

# vRealize Operations Definitions for Metrics, Properties, and Alerts

vRealize Operations Manager 6.5

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

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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

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# 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,”](#) on page 8
- [“Calculated Metrics,”](#) on page 63
- [“Self-Monitoring Metrics for vRealize Operations Manager,”](#) on page 68
- [“Metrics for the Operating Systems and Remote Service Monitoring Plug-ins in Endpoint Operations Management,”](#) on page 93

## 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,”](#) on page 63.

### CPU Usage Metrics

CPU usage metrics provide information about CPU use.

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

| Metric Key                    | Metric Name    | Description  |
|-------------------------------|----------------|--|
| cpu capacity_usagepct_average | Capacity Usage | CPU usages as a percent during the interval.   |
| cpu capacity_contentionPct    | CPU Contention | Percent of time the virtual machine is unable to run because it is contending for access to the physical CPU(s). |



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

| Metric Key                   | Metric Name                | Description   |
|------------------------------|----------------------------|---|
| cpu demandPct                | Demand (%)                 | CPU resource entitlement to CPU demand ratio (in percents).   |
| cpu demandmhz                | Demand (MHz)               | The amount of CPU resources a virtual machine would use if there were no CPU contention or CPU limit.   |
| cpu demand_average           | Demand                     | CPU demand in megahertz.  |
| cpu iowait                   | IO Wait                    | IO wait (ms).   |
| cpu numpackages              | Number of CPU Sockets      | Number of CPU sockets.  |
| cpu capacity_contention      | Overall CPU Contention     | Overall CPU contention in milliseconds.   |
| cpu capacity_provisioned     | Provisioned Capacity (MHz) | capacity in MHz of the physical CPU cores.  |
| cpu corecount_provisioned    | Provisioned vCPU(s)        | Number of provisioned CPU cores.  |
| cpu reservedCapacity_average | Reserved Capacity (MHz)    | Total CPU capacity reserved by virtual machines.  |
| cpu usagemhz_average         | Usage (MHz)                | CPU usages, as measured in megahertz, during the interval. <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> |
| cpu wait                     | Wait                       | 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.   |
| cpu workload                 | Workload (%)               | Percent of workload   |

## Memory Metrics

Memory metrics provide information about memory use and allocation.

**Table 1-3.** 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.   |
| mem host_provisioned         | Provisioned Memory     | Provisioned host memory in kilobytes.  |
| mem reservedCapacity_average | Reserved Capacity (KB) | Total amount of memory reservation used by powered-on virtual machines and vSphere services on the host. |
| 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 (%)       | Memory usage as percentage of total configured or available memory.                                      |
| mem workload                 | Workload (%)           | Percent of workload.   |

## Network Metrics

Network metrics provide information about network performance.

**Table 1-4.** Network Metrics

| Metric Key        | Metric Name                | Description   |
|-------------------|----------------------------|---|
| net droppedPct    | Packets Dropped (%)        | Percent network packets dropped.  |
| net usage_average | Usage Rate (KB per second) | Sum of the data transmitted and received for all of the NIC instances of the host or virtual machine. |
| net workload      | Workload (%)               | Percent of workload.  |

## Disk Metrics

Disk metrics provide information about disk use.

**Table 1-5.** 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 usage_average            | 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. |
| disk workload                 | Workload (%)               | Percent of workload.  |

## Summary Metrics

Summary metrics provide information about overall performance.

**Table 1-6.** Summary Metrics

| Metric Key                       | Metric Name                               | Description   |
|----------------------------------|---|---|
| summary number_running_hosts     | Number of Running Hosts                   | Number of running hosts.                                |
| summary number_running_vms       | Number of Running VMs                     | Number of running virtual machines.                     |
| 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 total_number_datacenters | Total Number of Datacenters               | Total number of data centers.                           |
| 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. |

## 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,”](#) on page 63
- [“Badge Metrics,”](#) on page 66

## 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.   |

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

| Metric Key                            | Metric Name                                      | Description  |
|---------------------------------------|--|--|
| 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. |
| 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

| <b>Metric Key</b>            | <b>Metric Name</b>      | <b>Description</b>  |
|------------------------------|-------------------------|---|
| mem host_contentionPct       | Contention (%)          | Percent host memory contention.   |
| mem host_demand              | Machine Demand (KB)     | Host memory demand in kilobytes.  |
| 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

| <b>Metric Key</b>       | <b>Metric Name</b>                         | <b>Description</b>  |
|-------------------------|--|---|
| 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

| 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 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,”](#) on page 63.

## Configuration Metrics for Virtual Machines

Configuration metrics provide information about virtual machine configuration.

**Table 1-14.** Configuration Metrics for Virtual Machines

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

## CPU Usage Metrics for Virtual Machines

CPU usage metrics provide information about CPU use.

**Table 1-15.** CPU Use Metrics for Virtual Machines

| <b>Metric Key</b>                 | <b>Metric Name</b>                    | <b>Description</b>   |
|-----------------------------------|---------------------------------------|--|
| cpu iowait                        | IO Wait (ms)                          | CPU time spent waiting for IO.                                       |
| cpu wait                          | Wait (ms)                             | Wait time in milliseconds.   |
| cpu capacity_contention           | Overall CPU Contention (ms)           | The amount of time the CPU cannot run due to contention.             |
| cpu reservation_used              | Reservation Used                      | CPU Reservation Used.  |
| cpu effective_limit               | Effective Limit                       | CPU Effective Limit.   |
| cpu estimated_entitlement         | Estimated Entitlement                 | CPU Estimated Entitlement.   |
| cpu idlePct                       | Idle (%)                              | Percentage time that CPU is idle.                                    |
| cpu iowaitPct                     | IO Wait (%)                           | Percentage IO Wait.  |
| cpu swapwaitPct                   | Swap wait (%)                         | Percentage swap wait for CPU.  |
| cpu waitPct                       | Wait (%)                              | Percentage of total CPU time spent in wait state.                    |
| cpu systemSummationPct            | System (%)                            | Percentage CPU time spent on system processes.                       |
| cpu demandOverLimit               | Demand Over Limit (MHz)               | Amount of CPU Demand that is over the configured CPU Limit.          |
| cpu demandOverCapacity            | Demand Over Capacity (MHz)            | Amount of CPU Demand that is over the configured CPU Capacity.       |
| cpu sizePctReduction              | Recommended Size Reduction (%)        | Percentage of recommended CPU size reduction.                        |
| cpu perCpuCoStopPct               | Normalized Co-stop                    | Percentage of co-stop time, normalized across all vCPUs.             |
| cpu numberToAdd                   | Recommended number of vCPUs to Add    | Recommended number of vCPUs to Add to the VM.                        |
| cpu numberToRemove                | Recommended number of vCPUs to Remove | Recommended number of vCPUs to Remove from the VM.                   |
| cpu capacity_entitlement          | Capacity entitlement (MHz)            | CPU entitlement for the VM after taking limits into account.         |
| cpu corecount_provisioned         | Provisioned CPU Cores                 | Number of provisioned CPU cores.                                     |
| cpu capacity_demandEntitlementPct | Capacity Demand Entitlement (%)       | Percent capacity demand entitlement.                                 |
| cpu capacity_contentionPct        | CPU Contention (%)                    | CPU contention as a percentage of 20-second collection interval.     |
| cpu capacity_provisioned          | Provisioned Capacity (MHz)            | Provisioned CPU capacity in megahertz.                               |
| cpu demandmhz                     | Demand (MHz)                          | CPU demand in megahertz.   |
| cpu host_demand_for_aggregation   | Host demand for aggregation           | Host demand for aggregation.   |
| cpu demand_average                | Demand (ms)                           | The total CPU time that the VM could use if there was no contention. |
| cpu demandPct                     | Demand (%)                            | CPU demand as a percentage of the provisioned capacity.              |
| cpu dynamic_entitlement           | Dynamic Entitlement                   | CPU Dynamic Entitlement.   |

**Table 1-15.** CPU Use Metrics for Virtual Machines (Continued)

| <b>Metric Key</b>        | <b>Metric Name</b> | <b>Description</b>  |
|--------------------------|--------------------|---|
| cpu usage_average        | Usage (%)          | CPU Usage as a percentage of 20-second collection interval.   |
| cpu usagemhz_average     | Usage (MHz)        | CPU use in megahertz.   |
| cpu system_summation     | System (ms)        | CPU time spent on system processes.   |
| cpu wait_summation       | 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. |
| cpu ready_summation      | Ready (ms)         | CPU time spent in the ready state.  |
| cpu readyPct             | Ready (%)          | CPU time spent in the ready state as a percentage of the collection interval.   |
| cpu used_summation       | Used (ms)          | CPU time that is used.  |
| cpu extra_summation      | Extra (ms)         | Extra CPU time in milliseconds.   |
| cpu guaranteed_latest    | Guaranteed (ms)    | CPU time that is guaranteed for the virtual machine.  |
| cpu swapwait_summation   | Swap Wait (ms)     | Swap wait time in milliseconds.   |
| cpu costop_summation     | Co-stop (ms)       | Time the VM is ready to run, but is unable to due to co-scheduling constraints.                                       |
| cpu costopPct            | Co-stop (%)        | Percentage of time the VM is ready to run, but is unable to due to co-scheduling constraints.                         |
| cpu idle_summation       | Idle (ms)          | CPU time that is idle.  |
| cpu latency_average      | Latency            | Percentage of time the VM is unable to run because it is contending for access to the physical CPUs.                  |
| cpu maxlimited_summation | Max Limited        | Time the VM is ready to run, but is not run due to maxing out its CPU limit setting.                                  |
| cpu overlap_summation    | Overlap            | Time the VM was interrupted to perform system services on behalf of that VM or other VMs.                             |
| cpu run_summation        | Run                | Time the VM is scheduled to run.  |
| cpu entitlement_latest   | Entitlement Latest | Entitlement Latest.   |

## CPU Utilization for Resources Metrics for Virtual Machines

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



**Table 1-16.** CPU Utilization for Resources Metrics for Virtual Machines

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

## Memory Metrics for Virtual Machines

Memory metrics provide information about memory use and allocation.

**Table 1-17.** Memory Metrics for Virtual Machines

| Metric Key                      | Metric Name                    | Description  |
|---------------------------------|--------------------------------|--|
| mem host_active                 | Host Active (KB)               | Host active memory use in kilobytes.                     |
| mem host_usage                  | Usage (KB)                     | Memory use in kilobytes.                                 |
| mem host_contention             | Contention (KB)                | Memory contention in kilobytes.                          |
| mem host_contentionPct          | Contention (%)                 | Percent memory contention.                               |
| mem guest_provisioned           | Guest Configured Memory (KB)   | Guest operating system configured memory in kilobytes.   |
| mem guest_dynamic_entitlement   | Guest Dynamic Entitlement (KB) | Guest Memory Dynamic Entitlement.                        |
| mem guest_activePct             | Guest Active Memory (%)        | Percent guest operating system active memory.            |
| mem guest_nonpageable_estimate  | Guest Non Pageable Memory (KB) | Guest operating system non-pageable memory in kilobytes. |
| mem reservation_used            | Reservation Used               | Memory Reservation Used.                                 |
| mem effective_limit             | Effective Limit                | Memory Effective Limit.                                  |
| mem estimated_entitlement       | Estimated Entitlement          | Memory Estimated Entitlement.                            |
| mem host_demand_for_aggregation | Demand for aggregation         | Host demand for aggregation.                             |
| mem numa.remote_latest          | NUMA Remote Latest             | Non-uniform memory access Remote (Kb).                   |
| mem numa.local_latest           | NUMA Local Latest              | Non-uniform memory access Local (Kb).                    |
| mem numa.migrations_latest      | NUMA Migrations Latest         | Non-uniform memory access Migrations (number).           |

**Table 1-17.** Memory Metrics for Virtual Machines (Continued)

| <b>Metric Key</b>             | <b>Metric Name</b>             | <b>Description</b>   |
|-------------------------------|--------------------------------|--|
| mem numa.locality_average     | NUMA Locality Average          | Non-uniform memory access Locality (%).  |
| mem demandOverLimit           | Demand Over Limit              | Amount of Memory Demand that is over the configured Memory Limit.                    |
| mem demandOverCapacity        | Demand Over Capacity           | Amount of Memory Demand that is over the configured Memory Capacity.                 |
| mem sizePctReduction          | Recommended Size Reduction (%) | Percentage of recommended Memory size reduction.                                     |
| mem balloonPct                | Balloon (%)                    | Percentage of total memory that has been reclaimed via ballooning.                   |
| mem guest_usage               | Guest Usage (KB)               | Guest operating system use in kilobytes.   |
| mem guest_demand              | Guest Demand (KB)              | Guest operating system demand in kilobytes.  |
| mem host_nonpageable_estimate | Guest Non Pageable Memory (KB) | Guest operating system non-pageable memory in kilobytes.                             |
| mem host_demand               | Host Demand (KB)               | Memory demand in kilobytes.  |
| mem host_demand_reservation   | Demand with Reservation (KB)   | Memory Demand with Reservation considered in KB.                                     |
| mem guest_workload            | Guest Workload                 | Guest Workload (%).  |
| mem host_workload             | Host Workload                  | Host Workload (%).   |
| mem vmmemctl_average          | Balloon (%)                    | Amount of memory currently used by the virtual machine memory control.               |
| mem active_average            | Guest Active (%)               | Amount of memory that is actively used.  |
| mem granted_average           | Granted (KB)                   | Amount of memory available for use.  |
| mem shared_average            | Shared (KB)                    | Amount of shared memory in kilobytes.  |
| mem zero_average              | Zero (KB)                      | Amount of memory that is all 0.  |
| mem swapped_average           | Swapped (KB)                   | amount of unreserved memory in kilobytes.  |
| mem swaptarget_average        | Swap Target (KB)               | Amount of memory that can be swapped in kilobytes.                                   |
| mem swapin_average            | Swap In (KB)                   | Swap-in memory in kilobytes.   |
| mem swapout_average           | Swap Out (KB)                  | amount of memory swapped out in kilobytes.   |
| mem usage_average             | Usage (%)                      | Memory currently in use as a percentage of total available memory.                   |
| mem vmmemctltarget_average    | Balloon Target (KB)            | Amount of memory that can be used by the virtual machine memory control.             |
| mem consumed_average          | Consumed (KB)                  | Amount of host memory consumed by the virtual machine for guest memory in kilobytes. |
| mem overhead_average          | Overhead (KB)                  | Memory overhead in kilobytes.  |
| mem host_dynamic_entitlement  | Host Dynamic Entitlement       | Mem Machine Dynamic Entitlement.   |
| mem swapinRate_average        | Swap In Rate (KBps)            | Rate at which memory is swapped from disk into active memory during the interval.    |

**Table 1-17.** Memory Metrics for Virtual Machines (Continued)

| Metric Key                      | Metric Name                   | Description   |
|---------------------------------|-------------------------------|---|
| mem swapoutRate_average         | Swap Out Rate (KBps)          | Rate at which memory is being swapped from active memory to disk during the current interval.     |
| mem activewrite_average         | Active Write (KB)             | Active writes in kilobytes.   |
| mem compressed_average          | Compressed (KB)               | Compressed memory in kilobytes.   |
| mem compressionRate_average     | Compression Rate (KBps)       | Compression rate in kilobytes per second.   |
| mem decompressionRate_average   | Decompression Rate (KBps)     | Decompression rate in kilobytes per second.   |
| mem overheadMax_average         | Overhead Max (KB)             | Maximum overhead in kilobytes.  |
| mem zipSaved_latest             | Zip Saved (KB)                | Zip-saved memory in kilobytes.  |
| mem zipped_latest               | Zipped (KB)                   | Zipped memory in kilobytes.   |
| mem entitlement_average         | Entitlement                   | Amount of host physical memory the VM is entitled to, as determined by the ESX schedule.          |
| mem latency_average             | Latency                       | Percentage of time the VM is waiting to access swapped or compressed memory.                      |
| mem capacity.contention_average | Capacity Contention           | Capacity Contention.  |
| mem llSwapInRate_average        | Swap In Rate from Host Cache  | Rate at which memory is being swapped from host cache into active memory.                         |
| mem llSwapOutRate_average       | Swap Out Rate to Host Cache   | Rate at which memory is being swapped to host cache from active memory.                           |
| mem llSwapUsed_average          | Swap Space Used in Host Cache | Space used for caching swapped pages in the host cache.   |
| mem overheadTouched_average     | Overhead Touched              | Actively touched overhead memory (KB) reserved for use as the virtualization overhead for the VM. |

## Datastore Metrics for Virtual Machines

Datastore metrics provide information about datastore use.

**Table 1-18.** Datastore Metrics for Virtual Machines

| Metric Key                         | Metric Name                         | Description   |
|------------------------------------|-------------------------------------|---|
| datastore commandsAveraged_average | Commands per second                 | Average number of commands issued per second during the collection interval.  |
| datastore demand_oio               | Outstanding IO requests             | OIO for datastore.  |
| datastore oio                      | Number of Outstanding IO Operations | Number of outstanding IO operations.  |
| datastore demand                   | Demand                              | Datastore demand.   |
| datastore totalLatency_average     | 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. |
| datastore usage_average            | Usage Average (KBps)                | Usage Average (KBps).   |
| datastore used                     | Used Space (MB)                     | Used space in megabytes.  |

**Table 1-18.** Datastore Metrics for Virtual Machines (Continued)

| <b>Metric Key</b>                     | <b>Metric Name</b>                               | <b>Description</b>   |
|---------------------------------------|--|--|
| datastore notshared                   | Not Shared (GB)                                  | Space used by VMs that is not shared.  |
| 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 (KBps)                                 | Rate of reading data from the datastore in kilobytes per second.   |
| datastore totalReadLatency_average    | Read Latency (ms)                                | Average amount of time for a read operation from the datastore. Total latency = kernel latency + device latency. |
| datastore totalWriteLatency_average   | Write Latency (ms)                               | Average amount of time for a write operation to the datastore. Total latency = kernel latency + device latency.  |
| datastore write_average               | Write Rate                                       | Rate of writing data to the datastore.   |
| datastore maxTotalLatency_latest      | Highest Latency                                  | Highest Latency.   |
| datastore totalLatency_max            | Total Latency Max                                | Total Latency Max (ms).  |
| 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.  |

## Disk Metrics for Virtual Machines

Disk metrics provide information about disk use.

**Table 1-19.** Disk Metrics for Virtual Machines

| <b>Metric Key</b>                | <b>Metric Name</b>  | <b>Description</b>   |
|----------------------------------|---------------------|--|
| disk numberReadAveraged_average  | Reads per second    | Average number of read commands issued per second during the collection interval.  |
| disk numberWriteAveraged_average | Writes per second   | Average number of write commands issued per second during the collection interval. |
| disk commandsAveraged_average    | Commands per second | Average number of commands issued per second during the collection interval.       |
| disk usage_average               | Usage Rate (KBps)   | Use rate in kilobytes per second.  |
| disk usage_capacity              | I/O Usage Capacity  | I/O Usage Capacity.  |

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

| <b>Metric Key</b>                       | <b>Metric Name</b>                  | <b>Description</b>  |
|---|-------------------------------------|---|
| disk diskoio                            | Number of Outstanding IO Operations | Number of outstanding IO operations.  |
| disk diskqueued                         | Queued Operations                   | Queued operations.  |
| disk diskdemand                         | Demand (%)                          | Percent demand.   |
| disk sum_queued_oio                     | Total Queued Outstanding operations | Sum of Queued Operation and Outstanding Operations.   |
| disk max_observed                       | Max Observed OIO                    | Max Observed IO for a disk.   |
| disk read_average                       | Read Rate (KBps)                    | Amount of data read in the performance interval.  |
| disk write_average                      | Write Rate (KBps)                   | Amount of data written to disk in the performance interval.   |
| disk numberRead_summation               | Read Requests                       | Number of times data was read from the disk in the defined interval.  |
| disk numberWrite_summation              | Write Requests                      | Number of times data was written to the disk in the defined interval.   |
| disk busResets_summation                | Bus Resets                          | The number of bus resets in the performance interval.   |
| disk commands_summation                 | Commands Issued                     | The number of disk commands issued in the performance interval.   |
| disk commandsAborted_summation          | Commands Aborted                    | The number of disk commands aborted in the performance interval.  |
| disk maxTotalLatency_latest             | Highest Latency                     | Highest latency.  |
| disk scsiReservationConflicts_summation | SCSI Reservation Conflicts          | SCSI Reservation Conflicts.   |
| disk totalReadLatency_average           | 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.          |
| disk totalWriteLatency_average          | 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.       |
| disk totalLatency_average               | 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. |

## Virtual Disk Metrics for Virtual Machines

Virtual disk metrics provide information about virtual disk use.

**Table 1-20.** Virtual Disk Metrics for Virtual Machines

| <b>Metric Key</b>                    | <b>Metric Name</b>  | <b>Description</b>                     |
|--------------------------------------|---------------------|--|
| virtualDisk usage                    | Usage               | Average CPU usage as a percentage.     |
| virtualDisk totalLatency             | Total Latency       | Total latency.                         |
| virtualDisk commandsAveraged_average | Commands Per Second | Average number of commands per second. |

**Table 1-20.** Virtual Disk Metrics for Virtual Machines (Continued)

| <b>Metric Key</b>                       | <b>Metric Name</b>           | <b>Description</b>  |
|---|------------------------------|---|
| virtualDisk numberReadAveraged_average  | Read Requests                | Average number of read commands issued per second to the virtual disk during the collection interval.               |
| virtualDisk numberWriteAveraged_average | Write Requests               | Average number of write commands issued per second to the virtual disk during the collection interval.              |
| virtualDisk read_average                | Read Rate (KBps)             | Rate of reading data from the virtual disk in kilobytes per second.   |
| virtualDisk totalReadLatency_average    | Read Latency (ms)            | Average amount of time for a read operation from the virtual disk. Total latency = kernel latency + device latency. |
| virtualDisk totalWriteLatency_average   | Write Latency (ms)           | Average amount of time for a write operation to the virtual disk. Total latency = kernel latency + device latency.  |
| virtualDisk write_average               | Write Rate (KBps)            | Rate of writing data from the virtual disk in kilobytes per second.   |
| virtualDisk busResets_summation         | Bus Resets                   | The number of bus resets in the performance interval.   |
| virtualDisk commandsAborted_summation   | Commands Aborted             | The number of disk commands aborted in the performance interval.  |
| virtualDisk readLoadMetric_latest       | Read Load                    | Storage DRS virtual disk metric read load.  |
| virtualDisk readOIO_latest              | Outstanding Read Requests    | Average number of outstanding read requests to the virtual disk.  |
| virtualDisk writeLoadMetric_latest      | Write Load                   | Storage DRS virtual disk write load.  |
| virtualDisk writeOIO_latest             | Outstanding Write Requests   | Average number of outstanding write requests to the virtual disk.   |
| virtualDisk smallSeeks_latest           | Number of Small Seeks        | Small Seeks.  |
| virtualDisk mediumSeeks_latest          | Number of Medium Seeks       | Medium Seeks.   |
| virtualDisk largeSeeks_latest           | Number of Large Seeks        | Large Seeks.  |
| virtualDisk readLatencyUS_latest        | Read Latency (microseconds)  | Read Latency in microseconds.   |
| virtualDisk writeLatencyUS_latest       | Write Latency (microseconds) | Write Latency in microseconds.  |
| virtualDisk readIOSize_latest           | Average Read request size    | Read IO size.   |
| virtualDisk writeIOSize_latest          | Average Write request size   | Write IO size.  |

## Guest File System Metrics for Virtual Machines

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

**Table 1-21.** Guest File System Metrics for Virtual Machines

| <b>Metric Key</b>          | <b>Metric Name</b>              | <b>Description</b>                                  |
|----------------------------|---------------------------------|---|
| guestfilesystem capacity   | Guest File System Capacity (MB) | Total capacity on guest file system in megabytes.   |
| guestfilesystem freespace  | Guest File System Free (MB)     | Total free space on guest file system in megabytes. |
| guestfilesystem percentage | Guest File System Usage (%)     | Percent guest file system.                          |

**Table 1-21.** Guest File System Metrics for Virtual Machines (Continued)

| Metric Key                       | Metric Name                          | Description                            |
|----------------------------------|--------------------------------------|--|
| guestfilesystem usage            | Guest File System Usage              | Total usage of guest file system.      |
| guestfilesystem freespace_total  | Total Guest File System Free (GB)    | Total free space on guest file system. |
| guestfilesystem capacity_total   | Total Guest File System Capacity(GB) | Total capacity on guest file system.   |
| guestfilesystem percentage_total | Total Guest File System Usage (%)    | Guest file system space utilization.   |
| guestfilesystem usage_total      | Total Guest File System Usage        | Total usage of guest file system.      |

## Network Metrics for Virtual Machines

Network metrics provide information about network performance.

**Table 1-22.** Network Metrics for Virtual Machines

| Metric Key                | Metric Name                         | Description  |
|---------------------------|-------------------------------------|--|
| net demand                | Demand (%)                          | Percent demand.  |
| 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. |
| net packetsRxPerSec       | Packets Received per second         | Number of packets received in the performance interval.  |
| net packetsTxPerSec       | Packets Transmitted per second      | Number of packets transmitted in the performance interval.   |
| net transmitted_average   | Data Transmit Rate (KBps)           | Average amount of data transmitted in kilobytes per second.  |
| net received_average      | Data Receive Rate (KBps)            | Average amount of data received per second.  |
| net PacketsPerSec         | Packets per second                  | Number of packets transmitted and received per second.   |
| net usage_capacity        | I/O Usage Capacity                  | IO use capacity.   |
| net maxObserved_KBps      | Max Observed Throughput (KBps)      | Maximum observed throughput in kilobytes per second.   |
| 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 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 droppedPct            | Packets Dropped (%)                 | Percentage of packets dropped.   |
| net dropped               | Packets Dropped                     | Number of packets dropped in the performance interval.   |
| net broadcastTx_summation | Broadcast Packets Transmitted       | Number of broadcast packets transmitted during the sampling interval.                                  |

**Table 1-22.** Network Metrics for Virtual Machines (Continued)

| <b>Metric Key</b>            | <b>Metric Name</b>                             | <b>Description</b>  |
|------------------------------|--|---|
| net broadcastRx_summation    | Broadcast Packets Received                     | Number of broadcast packets received during the sampling interval.                          |
| net bytesRx_average          | bytes Rx (KBps)                                | Average amount of data received per second.   |
| net bytesTx_average          | bytes Tx (KBps)                                | Average amount of data transmitted per second.  |
| net multicastRx_summation    | Multicast Packets Received                     | Number of multicast packets received.   |
| net multicastTx_summation    | Multicast Packets Transmitted                  | Number of multicast packets transmitted.  |
| net host_transmitted_average | VM to Host Data Transmit Rate                  | Average amount of data transmitted per second between VM and host.                          |
| net host_received_average    | VM to Host Data Receive Rate                   | Average amount of data received per second between VM and host.                             |
| net host_usage_average       | VM to Host Usage Rate                          | The sum of the data transmitted and received for all the NIC instances between VM and host. |
| net host_maxObserved_Tx_KBps | VM to Host Max Observed Transmitted Throughput | Max observed transmitted rate of network throughput between VM and host.                    |
| net host_maxObserved_Rx_KBps | VM to Host Max Observed Received Throughput    | Max observed received rate of network throughput between VM and host.                       |
| net host_maxObserved_KBps    | VM to Host Max Observed Throughput             | Max observed rate of network throughput between VM and host.                                |
| net transmit_demand_average  | Data Transmit Demand Rate                      | Data transmitted demand rate.   |
| net receive_demand_average   | Data Receive Demand Rate                       | Data received demand rate.  |

## 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.

**Table 1-23.** System Metrics for Virtual Machines

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

## Power Metrics for Virtual Machines

Power metrics provide information about power use.



**Table 1-24.** Power Metrics for Virtual Machines

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

## Disk Space Metrics for Virtual Machines

Disk space metrics provide information about disk space use.

**Table 1-25.** Disk Space Metrics for Virtual Machines

| Metric Key                  | Metric Name                  | Description  |
|-----------------------------|------------------------------|--|
| diskspace notshared         | Not Shared (GB)              | Unshared space in kilobytes.   |
| diskspace numvmdisk         | Number of Virtual Disks      | Number of virtual disks.   |
| diskspace provisioned       | Provisioned Space (GB)       | Provisioned space in gigabytes.  |
| diskspace provisionedSpace  | Provisioned Space for VM     | Provisioned space for VM.  |
| diskspace shared            | Shared Used (GB)             | Shared used space in gigabytes.  |
| diskspace snapshot          | Snapshot Space (GB)          | Space used by snapshots.   |
| diskspace diskused          | Virtual Disk Used (GB)       | Space used by virtual disks in gigabytes.                              |
| diskspace used              | Virtual machine used (GB)    | Space used by virtual machine files 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 activeNotShared   | Active not shared            | Unshared disk space used by VMs excluding snapshot.                    |

## Storage Metrics for Virtual Machines

Storage metrics provide information about storage use.

**Table 1-26.** Storage Metrics for Virtual Machines

| Metric Key                         | Metric Name           | Description   |
|------------------------------------|-----------------------|---|
| storage commandsAveraged_average   | Commands per second   | Average number of commands issued per second during the collection interval.      |
| storage contention                 | Contention percentage | Percent contention.   |
| storage demandKBps                 | Demand (KBps)         | Demand in kilobytes per second.   |
| storage totalReadLatency_average   | Read Latency (ms)     | Average amount of time for a read operation.                                      |
| storage read_average               | Read Rate (KBps)      | Read throughput rate in kilobytes per second.                                     |
| storage numberReadAveraged_average | Reads per second      | Average number of read commands issued per second during the collection interval. |
| storage totalLatency_average       | Total Latency (ms)    | Total latency in milliseconds.  |
| storage usage_average              | Total Usage (KBps)    | Total throughput rate in kilobytes per second.                                    |
| storage totalWriteLatency_average  | Write Latency (ms)    | Average amount of time for a write operation.                                     |

**Table 1-26.** Storage Metrics for Virtual Machines (Continued)

| Metric Key                          | Metric Name       | Description  |
|-------------------------------------|-------------------|--|
| storage write_average               | Write Rate (KBps) | Write throughput rate in kilobytes per second.                                     |
| storage numberWriteAveraged_average | Writes per second | Average number of write commands issued per second during the collection interval. |

## Summary Metrics for Virtual Machines

Summary metrics provide information about overall performance.

**Table 1-27.** Summary Metrics for Virtual Machines

| Metric Key                 | Metric Name            | Description                         |
|----------------------------|------------------------|-------------------------------------|
| summary workload_indicator | Workload Indicator (%) | Percent workload indicator.         |
| summary cpu_shares         | CPU Shares             | CPU shares.                         |
| summary mem_shares         | Memory Shares          | Memory shares.                      |
| summary number_datastore   | Number of Datastores   | Number of datastores.               |
| summary number_network     | Number of Networks     | Number of networks.                 |
| summary running            | Running                | Number of running virtual machines. |
| summary desktop_status     | Desktop Status         | Horizon View 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,”](#) on page 63.

## vFlash Module Metrics for Host Systems

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

**Table 1-28.** vFlash Module Metrics for Host Systems

| Metric Key                         | Metric Name                      | Description                       |
|------------------------------------|----------------------------------|-----------------------------------|
| vflashModule numActiveVMDKs_latest | Latest Number of Active VM Disks | Latest Number of Active VM Disks. |

## Configuration Metrics for Host Systems

Configuration metrics provide information about host system configuration.

**Table 1-29.** Configuration Metrics for Host Systems

| Metric Key  | Metric Name    | Description     |
|---|----------------|-----------------|
| configuration dasConfig admissionControlPolicy failoverHost | Failover Hosts | Failover Hosts. |

## Hardware Metrics for Host Systems

Hardware metrics provide information about host system hardware.

**Table 1-30.** Hardware Metrics for Host Systems

| Metric Key                    | Metric Name    | Description                |
|-------------------------------|----------------|----------------------------|
| hardware cpuinfo num_CpuCores | Number of CPUs | Number of CPUs for a host. |

## CPU Usage Metrics for Host Systems

CPU usage metrics provide information about CPU use.

**Table 1-31.** CPU Metrics for Host Systems

| Metric Key                    | Metric Name                 | Description  |
|-------------------------------|-----------------------------|--|
| cpu capacity_usagepct_average | Capacity Usage (%)          | Percent CPU capacity used.   |
| cpu usage_average             | Usage (%)                   | Average CPU usage as a percentage.   |
| cpu capacity_contentionPct    | CPU Contention (%)          | Percent of time the virtual machine is unable to run because it is contending for access to the physical CPU(s).   |
| cpu demandPct                 | Demand (%)                  | The amount of CPU resources a virtual machine would use if there were no CPU contention or CPU limit.  |
| cpu demandmhz                 | Demand (MHz)                | CPU demand in megahertz.   |
| 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)  | Capacity in MHz of the physical CPU cores.   |
| cpu corecount_provisioned     | Provisioned virtual CPUs    | Provisioned virtual CPUs.  |
| cpu wait                      | Total Wait                  | CPU time spent in idle state.  |
| cpu demand_average            | Demand                      | CPU demand.  |
| cpu used_summation            | 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. |
| cpu usagemhz_average          | Usage (MHz)                 | CPU use in megahertz.  |
| cpu reservedCapacity_average  | Reserved Capacity (MHz)     | The sum of the reservation properties of the (immediate) children of the host's root resource pool.  |
| cpu totalCapacity_average     | Total Capacity (MHz)        | Total CPU capacity in megahertz.   |
| cpu idle_summation            | Idle (ms)                   | CPU idle time in milliseconds.   |
| cpu overhead_average          | Overhead (KB)               | Amount of CPU overhead.  |
| cpu demand_without_overhead   | Demand without overhead     | Value of demand excluding any overhead.  |
| cpu coreUtilization_average   | Core Utilization (%)        | Percent core utilization.  |
| cpu utilization_average       | Utilization(%)              | Percent CPU utilization.   |
| cpu coreUtilization_average   | Core Utilization (%)        | Core Utilization.  |
| cpu utilization_average       | Utilization (%)             | Utilization.   |

**Table 1-31.** CPU Metrics for Host Systems (Continued)

| Metric Key                                     | Metric Name                               | Description  |
|--|---|--|
| cpu costop_summation                           | Co-stop (ms)                              | Time the VM is ready to run, but is unable to due to co-scheduling constraints.                      |
| cpu latency_average                            | Latency (%)                               | Percentage of time the VM is unable to run because it is contending for access to the physical CPUs. |
| cpu ready_summation                            | Ready (ms)                                | Time spent in ready state.   |
| cpu run_summation                              | Run (ms)                                  | Time the virtual machine is scheduled to run.  |
| cpu swapwait_summation                         | Swap wait (ms)                            | Amount of time waiting for swap space.   |
| cpu wait_summation                             | Wait (ms)                                 | Total CPU time spent in wait state.  |
| cpu vm_capacity_provisioned                    | Provisioned Capacity                      | Provisioned capacity (MHz).  |
| cpu acvmWorkloadDisparityPcttive_longterm_load | Active Host Load For Balance (Long Term)  | Active Host Load For Balance (Long Term).  |
| cpu active_shortterm_load                      | Active Host Load For Balance (Short Term) | Active Host Load For Balance (Short Term).   |

## CPU Utilization for Resources Metrics for Host Systems

CPU utilization for resources metrics provide information about CPU activity.

**Table 1-32.** CPU Utilization for Resources Metrics for Host Systems

| Metric Key   | Metric Name                           | Description  |
|--|---------------------------------------|--|
| rescpu actav1_latest<br>rescpu actav5_latest<br>rescpu actav15_latest<br>rescpu actpk1_latest<br>rescpu actpk5_latest<br>rescpu actpk15_latest | 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.        |
| rescpu runav1_latest<br>rescpu runav5_latest<br>rescpu runav15_latest<br>rescpu runpk1_latest<br>rescpu runpk5_latest<br>rescpu runpk15_latest | 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. |
| rescpu maxLimited1_latest<br>rescpu maxLimited5_latest<br>rescpu maxLimited15_latest   | CPU Throttled (%) ( <i>interval</i> ) | Scheduling limit over the past minute, past five minutes, and past 15 minutes  |
| rescpu sampleCount_latest  | Group CPU Sample Count                | Group CPU sample count.  |
| rescpu samplePeriod_latest   | Group CPU Sample Period (ms)          | Group CPU sample period in milliseconds.   |

## Datastore Metrics for Host Systems

Datastore metrics provide information about datastore use.

**Table 1-33.** Datastore Metrics for Host Systems

| <b>Metric Key</b>                                | <b>Metric Name</b>                               | <b>Notes</b>  |
|--|--|---|
| datastore demand_oio                             | Outstanding IO requests                          | OIO for datastore.  |
| 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 commandsAveraged_average               | Commands Averaged                                | Average number of commands issued per second during the collection interval.  |
| datastore oio                                    | Number of Outstanding IO Operations              | Number of outstanding IO operations.  |
| datastore totalLatency_average                   | 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. |
| datastore usage_average                          | Usage Average (KBps)                             | Usage Average (KBps).   |
| datastore demand                                 | Demand   | Demand.   |
| datastore datastorelops_average                  | Storage I/O Control aggregated IOPS              | Aggregate number of IO operations on the 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 (KBps)                                 | Rate of reading data from the datastore in kilobytes per second.  |
| datastore sizeNormalizedDatastoreLatency_average | Storage I/O Control normalized latency (ms)      | Normalized latency in microseconds on the datastore. Data for all virtual machines is combined.   |
| datastore totalReadLatency_average               | Read Latency (ms)                                | Average amount of time for a read operation from the datastore. Total latency = kernel latency + device latency.  |
| datastore totalWriteLatency_average              | Write Latency (ms)                               | Average amount of time for a write operation to the datastore. Total latency = kernel latency + device latency.   |
| datastore write_average                          | Write Rate (KBps)                                | Rate of writing data to the datastore in kilobytes per second.  |
| datastore datastoreMaxQueueDepth_latest          | Max Queue Depth                                  | Max Queue Depth.  |
| datastore maxTotalLatency_latest                 | Highest Latency                                  | Highest Latency.  |

**Table 1-33.** Datastore Metrics for Host Systems (Continued)

| <b>Metric Key</b>                            | <b>Metric Name</b>                                 | <b>Notes</b>  |
|--|--|---|
| datastore totalLatency_max                   | Total Latency Max                                  | Total Latency Max (ms).   |
| datastore datastoreNormalReadLatency_latest  | Read Latency                                       | Read Latency.   |
| datastore datastoreNormalWriteLatency_latest | Write Latency                                      | Write Latency.  |
| datastore datastoreReadBytes_latest          | Data Read  | Data Read.  |
| datastore datastoreReadIops_latest           | Data Read Rate                                     | Data Rate.  |
| datastore datastoreReadLoadMetric_latest     | Read Load  | Storage DRS metric read load.                                     |
| datastore datastoreReadOIO_latest            | Outstanding Read Requests                          | Outstanding Read Requests.  |
| datastore datastoreWriteBytes_latest         | Data Written                                       | Data Written.   |
| datastore datastoreWriteIops_latest          | Data Write Rate                                    | Data Write Rate.  |
| datastore datastoreWriteLoadMetric_latest    | Write Load   | Storage DRS metric write load.                                    |
| datastore datastoreWriteOIO_latest           | Outstanding Write Requests                         | Outstanding Write Requests.                                       |
| datastore vmPopulationAvgWorkload            | Average Observed Virtual Machine Disk I/O Workload | Average Observed Virtual Machine Disk I/O Workload on the Host.   |
| datastore vmPopulationMaxWorkload            | Maximum Observed VM Disk I/O Workload              | Maximum Observed VM Disk I/O Workload on the Host.                |
| datastore vmWorkloadDisparityPct             | VM Disk I/O Workload Disparity                     | Percentage Disk I/O workload disparity among the VMs on the Host. |

## Disk Metrics for Host Systems

Disk metrics provide information about disk use.

**Table 1-34.** Disk Metrics for Host Systems

| <b>Metric Key</b>                | <b>Metric Name</b>        | <b>Description</b>  |
|----------------------------------|---------------------------|---|
| 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 usage_capacity              | I/O Usage Capacity        | I/O Usage Capacity.   |
| disk commandsAveraged_average    | Commands per second       | Average number of commands issued per second during the collection interval.  |
| disk totalLatency_average        | 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. |
| disk numberReadAveraged_average  | Reads per second          | Average number of read commands issued per second during the collection interval.   |
| disk numberWriteAveraged_average | Writes per second         | Average number of write commands issued per second during the collection interval.  |

**Table 1-34.** Disk Metrics for Host Systems (Continued)

| <b>Metric Key</b>               | <b>Metric Name</b>                   | <b>Description</b>  |
|---------------------------------|--------------------------------------|---|
| disk numberRead_summation       | Read Requests                        | Number of times data was read from the disk in the defined interval.  |
| disk numberWrite_summation      | Write Requests                       | Number of times data was written to the disk in the defined interval.   |
| disk read_average               | Read Rate                            | Amount of data read in the performance interval.  |
| disk write_average              | Write Rate                           | Amount of data written to disk in the performance interval.   |
| disk busResets_summation        | Bus Resets                           | The number of bus resets in the performance interval.   |
| disk commands_summation         | Commands Issued                      | The number of disk commands issued in the performance interval.   |
| disk commandsAborted_summation  | Commands Aborted                     | The number of disk commands aborted in the performance interval.  |
| disk deviceReadLatency_average  | Physical Device Read Latency (ms)    | The average time taken to complete a read from the physical device.   |
| disk kernelReadLatency_average  | Kernel Disk Read Latency (ms)        | The average time spent in ESX Server VMKernel per read.   |
| disk totalReadLatency_average   | 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.    |
| disk queueReadLatency_average   | Queue Read Latency (ms)              | The average time spent in the ESX Server VMKernel queue per read.   |
| disk deviceWriteLatency_average | Physical Device Write Latency (ms)   | The average time taken to complete a write from the physical device.  |
| disk kernelWriteLatency_average | Kernel Disk Write Latency (ms)       | The average time spent in ESX Server VMKernel per write.  |
| disk totalWriteLatency_average  | 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. |
| disk queueWriteLatency_average  | Queue Write Latency (ms)             | The average time spent in the ESX Server VMKernel queue per write.  |
| disk deviceLatency_average      | Physical Device Command Latency (ms) | The average time taken to complete a command from the physical device.  |
| disk kernelLatency_average      | Kernel Disk Command Latency (ms)     | The average time spent in ESX Server VMKernel per command.  |
| disk queueLatency_average       | Queue Command Latency (ms)           | The average time spent in the ESX Server VMKernel queue per command.  |
| disk diskoio                    | Number of Outstanding IO Operations  | Number of Outstanding IO Operations.  |
| disk diskqueued                 | Queued Operations                    | Queued Operations.  |
| disk diskdemand                 | Demand                               | Demand.   |

**Table 1-34.** Disk Metrics for Host Systems (Continued)

| <b>Metric Key</b>                       | <b>Metric Name</b>                  | <b>Description</b>                                  |
|---|-------------------------------------|---|
| disk sum_queued_oio                     | Total Queued Outstanding operations | Sum of Queued Operation and Outstanding Operations. |
| disk max_observed                       | Max Observed OIO                    | Max Observed IO for a disk.                         |
| disk maxTotalLatency_latest             | Highest Latency                     | Highest Latency.                                    |
| disk maxQueueDepth_average              | Max Queue Depth                     | Maximum queue depth during the collection interval. |
| disk scsiReservationConflicts_summation | SCSI Reservation Conflicts          | SCSI Reservation Conflicts.                         |

## Memory Metrics for Host Systems

Memory metrics provide information about memory use and allocation.

**Table 1-35.** Memory Metrics for Host Systems

| <b>Metric Key</b>            | <b>Metric Name</b>                          | <b>Description</b>  |
|------------------------------|---|---|
| mem host_contentionPct       | Contention (%)                              | Percent host contention.  |
| mem host_contention          | Contention (KB)                             | Host contention in kilobytes.   |
| mem host_usage               | Host Usage (KB)                             | Machine usage in kilobytes.   |
| mem host_demand              | Machine Demand (KB)                         | Host demand in kilobytes.   |
| mem host_usageVM             | Overall Memory used to run VMs on Host (KB) | Overall memory used to run virtual machines on the host in kilobytes.   |
| mem host_provisioned         | Provisioned Memory (KB)                     | Provisioned memory in kilobytes.  |
| mem host_minfree             | Minimum Free Memory (KB)                    | Minimum free memory.  |
| mem reservedCapacityPct      | Reserved Capacity (%)                       | Percent reserved capacity.  |
| mem host_usable              | Usable Memory (KB)                          | Usable memory in kilobytes.   |
| mem host_usagePct            | Usage (%)                                   | Memory currently in use as a percentage of total available memory.      |
| mem host_systemUsage         | ESX System Usage                            | Memory usage by the VMkernel and ESX user-level services.               |
| mem active_average           | Guest Active (KB)                           | Amount of memory that is actively used.                                 |
| mem consumed_average         | Consumed (KB)                               | Amount of host memory consumed by the virtual machine for guest memory. |
| mem granted_average          | Granted (KB)                                | Amount of memory available for use.                                     |
| mem heap_average             | Heap (KB)                                   | Amount of memory allocated for heap.                                    |
| mem heapfree_average         | Heap Free (KB)                              | Amount of free space in the heap.                                       |
| mem overhead_average         | VM Overhead (KB)                            | Memory overhead reported by host.                                       |
| mem reservedCapacity_average | Reserved Capacity (KB)                      | Reserved capacity in kilobytes.   |
| mem shared_average           | Shared (KB)                                 | Amount of shared memory in kilobytes.                                   |



**Table 1-35.** Memory Metrics for Host Systems (Continued)

| <b>Metric Key</b>               | <b>Metric Name</b>           | <b>Description</b>  |
|---------------------------------|------------------------------|---|
| mem sharedcommon_average        | Shared Common (KB)           | Amount of shared common memory in kilobytes.  |
| mem swapin_average              | Swap In (KB)                 | Amount of memory swapped in.  |
| mem swapout_average             | Swap Out (KB)                | Amount of memory swapped out.   |
| mem swapped_average             | Swap Used (KB)               | Amount of memory used for swapped space in kilobytes.   |
| mem sysUsage_average            | VM kernel Usage (KB)         | Amount of memory used by the VM kernel.   |
| mem unreserved_average          | Unreserved (KB)              | Amount of unreserved memory in kilobytes.   |
| mem vmmemctl_average            | Balloon (KB)                 | Amount of memory currently used by the virtual machine memory control.  |
| mem zero_average                | Zero (KB)                    | Amount of memory that is all zero.  |
| mem state_latest                | State (0-3)                  | Overall state of the memory. The value is an integer between 0 (high) and 3 (low).                                    |
| mem host_usage                  | Usage (KB)                   | Host memory use in kilobytes.   |
| mem usage_average               | Usage (%)                    | Memory currently in use as a percentage of total available memory.  |
| mem swapinRate_average          | Swap In Rate (KBps)          | Rate at which memory is swapped from disk into active memory during the interval in kilobyte per second.              |
| mem swapoutRate_average         | Swap Out Rate (KBps)         | Rate at which memory is being swapped from active memory to disk during the current interval in kilobytes per second. |
| mem activewrite_average         | Active Write (KB)            | Average active writes in kilobytes.   |
| mem compressed_average          | Compressed (KB)              | Average memory compression in kilobytes.  |
| mem compressionRate_average     | Compression Rate (KBps)      | Average compression rate in kilobytes per second.   |
| mem decompressionRate_average   | Decompression Rate (KBps)    | Decompression rate in kilobytes per second.   |
| mem totalCapacity_average       | Total Capacity (KB)          | Total capacity in kilobytes.  |
| mem latency_average             | Latency                      | Percentage of time the VM is waiting to access swapped or compressed memory.  |
| mem capacity.contention_average | Capacity Contention          | Capacity Contention.  |
| mem llSwapInRate_average        | Swap In Rate from Host Cache | Rate at which memory is being swapped from host cache into active memory.   |
| mem llSwapIn_average            | Swap In from Host Cache      | Amount of memory swapped-in from host cache.  |
| mem llSwapOutRate_average       | Swap Out Rate to Host Cache  | Rate at which memory is being swapped to host cache from active memory.   |

**Table 1-35.** Memory Metrics for Host Systems (Continued)

| <b>Metric Key</b>            | <b>Metric Name</b>                        | <b>Description</b>  |
|------------------------------|---|---|
| mem llSwapOut_average        | Swap Out to Host Cache                    | Amount of memory swapped-out to host cache.   |
| mem llSwapUsed_average       | Swap Space Used in Host Cache             | Space used for caching swapped pages in the host cache.   |
| mem lowfreethreshold_average | Low Free Threshold                        | Threshold of free host physical memory below which ESX will begin reclaiming memory from VMs through ballooning and swapping. |
| mem vmWorkloadDisparityPct   | VM Memory Workload Disparity              | Percentage Memory workload disparity among the VMs on the Host.   |
| mem active_longterm_load     | Active Host Load For Balance (Long Term)  | Active Host Load For Balance (Long Term).   |
| mem active_shortterm_load    | Active Host Load For Balance (Short Term) | Active Host Load For Balance (Short Term).  |

## Network Metrics for Host Systems

Network metrics provide information about network performance.

**Table 1-36.** Network Metrics for Host Systems

| <b>Metric Key</b>       | <b>Metric Name</b>                  | <b>Description</b>   |
|-------------------------|-------------------------------------|--|
| net packetsRxPerSec     | Packets Received per second         | Number of packets received in the performance interval.  |
| net packetsTxPerSec     | Packets Transmitted per second      | Number of packets transmitted in the performance interval.   |
| net packetsPerSec       | Packets per second                  | Number of packets transmitted and 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. |
| net usage_capacity      | I/O Usage Capacity                  | I/O Usage Capacity.  |
| 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 demand              | Demand (%)                          | Percent demand.  |
| 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.  |
| 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.   |

**Table 1-36.** Network Metrics for Host Systems (Continued)

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

## System Metrics for Host Systems

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

**Table 1-37.** System Metrics for Host Systems

| <b>Metric Key</b>            | <b>Metric Name</b>       | <b>Description</b>  |
|------------------------------|--------------------------|---|
| sys poweredOn                | 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. |
| sys uptime_latest            | Uptime (seconds)         | Number of seconds since the last system startup.  |
| sys diskUsage_latest         | Disk Usage (%)           | Percent disk use.   |
| sys resourceCpuUsage_average | Resource CPU Usage (MHz) | Amount of CPU that the Service Console and other applications use.  |

**Table 1-37.** System Metrics for Host Systems (Continued)

| <b>Metric Key</b>                 | <b>Metric Name</b>                            | <b>Description</b>   |
|-----------------------------------|---|--|
| sys resourceCpuAct1_latest        | Resource CPU Active (1 min. average)          | Percentage of resource CPU that is active. Average value during a one-minute period.                         |
| sys resourceCpuAct5_latest        | Resource CPU Active (%) (5 min. average)      | Percentage of resource CPU that is active. Average value during a five-minute period.                        |
| sys resourceCpuAllocMax_latest    | Resource CPU Alloc Max (MHz)                  | Maximum resource CPU allocation in megahertz.  |
| sys resourceCpuAllocMin_latest    | Resource CPU Alloc Min (MHz)                  | Minimum resource CPU allocation in megahertz.  |
| sys resourceCpuAllocShares_latest | Resource CPU Alloc Shares                     | Number of resource CPU allocation shares.  |
| sys resourceCpuMaxLimited1_latest | 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.     |
| sys resourceCpuMaxLimited5_latest | 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. |
| sys resourceCpuRun1_latest        | Resource CPU Run1 (%)                         | Percent resource CPU for Run1.   |
| sys resourceCpuRun5_latest        | Resource CPU Run5 (%)                         | Percent resource CPU for Run5.   |
| sys resourceMemAllocMax_latest    | Resource Memory Alloc Max (KB)                | Maximum resource memory allocation in kilobytes.   |
| sys resourceMemAllocMin_latest    | Resource Memory Alloc Min (KB)                | Minimum resource memory allocation in kilobytes.   |
| sys resourceMemAllocShares_latest | Resource Memory Alloc Shares                  | Number of resource memory shares allocated.  |
| sys resourceMemCow_latest         | Resource Memory Cow (KB)                      | Cow resource memory in kilobytes.  |
| sys resourceMemMapped_latest      | Resource Memory Mapped (KB)                   | Mapped resource memory in kilobytes.   |
| sys resourceMemOverhead_latest    | Resource Memory Overhead (KB)                 | Resource memory overhead in kilobytes.   |
| sys resourceMemShared_latest      | Resource Memory Shared (KB)                   | Shared resource memory in kilobytes.   |
| sys resourceMemSwapped_latest     | Resource Memory Swapped (KB)                  | Swapped resource memory in kilobytes.  |
| sys resourceMemTouched_latest     | Resource Memory Touched (KB)                  | Touched resource memory in kilobytes.  |
| sys resourceMemZero_latest        | Resource Memory Zero (KB)                     | Zero resource memory in kilobytes.   |
| sys resourceMemConsumed_latest    | Resource Memory Consumed                      | Resource Memory Consumed Latest (KB).  |
| sys resourceFdUsage_latest        | Resource File descriptors usage               | Resource File descriptors usage (KB).  |
| sys vmotionEnabled                | vMotion Enabled                               | 1 if vMotion is enabled or 0 if vMotion is not enabled.  |
| sys notInMaintenance              | Not in Maintenance                            | Not in maintenance.  |

## Management Agent Metrics for Host Systems

Management agent metrics provide information about memory use.

**Table 1-38.** Management Agent Metrics for Host Systems

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

## Storage Path Metrics for Host Systems

Storage path metrics provide information about data storage use.

**Table 1-39.** Storage Adapter Metrics for Host Systems

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

## Storage Adapter Metrics for Host Systems

Storage adapter metrics provide information about data storage use.

**Table 1-40.** Storage Adapter Metrics for Host Systems

| <b>Metric Key</b>                          | <b>Metric Name</b>         | <b>Description</b>  |
|--|----------------------------|---|
| storageAdapter usage                       | Total Usage (KBps)         | Total latency.  |
| storageAdapter portWWN                     | Port WWN                   | Port World Wide Name.   |
| storageAdapter commandsAveraged_average    | Commands per second        | Average number of commands issued per second by the storage adapter during the collection interval.                                 |
| storageAdapter numberReadAveraged_average  | Reads per second           | Average number of read commands issued per second by the storage adapter during the collection interval.                            |
| storageAdapter numberWriteAveraged_average | Writes per second          | Average number of write commands issued per second by the storage adapter during the collection interval.                           |
| storageAdapter read_average                | Read Rate (KBps)           | Rate of reading data by the storage adapter.  |
| storageAdapter totalReadLatency_average    | Read Latency (ms)          | Average amount of time for a read operation by the storage adapter. Total latency is the sum of kernel latency and device latency.  |
| storageAdapter totalWriteLatency_average   | Write Latency (ms)         | Average amount of time for a write operation by the storage adapter. Total latency is the sum of kernel latency and device latency. |
| storageAdapter write_average               | Write Rate (KBps)          | Rate of writing data by the storage adapter.  |
| storageAdapter demand                      | Demand                     | Demand.   |
| storageAdapter maxTotalLatency_latest      | Highest Latency            | Highest Latency.  |
| storageAdapter outstandingIOs_average      | Outstanding Requests       | Outstanding Requests.   |
| storageAdapter queueDepth_average          | Queue Depth                | Queue Depth.  |
| storageAdapter queueLatency_average        | Queue Command Latency (ms) | The average time spent in the ESX Server VM Kernel queue per command.   |
| storageAdapter queued_average              | Queued                     | Queued.   |

## Storage Metrics for Host Systems

Storage metrics provide information about storage use.

**Table 1-41.** Storage Metrics for Host Systems

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

**Table 1-41.** Storage Metrics for Host Systems (Continued)

| Metric Key                          | Metric Name       | Description  |
|-------------------------------------|-------------------|--|
| storage write_average               | Write Rate (KBps) | Write throughput rate in kilobytes per second.                                     |
| storage numberWriteAveraged_average | Writes per second | Average number of write commands issued per second during the collection interval. |

## Sensor Metrics for Host Systems

Sensor metrics provide information about host system cooling.

**Table 1-42.** Fan Metrics for Host Systems

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

## Power Metrics for Host Systems

Power metrics provide information about host system power use.

**Table 1-43.** Power Metrics for Host Systems

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

## Disk Space Metrics for Host Systems

Disk space metrics provide information about disk space use.

**Table 1-44.** Disk Space Metrics for Host Systems

| Metric Key                  | Metric Name                  | Description   |
|-----------------------------|------------------------------|---|
| diskspace notshared         | Not Shared (GB)              | Unshared disk space in gigabytes.                                       |
| diskspace numvmdisk         | Number of Virtual Disks      | Number of virtual disks.  |
| diskspace shared            | Shared Used (GB)             | Used shared disk space in gigabytes.                                    |
| diskspace snapshot          | Snapshot Space (GB)          | Disk space used by snapshots in gigabytes.                              |
| diskspace diskused          | Virtual Disk Used (GB)       | Disk space used by virtual disks in gigabytes.                          |
| diskspace used              | Virtual machine used (GB)    | Disk space used by virtual machines 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 . |

## Summary Metrics for Host Systems

Summary metrics provide information about overall host system performance.

**Table 1-45.** Summary Metrics for Host Systems

| 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 number_vmotion          | Number of vMotions                | Number of vMotions.  |
| 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 total_number_vms        | Total Number of VMs               | Total number of virtual machines.                              |
| summary workload_indicator      | Workload Indicator (%)            | Percent workload indicator.                                    |

## HBR Metrics for Host Systems

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

**Table 1-46.** HBR Metrics for Host Systems

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

## 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,”](#) on page 63
- [“Badge Metrics,”](#) on page 66

## Configuration Metrics for Cluster Compute Resources

Configuration metrics provide information about configuration settings.

**Table 1-47.** Configuration Metrics for Cluster Compute Resources

| Metric Key  | Metric Name                     | Description  |
|---|---------------------------------|--|
| configuration dasconfig failoverLevel                     | Failover Level                  | DAS configuration failover level.                  |
| configuration dasconfig activeAdministrationControlPolicy | Active Admission Control Policy | DAS configuration active admission control policy. |



**Table 1-47.** Configuration Metrics for Cluster Compute Resources (Continued)

| Metric Key  | Metric Name                       | Description   |
|---|-----------------------------------|---|
| configuration dasconfig admissionControlPolicy cpuFailoverResourcesPercent    | CPU Failover Resources Percent    | Percent CPU failover resources for DAS configuration admission control policy.    |
| configuration dasconfig admissionControlPolicy memoryFailoverResourcesPercent | Memory Failover Resources Percent | Percent memory failover resources for DAS configuration admission control policy. |

## Storage Metrics for Cluster Compute Resources

Storage metrics provide information about storage use.

**Table 1-48.** Storage Metrics for Cluster Compute Resources

| Metric Key            | Metric Name | Description                                    |
|-----------------------|-------------|--|
| storage usage_average | Total Usage | Total throughput rate in kilobytes per second. |

## Disk Space Metrics for Cluster Compute Resources

Disk space metrics provide information about disk space use.

**Table 1-49.** Disk Space Metrics for Cluster Compute Resources

| Metric Key                  | Metric Name                  | Description  |
|-----------------------------|------------------------------|--|
| diskspace used              | Virtual machine used (GB)    | Space used by virtual machine files 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 diskused          | Virtual Disk Used (GB)       | Space used by virtual disks in gigabytes.                              |
| diskspace snapshot          | Snapshot Space (GB)          | Space used by snapshots in gigabytes.                                  |
| diskspace shared            | Shared Used (GB)             | Shared used space in gigabytes.  |
| diskspace notshared         | Not Shared (GB)              | Space used by VMs that is not shared.                                  |

## CPU Usage Metrics for Cluster Compute Resources

CPU usage metrics provide information about CPU use.

**Table 1-50.** CPU Usage Metrics for Cluster Compute Resources

| 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.                  |
| cpu demandmhz                 | Demand                 | Demand in megahertz.                    |
| cpu iowait                    | IO Wait                | IO wait time in milliseconds.           |
| cpu numpackages               | Number of CPU Sockets  | Number of CPU sockets.                  |
| cpu capacity_contention       | Overall CPU Contention | Overall CPU contention in milliseconds. |

**Table 1-50.** CPU Usage Metrics for Cluster Compute Resources (Continued)

| <b>Metric Key</b>               | <b>Metric Name</b>                 | <b>Description</b>   |
|---------------------------------|------------------------------------|--|
| cpu capacity_provisioned        | Host Provisioned Capacity          | Provisioned CPU capacity in megahertz.   |
| cpu corecount_provisioned       | Provisioned vCPUs                  | Number of provisioned CPU cores.   |
| cpu reservedCapacity_average    | Reserved Capacity                  | The sum of the reservation properties of the (immediate) children of the host's root resource pool in megahertz. |
| cpu wait                        | Wait                               | CPU time spent on idle state in milliseconds.  |
| cpu usagemhz_average            | Usage (MHz)                        | Average CPU use in megahertz.  |
| cpu totalCapacity_average       | Total Capacity                     | Total CPU capacity in megahertz.   |
| cpu demand_average              | Demand                             | CPU Demand.  |
| cpu overhead_average            | Overhead                           | Amount of CPU overhead.  |
| cpu demand_without_overhead     | Demand without overhead            | Value of demand excluding any overhead.  |
| cpu vm_capacity_provisioned     | Provisioned Capacity               | Provisioned Capacity (MHz).  |
| 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    | 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 Cluster Compute Resources

Disk metrics provide information about disk use.

**Table 1-51.** Disk Metrics for Cluster Compute Resources

| <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 Command Latency and Physical Device Command Latency metrics. |
| disk totalReadLatency_average   | 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.  |
| disk totalWriteLatency_average  | 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.   |
| disk numberRead_summation       | Read Rate (KBps)          | Number of times data was read from the disk in the defined interval.   |
| disk numberReadAveraged_average | Reads per second          | Average number of read commands issued per second during the collection interval.  |

**Table 1-51.** Disk Metrics for Cluster Compute Resources (Continued)

| <b>Metric Key</b>                | <b>Metric Name</b>                  | <b>Description</b>  |
|----------------------------------|-------------------------------------|---|
| 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 numberWrite_summation       | Write Rate (KBps)                   | Number of times data was written to disk during the collection interval.                                      |
| disk numberWriteAveraged_average | Writes per second                   | Average number of write commands issued per second during the collection interval.                            |
| disk read_average                | Read Requests                       | Amount of data read from the disk during the collection interval.   |
| disk write_average               | Write Requests                      | Amount of data written to the disk during the collection interval.  |
| disk commands_summation          | Commands Issued                     | Number of disk commands issued during the collection interval.  |
| disk sum_queued_oio              | Total Queued Outstanding operations | Sum of queued operation and outstanding operations.   |
| disk max_observed                | Max Observed OIO                    | Max observed outstanding IO for a disk.   |

## Memory Metrics for Cluster Compute Resources

Memory metrics provide information about memory use and allocation.

**Table 1-52.** Memory Metrics for Cluster Computer Resources

| <b>Metric Key</b>             | <b>Metric Name</b>        | <b>Description</b>  |
|-------------------------------|---------------------------|---|
| mem activewrite_average       | Active Write (KB)         | Active writes in kilobytes.   |
| mem compressed_average        | Compressed (KB)           | Average compression in kilobytes.                                       |
| mem compressionRate_average   | Compression Rate (KBps)   | Average compression rate in kilobytes.                                  |
| 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 host_contention           | Contention (KB)           | Contention in kilobytes.  |
| mem decompressionRate_average | Decompression Rate (KBps) | Decompression rate in kilobytes.  |
| mem granted_average           | Granted (KB)              | Amount of memory available for use.                                     |
| mem active_average            | Guest Active (KB)         | Amount of memory that is actively used.                                 |
| mem heap_average              | Heap (KB)                 | Amount of memory allocated for heap.                                    |
| mem heapfree_average          | Heap Free (KB)            | Free space in the heap.   |
| mem vmemctl_average           | Balloon                   | Amount of memory currently used by the virtual machine memory control.  |
| mem overhead_average          | VM Overhead (KB)          | Memory overhead reported by host.                                       |
| mem host_provisioned          | Provisioned Memory (KB)   | Provisioned memory in kilobytes.  |
| mem reservedCapacity_average  | Reserved Capacity (KB)    | Reserved capacity in kilobytes.   |
| mem shared_average            | Shared (KB)               | Amount of shared memory.  |
| mem sharedcommon_average      | Shared Common (KB)        | Amount of shared common memory.   |
| mem swapiin_average           | Swap In (KB)              | Amount of memory that is swapped in for the service console.            |

**Table 1-52.** Memory Metrics for Cluster Computer Resources (Continued)

| <b>Metric Key</b>               | <b>Metric Name</b>                 | <b>Description</b>  |
|---------------------------------|------------------------------------|---|
| mem swpinRate_average           | Swap In Rate (KBps)                | Rate at which memory is swapped from disk into active memory during the interval.               |
| mem swapout_average             | Swap Out (KB)                      | Amount of memory that is swapped out for the service console.                                   |
| mem swapoutRate_average         | Swap Out Rate (KBps)               | Rate at which memory is being swapped from active memory into disk during the current interval. |
| mem swapped_average             | Swap Used (KB)                     | Amount of memory used for swap space.   |
| mem totalCapacity_average       | Total Capacity (KB)                | Total capacity in kilobytes.  |
| mem unreserved_average          | Unreserved (KB)                    | Amount of unreserved memory.  |
| mem host_usable                 | Usable Memory (KB)                 | Usable memory in kilobytes.   |
| mem host_usagePct               | Usage/Usable                       | Percent memory used.  |
| mem host_usage                  | Host Usage (KB)                    | Memory use in kilobytes.  |
| mem host_demand                 | Machine Demand                     | Memory Machine Demand in KB.  |
| mem host_systemUsage            | ESX System Usage                   | Memory usage by the VMkernel and ESX user-level services.                                       |
| mem usage_average               | Usage                              | Memory currently in use as a percentage of total available memory.                              |
| mem sysUsage_average            | VM kernel Usage (KB)               | Amount of memory that the VM kernel uses.   |
| mem zero_average                | Zero (KB)                          | Amount of memory that is all 0.   |
| 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    | 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 Cluster Compute Resources

Network metrics provide information about network performance.

**Table 1-53.** Network Metrics for Cluster Compute Resources

| <b>Metric Key</b>       | <b>Metric Name</b>        | <b>Description</b>                                      |
|-------------------------|---------------------------|---|
| net received_average    | Data Receive Rate (KBps)  | Average amount of data received per second.             |
| net transmitted_average | Data Transmit Rate (KBps) | Average amount of data transmitted per second.          |
| net dropped             | Packets Dropped           | Number of packets dropped in the performance interval.  |
| net droppedPct          | Packets Dropped (%)       | Percentage of packets dropped.                          |
| net packetsRx_summation | Packets Received          | Number of packets received in the performance interval. |

**Table 1-53.** Network Metrics for Cluster Compute Resources (Continued)

| Metric Key              | Metric Name                         | Description  |
|-------------------------|-------------------------------------|--|
| 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 usage_average       | Usage Rate (KBps)                   | The sum of the data transmitted and received for all the NIC instances of the host or virtual machine. |
| 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.  |

## Datastore Metrics for Cluster Compute Resources

Datastore metrics provide information about Datastore use.

**Table 1-54.** Datastore Metrics for Cluster Compute Resources

| 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.  |
| 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.                                     |

## Cluster Services Metrics for Cluster Compute Resources

Cluster Services metrics provide information about cluster services.

**Table 1-55.** Cluster Services Metrics for Cluster Compute Resources

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

## Power Metrics for Cluster Compute Resources

Power metrics provide information about power use.

**Table 1-56.** Power Metrics for Cluster Compute Resources

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

## Summary Metrics for Cluster Compute Resources

Summary metrics provide information about overall performance.

**Table 1-57.** Summary Metrics for Cluster Compute Resources

| Metric Key                      | Metric Name                                       | Description  |
|---------------------------------|---|--|
| summary number_running_hosts    | Number of Running Hosts                           | Number of running hosts.   |
| summary number_running_vms      | Number of Running VMs                             | Number of running virtual machines.                                      |
| summary number_vmotion          | Number of vMotions                                | Number of vMotions.  |
| 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_datastores | Total Number of Datastores                        | Total number of datastores.  |
| summary number_running_vcpus    | Number of 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 number of running virtual machines per running host.             |
| summary avg_vm_cpu              | Average Provisioned Capacity (MHz) per Running VM | Average provisioned capacity, in megahertz, per running virtual machine. |
| summary avg_vm_mem              | Average Provisioned Memory (KB) per Running VM    | Average provisioned memory, in kilobytes, per running virtual machine.   |

## 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,”](#) on page 63
- [“Badge Metrics,”](#) on page 66

## Configuration Metrics for Resource Pools

Configuration metrics provide information about memory and CPU allocation configuration.

**Table 1-58.** 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 1-59.** 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.     |
| 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 1-60.** Memory Metrics for Resource Pools

| Metric Key                  | Metric Name             | Description  |
|-----------------------------|-------------------------|--|
| mem vmmemctl_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.                              |

**Table 1-60.** Memory Metrics for Resource Pools (Continued)

| <b>Metric Key</b>             | <b>Metric Name</b>           | <b>Description</b>  |
|-------------------------------|------------------------------|---|
| 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. |
| 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 swpin_average             | Swap In (KB)                 | Amount of memory swapped in kilobytes.  |
| mem swapout_average           | Swap Out (KB)                | Amount of memory swapped out in kilobytes.  |
| mem swapped_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 1-61.** Summary Metrics for Resource Pools

| <b>Metric Key</b>          | <b>Metric Name</b>    | <b>Description</b>                  |
|----------------------------|-----------------------|-------------------------------------|
| 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.       |



## Datcenter Metrics

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

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

- [“Capacity and Project-Based Metrics,”](#) on page 63
- [“Badge Metrics,”](#) on page 66

## CPU Usage Metrics for Datacenters

CPU usage metrics provide information about CPU use.

**Table 1-62.** 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.  |
| 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 1-63.** 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. |
| 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 1-64.** Memory Metrics for Datacenters

| <b>Metric Key</b>               | <b>Metric Name</b>                 | <b>Description</b>   |
|---------------------------------|------------------------------------|--|
| 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 1-65.** 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 1-66.** 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 1-67.** 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.  |
| 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 1-67.** Datastore Metrics for Datacenters (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 Space Metrics for Datacenters

Disk space metrics provide information about disk use.

**Table 1-68.** 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 1-69.** 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.                                      |
| 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,”](#) on page 63
- [“Badge Metrics,”](#) on page 66

## CPU Usage Metrics for Custom Datacenters

CPU usage metrics provide information about CPU use.

**Table 1-70.** 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 1-71.** 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      | Host stress max-min disparity.      |

## Summary Metrics for Custom Datacenters

Summary metrics provide information about overall performance.

**Table 1-72.** 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 1-73.** 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 1-74.** 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.  |

**Table 1-74.** Datastore Metrics for Custom 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.                        |

## 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,”](#) on page 63
- [“Badge Metrics,”](#) on page 66

**Table 1-75.** 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.  |
| 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 1-76.** 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.         |

**Table 1-76.** Diskspace Metrics for Storage Pods (Continued)

| Metric Key         | Metric Name          | Description                          |
|--------------------|----------------------|--------------------------------------|
| 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,”](#) on page 63
- [“Badge Metrics,”](#) on page 66

**Table 1-77.** 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.    |
| 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).  |



**Table 1-77.** Network Metrics for VMware Distributed Virtual Switches (Continued)

| Metric Key                                      | Metric Name                        | Description                         |
|---|------------------------------------|-------------------------------------|
| 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 1-78.** 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 1-79.** 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.                          |
| 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,”](#) on page 63
- [“Badge Metrics,”](#) on page 66

**Table 1-80.** 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. |

**Table 1-80.** Network Metrics for Distributed Virtual Port Groups (Continued)

| Metric Key                                      | Metric Name                          | Description                           |
|---|--------------------------------------|---------------------------------------|
| 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.        |
| 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 1-81.** 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,”](#) on page 63.

### Capacity Metrics for Datastores

Capacity metrics provide information about datastore capacity.

**Table 1-82.** Capacity Metrics for Datastores

| Metric Key               | Metric Name                    | Description                    |
|--------------------------|--------------------------------|--------------------------------|
| capacity available_space | Available Space (GB)           | Available space in gigabytes.  |
| capacity contention      | Data Store Capacity Contention | Datastore capacity contention. |
| capacity provisioned     | Provisioned (GB)               | Datastore size.                |
| capacity total_capacity  | Total Capacity (GB)            | Total capacity in gigabytes.   |
| capacity used_space      | Used Space (GB)                | Used space in gigabytes.       |
| capacity workload        | Workload (%)                   | Capacity workload.             |

**Table 1-82.** Capacity Metrics for Datastores (Continued)

| Metric Key                    | Metric Name                      | Description                         |
|-------------------------------|----------------------------------|-------------------------------------|
| capacity uncommitted          | Uncommitted Space (GB)           | Uncommitted space in gigabytes.     |
| capacity consumer_provisioned | Total Provisioned Consumer Space | Total Provisioned Consumer Space.   |
| capacity usedSpacePct         | Used Space (%)                   | Percentage of datastore space used. |

## Device Metrics for Datastores

Device metrics provide information about device performance.

**Table 1-83.** Devices Metrics for Datastores

| Metric Key                         | Metric Name                          | Description   |
|------------------------------------|--------------------------------------|---|
| devices busResets_summation        | Bus Resets                           | Number of bus resets in the performance interval.   |
| devices commandsAborted_summation  | Commands Aborted                     | Number of disk commands aborted in the performance interval.  |
| devices commands_summation         | Commands Issued                      | Number of disk commands issued in the performance interval.   |
| devices totalLatency_average       | Disk Command Latency (ms)            | 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. |
| devices totalReadLatency_average   | Disk Read Latency (ms)               | 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.      |
| devices totalWriteLatency_average  | Disk Write Latency (ms)              | Average amount of time for a write operation to the datastore. Total latency is the sum of kernel latency and device latency.   |
| devices kernelLatency_average      | Kernel Disk Command Latency (ms)     | Average time spent in ESX Server V. Kernel per command.   |
| devices kernelReadLatency_average  | Kernel Disk Read Latency (ms)        | Average time spent in ESX host VM Kernel per read.  |
| devices kernelWriteLatency_average | Kernel Disk Write Latency (ms)       | Average time spent in ESX Server VM Kernel per write.   |
| devices number_running_hosts       | Number of Running Hosts              | Number of running hosts that are powered on.  |
| devices number_running_vms         | Number of Running VMs                | Number of running virtual machines that are powered on.   |
| devices deviceLatency_average      | Physical Device Command Latency (ms) | Average time taken to complete a command from the physical device.  |
| devices deviceReadLatency_average  | Physical Device Read Latency (ms)    | Average time taken to complete a read from the physical device.   |
| devices queueLatency_average       | Queue Command Latency (ms)           | Average time spent in the ESX Server VM Kernel queue per command.   |
| devices queueReadLatency_average   | Queue Read Latency (ms)              | Average time spent in the ESX Server VM Kernel queue per read.  |

**Table 1-83.** Devices Metrics for Datastores (Continued)

| <b>Metric Key</b>                   | <b>Metric Name</b>                 | <b>Description</b>  |
|-------------------------------------|------------------------------------|---|
| devices queueWriteLatency_average   | Queue Write Latency (ms)           | Average time spent in the ESX Server VM Kernel queue per write.                                     |
| devices read_average                | Read Rate (KBps)                   | Amount of data read in the performance interval.  |
| devices numberRead_summation        | Read Requests                      | Number of times data was read from the disk in the defined interval.                                |
| devices numberReadAveraged_average  | Reads per second                   | Average number of read commands issued per second to the datastore during the collection interval.  |
| devices usage_average               | Usage Average (KBps)               | Average use in kilobytes per second.  |
| devices write_average               | Write Rate (KBps)                  | Amount of data written to disk in the performance interval.   |
| devices numberWrite_summation       | Write Requests                     | Number of times data was written to the disk in the defined interval.                               |
| devices numberWriteAveraged_average | Writes per second                  | Average number of write commands issued per second to the datastore during the collection interval. |
| devices commandsAveraged_average    | Commands per second                | Average number of commands issued per second during the collection interval.                        |
| devices deviceWriteLatency_average  | Physical Device Write Latency (ms) | Average time taken to complete a write from the physical disk.                                      |

## Datastore Metrics for Datastores

Datastore metrics provide information about datastore use.

**Table 1-84.** Datastore Metrics for Datastores

| <b>Metric Key</b>                   | <b>Metric Name</b>            | <b>Description</b>  |
|-------------------------------------|-------------------------------|---|
| datastore totalLatency_average      | 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. |
| datastore usage_average             | Usage Average (KBps)          | Average use in kilobytes per second.  |
| datastore totalReadLatency_average  | Read Latency (ms)             | Average amount of time for a read operation from the datastore. Total latency = kernel latency + device latency.  |
| datastore totalWriteLatency_average | Write Latency (ms)            | Average amount of time for a write operation to the datastore. Total latency = kernel latency + device latency.   |
| datastore demand                    | Demand                        | Demand.   |
| datastore demand_indicator          | Demand Indicator              | Demand Indicator.   |
| datastore maxObserved_NumberRead    | Max Observed Reads per Second | Maximum observed average number of read commands issued per second during the collection interval.  |
| datastore maxObserved_Read          | Max Observed Read Rate (KBps) | Max observed rate of reading data from the datastore.   |

**Table 1-84.** Datastore Metrics for Datastores (Continued)

| Metric Key                            | Metric Name                                      | Description  |
|---------------------------------------|--|--|
| datastore maxObserved_ReadLatency     | Max Observed Read Latency (ms)                   | Max observed average amount of time for a read operation from the datastore. Total latency = kernel latency + device latency.  |
| 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 (KBps)                   | Max observed rate of writing data from the datastore.  |
| datastore maxObserved_WriteLatency    | Max Observed Write Latency (ms)                  | Max observed average amount of time for a write operation from the datastore. Total latency = kernel latency + device latency. |
| 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.   |
| 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.  |

## 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.

**Table 1-85.** Disk Space Metrics for Datastores

| Metric Key           | Metric Name             | Description                     |
|----------------------|-------------------------|---------------------------------|
| diskspace notshared  | Not Shared (GB)         | Unshared space in gigabytes.    |
| diskspace numvmdisk  | Number of Virtual Disks | Number of virtual disks.        |
| diskpace provisioned | Provisioned Space (GB)  | Provisioned space in gigabytes. |

**Table 1-85.** Disk Space Metrics for Datastores (Continued)

| <b>Metric Key</b>           | <b>Metric Name</b>           | <b>Description</b>   |
|-----------------------------|------------------------------|--|
| diskspace shared            | Shared Used (GB)             | Shared used space in gigabytes.  |
| diskspace snapshot          | Snapshot Space (GB)          | Snapshot space in gigabytes.   |
| diskspace diskused          | Virtual Disk Used (GB)       | Virtual disk used space in gigabytes.                                  |
| diskspace used              | Virtual machine used (GB)    | Virtual machine used 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 disktotal         | Total used (GB)              | Total used space in gigabytes.   |
| diskspace swap              | Swap File Space (GB)         | Swap file space in gigabytes.  |
| diskspace otherused         | Other VM Space (GB)          | Other virtual machine space in gigabytes.                              |
| diskspace freespace         | Freespace (GB)               | Unused space available on datastore.                                   |
| diskspace capacity          | Capacity (GB)                | Total capacity of datastore in gigabytes.                              |
| diskspace overhead          | Overhead                     | Amount of disk space that is overhead.                                 |

## Summary Metrics for Datastores

Summary metrics provide information about overall performance.

**Table 1-86.** Summary Metrics for Datastores

| <b>Metric Key</b>             | <b>Metric Name</b>       | <b>Description</b>                  |
|-------------------------------|--------------------------|-------------------------------------|
| 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       | Workload indicator.                 |
| summary total_number_clusters | Total Number of Clusters | Total number of clusters.           |

## Template Metrics for Datastores

**Table 1-87.** Template Metrics for Datastores

| <b>Metric Key</b>   | <b>Metric Name</b>   | <b>Description</b>                   |
|---------------------|----------------------|--------------------------------------|
| template used       | Virtual Machine used | Space used by virtual machine files. |
| template accessTime | Access Time          | Last access time.                    |

## 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 1-88.** 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. |

**Table 1-88.** Capacity Metrics Group (Continued)

| <b>Metric Key</b>                     | <b>Metric Name</b>                            | <b>Generated for</b> | <b>Description</b>   |
|---------------------------------------|---|----------------------|--|
| capacityRemainingUsingConsumers_large | 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.  |
| capacityRemaining                     | 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 capacityRemaining = 20%.   |
| underusedpercent                      | Under used (%)                                | Both                 | Percent capacity not being used.   |
| idletimepercent                       | 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, idletimepercent = 20%.   |
| 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.   |



**Table 1-88.** Capacity Metrics Group (Continued)

| Metric Key      | Metric Name              | Generated for | Description  |
|-----------------|--------------------------|---------------|--|
| 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 1-89.** 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.  |

**Table 1-89.** Object-level Metrics Group (Continued)

| Metric Key                                | Metric Name   | Description   |
|---|---|---|
| summary capacityRemaining_min             | Capacity Remaining<br>(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.   |
| 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 1-90.** 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.                                       |

**Table 1-90.** Badge Metrics (Continued)

| <b>Metric Key</b>      | <b>Metric Name</b>         | <b>Description</b>   |
|------------------------|----------------------------|--|
| 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.   |
| 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 1-91.** System Metrics

| <b>Metric Key</b>                  | <b>Metric Name</b>             | <b>Description</b>                           |
|------------------------------------|--------------------------------|--|
| 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 |
| 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      |

**Table 1-91.** System Metrics (Continued)

| <b>Metric Key</b>                        | <b>Metric Name</b>                 | <b>Description</b>                                |
|--|------------------------------------|---|
| 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 1-92.** Analytics Metrics

| <b>Metric Key</b>     | <b>Metric Name</b>             | <b>Description</b>   |
|-----------------------|--------------------------------|--|
| 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  |
| 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. |

**Table 1-92.** Analytics Metrics (Continued)

| Metric Key            | Metric Name  | Description  |
|-----------------------|--|--|
| LocalPrimaryFDSize    | Number of primary forward data entries             | Number of locally stored primary entries in forward data region.                           |
| LocalFDAltSize        | Number of alternative forward data entries         | Number of locally stored primary and redundant entries in alternative forward data region. |
| LocalPrimaryFDAltSize | 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 1-93.** 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                       |
| 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                         |

**Table 1-93.** Overall Threshold Checking Metrics for the Analytics Service (Continued)

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

**Table 1-93.** Overall Threshold Checking Metrics for the Analytics Service (Continued)

| <b>Metric Key</b>  | <b>Metric Name</b> | <b>Description</b>  |
|--|--------------------|---|
| 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   |
| 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 1-94.** Dynamic Threshold Calculation Metrics for the Analytics Service

| <b>Metric Key</b>                         | <b>Metric Name</b>    | <b>Description</b>            |
|---|-----------------------|-------------------------------|
| 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                       |

**Table 1-94.** Dynamic Threshold Calculation Metrics for the Analytics Service (Continued)

| <b>Metric Key</b>                         | <b>Metric Name</b>      | <b>Description</b>            |
|---|-------------------------|-------------------------------|
| 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                       |
| DtDataRead ReadDataPointsCount MinCount   | Minimal                 | Minimal                       |
| DtDataRead ReadDataPointsCount MaxCount   | Maximal                 | Maximal                       |

**Table 1-95.** Function Call Metrics for the Analytics Service

| <b>Metric Key</b>         | <b>Metric Name</b>       | <b>Description</b>       |
|---------------------------|--------------------------|--------------------------|
| 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 1-96.** Collector Metrics

| <b>Metric Key</b>      | <b>Metric Name</b>              | <b>Description</b>              |
|------------------------|---------------------------------|---------------------------------|
| ThreadpoolThreadsCount | Number of pool threads          | Number of pool threads.         |
| RejectedFDCount        | Number of rejected forward data | Number of rejected forward data |



**Table 1-96.** Collector Metrics (Continued)

| Metric Key         | Metric Name                                 | Description                                 |
|--------------------|---|---|
| RejectedFDAltCount | Number of rejected alternative forward data | Number of rejected alternative forward data |
| SentFDCCount       | Number of sent objects                      | Number of sent objects                      |
| SentFDAltCount     | 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 1-97.** 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 1-98.** 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 1-99.** 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)         |

**Table 1-99.** Storage Thread Pool Metrics for FSDB (Continued)

| Metric Key                                     | Metric Name | Description |
|--|-------------|-------------|
| 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 1-100.** 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.            |
| Threads                 | Threads                    | Number of threads.          |
| SessionCount            | Number of active sessions  | Number of active sessions   |
| SelfMonitoringQueueSize | Self Monitoring queue size | Self Monitoring queue size  |

**Table 1-101.** 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)         |

**Table 1-101.** API Call Metrics for the Product UI (Continued)

| Metric Key                         | Metric Name                      | Description                           |
|------------------------------------|----------------------------------|---------------------------------------|
| 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 1-102.** 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.                |
| SessionCount            | Number of active sessions  | Number of active sessions         |
| SelfMonitoringQueueSize | Self Monitoring queue size | Self Monitoring queue size        |

**Table 1-103.** 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 1-104.** 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 1-105.** 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           |
| GemfireClientCalls RequestsCount     | Requests Count        | Requests Count             |
| GemfireClientCalls ResponsesCount    | Responses Count       | Responses Count            |

**Table 1-106.** 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 1-107.** 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 1-108.** 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) |

**Table 1-108.** API Call Metrics for Cluster and Slice Administration (Continued)

| Metric Key                          | Metric Name                 | Description                 |
|-------------------------------------|-----------------------------|-----------------------------|
| API Calls MinResponseTime           | Minimum Response Time       | Minimum Response Time (ms)  |
| API Calls MaxResponseTime           | Maximum Response Time       | Maximum Response Time (ms)  |
| 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 1-109.** Watchdog Metrics

| Metric Key   | Metric Name   | Description   |
|--------------|---------------|---------------|
| ServiceCount | Service Count | Service Count |

### Service Metrics

Service metrics provide information about watchdog activity.

**Table 1-110.** 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,”](#) on page 63.

**Table 1-111.** 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   |
| LocalResourcesCount   | Number of local objects   | Number of local objects   |
| PrimaryMetricsCount   | Number of primary metrics | Number of primary metrics   |

**Table 1-111.** Node Metrics (Continued)

| <b>Metric Key</b>          | <b>Metric Name</b>                  | <b>Description</b>                  |
|----------------------------|-------------------------------------|-------------------------------------|
| 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 1-112.** Memory Metrics for the Node

| <b>Metric Key</b> | <b>Metric Name</b>      | <b>Description</b>      |
|-------------------|-------------------------|-------------------------|
| 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 1-113.** Swap Metrics for the Node

| <b>Metric Key</b> | <b>Metric Name</b> | <b>Description</b> |
|-------------------|--------------------|--------------------|
| 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 1-114.** Resource Limit Metrics for the Node

| <b>Metric Key</b>             | <b>Metric Name</b>                 | <b>Description</b>                 |
|-------------------------------|------------------------------------|------------------------------------|
| 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 1-115.** Network Metrics for the Node

| <b>Metric Key</b>    | <b>Metric Name</b>       | <b>Description</b>                            |
|----------------------|--------------------------|---|
| 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    |

**Table 1-115.** Network Metrics for the Node (Continued)

| <b>Metric Key</b>    | <b>Metric Name</b>       | <b>Description</b>                             |
|----------------------|--------------------------|--|
| 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 1-116.** 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      |
| net iface txErrors     | Transmit packet errors     | Number of transmit errors          |
| net iface txOverruns   | Transmit packet overruns   | Number of transmit overruns        |

**Table 1-117.** Disk Filesystem Metrics for the Node

| <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 file nodes      |
| disk fileSystem filesFree | Total free file nodes | Total free file nodes |

**Table 1-117.** Disk Filesystem Metrics for the Node (Continued)

| <b>Metric Key</b>          | <b>Metric Name</b> | <b>Description</b>      |
|----------------------------|--------------------|-------------------------|
| 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 1-118.** Disk Installation Metrics for the Node

| <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 1-119.** Disk Database Metrics for the Node

| <b>Metric Key</b> | <b>Metric Name</b> | <b>Description</b> |
|-------------------|--------------------|--------------------|
| disk db used      | Used               | Used               |
| disk db total     | Total              | Total              |
| disk db available | Available          | Available          |

**Table 1-120.** Disk Log Metrics for the Node

| <b>Metric Key</b>  | <b>Metric Name</b> | <b>Description</b> |
|--------------------|--------------------|--------------------|
| disk log used      | Used               | Used               |
| disk log total     | Total              | Total              |
| disk log available | Available          | Available          |

**Table 1-121.** 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)           |



**Table 1-121.** CPU Metrics for the Node (Continued)

| Metric Key                 | Metric Name                      | Description  |
|----------------------------|----------------------------------|--|
| 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 1-122.** Device Metrics for the Node

| 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).  |
| 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 1-123.** 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 1-124.** 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 1-125.** 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,”](#) on page 63.

### Cluster Metrics

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

**Table 1-126.** 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 1-127.** 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 1-128.** 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     |

**Table 1-128.** CC Metrics for the Cluster (Continued)

| Metric Key                 | Metric Name              | Description              |
|----------------------------|--------------------------|--------------------------|
| 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 1-129.** Gemfire cluster Metrics for the Cluster

| Metric Key  | Metric Name                    | Description  |
|---|--------------------------------|--|
| 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)  |

**Table 1-129.** Gemfire cluster Metrics for the Cluster (Continued)

| <b>Metric Key</b>   | <b>Metric Name</b>                   | <b>Description</b>                               |
|---|--------------------------------------|--|
| 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)                       |
| 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)                            |

**Table 1-129.** Gemfire cluster Metrics for the Cluster (Continued)

| <b>Metric Key</b>                             | <b>Metric Name</b>                   | <b>Description</b>                   |
|---|--------------------------------------|--------------------------------------|
| GemfireCluster System Member JVM MaxMemory    | Max Memory                           | Max Memory (MB)                      |
| 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 1-130.** Threshold Checking Metrics for the Cluster

| <b>Metric Key</b>                      | <b>Metric Name</b>                           | <b>Description</b>                           |
|--|--|--|
| 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 1-131.** 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 1-132.** 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 1-133.** 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 1-134.** 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 |
| 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                        |

**Table 1-134.** Disk Metrics for the Cluster (Continued)

| Metric Key                     | Metric Name                 | Description                 |
|--------------------------------|-----------------------------|-----------------------------|
| 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 1-135.** 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 1-136.** 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  |
| 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                       |

**Table 1-136.** Controller XDB Metrics for Persistence (Continued)

| Metric Key                              | Metric Name  | Description   |
|---|--|---|
| 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 1-137.** 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  |
| 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 1-138.** 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)             |



**Table 1-138.** Historical XDB Metrics for Persistence (Continued)

| <b>Metric Key</b>                    | <b>Metric Name</b>                                 | <b>Description</b>  |
|--------------------------------------|--|---|
| 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 |
| 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 1-139.** Remote Collector Metrics

| <b>Metric Key</b> | <b>Metric Name</b> | <b>Description</b>   |
|-------------------|--------------------|--|
| ComponentCount    | Component Count    | The number of vRealize Operations Manager Objects reporting for this node. |

**Table 1-140.** Memory Metrics for the Remote Collector

| <b>Metric Key</b> | <b>Metric Name</b>      | <b>Description</b>      |
|-------------------|-------------------------|-------------------------|
| 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 1-141.** Swap Metrics for the Remote Collector

| <b>Metric Key</b> | <b>Metric Name</b> | <b>Description</b> |
|-------------------|--------------------|--------------------|
| 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 1-142.** Resource limit Metrics for the Remote Collector

| <b>Metric Key</b>             | <b>Metric Name</b>                 | <b>Description</b>                 |
|-------------------------------|------------------------------------|------------------------------------|
| 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 1-143.** Network Metrics for the Remote Collector

| <b>Metric Key</b>    | <b>Metric Name</b>       | <b>Description</b>                             |
|----------------------|--------------------------|--|
| 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    |

**Table 1-143.** Network Metrics for the Remote Collector (Continued)

| <b>Metric Key</b> | <b>Metric Name</b>  | <b>Description</b>                           |
|-------------------|---------------------|--|
| 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 1-144.** Network Interface Metrics for the Remote Collector

| <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      |
| net iface txErrors     | Transmit packet errors     | Number of transmit errors          |
| net iface txOverruns   | Transmit packet overruns   | Number of transmit overruns        |

**Table 1-145.** 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 1-146.** 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 1-147.** Disk Database Metrics for the Remote Collector

| <b>Metric Key</b> | <b>Metric Name</b> | <b>Description</b> |
|-------------------|--------------------|--------------------|
| disk db used      | Used               | Used               |
| disk db total     | Total              | Total              |
| disk db available | Available          | Available          |

**Table 1-148.** Disk Log Metrics for the Remote Collector

| <b>Metric Key</b>  | <b>Metric Name</b> | <b>Description</b> |
|--------------------|--------------------|--------------------|
| disk log used      | Used               | Used               |
| disk log total     | Total              | Total              |
| disk log available | Available          | Available          |

**Table 1-149.** CPU Metrics for the Remote Collector

| <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                             | 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 1-150.** 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 1-151.** 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 1-152.** 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 the Operating Systems and Remote Service Monitoring Plug-ins in Endpoint 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 Endpoint 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 1-153.** 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 |

**Table 1-153.** AIX metrics (Continued)

| <b>Name</b>                          | <b>Category</b> | <b>KPI</b> |
|--------------------------------------|-----------------|------------|
| 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      |
| 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      |

**Table 1-153.** AIX metrics (Continued)

| <b>Name</b>                       | <b>Category</b> | <b>KPI</b> |
|-----------------------------------|-----------------|------------|
| 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 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 Finfo per Minute    | UTILIZATION     | False      |
| Nfs Server V3 Finfo               | 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      |
| Number of CPUs                    | UTILIZATION     | False      |
| Page Major faults                 | UTILIZATION     | False      |
| Percent Used Memory               | UTILIZATION     | True       |
| Page Major faults per Second      | UTILIZATION     | False      |

**Table 1-153.** AIX metrics (Continued)

| Name                       | Category    | KPI   |
|----------------------------|-------------|-------|
| 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 1-154.** Linux 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 |



**Table 1-154.** Linux Metrics (Continued)

| <b>Name</b>                  | <b>Category</b> | <b>KPI</b> |
|------------------------------|-----------------|------------|
| 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      |
| 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      |

**Table 1-154.** Linux Metrics (Continued)

| <b>Name</b>                          | <b>Category</b> | <b>KPI</b> |
|--------------------------------------|-----------------|------------|
| 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      |
| 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      |

**Table 1-154.** Linux Metrics (Continued)

| <b>Name</b>                       | <b>Category</b> | <b>KPI</b> |
|-----------------------------------|-----------------|------------|
| 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 Finfo per Minute    | UTILIZATION     | False      |
| Nfs Server V3 Finfo               | 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      |
| 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      |

**Table 1-154.** Linux Metrics (Continued)

| Name                          | Category    | KPI   |
|-------------------------------|-------------|-------|
| 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 1-155.** 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 |

**Table 1-155.** Solaris Metrics (Continued)

| <b>Name</b>                          | <b>Category</b> | <b>KPI</b> |
|--------------------------------------|-----------------|------------|
| 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      |
| 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      |

**Table 1-155.** Solaris Metrics (Continued)

| <b>Name</b>                       | <b>Category</b> | <b>KPI</b> |
|-----------------------------------|-----------------|------------|
| 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      |
| 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      |

**Table 1-155.** Solaris Metrics (Continued)

| Name                         | Category    | KPI   |
|------------------------------|-------------|-------|
| 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 |
| 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 1-156.** Microsoft Windows Metrics

| Name                     | Category     | KPI   |
|--------------------------|--------------|-------|
| Resource Availability    | AVAILABILITY | True  |
| System Uptime            | AVAILABILITY | False |
| Avg. Disk sec/Transfer   | THROUGHPUT   | False |
| File System Reads/Writes | THROUGHPUT   | False |

**Table 1-156.** Microsoft Windows Metrics (Continued)

| <b>Name</b>                         | <b>Category</b> | <b>KPI</b> |
|-------------------------------------|-----------------|------------|
| 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      |
| 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      |



**Table 1-156.** Microsoft Windows Metrics (Continued)

| <b>Name</b>                                | <b>Category</b> | <b>KPI</b> |
|--|-----------------|------------|
| 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      |
| 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      |

**Table 1-156.** Microsoft Windows Metrics (Continued)

| Name                       | Category    | KPI   |
|----------------------------|-------------|-------|
| 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 1-157.** 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 |

**Table 1-157.** Windows Services Metrics (Continued)

| Name                 | Category    | KPI   |
|----------------------|-------------|-------|
| Resident Memory Size | UTILIZATION | False |
| Threads              | UTILIZATION | False |

If you stop an Endpoint 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 Endpoint 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 1-158.** 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 1-159.** Multiprocess Metrics

| Name                       | Category     | KPI   |
|----------------------------|--------------|-------|
| Resource Availability      | AVAILABILITY | True  |
| 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  |
| Number of Processes        | UTILIZATION  | False |
| Resident Memory Size       | UTILIZATION  | False |

## 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 1-160.** 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 |
| 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 1-161.** 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 1-162.** TCP Check Metrics

| <b>Name</b>              | <b>Category</b> | <b>KPI</b> |
|--------------------------|-----------------|------------|
| 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      |
| 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,”](#) on page 111
- [“Self-Monitoring Properties for vRealize Operations Manager,”](#) on page 124

## 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.** 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 2-5.** 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                                     |



**Table 2-5.** Configuration Properties Collected for Virtual Machine Objects (Continued)

| Property Key  | Property Name  | Description  |
|---|--|--|
| 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<br>(isolation.tools.autoInstall.disable)                | Disable tools auto install<br>(isolation.tools.autoInstall.disable)                |
| config security disable_console_copy                  | Disable console copy operations<br>(isolation.tools.copy.disable)                  | Disable console copy operations<br>(isolation.tools.copy.disable)                  |
| config security disable_console_dnd                   | Disable console drag and drop operations<br>(isolation.tools.dnd.disable)          | Disable console drag and drop operations<br>(isolation.tools.dnd.disable)          |
| config security enable_console_gui_options            | Enable console GUI operations<br>(isolation.tools.setGUIOptions.enable)            | Enable console GUI operations<br>(isolation.tools.setGUIOptions.enable)            |
| config security disable_console_paste                 | Disable console paste operations<br>(isolation.tools.paste.disable)                | Disable console paste operations<br>(isolation.tools.paste.disable)                |
| config security disable_disk_shrinking_shrink         | Disable virtual disk shrink<br>(isolation.tools.diskShrink.disable)                | Disable virtual disk shrink<br>(isolation.tools.diskShrink.disable)                |
| config security disable_disk_shrinking_wiper          | Disable virtual disk wiper<br>(isolation.tools.diskWiper.disable)                  | Disable virtual disk wiper<br>(isolation.tools.diskWiper.disable)                  |
| config security disable_hgfs                          | Disable HGFS file transfers<br>(isolation.tools.hgfsServerSet.disable)             | Disable HGFS file transfers<br>(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<br>(vmci0.unrestricted)                 | Enable VM-to-VM communication through VMCI<br>(vmci0.unrestricted)                 |
| config security enable_logging                        | Enable VM logging (logging)  | Enable VM logging (logging)  |
| config security disable_monitor_control               | Disable VM Monitor Control<br>(isolation.monitor.control.disable)                  | Disable VM Monitor Control<br>(isolation.monitor.control.disable)                  |
| config security enable_non_essential_3D_features      | Enable 3D features on Server and desktop virtual machines<br>(mks.enable3d)        | Enable 3D features on Server and desktop virtual machines<br>(mks.enable3d)        |
| config security disable_unexposed_features_autologon  | Disable unexposed features - autologon<br>(isolation.tools.ghi.autologon.disable)  | Disable unexposed features - autologon<br>(isolation.tools.ghi.autologon.disable)  |
| config security disable_unexposed_features_biosbbs    | Disable unexposed features - biosbbs<br>(isolation.bios.bbs.disable)               | Disable unexposed features - biosbbs<br>(isolation.bios.bbs.disable)               |
| config security disable_unexposed_features_getcreds   | Disable unexposed features - getcreds<br>(isolation.tools.getCreds.disable)        | Disable unexposed features - getcreds<br>(isolation.tools.getCreds.disable)        |
| config security disable_unexposed_features_launchmenu | Disable unexposed features - launchmenu<br>(isolation.tools.ghi.launchmenu.change) | Disable unexposed features - launchmenu<br>(isolation.tools.ghi.launchmenu.change) |

**Table 2-5.** Configuration Properties Collected for Virtual Machine Objects (Continued)

| Property Key  | Property Name   | Description   |
|---|---|---|
| config security <br>disable_unexposed_features_memsfss              | Disable unexposed features - memsfss<br>(isolation.tools.memSchedFakeSampleStats.disable)           | Disable unexposed features - memsfss<br>(isolation.tools.memSchedFakeSampleStats.disable)           |
| config security <br>disable_unexposed_features_protocolhandler      | Disable unexposed features - protocolhandler<br>(isolation.tools.ghi.protocolhandler.info.disable)  | Disable unexposed features - protocolhandler<br>(isolation.tools.ghi.protocolhandler.info.disable)  |
| config security <br>disable_unexposed_features_shellaction          | Disable unexposed features - shellaction<br>(isolation.ghi.host.shellAction.disable)                | Disable unexposed features - shellaction<br>(isolation.ghi.host.shellAction.disable)                |
| config security <br>disable_unexposed_features_toporequest          | Disable unexposed features - toporequest<br>(isolation.tools.dispTopoRequest.disable)               | Disable unexposed features - toporequest<br>(isolation.tools.dispTopoRequest.disable)               |
| config security <br>disable_unexposed_features_trashfolderstate     | Disable unexposed features - trashfolderstate<br>(isolation.tools.trashFolderState.disable)         | Disable unexposed features - trashfolderstate<br>(isolation.tools.trashFolderState.disable)         |
| config security <br>disable_unexposed_features_trayicon             | Disable unexposed features - trayicon<br>(isolation.tools.ghi.trayicon.disable)                     | Disable unexposed features - trayicon<br>(isolation.tools.ghi.trayicon.disable)                     |
| config security <br>disable_unexposed_features_unity                | Disable unexposed features - unity<br>(isolation.tools.unity.disable)                               | Disable unexposed features - unity<br>(isolation.tools.unity.disable)                               |
| config security <br>disable_unexposed_features_unity_interlock      | Disable unexposed features - unity-interlock<br>(isolation.tools.unityInterlockOperation.disable)   | Disable unexposed features - unity-interlock<br>(isolation.tools.unityInterlockOperation.disable)   |
| config security <br>disable_unexposed_features_unity_taskbar        | Disable unexposed features - unity-taskbar<br>(isolation.tools.unity.taskbar.disable)               | Disable unexposed features - unity-taskbar<br>(isolation.tools.unity.taskbar.disable)               |
| config security <br>disable_unexposed_features_unity_unityactive    | Disable unexposed features - unity-unityactive<br>(isolation.tools.unityActive.disable)             | Disable unexposed features - unity-unityactive<br>(isolation.tools.unityActive.disable)             |
| config security <br>disable_unexposed_features_unity_windowcontents | Disable unexposed features - unity-windowcontents<br>(isolation.tools.unity.windowContents.disable) | Disable unexposed features - unity-windowcontents<br>(isolation.tools.unity.windowContents.disable) |
| config security <br>disable_unexposed_features_unitypush            | Disable unexposed features - unitypush<br>(isolation.tools.unity.push.update.disable)               | Disable unexposed features - unitypush<br>(isolation.tools.unity.push.update.disable)               |
| config security <br>disable_unexposed_features_versionget           | Disable unexposed features - versionget<br>(isolation.tools.vmxDnDVersionGet.disable)               | Disable unexposed features - versionget<br>(isolation.tools.vmxDnDVersionGet.disable)               |
| config security <br>disable_unexposed_features_versionset           | Disable unexposed features - versionset<br>(isolation.tools.guestDnDVersionSet.disable)             | Disable unexposed features - versionset<br>(isolation.tools.guestDnDVersionSet.disable)             |

**Table 2-5.** Configuration Properties Collected for Virtual Machine Objects (Continued)

| Property Key                                       | Property Name   | Description   |
|--|---|---|
| config security disable_vix_messages               | Disable VIX messages from the VM<br>(isolation.tools.vixMessage.disable)                      | Disable VIX messages from the VM<br>(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<br>(RemoteDisplay.maxConnection)                          | Limit number of console connections<br>(RemoteDisplay.maxConnection)                          |
| config security limit_log_number                   | Limit number of log files<br>(log.keepOld)  | Limit number of log files<br>(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<br>(tools.setInfo.sizeLimit)  | Limit VMX file size<br>(tools.setInfo.sizeLimit)  |
| config security enable_console_VNC                 | Enable access to VM console via VNC protocol<br>(RemoteDisplay.vnc.enabled)                   | Enable access to VM console via VNC protocol<br>(RemoteDisplay.vnc.enabled)                   |
| config security disable_device_interaction_connect | Disable unauthorized removal, connection of devices<br>(isolation.device.connectable.disable) | Disable unauthorized removal, connection of devices<br>(isolation.device.connectable.disable) |
| config security disable_device_interaction_edit    | Disable unauthorized modification of devices<br>(isolation.device.edit.disable)               | Disable unauthorized modification of devices<br>(isolation.device.edit.disable)               |
| config security enable_host_info                   | Enable send host information to guests<br>(tools.guestlib.enableHostInfo)                     | Enable send host information to guests<br>(tools.guestlib.enableHostInfo)                     |
| config security network_filter_enable              | Enable dvfilter network APIs<br>(ethernetX.filterY.name)                                      | Enable dvfilter network APIs<br>(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 2-6.** Runtime Properties Collected for Virtual Machine Objects

| Property Key      | Property Name   | Description     |
|-------------------|-----------------|-----------------|
| runtime memoryCap | Memory Capacity | Memory Capacity |

**Table 2-7.** 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 2-8.** 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 2-9.** 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 2-10.** 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            |

**Table 2-10.** Summary Properties Collected for Virtual Machine Objects (Continued)

| Property Key                    | Property Name    | Description      |
|---------------------------------|------------------|------------------|
| summary runtime powerState      | Power State      | Power State      |
| summary runtime connectionState | Connection State | Connection State |

**Table 2-11.** 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 |
| datastore maxObservedWrite       | Highest Observed Write Rate               | Highest Observed Write Rate (KBps)        |
| datastore maxObservedOIO         | Highest Observed Outstanding Requests     | Highest Observed Outstanding Requests     |

**Table 2-12.** 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 2-13.** 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 dnserver                               | 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 |

**Table 2-13.** Configuration Properties Collected for Host System Objects (Continued)

| Property Key                              | Property Name  | Description   |
|---|--|---|
| 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   |
| 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 2-14.** 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 2-14.** 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 2-15.** 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 2-16.** 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 2-17.** 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 2-18.** 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                   |
| net discoveryProtocol cdp timeToLive           | Time to Live                | Time to Live                       |
| net discoveryProtocol lldp managementIpAddress | Management IP Address       | Management IP Address              |

**Table 2-18.** Network Properties Collected for Host System Objects (Continued)

| Property Key                          | Property Name | Description  |
|---------------------------------------|---------------|--------------|
| 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 2-19.** 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 2-20.** Summary Properties Collected for Host System Objects

| Property Key                     | Property Name     | Description       |
|----------------------------------|-------------------|-------------------|
| summary version                  | Version           | Version           |
| summary hostuuid                 | 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 2-21.** 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 2-22.** Configuration Properties Collected for Cluster Compute Resource Objects

| Property Key | Property Name | Description |
|--------------|---------------|-------------|
| config name  | Name          | Name        |



**Table 2-23.** 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 2-24.** 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 2-25.** Configuration Properties Collected for Resource Pool Objects

| Property Key                                  | Property Name          | Description                   |
|---|------------------------|-------------------------------|
| config name                                   | Name                   | Name                          |
| config cpuAllocation reservation              | Reservation            | CPU reservation               |
| 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 2-26.** 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 |

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

| Property Key               | Property Name              | Description                |
|----------------------------|----------------------------|----------------------------|
| 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 2-27.** 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 2-28.** 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 2-29.** Configuration Properties Collected for Data Center Objects

| Property Key | Property Name | Description |
|--------------|---------------|-------------|
| config name  | Name          | Name        |

**Table 2-30.** 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 2-31.** 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 2-32.** Configuration Properties Collected for VMware Distributed Virtual Switch Objects

| Property Key | Property Name | Description |
|--------------|---------------|-------------|
| config name  | Name          | Name        |

**Table 2-33.** 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 2-34.** Configuration Properties Collected for Distributed Virtual Port Group Objects

| Property Key | Property Name | Description |
|--------------|---------------|-------------|
| config name  | Name          | Name        |

**Table 2-35.** 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 2-36.** Configuration Properties Collected for Datastore Objects

| Property Key | Property Name | Description |
|--------------|---------------|-------------|
| config name  | Name          | Name        |

**Table 2-37.** 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 2-38.** 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 |

**Table 2-38.** Datastore Properties Collected for Datastore Objects (Continued)

| 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 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 2-39.** 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 2-40.** 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 2-41.** Memory Properties Collected for Node Objects

| Property Key | Property Name | Description |
|--------------|---------------|-------------|
| mem RAM      | System RAM    | System RAM  |

**Table 2-42.** 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 2-43.** 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 2-44.** Memory Properties Collected for Remote Collector Objects

| Property Key | Property Name | Description |
|--------------|---------------|-------------|
| mem RAM      | System RAM    | System RAM  |

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

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



# Alert Definitions in vRealize Operations Manager

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# 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](#) on page 128  
The vCenter adapter provides alert definitions that generate alerts on the Cluster Compute Resource objects in your environment.
- [Host System Alert Definitions](#) on page 131  
The vCenter adapter provides alert definitions that generate alerts on the Host System objects in your environment..
- [vSphere Distributed Port Group](#) on page 143  
The vCenter adapter provides alert definitions that generate alerts on the vSphere Distributed Port objects in your environment.
- [Virtual Machine Alert Definitions](#) on page 144  
The vCenter adapter provides alert definitions that generate alerts on the virtual machine objects in your environment.
- [vSphere Distributed Switch Alert Definitions](#) on page 152  
The vCenter adapter provides alert definitions that generate alerts on the vSphere Distributed Switch objects in your environment.
- [vCenter Server Alert Definitions](#) on page 153  
The vCenter adapter provides alert definitions that generate alerts on the vCenter Server objects in your environment.
- [Datastore Alert Definitions](#) on page 154  
The vCenter adapter provides alert definitions that generate alerts on the datastore objects in your environment.
- [Data Center Alert Definitions](#) on page 159  
The vCenter adapter provides alert definitions that generate alerts on the Data Center objects in your environment.
- [Custom Data Center Alert Definitions](#) on page 160  
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   |
|--|---|---|
| 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> </ul> | Use vSphere vMotion to migrate some virtual machines to a different cluster if possible.  |
| 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 workload at warning/immediate/critical level</li> <li>■ &gt; 50% of descendant virtual machines have [ Virtual machine CPU demand at warning/immediate/critical level ]</li> </ul>  | <ol style="list-style-type: none"> <li>1 Use vSphere vMotion to migrate some virtual machines to a different cluster if possible.</li> <li>2 Add more hosts to the cluster to increase CPU capacity.</li> </ol> |
| 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> </ul>   | <ol style="list-style-type: none"> <li>1 Use vSphere vMotion to migrate some virtual machines to a different cluster if possible.</li> <li>2 Add more hosts to the cluster to increase CPU capacity.</li> </ol> |



| Alert Definition  | Symptoms   | Recommendations  |
|---|--|--|
| DRS-enabled cluster has unexpected high CPU workload.                                       | <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 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> |
| DRS-enabled cluster has memory contention caused by less than half of the virtual machines. | <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 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> </ul> | Use vSphere vMotion to migrate some virtual machines to a different cluster if possible.   |
| DRS-enabled cluster has memory contention caused by more than half of the virtual machines. | <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 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> </ul>  | <ol style="list-style-type: none"> <li>1 Use vSphere vMotion to migrate some virtual machines to a different cluster if possible.</li> <li>2 Add more hosts to the cluster to increase memory capacity.</li> </ol>   |
| DRS-enabled cluster has memory contention caused by overpopulation of virtual machines.     | <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 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> </ul>   | <ol style="list-style-type: none"> <li>1 Use vSphere vMotion to migrate some virtual machines to a different cluster if possible.</li> <li>2 Add more hosts to the cluster to increase memory capacity.</li> </ol>   |

| Alert Definition   | Symptoms   | Recommendations  |
|--|--|--|
| More than 5% of virtual machines in the cluster have memory contention caused by 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 vSphere vMotion some virtual machines off the host or cluster.</li> </ol>   |
| 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)   | <ul style="list-style-type: none"> <li>■ Use similar CPU and memory reservations for all virtual machines in the cluster OR</li> <li>■ Use a different vSphere HA admission control policy, such as reserving a percentage of cluster resource for failover OR</li> <li>■ Use advanced options to specify a cap for the slot size.</li> </ul> <p>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, the 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.

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

| Alert Definition  | Symptoms  | Recommendations  |
|---|---|--|
| Host 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>■ ! 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 vSphere vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.   |
| Host 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>■ ! 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>   | 1 Use vSphere vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.<br>2 Upgrade the host or use a host that has larger CPU capacity. |
| Host has CPU contention due to overpopulation of virtual machines.        | Symptoms include all of 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>■ Zero child virtual machines have [ Virtual machine CPU demand at warning/ immediate/critical level ]</li> </ul>   | 1 Use vSphere vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.<br>2 Upgrade the host or use a host that has larger CPU capacity. |

| Alert Definition   | Symptoms   | Recommendations  |
|--|--|--|
| Host in a non-DRS cluster has CPU contention caused by less than half of the virtual machines. | <p>Symptoms include all of the following:</p> <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> | Use vSphere vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.   |
| Host in a non-DRS cluster has CPU contention caused by more than half of the virtual machines. | <p>Symptoms include all of the following:</p> <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 Use vSphere vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>2 Upgrade the host or use a host that has larger CPU capacity.</li> </ol> |
| Host in a non-DRS cluster has CPU contention due to overpopulation of virtual machines.        | <p>Symptoms include all of the following:</p> <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>■ Zero child virtual machines have [ Virtual machine CPU demand at warning /immediate/critical level</li> </ul>  | <ol style="list-style-type: none"> <li>1 Use vSphere vMotion to migrate some virtual machines with high CPU workload to other hosts that have available CPU capacity.</li> <li>2 Upgrade the host or use a host that has larger CPU capacity.</li> </ol> |
| Host has memory contention caused by less than half of the virtual machines.                   | <p>Symptoms include all of the following:</p> <ul style="list-style-type: none"> <li>■ ! Host inside a cluster</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>   | Use vSphere vMotion to migrate some virtual machines with high memory workload to other hosts that have available memory capacity.   |

| Alert Definition  | Symptoms   | Recommendations   |
|---|--|---|
| Host has memory contention caused by more than half of the virtual machines.                      | <p>Symptoms include all of the following:</p> <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 Use vSphere vMotion to migrate some virtual machines with high memory workload to other hosts that have available memory capacity.</li> <li>2 Upgrade the host to use a host that has larger memory capacity.</li> </ol> |
| Host has memory contention due to overpopulation of virtual machines.                             | <p>Symptoms include all of the following:</p> <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>■ Zero child virtual machines have [ Virtual machine memory workload at warning/ immediate/critical level ]</li> </ul>   | <ol style="list-style-type: none"> <li>1 Use vSphere vMotion to migrate some virtual machines with high memory workload to other hosts that have available memory capacity.</li> <li>2 Upgrade the host or use a host that has larger memory capacity.</li> </ol> |
| Host in a non-DRS cluster has memory contention caused by less than half of the virtual machines. | <p>Symptoms include all of the following:</p> <ul style="list-style-type: none"> <li>■ Host inside a cluster</li> <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> | Use vSphere vMotion to migrate some virtual machines with high memory workload to other hosts that have available memory capacity.  |
| Host in a non-DRS cluster has memory contention caused by more than half of the virtual machines. | <p>Symptoms include all of the following:</p> <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 Use vSphere vMotion to migrate some virtual machines with high memory workload to other hosts that have available memory capacity.</li> <li>2 Upgrade the host or use a host that has larger memory capacity.</li> </ol> |

| Alert Definition   | Symptoms   | Recommendations  |
|--|--|--|
| Host in a non-DRS cluster has memory contention due to overpopulation of virtual machines. | <p>Symptoms include all of the following:</p> <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>■ Zero child virtual machines have [ Virtual machine memory workload at warning /immediate/critical level ]</li> </ul> | <ol style="list-style-type: none"> <li>1 Use vSphere vMotion to migrate some virtual machines with high memory workload to other hosts that have available memory capacity.</li> <li>2 Upgrade the host or use a host that has larger memory capacity.</li> </ol>  |
| Host is experiencing high number of received packets dropped.                              | <p>Symptoms include all of the following:</p> <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.                           | <p>Symptoms include all of the following:</p> <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>  |
| 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.  |

| Alert Definition                          | Symptoms   | Recommendations   |
|---|--|---|
| Battery sensors are reporting problems.   | <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. |
| BMC sensors are reporting problems.       | <ul style="list-style-type: none"> <li>■ BMC sensor health is red OR</li> <li>■ BMC 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 exist.  |
| 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. |

| Alert Definition                             | Symptoms   | Recommendations   |
|--|--|---|
| 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.                                 | <ul style="list-style-type: none"> <li>■ Connection to the host has been lost (fault symptom) OR</li> <li>■ Host disconnected from vCenter</li> </ul> | Log on to the vSphere Client and vSphere Web Client and manually reconnect the host to the vCenter Server server. After the connection to the host is restored to the vCenter Server, the alert is cancelled.   |
| 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. |



| Alert Definition   | Symptoms  | Recommendations  |
|--|---|--|
| vSphere High Availability (HA) has detected a possible host failure. | vSphere HA detected a host failure (fault symptom).   | <p>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.</p> <p><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.</p> |
| Host is experiencing network contention caused by too much traffic.  | <p>Symptoms include all of the following:</p> <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>   |
| 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:           <pre> 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. 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, bring </pre> </li> </ul> |

| Alert Definition  | Symptoms                                       | Recommendations  |
|---|--|--|
|   |  | <p>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/1003967">http://kb.vmware.com/kb/1003967</a></li> </ol>   |
| 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.

|                    |           |
|--------------------|-----------|
| <b>Impact</b>      | Health    |
| <b>Criticality</b> | 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>Identify the available uplinks by running <code>esxcfg-nics -l</code>.</li> <li>Remove the reported vmnic from the port groups by running <code>esxcfg-vswitch -U &lt;affected vmnic&gt;</code>; affected vSwitch.</li> <li>Link available uplinks to the affected port groups by running <code>esxcfg-vswitch -L &lt;available vmnic&gt;</code>; affected vSwitch.</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>In vSphere Client, select the ESX host, click <b>Configuration</b>, and then click <b>Networking</b>.<br/><br/>The vmnics currently assigned to virtual switches appear in the diagrams. If a vmnic displays a red X, that link is currently unavailable.</li> <li>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.<br/><br/>----- vmnic0 04:04.00 tg3 Up<br/>1000Mbps Full Broadcom BCM5780<br/>Gigabit Ethernet vmnic1 04:04.01 tg3<br/>Up 1000Mbps Full Broadcom<br/>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 observe the affected vmnics. Verify that the vmnic identified in the alert is still connected to the switch and configured properly:</li> </ol> <ol style="list-style-type: none"> <li>Make sure that the network cable is still connected to the switch and to the host.</li> </ol> |

| Alert Definition  | Symptom                              | Recommendations   |
|---|--------------------------------------|---|
|   |                                      | <ol style="list-style-type: none"> <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.

|                    |               |
|--------------------|---------------|
| <b>Impact</b>      | Risk          |
| <b>Criticality</b> | 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> |

## 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.

**Impact** Health

**Criticality** 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. |

## 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.

|                    |               |
|--------------------|---------------|
| <b>Impact</b>      | Health        |
| <b>Criticality</b> | 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>1 Upgrade the host with more memory.</li> <li>2 Use vSphere vMotion to migrate this virtual machine to a different host or cluster.</li> <li>3 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.  |
| 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>   |



| Alert Definition   | Symptom  | Recommendations   |
|--|--|---|
| Virtual machine has unexpected high memory workload.                                     | <p>Symptoms include all of the following:</p> <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.       | <p>Symptoms include all of the following:</p> <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.                                   | <p>Symptoms include all of the following:</p> <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.                                       | <p>Symptoms include all of the following:</p> <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.                               | <p>Symptoms include all of the following:</p> <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.                 | <p>Symptoms include all of the following:</p> <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.         | <p>Symptoms include all of the following:</p> <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> |
| 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.  |

| Alert Definition  | Symptom  | Recommendations   |
|---|--|---|
| 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 HA master 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.

**Impact** Efficiency

**Criticality** 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.

**Impact** Risk

**Criticality** Symptom-based

| Alert Definition   | Symptom  | Recommendations   |
|--|--|---|
| Virtual machine has CPU contention caused by co-stop.                | Symptoms include all of the following: <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. | Symptoms include all of the following: <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.   |

| Alert Definition   | Symptom   | Recommendations   |
|--|---|---|
| Virtual machine has high CPU co-stop due to snapshots.                     | Symptoms include all of the following: <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. | Symptoms include all of the following: <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.                     | Symptoms include all of the following: <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: MemsFss 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> <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> </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>■ 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.

|                    |         |
|--------------------|---------|
| <b>Impact</b>      | Risk    |
| <b>Criticality</b> | 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.  |



| Alert Definition   | Symptom  | Recommendations   |
|--|--|---|
| 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.

|                    |          |
|--------------------|----------|
| <b>Impact</b>      | Health   |
| <b>Criticality</b> | 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> <pre>----- vmhba35   HBA (Host Bus Adapter) C1   Channel T0   Target (storage processor port) L7   LUN (Logical Unit Number or Disk Unit).</pre> <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="http://kb.vmware.com/kb/1003973">http://kb.vmware.com/kb/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="http://kb.vmware.com/kb/1003988">http://kb.vmware.com/kb/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="http://kb.vmware.com/kb/1003486">http://kb.vmware.com/kb/1003486</a></li> <li>2 Check whether a vmkping to each network portal of the storage array fails. For more information, see <a href="http://kb.vmware.com/kb/10037828">http://kb.vmware.com/kb/10037828</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 see the storage array. If you require assistance, contact your switch vendor. The fiber switch propagates RSCN</p> |

| Alert Definition | Symptom | Recommendations   |
|------------------|---------|---|
|                  |         | <p>messages to the ESX hosts. For more information about configuring the fiber switch, see <a href="http://kb.vmware.com/kb/1002301">http://kb.vmware.com/kb/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.</p> <p>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  |
|---|---|--|
| Datastore has one or more hosts that have lost redundant paths to a storage device. | Host(s) lost redundancy to storage device(s) (fault symptom). | <p>The storage device path, for example, <code>vmhba35:C1:T0:L7</code>, contains several potential failure points:</p> <p>Path Element   Failure Point</p> <p>----- vmhba35<br/>   HBA (Host Bus Adapter) C1  <br/> 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="http://kb.vmware.com/kb/1003973">http://kb.vmware.com/kb/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="http://kb.vmware.com/kb/1003988">http://kb.vmware.com/kb/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="http://kb.vmware.com/kb/1003486">http://kb.vmware.com/kb/1003486</a>.</li> <li>2 Check whether a vmkping to each network portal of the storage array fails. For more information, see <a href="http://kb.vmware.com/kb/10037828">http://kb.vmware.com/kb/10037828</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 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="http://kb.vmware.com/kb/1002301">http://kb.vmware.com/kb/1002301</a>.</p> |

| Alert Definition | Symptom | Recommendations   |
|------------------|---------|---|
|                  |         | 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. |

## 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.          | 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 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. | Symptoms include all of the following: <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:

|                    |               |
|--------------------|---------------|
| <b>Impact</b>      | Risk          |
| <b>Criticality</b> | 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. |



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