

# vRealize Operations Definitions for Metrics, Properties, and Alerts

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vRealize Operations Manager 6.6



vmware®

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# About vRealize Operations Manager Reference for Metrics, Properties, and Alerts

The *vRealize Operations Manager Reference for Metrics, Properties, and Alerts* provides information about the metric, properties, and alert definitions provided with vRealize Operations Manager.

## Intended Audience

This information is intended for anyone who wants to install and configure vRealize Operations Manager by using a virtual appliance deployment. The information is written for experienced virtual machine administrators who are familiar with enterprise management applications and datacenter operations.

## VMware Technical Publications Glossary

VMware Technical Publications provides a glossary of terms that might be unfamiliar to you. For definitions of terms as they are used in VMware technical documentation, go to <http://www.vmware.com/support/pubs>.

# Metric Definitions in vRealize Operations Manager

# 1

Metric definitions provide an overview of how the metric value is calculated or derived. If you understand the metric, you can better tune vRealize Operations Manager to display results that help you to manage your environment.

vRealize Operations Manager collects data from objects in your environment. Each piece of data collected is called a metric observation or value. vRealize Operations Manager uses the VMware vCenter<sup>®</sup> adapter to collect raw metrics. vRealize Operations Manager uses the vRealize Operations Manager adapter to collect self-monitoring metrics. In addition to the metrics it collects, vRealize Operations Manager calculates capacity metrics, badge metrics, and metrics to monitor the health of your system.

All metric definitions are provided. The metrics reported on your system depend on the objects in your environment. You can use metrics to help troubleshoot problems. See the *vRealize Operations Manager User Guide*.

## Changes in Metric Availability

The CPU Demand of Recommended (%) metric is no longer available in vRealize Operations Manager version 6.x. To approximate the metric, create a super metric using the following calculations, and add it to your Views and Reports as needed.

$$\left( (\text{CPU|Stress Free Demand (MHz)}) \times (\text{CPU|Current Size in Unit(s)}) \right) \div \left( (\text{CPU|Recommended Size (vCPUs)}) \times (\text{CPU|Current Size (MHz)}) \right)$$

For more information about super metrics, see the vRealize Operations Manager Information Center.

This chapter includes the following topics:

- [Metrics for vCenter Server Components](#)
- [Calculated Metrics](#)
- [Self-Monitoring Metrics for vRealize Operations Manager](#)
- [Metrics for vRealize Automation](#)
- [Metrics for vSAN](#)
- [Metrics for the Operating Systems and Remote Service Monitoring Plug-ins in End Point Operations Management](#)

## Metrics for vCenter Server Components

vRealize Operations Manager connects to VMware vCenter Server<sup>®</sup> instances through the vCenter adapter to collect metrics for vCenter Server components and uses formulas to derive statistics from those metrics. You can use metrics to troubleshoot problems in your environment.

vCenter Server components are listed in the `describe.xml` file for the vCenter adapter. The following example shows sensor metrics for the host system in the `describe.xml` file.

```
<ResourceGroup instanced="false" key="Sensor" nameKey="1350" validation="">
  <ResourceGroup instanced="false" key="fan" nameKey="1351" validation="">
    <ResourceAttribute key="currentValue" nameKey="1360" dashboardOrder="1" dataType="float"
defaultMonitored="false" isDiscrete="false" isRate="false" maxVal="" minVal="" unit="percent"/>
    <ResourceAttribute key="healthState" nameKey="1361" dashboardOrder="1" dataType="float"
defaultMonitored="false" isDiscrete="false" isRate="false" maxVal="" minVal="" />
  </ResourceGroup>
  <ResourceGroup instanced="false" key="temperature" nameKey="1352" validation="">
    <ResourceAttribute key="currentValue" nameKey="1362" dashboardOrder="1" dataType="float"
defaultMonitored="false" isDiscrete="false" isRate="false" maxVal="" minVal="" />
    <ResourceAttribute key="healthState" nameKey="1363" dashboardOrder="1" dataType="float"
defaultMonitored="false" isDiscrete="false" isRate="false" maxVal="" minVal="" />
  </ResourceGroup>
</ResourceGroup>
```

Each `ResourceAttribute` element includes the name of a metric that appears in the UI and is documented as a Metric Key.

**Table 1-1. Sensor Metrics for Host System Cooling**

Metric Key	Metric Name	Description
Sensor fan currentValue	Speed	Fan speed.
Sensor fan healthState	Health State	Fan health state.
Sensor temperature currentValue	Temperature	Host system temperature.
Sensor temperature healthState	Health State	Host system health state.

## vSphere Metrics

vRealize Operations Manager collects CPU use, disk, memory, network, and summary metrics for objects in the vSphere world.

Capacity metrics can be calculated for vSphere world objects. See [Capacity and Project-Based Metrics](#).

### CPU Usage Metrics

CPU usage metrics provide information about CPU use.

**Table 1-2. CPU Usage Metrics**

Metric Name	Description
CPU Capacity usage	CPU usages as a percent during the interval. Key: cpu capacity_usagepct_average
CPU CPU contention(%)	This metric shows the percentage of time the VMs in the ESXi hosts are unable to run because they are contending for access to the physical CPUs. The number shown is the average number for all VMs. The number will be lower than the highest number experienced by the VM that is most impacted by CPU contention. Use this metric to verify if the host can serve all its VMs efficiently. Low contention means that the VM can access everything it demands to run smoothly. It means that the infrastructure is providing good service to the application team. When using this metric, ensure that the number is within your expectation. Look at both the relative number and the absolute number. Relative means a drastic change in value, meaning that the ESXi is unable to serve the VMs. Absolute means that the real value itself is high. Investigate why the number is high. One factor that impacts this metric is CPU Power Management. If CPU Power Management clocks down the CPU speed from 3 GHz to 2 GHz, the reduction in speed is accounted for because it shows that the VM is not running at full speed. This metric is calculated in the following way: $\text{cpu capacity\_contention} / (200 * \text{summary number\_running\_vcpus})$ Key: cpu capacity_contentionPct
CPU Demand (%)	This metric shows the amount of CPU resources a virtual machine would use if there were no CPU contention or CPU limit. This metric represents the average active CPU load for the past five minutes. Keep this number below 100% if you set the power management to maximum. This metric is calculated in the following way: $(\text{cpu.demandmhz} / \text{cpu.capacity\_provisioned}) * 100$ Key: cpu demandPct
CPU Demand (MHz)	This metric shows the amount of CPU resources a virtual machine would use if there were no CPU contention or CPU limit. Key: cpu demandmhz
CPU Demand	CPU demand in megahertz. Key: cpu demand_average
CPU IO wait	IO wait (ms). Key: cpu iowait
CPU number of CPU Sockets	Number of CPU sockets. Key: cpu numpackages
CPU Overall CPU Contention	Overall CPU contention in milliseconds. Key: cpu capacity_contention
CPU Provisioned Capacity (MHz)	capacity in MHz of the physical CPU cores. Key: cpu capacity_provisioned
CPU Provisioned vCPU(s)	Number of provisioned CPU cores. Key: cpu corecount_provisioned
CPU Reserved Capacity (MHz)	Total CPU capacity reserved by virtual machines. Key: cpu reservedCapacity_average

**Table 1-2. CPU Usage Metrics (Continued)**

Metric Name	Description
CPU Usage (MHz)	<p>CPU usages, as measured in megahertz, during the interval.</p> <ul style="list-style-type: none"> <li>VM - Amount of actively used virtual CPU. This is the host's view of the CPU usage, not the guest operating system view.</li> <li>Host - Sum of the actively used CPU of all powered on virtual machines on a host. The maximum possible value is the frequency of the two processors multiplied by the number of processors. For example, if you have a host with four 2 GHz CPUs running a virtual machine that is using 4000 MHz, the host is using two CPUs completely: <math>400 / (4 \cdot 2000) = 0.50</math></li> </ul> <p>Key: cpu usagemhz_average</p>
CPU Wait	<p>Total CPU time spent in wait state. The wait total includes time spent in the CPU Idle, CPU Swap Wait, and CPU I/O Wait states.</p> <p>Key:cpu wait</p>
CPU Workload (%)	<p>Percent of workload</p> <p>Key: cpu workload</p>

## Memory Metrics

Memory metrics provide information about memory use and allocation.

**Table 1-3. Memory Metrics**

Metric Name	Description
mem Contention (%)	<p>This metric shows the percentage of time VMs are waiting to access swapped memory.</p> <p>Use this metric to monitor ESXi memory swapping. A high value indicates that the ESXi is running low on memory, and a large amount of memory is being swapped.</p> <p>Key: mem host_contentionPct</p>
mem Machine Demand (KB)	<p>Host memory demand in kilobytes.</p> <p>Key: mem host_demand</p>
mem Provisioned Memory	<p>Provisioned host memory in kilobytes.</p> <p>Key: mem host_provisioned</p>
mem Reserved Capacity (KB)	<p>Total amount of memory reservation used by powered-on virtual machines and vSphere services on the host.</p> <p>Key: mem reservedCapacity_average</p>
mem Usable Memory (KB)	<p>Usable host memory in kilobytes.</p> <p>Key: mem host_usable</p>
mem Host Usage (KB)	<p>Host memory use in kilobytes.</p> <p>Key: mem host_usage</p>
mem Usage/Usable (%)	<p>Memory usage as percentage of total configured or available memory.</p> <p>Key: mem host_usagePct</p>
mem Workload (%)	<p>Percent of workload.</p> <p>Key: mem workload</p>

## Network Metrics

Network metrics provide information about network performance.

**Table 1-4. Network Metrics**

Metric Name	Description
net Packets Dropped (%)	This metric shows the percentage of received and transmitted packets dropped in the collection interval. Use this metric to monitor the reliability and performance of the ESXi network. A high value indicates that the network is not reliable and performance decreases. Key: net droppedPct
net Usage Rate (KB per second)	Sum of the data transmitted and received for all of the NIC instances of the host or virtual machine. Key: net usage_average
net Workload (%)	Percent of workload. Key: net workload

## Disk Metrics

Disk metrics provide information about disk use.

**Table 1-5. Disk Metrics**

Metric Name	Description
disk Commands per second	Average number of commands issued per second during the collection cycle. Key: disk commandsAveraged_average
disk Usage Rate (KB per second)	Average of the sum of the data read and written for all of the disk instances of the host or virtual machine. Key: disk usage_average
disk Workload (%)	Percent of workload. Key: disk workload

## Summary Metrics

Summary metrics provide information about overall performance.

**Table 1-6. Summary Metrics**

Metric Name	Description
summary Number of Running Hosts	Number of running hosts. Key: summary number_running_hosts
summary Number of Running VMs	This metric shows the number of running VMs at a given point in time. The data is sampled every five minutes.  A large number of running VMs might be a reason for CPU or memory spikes because more resources are used in the host. The number of running VMs gives you a good indicator of how many requests the ESXi host must juggle. Powered off VMs are not included because they do not impact ESXi performance. A change in the number of running VMs can contribute to performance problems. A high number of running VMs in a host also means a higher concentration risk, because all the VMs will fail if the ESXi crashes.  Use this metric to look for a correlation between spikes in the running VMs and spikes in other metrics such as CPU contention, or memory contention. Key: summary number_running_vms
summary Total Number of Clusters	Total number of clusters. Key: summary total_number_clusters
summary Total Number of Datastores	Total number of datastores. Key: summary total_number_datastores
summary Total Number of Hosts	Total number of hosts. Key: summary total_number_hosts
summary Total Number of VMs	Total number of virtual machines. Key: summary total_number_vms
summary Total Number of Datacenters	Total number of data centers. Key: summary total_number_datacenters
summary Number VCPUs on Powered on VMs	Number of virtual CPUs on powered-on virtual machines. Key: summary number_running_vcpus
summary Average Running VM Count per Running Host	Average running virtual machine count per running host. Key: summary avg_vm_density

## vCenter Server Metrics

vRealize Operations Manager collects CPU use, disk, memory, network, and summary metrics for vCenter Server system objects.

vCenter Server metrics include capacity and badge metrics. See definitions in:

- [Capacity and Project-Based Metrics](#)
- [Badge Metrics](#)

## CPU Usage Metrics

CPU usage metrics provide information about CPU use.

**Table 1-7. CPU Usage Metrics**

Metric Key	Metric Name	Description
cpu capacity_usagepct_average	Capacity Usage (%)	Percent capacity used.
cpu capacity_contentionPct	CPU Contention (%)	Percent CPU contention.
cpu demandPct	Demand (%)	Percent demand.
cpu demandmhz	Demand (MHz)	Demand in megahertz.
cpu demand_average	Demand	CPU Demand.
cpu iowait	IO Wait (ms)	IO wait time in milliseconds.
cpu numpackages	Number of CPU Sockets	Number of CPU sockets.
cpu capacity_contention	Overall CPU Contention (ms)	Overall CPU contention in milliseconds.
cpu capacity_provisioned	Provisioned Capacity (MHz)	Provisioned capacity in megahertz.
cpu corecount_provisioned	Provisioned vCPU	Number of provisioned virtual CPU cores.
cpu reservedCapacity_average	Reserved Capacity (MHz)	Sum of the reservation properties of the immediate children of the host's root resource pool.
cpu usagemhz_average	Usage (MHz)	Average CPU use in megahertz.
cpu wait	Wait (ms)	CPU time spent on the idle state.
cpu overhead_average	Overhead	Amount of CPU that is overhead.
cpu demand_without_overhead	Demand without overhead	Value of demand excluding any overhead.
cpu vm_capacity_provisioned	Provisioned Capacity	Provisioned capacity (MHz).

## Datastore Metrics

Datastore metrics provide information about the datastore.

**Table 1-8. Datastore Metrics**

Metric Key	Metric Name	Description
datastore maxObserved_NumberRead	Max Observed Reads per second	Max observed average number of read commands issued per second during the collection interval.
datastore maxObserved_Read	Max Observed Read Rate	Max observed rate of reading data from the datastore.
datastore maxObserved_NumberWrite	Max Observed Writes per second	Max observed average number of write commands issued per second during the collection interval.
datastore maxObserved_Write	Max Observed Write Rate	Max observed rate of writing data from the datastore.
datastore maxObserved_OIO	Max Observed Number of Outstanding IO Operations	Maximum observed number of outstanding IO operations.
datastore demand_oio	Outstanding IO requests	OIO for datastore.
datastore numberReadAveraged_average	Reads per second	Average number of read commands issued per second during the collection interval.
datastore numberWriteAveraged_average	Writes per second	Average number of write commands issued per second during the collection interval.

**Table 1-8. Datastore Metrics (Continued)**

Metric Key	Metric Name	Description
datastore read_average	Read Rate	Amount of data read in the performance interval.
datastore write_average	Write Rate	Amount of data written to disk in the performance interval.

## Disk Metrics

Disk metrics provide information about disk use.

**Table 1-9. Disk Metrics**

Metric Key	Metric Name	Description
disk commandsAveraged_average	Commands per second	Average number of commands issued per second during the collection cycle.
disk totalLatency_average	Disk Command Latency (ms)	Average amount of time taken for a command from the perspective of the guest operating system. This metric is the sum of the Kernel Device Command Latency and Physical Device Command Latency metrics.
disk usage_average	Usage Rate (KBps)	Average of the sum of the data read and written for all of the disk instances of the host or virtual machine.
disk sum_queued_oio	Total queued outstanding operations	Sum of queued operations and outstanding operations.
disk max_observed	Max Observed OIO	Max observed IO for a disk.

## Diskspace Metrics

Disk space metrics provide information about disk space use.

**Table 1-10. Diskspace Metrics**

Metric Key	Metric Name	Description
diskspace total_usage	Total disk space used (KB)	Total disk space used on all datastores visible to this object.
diskspace total_capacity	Total disk space (KB)	Total disk space on all datastores visible to this object.
diskspace total_provisioned	Total provisioned disk space (KB)	Total provisioned disk space on all datastores visible to this object.

## Memory Metrics

Memory metrics provide information about memory use and allocation.

**Table 1-11. Memory Metrics**

Metric Key	Metric Name	Description
mem host_contentionPct	Contention (%)	Percent host memory contention.
mem host_demand	Machine Demand (KB)	Host memory demand in kilobytes.

**Table 1-11. Memory Metrics (Continued)**

Metric Key	Metric Name	Description
mem host_systemUsage	ESX System Usage	Memory usage by the VMkernel and ESX user-level services.
mem host_provisioned	Provisioned Memory (KB)	Provisioned host memory in kilobytes.
mem reservedCapacity_average	Reserved Capacity (KB)	Sum of the reservation properties of the immediate children of the host's root resource pool.
mem host_usable	Usable Memory (KB)	Usable host memory in kilobytes.
mem host_usage	Host Usage (KB)	Host memory use in kilobytes.
mem host_usagePct	Usage/Usable (%)	Percent host memory used.
mem host_contention	Contention (KB)	Host contention in kilobytes.
mem overhead_average	VM Overhead (KB)	Memory overhead reported by host.

## Network Metrics

Network metrics provide information about network performance.

**Table 1-12. Network Metrics**

Metric Key	Metric Name	Description
net droppedPct	Packets Dropped (%)	Percent network packets dropped.
net usage_average	Usage Rate (KBps)	Sum of the data transmitted and received for all of the NIC instances of the host or virtual machine.
net packetsRx_summation	Packets Received	Number of packets received in the performance interval.
net packetsTx_summation	Packets Transmitted	Number of packets transmitted in the performance interval.
net droppedRx_summation	Received Packets Dropped	Number of received packets dropped in the performance interval.
net droppedTx_summation	Transmitted Packets Dropped	Number of transmitted packets dropped in the performance interval.
net maxObserved_KBps	Max Observed Throughput (KBps)	Max observed rate of network throughput.
net maxObserved_Tx_KBps	Max Observed Transmitted Throughput (KBps)	Max observed transmitted rate of network throughput.
net maxObserved_Rx_KBps	Max Observed Received Throughput (KBps)	Max observed received rate of network throughput.
net transmitted_average	Data Transmit Rate (KBps)	Average amount of data transmitted per second.
net received_average	Data Receive Rate (KBps)	Average amount of data received per second.

## Summary Metrics

Summary metrics provide information about overall performance.

**Table 1-13. Summary Metrics**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
summary number_running_hosts	Number of Running Hosts	Number of hosts that are on.
summary number_running_vms	Number of Running VMs	Number of virtual machines that are on.
summary total_number_clusters	Total Number of Clusters	Total number of clusters.
summary total_number_datastores	Total Number of Datastores	Total number of datastores.
summary total_number_hosts	Total Number of Hosts	Total number of hosts.
summary total_number_vms	Total Number of VMs	Total number of virtual machines.
summary max_number_vms	Maximum Number of VMs	Maximum number of virtual machines.
summary workload_indicator	Workload Indicator (%)	Percent workload indicator.
summary total_number_datacenters	Total Number of Datacenters	Total number of datacenters.
summary number_powered_on_cores	Number of Cores on Powered On Hosts	Number of cores on powered-on hosts.
summary number_running_vcpus	Number VCPUs on Powered on VMs	Number of virtual CPUs on powered-on virtual machines.
summary avg_vm_density	Average Running VM Count per Running Host	Average running virtual machine count per running host.
summary vc_query_time	VC Query Time (ms)	vCenter Server query time in milliseconds.
summary derived_metrics_comp_time	Derived Metrics Computation Time (ms)	Derived metrics computation time in milliseconds.
summary number_objs	Number of objects	Number of objects.
summary number_vc_events	Number of VC Events	Number of vCenter Server events.
summary number_sms_metrics	Number of SMS Metrics	Number of SMS metrics.
summary collector_mem_usage	Collector Memory Usage (MB)	Collector memory use in megabytes.

## Virtual Machine Metrics

vRealize Operations Manager collects configuration, CPU use, memory, datastore, disk, virtual disk, guest file system, network, power, disk space, storage, and summary metrics for virtual machine objects.

Capacity metrics can be calculated for virtual machine objects. See [Capacity and Project-Based Metrics](#).

Metrics marked with an asterisk (\*) provide the most relevant data to use when you troubleshoot the virtual machines in your environment.

## Configuration Metrics for Virtual Machines

Configuration metrics provide information about virtual machine configuration.

Metric	Description
Config Thin Provisioned Disk	Thin Provisioned Disk. Key: config hardware thin_Enabled
Config Number of CPUs	Number of CPUs for a Virtual Machine. Key: config hardware num_Cpu
Config Disk Space	Disk space metrics. Key: config hardware disk_Space

## CPU Usage Metrics for Virtual Machines

CPU usage metrics provide information about CPU use.

Metric	Description
CPU IO Wait (ms)	CPU time spent waiting for IO. Key: cpu iowait
CPU Wait (ms)	Wait time in milliseconds. Key: cpu wait
CPU Overall CPU Contention (ms)	The amount of time the CPU cannot run due to contention. Key: cpu capacity_contention
CPU Reservation Used	CPU Reservation Used. Key: cpu reservation_used
CPU Effective Limit	CPU Effective Limit. Key: cpu effective_limit
CPU Estimated Entitlement	CPU Estimated Entitlement. key: cpu estimated_entitlement
CPU Idle (%)	Percentage time that CPU is idle. Key: cpu idlePct
CPU IO Wait (%)	Percentage IO Wait. Key: cpu iowaitPct
CPU Swap wait (%)	Percentage swap wait for CPU. Key: cpu swapwaitPct
CPU Wait (%)	Percentage of total CPU time spent in wait state. Key: cpu waitPct
CPU System (%)	Percentage CPU time spent on system processes. Key: cpu systemSummationPct
CPU Demand Over Limit (MHz)	Amount of CPU Demand that is over the configured CPU Limit. Key: cpu demandOverLimit
CPU Demand Over Capacity (MHz)	Amount of CPU Demand that is over the configured CPU Capacity. Key: cpu demandOverCapacity

Metric	Description
CPU Recommended Size Reduction (%)	Percentage of recommended CPU size reduction. Key: cpu sizePctReduction
CPU Normalized Co-stop	Percentage of co-stop time, normalized across all vCPUs. Key: cpu perCpuCoStopPct
CPU Recommended number of vCPUs to Add	Recommended number of vCPUs to Add to the VM. Key: cpu numberToAdd
CPU Recommended number of vCPUs to Remove	Recommended number of vCPUs to Remove from the VM. Key: cpu numberToRemove
CPU Capacity entitlement (MHz)	CPU entitlement for the VM after taking limits into account. Key: cpu capacity_entitlement
CPU Provisioned CPU Cores	Number of provisioned CPU cores. Key: cpu corecount_provisioned
CPU Capacity Demand Entitlement (%)	Percent capacity demand entitlement. Key: cpu capacity_demandEntitlementPct
* CPU CPU Contention (%)	CPU contention as a percentage of 20-second collection interval. Key: cpu capacity_contentionPct
CPU Capacity Provisioned	Provisioned CPU capacity in megahertz. Key: cpu capacity_provisioned
CPU Demand (MHz)	CPU demand in megahertz. Key: cpu demandmhz
CPU Host demand for aggregation	Host demand for aggregation. Key: cpu host_demand_for_aggregation
CPU Demand (ms)	The total CPU time that the VM could use if there was no contention. Key: cpu demand_average
CPU Demand (%)	CPU demand as a percentage of the provisioned capacity. Key: cpu demandPct
CPU Dynamic Entitlement	CPU Dynamic Entitlement. Key: cpu dynamic_entitlement
* CPU Usage (%)	This metric indicates the percentage of CPU that was used out of all the CPU that was allocated to the VM. CPU usage can indicate if the VM is undersized. Key: cpu usage_average
CPU Usage (MHz)	CPU use in megahertz. Key: cpu usagemhz_average
CPU System (ms)	CPU time spent on system processes. Key: cpu system_summation

Metric	Description
CPU Wait (ms)	Total time that a virtual CPU can not be run. It could be idle (halted) or waiting for an external event such as I/O. Key: cpu wait_summation
CPU Ready (ms)	CPU time spent in the ready state. Key: cpu ready_summation
* CPU Ready (%)	This metric indicates the percentage of time in which the VM was waiting in line to use the CPU on the host. A large ready time for a VM indicates that the VM needed CPU resources but the infrastructure was busy serving other VMs. This might indicate that the host is trying to serve too many VMs. Whenever the CPU ready is larger than 10%, you should check if the host is overloaded, or if the VM really needs all the resources that were allocated to it. Key: cpu readyPct
CPU Used (ms)	CPU time that is used. Key: cpu used_summation
CPU Extra (ms)	Extra CPU time in milliseconds. Key: cpu extra_summation
CPU Guaranteed (ms)	CPU time that is guaranteed for the virtual machine. Key: cpu guaranteed_latest
CPU Swap Wait (ms)	Swap wait time in milliseconds. Key: cpu swapwait_summation
CPU Co-stop (ms)	Time the VM is ready to run, but is unable to due to co-scheduling constraints. Key: cpu costop_summation
CPU Co-stop (%)	Percentage of time the VM is ready to run, but is unable to due to co-scheduling constraints. Key: cpu costopPct
CPU Idle (ms)	CPU time that is idle. Key: cpu idle_summation
CPU Latency	Percentage of time the VM is unable to run because it is contending for access to the physical CPUs. Key: cpu latency_average
CPU Max Limited	Time the VM is ready to run, but is not run due to maxing out its CPU limit setting. Key: cpu maxlimited_summation
CPU Overlap	Time the VM was interrupted to perform system services on behalf of that VM or other VMs. Key: cpu overlap_summation

Metric	Description
CPU Run	Time the VM is scheduled to run. Key: cpu run_summation
CPU Entitlement Latest	Entitlement Latest. Key: cpu entitlement_latest

## CPU Utilization for Resources Metrics for Virtual Machines

CPU utilization for resources metrics provide information about resource CPU use.

Metric	Description
rescpu CPU Active (%) ( <i>interval</i> )	The average active time (actav) or peak active time (actpk) for the CPU during various intervals. Key: rescpu actav1_latest rescpu actav5_latest rescpu actav15_latest rescpu actpk1_latest rescpu actpk5_latest rescpu actpk15_latest
rescpu CPU Running (%) ( <i>interval</i> )	The average runtime (runav) or peak active time (runpk) for the CPU during various intervals. Key: rescpu runav1_latest rescpu runav5_latest rescpu runav15_latest rescpu runpk1_latest rescpu runpk5_latest rescpu runpk15_latest
rescpu CPU Throttled (%) ( <i>interval</i> )	Amount of CPU resources over the limit that were refused, average over various intervals. Key: rescpu maxLimited1_latest rescpu maxLimited5_latest rescpu maxLimited15_latest
rescpu Group CPU Sample Count	The sample CPU count. Key: rescpu sampleCount_latest
rescpu Group CPU Sample Period (ms)	The sample period. Key: rescpu samplePeriod_latest

## Memory Metrics for Virtual Machines

Memory metrics provide information about memory use and allocation.

<b>Metric</b>	<b>Description</b>
Mem Host Active (KB)	Host active memory use in kilobytes. Key: mem host_active
Mem Usage (KB)	Memory use in kilobytes. Key: mem host_usage
Mem Contention (KB)	Memory contention in kilobytes. Key: mem host_contention
Mem Contention (%)	Percent memory contention. Key: mem host_contentionPct
Mem Guest Configured Memory (KB)	Guest operating system configured memory in kilobytes. Key: mem guest_provisioned
Mem Guest Dynamic Entitlement (KB)	Guest Memory Dynamic Entitlement. Key: mem guest_dynamic_entitlement
Mem Guest Active Memory (%)	Percent guest operating system active memory. Key: mem guest_activePct
Mem Guest Non Pageable Memory (KB)	Guest operating system non-pageable memory in kilobytes. Key: mem guest_nonpageable_estimate
Mem Reservation Used	Memory Reservation Used. Key: mem reservation_used
Mem Effective Limit	Memory Effective Limit. Key: mem effective_limit
Mem Estimated Entitlement	Memory Estimated Entitlement. Key: mem estimated_entitlement
Mem Demand for aggregation	Host demand for aggregation. Key: mem host_demand_for_aggregation
Mem NUMA Remote Latest	Non-uniform memory access Remote (Kb). Key: mem numa.remote_latest
Mem NUMA Local Latest	Non-uniform memory access Local (Kb). Key: mem numa.local_latest
Mem NUMA Migrations Latest	Non-uniform memory access Migrations (number). Key: mem numa.migrations_latest
Mem NUMA Locality Average	Non-uniform memory access Locality (%). Key: mem numa.locality_average
Mem Demand Over Limit	Amount of Memory Demand that is over the configured Memory Limit. Key: mem demandOverLimit
Mem Demand Over Capacity	Amount of Memory Demand that is over the configured Memory Capacity. Key: mem demandOverCapacity
Mem Recommended Size Reduction (%)	Percentage of recommended Memory size reduction. Key: mem sizePctReduction

Metric	Description
Mem Balloon (%)	Percentage of total memory that has been reclaimed via ballooning. Key: mem balloonPct
* Mem Guest Usage (KB)	This metric shows the amount of memory the VM uses. Key: mem guest_usage
Mem Guest Demand (KB)	Guest operating system demand in kilobytes. Key: mem guest_demand
Mem Guest Non Pageable Memory (KB)	Guest operating system non-pageable memory in kilobytes. Key: mem host_nonpageable_estimate
Mem Host Demand (KB)	Memory demand in kilobytes. Key mem host_demand
Mem Demand with Reservation (KB)	Memory Demand with Reservation considered in KB. Key: mem host_demand_reservation
Mem Guest Workload	Guest Workload (%). Key: mem guest_workload
Mem Host Workload	Host Workload (%). Key: host_workload
Mem Balloon (%)	Amount of memory currently used by the virtual machine memory control. Key: mem vmemctl_average
Mem Guest Active (%)	Amount of memory that is actively used. Key: mem active_average
Mem Granted (KB)	Amount of memory available for use. Key: mem granted_average
Mem Shared (KB)	Amount of shared memory in kilobytes. Key: mem shared_average
Mem Zero (KB)	Amount of memory that is all 0. Key: mem zero_average
* Mem Swapped (KB)	This metric shows how much memory is being swapped. Meaning, the amount of unreserved memory in kilobytes. Key: mem swapped_average
Mem Swap Target (KB)	Amount of memory that can be swapped in kilobytes. Key: mem swaptarget_average
Mem Swap In (KB)	Swap-in memory in kilobytes. Key: mem swopin_average
Mem Swap Out (KB)	amount of memory swapped out in kilobytes. Key: mem swapout_average
* Mem Usage (%)	This metric shows how much memory is being used out of the allocated memory for the VM. Key: mem usage_average

Metric	Description
Mem Balloon Target (KB)	Amount of memory that can be used by the virtual machine memory control. Key: mem vmmemctltarget_average
Mem Consumed (KB)	Amount of host memory consumed by the virtual machine for guest memory in kilobytes. Key: mem consumed_average
Mem Overhead (KB)	Memory overhead in kilobytes. Key: mem overhead_average
Mem Host Dynamic Entitlement	Mem Machine Dynamic Entitlement. Key: mem host_dynamic_entitlement
Mem Swap In Rate (KBps)	Rate at which memory is swapped from disk into active memory during the interval. Key: mem swpinRate_average
Mem Swap Out Rate (KBps)	Rate at which memory is being swapped from active memory to disk during the current interval. Key: mem swapoutRate_average
Mem Active Write (KB)	Active writes in kilobytes. Key: mem activewrite_average
Mem Compressed (KB)	Compressed memory in kilobytes. Key: mem compressed_average
Mem Compression Rate (KBps)	Compression rate in kilobytes per second. Key: mem compressionRate_average
Mem Decompression Rate (KBps)	Decompression rate in kilobytes per second. Key: mem decompressionRate_average
Mem Overhead Max (KB)	Maximum overhead in kilobytes. Key: mem overheadMax_average
Mem Zip Saved (KB)	Zip-saved memory in kilobytes. Key: mem zipSaved_latest
Mem Zipped (KB)	Zipped memory in kilobytes. Key: mem zipped_latest
Mem Entitlement	Amount of host physical memory the VM is entitled to, as determined by the ESX schedule. Key: mem entitlement_average
Mem Latency	Percentage of time the VM is waiting to access swapped or compressed memory. Key: mem latency_average
Mem Capacity Contention	Capacity Contention. Key: mem capacity.contention_average
Mem Swap In Rate from Host Cache	Rate at which memory is being swapped from host cache into active memory. Key: mem  ISwapInRate_average

Metric	Description
Mem Swap Out Rate to Host Cache	Rate at which memory is being swapped to host cache from active memory. Key: mem ISwapOutRate_average
Mem Swap Space Used in Host Cache	Space used for caching swapped pages in the host cache. Key: mem ISwapUsed_average
Mem Overhead Touched	Actively touched overhead memory (KB) reserved for use as the virtualization overhead for the VM. Key: mem overheadTouched_average

## Datastore Metrics for Virtual Machines

Datastore metrics provide information about datastore use.

Metric	Description
Datastore Commands per second	Average number of commands issued per second during the collection interval. Key: datastore commandsAveraged_average
Datastore Outstanding IO requests	OIO for datastore. Key: datastore demand_oio
Datastore Number of Outstanding IO Operations	Number of outstanding IO operations. Key: datastore oio
Datastore Demand	Datastore demand. Key: datastore demand
Datastore Disk Command Latency (ms)	The average amount of time taken for a command from the perspective of a Guest OS. This is the sum of Kernel Command Latency and Physical Device Command Latency. Key: datastore totalLatency_average
Datastore Usage Average (KBps)	Usage Average (KBps). Key: datastore usage_average
Datastore Used Space (MB)	Used space in megabytes. Key: datastore used
Datastore Not Shared (GB)	Space used by VMs that is not shared. Key: datastore notshared
* Datastore Reads per second	Average number of read commands issued per second during the collection interval. Key: datastore numberReadAveraged_average
* Datastore Writes per second	Average number of write commands issued per second during the collection interval. Key: datastore numberWriteAveraged_average
* Datastore Read Rate (KBps)	This metric shows the amount of data that the VM reads to the datastore per second.. Key: datastore read_average

Metric	Description
*Datastore Read Latency (ms)	Average amount of time for a read operation from the datastore. Total latency = kernel latency + device latency. Key: datastore totalReadLatency_average
*Datastore Write Latency (ms)	Average amount of time for a write operation to the datastore. Total latency = kernel latency + device latency. Key: datastore totalWriteLatency_average
* Datastore Write Rate	This metric shows the amount of data that the VM writes to the datastore per second. Key: datastore write_average
Datastore Highest Latency	Highest Latency. Key: datastore maxTotalLatency_latest
Datastore Total Latency Max	Total Latency Max (ms). Key: datastore totalLatency_max
Datastore Max Observed Reads per second	Max observed average number of read commands issued per second during the collection interval. Key: datastore maxObserved_NumberRead
Datastore Max Observed Read Rate	Max observed rate of reading data from the datastore. Key: datastore maxObserved_Read
Datastore Max Observed Writes per second	Max observed average number of write commands issued per second during the collection interval. Key: datastore maxObserved_NumberWrite
Datastore Max Observed Write Rate	Max observed rate of writing data from the datastore. Key: datastore maxObserved_Write
Datastore Max Observed Number of Outstanding IO Operations	Max Observed Number of Outstanding IO Operations. Key: datastore maxObserved_OIO

## Disk Metrics for Virtual Machines

Disk metrics provide information about disk use.

Metric	Description
Disk Reads per second	Average number of read commands issued per second during the collection interval. Key: disk numberReadAveraged_average
Disk Writes per second	Average number of write commands issued per second during the collection interval. Key: disk numberWriteAveraged_average
Disk Commands per second	Average number of commands issued per second during the collection interval. Key: disk commandsAveraged_average
Disk Usage Rate (KBps)	Use rate in kilobytes per second. Key: disk usage_average

Metric	Description
Disk I/O Usage Capacity	This metric is a function of storage usage_average and disk workload. storage usage_average is an average over all storage devices. This means that disk usage_capacity is not specific to the selected VM or the host of the VM. Key: disk usage_capacity
Disk Number of Outstanding IO Operations	Number of outstanding IO operations. Key: disk diskoio
Disk Queued Operations	Queued operations. Key: disk diskqueued
Disk Demand (%)	Percent demand. Key: disk diskdemand
Disk  Total Queued Outstanding Operations	Sum of Queued Operation and Outstanding Operations. Key: disk  sum_queued_oio
Disk Max Observed OIO	Max Observed IO for a disk. Key: disk max_observed
Disk Read Rate (KBps)	Amount of data read in the performance interval. Key: disk read_average
Disk Write Rate (KBps)	Amount of data written to disk in the performance interval. Key: disk write_average
Disk Read Requests	Number of times data was read from the disk in the defined interval. Key: disk numberRead_summation
Disk Write Requests	Number of times data was written to the disk in the defined interval. Key: disk numberWrite_summation
Disk Bus Resets	The number of bus resets in the performance interval. Key: disk busResets_summation
Disk Commands Issued	The number of disk commands issued in the performance interval. Key: disk commands_summation
Disk Commands Aborted	The number of disk commands aborted in the performance interval. Key: disk commandsAborted_summation
Disk Highest Latency	Highest latency. Key: disk maxTotalLatency_latest
Disk SCSI Reservation Conflicts	SCSI Reservation Conflicts. Key: disk scsiReservationConflicts_summation
Disk Disk Read Latency	The average amount of time taken for a read from the perspective of a Guest OS. This is the sum of Kernel Read Latency and Physical Device Read Latency. Key: disk totalReadLatency_average

Metric	Description
Disk Disk Write Latency	The average amount of time taken for a write from the perspective of a Guest OS. This is the sum of Kernel Write Latency and Physical Device Write Latency. Key: disk totalWriteLatency_average
Disk Disk Command Latency (ms)	The average amount of time taken for a command from the perspective of a Guest OS. This is the sum of Kernel Command Latency and Physical Device Command Latency. Key: disk totalLatency_average

## Virtual Disk Metrics for Virtual Machines

Virtual disk metrics provide information about virtual disk use.

Metric	Description
VirtualDisk Usage	Average CPU usage as a percentage. Key: virtualDisk usage
VirtualDisk Total Latency	Total latency. Key: virtualDisk totalLatency
VirtualDisk Commands Per Second	Average number of commands per second. Key: virtualDisk commandsAveraged_average
VirtualDisk Read Requests	Average number of read commands issued per second to the virtual disk during the collection interval. Key: virtualDisk numberReadAveraged_average
VirtualDisk Write Requests	Average number of write commands issued per second to the virtual disk during the collection interval. Key: virtualDisk numberWriteAveraged_average
VirtualDisk Read Rate (KBps)	Rate of reading data from the virtual disk in kilobytes per second. Key: virtualDisk read_average
VirtualDisk Read Latency (ms)	Average amount of time for a read operation from the virtual disk. Total latency = kernel latency + device latency. Key: virtualDisk totalReadLatency_average
VirtualDisk Write Latency (ms)	Average amount of time for a write operation to the virtual disk. Total latency = kernel latency + device latency. Key: virtualDisk totalWriteLatency_average
VirtualDisk Write Rate (KBps)	Rate of writing data from the virtual disk in kilobytes per second. Key: virtualDisk write_average
VirtualDisk Bus Resets	The number of bus resets in the performance interval. Key: virtualDisk busResets_summation
VirtualDisk Commands Aborted	The number of disk commands aborted in the performance interval. Key: virtualDisk commandsAborted_summation

Metric	Description
VirtualDisk Read Load	Storage DRS virtual disk metric read load. Key: virtualDisk readLoadMetric_latest
VirtualDisk Outstanding Read Requests	Average number of outstanding read requests to the virtual disk. Key: virtualDisk readOIO_latest
VirtualDisk Write Load	Storage DRS virtual disk write load. Key: virtualDisk writeLoadMetric_latest
VirtualDisk Outstanding Write Requests	Average number of outstanding write requests to the virtual disk. Key: virtualDisk writeOIO_latest
VirtualDisk Number of Small Seeks	Small Seeks. Key: virtualDisk smallSeeks_latest
VirtualDisk Number of Medium Seeks	Medium Seeks. Key: virtualDisk mediumSeeks_latest
VirtualDisk Number of Large Seeks	Large Seeks. Key: virtualDisk largeSeeks_latest
VirtualDisk Read Latency (microseconds)	Read Latency in microseconds. Key: virtualDisk readLatencyUS_latest
VirtualDisk Write Latency (microseconds)	Write Latency in microseconds. Key: virtualDisk writeLatencyUS_latest
VirtualDisk Average Read request size	Read IO size. Key: virtualDisk readIOSize_latest
VirtualDisk Average Write request size	Write IO size. Key: virtualDisk writeIOSize_latest

## Guest File System Metrics for Virtual Machines

Guest file system metrics provide information about guest file system capacity and free space.

Metric	Description
Guest file system Guest File System Capacity (MB)	Total capacity on guest file system in megabytes. Key: guestfilesystem capacity
Guest file system Guest File System Free (MB)	Total free space on guest file system in megabytes. Key: guestfilesystem freespace
Guest file system Guest File System Usage (%)	Percent guest file system. Key: guestfilesystem percentage
Guest file system Guest File System Usage	Total usage of guest file system. Key: guestfilesystem usage

Metric	Description
* Guest file system Total Guest File System Free (GB)	This metric displays the amount of free disk space from all file systems attached to this VM. Use this metric to see if there are spikes in the free space or if there is an organic growth for this VM. Key: guestfilesystem freespace_total
* Guest file system Total Guest File System Capacity (GB)	This metric displays the amount of disk space allocated for the VM. Correlate other metrics with this metric to indicate if changes occur in the disk space allocation for the VM. Key: guestfilesystem capacity_total
* Guest file system Total Guest File System Usage (%)	This metric displays the amount of disk space being used out of the total allocated disk space. Use this metric to track if the overall usage is stable, or if it reaches the limits. You should avoid having VMs with a disk space usage of >95% since this could impact your system. Key: guestfilesystem percentage_total
Guest file system Total Guest File System Usage	Total usage of guest file system. Key: guestfilesystem usage_total

## Network Metrics for Virtual Machines

Network metrics provide information about network performance.

Metric	Description
Net Demand (%)	Percent demand. Key: net demand
Net Usage Rate (KBps)	The sum of the data transmitted and received for all the NIC instances of the host or virtual machine. Key: net usage_average
Net Packets Received per second	Number of packets received in the performance interval. Key: net packetsRxPerSec
Net Packets Transmitted per second	Number of packets transmitted in the performance interval. Key: net packetsTxPerSec
* Net Data Transmit Rate (KBps)	This metric shows the rate of data being sent by the VM per second. Key: net transmitted_average
* Net Data Receive Rate (KBps)	This metric shows the rate of data received by the VM per second. Key: net received_average
Net Packets per second	Number of packets transmitted and received per second. Key: net PacketsPerSec
Net I/O Usage Capacity	IO use capacity. Key: net usage_capacity

Metric	Description
Net Max Observed Throughput (KBps)	Maximum observed throughput in kilobytes per second. Key: net maxObserved_KBps
Net Max Observed Transmitted Throughput	Max observed transmitted rate of network throughput. Key: net maxObserved_Tx_KBps
Net Max Observed Received Throughput	Max observed received rate of network throughput. Key: net maxObserved_Rx_KBps
Net Packets Received	Number of packets received in the performance interval. Key: net packetsRx_summation
Net Packets Transmitted	Number of packets transmitted in the performance interval. Key: net packetsTx_summation
* Net Received Packets Dropped	This metric shows the number of received packets dropped in the collection interval. Key: net droppedRx_summation
* Net Transmitted Packets Dropped	This metric shows the number of transmitted packets dropped in the collection interval. Key: net droppedTx_summation
Net Packets Dropped (%)	Percentage of packets dropped. Key: net droppedPct
Net Packets Dropped	Number of packets dropped in the performance interval. Key: net dropped
Net Broadcast Packets Transmitted	Number of broadcast packets transmitted during the sampling interval. Key: net broadcastTx_summation
Net Broadcast Packets Received	Number of broadcast packets received during the sampling interval. Key: net broadcastRx_summation
Net Bytes Rx (KBps)	Average amount of data received per second. Key: net bytesRx_average
Net Bytes Tx (KBps)	Average amount of data transmitted per second. Key: net bytesTx_average
Net Multicast Packets Received	Number of multicast packets received. Key: net multicastRx_summation
Net Multicast Packets Transmitted	Number of multicast packets transmitted. Key: net multicastTx_summation
Net VM to Host Data Transmit Rate	Average amount of data transmitted per second between VM and host. Key: net host_transmitted_average
Net VM to Host Data Receive Rate	Average amount of data received per second between VM and host. Key: net host_received_average

Metric	Description
Net VM to Host Usage Rate	The sum of the data transmitted and received for all the NIC instances between VM and host. Key: net host_usage_average
Net VM to Host Max Observed Transmitted Throughput	Max observed transmitted rate of network throughput between VM and host. Key: net host_maxObserved_Tx_KBps
Net VM to Host Max Observed Received Throughput	Max observed received rate of network throughput between VM and host. Key: net host_maxObserved_Rx_KBps
Net VM to Host Max Observed Throughput	Max observed rate of network throughput between VM and host. Key: net host_maxObserved_KBps
Net Data Transmit Demand Rate	Data transmitted demand rate. Key: net transmit_demand_average
Net Data Receive Demand Rate	Data received demand rate. Key: net receive_demand_average

## System Metrics for Virtual Machines

System metrics for virtual machines provide general information about the virtual machine, such as its build number and running state.

Metric	Description
Sys Powered ON	Powered on virtual machines. 1 if powered on, 0 if powered off, -1 if unknown Key: sys poweredOn
Sys Uptime (seconds)	Number of seconds since system startup. Key: sys uptime_latest
Sys Heartbeat	Number of heartbeats from the virtual machine in the defined interval. Key: sys heartbeat_summation
Sys vMotion Enabled	1 if vMotion is enabled or 0 if vMotion is not enabled. Key: sys vmotionEnabled
Sys Product String	VMware product string. Key: sys productString
Sys Build Number	VMware build number. Key: sys build
Sys OS Uptime	Total time elapsed, in seconds, since last operating system boot-up. Key: sys osUptime_latest

## Power Metrics for Virtual Machines

Power metrics provide information about power use.

Metric	Description
Power Energy (Joule)	Energy use in joules. Key: power energy_summation
Power Power (Watt)	Average power use in watts. Key: power power_average

## Disk Space Metrics for Virtual Machines

Disk space metrics provide information about disk space use.

Metric	Description
Diskspace Not Shared (GB)	Unshared space in kilobytes. Key: diskspace notshared
Diskspace Number of Virtual Disks	Number of virtual disks. Key: diskspace numvmdisk
Diskspace Provisioned Space (GB)	Provisioned space in gigabytes. Key: diskspace provisioned
Diskspace Provisioned Space for VM	Provisioned space for VM. Key: diskspace provisionedSpace
Diskspace Shared Used (GB)	Shared used space in gigabytes. Key: diskspace shared
Diskspace Snapshot Space (GB)	Space used by snapshots. Key: diskspace snapshot
Diskspace Virtual Disk Used (GB)	Space used by virtual disks in gigabytes. Key: diskspace diskused
Diskspace Virtual machine used (GB)	Space used by virtual machine files in gigabytes. Key: diskspace used
Diskspace Total disk space used	Total disk space used on all datastores visible to this object. Key: diskspace total_usage
Diskspace Total disk space	Total disk space on all datastores visible to this object. Key: diskspace total_capacity
Diskspace Total provisioned disk space	Total provisioned disk space on all datastores visible to this object. Key: diskspace total_provisioned
Diskspace Active not shared	Unshared disk space used by VMs excluding snapshot. Key: diskspace activeNotShared

## Storage Metrics for Virtual Machines

Storage metrics provide information about storage use.

Metric	Description
Storage Commands per second	Average number of commands issued per second during the collection interval. Key: storage commandsAveraged_average
Storage Contention (%)	Percent contention. Key: storage contention
Storage Demand (KBps)	Demand in kilobytes per second. Key: storage demandKBps
* Storage Read Latency (ms)	This metric shows the latency that the VM experiences while performing a read action. Key: storage totalReadLatency_average
Storage Read Rate (KBps)	Read throughput rate in kilobytes per second. Key: storage read_average
Storage Reads per second	Average number of read commands issued per second during the collection interval. Key: storage numberReadAveraged_average
Storage Total Latency (ms)	Total latency in milliseconds. Key: storage totalLatency_average
Storage Total Usage (KBps)	Total throughput rate in kilobytes per second. Key: storage usage_average
* Storage Write Latency (ms)	This metric shows the latency that this VM experiences while performing a write action. Key: storage totalWriteLatency_average
Storage Write Rate (KBps)	Write throughput rate in kilobytes per second. Key: storage write_average
Storage Writes per second	Average number of write commands issued per second during the collection interval. Key: storage numberWriteAveraged_average

## Summary Metrics for Virtual Machines

Summary metrics provide information about overall performance.

Metric	Description
Summary Workload Indicator (%)	Percent workload indicator. Key: summary workload_indicator
Summary CPU Shares	CPU shares. Key: summary cpu_shares
Summary Memory Shares	Memory shares. Key: summary mem_shares
Summary Number of Datastores	Number of datastores. Key: summary number_datastore

Metric	Description
Summary Number of Networks	Number of networks. Key: summary number_network
Summary Running	Number of running virtual machines. Key: summary running
Summary Desktop Status	Horizon View Desktop Status. Key: summary desktop_status

## Host System Metrics

vRealize Operations Manager collects many metrics for host systems, including CPU use, datastore, disk, memory, network, storage, and summary metrics for host system objects.

Capacity metrics can be calculated for host system objects. See [Capacity and Project-Based Metrics](#).

Metrics marked with an asterisk (\*) provide the most relevant data to use when you troubleshoot the hosts in your environment.

### vFlash Module Metrics for Host Systems

vFlash Module metrics provide information about the host system's flash devices.

Metric	Description
vFlashModule Latest Number of Active VM Disks	Latest Number of Active VM Disks. Key: vflashModule numActiveVMDKs_latest

### Configuration Metrics for Host Systems

Configuration metrics provide information about host system configuration.

Metric	Description
Configuration Failover Hosts	Failover Hosts. Key: configuration dasConfig admissionControlPolicy failoverHost

### Hardware Metrics for Host Systems

Hardware metrics provide information about host system hardware.

Metric	Description
Hardware Number of CPUs	Number of CPUs for a host. Key: hardware cpuinfo num_CpuCores

### CPU Usage Metrics for Host Systems

CPU usage metrics provide information about CPU use.

Metric	Description
CPU Capacity Usage (%)	Percent CPU capacity used. Key: cpu capacity_usagepct_average
CPU Usage (%)	Average CPU usage as a percentage. Key: cpu usage_average
* CPU CPU Contention (%)	<p>This metric indicates the percentage of time the virtual machines in the ESXi hosts are unable to run because they are contending for access to the physical CPU(s). This is the average number of all VMs. Naturally, the number will be lower than the highest number experienced by the worst hit VM (a VM that suffers the highest CPU contention).</p> <p>Use this metric to verify if the host is able to serve all of its VMs well.</p> <p>When using this metric, ensure the number is within your expectation. The metric is affected by several factors so you need to watch both relative numbers and absolute numbers. Relative means a drastic change in value. This indicates that the ESXi is unable to service its VMs.</p> <p>Absolute means that the real value is high. You should investigate why the value is high. One factor that impacts the CPU contention metric is CPU Power Management. If CPU Power Management clocks down the CPU speed from 3 GHz to 2 GHz that reduction in speed is taken into account. This is because the VM is not running at full speed.</p> <p>Key: cpu capacity_contentionPct</p>
* CPU Demand (%)	<p>This metric shows the percentage of CPU resources all the VMs would use if there was no CPU contention or any CPU limits set. It represents the average active CPU load for the past five minutes.</p> <p>Keep the number of this metric below 100% if you set Power Management to Maximum.</p> <p>Key: cpu demandPct</p>
CPU Demand (MHz)	CPU demand in megahertz. Key: cpu demandmhz
CPU IO Wait (ms)	IO wait time in milliseconds. Key: cpu iowait
CPU Number of CPU Sockets	Number of CPU sockets. Key: cpu numpackages
CPU Overall CPU Contention (ms)	Overall CPU contention in milliseconds. Key: cpu capacity_contention
CPU Provisioned Capacity (MHz)	Capacity in MHz of the physical CPU cores. Key: cpu capacity_provisioned
CPU Provisioned virtual CPUs	Provisioned virtual CPUs. Key: cpu corecount_provisioned
CPU Total Wait	CPU time spent in idle state. Key: cpu wait

Metric	Description
CPU Demand	CPU demand. Key: cpu demand_average
CPU Used (msec)	Time accounted to the virtual machine. If a system service runs on behalf of this virtual machine, the time spent by that service (represented by cpu.system) should be charged to this virtual machine. If not, the time spent (represented by cpu.overlap) should not be charged against this virtual machine. Key: cpu used_summation
CPU Usage (MHz)	CPU use in megahertz. Key: cpu usagemhz_average
CPU Reserved Capacity (MHz)	The sum of the reservation properties of the (immediate) children of the host's root resource pool. Key: cpu reservedCapacity_average
CPU Total Capacity (MHz)	Total CPU capacity in megahertz. Key: cpu totalCapacity_average
CPU Idle (ms)	CPU idle time in milliseconds. Key: cpu idle_summation
CPU Overhead (KB)	Amount of CPU overhead. Key: cpu overhead_average
CPU Demand without overhead	Value of demand excluding any overhead. Key: cpu demand_without_overhead
CPU Core Utilization (%)	Percent core utilization. Key: cpu coreUtilization_average
CPU Utilization(%)	Percent CPU utilization. Key: cpu utilization_average
CPU Core Utilization (%)	Core Utilization. Key: cpu coreUtilization_average
CPU Utilization (%)	Utilization. Key: cpu utilization_average
CPU Co-stop (ms)	Time the VM is ready to run, but is unable to due to co-scheduling constraints. Key: cpu costop_summation
CPU Latency (%)	Percentage of time the VM is unable to run because it is contending for access to the physical CPUs. Key: cpu latency_average
CPU Ready (ms)	Time spent in ready state. Key: cpu ready_summation
CPU Run (ms)	Time the virtual machine is scheduled to run. Key: cpu run_summation
CPU Swap wait (ms)	Amount of time waiting for swap space. Key: cpu swapwait_summation

Metric	Description
CPU Wait (ms)	Total CPU time spent in wait state. Key: cpu wait_summation
CPU Provisioned Capacity	Provisioned capacity (MHz). Key: cpu vm_capacity_provisioned
CPU Active Host Load For Balance (Long Term)	Active Host Load For Balance (Long Term). Key: cpu acvmWorkloadDisparityPcttive_longterm_load
CPU Active Host Load For Balance (Short Term)	Active Host Load For Balance (Short Term). Key: cpu active_shortterm_load

## CPU Utilization for Resources Metrics for Host Systems

CPU utilization for resources metrics provide information about CPU activity.

Metric Name	Description
Rescpu CPU Active (%) ( <i>interval</i> )	Average active time for the CPU over the past minute, past five minutes, and at one-minute, five-minute, and 15-minute peak active times. Key: rescpu actav1_latest rescpu actav5_latest rescpu actav15_latest rescpu actpk1_latest rescpu actpk5_latest rescpu actpk15_latest
Rescpu CPU Running (%) ( <i>interval</i> )	Average run time for the CPU over the past minute, past five minutes, past 15 minutes, and at one-minute, five-minute, and 15-minute peak times. Key: rescpu runav1_latest rescpu runav5_latest rescpu runav15_latest rescpu runpk1_latest rescpu runpk5_latest rescpu runpk15_latest
Rescpu CPU Throttled (%) ( <i>interval</i> )	Scheduling limit over the past minute, past five minutes, and past 15 minutes. Key: rescpu maxLimited1_latest rescpu maxLimited5_latest rescpu maxLimited15_latest
Rescpu Group CPU Sample Count	Group CPU sample count. Key: rescpu sampleCount_latest
Rescpu Group CPU Sample Period (ms)	Group CPU sample period in milliseconds. Key: rescpu samplePeriod_latest

## Datastore Metrics for Host Systems

Datastore metrics provide information about datastore use.

Metric	Notes
Datastore Outstanding IO requests	OIO for datastore. Key: datastore demand_oio
Datastore Max Observed Reads per second	Max observed average number of read commands issued per second during the collection interval. Key: datastore maxObserved_NumberRead
Datastore Max Observed Read Rate	Max observed rate of reading data from the datastore. Key: datastore maxObserved_Read
Datastore Max Observed Writes per second	Max observed average number of write commands issued per second during the collection interval. Key: datastore maxObserved_NumberWrite
Datastore Max Observed Write Rate	Max observed rate of writing data from the datastore. Key: datastore maxObserved_Write
Datastore Max Observed Number of Outstanding IO Operations	Max Observed Number of Outstanding IO Operations. Key: datastore maxObserved_OIO
Datastore Commands Averaged	Average number of commands issued per second during the collection interval. Key: datastore commandsAveraged_average
Datastore Number of Outstanding IO Operations	Number of outstanding IO operations. Key: datastore oio
Datastore Disk Command Latency (ms)	The average amount of time taken for a command from the perspective of a Guest OS. This is the sum of Kernel Command Latency and Physical Device Command Latency. Key: datastore totalLatency_average
Datastore Usage Average (KBps)	Usage Average (KBps). Key: datastore usage_average
Datastore Demand	Demand. Key: datastore demand
Datastore Storage I/O Control aggregated IOPS	Aggregate number of IO operations on the datastore. Key: datastore datastorelops_average
Datastore Reads per second	Average number of read commands issued per second during the collection interval. Key: datastore numberReadAveraged_average
Datastore Writes per second	Average number of write commands issued per second during the collection interval. Key: datastore numberWriteAveraged_average

Metric	Notes
Datastore Read Rate (KBps)	Rate of reading data from the datastore in kilobytes per second. Key: datastore read_average
Datastore Storage I/O Control normalized latency (ms)	Normalized latency in microseconds on the datastore. Data for all virtual machines is combined. Key: datastore sizeNormalizedDatastoreLatency_average
Datastore Read Latency (ms)	Average amount of time for a read operation from the datastore. Total latency = kernel latency + device latency. Key: datastore totalReadLatency_average
Datastore Write Latency (ms)	Average amount of time for a write operation to the datastore. Total latency = kernel latency + device latency. Key: datastore totalWriteLatency_average
Datastore Write Rate (KBps)	Rate of writing data to the datastore in kilobytes per second. Key: datastore write_average
Datastore Max Queue Depth	Max Queue Depth. Key: datastore datastoreMaxQueueDepth_latest
Datastore Highest Latency	Highest Latency. Key: datastore maxTotalLatency_latest
Datastore Total Latency Max	Total Latency Max (ms). Key: datastore totalLatency_max
Datastore Read Latency	Read Latency. Key: datastore datastoreNormalReadLatency_latest
Datastore Write Latency	Write Latency. Key: datastore datastoreNormalWriteLatency_latest
Datastore Data Read	Data Read. Key: datastore datastoreReadBytes_latest
Datastore Data Read Rate	Data Rate. Key: datastore datastoreReadlops_latest
Datastore Read Load	Storage DRS metric read load. Key: datastore datastoreReadLoadMetric_latest
Datastore Outstanding Read Requests	Outstanding Read Requests. Key: datastore datastoreReadOIO_latest
Datastore Data Written	Data Written. Key: datastore datastoreWriteBytes_latest
Datastore Data Write Rate	Data Write Rate. Key: datastore datastoreWritelops_latest
Datastore Write Load	Storage DRS metric write load. Key: datastore datastoreWriteLoadMetric_latest

Metric	Notes
Datastore Outstanding Write Requests	Outstanding Write Requests. Key: datastore datastoreWriteOIO_latest
* Datastore Average Observed Virtual Machine Disk I/O Workload	Average Observed Virtual Machine Disk I/O Workload on the Host. Key: datastore vmPopulationAvgWorkload
Datastore Maximum Observed VM Disk I/O Workload	Maximum Observed VM Disk I/O Workload on the Host. Key: datastore vmPopulationMaxWorkload
Datastore VM Disk I/O Workload Disparity	Percentage Disk I/O workload disparity among the VMs on the Host. Key: datastore vmWorkloadDisparityPc

## Disk Metrics for Host Systems

Disk metrics provide information about disk use.

Metric	Description
Disk Usage Rate (KBps)	Average of the sum of the data read and written for all of the disk instances of the host or virtual machine. disk usage_average
Disk I/O Usage Capacity	This metric is a function of storage usage_average and disk workload. storage usage_average is an average over all storage devices. This means that disk usage_capacity is not specific to the selected VM or the host of the VM. Key: disk usage_capacity
Disk Commands per second	Average number of commands issued per second during the collection interval. Key: disk commandsAveraged_average
Disk Disk Command Latency (ms)	The average amount of time taken for a command from the perspective of a Guest OS. This is the sum of Kernel Command Latency and Physical Device Command Latency. Key: disk totalLatency_average
Disk Reads per second	Average number of read commands issued per second during the collection interval. Key: disk numberReadAveraged_average
Disk Writes per second	Average number of write commands issued per second during the collection interval. Key: disk numberWriteAveraged_average
Disk Read Requests	Number of times data was read from the disk in the defined interval. Key: disk numberRead_summation
Disk Write Requests	Number of times data was written to the disk in the defined interval. Key: disk numberWrite_summation

Metric	Description
Disk Read Rate	Amount of data read in the performance interval. Key: disk read_average
Disk Write Rate	Amount of data written to disk in the performance interval. Key: disk write_average
Disk Bus Resets	The number of bus resets in the performance interval. Key: disk busResets_summation
Disk Commands Issued	The number of disk commands issued in the performance interval. Key: disk commands_summation
Disk Commands Aborted	The number of disk commands aborted in the performance interval. Key: disk commandsAborted_summation
Disk Physical Device Read Latency (ms)	The average time taken to complete a read from the physical device. Key: disk deviceReadLatency_average
Disk Kernel Disk Read Latency (ms)	The average time spent in ESX Server VMKernel per read. Key: disk kernelReadLatency_average
Disk Disk Read Latency (ms)	The average amount of time taken for a read from the perspective of a Guest OS. This is the sum of Kernel Read Latency and Physical Device Read Latency. Key: disk totalReadLatency_average
Disk Queue Read Latency (ms)	The average time spent in the ESX Server VMKernel queue per read. Key: disk queueReadLatency_average
Disk Physical Device Write Latency (ms)	The average time taken to complete a write from the physical device. Key: disk deviceWriteLatency_average
Disk Kernel Disk Write Latency (ms)	The average time spent in ESX Server VMKernel per write. Key: disk kernelWriteLatency_average
Disk Disk Write Latency (ms)	The average amount of time taken for a write from the perspective of a Guest OS. This is the sum of Kernel Write Latency and Physical Device Write Latency. Key: disk totalWriteLatency_average
Disk Queue Write Latency (ms)	The average time spent in the ESX Server VMKernel queue per write. Key: disk queueWriteLatency_average
Disk Physical Device Command Latency (ms)	The average time taken to complete a command from the physical device. Key: disk deviceLatency_average

Metric	Description
Disk Kernel Disk Command Latency (ms)	The average time spent in ESX Server VMKernel per command. Key: disk kernelLatency_average
Disk Queue Command Latency (ms)	The average time spent in the ESX Server VMKernel queue per command. Key: disk queueLatency_average
Disk Number of Outstanding IO Operations	Number of Outstanding IO Operations. Key: disk diskoio
Disk Queued Operations	Queued Operations. Key: disk diskqueued
Disk Demand	Demand. Key: disk diskdemand
Disk Total Queued Outstanding operations	Sum of Queued Operation and Outstanding Operations. Key: disk sum_queued_oio
Disk Max Observed OIO	Max Observed IO for a disk. Key: disk max_observed
Disk Highest Latency	Highest Latency. Key: disk maxTotalLatency_latest
Disk Max Queue Depth	Maximum queue depth during the collection interval. Key: disk maxQueueDepth_average
Disk SCSI Reservation Conflicts	SCSI Reservation Conflicts. Key: disk scsiReservationConflicts_summation

## Memory Metrics for Host Systems

Memory metrics provide information about memory use and allocation.

Metric	Description
* Mem Contention (%)	This metric is used to monitor ESXi memory usage. When the value is high, it means the ESXi is using a good percentage of available memory. You may need to add more memory to other memory-related metrics. Key: mem host_contentionPct
Mem Contention (KB)	Host contention in kilobytes. Key: mem host_contention
Mem Host Usage (KB)	Machine usage in kilobytes. Key: mem host_usage
Mem Machine Demand (KB)	Host demand in kilobytes. Key: mem host_demand
Mem Overall Memory used to run VMs on Host (KB)	Overall memory used to run virtual machines on the host in kilobytes. Key: mem host_usageVM

Metric	Description
Mem Provisioned Memory (KB)	Provisioned memory in kilobytes. Key: mem host_provisioned
Mem Minimum Free Memory (KB)	Minimum free memory. Key: mem host_minfree
Mem Reserved Capacity (%)	Percent reserved capacity. Key: mem reservedCapacityPct
Mem Usable Memory (KB)	Usable memory in kilobytes. Key: mem host_usable
* Mem Usage (%)	Memory currently in use as a percentage of total available memory. Key: mem host_usagePct
Mem ESX System Usage	Memory usage by the VMkernel and ESX user-level services. Key: mem host_systemUsage
Mem Guest Active (KB)	Amount of memory that is actively used. Key: mem active_average
Mem Consumed (KB)	Amount of host memory consumed by the virtual machine for guest memory. Key: mem consumed_average
Mem Granted (KB)	Amount of memory available for use. Key: mem granted_average
Mem Heap (KB)	Amount of memory allocated for heap. Key: mem heap_average
Mem Heap Free (KB)	Amount of free space in the heap. Key: mem heapfree_average
Mem VM Overhead (KB)	Memory overhead reported by host. Key: mem overhead_average
Mem Reserved Capacity (KB)	Reserved capacity in kilobytes. Key: mem reservedCapacity_average
Mem Shared (KB)	Amount of shared memory in kilobytes. Key: mem shared_average
Mem Shared Common (KB)	Amount of shared common memory in kilobytes. Key: mem sharedcommon_average
Mem Swap In (KB)	Amount of memory swapped in. Key: mem swpin_average
Mem Swap Out (KB)	Amount of memory swapped out. Key: mem swapout_average
Mem Swap Used (KB)	Amount of memory used for swapped space in kilobytes. Key: mem swapused_average

Metric	Description
Mem VM kernel Usage (KB)	Amount of memory used by the VM kernel. Key: mem sysUsage_average
Mem Unreserved (KB)	Amount of unreserved memory in kilobytes. Key: mem unreserved_average
* Mem Balloon (KB)	<p>This metric shows the total amount of memory currently used by the VM memory control. This memory was reclaimed from the respective VMs at some point in the past, and was not returned.</p> <p>Use this metric to monitor how much VM memory has been reclaimed by ESXi through memory ballooning. The presence of ballooning indicates the ESXi has been under memory pressure. The ESXi activates ballooning when consumed memory reaches a certain threshold. Look for increasing size of ballooning. This indicates that there has been a shortage of memory more than once. Look for size fluctuations which indicate the ballooned out page was actually required by the VM. This translates into a memory performance problem for the VM requesting the page, since the page must first be brought back from the disk.</p> <p>Key: mem vmmemctl_average</p>
Mem Zero (KB)	Amount of memory that is all zero. Key: mem zero_average
Mem State (0-3)	Overall state of the memory. The value is an integer between 0 (high) and 3 (low). Key: mem state_latest
Mem Usage (KB)	Host memory use in kilobytes. Key: mem host_usage
Mem Usage (%)	Memory currently in use as a percentage of total available memory. Key: mem usage_average
Mem Swap In Rate (KBps)	Rate at which memory is swapped from disk into active memory during the interval in kilobyte per second. Key: mem swpinRate_average
Mem Swap Out Rate (KBps)	Rate at which memory is being swapped from active memory to disk during the current interval in kilobytes per second. Key: mem swapoutRate_average
Mem Active Write (KB)	Average active writes in kilobytes. Key: mem activewrite_average
Mem Compressed (KB)	Average memory compression in kilobytes. Key: mem compressed_average
Mem Compression Rate (KBps)	Average compression rate in kilobytes per second. Key: mem compressionRate_average

Metric	Description
Mem Decompression Rate (KBps)	Decompression rate in kilobytes per second. Key: mem decompressionRate_average
Mem Total Capacity (KB)	Total capacity in kilobytes. Key: mem totalCapacity_average
Mem Latency	Percentage of time the VM is waiting to access swapped or compressed memory. Key: mem latency_average
Mem Capacity Contention	Capacity Contention. Key: mem capacity.contention_average
Mem Swap In Rate from Host Cache	Rate at which memory is being swapped from host cache into active memory. Key: mem   SwapInRate_average
Mem Swap In from Host Cache	Amount of memory swapped-in from host cache. Key: mem   SwapIn_average
Mem Swap Out Rate to Host Cache	Rate at which memory is being swapped to host cache from active memory. Key: mem   SwapOutRate_average
Mem Swap Out to Host Cache	Amount of memory swapped-out to host cache. Key: mem   SwapOut_average
Mem Swap Space Used in Host Cache	Space used for caching swapped pages in the host cache. Key: mem   SwapUsed_average
Mem Low Free Threshold	Threshold of free host physical memory below which ESX will begin reclaiming memory from VMs through ballooning and swapping. Key: mem lowfreethreshold_average
Mem VM Memory Workload Disparity	Percentage Memory workload disparity among the VMs on the Host. Key: mem vmWorkloadDisparityPct
Mem Active Host Load For Balance (Long Term)	Active Host Load For Balance (Long Term). Key: mem active_longterm_load
Mem Active Host Load For Balance (Short Term)	Active Host Load For Balance (Short Term). Key: mem active_shortterm_load

## Network Metrics for Host Systems

Network metrics provide information about network performance.

Metric	Description
* Net Packets Received per second	This metric shows the number of packets received during the collection interval. Use this metric to monitor the network usage of the ESXi. Key: net packetsRxPerSec
* Net Packets Transmitted per second	This metric shows the number of packets transmitted during the collection interval. Key: net packetsTxPerSec
Net Packets per second	Number of packets transmitted and received per second. Key: net packetsPerSec
Net Usage Rate (KBps)	The sum of the data transmitted and received for all the NIC instances of the host or virtual machine. Key: net usage_average
Net I/O Usage Capacity	I/O Usage Capacity. Key: net usage_capacity
Net Max Observed Throughput	Max observed rate of network throughput. Key: net maxObserved_KBps
Net Max Observed Transmitted Throughput	Max observed transmitted rate of network throughput. Key: net maxObserved_Tx_KBps
Net Max Observed Received Throughput	Max observed received rate of network throughput. Key: net maxObserved_Rx_KBps
Net Demand (%)	Percent demand. Key: net demand
Net Data Transmit Rate (KBps)	Average amount of data transmitted per second. Key: net transmitted_average
Net Data Receive Rate (KBps)	Average amount of data received per second. Key: net received_average
Net Packets Received	Number of packets received in the performance interval. Key: net packetsRx_summation
Net Packets Transmitted	Number of packets transmitted in the performance interval. Key: net packetsTx_summation
Net Received Packets Dropped	Number of received packets dropped in the performance interval. Key: net droppedRx_summation
Net Transmitted Packets Dropped	Number of transmitted packets dropped in the performance interval. Key: net droppedTx_summation
* Net Packets Dropped (%)	This metric shows the percentage of received and transmitted packets dropped during the collection interval. This metric is used to monitor reliability and performance of the ESXi network. When a high value is displayed, the network is not reliable and performance suffers. Key: net droppedPct

Metric	Description
Net Packets Dropped	Number of packets dropped in the performance interval. Key: net dropped
Net bytes Rx (KBps)	Average amount of data received per second. Key: net bytesRx_average
Net bytes Tx (KBps)	Average amount of data transmitted per second. Key: net bytesTx_average
Net Broadcast Packets Received	Number of broadcast packets received during the sampling interval. Key: net broadcastRx_summation
Net Broadcast Packets Transmitted	Number of broadcast packets transmitted during the sampling interval. Key: net broadcastTx_summation
Net Error Packets Received	Number of packets with errors received. Key: net errorsRx_summation
Net Error Packets Transmitted	Number of packets with errors transmitted. Key: net errorsTx_summation
Net Multicast Packets Received	Number of multicast packets received. Key: net multicastRx_summation
Net Multicast Packets Transmitted	Number of multicast packets transmitted. Key: net multicastTx_summation
Net FT Throughput Usage	FT Throughput Usage. Key: net throughput.usage.ft_average
Net HBR Throughput Usage	HBR Throughput Usage. Key: net throughput.usage.hbr_average
Net iSCSI Throughput Usage	iSCSI Throughput Usage. Key: net throughput.usage.iscsi_average
Net NFS Throughput Usage	NFS Throughput Usage. Key: net throughput.usage.nfs_average
Net VM Throughput Usage	VM Throughput Usage. Key: net throughput.usage.vm_average
Net vMotion Throughput Usage	vMotion Throughput Usage. Key: net throughput.usage.vmotion_average
Net Unknown Protocol Frames Received	Number of frames with unknown protocol received. Key: net unknownProtos_summation

## System Metrics for Host Systems

System metrics provide information about the amount of CPU that resources and other applications use.

Metric	Description
Sys Power On	1 if the host system is powered on, 0 if the host system is powered off, or -1 if the power state is unknown. Key: sys poweredOn
Sys Uptime (seconds)	Number of seconds since the last system startup. Key: sys uptime_latest
Sys Disk Usage (%)	Percent disk use. Key: sys diskUsage_latest
Sys Resource CPU Usage (MHz)	Amount of CPU that the Service Console and other applications use. Key: sys resourceCpuUsage_average
Sys Resource CPU Active (1 min. average)	Percentage of resource CPU that is active. Average value during a one-minute period. Key: sys resourceCpuAct1_latest
Sys Resource CPU Active (%) (5 min. average)	Percentage of resource CPU that is active. Average value during a five-minute period. Key: sys resourceCpuAct5_latest
Sys Resource CPU Alloc Max (MHz)	Maximum resource CPU allocation in megahertz. Key: sys resourceCpuAllocMax_latest
Sys Resource CPU Alloc Min (MHz)	Minimum resource CPU allocation in megahertz. Key: sys resourceCpuAllocMin_latest
Sys Resource CPU Alloc Shares	Number of resource CPU allocation shares. Key: sys resourceCpuAllocShares_latest
Sys Resource CPU Max Limited (%) (1 min. average)	Percent of resource CPU that is limited to the maximum amount. Average value during a one-minute period. Key: sys resourceCpuMaxLimited1_latest
Sys Resource CPU Max Limited (%) (5 min. average)	Percentage of resource CPU that is limited to the maximum amount. Average value during a five-minute period. Key: sys resourceCpuMaxLimited5_latest
Sys Resource CPU Run1 (%)	Percent resource CPU for Run1. Key: sys resourceCpuRun1_latest
Sys Resource CPU Run5 (%)	Percent resource CPU for Run5. Key: sys resourceCpuRun5_latest
Sys Resource Memory Alloc Max (KB)	Maximum resource memory allocation in kilobytes. Key: sys resourceMemAllocMax_latest
Sys Resource Memory Alloc Min (KB)	Minimum resource memory allocation in kilobytes. Key: sys resourceMemAllocMin_latest
Sys Resource Memory Alloc Shares	Number of resource memory shares allocated. Key: sys resourceMemAllocShares_latest
Sys Resource Memory Cow (KB)	Cow resource memory in kilobytes. Key: Sys resourceMemCow_latest

Metric	Description
Sys Resource Memory Mapped (KB)	Mapped resource memory in kilobytes. Key: ys resourceMemMapped_latest
Sys Resource Memory Overhead (KB)	Resource memory overhead in kilobytes. Key: sys resourceMemOverhead_latest
Sys Resource Memory Shared (KB)	Shared resource memory in kilobytes. Key: sys resourceMemShared_latest
Sys Resource Memory Swapped (KB)	Swapped resource memory in kilobytes. Key: sys resourceMemSwapped_latest
Sys Resource Memory Touched (KB)	Touched resource memory in kilobytes. Key: sys resourceMemTouched_latest
Sys Resource Memory Zero (KB)	Zero resource memory in kilobytes. Key: sys resourceMemZero_latest
Sys Resource Memory Consumed	Resource Memory Consumed Latest (KB). Key: sys resourceMemConsumed_latest
Sys Resource File descriptors usage	Resource File descriptors usage (KB). Key: sys resourceFdUsage_latest
Sys vMotion Enabled	1 if vMotion is enabled or 0 if vMotion is not enabled. Key: sys vmotionEnabled
Sys Not in Maintenance	Not in maintenance. Key: sys notInMaintenance

## Management Agent Metrics for Host Systems

Management agent metrics provide information about memory use.

Metric	Description
Management Agent Memory Used (%)	Amount of total configured memory that is available for use. Key: managementAgent memUsed_average
Management Agent Memory Swap Used (KB)	Sum of the memory swapped by all powered-on virtual machines on the host. Key: managementAgent swapUsed_average
Management Agent Memory Swap In (KBps)	Amount of memory that is swapped in for the Service Console. Key: managementAgent swapIn_average
Management Agent Memory Swap Out (KBps)	Amount of memory that is swapped out for the Service Console. Key: managementAgent swapOut_average
Management Agent CPU Usage	CPU usage. Key: managementAgent cpuUsage_average

## Storage Path Metrics for Host Systems

Storage path metrics provide information about data storage use.

Metric	Description
StoragePath Total Latency (ms)	Total latency in milliseconds. Key: storagePath totalLatency
StoragePath Total Usage (KBps)	Total latency in kilobytes per second. Key: storagePath usage
StoragePath Read Rate (KBps)	Rate of reading data from the virtual disk. Key: storagePath read_average
StoragePath Write Rate (KBps)	Rate of writing data. Key: storagePath write_average
StoragePath Commands per second	Average number of commands issued per second during the collection interval. Key: storagePath commandsAveraged_average
StoragePath Reads per second	Average number of read commands issued per second during the collection interval. Key: storagePath numberReadAveraged_average
StoragePath Writes per second	Average number of write commands issued per second during the collection interval. Key: storagePath totalWriteLatency_average
StoragePath Writes per second	Average number of write commands issued per second during the collection interval. Key: storagePath numberWriteAveraged_average
StoragePath Read Latency (ms)	Average amount of time for a read operation by the storage adapter. Key: storagePath totalReadLatency_average
StoragePath Highest Latency	Highest Latency. Key: storagePath maxTotalLatency_latest
StoragePath Storage Path Name	Storage path name. Key: storagePath storagePathName

## Storage Adapter Metrics for Host Systems

Storage adapter metrics provide information about data storage use.

Metric	Description
Storage Adapter Total Usage (KBps)	Total latency. Key: storageAdapter usage
Storage Adapter Port WWN	Port World Wide Name. Key: storageAdapter portWWN

Metric	Description
Storage Adapter Commands per second	Average number of commands issued per second by the storage adapter during the collection interval. Key: storageAdapter commandsAveraged_average
Storage Adapter Reads per second	Average number of read commands issued per second by the storage adapter during the collection interval. Key: storageAdapter numberReadAveraged_average
Storage Adapter Writes per second	Average number of write commands issued per second by the storage adapter during the collection interval. Key: storageAdapter numberWriteAveraged_average
Storage Adapter Read Rate (KBps)	Rate of reading data by the storage adapter. Key: storageAdapter read_average
* Storage Adapter Read Latency (ms)	This metric shows the average amount of time for a read operation by the storage adapter. Use this metric to monitor the storage adapter read operation performance. A high value means that the ESXi is performing a slow storage read operation. Total latency is the sum of kernel latency and device latency. Key: storageAdapter totalReadLatency_average
* Storage Adapter Write Latency (ms)	This metric shows the average amount of time for a write operation by the storage adapter. Use this metric to monitor the storage adapter write performance operation. A high value means that the ESXi is performing a slow storage write operation. Total latency is the sum of kernel latency and device latency. Key: storageAdapter totalWriteLatency_average
Storage Adapter Write Rate (KBps)	Rate of writing data by the storage adapter. Key: storageAdapter write_average
Storage Adapter Demand	Demand. Key: storageAdapter demand
Storage Adapter Highest Latency	Highest Latency. Key: storageAdapter maxTotalLatency_latest
Storage Adapter Outstanding Requests	Outstanding Requests. Key: storageAdapter outstandingIOs_average
Storage Adapter Queue Depth	Queue Depth. Key: storageAdapter queueDepth_average
Storage Adapter Queue Command Latency (ms)	The average time spent in the ESX Server VM Kernel queue per command. Key: storageAdapter queueLatency_average
Storage Adapter Queued	Queued. Key: storageAdapter queued_average

## Storage Metrics for Host Systems

Storage metrics provide information about storage use.

Metric	Description
Storage Commands per second	Average number of commands issued per second during the collection interval. Key: storage commandsAveraged_average
Storage Read Latency (ms)	Average amount of time for a read operation in milliseconds. Key: storage totalReadLatency_average
Storage Read Rate (KBps)	Read throughput rate in kilobytes. Key: storage read_average
Storage Reads per second	Average number of read commands issued per second during the collection interval. Key: storage numberReadAveraged_average
Storage Total Latency (ms)	Total latency in milliseconds. Key: storage totalLatency_average
Storage Total Usage (KBps)	Total throughput rate in kilobytes per second. Key: storage usage_average
Storage Write Latency (ms)	Average amount of time for a write operation in milliseconds. Key: storage totalWriteLatency_average
Storage Write Rate (KBps)	Write throughput rate in kilobytes per second. Key: storage write_average
Storage Writes per second	Average number of write commands issued per second during the collection interval. Key: storage numberWriteAveraged_average

## Sensor Metrics for Host Systems

Sensor metrics provide information about host system cooling.

Metric	Description
Sensor Fan Speed (%)	Percent fan speed. Key: Sensor fan currentValue
Sensor Fan Health State	Fan health state. Key: Sensor fan healthState
Sensor Temperature Temp C	Fan temperature in centigrade. Key: Sensor temperature currentValue
Sensor Temperature Health State	Fan health state. Key: Sensor temperature healthState

## Power Metrics for Host Systems

Power metrics provide information about host system power use.

Metric	Description
Power Energy (Joule)	Host power use in joules. Key: power energy_summation
Power Power (Watt)	Host power use in watts. Key: power power_average
Power Power Cap (Watt)	Host power capacity in watts. Key: power powerCap_average

## Disk Space Metrics for Host Systems

Disk space metrics provide information about disk space use.

Metric	Description
Diskspace Not Shared (GB)	Unshared disk space in gigabytes. Key: diskspace notshared
Diskspace Number of Virtual Disks	Number of virtual disks. Key: diskspace numvmdisk
Diskspace Shared Used (GB)	Used shared disk space in gigabytes. Key: diskspace shared
Diskspace Snapshot	Disk space used by snapshots in gigabytes. Key: diskspace snapshot
Diskspace Virtual Disk Used (GB)	Disk space used by virtual disks in gigabytes. Key: diskspace diskused
Diskspace Virtual machine used (GB)	Disk space used by virtual machines in gigabytes. Key: diskspace used
Diskspace Total disk space used	Total disk space used on all datastores visible to this object. Key: diskspace total_usage
Diskspace Total disk spacey	Total disk space on all datastores visible to this object. Key: diskspace total_capacity
Diskspace Total provisioned disk space	Total provisioned disk space on all datastores visible to this object. Key: diskspace total_provisioned .

## Summary Metrics for Host Systems

Summary metrics provide information about overall host system performance.

Metric	Description
* Summary Number of Running VMs	<p>This metric shows the number of VMs running on the host during the last metric collection time.</p> <p>Large spikes of running VMs might be a reason for CPU or memory spikes as more resources will be used in the host.</p> <p>Number of Running VMs gives you a good indicator of how many requests the ESXi host must juggle. This excludes powered off VMs as they do not impact ESXi performance. A change in this number in your environment can contribute to performance problems. A high number of running VMs in a host also means a higher concentration risk, as all the VMs will go down (or be relocated by HA) if the ESXi crashes.</p> <p>Look for any correlation between spikes in the number of running VMs and spikes in other metrics such as CPU Contention/Memory Contention.</p> <p>Key: summary number_running_vms</p>
Summary Maximum Number of VMs	<p>Maximum number of virtual machines</p> <p>Key: summary max_number_vms</p>
* Summary Number of vMotions	<p>This metric shows the number of vMotions that occurred in the host in the last X minutes.</p> <p>The number of vMotions is a good indicator of stability. In a healthy environment, this number should be stable and relatively low.</p> <p>Look for correlation between vMotions and spikes in other metrics such as CPU/Memory contention.</p> <p>The vMotion should not create any spikes, however, the VMs moved into the host might create spikes in memory usage, contention and CPU demand and contention.</p> <p>Key: summary number_vmotion</p>
Summary Total Number of Datastores	<p>Total Number of Datastores.</p> <p>Key: summary total_number_datastores</p>
Summary Number of VCPUs on Powered On VMs	<p>Total number of VCPUs of Virtual Machines that are powered on.</p> <p>Key: summary number_running_vcpus</p>
Summary Total Number of VMs	<p>Total number of virtual machines.</p> <p>Key: summary total_number_vms</p>
Summary Workload Indicator (%)	<p>Percent workload indicator.</p> <p>Key: summary workload_indicator</p>

## HBR Metrics for Host Systems

Host-based replication (HBR) metrics provide information about vSphere replication.

Metric	Description
HBR Replication Data Received Rate	Replication Data Received Rate. Key: hbr hbrNetRx_average
HBR Replication Data Transmitted Rate	Replication Data Transmitted Rate. Key: hbr hbrNetTx_average
HBR Replicated VM Count	Number of replicated virtual machines. Key: hbr hbrNumVms_average

## Cluster Compute Resource Metrics

vRealize Operations Manager collects configuration, storage, disk space, CPU use, disk, memory, network, power, and summary metrics for cluster compute resources.

Cluster Compute Resource metrics include capacity and badge metrics. See definitions in:

- [Capacity and Project-Based Metrics](#)
- [Badge Metrics](#)

Metrics marked with an asterisk (\*) provide the most relevant data to use when you troubleshoot the clusters in your environment.

## Configuration Metrics for Cluster Compute Resources

Configuration metrics provide information about configuration settings.

Metric	Description
Configuration Failover Level	DAS configuration failover level. Key: configuration dasconfig failoverLevel
Configuration Active Admission Control Policy	DAS configuration active admission control policy. Key: configuration dasconfig activeAdministrationControlPolicy
Configuration CPU Failover Resources Percent	Percent CPU failover resources for DAS configuration admission control policy. Key: configuration dasconfig admissionControlPolicy cpuFailoverResourcesPercent
Configuration Memory Failover Resources Percent	Percent memory failover resources for DAS configuration admission control policy. Key: configuration dasconfig admissionControlPolicy memoryFailoverResourcesPercent

## Storage Metrics for Cluster Compute Resources

Storage metrics provide information about storage use.

Metric	Description
Storage Total Usage	Total throughput rate in kilobytes per second. Key: storage usage_average

## Disk Space Metrics for Cluster Compute Resources

Disk space metrics provide information about disk space use.

Metric	Description
DiskSpace Virtual machine used (GB)	Space used by virtual machine files in gigabytes. Key: diskSpace used
DiskSpace Total disk space used	Total disk space used on all datastores visible to this object. Key: diskSpace total_usage
DiskSpace Total disk space	Total disk space on all datastores visible to this object. Key: diskSpace total_capacity
DiskSpace Total provisioned disk space	Total provisioned disk space on all datastores visible to this object. Key: diskSpace total_provisioned
DiskSpace Virtual Disk Used (GB)	Space used by virtual disks in gigabytes. Key: diskSpace diskused
DiskSpace Snapshot Space (GB)	Space used by snapshots in gigabytes. Key: diskSpace snapshot
DiskSpace Shared Used (GB)	Shared used space in gigabytes. Key: diskSpace shared
DiskSpace Not Shared (GB)	Space used by VMs that is not shared. Key: diskSpace notshared

## CPU Usage Metrics for Cluster Compute Resources

CPU usage metrics provide information about CPU use.

Metric	Description
CPU Capacity Usage	<p>This metric shows the percentage of the capacity used.</p> <p>Key: cpu capacity_usagepct_average</p>
* CPU CPU Contention (%)	<p>This metric is an indicator of the overall contention for CPU resources that occurs across the workloads in the cluster. When contention occurs, it means that some of the virtual machines are not immediately getting the CPU resources they are requesting.</p> <p>Use this metric to identify when a lack of CPU resources might be causing performance issues in the cluster.</p> <p>This metric is the sum of the CPU contention across all hosts in the cluster averaged over two times the number of physical CPUs in the cluster to account for hyper-threading. CPU contention takes into account:</p> <ul style="list-style-type: none"> <li>■ CPU Ready</li> <li>■ CPU Co-stop</li> <li>■ Power management</li> <li>■ Hyper threading</li> </ul> <p>This metric is more accurate than CPU Ready since it takes into account CPU Co-stop and Hyper threading.</p> <p>When using this metric, the number should be lower than the performance you expect. If you expect performance at 10%, then the number should be lower than 10%.</p> <p>Since this value is averaged across all hosts in the cluster, you may find that some hosts have a higher CPU contention while others are lower. In order to ensure that vSphere spreads out the running workloads across hosts, consider enabling a fully-automated DRS in the cluster.</p> <p>Key: cpu capacity_contentionPct</p>
* CPU Demand (%)	<p>This metric is an indicator of the overall demand for CPU resources by the workloads in the cluster.</p> <p>It shows the percentage of CPU resources that all the virtual machines would use if there were no CPU contention or CPU limits set. It represents the average active CPU load in the past five minutes.</p> <p>Key: cpu demandPct</p>
CPU Demand (MHz)	<p>Demand in megahertz.</p> <p>Key: cpu demandmhz</p>
CPU IO Wait	<p>IO wait time in milliseconds.</p> <p>Key: cpu iowait</p>
CPU Number of CPU Sockets	<p>Number of CPU sockets.</p> <p>Key: cpu numpackages</p>
CPU Overall CPU Contention	<p>Overall CPU contention in milliseconds.</p> <p>Key: cpu capacity_contention</p>
CPU Host Provisioned Capacity	<p>Provisioned CPU capacity in megahertz.</p> <p>Key: cpu capacity_provisioned</p>
CPU Provisioned vCPUs	<p>Number of provisioned CPU cores.</p> <p>Key: cpu corecount_provisioned</p>

Metric	Description
CPU Reserved Capacity	The sum of the reservation properties of the (immediate) children of the host's root resource pool in megahertz. Key: cpu reservedCapacity_average
CPU Wait	CPU time spent on idle state in milliseconds. Key: cpu wait
CPU Usage (MHz)	Average CPU use in megahertz. Key: cpu usagemhz_average
CPU Total Capacity	Total CPU capacity in megahertz. Key: cpu totalCapacity_average
CPU Demand	CPU Demand. Key: cpu demand_average
CPU Overhead	Amount of CPU overhead. Key: cpu overhead_average
CPU Demand without overhead	Value of demand excluding any overhead. Key: cpu demand_without_overhead
CPU Provisioned Capacity	Provisioned Capacity (MHz). Key: cpu vm_capacity_provisioned
CPU Number of hosts stressed	Number of hosts stressed. Key: cpu num_hosts_stressed
CPU Stress Balance Factor	Stress Balance Factor. Key: cpu stress_balance_factor
CPU Lowest Provider Capacity Remaining	Lowest Provider Capacity Remaining. Key: cpu min_host_capacity_remaining
CPU Workload Balance Factor	Workload Balance Factor. Key: cpu workload_balance_factor
CPU Highest Provider Workload	Highest Provider Workload. Key: cpu max_host_workload
CPU Host workload Max-Min Disparity	Difference of Max and Min host workload in the container. Key: cpu host_workload_disparity
CPU Host stress Max-Min Disparity	Difference of Max and Min host stress in the container. Key: cpu host_stress_disparity

## Disk Metrics for Cluster Compute Resources

Disk metrics provide information about disk use.

Metric	Description
Disk Commands per second	Average number of commands issued per second during the collection interval. Key: disk commandsAveraged_average
Disk Disk Command Latency (ms)	Average amount of time taken for a command from the perspective of the guest operating system. This metric is the sum of the Kernel Command Latency and Physical Device Command Latency metrics. Key: disk totalLatency_average
Disk Disk Read Latency	Average amount of time for a read operation from the virtual disk. The total latency is the sum of Kernel latency and device latency. Key: disk totalReadLatency_average
Disk Disk Write Latency	The average amount of time taken for a read from the perspective of a Guest OS. This is the sum of Kernel Read Latency and Physical Device Read Latency. Key: disk totalWriteLatency_averag
Disk Read Rate (KBps)	Number of times data was read from the disk in the defined interval. Key: disk numberRead_summation
Disk Reads per second	Average number of read commands issued per second during the collection interval. Key: disk numberReadAveraged_averag
Disk Usage Rate (KBps)	Average of the sum of the data read and written for all of the disk instances of the host or virtual machine. Key: disk usage_average
Disk Write Rate (KBps)	Number of times data was written to disk during the collection interval. Key: disk numberWrite_summation
Disk Writes per second	Average number of write commands issued per second during the collection interval. Key: disk numberWriteAveraged_average
Disk Read Requests	Amount of data read from the disk during the collection interval. Key: disk read_average
Disk Write Requests	Amount of data written to the disk during the collection interval. Key: disk write_average
Disk Commands Issued	Number of disk commands issued during the collection interval. Key: disk commands_summation
Disk Total Queued Outstanding operations	Sum of queued operation and outstanding operations. Key: disk sum_queued_oio
Disk Max Observed OIO	Max observed outstanding IO for a disk. Key: disk max_observed

## Memory Metrics for Cluster Compute Resources

Memory metrics provide information about memory use and allocation.

Metric	Description
Mem Active Write (KB)	Active writes in kilobytes. Key: mem activewrite_average
Mem Compressed (KB)	Average compression in kilobytes. Key: mem compressed_average
Mem Compression Rate (KBps)	Average compression rate in kilobytes. Key: mem compressionRate_average
Mem Consumed (KB)	Amount of host memory consumed by the virtual machine for guest memory. Key: mem consumed_average
* Mem Contention (%)	This metric is an indicator of the overall contention for memory resources that occurs across the workloads in the cluster. When contention occurs, it means that some portion of the VMs are not immediately getting the memory resources that they are requesting. Use this metric to identify when lack of memory resources might be causing performance issues in the cluster. Key: mem host_contentionPct
Mem Contention (KB)	Contention in kilobytes. Key: mem host_contention
Mem Decompression Rate (KBps)	Decompression rate in kilobytes. Key: mem decompressionRate_average
Mem Granted (KB)	Amount of memory available for use. Key: mem granted_average
Mem Guest Active (KB)	Amount of memory that is actively used. Key: mem active_average
Mem Heap (KB)	Amount of memory allocated for heap. Key: mem heap_average
Mem Heap Free (KB)	Free space in the heap. Key: mem heapfree_average
* Mem Balloon	This metric shows the amount of memory currently used by the virtual machine memory control. It is only defined at the VM level. Key: mem vmemctl_average
Mem VM Overhead (KB)	Memory overhead reported by host. Key: mem overhead_average
Mem Provisioned Memory (KB)	Provisioned memory in kilobytes. Key: mem host_provisioned
Mem Reserved Capacity (KB)	Reserved capacity in kilobytes. Key: mem reservedCapacity_average
Mem Shared (KB)	Amount of shared memory. Key: mem shared_average
Mem Shared Common (KB)	Amount of shared common memory. Key: mem sharedcommon_average

Metric	Description
Mem Swap In (KB)	Amount of memory that is swapped in for the service console. Key: mem swopin_average
Mem Swap In Rate (KBps)	Rate at which memory is swapped from disk into active memory during the interval. Key: mem swopinRate_average
Mem Swap Out (KB)	Amount of memory that is swapped out for the service console. Key: mem swapout_average
Mem Swap Out Rate (KBps)	Rate at which memory is being swapped from active memory into disk during the current interval. Key: mem swapoutRate_average
Mem Swap Used (KB)	Amount of memory used for swap space. Key: mem swapused_average
Mem Total Capacity (KB)	Total capacity in kilobytes. Key: mem totalCapacity_average
Mem Reserved (KB)	Amount of unreserved memory. Key: mem unreserved_average
Mem Usable Memory (KB)	Usable memory in kilobytes. Key: mem host_usable
Mem Usage/Usable	Percent memory used. Key: mem host_usagePct
Mem Host Usage (KB)	Memory use in kilobytes. Key: mem host_usage
Mem Machine Demand	Memory Machine Demand in KB. Key: mem host_demand
Mem ESX System Usage	Memory usage by the VMkernel and ESX user-level services. Key: mem host_systemUsage
* Mem Usage (%)	This metric shows the portion of the total memory in all hosts in the cluster that is being used.  This metric is the sum of memory consumed across all hosts in the cluster divided by the sum of physical memory across all hosts in the cluster. $\frac{\sum \text{memory consumed on all hosts}}{\sum \text{physical memory on all hosts}} \times 100\%$
Mem Usage (KB)	Memory currently in use as a percentage of total available memory. Key: mem usage_average
Mem VM kernel Usage (KB)	Amount of memory that the VM kernel uses. Key: mem sysUsage_average
Mem Zero (KB)	Amount of memory that is all 0. Key: mem zero_average

Metric	Description
Mem Number of Hosts Stressed	Number of hosts stressed. Key: mem num_hosts_stressed
Mem Stress Balance Factor	Stress balance factor. Key: mem stress_balance_factor
Mem Lowest Provider Capacity Remaining	Lowest provider capacity remaining. Key: mem min_host_capacity_remaining
Mem Workload Balance Factor	Workload balance factor. Key: mem workload_balance_factor
Mem Highest Provider Workload	Highest provider workload. Key: mem max_host_workload
Mem Host workload Max-Min Disparity	Difference of Max and Min host workload in the container. Key: mem host_workload_disparity
Mem Host stress Max-Min Disparity	Difference of Max and Min host stress in the container. Key: mem host_stress_disparity

## Network Metrics for Cluster Compute Resources

Network metrics provide information about network performance.

Metric	Description
Net Data Receive Rate (KBps)	Average amount of data received per second. Key: net received_average
Net Data Transmit Rate (KBps)	Average amount of data transmitted per second. Key: net transmitted_average
Net Packets Dropped	Number of packets dropped in the performance interval. Key: net dropped
Net Packets Dropped (%)	Percentage of packets dropped. Key: net droppedPct
Net Packets Received	Number of packets received in the performance interval. Key: net packetsRx_summation
Net Packets Transmitted	Number of packets transmitted in the performance interval. Key: net packetsTx_summation
Net Received Packets Dropped	Number of received packets dropped in the performance interval. Key: net droppedRx_summation
Net Transmitted Packets Dropped	Number of transmitted packets dropped in the performance interval. Key: net droppedTx_summation
Net Usage Rate (KBps)	The sum of the data transmitted and received for all the NIC instances of the host or virtual machine. Key: net usage_average
Net Max Observed Throughput	Max observed rate of network throughput. Key: net maxObservedKBps

Metric	Description
Net Max Observed Transmitted Throughput	Max observed transmitted rate of network throughput. Key: net maxObserved_Tx_KBps
Net Max Observed Received Throughput	Max observed received rate of network throughput. Key: net maxObserved_Rx_KBps

## Datastore Metrics for Cluster Compute Resources

Datastore metrics provide information about Datastore use.

Metric	Description
Datastore Max Observed Reads per second	Max observed average number of read commands issued per second during the collection interval. Key: datastore maxObserved_NumberRead
Datastore Max Observed Read Rate	Max observed rate of reading data from the datastore. Key: datastore maxObserved_Read
Datastore Max Observed Writes per second	Max observed average number of write commands issued per second during the collection interval. Key: datastore maxObserved_NumberWrite
Datastore Max Observed Write Rate	Max observed rate of writing data from the datastore. Key: datastore maxObserved_Write
Datastore Max Observed Number of Outstanding IO Operations	Max Observed Number of Outstanding IO Operations. Key: datastore maxObserved_OIO
Datastore Outstanding IO requests	OIO for datastore. Key: datastore demand_oio
Datastore Reads per second	Average number of read commands issued per second during the collection interval. Key: datastore numberReadAveraged_average
Datastore Writes per second	Average number of write commands issued per second during the collection interval. Key: datastore numberWriteAveraged_average
Datastore Read Rate	Amount of data read in the performance interval. Key: datastore read_average
Datastore Write Rate	Amount of data written to disk in the performance interval. Key: datastore write_average

## Cluster Services Metrics for Cluster Compute Resources

Cluster Services metrics provide information about cluster services.

Metric	Description
ClusterServices Effective CPU Resources (MHz)	VMware DRS effective CPU resources available. Key: clusterServices effectivecpu_average
ClusterServices Effective Memory Resources (KB)	VMware DRS effective memory resources available. Key: clusterServices effectivemem_average

## Power Metrics for Cluster Compute Resources

Power metrics provide information about power use.

Metric	Description
Power Energy (Joule)	Energy use in joules. Key: power energy_summation
Power Power (Watt)	Average power use in watts. Key: power power_average
Power Power Cap (Watt)	Average power capacity in watts. Key: power powerCap_average

## Summary Metrics for Cluster Compute Resources

Summary metrics provide information about overall performance.

Metric	Description
Summary Number of Running Hosts	Number of running hosts. Key: summary number_running_hosts
* Summary Number of Running VMs	This metric shows the total number of VMs running on all hosts in the cluster. Key: summary number_running_vms
* Summary Number of vMotions	This metric shows the number of vMotions that occurred during the last collection cycle. When using this metric, look for a low number which indicates that the cluster is able to serve its VMs. A vMotion can impact VM performance during the stun time. Key: summary number_vmotion
Summary Total Number of Hosts	Total number of hosts. Key: summary total_number_hosts
Summary Total Number of VMs	Total number of virtual machines. Key: summary total_number_vms
Summary Maximum Number of VMs	Maximum Number of virtual machines. Key: summary max_number_vms
Summary Workload Indicator	Percent workload indicator. Key: summary workload_indicator

Metric	Description
Summary Total Number of Datastores	Total number of datastores. Key: summary total_number_datastores
Summary Number of VCPUs on Powered On VMs	Number of virtual CPUs on powered-on virtual machines. Key: summary number_running_vcpus
Summary Average Running VM Count per Running Host	Average number of running virtual machines per running host. Key: summary avg_vm_density
Summary Average Provisioned Capacity (MHz) per Running VM	Average provisioned capacity, in megahertz, per running virtual machine. Key: summary avg_vm_cpu
Summary Average Provisioned Memory (KB) per Running VM	Average provisioned memory, in kilobytes, per running virtual machine. Key: summary avg_vm_mem

## Resource Pool Metrics

vRealize Operations Manager collects configuration, CPU usage, memory, and summary metrics for resource pool objects.

Resource Pool metrics include capacity and badge metrics. See definitions in:

- [Capacity and Project-Based Metrics](#)
- [Badge Metrics](#)

## Configuration Metrics for Resource Pools

Configuration metrics provide information about memory and CPU allocation configuration.

**Table 1-14. Configuration Metrics for Resource Pools**

Metric Key	Metric Name	Description
config mem_alloc_reservation	Memory Allocation Reservation	Memory Allocation Reservation.

## CPU Usage Metrics for Resource Pools

CPU usage metrics provide information about CPU use.

**Table 1-15. CPU Usage Metrics for Resource Pools**

Metric Key	Metric Name	Description
cpu capacity_demandEntitlementPct	Capacity Demand Entitlement (%)	CPU Capacity Demand Entitlement Percentage.
cpu capacity_entitlement	Capacity entitlement (MHz)	CPU Capacity Entitlement.
cpu capacity_contentionPct	CPU Contention (%)	CPU capacity contention.
cpu demandmhz	Demand (MHz)	CPU demand in megahertz.
cpu capacity_contention	Overall CPU Contention (ms)	Overall CPU contention in milliseconds.

**Table 1-15. CPU Usage Metrics for Resource Pools (Continued)**

Metric Key	Metric Name	Description
cpu usagemhz_average	Usage	Average CPU use in megahertz.
cpu effective_limit	Effective limit	CPU effective limit.
cpu reservation_used	Reservation Used	CPU reservation used.
cpu estimated_entitlement	Estimated entitlement	CPU estimated entitlement.
cpu dynamic_entitlement	Dynamic entitlement	CPU dynamic entitlement.
cpu demand_without_overhead	Demand without overhead	Value of demand excluding any overhead

## Memory Metrics for Resource Pools

Memory metrics provide information about memory use and allocation.

**Table 1-16. Memory Metrics for Resource Pools**

Metric Key	Metric Name	Description
mem vmemctl_average	Balloon (KB)	Amount of memory currently used by the virtual machine memory control.
mem compressionRate_average	Compression Rate (KBps)	Compression rate in kilobytes per second.
mem consumed_average	Consumed (KB)	Amount of host memory consumed by the virtual machine for guest memory.
mem host_contentionPct	Contention (%)	Machine contention percentage.
mem guest_usage	Guest usage	Guest memory entitlement.
mem guest_demand	Guest demand	Guest memory entitlement.
mem host_contention	Contention (KB)	Machine contention in kilobytes.
mem decompressionRate_average	Decompression Rate (KBps)	Decompression rate in kilobytes per second.
mem granted_average	Granted (KB)	Average of memory available for use.
mem active_average	Guest Active (KB)	Amount of memory that is actively used.
mem overhead_average	VM Overhead (KB)	Memory overhead reported by host.
mem shared_average	Shared (KB)	Amount of shared memory.
mem reservation_used	Reservation Used	Memory Reservation Used.
mem dynamic_entitlement	Dynamic Entitlement	Memory Dynamic Entitlement.
mem effective_limit	Effective Limit	Memory Effective Limit.
mem swpinRate_average	swpinRate_average	Rate at which memory is swapped from disk into active memory during the interval.
mem swapoutRate_average	swapoutRate_average	Rate at which memory is being swapped from active memory to disk during the current interval.

**Table 1-16. Memory Metrics for Resource Pools (Continued)**

Metric Key	Metric Name	Description
mem swapped_average	Swapped (KB)	Amount of unreserved memory.
mem usage_average	Usage (%)	Memory currently in use as a percentage of total available memory.
mem zero_average	Zero (KB)	Amount of memory that is all zero.
mem zipped_latest	Zipped (KB)	Latest zipped memory in kilobytes.
mem swapi_average	Swap In (KB)	Amount of memory swapped in in kilobytes.
mem swapout_average	Swap Out (KB)	Amount of memory swapped out in kilobytes.
mem swapused_average	Swap Used (KB)	Amount of memory used for swap space in kilobytes.
mem guest_provisioned	Guest Configured Memory (KB)	Guest configured memory in kilobytes.

## Summary Metrics for Resource Pools

Summary metrics provide information about overall performance.

**Table 1-17. Summary Metrics for Resource Pools**

Metric Key	Metric Name	Description
summary number_running_vms	Number of Running VMs	Number of running virtual machines.
summary total_number_vms	Total Number of VMs	Total number of virtual machines.
summary iowait	IO Wait (ms)	IO wait time in milliseconds.

## Datacenter Metrics

vRealize Operations Manager collects CPU usage, disk, memory, network, storage, disk space, and summary metrics for datacenter objects.

Datacenter metrics include capacity and badge metrics. See definitions in:

- [Capacity and Project-Based Metrics](#)
- [Badge Metrics](#)

## CPU Usage Metrics for Datacenters

CPU usage metrics provide information about CPU use.

**Table 1-18. CPU Usage Metrics for Datacenters**

Metric Key	Metric Name	Description
cpu capacity_usagepct_average	Capacity Usage (%)	Percent capacity used.
cpu capacity_contentionPct	CPU Contention (%)	CPU capacity contention.
cpu demandPct	Demand (%)	CPU demand percentage.

**Table 1-18. CPU Usage Metrics for Datacenters (Continued)**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
cpu demandmhz	Demand	Demand in megahertz.
cpu demand_average	Demand (MHz)	CPU Demand.
cpu overhead_average	Overhead (KB)	Amount of CPU overhead.
cpu demand_without_overhead	Demand without overhead	Value of demand excluding any overhead.
cpu wait	Total Wait	CPU time spent on idle state.
cpu numpackages	Number of CPU Sockets	Number of CPU sockets.
cpu capacity_contention	Overall CPU Contention (ms)	Overall CPU contention in milliseconds.
cpu capacity_provisioned	Host Provisioned Capacity (MHz)	Host provisioned capacity in megahertz.
cpu corecount_provisioned	Provisioned vCPU(s)	Provisioned vCPU(s).
cpu reservedCapacity_average	Reserved Capacity (MHz)	The sum of the reservation properties of the (immediate) children of the host's root resource pool.
cpu usagemhz_average	Usage	Average CPU usage in megahertz.
cpu iowait	IO Wait	IO wait time in milliseconds.
cpu vm_capacity_provisioned	Provisioned Capacity	Provisioned Capacity.
cpu stress_balance_factor	Stress Balance Factor	Stress Balance Factor.
cpu min_host_capacity_remaining	Lowest Provider Capacity Remaining	Lowest Provider Capacity Remaining.
cpu workload_balance_factor	Workload Balance Factor	Workload Balance Factor.
cpu max_host_workload	Highest Provider Workload	Highest Provider Workload.
cpu host_workload_disparity	Host workload Max-Min Disparity	Difference of Max and Min host workload in the container.
cpu host_stress_disparity	Host stress Max-Min Disparity	Difference of Max and Min host stress in the container.

## Disk Metrics for Datacenters

Disk metrics provide information about disk use.

**Table 1-19. Disk Metrics for Datacenters**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
disk commandsAveraged_average	Commands per second	Average number of commands issued per second during the collection interval.
disk totalLatency_average	Disk Command Latency (ms)	Average amount of time taken for a command from the perspective of the guest operating system. This metric is the sum of the Kernel Disk Command Latency and Physical Device Command Latency metrics.

**Table 1-19. Disk Metrics for Datacenters (Continued)**

Metric Key	Metric Name	Description
disk usage_average	Usage Rate (KBps)	Average of the sum of the data read and written for all of the disk instances of the host or virtual machine.
disk sum_queued_oio	Total queued outstanding operations	Sum of queued operations and outstanding operations.
disk max_observed	Max observed OIO	Max observed IO for a disk.

## Memory Metrics for Datacenters

Memory metrics provide information about memory use and allocation.

**Table 1-20. Memory Metrics for Datacenters**

Metric Key	Metric Name	Description
mem host_contentionPct	Contention (%)	Machine Contention Percentage.
mem host_demand	Machine Demand (KB)	Memory machine demand in kilobytes.
mem host_systemUsage	ESX System Usage	Memory usage by the VM kernel and ESX user-level services.
mem host_provisioned	Provisioned Memory (KB)	Provisioned host memory in kilobytes.
mem reservedCapacity_average	Reserved Capacity (KB)	Reserved memory capacity in kilobytes.
mem host_usable	Usable Memory (KB)	Usable host memory in kilobytes.
mem host_usage	Host Usage	Host memory use in kilobytes.
mem host_usagePct	Usage/Usable (%)	Percent host memory used.
mem overhead_average	VM Overhead	Memory overhead reported by host.
mem stress_balance_factor	Stress Balance Factor	Stress Balance Factor.
mem min_host_capacity_remaining	Lowest Provider Capacity Remaining	Lowest Provider Capacity Remaining.
mem workload_balance_factor	Workload Balance Factor	Workload Balance Factor.
mem max_host_workload	Highest Provider Workload	Highest Provider Workload.
mem host_workload_disparity	Host workload Max-Min Disparity	Difference of Max and Min host workload in the container.
mem host_stress_disparity	Host stress Max-Min Disparity	Difference of Max and Min host stress in the container.

## Network Metrics for Datacenters

Network metrics provide information about network performance.

**Table 1-21. Network Metrics for Datacenters**

Metric Key	Metric Name	Description
net droppedPct	Packets Dropped	Percentage of packets dropped.
net maxObservedKBps	Max Observed Throughput	Max observed rate of network throughput.
net maxObserved_Tx_KBps	Max Observed Transmitted Throughput	Max observed transmitted rate of network throughput.
net maxObserved_Rx_KBps	Max Observed Received Throughput	Max observed received rate of network throughput.
net transmitted_average	Data Transmit Rate	Average amount of data transmitted per second.
net received_average	Data Receive Rate	Average amount of data received per second.
net usage_average	Usage Rate (KBps)	The sum of the data transmitted and received for all the NIC instances of the host or virtual machine.

## Storage Metrics for Datacenters

Storage metrics provide information about storage use.

**Table 1-22. Storage Metrics for Datacenters**

Metric Key	Metric Name	Description
storage usage_average	Total Usage	Total throughput rate.

## Datastore Metrics for Datacenters

Datastore metrics provide information about Datastore use.

**Table 1-23. Datastore Metrics for Datacenters**

Metric Key	Metric Name	Description
datastore maxObserved_NumberRead	Max Observed Reads per second	Max observed average number of read commands issued per second during the collection interval.
datastore maxObserved_Read	Max Observed Read Rate	Max observed rate of reading data from the datastore.
datastore maxObserved_NumberWrite	Max Observed Writes per second	Max observed average number of write commands issued per second during the collection interval.
datastore maxObserved_Write	Max Observed Write Rate	Max observed rate of writing data from the datastore.
datastore maxObserved_OIO	Max Observed Number of Outstanding IO Operations	Max Observed Number of Outstanding IO Operations.
datastore demand_oio	Outstanding IO requests	OIO for datastore.

**Table 1-23. Datastore Metrics for Datacenters (Continued)**

Metric Key	Metric Name	Description
datastore numberReadAveraged_average	Reads per second	Average number of read commands issued per second during the collection interval.
datastore numberWriteAveraged_average	Writes per second	Average number of write commands issued per second during the collection interval.
datastore read_average	Read Rate	Amount of data read in the performance interval.
datastore write_average	Write Rate	Amount of data written to disk in the performance interval.

## Disk Space Metrics for Datacenters

Disk space metrics provide information about disk use.

**Table 1-24. Disk Space Metrics for Datacenters**

Metric Key	Metric Name	Description
diskspace used	Virtual machine used	Used virtual machine disk space in gigabytes.
diskspace total_usage	Total disk space used	Total disk space used on all datastores visible to this object.
diskspace total_capacity	Total disk space	Total disk space on all datastores visible to this object.
diskspace total_provisioned	Total provisioned disk space	Total provisioned disk space on all datastores visible to this object.
diskspace notshared	Not Shared (GB)	Unshared disk space in gigabytes.
diskspace shared	Shared Used (GB)	Shared disk space in gigabytes.
diskspace snapshot	Snapshot Space (GB)	Snapshot disk space in gigabytes.
diskspace diskused	Virtual Disk Used (GB)	Used virtual disk space in gigabytes.
diskspace numvmdisk	Number of Virtual Disks	Number of Virtual Disks.

## Summary Metrics for Datacenters

Summary metrics provide information about overall performance.

**Table 1-25. Summary Metrics for Datacenters**

Metric Key	Metric Name	Description
summary number_running_hosts	Number of Running Hosts	Number of hosts that are ON.
summary number_running_vms	Number of Running VMs	Number of running virtual machines.
summary max_number_vms	Maximum Number of VMs	Maximum number of virtual machines.
summary total_number_clusters	Total Number of Clusters	Total number of clusters.

**Table 1-25. Summary Metrics for Datacenters (Continued)**

Metric Key	Metric Name	Description
summary total_number_hosts	Total Number of Hosts	Total number of hosts.
summary total_number_vms	Total Number of VMs	Total number of virtual machines.
summary total_number_datastores	Total Number of Datastores	Total number of datastores.
summary number_running_vcpus	Number of VCPUs on Powered On VMs	Total number of VCPUs of virtual machines that are powered on.
summary workload_indicator	Workload Indicator	Workload indicator.
summary avg_vm_density	Average Running VM Count per Running Host	Average number of running virtual machines per running host.

## Custom Datacenter Metrics

vRealize Operations Manager collects CPU usage, memory, summary, network, and datastore metrics for custom datacenter objects.

Custom datacenter metrics include capacity and badge metrics. See definitions in:

- [Capacity and Project-Based Metrics](#)
- [Badge Metrics](#)

## CPU Usage Metrics for Custom Datacenters

CPU usage metrics provide information about CPU use.

**Table 1-26. CPU Usage Metrics for Custom Datacenters**

Metric Key	Metric Name	Description
cpu capacity_provisioned	Host Provisioned Capacity	Host provisioned capacity (MHz).
cpu corecount_provisioned	Provisioned vCPU(s)	Provisioned vCPU(s).
cpu demand_without_overhead	Demand without overhead	Value of demand excluding any overhead.
cpu num_hosts_stressed	Number of hosts stressed	Number of hosts stressed.
cpu stress_balance_factor	Stress Balance Factor	Stress balance factor.
cpu min_host_capacity_remaining	Lowest Provider Capacity Remaining	Lowest provider capacity remaining.
cpu workload_balance_factor	Workload Balance Factor	Workload balance factor.
cpu max_host_workload	Highest Provider Workload	Highest provider workload.
cpu host_workload_disparity	Host workload Max-Min Disparity	Host workload max-min disparity.
cpu host_stress_disparity	Host stress Max-Min Disparity	Difference of max and min host stress in the container.

## Memory Metrics for Custom Datacenters

Memory metrics provide information about memory use.

**Table 1-27. Memory Metrics for Custom Datacenters**

Metric Key	Metric Name	Description
mem host_usable	Usable Memory	Usable memory.
mem host_demand	Machine Demand	Memory machine demand in KB.
mem num_hosts_stressed	Number of hosts stressed	Number of hosts stressed.
mem stress_balance_factor	Stress Balance Factor	Stress balance factor.
mem min_host_capacity_remaining	Lowest Provider Capacity Remaining	Lowest provider capacity remaining.
mem workload_balance_factor	Workload Balance Factor	Workload balance factor.
mem max_host_workload	Highest Provider Workload	Highest provider workload.
mem host_workload_disparity	Host workload Max-Min Disparity	Host workload max-min disparity.
mem host_stress_disparity		Host stress max-min disparity.

## Summary Metrics for Custom Datacenters

Summary metrics provide information about overall performance.

**Table 1-28. Summary Metrics for Custom Datacenters**

Metric Key	Metric Name	Description
summary number_running_vms	Number of Running VMs	Number of virtual machines that are ON.
summary max_number_vms	Maximum Number of VMs	Maximum number of virtual machines.
summary status	Status	Status of datacenter.

## Network Metrics for Custom Datacenters

Network metrics provide information about network performance.

**Table 1-29. Network Metrics for Custom Datacenters**

Metric Key	Metric Name	Description
net usage_average	Usage Rate	The sum of the data transmitted and received for all the NIC instances of the host or virtual machine.
net maxObserved_KBps	Max Observed Throughput	Max observed rate of network throughput.
net maxObserved_Tx_KBps	Max Observed Transmitted Throughput	Max observed transmitted rate of network throughput.
net maxObserved_Rx_KBps	Max Observed Received Throughput	Max observed received rate of network throughput.
net transmitted_average	Data Transmit Rate	Average amount of data transmitted per second.
net received_average	Data REceive Rate	Average amount of data received per second.

## Datastore Metrics for Custom Datacenters

Datastore metrics provide information about datastore use.

**Table 1-30. Datastore Metrics for Custom Datacenters**

Metric Key	Metric Name	Description
datastore maxObserved_NumberRead	Max Observed Reads per second	Max observed average number of read commands issued per second during the collection interval.
datastore maxObserved_Read	Max Observed Read Rate	Max observed rate of reading data from the datastore.
datastore maxObserved_NumberWrite	Max Observed Writes per second	Max observed average number of write commands issued per second during the collection interval.
datastore maxObserved_Write	Max Observed Write Rate	Max observed rate of writing data from the datastore.
datastore maxObserved_OIO	Max Observed Number of Outstanding IO Operations	Max observer number of outstanding IO operations.
datastore demand_oio	Outstanding IO requests	OIO for datastore.
datastore numberReadAveraged_average	Reads per second	Average number of read commands issued per second during the collection interval.
datastore numberWriteAveraged_average	Writes per second	Average number of write commands issued per second during the collection interval.
datastore read_average	Read rate	Amount of data read in the performance interval.
datastore write_average	Write rate	Amount of data written to disk in the performance interval.

## Storage Pod Metrics

vRealize Operations Manager collects datastore and disk space metrics for storage pod objects.

Storage Pod metrics include capacity and badge metrics. See definitions in:

- [Capacity and Project-Based Metrics](#)
- [Badge Metrics](#)

**Table 1-31. Datastore Metrics for Storage Pods**

Metric Key	Metric Name	Description
datastore numberReadAveraged_average	Reads per second	Average number of read commands issued per second during the collection interval.
datastore numberWriteAveraged_average	Writes per second	Average number of write commands issued per second during the collection interval.

**Table 1-31. Datastore Metrics for Storage Pods (Continued)**

Metric Key	Metric Name	Description
datastore read_average	Read Rate	Amount of data read in the performance interval.
datastore write_average	Write Rate	Amount of data written to disk in the performance interval.
datastore usage_average	Usage Average	Usage Average.
datastore totalReadLatency_average	Read Latency	Average amount of time for a read operation from the datastore. Total latency = kernel latency + device latency.
datastore totalWriteLatency_average	Write Latency	Average amount of time for a write operation to the datastore. Total latency = kernel latency + device latency.
datastore totalLatency_average	Disk Command Latency	The average amount of time taken for a command from the perspective of a Guest OS. This is the sum of Kernel Command Latency and Physical Device Command Latency.
datastore commandsAveraged_average	Commands per second	Average number of commands issued per second during the collection interval.

**Table 1-32. Diskspace Metrics for Storage Pods**

Metric Key	Metric Name	Description
diskspace disktotal	Total used	Total space used.
diskspace freespace	Freespace	Unused space available on datastore.
diskspace capacity	Capacity	Total capacity of datastore.
diskspace used	Virtual Machine used	Space used by virtual machine files.
diskspace snapshot	Snapshot Space	Space used by snapshots.

## VMware Distributed Virtual Switch Metrics

vRealize Operations Manager collects network and summary metrics for VMware distributed virtual switch objects.

VMware Distributed Virtual Switch metrics include capacity and badge metrics. See definitions in:

- [Capacity and Project-Based Metrics](#)
- [Badge Metrics](#)

**Table 1-33. Network Metrics for VMware Distributed Virtual Switches**

Metric Key	Metric Name	Description
network port_statistics rx_bytes	Total Ingress Traffic	Total ingress traffic (KBps).
network port_statistics tx_bytes	Total Egress Traffic	Total egress traffic (KBps).
network port_statistics ucast_tx_pkts	Egress Unicast Packets per second	Egress unicast packets per second.

**Table 1-33. Network Metrics for VMware Distributed Virtual Switches (Continued)**

Metric Key	Metric Name	Description
network port_statistics mcast_tx_pkts	Egress Multicast Packets per second	Egress multicast packets per second.
network port_statistics bcast_tx_pkts	Egress Broadcast Packets per second	Egress broadcast packets per second.
network port_statistics ucast_rx_pkts	Ingress Unicast Packets per second	Ingress unicast packets per second.
network port_statistics mcast_rx_pkts	Ingress Multicast Packets per second	Ingress multicast packets per second.
network port_statistics bcast_rx_pkts	Ingress Broadcast Packets per second	Ingress broadcast packets per second.
network port_statistics dropped_tx_pkts	Egress Dropped Packets per second	Egress dropped packets per second.
network port_statistics dropped_rx_pkts	Ingress Dropped Packets per second	Ingress dropped packets per second.
network port_statistics rx_pkts	Total Ingress Packets per second	Total ingress packets per second.
network port_statistics tx_pkts	Total Egress Packets per second	Total egress packets per second.
network port_statistics utilization	Utilization	Use (KBps).
network port_statistics dropped_pkts	Total Dropped Packets per second	Total dropped packets per second.
network port_statistics dropped_pkts_pct	Percentage of Dropped Packets	Percentage of dropped packets.
network port_statistics maxObserved_rx_bytes	Max Observed Ingress Traffic (KBps)	Max observed ingress traffic (KBps).
network port_statistics maxObserved_tx_bytes	Max Observed Egress Traffic (KBps)	Max observed egress traffic (KBps).
network port_statistics maxObserved_utilization	Max Observed Utilization (KBps)	Max observed utilization (KBps).

**Table 1-34. Summary Metrics for VMware Distributed Virtual Switches**

Metric Key	Metric Name	Description
summary max_num_ports	Maximum Number of Ports	Maximum number of ports.
summary used_num_ports	Used Number of Ports	Used number of ports.
summary num_blocked_ports	Number of Blocked Ports	Number of blocked ports.

**Table 1-35. Host Metrics for VMware Distributed Virtual Switches**

Metric Key	Metric Name	Description
host mtu_mismatch	MTU Mismatch	Maximum Transmission Unit (MTU) mismatch.
host teaming_mismatch	Teaming Mismatch	Teaming mismatch.
host mtu_unsupported	Unsupported MTU	Unsupported MTU.

**Table 1-35. Host Metrics for VMware Distributed Virtual Switches (Continued)**

Metric Key	Metric Name	Description
host vlans_unsupported	Unsupported VLANs	Unsupported VLANs.
host config_outofsync	Config Out Of Sync	Config Out Of Sync.
host attached_pnics	Number of Attached pNICs	Number of attached physical NICs.

## Distributed Virtual Port Group Metrics

The vCenter Adapter instance collects network and summary metrics for distributed virtual port groups.

Distributed Virtual Port Group metrics include capacity and badge metrics. See definitions in:

- [Capacity and Project-Based Metrics](#)
- [Badge Metrics](#)

**Table 1-36. Network Metrics for Distributed Virtual Port Groups**

Metric Key	Metric Name	Description
network port_statistics rx_bytes	Ingress Traffic	Ingress traffic (KBps).
network port_statistics tx_bytes	Egress Traffic	Egress traffic (KBps).
network port_statistics ucast_tx_pkts	Egress Unicast Packets per second	Egress unicast packets per second.
network port_statistics mcast_tx_pkts	Egress Multicast Packets per second	Egress multicast packets per second.
network port_statistics bcast_tx_pkts	Egress Broadcast Packets per second	Egress broadcast packets per second.
network port_statistics ucast_rx_pkts	Ingress Unicast Packets per second	Ingress unicast packets per second.
network port_statistics mcast_rx_pkts	Ingress Multicast Packets per second	Ingress multicast packets per second.
network port_statistics bcast_rx_pkts	Ingress Broadcast Packets per second	Ingress broadcast packets per second.
network port_statistics dropped_tx_pkts	Egress Dropped Packets per second	Egress dropped packets per second.
network port_statistics dropped_rx_pkts	Ingress Dropped Packets per second	Ingress dropped packets per second.
network port_statistics rx_pkts	Total Ingress Packets per second	Total Ingress packets per second.
network port_statistics tx_pkts	Total Egress Packets per second	Total Egress packets per second.
network port_statistics utilization	Utilization	Utilization (KBps).
network port_statistics dropped_pkts	Total Dropped Packets per second	Total dropped packets per second.
network port_statistics dropped_pkts_pct	Percentage of Dropped Packets	Percentage of dropped packets.

**Table 1-36. Network Metrics for Distributed Virtual Port Groups (Continued)**

Metric Key	Metric Name	Description
network port_statistics maxObserved_rx_bytes	Max Observed Ingress Traffic (KBps)	Max observed ingress traffic (KBps).
network port_statistics maxObserved_tx_bytes	Max Observed Egress Traffic (KBps)	Max observed egress traffic (KBps).
network port_statistics maxObserved_utilization	Max Observed Utilization (KBps)	Max observed utilization (KBps).

**Table 1-37. Summary Metrics for Distributed Virtual Port Groups**

Metric Key	Metric Name	Description
summary max_num_ports	Maximum Number of Ports	Maximum number of ports.
summary used_num_ports	Used Number of Ports	Used number of ports.
summary num_blocked_ports	Number of Blocked Ports	Number of blocked ports.

## Datastore Metrics

vRealize Operations Manager collects capacity, device, and summary metrics for datastore objects.

Capacity metrics can be calculated for datastore objects. See [Capacity and Project-Based Metrics](#).

Metrics marked with an asterisk (\*) provide the most relevant data to use when you troubleshoot the datastores in your environment.

## Capacity Metrics for Datastores

Capacity metrics provide information about datastore capacity.

Metric	Description
* Capacity Available Space (GB)	<p>This metric shows the amount of free space that a datastore has available.</p> <p>Use this metric to know how much storage space is unused on the datastore. Try to avoid having too little free disk space in order to accommodate unexpected storage growth on the datastore. The exact size of the datastore is based on company policy.</p> <p>Key: capacity available_space</p>
Capacity Data Store Capacity Contention	<p>Datastore capacity contention.</p> <p>Key: capacity contention</p>
* Capacity Provisioned (GB)	<p>This metric shows the amount of storage that was allocated to the virtual machines.</p> <p>Use this metric to know how much storage space is currently being used on the datastore.</p> <p>Check the metric trend to identify spikes or abnormal growth.</p> <p>Key: capacity provisioned</p>

Metric	Description
* Capacity Total Capacity (GB)	<p>This metric shows the overall size of the datastore.</p> <p>Use this metric to know the total capacity of the datastore.</p> <p>Typically the size of the datastore should not be too small. VMFS datastore size has grown over the years as virtualization matures and larger virtual machines are now onboard. Ensure the size can handle enough virtual machines to avoid datastore sprawl. A best practise is to use 5 TB for VMFS and more for vSAN.</p> <p>Key: capacity total_capacity</p>
Capacity Used Space (GB)	<p>This metric shows the amount of storage that is being used on the datastore.</p> <p>Key: capacity used_space</p>
Capacity Workload (%)	<p>Capacity workload.</p> <p>Key: capacity workload</p>
Capacity Uncommitted Space (GB)	<p>Uncommitted space in gigabytes.</p> <p>Key: capacity uncommitted</p>
Capacity Total Provisioned Consumer Space	<p>Total Provisioned Consumer Space.</p> <p>Key: capacity consumer_provisioned</p>
* Capacity Used Space (%)	<p>This metric shows the amount of storage that is being used on the datastore.</p> <p>Use this metric to know the percentage of storage space being used on the datastore.</p> <p>When using this metric, verify that you have at least 20% of free storage. Less than this, and you may experience problems when a snapshot is not deleted. If you have more than 50% free storage space, you are not utilizing your storage in the best possible way.</p> <p>Key: capacity usedSpacePct</p>

## Device Metrics for Datastores

Device metrics provide information about device performance.

Metric	Description
Devices Bus Resets	<p>This metric shows the number of bus resets in the performance interval.</p> <p>Key: devices busResets_summation</p>
Devices Commands Aborted	<p>This metric shows the number of disk commands aborted in the performance interval.</p> <p>Key: devices commandsAborted_summation</p>
Devices Commands Issued	<p>This metric shows the number of disk commands issued in the performance interval.</p> <p>Key: devices commands_summation</p>

Metric	Description
Devices Disk Command Latency (ms)	<p>This metric shows the average time taken for a command from the perspective of a guest operating system. This metric is the sum of Kernel Disk Command Latency and Physical Device Command Latency metrics.</p> <p>Key: devices totalLatency_average</p>
Devices Disk Read Latency (ms)	<p>This metric shows the average time taken for a read from the perspective of a guest operating system. This metric is the sum of the Kernel Disk Read Latency and Physical Device Read Latency metrics.</p> <p>Key: devices totalReadLatency_averag</p>
Devices Disk Write Latency (ms)	<p>This metric shows the average amount of time for a write operation to the datastore. Total latency is the sum of kernel latency and device latency.</p> <p>Key: devices totalWriteLatency_average</p>
Devices Kernel Disk Command Latency (ms)	<p>Average time spent in ESX Server V. Kernel per command.</p> <p>Key: devices kernelLatency_average</p>
Devices Kernel Disk Read Latency (ms)	<p>Average time spent in ESX host VM Kernel per read.</p> <p>Key: devices kernelReadLatency_average</p>
Devices Kernel Disk Write Latency (ms)	<p>Average time spent in ESX Server VM Kernel per write.</p> <p>Key: devices kernelWriteLatency_average</p>
Devices Number of Running Hosts	<p>Number of running hosts that are powered on.</p> <p>Key: devices number_running_hosts</p>
Devices Number of Running VMs	<p>Number of running virtual machines that are powered on.</p> <p>Key: devices number_running_vms</p>
Devices Physical Device Command Latency (ms)	<p>Average time taken to complete a command from the physical device.</p> <p>Key: devices deviceLatency_average</p>
Devices Physical Device Read Latency (ms)	<p>Average time taken to complete a read from the physical device.</p> <p>Key: devices deviceReadLatency_average</p>
Devices Queue Command Latency (ms)	<p>Average time spent in the ESX Server VM Kernel queue per command.</p> <p>Key: devices queueLatency_average</p>
Devices Queue Read Latency (ms)	<p>Average time spent in the ESX Server VM Kernel queue per read.</p> <p>Key: devices queueReadLatency_average</p>
Devices Queue Write Latency (ms)	<p>Average time spent in the ESX Server VM Kernel queue per write.</p> <p>Key: devices queueWriteLatency_average</p>
Devices Read Rate (KBps)	<p>Amount of data read in the performance interval.</p> <p>Key: devices read_average</p>

Metric	Description
Devices Read Requests	Number of times data was read from the disk in the defined interval. Key: devices numberRead_summation
Devices Reads per second	Average number of read commands issued per second to the datastore during the collection interval. Key: devices numberReadAveraged_average
Devices Usage Average (KBps)	Average use in kilobytes per second. Key: devices usage_average
Devices Write Rate (KBps)	Amount of data written to disk in the performance interval. Key: devices write_average
Devices Write Requests	Number of times data was written to the disk in the defined interval. Key: devices numberWrite_summation
Devices Writes per second	Average number of write commands issued per second to the datastore during the collection interval. Key: devices numberWriteAveraged_average
Devices Commands per second	Average number of commands issued per second during the collection interval. Key: devices commandsAveraged_average
Devices Physical Device Write Latency (ms)	Average time taken to complete a write from the physical disk. Key: devices deviceWriteLatency_average

## Datastore Metrics for Datastores

Datastore metrics provide information about datastore use.

Metric	Description
* Datastore Disk Command Latency (ms)	<p>This metric shows the adjusted read and write latency at the datastore level. Adjusted means that the latency is taking into account the number of IOs. If your IO is read-dominated, the combined value is influenced by the reads.</p> <p>This is the average of all the VMs running in the datastore. Because it is an average, some VMs logically experience higher latency than the value shown by this metric. To see the worst latency experienced by any VM, use the Maximum VM Disk Latency metric.</p> <p>Use this metric to see the performance of the datastore. It is one of two key performance indicators for a datastore, the other being the Max Read Latency. The combination of Maximum and Average gives better insight into how well the datastore is coping with the demand.</p> <p>The number should be lower than the performance you expect.</p> <p>Key: datastore totalLatency_average</p>
Datastore Usage Average (KBps)	<p>Average use in kilobytes per second.</p> <p>Key: datastore usage_average</p>
Datastore Read Latency (ms)	<p>Average amount of time for a read operation from the datastore. Total latency = kernel latency + device latency.</p> <p>Key: datastore totalReadLatency_average</p>
* Datastore Write Latency (ms)	<p>Average amount of time for a write operation to the datastore. Total latency = kernel latency + device latency.</p> <p>Key: datastore totalWriteLatency_average</p>
Datastore Demand	<p>Demand.</p> <p>Key: datastore demand</p>
Datastore Demand Indicator	<p>Demand Indicator.</p> <p>Key: datastore demand_indicator</p>
Datastore Max Observed Reads per Second	<p>Maximum observed average number of read commands issued per second during the collection interval.</p> <p>Key: datastore maxObserved_NumberRead</p>
Datastore Max Observed Read Rate (KBps)	<p>Max observed rate of reading data from the datastore.</p> <p>Key: datastore maxObserved_Read</p>
* Datastore Max Observed Read Latency (ms)	<p>This metric displays the maximum observed average amount of time for a read operation from the datastore.</p> <p>Use this metric to troubleshoot when the overall datastore latency is higher than expected. Look for a number that matches the overall latency.</p> <p>Total latency = kernel latency + device latency.</p> <p>Key: datastore maxObserved_ReadLatency</p>
Datastore Max Observed Writes per second	<p>Max observed average number of write commands issued per second during the collection interval.</p> <p>Key: datastore maxObserved_NumberWrite</p>

Metric	Description
Datastore Max Observed Write Rate (KBps)	Max observed rate of writing data from the datastore. Key: datastore maxObserved_Write
Datastore Max Observed Write Latency (ms)	This metric displays the maximum observed average amount of time for a write operation from the datastore. Use this metric to troubleshoot when the overall datastore latency is higher than expected. Look for a number that matches the overall latency. Total latency = kernel latency + device latency. Key: datastore maxObserved_WriteLatency
Datastore Max Observed Number of Outstanding IO Operations	Maximum observed number of outstanding IO operations. Key: datastore maxObserved_OIO
Datastore Outstanding IO requests	OIO for datastore. Key: datastore demand_oio
* Datastore Reads per second (IOPS)	This metric displays the average number of read commands issued per second during the collection interval. Use this metric when the total IOPS is higher than expected. Drill down to see if the metric is read or write dominated. This helps determine the cause of the high IOPS. Certain workloads such as backups, anti-virus scans, and Windows updates carry a Read/Write pattern. For example, an anti-virus scan is heavy on read since it is mostly reading the file system. Key: datastore numberReadAveraged_average
* Datastore Writes per second (IOPS)	This metric displays the average number of write commands issued per second during the collection interval. Use this metric when the total IOPS is higher than expected. Drill down to see if the metric is read or write dominated. This helps determine the cause of the high IOPS. Certain workloads such as backups, anti-virus scans, and Windows updates carry a Read/Write pattern. For example, an anti-virus scan is heavy on read since it is mostly reading the file system. Key: datastore numberWriteAveraged_average
Datastore Read rate	This metric displays the amount of data read in the performance interval. Key: datastore read_average
Datastore Write rate	This metric displays the amount of data written to disk in the performance interval. Key: datastore write_average

## About Datastore Metrics for Virtual SAN

The metric named `datastore|oio|workload` is not supported on Virtual SAN datastores. This metric depends on `datastore|demand_oio`, which is supported for Virtual SAN datastores.

The metric named `datastore|demand_oio` also depends on several other metrics for Virtual SAN datastores, one of which is not supported.

- The metrics named `devices|numberReadAveraged_average` and `devices|numberWriteAveraged_average` are supported.
- The metric named `devices|totalLatency_average` is not supported.

As a result, vRealize Operations Manager does not collect the metric named `datastore|oio|workload` for Virtual SAN datastores.

## Disk Space Metrics for Datastores

Disk space metrics provide information about disk space use.

Metric	Description
Diskspace Not Shared (GB)	Unshared space in gigabytes. Key: <code>diskspace notshared</code>
Diskspace Number of Virtual Disk	Number of virtual disks. Key: <code>diskspace numvmdisk</code>
Diskspace Provisioned Space (GB)	Provisioned space in gigabytes. Key: <code>diskspace provisioned</code>
Diskspace Shared Used (GB)	Shared used space in gigabytes. Key: <code>diskspace shared</code>
* Diskspace Snapshot Space (GB)	This metric shows the amount of space taken by snapshots on a given database.  Use this metric to know how much storage space is being used by virtual machine snapshots on the datastore.  Check that the snapshot is using 0 GB or minimal space. Anything over 1 GB should trigger a warning. The actual value depends on how IO intensive the virtual machines in the datastore are. Run a DT on them to detect anomaly. Clear the snapshot within 24 hours, preferably as soon as you have finished backing up, or patching.  Key: <code>diskspace snapshot</code>
Diskspace Virtual Disk Used (GB)	Virtual disk used space in gigabytes. Key: <code>diskspace diskused</code>
Diskspace Virtual machine used (GB)	Virtual machine used space in gigabytes. Key: <code>diskspace used</code>
Diskspace Total disk space used	Total disk space used on all datastores visible to this object. Key: <code>diskspace total_usage</code>
Diskspace Total disk space	Total disk space on all datastores visible to this object. Key: <code>diskspace total_capacity</code>
Diskspace Total provisioned disk space	Total provisioned disk space on all datastores visible to this object. Key: <code>diskspace total_provisioned</code>

Metric	Description
DiskSpace Total used (GB)	Total used space in gigabytes. Key: diskSpace disktotal
DiskSpace Swap File Space (GB)	Swap file space in gigabytes. Key: diskSpace swap
DiskSpace Other VM Space (GB)	Other virtual machine space in gigabytes. Key: diskSpace otherused
DiskSpace Freespace (GB)	Unused space available on datastore. Key: diskSpace freespace
DiskSpace Capacity (GB)	Total capacity of datastore in gigabytes. Key: diskSpace capacity
DiskSpace Overhead	Amount of disk space that is overhead. Key: diskSpace overhead

## Summary Metrics for Datastores

Summary metrics provide information about overall performance.

Metric	Description
* Summary Total Number of Hosts	<p>This metric shows the number of hosts that the datastore is connected to.</p> <p>Use this metric to know how many clusters the datastore is attached to.</p> <p>The number should not be too high, as a datastore should not be mounted by every host. The datastore and cluster should be paired to keep operations simple.</p> <p>Key: summary total_number_hosts</p>
* Summary Total Number of VMs	<p>This metric shows the number of virtual machines which save their VMDK files on the datastore. If a VM has four VMDKs stored in four datastores, the VM will be counted on each datastore.</p> <p>Use this metric to know how many VMs have at least one VMDK on a specific datastore.</p> <p>The number of VMs should be within your Concentration Risk policy.</p> <p>You should also expect the datastore to be well used. If only a few VMs are using the datastore, this is not considered a good use.</p> <p>Key: summary total_number_vms</p>
Summary Maximum Number of VMs	<p>Maximum number of virtual machines.</p> <p>Key: summary max_number_vms</p>

Metric	Description
Summary Workload Indicator	Workload indicator. Key: summary workload_indicator
* Summary Total Number of Clusters	This metric shows the number of clusters that the datastore is connected to. Key: summary total_number_clusters

## Template Metrics for Datastores

Metric	Description
Template Virtual Machine used	Space used by virtual machine files. Key: template used
Template Access Time	Last access time. Key: template accessTime

## Calculated Metrics

vRealize Operations Manager calculates metrics for capacity, badges, and the health of the system. Calculated metrics apply to a subset of objects found in the `describe.xml` file that describes each adapter.

From data that the vCenter adapter collects, vRealize Operations Manager calculates metrics for objects of type:

- vSphere World
- Virtual Machine
- Host System
- Datastore

From data that the vRealize Operations Manager adapter collects, vRealize Operations Manager calculates metrics for objects of type:

- Node
- Cluster

## Capacity and Project-Based Metrics

The capacity engine computes and publishes metrics that help you to plan your resource use based on consumer demand. Project-based metrics are a subset of capacity metrics that help to plan future resource use based on predicted consumer demand.

## Capacity Metrics Group

For the capacity metrics group, full metric names include the name of the resource container. For example, if density metrics are computed for CPU or memory, the actual metric names appear as `cpu|density` or `mem|density`.

Only resource containers enabled for the capacity computations have relevant metrics. Not all metric types are generated for all resource containers. For example, if CPU or memory resource containers are enabled in a policy for density, but the network resource container is not, then `cpu|density` and `mem|density` metrics are calculated but `network|density` metrics are not.

A capacity metric definition includes resource containers that act as a consumer or a provider. For example in vSphere, the virtual machines are consumers of CPU and memory that the ESX host provides.

**Table 1-38. Capacity Metrics Group**

Metric Key	Metric Name	Generated for	Description
<code>capacityRemainingUsingConsumers_average</code>	Capacity Remaining for Average Consumer Profile	Provider	Number of average-size consumers that can fit into the capacity remaining. An average-size consumer demands 50% of total capacity.
<code>capacityRemainingUsingConsumers_small</code>	Capacity Remaining for Small Consumer Profile	Provider	Number of small-size consumers that can fit into the capacity remaining. A small-size consumer demands 0 - 33% of the total capacity.
<code>capacityRemainingUsingConsumers_medium</code>	Capacity Remaining for Medium Consumer Profile	Provider	Number of medium-size consumers that can fit into the capacity remaining. A medium-size consumer demands 33-66% of the total capacity.
<code>capacityRemainingUsingConsumers_large</code>	Capacity Remaining for Large Consumer Profile	Provider	Number of large-size consumers that can fit into the capacity remaining. A large-size consumer demands 66-100% of the total capacity.
<code>capacityRemaining</code>	Capacity Remaining (%)	Both	Percent capacity remaining in the resource container. For example, if the resource container is memory and 2 GB out of 10 GB of memory is free, the <code>capacityRemaining</code> = 20%.
<code>underusedpercent</code>	Under used (%)	Both	Percent capacity not being used.
<code>idletimepercent</code>	Idle time (%)	Both	Percent time a resource is idle based on use over time. Time is a policy setting. If not set, the default period is 30 days. For example, if a resource is idle for a total of 6 days out of 30 days, <code>idletimepercent</code> = 20%.

**Table 1-38. Capacity Metrics Group (Continued)**

Metric Key	Metric Name	Generated for	Description
wasteValue	Reclaimable Capacity	Both	Amount of reclaimable capacity based on consumer demand over time. Time is a policy setting. If not set, the default period is 30 days. For example, if a vSphere host is configured with 10 GB of memory but only 2 GB of memory is used on average over 30 days, then wasteValue = 8 GB.
size.recommendation	Recommended Size	Both	Capacity recommendation based on demand over time. Time is a policy setting. If not set, the default period is 30 days. For example, if consumer demand is 2 GB of memory on average over 30 days, then the capacity recommendation is 2 GB.
optimal.vConsumption.per.pConsumption	Optimal consumption ratio	Provider	Ratio of ideal resource consumption to provision based on consumer demand over time. Ideal resource consumption is when the current capacity satisfies demand. Time is a policy setting. If not set, the default period is 30 days.
vConsumption.per.pConsumption	Consumption ratio	Provider	Ratio of current resource consumption to provision based on consumer demand.
object.demand	Stress Free Demand	Both	Demand based on peak analysis of raw demand values.
object.capacity	Usable Capacity	Both	Total capacity minus buffers. Capacity buffer is a policy setting.
object.demand.percent	Effective Demand (%)	Both	Percent capacity required by effective demand.
powered.on.consumer.count	Number of powered on consumers	Both	Number of consumers that are using a resource.
base.demand	Computed Demand	Both	Demand for an object based on self or consumer demand without the peak consideration policy setting.
actual.capacity	Current size	Both	Actual capacity without buffers
wastePercent	Reclaimable Capacity (%)	Both	Percent of reclaimable capacity based on consumer demand over time. Time is a policy setting. If not set, the default period is 30 days. For example, if a vSphere host is configured with 10 GB of memory but only 2 GB of memory is used on average over 30 days, then wastePercent = 80%.

## Object-level Metrics Group

Object-level metrics are calculated to track capacity use for all objects of a particular object type.

**Table 1-39. Object-level Metrics Group**

Metric Key	Metric Name	Description
summary timeRemaining	Time Remaining	Time remaining before usable capacity runs out. Usable capacity excludes capacity reserved for HA and buffers.
summary isStress	Is Stressed	Value equals 1 or a yellow badge indicates that an object is stressed. Value equals 0 or a green badge indicates that the object is not stressed. For a stress badge defined in a policy, when the stress exceeds the lowest threshold, the badge color changes from green to yellow.
summary capacityRemainingValue	Capacity Remaining Value	Capacity remaining.
summary oversized	Is Oversized	Indicates if an object has too much capacity configured, value of 1, or not, value of 0.
summary idle	Is Idle	Indicates if an object is idle (value of 1) or not (value of 0).
summary poweredOff	Powered Off	Indicates power state of an object. Value of 1 means ON and value of 0 means OFF.
summary capacityRemainingUsingConsumers_average	Capacity Remaining (Average consumer profile)	Capacity remaining based on average consumer demand.
summary capacityRemainingUsingConsumers_small	Capacity Remaining (Small consumer profile)	Capacity remaining based on small consumer demand.
summary capacityRemainingUsingConsumers_medium	Capacity Remaining (Medium consumer profile)	Capacity remaining based on medium consumer demand.
summary capacityRemainingUsingConsumers_large	Capacity Remaining (Large consumer profile)	Capacity remaining based on large consumer demand.
summary capacityRemaining_min	Capacity Remaining (Based on instantaneous peak)	Capacity remaining based on peak demand or stress.
summary capacity.provider.count	Number of Capacity providers	Number of capacity providers.
summary consumer.count	Number of Capacity consumers	Number of capacity consumers.

**Table 1-39. Object-level Metrics Group (Continued)**

Metric Key	Metric Name	Description
summary consumer.count.per.provider.count	Consumer Provider ratio	Ratio of number of consumers to number of providers.
summary optimal.consumer.per.provider	Optimal Consumer Provider ratio	Ratio of consumer to provider that would be optimal based on consumer demand.

## Project-Based Metrics

Project-based metrics are calculated for a change in resources or demand that could affect capacity at some time in the future. See *vRealize Operations Manager User Guide*. Most metrics appear with `_whatif` appended to the capacity metric name. For example, the what-if applicable metric for capacity remaining is published as `capacityRemaining_whatif`.

## Badge Metrics

Badge metrics provide information for badges in the user interface. They report the health, risk, and efficiency of objects in your environment.

vRealize Operations Manager 6.x analyzes badge metric data at five-minute averages, instead of hourly. As a result, you might find that efficiency and risk badge calculations are more sensitive than in previous versions. Badge metrics continue to be published nightly.

**Table 1-40. Badge Metrics**

Metric Key	Metric Name	Description
badge alert_count_critical	Alert Count Critical	Count of critical alerts on the object.
badge alert_count_immediate	Alert Count Immediate	Count of immediate alerts on the object.
badge alert_count_info	Alert Count Info	Count of info alerts on the object.
badge alert_count_warning	Alert Count Warning	Count of warning alerts on the object.
badge anomaly	Anomaly	Overall score for anomalies, on a scale of 100.
badge capacityRemaining	Capacity Remaining	Overall score for capacity remaining, on a scale of 100.
badge compliance	Compliance	Overall score for compliance, on a scale of 100.
badge density	Density	Overall score for density, on a scale of 100.
badge efficiency	Efficiency	Overall score for efficiency. The score will be one of these discrete values representing each state of the badge: Green - 100, Yellow - 75, Orange - 50, Red - 25, Unknown: -1.
badge efficiency_classic	Legacy Efficiency	The legacy efficiency score computed on a scale of 100 as per vCenter Operations Manager version 5.x. For backward compatibility purposes.
badge efficiency_state	Efficiency State	Represents the state of the efficiency badge with discrete values - Green: 1, Yellow: 2, Orange: 3, Red: 4, Unknown: -1.

**Table 1-40. Badge Metrics (Continued)**

Metric Key	Metric Name	Description
badge fault	Fault	Overall score for fault, on a scale of 100.
badge health	Health	Overall score for health. The score will be one of these discrete values representing each state of the badge: Green - 100, Yellow - 75, Orange - 50, Red - 25, Unknown: -1.
badge health_classic	Legacy Health	The legacy health score computed on a scale of 100 as per vCenter Operations Manager 5.x. For backward compatibility purposes.
badge health_state	Health State	Represents the state of health badge with discrete values - Green: 1, Yellow: 2, Orange: 3, Red: 4, Unknown: -1
badge risk	Risk	Overall score for risk. The score will be one of these discrete values representing each state of the badge: Green - 0, Yellow - 25, Orange - 50, Red - 75, Unknown: -1.
badge risk_classic	Legacy Risk	The legacy risk score computed on a scale of 100 as per vCenter Operations Manager 5.x. For backward compatibility purposes.
badge risk_state	Risk State	Represents the state of risk badge with discrete values - Green: 1, Yellow: 2, Orange: 3, Red: 4, Unknown: -1.
badge stress	Stress	Overall score of stress, on a scale of 100.
badge timeRemaining	Time Remaining - Real Time	Overall score of real time remaining, on a scale of 100.
badge waste	Waste	Overall score of waste, on a scale of 100.
badge workload	Workload (%)	Overall score of workload, on a scale of 100.

## System Metrics

System metrics provide information used to monitor the health of the system. They help you to identify problems in your environment.

**Table 1-41. System Metrics**

Metric Key	Metric Name	Description
System Attributes health	Self - Health Score	System health score of self resource
System Attributes all_metrics	Self - Metric Count	Number of metrics of self resource
System Attributes ki_metrics	Self - KPI Count	Number of KPI metrics of self resource
System Attributes active_alarms	Self - Active Anomaly Count	Number of active alarms of self resource
System Attributes new_alarms	Self - New Anomaly Count	Number of new alarms of self resource
System Attributes active_ki_alarms	Self - Active KPI Breach Count	Number of active KPI alarms of self resource

**Table 1-41. System Metrics (Continued)**

Metric Key	Metric Name	Description
System Attributes new_ki_alarms	Self - New KPI Breach Count	Number of new KPI alarms of self resource
System Attributes total_alarms	Self - Total Anomalies	Number of total alarms of self resource
System Attributes change_index	Self - Change Index	Change index of self resource(100 - health score)
System Attributes child_all_metrics	Full Set - Metric Count	Number of metrics of child resources
System Attributes child_ki_metrics	Full Set - KPI Count	Number of KPI metrics of child resources
System Attributes child_active_alarms	Full Set - Active Anomaly Count	Number of active alarms of child resources
System Attributes child_new_alarms	Full Set - New Anomaly Count	Number of new alarms of child resources
System Attributes child_active_ki_alarms	Full Set - Active KPI Breach Count	Number of active KPI alarms of child resources
System Attributes child_new_ki_alarms	Full Set - New KPI Breach Count	Number of new KPI alarms of child resources
System Attributes availability	Availability	Resource availability (0-down, 1-Up, -1-Unknown)
System Attributes alert_count_critical	Alert Count Critical	Number of Critical alerts
System Attributes alert_count_immediate	Alert Count Immediate	Number of Immediate alerts
System Attributes alert_count_warning	Alert Count Warning	Number of Warning alerts
System Attributes alert_count_info	Alert Count Info	Number of Info alerts

## Self-Monitoring Metrics for vRealize Operations Manager

vRealize Operations Manager uses the vRealize Operations Manager adapter to collect metrics that monitor its own performance. These self-monitoring metrics drive capacity models for vRealize Operations Manager objects and are useful for diagnosing problems with vRealize Operations Manager.

## Analytics Metrics

vRealize Operations Manager collects metrics for the vRealize Operations Manager analytics service, including threshold checking metrics.

**Table 1-42. Analytics Metrics**

Metric Key	Metric Name	Description
ActiveAlarms	Active DT Symptoms	Active DT Symptoms.
ActiveAlerts	Active Alerts	Active alerts.
PrimaryResourcesCount	Number of primary objects	Number of primary objects
LocalResourcesCount	Number of local objects	Number of local objects

**Table 1-42. Analytics Metrics (Continued)**

Metric Key	Metric Name	Description
PrimaryMetricsCount	Number of primary metrics	Number of primary metrics
LocalMetricsCount	Number of local metrics	Number of local metrics
ReceivedResourceCount	Number of received objects	Number of received objects
ReceivedMetricCount	Number of received metrics	Number of received metrics
LocalFDSize	Number of forward data entries	Number of locally stored primary and redundant entries in forward data region.
LocalPrimaryFDSize	Number of primary forward data entries	Number of locally stored primary entries in forward data region.
LocalFDAItSize	Number of alternative forward data entries	Number of locally stored primary and redundant entries in alternative forward data region.
LocalPrimaryFDAItSize	Number of alternative primary forward data entries	Number of locally stored primary entries in alternative forward data region.
CurrentHeapSize	Current heap size	Current heap size.
MaxHeapSize	Max heap size	Max heap size
CommittedMemory	Committed memory	Committed memory
CPUUsage	CPU usage	CPU usage
Threads	Threads	Threads
UpStatus	Threads	Threads

## Overall Threshold Checking Metrics for the Analytics Service

Overall threshold checking captures various metrics for work items used to process incoming observation data. All metrics keys for the overall threshold checking metrics begin with `OverallThresholdChecking`, as in `OverallThresholdChecking|Count` or `OverallThresholdChecking|CheckThresholdAndHealth|OutcomeObservationsSize|TotalCount`.

**Table 1-43. Overall Threshold Checking Metrics for the Analytics Service**

Metric Key	Metric Name	Description
Count	Count	Count
Duration TotalDuration	Total	Total length of duration (ms)
Duration AvgDuration	Average	Average duration (ms)
Duration MinDuration	Minimum	Minimum duration (ms)
Duration MaxDuration	Maximum	Maximum duration (ms)
IncomingObservationsSize TotalCount	Total	Total
IncomingObservationsSize AvgCount	Average	Average
IncomingObservationsSize MinCount	Minimal	Minimal

**Table 1-43. Overall Threshold Checking Metrics for the Analytics Service (Continued)**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
IncomingObservationsSize MaxCount	Maximal	Maximal
CheckThresholdAndHealth Count	Count	Count
CheckThresholdAndHealth Duration TotalDuration	Total	Total length of duration (ms)
CheckThresholdAndHealth Duration AvgDuration	Average	Average duration (ms)
CheckThresholdAndHealth Duration MinDuration	Minimum	Minimum duration (ms)
CheckThresholdAndHealth Duration MaxDuration	Maximum	Maximum duration (ms)
CheckThresholdAndHealth OutcomeObservationsSize TotalCount	Total	Total
CheckThresholdAndHealth OutcomeObservationsSize AvgCount	Average	Average
CheckThresholdAndHealth OutcomeObservationsSize MinCount	Minimal	Minimal
CheckThresholdAndHealth OutcomeObservationsSize MaxCount	Maximal	Maximal
SuperMetricComputation Count	Count	Count
SuperMetricComputation Duration TotalDuration	Total	Total length of duration (ms)
SuperMetricComputation Duration AvgDuration	Average	Average duration (ms)
SuperMetricComputation Duration MinDuration	Minimum	Minimum duration (ms)
SuperMetricComputation Duration MaxDuration	Maximum	Maximum duration (ms)
SuperMetricComputation SuperMetricsCount TotalCount	Total	Total
SuperMetricComputation SuperMetricsCount AvgCount	Average	Average
SuperMetricComputation SuperMetricsCount MinCount	Minimal	Minimal
SuperMetricComputation SuperMetricsCount MaxCount	Maximal	Maximal
StoreObservationToFSDDB Count	Count	Count
StoreObservationToFSDDB Duration TotalDuration	Total	Total length of duration (ms)
StoreObservationToFSDDB Duration AvgDuration	Average	Average duration (ms)
StoreObservationToFSDDB Duration MinDuration	Minimum	Minimum duration (ms)

**Table 1-43. Overall Threshold Checking Metrics for the Analytics Service (Continued)**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
StoreObservationToFSDDB Duration MaxDuration	Maximum	Maximum duration (ms)
StoreObservationToFSDDB StoredObservationsSize TotalCount	Total	Total
StoreObservationToFSDDB StoredObservationsSize AvgCount	Average	Average
StoreObservationToFSDDB StoredObservationsSize MinCount	Minimal	Minimal
StoreObservationToFSDDB StoredObservationsSize MaxCount	Maximal	Maximal
UpdateResourceCache Count	Count	Count
UpdateResourceCache Duration TotalDuration	Total	Total
UpdateResourceCache Duration AvgDuration	Average	Average
UpdateResourceCache Duration MinDuration	Minimum	Minimum
UpdateResourceCache Duration MaxDuration	Maximum	Maximum
UpdateResourceCache ModificationEstimateCount TotalCount	Total	The number of estimated modifications done during each resource cache object update.
UpdateResourceCache ModificationEstimateCount AvgCount	Average	Average
UpdateResourceCache ModificationEstimateCount MinCount	Minimal	Minimal
UpdateResourceCache ModificationEstimateCount MaxCount	Maximal	Maximal
ManageAlerts Count	Count	The total number of times the threshold checking work items perform alert updates.
ManageAlerts Duration TotalDuration	Total	The duration for the alert updates operations.
ManageAlerts Duration AvgDuration	Average	Average
ManageAlerts Duration MinDuration	Minimum	Minimum
ManageAlerts Duration MaxDuration	Maximum	Maximum
UpdateSymptoms Count	Count	The total number of times the threshold checking work items check and build symptoms.
UpdateSymptoms Duration TotalDuration	Total	The duration for the check and build symptoms operation.
UpdateSymptoms Duration AvgDuration	Average	Average

**Table 1-43. Overall Threshold Checking Metrics for the Analytics Service (Continued)**

Metric Key	Metric Name	Description
UpdateSymptoms Duration MinDuration	Minimum	Minimum
UpdateSymptoms Duration MaxDuration	Maximum	Maximum

## Dynamic Threshold Calculation Metrics for the Analytics Service

All metrics keys for the dynamic threshold calculation metrics begin with DtCalculation, as in DtCalculation|DtDataWrite|WriteOperationCount or DtCalculation|DtAnalyze|AnalyzeOperationCount.

**Table 1-44. Dynamic Threshold Calculation Metrics for the Analytics Service**

Metric Key	Metric Name	Description
DtDataWrite WriteOperationCount	Write operation count	Write operation count
DtDataWrite Duration TotalDuration	Total	Total length of duration (ms)
DtDataWrite Duration AvgDuration	Average	Average duration (ms)
DtDataWrite Duration MinDuration	Minimum	Minimum duration (ms)
DtDataWrite Duration MaxDuration	Maximum	Maximum duration (ms)
DtDataWrite SavedDtObjectCount TotalCount	Total	Total
DtDataWrite SavedDtObjectCount AvgCount	Average	Average
DtDataWrite SavedDtObjectCount MinCount	Minimal	Minimal
DtDataWrite SavedDtObjectCount MaxCount	Maximal	Maximal
DtAnalyze AnalyzeOperationCount	Analyze Operation Count	Analyze Operation Count
DtAnalyze Duration TotalDuration	Total	Total length of duration (ms)
DtAnalyze Duration AvgDuration	Average	Average duration (ms)
DtAnalyze Duration MinDuration	Minimum	Minimum duration (ms)
DtAnalyze Duration MaxDuration	Maximum	Maximum duration (ms)
DtAnalyze AnalyzedMetricsCount TotalCount	Total	Total
DtAnalyze AnalyzedMetricsCount AvgCount	Average	Average
DtAnalyze AnalyzedMetricsCount MinCount	Minimal	Minimal
DtAnalyze AnalyzedMetricsCount MaxCount	Maximal	Maximal
DtDataRead ReadOperationsCount	Read Operation Count	Read Operation Count
DtDataRead Duration TotalDuration	Total	Total length of duration (ms)
DtDataRead Duration AvgDuration	Average	Average duration (ms)
DtDataRead Duration MinDuration	Minimum	Minimum duration (ms)
DtDataRead Duration MaxDuration	Maximum	Maximum duration (ms)
DtDataRead ReadDataPointsCount TotalCount	Total	Total
DtDataRead ReadDataPointsCount AvgCount	Average	Average

**Table 1-44. Dynamic Threshold Calculation Metrics for the Analytics Service (Continued)**

Metric Key	Metric Name	Description
DtDataRead ReadDataPointsCount MinCount	Minimal	Minimal
DtDataRead ReadDataPointsCount MaxCount	Maximal	Maximal

**Table 1-45. Function Call Metrics for the Analytics Service**

Metric Key	Metric Name	Description
FunctionCalls Count	Number of function calls	Number of function calls
FunctionCalls AvgDuration	Average execution time	Average execution time
FunctionCalls MaxDuration	Max execution time	Max execution time

## Collector Metrics

vRealize Operations Manager collects metrics for the vRealize Operations Manager Collector service objects.

**Table 1-46. Collector Metrics**

Metric Key	Metric Name	Description
ThreadpoolThreadsCount	Number of pool threads	Number of pool threads.
RejectedFDCount	Number of rejected forward data	Number of rejected forward data
RejectedFDAItCount	Number of rejected alternative forward data	Number of rejected alternative forward data
SentFDCount	Number of sent objects	Number of sent objects
SentFDAItCount	Number of alternative sent objects	Number of alternative sent objects
CurrentHeapSize	Current heap size (MB)	Current heap size.
MaxHeapsize	Max heap size (MB)	Maximum heap size.
CommittedMemory	Committed memory (MB)	Amount of committed memory.
CPUUsage	CPU usage	CPU usage.
Threads	Threads	Number of threads.
UpStatus	Up Status	Up Status

## Controller Metrics

vRealize Operations Manager collects metrics for the vRealize Operations Manager Controller objects.

**Table 1-47. Controller Metrics**

Metric Key	Metric Name	Description
RequestedMetricCount	Number of requested metrics	Number of requested metrics
ApiCallsCount	Number of API calls	Number of API calls
NewDiscoveredResourcesCount	Number of discovered objects	Number of discovered objects

## FSDB Metrics

vRealize Operations Manager collects metrics for the vRealize Operations Manager file system database (FSDB) objects.

**Table 1-48. FSDB Metrics**

Metric Key	Metric Name	Description
StoragePoolElementsCount	Number of storage work items	Number of storage work items
FsdbState	Fsdb state	Fsdb state
StoredResourcesCount	Number of stored objects	Number of stored objects
StoredMetricsCount	Number of stored metrics	Number of stored metrics

**Table 1-49. Storage Thread Pool Metrics for FSDB**

Metric Key	Metric Name	Description
StoreOperationsCount	Store operations count	Store operations count
StorageThreadPool Duration TotalDuration	Total	Total number of duration (ms)
StorageThreadPool Duration AvgDuration	Average	Average duration (ms)
StorageThreadPool Duration MinDuration	Minimum	Minimum duration (ms)
StorageThreadPool Duration MaxDuration	Maximum	Maximum duration (ms)
StorageThreadPool SavedMetricsCount TotalCount	Total	Total
StorageThreadPool SavedMetricsCount AvgCount	Average	Average
StorageThreadPool SavedMetricsCount MinCount	Minimal	Minimal
StorageThreadPool SavedMetricsCount MaxCount	Maximal	Maximal

## Product UI Metrics

vRealize Operations Manager collects metrics for the vRealize Operations Manager product user interface objects.

**Table 1-50. Product UI Metrics**

Metric Key	Metric Name	Description
ActiveSessionsCount	Active sessions	Active sessions
CurrentHeapSize	Current heap size	Current heap size.
MaxHeapsize	Max heap size	Maximum heap size.
CommittedMemory	Committed memory	Amount of committed memory.
CPUUsage	CPU usage	Percent CPU use.

**Table 1-50. Product UI Metrics (Continued)**

Metric Key	Metric Name	Description
Threads	Threads	Number of threads.
SessionCount	Number of active sessions	Number of active sessions
SelfMonitoringQueueSize	Self Monitoring queue size	Self Monitoring queue size

**Table 1-51. API Call Metrics for the Product UI**

Metric Key	Metric Name	Description
APICalls HTTPRequesterRequestCount	HTTPRequester request count	HTTPRequester request count
APICalls AvgHTTPRequesterRequestTime	HTTPRequester average request time	HTTPRequester average request time (ms)
APICalls FailedAuthenticationCount	Failed Authentication Count	Failed Authentication Count
APICalls AvgAlertRequestTime	Average alert request time	Average alert request time (ms)
APICalls AlertRequestCount	Alert request count	Alert request count
APICalls AvgMetricPickerRequestTime	Average metric-picker request time	Average metric-picker request time (ms)
APICalls MetricPickerRequestCount	Metric picker request count	Metric picker request count
APICalls HeatmapRequestCount	Heatmap request count	Heatmap request count
APICalls AvgHeatmapRequestTime	Average HeatMap request time	Average HeatMap request time (ms)
APICalls MashupChartRequestCount	Mashup Chart request count	Mashup Chart request count
APICalls AvgMashupChartRequestTime	Average Mashup Chart request time	Average Mashup Chart request time (ms)
APICalls TopNRequestCount	Top N request count	Top N request count
APICalls AvgTopNRequestTime	Average Top N request time	Average Top N request time (ms)
APICalls MetricChartRequestCount	Metric Chart request count	Metric Chart request count
APICalls AvgMetricChartRequestTime	Average MetricChart request time	Average MetricChart request time (ms)

## Admin UI Metrics

vRealize Operations Manager collects metrics for the vRealize Operations Manager administration user interface objects.

**Table 1-52. Admin UI Metrics**

Metric Key	Metric Name	Description
CurrentHeapSize	Current heap size	Current heap size (MB).
MaxHeapsize	Max heap size	Maximum heap size (MB).
CommittedMemory	Committed memory	Amount of committed memory (MB) .
CPUUsage	CPU usage	CPU usage (%).
Threads	Threads	Number of threads.

**Table 1-52. Admin UI Metrics (Continued)**

Metric Key	Metric Name	Description
SessionCount	Number of active sessions	Number of active sessions
SelfMonitoringQueueSize	Self Monitoring queue size	Self Monitoring queue size

**Table 1-53. API Call Metrics for the Admin UI**

Metric Key	Metric Name	Description
APICalls HTTPRequesterRequestCount	HTTPRequester request count	HTTPRequester request count
APICalls AvgHTTPRequesterRequestTime	HTTPRequester average request time	HTTPRequester average request time (ms)

## Suite API Metrics

vRealize Operations Manager collects metrics for the VMware vRealize Operations Management Suite API objects.

**Table 1-54. Suite API Metrics**

Metric Key	Metric Name	Description
UsersCount	Number of users	Number of users
ActiveSessionsCount	Active sessions	Active sessions
GemfireClientReconnects	Gemfire Client Reconnects	Gemfire Client Reconnects
GemfireClientCurrentCalls	Gemfire Client Total Outstanding	Gemfire Client Total Outstanding
CurrentHeapSize	Current heap size	Current heap size (MB) .
MaxHeapsize	Max heap size	Maximum heap size (MB) .
CommittedMemory	Committed memory	Amount of committed memory (MB).
CPUUsage	CPU usage	CPU usage (%) .
CPUProcessTime	CPU process time	CPU process time (ms)
CPUProcessTimeCapacity	CPU process time capacity	CPU process time capacity (ms)
Threads	Threads	Number of threads.

**Table 1-55. Gemfire Client Call Metrics for the Suite API**

Metric Key	Metric Name	Description
GemfireClientCalls TotalRequests	Total Requests	Total Requests
GemfireClientCalls AvgResponseTime	Average Response Time	Average Response Time (ms)
GemfireClientCalls MinResponseTime	Minimum Response Time	Minimum Response Time (ms)
GemfireClientCalls MaxResponseTime	Maximum Response Time	Maximum Response Time
GemfireClientCalls RequestsPerSecond	Requests per Second	Requests per Second
GemfireClientCalls CurrentRequests	Current Requests	Current Requests

**Table 1-55. Gemfire Client Call Metrics for the Suite API (Continued)**

Metric Key	Metric Name	Description
GemfireClientCalls RequestsCount	Requests Count	Requests Count
GemfireClientCalls ResponsesCount	Responses Count	Responses Count

**Table 1-56. API Call Metrics for the Suite API**

Metric Key	Metric Name	Description
APICalls TotalRequests	Total Requests	Total Requests
APICalls AvgResponseTime	Average Response Time (ms)	Average Response Time (ms)
APICalls MinResponseTime	Minimum Response Time (ms)	Minimum Response Time (ms)
APICalls MaxResponseTime	Maximum Response Time	Maximum Response Time
APICalls ServerErrorResponseCount	Server Error Response Count	Server Error Response Count
APICalls FailedAuthenticationCount	Failed Authentication Count	Failed Authentication Count
APICalls FailedAuthorizationCount	Failed Authorization Count	Failed Authorization Count
APICalls RequestsPerSecond	Requests per Second	Requests per Second
APICalls CurrentRequests	Current Requests	Current Requests
APICalls ResponsesPerSecond	Responses per Second	Responses per Second
APICalls RequestsCount	Requests Count	Requests Count
APICalls ResponsesCount	Responses Count	Responses Count

## Cluster and Slice Administration Metrics

vRealize Operations Manager collects metrics for vRealize Operations Manager Cluster and Slice Administration (CaSA) objects.

**Table 1-57. Cluster and Slice Administration Metrics**

Metric Key	Metric Name	Description
CurrentHeapSize	Current heap size	Current heap size (MB).
MaxHeapsize	Max heap size	Maximum heap size (MB).
CommittedMemory	Committed memory	Amount of committed memory (MB).
CPUUsage	CPU usage	CPU usage (%)
Threads	Threads	Number of threads.

**Table 1-58. API Call Metrics for Cluster and Slice Administration**

Metric Key	Metric Name	Description
API Calls TotalRequests	Total Requests	Total Requests
API Calls AvgResponseTime	Average Response Time	Average Response Time (ms)
API Calls MinResponseTime	Minimum Response Time	Minimum Response Time (ms)
API Calls MaxResponseTime	Maximum Response Time	Maximum Response Time (ms)

**Table 1-58. API Call Metrics for Cluster and Slice Administration (Continued)**

Metric Key	Metric Name	Description
API Calls ServerErrorResponseCount	Server Error Response Count	Server Error Response Count
API Calls FailedAuthenticationCount	Failed Authentication Count	Failed Authentication Count
API Calls FailedAuthorizationCount	Minimum Response Time	Minimum Response Time (ms)

## Watchdog Metrics

vRealize Operations Manager collects watchdog metrics to ensure that the vRealize Operations Manager services are running and responsive.

### Watchdog Metrics

The watchdog metric provides the total service count.

**Table 1-59. Watchdog Metrics**

Metric Key	Metric Name	Description
ServiceCount	Service Count	Service Count

## Service Metrics

Service metrics provide information about watchdog activity.

**Table 1-60. Metrics for the vRealize Operations Manager Watchdog Service**

Metric Key	Metric Name	Description
Service Enabled	Enabled	Enabled
Service Restarts	Restarts	Number of times the process has been unresponsive and been restarted by Watchdog.
Service Starts	Starts	Number of times the process has been revived by Watchdog.
Service Stops	Stops	Number of times the process has been stopped by Watchdog.

## Node Metrics

vRealize Operations Manager collects metrics for the vRealize Operations Manager node objects.

Metrics can be calculated for node objects. See [Calculated Metrics](#).

**Table 1-61. Node Metrics**

Metric Key	Metric Name	Description
Component Count	Component count	The number of vRealize Operations Manager objects reporting for this node
PrimaryResourcesCount	Number of primary objects	Number of primary objects

**Table 1-61. Node Metrics (Continued)**

Metric Key	Metric Name	Description
LocalResourcesCount	Number of local objects	Number of local objects
PrimaryMetricsCount	Number of primary metrics	Number of primary metrics
LocalMetricsCount	Number of local metrics	Number of local metrics
PercentDBStorageAvailable	Percent disk available /storage/db	Percent disk available /storage/db
PercentLogStorageAvailable	Percent disk available /storage/log	Percent disk available /storage/log

**Table 1-62. Memory Metrics for the Node**

Metric Key	Metric Name	Description
mem actualFree	Actual Free	Actual Free
mem actualUsed	Actual Used	Actual Used
mem free	Free	Free )
mem used	Used	Used
mem total	Total	Total
mem demand_gb	Estimated memory demand	Estimated memory demand

**Table 1-63. Swap Metrics for the Node**

Metric Key	Metric Name	Description
swap total	Total	Total
swap free	Free	Free
swap used	Used	Used
swap pageIn	Page in	Page in
swap pageOut	Page out	Page out

**Table 1-64. Resource Limit Metrics for the Node**

Metric Key	Metric Name	Description
resourceLimit numProcesses	Number of processes	Number of processes
resourceLimit openFiles	Number of open files	Number of open files
resourceLimit openFilesMax	Number of open files maximum limit	Number of open files maximum limit
resourceLimit numProcessesMax	Number of processes maximum limit	Number of processes maximum limit

**Table 1-65. Network Metrics for the Node**

Metric Key	Metric Name	Description
net allInboundTotal	All inbound connections	All inbound total
net allOutboundTotal	All outbound connections	All outbound total

**Table 1-65. Network Metrics for the Node (Continued)**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
net tcpBound	TCP bound	TCP bound
net tcpClose	TCP state CLOSE	Number of connections in TCP CLOSE
net tcpCloseWait	TCP state CLOSE WAIT	Number of connections in TCP state CLOSE WAIT
net tcpClosing	TCP state CLOSING	Number of connections in TCP state CLOSING
net tcpEstablished	TCP state ESTABLISHED	Number of connections in TCP state ESTABLISHED
net tcpIdle	TCP state IDLE	Number of connections in TCP state IDLE
net tcpInboundTotal	TCP inbound connections	TCP inbound connections
net tcpOutboundTotal	TCP outbound connections	TCP outbound connections
net tcpLastAck	TCP state LAST ACK	Number of connections in TCP state LAST ACK
net tcpListen	TCP state LISTEN	Number of connections in TCP state LISTEN
net tcpSynRecv	TCP state SYN RCVD	Number of connections in TCP state SYN RCVD
net tcpSynSent	TCP state SYN_SENT	Number of connections in TCP state SYN_SENT
net tcpTimeWait	TCP state TIME WAIT	Number of connections in TCP state TIME WAIT

**Table 1-66. Network Interface Metrics for the Node**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
net iface speed	Speed	Speed (bits/sec)
net iface rxPackets	Receive packets	Number of received packets
net iface rxBytes	Receive bytes	Number of received bytes
net iface rxDropped	Receive packet drops	Number of received packets dropped
net iface rxFrame	Receive packets frame	Number of receive packets frame
net iface rxOverruns	Receive packets overruns	Number of receive packets overrun
net iface txPackets	Transmit packets	Number of transmit packets
net iface txBytes	Transmit bytes	Number of transmit bytes
net iface txDropped	Transmit packet drops	Number of transmit packets dropped
net iface txCarrier	Transmit carrier	Transmit carrier
net iface txCollisions	Transmit packet collisions	Number of transmit collisions

**Table 1-66. Network Interface Metrics for the Node (Continued)**

Metric Key	Metric Name	Description
net iface txErrors	Transmit packet errors	Number of transmit errors
net iface txOverruns	Transmit packet overruns	Number of transmit overruns

**Table 1-67. Disk Filesystem Metrics for the Node**

Metric Key	Metric Name	Description
disk fileSystem total	Total	Total
disk fileSystem available	Available	Available
disk fileSystem used	Used	Used
disk fileSystem files	Total file nodes	Total file nodes
disk fileSystem filesFree	Total free file nodes	Total free file nodes
disk fileSystem queue	Disk queue	Disk queue
disk fileSystem readBytes	Read bytes	Number of bytes read
disk fileSystem writeBytes	Write bytes	Number of bytes written
disk fileSystem reads	Reads	Number of reads
disk fileSystem writes	Writes	Number of writes

**Table 1-68. Disk Installation Metrics for the Node**

Metric Key	Metric Name	Description
disk installation used	Used	Used
disk installation total	Total	Total
disk installation available	Available	Available

**Table 1-69. Disk Database Metrics for the Node**

Metric Key	Metric Name	Description
disk db used	Used	Used
disk db total	Total	Total
disk db available	Available	Available

**Table 1-70. Disk Log Metrics for the Node**

Metric Key	Metric Name	Description
disk log used	Used	Used
disk log total	Total	Total
disk log available	Available	Available

**Table 1-71. CPU Metrics for the Node**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
cpu combined	Combined load	Combined load (User + Sys + Nice + Wait)
cpu idle	Idle	Idle time fraction of total available cpu (cpu load)
cpu irq	Irq	Interrupt time fraction of total available cpu (cpu load)
cpu nice	Nice	Nice time fraction of total available cpu (cpu load)
cpu softIrq	Soft Irq	Soft interrupt time fraction of total available cpu (cpu load)
cpu stolen	Stolen	Stolen time fraction of total available cpu (cpu load)
cpu sys	Sys	Sys time fraction of total available cpu (cpu load)
cpu user	User (cpu load)	User time fraction of total available cpu (cpu load)
cpu wait	Wait (cpu load)	Wait time fraction of total available cpu (cpu load)
cpu total	Total available for a cpu	Total available for a cpu
cpu allCpuCombined	Total combined load for all cpus	Total combined load for all cpus (cpu load)
cpu allCpuTotal_ghz	Available	Available
cpu allCpuCombined_ghz	Used	Used
cpu allCpuCombined_percent	CPU usage	CPU usage (%)

**Table 1-72. Device Metrics for the Node**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
device iops	Reads/Writes per second	Average number of read/write commands issued per second during the collection interval.
device await	Average transaction time	Average transaction time (milliseconds).
device iops_readMaxObserved	Maximum observed reads per second	Maximum observed reads per second.
device iops_writeMaxObserved	Maximum observed writes per second	Maximum observed writes per second.

**Table 1-73. Service Metrics for the Node**

Metric Key	Metric Name	Description
service proc fdUsage	Total number of open file descriptors	Total number of open file descriptors.

**Table 1-74. NTP Metrics for the Node**

Metric Key	Metric Name	Description
ntp serverCount	Configured server count	Configured server count
ntp unreachableCount	Unreachable server count	Unreachable server count
ntp unreachable	Unreachable	Is the NTP server unreachable. Value of 0 is reachable, 1 means the server was not reached or didn't respond.

**Table 1-75. Heap Metrics for the Node**

Metric Key	Metric Name	Description
heap CurrentHeapSize	Current heap size	Current heap size
heap MaxHeapSize	Max heap size	Max heap size
heap CommittedMemory	Committed Memory	Committed Memory

## Cluster Metrics

vRealize Operations Manager collects metrics for the vRealize Operations Manager cluster objects including dynamic threshold calculation metrics and capacity computation metrics.

Metrics can be calculated for cluster objects. See [Calculated Metrics](#).

## Cluster Metrics

Cluster metrics provide host, resource, and metric counts on the cluster.

**Table 1-76. Cluster Metrics**

Metric Key	Metric Name	Description
HostCount	Number of Nodes in Cluster	Number of Nodes in Cluster
PrimaryResourcesCount	Number of primary resources	Number of primary resources
LocalResourcesCount	Number of local resources	Number of local resources
PrimaryMetricsCount	Number of primary metrics	Number of primary metrics
ReceivedResourceCount	Number of received resources	Number of received resources
ReceivedMetricCount	Number of received metrics	Number of received metrics

## DT Metrics

DT metrics are dynamic threshold metrics for the cluster. Non-zero values appear only if metric collection occurs while the dynamic threshold calculations are running.

**Table 1-77. DT Metrics for the Cluster**

Metric Key	Metric Name	Description
dt isRunning	Running	Running
dt dtRunTime	Running duration	Running duration (ms)
dt startTime	Running start time	Running start time
dt percentage	Percent	Percent (%)
dt executorCount	Executor Node Count	Executor Node Count
dt resourceCount	Resource Count	Resource Count
dt fsdbReadTime	FSDB Read Time	FSDB Read Time (ms)
dt dtObjectSaveTime	DT Object Save Time	DT Object Save Time (ms)
dt dtHistorySaveTime	DT History Save Time	DT History Save Time (ms)
dt executor resourceCount	Resource Count	Resource Count

## Capacity Computation (CC) Metrics

CC metrics are capacity computation metrics for the cluster. Non-zero values appear only if metric collection occurs while the capacity computation calculations are running.

**Table 1-78. CC Metrics for the Cluster**

Metric Key	Metric Name	Description
cc isRunning	Running	Running
cc runTime	Total Run Time	Total Run Time
cc startTime	Start time	Start time
cc finishTime	Finish Time	Finish Time
cc totalResourcesToProcess	Total Objects Count	Total Objects Count
cc progress	Progress	Progress
cc phase1TimeTaken	Phase 1 Computation Time	Phase 1 Computation Time
cc phase2TimeTaken	Phase 2 Computation Time	Phase 2 Computation Time

## Gemfire Cluster Metrics

Gemfire metrics provide information about the Gemfire cluster.

**Table 1-79. Gemfire cluster Metrics for the Cluster**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
GemfireCluster System AvgReads	Average reads per second	The average number of reads per second for all members
GemfireCluster System AvgWrites	Average writes per second	The average number of writes per second for all members
GemfireCluster System DiskReadsRate	Disk reads rate	The average number of disk reads per second across all distributed members
GemfireCluster System DiskWritesRate	Disk writes rate	The average number of disk writes per second across all distributed members
GemfireCluster System GarbageCollectionCount	Total garbage collection count	The total garbage collection count for all members
GemfireCluster System GarbageCollectionCountDelta	New garbage collection count	The new garbage collection count for all members
GemfireCluster System JVMPauses	JVM pause count	The number of detected JVM pauses
GemfireCluster System JVMPausesDelta	New JVM pause count	The number of new detected JVM pauses
GemfireCluster System DiskFlushAvgLatency	Disk flush average latency	Disk flush average latency (msec)
GemfireCluster System NumRunningFunctions	Number of running functions	The number of map-reduce jobs currently running on all members in the distributed system
GemfireCluster System NumClients	Number of clients	The number of connected clients
GemfireCluster System TotalHitCount	Total hit count	Total number of cache hits for all regions
GemfireCluster System TotalHitCountDelta	New hit count	Number of new cache hits for all regions
GemfireCluster System TotalMissCount	Total miss count	The total number of cache misses for all regions
GemfireCluster System TotalMissCountDelta	New miss count	Number of new cache misses for all regions
GemfireCluster System Member FreeSwapSpace	Swap space free	Swap space free (MB)
GemfireCluster System Member TotalSwapSpace	Swap space total	Swap space total (MB)
GemfireCluster System Member CommittedVirtualMemorySize	Committed virtual memory size	Committed virtual memory size (MB)
GemfireCluster System Member SystemLoadAverage	System load average	System load average
GemfireCluster System Member FreePhysicalMemory	Free physical memory	Free physical memory (MB)
GemfireCluster System Member TotalPhysicalMemory	Total physical memory	Total physical memory (MB)

**Table 1-79. Gemfire cluster Metrics for the Cluster (Continued)**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
GemfireCluster System Member CacheListenerCallsAvgLatency	Average cache listener calls latency	Average cache listener calls latency (msec)
GemfireCluster System Member CacheWriterCallsAvgLatency	Average cache writer calls latency	Average cache writer calls latency (msec)
GemfireCluster System Member DeserializationAvgLatency	Average deserialization latency	Average deserialization latency (msec)
GemfireCluster System Member FunctionExecutionRate	Function executions per second	Function executions per second
GemfireCluster System Member JVMPauses	Number of JVM pauses	Number of JVM pauses
GemfireCluster System Member NumRunningFunctions	Number of running functions	Number of running functions
GemfireCluster System Member PutsRate	Puts per second	Puts per second
GemfireCluster System Member GetsRate	Gets per second	Gets per second
GemfireCluster System Member GetsAvgLatency	Average gets latency	Average gets latency (msec)
GemfireCluster System Member PutsAvgLatency	Average puts latency	Average puts latency (msec)
GemfireCluster System Member SerializationAvgLatency	Average serialization latency	Average serialization latency (msec)
GemfireCluster System Member Disk DiskFlushAvgLatency	Flush average latency	Flush average latency (msec)
GemfireCluster System Member Disk DiskReadsRate	Average reads per second	Average reads per second
GemfireCluster System Member Disk DiskWritesRate	Average writes per second	Average writes per second
GemfireCluster System Member Network BytesReceivedRate	Average received bytes per second	Average received bytes per second
GemfireCluster System Member Network BytesSentRate	Average sent bytes per second	Average sent bytes per second
GemfireCluster System Member JVM GCTimeMillis	Garbage Collection time	Total amount of time spent on garbage collection
GemfireCluster System Member JVM GCTimeMillisDelta	New Garbage Collection time	New amount of time spent on garbage collection
GemfireCluster System Member JVM TotalThreads	Total threads	Total threads
GemfireCluster System Member JVM CommittedMemory	Committed Memory	Committed Memory (MB)
GemfireCluster System Member JVM MaxMemory	Max Memory	Max Memory (MB)

**Table 1-79. Gemfire cluster Metrics for the Cluster (Continued)**

Metric Key	Metric Name	Description
GemfireCluster System Member JVM UsedMemory	Used Memory	Used Memory (MB)
GemfireCluster Region SystemRegionEntryCount	Entry Count	Entry Count
GemfireCluster Region DestroyRate	Destroys per second	Destroys per second
GemfireCluster Region CreatesRate	Creates per second	Creates per second
GemfireCluster Region GetsRate	Gets per second	Gets per second
GemfireCluster Region BucketCount	Bucket count	Bucket count
GemfireCluster Region AvgBucketSize	Average number of entries per bucket	Average number of entries per bucket
GemfireCluster Region Member ActualRedundancy	Actual redundancy	Actual redundancy
GemfireCluster Region Member BucketCount	Bucket count	Bucket count
GemfireCluster Region Member AvgBucketSize	Average number of entries per bucket	Average number of entries per bucket
GemfireCluster Region Member CreatesRate	Creates per second	Creates per second
GemfireCluster Region Member GetsRate	Gets per second	Gets per second
GemfireCluster Region Member DestroyRate	Destroys per second	Destroys per second
GemfireCluster Region Member MissCount	Number of misses count	Number of cache misses
GemfireCluster Region Member MissCountDelta	Number of new cache misses	Number of new cache misses
GemfireCluster Region Member HitCount	Number of hits count	Number of cache hits
GemfireCluster Region Member HitCountDelta	Number of new cache hits	Number of new cache hits

## Threshold Checking Metrics

Threshold checking metrics check the processed and computed metrics for the cluster.

**Table 1-80. Threshold Checking Metrics for the Cluster**

Metric Key	Metric Name	Description
ThresholdChecking ProcessedMetricCount	Number of processed metrics	Number of processed metrics
ThresholdChecking ProcessedMetricRate	Received metric processing rate (per second)	Received metric processing rate (per second)
ThresholdChecking ComputedMetricCount	Number of computed metrics	Number of computed metrics
ThresholdChecking ComputedMetricRate	Computed metric processing rate (per second)	Computed metric processing rate (per second)

## Memory Metrics

Memory metrics provide memory CPU use information for the cluster.

**Table 1-81. Memory Metrics for the Cluster**

Metric Key	Metric Name	Description
Memory AvgFreePhysicalMemory	Average free physical memory	Average free physical memory (GB)
Memory TotalFreePhysicalMemory	Free physical memory	Free physical memory (GB)
Memory TotalMemory	Total Available Memory	Total Available Memory (GB)
Memory TotalUsedMemory	Actual Used Memory	Actual Used Memory (GB)
Memory TotalDemandMemory	Memory Demand	Memory Demand (GB)

## Elastic Memory Metrics

Elastic memory metrics provide reclaimable memory CPU use information for the cluster.

**Table 1-82. Memory Metrics for the Cluster**

Metric Key	Metric Name	Description
ElasticMemory TotalMemory	Total Available Memory	Total Available Memory (GB)
ElasticMemory TotalUsedMemory	Actual Used Memory	Actual Used Memory (GB)
ElasticMemory TotalDemandMemory	Memory Demand	Memory Demand (GB)

## CPU Metrics

CPU metrics provide CPU information for the cluster.

**Table 1-83. CPU Metrics for the Cluster**

Metric Key	Metric Name	Description
cpu TotalCombinedUsage	CPU Load	CPU Load
cpu TotalAvailable	CPU Available	CPU Available
cpu TotalAvailable_ghz	Available	Available (GHz)
cpu TotalUsage_ghz	Used	Used (GHz)
cpu TotalUsage	CPU usage	CPU usage (%)

## Disk Metrics

Disk metrics provide available disk information for the cluster.

**Table 1-84. Disk Metrics for the Cluster**

Metric Key	Metric Name	Description
Disk DatabaseStorage AvgAvailable	Average node disk available	Average node disk available
Disk DatabaseStorage MinAvailable	Minimum node disk available	Minimum node disk available

**Table 1-84. Disk Metrics for the Cluster (Continued)**

Metric Key	Metric Name	Description
Disk DatabaseStorage MaxAvailable	Maximum node disk available	Maximum node disk available
Disk DatabaseStorage TotalAvailable	Available	Available
Disk DatabaseStorage Total	Total	Total
Disk DatabaseStorage TotalUsed	Used	Used
Disk LogStorage AvgAvailable	Average node disk available	Average node disk available
Disk LogStorage MinAvailable	Minimum node disk available	Minimum node disk available
Disk LogStorage MaxAvailable	Maximum node disk available	Maximum node disk available
Disk LogStorage TotalAvailable	Available	Available
Disk LogStorage Total	Total	Total
Disk LogStorage TotalUsed	Used	Used

## Persistence Metrics

vRealize Operations Manager collects metrics for various persistence resources or service groups.

## Activity Metrics

Activity metrics relate to the activity framework.

**Table 1-85. Activity Metrics for Persistence**

Metric Key	Metric Name	Description
Activity RunningCount	Number Running	Number Running
Activity ExecutedCount	Number Executed	Number Executed
Activity SucceededCount	Number Succeeded	Number Succeeded
Activity FailedCount	Number Failed	Number Failed

## Controller XDB Metrics

Controller metrics relate to the master database.

**Table 1-86. Controller XDB Metrics for Persistence**

Metric Key	Metric Name	Description
ControllerXDB Size	Size	Size (Bytes)
ControllerXDB TempDBSize	Temporary DB Size	Temporary DB Size (Bytes)
ControllerXDB TotalObjectCount	Total Object Count	Total Object Count
ControllerXDB AvgQueryDuration	Average Query Duration	Average Query Duration (ms)
ControllerXDB MinQueryDuration	Minimum Query Duration	Minimum Query Duration (ms)
ControllerXDB MaxQueryDuration	Maximum Query Duration	Maximum Query Duration (ms)
ControllerXDB TotalTransactionCount	Total Transaction Count	Total Transaction Count

**Table 1-86. Controller XDB Metrics for Persistence (Continued)**

Metric Key	Metric Name	Description
ControllerXDB LockOperationErrorCount	Lock Operation Error Count	Lock Operation Error Count
ControllerXDB DBCorruptionErrorCount	DB Corruption Error Count	DB Corruption Error Count
ControllerXDB DBMaxSessionExceededCount	DB Maximum Sessions Exceeded Count	DB Maximum Sessions Exceeded Count
ControllerXDB NumberWaitingForSession	Number of operations waiting for a session	Number of operations waiting for a session from the session pool
ControllerXDB AvgWaitForSessionDuration	Average acquisition time from session pool	Average acquisition time from session pool
ControllerXDB MinWaitForSessionDuration	Minimum acquisition time from session pool	Minimum acquisition time from session pool
ControllerXDB MaxWaitForSessionDuration	Maximum acquisition time from session pool	Maximum acquisition time from session pool
ControllerXDB TotalGetSessionCount	Total requests for a session from the session pool	Total requests for a session from the session pool
ControllerXDB MaxActiveSessionCount	Maximum Concurrent Session Count	Maximum concurrent session count during the past collection interval.

## Alarm SQL Metrics

Alarm metrics relate to the persistence of alerts and symptoms.

**Table 1-87. Alarm XDB Metrics for Persistence**

Metric Key	Metric Name	Description
AlarmSQL Size	Size (Bytes)	Size (Bytes)
AlarmSQL AvgQueryDuration	Average Query Duration (ms)	Average Query Duration (ms)
AlarmSQL MinQueryDuration	Minimum Query Duration (ms)	Minimum Query Duration (ms)
AlarmSQL MaxQueryDuration	Maximum Query Duration (ms)	Maximum Query Duration (ms)
AlarmSQL TotalTransactionCount	Total Transaction Count	Total Transaction Count
AlarmSQL TotalAlarms	Alarm Total Object Count	Alarm Total Object Count
AlarmSQL TotalAlerts	Alert Total Object Count	Alert Total Object Count
AlarmSQL AlertTableSize	Alert Table Size	Alert Table Size
AlarmSQL AlarmTableSize	Alarm Table Size	Alarm Table Size

## Key Value Store Database (KVDB)

KVDB metrics relate to the persistence of storing key-value data.

Metric Key	Metric Name	Description
KVDB AvgQueryDuration	Average Query Duration	Average Query Duration
KVDB MinQueryDuration	Minimum Query Duration	Minimum Query Duration

Metric Key	Metric Name	Description
KVDB MaxQueryDuration	Maximum Query Duration	Maximum Query Duration
KVDB TotalTransactionCount	Total Transaction Count	Total Transaction Count

## Historical Inventory Service XDB Metrics

Historical inventory service metrics relate to the persistence of configuration properties and their changes.

**Table 1-88. Historical XDB Metrics for Persistence**

Metric Key	Metric Name	Description
HisXDB FunctionCalls Count HisXDB FunctionCalls	Number of Function calls	Number of Function calls
HisXDB FunctionCalls AvgDuration	Average execution time	Average execution time
HisXDB FunctionCalls MaxDuration	Max execution time	Max execution time
HisXDB Size	Size	Size (Bytes)
HisXDB TempDBSize	Temporary DB Size	Temporary DB Size (Bytes)
HisXDB TotalObjectCount	Total Object Count	Total Object Count
HisXDB AvgQueryDuration	Average Query Duration	Average Query Duration (ms)
HisXDB MinQueryDuration	Minimum Query Duration	Minimum Query Duration (ms)
HisXDB MaxQueryDuration	Maximum Query Duration	Maximum Query Duration (ms)
HisXDB TotalTransactionCount	Total Transaction Count	Total Transaction Count
HisXDB LockOperationErrorCount	Lock Operation Error Count	Lock Operation Error Count
HisXDB DBCorruptionErrorCount	DB Corruption Error Count	DB Corruption Error Count
HisXDB DBMaxSessionExceededCount	DB Maximum Sessions Exceeded Count	DB Maximum Sessions Exceeded Count
HisXDB NumberWaitingForSession	Number of operations waiting for a session	Number of operations waiting for a session from the session pool
HisXDB AvgWaitForSessionDuration	Average acquisition time from session pool	Average acquisition time from session pool
HisXDB MinWaitForSessionDuration	Minimum acquisition time from session pool	Minimum acquisition time from session pool
HisXDB MaxWaitForSessionDuration	Maximum acquisition time from session pool	Maximum acquisition time from session pool
HisXDB TotalGetSessionCount	Total requests for a session from the session pool	Total requests for a session from the session pool
HisXDB HisActivitySubmissionCount	HIS activity submission count	Number of Historical Inventory Service activities submitted
HisXDB HisActivityCompletionCount	HIS activity completion count	Number of Historical Inventory Service activities completed
HisXDB HisActivityCompletionDelayAvg	HIS activity average completion delay	The average amount of time from activity submission to completion

**Table 1-88. Historical XDB Metrics for Persistence (Continued)**

Metric Key	Metric Name	Description
HisXDB HisActivityCompletionDelayMax	HIS activity maximum completion delay	The maximum amount of time from activity submission to completion
HisXDB HisActivityAbortedCount	HIS activity abort count	Number of Historical Inventory Service activities aborted

## Remote Collector Metrics

vRealize Operations Manager collects metrics for the vRealize Operations Manager remote collector node objects.

**Table 1-89. Remote Collector Metrics**

Metric Key	Metric Name	Description
ComponentCount	Component Count	The number of vRealize Operations Manager Objects reporting for this node.

**Table 1-90. Memory Metrics for the Remote Collector**

Metric Key	Metric Name	Description
mem actualFree	Actual Free	Actual Free
mem actualUsed	Actual Used	Actual Used
mem free	Free	Free )
mem used	Used	Used
mem total	Total	Total
mem demand_gb	Estimated memory demand	Estimated memory demand

**Table 1-91. Swap Metrics for the Remote Collector**

Metric Key	Metric Name	Description
swap total	Total	Total
swap free	Free	Free
swap used	Used	Used
swap pageIn	Page in	Page in
swap pageOut	Page out	Page out

**Table 1-92. Resource limit Metrics for the Remote Collector**

Metric Key	Metric Name	Description
resourceLimit numProcesses	Number of processes	Number of processes
resourceLimit openFiles	Number of open files	Number of open files

**Table 1-92. Resource limit Metrics for the Remote Collector (Continued)**

Metric Key	Metric Name	Description
resourceLimit openFilesMax	Number of open files maximum limit	Number of open files maximum limit
resourceLimit numProcessesMax	Number of processes maximum limit	Number of processes maximum limit

**Table 1-93. Network Metrics for the Remote Collector**

Metric Key	Metric Name	Description
net allInboundTotal	All inbound connections	All inbound total
net allOutboundTotal	All outbound connections	All outbound total
net tcpBound	TCP bound	TCP bound
net tcpClose	TCP state CLOSE	Number of connections in TCP CLOSE
net tcpCloseWait	TCP state CLOSE WAIT	Number of connections in TCP state CLOSE WAIT
net tcpClosing	TCP state CLOSING	Number of connections in TCP state CLOSING
net tcpEstablished	TCP state ESTABLISHED	Number of connections in TCP state ESTABLISHED
net tcpIdle	TCP state IDLE	Number of connections in TCP state IDLE
net tcpInboundTotal	TCP inbound connections	TCP inbound connections
net tcpOutboundTotal	TCP outbound connections	TCP outbound connections
net tcpLastAck	TCP state LAST ACK	Number of connections in TCP state LAST ACK
net tcpListen	TCP state LISTEN	Number of connections in TCP state LISTEN
net tcpSynRecv	TCP state SYN RCVD	Number of connections in TCP state SYN RCVD
net tcpSynSent	TCP state SYN_SENT	Number of connections in TCP state SYN_SENT
net tcpTimeWait	TCP state TIME WAIT	Number of connections in TCP state TIME WAIT

**Table 1-94. Network Interface Metrics for the Remote Collector**

Metric Key	Metric Name	Description
net iface speed	Speed	Speed (bits/sec)
net iface rxPackets	Receive packets	Number of received packets
net iface rxBytes	Receive bytes	Number of received bytes

**Table 1-94. Network Interface Metrics for the Remote Collector (Continued)**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
net iface rxDropped	Receive packet drops	Number of received packets dropped
net iface rxFrame	Receive packets frame	Number of receive packets frame
net iface rxOverruns	Receive packets overruns	Number of receive packets overrun
net iface txPackets	Transmit packets	Number of transmit packets
net iface txBytes	Transmit bytes	Number of transmit bytes
net iface txDropped	Transmit packet drops	Number of transmit packets dropped
net iface txCarrier	Transmit carrier	Transmit carrier
net iface txCollisions	Transmit packet collisions	Number of transmit collisions
net iface txErrors	Transmit packet errors	Number of transmit errors
net iface txOverruns	Transmit packet overruns	Number of transmit overruns

**Table 1-95. Disk Filesystem Metrics for the Remote Collector**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
disk fileSystem total	Total	Total
disk fileSystem available	Available	Available
disk fileSystem used	Used	Used
disk fileSystem files	Total file nodes	Total number of file nodes
disk fileSystem filesFree	Total free file nodes	Total free file nodes
disk fileSystem queue	Disk queue	Disk queue
disk fileSystem readBytes	Read bytes	Number of bytes read
disk fileSystem writeBytes	Write bytes	Number of bytes written
disk fileSystem reads	Reads	Number of reads
disk fileSystem writes	Writes	Number of writes

**Table 1-96. Disk Installation Metrics for the Remote Collector**

<b>Metric Key</b>	<b>Metric Name</b>	<b>Description</b>
disk installation used	Used	Used
disk installation total	Total	Total
disk installation available	Available	Available

**Table 1-97. Disk Database Metrics for the Remote Collector**

Metric Key	Metric Name	Description
disk db used	Used	Used
disk db total	Total	Total
disk db available	Available	Available

**Table 1-98. Disk Log Metrics for the Remote Collector**

Metric Key	Metric Name	Description
disk log used	Used	Used
disk log total	Total	Total
disk log available	Available	Available

**Table 1-99. CPU Metrics for the Remote Collector**

Metric Key	Metric Name	Description
cpu combined	Combined load	Combined load (User + Sys + Nice + Wait)
cpu idle	Idle	Idle time fraction of total available cpu (cpu load)
cpu irq	Irq	Interrupt time fraction of total available cpu (cpu load)
cpu nice	Nice	Nice time fraction of total available cpu (cpu load)
cpu softIrq	Soft Irq	Soft interrupt time fraction of total available cpu (cpu load)
cpu stolen	Stolen	Stolen time fraction of total available cpu (cpu load)
cpu sys	Sys	Sys time fraction of total available cpu (cpu load)
cpu user	User	User time fraction of total available cpu (cpu load)
cpu wait	Wait	Wait time fraction of total available cpu (cpu load)
cpu total	Total available for a cpu	Total available for a cpu
cpu allCpuCombined	Total combined load for all cpus	Total combined load for all cpus (cpu load)
cpu allCpuTotal_ghz	Available	Available
cpu allCpuCombined_ghz	Used	Used
cpu allCpuCombined_percent	CPU usage	CPU usage (%)

**Table 1-100. Device Metrics for the Remote Collector**

Metric Key	Metric Name	Description
device iops	Reads/writes per second	Average number of read/write commands issued per second during the collection interval
device await	Average transaction time	Average transaction time (milliseconds)

**Table 1-101. Service Metrics for the Remote Collector**

Metric Key	Metric Name	Description
service proc fdUsage	Total number of open file descriptors	Total number of open file descriptors (Linux). Total number of open handles (Windows)

**Table 1-102. NTP Metrics for the Remote Collector**

Metric Key	Metric Name	Description
ntp serverCount	Configured server count	Configured server count
ntp unreachableCount	Unreachable server count	Unreachable server count
ntp unreachable	Unreachable	Is the NTP server unreachable. Value of 0 is reachable, 1 means the server was not reached or didn't respond.

## Metrics for vRealize Automation

The vRealize Automation solution collects metrics about the total number of virtual machines deployed.

**Table 1-103. Metrics**

Metric Name	Description
Total Deployed	The total number of virtual machines deployed from the blueprint. Key: DeploymentCount   TotalDeployed

## Managed Resources Object as a Filter in vRealize Automation

The vRealize Automation solution uses filters to display the VMware vCenter adapter objects that are managed by or have some association with vRealize Automation. Some of the dashboards have widgets that are configured to display only VMware vCenter adapter objects that vRealize Automation manages or is associated with. vRealize Automation uses an object called Managed Resources as a filter to display only those objects. All of these resources are placed under the Managed Resources object of type vRealize Automation Entity Status. The absence of this filter causes all VMware vCenter adapter objects to be displayed in the widgets. If you delete the Managed Resources object, the adapter re-creates the object, but the dashboards display incorrect information in the widgets that use this filter. If you delete the Managed Resources object, you must manually configure the widgets in the dashboard and select the Managed Resources object as a filter in each section that displays the VMware vCenter adapter objects.

## Metrics for vSAN

vRealize Operations Manager collects metrics for vSAN objects.

In the menu, click **Environment > All Objects > vSAN Adapter**. Select one of the vSAN adapter objects listed and click the **All Metrics** tab.

## Disk I/O and Disk Space Metrics for vSAN Disk Groups

The vRealize Operations Manager collects the metrics you use to monitor the performance of your vSAN disk groups.

Disk I/O metrics for the vSAN disk groups include:

- Disk I/O|Reads Per Second (IOPS)
- Disk I/O|Writes Per Second (IOPS)
- Disk I/O|Max Observed Reads Per Second (IOPS)
- Disk I/O|Max Observed Writes Per Second (IOPS)
- Disk I/O|Throughput Read (bps)
- Disk I/O|Throughput Write (bps)
- Disk I/O|Average Read Latency (ms)
- Disk I/O|Average Write Latency (ms)
- Disk I/O|Read Count
- Disk I/O|Write Count
- Disk I/O|Average Device Latency
- Disk I/O|Average Device Read Latency
- Disk I/O|Average Device Write Latency
- Disk I/O|Total Bus Resets
- Disk I/O|Total Commands Aborted per second
- Disk I/O|Total Number of Errors

Disk space metrics for vSAN disk groups include:

- Disk Space|Capacity (bytes)
- Disk Space|Used (bytes)
- Disk Space|Usage (%)

## Read Cache Metrics for vSAN Disk Groups

The vRealize Operations Manager collects metrics and performs capacity trend analysis on a hybrid vSAN read cache. Read Cache metrics are not collected for a vSAN all-flash configuration.

Read cache metrics for the vSAN disk group include:

- Read Cache|Hit Rate (%)
- Read Cache|Miss Rate Ratio
- Read Cache|Read Cache Reads Per Second (IOPS)
- Read Cache|Read Cache Read Latency (ms)
- Read Cache|Read Cache Read I/O Count
- Read Cache|Read Cache Writes Per Second (IOPS)
- Read Cache|Read Cache Write Latency (ms)
- Read Cache|Read Cache Write I/O Count

## Write Buffer Metrics for vSAN Disk Groups

The vRealize Operations Manager collects the metrics you use to monitor the write buffer capacity of your vSAN disk groups.

A reasonably balanced system consumes a significant amount of write buffer. Before placing additional workload on the vSAN, check the write buffer metrics for the vSAN disk group.

- Write Buffer|Capacity (bytes)
- Write Buffer|Free (%)
- Write Buffer|Usage (%)
- Write Buffer|Used (byte)
- Write Buffer|Write Buffer Reads Per Second (IOPS)
- Write Buffer|Write Buffer Read Latency (ms)
- Write Buffer|Write Buffer Read I/O Count
- Write Buffer|Write Buffer Writes Per Second (IOPS)
- Write Buffer|Write Buffer Write Latency (ms)
- Write Buffer|Write Buffer Write I/O Count

## Congestion Metrics for vSAN Disk Groups

The vRealize Operations Manager collects congestion metrics for the vSAN disk group.

- Congestion| Memory Congestion - Favorite
- Congestion| SSD Congestion - Favorite

- Congestion| IOPS Congestion - Favorite
- Congestion| Slab Congestion
- Congestion| Log Congestion
- Congestion| Comp Congestion

## Metrics for vSAN Cluster

The vRealize Operations Manager collects the metrics you use to monitor the performance of your vSAN cluster.

Metrics for vSAN cluster include:

Component	Metrics
Component Limit	<ul style="list-style-type: none"> <li>■ vSAN Component Limit Component Limit Used (%)</li> <li>■ vSAN Component Limit Total Component Limit</li> <li>■ vSAN Component Limit Used Component Limit</li> </ul>
Disk Space	<ul style="list-style-type: none"> <li>■ vSAN Disk Space Disk Space Used (%)</li> <li>■ vSAN Disk Space Total Disk Space (GB)</li> <li>■ vSAN Disk Space Used Disk Space (GB)</li> </ul>
Read Cache	<ul style="list-style-type: none"> <li>■ vSAN Read Cache Read Cache Reserved (%)</li> <li>■ vSAN Read Cache Reserved Read Cache Size (GB)</li> <li>■ vSAN Read Cache Total Read Cache Size (GB)</li> </ul>
Performance	<ul style="list-style-type: none"> <li>■ vSAN Read Cache Reads Per Second (IOPS)</li> <li>■ vSAN Read Cache Read Throughput (KBps)</li> <li>■ vSAN Read Cache Average Read Latency (ms)</li> <li>■ vSAN Read Cache Writes Per Second (IOPS)</li> <li>■ vSAN Read Cache Write Throughput (KBps)</li> <li>■ vSAN Read Cache Average Write Latency (ms)</li> <li>■ vSAN Read Cache Congestion</li> <li>■ vSAN Read Cache Outstanding I/O</li> <li>■ vSAN Read Cache Total IOPS</li> <li>■ vSAN Read Cache Total Latency (ms)</li> <li>■ vSAN Read Cache Total Throughput (KBps)</li> </ul>

Component	Metrics
Deduplication And Compression Overview	<ul style="list-style-type: none"> <li>■ vSAN Deduplication And Compression Overview Used Before</li> <li>■ vSAN Deduplication And Compression Overview Used After</li> <li>■ vSAN Deduplication And Compression Overview Savings</li> <li>■ vSAN Deduplication And Compression Overview Ratio</li> </ul>
Summary	<ul style="list-style-type: none"> <li>■ Summary Number of Cache Disks</li> <li>■ Summary Total Number of Capacity Disks</li> <li>■ Summary CPU Workload</li> <li>■ Summary Memory Workload</li> <li>■ Summary Total Number of Disk Groups</li> <li>■ Summary Total Active Alerts Count</li> <li>■ Summary Total Number of VMs</li> <li>■ Summary Total Number of Hosts</li> <li>■ Summary vSAN Cluster Capacity Remaining (%)</li> <li>■ Summary vSAN Cluster Storage Time Remaining</li> <li>■ Summary vSAN Capacity Disk Used</li> </ul>

## Metrics for vSAN Enabled Host

The vRealize Operations Manager collects the metrics you use to monitor the performance of your vSAN enabled host.

Metrics for vSAN enabled host include:

Component	Metrics
Component Limit	<ul style="list-style-type: none"> <li>■ vSAN Component Limit Component Limit Used (%)</li> <li>■ vSAN Component Limit Total Component Limit</li> <li>■ vSAN Component Limit Used Component Limit</li> </ul>
Disk Space	<ul style="list-style-type: none"> <li>■ vSAN Disk Space Disk Space Used (%)</li> <li>■ vSAN Disk Space Total Disk Space (GB)</li> <li>■ vSAN Disk Space Used Disk Space (GB)</li> </ul>
Read Cache	<ul style="list-style-type: none"> <li>■ vSAN Read Cache Read Cache Reserved (%)</li> <li>■ vSAN Read Cache Reserved Read Cache Size (GB)</li> <li>■ vSAN Read Cache Total Read Cache Size (GB)</li> </ul>

## Metrics for vSAN Datastore

The vRealize Operations Manager collects the metrics you use to monitor the performance of your vSAN datastore.

Datastore I/O metrics for vSAN datastore include:

- Datastore I/O|Reads Per Second (IOPS)
- Datastore I/O|Read Rate (KBps)
- Datastore I/O|Read Latency (ms)

- Datastore I/O|Writes Per Second (IOPS)
- Datastore I/O|Write Rate (KBps)
- Datastore I/O|Write Latency (ms)
- Datastore I/O|Outstanding I/O requests
- Datastore I/O|Congestion

## Metrics for vSAN Cache Disk

The vRealize Operations Manager collects the metrics you use to monitor the performance of your vSAN cache disk.

Metrics for vSAN cache disk include:

Component	Metrics
Performance	<ul style="list-style-type: none"> <li>▪ Performance Bus Resets</li> <li>▪ Performance Commands Aborted Per Second</li> <li>▪ Performance Device Latency (ms)</li> <li>▪ Performance Device Read Latency (ms)</li> <li>▪ Performance Device Write Latency (ms)</li> <li>▪ Performance Read Requests Per Second</li> <li>▪ Performance Average Reads Per Second</li> <li>▪ Performance Write Requests Per Second</li> <li>▪ Performance Average Writes Per Second</li> <li>▪ Performance Read Rate</li> <li>▪ Performance Write Rate</li> <li>▪ Performance Usage</li> <li>▪ Performance HDD Errors</li> </ul>
SCSI SMART Statistics	<ul style="list-style-type: none"> <li>▪ SCSI SMART Statistics Health Status</li> <li>▪ SCSI SMART Statistics Media Wearout Indicator</li> <li>▪ SCSI SMART Statistics Write Error Count</li> <li>▪ SCSI SMART Statistics Read Error Count</li> <li>▪ SCSI SMART Statistics Power on Hours</li> <li>▪ SCSI SMART Statistics Reallocated Sector Count</li> <li>▪ SCSI SMART Statistics Raw Read Error Rate</li> <li>▪ SCSI SMART Statistics Drive Temperature</li> <li>▪ SCSI SMART Statistics Maximum Observed Drive Temperature</li> <li>▪ SCSI SMART Statistics Drive Rated Max Temperature</li> <li>▪ SCSI SMART Statistics Write Sectors TOT Count</li> <li>▪ SCSI SMART Statistics Read Sectors TOT Count</li> <li>▪ SCSI SMART Statistics Initial Bad Block Count</li> </ul>
Capacity	<ul style="list-style-type: none"> <li>▪ vSAN Health Capacity Total Disk Capacity (GB)</li> <li>▪ vSAN Health Capacity Used Disk Capacity (GB)</li> </ul>

Component	Metrics
Congestion Health	<ul style="list-style-type: none"> <li>■ vSAN Health Congestion Health Congestion Value</li> </ul>
Performance	<ul style="list-style-type: none"> <li>■ vSAN Performance Physical Layer Reads Per Second</li> <li>■ vSAN Performance Physical Layer Writes Per Second</li> <li>■ vSAN Performance Physical Layer Read Throughput (KBps)</li> <li>■ vSAN Performance Physical Layer Write Throughput (KBps)</li> <li>■ vSAN Performance Physical Layer Read Latency (ms)</li> <li>■ vSAN Performance Physical Layer Write Latency (ms)</li> <li>■ vSAN Performance Physical Layer Read Count</li> <li>■ vSAN Performance Physical Layer Write Count</li> <li>■ vSAN Performance Device Average Latency (ms)</li> <li>■ vSAN Performance Guest Average Latency (ms)</li> </ul>

## Metrics for vSAN Capacity Disk

The vRealize Operations Manager collects the metrics you use to monitor the performance of your vSAN capacity disk.

Metrics for vSAN capacity disk include:

Component	Metrics
Performance	<ul style="list-style-type: none"> <li>■ Performance Bus Resets</li> <li>■ Performance Commands Aborted Per Second</li> <li>■ Performance Device Latency (ms)</li> <li>■ Performance Device Read Latency (ms)</li> <li>■ Performance Device Write Latency (ms)</li> <li>■ Performance Read Requests Per Second</li> <li>■ Performance Average Reads Per Second</li> <li>■ Performance Write Requests Per Second</li> <li>■ Performance Average Writes Per Second</li> <li>■ Performance Read Rate</li> <li>■ Performance Write Rate</li> <li>■ Performance Usage</li> <li>■ Performance HDD Errors</li> </ul>
SCSI SMART Statistics	<ul style="list-style-type: none"> <li>■ SCSI SMART Statistics Health Status</li> <li>■ SCSI SMART Statistics Media Wearout Indicator</li> <li>■ SCSI SMART Statistics Write Error Count</li> <li>■ SCSI SMART Statistics Read Error Count</li> <li>■ SCSI SMART Statistics Power on Hours</li> <li>■ SCSI SMART Statistics Reallocated Sector Count</li> <li>■ SCSI SMART Statistics Raw Read Error Rate</li> <li>■ SCSI SMART Statistics Drive Temperature</li> <li>■ SCSI SMART Statistics Maximum Observed Drive Temperature</li> <li>■ SCSI SMART Statistics Drive Rated Max Temperature</li> <li>■ SCSI SMART Statistics Write Sectors TOT Count</li> <li>■ SCSI SMART Statistics Read Sectors TOT Count</li> <li>■ SCSI SMART Statistics Initial Bad Block Count</li> </ul>
Capacity	<ul style="list-style-type: none"> <li>■ vSAN Health Total Disk Capacity (GB)</li> <li>■ vSAN Health Used Disk Capacity (GB)</li> </ul>

Component	Metrics
Congestion Health	vSAN Health Congestion Value
Performance	<ul style="list-style-type: none"> <li>■ vSAN Performance Physical Layer Reads Per Second</li> <li>■ vSAN Performance Physical Layer Writes Per Second</li> <li>■ vSAN Performance Physical Layer Read Throughput (KBps)</li> <li>■ vSAN Performance Physical Layer Write Throughput (KBps)</li> <li>■ vSAN Performance Physical Layer Read Latency (ms)</li> <li>■ vSAN Performance Physical Layer Write Latency (ms)</li> <li>■ vSAN Performance Physical Layer Read Count</li> <li>■ vSAN Performance Physical Layer Write Count</li> <li>■ vSAN Performance Device Average Latency (ms)</li> <li>■ vSAN Performance Guest Average Latency (ms)</li> <li>■ vSAN Performance vSAN Layer Reads Per Second</li> <li>■ vSAN Performance vSAN Layer Writes Per Second</li> <li>■ vSAN Performance vSAN Layer Read Latency (ms)</li> <li>■ vSAN Performance vSAN Layer Write Latency (ms)</li> <li>■ vSAN Performance vSAN Layer Read Count</li> <li>■ vSAN Performance vSAN Layer Write Count</li> </ul>

Properties for vSAN capacity disk include:

- Name
- Size
- Vendor
- Type
- Queue Depth

## Metrics for vSAN World

The vRealize Operations Manager collects the metrics you use to monitor the performance of your vSAN world.

Metrics for vSAN world include:

- Summary|Total Number of VMs
- Summary|Total Number of Hosts
- Summary|Total IOPS
- Summary|Total Latency
- Summary|Total Number of Clusters
- Summary|Total Number of DiskGroups
- Summary|Total Number of Cache Disks
- Summary|Total Number of Capacity Disks

- Summary|Total Number of Datastores
- Summary|Total vSAN Disk Capacity (TB)
- Summary|Total vSAN Disk Capacity Used (TB)
- Summary|Remaining Capacity (TB)
- Summary|Remaining Capacity (%)
- Summary|Total Savings by Deduplication and Compression (GB)

## Metrics for the Operating Systems and Remote Service Monitoring Plug-ins in End Point Operations Management

vRealize Operations Manager collects metrics for the object types in the Operating Systems and Remote Service Monitoring plug-ins.

Due to rounding in metric time calculation, there can be situations in which the Resource Availability metric is rounded up. Rounding up the metric appears as gaps in the metrics reported by the End Point Operations Management agent. However, the metrics are fully reported.

### Operating Systems Plug-in Metrics

The Operating Systems plug-in collects metrics for object types such Linux, AIX, Solaris, and Windows. The Operating Systems plug-in also collects metrics for Windows services, Script services, and Multiprocess services.

#### AIX Metrics

The Operating Systems Plug-in discovers the metrics for the AIX object type. AIX 6.1 and 7.1 are supported.

**Table 1-104. AIX metrics**

Name	Category	KPI
Resource Availability	AVAILABILITY	True
System Uptime	AVAILABILITY	True
File System Reads/Writes	THROUGHPUT	False
File System Reads/Writes per Minute	THROUGHPUT	False
Tcp Passive Opens	THROUGHPUT	False
Tcp Out Segs per Minute	THROUGHPUT	False
Tcp Attempt Fails	THROUGHPUT	False
Tcp Estab Resets per Minute	THROUGHPUT	False
Tcp Retrans Segs	THROUGHPUT	False
Tcp Out Segs	THROUGHPUT	False
Tcp Estab Resets	THROUGHPUT	False

**Table 1-104. AIX metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
Tcp Active Opens	THROUGHPUT	False
Tcp Curr Estab	THROUGHPUT	False
Tcp In Errs	THROUGHPUT	False
Tcp In Errs per Minute	THROUGHPUT	False
Tcp Active Opens per Minute	THROUGHPUT	False
Tcp Out Rsts per Minute	THROUGHPUT	False
Tcp Out Rsts	THROUGHPUT	False
Tcp Attempt Fails per Minute	THROUGHPUT	False
Tcp Passive Opens per Minute	THROUGHPUT	False
Tcp In Segs per Minute	THROUGHPUT	False
Tcp In Segs	THROUGHPUT	False
Tcp Retrans Segs per Minute	THROUGHPUT	False
Cpu Wait Time	UTILIZATION	False
Cpu Idle	UTILIZATION	False
Cpu Idle Time	UTILIZATION	False
Cpu Idle Time per Minute	UTILIZATION	False
Cpu Wait Time per Minute	UTILIZATION	False
Cpu Usage	UTILIZATION	True
Cpu Wait	UTILIZATION	False
Cpu Nice	UTILIZATION	False
Free Memory	UTILIZATION	False
Load Average 15 Minutes	UTILIZATION	False
Load Average 5 Minutes	UTILIZATION	False
Load Average 1 Minute	UTILIZATION	False
Nfs Server V3 Write per Minute	UTILIZATION	False
Nfs Server V3 Readlink per Minute	UTILIZATION	False
Nfs Server V3 Readdirplus per Minute	UTILIZATION	False
Nfs Server V3 Commit per Minute	UTILIZATION	False
Nfs Server V3 Access	UTILIZATION	False
Nfs Server V3 Access per Minute	UTILIZATION	False
Nfs Server V3 Rename per Minute	UTILIZATION	False
Nfs Server V3 Fsstat per Minute	UTILIZATION	False
Nfs Server V3 Create per Minute	UTILIZATION	False
Nfs Server V3 Mkdir per Minute	UTILIZATION	False

**Table 1-104. AIX metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
Nfs Server V3 Mknod	UTILIZATION	False
Nfs Server V3 Read per Minute	UTILIZATION	False
Nfs Server V3 Fsstat	UTILIZATION	False
Nfs Server V3 Link	UTILIZATION	False
Nfs Server V3 Write	UTILIZATION	False
Nfs Server V3 Lookup per Minute	UTILIZATION	False
Nfs Server V3 Link per Minute	UTILIZATION	False
Nfs Server V3 Rmdir per Minute	UTILIZATION	False
Nfs Server V3 Mkdir	UTILIZATION	False
Nfs Server V3 Remove per Minute	UTILIZATION	False
Nfs Server V3 Symlink	UTILIZATION	False
Nfs Server V3 Symlink per Minute	UTILIZATION	False
Nfs Server V3 Remove	UTILIZATION	False
Nfs Server V3 Null	UTILIZATION	False
Nfs Server V3 Readdirplus	UTILIZATION	False
Nfs Server V3 Readdir	UTILIZATION	False
Nfs Server V3 Getattr per Minute	UTILIZATION	False
Nfs Server V3 Read	UTILIZATION	False
Nfs Server V3 Lookup	UTILIZATION	False
Nfs Server V3 Pathconf	UTILIZATION	False
Nfs Server V3 Readlink	UTILIZATION	False
Nfs Server V3 Pathconf per Minute	UTILIZATION	False
Nfs Server V3 Mknod per Minute	UTILIZATION	False
Nfs Server V3 Setattr per Minute	UTILIZATION	False
Nfs Server V3 Setattr	UTILIZATION	False
Nfs Server V3 Create	UTILIZATION	False
Nfs Server V3 Fsinfo per Minute	UTILIZATION	False
Nfs Server V3 Fsinfo	UTILIZATION	False
Nfs Server V3 Getattr	UTILIZATION	False
Nfs Server V3 Rmdir	UTILIZATION	False
Nfs Server V3 Readdir per Minute	UTILIZATION	False
Nfs Server V3 Rename	UTILIZATION	False
Nfs Server V3 Commit	UTILIZATION	False
Nfs Server V3 Null per Minute	UTILIZATION	False

**Table 1-104. AIX metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
Number of CPUs	UTILIZATION	False
Page Major faults	UTILIZATION	False
Percent Used Memory	UTILIZATION	True
Page Major faults per Second	UTILIZATION	False
Page Faults per Second	UTILIZATION	False
Page Faults	UTILIZATION	False
Percent Used Swap	UTILIZATION	True
Percent Free Swap	UTILIZATION	False
Percent Free Memory	UTILIZATION	False
Running Processes	UTILIZATION	False
Sleeping Processes	UTILIZATION	False
Stopped Processes	UTILIZATION	False
System Cpu Time per Minute	UTILIZATION	False
System Cpu	UTILIZATION	False
System Cpu Time	UTILIZATION	False
Swap Used	UTILIZATION	False
Swap Pages In	UTILIZATION	False
Swap Pages In per Minute	UTILIZATION	False
Swap Total	UTILIZATION	False
Swap Free	UTILIZATION	False
Swap Pages Out	UTILIZATION	False
Swap Pages Out per Minute	UTILIZATION	False
Total disk capacity	UTILIZATION	False
Total Processes	UTILIZATION	False
Total Memory	UTILIZATION	False
Total disk usage	UTILIZATION	False
User Cpu Time	UTILIZATION	False
User Cpu	UTILIZATION	False
User Cpu Time per Minute	UTILIZATION	False
Used Memory	UTILIZATION	False
Zombie Processes	UTILIZATION	False

## Linux Metrics

The Operating Systems Plug-in discovers the metrics for the Linux object type.

**Table 1-105. Linux Metrics**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
Resource Availability	AVAILABILITY	True
System Uptime	AVAILABILITY	False
File System Reads/Writes	THROUGHPUT	False
File System Reads/Writes per Minute	THROUGHPUT	False
Tcp Attempt Fails	THROUGHPUT	False
Tcp State Established	THROUGHPUT	False
Tcp Estab Resets per Minute	THROUGHPUT	False
Tcp Retrans Segs	THROUGHPUT	False
Tcp State LISTEN	THROUGHPUT	False
Tcp State CLOSING	THROUGHPUT	False
Tcp State SYN_SENT	THROUGHPUT	False
Tcp State TIME_WAIT	THROUGHPUT	False
Tcp State SYN_RECV	THROUGHPUT	False
Tcp In Errs per Minute	THROUGHPUT	False
Tcp Out Segs per Minute	THROUGHPUT	False
Tcp Passive Opens per Minute	THROUGHPUT	False
Tcp Out Segs	THROUGHPUT	False
Tcp Estab Resets	THROUGHPUT	False
Tcp Active Opens	THROUGHPUT	False
Tcp Outbound Connections	THROUGHPUT	False
Tcp Curr Estab	THROUGHPUT	False
Tcp In Errs	THROUGHPUT	False
Tcp Inbound Connections	THROUGHPUT	False
Tcp Active Opens per Minute	THROUGHPUT	False
Tcp Out Rsts per Minute	THROUGHPUT	False
Tcp In Segs	THROUGHPUT	False
Tcp Retrans Segs per Minute	THROUGHPUT	False
Tcp Passive Opens	THROUGHPUT	False
Tcp Out Rsts	THROUGHPUT	False
Tcp State FIN_WAIT1	THROUGHPUT	False
Tcp State FIN_WAIT2	THROUGHPUT	False
Tcp State CLOSE_WAIT	THROUGHPUT	False
Tcp In Segs per Minute	THROUGHPUT	False

**Table 1-105. Linux Metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
Tcp State CLOSE	THROUGHPUT	False
Tcp State LAST_ACK	THROUGHPUT	False
Tcp Attempt Fails per Minute	THROUGHPUT	False
Cpu Stolen	UTILIZATION	False
Cpu Wait Time	UTILIZATION	False
Cpu Irq Time per Minute	UTILIZATION	False
Cpu Softirq Time	UTILIZATION	False
Cpu Stolen Time per Minute	UTILIZATION	False
Cpu Stolen Time	UTILIZATION	False
Cpu Idle Time	UTILIZATION	False
Cpu Irq	UTILIZATION	False
Cpu Softirq Time per Minute	UTILIZATION	False
Cpu Idle Time per Minute	UTILIZATION	False
Cpu Wait Time per Minute	UTILIZATION	False
Cpu Irq Time	UTILIZATION	False
Cpu Softirq	UTILIZATION	False
Cpu Idle	UTILIZATION	False
Cpu Usage	UTILIZATION	True
Cpu Wait	UTILIZATION	False
Cpu Nice	UTILIZATION	False
Free Memory	UTILIZATION	False
Free Memory (+ buffers/cache)	UTILIZATION	False
Load Average 15 Minutes	UTILIZATION	False
Load Average 5 Minutes	UTILIZATION	False
Load Average 1 Minute	UTILIZATION	False
Nfs Server V3 Readlink per Minute	UTILIZATION	False
Nfs Server V3 Readdirplus per Minute	UTILIZATION	False
Nfs Server V3 Commit per Minute	UTILIZATION	False
Nfs Server V3 Access	UTILIZATION	False
Nfs Server V3 Access per Minute	UTILIZATION	False
Nfs Server V3 Remove	UTILIZATION	False
Nfs Server V3 Rename per Minute	UTILIZATION	False
Nfs Server V3 Fsstat per Minute	UTILIZATION	False

**Table 1-105. Linux Metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
Nfs Server V3 Create per Minute	UTILIZATION	False
Nfs Server V3 Mkdir per Minute	UTILIZATION	False
Nfs Server V3 Mknod	UTILIZATION	False
Nfs Server V3 Read per Minute	UTILIZATION	False
Nfs Server V3 Fsstat	UTILIZATION	False
Nfs Server V3 Link	UTILIZATION	False
Nfs Server V3 Write	UTILIZATION	False
Nfs Server V3 Remove per Minute	UTILIZATION	False
Nfs Server V3 Lookup per Minute	UTILIZATION	False
Nfs Server V3 Link per Minute	UTILIZATION	False
Nfs Server V3 Rmdir per Minute	UTILIZATION	False
Nfs Server V3 Mkdir	UTILIZATION	False
Nfs Server V3 Mknod per Minute	UTILIZATION	False
Nfs Server V3 Getattr per Minute	UTILIZATION	False
Nfs Server V3 Null	UTILIZATION	False
Nfs Server V3 Readdirplus	UTILIZATION	False
Nfs Server V3 Lookup	UTILIZATION	False
Nfs Server V3 Pathconf	UTILIZATION	False
Nfs Server V3 Readlink	UTILIZATION	False
Nfs Server V3 Write per Minute	UTILIZATION	False
Nfs Server V3 Readdir	UTILIZATION	False
Nfs Server V3 Setattr per Minute	UTILIZATION	False
Nfs Server V3 Setattr	UTILIZATION	False
Nfs Server V3 Read	UTILIZATION	False
Nfs Server V3 Pathconf per Minute	UTILIZATION	False
Nfs Server V3 Symlink per Minute	UTILIZATION	False
Nfs Server V3 Fsinfo per Minute	UTILIZATION	False
Nfs Server V3 Fsinfo	UTILIZATION	False
Nfs Server V3 Getattr	UTILIZATION	False
Nfs Server V3 Rmdir	UTILIZATION	False
Nfs Server V3 Readdir per Minute	UTILIZATION	False
Nfs Server V3 Create	UTILIZATION	False
Nfs Server V3 Rename	UTILIZATION	False
Nfs Server V3 Commit	UTILIZATION	False

**Table 1-105. Linux Metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
Nfs Server V3 Null per Minute	UTILIZATION	False
Number of CPUs	UTILIZATION	False
Page Major faults	UTILIZATION	False
Page Major faults per Second	UTILIZATION	False
Page Faults per Second	UTILIZATION	False
Percent Free Swap	UTILIZATION	False
Percent Free Memory	UTILIZATION	False
Percent Used Memory	UTILIZATION	True
Percent Used Swap	UTILIZATION	True
Page Faults	UTILIZATION	False
Running Processes	UTILIZATION	False
Sleeping Processes	UTILIZATION	False
Stopped Processes	UTILIZATION	False
Swap Pages Out per Minute	UTILIZATION	False
Swap Pages In per Minute	UTILIZATION	False
Swap Free	UTILIZATION	False
Swap Pages Out	UTILIZATION	False
Swap Used	UTILIZATION	False
Swap Total	UTILIZATION	False
Swap Pages In	UTILIZATION	False
System Cpu	UTILIZATION	False
System Cpu Time per Minute	UTILIZATION	False
System Cpu Time	UTILIZATION	False
Total disk capacity	UTILIZATION	False
Total Processes	UTILIZATION	False
Total Memory	UTILIZATION	False
Total disk usage	UTILIZATION	False
User Cpu Time	UTILIZATION	False
Used Memory (- buffers/cache)	UTILIZATION	False
User Cpu	UTILIZATION	False
User Cpu Time per Minute	UTILIZATION	False
Used Memory	UTILIZATION	False
Zombie Processes	UTILIZATION	False

## Solaris Metrics

The Operating Systems Plug-in discovers the metrics for the Solaris object type. Solaris x86 and SPARC are supported.

**Table 1-106. Solaris Metrics**

Name	Category	KPI
Resource Availability	AVAILABILITY	True
System Uptime	AVAILABILITY	False
File System Reads/Writes	THROUGHPUT	False
File System Reads/Writes per Minute	THROUGHPUT	False
Tcp Attempt Fails	THROUGHPUT	False
Tcp State Established	THROUGHPUT	False
Tcp Estab Resets per Minute	THROUGHPUT	False
Tcp Retrans Segs	THROUGHPUT	False
Tcp State LISTEN	THROUGHPUT	False
Tcp State CLOSING	THROUGHPUT	False
Tcp State SYN_SENT	THROUGHPUT	False
Tcp State TIME_WAIT	THROUGHPUT	False
Tcp State SYN_RECV	THROUGHPUT	False
Tcp In Errs per Minute	THROUGHPUT	False
Tcp Out Segs per Minute	THROUGHPUT	False
Tcp Passive Opens per Minute	THROUGHPUT	False
Tcp Out Segs	THROUGHPUT	False
Tcp Estab Resets	THROUGHPUT	False
Tcp Active Opens per Minute	THROUGHPUT	False
Tcp Outbound Connections	THROUGHPUT	False
Tcp Curr Estab	THROUGHPUT	False
Tcp In Errs	THROUGHPUT	False
Tcp Inbound Connections	THROUGHPUT	False
Tcp Active Opens	THROUGHPUT	False
Tcp Out Rsts per Minute	THROUGHPUT	False
Tcp In Segs	THROUGHPUT	False
Tcp Retrans Segs per Minute	THROUGHPUT	False
Tcp Passive Opens	THROUGHPUT	False
Tcp Out Rsts	THROUGHPUT	False
Tcp State FIN_WAIT1	THROUGHPUT	False

**Table 1-106. Solaris Metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
Tcp State FIN_WAIT2	THROUGHPUT	False
Tcp State CLOSE_WAIT	THROUGHPUT	False
Tcp In Segs per Minute	THROUGHPUT	False
Tcp State CLOSE	THROUGHPUT	False
Tcp State LAST_ACK	THROUGHPUT	False
Tcp Attempt Fails per Minute	THROUGHPUT	False
Cpu Wait Time	UTILIZATION	False
Cpu Idle Time	UTILIZATION	False
Cpu Idle Time per Minute	UTILIZATION	False
Cpu Wait Time per Minute	UTILIZATION	False
Cpu Idle	UTILIZATION	False
Cpu Usage	UTILIZATION	True
Cpu Wait	UTILIZATION	False
Cpu Nice	UTILIZATION	False
Free Memory	UTILIZATION	False
Load Average 15 Minutes	UTILIZATION	False
Load Average 5 Minutes	UTILIZATION	False
Load Average 1 Minute	UTILIZATION	False
Nfs Server V3 Readlink per Minute	UTILIZATION	False
Nfs Server V3 Readdirplus per Minute	UTILIZATION	False
Nfs Server V3 Commit per Minute	UTILIZATION	False
Nfs Server V3 Access	UTILIZATION	False
Nfs Server V3 Access per Minute	UTILIZATION	False
Nfs Server V3 Remove	UTILIZATION	False
Nfs Server V3 Rename per Minute	UTILIZATION	False
Nfs Server V3 Fsstat per Minute	UTILIZATION	False
Nfs Server V3 Create per Minute	UTILIZATION	False
Nfs Server V3 Mkdir per Minute	UTILIZATION	False
Nfs Server V3 Mknod	UTILIZATION	False
Nfs Server V3 Read per Minute	UTILIZATION	False
Nfs Server V3 Fsstat	UTILIZATION	False
Nfs Server V3 Link	UTILIZATION	False
Nfs Server V3 Write	UTILIZATION	False
Nfs Server V3 Remove per Minute	UTILIZATION	False

**Table 1-106. Solaris Metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
Nfs Server V3 Lookup per Minute	UTILIZATION	False
Nfs Server V3 Link per Minute	UTILIZATION	False
Nfs Server V3 Rmdir per Minute	UTILIZATION	False
Nfs Server V3 Mkdir	UTILIZATION	False
Nfs Server V3 Mknod per Minute	UTILIZATION	False
Nfs Server V3 Getattr per Minute	UTILIZATION	False
Nfs Server V3 Null	UTILIZATION	False
Nfs Server V3 Readdirplus	UTILIZATION	False
Nfs Server V3 Lookup	UTILIZATION	False
Nfs Server V3 Pathconf	UTILIZATION	False
Nfs Server V3 Readlink	UTILIZATION	False
Nfs Server V3 Write per Minute	UTILIZATION	False
Nfs Server V3 Readdir	UTILIZATION	False
Nfs Server V3 Setattr per Minute	UTILIZATION	False
Nfs Server V3 Setattr	UTILIZATION	False
Nfs Server V3 Read	UTILIZATION	False
Nfs Server V3 Pathconf per Minute	UTILIZATION	False
Nfs Server V3 Symlink per Minute	UTILIZATION	False
Nfs Server V3 Symlink	UTILIZATION	False
Nfs Server V3 Fsinfo per Minute	UTILIZATION	False
Nfs Server V3 Fsinfo	UTILIZATION	False
Nfs Server V3 Getattr	UTILIZATION	False
Nfs Server V3 Rmdir	UTILIZATION	False
Nfs Server V3 Readdir per Minute	UTILIZATION	False
Nfs Server V3 Create	UTILIZATION	False
Nfs Server V3 Rename	UTILIZATION	False
Nfs Server V3 Commit	UTILIZATION	False
Nfs Server V3 Null per Minute	UTILIZATION	False
Number of CPUs	UTILIZATION	False
Page Major faults	UTILIZATION	False
Page Major faults per Second	UTILIZATION	False
Page Faults per Second	UTILIZATION	False
Percent Free Swap	UTILIZATION	False
Percent Free Memory	UTILIZATION	False

**Table 1-106. Solaris Metrics (Continued)**

Name	Category	KPI
Percent Used Memory	UTILIZATION	True
Percent Used Swap	UTILIZATION	True
Page Faults	UTILIZATION	False
Running Processes	UTILIZATION	False
Sleeping Processes	UTILIZATION	False
Stopped Processes	UTILIZATION	False
Swap Pages Out per Minute	UTILIZATION	False
Swap Pages In per Minute	UTILIZATION	False
Swap Free	UTILIZATION	False
Swap Pages Out	UTILIZATION	False
Swap Used	UTILIZATION	False
Swap Total	UTILIZATION	False
Swap Pages In	UTILIZATION	False
System Cpu	UTILIZATION	False
System Cpu Time per Minute	UTILIZATION	False
System Cpu Time	UTILIZATION	False
Total disk capacity	UTILIZATION	False
Total Processes	UTILIZATION	False
Total Memory	UTILIZATION	False
Total disk usage	UTILIZATION	False
User Cpu Time	UTILIZATION	False
User Cpu	UTILIZATION	False
User Cpu Time per Minute	UTILIZATION	False
Used Memory	UTILIZATION	False
Zombie Processes	UTILIZATION	False

## Microsoft Windows Metrics

The Operating Systems Plug-in discovers the metrics for the Microsoft Windows object type. Microsoft Windows Server 2012 R2 and 2008 R2 are supported.

**Table 1-107. Microsoft Windows Metrics**

Name	Category	KPI
Resource Availability	AVAILABILITY	True
System Uptime	AVAILABILITY	False
Avg. Disk sec/Transfer	THROUGHPUT	False

**Table 1-107. Microsoft Windows Metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
File System Reads/Writes	THROUGHPUT	False
File System Reads/Writes per Minute	THROUGHPUT	False
Tcp Attempt Fails	THROUGHPUT	False
Tcp State Established	THROUGHPUT	False
Tcp Estab Resets per Minute	THROUGHPUT	False
Tcp Retrans Segs	THROUGHPUT	False
Tcp State LISTEN	THROUGHPUT	False
Tcp State CLOSING	THROUGHPUT	False
Tcp State SYN_SENT	THROUGHPUT	False
Tcp State TIME_WAIT	THROUGHPUT	False
Tcp State SYN_RECV	THROUGHPUT	False
Tcp In Errs per Minute	THROUGHPUT	False
Tcp Out Segs per Minute	THROUGHPUT	False
Tcp Passive Opens per Minute	THROUGHPUT	False
Tcp Out Segs	THROUGHPUT	False
Tcp Estab Resets	THROUGHPUT	False
Tcp Active Opens	THROUGHPUT	False
Tcp Outbound Connections	THROUGHPUT	False
Tcp Curr Estab	THROUGHPUT	False
Tcp In Errs	THROUGHPUT	False
Tcp Inbound Connections	THROUGHPUT	False
Tcp Active Opens per Minute	THROUGHPUT	False
Tcp Out Rsts per Minute	THROUGHPUT	False
Tcp In Segs	THROUGHPUT	False
Tcp Retrans Segs per Minute	THROUGHPUT	False
Tcp Passive Opens	THROUGHPUT	False
Tcp Out Rsts	THROUGHPUT	False
Tcp State FIN_WAIT1	THROUGHPUT	False
Tcp State FIN_WAIT2	THROUGHPUT	False
Tcp State CLOSE_WAIT	THROUGHPUT	False
Tcp In Segs per Minute	THROUGHPUT	False
Tcp State CLOSE	THROUGHPUT	False
Tcp State LAST_ACK	THROUGHPUT	False
Tcp Attempt Fails per Minute	THROUGHPUT	False

**Table 1-107. Microsoft Windows Metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
Cpu Idle Time	UTILIZATION	False
Cpu Idle Time per Minute	UTILIZATION	False
Cpu Usage	UTILIZATION	True
Free Memory	UTILIZATION	False
Memory Page Faults/sec	UTILIZATION	False
Memory System Driver Resident Bytes	UTILIZATION	False
Memory Available Bytes	UTILIZATION	False
Memory System Driver Total Bytes	UTILIZATION	False
Memory % Committed Bytes In Use	UTILIZATION	False
Memory Standby Cache Core Bytes	UTILIZATION	False
Memory Transition Pages RePurposed/sec	UTILIZATION	False
Memory Write Copies/sec	UTILIZATION	False
Memory Available KBytes	UTILIZATION	False
Memory Page Reads/sec	UTILIZATION	False
Memory Committed Bytes	UTILIZATION	False
Memory Pool Nonpaged Bytes	UTILIZATION	False
Memory System Code Resident Bytes	UTILIZATION	False
Memory Page Writes/sec	UTILIZATION	False
Memory Available MBytes	UTILIZATION	False
Memory Standby Cache Normal Priority Bytes	UTILIZATION	False
Memory Pages/sec	UTILIZATION	False
Memory Modified Page List Bytes	UTILIZATION	False
Memory Cache Faults/sec	UTILIZATION	False
Memory Pool Nonpaged Allocs	UTILIZATION	False
Memory System Code Total Bytes	UTILIZATION	False
Memory Pool Paged Allocs	UTILIZATION	False
Memory Pages Input/sec	UTILIZATION	False
Memory Pool Paged Bytes	UTILIZATION	False
Memory Pool Paged Resident Bytes	UTILIZATION	False
Memory Cache Bytes	UTILIZATION	False
Memory Standby Cache Reserve Bytes	UTILIZATION	False
MemoryFreeSystemPageTableEntries	UTILIZATION	False
Memory Free %26 Zero Page List Bytes	UTILIZATION	False
Memory System Cache Resident Bytes	UTILIZATION	False

**Table 1-107. Microsoft Windows Metrics (Continued)**

Name	Category	KPI
Memory Cache Bytes Peak	UTILIZATION	False
Memory Commit Limit	UTILIZATION	False
Memory Transition Faults/sec	UTILIZATION	False
Memory Pages Output/sec	UTILIZATION	False
Number of CPUs	UTILIZATION	False
Percent Free Swap	UTILIZATION	False
Percent Free Memory	UTILIZATION	False
Percent Used Memory	UTILIZATION	True
Percent Used Swap	UTILIZATION	True
Running Processes	UTILIZATION	False
Sleeping Processes	UTILIZATION	False
Stopped Processes	UTILIZATION	False
Swap Pages Out per Minute	UTILIZATION	False
Swap Pages In per Minute	UTILIZATION	False
Swap Free	UTILIZATION	False
Swap Pages Out	UTILIZATION	False
Swap Used	UTILIZATION	False
Swap Total	UTILIZATION	False
Swap Pages In	UTILIZATION	False
System Cpu	UTILIZATION	False
System Cpu Time per Minute	UTILIZATION	False
System Cpu Time	UTILIZATION	False
Total disk capacity	UTILIZATION	False
Total Processes	UTILIZATION	False
Total Memory	UTILIZATION	True
Total disk usage	UTILIZATION	False
User Cpu Time	UTILIZATION	False
User Cpu	UTILIZATION	False
User Cpu Time per Minute	UTILIZATION	False
Used Memory	UTILIZATION	False
Zombie Processes	UTILIZATION	False

## Windows Service Metrics

The Operating Systems Plug-in discovers the metrics for Windows service.

**Table 1-108. Windows Services Metrics**

Name	Category	KPI
Resource Availability	AVAILABILITY	True
Start Time	AVAILABILITY	False
Start Type	AVAILABILITY	False
Cpu User Time	UTILIZATION	False
Cpu Usage	UTILIZATION	True
Cpu Total Time per Minute	UTILIZATION	False
Cpu System Time per Minute	UTILIZATION	False
Cpu Total Time	UTILIZATION	False
Cpu User Time per Minute	UTILIZATION	False
Cpu System Time	UTILIZATION	False
Memory Size	UTILIZATION	True
Open Handles	UTILIZATION	False
Resident Memory Size	UTILIZATION	False
Threads	UTILIZATION	False

If you stop an End Point Operations Management agent by using Windows Services, and remove the data directory from inside the agent installation directory, when you start the agent again, using Windows Services, no metrics are collected. If you are deleting the data directory, do not use Windows Services to stop and start an End Point Operations Management agent. Stop the agent using `epops-agent.bat stop`. Delete the data directory, then start the agent using `epops-agent.bat start`.

## Script Metrics

The Operating Systems Plug-in discovers the metrics for the Script service.

**Table 1-109. Script Metrics**

Name	Category	KPI
Resource Availability	AVAILABILITY	True
Execution Time	THROUGHPUT	True
Result Value	UTILIZATION	True

## Multiprocess Service Metrics

The Operating Systems Plug-in discovers the metrics for the Multiprocess service.

**Table 1-110. Multiprocess Metrics**

Name	Category	KPI
Resource Availability	AVAILABILITY	True
Cpu User Time	UTILIZATION	False

**Table 1-110. Multiprocess Metrics (Continued)**

Name	Category	KPI
Cpu Usage	UTILIZATION	True
Cpu Total Time per Minute	UTILIZATION	False
Cpu System Time per Minute	UTILIZATION	False
Cpu Total Time	UTILIZATION	False
Cpu User Time per Minute	UTILIZATION	False
Cpu System Time	UTILIZATION	False
Memory Size	UTILIZATION	True
Number of Processes	UTILIZATION	False
Resident Memory Size	UTILIZATION	False

## NFS Metrics

The End Point Operations Management agents collect metrics for the NFS-mounted file systems.

The following metrics are collected.

Name	Category
Resource Availability	Availability
Use Percent (%)	Utilization
Total Bytes Free (KB)	Utilization

## Remote Service Monitoring Plug-in Metrics

The Remote Service Monitoring plug-in collects metrics for object types such HTTP Check, TCP Check, and ICMP Check.

### HTTP Check Metrics

The Remote Service Monitoring Plug-in discovers the metrics for the HTTP Check object type.

**Table 1-111. HTTP Check Metrics**

Name	Category	KPI
Resource Availability	AVAILABILITY	True
Last Modified	AVAILABILITY	False
State CLOSE	THROUGHPUT	False
State CLOSE_WAIT	THROUGHPUT	False
State ESTABLISHED	THROUGHPUT	False
Inbound Connections	THROUGHPUT	False
State TIME_WAIT	THROUGHPUT	False
All Inbound Connections	THROUGHPUT	False

**Table 1-111. HTTP Check Metrics (Continued)**

Name	Category	KPI
State SYN_SENT	THROUGHPUT	False
State FIN_WAIT2	THROUGHPUT	False
Outbound Connections	THROUGHPUT	False
State LAST_ACK	THROUGHPUT	False
Response Time	THROUGHPUT	True
State CLOSING	THROUGHPUT	False
All Outbound Connections	THROUGHPUT	False
State SYN_RECV	THROUGHPUT	False
State FIN_WAIT1	THROUGHPUT	False
Response Code	UTILIZATION	True

## ICMP Check Metrics

The Remote Service Monitoring Plug-in discovers the metrics for the ICMP Check object type.

**Table 1-112. ICMP Check Metrics**

Name	Category	KPI
Resource Availability	AVAILABILITY	True
Response Time	THROUGHPUT	True

## TCP Check Metrics

The Remote Service Monitoring Plug-in discovers the metrics for the TCP Check object type.

**Table 1-113. TCP Check Metrics**

Name	Category	KPI
Resource Availability	AVAILABILITY	True
Response Time	THROUGHPUT	True
State CLOSE	THROUGHPUT	False
State CLOSE_WAIT	THROUGHPUT	False
State ESTABLISHED	THROUGHPUT	False
Inbound Connections	THROUGHPUT	False
State TIME_WAIT	THROUGHPUT	False
All Inbound Connections	THROUGHPUT	False
State SYN_SENT	THROUGHPUT	False
State FIN_WAIT2	THROUGHPUT	False
Outbound Connections	THROUGHPUT	False
State LAST_ACK	THROUGHPUT	False

**Table 1-113. TCP Check Metrics (Continued)**

<b>Name</b>	<b>Category</b>	<b>KPI</b>
State CLOSING	THROUGHPUT	False
All Outbound Connections	THROUGHPUT	False
State SYN_RECV	THROUGHPUT	False
State FIN_WAIT1	THROUGHPUT	False

# Property Definitions in vRealize Operations Manager

# 2

Properties are attributes of objects in the vRealize Operations Manager environment. You use properties in symptom definitions. You can also use properties in dashboards, views, and reports.

vRealize Operations Manager uses adapters to collect properties for target objects in your environment. Property definitions for all objects connected through the vCenter adapter are provided. The properties collected depend on the objects in your environment.

You can add symptoms based on properties to an alert definition so that you are notified if a change occurs to properties on your monitored objects. For example, disk space is a hardware property of a virtual machine. You can use disk space to define a symptom that warns you when the value falls below a certain numeric value. See the *vRealize Operations Manager User Guide*.

vRealize Operations Manager generates Object Type Classification and Subclassification properties for every object. You can use object type classification properties to identify whether an object is an adapter instance, custom group, application, tier, or a general object with property values *ADAPTER\_INSTANCE*, *GROUP*, *BUSINESS\_SERVICE*, *TIER*, or *GENERAL*, respectively.

This chapter includes the following topics:

- [Properties for vCenter Server Components](#)
- [Self-Monitoring Properties for vRealize Operations Manager](#)
- [Properties for vSAN](#)

## Properties for vCenter Server Components

The VMware vSphere solution is installed with vRealize Operations Manager and includes the vCenter adapter. vRealize Operations Manager uses the vCenter adapter to collect properties for objects in the vCenter Server system.

vCenter Server components are listed in the `describe.xml` file for the vCenter adapter. The following example shows the runtime property `memoryCap` or Memory Capacity for the virtual machine in the `describe.xml`.

```
<ResourceGroup instanced="false" key="runtime" nameKey="5300" validation="">
  <ResourceAttribute key="memoryCap" nameKey="1780" dashboardOrder="200" dataType="float"
    defaultMonitored="true" isDiscrete="false" isRate="false" maxVal=""
    minVal="" isProperty="true" unit="kb"/>
</ResourceGroup>
```

The ResourceAttribute element includes the name of the property that appears in the UI and is documented as a Property Key. isProperty = "true" indicates that ResourceAttribute is a property.

## vCenter Server Properties

vRealize Operations Manager collects summary and event properties for vCenter Server system objects.

**Table 2-1. Summary Properties Collected for vCenter Server System Objects**

Property Key	Property Name	Description
summary version	Version	Version
summary vcuuid	VirtualCenter ID	Virtual Center ID
summary vcfullname	Product Name	Product Name

**Table 2-2. Event Properties Collected for vCenter Server System Objects**

Property Key	Property Name	Description
event time	Last VC Event Time	Last Virtual Center Event Time
event key	Last VC Event ID	Last Virtual Center Event ID

**Table 2-3. Custom Field Manager Property Collected for vCenter Server System Objects**

Property Key	Property Name	Description
CustomFieldManager CustomFieldDef	Custom Field Def	Custom Field Def for VCenter Tagging information at Adapter level.

## Virtual Machine Properties

vRealize Operations Manager collects configuration, runtime, CPU, memory, network I/O, summary, guest file system, and properties about datastore use for virtual machine objects.

**Table 2-4. vRealize Automation Properties Collected for Virtual Machine Objects**

Property Key	Property Name	Description
vRealize Automation Blueprint Name	Blueprint Name	Virtual machines deployed by vRealize Automation to be excluded from workload placements.

**Table 2-5. Properties Collected for Virtual Machine Objects to Support VIN Adapter Localization**

Property Key	Property Name	Description
RunsOnApplicationComponents	Application components running on the Virtual Machine	Application components running on the Virtual Machine
DependsOnApplicationComponents	Application components the Virtual Machine depends on	Application components running on other machines that this Virtual Machine depends on.

**Table 2-6. Configuration Properties Collected for Virtual Machine Objects**

Property Key	Property Name	Description
config name	Name	Name
config guestFullName	Guest Fullname	Guest OS full name configured by the user.
config hardware numCpu	Number of virtual CPUs	Number of virtual CPUs
config hardware memoryKB	Memory	Memory
config hardware thinEnabled	Thin Provisioned Disk	Indicates whether thin provisioning is enabled
config hardware diskSpace	Disk Space	Disk Space
config cpuAllocation reservation	Reservation	CPU reservation
config cpuAllocation limit	Limit	CPU limit
config cpuAllocation shares shares	Shares	CPU shares
config memoryAllocation reservation	Reservation	CPU reservation
config memoryAllocation limit	Limit	Limit
config memoryAllocation shares shares	Shares	Memory shares
config extraConfig mem_hotadd	Memory Hot Add	Memory Hot Add Configuration
config extraConfig vcpu_hotadd	VCPU Hot Add	VCPU Hot Add Configuration
config extraConfig vcpu_hotremove	VCPU Hot Remove	VCPU Hot Remove Configuration
config security disable_autoinstall	Disable tools auto install (isolation.tools.autoInstall.disable)	Disable tools auto install (isolation.tools.autoInstall.disable)
config security disable_console_copy	Disable console copy operations (isolation.tools.copy.disable)	Disable console copy operations (isolation.tools.copy.disable)
config security disable_console_dnd	Disable console drag and drop operations (isolation.tools.dnd.disable)	Disable console drag and drop operations (isolation.tools.dnd.disable)
config security enable_console_gui_options	Enable console GUI operations (isolation.tools.setGUIOptions.enable)	Enable console GUI operations (isolation.tools.setGUIOptions.enable)
config security disable_console_paste	Disable console paste operations (isolation.tools.paste.disable)	Disable console paste operations (isolation.tools.paste.disable)
config security disable_disk_shrinking_shrink	Disable virtual disk shrink (isolation.tools.diskShrink.disable)	Disable virtual disk shrink (isolation.tools.diskShrink.disable)
config security disable_disk_shrinking_wiper	Disable virtual disk wiper (isolation.tools.diskWiper.disable)	Disable virtual disk wiper (isolation.tools.diskWiper.disable)
config security disable_hgfs	Disable HGFS file transfers (isolation.tools.hgfsServerSet.disable)	Disable HGFS file transfers (isolation.tools.hgfsServerSet.disable)
config security disable_independent_nonpersistent	Avoid using independent nonpersistent disks (scsiX:Y.mode)	Avoid using independent nonpersistent disks (scsiX:Y.mode)
config security enable_intervm_vmci	Enable VM-to-VM communication through VMCI (vmci0.unrestricted)	Enable VM-to-VM communication through VMCI (vmci0.unrestricted)
config security enable_logging	Enable VM logging (logging)	Enable VM logging (logging)

**Table 2-6. Configuration Properties Collected for Virtual Machine Objects (Continued)**

Property Key	Property Name	Description
config security disable_monitor_control	Disable VM Monitor Control (isolation.monitor.control.disable)	Disable VM Monitor Control (isolation.monitor.control.disable)
config security enable_non_essential_3D_features	Enable 3D features on Server and desktop virtual machines (mks.enable3d)	Enable 3D features on Server and desktop virtual machines (mks.enable3d)
config security disable_unexposed_features_autologon	Disable unexposed features - autologon (isolation.tools.ghi.autologon.disable)	Disable unexposed features - autologon (isolation.tools.ghi.autologon.disable)
config security disable_unexposed_features_biosbbs	Disable unexposed features - biosbbs (isolation.bios.bbs.disable)	Disable unexposed features - biosbbs (isolation.bios.bbs.disable)
config security disable_unexposed_features_getcreds	Disable unexposed features - getcreds (isolation.tools.getCreds.disable)	Disable unexposed features - getcreds (isolation.tools.getCreds.disable)
config security disable_unexposed_features_launchmenu	Disable unexposed features - launchmenu (isolation.tools.ghi.launchmenu.change)	Disable unexposed features - launchmenu (isolation.tools.ghi.launchmenu.change)
config security disable_unexposed_features_memssfss	Disable unexposed features - memssfss (isolation.tools.memSchedFakeSampleStats.disable)	Disable unexposed features - memssfss (isolation.tools.memSchedFakeSampleStats.disable)
config security disable_unexposed_features_protocolhandler	Disable unexposed features - protocolhandler (isolation.tools.ghi.protocolhandler.info.disable)	Disable unexposed features - protocolhandler (isolation.tools.ghi.protocolhandler.info.disable)
config security disable_unexposed_features_shellaction	Disable unexposed features - shellaction (isolation.ghi.host.shellAction.disable)	Disable unexposed features - shellaction (isolation.ghi.host.shellAction.disable)
config security disable_unexposed_features_toporequest	Disable unexposed features - toporequest (isolation.tools.dispTopoRequest.disable)	Disable unexposed features - toporequest (isolation.tools.dispTopoRequest.disable)
config security disable_unexposed_features_trashfolderstate	Disable unexposed features - trashfolderstate (isolation.tools.trashFolderState.disable)	Disable unexposed features - trashfolderstate (isolation.tools.trashFolderState.disable)
config security disable_unexposed_features_trayicon	Disable unexposed features - trayicon (isolation.tools.ghi.trayicon.disable)	Disable unexposed features - trayicon (isolation.tools.ghi.trayicon.disable)
config security disable_unexposed_features_unity	Disable unexposed features - unity (isolation.tools.unity.disable)	Disable unexposed features - unity (isolation.tools.unity.disable)
config security disable_unexposed_features_unity_interlock	Disable unexposed features - unity-interlock (isolation.tools.unityInterlockOperation.disable)	Disable unexposed features - unity-interlock (isolation.tools.unityInterlockOperation.disable)

**Table 2-6. Configuration Properties Collected for Virtual Machine Objects (Continued)**

Property Key	Property Name	Description
config security disable_unexposed_features_unity_taskbar	Disable unexposed features - unity-taskbar (isolation.tools.unity.taskbar.disable)	Disable unexposed features - unity-taskbar (isolation.tools.unity.taskbar.disable)
config security disable_unexposed_features_unity_unityactive	Disable unexposed features - unity-unityactive (isolation.tools.unityActive.disable)	Disable unexposed features - unity-unityactive (isolation.tools.unityActive.disable)
config security disable_unexposed_features_unity_windowcontents	Disable unexposed features - unity-windowcontents (isolation.tools.unity.windowContents.disable)	Disable unexposed features - unity-windowcontents (isolation.tools.unity.windowContents.disable)
config security disable_unexposed_features_unitypush	Disable unexposed features - unitypush (isolation.tools.unity.push.update.disable)	Disable unexposed features - unitypush (isolation.tools.unity.push.update.disable)
config security disable_unexposed_features_versionget	Disable unexposed features - versionget (isolation.tools.vmxDnDVersionGet.disable)	Disable unexposed features - versionget (isolation.tools.vmxDnDVersionGet.disable)
config security disable_unexposed_features_versionset	Disable unexposed features - versionset (isolation.tools.guestDnDVersionSet.disable)	Disable unexposed features - versionset (isolation.tools.guestDnDVersionSet.disable)
config security disable_vix_messages	Disable VIX messages from the VM (isolation.tools.vixMessage.disable)	Disable VIX messages from the VM (isolation.tools.vixMessage.disable)
config security enable_vga_only_mode	Disable all but VGA mode on virtual machines (svga.vgaOnly)	Disable all but VGA mode on virtual machines (svga.vgaOnly)
config security limit_console_connection	Limit number of console connections (RemoteDisplay.maxConnection)	Limit number of console connections (RemoteDisplay.maxConnection)
config security limit_log_number	Limit number of log files (log.keepOld)	Limit number of log files (log.keepOld)
config security limit_log_size	Limit log file size (log.rotateSize)	Limit log file size (log.rotateSize)
config security limit_setinfo_size	Limit VMX file size (tools.setInfo.sizeLimit)	Limit VMX file size (tools.setInfo.sizeLimit)
config security enable_console_VNC	Enable access to VM console via VNC protocol (RemoteDisplay.vnc.enabled)	Enable access to VM console via VNC protocol (RemoteDisplay.vnc.enabled)
config security disable_device_interaction_connect	Disable unauthorized removal, connection of devices (isolation.device.connectable.disable)	Disable unauthorized removal, connection of devices (isolation.device.connectable.disable)
config security disable_device_interaction_edit	Disable unauthorized modification of devices (isolation.device.edit.disable)	Disable unauthorized modification of devices (isolation.device.edit.disable)
config security enable_host_info	Enable send host information to guests (tools.guestlib.enableHostInfo)	Enable send host information to guests (tools.guestlib.enableHostInfo)

**Table 2-6. Configuration Properties Collected for Virtual Machine Objects (Continued)**

Property Key	Property Name	Description
config security network_filter_enable	Enable dvfilter network APIs (ethernetX.filterY.name)	Enable dvfilter network APIs (ethernetX.filterY.name)
config security vmsafe_cpumem_agentaddress	VMsafe CPU/memory APIs - IP address (vmsafe.agentAddress)	VMsafe CPU/memory APIs - IP address (vmsafe.agentAddress)
config security vmsafe_cpumem_agentport	VMsafe CPU/memory APIs - port number (vmsafe.agentPort)	VMsafe CPU/memory APIs - port number (vmsafe.agentPort)
config security vmsafe_cpumem_enable	Enable VMsafe CPU/memory APIs (vmsafe.enable)	Enable VMsafe CPU/memory APIs (vmsafe.enable)
config security disconnect_devices_floppy	Disconnect floppy drive	Disconnect floppy drive
config security disconnect_devices_cd	Disconnect CD-ROM	Disconnect CD-ROM
config security disconnect_devices_usb	Disconnect USB controller	Disconnect USB controller
config security disconnect_devices_parallel	Disconnect parallel port	Disconnect parallel port
config security disconnect_devices_serial	Disconnect serial port	Disconnect serial port

**Note** Security properties not collected by default. They are collected only if the *vSphere Hardening Guide* policy is applied to the objects, or if the *vSphere Hardening Guide* alerts are manually enabled in the currently applied policy.

For more information on the *vSphere Hardening Guide* alerts, see the *vRealize Operations Manager User Guide*.

**Table 2-7. Runtime Properties Collected for Virtual Machine Objects**

Property Key	Property Name	Description
runtime memoryCap	Memory Capacity	Memory Capacity

**Table 2-8. CPU Usage Properties Collected for Virtual Machine Objects**

Property Key	Property Name	Description
cpu limit	CPU limit	CPU limit
cpu reservation	CPU reservation	CPU reservation
cpu speed	CPU	CPU Speed
cpu cpuModel	CPU Model	CPU Model

**Table 2-9. Memory Properties Collected for Virtual Machine Objects**

Property Key	Property Name	Description
mem host_reservation	VM Reservation	Mem Machine Reservation
mem host_limit	VM Limit	Mem Machine Limit

**Table 2-10. Network Properties Collected for Virtual Machine Objects**

Property Key	Property Name	Description
net mac_address	Mac Address	Mac Address
net ip_address	IP Address	IP Address
net subnet_mask	Subnet Mask	Subnet Mask
net default_gateway	Default Gateway	Default Gateway
net nvp_vm_uuid	NVP VM UUID	NVP VM UUID

**Table 2-11. Summary Properties Collected for Virtual Machine Objects**

Property Key	Property Name	Description
summary customTag customTagValue	Value	Custom Tag Value
summary tag	vSphere Tag	vSphere Tag Name
summary parentCluster	Parent Cluster	Parent Cluster
summary parentHost	Parent Host	Parent Host
summary parentDatacenter	Parent Datacenter	Parent Datacenter
summary parentVcenter	Parent Vcenter	Parent Vcenter
summary guest fullName	Guest OS Full Name	Guest OS Full Name as identified by VMware tools
summary guest ipAddress	Guest OS IP Address	Guest OS IP Address
summary guest toolsRunningStatus	Tools Running Status	Guest Tools Running Status
summary guest toolsVersionStatus2	Tools Version Status	Guest Tools Version Status 2
summary guest vrealize_operations_agent_id	vRealize Operations Agent ID	An ID to identify a VM in Agent Adapter's world
summary guest vrealize_operations_euc_agent_id	vRealize Operations Euc Agent ID	An ID to identify a VM in Agent Adapter's world
summary config numEthernetCards	Number of NICs	Number of NICs
summary config isTemplate	VM Template	Indicates whether it is a VM Template
summary runtime powerState	Power State	Power State
summary runtime connectionState	Connection State	Connection State

**Table 2-12. Datastore Properties Collected for Virtual Machine Objects**

Property Key	Property Name	Description
datastore maxObservedNumberRead	Highest Observed Number of Read Requests	Highest Observed Number of Read Requests
datastore maxObservedRead	Highest Observed Read Rate	Highest Observed Read Rate (KBps)
datastore maxObservedNumberWrite	Highest Observed Number of Write Requests	Highest Observed Number of Write Requests

**Table 2-12. Datastore Properties Collected for Virtual Machine Objects (Continued)**

Property Key	Property Name	Description
datastore maxObservedWrite	Highest Observed Write Rate	Highest Observed Write Rate (KBps)
datastore maxObservedOIO	Highest Observed Outstanding Requests	Highest Observed Outstanding Requests

**Table 2-13. Guest File System Properties Collected for Virtual Machine Objects**

Property Key	Property Name	Description
guestfilesystem capacity_property	Guest File System Capacity Property	Total capacity of guest file system as a property, reported for each file system.
guestfilesystem capacity_property_total	Total Guest File System Capacity Property	Overall total capacity of guest file system as a property, reported across all file systems.

## Host System Properties

vRealize Operations Manager collects configuration, hardware, runtime, CPU, network I/O, summary, and properties about datastore use for host system objects.

**Table 2-14. Configuration Properties Collected for Host System Objects**

Property Key	Property Name	Description
config name	Name	Name
config diskSpace	Disk Space	Disk Space
config network nnic	Number of NICs	Number of NICs
config network linkspeed	Average Physical NIC Speed	Average Physical NIC Speed
config network dnsserver	DNS Server	List of DNS Servers
config product productLineId	Product Line ID	Product Line ID
config product apiVersion	API Version	API Version
config storageDevice plugStoreTopology numberOfPath	Total number of Path	Total number of storage paths
config storageDevice multipathInfo numberOfActivePath	Total number of Active Path	Total number of active storage paths
config storageDevice multipathInfo multipathPolicy	Multipath Policy	Multipath Policy
config hyperThread available	Available	Indicates whether hyperthreading is supported by the server
config hyperThread active	Active	Indicates whether hyperthreading is active
config ntp server	NTP Servers	NTP Servers
config security ntpServer	NTP server	NTP server
config security enable_ad_auth	Enable active directory authentication	Enable active directory authentication
config security enable_chap_auth	Enable mutual chap authentication	Enable mutual chap authentication

**Table 2-14. Configuration Properties Collected for Host System Objects (Continued)**

Property Key	Property Name	Description
config security enable_auth_proxy	Enable authentication proxy (UserVars.ActiveDirectoryVerifyCAMCertificate)	Enable authentication proxy (UserVars.ActiveDirectoryVerifyCAMCertificate)
config security syslog_host	Remote log host (Syslog.global.logHost)	Remote log host (Syslog.global.logHost)
config security dcui_access	Users who can override lock down mode and access the DCUI (DCUI.Access)	Users who can override lock down mode and access the DCUI (DCUI.Access)
config security shell_interactive_timeout	Shell interactive timeout (UserVars.ESXiShellInteractiveTimeout)	Shell interactive timeout (UserVars.ESXiShellInteractiveTimeout)
config security shell_timeout	Shell timeout (UserVars.ESXiShellTimeout)	Shell timeout (UserVars.ESXiShellTimeout)
config security dvfilter_bind_address	Dvfilter bind ip address (Net.DVFilterBindIpAddress)	Dvfilter bind ip address (Net.DVFilterBindIpAddress)
config security syslog_dir	Log directory (Syslog.global.logDir)	Log directory (Syslog.global.logDir)
config security firewallRule allowedHosts	Allowed hosts	Allowed hosts in the firewall configuration
config security service isRunning	Running	Indicates whether a service is running or not. Services are: Direct Console UI, ESXi shell, SSH, or NTP Daemon.
config security service ruleSet	Ruleset	Ruleset for each service.
config security service policy	Policy	Policy for each service.

**Note** Security properties not collected by default. They are collected only if the *vSphere Hardening Guide* policy is applied to the objects, or if the *vSphere Hardening Guide* alerts are manually enabled in the currently applied policy.

For more information on the *vSphere Hardening Guide* alerts, see the *vRealize Operations Manager User Guide*.

**Table 2-15. Hardware Properties Collected for Host System Objects**

Property Key	Property Name	Description
hardware memorySize	Memory Size	Memory Size
hardware cpuInfo numCpuCores	Number of CPU Cores	Number of CPU Cores
hardware cpuInfo hz	CPU Speed per Core	CPU Speed per Core
hardware cpuInfo numCpuPackages	Number of CPU Packages	Number of CPU Packages
hardware cpuInfo powerManagementPolicy	Active CPU Power Management Policy	Active CPU Power Management Policy

**Table 2-15. Hardware Properties Collected for Host System Objects (Continued)**

Property Key	Property Name	Description
hardware cpuInfo  powerManagementTechnology	Power Management Technology	Power Management Technology
hardware cpuInfo biosVersion	BIOS Version	BIOS Version

**Table 2-16. Runtime Properties Collected for Host System Objects**

Property Key	Property Name	Description
runtime connectionState	Connection State	Connection State
runtime powerState	Power State	Power State
runtime maintenanceState	Maintenance State	Maintenance State
runtime memoryCap	Memory Capacity	Memory Capacity

**Table 2-17. Configuration Manager Properties Collected for Host System Objects**

Property Key	Property Name	Description
configManager memoryManager  consoleReservationInfo  serviceConsoleReserved	Service Console Reserved	Service console reserved memory

**Table 2-18. CPU Usage Properties Collected for Host System Objects**

Property Key	Property Name	Description
cpu speed	CPU	CPU Speed
cpu cpuModel	CPU Model	CPU Model

**Table 2-19. Network Properties Collected for Host System Objects**

Property Key	Property Name	Description
net maxObservedKBps	Highest Observed Throughput	Highest Observed Throughput (KBps)
net mgmt_address	Management Address	Management Address
net ip_address	IP Address	IP Address
net discoveryProtocol cdp  managementIpAddress	Management IP Address	Management IP Address
net discoveryProtocol cdp  systemName	System Name	System Name
net discoveryProtocol cdp portName	Port Name	Port Name
net discoveryProtocol cdp vlan	VLAN	VLAN
net discoveryProtocol cdp mtu	MTU	MTU
net discoveryProtocol cdp  hardwarePlatform	Hardware Platform	Hardware Platform
net discoveryProtocol cdp  softwareVersion	Software Version	Software Version

**Table 2-19. Network Properties Collected for Host System Objects (Continued)**

Property Key	Property Name	Description
net discoveryProtocol cdp timeToLive	Time to Live	Time to Live
net discoveryProtocol lldp managementIpAddress	Management IP Address	Management IP Address
net discoveryProtocol lldp systemName	System Name	System Name
net discoveryProtocol lldp portName	Port Name	Port Name
net discoveryProtocol lldp vlan	VLAN	VLAN
net discoveryProtocol lldp timeToLive	Time to Live	Time to Live

**Table 2-20. System Properties Collected for Host System Objects**

Property Key	Property Name	Description
sys build	Build number	VMWare build number
sys productString	Product String	VMWare product string

**Table 2-21. Summary Properties Collected for Host System Objects**

Property Key	Property Name	Description
summary version	Version	Version
summary hostuid	Host UUID	Host UUID
summary evcMode	Current EVC Mode	Current EVC Mode
summary customTag customTagValue	Value	Custom Tag Value
summary tag	vSphere Tag	vSphere Tag Name
summary parentCluster	Parent Cluster	Parent Cluster
summary parentDatacenter	Parent Datacenter	Parent Datacenter
summary parentVcenter	Parent Vcenter	Parent Vcenter

**Table 2-22. Datastore Properties Collected for Host System Objects**

Property Key	Property Name	Description
datastore maxObservedNumberRead	Highest Observed Number of Read Requests	Highest Observed Number of Read Requests
datastore maxObservedRead	Highest Observed Read Rate	Highest Observed Read Rate (KBps)
datastore maxObservedNumberWrite	Highest Observed Number of Write Requests	Highest Observed Number of Write Requests
datastore maxObservedWrite	Highest Observed Write Rate	Highest Observed Write Rate (KBps)
datastore maxObservedOIO	Highest Observed Outstanding Requests	Highest Observed Outstanding Requests

## Cluster Compute Resource Properties

vRealize Operations Manager collects configuration and summary properties for cluster compute resource objects.

**Table 2-23. Configuration Properties Collected for Cluster Compute Resource Objects**

Property Key	Property Name	Description
config name	Name	Name

**Table 2-24. Summary Properties Collected for Cluster Compute Resource Objects**

Property Key	Property Name	Description
summary parentDatacenter	Parent Datacenter	Parent Datacenter
summary parentVcenter	Parent Vcenter	Parent Vcenter
summary customTag customTagValue	Value	Custom Tag Value
summary tag	vSphere Tag	vSphere Tag Name

**Table 2-25. DR, DAS, and DPM Configuration Properties Collected for Cluster Compute Resource Objects**

Property Key	Property Name	Description
configuration drsconfig enabled	Enabled	Indicates whether DRS is enabled
configuration drsconfig defaultVmBehavior	Default DRS Behaviour	Default DRS Behaviour
configuration drsconfig affinityRules	Affinity Rules	DRS Affinity Rules
configuration dasconfig enabled	HA Enabled	HA Enabled
configuration dasconfig admissionControlEnabled	Admission Control Enabled	Admission Control Enabled
configuration dpmconfiginfo enabled	DPM Enabled	DPM Enabled
configuration dpmconfiginfo defaultDpmBehavior	Default DPM Behaviour	Default DPM Behaviour

DRS properties are collected for disaster recovery. DAS properties are collected for high availability service, formerly distributed availability service. DPM properties are collected for distributed power management.

## Resource Pool Properties

vRealize Operations Manager collects configuration, CPU, memory, and summary properties for resource pool objects.

**Table 2-26. Configuration Properties Collected for Resource Pool Objects**

Property Key	Property Name	Description
config name	Name	Name
config cpuAllocation reservation	Reservation	CPU reservation

**Table 2-26. Configuration Properties Collected for Resource Pool Objects (Continued)**

Property Key	Property Name	Description
config cpuAllocation limit	Limit	CPU limit
config cpuAllocation expandableReservation	Expandable Reservation	CPU expandable reservation
config cpuAllocation shares shares	Shares	CPU shares
config memoryAllocation reservation	Reservation	Memory reservation
config memoryAllocation limit	Limit	Memory limit
config memoryAllocation expandableReservation	Expandable Reservation	Memory expandable reservation
config memoryAllocation shares shares	Shares	Memory shares

**Table 2-27. CPU Usage Properties Collected for Resource Pool Objects**

Property Key	Property Name	Description
cpu limit	CPU Limit	CPU Limit
cpu reservation	CPU reservation	CPU Reservation
cpu expandable_reservation	CPU expandable reservation	CPU Expandable Reservation
cpu shares	CPU Shares	CPU Shares
cpu corecount_provisioned	Provisioned vCPU(s)	Provisioned vCPU(s)

**Table 2-28. Memory Properties Collected for Resource Pool Objects**

Property Key	Property Name	Description
mem limit	Memory limit	Memory limit
mem reservation	Memory reservation	Memory reservation
mem expandable_reservation	Memory expandable reservation	Memory expandable reservation
mem shares	Memory Shares	Memory Shares

**Table 2-29. Summary Properties Collected for Resource Pool Objects**

Property Key	Property Name	Description
summary customTag customTagValue	Value	Custom Tag Value
summary tag	vSphere Tag	vSphere Tag Name

## Data Center Properties

vRealize Operations Manager collects configuration and summary properties for data center objects.

**Table 2-30. Configuration Properties Collected for Data Center Objects**

Property Key	Property Name	Description
config name	Name	Name

**Table 2-31. Summary Properties Collected for Data Center Objects**

Property Key	Property Name	Description
summary parentVcenter	Parent Vcenter	Parent Vcenter
summary customTag customTagValue	Value	Custom Tag Value
summary tag	vSphere Tag	vSphere Tag Name

## Storage Pod Properties

vRealize Operations Manager collects configuration and summary properties for storage pod objects.

**Table 2-32. Configuration Properties Collected for Storage Pod Objects**

Property Key	Property Name	Description
config name	Name	Name
config sdrsconfig vmStorageAntiAffinityRules	VM storage antiaffinity rules	Storage Distributed Resource Scheduler (SDRS) VM anti-affinity rules
config sdrsconfig vmDkAntiAffinityRules	VMDK antiaffinity rules	Storage Distributed Resource Scheduler (SDRS) Virtual Machine Disk (VMDK) anti-affinity rules

## VMware Distributed Virtual Switch Properties

vRealize Operations Manager collects configuration and summary properties for VMware distributed virtual switch objects.

**Table 2-33. Configuration Properties Collected for VMware Distributed Virtual Switch Objects**

Property Key	Property Name	Description
config name	Name	Name

**Table 2-34. Capability Properties Collected for VMware Distributed Virtual Switch Objects**

Property Key	Property Name	Description
capability nicTeamingPolicy	NIC Teaming Policy	NIC Teaming Policy

## Distributed Virtual Port Group Properties

vRealize Operations Manager collects configuration and summary properties for distributed virtual port group objects.

**Table 2-35. Configuration Properties Collected for Distributed Virtual Port Group Objects**

Property Key	Property Name	Description
config name	Name	Name

**Table 2-36. Summary Properties Collected for Distributed Virtual Port Group Objects**

Property Key	Property Name	Description
summary active_uplink_ports	Active DV uplinks	Active DV uplinks

## Datastore Properties

vRealize Operations Manager collects configuration, summary, and properties about datastore use for datastore objects.

**Table 2-37. Configuration Properties Collected for Datastore Objects**

Property Key	Property Name	Description
config name	Name	Name

**Table 2-38. Summary Properties Collected for Datastore Objects**

Property Key	Property Name	Description
summary diskCapacity	Disk Capacity	Disk Capacity
summary isLocal	Is Local	Is local datastore
summary customTag customTagValue	Value	Custom Tag Value
summary accessible	Datastore Accessible	Datastore Accessible

**Table 2-39. Datastore Properties Collected for Datastore Objects**

Property Key	Property Name	Description
datastore hostcount	Host Count	Host Count
datastore hostScsiDiskPartition	Host SCSI Disk Partition	Host SCSI Disk Partition
datastore maxObservedNumberRead	Highest Observed Number of Read Requests	Highest Observed Number of Read Requests
datastore maxObservedRead	Highest Observed Read Rate	Highest Observed Read Rate (KBps)
datastore maxObservedReadLatency	Highest Observed Read Latency	Highest Observed Read Latency
datastore maxObservedNumberWrite	Highest Observed Number of Write Requests	Highest Observed Number of Write Requests
datastore maxObservedWrite	Highest Observed Write Rate	Highest Observed Write Rate (KBps)
datastore maxObservedWriteLatency	Highest Observed Write Latency	Highest Observed Write Latency
datastore maxObservedOIO	Highest Observed Outstanding Requests	Highest Observed Outstanding Requests

## Self-Monitoring Properties for vRealize Operations Manager

vRealize Operations Manager uses the vRealize Operations Manager adapter to collect properties that monitor its own objects. These self-monitoring properties are useful for monitoring changes within vRealize Operations Manager.

### Analytics Properties

vRealize Operations Manager collects properties for the vRealize Operations Manager analytics service.

**Table 2-40. Properties Collected for Analytics Service Objects**

Property Key	Property Name	Description
HAEnabled	HA Enabled	Indicates HA is enabled with a value of 1, disabled with a value of 0.
ControllerDBRole	Role	Indicates persistence service role for the controller: 0 – Master, 1 – Replica, 4 – Client..
ShardRedundancyLevel	Shard redundancy level	The target number of redundant copies for Object data.
LocatorCount	Locator Count	The number of configured locators in the system
ServersCount	Servers Count	The number of configured servers in the system

### Node Properties

vRealize Operations Manager collects properties for the vRealize Operations Manager node objects.

**Table 2-41. Configuration Properties Collected for Node Objects**

Property Key	Property Name	Description
config numCpu	Number of CPU	Number of CPUs
config numCoresPerCpu	Number of cores per CPU	Number of cores per CPU
config coreFrequency	Core Frequency	Core Frequency

**Table 2-42. Memory Properties Collected for Node Objects**

Property Key	Property Name	Description
mem RAM	System RAM	System RAM

**Table 2-43. Service Properties Collected for Node Objects**

Property Key	Property Name	Description
service proc pid	Process ID	Process ID

## Remote Collector Properties

vRealize Operations Manager collects properties for the vRealize Operations Manager remote collector objects.

**Table 2-44. Configuration Properties Collected for Remote Collector Objects**

Property Key	Property Name	Description
config numCpu	Number of CPU	Number of CPUs
config numCoresPerCpu	Number of cores per CPU	Number of cores per CPU
config coreFrequency	Core Frequency	Core Frequency

**Table 2-45. Memory Properties Collected for Remote Collector Objects**

Property Key	Property Name	Description
mem RAM	System RAM	System RAM

**Table 2-46. Service Properties Collected for Remote Collector Objects**

Property Key	Property Name	Description
service proclpid	Process ID	Process ID

## Properties for vSAN

vRealize Operations Manager displays object properties for vSAN.

### Properties for vSAN Disk Groups

The vRealize Operations Manager displays the following property for vSAN disk groups:

- vSAN Disk Groups:Configuration|vSAN Configuration

### Properties for vSAN Cluster

The vRealize Operations Manager displays the following properties for vSAN cluster.

- Cluster Configuration|vSAN|Deduplication and Compression Enabled
- Cluster Configuration|vSAN|Preferred fault domain
- Cluster Configuration|vSAN|Stretched Cluster
- Cluster Configuration|vSAN|vSAN Configuration

### Properties for vSAN Enabled Host

The vRealize Operations Manager displays the following property for vSAN enabled host.

- Configuration|vSAN Enabled

## Properties for vSAN Cache Disk

The vRealize Operations Manager displays the following properties for vSAN cache disk.

Properties for vSAN include:

Component	Metrics
Configuration	<ul style="list-style-type: none"> <li>■ Configuration Properties Name</li> <li>■ Configuration Properties Size</li> <li>■ Configuration Properties Vendor</li> <li>■ Configuration Properties Type</li> <li>■ Configuration Properties Queue Depth</li> </ul>
SCSI SMART Statistics	<ul style="list-style-type: none"> <li>■ SCSI SMART Statistics Media Wearout Indicator Threshold</li> <li>■ SCSI SMART Statistics Write Error Count Threshold</li> <li>■ SCSI SMART Statistics Read Error Count Threshold</li> <li>■ SCSI SMART Statistics Reallocated Sector Count Threshold</li> <li>■ SCSI SMART Statistics Raw Read Error Rate Threshold</li> <li>■ SCSI SMART Statistics Drive Temperature Threshold</li> <li>■ SCSI SMART Statistics Drive Rated Max Temperature Threshold</li> <li>■ SCSI SMART Statistics Write Sectors TOT Count Threshold</li> <li>■ SCSI SMART Statistics Read Sectors TOT Count Threshold</li> <li>■ SCSI SMART Statistics Initial Bad Block Count Threshold</li> </ul>

## Properties for vSAN Capacity Disk

The vRealize Operations Manager displays the following properties for vSAN capacity disk.

Properties for vSAN include:

Component	Metrics
Configuration	<ul style="list-style-type: none"> <li>■ Configuration Properties Name</li> <li>■ Configuration Properties Size</li> <li>■ Configuration Properties Vendor</li> <li>■ Configuration Properties Type</li> <li>■ Configuration Properties Queue Depth</li> </ul>
SCSI SMART Statistics	<ul style="list-style-type: none"> <li>■ SCSI SMART Statistics Media Wearout Indicator Threshold</li> <li>■ SCSI SMART Statistics Write Error Count Threshold</li> <li>■ SCSI SMART Statistics Read Error Count Threshold</li> <li>■ SCSI SMART Statistics Reallocated Sector Count Threshold</li> <li>■ SCSI SMART Statistics Raw Read Error Rate Threshold</li> <li>■ SCSI SMART Statistics Drive Temperature Threshold</li> <li>■ SCSI SMART Statistics Drive Rated Max Temperature Threshold</li> <li>■ SCSI SMART Statistics Write Sectors TOT Count Threshold</li> <li>■ SCSI SMART Statistics Read Sectors TOT Count Threshold</li> <li>■ SCSI SMART Statistics Initial Bad Block Count Threshold</li> </ul>

# Alert Definitions in vRealize Operations Manager

# 3

Alert definitions are a combination of symptoms and recommendations that identify problem areas in vRealize Operations Manager and generate alerts on which you act for those areas.

Alert definitions are provided for various objects in your environment. You can also create your own alert definitions. See the *vRealize Operations Manager User Guide*.

- [Cluster Compute Resource Alert Definitions](#)

The vCenter adapter provides alert definitions that generate alerts on the Cluster Compute Resource objects in your environment.

- [Host System Alert Definitions](#)

The vCenter adapter provides alert definitions that generate alerts on the Host System objects in your environment.

- [vRealize Automation Alert Definitions](#)

Alert definitions are combinations of symptoms and recommendations that identify problem areas in your environment and generate alerts on which you can act.

- [vSAN Alerts Definitions](#)

vRealize Operations Manager generates an alert if a problem occurs with the components in the storage area network that the vSAN adapter is monitoring.

- [Alerts in the vSphere Web Client](#)

The vSphere Web Client displays the results of health tests for the following vSAN monitored groups:

- [vSphere Distributed Port Group](#)

The vCenter adapter provides alert definitions that generate alerts on the vSphere Distributed Port objects in your environment.

- [Virtual Machine Alert Definitions](#)

The vCenter adapter provides alert definitions that generate alerts on the virtual machine objects in your environment.

- [vSphere Distributed Switch Alert Definitions](#)

The vCenter adapter provides alert definitions that generate alerts on the vSphere Distributed Switch objects in your environment.

- [vCenter Server Alert Definitions](#)

The vCenter adapter provides alert definitions that generate alerts on the vCenter Server objects in your environment.

- [Datastore Alert Definitions](#)

The vCenter adapter provides alert definitions that generate alerts on the datastore objects in your environment.

- [Data Center Alert Definitions](#)

The vCenter adapter provides alert definitions that generate alerts on the Data Center objects in your environment.

- [Custom Data Center Alert Definitions](#)

The vCenter adapter provides alert definitions that generate alerts on the Custom Data Center objects in your environment.

## Cluster Compute Resource Alert Definitions

The vCenter adapter provides alert definitions that generate alerts on the Cluster Compute Resource objects in your environment.

## Health/Symptom-Based

These alert definitions have the following impact and criticality information.

<b>Impact</b>	Health
<b>Criticality</b>	Symptom-based

Alert Definition	Symptoms	Recommendations
Fully-automated DRS-enabled cluster has CPU contention caused by less than half of the virtual machines.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ Cluster CPU contention at warning/immediate/critical level</li> <li>■ &gt; 0 descendant virtual machines have [ Virtual machine CPU demand at warning/ immediate/critical level ]</li> <li>■ &lt;= 50% of descendant virtual machines have [Virtual machine CPU demand at warning/ immediate/critical level ]</li> <li>■ DRS Migration Threshold is not zero</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the migration threshold in the DRS settings for the cluster. Change it to a more aggressive level to enable DRS to balance the cluster workloads.</li> <li>2 Use the workload balance feature in vRealize Operations to migrate one or more virtual machines to a different cluster.</li> <li>3 Use vMotion to migrate some virtual machines to a different cluster if possible.</li> <li>4 Add more hosts to the cluster to increase memory capacity.</li> <li>5 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Fully-automated DRS-enabled cluster has CPU contention caused by more than half of the virtual machines.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ Cluster CPU contention at warning/immediate/critical level</li> <li>■ Cluster CPU demand at warning/immediate/critical level</li> <li>■ &gt; 50% of descendant virtual machines have [ Virtual machine CPU demand at warning/ immediate/critical level ]</li> <li>■ DRS Migration Threshold is not zero</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the migration threshold in the DRS settings for the cluster. Change it to a more aggressive level to enable DRS to balance the cluster workloads.</li> <li>2 User the workload balance feature in vRealize Operations to migrate one or more virtual machines to a different cluster.</li> <li>3 Use vMotion to migrate some virtual machines to a different cluster if possible.</li> <li>4 Add more hosts to the cluster to increase CPU capacity.</li> <li>5 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>

Alert Definition	Symptoms	Recommendations
Fully-automated DRS-enabled cluster has CPU contention caused by overpopulation of virtual machines.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ Cluster CPU contention at warning/immediate/critical level</li> <li>■ Cluster CPU workload at warning/immediate/critical level</li> <li>■ = 0 descendant virtual machines have [ Virtual machine CPU demand at warning/ immediate/critical level ]</li> <li>■ DRS Migration Threshold is not zero</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the migration threshold in the DRS settings for the cluster. Change it to a more aggressive level to enable DRS to balance the cluster workloads.</li> <li>2 Use the workload balance feature in vRealize Operations to migrate one or more virtual machines to a different cluster.</li> <li>3 Use vMotion to migrate some virtual machines to a different cluster if possible.</li> <li>4 Add more hosts to the cluster to increase CPU capacity.</li> <li>5 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Fully-automated DRS-enabled cluster has unexpected high CPU workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ Cluster CPU workload above DT</li> <li>■ Cluster CPU workload at warning/immediate/critical level</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the applications running on the virtual machines in the cluster to determine whether high CPU workload is an expected behavior.</li> <li>2 Add more hosts to the cluster to increase CPU capacity.</li> <li>3 Use vSphere vMotion to migrate some virtual machines to a different cluster if possible.</li> </ol>
Fully-automated DRS-enabled cluster has memory contention caused by less than half of the virtual machines.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ Cluster memory contention at warning/immediate/critical level</li> <li>■ &gt; 0 descendant virtual machines have [ Virtual machine memory workload at warning /immediate/critical level ]</li> <li>■ &lt;= 50% of descendant virtual machines have [Virtual machine memory workload at warning/ immediate/critical level ]</li> <li>■ DRS Migration Threshold is not zero</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the migration threshold in the DRS settings for the cluster. Change it to a more aggressive level to enable DRS to balance the cluster workloads.</li> <li>2 Use the workload balance feature in vRealize Operations to migrate one or more virtual machines to a different cluster.</li> <li>3 Use vMotion to migrate some virtual machines to a different cluster if possible.</li> <li>4 Add more hosts to the cluster to increase memory capacity.</li> <li>5 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>

Alert Definition	Symptoms	Recommendations
Fully-automated DRS-enabled cluster has memory contention caused by more than half of the virtual machines.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ Cluster memory contention at warning/immediate/critical level</li> <li>■ Cluster memory workload at warning/immediate/critical level</li> <li>■ &gt; 50% of descendant virtual machines have [ Virtual machine memory demand at warning/immediate/critical level ]</li> <li>■ DRS Migration Threshold is not zero</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the migration threshold in the DRS settings for the cluster. Change it to a more aggressive level to enable DRS to balance the cluster workloads.</li> <li>2 Use the workload balance feature in vRealize Operations to migrate one or more virtual machines to a different cluster.</li> <li>3 Use vMotion to migrate some virtual machines to a different cluster if possible.</li> <li>4 Add more hosts to the cluster to increase memory capacity.</li> <li>5 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Fully-automated DRS-enabled cluster has memory contention caused by overpopulation of virtual machines.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ Cluster memory contention at warning/immediate/critical level</li> <li>■ Cluster memory workload at warning/immediate/critical level</li> <li>■ = 0 descendant virtual machines have [ Virtual machine memory demand at warning /immediate/critical level ]</li> <li>■ DRS Migration Threshold is not zero</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the migration threshold in the DRS settings for the cluster. Change it to a more aggressive level to enable DRS to balance the cluster workloads.</li> <li>2 Use the workload balance feature in vRealize Operations to migrate one or more virtual machines to a different cluster.</li> <li>3 Use vMotion to migrate some virtual machines to a different cluster if possible.</li> <li>4 Add more hosts to the cluster to increase memory capacity.</li> <li>5 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>

Alert Definition	Symptoms	Recommendations
More than 5% of virtual machines in the cluster have memory contention due to memory compression, ballooning or swapping.	<ul style="list-style-type: none"> <li>■ Virtual machine memory limit is set AND</li> <li>■ &gt; 5% of descendant virtual machines have [ virtual machine memory contention is at warning/immediate/critical level] AND</li> <li>■ &gt; 5% of descendant virtual machines have [ Virtual machine memory is compressed OR</li> <li>■ Virtual machine is using swap OR</li> <li>■ Virtual machine memory ballooning is at warning/immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Add more hosts to the cluster to increase memory capacity.</li> <li>2 Use vMotion to migrate some virtual machines off the host or cluster.</li> </ol>
Fully-automated DRS-enabled cluster has unexpected high memory workload and contention.	<p>Symptoms include all of the following:</p> <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ Cluster memory contention above DT</li> <li>■ Cluster memory content is at warning/immediate/critical level</li> <li>■ Cluster memory workload at warning/immediate/critical level</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the applications running on the virtual machines in the cluster to determine whether high memory workload is an expected behavior.</li> <li>2 Add more hosts to the cluster to increase memory capacity.</li> <li>3 Use vSphere vMotion to migrate some virtual machines to a different cluster if possible.</li> </ol>
vSphere HA failover resources are insufficient.	vSphere HA failover resources are insufficient (fault symptom)	<p>To resolve this problem, use similar CPU and memory reservations for all virtual machines in the cluster. If this solution is not possible, consider using a different vSphere HA admission control policy, such as reserving a percentage of cluster resource for failover. Alternatively, you can use advanced options to specify a cap for the slot size. For more information, see the vSphere Availability Guide. Hosts that have vSphere HA agent errors are not good candidates for providing failover capacity in the cluster and their resources are not considered for vSphere HA admission control purposes. If many hosts have a vSphere HA agent error, vCenter Server generates this event leading to the fault. To resolve vSphere HA agent errors, check the event logs for the hosts to determine the cause of the errors. After you resolve any configuration problems, reconfigure vSphere HA on the affected hosts or on the cluster.</p>
vSphere HA master missing.	vCenter Server is unable to find a master vSphere HA agent (fault symptom)	Check the fault page under the <b>Analysis</b> tab for this object to find more objects.

## Host System Alert Definitions

The vCenter adapter provides alert definitions that generate alerts on the Host System objects in your environment.

### Health/Symptom-Based

These alert definitions have the following impact and criticality information.

**Impact**

Health

**Criticality**

Symptom-based

Alert Definition	Symptoms	Recommendations
Standalone host has CPU contention caused by less than half of the virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ Host CPU contention is at warning/immediate/critical level</li> <li>■ &gt; 0 child virtual machines have [Virtual machine CPU demand at warning /immediate/critical level]</li> <li>■ &lt;= 50% of child virtual machines have [Virtual machine CPU demand at warning/ immediate/critical level]</li> </ul>	Use <ol style="list-style-type: none"> <li>1 Add the host to a fully-automated-DRS cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Standalone host has CPU contention caused by more than half of the virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ Host CPU contention is at warning/immediate/critical level</li> <li>■ Host CPU demand at warning/immediate/critical level</li> <li>■ &gt; 50% of child virtual machines have [Virtual machine CPU demand at warning/ immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Add the host to a fully-automated-DRS cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>

Alert Definition	Symptoms	Recommendations
Standalone host has CPU contention due to overpopulation of virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ Host CPU contention is at warning/immediate/critical level</li> <li>■ Host CPU demand at warning/immediate/critical level</li> <li>■ = 0 child virtual machines have [Virtual machine CPU demand at warning/ immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Add the host to a fully-automated-DRS cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Host in a cluster that does not have fully-automated DRS enabled has contention caused by less than half of the virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ [ DRS Enabled OR ! DRS fully automated ]</li> <li>■ Host CPU contention is at warning/immediate/critical level</li> <li>■ &gt; 0 child virtual machines have [Virtual machine CPU demand at warning /immediate/critical level]</li> <li>■ &lt;= 50% of child virtual machines have [Virtual machine CPU demand at warning /immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Enable fully-automated DRS in the cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Host in a cluster that does not have fully-automated DRS enabled has CPU contention caused by more than half of the virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ [ DRS Enabled OR ! DRS fully automated]</li> <li>■ Host CPU contention at warning/immediate/critical level</li> <li>■ Host CPU demand at warning/immediate/critical level</li> <li>■ &gt; 50% of child virtual machines have [Virtual machine CPU demand at warning /immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Enable fully-automated DRS in the cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>

Alert Definition	Symptoms	Recommendations
Host in a cluster that does not have fully-automated DRS enabled has CPU contention caused by overpopulation of virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ [ DRS Enabled OR ! DRS fully automated]</li> <li>■ Host CPU contention at warning/immediate/critical level</li> <li>■ Host CPU demand at warning/immediate/critical level</li> <li>■ = 0 child virtual machines have [Virtual machine CPU demand at warning /immediate/critical level</li> </ul>	<ol style="list-style-type: none"> <li>1 Enable fully-automated DRS in the cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Standalone host has memory contention caused by less than half of the virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ Host memory workload at warning/immediate/critical level</li> <li>■ Host memory contention at warning/immediate/critical level</li> <li>■ &gt; 50% of child virtual machines have [Virtual machine memory workload at warning /immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Add the host to a fully-automated-DRS cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Upgrade the host to use a host that has larger memory capacity.</li> <li>4 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Standalone host has memory contention caused by more than half of the virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ Host memory workload at warning/immediate/critical level</li> <li>■ Host memory contention at warning/immediate/critical level</li> <li>■ &gt; 50% of child virtual machines have [Virtual machine memory workload at warning /immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Add the host to a fully-automated-DRS cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Upgrade the host to use a host that has larger memory capacity.</li> <li>4 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>

Alert Definition	Symptoms	Recommendations
Standalone host has memory contention due to overpopulation of virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ Host memory workload at warning/immediate/critical level</li> <li>■ Host memory contention at warning/immediate/critical level</li> <li>■ = 0 child virtual machines have [Virtual machine memory workload at warning/ immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Add the host to a fully-automated-DRS cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Upgrade the host to use a host that has larger memory capacity.</li> <li>4 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Host in a cluster that does not have fully-automated DRS enabled has memory contention caused by less than half of the virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ [DRS Enabled OR ! DRS fully automated]</li> <li>■ Host memory contention at warning/immediate/critical level</li> <li>■ &gt; 0 child virtual machines have [Virtual machine memory workload at warning/ immediate/critical level]</li> <li>■ &lt;= 50% of child virtual machines have [Virtual machine memory workload at warning/ immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Enable fully-automated DRS in the cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Host in a cluster that does not have fully-automated DRS enabled has memory contention caused by more than half of the virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ [DRS Enabled OR ! DRS fully automated]</li> <li>■ Host memory workload at warning/immediate/critical level</li> <li>■ Host memory contention at warning/immediate/critical level</li> <li>■ &gt; 50% of child virtual machines have [Virtual machine memory workload at warning /immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Enable fully-automated DRS in the cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Upgrade the host to use a host that has larger memory capacity.</li> <li>4 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>

Alert Definition	Symptoms	Recommendations
Host in a cluster that does not have fully-automated DRS enabled has memory contention caused by overpopulation of virtual machines.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <li>■ [DRS Enabled OR ! DRS fully automated]</li> <li>■ Host memory workload at warning/immediate/critical level</li> <li>■ Host memory contention at warning/immediate/critical level</li> <li>■ = 0 child virtual machines have [Virtual machine memory workload at warning /immediate/critical level]</li> </ul>	<ol style="list-style-type: none"> <li>1 Enable fully-automated DRS in the cluster to allow vSphere to move virtual machine as needed when resources are available on other hosts in the cluster.</li> <li>2 Use vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>3 Upgrade the host to use a host that has larger memory capacity.</li> <li>4 Right-size large virtual machines as it helps in reducing overall resource contention. Use the Reclaimable Capacity feature within vRealize Operations for recommended rightsizing of VMs.</li> </ol>
Host is experiencing high number of received or transmitted packets dropped.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host network received packets dropped</li> <li>■ Host network transmitted packets dropped</li> </ul>	<ol style="list-style-type: none"> <li>1 Reduce the amount of network traffic being generated by virtual machines by moving some of them to a host with lower network traffic.</li> <li>2 Verify the health of the physical network adapter, configuration, driver and firmware versions.</li> <li>3 Contact VMware support.</li> </ol>
Host is experiencing high number of received packets dropped.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host network received packets dropped</li> <li>■ Host network received packets dropped above DT</li> <li>■ Host network data receive workload at Warning level</li> <li>■ Host network data receive workload above DT</li> <li>■ Host CPU demand at Critical level</li> </ul>	<ol style="list-style-type: none"> <li>1 If the host has one CPU, upgrade the host or use a host that has larger CPU capacity.</li> <li>2 Add an additional NIC to the host.</li> <li>3 Reduce the amount of network traffic being generated by virtual machines by moving some of them to a host with lower network traffic.</li> </ol>
Host is experiencing high number of transmitted packets dropped.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Host network transmitted packets dropped</li> <li>■ Host network transmitted packets dropped above DT</li> <li>■ Host network data transmit workload at Warning level</li> <li>■ Host network data transmit workload above DT</li> <li>■ Host is dropping high percentage of packets</li> </ul>	<ol style="list-style-type: none"> <li>1 Add an additional NIC to the host.</li> <li>2 Reduce the amount of network traffic being generated by virtual machines by moving some of them to a host with lower network traffic.</li> </ol>

Alert Definition	Symptoms	Recommendations
ESXi host has detected a link status 'flapping' on a physical NIC.	Physical NIC link state flapping (fault symptom).	ESXi disables the device to avoid the link flapping state. You might need to replace the physical NIC. The alert will be canceled when the NIC is repaired and functioning. If you replace the physical NIC, you might need to manually cancel the alert.
ESXi host has detected a link status down on a physical NIC.	Physical NIC link state down (fault symptom).	ESXi disables the device to avoid the link flapping state. You might need to replace the physical NIC. The alert will be canceled when the NIC is repaired and functioning. If you replace the physical NIC, you might need to manually cancel the alert.
Battery sensors are reporting problems.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Battery sensor health is red OR</li> <li>■ Battery sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.
Baseboard Management Controller sensors are reporting problems.	Symptoms include the following: <ul style="list-style-type: none"> <li>■ Baseboard Management Controller sensor health is red OR</li> <li>■ Baseboard Management Controller sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.
Fan sensors are reporting problems.	<ul style="list-style-type: none"> <li>■ Fan sensor health is red OR</li> <li>■ Fan sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.
Hardware sensors are reporting problems.	<ul style="list-style-type: none"> <li>■ Hardware sensor health is red OR</li> <li>■ Hardware sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.
Memory sensors are reporting problems.	<ul style="list-style-type: none"> <li>■ Memory sensor health is red OR</li> <li>■ Memory sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.

Alert Definition	Symptoms	Recommendations
Power sensors are reporting problems.	<ul style="list-style-type: none"> <li>■ Power sensor health is red OR</li> <li>■ Power sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.
Processor sensors are reporting problems.	<ul style="list-style-type: none"> <li>■ Processor sensor health is red</li> <li>■ Processor sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.
SEL sensors are reporting problems.	<ul style="list-style-type: none"> <li>■ SEL sensor health is red OR</li> <li>■ SEL sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.
Storage sensors are reporting problems.	<ul style="list-style-type: none"> <li>■ Storage sensor health is red OR</li> <li>■ Storage sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.
System Board sensors are reporting problems.	<ul style="list-style-type: none"> <li>■ System board sensor health is red OR</li> <li>■ System board sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.
Temperature sensors are reporting problems.	<ul style="list-style-type: none"> <li>■ Temperature sensor health is red OR</li> <li>■ Temperature sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.
Voltage sensors are reporting problems.	<ul style="list-style-type: none"> <li>■ Voltage sensor health is red OR</li> <li>■ Voltage sensor health is yellow</li> </ul>	Change or replace the hardware if necessary. Contact the hardware vendor for assistance. After the problem is resolved, the alert will be canceled when the sensor that reported the problem indicates that the problem no longer exists.

## Health/Critical

These alert definitions have the following impact and criticality information.

**Impact** Health

**Criticality** Critical

Alert Definition	Symptoms	Recommendations
Host has lost connection to vCenter.	Host disconnected from vCenter	Click "Open Host in vSphere Web Client" in the Actions menu at the top of Alert details page to connect to the vCenter managing this host and manually reconnect the host to vCenter Server. After the connection to the host is restored by vCenter Server, the alert will be canceled.
vSphere High Availability (HA) has detected a network-isolated host.	vSphere HA detected a network isolated host (fault symptom).	Resolve the networking problem that prevents the host from pinging its isolation addresses and communicating with other hosts. Make sure that the management networks that vSphere HA uses include redundancy. With redundancy, vSphere HA can communicate over more than one path, which reduces the chance of a host becoming isolated.
vSphere High Availability (HA) has detected a possible host failure.	vSphere HA detected a host failure (fault symptom).	Find the computer that has the duplicate IP address and reconfigure it to have a different IP address. This fault is cleared and the alert canceled when the underlying problem is resolved, and the vSphere HA master agent is able to connect to the HA agent on the host.  <b>Note</b> You can use the Duplicate IP warning in the <code>/var/log/vmkernel</code> log file on an ESX host or the <code>/var/log/messages</code> log file on an ESXi host to identify the computer that has the duplicate IP address.
Host is experiencing network contention caused by too much traffic.	Symptoms include all the following: <ul style="list-style-type: none"> <li>■ Host is experiencing dropped network packets</li> <li>■ Host network workload at warning/immediate/critical level</li> </ul>	<ol style="list-style-type: none"> <li>1 Review the load balancing policy in the Port Group and the vSwitch.</li> <li>2 Add an additional NIC to the host.</li> <li>3 Reduce the amount of network traffic being generated by virtual machines by moving some of them to a host with lower network traffic.</li> </ol>

<b>Alert Definition</b>	<b>Symptoms</b>	<b>Recommendations</b>
The host has lost connectivity to a dvPort.	Lost network connectivity to dvPorts (fault symptom).	Replace the physical adapter or reset the physical switch. The alert will be canceled when connectivity is restored to the dvPort.

Alert Definition	Symptoms	Recommendations																									
The host has lost connectivity to the physical network.	Lost network connectivity (fault symptom).	<p>To determine the actual failure or to eliminate possible problems, check the status of the vmnic in the vSphere Client or from the ESX service console:</p> <ul style="list-style-type: none"> <li>■ To check the status in the vSphere Client, select the ESX host, click <b>Configuration</b>, and then click <b>Networking</b>. The vmnics currently assigned to virtual switches appear in the diagrams. If a vmnic displays a red X, that link is currently down.</li> <li>■ From the service console, run the command: <code>esxcfg-nics</code>. The output that appears is similar to the following:           <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Name</th> <th>PCI Driver</th> <th>Link Speed</th> <th>Duplex</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>-----</td> <td>vmnic0</td> <td>04:04.00</td> <td>tg3</td> <td></td> </tr> <tr> <td>Up</td> <td>1000Mbps</td> <td>Full</td> <td>Broadcom BCM5780</td> <td>Gigabit Ethernet</td> </tr> <tr> <td>vmnic1</td> <td>04:04.01</td> <td>tg3</td> <td>Up</td> <td>1000Mbps Full</td> </tr> <tr> <td>Broadcom BCM5780</td> <td>Gigabit Ethernet</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>           The Link column shows the status of the link between the network adapter and the physical switch. The status can be either Up or Down. If some network adapters are up and others are down, you might need to verify that the adapters are connected to the intended physical switch ports. To         </li> </ul>	Name	PCI Driver	Link Speed	Duplex	Description	-----	vmnic0	04:04.00	tg3		Up	1000Mbps	Full	Broadcom BCM5780	Gigabit Ethernet	vmnic1	04:04.01	tg3	Up	1000Mbps Full	Broadcom BCM5780	Gigabit Ethernet			
Name	PCI Driver	Link Speed	Duplex	Description																							
-----	vmnic0	04:04.00	tg3																								
Up	1000Mbps	Full	Broadcom BCM5780	Gigabit Ethernet																							
vmnic1	04:04.01	tg3	Up	1000Mbps Full																							
Broadcom BCM5780	Gigabit Ethernet																										

Alert Definition	Symptoms	Recommendations
		<p>verify the connections, bring down each ESX host port on the physical switch, run <code>esxcfg-nics -l</code>, and observe the affected vmnics.</p> <p>Verify that the vmnic identified in the alert is still connected to the switch and configured properly:</p> <ul style="list-style-type: none"> <li>■ Make sure that the network cable is still connected to the switch and to the host.</li> <li>■ Make sure that the switch is connected to the system, is still functioning properly, and has not been inadvertently misconfigured. For more information, see the switch documentation.</li> <li>■ Check for activity between the physical switch and the vmnic. You can check activity by performing a network trace or observing activity LEDs.</li> <li>■ Check for network port settings on the physical switch.</li> </ul> <p>To reconfigure the service console IP address if the affected vmnic is associated with a service console, see <a href="http://kb.vmware.com/kb/1000258">http://kb.vmware.com/kb/1000258</a> If the problem is caused by your hardware, contact your hardware vendor for replacement hardware.</p>
The host lost connectivity to a Network File System (NFS) server.	Lost connection to NFS server (fault symptom).	<ol style="list-style-type: none"> <li>1 Verify the NFS server is running.</li> <li>2 Check the network connection to make sure the ESX host can connect to the NFS server.</li> <li>3 Determine whether the other hosts that use the same NFS mount are experiencing the same problem, and check the NFS server status and share points.</li> <li>4 Make sure that you can reach the NFS server by logging into the service console and using <code>vmkping</code> to ping the NFS server: "<code>vmkping &lt;nfs server&gt;</code>".</li> <li>5 For advanced troubleshooting information, see <a href="http://kb.vmware.com/kb/100396">http://kb.vmware.com/kb/100396</a></li> </ol>

Alert Definition	Symptoms	Recommendations
A fatal error occurred on a PCIe bus during system reboot.	A fatal PCIe error occurred.	Check and replace the PCIe device identified in the alert as the cause of the problem. Contact the vendor for assistance.
A fatal memory error was detected at system boot time.	A fatal memory error occurred.	Replace the faulty memory or contact the vendor.

## Health/Immediate

These alert definitions have the following impact and criticality information.

**Impact**

Health

**Criticality**

Immediate

Alert Definition	Symptom	Recommendations
The host has lost redundant connectivity to a dvPort.	Lost network redundancy to DVPorts (fault symptom).	Replace the physical adapter or reset the physical switch. The alert will be canceled when connectivity is restored to the DVPort.
The host has lost redundant uplinks to the network.	Lost network redundancy (fault symptom).	<p>To determine the actual failure or to eliminate possible problems, first connect to ESX through SSH or the console:</p> <ol style="list-style-type: none"> <li>1 Identify the available uplinks by running <code>esxcfg-nics -l</code>.</li> <li>2 Remove the reported vmnic from the port groups by running <code>esxcfg-vswitch -U &lt;affected vmnic&gt; affected vSwitch</code>.</li> <li>3 Link available uplinks to the affected port groups by running <code>esxcfg-vswitch -L &lt;available vmnic&gt; affected vSwitch</code>.</li> </ol> <p>Next, check the status of the vmnic in vSphere Client or the ESX service console:</p> <ol style="list-style-type: none"> <li>1 In vSphere Client, select the ESX host, click <b>Configuration</b>, and then click <b>Networking</b>.</li> </ol> <p>The vmnics currently assigned to virtual switches appear in the diagrams. If a vmnic displays a red X, that link is currently unavailable.</p> <ol style="list-style-type: none"> <li>2 From the service console, run <code>esxcfg-nics -l</code>. The output that appears is similar to the following example: Name PCI Driver Link Speed Duplex Description.</li> </ol> <pre> ----- ----- vmnic0 04:04.00 tg3 Up 1000Mbps Full Broadcom BCM5780 Gigabit Ethernet vmnic1 04:04.01 tg3 Up 1000Mbps Full Broadcom BCM5780 Gigabit Ethernet. The Link column shows the status of the link between the network adapter and the physical switch. The status can be either Up or Down. If some network adapters are up and others are down, you might need to verify that the adapters are connected to the intended physical switch ports. To verify the connections, shut down each ESX host port on the physical switch, run the "esxcfg-nics -l" command, and </pre>

Alert Definition	Symptom	Recommendations
		<p>observe the affected vmnics. Verify that the vmnic identified in the alert is still connected to the switch and configured properly:</p> <ol style="list-style-type: none"> <li>1 Make sure that the network cable is still connected to the switch and to the host.</li> <li>2 Make sure that the switch is connected to the system, is still functioning properly, and was not inadvertently misconfigured. (See the switch documentation.)</li> <li>3 Perform a network trace or observe activity LEDs to check for activity between the physical switch and the vmnic.</li> <li>4 Check for network port settings on the physical switch.</li> </ol> <p>If the problem is caused by hardware, contact your hardware vendor for a hardware replacement.</p>
A PCIe error occurred during system boot, but the error is recoverable.	A recoverable PCIe error occurred.	The PCIe error is recoverable, but the system behavior is dependent on how the error is handled by the OEM vendor's firmware. Contact the vendor for assistance.
A recoverable memory error has occurred on the host.	A recoverable memory error occurred.	Since recoverable memory errors are vendor-specific, contact the vendor for assistance.

## Risk/Symptom-Based

These alert definitions have the following impact and criticality information.

**Impact**

Risk

**Criticality**

Symptom-based

Alert Definition	Symptom	Recommendations
ESXi Host is violating vSphere 5.5 Hardening Guide.	<ul style="list-style-type: none"> <li>■ Active directory authentication disabled OR</li> <li>■ Non-compliant NTP service startup policy OR</li> <li>■ SSH service is running OR</li> <li>■ NTP service stopped OR</li> <li>■ Non-compliant timeout value for automatically disabling local and remote shell access OR</li> <li>■ vSphere Authentication Proxy not used for password protection when adding ESXi hosts to active directory OR</li> <li>■ Persistent logging disabled OR</li> <li>■ Bidirectional CHAP for iSCSI traffic disabled OR</li> <li>■ Non-compliant firewall setting to restrict access to NTP client OR</li> <li>■ NTP server for time synchronization not configured OR</li> <li>■ Non-compliant ESXi Shell service startup policy OR</li> <li>■ Non-compliant firewall setting to restrict access to SNMP server OR</li> <li>■ ESXi Shell service is running OR</li> <li>■ Non-compliant DCUI service startup policy OR</li> <li>■ Dvfilter bind IP address configured OR</li> <li>■ Non-compliant SSH service startup policy OR</li> <li>■ DCUI service is running OR</li> <li>■ Non-compliant idle time before an interactive shell is automatically logged out OR</li> <li>■ Non-compliant DCUI access user list OR</li> <li>■ Remote syslog is not enabled</li> </ul>	Fix the vSphere 5.5 Hardening Guide Rules Violations according to the recommendations in the <a href="#">vSphere5 Hardening Guide</a>

## vRealize Automation Alert Definitions

Alert definitions are combinations of symptoms and recommendations that identify problem areas in your environment and generate alerts on which you can act.

Symptom and alert definitions are defined for vRealize Automation objects. The alerts are population-based alerts based on the risk or health of a certain percentage of child objects. There are no alerts generated for network profiles.

The health and risk thresholds are as follows:

## Health

- When 25%-50% of the child objects have health issues, the parent object will trigger an alert with a Warning health level.
- When 50%-75% of the child objects have health issues, the parent object will trigger an alert with an Immediate health level.
- When 75%-100% of the child objects have health issues, the parent object will trigger an alert with a Critical health level.

## Risk

- When 25%-50% of the child objects have risk issues, the parent object will trigger an alert with a Warning risk level.
- When 50%-75% of the child objects have risk issues, the parent object will trigger an alert with an Immediate risk level.
- When 75%-100% of the child objects have risk issues, the parent object will trigger an alert with a Critical risk level.

## vSAN Alerts Definitions

vRealize Operations Manager generates an alert if a problem occurs with the components in the storage area network that the vSAN adapter is monitoring.

**Table 3-1. vSAN Alert Definitions**

Alert	Alert Level	Affected Object Type	Description
Performance Service on vSAN cluster might be off or experience issues	Critical	vSAN Adapter Instance	Triggered when the vSphere Virtual SAN Performance Service is off or experiences issues for one of the vSAN-enabled cluster compute resources.  Cleared by enabling Virtual SAN performance service in vSphere.
vSAN adapter instance failed to collect data from Virtual SAN Health Service. The health service might have issues.	Critical	vSAN Adapter Instance	Triggered when the vSAN adapter instance is unable to collect data from the vSphere Virtual SAN Health Service for one of the vSAN-enabled cluster compute resources.  Check Virtual SAN health service settings in vSphere.

**Table 3-1. vSAN Alert Definitions (Continued)**

<b>Alert</b>	<b>Alert Level</b>	<b>Affected Object Type</b>	<b>Description</b>
vSAN Cluster disk space usage is approaching capacity	Warning	Cluster Compute Resource	Triggered when the disk usage in a vSAN cluster reaches 80% of capacity. Cleared by removing virtual machines that are no longer in use or adding more disks to the cluster.
vSAN Cluster disk space capacity is less than 5%	Critical	Cluster Compute Resource	Triggered when the disk usage in a vSAN cluster reaches 95% of capacity. Cleared by removing virtual machines that are no longer in use or adding more disks to the cluster.
vSAN Cluster flash read cache is approaching capacity	Warning	Cluster Compute Resource	Triggered when the Read Cache (RC) in the vSAN cluster reaches 80% of capacity. Cleared by adding flash storage to the read cache.
vSAN Cluster flash read cache capacity is less than 5%	Critical	Cluster Compute Resource	Triggered when the Read Cache (RC) in the vSAN cluster reaches 95% of capacity. Cleared by adding flash storage to the read cache.
vSAN Cluster virtual disk count is approaching capacity	Warning	Cluster Compute Resource	Triggered when the number of virtual disks per host in the vSAN cluster reaches 75% of capacity. Cleared by adding most hosts to the cluster.
vSAN Cluster virtual disk count capacity is less than 5%	Critical	Cluster Compute Resource	Triggered when the number of virtual disks per host in the vSAN cluster reaches 95% of capacity. Cleared by adding most hosts to the cluster.
vSAN Disk Group read cache hit rate is less than 90%	Warning	vSAN Disk Group	Triggered when the vSAN disk group read cache hit rate is less than 90%. Cleared by adding more cache to accommodate the workload.
vSAN Disk Group read cache hit rate is less than 90% and write buffer free space is less than 10%	Warning	vSAN Disk Group	Triggered when the vSAN disk group read cache hit rate is less than 90% and the vSAN disk group write buffer free space is less than 10%. Cleared by adding more flash capacity to the vSAN disk group.
vSAN Host has no VMkernel NIC configured	Immediate	Host System	Triggered when vSAN host has no VMkernel NIC configured. Clears when the symptom disappears.

**Table 3-1. vSAN Alert Definitions (Continued)**

<b>Alert</b>	<b>Alert Level</b>	<b>Affected Object Type</b>	<b>Description</b>
One or more physical disks on vSAN host is experiencing software state health issues	Critical	Host System	Triggered when one or more physical disks on vSAN host is experiencing software state health issues.
vSAN Performance Service is unable to communicate and retrieve statistics from host	Critical	Host System	Triggered when vSAN Performance Service is unable to communicate and retrieve statistics from host.
vSAN enabled hosts have inconsistent values for advanced configuration options	Critical	vSAN Cluster	Triggered when some advanced configuration settings have different values on different hosts in the vSAN cluster.
vSAN is disabled on the host	Critical	Host System	Triggered when vSAN is disabled on the host.  vSAN objects health will be impacted If this host stores any vSAN data (For example: virtual machine objects) on its local disks.
One or more vSAN enabled hosts are not in the same IP subnet	Critical	Host System	Triggered when one or more vSAN enabled hosts are not in the same IP subnet.
Host in a vSAN cluster does not have a VMkernel NIC configured for vSAN traffic	Critical	Host System	Triggered when host in a vSAN cluster does not have a VMkernel NIC configured for vSAN traffic.  <b>Note</b>  Even if an ESXi host is part of the vSAN cluster, but is not contributing storage, it must still have a VMkernel NIC configured for vSAN traffic.
One or more hosts in the vSAN cluster have misconfigured multicast addresses	Critical	Host System	Triggered when one or more hosts in the vSAN cluster have misconfigured multicast addresses.
vSAN health service is not installed on the host	Critical	Host System	Triggered when vSAN health service is not installed on the host.
Host in a vSAN cluster has IP multicast connectivity issue	Critical	Host System	Triggered when host in a vSAN cluster has IP multicast connectivity issue. It means that multicast is most likely the root cause of a vSAN network partition.
Host in a vSAN cluster has connectivity issues and vCenter Server does not know its state	Critical	Host System	Triggered when host in a vSAN cluster has connectivity issues and vCenter Server does not know its state.
vSAN disk group has incorrect deduplication and compression configuration	Critical	Host System	Triggered when vSAN disk group has incorrect deduplication and compression configuration.

**Table 3-1. vSAN Alert Definitions (Continued)**

<b>Alert</b>	<b>Alert Level</b>	<b>Affected Object Type</b>	<b>Description</b>
vSAN witness host has an invalid preferred fault domain	Critical	Host System	Triggered when vSAN witness host has an invalid preferred fault domain.
vSAN Cluster contains host whose ESXi version does not support vSAN Stretched Cluster	Critical	Host System	Triggered when vSAN Cluster contains host whose ESXi version does not support vSAN Stretched Cluster.
Host has invalid unicast agent and impacting the health of vSAN Stretched Cluster	Critical	Host System	Triggered when host has invalid unicast agent and impacting the health of vSAN Stretched Cluster.  An invalid unicast agent on the host can cause a communication malfunction with the witness host.
Storage I/O controller driver is not VMware certified	Critical	Host System	Triggered when stability and integrity of vSAN may be at risk as the storage I/O controller driver is not VMware certified.
Storage I/O controller is not compatible with the VMware Compatibility Guide	Critical	Host System	Triggered when vSAN environment may be at risk as the Storage I/O controller on the ESXi hosts that are participating in a vSAN cluster are not compatible with the VMware Compatibility Guide.
vSAN host and its disks have inconsistent deduplication and compression configuration with the cluster	Critical	Host System	Triggered when vSAN host and its disks have inconsistent deduplication and compression configuration with the cluster.
Unicast agent is not configured on the host and affecting operations of vSAN Stretched cluster	Critical	Host System	Triggered when unicast agent is not configured on the host and affecting operations of vSAN Stretched cluster.
The preferred fault domain is not set for the witness host in a vSAN Stretched cluster	Critical	Host System	Triggered when the preferred fault domain is not set for the witness host in a vSAN Stretched cluster and affecting the operations of vSAN Stretched cluster.
vSAN Stretched cluster contains a witness host without a valid disk group	Critical	Host System	Triggered when vSAN Stretched cluster contains a witness host without a valid disk group.  If the witness host does not have any disk claimed by vSAN then its fault domain is not available.
vSAN Stretched cluster has inconsistent configuration for Unicast agent	Critical	Host System	Triggered when vSAN Stretched cluster contains multiple unicast agents.  This means multiple unicast agents were set on non-witness hosts.

**Table 3-1. vSAN Alert Definitions (Continued)**

<b>Alert</b>	<b>Alert Level</b>	<b>Affected Object Type</b>	<b>Description</b>
vSAN Stretched cluster does not contain a valid witness host	Critical	Host System	Triggered when vSAN Stretched cluster does not contain a valid witness host.  This affects the operations of vSAN Stretched cluster.
vSAN cluster has multiple network partitions	Critical	Host System	Triggered when vSAN cluster has multiple network partitions due to a network issue.
Witness host is a part of vSAN Stretched cluster	Critical	Host System	Triggered when witness host is a part of the vCenter cluster, which forms vSAN Stretched cluster.
Witness host resides in one of the data fault domains	Critical	Host System	Triggered when witness host resides in one of the data fault domains.  This affects the operations of vSAN Stretched cluster.
vSAN cluster has unexpected hosts	Critical	Host System	Triggered when vSAN cluster has unexpected hosts.
vSAN is unable to retrieve the physical disk information from host	Critical	Host System	Triggered when vSAN is unable to retrieve the physical disk information from host. vSAN Health Service may not be working properly on this host.
vCenter Server has lost connection to a host that is part of a vSAN cluster.	Critical	Host System	Triggered when host that is part of a vSAN cluster is in disconnected state or not responding and vCenter Server does not know its state.
vSAN has encountered an integrity issue with the metadata of an individual component on a physical disk	Critical	Host System	Triggered when vSAN has encountered an integrity issue with the metadata of an individual component on a physical disk.
vSAN is running low on the vital memory pool (slabs) needed for the operation of physical disks.	Critical	Host System	Triggered when vSAN is running low on the vital memory pool (slabs) needed for the operation of physical disks.  This can lead to a variety of performance issues such as virtual machine storage performance degradation, operation failures, or even ESXi hosts going unresponsive.

**Table 3-1. vSAN Alert Definitions (Continued)**

<b>Alert</b>	<b>Alert Level</b>	<b>Affected Object Type</b>	<b>Description</b>
vSAN is running low on the vital memory pool (heaps) needed for the operation of physical disks.	Critical	Host System	<p>Triggered when vSAN is running low on the vital memory pool (heaps) needed for the operation of physical disks.</p> <p>This can lead to a variety of performance issues such as virtual machine storage performance degradation, operation failures, or even ESXi hosts going unresponsive.</p>
vSAN is using a physical disk which has high congestion value	Critical	Host System	<p>Triggered when vSAN is using a physical disk which has high congestion value.</p> <p>This can lead to a variety of performance issues such as virtual machine storage performance degradation, operation failures, or even ESXi hosts going unresponsive.</p>
Disk format version of one or more vSAN disks is out of date	Critical	Host System	<p>Triggered when disk format version of one or more vSAN disks is out of date and is not compatible with other vSAN disks. This can lead to problems in creating or powering on VMs, performance degradation, and EMM failures.</p>
vSAN Cluster has multiple Stats DB objects which are creating conflicts and affecting vSAN Performance Service	Critical	vSAN Cluster	<p>Triggered when vSAN cluster has issues in electing stats master of vSAN Performance service.</p> <p>This affects the functionality of vSAN Performance service.</p>
vSAN cluster has issues in electing stats master of vSAN Performance service	Critical	vSAN Cluster	<p>Triggered when vSAN cluster has issues in electing stats master of vSAN Performance service.</p> <p>This affects the functionality of vSAN Performance service.</p>
CLOMD process on the host has issues and impacting the functionality of vSAN cluster	Critical	Host System	<p>Triggered when CLOMD process on the host has issues and impacting the functionality of vSAN cluster.</p>
Number of vSAN components on a disk is reaching or has reached its limit	Critical	vSAN Cluster	<p>Triggered when number of vSAN components on a disk is reaching or has reached its limit. This will cause failure in the deployment of new Virtual Machines and also impact rebuild operations.</p>

**Table 3-1. vSAN Alert Definitions (Continued)**

<b>Alert</b>	<b>Alert Level</b>	<b>Affected Object Type</b>	<b>Description</b>
vSAN HCL DB auto updater is not working properly	Critical	vSAN Cluster	Triggered when vSAN HCL DB auto updater is not working properly. This means that vSAN cannot download and update its HCL DB automatically.
vSAN has encountered an issue while reading the metadata of a physical disk	Critical	Host System	Triggered when vSAN has encountered an issue while reading the metadata of a physical disk and cannot use this disk.
Overall health of the physical disks in a vSAN Cluster is impacted	Critical	Host System	Triggered when overall health of the physical disks in a vSAN Cluster is impacted. See the health status of each physical disk individually on all the hosts.
vSAN performance service statistics database object is reporting issues.	Critical	Host System	Triggered when vSAN performance service statistics database object is reporting issues.
Overall health of vSAN objects is reporting issues	Critical	vSAN Cluster	Triggered when overall health of vSAN objects is reporting issues.
Number of vSAN components on a host is reaching or has reached its limit	Critical	Host System	Triggered when number of vSAN components on a host is reaching or has reached its limit.  This will cause failure in the deployment of new Virtual Machines and also impact rebuild operations.
Site latency between two fault domains and the witness host has exceeded the recommended threshold values in a vSAN Stretched cluster	Critical	vSAN Cluster	Site latency between two fault domains and the witness host has exceeded the recommended threshold values in a vSAN Stretched cluster.
Host ESXi version and the vSAN disk format version is incompatible with the other hosts and disks in a vSAN cluster	Critical	Host System	Host ESXi version and the vSAN disk format version is incompatible with the other hosts and disks in a vSAN cluster.
Statistics collection of vSAN performance service is not working correctly	Critical	vSAN Cluster	Triggered when statistics collection of vSAN performance service is not working correctly.  This means that statistics collection or writing statistics data to storage have failed for three consecutive intervals.
After one additional host failure, vSAN Cluster will not have enough resources to rebuild all objects	Critical	vSAN Cluster	Triggered when after one additional host failure, vSAN Cluster will not have enough resources to rebuild all objects.

**Table 3-1. vSAN Alert Definitions (Continued)**

<b>Alert</b>	<b>Alert Level</b>	<b>Affected Object Type</b>	<b>Description</b>
vSAN cluster is reaching or has reached its limit for components, free disk space and read cache reservations	Critical	vSAN Cluster	Triggered when vSAN cluster is reaching or has reached its limit for components, free disk space and read cache reservations.
Disk load variance between some vSAN disks exceeded the threshold value	Critical	vSAN Cluster	Triggered when disk load variance between some vSAN disks exceeded the threshold value. vSAN cannot perform the load balance properly.
Host is either running an outdated version of the vSAN Health Service VIB or It is not installed on the host	Critical	Host System	Triggered when host is either running an outdated version of the vSAN Health Service VIB or It is not installed on the host.
Storage I/O controller drivers is not supported with the current version of ESXi running on the host	Critical	Host System	Triggered when stability and integrity of vSAN may be at risk as the storage I/O controller driver is not supported with the current version of ESXi running on the host.
vSAN HCL DB is not up-to-date	Critical	vSAN Cluster	Triggered when vSAN HCL DB is not up-to-date.
vSAN cluster health checks are reporting issues	Critical	vSAN Cluster	Triggered when vSAN cluster health checks are reporting issues.
vSAN cluster Hardware Compatibility health checks are experiencing issues	Critical	vSAN Cluster	Triggered when vSAN cluster Hardware Compatibility health checks are experiencing issues.
vSAN cluster Limits health checks are experiencing issues	Critical	vSAN Cluster	Triggered when vSAN cluster Limits health checks are experiencing issues.
vSAN cluster network health checks are experiencing issues	Critical	vSAN Cluster	Triggered when vSAN cluster network health checks are experiencing issues.
Performance Service on vSAN cluster might be off or experiencing issues	Critical	vSAN Cluster	Triggered when performance service on vSAN cluster might be off or experiencing issues. vROps will not be able to collect the data from vSAN cluster in this state.
vSAN Stretched cluster health checks are experiencing issues	Critical	vSAN Cluster	Triggered when vSAN Stretched cluster health checks are experiencing issues.
MTU check (ping with large packet size) has failed on vSAN host	Critical	Host System	Triggered when MTU check (ping with large packet size) has failed on vSAN environment due to some MTU misconfiguration in the vSAN network.

**Table 3-1. vSAN Alert Definitions (Continued)**

<b>Alert</b>	<b>Alert Level</b>	<b>Affected Object Type</b>	<b>Description</b>
Basic (unicast) connectivity check (normal ping) has failed on vSAN host	Critical	Host System	Triggered when basic (unicast) connectivity check (normal ping) has failed on vSAN host due to network misconfiguration.
vSAN adapter instance failed to collect data from vSAN Health Service. The health Service might have issues.	Critical	Host System	Triggered when vSAN adapter instance failed to collect data from vSAN Health Service. The health Service might have issues.

## Alerts in the vSphere Web Client

The vSphere Web Client displays the results of health tests for the following vSAN monitored groups:

- Network
- Physical disk
- Cluster
- Limits
- Data
- Hardware compatibility
- Performance Service
- Stretched Cluster (if enabled)

Each group contains several individual checks. If a check fails, the vSAN adapter issues a warning or error level alert. The alert indicates the host or cluster where the problem occurred and provides a recommendation to clear the alert. For a complete list of all vSAN health test alerts, see [Knowledge Base article 2114803](#).

## vSphere Distributed Port Group

The vCenter adapter provides alert definitions that generate alerts on the vSphere Distributed Port objects in your environment.

### Health/Critical

These alert definitions have the following impact and criticality information.

<b>Impact</b>	Health
<b>Criticality</b>	Critical

Alert Definition	Symptom	Recommendations
One or more ports are in link down state.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>Port is connected</li> <li>One or more ports are in a link down state</li> </ul>	Verify that there is physical connectivity for the NICs on the host. Verify the admin status on the port.
One or more ports are experiencing network contention.	Port is experiencing dropped packets	Check if the packet drops are due to high CPU resource utilization or uplink bandwidth utilization. Use vMotion to migrate the virtual machine that the port is attached to a different host.

## Virtual Machine Alert Definitions

The vCenter adapter provides alert definitions that generate alerts on the virtual machine objects in your environment.

### Health/Symptom-Based

These alert definitions have the following impact and criticality information.

#### Impact

Health

#### Criticality

Symptom-based

Alert Definition	Symptom	Recommendations
Virtual machine is experiencing memory compression, ballooning or swapping due to memory limit.	<ul style="list-style-type: none"> <li>Virtual machine memory limit is set AND</li> <li>Virtual machine memory demand exceeds configured memory limit AND</li> <li>[Virtual machine memory is compressed OR</li> <li>Virtual machine is using swap OR</li> <li>Virtual machine memory ballooning is at warning/immediate/critical level] AND</li> <li>Recommended virtual machine memory size</li> </ul>	Increase the memory limit for the virtual machine to match the recommended memory size. Alternatively, remove memory limit for the virtual machine.
Virtual machine has CPU contention caused by swap wait.	Virtual machine CPU swap wait is at warning/Immediate/Critical level.	<ol style="list-style-type: none"> <li>Upgrade the host with more memory.</li> <li>Use vSphere vMotion to migrate this virtual machine to a different host or cluster.</li> <li>Set memory reservations for the virtual machine to prevent swapping.</li> </ol>
Virtual machine has CPU contention caused by IO wait.	Virtual machine CPU I/O wait is at warning/immediate/critical level.	Increase the datastore I/O capacity for the connected data stores to reduce CPU I/O wait on the virtual machine.

Alert Definition	Symptom	Recommendations
Virtual machine has unexpected high CPU workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Virtual machine CPU demand at warning/immediate/critical level</li> <li>■ Anomaly is starting to/moderately/critically high</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the guest applications to determine whether high CPU workload is an expected behavior.</li> <li>2 Add more CPU capacity for this virtual machine.</li> </ol>
Virtual machine has unexpected high memory workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Virtual machine memory workload is at Warning/Immediate/Critical level</li> <li>■ Anomaly is starting to/moderately/critically high</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the guest applications to determine whether high memory workload is an expected behavior.</li> <li>2 Add more memory for this virtual machine.</li> </ol>
Virtual machine has memory contention due to swap wait and high disk read latency.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Virtual machine CPU swap wait is at warning/immediate/critical level (5/10/15)</li> <li>■ Virtual machine has read latency at warning level</li> <li>■ Recommended virtual machine memory size</li> </ul>	Add more memory for this virtual machine.
Virtual machine has memory contention due to memory compression, ballooning or swapping.	<ul style="list-style-type: none"> <li>■ ! Virtual machine memory limit is set AND</li> <li>■ Virtual machine has memory contention at warning/immediate/critical level AN</li> <li>■ [ Virtual machine memory ballooning at warning/immediate/critical level OR</li> <li>■ Virtual machine memory is compressed OR</li> <li>■ Virtual machine is using swap]</li> </ul>	<ol style="list-style-type: none"> <li>1 Add memory reservations to this virtual machine to prevent ballooning and swapping.</li> <li>2 Use vSphere vMotion to migrate this virtual machine to a different host or cluster.</li> </ol>
Virtual machine has unexpected high disk I/O workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Virtual machine disk I/O workload at Warning/Immediate/Critical level (80/90/95)</li> <li>■ Virtual machine disk I/O workload above DT</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the applications running on the virtual machine to determine whether high disk I/O workload is an expected behavior.</li> <li>2 Use vSphere Storage vMotion to migrate this virtual machine to a different datastore with higher IOPS.</li> </ol>
Virtual machine has disk I/O read latency problem.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Virtual machine disk read latency at Warning /Immediate/Critical level</li> <li>■ Virtual machine disk read latency above DT</li> <li>■ Virtual machine has low co-stop</li> <li>■ Virtual machine has low CPU swap wait</li> </ul>	<ol style="list-style-type: none"> <li>1 Check whether you have enabled Storage IO control on the datastores connected to the virtual machine.</li> <li>2 Increase IOPS for the datastores connected to the virtual machine.</li> <li>3 Use vSphere Storage vMotion to migrate this virtual machine to a different datastore with higher IOPS.</li> </ol>

Alert Definition	Symptom	Recommendations
Virtual machine has disk I/O write latency problem.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Virtual machine disk write latency at Warning/ Immediate/Critical level</li> <li>■ Virtual machine disk write latency above DT</li> <li>■ Virtual machine has low CPU swap wait (&lt; 3 ms)</li> </ul>	<ol style="list-style-type: none"> <li>1 Check whether you have enabled Storage IO Control on the data stores connected to the datastore.</li> <li>2 Increase IOPS for the data stores connected to the virtual machine.</li> <li>3 If the virtual machine has multiple snapshots, delete the older snapshots.</li> <li>4 Use vSphere Storage vMotion to migrate some virtual machines to a different datastore.</li> </ol>
Virtual machine has disk I/O latency problem caused by snapshots.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Virtual machine CPU I/O wait is at warning/immediate/critical level</li> <li>■ Virtual machine has at least one snapshot</li> <li>■ All child datastores have [ ! Disk command latency at warning level ]</li> </ul>	<ol style="list-style-type: none"> <li>1 If the virtual machine has multiple snapshots, delete the older snapshots.</li> <li>2 Reduce the number of snapshots by consolidating the snapshots into one snapshot. In vSphere Client, select the VM, right-click, select <b>Snapshot</b>, and then <b>Consolidate</b>.</li> </ol>
Virtual machine is consuming disk space in a rapid and unexpected manner.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Guest file system overall disk space usage reaching warning/immediate/critical limit (80, 90, 95)</li> <li>■ Virtual machine disk space time remaining high (&gt; 60 days)</li> <li>■ Guest file system space usage above DT</li> <li>■ Guest partition disk space usage</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the application and verify that it is behaving correctly.</li> <li>2 Add a new hard disk to the virtual machine and configure the guest file system partition to use the disk.</li> </ol>
One or more guest file systems is out of disk space.	One or more guest file systems out of disk space (Fault symptom).	Add a new hard disk to the virtual machine and configured the guest file system partition to use the disk.
Not enough resources for vSphere HA to start the virtual machine.	Not enough resources for vSphere HA to start VM (Fault symptom).	<ol style="list-style-type: none"> <li>1 If virtual machine CPU reservation is set, decrease the CPU reservation configuration.</li> <li>2 If virtual machine memory reservation is set, decrease the memory reservation configuration.</li> <li>3 Add more hosts to cluster.</li> <li>4 Bring any failed hosts online or resolve a network partition, if one exists.</li> <li>5 If DRS is in manual mode, look for pending recommendations and approve the recommendations so that vSphere HA failover can proceed.</li> </ol>

Alert Definition	Symptom	Recommendations
The Fault tolerance state of the virtual machine has changed to "Disabled" state.	VM fault tolerance state changed to disabled (Fault symptom).	Enable the secondary virtual machine indicated in the alert.
vSphere HA failed to restart a network isolated virtual machine.	vSphere HA failed to restart a network isolated virtual machine (Fault symptom).	Manually power on the virtual machine.
The fault tolerance state of the virtual machine has changed to "Needs Secondary" state.	VM Fault Tolerance state changed to needs secondary (Fault symptom).	Keep HA enabled when Fault tolerance (FT) is required to protect virtual machines.
vSphere HA cannot perform a failover operation for the virtual machine	vSphere HA virtual machine failover unsuccessful (Fault symptom)	<ol style="list-style-type: none"> <li>1 If the error information reports that a file is locked, the virtual machine might be powered on a host that the vSphere HAmaster agent can no longer monitor by using the management network or heartbeat datastores.</li> <li>2 The virtual machine might have been powered on by a user on a host outside of the cluster. If any hosts are declared offline, determine whether a networking or storage problem caused the situation.</li> <li>3 If the error information reports that the virtual machine is in an invalid state, an in-progress operation might be preventing access to the virtual machine files. Determine whether any operations are in progress, such as a clone operation that is taking a long time to complete.</li> <li>4 You can also try to power on the virtual machine and investigate any returned errors.</li> </ol>
Virtual machine is experiencing memory compression, ballooning or swapping due to memory limit.	<ul style="list-style-type: none"> <li>■ Virtual machine memory limit is set</li> <li>■ Virtual machine memory demand exceeds configured memory limit</li> <li>■ [Virtual machine memory is compressed OR</li> <li>■ Virtual machine is using swap OR</li> <li>■ Virtual machine memory ballooning is at warning/immediate/critical level]</li> <li>■ Recommended virtual machine memory size</li> </ul>	Increase the memory limit for the virtual machine to match the recommended memory size. Alternatively, remove memory limit for the virtual machine.

## Efficiency/Symptom-Based

These alert definitions have the following impact and criticality information.

<b>Impact</b>	Efficiency
<b>Criticality</b>	Symptom-based

Alert Definition	Symptom	Recommendations
Virtual machine has large disk snapshots.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Virtual machine has large disk snapshots</li> <li>■ Reclaimable snapshot waste</li> <li>■ Datastore space usage reaching warning/immediate/critical limit</li> </ul>	If the virtual machine has multiple snapshots, delete the older snapshots.

## Efficiency/Warning

These alert definitions have the following impact and criticality information.

<b>Impact</b>	Efficiency
<b>Criticality</b>	Warning

Alert Definition	Symptom	Recommendations
Virtual machine is idle.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Virtual machine is idle</li> <li>■ Virtual machine high ready time on each vCPU</li> <li>■ ! Virtual machine is powered off</li> </ul>	Power off this virtual machine to allow for other virtual machines to use CPU and memory that this virtual machine is wasting.

## Risk/Symptom-Based

These alert definitions have the following impact and criticality information.

<b>Impact</b>	Risk
<b>Criticality</b>	Symptom-based

Alert Definition	Symptom	Recommendations
Virtual machine has CPU contention caused by co-stop.	<p>Symptoms include all of the following:</p> <ul style="list-style-type: none"> <li>■ Virtual machine CPU co-stop at warning/immediate/critical level</li> <li>■ ! Virtual machine is powered off</li> <li>■ Number of vCPUs to remove from virtual machine</li> </ul>	Review the symptoms listed and remove the number of vCPUs from the virtual machine as recommended by the symptom.
Virtual machine has chronic high CPU workload leading to CPU stress.	<p>Symptoms include all of the following:</p> <ul style="list-style-type: none"> <li>■ Virtual machine CPU stress is at warning/immediate/critical level</li> <li>■ Recommended number of vCPUs to add</li> </ul>	Add more CPU capacity for this virtual machine.
Virtual machine has high CPU co-stop due to snapshots.	<p>Symptoms include all of the following:</p> <ul style="list-style-type: none"> <li>■ Virtual machine CPU co-stop is at warning/immediate/critical level</li> <li>■ Virtual machine has at least one snapshot</li> </ul>	To reduce the high co-stop (%CSTP) values and increase virtual machine performance, consolidate any snapshots into the main virtual disk. In the vSphere Client, select the VM, right click, and select <b>Snapshot</b> , and then <b>Consolidate</b> . After consolidation, the %CSTP value is reduced or eliminated and VM performance is improved. If performance is not improved enough, continue researching other potential VM performance issues. See VMware KB: <a href="http://kb.vmware.com/kb/2000058">http://kb.vmware.com/kb/2000058</a>
Virtual machine has chronic high memory workload leading to memory stress.	<p>Symptoms include all of the following:</p> <ul style="list-style-type: none"> <li>■ Virtual machine memory stress at warning/immediate/critical level</li> <li>■ Recommended virtual machine memory size &gt; 0</li> </ul>	Add more memory for the VM.
Virtual machine is projected to run out of disk space.	<p>Symptoms include all of the following:</p> <ul style="list-style-type: none"> <li>■ Virtual machine disk space time remaining low (&lt;= 60 days)</li> <li>■ ! Guest file system space usage above DT</li> <li>■ ! Guest file system overall disk space usage reaching warning limit (85%)</li> <li>■ Guest partition disk space usage</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the application configuration to determine whether the virtual machine disk capacity will be sufficient.</li> <li>2 Add a new hard disk to the virtual machine and configured the guest file system partition to use the disk.</li> </ol>

Alert Definition	Symptom	Recommendations
Virtual machine is running out of disk space.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Guest file system overall disk space usage reaching warning/immediate/critical limit (80, 90, 95)</li> <li>■ Virtual machine disk space time remaining low (&lt;= 60 days)</li> <li>■ ! Guest file system space usage above DT</li> <li>■ Guest partition disk space usage</li> </ul>	<ol style="list-style-type: none"> <li>1 Add a new hard disk to the virtual machine and configured the guest file system partition to use the disk.</li> <li>2 Reclaim disk space using in-guest disk cleanup mechanisms.</li> </ol>
Virtual machine is violating vSphere 5.5 hardening guide.	<ul style="list-style-type: none"> <li>■ Unrestricted VM-to-VM communication through VMCI OR</li> <li>■ VMsafe CPU/Memory APIs-port number configured OR</li> <li>■ Dvfilter network API enabled OR</li> <li>■ Non-compliant max VMX file size OR</li> <li>■ Non-compliant max VM log file size OR</li> <li>■ Allow unauthorized modification of device settings OR</li> <li>■ Allow unauthorized connect and disconnect of devices OR</li> <li>■ Tools auto install not disabled OR</li> <li>■ Non-compliant max number of remote console connections OR</li> <li>■ Allow VM to obtain detailed information about the physical host OR</li> <li>■ Non-compliant max VM log file count OR</li> <li>■ Feature not exposed in vSphere: MemFS is not disabled OR</li> <li>■ VMsafe CPU/memory API enabled OR</li> <li>■ Parallel port connected OR</li> <li>■ Console drag and drop operation not disabled OR</li> <li>■ Console copy operation not disabled OR</li> <li>■ Serial port connected OR</li> <li>■ Feature not exposed in vSphere: AutoLogon is not disabled OR</li> <li>■ Use independent non persistent disk OR</li> <li>■ Feature not exposed in vSphere: UnityPush is not disabled OR</li> <li>■ Shrink virtual disk not disabled - diskShrink OR</li> </ul>	Fix the vSphere 5.5 hardening guide rule violations according to the recommendations in the vSphere Hardening Guide (XLSX).

Alert Definition	Symptom	Recommendations
	<ul style="list-style-type: none"> <li>■ Feature not exposed in vSphere: GetCreds is not disabled OR</li> <li>■ CD-ROM connected OR</li> <li>■ Feature not exposed in vSphere: HGFSServerSet is not disabled OR</li> <li>■ Console paste operation not disabled OR</li> <li>■ Feature not exposed in vSphere: BIOSBBS is not disabled OR</li> <li>■ Shrink virtual disk not disabled - diskWiper OR</li> <li>■ USB controller connected OR</li> <li>■ Feature not exposed in vSphere: Monitor Control is not disabled OR</li> <li>■ Floppy drive connected OR</li> <li>■ Feature not exposed in vSphere: LaunchMenu is not disabled OR</li> <li>■ Versionget is not disabled OR</li> <li>■ Feature not exposed in vSphere: Toporequest is not disabled OR</li> <li>■ Feature not exposed in vSphere: Unity-interlock not disabled OR</li> <li>■ VM logging is not disabled OR</li> <li>■ Feature not exposed in vSphere: Unity is not disabled OR</li> <li>■ Feature not exposed in vSphere: Trashfolderstate is not disabled OR</li> <li>■ VGA only mode is not enabled OR</li> <li>■ Feature not exposed in vSphere: Trayicon is not disabled OR</li> <li>■ Feature not exposed in vSphere: Unity-Taskbar is not disabled OR</li> <li>■ Feature not exposed in vSphere: Versionset is not disabled OR</li> <li>■ VM console access via VNC protocol is not disabled OR</li> <li>■ Feature not exposed in vSphere: Protocolhandler is not disabled OR</li> <li>■ VIX message is not disabled OR</li> <li>■ Feature not exposed in vSphere: Shellaction is not disabled OR</li> <li>■ 3D features is not disabled OR</li> <li>■ Feature not exposed in vSphere: Unity-Windowcontents is not disabled OR</li> <li>■ Feature not exposed in vSphere: Unity-Unityactive is not disabled</li> </ul>	

## Risk/Warning

These alert definitions have the following impact and criticality information.

**Impact** Risk

**Criticality** Warning

Alert Definition	Symptom	Recommendations
Virtual machine is demanding more CPU than the configured limit.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Virtual machine CPU limit is set</li> <li>■ Virtual machine CPU demand exceeds configured limit</li> <li>■ ! Virtual machine's CPU demand exceeds its provisioned capacity</li> </ul>	Increase or remove CPU limits on the VM.

## vSphere Distributed Switch Alert Definitions

The vCenter adapter provides alert definitions that generate alerts on the vSphere Distributed Switch objects in your environment.

### Health/Critical

These alert definitions have the following impact and criticality information.

**Impact** Health

**Criticality** Critical

Alert Definition	Symptom	Recommendations
Network traffic is blocked for one or more ports.	Network traffic is blocked for one or more ports.	Check the security policy on the port groups as well as any ACL rule configuration.

### Health/Warning

These alert definitions have the following impact and criticality information.

**Impact** Health

**Criticality** Warning

Alert Definition	Symptom	Recommendations
Distributed Switch configuration is out of sync.	Distributed Switch configuration is out of sync with the vCenter Server.	Change the distributed switch configuration to match the host. Identify the distributed switch properties that are out of sync. If these properties were changed locally on the host in order to maintain connectivity, update the distributed switch configuration in the vCenter Server. Otherwise, re-apply the the vCenter Server configuration to this host.
One or more VLANs are unsupported by the physical switch.	One or more VLANs are unsupported by the physical switch.	Ensure the VLAN configuration on the physical switch and the distributed port groups are consistent.
Teaming configuration does not match the physical switch.	Teaming configuration does not match the physical switch.	Ensure the teaming configuration on the physical switch and the distributed switch are consistent.
The MTU on the Distributed Switch is not allowed by one or more VLANs on the host.	The MTU on the Distributed Switch is not allowed by one or more VLANs on the host.	Ensure the MTU configuration on the physical switch and the distributed switch are consistent.
There is an MTU mismatch between the host and a physical switch.	There is an MTU mismatch between the host and a physical switch.	Adjust the MTU configuration on the host to match the physical switch. Change the MTU configuration on the physical switch.

## Risk/Warning

These alert definitions have the following impact and criticality information.

<b>Impact</b>	Risk
<b>Criticality</b>	Warning

Alert Definition	Symptom	Recommendations
The distributed switch configuration is incorrect.	Host without redundant physical connectivity to the distributed switch.	Verify that at least two NICs on each host is connected to the distributed switch.

## vCenter Server Alert Definitions

The vCenter adapter provides alert definitions that generate alerts on the vCenter Server objects in your environment.

## Health/Symptom-Based

These alert definitions have the following impact and criticality information.

<b>Impact</b>	Health
<b>Criticality</b>	Symptom-based

Alert Definition	Symptom	Recommendations
A problem occurred with a vCenter Server component.	The vCenter Server health changed (fault symptom).	The actions to take to resolve the problems depend on the specific problem that caused the fault. Review the issue details, and check the documentation.
Duplicate object name found in the vCenter Server.	Duplicate object name found in the vCenter Server.	Ensure the virtual machines names are unique before enabling the Name-Based Identification feature.
The vCenter Server Storage data collection failed.	The vCenter Server storage data collection failed.	Ensure vCenter Management Webservice is started and Storage Management Service is functioning.

## Datastore Alert Definitions

The vCenter adapter provides alert definitions that generate alerts on the datastore objects in your environment.

## Health/Symptom-Based

These alert definitions have the following impact and criticality information.

<b>Impact</b>	Health
<b>Criticality</b>	Symptom-based

Alert Definition	Symptom	Recommendations
Datastore has unexpected high Disk I/O workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Datastore disk I/O workload at warning/immediate/critical level</li> <li>■ Datastore disk I/O workload above DT</li> </ul>	<ol style="list-style-type: none"> <li>1 Check the applications running on the virtual machines placed on the datastore to determine whether high disk I/O workload is expected behavior.</li> <li>2 Increase IOPS for the datastore.</li> </ol>
Datastore is consuming disk space in a rapid and unexpected manner.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ Datastore space usage reaching warning/immediate/critical level</li> <li>■ Datastore space growth above DT</li> <li>■ Datastore time remaining high</li> </ul>	<ol style="list-style-type: none"> <li>1 Check if there is an unexpected provisioning of virtual machines on this datastore.</li> <li>2 Use vSphere Storage vMotion to migrate some virtual machines to a different datastore.</li> <li>3 Add more capacity to the datastore.</li> </ol>

## Health/Critical

These alert definitions have the following impact and criticality information.

**Impact** Health

**Criticality** Critical

Alert Definition	Symptom	Recommendations
A storage device for a datastore has been detected to be off.	Storage device has been turned off administratively (fault symptom).	Ask the administrator about the device state. The fault will be resolved and the alert canceled if the device is turned on. If SCSI devices are detached or permanently removed, you must manually cancel the alert.
Datastore has lost connectivity to a storage device.	Host(s) lost connectivity to storage device(s) (fault symptom).	<p>The storage device path, for example, <code>vmhba35:C1:T0:L7</code>, contains several potential failure points: Path Element   Failure Point</p> <p>----- vmhba35    HBA (Host Bus Adapter) C1   Channel  T0   Target (storage processor port) L7    LUN (Logical Unit Number or Disk Unit).</p> <p>To determine the cause of the failure or to eliminate possible problems: Identify the available storage paths to the reported storage device by running <code>esxcfg-mpath -l</code>. For more information, see <a href="https://kb.vmware.com/s/article/1003973?lang=en_US#q=1003973">https://kb.vmware.com/s/article/1003973?lang=en_US#q=1003973</a>. Check that a rescan does not restore visibility to the targets. For information on rescanning the storage device by using the command-line interface and the vSphere Client, see <a href="https://kb.vmware.com/s/article/1003988?lang=en_US#q=1003988">https://kb.vmware.com/s/article/1003988?lang=en_US#q=1003988</a>. Determine whether the connectivity issue is with the iSCSI storage or the fiber storage.</p> <p>Troubleshoot the connectivity to the iSCSI storage by using the software initiator:</p> <ol style="list-style-type: none"> <li>1 Check whether a ping to the storage array fails from ESX. For more information, see <a href="https://kb.vmware.com/s/article/1003486?lang=en_US#q=1003486">https://kb.vmware.com/s/article/1003486?lang=en_US#q=1003486</a></li> <li>2 Check whether a vmkping to each network portal of the storage array fails. For more information, see <a href="https://kb.vmware.com/s/article/1003728?lang=en_US#q=1003728">https://kb.vmware.com/s/article/1003728?lang=en_US#q=1003728</a>.</li> <li>3 Check that the initiator is registered on the array. For more information, contact your storage vendor.</li> </ol>

Alert Definition	Symptom	Recommendations
		<p>4 Check that the following physical hardware is functioning correctly: Ethernet switch, Ethernet cables between the switch and the ESX host, and Ethernet cables between the switch and the storage array.</p> <p>To troubleshoot the connectivity to the fiber-attached storage, check the fiber switch. The fiber switch zoning configuration permits the ESX host to see the storage array. If you require assistance, contact your switch vendor. The fiber switch propagates RSCN messages to the ESX hosts. For more information about configuring the fiber switch, see <a href="https://kb.vmware.com/s/article/1002301?lang=en_US#q=1002301">https://kb.vmware.com/s/article/1002301?lang=en_US#q=1002301</a>.</p> <p>Finally, check the following physical hardware: the storage processors on the array, the fiber switch and the Gigabit Interface Converter (GBIC) units in the switch, the fiber cables between the fiber switch and the array, and the array itself. You must rescan after making changes to make sure that the targets are detected. If storage connectivity is restored for all of the affected host and storage device combinations, the fault is cleared and the alert canceled. If storage connectivity for the devices indicated is caused by a permanent loss or change, you must cancel the fault alert as a workaround. The alert will then be canceled automatically.</p>

## Health/Immediate

These alert definitions have the following impact and criticality information.

<b>Impact</b>	Health
<b>Criticality</b>	Immediate

Alert Definition	Symptom	Recommendations
<p>Datastore has one or more hosts that have lost redundant paths to a storage device.</p>	<p>Host(s) lost redundancy to storage device(s) (fault symptom).</p>	<p>The storage device path, for example, vmhba35:C1:T0:L7, contains several potential failure points:</p> <p>Path Element   Failure Point</p> <p>----- vmhba35    HBA (Host Bus Adapter) C1   Channel  T0   Target (storage processor port) L7    LUN (Logical Unit Number or Disk Unit).</p> <p>Use the following guidance to determine the cause of the failure or to eliminate possible problems. Identify the available storage paths to the reported storage device by running <code>esxcfg-mpath - l</code>. For more information, see <a href="https://kb.vmware.com/s/article/1003973?lang=en_US#q=1003973">https://kb.vmware.com/s/article/1003973?lang=en_US#q=1003973</a>.</p> <p>Check that a rescan does not restore visibility to the targets. For information on rescanning the storage device by using the command-line interface and the vSphere Client, see <a href="https://kb.vmware.com/s/article/1003988?lang=en_US#q=1003988">https://kb.vmware.com/s/article/1003988?lang=en_US#q=1003988</a>.</p> <p>Determine whether the connectivity issue is with the iSCSI storage or the fiber storage. Troubleshoot the connectivity to the iSCSI storage by using the software initiator:</p> <ol style="list-style-type: none"> <li>1 Check whether a ping to the storage array fails from ESX. For more information, see <a href="https://kb.vmware.com/s/article/1003486?lang=en_US#q=1003486">https://kb.vmware.com/s/article/1003486?lang=en_US#q=1003486</a>.</li> <li>2 Check whether a vmkping to each network portal of the storage array fails. For more information, see <a href="https://kb.vmware.com/s/article/1003728?lang=en_US#q=1003728">https://kb.vmware.com/s/article/1003728?lang=en_US#q=1003728</a>.</li> <li>3 Check that the initiator is registered on the array. For more information, contact your storage vendor.</li> <li>4 Check that the following physical hardware is functioning correctly: Ethernet switch, Ethernet cables between the switch and the ESX host, and Ethernet cables between the switch and the storage array.</li> </ol> <p>To troubleshoot the connectivity to the fiber-attached storage, check the fiber switch. The fiber switch zoning configuration permits the ESX host to</p>

Alert Definition	Symptom	Recommendations
		<p>see the storage array. If you require assistance, contact your switch vendor. The fiber switch propagates RSCN messages to the ESX hosts. For more information about configuring the fiber switch, see <a href="https://kb.vmware.com/s/article/1002301?lang=en_US#q=1002301">https://kb.vmware.com/s/article/1002301?lang=en_US#q=1002301</a>.</p> <p>Finally, check the following physical hardware: the storage processors on the array, the fiber switch and the Gigabit Interface Converter (GBIC) units in the switch, the fiber cables between the fiber switch and the array, and the array itself. You must rescan after making changes to make sure that the targets are detected. If storage connectivity is restored for all of the affected host and storage device combinations, the fault is cleared and the alert canceled. If storage connectivity for the devices indicated is caused by a permanent loss or change, you must cancel the fault alert as a workaround. The alert will be canceled automatically after that.</p>

## Risk/Symptom-Based

These alert definitions have the following impact and criticality information.

<b>Impact</b>	Risk
<b>Criticality</b>	Symptom-based

Alert Definition	Symptom	Recommendations
Datastore is running out of disk space.	<p>Symptoms include all of the following:</p> <ul style="list-style-type: none"> <li>■ Datastore space usage reaching warning/immediate/critical level</li> <li>■ ! Datastore space growth above DT</li> <li>■ Datastore space time remaining is low</li> </ul>	<ol style="list-style-type: none"> <li>1 Add more capacity to the datastore.</li> <li>2 Use vSphere vMotion to migrate some virtual machines to a different datastore.</li> <li>3 Delete unused snapshots of virtual machines from datastore.</li> <li>4 Delete any unused templates on the datastore.</li> </ol>
Datastore is projected to run out of disk space.	<p>Symptoms include all of the following:</p> <ul style="list-style-type: none"> <li>■ ! Datastore space usage reaching warning level</li> <li>■ ! Datastore space growth above DT</li> <li>■ Datastore space time remaining is low</li> </ul>	<ol style="list-style-type: none"> <li>1 Check if datastore usage is a planned growth and expand the storage if necessary.</li> <li>2 Use vSphere vMotion to migrate some virtual machines to a different datastore.</li> </ol>

## Data Center Alert Definitions

The vCenter adapter provides alert definitions that generate alerts on the Data Center objects in your environment.

### Risk/Symptom-Based

These alert definitions have the following impact and criticality information:

**Impact**

Risk

**Criticality**

Symptom-based

Alert Definition	Symptoms	Recommendations
Data center has unbalanced CPU "demand" workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ DC is unbalanced on CPU "demand" workload</li> <li>■ DC has significant CPU "demand" workload difference</li> <li>■ At least one cluster in DC has high CPU "demand" workload</li> </ul>	Rebalance the container to spread the workload more evenly.
Data center has unbalanced memory "demand" workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully enabled</li> <li>■ DC is unbalanced on memory "demand" workload difference</li> <li>■ At least one cluster in DC has high memory "demand" workload</li> </ul>	Rebalance the container to spread the workload more evenly.
Data center has unbalanced memory "consumed" workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ DC is unbalanced on memory "consumed" workload</li> <li>■ DC has significant memory "consumed" workload difference</li> <li>■ At least one cluster in DC has high memory "consumed" workload</li> </ul>	Rebalance the container to spread the workload more evenly.

## Custom Data Center Alert Definitions

The vCenter adapter provides alert definitions that generate alerts on the Custom Data Center objects in your environment.

## Risk/Symptom-Based

These alert definitions have the following impact and criticality information.

**Impact**

Risk

**Criticality**

Symptom-based

Alert Definition	Symptoms	Recommendations
Custom data center has unbalanced CPU "demand" workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ CDC is unbalanced on CPU "demand" workload</li> <li>■ CDC has significant CPU "demand" workload difference</li> <li>■ At least one cluster in CDC has high CPU "demand" workload</li> </ul>	Rebalance the container to spread the workload more evenly.
Custom data center has unbalanced memory "demand" workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ CDC is unbalanced on memory "demand" workload</li> <li>■ CDC has significant memory "demand" workload difference</li> <li>■ At least one cluster in CDC has high memory"demand" workload</li> </ul>	Rebalance the container to spread the workload more evenly.
Custom Datacenter has unbalanced memory "consumed" workload.	Symptoms include all of the following: <ul style="list-style-type: none"> <li>■ DRS enabled</li> <li>■ DRS fully automated</li> <li>■ CDC is unbalanced on memory "consumed" workload</li> <li>■ CDC has significant memory "consumed" workload difference</li> <li>■ At least one cluster in CDC has high memory"consumed" workload</li> </ul>	Rebalance the container to spread the workload more evenly.