Monitor performance using the Performance Explorer pages

Active IQ Unified Manager

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Monitor performance using the Performance Explorer pages

Monitor performance using the Performance Explorer pages in Active IQ Unified Manager

The Performance Explorer pages display detailed information about the performance of each object in a cluster. The page provides a detailed view into the performance of all cluster objects, enabling you to select and compare the performance data of specific objects across various time periods.

You can also assess the overall performance of all objects, and compare object performance data in a side-by-side format.

Use root objects for performance monitoring in Active IQ Unified Manager

The root object is the baseline against which other object comparisons are made. This enables you to view and compare the data from other objects to the root object, providing performance data analysis that helps you to troubleshoot and improve object performance.

The root object name displays at the top of the Comparing pane. Additional objects display below the root object. Although there is no limit to the number of additional objects you can add to the Comparing pane, only one root object is allowed. Data for the root object automatically displays in the graphs in the Counter Charts pane.

You cannot change the root object; it is always set to the object page you are viewing. For example, if you open the Volume Performance Explorer page of Volume1, then Volume1 is the root object and cannot be changed. If you want to compare against a different root object, then you must click the link for an object and open its landing page.

Events and Thresholds are displayed only for root objects.

Filter correlated objects in the Active IQ Unified Manager grid

Filtering enables you to display a smaller, more well-defined subset of objects in the grid. For example, if you have 25 volumes in the grid, filtering enables you to view only those volumes that have throughput less than 90 MBps, or latency greater than 1 ms/op.

Specify a time range for correlated objects

Specify a time range for correlated objects in Active IQ Unified Manager

The Time Range selector on the Performance Explorer page enables you to specify the time range for object data comparison. Specifying a time range refines the contents of the Performance Explorer pages to show only the object data within the time range you have specified.

Refining the time range provides an efficient method of displaying only the performance data in which you are interested. You can select a predefined time range or specify a custom time range. The default time range is the preceding 72 hours.

Select a predefined time range in Active IQ Unified Manager

Selecting a predefined time range is a quick and efficient way for you to customize and focus data output when viewing cluster object performance data. When selecting a predefined time range, data for up to 13 months is available.

Steps

1. At the top right of the **Performance Explorer** page, click **Time Range**.
2. From the right side of the **Time Range Selection** panel, select a predefined time range.
3. Click **Apply Range**.

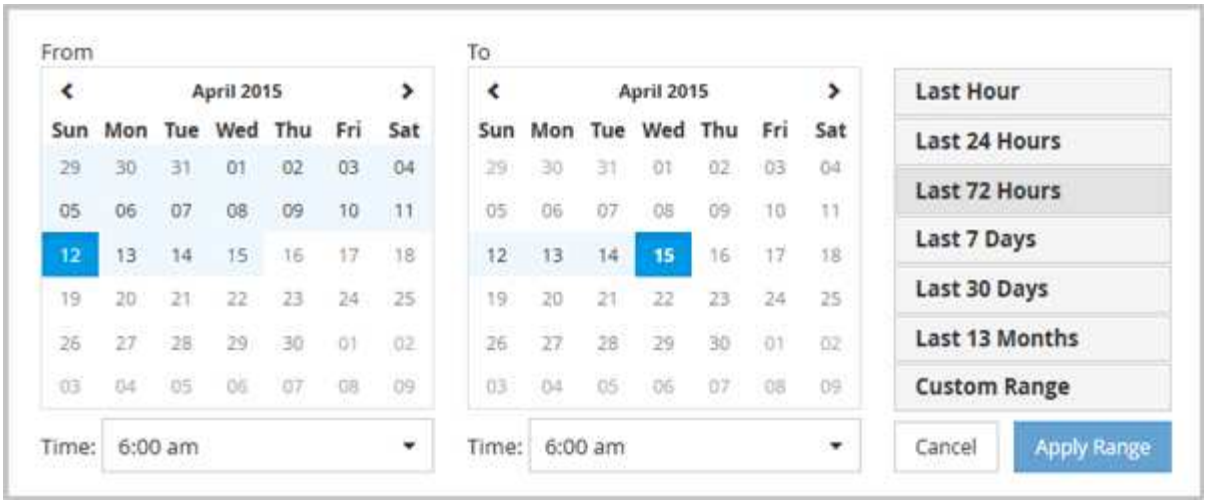
Specify a custom time range in Active IQ Unified Manager

The Performance Explorer page enables you to specify the date and time range for your performance data. Specifying a custom time range provides greater flexibility than using predefined time ranges when refining cluster object data.

You can select a time range between one hour and 390 days. 13 months equals 390 days because each month is counted as 30 days. Specifying a date and time range provides more detail and enables you to zoom in on specific performance events or series of events. Specifying a time range also aids in troubleshooting potential performance issues, as specifying a date and time range displays data surrounding the performance event in finer detail. Use the **Time Range** control to select predefined date and time ranges, or specify your own custom date and time range of up to 390 days. Buttons for predefined time ranges vary from the **Last Hour** through the **Last 13 Months**.

Selecting the **Last 13 Months** option or specifying a custom date range greater than 30 days displays a dialog box alerting you that performance data displayed for a period greater than 30 days is charted using hourly averages and not 5-minute data polling. Therefore, a loss of timeline visual granularity might occur. If you click the **Do not show again** option in the dialog box, the message does not appear when you select the **Last 13 Months** option or specify a custom date range greater than 30 days. Summary data also applies on a smaller time range, if the time range includes a time/date that is more than 30 days from today.

When selecting a time range (either custom or predefined), time ranges of 30 days or fewer are based on 5-minute interval data samples. Time ranges greater than 30 days are based on one-hour interval data samples.



1. Click the **Time Range** drop-down box and the Time Range panel displays.
2. To select a predefined time range, click one of the **Last…** buttons at the right of the **Time Range** panel. When selecting a predefined time range, data for up to 13 months is available. The predefined time range button you selected is highlighted, and the corresponding days and time display in the calendars and time selectors.
3. To select a custom date range, click the start date in the **From** calendar on the left. Click **<** or **>** to navigate forward or backward in the calendar. To specify the end date, click a date in the **To** calendar on the right. Note that the default end date is today unless you specify a different end date. The **Custom Range** button at the right of the Time Range panel is highlighted, indicating that you have selected a custom date range.
4. To select a custom time range, click the **Time** control below the **From** calendar and select the start time. To specify the end time, click the **Time** control below the **To** calendar on the right and select the end time. The **Custom Range** button at the right of the Time Range panel is highlighted, indicating that you have selected a custom time range.
5. Optionally, you can specify the start and end times when selecting a predefined date range. Select the predefined date range as previously described, then select the start and end times as previously described. The selected dates are highlighted in the calendars, your specified start and end times display in the **Time** controls, and the **Custom Range** button is highlighted.
6. After selecting the date and time range, click **Apply Range**. The performance statistics for that time range display in the charts and in the Events timeline.

Define correlated objects for comparison graphing in Active IQ Unified Manager

You can define a list of correlated objects for data and performance comparison in the Counter Chart pane. For example, if your storage virtual machine (SVM) is experiencing a performance issue, you can compare all volumes in the SVM to identify which volume might be causing the issue.

You can add any object in the correlated objects grid to the Comparing and Counter Chart panes. This enables you to view and compare data of multiple objects and with the root object. You can add and remove objects to and from the correlated objects grid; however, the root object in the Comparing pane is not removable.

Adding many objects to the Comparing pane may have a negative impact on performance. To maintain performance, you should select a limited number of charts for data comparison.

Steps

1. In the objects grid, locate the object that you want to add, and click the **Add** button.

   The **Add** button turns gray, and the object is added to the additional objects list in the Comparing pane. The object's data is added to the graphs in the Counter Charts panes. The color of the object's eye icon ( ) matches the color of the object's data trend line in the graphs.

2. **Optional:** Hide or show data for selected objects:

To do this…	Take this action…
Hide a selected object	Click the selected object's eye icon ( ) in the Comparing pane. The object's data is hidden, and the eye icon for that object turns gray.
Show a hidden object	Click the gray eye icon of the selected object in the Comparing pane. The eye icon returns to its original color, and the object data is added back into the graphs in the Counter Charts pane.

3. **Optional:** Remove selected objects from the **Comparing** pane:

To do this…	Take this action…
Remove a selected object	Hover over the selected object's name in the Comparing pane to show the remove object button (**X**), and then click the button. The object is removed from the Comparing pane, and its data is cleared from the counter charts.
Remove all selected objects	Click the remove all object's button (**X**) at the top of the Comparing pane. All selected objects and their data are removed, leaving only the root object.

Understand counter charts in Active IQ Unified Manager

Charts in the Counter Charts pane enable you to view and compare performance data for the root object and for objects you have added from the correlated objects grid. This can help you understand performance trends and isolate and resolve performance issues.

Counter charts displayed by default are Events, Latency, IOPS, and MBps. Optional charts that you can choose to display are Utilization, Performance Capacity Used, Available IOPS, IOPS/TB, and Cache Miss Ratio. Additionally, you can choose to view total values or breakdown values for the Latency, IOPS, MBps, and Performance Capacity Used charts.

The Performance Explorer displays certain counter charts by default; whether the storage object supports them all or not. When a counter is not supported, the counter chart is empty and the message `Not applicable for <object>` is displayed.

The charts display performance trends for the root object and for all objects you have selected in the Comparing pane. Data in each chart is arranged as follows:

- **X axis**

  Displays the specified time period. If you have not specified a time range, the default is the preceding 72-hour period.

- **Y axis**

  Displays counter units unique to the selected object, or objects.

Trend line colors match the color of the object name as displayed in the Comparing pane. You can position your cursor over a point on any trend line to view details for time and value for that point.

If you want to investigate a specific period of time within a chart, you can use one of the following methods:

- Use the **<** button to expand the Counter Charts pane to span the width of the page.
- Use the cursor (when it transitions to a magnifying glass) to select a portion of the timeframe in the chart to focus and enlarge that area. You can click Reset Chart Zoom to return the chart to the default timeframe.
- Use the **Zoom View** button to display a large single counter chart that contains expanded details and threshold indicators.

Occasionally, gaps in the trend lines display. Gaps mean that either Unified Manager failed to collect performance data from the storage system or that Unified Manager might have been down.

Understand the types of performance counter charts in Active IQ Unified Manager

There are standard performance charts that display the counter values for the selected storage object. Each of the Breakdown counter charts display the total values separated out into read, write, and other categories. Furthermore, some Breakdown counter charts display additional detail when the chart is displayed in Zoom view.

The following table shows the available performance counter charts.

Available charts	Chart description
Events	Displays critical, error, warning, and information events in correlation with the statistical charts for the root object. Health events display in addition to performance events to provide a complete picture of the reasons performance may be affected.
Latency - Total	Number of milliseconds required to respond to application requests. Note that the average latency values are I/O weighted.
Latency - Breakdown	The same information shown in Latency Total, but with the performance data separated into read, write, and other latency. This chart option applies only when the selected object is an SVM, node, aggregate, volume, LUN, or namespace.

Available charts	Chart description
Latency - Cluster Components	The same information shown in Latency Total, but with the performance data separated into latency by cluster component. This chart option applies only when the selected object is a volume.
IOPS - Total	Number of input/output operations processed per second. When displayed for a node, selecting “Total” displays the IOPS for data moving through this node that may reside on the local or the remote node, and selecting “Total (Local)” displays the IOPS for data that resides only on the current node.
IOPS - Breakdown	The same information shown in IOPS Total, but with the performance data separated into read, write, and other IOPS. This chart option applies only when the selected object is an SVM, node, aggregate, volume, LUN, or namespace. When displayed in Zoom view, the volumes chart displays QoS minimum and maximum throughput values, if configured in ONTAP. When displayed for a node, selecting “Breakdown” displays the IOPS breakdown for data moving through this node that may reside on the local or the remote node, and selecting “Breakdown (Local)” displays the IOPS breakdown for data that resides only on the current node.
IOPS - Protocols	The same information shown in IOPS Total, but the performance data is separated into individual charts for CIFS, NFS, FCP, NVMe, and iSCSI protocol traffic. This chart option applies only when the selected object is an SVM.
IOPS/TB - Total	Number of input/output operations processed per second based on the total space that is being consumed by the workload, in terabytes. Also called I/O density, this counter measures how much performance can be delivered by a given amount of storage capacity. When displayed in Zoom view the volumes chart displays QoS expected and peak throughput values, if configured in ONTAP. This chart option applies only when the selected object is a volume.
MB/s - Total	Number of megabytes of data transferred to and from the object per second.

Available charts	Chart description
MB/s - Breakdown	The same information shown in the MB/s chart, but with the throughput data separated into disk reads, Flash Cache reads, writes, and other. When displayed in Zoom view, the volumes chart displays QoS maximum throughput values, if configured in ONTAP. This chart option applies only when the selected object is an SVM, node, aggregate, volume, LUN, or namespace. Flash Cache data is displayed only for nodes, and only when a Flash Cache module is installed in the node.
Performance Capacity Used - Total	Percentage of performance capacity that is being consumed by the node or aggregate.
Performance Capacity Used - Breakdown	Performance Capacity Used data separated into user protocols and system background processes. Additionally, the amount of free performance capacity is shown.
Available IOPS - Total	Number of input/output operations per second that are currently available (free) on this object. This number is the result of subtracting the currently used IOPS from the total IOPS that Unified Manager calculates that the object can perform. This chart option applies only when the selected object is a node or aggregate.
Utilization - Total	Available resource percentage of the object that is being used. Utilization indicates node utilization for nodes, disk utilization for aggregates, and bandwidth utilization for ports. This chart option applies only when the selected object is a node, aggregate, or port.
Cache Miss Ratio - Total	Percentage of read requests from client applications that are returned from the disk instead of being returned from the cache. This chart option applies only when the selected object is a volume.

Select performance charts to display in Active IQ Unified Manager

The Choose charts drop-down list enables you to select the types of performance counter charts to display in the Counter Charts pane. This enables you to view specific data and counters, based on your performance requirements.

Steps

1. In the **Counter Charts** pane, click the **Choose charts** drop-down list.
2. Add or remove charts:

To…	Do this…
Add or remove individual charts	Click the check boxes next to the charts you want to show or hide
Add all charts	Click **Select All**
Remove all charts	Click **Unselect All**

Your chart selections are displayed in the Counter Charts pane. Note that as you add charts, the new charts are inserted into the Counter Charts pane to match the order of the charts listed in the Choose charts drop-down list. Selecting additional charts might require additional scrolling.

Expand the Counter Charts pane in Active IQ Unified Manager

You can expand the Counter Charts pane so that the charts are larger and more readable.

After you have defined the comparison objects and the time range for counters, you can view a larger Counter Charts pane. You use the **<** button in the middle of the Performance Explorer window to expand the pane.

Step

1. Expand or reduce the **Counter Charts** pane.

To…	Do this…
Expand the Counter Charts pane to fit the width of the page	Click the **<** button
Reduce the Counter Charts pane to the right half of the page	Click the **>** button

Change the Counter Charts focus to a shorter period in Active IQ Unified Manager

You can use your mouse to reduce the time range to focus on a specific period of time in the Counter Chart pane or in the Counter Charts Zoom View window. This enables you to see a more granular and microscopic view of any part of the timeline of performance data, events, and thresholds.

Before you begin

The cursor must have changed to a magnifying glass to indicate that this functionality is active.

When using this feature, which alters the timeline to display values that correspond to the more granular display, the time and date range on the **Time Range** selector does not change from the original values for the chart.

Steps

1. To zoom into a specific period of time, click using the magnifying glass and drag the mouse to highlight the area that you want to see in detail.

The counter values for the time period you select fills the counter chart.

2. To return to the original period of time as set in the **Time Range** selector, click the **Reset Chart Zoom** button.

   The counter chart displays in its original state.

View event details in the Active IQ Unified Manager Events Timeline

You can view all events and their related details in the Events Timeline pane of Performance Explorer. This is a quick and efficient method of viewing all the health and performance events that occurred on the root object during a specified time range, which can be helpful when troubleshooting performance issues.

The Events Timeline pane shows critical, error, warning, and informational events that occurred on the root object during the selected time range. Each event severity has its own timeline. Single and multiple events are represented by an event dot on the timeline. You can position your cursor over an event dot to see the event details. To increase the visual granularity of multiple events, you can decrease the time range. This spreads out multiple events into single events, enabling you to separately view and investigate each event.

Each performance event dot on the Events Timeline lines up vertically with a corresponding spike in the counter charts trend lines that are displayed below the Events Timeline. This provides a direct visual correlation between events and overall performance. Health events are displayed on the timeline as well, but these types of events do not necessarily line up with a spike in one of the performance charts.

Steps

1. On the **Events Timeline** pane, position the cursor over an event dot on a timeline to view a summary of the event or events at that event point.

   A pop-up dialog displays information about the event types, the date and time when the events occurred, the state, and the event duration.

2. View full event details for one event or multiple events:

To do this…	Click this…
View details for a single event	**View Event Detail** in the pop-up dialog.
View details for multiple events	**View Event Details** in the pop-up dialog. Clicking a single event on the multiple events dialog displays the appropriate Event Details page.

Counter Charts Zoom View

Learn about the zoom view in Counter Charts in Active IQ Unified Manager

The Counter Charts provide a Zoom View that enables you to zoom in on performance details over your specified time period. This enables you to see performance details and

events with much higher granularity, which is beneficial when troubleshooting performance issues.

When displayed in Zoom View, some of the breakdown charts provide additional information than what appears when the chart is not in Zoom View. For example, the IOPS, IOPS/TB, and MBps Breakdown chart Zoom View pages display QoS policy values for volumes and LUNs if they have been set in ONTAP.

For system-defined performance threshold policies, only the “Node resources over-utilized” and “QoS throughput limit breached” policies are available from the **Policies** list. The other system-defined threshold policies are not available at this time.

Display the Counter Charts zoom view in Active IQ Unified Manager

The Counter Charts Zoom View provides a finer level of detail for the selected counter chart and its associated timeline. This magnifies the counter chart data, enabling you to have a sharper view into performance events and their underlying causes.

You can display the Counter Charts Zoom View for any counter chart.

Steps

1. Click **Zoom View** to open the selected chart a new browser window.
2. If you are viewing a Breakdown chart and then click **Zoom View** the Breakdown chart is shown in Zoom View. You can select **Total** while in Zoom View if you want to change the view option.

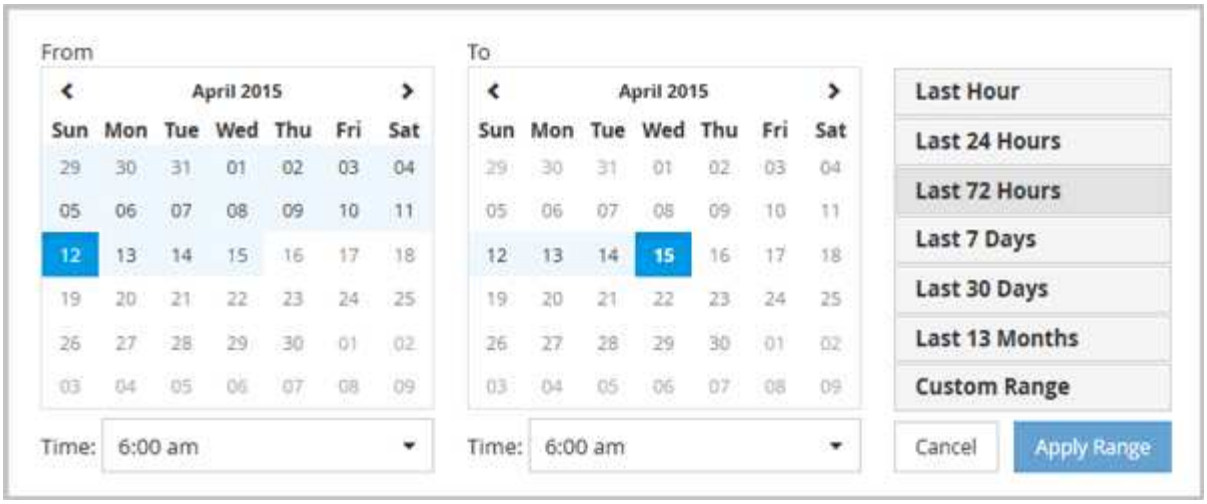
Specify the time range in Zoom View in Active IQ Unified Manager

The **Time Range** control in the Counter Charts Zoom View window enables you to specify a date and time range for the selected chart. This enables you to quickly locate specific data based on either a preset time range or your own custom time range.

You can select a time range between one hour and 390 days. 13 months equals 390 days because each month is counted as 30 days. Specifying a date and time range provides more detail and enables you to zoom in on specific performance events or series of events. Specifying a time range also aids in troubleshooting potential performance issues, as specifying a date and time range displays data surrounding the performance event in finer detail. Use the **Time Range** control to select predefined date and time ranges, or specify your own custom date and time range of up to 390 days. Buttons for predefined time ranges vary from the **Last Hour** through the **Last 13 Months**.

Selecting the **Last 13 Months** option or specifying a custom date range greater than 30 days displays a dialog box alerting you that performance data displayed for a period greater than 30 days is charted using hourly averages and not 5-minute data polling. Therefore, a loss of timeline visual granularity might occur. If you click the **Do not show again** option in the dialog box, the message does not appear when you select the **Last 13 Months** option or specify a custom date range greater than 30 days. Summary data also applies on a smaller time range, if the time range includes a time/date that is more than 30 days from today.

When selecting a time range (either custom or predefined), time ranges of 30 days or fewer are based on 5-minute interval data samples. Time ranges greater than 30 days are based on one-hour interval data samples.



1. Click the **Time Range** drop-down box and the Time Range panel displays.
2. To select a predefined time range, click one of the **Last…** buttons at the right of the **Time Range** panel. When selecting a predefined time range, data for up to 13 months is available. The predefined time range button you selected is highlighted, and the corresponding days and time display in the calendars and time selectors.
3. To select a custom date range, click the start date in the **From** calendar on the left. Click **<** or **>** to navigate forward or backward in the calendar. To specify the end date, click a date in the **To** calendar on the right. Note that the default end date is today unless you specify a different end date. The **Custom Range** button at the right of the Time Range panel is highlighted, indicating that you have selected a custom date range.
4. To select a custom time range, click the **Time** control below the **From** calendar and select the start time. To specify the end time, click the **Time** control below the **To** calendar on the right and select the end time. The **Custom Range** button at the right of the Time Range panel is highlighted, indicating that you have selected a custom time range.
5. Optionally, you can specify the start and end times when selecting a predefined date range. Select the predefined date range as previously described, then select the start and end times as previously described. The selected dates are highlighted in the calendars, your specified start and end times display in the **Time** controls, and the **Custom Range** button is highlighted.
6. After selecting the date and time range, click **Apply Range**. The performance statistics for that time range display in the charts and in the Events timeline.

Select performance thresholds in Counter Charts Zoom View in Active IQ Unified Manager

Applying thresholds in the Counter Charts Zoom View provides a detailed view of occurrences of performance threshold events. This enables you to apply or remove thresholds, and immediately view the results, which can be helpful while deciding whether troubleshooting should be your next step.

Selecting thresholds in the Counter Charts Zoom View enables you to view precise data about performance threshold events. You can apply any threshold that appears under the **Policies** area of the Counter Charts Zoom View.

Only one policy at a time can be applied to the object in the Counter Charts Zoom View.

Step

1. Select or deselect the that is associated with a policy.

   The selected threshold is applied to the Counter Charts Zoom View. Critical thresholds are displayed as a red line; warning thresholds are displayed as a yellow line.

View volume latency by cluster component in Active IQ Unified Manager

You can view detailed latency information for a volume by using the Volume Performance Explorer page. The Latency - Total counter chart shows total latency on the volume, and the Latency - Breakdown counter chart is useful for determining the impact of read and write latency on the volume.

Additionally, the Latency - Cluster Components chart shows a detailed comparison of the latency of each cluster component to help determine how each component contributes to the total latency on the volume. The following cluster components are displayed:

- Network
- QoS Limit Max
- QoS Limit Min
- Network Processing
- Cluster Interconnect
- Data Processing
- Aggregate Operations
- Volume Activation
- MetroCluster Resources
- Cloud Latency
- Sync SnapMirror

Steps

1. In the **Volume Performance Explorer** page for your selected volume, from the Latency chart, select **Cluster Components** from the drop-down menu.

   The Latency - Cluster Components chart is displayed.

2. To view a larger version of the chart, select **Zoom View**.

   The cluster component comparative chart is displayed. You can restrict the comparison by deselecting or selecting the that is associated with each cluster component.

3. To view the specific values, move your cursor into the chart area to see the popup window.

View SVM IOPS traffic by protocol in Active IQ Unified Manager

You can view detailed IOPS information for an SVM by using the Performance/SVM

Explorer page. The IOPS - Total counter chart shows total IOPS usage on the SVM, and the IOPS - Breakdown counter chart is useful for determining the impact of read, write, and other IOPS on the SVM.

Additionally, the IOPS - Protocols chart shows a detailed comparison of the IOPS traffic for each protocol that is being used on the SVM. The following protocols are available:

- CIFS
- NFS
- FCP
- iSCSI
- NVMe-FC

Steps

1. In the **Performance/SVM Explorer** page for your selected SVM, from the IOPS chart, select **Protocols** from the drop-down menu.

   The IOPS - Protocols chart is displayed.

2. To view a larger version of the chart, select **Zoom View**.

   The IOPS advanced protocol comparative chart is displayed. You can restrict the comparison by deselecting or selecting the that is associated with a protocol.

3. To view the specific values, move your cursor into the chart area of either chart to see the popup window.

View volume and LUN latency charts to verify performance guarantee in Active IQ Unified Manager

You can view the volumes and LUNs that you have subscribed to the “Performance Guarantee” program to verify that latency has not exceeded the level you have been guaranteed.

The latency performance guarantee is a millisecond per operation value that should not be exceeded. It is based on an hourly average, not on the default five minute performance collection period.

Steps

1. In the **Performance: All Volumes** view or **Performance: All LUNs** view, select the volume or LUN that you are interested in.
2. In the **Performance Explorer** page for your selected volume or LUN, choose **Hourly Average** from the **View statistics in** selector.

   The horizontal line in the Latency chart will show a smoother line as the five-minute collections are replaced with the hourly average.

3. If you have other volumes on the same aggregate that are under the performance guarantee, you can add those volumes to view their latency value in the same chart.

View the performance for All SAN Array clusters in Active IQ Unified Manager

You can use the Performance: All Clusters view to display the performance status of your All SAN Array clusters.

Before you begin

You must have the Operator, Application Administrator, or Storage Administrator role.

You can view overview information for All SAN Array clusters in the Performance: All Clusters view, and details in the Cluster / Performance Explorer page.

Steps

1. In the left navigation pane, click **Storage** > **Clusters**.
2. Make sure that the “Personality” column is displayed in the **Health: All Clusters** view, or add it using the **Show / Hide** control.

   This column displays “All SAN Array” for your All SAN Array clusters.

3. To view information about the performance in those clusters, select the **Performance: All Clusters** view.

   View the performance information for the All SAN Array cluster.

4. To view detailed information about performance in those clusters, click the name of an All SAN Array cluster.
5. Click the **Explorer** tab.
6. On the **Cluster / Performance Explorer** page, select **Nodes on this Cluster** from the **View and Compare** menu.

   You can compare the performance statistics of both nodes on this cluster to make sure the load is almost identical on both nodes. If there are large discrepancies between the two nodes you can add the second node to the charts and compare the values over a longer timeframe to identify any configuration issues.

View node IOPS based on local workloads in Active IQ Unified Manager

The node IOPS counter chart can highlight where operations are only passing through the local node using a network LIF to perform read/write operations on volumes on a remote node. The IOPS - “Total (Local)” and “Breakdown (Local)” charts display the IOPS for data that resides in local volumes only on the current node.

The “Local” versions of these counter charts are similar to the node charts for Performance Capacity and Utilization because they also show only the statistics for data that resides on local volumes.

By comparing the “Local” versions of these counter charts to the regular Total versions of these counter charts you can see if there is a lot of traffic moving through the local node to access volumes on the remote node. This situation could cause performance issues, possibly indicated by high utilization on the node, if there are too many operations passing through the local node to reach a volume on a remote node. In these cases you may want to move a volume to the local node, or to create a LIF on the remote node where traffic from hosts accessing that volume can be connected.

Steps

1. In the **Performance/Node Explorer** page for your selected node, from the IOPS chart, select **Total** from the drop-down menu.

   The IOPS - Total chart is displayed.

2. Click **Zoom View** to display a larger version of the chart in a new browser tab.
3. Back in the **Performance/Node Explorer** page, from the IOPS chart, select **Total (Local)** from the drop-down menu.

   The IOPS - Total (Local) chart is displayed.

4. Click **Zoom View** to display a larger version of the chart in a new browser tab.
5. View both of the charts next to each other and identify areas where the IOPS values appear to be quite different.
6. Move your cursor over these areas to compare the local and total IOPS for a specific point in time.

Components of the Object Landing pages

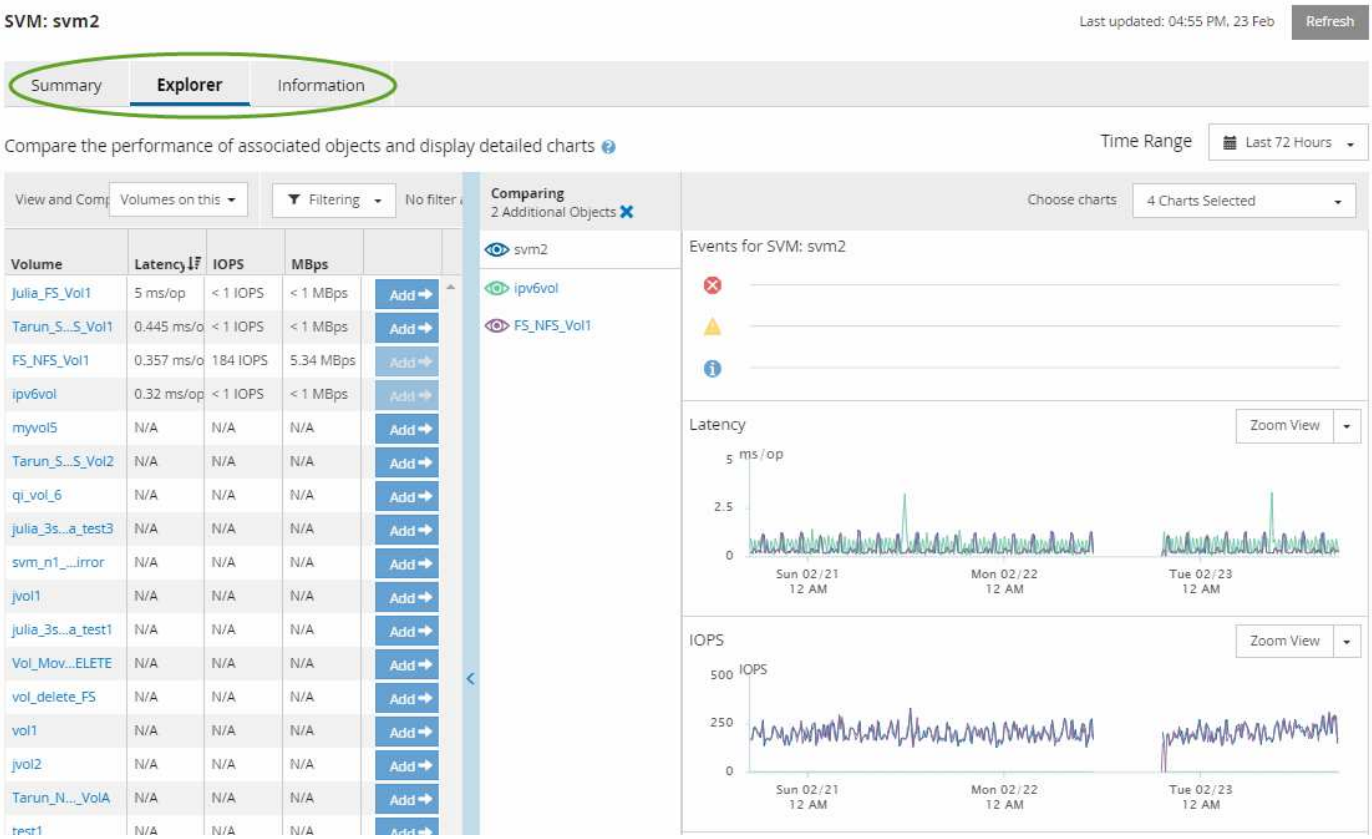
Review the components of the Object Landing pages in Active IQ Unified Manager

The Object Landing pages provide details about all critical, warning, and informational events. They provide a detailed view into the performance of all cluster objects, enabling you to select and compare individual objects across various time periods.

The Object Landing pages enable you to examine the overall performance of all objects, and to compare object performance data in a side-by-side format. This is beneficial when assessing performance and when troubleshooting events.

> The data displayed in the counter summary panels and in the Counter Charts are based on a five-minute sampling interval. The data displayed in the objects inventory grid in the left side of the page is based on a one-hour sampling interval.

The following image shows an example of an Object Landing page displaying the Explorer information:



Depending on the storage object that is being viewed, the Object Landing page can have the following tabs that provide performance data about the object:

- Summary

  Displays three or four counter charts containing the events and performance per object for the preceding 72-hour period, including a trend line that shows the high and low values during that period.

- Explorer

  Displays a grid of storage objects that are related to the current object, which enables you to compare the performance values of the current object with those of the related objects. This tab includes up to eleven counter charts and a time range selector, which enable you to perform a variety of comparisons.

- Information

  Displays values for non-performance configuration attributes about the storage object, including the installed version of ONTAP software, HA partner name, and number of ports and LIFs.

- Top Performers

  For clusters: Displays the storage objects that have the highest performance or the lowest performance, based on the performance counter that you select.

- Failover Planning

  For nodes: Displays the estimate of the performance impact on a node if the HA partner of the node fails.

- Details

For volumes: Displays detailed performance statistics for all I/O activity and operations for the selected volume workload. This tab is available for FlexVol volumes, FlexGroup volumes, and constituents of FlexGroups.

Review the Performance Summary page in Active IQ Unified Manager

The Summary page displays counter charts that contain details about the events and performance per object for the preceding 72-hour period. This data is not automatically refreshed, but is current as of the last page load. The charts in the Summary page answer the question *Do I need to look further?*

Charts and counter statistics

The summary charts provide a quick, high-level overview for the last 72-hour period, and help you to identify possible issues that require further investigation.

The Summary page counter statistics are displayed in graphs.

You can position your cursor over the trend line in a graph to view the counter values for a particular point in time. The summary charts also display the total number of active critical and warning events for the preceding 72-hour period for the following counters:

- **Latency**

  Average response time for all I/O requests; expressed in milliseconds per operation.

  Displayed for all object types.

- **IOPS**

  Average operating speed; expressed in input/output operations per second.

  Displayed for all object types.

- **MB/s**

  Average throughput; expressed in megabytes per second.

  Displayed for all object types.

- **Performance Capacity Used**

  Percentage of performance capacity that is being consumed by a node or aggregate.

  Displayed for nodes and aggregates only.

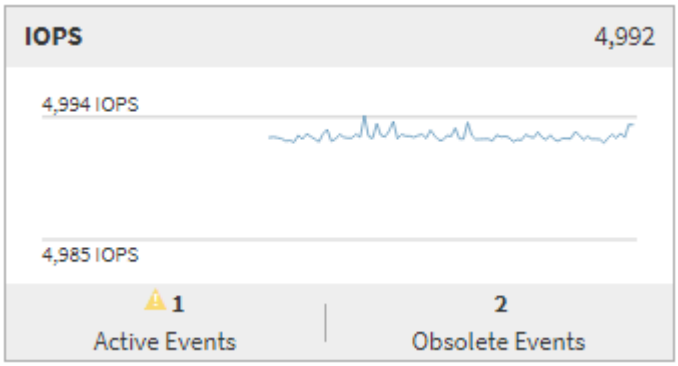
- **Utilization**

  Percentage of object utilization for nodes and aggregates, or bandwidth utilization for ports.

  Displayed for nodes, aggregates, and ports only.

Positioning the cursor over the event count for Active events shows the type and number of events. Critical events are displayed in red (), and warning events are displayed in yellow ().

The number at the top right of the chart in the gray bar is the average value from the last 72-hour period. Numbers shown at the bottom and top of the trend line graph are the minimum and maximum values for the last 72-hour period. The gray bar below the chart contains the count of active (new and acknowledged) events and obsolete events from the last 72-hour period.



- **Latency counter chart**

  The Latency counter chart provides a high-level overview of the object latency for the preceding 72-hour period. Latency refers to the average response time for all I/O requests; expressed in milliseconds per operation, the service time, wait time, or both experienced by a data packet or block in the cluster storage component under consideration.

  Top (counter value): The number in the header displays the average for the preceding 72-hour period.

  Middle (performance graph): The number at the bottom of the graph displays the lowest latency, and the number at the top of the graph displays the highest latency for the preceding 72-hour period. Position your cursor over the graph trend line to view the latency value for a specific time.

  Bottom (events): On hover, the pop-up displays the details of the events. Click the **Active Events** link below the graph to navigate to the Events Inventory page to view complete event details.

- **IOPS counter chart**

  The IOPS counter chart provides a high-level overview of the object IOPS health for the preceding 72-hour period. IOPS indicates the speed of the storage system in number of input/output operations per second.

  Top (counter value): The number in the header displays the average for the preceding 72-hour period.

  Middle (performance graph): The number at the bottom of the graph displays the lowest IOPS, and the number at the top of the graph displays the highest IOPS for the preceding 72-hour period. Position your cursor over the graph trend line to view the IOPS value for a specific time.

  Bottom (events): On hover, the pop-up displays the details of the events. Click the **Active Events** link below the graph to navigate to the Events Inventory page to view complete event details.

- **MB/s counter chart**

  The MB/s counter chart displays the object MB/s performance, and indicates how much data has been transferred to and from the object in megabytes per second. The MB/s counter chart provides a high-level overview of the object's MB/s health for the preceding 72-hour period.

  Top (counter value): The number in the header displays the average number of MB/s for the preceding 72-hour period.

Middle (performance graph): The value at the bottom of the graph displays the lowest number of MB/s, and the value at the top of the graph displays the highest number of MB/s for the preceding 72-hour period. Position your cursor over the graph trend line to view the MB/s value for a specific time.

Bottom (events): On hover, the pop-up displays the details of the events. Click the **Active Events** link below the graph to navigate to the Events Inventory page to view complete event details.

- **Performance Capacity Used counter chart**

  The Performance Capacity Used counter chart displays the percentage of performance capacity that is being consumed by the object.

  Top (counter value): The number in the header displays the average used performance capacity for the preceding 72-hour period.

  Middle (performance graph): The value at the bottom of the graph displays the lowest used performance capacity percentage, and the value at the top of the graph displays the highest used performance capacity percentage for the preceding 72-hour period. Position your cursor over the graph trend line to view the used performance capacity value for a specific time.

  Bottom (events): On hover, the pop-up displays the details of the events. Click the **Active Events** link below the graph to navigate to the Events Inventory page to view complete event details.

- **Utilization counter chart**

  The Utilization counter chart displays the object utilization percentage. The Utilization counter chart provides a high-level overview of the percentage of the object or bandwidth utilization for the preceding 72-hour period.

  Top (counter value): The number in the header displays the average utilization percentage for the preceding 72-hour period.

  Middle (performance graph): The value at the bottom of the graph displays the lowest utilization percentage, and the value at the top of the graph displays the highest utilization percentage for the preceding 72-hour period. Position your cursor over the graph trend line to view the utilization value for a specific time.

  Bottom (events): On hover, the pop-up displays the details of the events. Click the **Active Events** link below the graph to navigate to the Events Inventory page to view complete event details.

Events

The events history table, where applicable, lists the most recent events that occurred on that object. Clicking the event name displays details of the event on the Event Details page.

Review the Performance Explorer page in Active IQ Unified Manager

The Performance Explorer page enables you to compare the performance of similar objects in a cluster—for example, all the volumes in a cluster. This is beneficial when troubleshooting performance events and fine-tuning object performance. You can also compare objects with the root object, which is the baseline against which other object comparisons are made.

You can click the **Switch to Health View** button to display the Health details page for this object. In some

cases you can learn important information about the storage configuration settings for this object that may help when troubleshooting an issue.

The Performance Explorer page displays a list of cluster objects and their performance data. This page displays all the cluster objects of the same type (for example, volumes and their object-specific performance statistics) in a tabular format. This view provides an efficient overview of cluster object performance.

If “N/A” appears in any cell of the table, it means that a value for that counter is not available because there is no I/O on that object at this time.

The Performance Explorer page contains the following components:

- **Time Range**

  Enables you to select a time range for the object data.

  You can choose a predefined range, or specify your own custom time range.

- **View and Compare**

  Enables you to select which type of correlated object is displayed in the grid.

  The options available depend on the root object type and its available data. You can click the View and Compare drop-down list to select an object type. The object type that you select is displayed in the list.

- **Filtering**

  Enables you to narrow the amount of data you receive, based on your preferences.

  You can create filters that apply to the object data—for example, IOPS greater than 4. You can add up to four simultaneous filters.

- **Comparing**

  Displays a list of the objects that you have selected for comparison with the root object.

  Data for the objects in the Comparing pane is displayed in the Counter Charts.

- **View Statistics In**

  For volume and LUNs, enables you to select whether the statistics are displayed after each collection cycle (default 5 minutes), or whether the statistics are shown as an hourly average. This functionality enables you to view the latency chart in support of the NetApp "Performance Guarantee" program.

- **Counter Charts**

  Displays graphed data for each object performance category.

  Typically, only three or four charts are displayed by default. The Choose charts component enables you to display additional charts, or hide specific charts. You can also choose to show or hide the Events Timeline.

- **Events Timeline**

  Displays performance and health events occurring across the timeline that you selected in the Time Range component.

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