



Understanding performance events and alerts

Active IQ Unified Manager

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Understanding performance events and alerts

Performance events are notifications that Unified Manager generates automatically when a predefined condition occurs, or when a performance counter value crosses a threshold. Events help you identify performance issues in the clusters that are monitored.

You can configure alerts to send email notification automatically when performance events of certain severity types occur.

Sources of performance events

Performance events are issues related to workload performance on a cluster. They help you identify storage objects with slow response times, also known as high latency. Together with other health events that occurred at the same time, you can determine the issues that might have caused, or contributed to, the slow response times.

Unified Manager receives performance events from the following sources:

- **User-defined performance threshold policy events**

Performance issues based on custom threshold values that you have set. You configure performance threshold policies for storage objects; for example, aggregates and volumes, so that events are generated when a threshold value for a performance counter has been breached.

You must define a performance threshold policy and assign it to a storage object to receive these events.

- **System-defined performance threshold policy events**

Performance issues based on threshold values that are system-defined. These threshold policies are included with the installation of Unified Manager to cover common performance problems.

These threshold policies are enabled by default, and you might see events shortly after adding a cluster.

- **Dynamic performance threshold events**

Performance issues that are the result of failures or errors in an IT infrastructure, or from workloads overutilizing cluster resources. The cause of these events might be a simple issue that corrects itself over a period of time or that can be addressed with a repair or configuration change. A dynamic threshold event indicates that the workloads on an ONTAP system are slow due to other workloads with high usage of shared cluster components.

These thresholds are enabled by default, and you might see events after three days of collecting data from a new cluster.

Performance event severity types

Each performance event is associated with a severity type to help you prioritize the events that require immediate corrective action.

- **Critical**

A performance event occurred that might lead to service disruption if corrective action is not taken immediately.

Critical events are sent from user-defined thresholds only.

- **Warning**

A performance counter for a cluster object is out of normal range and should be monitored to make sure it does not reach the critical severity. Events of this severity do not cause service disruption, and immediate corrective action might not be required.

Warning events are sent from user-defined, system-defined, or dynamic thresholds.

- **Information**

The event occurs when a new object is discovered, or when a user action is performed. For example, when any storage object is deleted or when there are any configuration changes, the event with severity type Information is generated.

Information events are sent directly from ONTAP when it detects a configuration change.

For more information, see the following links:

- [What happens when an event is received](#)
- [What information is contained in an alert email](#)
- [Adding alerts](#)
- [Adding alerts for performance events](#)

Configuration changes detected by Unified Manager

Unified Manager monitors your clusters for configuration changes to help you determine whether a change might have caused or contributed to a performance event. The Performance Explorer pages display a change event icon (●) to indicate the date and time when the change was detected.

You can review the performance charts in the Performance Explorer pages and in the Workload Analysis page to see whether the change event impacted the performance of the selected cluster object. If the change was detected at or around the same time as a performance event, the change might have contributed to the issue, which caused the event alert to trigger.

Unified Manager can detect the following change events, which are categorized as Informational events:

- A volume moves between aggregates.

Unified Manager can detect when the move is in progress, completed, or failed. If Unified Manager is down during a volume move, when it is back up it detects the volume move and displays a change event for it.

- The throughput (MB/s or IOPS) limit of a QoS policy group that contains one or more monitored workloads changes.

Changing a policy group limit can cause intermittent spikes in the latency (response time), which might also trigger events for the policy group. The latency gradually returns to normal and any events caused by the

spikes become obsolete.

- A node in an HA pair takes over or gives back the storage of its partner node.

Unified Manager can detect when the takeover, partial takeover, or giveback operation has been completed. If the takeover is caused by a panicked node, Unified Manager does not detect the event.

- An ONTAP upgrade or revert operation is completed successfully.

The previous version and new version are displayed.

Types of system-defined performance threshold policies

Unified Manager provides some standard threshold policies that monitor cluster performance and generate events automatically. These policies are enabled by default, and they generate warning or information events when the monitored performance thresholds are breached.



System-defined performance threshold policies are not enabled on Cloud Volumes ONTAP, ONTAP Edge, or ONTAP Select systems.

If you are receiving unnecessary events from any system-defined performance threshold policies, you can disable the events for individual policies from the Event Setup page.

Cluster threshold policies

The system-defined cluster performance threshold policies are assigned, by default, to every cluster being monitored by Unified Manager:

- **Cluster load imbalance**

Identifies situations in which one node is operating at a much higher load than other nodes in the cluster, and therefore potentially affecting workload latencies.

It does this by comparing the performance capacity used value for all nodes in the cluster to see if there is a load difference of 30% between any nodes. This is a warning event.

- **Cluster capacity imbalance**

Identifies situations in which one aggregate has a much higher used capacity than other aggregates in the cluster, and therefore potentially affecting space required for operations.

It does this by comparing the used capacity value for all aggregates in the cluster to see if there is a difference of 70% between any aggregates. This is a warning event.

Node threshold policies

The system-defined node performance threshold policies are assigned, by default, to every node in the clusters being monitored by Unified Manager:

- **Performance Capacity Used Threshold Breached**

Identifies situations in which a single node is operating above the bounds of its operational efficiency, and therefore potentially affecting workload latencies.

It does this by looking for nodes that are using more than 100% of their performance capacity for more than 12 hours. This is a warning event.

- **Node HA pair over-utilized**

Identifies situations in which nodes in an HA pair are operating above the bounds of the HA pair operational efficiency.

It does this by looking at the performance capacity used value for the two nodes in the HA pair. If the combined performance capacity used of the two nodes exceeds 200% for more than 12 hours, then a controller failover will impact workload latencies. This is an informational event.

- **Node disk fragmentation**

Identifies situations in which a disk or disks in an aggregate are fragmented, slowing key system services and potentially affecting workload latencies on a node.

It does this by looking at certain read and write operation ratios across all aggregates on a node. This policy might also be triggered during SyncMirror resynchronization or when errors are found during disk scrub operations. This is a warning event.



The “Node disk fragmentation” policy analyzes HDD-only aggregates; Flash Pool, SSD, and FabricPool aggregates are not analyzed.

Aggregate threshold policies

The system-defined aggregate performance threshold policy is assigned by default to every aggregate in the clusters being monitored by Unified Manager:

- **Aggregate disks over-utilized**

Identifies situations in which an aggregate is operating above the limits of its operational efficiency, thereby potentially affecting workload latencies. It identifies these situations by looking for aggregates where the disks in the aggregate are more than 95% utilized for more than 30 minutes. This multicondition policy then performs the following analysis to help determine the cause of the issue:

- Is a disk in the aggregate currently undergoing background maintenance activity?

Some of the background maintenance activities a disk could be undergoing are disk reconstruction, disk scrub, SyncMirror resynchronization, and parity.

- Is there a communications bottleneck in the disk shelf Fibre Channel interconnect?
- Is there too little free space in the aggregate? A warning event is issued for this policy only if one (or more) of the three subordinate policies are also considered breached. A performance event is not triggered if only the disks in the aggregate are more than 95% utilized.



The “Aggregate disks over-utilized” policy analyzes HDD-only aggregates and Flash Pool (hybrid) aggregates; SSD and FabricPool aggregates are not analyzed.

Workload latency threshold policies

The system-defined workload latency threshold policies are assigned to any workload that has a configured Performance Service Level policy that has a defined “expected latency” value:

- **Workload Volume/LUN Latency Threshold Breached as defined by Performance Service Level**

Identifies volumes (file shares) and LUNs that have exceeded their “expected latency” limit, and that are affecting workload performance. This is a warning event.

It does this by looking for workloads that have exceeded the expected latency value for 30% of the time during the previous hour.

QoS threshold policies

The system-defined QoS performance threshold policies are assigned to any workload that has a configured ONTAP QoS maximum throughput policy (IOPS, IOPS/TB, or MB/s). Unified Manager triggers an event when the workload throughput value is 15% less than the configured QoS value:

- **QoS Max IOPS or MB/s threshold**

Identifies volumes and LUNs that have exceeded their QoS maximum IOPS or MB/s throughput limit, and that are affecting workload latency. This is a warning event.

When a single workload is assigned to a policy group, it does this by looking for workloads that have exceeded the maximum throughput threshold defined in the assigned QoS policy group during each collection period for the previous hour.

When multiple workloads share a single QoS policy, it does this by adding the IOPS or MB/s of all workloads in the policy and checking that total against the threshold.

- **QoS Peak IOPS/TB or IOPS/TB with Block Size threshold**

Identifies volumes that have exceeded their adaptive QoS peak IOPS/TB throughput limit (or IOPS/TB with Block Size limit), and that are affecting workload latency. This is a warning event.

It does this by converting the peak IOPS/TB threshold defined in the adaptive QoS policy into a QoS maximum IOPS value based on the size of each volume, and then it looks for volumes that have exceeded the QoS max IOPS during each performance collection period for the previous hour.



This policy is applied to volumes only when the cluster is installed with ONTAP 9.3 and later software.

When the “block size” element has been defined in the adaptive QoS policy, the threshold is converted into a QoS maximum MB/s value based on the size of each volume. Then it looks for volumes that have exceeded the QoS max MB/s during each performance collection period for the previous hour.



This policy is applied to volumes only when the cluster is installed with ONTAP 9.5 and later software.

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