qos statistics commands

Command reference

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qos statistics commands

qos statistics characteristics show

Display QoS policy group characterization

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics characteristics show` command displays data that characterizes the behavior of QoS policy groups.

The command displays the following data:

- The QoS policy group name (Policy Group)
- Input/output operations performed per second (IOPS)
- Throughput achieved in kilobytes per second (KB/s) or megabytes per second (MB/s) as appropriate (Throughput)
- Request size in bytes (B) (Request size)
- Read percentage from total I/O (Read)
- Concurrency, which indicates the number of concurrent users generating the I/O traffic (Concurrency)

The results displayed per iteration are sorted by IOPS. Each iteration starts with a row that displays the total IOPS used across all QoS policy groups. Other columns in this row are either totals or averages.

Parameters

`[-node {<nodename>|local}]` - Node

Selects the policy groups that match this parameter value. If you do not specify this parameter, the command displays data for the entire cluster.

`[-iterations <integer>]` - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

{ `[-rows <integer>]` - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. Valid values are from 1 to 20. The default value is 10.

| `[-policy-group <text>]` - QoS Policy Group Name

Selects the QoS policy group whose name matches the specified value. If you do not specify this parameter, the command displays data for all QoS policy groups.

| `[-adaptive-policy-group <text>]` - Adaptive QoS Policy Group Name }

Selects the QoS adaptive policy group whose name matches the specified value. If you do not specify this parameter, the command displays data for all QoS policy groups.

[-refresh-display {true|false}] - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

Examples

```
cluster1::> qos statistics characteristics show -iterations 100 -rows 4
Policy Group             IOPS      Throughput Request size  Read
Concurrency
-------------------- -------- --------------- ------------  ----
-----------
-total-                    31      304.00KB/s       10041B    0%
16
_System-Best-Effort        15           0KB/s           0B    0%
0
vol1                       11       44.00KB/s        4096B    0%
40
vol2                        4      256.00KB/s       65536B    0%
14
vs1vol0                     1        4.00KB/s        4096B    0%
4
-total-                    37      808.00KB/s       22361B    2%
3
_System-Best-Effort        15           0KB/s           0B    0%
0
vol2                       12      768.00KB/s       65536B    0%
9
vs1vol0                     8       32.00KB/s        4096B   12%
1
vol1                        2        8.00KB/s        4096B    0%
1
```

The example above displays the characteristics of the *4* QoS policy groups with the highest IOPS values and refreshes the display *100* times before terminating.

```
cluster1::> qos statistics characteristics show -iterations 100 -policy
-group pg1
Policy Group             IOPS      Throughput Request size Read
Concurrency
-------------------- -------- --------------- ------------ ----
-----------
-total-                   293        3.02MB/s       10783B  54%
0
pg1                       118      470.67KB/s        4096B 100%
0
-total-                   181      478.14KB/s        2700B  65%
0
pg1                       117      469.33KB/s        4096B 100%
0
-total-                   226      525.78KB/s        2382B  60%
1
pg1                       110      440.00KB/s        4096B 100%
1
-total-                   233        1.67MB/s        7527B  49%
1
pg1                       112      446.67KB/s        4096B 100%
1
```

The example above displays the system characteristics of the QoS policy group *pg1* and refreshes the display *100* times before terminating.

qos statistics latency show

Display latency breakdown data per QoS policy group

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics latency show` command displays the average latencies for QoS policy groups across the various ONTAP subsystems.

The command displays the following data:

- The QoS policy group name (Policy Group)
- Total latency observed per I/O operation (Latency)
- Latency observed per I/O operation in the N-Blade subsystem (N-Blade)
- Latency observed per I/O operation across the internally connected nodes in a Cluster (Cluster)
- Latency observed per I/O operation in the D-Blade subsystem (D-Blade)
- Latency observed per I/O operation in the Storage subsystem (Disk)

- Latency observed per I/O operation for QoS Policy Group Ceiling (QoS Max)
- Latency observed per I/O operation for QoS Policy Group Floor (QoS Min)
- Latency observed per I/O operation for NVRAM transfer (NVRAM)
- Latency observed per I/O operation for Object Store (Cloud) operations
- Latency observed per I/O operation for FlexCache (FlexCache) operations
- Latency observed per I/O operation for SnapMirror Synchronous (SM Sync) operations
- Latency observed per I/O operation for Volume Activation (VA) operations
- Latency observed per I/O operation for Anti Virus Scan (AVSCAN) operations
- Latency observed per I/O operation in the Network queues (Network)
- Latency observed for suspended I/O operations waiting in the WAFL for reasons related to CP (Susp-CP)
- Latency observed for suspended I/O operations waiting in the WAFL for reasons not related to CP (Susp-Other)
- Latency observed for I/O operations in D-Blade response queues (WAFL Resp)

The results displayed per iteration are sorted by the Latency field. Each iteration starts with a row that displays the average latency, in microseconds (us) or milliseconds (ms), observed across all QoS policy groups.

Parameters

`[-node {<nodename>|local}]` - Node

Selects the policy groups that match this parameter value. If you do not specify this parameter, the command displays data for the entire cluster.

`[-iterations <integer>]` - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

{ `[-rows <integer>]` - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. Valid values are from 1 to 20. The default value is 10.

| `[-policy-group <text>]` - QoS Policy Group Name

Selects the QoS policy group whose name matches the specified value. If you do not specify this parameter, the command displays data for all QoS policy groups.

| `[-adaptive-policy-group <text>]` - Adaptive QoS Policy Group Name }

Selects the QoS adaptive policy group whose name matches the specified value. If you do not specify this parameter, the command displays data for all QoS policy groups.

`[-refresh-display {true|false}]` - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

Examples

```
cluster1::> qos statistics latency show -iterations 100 -rows 3
```

```
    Policy Group             Latency    N-Blade    Cluster    D-Blade
Disk    QoS Max    QoS Min     NVRAM       Cloud  FlexCache   SM Sync
VA    Network    Susp CP Susp Other  WAFL Resp
    -------------------- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
    -total-                110.35ms   110.02ms        0ms   327.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    vs1vol0                167.82ms   167.22ms        0ms   603.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    vol1                   117.76ms   117.56ms        0ms   191.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    vol2                    44.24ms    44.05ms        0ms   190.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    -total-                 38.89ms    38.63ms        0ms   256.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    vol2                    64.47ms    64.20ms        0ms   266.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    vol1                    27.28ms    27.03ms        0ms   253.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    vs1vol0                 23.72ms    23.47ms        0ms   249.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    -total-                409.81ms   409.65ms        0ms   169.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    vol1                   816.92ms   816.80ms        0ms   120.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    vol2                   407.88ms   407.66ms        0ms   219.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    vs1vol0                  3.68ms     3.49ms        0ms   193.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    -total-               1169.00us   107.00us        0ms  1062.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    vol2                  1169.00us   107.00us        0ms  1062.00us
```

```
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
```

The example above displays latencies for the *3* QoS policy groups with the highest latencies and refreshes the display *100* times before terminating.

```
cluster1::> qos statistics latency show -iterations 100 -policy-group pg1
    Policy Group            Latency    N-Blade    Cluster    D-Blade
Disk    QoS Max    QoS Min     NVRAM       Cloud  FlexCache   SM Sync
VA    Network    Susp CP Susp Other  WAFL Resp
    -------------------- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
    -total-                   5.88ms   308.00us         0ms   434.00us
5.14ms         0ms         0ms          0ms        0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    pg1                       5.88ms   308.00us         0ms   434.00us
5.14ms         0ms         0ms          0ms        0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    -total-                   4.17ms   280.00us         0ms   477.00us
3.42ms         0ms         0ms          0ms        0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    pg1                       4.17ms   280.00us         0ms   477.00us
3.42ms         0ms         0ms          0ms        0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    -total-                   4.43ms   274.00us         0ms   656.00us
3.50ms         0ms         0ms          0ms        0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    pg1                       4.43ms   274.00us         0ms   656.00us
3.50ms         0ms         0ms          0ms        0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    -total-                   4.89ms   276.00us         0ms   699.00us
3.92ms         0ms         0ms          0ms        0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
    pg1                       4.89ms   276.00us         0ms   699.00us
3.92ms         0ms         0ms          0ms        0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms
```

The example above displays latencies for the QoS policy group *pg1* and refreshes the display *100* times before terminating.

qos statistics performance show

Display system performance data per QoS policy group

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics performance show` command shows the current system performance levels that QoS policy groups are achieving.

The command displays the following data:

- The QoS policy group name (Policy Group)
- Input/output operations performed per second (IOPS)
- Throughput in kilobytes per second (KB/s) or megabytes per second (MB/s) as appropriate (Throughput)
- Latency observed per request in microseconds (us) or milliseconds (ms) as appropriate (Latency)

The results displayed per iteration are sorted by IOPS. Each iteration starts with a row that displays the total IOPS used across all QoS policy groups. Other columns in this row are either totals or averages.

Parameters

`[-node {<nodename>|local}]` - Node

Selects the policy groups that match this parameter value. If you do not specify this parameter, the command displays data for the entire cluster.

`[-iterations <integer>]` - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

{ `[-rows <integer>]` - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. Valid values are from 1 to 20. The default value is 10.

| `[-policy-group <text>]` - QoS Policy Group Name

Selects the QoS policy group whose name matches the specified value. If you do not specify this parameter, the command displays data for all QoS policy groups.

| `[-adaptive-policy-group <text>]` - Adaptive QoS Policy Group Name }

Selects the QoS adaptive policy group whose name matches the specified value. If you do not specify this parameter, the command displays data for all QoS policy groups.

`[-refresh-display {true|false}]` - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

Examples

```
cluster1::> qos statistics performance show -iterations 100 -rows 4
Policy Group              IOPS      Throughput    Latency
-------------------- -------- --------------- ----------
-total-                     79     1296.00KB/s   337.41ms
_System-Best-Effort         25           0KB/s        0ms
vol1                        24       96.00KB/s   193.72ms
vol2                        18     1152.00KB/s   750.98ms
vs1vol0                     12       48.00KB/s   707.38ms
-total-                    109        1.99MB/s   133.27ms
_System-Best-Effort         35           0KB/s        0ms
vol2                        29        1.81MB/s   249.27ms
vs1vol0                     24       96.00KB/s    48.32ms
vol1                        21       84.00KB/s   292.30ms
```

The example above displays the system performance for the *4* QoS policy groups with the highest IOPS and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics performance show -iterations 100 -policy-group
pg1
Policy Group              IOPS      Throughput    Latency
-------------------- -------- --------------- ----------
-total-                   2833       10.66MB/s   924.00us
pg1                       2655       10.37MB/s   917.00us
-total-                   2837       10.65MB/s   923.00us
pg1                       2655       10.37MB/s   917.00us
-total-                   2799       10.73MB/s   802.00us
pg1                       2737       10.69MB/s   815.00us
-total-                   2930       13.33MB/s   905.00us
pg1                       2720       10.62MB/s   858.00us
```

The example above displays the system performance for the QoS policy group *pg1* and refreshes the display *100* times before terminating.

qos statistics resource cpu show

Display CPU resource utilization data per QoS policy group

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics resource cpu show` command displays the CPU utilization for QoS policy groups per node.

The command displays the following data:

- The QoS policy group name (Policy Group)
- CPU utilization observed in percentage (CPU)

The results displayed per iteration are sorted by total CPU utilization. Each iteration starts with a row that displays the total CPU utilization across all QoS policy groups.

Parameters

-node {<nodename>|local} - Node

Selects the policy groups that match this parameter value.

[-iterations <integer>] - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

{ [-rows <integer>] - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. Valid values are from 1 to 20. The default value is 10.

| [-policy-group <text>] - QoS Policy Group Name

Selects the QoS policy group whose name matches the specified value. If you do not specify this parameter, the command displays data for all QoS policy groups.

| [-adaptive-policy-group <text>] - Adaptive QoS Policy Group Name }

Selects the QoS adaptive policy group whose name matches the specified value. If you do not specify this parameter, the command displays data for all QoS policy groups.

[-refresh-display {true|false}] - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

Examples

```
cluster1::> qos statistics resource cpu show -node nodeA -iterations 100
-rows 3
         Policy Group           CPU
         -------------------- -----
         -total- (100%)          9%
         fast                    1%
         slow                    3%
         medium                  5%
         -total- (100%)          8%
         slow                    1%
         fast                    3%
         medium                  3%
```

The example above displays the total CPU utilization for the *3* QoS policy groups with the highest CPU utilization and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics resource cpu show -node local -iterations 100
-policy-group pg1
         Policy Group           CPU
         -------------------- -----
         -total- (100%)          7%
         pg1                     1%
         -total- (100%)          7%
         pg1                     1%
         -total- (100%)          7%
         pg1                     1%
         -total- (100%)         10%
         pg1                     1%
```

The example above displays the total CPU utilization for the QoS policy group *pg1* and refreshes the display *100* times before terminating.

qos statistics resource disk show

Display disk resource utilization data per QoS policy group

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics resource disk show` command displays the disk utilization for QoS policy groups per node. The disk utilization shows the percentage of time spent on the disk during read and write operations. The command displays disk utilization for system-defined policy groups; however, their disk utilization is not included in the total utilization. The command only supports hard disks.

The command displays the following data:

- The QoS policy group name (Policy Group)
- Disk utilization (Disk)
- The number of HDD data disks utilized (Number of HDD Disks)

The results displayed are sorted by total disk utilization. Each iteration starts with a row that displays the total disk utilization across all QoS policy groups.

Parameters

`-node {<nodename>|local}` - Node

Selects the policy groups that match this parameter value.

`[-iterations <integer>]` - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

{ [-rows <integer>] - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. Valid values are from 1 to 20. The default value is 10.

| [-policy-group <text>] - QoS Policy Group Name

Selects the QoS policy group whose name matches the specified value. If you do not specify this parameter, the command displays data for all QoS policy groups.

| [-adaptive-policy-group <text>] - Adaptive QoS Policy Group Name }

Selects the QoS adaptive policy group whose name matches the specified value. If you do not specify this parameter, the command displays data for all QoS policy groups.

[-refresh-display {true|false}] - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

Examples

```
cluster1::> qos statistics resource disk show -node nodeA -iterations 100
-rows 3
        Policy Group          Disk Number of HDD Disks
        -------------------- ----- ------------------
        -total-                40%                 27
        pg1                    22%                  5
        slow                   10%                 10
        fast                    8%                 12
        _System_Default         7%                 20
        -total-                42%                 27
        pg1                    22%                  5
        slow                   12%                 10
        fast                    8%                 12
        _System_Default         7%                 20
```

The example above displays the total disk utilization for the *3* QoS policy groups with the highest disk utilization and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics resource disk show -node local -iterations 100
-policy-group pg1
        Policy Group          Disk Number of HDD Disks
        -------------------- ----- -------------------
        -total-                 3%                  10
        pg1                     1%                  24
        -total-                 3%                  10
        pg1                     1%                  24
        -total-                 3%                  10
        pg1                     1%                  24
        -total-                 3%                  10
        pg1                     1%                  24
```

The example above displays the total disk utilization for the QoS policy group *pg1* and refreshes the display *100* times before terminating.

qos statistics volume characteristics show

Display volume characteristics

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics volume characteristics show` command displays data that characterizes the behavior of volumes.

The command displays the following data:

- QoS volume name (Workload)
- QoS workload ID (ID)
- Input/output operations per second (IOPS)
- Throughput achieved in kilobytes per second (KB/s) or megabytes per second (MB/s) as appropriate (Throughput)
- Request size in bytes (B) (Request size)
- Read percentage from total IOPS (Read)
- Concurrency, which indicates the number of concurrent users generating the I/O traffic (Concurrency)

The results displayed per iteration are sorted by IOPS. Each iteration starts with a row that displays the total IOPS used across all volumes. Other columns in this row are either totals or averages.

Parameters

[-node {<nodename>|local}] - Node

Selects the volumes that match this parameter value. If you do not specify this parameter, the command displays data for the entire cluster.

{ [-rows <integer>] - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. The default setting is 10. The allowed range of values is 1 to 20.

| -vserver <vserver name> - Vserver Name

Specifies the Vserver to which the volume belongs.

-volume <volume name> - Volume Name }

Selects the characteristic data that match this parameter value. Enter a complete volume name or press the <Tab> key to complete the name. Wildcard query characters are not supported.

[-iterations <integer>] - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

[-refresh-display {true|false}] - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

[-show-flexgroup-as-constituents {true|false}] - Display Flexgroups as Constituents

If the parameter is specified and if the value is true, it will display data for FlexVol volumes and FlexGroup constituents. Otherwise it will display data for FlexVol volumes and FlexGroup volumes.

Examples

```
cluster1::> qos statistics volume characteristics show -iterations 100
-rows 3
Workload            ID     IOPS       Throughput Request size Read
Concurrency
--------------- ------ -------- ---------------- ------------ ----
-----------
-total-              -       68       176.00KB/s        2650B   7%
8
vs1vol0-wid102     102       24        96.00KB/s        4096B  20%
13
vol_1-wid103       103       20        80.00KB/s        4096B   0%
12
vol_2-wid104       104        1            0KB/s           0B   0%
0
-total-              -      157       528.00KB/s        3443B   3%
4
vol_2-wid104       104       48       192.00KB/s        4096B   0%
9
vol_1-wid103       103       43       172.00KB/s        4096B   0%
0
vs1vol0-wid102     102       41       164.00KB/s        4096B  14%
6
-total-              -      274      1016.00KB/s        3797B   2%
2
vs1vol0-wid102     102       85       340.00KB/s        4096B   8%
4
vol_2-wid104       104       85       340.00KB/s        4096B   0%
1
vol_1-wid103       103       84       336.00KB/s        4096B   0%
3
```

The example above displays characteristics for the *3* volumes with the highest IOPS and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics volume characteristics show -vserver vs0
-volume vs0_vol0 -iterations 100
Workload            ID     IOPS       Throughput Request Size Read
Concurrency
--------------- ------ -------- ---------------- ------------ ----
-----------
-total-              -     1567       783.33KB/s        512Kb  90%
2
vs0_vol0-wid1..  15658      785       392.33KB/s        512Kb  89%
1
-total-              -     1521       760.50KB/s        512Kb  90%
1
vs0_vol0-wid1..  15658      982       491.17KB/s        512Kb  90%
0
-total-              -     1482       741.00KB/s        512Kb  89%
0
vs0_vol0-wid1..  15658      945       472.50KB/s        512Kb  90%
0
-total-              -     1482       741.00KB/s        512Kb  89%
0
vs0_vol0-wid1..  15658      945       472.50KB/s        512Kb  90%
0
-total-              -     1702       850.83KB/s        512Kb  90%
0
vs0_vol0-wid1..  15658     1018       509.00KB/s        512Kb  90%
0
```

The example above displays characteristics for volume *vs0_vol0* in Vserver *vs0* and it refreshes the display *100* times before terminating.

qos statistics volume latency show

Display latency breakdown data per volume

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics volume latency show` command displays the average latencies for volumes on ONTAP subsystems.

The command displays the following data:

- The QoS volume name (Workload)
- The QoS workload ID (ID)
- Total latency observed per I/O operation (Latency)

- Latency observed per I/O operation in the N-Blade subsystem (N-Blade)
- Latency observed per I/O operation across the internally connected nodes in a Cluster (Cluster)
- Latency observed per I/O operation in the D-Blade subsystem (D-Blade)
- Latency observed per I/O operation in the Storage subsystem (Disk)
- Latency observed per I/O operation for QoS Policy Group Ceiling (QoS Max)
- Latency observed per I/O operation for QoS Policy Group Floor (QoS Min)
- Latency observed per I/O operation for NVRAM transfer (NVRAM)
- Latency observed per I/O operation for Object Store (Cloud) operations
- Latency observed per I/O operation for FlexCache (FlexCache) operations
- Latency observed per I/O operation for SnapMirror Synchronous (SM Sync) operations
- Latency observed per I/O operation for Volume Activation (VA) operations
- Latency observed per I/O operation for Anti Virus Scan (AVSCAN) operations
- Latency observed per I/O operation in the Network queues (Network)
- Latency observed for suspended I/O operations waiting in the WAFL for reasons related to CP (Susp-CP)
- Latency observed for suspended I/O operations waiting in the WAFL for reasons not related to CP (Susp-Other)
- Latency observed for I/O operations in D-Blade response queues (WAFL Resp)

The results displayed per iteration are sorted by the total latency field. Each iteration starts with a row that displays the average latency, in microseconds (us) or milliseconds (ms) observed across all volumes.

Parameters

[-node {<nodename>|local}] - Node

Selects the volumes that match this parameter value. If you do not specify this parameter, the command displays data for the entire cluster.

{ [-rows <integer>] - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. The default setting is 10. The allowed range of values is 1 to 20.

| -vserver <vserver name> - Vserver Name

Specifies the Vserver to which the volume belongs.

-volume <volume name> - Volume Name }

Selects the latency data that match this parameter value. Enter a complete volume name or press the <Tab> key to complete the name. Wildcard query characters are not supported.

[-iterations <integer>] - Number of Iterations

Specifies the number of times that the command refreshes the display with updated data before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

[-refresh-display {true|false}] - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

[-show-flexgroup-as-constituents {true|false}] - Display Flexgroups as Constituents

If the parameter is specified and if the value is true, it will display data for FlexVol volumes and FlexGroup constituents. Otherwise it will display data for FlexVol volumes and FlexGroup volumes.

Examples

```
cluster1::> qos statistics volume latency show -iterations 100 -rows 3
    Workload            ID  Latency    N-Blade  Cluster    D-Blade
Disk  Qos Max    Qos Min      NVRAM      Cloud  FlexCache    SM Sync
VA     AVSCAN    Network    Susp CP Susp Other  WAFL Resp
    -------------- ------ --------   -------- --------   --------
-------- -------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
    -total-                110.35ms   110.02ms      0ms   327.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vs1vol0             111 167.82ms   167.22ms      0ms   603.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol1               1234 117.76ms   117.56ms      0ms   191.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol2                999  44.24ms    44.05ms      0ms   190.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    -total-               -   38.89ms    38.63ms      0ms   256.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol2                999  64.47ms    64.20ms      0ms   266.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol1               1234  27.28ms    27.03ms      0ms   253.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vs1vol0             111  23.72ms    23.47ms      0ms   249.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    -total-               - 409.81ms   409.65ms      0ms   169.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol1               1234 816.92ms   816.80ms      0ms   120.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol2                999 407.88ms   407.66ms      0ms   219.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vs1vol0             111   3.68ms     3.49ms      0ms   193.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
```

The example above displays latencies for the *3* volumes with the highest latencies and it refreshes the display

100 times before terminating.

```
cluster1::> qos statistics volume latency show -vserver vs0 -volume
vs0_vol0 -iterations 100
    Workload            ID    Latency    N-Blade    Cluster    D-Blade
Disk    Qos Max    Qos Min      NVRAM      Cloud  FlexCache    SM Sync
VA     AVSCAN    Network    Susp CP Susp Other  WAFL Resp
    -------------- ------ ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
----------
    -total-              -   455.00us   158.00us        0ms   297.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms         0ms
    vs0_vol0-wid1..  15658   428.00us   155.00us        0ms   273.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms         0ms
    -total-              -   337.00us   130.00us        0ms   207.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms         0ms
    vs0_vol0-wid1..  15658   316.00us   128.00us        0ms   188.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms         0ms
    -total-              -   464.00us   132.00us        0ms   332.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms         0ms
    vs0_vol0-wid1..  15658   471.00us   130.00us        0ms   341.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms         0ms
    -total-              -   321.00us   138.00us        0ms   183.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms         0ms
    vs0_vol0-wid1..  15658   302.00us   137.00us        0ms   165.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms         0ms
    -total-              -   418.00us   142.00us        0ms   276.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms         0ms
    vs0_vol0-wid1..  15658   424.00us   143.00us        0ms   281.00us
0ms         0ms         0ms         0ms         0ms         0ms         0ms
0ms         0ms         0ms         0ms         0ms         0ms
```

The example above displays latencies for volume *vs0_vol0* in Vserver *vs0* and it refreshes the display *100* times before terminating.

qos statistics volume performance show

Display system performance data per volume

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics volume performance show` command shows the current system performance that each volume is achieving.

The command displays the following data:

- The QoS volume name (Workload)
- The QoS workload ID (ID)
- Input/output operations performed per second (IOPS)
- Throughput in kilobytes per second (KB/s) or megabytes per second (MB/s) as appropriate (Throughput)
- Latency observed per request in microseconds (us) or milliseconds (ms) as appropriate (Latency)

The results displayed per iteration are sorted by IOPS. Each iteration starts with a row that displays the total IOPS used across all volumes. Other columns in this row are either totals or averages.

Parameters

`[-node {<nodename>|local}]` - Node

Selects the volumes that match this parameter value. If you do not specify this parameter, the command displays data for the entire cluster.

{ `[-rows <integer>]` - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. The default setting is 10. The allowed range of values is 1 to 20.

| `-vserver <vserver name>` - Vserver Name

Specifies the Vserver to which the volume belongs.

`-volume <volume name>` - Volume Name }

Selects the performance data that match this parameter value. Enter a complete volume name or press the <Tab> key to complete the name. Wildcard query characters are not supported.

`[-iterations <integer>]` - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

`[-refresh-display {true|false}]` - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

`[-show-flexgroup-as-constituents {true|false}]` - Display Flexgroups as Constituents

If the parameter is specified and if the value is true, it will display data for FlexVol volumes and FlexGroup

constituents. Otherwise it will display data for FlexVol volumes and FlexGroup volumes.

Examples

```
cluster1::> qos statistics volume performance show -iterations 100 -rows 3
Workload            ID     IOPS       Throughput    Latency
--------------- ------ -------- ---------------- ----------
-total-              -       97         1.90MB/s   216.87ms
vol_2-wid104       104       28         1.75MB/s   412.78ms
vol_1-wid103       103       25       100.00KB/s   169.16ms
vs1vol0-wid102     102       13        52.00KB/s   403.78ms
-total-              -       98      1276.00KB/s    89.98ms
vs1vol0-wid102     102       28       112.00KB/s    80.70ms
vol_1-wid103       103       19        76.00KB/s   114.72ms
vol_2-wid104       104       17      1088.00KB/s   257.60ms
-total-              -       78      1152.00KB/s   225.22ms
vol_1-wid103       103       17        68.00KB/s   452.27ms
vol_2-wid104       104       16      1024.00KB/s   419.93ms
vs1vol0-wid102     102       15        60.00KB/s   210.63ms
```

The example above displays the system performance for the *3* volumes with the highest IOPS and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics volume performance show -vserver vs0 -volume
vs0_vol0 -iterations 100
Workload            ID     IOPS       Throughput    Latency
--------------- ------ -------- ---------------- ----------
-total-              -     1278       639.17KB/s   404.00us
vs0_vol0-wid1..  15658      526       263.17KB/s   436.00us
-total-              -     1315       657.33KB/s    86.00us
vs0_vol0-wid1..  15658      528       264.17KB/s    88.00us
-total-              -     1220       609.83KB/s   418.00us
vs0_vol0-wid1..  15658      515       257.33KB/s   531.00us
-total-              -     1202       600.83KB/s   815.00us
vs0_vol0-wid1..  15658      519       259.67KB/s   924.00us
-total-              -     1240       620.17KB/s   311.00us
vs0_vol0-wid1..  15658      525       262.50KB/s   297.00us
```

The example above displays the system performance for volume *vs0_vol0* in Vserver *vs0* and it refreshes the display *100* times before terminating.

qos statistics volume resource cpu show

Display CPU resource utilization data per volume

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics volume resource cpu show` command displays the CPU utilization for volumes per node.

The command displays the following data:

- The QoS volume name (Workload)
- The QoS workload ID (ID)
- CPU utilization observed in percentage (CPU)

The results displayed per iteration are sorted by total CPU utilization. Each iteration starts with a row that displays the total CPU utilization across all volumes.

Parameters

`-node {<nodename>|local}` - Node

Selects the volumes that match this parameter value.

{ `[-rows <integer>]` - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. The default setting is 10. The allowed range of values is 1 to 20.

| `-vserver <vserver name>` - Vserver Name

Specifies the Vserver to which the volume belongs.

`-volume <volume name>` - Volume Name }

Selects the CPU utilization data that match this parameter value. Enter a complete volume name or press the <Tab> key to complete the name. Wildcard query characters are not supported.

`[-iterations <integer>]` - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

`[-refresh-display {true|false}]` - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

`[-show-flexgroup-as-constituents {true|false}]` - Display Flexgroups as Constituents

If the parameter is specified and if the value is true, it will display data for FlexVol volumes and FlexGroup constituents. Otherwise it will display data for FlexVol volumes and FlexGroup volumes.

Examples

```
cluster1::> qos statistics volume resource cpu show -node nodeA
-iterations 100 -rows 3
    Workload           ID   CPU
    --------------- ----- -----
    --total- (100%)     -    9%
    vs0vol1-wid-102   102    5%
    vs0vol2-wid-121   121    2%
    vs2_vol0-wid-..   212    2%
    -total- (100%)      -    8%
    vs0vol1-wid-102   102    5%
    vs0vol2-wid-121   121    2%
    vs2_vol0-wid-..   212    1%
```

The example above displays total CPU utilization for the *3* volumes with the highest CPU utilization and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics volume resource cpu show -node local -vserver
vs0 -volume vs0_vol1 -iterations 100
    Workload           ID   CPU
    --------------- ----- -----
    -total- (100%)      -    2%
    vs0_vol1-wid7..  7916    2%
    -total- (100%)      -    2%
    vs0_vol1-wid7..  7916    2%
    -total- (100%)      -    1%
    vs0_vol1-wid7..  7916    1%
    -total- (100%)      -    2%
    vs0_vol1-wid7..  7916    1%
    -total- (100%)      -    2%
    vs0_vol1-wid7..  7916    2%
```

The example above displays total CPU utilization for volume *vs0_vol1* in Vserver *vs0* and it refreshes the display *100* times before terminating.

qos statistics volume resource disk show

Display disk resource utilization data per volume

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics volume resource disk show` command displays the disk utilization for volumes per node. The disk utilization shows the percentage of time spent on the disk during read and write operations. The command only supports hard disks.

The command displays the following data:

- The QoS volume name (Workload)
- The QoS workload ID (ID)
- Disk utilization (Disk)
- The number of HDD data disks utilized (Number of HDD Disks)

The results displayed are sorted by total disk utilization. Each iteration starts with a row that displays the total disk utilization across all volumes.

Parameters

-node {<nodename>|local} - Node

Selects the volumes that match this parameter value.

{ [-rows <integer>] - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. The default setting is 10. The allowed range of values is 1 to 20.

| -vserver <vserver name> - Vserver Name

Specifies the Vserver to which the volume belongs.

-volume <volume name> - Volume Name }

Selects the disk utilization data that match this parameter value. Enter a complete volume name or press the <Tab> key to complete the name. Wildcard query characters are not supported.

[-iterations <integer>] - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

[-refresh-display {true|false}] - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

[-show-flexgroup-as-constituents {true|false}] - Display Flexgroups as Constituents

If the parameter is specified and if the value is true, it will display data for FlexVol volumes and FlexGroup constituents. Otherwise it will display data for FlexVol volumes and FlexGroup volumes.

Examples

```
cluster1::> qos statistics volume resource disk show -node nodeB
-iterations 100 -rows 3
            Workload            ID  Disk Number of HDD Disks
            --------------- ------ ----- ------------------
            -total- (100%)       -   30%                  4
            vs0vol1-wid101     101   12%                  2
            vs0vol2-wid121     121   10%                  1
            vol0-wid1002      1002    8%                  1
            -total- (100%)       -   30%                  4
            vs0vol1-wid101     101   12%                  2
            vs0vol2-wid121     121   10%                  1
            vol0-wid1002      1002    8%                  1
```

The example above displays total disk utilization for the *3* volumes with the highest disk utilization and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics volume resource disk show -node local -vserver
vs0 -volume vs0_vol0 -iterations 100
            Workload            ID   Disk Number of HDD Disks
            --------------- ------ ------ ------------------
            -total-              -     5%                 10
            vs0_vol0-wid1..  15658     1%                  6
            -total-              -     5%                 10
            vs0_vol0-wid1..  15658     1%                  6
            -total-              -     6%                 10
            vs0_vol0-wid1..  15658     2%                  6
            -total-              -     6%                 10
            vs0_vol0-wid1..  15658     2%                  6
            -total-              -     6%                 10
            vs0_vol0-wid1..  15658     2%                  6
```

The example above displays total disk utilization for volume *vs0_vol0* in Vserver *vs0* and it refreshes the display *100* times before terminating.

qos statistics workload characteristics show

Display QoS workload characterization

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics workload characteristics show` command displays data that characterizes the behavior of QoS workloads.

The command displays the following data:

- The QoS workload name (Workload)
- The QoS workload ID (ID)
- Input/output operations performed per second (IOPS)
- Throughput achieved in kilobytes per second (KB/s) or megabytes per second (MB/s) as appropriate (Throughput)
- Request size in bytes (B) (Request size)
- Read percentage from total IOPS (Read)
- Concurrency, which indicates the number of concurrent users generating the I/O traffic (Concurrency)

The results displayed per iteration are sorted by IOPS. Each iteration starts with a row that displays the total IOPS used across all QoS workloads. Other columns in this row are either totals or averages.

Parameters

[-node {<nodename>|local}] - Node

Selects the QOS workloads that match this parameter value. If you do not specify this parameter, the command displays data for the entire cluster.

[-iterations <integer>] - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

[-refresh-display {true|false}] - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

{ [-rows <integer>] - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. Valid values are from 1 to 20. The default value is 10.

[-policy-group <text>] - QoS Policy Group Name

Selects the QoS workloads that belong to the QoS policy group specified by this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-adaptive-policy-group <text>] - Adaptive QoS Policy Group Name

Selects the QoS workloads that belong to the QoS adaptive policy group specified by this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-workload <text>] - QoS Workload Name

Selects the QoS workload that match this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-workload-id <integer>] - QoS Workload ID }

Selects the QoS workload that match the QoS workload ID specified by this parameter value.

[-show-flexgroup-as-constituents {true|false}] - Display Flexgroups as Constituents

If the parameter is specified and if the value is true, it will display data for FlexVol volumes and FlexGroup constituents. Otherwise it will display data for FlexVol volumes and FlexGroup volumes.

Examples

```
cluster1::> qos statistics workload characteristics show -iterations 100
-rows 4
Workload            ID     IOPS       Throughput Request size Read
Concurrency
--------------- ------ -------- ---------------- ------------ ----
-----------
-total-              -       68       176.00KB/s        2650B   7%
8
vs1vol0-wid102     102       24        96.00KB/s        4096B  20%
13
_Scan_Besteff..    101       23            0KB/s           0B   0%
0
vol_1-wid103       103       20        80.00KB/s        4096B   0%
12
vol_2-wid104       104        1            0KB/s           0B   0%
0
-total-              -      157       528.00KB/s        3443B   3%
4
vol_2-wid104       104       48       192.00KB/s        4096B   0%
9
vol_1-wid103       103       43       172.00KB/s        4096B   0%
0
vs1vol0-wid102     102       41       164.00KB/s        4096B  14%
6
_Scan_Besteff..    101       25            0KB/s           0B   0%
0
-total-              -      274      1016.00KB/s        3797B   2%
2
vs1vol0-wid102     102       85       340.00KB/s        4096B   8%
4
vol_2-wid104       104       85       340.00KB/s        4096B   0%
1
vol_1-wid103       103       84       336.00KB/s        4096B   0%
3
_Scan_Besteff..    101       20            0KB/s           0B   0%
0
```

The example above displays characteristics for the *4* QoS workloads with the highest IOPS and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics workload characteristics  show -iterations 100
-rows 2 -policy-group pg1
    Workload            ID     IOPS       Throughput Request size Read
Concurrency
    --------------- ------ -------- ---------------- ------------ ----
-----------
    -total-              -      243       546.86KB/s        2307B  61%
1
    file-test1_a-..   6437       34       136.00KB/s        4096B 100%
0
    file-test1_c-..   5078       33       133.33KB/s        4096B 100%
0
    -total-              -      310         3.09MB/s       10428B  55%
1
    file-test1_a-..   6437       36       142.67KB/s        4096B 100%
0
    file-test1_b-..   9492       35       138.67KB/s        4096B 100%
0
    -total-              -      192       575.71KB/s        3075B  71%
1
    file-test1-wi..   7872       39       157.33KB/s        4096B 100%
0
    file-test1_c-..   5078       38       153.33KB/s        4096B 100%
0
```

The example above displays the characteristics for the *2* QoS workloads belonging to QoS policy group *pg1* with the highest IOPS and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics workload characteristics show -iterations 100
-workload-id 9492
    Workload            ID     IOPS       Throughput Request size Read
Concurrency
    --------------- ------ -------- ---------------- ------------ ----
-----------
    -total-              -      737         2.14MB/s        3045B  79%
1
    file-test1_b-..   9492      265      1058.67KB/s        4096B 100%
0
    -total-              -      717         4.26MB/s        6235B  80%
1
    file-test1_b-..   9492      272      1086.67KB/s        4096B 100%
1
    -total-              -      623         2.50MB/s        4202B  86%
0
    file-test1_b-..   9492      263      1050.67KB/s        4096B 100%
0
    -total-              -      595         2.11MB/s        3712B  89%
0
    file-test1_b-..   9492      266      1064.00KB/s        4096B 100%
0
```

The example above displays the characteristics for the QoS workload with QoS workload ID *9492* and it refreshes the display *100* times before terminating.

qos statistics workload latency show

Display latency breakdown data per QoS workload

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics workload latency show` command displays the average latencies for QoS workloads on ONTAP subsystems.

The command displays the following data:

- The QoS workload name (Workload)
- The QoS workload ID (ID)
- Total latency observed per I/O operation (Latency)
- Latency observed per I/O operation in the N-Blade subsystem (N-Blade)
- Latency observed per I/O operation across the internally connected nodes in a Cluster (Cluster)
- Latency observed per I/O operation in the D-Blade subsystem (D-Blade)

- Latency observed per I/O operation in the Storage subsystem (Disk)
- Latency observed per I/O operation for QoS Policy Group Ceiling (QoS Max)
- Latency observed per I/O operation for QoS Policy Group Floor (QoS Min)
- Latency observed per I/O operation for NVRAM transfer (NVRAM)
- Latency observed per I/O operation for Object Store (Cloud) operations
- Latency observed per I/O operation for FlexCache (FlexCache) operations
- Latency observed per I/O operation for SnapMirror Synchronous (SM Sync) operations
- Latency observed per I/O operation for Volume Activation (VA) operations
- Latency observed per I/O operation for Anti Virus Scan (AVSCAN) operations
- Latency observed per I/O operation in the Network queues (Network)
- Latency observed for suspended I/O operations waiting in the WAFL for reasons related to CP (Susp-CP)
- Latency observed for suspended I/O operations waiting in the WAFL for reasons not related to CP (Susp-Other)
- Latency observed for I/O operations in D-Blade response queues (WAFL Resp)

The results displayed per iteration are sorted by the total latency field. Each iteration starts with a row that displays the average latency, in microseconds (us) or milliseconds (ms) observed across all QoS workloads.

Parameters

[-node {<nodename>|local}] - Node

Selects the QOS workloads that match this parameter value. If you do not specify this parameter, the command displays data for the entire cluster.

[-iterations <integer>] - Number of Iterations

Specifies the number of times that the command refreshes the display with updated data before terminating. If you do not specify this parameter, the command continues to run until you interrupt it by pressing Ctrl-C.

[-refresh-display {true|false}] - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

{ [-rows <integer>] - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. Valid values are from 1 to 20. The default value is 10.

[-policy-group <text>] - QoS Policy Group Name

Selects the QoS workloads that belong to the QoS policy group specified by this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-adaptive-policy-group <text>] - Adaptive QoS Policy Group Name

Selects the QoS workloads that belong to the QoS adaptive policy group specified by this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-workload <text>] - QoS Workload Name

Selects the QoS workload that match this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-workload-id <integer>] - QoS Workload ID }

Selects the QoS workload that match the QoS workload ID specified by this parameter value.

[-show-flexgroup-as-constituents {true|false}] - Display Flexgroups as Constituents

If the parameter is specified and if the value is true, it will display data for FlexVol volumes and FlexGroup constituents. Otherwise it will display data for FlexVol volumes and FlexGroup volumes.

Examples

```
cluster1::> qos statistics workload latency show -iterations 100 -rows 3
    Workload            ID  Latency    N-Blade  Cluster    D-Blade
Disk  Qos Max    Qos Min      NVRAM      Cloud  FlexCache    SM Sync
VA     AVSCAN    Network    Susp CP Susp Other  WAFL Resp
    -------------- ------ --------   -------- --------   --------
-------- -------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
    -total-                110.35ms   110.02ms      0ms   327.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vs1vol0             111 167.82ms   167.22ms      0ms   603.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol1               1234 117.76ms   117.56ms      0ms   191.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol2                999  44.24ms    44.05ms      0ms   190.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    -total-               -   38.89ms    38.63ms      0ms   256.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol2                999  64.47ms    64.20ms      0ms   266.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol1               1234  27.28ms    27.03ms      0ms   253.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vs1vol0             111  23.72ms    23.47ms      0ms   249.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    -total-               - 409.81ms   409.65ms      0ms   169.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol1               1234 816.92ms   816.80ms      0ms   120.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vol2                999 407.88ms   407.66ms      0ms   219.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    vs1vol0             111   3.68ms     3.49ms      0ms   193.00us
0ms      0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
```

The example above displays latencies for the *3* QoS workloads with the highest latencies and it refreshes the

display *100* times before terminating.

```
cluster1::> qos statistics workload latency show -iterations 100 -rows 2
-policy-group pg1
    Workload            ID    Latency    N-Blade    Cluster    D-Blade
Disk    Qos Max    Qos Min      NVRAM      Cloud  FlexCache    SM Sync
VA     AVSCAN    Network    Susp CP Susp Other  WAFL Resp
    --------------- ------ ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
----------
    -total-              -     4.80ms   287.00us        0ms   427.00us
4.08ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    file-test1-wi..   7872     9.60ms   265.00us        0ms   479.00us
8.85ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    file-test1_a-..   6437     8.22ms   262.00us        0ms   424.00us
7.53ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    -total-              -     4.20ms   296.00us        0ms   421.00us
3.48ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    file-test1-wi..   7872     8.70ms   211.00us        0ms   489.00us
8.00ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    file-test1_a-..   6437     6.70ms   297.00us        0ms   464.00us
5.94ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    -total-              -     5.90ms   303.00us        0ms     1.71ms
3.88ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    file-test1-wi..   7872    11.36ms   263.00us        0ms     2.06ms
9.04ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    file-test1_a-..   6437     9.48ms   250.00us        0ms     2.30ms
6.93ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
```

The example above displays latencies for the *2* QoS workloads belonging to QoS policy group *pg1* with the highest IOPS and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics workload latency show -iterations 100 -workload
-id 9492
    Workload            ID    Latency    Network    Cluster       Data
Disk    Qos Max    Qos Min      NVRAM      Cloud  FlexCache    SM Sync
VA     AVSCAN    Network    Susp CP Susp Other  WAFL Resp
    --------------- ------ ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- ---------- ----------
----------
    -total-              -   443.00us   273.00us        0ms   170.00us
0ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    file-test1_b-..   9492   440.00us   272.00us        0ms   168.00us
0ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    -total-              -   577.00us   313.00us        0ms   264.00us
0ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    file-test1_b-..   9492   607.00us   316.00us        0ms   291.00us
0ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    -total-              -   475.00us   291.00us        0ms   184.00us
0ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    file-test1_b-..   9492   476.00us   293.00us        0ms   183.00us
0ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    -total-              -   628.00us   284.00us        0ms   344.00us
0ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
    file-test1_b-..   9492   591.00us   281.00us        0ms   310.00us
0ms        0ms        0ms        0ms        0ms        0ms        0ms
0ms        0ms        0ms        0ms        0ms        0ms
```

The example above displays the latencies for the QoS workload with QoS workload ID *9492* and it refreshes the display *100* times before terminating.

qos statistics workload performance show

Display system performance data per QoS workload

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics workload performance show` command shows the current system performance that each QoS workload is achieving.

The command displays the following data:

- The QoS workload name (Workload)
- The QoS workload ID (ID)
- Input/output operations performed per second (IOPS)
- Throughput in kilobytes per second (KB/s) or megabytes per second (MB/s) as appropriate (Throughput)
- Latency observed per request in microseconds (us) or milliseconds (ms) as appropriate (Latency)

The results displayed per iteration are sorted by IOPS. Each iteration starts with a row that displays the total IOPS used across all QoS workloads. Other columns in this row are either totals or averages.

Parameters

`[-node {<nodename>|local}]` - Node

Selects the QOS workloads that match this parameter value. If you do not specify this parameter, the command displays data for the entire cluster.

`[-iterations <integer>]` - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

`[-refresh-display {true|false}]` - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

{ `[-rows <integer>]` - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. Valid values are from 1 to 20. The default value is 10.

`[-policy-group <text>]` - QoS Policy Group Name

Selects the QoS workloads that belong to the QoS policy group specified by this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| `[-adaptive-policy-group <text>]` - Adaptive QoS Policy Group Name

Selects the QoS workloads that belong to the QoS adaptive policy group specified by this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| `[-workload <text>]` - QoS Workload Name

Selects the QoS workload that match this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| `[-workload-id <integer>]` - QoS Workload ID }

Selects the QoS workload that match the QoS workload ID specified by this parameter value.

[-show-flexgroup-as-constituents {true|false}] - Display Flexgroups as Constituents

If the parameter is specified and if the value is true, it will display data for FlexVol volumes and FlexGroup constituents. Otherwise it will display data for FlexVol volumes and FlexGroup volumes.

Examples

```
cluster1::> qos statistics workload performance show -iterations 100 -rows
4
Workload            ID     IOPS       Throughput    Latency
--------------- ------ -------- ---------------- ----------
-total-              -       97         1.90MB/s   216.87ms
_Scan_Besteff..    101       31            0KB/s        0ms
vol_2-wid104       104       28         1.75MB/s   412.78ms
vol_1-wid103       103       25       100.00KB/s   169.16ms
vs1vol0-wid102     102       13        52.00KB/s   403.78ms
-total-              -       98      1276.00KB/s    89.98ms
_Scan_Besteff..    101       34            0KB/s        0ms
vs1vol0-wid102     102       28       112.00KB/s    80.70ms
vol_1-wid103       103       19        76.00KB/s   114.72ms
vol_2-wid104       104       17      1088.00KB/s   257.60ms
-total-              -       78      1152.00KB/s   225.22ms
_Scan_Besteff..    101       30            0KB/s        0ms
vol_1-wid103       103       17        68.00KB/s   452.27ms
vol_2-wid104       104       16      1024.00KB/s   419.93ms
vs1vol0-wid102     102       15        60.00KB/s   210.63ms
```

The example above displays the system performance for the *4* QoS workloads with the highest IOPS and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics workload performance show -iterations 100 -rows
2 -policy-group pg1
Workload          ID       IOPS       Throughput    Latency
--------------- ------ -------- ---------------- ----------
-total-              -     2598         9.96MB/s  1223.00us
file-testfile..   4228      650         2.54MB/s  1322.00us
file-testfile..  11201      635         2.48MB/s  1128.00us
-total-              -     2825        10.89MB/s   714.00us
file-testfile..   4228      707         2.76MB/s   759.00us
file-testfile..  11201      697         2.72MB/s   693.00us
-total-              -     2696        10.13MB/s  1149.00us
file-testfile..   4228      645         2.52MB/s   945.00us
file-testfile..   6827      634         2.48MB/s  1115.00us
```

The example above displays the system performance for the *2* QoS workloads belonging to QoS policy group

pg1 with the highest IOPS and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics workload performance show -iterations 100
-workload-id 11201
Workload            ID     IOPS       Throughput    Latency
--------------- ------ -------- ---------------- ----------
-total-              -     2866        10.92MB/s   905.00us
file-testfile..  11201      674         2.63MB/s   889.00us
-total-              -     2761        10.55MB/s  1054.00us
file-testfile..  11201      638         2.49MB/s  1055.00us
-total-              -     2810        10.58MB/s   832.00us
file-testfile..  11201      685         2.68MB/s   909.00us
-total-              -     2593         9.86MB/s  1092.00us
file-testfile..  11201      632         2.47MB/s   964.00us
```

The example above displays the system performance for the QoS workload with QoS workload ID *11201* and it refreshes the display *100* times before terminating.

qos statistics workload resource cpu show

Display CPU resource utilization data per QoS workload

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics workload resource cpu show` command displays the CPU utilization for QoS workloads per node.

The command displays the following data:

- The QoS workload name (Workload)
- The QoS workload ID (ID)
- CPU utilization observed in percentage (CPU)

The results displayed per iteration are sorted by total CPU utilization. Each iteration starts with a row that displays the total CPU utilization across all QoS workloads.

Parameters

`-node {<nodename>|local}` - Node

Selects the QOS workloads that match this parameter value.

`[-iterations <integer>]` - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

[-refresh-display {true|false}] - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

{ [-rows <integer>] - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. Valid values are from 1 to 20. The default value is 10.

[-policy-group <text>] - QoS Policy Group Name

Selects the QoS workloads that belong to the QoS policy group specified by this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-adaptive-policy-group <text>] - Adaptive QoS Policy Group Name

Selects the QoS workloads that belong to the QoS adaptive policy group specified by this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-workload <text>] - QoS Workload Name

Selects the QoS workload that match this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-workload-id <integer>] - QoS Workload ID }

Selects the QoS workload that match the QoS workload ID specified by this parameter value.

[-show-flexgroup-as-constituents {true|false}] - Display Flexgroups as Constituents

If the parameter is specified and if the value is true, it will display data for FlexVol volumes and FlexGroup constituents. Otherwise it will display data for FlexVol volumes and FlexGroup volumes.

Examples

```
cluster1::> qos statistics workload resource cpu show -node nodeA
-iterations 100 -rows 3
    Workload           ID   CPU
    --------------- ----- -----
    --total- (100%)     -    9%
    vs0-wid-102       102    5%
    file-bigvmdk-..   121    2%
    vs2_vol0-wid-..   212    2%
    -total- (100%)      -    8%
    vs0-wid-101       102    5%
    file-bigvmdk-..   121    2%
    vs2_vol0-wid-..   212    1%
```

The example above displays total CPU utilization for the *3* QoS workloads with the highest CPU utilization and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics workload resource cpu show -node local
-iterations 100 -rows 2 -policy-group pg1
    Workload           ID   CPU
    -------------- ----- -----
    -total- (100%)      -   41%
    file-test1_b-..  9492   16%
    file-test1_c-..  5078   16%
    -total- (100%)      -   43%
    file-test1_c-..  5078   17%
    file-test1_b-..  9492   16%
    -total- (100%)      -   40%
    file-test1_c-..  5078   16%
    file-test1_b-..  9492   15%
```

The example above displays total CPU utilization for the *2* QoS workloads belonging to QoS policy group *pg1* with the highest IOPS and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics workload resource cpu show -node local
-iterations 100 -workload-id 9492
    Workload           ID   CPU
    -------------- ----- -----
    -total- (100%)      -   15%
    file-test1_b-..  9492    3%
    -total- (100%)      -   14%
    file-test1_b-..  9492    3%
    -total- (100%)      -   14%
    file-test1_b-..  9492    2%
    -total- (100%)      -   13%
    file-test1_b-..  9492    3%
```

The example above displays total CPU utilization for the QoS workload with QoS workload ID *9492* and it refreshes the display *100* times before terminating.

qos statistics workload resource disk show

Display disk resource utilization data per QoS workload

Availability: This command is available to *cluster* administrators at the *admin* privilege level.

Description

The `qos statistics workload resource disk show` command displays the disk utilization for QoS workloads per node. The disk utilization shows the percentage of time spent on the disk during read and write operations. The command displays disk utilization for system-defined workloads; however, their disk utilization is not included in the total utilization. The command only supports hard disks.

The command displays the following data:

- The QoS workload name (Workload)
- The QoS workload ID (ID)
- Disk utilization (Disk)
- The number of HDD data disks utilized (Number of HDD Disks)

The results displayed are sorted by total disk utilization. Each iteration starts with a row that displays the total disk utilization across all QoS workloads.

Parameters

-node {<nodename>|local} - Node

Selects the QOS workloads that match this parameter value.

[-iterations <integer>] - Number of Iterations

Specifies the number of times the display is refreshed before terminating. If you do not specify this parameter, the command iterates until interrupted by Ctrl-C.

[-refresh-display {true|false}] - Toggle Screen Refresh Between Each Iteration

Specifies the display style. If true, the command clears the display after each data iteration. If false, the command displays each data iteration below the previous one. The default is false.

{ [-rows <integer>] - Number of Rows in the Output

Specifies the number of busiest QoS policy groups to display. Valid values are from 1 to 20. The default value is 10.

[-policy-group <text>] - QoS Policy Group Name

Selects the QoS workloads that belong to the QoS policy group specified by this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-adaptive-policy-group <text>] - Adaptive QoS Policy Group Name

Selects the QoS workloads that belong to the QoS adaptive policy group specified by this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-workload <text>] - QoS Workload Name

Selects the QoS workload that match this parameter value. If you do not specify this parameter, the command displays data for all QoS workloads.

| [-workload-id <integer>] - QoS Workload ID }

Selects the QoS workload that match the QoS workload ID specified by this parameter value.

[-show-flexgroup-as-constituents {true|false}] - Display Flexgroups as Constituents

If the parameter is specified and if the value is true, it will display data for FlexVol volumes and FlexGroup constituents. Otherwise it will display data for FlexVol volumes and FlexGroup volumes.

Examples

```
cluster1::> qos statistics workload resource disk show -node nodeB
-iterations 100 -rows 3
            Workload            ID  Disk Number of HDD Disks
            --------------- ------ ----- ------------------
            -total- (100%)       -   30%                  4
            _RAID                -   20%                  4
            vs0-wid101         101   12%                  2
            file-1-wid121      121   10%                  1
            vol0-wid1002      1002    8%                  1
            _WAFL                -    7%                  3
            -total- (100%)       -   30%                  4
            vs0-wid101         101   12%                  2
            file-1-wid121      121   10%                  1
            _RAID                -   10%                  4
            vol0-wid1002      1002    8%                  1
            _WAFL                -    7%                  3
```

The example above displays total disk utilization for the *3* QoS workloads with the highest disk utilization and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics workload resource disk show -node local
-iterations 100 -rows 2 -policy-group pg1
Workload            ID  Disk Number of HDD Disks
--------------- ------ ----- ------------------
-total-              -    3%                 10
file-test1_a-..   6437    6%                  6
file-test1-wi..   7872    6%                  6
-total-              -    3%                 10
file-test1_a-..   6437    5%                  6
file-test1-wi..   7872    5%                  6
-total-              -    3%                 10
file-test1_a-..   6437    6%                  6
file-test1-wi..   7872    6%                  6
```

The example above displays total disk utilization for the *2* QoS workloads belonging to QoS policy group *pg1* with the highest IOPS and it refreshes the display *100* times before terminating.

```
cluster1::> qos statistics workload resource disk show -node local
-iterations 100 -workload-id 6437
Workload            ID  Disk Number of HDD Disks
--------------- ------ ----- ------------------
-total-              -    3%                 10
file-test1_a-..   6437    6%                  6
-total-              -    3%                 10
file-test1_a-..   6437    5%                  6
-total-              -    3%                 10
file-test1_a-..   6437    6%                  6
```

The example above displays total disk utilization for the QoS workload with QoS workload ID *6437* and it refreshes the display *100* times before terminating.

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