# QoS policy groups

## System Manager Classic

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# QoS policy groups

You can use System Manager to create, edit, and delete QoS policy groups.

## Create QoS policy groups

You can use System Manager to create storage Quality of Service (QoS) policy groups to limit the throughput of workloads and to monitor workload performance.

**Steps**

1. Click **Storage** > **SVMs**.
2. Select the SVM, and then click **SVM Settings**.
3. In the **Policies** pane, click **QoS Policy Groups**.
4. In the **QoS Policy Groups** window, click **Create**.
5. In the **Create Policy Group** dialog box, specify a group name for the policy.
6. Specify the minimum throughput limit.
   - In System Manager 9.5, you can set the minimum throughput limit only on a performance-based All Flash Optimized personality. In System Manager 9.6, you can also set the minimum throughput limit for ONTAP Select Premium systems.
   - You cannot set the minimum throughput limit for volumes on a FabricPool-enabled aggregate.
   - If you do not specify the minimum throughput value or if the minimum throughput value is set to 0, the system automatically displays “None” as the value.

     This value is case-sensitive.
7. Specify the maximum throughput limit.
   - The minimum throughput limit and the maximum throughput limit must be of the same unit type.
   - If you do not specify the minimum throughput limit, you can set the maximum throughput limit in IOPS and B/s, KB/s, MB/s, and so on.
   - If you do not specify the maximum throughput limit, the system automatically displays “Unlimited” as the value.

     This value is case-sensitive. The unit that you specify does not affect the maximum throughput.
8. Click **OK**.

# Deleting QoS policy groups

You can use System Manager to delete a Storage Quality of Service (QoS) policy group that is no longer required.

**Before you begin**

You must have unassigned all of the storage objects that are assigned to the policy group.

**Steps**

1. Click **Storage** > **SVMs**.

2. Select the SVM, and then click **SVM Settings**.
3. In the **Policies** pane, click **QoS Policy Groups**.
4. In the **QoS Policy Groups** window, select the policy group that you want to delete, and then click **Delete**.
5. In the confirmation dialog box, click **Delete**.

# Editing QoS policy groups

You can use the Edit Policy Group dialog box in System Manager to modify the name and maximum throughput of an existing storage Quality of Service (QoS) policy group.

**About this task**

- In System Manager 9.5, you can set the minimum throughput limit only on a performance-based All Flash Optimized personality. In System Manager 9.6, you can also set the minimum throughput limit for ONTAP Select Premium systems.
- You cannot set the minimum throughput limit for volumes on a FabricPool-enabled aggregate.

**Steps**

1. Click **Storage** > **SVMs**.
2. Select the SVM, and then click **SVM Settings**.
3. In the **Policies** pane, click **QoS Policy Groups**.
4. Select the QoS policy group that you want to edit, and then click **Edit**.
    - The minimum throughput limit and the maximum throughput limit must be of the same unit type.
    - If you do not specify the minimum throughput limit, you can set the maximum throughput limit in IOPS and B/s, KB/s, MB/s, and so on.
    - If you do not specify the maximum throughput limit, the value is set to unlimited, and the unit that you specify does not affect the maximum throughput.
5. In the **Edit Policy Group** dialog box, edit the QoS policy group details, and then click **Save**.

# Managing workload performance by using Storage QoS

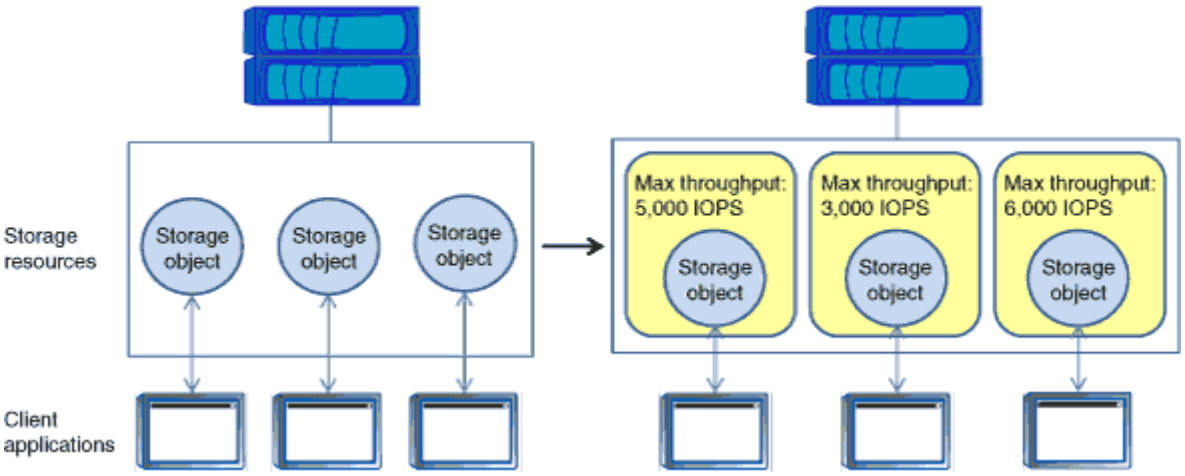
Storage Quality of Service (QoS) can help you manage risks around meeting your performance objectives. You can use Storage QoS to limit the throughput to workloads and to monitor workload performance. You can reactively limit workloads to address performance problems, and you can proactively limit workloads to prevent performance problems.

A workload represents the input/output (I/O) operations to one of the following kinds of storage objects:

- FlexVol volumes
- LUNs
- FlexGroup volumes

You can assign a storage object to a policy group to control and monitor a workload. You can monitor workloads without controlling them.

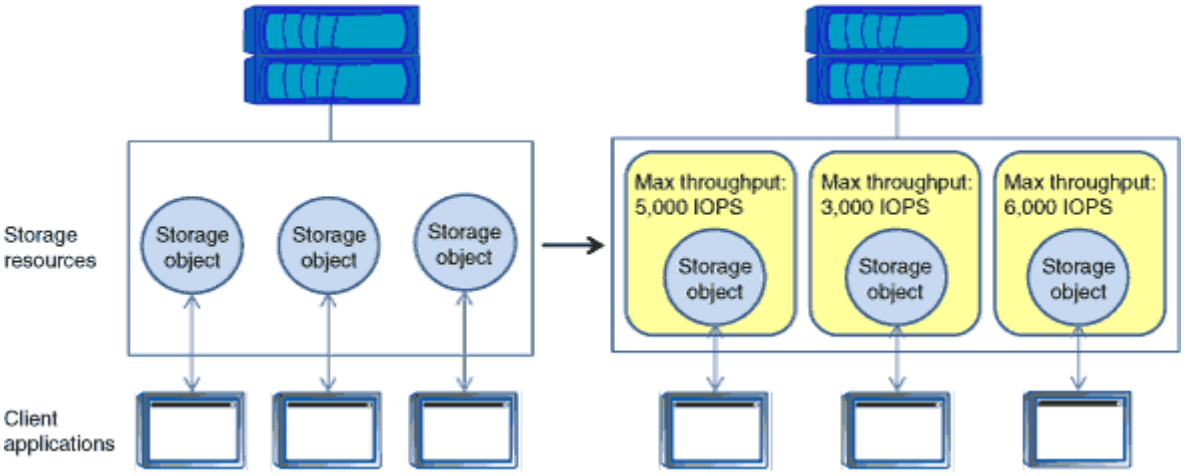
The following illustration shows a sample environment before and after using Storage QoS. On the left, the workloads compete for cluster resources to transmit I/O. These workloads get “best effort” performance, which means that you have less performance predictability (for example, a workload might get such good performance that it negatively impacts other workloads). On the right, the same workloads are assigned to policy groups. The policy groups enforce a maximum throughput limit.




# How Storage QoS works

Storage QoS controls workloads that are assigned to policy groups by throttling and prioritizing client operations (SAN and NAS data requests) and system operations.

The following illustration shows a sample environment before and after using Storage QoS. On the left, workloads compete for cluster resources to transmit I/O. These workloads get “best effort” performance, which means that you have less performance predictability (for example, a workload might get such good performance that it negatively impacts other workloads). On the right, the same workloads are assigned to policy groups that enforce maximum throughput limits.




The `-max-throughput` parameter specifies the maximum throughput limit for the policy group that the policy group must not exceed. The value of this parameter is specified in terms of IOPS or MB/s, or a combination of comma-separated IOPS and MB/s values, and the range is zero to infinity.

The units are base 10. There should be no space between the number and the unit. The default value for the `-max-throughput` parameter is `infinity`, which is specified by the special value INF.

There is no default unit for the `-max-throughput` parameter. For all values except zero and infinity, you must specify the unit.

The keyword “none” is available for a situation that requires the removal of a value. The keyword “INF” is available for a situation that requires the maximum available value to be specified. Examples of valid throughput specifications are: '"“100B/s”"', “10KB/s”, “1gb/s”, “500MB/s”, “1tb/s”, “100iops”, “100iops,400KB/s”, and “800KB/s,100iops”.

# How the maximum throughput limit works

You can specify one service-level objective for a Storage QoS policy group: a maximum throughput limit. A maximum throughput limit, which you define in terms of IOPS, MBps, or both, specifies the throughput that the workloads in the policy group cannot collectively exceed.

When you specify a maximum throughput for a policy group, Storage QoS controls client operations to ensure that the combined throughput for all workloads in the policy group does not exceed the specified maximum throughput.

For example, assume that you create the policy group “untested_apps” and specify a maximum throughput of 300 MBps. You assign three volumes to the policy group. The combined throughput to those three volumes cannot exceed 300 MBps.

The combined throughput to the workloads in a policy group might exceed the specified limit by up to 10 percent. A deviation might occur if you have a workload that experiences rapid changes in throughput (sometimes called a *bursty workload*).

Note the following about specifying a maximum throughput:

- You must not set the limit too low because you might underutilize the cluster.
- You must consider the minimum amount of throughput that you want to reserve for workloads that do not have limits.

  For example, you can ensure that your critical workloads get the throughput that they need by limiting noncritical workloads.

- You might want to provide room for growth.

  For example, if you see an average utilization of 500 IOPS, you might specify a limit of 1,000 IOPS.

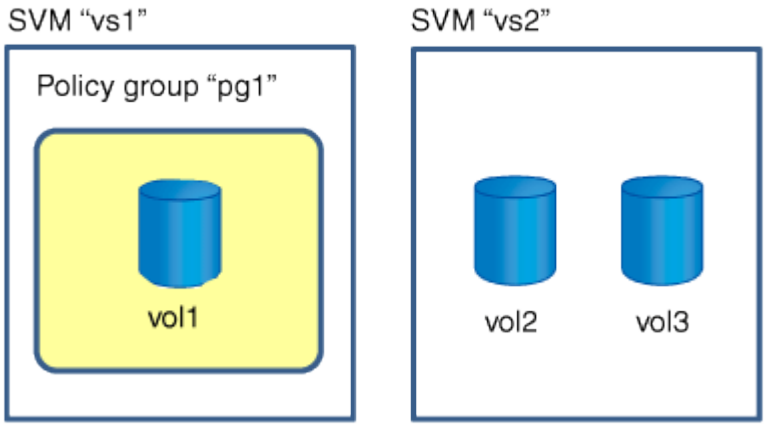
# Rules for assigning storage objects to policy groups

You should be aware of rules that dictate how you can assign storage objects to Storage QoS policy groups.

## Storage objects and policy groups must belong to the same SVM

A storage object must be contained by the SVM to which the policy group belongs. You specify the SVM to which the policy group belongs when you create the policy group. Multiple policy groups can belong to the same SVM.

In the following illustration, the policy group pg1 belongs to SVM vs1. You cannot assign volumes vol2 or vol3 to policy group pg1 because those volumes are contained by a different SVM.

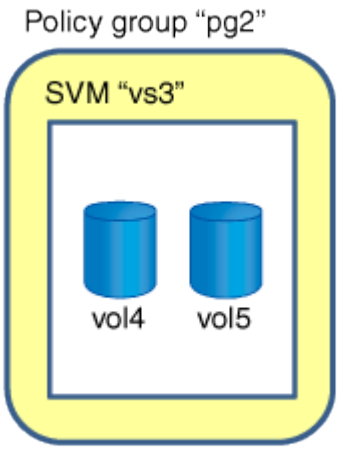



## Nested storage objects cannot belong to policy groups

You cannot assign a storage object to a policy group if its containing object or its child objects belong to a policy group. The following table lists the restrictions.

| If you assign the… | Then you cannot assign… |
|---|---|
| SVM to a policy group | Any storage objects contained by the SVM to a policy group |
| Volume to a policy group | The volume’s containing SVM or any child LUNs to a policy group |
| LUN to a policy group | The LUN’s containing volume or SVM to a policy group |
| File to a policy group | The file’s containing volume or SVM to a policy group |

In the following illustration, the SVM vs3 is assigned to policy group pg2. You cannot assign volumes vol4 or vol5 to a policy group because an object in the storage hierarchy (SVM vs3) is assigned to a policy group.



# QoS Policy Groups window

Storage QoS (Quality of Service) can help you manage risks related to meeting your performance objectives. Storage QoS enables you to limit the throughput of workloads and to monitor workload performance. You can use the QoS Policy groups window to manage your policy groups and view information about them.

## Command buttons

- **Create**

  Opens the Create QoS Policy Group dialog box, which enables you to create new policy groups.

- **Edit**

  Opens the Edit QoS Policy Group dialog box, which enables you to modify the selected policy group.

- **Delete**

  Deletes the selected policy groups.

- **Refresh**

  Updates the information in the window.

## QoS Policy Groups list

The QoS Policy Groups list displays the policy group name and the maximum throughput for each policy group.

- **Name**

  Displays the name of the QoS policy group.

- **Minimum Throughput**

  Displays the minimum throughput limit specified for the policy group.

  If you have not specified any minimum throughput value, the system automatically displays “None” as the value and this value is case-sensitive.

- **Maximum Throughput**

  Displays the maximum throughput limit specified for the policy group.

  If you have not specified any maximum throughput value, the system automatically displays “Unlimited” as the value and this value is case-sensitive.

- **Storage Objects Count**

  Displays the number of storage objects assigned to the policy group.

## Details area

The area below the QoS Policy Groups list displays detailed information about the selected policy group.

- **Assigned Storage Objects tab**

  Displays the name and type of the storage object that is assigned to the selected policy group.

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