target has `No Quotas Available`, and so cannot discover the available templates. This can happen when you initially set up the Azure account and you have not enabled any providers. If this occurs, you can install a single VM in your cloud subscription to make quotas available. Or you can navigate to the Azure Subscriptions Blade and select the subscription you want. Then for the resource providers, register the `Microsoft.Compute` option. For more information, see the following Microsoft article: [Resolve errors for resource provider registration](#).

External Access via Client/App ID

The administrator of an Azure account can register a Web App with the account — This gives an external application access to the account’s resources. connects to an Azure target via a Web App registered for that Azure account.

To register a Web App with your account:

- Log into the Azure Management Portal
- Add a Web App to an available Active Directory — The Active Directory will correspond with the Tenant ID that you set for the target.
- From the Application’s page in the Management Portal, go to the Configure page

This page displays the generated Client App ID and Client Secret Key for this app.

NOTE:

The person who registers the Web App must record the generated secret key. You can return to the Management Portal to see the Client App ID, but the portal only shows the Secret Key when you register that app.

For more information, refer to your Microsoft Azure documentation.

Adding Azure Targets

To add Azure targets, select **Cloud Management > Azure** on the Target Configuration page, and provide the following information:

NOTE:

For information about how to get these credentials, see the Green Circle article, [“Cloud Control: Azure Target Setup”](#)

- Name
The display name that will be used to identify the target in the Target List. This is for display in the UI only; it does not need to match any internal name.
- Tenant ID
The ID of the tenant you want to manage in your Azure subscription.
- Client App ID
The Client/App ID of the Web App that gives access to resources in your Azure subscription.
- Client Secret Key
The secret key for the Web App.

Firewall and Proxy Access

To use Azure with a proxy or firewall, it must be configured to allow unrestricted access to the following URLs:

- `ratecard.azure-api.net`
- `management.azure.com`

- login.microsoftonline.com
- *.core.windows.net

Memory Statistics

For to collect memory statistics in Azure, you must enable the collection of these statistics on the VMs in your environment. You can do this as you deploy your VMs, or you can enable the counters after the fact on VMs you have already deployed. For more information, see [Enabling Collection of Memory Statistics: Azure \(on page 85\)](#).

Actions

recommends actions for the cloud target supply chain as follows.

Entity Type	Action
Virtual Machines (Cloud)	<ul style="list-style-type: none"> • Scale up to template (based on VMem / VCPU) • Scale down to template (based on VMem / VCPU) • Move Virtual Machine (intra-cloud) <p>NOTE: This is a destructive move- data / applications are not preserved. This action also requires both a merge policy and the moved VM to be a Linux VM with template configuration.</p>

Monitored Resources

monitors the following resources for the cloud target supply chain:

Entity Type	Commodity
Virtual Machine (Cloud)	<ul style="list-style-type: none"> • Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) • Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) • Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) • Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS • Net Throughput Rate of message delivery over a port Measured in KB/s • I/O Throughput The throughput to the underlying storage for the entity

Entity Type	Commodity
	Measured in KB/s <ul style="list-style-type: none"> Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)
Database Server	<ul style="list-style-type: none"> Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) I/O Throughput The throughput to the underlying storage for the entity Measured in KB/s Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)

Microsoft Enterprise Agreement

You can configure to manage Azure subscriptions within the context of an Enterprise Agreement (EA). An EA target enables to use custom pricing and discover reserved instances. When you configure an EA target, uses that richer pricing information to calculate workload size and RI coverage for your Azure environment.

To enable management of Azure EA environments, you must configure both an EA target and at least one service principle target. For more information about service principal targets, see [Adding Azure Targets \(on page 33\)](#).

Prerequisites

- Microsoft Azure EA access key
- You must ensure that **DA View Charges** and **AO View Charges** are both enabled in the EA Portal (located under **Manage**). If you just enabled these settings, it can take up to 24 hours for the changes to take effect. For more information, see [Troubleshoot enterprise cost views](#) in the Microsoft Azure documentation.

Adding Microsoft Enterprise Agreement Targets

To add a Microsoft Enterprise Agreement target, select the **Cloud Management > Microsoft Enterprise Agreement** option on the Target Configuration page and provide the following information:

- **Target Name**
A user-friendly name that will identify the target
- **Enrollment Number**
Enterprise Agreement enrollment number (found in your EA admin account at ea.azure.com)
- **API Key**
The API Access Key for the Enterprise Agreement (found in your EA admin account at ea.azure.com)
- **Proxy Host**
The IP address of the proxy server used, if any
- **Proxy Port**
The port number of the proxy server
- **Proxy User**
The username of the proxy user used to authenticate
- **Proxy Password**
The password of the proxy user used to authenticate

When you add the target and it validates, :

- Recognizes any existing Azure targets in your environment that are part of the EA
- Updates these targets with custom prices from the EA
- Discovers RIs in these targets

Note that this can take up to 24 hours, as target stitching occurs after the next bill processing cycle.

NOTE: does not generate actions on the EA target specifically, but for the underlying service principal targets. For information about actions and monitored resources for Azure targets, see [Adding Azure Targets \(on page 33\)](#).

Azure Enterprise Agreements

The star indicates an EA account

Development is one of the targets related to this EA

The Service Principal target discovers the underlying Azure subscriptions. Some participate in the EA...

While others are Standalone, or pay-as-you-go

You can configure to manage Azure subscriptions within the context of an Enterprise Agreement (EA). An EA defines specific pricing, including the pricing for Reserved Instances (RIs). When you configure an EA target, and set the EA key to your Azure targets, uses that richer pricing information to calculate workload placement and RI coverage for your Azure environment.

To enable management of Azure EA environments, you must configure:

- One Microsoft Enterprise Agreement target
- At least one Service Principal target that can discover the underlying Azure subscriptions

For information about Azure targets, see [Microsoft Azure \(on page 33\)](#).

In the Targets View, you can identify the targets related to Azure EA as follows:

- EA Targets

The target that discovers the EA to track pricing and RI information. You can have one EA target per deployment. The EA target appears with a star next to the validation date. Expand the entry to see the EA enrollment number, and the Azure subscriptions that participate in the EA.
- Azure Subscription Targets

The targets that manage the workloads in your Azure environment. These are discovered by Service Principal targets. Note that not all subscription targets *necessarily* participate in the EA. Expand these entries to see the related Service Principal target. For members of the EA, you can see the related EA target as well.

Subscriptions that do not participate in the EA appear as Standalone targets.

NOTE:

In rare circumstances, you can have a subscription that is not in use – The subscription has no workloads associated with it. In this case, identifies the subscription as Standalone. This is because the target cannot discover any cost or usage information that would relate the subscription to its EA.

- Service Principal Targets

The Azure target that you configure to discover Azure subscription targets. Expand the entry to see the discovered targets. If you have configured an EA target, the entry lists that as well, along with the EA enrollment number.

Reserved Instances and Azure EA

For Azure environments, can only discover and use RIs if you have configured a Microsoft Enterprise Account target, and if one or more subscriptions participate in that EA.

To discover and manage RIs in Azure environments, uses both the EA target and the associated subscription targets. On its own, a subscription target exposes costs for pay-as-you-go pricing. The EA target discovers pricing for the available RI instance types. combines this information to track:

- RI utilization
- RI coverage
- Virtual machine costs (accounting for RIs)

NOTE:

This release of does not support RI discovery and management for Classic VMs and Classic Cloud Services. Also, it does not support RI discovery and management for Suppressed Core virtual machines.

Cost Calculations for Azure Environments

To understand the reported costs in your Azure environment, consider these points:

- For targets that participate in the EA, uses the terms of the given EA, and bases costs on the Offer ID that is effective for the given subscription.
- For VMs in Azure, RI pricing does not include the cost of the OS license. However pricing for on-demand VMs does include the license cost.

NOTE:

For Microsoft Azure EA environments, the projected cost for RI Purchase actions might not match associated costs you find in the Microsoft Pricing Calculator.

actions can recommend RI purchases. For these recommendations, the action assumes a free Linux OS, so the cost estimate does not include the OS cost. However, The Microsoft Pricing Calculator does include costs for OS licenses. As a result, when you compare the cost estimates to the values in the Pricing Calculator, it's likely that the two estimates will not match. This difference also affects the Break Even Point that appears in the Recommended RI Purchases chart. Because the recommended purchases do not include Azure costs for OS licenses, the listed Break Even Point can be optimistic.

- For workloads you migrated from on-prem to the Azure cloud, recognizes Azure Hybrid Benefit (AHUB) savings for RIs and on-demand workloads. The costs you see in charts include this benefit. However, remember that recommended actions do not include any license cost, so the actions will not reflect any proposed AHUB savings (see above).
- supports rate cards for workloads that use the pricing set by a Cloud Solution Provider. Note that rate cards only apply to on-demand workloads, and they do not include RI pricing data. For more information, see " Azure Rate Cards" in the *User Guide*.

Storage Targets

Adding a storage Target enables to connect to your storage subsystem through an SMI-S provider API or through the controller's native API. uses the target's API to access information about each of the underlying disk arrays, and uses this information to set disk performance characteristics according to the type and capacity of storage. This leads to improved workload placement. Similarly, knows the relationships between storage controllers and disk arrays, and about the location of datastores within those arrays. This information also helps optimize workload placement.

The section below describes the storage supply chain. For information on how to add specific storage targets, the resources can monitor for the various supply chain entities, and the actions it can take to optimize the environment, refer to the target configuration instructions for your specific storage type.

Supply Chain

Storage targets (storage controllers) add Storage Controller and Disk Array entities to the supply chain. Disk Array entities in turn host Storage entities (datastores).

Entity Mapping

Mapping	EMC VMAX	HPE 3Par	NetApp	Pure
Storage	Volume (Regular, Thin, Meta)	Virtual Volume	Volume	Volume
Disk Array	Disk Group or Thin Pool	CPG	Aggregate	Shelf Array
Storage Controller	VMAX Array	Controller	Controller / Fil-er	Controller

Actions

recommends actions for storage targets as follows.

NOTE:

This is a general list of actions for storage managed by storage controllers. Specific actions can recommend, and which actions it can automate depends on the actual technology — Not all actions make sense for all types of storage. For example, can automate a datastore move across disk arrays or storage controllers for NetApp in C mode, but not for other storage technologies.

You can see how actions differ per technology in each section that describes adding a specific type of Storage Manager target.

Entity Type	Action
Storage	<ul style="list-style-type: none"> Start Storage Provision Storage Suspend Storage Move (only with Storage Targets configured) Resize (only with Storage Targets configured)
Disk Arrays	<ul style="list-style-type: none"> Provision Disk Array

Entity Type	Action
	<ul style="list-style-type: none"> Start Disk Array Suspend Disk Array Move Disk Array (for NetApp Cluster-Mode, only) Move Virtual Machine Move Datastore
Storage Controller	<ul style="list-style-type: none"> Provision Storage Controller (recommendation only)

Monitored Resources

monitors the following storage resources:

Entity Type	Commodity
Storage	<ul style="list-style-type: none"> Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) Storage Provisioned The utilization of the datastore's capacity, including overprovisioning. Measured in Megabytes (MB) Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the datastore Measured in Operations per second Latency The utilization of latency on the datastore Measured in Milliseconds (ms)
Disk Array	<p>NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> Storage Amount The utilization of the Disk Array's capacity. Measured in Megabytes (MB) Storage Provisioned The utilization of the Disk Array's capacity, including overprovisioning. Measured in Megabytes (MB) Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the disk array Measured in Operations per second Latency The utilization of latency, computed from the latency of each device in the disk array.

Entity Type	Commodity
	Measured in milliseconds (ms)
Storage Controller	<p>NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> CPU The utilization of the Storage Controller's CPU in use Measured in Megahertz (MHz) Storage Amount The utilization of the storage controller's capacity. The storage allocated to a storage controller is the total of all the physical space available to aggregates managed by that storage controller Measured in Megabytes (MB)

EMC VMAX

supports management of VMAX2 and 3 Series storage arrays. The VMAX series is a family of enterprise storage arrays designed for SAN environments. connects to VMAX storage systems via an EMC SMI-S provider that has the disk arrays added to it. A single SMI-S provider can communicate with one or more disk arrays. When you specify an SMI-S provider as a target, discovers all the added disk arrays.

will create Storage Groups based on the SLO levels defined in VMAX3 Targets. By default, Storage Move actions will respect these SLO levels based on the configured response time.

Prerequisites

- EMC SMI-S Provider V8.x
- A service account that can use to connect to the EMC SMI-S Provider (typically the default `admin` account)

Adding VMAX Targets

To add VMAX targets, select the **Storage > VMAX** option on the Target Configuration page and provide the following information:

- Address
The IP or host name of the SMI-S provider. If using HTTPS, you must follow the IP with `:PORT`.
- Username
The Username for the SMI-S provider.
- Password
The Password for the SMI-S provider.

Entity Comparison

After validating the new target, discovers the connected storage entities. This table compares terms used in EMC VMAX to those used in :

EMC VMAX Name	Entity
Volume (Regular, Thin, Meta)	Storage
Storage Resource Pool (VMAX3) / Thick Provisioned Pool (earlier)	Disk Array
Storage Group (VMAX3) / Thin Provisioned Pool (earlier)	Logical Pool
VMAX Array	Storage Controller

Supported Actions

For each discovered entity, can execute or recommend certain actions, as outlined below.

Entity Type	Can Be Automated	Recommendations only
Storage	Provision (Cloning), Delete	Resize (V-Volumes only)
Logical Pool		Resize
Disk Array		Provision

Monitored Resources

When calculating available storage, excludes disks devoted to the VMAX operating system by default. If these disks are assigned to new raid groups or storage pools, the capacity of those disks will then be considered when calculating the capacity of the Storage Controller.

monitors the following storage resources:

Entity Type	Commodity
Storage	<ul style="list-style-type: none"> • Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) • Storage Provisioned The utilization of the datastore's capacity, including overprovisioning. Measured in Megabytes (MB) • Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the datastore Measured in Operations per second • Latency The utilization of latency on the datastore

Entity Type	Commodity
	Measured in Milliseconds (ms)
Logical Pool	<p>NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> • Storage Amount The utilization of the logical pool's capacity. Measured in Megabytes (MB) • Storage Provisioned The utilization of the logical pool's capacity, including overprovisioning. Measured in Megabytes (MB) • Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the logical pool. Measured in Operations per second • Latency The utilization of latency on the logical pool. Measured in milliseconds (ms)
Disk Array	<p>NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> • Storage Amount The utilization of the Disk Array's capacity. Measured in Megabytes (MB) • Storage Provisioned The utilization of the Disk Array's capacity, including overprovisioning. Measured in Megabytes (MB) • Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the disk array Measured in Operations per second • Latency The utilization of latency, computed from the latency of each device in the disk array. Measured in milliseconds (ms)
Storage Controller	<ul style="list-style-type: none"> • Storage Amount The utilization of the storage controller's capacity. Measured in Megabytes (MB)

HPE 3PAR

HPE 3PAR StoreServ systems use controller nodes to manage pools of storage resources and present a single storage system to consumers. communicates with the HPE 3PAR system via both the WSPAI and SMI-S providers that are installed on the 3PAR controller node.

Prerequisites

- SMI-S Provider enabled and configured on the controller node.
- WSPAI Provider enabled and configured on the controller node.
- A service account on the controller node that can use to connect to the SMI-S and WSPAI providers.

NOTE:

For discovery and monitoring, the service account must have the `Browse` permission on all monitored domains. To exclude domains from monitoring, the service account must have no permissions on those domains. For action execution, requires the `Edit` permission.

Setting Up the SMI-S Provider

The HPE 3PAR SMI-S Provider should be installed on the controller node. It is disabled by default — you must ensure that it is installed properly and running on the controller node.

To enable the SMI-S provider:

1. Log into the HPE 3PAR Command Line Interface (CLI).
Open a secure shell session (ssh) on the controller node. Default credentials are `3paradm/3pardata`.
2. Check the current status of the SMI-S provider.
In the shell session, execute the command, `showcim`.
3. If the CIM service is not running, start it.
Execute the command `startcim` to enable the CIM service and the SMI-S provider.

To stop the SMI-S provider, execute the command `stopcim -f -x`.

Setting Up the WSPAI Provider

The HPE 3PAR WSPAI Provider should be installed on the controller node.

To enable the WSPAI provider:

1. Log into the HPE 3PAR Command Line Interface (CLI).
Open a secure shell session (ssh) on the controller node. Default credentials are `3paradm/3pardata`.
2. Check the current status of the WSPAI provider.
In the shell session, execute the command, `showwsapi`.
3. If the WSPAI service is not running, start it by executing the command `startwsapi`.
Execute the command `set wsapi -http enable` to allow only insecure connections, or `set wsapi -https enable` to allow only secure connections.

To stop the WSPAI provider, execute the command `stopwsapi -f`.

Adding HPE 3PAR Targets

To add an HPE 3PAR target, select the **Storage > HPE 3Par** option on the Target Configuration page and provide the following information:

- **Address**
The name or IP address of the 3PAR controller node.
By default, the controller provides SMI-S data over port 5988 (HTTP) or port 5989 (HTTPS). If your installation uses a different port for SMI-S, include the port number in the Address field.
- **Username/Password**
Credentials for a user account on the controller node.

After validating the new target, discovers the connected storage entities. This table compares terms used in HPE 3PAR to those used in :

HPE 3PAR Name	Entity
Virtual Volume	Storage
CPG	Disk Array
AO Configuration	Logical Pool
Controller	Storage Controller

Supply Chain

Storage targets (storage controllers) add Storage Controller, Logical Pool and Disk Array entities to the supply chain. Logical Pool and Disk Array entities then host Storage entities (datastores). For a visual representation, see the introductory [Storage Supply Chain \(on page 40\)](#).

3Par Adaptive Optimization

Adaptive Optimization (AO) for HPE 3Par enables management of data storage across two or three tiers. AO places storage regions on the appropriate tier in response to periodic analysis that AO performs.

To work with the storage in an AO group, :

- Discovers each Common Provisioning Group (CPG) as a disk array
In the user interface, these disk arrays do not host storage — They appear empty. will not recommend storage moves between these disk arrays, because such moves would conflict with AO block-level placement.
- Creates a single logical pool that hosts all the datastores in an AO group
This logical pool represents the AO group, and it includes all the member CPGs. considers this single logical pool when it performs analysis — It can recommend moving storage into or out of the AO group. Also, aggregates resource capacity in this logical pool. For example, the IOPS capacity for the AO logical pool is a combination of IOPS capacity for the constituent CPGs.

You can see the AO logical pool in the user interface. The display name for this logical pool is the name of the AO Configuration.

Supported Actions

For each discovered entity, can execute or recommend certain actions, as outlined below.

Entity Type	Can Be Automated	Recommendations only
Storage	Provision, Resize Up/Down, Delete	Move
Disk Array	Provision, Resize Up/Down, Delete	
Logical Pool		Provision, Resize Up/Down, Delete
Storage Controller		Provision

Monitored Resources

monitors the following storage resources:

Entity Type	Commodity
Storage	<ul style="list-style-type: none"> Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) Storage Provisioned The utilization of the datastore's capacity, including overprovisioning. Measured in Megabytes (MB) Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the datastore Measured in Operations per second Latency The utilization of latency on the datastore Measured in Milliseconds (ms)
Disk Array	<p>NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> Storage Amount The utilization of the Disk Array's capacity. Measured in Megabytes (MB) Storage Provisioned The utilization of the Disk Array's capacity, including overprovisioning. Measured in Megabytes (MB) Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the disk array Measured in Operations per second Latency The utilization of latency, computed from the latency of each device in the disk array. Measured in milliseconds (ms)

Entity Type	Commodity
Logical Pool	<p>NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> • Storage Amount The utilization of the logical pool's capacity. Measured in Megabytes (MB) • Storage Provisioned The utilization of the logical pool's capacity, including overprovisioning. Measured in Megabytes (MB) • Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the logical pool. Measured in Operations per second • Latency The utilization of latency on the logical pool. Measured in milliseconds (ms)
Storage Controller	<p>NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> • CPU The utilization of the Storage Controller's CPU in use Measured in Megahertz (MHz) • Storage Amount The utilization of the storage controller's capacity. The storage allocated to a storage controller is the total of all the physical space available to aggregates managed by that storage controller Measured in Megabytes (MB)

NetApp

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. connects to these storage controllers to support NetApp targets in 7-Mode and Cluster-Mode (C-Mode).

Prerequisites

- Storage Control Module license
- Transport Layer Security (TLS) is enabled
- A service account can use to connect to the NetApp target

Enabling TLS

Starting with version 5.4, by default requires Transport Layer Security (TLS) version 1.2 to establish secure communications with targets. NetApp filers have TLS disabled by default, and the latest version they support is TLSv1. If your NetApp target fails to validate on 5.4 or later, this is probably the cause.

If target validation fails because of TLS support, you might see validation errors with the following strings:

- No appropriate protocol

To correct this error, ensure that you have enabled the latest version of TLS that your target technology supports. If this does not resolve the issue, please contact [Technical Support](#).

- Certificates does not conform to algorithm constraints

To correct this error, refer to your NetApp documentation for instructions to generate a certification key with a length of 1024 or greater on your target server. If this does not resolve the issue, please contact [Technical Support](#).

For information about enabling TLS, see the Data ONTAP **System Administration Guide** for sections on the SSL protocol.

Service User Account — Administrator Role

To discover and fully manage NetApp disk arrays, must have a service account that grants privileges to execute commands through the NetApp filer's OnTap API (ontapi). In most cases, you can provide a user account with Administrator privileges:

- **NetApp 7-Mode:** Create the administrator account from the NetApp command line — For example:

```
useradmin user add -g Administrators
```

- **NetApp C-Mode:** Create the administrator account via the NetApp OnCommand System Manager, or from the NetApp command line — For example:

```
security login create -role admin -username -application ontapi -authmethod password
```

If you prefer not to grant full administrator rights, see [Creating Restricted Service Accounts In NetApp \(on page 51\)](#)

Adding NetApp Targets

To add a NetApp target, select the **Storage > NetApp** option on the Target Configuration page and provide the following information:

- Address

The name or IP address of the NetApp Storage Controller.

7-Mode: Enter the storage controller address.

Cluster-Mode (C-Mode): Enter the cluster management address.

- Username/Password

Credentials for the NetApp service user account that you have configured for to use.

After validating the new target, discovers the connected storage entities. This table compares terms used in NetApp to those used in :

NetApp Name	Entity
Volume	Storage
Aggregate	Disk Array

NetApp Name	Entity
Controller / Filer	Storage Controller

Supply Chain

Storage targets (storage controllers) add Storage Controller and Disk Array entities to the supply chain. Disk Array entities then host Storage entities (datastores). For a visual representation, see the introductory [Storage Supply Chain \(on page 40\)](#).

Supported Actions

For each discovered entity, can execute or recommend certain actions, as outlined below.

Entity Type	Can Be Automated	Recommendations only
Storage	Move (C-Mode only)	Move (7-Mode), Provision, Resize Up
Disk Array		Resize Up, Move (C-Mode only), Provision (C-Mode only)
Storage Controller		Provision

Note that for NetApp in C-Mode, can automate moving a datastore to a disk array on the same storage controller, as well as moves to a disk array on a different storage controller.

Monitored Resources

monitors the following storage resources:

Entity Type	Commodity
Storage	<ul style="list-style-type: none"> Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) Storage Provisioned The utilization of the datastore's capacity, including overprovisioning. Measured in Megabytes (MB) Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the datastore Measured in Operations per second Latency The utilization of latency on the datastore Measured in Milliseconds (ms)
Disk Array	<p>NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> Storage Amount

Entity Type	Commodity
	<p>The utilization of the Disk Array's capacity. Measured in Megabytes (MB)</p> <ul style="list-style-type: none"> Storage Provisioned <p>The utilization of the Disk Array's capacity, including overprovisioning. Measured in Megabytes (MB)</p> <ul style="list-style-type: none"> Storage Access Operations Per Second (IOPS) <p>The summation of the read and write access operations per second on the disk array Measured in Operations per second</p> <ul style="list-style-type: none"> Latency <p>The utilization of latency, computed from the latency of each device in the disk array. Measured in milliseconds (ms)</p>
Storage Controller	<p>NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> CPU <p>The utilization of the Storage Controller's CPU in use Measured in Megahertz (MHz)</p> <ul style="list-style-type: none"> Storage Amount <p>The utilization of the storage controller's capacity. The storage allocated to a storage controller is the total of all the physical space available to aggregates managed by that storage controller Measured in Megabytes (MB)</p>

Restricted Service Accounts In NetApp

While prefers a NetApp service account with administrator rights, it is possible to create an account that has limited access, by following the steps outlined below, depending on NetApp mode.

NetApp 9.x Restricted Service Account Setup

If you prefer to use a service account that does not have full administrator rights:

1. Log into the NetApp filer from a command shell.
2. Create a role and assign it permission to execute each of the following commands:

For example:

```
security login role create -role RoleName -cmddirname "storage aggregate show"
-vserver Cluster-Name
```

The required capabilities are listed below:

- cluster identity modify
- cluster identity show

- lun create
- lun igroup create
- lun igroup modify
- lun igroup show
- lun mapping create
- lun mapping delete
- lun mapping show
- lun modify
- lun show
- network interface create
- network interface delete
- network interface modify
- network interface show
- statistics show
- storage aggregate create
- storage aggregate modify
- storage aggregate show
- storage disk show
- system controller flash-cache show
- system node modify
- system node show
- version
- volume create
- volume modify
- volume move modify
- volume move show
- volume move start
- volume qtree create
- volume qtree show
- volume show
- volume snapshot create
- volume snapshot modify
- volume snapshot show
- vserver create
- vserver fcp nodename
- vserver iscsi nodename
- vserver modify
- vserver options
- vserver show

3. For execution privileges, execute the following commands for the given role, where `Role-Name` is the name of the role you are creating, and `Cluster-Name` identifies the cluster you want the role to affect. You must execute these commands individually to set privileges that affect each individual cluster:
 - `security login role create -role Role-Name -access all -cmddirname "volume offline" -vserver Cluster-Name`
 - `security login role create -role Role-Name -access all -cmddirname "volume unmount" -vserver Cluster-Name`
 - `security login role create -role Role-Name -access all -cmddirname "volume move" -vserver Cluster-Name`
 - `security login role create -role Role-Name -access all -cmddirname "volume delete" -vserver Cluster-Name`

4. Create a user that will use the newly-created role.

For example:

```
security login create -User-Name -r Role
```

5. Enter a password for the new user when prompted.
6. Give the user access to the `ssh` and `ontapi` applications by using the following commands, replacing `Role-Name` and `User-Name` with the role and user you created:

```
security login create -role Role-Name -username User-Name -application ontapi
-authmethod password
```

```
security login create -role Role-Name -username User-Name -application ssh
-authmethod password
```

NetApp 7-Mode Restricted Service Account Setup

If you prefer to use a service account that does not have full administrator rights:

1. Log into the NetApp filer from a command shell.
2. Create a role with API privileges.

For example:

```
useradmin role add Role <capabilities>]
```

where `<capabilities>` is a comma-separated list of capabilities assigned to the role. The required capabilities are listed below:

- `api-aggr-list-info`
- `api-disk-list-info`
- `api-fcp-node-get-name`
- `api-flash-device-list-info`
- `api-igroup-list-info`
- `api-iscsi-node-get-name`
- `api-lun-initiator-list-map-info`
- `api-lun-map-list-info`
- `api-lun-list-info`
- `api-net-ifconfig-get`
- `api-nfs-exportfs-list-rules-2`
- `api-options-list-info`

- `api-system-get-info`
- `api-system-get-version`
- `api-volume-list-info`
- `api-snapshot-list-info`
- `api-perf-object-get-instances`
- `api-perf-object-instance-list-info`
- `api-perf-object-counter-list-info`
- `api-qtrees-list`
- `security-api-vfiler`
- `api-vfiler-list-info`
- `api-volume-options-list-info`
- `login-http-admin`
- `login-*`

Note that the last login capability (`login-*`) may be necessary for external users.

Execution capabilities:

- `api-volume-create`
- `api-volume-size`
- `api-volume-offline`
- `api-volume-online`
- `api-volume-destroy`
- `api-aggr-add`
- `api-aggr-create`
- `api-aggr-offline`
- `api-aggr-online`
- `api-aggr-destroy`

3. Create a group and assign the role.

For example:

```
useradmin add Group -r Role
```

4. Create a user that is a member of the group.

For example:

```
useradmin user add -g Group
```

5. Enter a password for the new user when prompted.

NetApp C-Mode Restricted Service Account Setup

If you prefer to use a service account that does not have full administrator rights:

1. Log into the NetApp filer from a command shell.
2. Create a role and assign it permission to execute each of the following commands:
 - `aggr-get-iter`
 - `igroup-get-iter`
 - `cluster-identity-get`

- lun-map-get-iter
- net-interface-get-iter
- storage-disk-get-iter
- system-get-node-info-iter
- volume-get-iter
- vserver-get-iter
- fcp-node-get-name
- flash-device-get-iter
- iscsi-node-get-name
- options-list-info
- qtree-list-iter
- system-get-version
- lun-get-iter
- snapshot-get-iter
- perf-object-get-instances
- volume-get-iter
- volume-move-get-iter
- volume-move-start

For example, to enable volume offline, execute the following:

```
security login role create -role Role -access all -cmddirname "volume offline"
-vserver <cluster_name>
```

3. Create a user based on the role you create.

Give the user access to the `ssh` and `ontapi` applications. For example:

```
security login create -role Role -username -application ontapi -authmethod password
```

```
security login create -role VMTurboRole -username VMTurbo -application ssh -authmethod password
```

Pure Storage

supports management of Pure Storage FlashArray systems. Note that one Pure Storage target manages a single Pure Storage FlashArray instance. The storage devices in the array are all flash storage — to analyze IOPS capacity, uses the setting made for SSD Disks in the Policy View.

Because of the improved performance of Pure Storage arrays, intelligently moves more demanding workloads to these datastores. analysis is also able to incorporate Pure Storage deduplication and compression when recommending actions.

Prerequisites

- A service account can use to connect to the FlashArray

This account needs privileges to execute commands through the Pure Storage API — Typically the default `pureuser` administrative account.

Adding Pure Storage Targets

To add a Pure Storage target, select the **Storage > Pure Storage** option on the Target Configuration page and provide the following information:

- Address
The name or IP address of the Pure Storage FlashArray.
- Username/Password
Credentials for the service account can use to connect to the FlashArray. The Username must not contain the domain. For example, `Username=jjsmith` is correct, while `Username=myDomain\jjsmith` will result in a failure to validate.
- Secure connection
When checked, uses SSL to connect to the Pure target. Most Pure installations do not accept insecure connections. If you receive an error when adding the target with secure connections disabled, try re-adding with this option enabled.

After validating the new target, discovers the connected storage entities. This table compares terms used in Pure to those used in :

Pure Name	Entity
Volume	Storage
Shelf Array	Disk Array
Controller	Storage Controller

Supply Chain

Storage targets (storage controllers) add Storage Controller and Disk Array entities to the supply chain. Disk Array entities then host Storage entities (datastores). For a visual representation, see the introductory [Storage Supply Chain \(on page 40\)](#).

Supported Actions

For each discovered entity, can execute or recommend certain actions, as outlined below.

Entity Type	Can Be Automated	Recommendations only
Storage		Resize Up
Disk Array		
Storage Controller		Provision

Pure Storage assigns all the disks managed by a storage controller to a single array, with a fixed form-factor. There are no actions to perform for an array — For example, there is no action to move a disk array from one storage controller to another. Likewise, there are no actions to move or provision volumes because of the fixed form-factor.

Monitored Resources

monitors the following storage resources:

Entity Type	Commodity
Storage	<ul style="list-style-type: none"> <li data-bbox="280 390 1490 520"> <p>• Storage Amount</p> <p>The utilization of the datastore's capacity</p> <p>Measured in Megabytes (MB)</p> <li data-bbox="280 527 1490 657"> <p>• Storage Provisioned</p> <p>The utilization of the datastore's capacity, including overprovisioning.</p> <p>Measured in Megabytes (MB)</p> <li data-bbox="280 663 1490 793"> <p>• Storage Access Operations Per Second (IOPS)</p> <p>The summation of the read and write access operations per second on the datastore</p> <p>Measured in Operations per second</p> <li data-bbox="280 800 1490 930"> <p>• Latency</p> <p>The utilization of latency on the datastore</p> <p>Measured in Milliseconds (ms)</p>
Disk Array	<p data-bbox="302 963 1463 1026">NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> <li data-bbox="280 1045 1490 1176"> <p>• Storage Amount</p> <p>The utilization of the Disk Array's capacity.</p> <p>Measured in Megabytes (MB)</p> <li data-bbox="280 1182 1490 1312"> <p>• Storage Provisioned</p> <p>The utilization of the Disk Array's capacity, including overprovisioning.</p> <p>Measured in Megabytes (MB)</p> <li data-bbox="280 1318 1490 1449"> <p>• Storage Access Operations Per Second (IOPS)</p> <p>The summation of the read and write access operations per second on the disk array</p> <p>Measured in Operations per second</p> <li data-bbox="280 1455 1490 1585"> <p>• Latency</p> <p>The utilization of latency, computed from the latency of each device in the disk array.</p> <p>Measured in milliseconds (ms)</p>
Storage Controller	<p data-bbox="302 1617 1463 1680">NOTE: Not all targets provide all possible commodities. For example, some storage controllers do not expose CPU activity. When a metric is not collected, its widget in the UI will display no data.</p> <ul style="list-style-type: none"> <li data-bbox="280 1698 1490 1829"> <p>• CPU</p> <p>The utilization of the Storage Controller's CPU in use</p> <p>Measured in Megahertz (MHz)</p> <li data-bbox="280 1835 1490 1862"> <p>• Storage Amount</p>

Entity Type	Commodity
	<p>The utilization of the storage controller's capacity. The storage allocated to a storage controller is the total of all the physical space available to aggregates managed by that storage controller</p> <p>Measured in Megabytes (MB)</p>

Guest OS Process Targets

supports the following Guest OS Process targets:

- SNMP (Simple Network Management Protocol)

Supply Chain

Guest Process targets add Application entities to the supply chain. You can navigate to each individual application server to see specific details.

Actions

recommends actions for the Guest OS Process supply chain as follows.

NOTE:

This is a general list of actions for entities discovered for applications. You can see how actions differ per technology in each section that describes adding a specific type of application target.

Entity Type	Action
Applications	<p>Without discovered Guest OS Processes or Application Servers, doesn't perform actions on applications. Instead, it performs resize actions on the host VMs. If host utilization is high enough on the physical machine running the application VM, may also recommend provisioning a new host.</p> <p>For specific application servers, see the individual application entry.</p>
Virtual Machines	<ul style="list-style-type: none"> • Provision additional resources (VMem, VCPU) • Move Virtual Machine • Move Virtual Machine Storage • Reconfigure Storage • Reconfigure Virtual Machine

Monitored Resources

monitors the following resources for the Guest OS Process supply chain:

Entity Type	Commodity
WMI/SNMP Application	<ul style="list-style-type: none"> Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz)
Virtual Machine	<ul style="list-style-type: none"> Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) Virtual Storage (VStorage) The utilization of the virtual storage capacity allocated for the VM Measured in Kilobytes (KB) Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)

AppDynamics

supports workload management of the application infrastructure monitored by AppDynamics, via adding the AppDynamics instance to as a target.

The integration with AppDynamics provides a full-stack view of your environment, from application to physical hardware. With information obtained from AppDynamics, is able to make recommendations and take actions to both assure performance and drive efficiency with the full knowledge of the demands of each individual application.

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

Prerequisites

- SaaS or on-prem installation of AppDynamics, version 4.1+
- A valid AppDynamics user account.

For all types of application instances, the service account must have the `Read Only User` role. For monitoring database instances, this user must also have the `DB Monitoring User` role.

NOTE:

In newer versions of AppDynamics where these roles are available, they should be used instead:

- Applications and Dashboards Viewer
- Dashboards Viewer
- DB Monitoring User
- Server Monitoring role

AppDynamics Database Servers

AppDynamics also monitors database servers. In order for your database servers to be correctly stitched to the rest of your environment, you must:

- Enable enhanced metric collection.

For Hyper-V hosts, you must install Hyper-V Integration Services on the target VM hosting the database. For more information, please refer to the following integration services TechNet article:

<https://technet.microsoft.com/en-us/library/dn798297%28v=ws.11%29.aspx>

For VMware hosts, you must install VMware Tools on the target VMs.

- Ensure that the database name in AppDynamics is resolvable to an IP address by the instance.

You may need to make changes to your DNS or the file `/etc/resolv.conf` on the instance.

Entity Comparison

After validating the new target, discovers the connected applications. This table compares terms used in AppDynamics to those used in :

AppDynamics	
Business Application	Business Application
Node	Application Server / Application
Database	Database Server

Adding an AppDynamics Target

NOTE:

It is possible to monitor certain applications or database servers with both AppDynamics and , but this must be avoided as it will cause the entities to appear duplicated in the market.

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

To add an AppDynamics instance as a target, specify:

- **Hostname or IP Address**
The host name or IP Address of the AppDynamics instance.
- **Username@Account**
Username and account ID with the necessary role(s). The format must be *Username@Account*.
- **Password**
Password for the account used to connect to the AppDynamics instance.
- **Port**
the port used to connect to the AppDynamics instance. By default, this is set to ports 80 (HTTP) and 443 (HTTPS).

NOTE: For SaaS-based AppDynamics instances, you must use port 443.
- **Secure Connection**
When checked, will connect via HTTPS. Make sure the required certificate is configured for use on the host.
- **Proxy Host**
The address of the proxy used for this target. Only fill out proxy information if you connect to the AppDynamics instance via a proxy.
- **Proxy Port**
The port to use with the proxy specified above. By default, this is 8080.
- **Proxy Username**
The username to use with the proxy specified above.
- **Proxy Password**
The password to use with the proxy specified above.

Actions

recommends actions for the AppDynamics supply chain as follows.

Entity Type	Action
Application / Application Server	<ul style="list-style-type: none"> • Resize Heap Recommendation only. • Resize Thread Pool Recommendation only. • Resize Connection Capacity Recommendation only. • Suspend VM Recommendation only. • Provision VM Recommendation only.
Virtual Machines	<ul style="list-style-type: none"> • Provision additional resources (VMem, VCPU) • Move Virtual Machine

Entity Type	Action
	<ul style="list-style-type: none"> • Move Virtual Machine Storage • Reconfigure Storage • Reconfigure Virtual Machine

Monitored Resources

NOTE:

The exact resources monitored will differ based on application type. This list includes all resources you may see.

monitors the following resources for the AppDynamics supply chain:

Entity Type	Commodity
Application	<ul style="list-style-type: none"> • Virtual Memory (VMem) The utilization of the VMem consumed from the hosting VM Measured in Kilobytes (KB) • Virtual CPU (VCPU) The utilization of VCPU consumed from the hosting VM Measured in Megahertz (MHz) • Transactions The utilization of the allocated transactions per second for the given application Measured in transactions per second • Heap The utilization of the application server’s heap Measured in Kilobytes (KB) • Response Time The utilization of the server’s allocated response time Measured in Milliseconds (ms) • Threads The utilization of the server’s thread capacity Measured in Threads • Connection The utilization of the connection capacity. Only applicable to database servers Measured in Connections • Garbage Collection The percentage of server uptime spent garbage collecting Measured in of uptime (%)
Virtual Machine	<ul style="list-style-type: none"> • Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM

Entity Type	Commodity
	Measured in Kilobytes (KB) <ul style="list-style-type: none"> Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM
	Measured in Megahertz (MHz) <ul style="list-style-type: none"> Virtual Storage (VStorage) The utilization of the virtual storage capacity allocated for the VM
	Measured in Kilobytes (KB) <ul style="list-style-type: none"> Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM
	Measured in IOPS <ul style="list-style-type: none"> Latency The utilization of latency allocated for the VStorage on the VM
	Measured in milliseconds (ms)

Application Insights

supports workload management of the application infrastructure monitored by Application Insights via the integration, which provides a full-stack view of your environment, from application to hosting server. With information obtained from Application Insights, is able to make recommendations and take actions to both assure performance and drive efficiency with the full knowledge of the demands of each individual application.

Prerequisites

- A valid Application Insights user account with the same permissions detailed for [Microsoft Azure \(on page 33\)](#) targets.

Entity Comparison

After validating the new target, discovers the connected applications. This table compares terms used in Application Insights to those used in :

Application Insights	
Application (with heap)	Application Server
Application (without heap)	Application
Application (Database)	SQL Server
Hosting Server	Virtual Machine

Adding an Application Insights Target

NOTE:

If an application is monitored by Application Insights or Azure, do not add it as a separate application target.

To add Application Insights as a target, specify:

- **Unique Target Description**
A user-created name that will appear in the UI.
- **Tenant Name**
The tenant associated to the Azure subscription associated to Application Insights.
- **Azure Subscription ID**
The ID of the Azure subscription with access to the Azure target associated to Application Insights.
- **Client App ID**
The Client/App ID of the Web App that gives access to resources in your Azure subscription.
- **Client Secret Key**
The secret key for the Web App.
- **Offer ID**
If applicable, the Azure Offer ID related to the Azure subscription.
- **Enrollment Number**
If an Azure EA account, the enrollment number associated to the Azure subscription.

Stitching Application Insights Applications to the Environment

Each application monitored by Application Insights can have several associated applications, and each of these applications can be deployed on a different hosting server. Likewise, a hosting server may host multiple groups or partial groups of multiple applications.

In order to accurately stitch metrics from Application Insights, the host name or IP address of the hosting server must be discoverable through the Application Insights instance. For most monitored application instances, this is automatic. If the hosting server is not discoverable, Azure tags on the application can be provided to indicate the IP address or hostname.

You can provide an Azure tag in the following name : value format:

```
Turbonomic-Host-Name : RoleInstance=hostname;RoleInstance=hostname;RoleInstance=hostname;
```

In the preceding example, `RoleInstance` is the name of the application instance, and `hostname` is the hosting server. For example: `Turbonomic-Host-Name : cluster-app-a=120.120.120.10;cluster-app-b=120.120.120.11;cluster-app-c=120.120.120.12;`

NOTE: If these tags are provided, they will replace any values discovered through the Application Insights API.

Actions

recommends actions for the Application Insights supply chain as follows.

Entity Type	Action
Application / Application Server	<ul style="list-style-type: none"> • Resize Heap Recommendation only. • Resize Thread Pool Recommendation only. • Resize Connection Capacity Recommendation only. • Suspend VM Recommendation only. • Provision VM Recommendation only.
Virtual Machines	<ul style="list-style-type: none"> • Provision additional resources (VMem, VCPU) • Move Virtual Machine • Move Virtual Machine Storage • Reconfigure Storage • Reconfigure Virtual Machine

Monitored Resources

NOTE:

The exact resources monitored will differ based on application type. This list includes all resources you may see.

monitors the following resources for the Application Insights supply chain:

Entity Type	Commodity
Application	<ul style="list-style-type: none"> • Virtual Memory (VMem) The utilization of the VMem consumed from the hosting VM Measured in Kilobytes (KB) • Virtual CPU (VCPU) The utilization of VCPU consumed from the hosting VM Measured in Megahertz (MHz) • Transactions The utilization of the allocated transactions per second for the given application Measured in transactions per second • Heap The utilization of the application server's heap

Entity Type	Commodity
	<p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> Response Time <p>The utilization of the server's allocated response time</p> <p>Measured in Milliseconds (ms)</p> <ul style="list-style-type: none"> Threads <p>The utilization of the server's thread capacity</p> <p>Measured in Threads</p> <ul style="list-style-type: none"> Connection <p>The utilization of the connection capacity. Only applicable to database servers</p> <p>Measured in Connections</p> <ul style="list-style-type: none"> Garbage Collection <p>The percentage of server uptime spent garbage collecting</p> <p>Measured in of uptime (%)</p>
Virtual Machine	<ul style="list-style-type: none"> Virtual Memory (VMem) <p>The utilization of the VMem allocated to the hosting VM</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> Virtual CPU (VCPU) <p>The utilization of the VCPU allocated to the hosting VM</p> <p>Measured in Megahertz (MHz)</p> <ul style="list-style-type: none"> Virtual Storage (VStorage) <p>The utilization of the virtual storage capacity allocated for the VM</p> <p>Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> Storage Access Operations Per Second (IOPS) <p>The utilization of IOPS allocated for the VStorage on the VM</p> <p>Measured in IOPS</p> <ul style="list-style-type: none"> Latency <p>The utilization of latency allocated for the VStorage on the VM</p> <p>Measured in milliseconds (ms)</p>

New Relic

supports workload management of the application infrastructure monitored by New Relic via the integration, which provides a full-stack view of your environment, from application instance to host. With information obtained from New Relic, is able to make recommendations and take actions to both assure performance and drive efficiency with the full knowledge of the demands of each individual application.

Prerequisites

- A valid New Relic user account that includes either APM or infrastructure monitoring.

Entity Comparison

After validating the new target, discovers the connected applications. This table compares terms used in New Relic to those used in :

New Relic	
This entity has no direct correlation to a New Relic entity. Instead, a Business Application is a group of application instances of the same language.	Business Application
APM: Application instance (with heap)	Application Server
APM: Application instance (without heap)	Application
Infra: Database	Database Server
Infra: Host	Virtual Machine

Adding a New Relic Target

NOTE:

If an application is monitored by New Relic, do not add it as a separate application target.

To add New Relic as a target, specify:

- Account ID
The New Relic Account ID.
- REST API Key
The REST API Key *provided by the New Relic platform*. For more information, see [Understand New Relic API Keys](#).
- GraphQL API Key
The REST API Key *provided by the GraphQL service*. This is not identical to the REST API Key above. For more information, see [Generate a new API key in the NerdGraph GraphQL Explorer](#).
- EU Region
If checked, will use the EU API endpoints.
- Proxy Host (Optional)
The IP of the Proxy Host.
- Proxy Port (Optional)
The port required by the proxy.
- Proxy Username (Optional)
The username required by the proxy.
- Proxy Password (Optional)
The password required by the proxy.

Supported Applications and Databases

The following applications and databases are supported for complete metrics. will discover other applications, but may not be able to retrieve metrics.

Application Types	<ul style="list-style-type: none"> • Go • Java • .NET Core • .NET Framework • Node.js • PHP • Python
Database Types	<ul style="list-style-type: none"> • MongoDB • MSSQL • MySQL • OracleDB

Actions

recommends actions for the New Relic supply chain as follows.

Entity Type	Action
Application / Application Server	<ul style="list-style-type: none"> • Resize Heap Recommendation only. • Resize Thread Pool Recommendation only. • Resize Connection Capacity Recommendation only. • Suspend VM Recommendation only. • Provision VM Recommendation only.
Virtual Machines	<ul style="list-style-type: none"> • Provision additional resources (VMem, VCPU) • Move Virtual Machine • Move Virtual Machine Storage • Reconfigure Storage • Reconfigure Virtual Machine

Monitored Resources

NOTE:

The exact resources monitored will differ based on application type. This list includes all resources you may see.

monitors the following resources for the New Relic supply chain:

Entity Type	Commodity
Application	<ul style="list-style-type: none"> <li data-bbox="370 470 1323 598"> • Virtual Memory (VMem) The utilization of the VMem consumed from the hosting VM Measured in Kilobytes (KB) <li data-bbox="370 611 1323 739"> • Virtual CPU (VCPU) The utilization of VCPU consumed from the hosting VM Measured in Megahertz (MHz) <li data-bbox="370 751 1323 913"> • Transactions The utilization of the allocated transactions per second for the given application Measured in transactions per second <li data-bbox="370 926 1323 1054"> • Heap The utilization of the application server's heap Measured in Kilobytes (KB) <li data-bbox="370 1066 1323 1194"> • Response Time The utilization of the server's allocated response time Measured in Milliseconds (ms) <li data-bbox="370 1207 1323 1335"> • Threads The utilization of the server's thread capacity Measured in Threads <li data-bbox="370 1348 1323 1476"> • Connection The utilization of the connection capacity. Only applicable to database servers Measured in Connections <li data-bbox="370 1488 1323 1617"> • Garbage Collection The percentage of server uptime spent garbage collecting Measured in of uptime (%)
Virtual Machine	<ul style="list-style-type: none"> <li data-bbox="370 1640 1323 1768"> • Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) <li data-bbox="370 1780 1323 1908"> • Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz)

Entity Type	Commodity
	<ul style="list-style-type: none"> • Virtual Storage (VStorage) The utilization of the virtual storage capacity allocated for the VM Measured in Kilobytes (KB) • Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS • Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)

Dynatrace

supports discovery of applications that are managed by the Dynatrace platform. includes the discovered information about these applications in its calculations for VM actions.

Prerequisites

- A Dynatrace Server instance running in your environment.
This instance must be configured to monitor applications running in your environment.
- Managed VMs that are running applications managed by Dynatrace.
For to discover applications through Dynatrace, the applications must be running on VMs in your environment. Also, these VMs must be managed by hypervisors that you have configured as targets.
- A valid Dynatrace user account.
The account must provide read-only access to the application data that is gathered by the Dynatrace server.

Adding a Dynatrace Target

NOTE:

It is possible to monitor certain applications or database servers with both Dynatrace and . You should avoid such a configuration because it can cause to generate duplicate entities in the market.

f you monitor an application via a Dynatrace server, and you configure that Dynatrace server as a target, then be sure you have not added that application as a separate application target in .

To add a Dynatrace server instance as a target, specify:

- Hostname or IP Address
The host name or IP and endpoint, separated by a slash. For example, 10.10.10.10/e/b70e3eb2-e82b-4c13-a5a4-560d9865841r
- API Token
The token that will use to authenticate its calls to the Dynatrace API. This token must have permission to execute GET methods via the Dynatrace API.
- Proxy Host

The address of the proxy used for this target. Only fill out proxy information if you connect to the Dynatrace server via a proxy.

- Proxy Port

The port to use with the proxy specified above. By default, this is 8080.

- Proxy Username

The username for the account to log into the proxy specified above.

- Proxy Password

The password to use with the proxy specified above.

Actions

does not recommend actions for Dynatrace applications. However, it considers resource utilization by these applications when recommending actions for the underlying VMs.

Monitored Resources

NOTE:

The exact resources monitored will differ based on application type. This list includes all resources you may see.

monitors the following resources for the Dynatrace supply chain:

Entity Type	Commodity
Application	<ul style="list-style-type: none"> • Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) • Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) • Transactions The utilization of the allocated transactions per second for the given virtual application Measured in transactions per second • Response Time The utilization of the server's allocated response time Measured in Milliseconds (ms) • Threads The utilization of the server's thread capacity Measured in Threads • Connection The utilization of the connection capacity. Only applicable to database servers Measured in Connections • Garbage Collection

Entity Type	Commodity
	<p>The percentage of server uptime spent garbage collecting</p> <p>Measured in of uptime (%)</p>
Virtual Machine	<ul style="list-style-type: none"> • Virtual Memory (VMem) <p>The utilization of the VMem allocated to the hosting VM</p> <p>Measured in Kilobytes (KB)</p> • Virtual CPU (VCPU) <p>The utilization of the VCPU allocated to the hosting VM</p> <p>Measured in Megahertz (MHz)</p> • Virtual Storage (VStorage) <p>The utilization of the virtual storage capacity allocated for the VM</p> <p>Measured in Kilobytes (KB)</p> • Storage Access Operations Per Second (IOPS) <p>The utilization of IOPS allocated for the VStorage on the VM</p> <p>Measured in IOPS</p> • Latency <p>The utilization of latency allocated for the VStorage on the VM</p> <p>Measured in milliseconds (ms)</p>

Fabric Targets

A fabric target is a service that unites compute, network and storage access into a cohesive system. When you connect to fabric targets, it monitors the performance and resource consumption of your fabric interconnects, IO modules, chassis, and Blade Servers to assure application performance while also utilizing resources as efficiently as possible.

Once connected, discovers the blades that host the VMs, the chassis and datastores that provide resources to the blades, the IO modules and fabric interconnects that provide network resources, and the virtual datastores that provide storage resources to the VMs.

As part of this process, will stitch information from the fabric target and the associated hypervisor targets together, to provide deeper insight into the state of the hardware, and information related to the applications and VM's running on the hypervisor-stitched blades.

Supply Chain

Fabric targets add IO Module, Fabric Interconnect, Domain, and Chassis entities to the supply chain. The Chassis entities host physical machines (blade servers) — The physical machines also consume network connection commodities from IO Modules. The Fabric Interconnect supplies connectivity to the overall network, and also hosts the UCS Manager for UCS Targets. The Domain serves as the bottom-level pool of network resource, supplying the Fabric Interconnect.

Supported Fabric Targets

supports the following fabric targets:

- Cisco UCS

Monitored Resources

monitors the following resources for the fabric supply chain:

Entity Type	Commodity
Virtual Machine	<ul style="list-style-type: none"> • Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) • Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) • Virtual Storage (VStorage) The utilization of the virtual storage capacity allocated for the VM Measured in Kilobytes (KB) • Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS • Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)
Blade	<ul style="list-style-type: none"> • Net The utilization of data through the Blade's network adapters Measured in Kilobytes per second (KB/s) • Treated as a Physical Machine of the underlying Hypervisor (see below) CPU, Mem, etc.
Physical Machine	<ul style="list-style-type: none"> • Memory (Mem) The utilization of the PM's memory reserved or in use Measured in Kilobytes (KB) • CPU The utilization of the PM's CPU reserved or in use Measured in Megahertz (MHz) • IO The utilization of the PM's IO adapters Measured in Kilobytes per second (KB/s)

Entity Type	Commodity
	<ul style="list-style-type: none"> • Net The utilization of data through the PM's network adapters Measured in Kilobytes per second (KB/s) • Swap The utilization of the PM's swap space Measured in Kilobytes (KB) • Balloon The utilization of shared memory among VMs running on the host. ESX-only Measured in Kilobytes (KB) • CPU Ready The utilization of the PM's allocated ready queue capacity (measured in Kbytes) that is in use, for 1, 2, and 4 CPU ready queues. ESX-only Measured in Megahertz (MHz)
I/O Module	<ul style="list-style-type: none"> • NetThroughput Rate of message delivery over a port Measured in Megabits per second (Mb/s)
Fabric Inter-connect	<ul style="list-style-type: none"> • NetThroughput Rate of message delivery over a port Measured in Mb/s • PortChannel Amalgamation of ports with a shared net throughput and utilization Measured in Mb/s

Cisco UCS Manager

The Cisco Unified Computing System (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.

UCS integrates all of these resources in a scalable multi-chassis platform to converge administration onto a single point. Managing these various entities on a network fabric with enables automation at the hardware level, including automated provisioning of hosts.

Prerequisites

- A service account can use to connect to UCS Manager

Adding UCS Targets

To add a UCS target, select the **Fabric** category and choose one of the UCS Fabric options to match the version of UCS you want to manage. Then provide the following information:

- **Address:** The IP address of the UCS Manager

This gives access to the Fabric Manager that resides on the interconnect.

connects to the UCS Manager via the HTTPS protocol by default. In order to force the HTTP protocol, the Address must be entered in one of two ways. For example, an IP of 8.8.8.8 must be entered as http://8.8.8.8 or by using a specific HTTP port, such as 8.8.8.8:80.

- **Username/Password:** The credentials of the account will use to connect to UCS Manager.

specify the IP address and credentials for UCS Manager. discovers the fabric interfaces associated with that manager.

NOTE:

When providing a username, if the account is managed in Active Directory you must include the domain in case-sensitive spelling. For example, MyDomain\john is not the same as mydomain\john. For local user accounts, just provide the username.

Supply Chain

Fabric targets add IO Module, Fabric Interconnect (Switch), Domain, and Chassis entities to the supply chain. The Chassis entities host physical machines — The physical machines also consume network connection commodities from IO Modules. The Fabric Interconnect supplies connectivity to the overall network, and also hosts the UCS Manager. The Domain serves as the bottom-level pool of network resource, supplying the Fabric Interconnect.

Actions

recommends actions for the various entities of the UCS Fabric Network as follows:

Entity Type	Action
Virtual Machines	<ul style="list-style-type: none"> • Provision additional resources (VMem, VCPU) • Move Virtual Machine • Move Virtual Machine Storage • Reconfigure Storage • Reconfigure Virtual Machine
Physical Machines	<ul style="list-style-type: none"> • Start Physical Machine • Provision Physical Machine • Suspend Physical Machine
Chassis	<ul style="list-style-type: none"> • Provision New Chassis
Fabric Interconnect	<ul style="list-style-type: none"> • Add Port to Port Channel • Remove Port from Port Channel • Add Port
DPod (if Network Flow target is present)	<ul style="list-style-type: none"> • Provision new DPod

Monitored Resources

monitors the following commodities of the UCS target:

Entity Type	Commodity
Virtual Machine	<ul style="list-style-type: none"> <li data-bbox="459 352 1175 485"> <p>• Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB)</p> <li data-bbox="459 491 1162 623"> <p>• Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz)</p> <li data-bbox="459 630 1284 762"> <p>• Virtual Storage (VStorage) The utilization of the virtual storage capacity allocated for the VM Measured in Kilobytes (KB)</p> <li data-bbox="459 768 1216 900"> <p>• Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS</p> <li data-bbox="459 907 1247 1039"> <p>• Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)</p>
Physical Machine	<ul style="list-style-type: none"> <li data-bbox="459 1071 1143 1203"> <p>• Memory (Mem) The utilization of the PM's memory reserved or in use Measured in Kilobytes (KB)</p> <li data-bbox="459 1209 1092 1341"> <p>• CPU The utilization of the PM's CPU reserved or in use Measured in Megahertz (MHz)</p> <li data-bbox="459 1348 987 1480"> <p>• IO The utilization of the PM's IO adapters Measured in Kilobytes per second (KB/s)</p> <li data-bbox="459 1486 1195 1619"> <p>• Net The utilization of data through the PM's network adapters Measured in Kilobytes per second (KB/s)</p> <li data-bbox="459 1625 959 1757"> <p>• Swap The utilization of the PM's swap space Measured in Kilobytes (KB)</p> <li data-bbox="459 1764 1406 1896"> <p>• Balloon The utilization of shared memory among VMs running on the host. ESX-only Measured in Kilobytes (KB)</p>

Entity Type	Commodity
	<ul style="list-style-type: none"> • CPU Ready The utilization of the PM's allocated ready queue capacity (measured in Kbytes) that is in use, for 1, 2, and 4 CPU ready queues. ESX-only Measured in Megahertz (MHz)
Chassis	<ul style="list-style-type: none"> • Power Electricity being consumed by the Chassis Measured in Watts (W) • Temperature Temperature of the internals of the Chassis Measured in degrees Celsius (C)
I/O Module	<ul style="list-style-type: none"> • NetThroughput Rate of message delivery over a port Measured in Megabits per second (Mb/s)
Fabric Interconnect	<ul style="list-style-type: none"> • NetThroughput Rate of message delivery over a port Measured in Mb/s • PortChannel Amalgamation of ports with a shared net throughput and utilization Measured in Mb/s
DPod (if Network Flow target is present)	<ul style="list-style-type: none"> • Memory (Mem) The utilization of the DPod's memory reserved or in use Measured in Kilobytes (KB) • CPU The utilization of the DPod's CPU reserved or in use Measured in Megahertz (MHz) • Storage The utilization of the storage attached to the DPod Measured in Kilobytes (KB) • Flow The utilization of the network flow capacity utilized by the DPod. This is divided into Flow1 (Low Cost) and Flow2 (Medium Cost) utilization Measured in Kilobytes per second (KB/s)

HPE OneView

HPE OneView is a management solution that streamlines provisioning and lifecycle management across compute, storage, and fabric. Through a unified API, infrastructure can be configured, monitored, updated, and re-purposed.

HPE OneView integrates all of these resources in a scalable multi-enclosure platform to converge administration onto a single point. Managing these various entities on a network fabric with enables automation at the hardware level, including automated provisioning of hosts.

Prerequisites

- A service account can use to connect to HPE OneView.
- HPE OneView 2.0 and compatible hardware.

Adding HPE OneView Targets

To add a HPE OneView as a target, select the **Fabric** category and choose the HPE OneView radio button. Then provide the following information:

- **Address:** The IP address of the HPE OneView target

This gives access to the Fabric Manager that resides on the VM.

uses the HTTPS protocol by default. In order to force the HTTP protocol, the Address must be entered in one of two ways. For example, an IP of 8.8.8.8 must be entered as `http://8.8.8.8` or by using a specific HTTP port, such as `8.8.8.8:80`.

- **Username/Password:** The credentials of the account will use to connect to the HPE OneView target.

specify the IP address and credentials for HPE OneView. discovers the fabric interfaces associated with that instance.

NOTE:

When providing a username, if the account is managed in Active Directory you must include the domain in case-sensitive spelling. For example, `MyDomain\john` is not the same as `mydomain\john`. For local user accounts, just provide the username.

Supply Chain

Fabric targets add IO Module, Fabric Interconnect (Switch), Domain, and Chassis entities to the supply chain. The Chassis entities host physical machines — The physical machines also consume network connection commodities from IO Modules. The Fabric Interconnect supplies connectivity to the overall network. The Domain serves as the bottom-level pool of network resource, supplying the Fabric Interconnect.

NOTE:

For HPE OneView targets, the "Fabric Interconnect" entity exists as a false "Switch", and only as a pass-through for network resources. Unlike other fabric targets, such as UCS, there is no physical hardware that serves this function.

Actions

recommends actions for the various entities of the HPE OneView Fabric Network as follows:

Entity Type	Action
Virtual Machines	<ul style="list-style-type: none"> Provision additional resources (VMem, VCPU) Move Virtual Machine Move Virtual Machine Storage Reconfigure Storage Reconfigure Virtual Machine
Physical Machines	<ul style="list-style-type: none"> Start Physical Machine Provision Physical Machine Suspend Physical Machine
Fabric Interconnect	<ul style="list-style-type: none"> Add Port to Port Channel Remove Port from Port Channel Add Port
DPod (if Network Flow target is present)	<ul style="list-style-type: none"> Provision new DPod

Monitored Resources

monitors the following commodities of the HPE OneView target:

Entity Type	Commodity
Virtual Machine	<ul style="list-style-type: none"> Virtual Memory (VMem) The utilization of the VMem allocated to the hosting VM Measured in Kilobytes (KB) Virtual CPU (VCPU) The utilization of the VCPU allocated to the hosting VM Measured in Megahertz (MHz) Virtual Storage (VStorage) The utilization of the virtual storage capacity allocated for the VM Measured in Kilobytes (KB) Storage Access Operations Per Second (IOPS) The utilization of IOPS allocated for the VStorage on the VM Measured in IOPS Latency The utilization of latency allocated for the VStorage on the VM Measured in milliseconds (ms)
Physical Machine	<ul style="list-style-type: none"> Memory (Mem)

Entity Type	Commodity
	<p>The utilization of the PM's memory reserved or in use Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> • CPU <p>The utilization of the PM's CPU reserved or in use Measured in Megahertz (MHz)</p> <ul style="list-style-type: none"> • IO <p>The utilization of the PM's IO adapters Measured in Kilobytes per second (KB/s)</p> <ul style="list-style-type: none"> • Net <p>The utilization of data through the PM's network adapters Measured in Kilobytes per second (KB/s)</p> <ul style="list-style-type: none"> • Swap <p>The utilization of the PM's swap space Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> • Balloon <p>The utilization of shared memory among VMs running on the host. ESX-only Measured in Kilobytes (KB)</p> <ul style="list-style-type: none"> • CPU Ready <p>The utilization of the PM's allocated ready queue capacity (measured in Kbytes) that is in use, for 1, 2, and 4 CPU ready queues. ESX-only Measured in Megahertz (MHz)</p>
Storage	<ul style="list-style-type: none"> • Storage Amount The utilization of the datastore's capacity Measured in Megabytes (MB) • Storage Provisioned The utilization of the datastore's capacity, including overprovisioning. Measured in Megabytes (MB) • Storage Access Operations Per Second (IOPS) The summation of the read and write access operations per second on the datastore Measured in Operations per second • Latency The utilization of latency on the datastore Measured in Milliseconds (ms)
I/O Module	<ul style="list-style-type: none"> • NetThroughput Rate of message delivery over a port

Entity Type	Commodity
	Measured in Megabits per second (Mb/s)
Fabric Interconnect	<ul style="list-style-type: none"> <li data-bbox="456 300 691 331">• NetThroughput Rate of message delivery over a port Measured in Mb/s <li data-bbox="456 436 1308 573">• PortChannel Amalgamation of ports with a shared net throughput and utilization Measured in Mb/s
DPod (if Network Flow target is present)	<ul style="list-style-type: none"> <li data-bbox="456 594 1166 730">• Memory (Mem) The utilization of the DPod's memory reserved or in use Measured in Kilobytes (KB) <li data-bbox="456 741 1114 877">• CPU The utilization of the DPod's CPU reserved or in use Measured in Megahertz (MHz) <li data-bbox="456 888 1105 1024">• Storage The utilization of the storage attached to the DPod Measured in Kilobytes (KB) <li data-bbox="456 1035 1446 1182">• Flow The utilization of the network flow capacity utilized by the DPod. This is divided into Flow1 (Low Cost) and Flow2 (Medium Cost) utilization Measured in Kilobytes per second (KB/s)

Appendix — Target Configuration

This appendix contains topics that are related to configuring targets.

Cisco Unified Computing System

UCS Blade Provisioning

When managing a UCS fabric target, can provision any blade servers that are installed in a chassis but not currently in operation. If the workload demands more physical compute resources, can automatically direct UCS to provision a blade, or it can recommend that you provision a blade and you can execute the action from the To Do list. To enable this capability, you must perform two basic steps:

- Configure the way UCS and vCenter Server manage information as blades are provisioned

To enable to perform automatic provisioning of UCS blades, you must configure UCS to work with vCenter Server as they both manage resources such as server pools, policies, and Service Profile Templates. This ensures that as directs the UCS Manager to provision a new blade, vCenter Server will recognize that the new physical host is available. Once vCenter Server can recognize the new blade, can direct vCenter Server to move workloads onto the server.

provisions new blades based on the service profiles of operating blades. To enable this, the configuration must include Service Profile Templates, and the operating blades must be bound to these templates.

For information about configuration that enables automated provisioning of blades, see the Cisco Communities post, “UCS PowerTool and VMware PowerCLI automated management of Auto-deploy” at the following location:

https://communities.cisco.com/community/technology/datacenter/ucs_management/cisco_ucs_developed_integrations/blog/2013/09/16/ucs-powertool-and-vmware-powercli-automated-management-of-auto-deploy

This post includes a video that shows “a joint PowerShell integration utilizing both Cisco UCS PowerTool and VMware PowerCLI.” You can also download the scripts from this post and modify them as necessary for your deployment.

- Set the Host Provision action to Automate or Manual for the blade servers. By default, sets the Host Provision action to Recommend.

For any hosts other than blade servers managed by UCS, cannot provision hosts automatically or manually. Instead, it recommends that you provision a host, and you then install the physical machine and wire it to the network.

In a UCS deployment you can have blade servers installed in the chassis and ready to provision. In that case, can direct UCS to provision a new blade to meet workload demands. For these servers, you can set the Host Provision action to Automated or Manual.

NOTE:

It's important that you only set Automated or Manual host provisioning to UCS blades. If you set Host Provision to Automated for other types of hosts, will attempt to perform the action and fail. As a result, you might never see the recommendation to provision a new host of that type.

groups blade servers by chassis. To restrict Automated or Manual settings to blade servers, use this group. You can set the action mode for all blade servers in your environment, or you can set the mode differently for individual chassis.

Enabling Collection of Memory Statistics: AWS

So can collect memory statistics in your AWS environment, you must set up your VMs to publish statistics via CloudWatch. The steps to do this are different depending on the OS running on your VMs.

AWS Memory Statistics: Linux VMs

To enable memory statistics on Linux VMs, you must set up your VMs to publish metrics to CloudWatch. You must meet the following requirements:

- Your Linux image must have the SSM Agent installed
 - By default, Linux AMIs dated 2017.09 and later include an installed SSM Agent.
- Access to the CloudWatch service

Your AWS Instance must have internet access or direct access to CloudWatch so it can push data to CloudWatch.

- Access to AWS System Manager

The user account must include an attached AmazonEC2RoleforSSM Policy. As a minimum, the policy must have the following permissions:

- AmazonEC2ReadOnlyAccess
- AmazonS3ReadOnlyAccess
- AmazonRDSReadOnlyAccess
- AmazonEC2RoleforSSM
- CloudWatchFullAccess
- AmazonSSMFullAccess

In addition, you must install the CloudWatch agent on your VMs. To configure the agent, add the following JSON as the EC2 Parameter Store:

```
{
  "agent": {
    "metrics_collection_interval": 60,
    "logfile": "/opt/aws/amazon-cloudwatch-agent/logs/amazon-cloudwatch-agent.log"
  },
  "metrics": {
    "metrics_collected": {
      "mem": {
        "measurement": [
          {"name": "used", "rename": "MemoryUsed"},
          {"name": "mem_available", "rename": "MemoryAvailable"}
        ]
      }
    }
  },
  "append_dimensions": {
    "InstanceId": "${aws:InstanceId}"
  }
}
```

For more information about enabling Windows memory statistics for AWS, see the Green Circle article, [“Setting up CloudWatch with your Linux Instances on AWS”](#).

AWS Memory Statistics: Windows VMs

To enable memory statistics on Windows VMs, you must enable AWS SSM:

- Ensure the AWS SSM Agent is installed on your VMs
- Create an IAM Role that supports AWS SSM. The role must have the following permissions at a minimum:
 - AmazonEC2ReadOnlyAccess
 - AmazonS3ReadOnlyAccess
 - AmazonRDSReadOnlyAccess
 - AmazonEC2RoleforSSM
 - CloudWatchFullAccess

- AmazonSSMFullAccess
- Assign the IAM role to the VMs that you want to manage.

After you enable AWS SSM, you must deploy the following JSON file to configure CloudWatch.

```

    "IsEnabled": true,
    "EngineConfiguration": {
      "Components": [
        {
          "FullName": "AWS.EC2.Windows.CloudWatch.PerformanceCounterComponent.Performance
CounterInputComponent,AWS.EC2.Windows.CloudWatch",
          "Id": "PerformanceCounter",
          "Parameters": {
            "CategoryName": "Memory",
            "CounterName": "Committed Bytes",
            "DimensionName": "InstanceId",
            "DimensionValue": "{instance_id}",
            "InstanceName": "",
            "MetricName": "MemoryUsed",
            "Unit": "bytes"
          }
        },
        {
          "FullName": "AWS.EC2.Windows.CloudWatch.PerformanceCounterComponent.Performance
CounterInputComponent,AWS.EC2.Windows.CloudWatch",
          "Id": "PerformanceCounter2",
          "Parameters": {
            "CategoryName": "Memory",
            "CounterName": "Available Bytes",
            "DimensionName": "InstanceId",
            "DimensionValue": "{instance_id}",
            "InstanceName": "",
            "MetricName": "MemoryAvailable",
            "Unit": "bytes"
          }
        },
        {
          "FullName": "AWS.EC2.Windows.CloudWatch.CloudWatch.CloudWatchOutputCompone
nt,AWS.EC2.Windows.CloudWatch",
          "Id": "CloudWatch",
          "Parameters": {
            "AccessKey": "",
            "NameSpace": "Windows System",
            "Region": "",
            "SecretKey": ""
          }
        }
      ],
      "Flows": {
        "Flows": [
          "(PerformanceCounter,PerformanceCounter2), CloudWatch"
        ]
      },
      "PollInterval": "00:05:00"

```

```
}
```

For more information about enabling Windows memory statistics for AWS, see the Green Circle article, [“AWS Memory Stats - Windows”](#).

Enabling Collection of Memory Statistics: Azure

For to collect memory statistics in Azure, you must enable the collection of these statistics on the VMs in your environment. You can do this as you deploy your VMs, or you can enable the counters after the fact on VMs you have already deployed. For each VM, open the Azure Portal and navigate to Diagnostics Settings. Then enable the metrics for your VMs:

To enable the collection of memory statistics in Azure environments, open the Azure Portal, and then navigate to **Diagnostics Settings**. Then enable the metrics for your VMs:

- For Windows VMs

Navigate to **Performance Counters**, display **Basic**, and enable the performance counters for the VM.

- For Linux VMs

For supported Linux versions, Azure automatically deploys the Linux Diagnostics Extension v2.3 to gather these metrics. Refer to Microsoft Azure documentation for supported Linux OS versions. For unsupported versions, you can enable the statistics manually:

1. Set **Status** to ON.
2. For **Storage Account**, specify the storage that will retain the metric data.
3. Enable **Basic Metrics** and then click **Save**.
4. Navigate to **Metrics** in the Azure Portal and enable the metrics to collect.

For more information about enabling memory statistics for Azure, see the Green Circle article, [“Enable Basic Metrics on Azure - Manually”](#).