Configure storage pools

StorageGRID

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Configure storage pools

What a storage pool is

A storage pool is a logical grouping of Storage Nodes or Archive Nodes. You configure storage pools to determine where the StorageGRID system stores object data and the type of storage used.

Storage pools have two attributes:

- **Storage grade**: For Storage Nodes, the relative performance of backing storage.
- **Site**: The data center where objects will be stored.

Storage pools are used in ILM rules to determine where object data is stored. When you configure ILM rules for replication, you select one or more storage pools that include either Storage Nodes or Archive Nodes. When you create Erasure Coding profiles, you select a storage pool that includes Storage Nodes.

Guidelines for creating storage pools

When configuring and using storage pools, follow these guidelines.

Guidelines for all storage pools

- StorageGRID includes a default storage pool, All Storage Nodes, that uses the default site, All Sites, and the default storage grade, All Storage Nodes. The All Storage Nodes storage pool is automatically updated whenever you add new data center sites.

> Using the All Storage Nodes storage pool or the All Sites site is not recommended because these items are automatically updated to include any new sites you add in an expansion, which might not be the behavior you want. Before using the All Storage Nodes storage pool or the default site, carefully review the guidelines for replicated and erasure-coded copies.

- Keep storage pool configurations as simple as possible. Do not create more storage pools than necessary.
- Create storage pools with as many nodes as possible. Each storage pool should contain two or more nodes. A storage pool with insufficient nodes can cause ILM backlogs if a node becomes unavailable.
- Avoid creating or using storage pools that overlap (contain one or more of the same nodes). If storage pools overlap, more than one copy of object data might be saved on the same node.

Guidelines for storage pools used for replicated copies

- Create a different storage pool for each site. Then, specify one or more site-specific storage pools in the placement instructions for each rule. Using a storage pool for each site ensures that replicated object copies are placed exactly where you expect (for example, one copy of every object at each site for site-loss protection).
- If you add a site in an expansion, create a new storage pool for the new site. Then, update ILM rules to control which objects are stored on the new site.
- In general, do not use the default storage pool, All Storage Nodes, or any storage pool that includes the default site, All Sites.

Guidelines for storage pools used for erasure-coded copies

- You cannot use Archive Nodes for erasure-coded data.
- The number of Storage Nodes and sites contained in the storage pool determine which erasure-coding schemes are available.
- If a storage pool includes only two sites, you cannot use that storage pool for erasure coding. No erasure-coding schemes are available for a storage pool that has two sites.
- In general, do not use the default storage pool, All Storage Nodes, or any storage pool that includes the default site, All Sites in any Erasure Coding profile.

> If your grid includes only one site, you are prevented from using the All Storage Nodes storage pool or the All Sites default site in an Erasure Coding profile. This behavior prevents the Erasure Coding profile from becoming invalid if a second site is added.

- If you have high throughput requirements, creating a storage pool that includes multiple sites is not recommended if the network latency between sites is greater than 100 ms. As latency increases, the rate at which StorageGRID can create, place, and retrieve object fragments decreases sharply due to the decrease in TCP network throughput. The decrease in throughput affects the maximum achievable rates of object ingest and retrieval (when Strict or Balanced are selected as the Ingest Behavior) or could lead to ILM queue backlogs (when Dual Commit is selected as the Ingest Behavior).
- If possible, a storage pool should include more than the minimum number of Storage Nodes required for the erasure-coding scheme you select. For example, if you use a 6+3 erasure-coding scheme, you must have at least nine Storage Nodes. However, having at least one additional Storage Node per site is recommended.
- Distribute Storage Nodes across sites as evenly as possible. For example, to support a 6+3 erasure-coding scheme, configure a storage pool that includes at least three Storage Nodes at three sites.

Guidelines for storage pools used for archived copies

- You cannot create a storage pool that includes both Storage Nodes and Archive Nodes. Archived copies require a storage pool that only includes Archive Nodes.
- When using a storage pool that includes Archive Nodes, you should also maintain at least one replicated or erasure-coded copy on a storage pool that includes Storage Nodes.
- If the global S3 Object Lock setting is enabled and you are creating a compliant ILM rule, you cannot use a storage pool that includes Archive Nodes. See the instructions for managing objects with S3 Object Lock.
- If an Archive Node's Target Type is Cloud Tiering - Simple Storage Service (S3), the Archive Node must be in its own storage pool. See Administer StorageGRID.

Related information

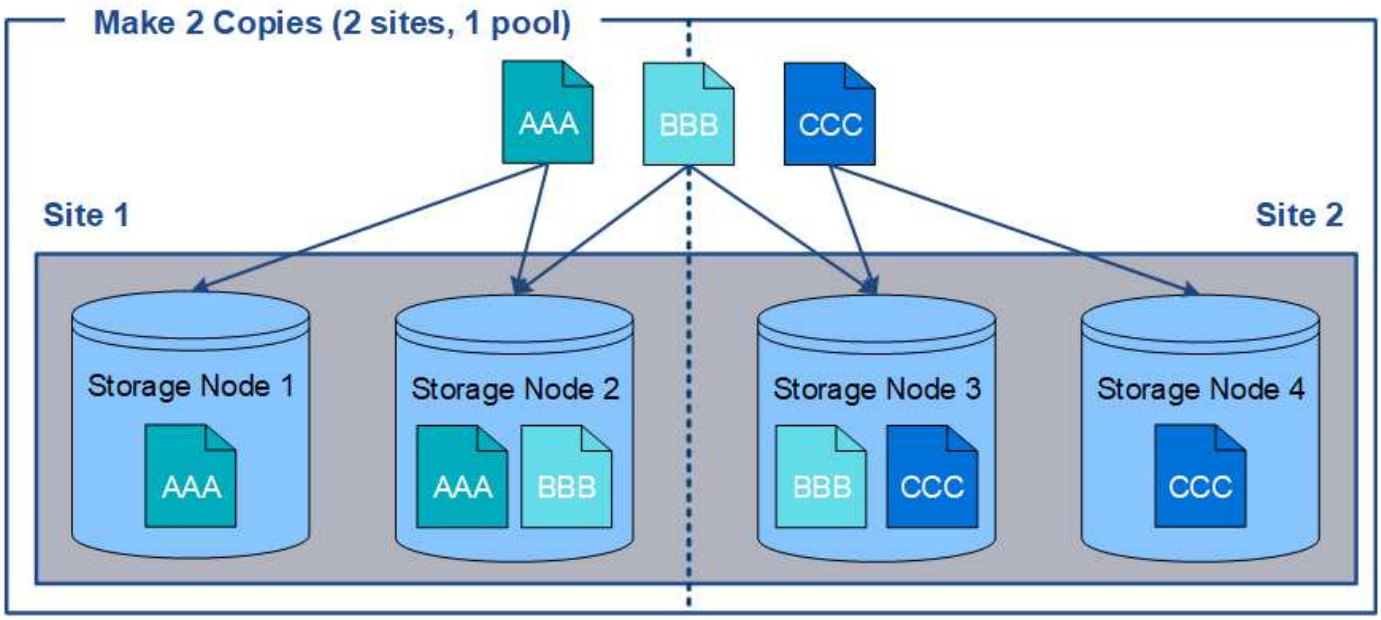
- What replication is
- What erasure coding is
- What erasure-coding schemes are
- Use multiple storage pools for cross-site replication

Use multiple storage pools for cross-site replication

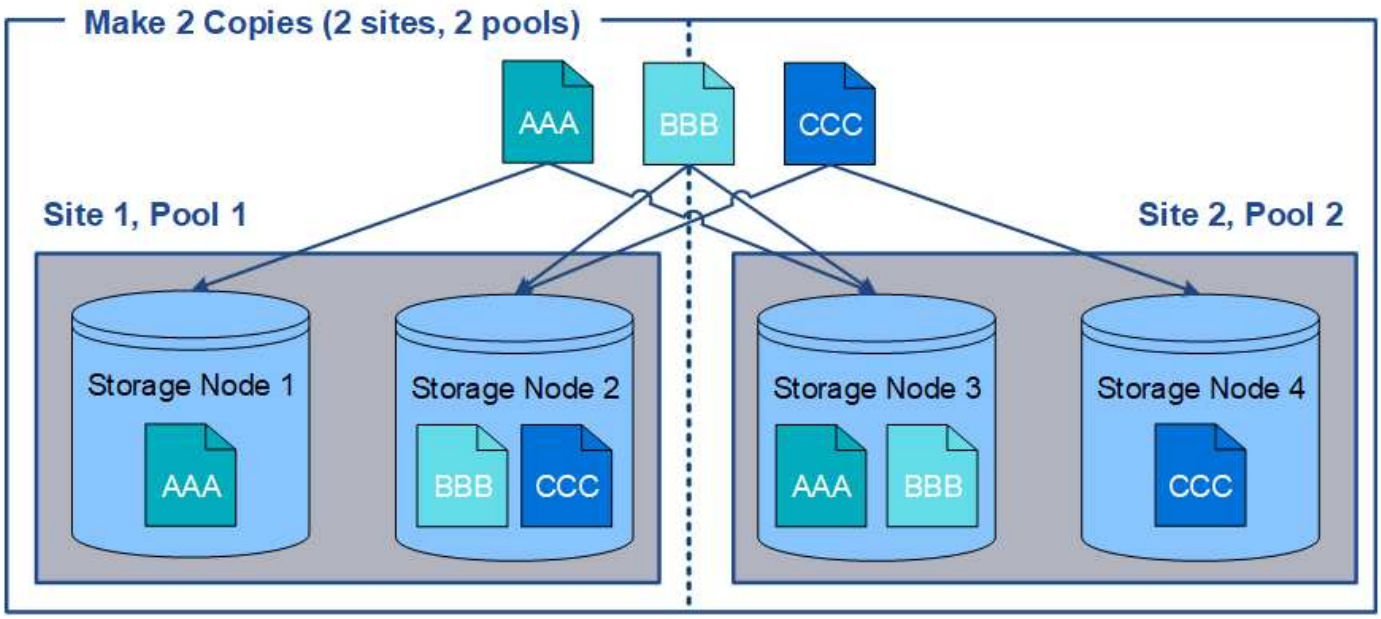
If your StorageGRID deployment includes more than one site, you can enable site-loss

protection by creating a storage pool for each site and specifying both storage pools in the rule's placement instructions. For example, if you configure an ILM rule to make two replicated copies and specify storage pools at two sites, one copy of each object will be placed at each site. If you configure a rule to make two copies and specify three storage pools, the copies are distributed to balance disk usage among the storage pools, while ensuring that the two copies are stored at different sites.

The following example illustrates what can happen if an ILM rule places replicated object copies to a single storage pool containing Storage Nodes from two sites. Because the system uses any available nodes in the storage pool when it places the replicated copies, it might place all copies of some objects within only one of the sites. In this example, the system stored two copies of object AAA on Storage Nodes at Site 1, and two copies of object CCC on Storage Nodes at Site 2. Only object BBB is protected if one of the sites fails or becomes inaccessible.



In contrast, this example illustrates how objects are stored when you use multiple storage pools. In the example, the ILM rule specifies that two replicated copies of each object be created, and that the copies be distributed to two storage pools. Each storage pool contains all Storage Nodes at one site. Because a copy of each object is stored at each site, object data is protected from site failure or inaccessibility.



When using multiple storage pools, keep the following rules in mind:

- If you are creating n copies, you must add n or more storage pools. For example, if a rule is configured to make three copies, you must specify three or more storage pools.
- If the number of copies equals the number of storage pools, one copy of the object is stored in each storage pool.
- If the number of copies is less than the number of storage pools, the system distributes the copies to keep disk usage among the pools balanced and to ensure that two or more copies are not stored in the same storage pool.
- If the storage pools overlap (contain the same Storage Nodes), all copies of the object might be saved at only one site. You must ensure that the selected storage pools do not contain the same Storage Nodes.

Use a storage pool as a temporary location (deprecated)

When you create an ILM rule with an object placement that includes a single storage pool, you are prompted to specify a second storage pool to use as a temporary location.

Temporary locations have been deprecated and will be removed in a future release. You should not select a storage pool as a temporary location for a new ILM rule.

> If you select the Strict ingest behavior (Step 3 of the Create ILM Rule wizard), the temporary location is ignored.

Related information

Data-protection options for ingest

Create a storage pool

You create storage pools to determine where the StorageGRID system stores object data and the type of storage used. Each storage pool includes one or more sites and one or more storage grades.

What you'll need

- You are signed in to the Grid Manager using a supported web browser.
- You have specific access permissions.
- You have reviewed the guidelines for creating storage pools.

About this task

Storage pools determine where object data is stored. The number of storage pools you need depends on the number of sites in your grid and on the types of copies you want: replicated or erasure-coded.

- For replication and single-site erasure coding, create a storage pool for each site. For example, if you want to store replicated object copies at three sites, create three storage pools.
- For erasure coding at three or more sites, create one storage pool that includes an entry for each site. For example, if you want to erasure code objects across three sites, create one storage pool. Select the plus icon ➕ to add an entry for each site.

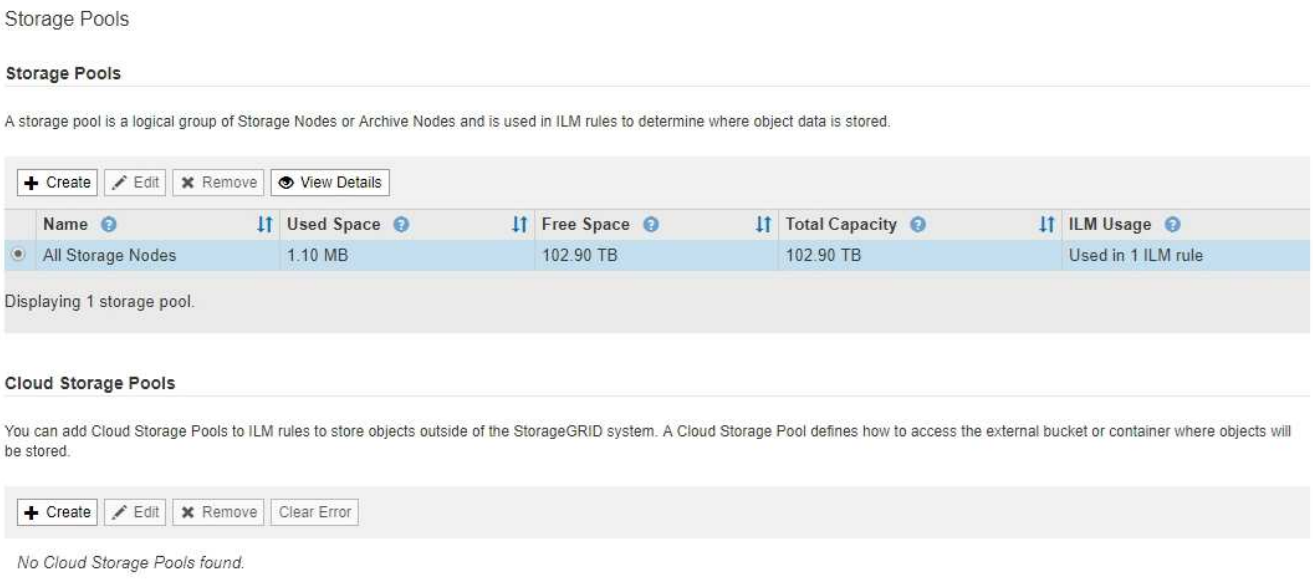
> Do not include the default All Sites site in a storage pool that will be used in an Erasure Coding profile. Instead, add a separate entry to the storage pool for each site that will store erasure coded data. See this step for an example.

- If you have more than one storage grade, do not create a storage pool that includes different storage grades at a single site. See the Guidelines for creating storage pools.

Steps

1. Select **ILM** > **Storage pools**.

   The Storage Pools page appears and lists all defined storage pools.

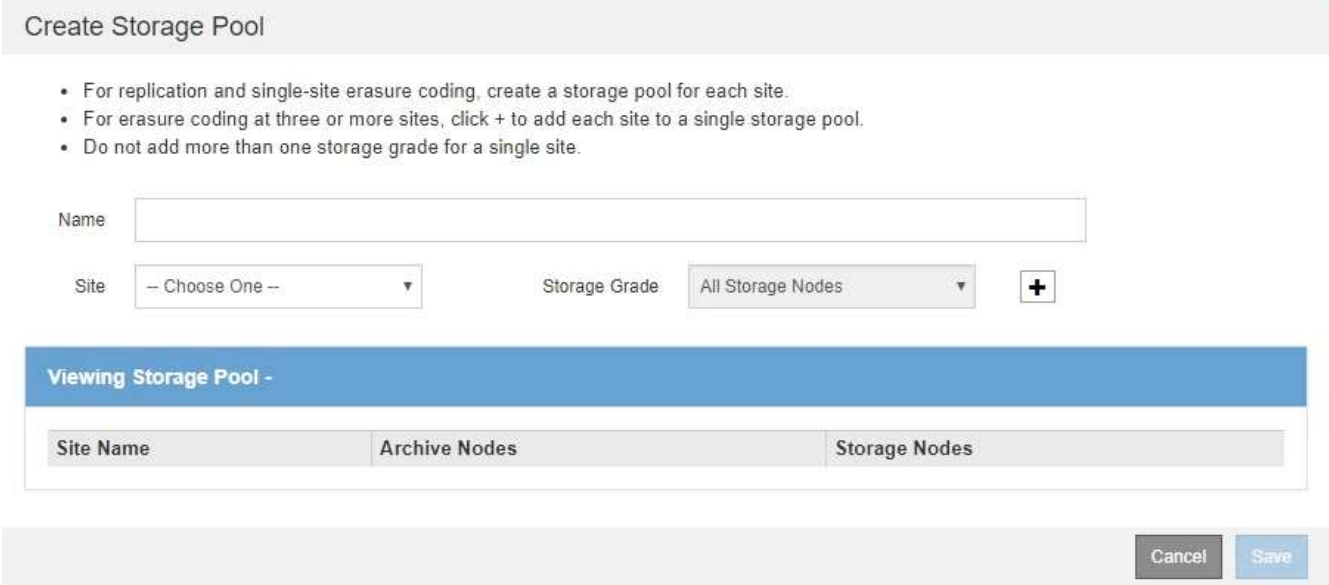


   The list includes the system-default storage pool, All Storage Nodes, which uses the system-default site, All Sites, and the default storage grade, All Storage Nodes.

   > Because the All Storage Nodes storage pool is automatically updated whenever you add new data center sites, using this storage pool in ILM rules is not recommended.

2. To create a new storage pool, select **Create**.

   The Create Storage Pool dialog box appears.



3. Enter a unique name for the storage pool.

   Use a name that will be easy to identify when you configure Erasure Coding profiles and ILM rules.

4. From the **Site** drop-down list, select a site for this storage pool.

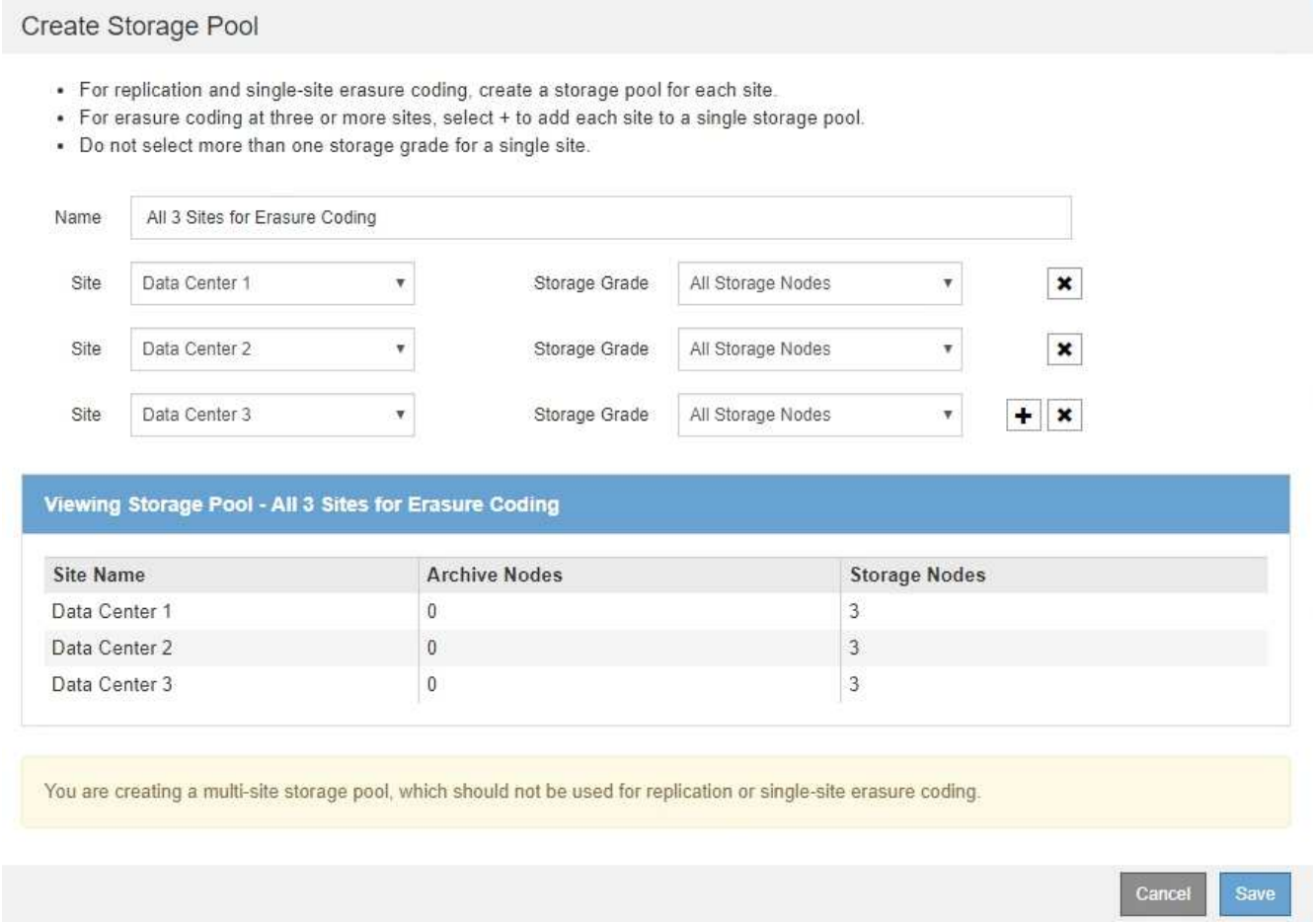
   When you select a site, the number of Storage Nodes and Archive Nodes in the table are automatically updated.

   In general, do not use the default All Sites site in any storage pool. ILM rules that use an All Sites storage pool place objects at any available site, giving you less control of object placement. Also, an All Sites storage pool uses the Storage Nodes at a new site immediately, which might not be the behavior you expect.

5. From the **Storage Grade** drop-down list, select the type of storage that will be used if an ILM rule uses this storage pool.

   The default All Storage Nodes storage grade includes all Storage Nodes at the selected site. The default Archive Nodes storage grade includes all Archive Nodes at the selected site. If you created additional storage grades for the Storage Nodes in your grid, they are listed in the drop-down.

6. If you want to use the storage pool in a multi-site Erasure Coding profile, select + to add an entry for each site to the storage pool.



> You are prevented from creating duplicate entries or from creating a storage pool that includes both the **Archive Nodes** storage grade and any storage grade that contains Storage Nodes.
>
> You are warned if you add more than one entry for a site but with different storage grades.

To remove an entry, select ✖.

7. When you are satisfied with your selections, select **Save**.

   The new storage pool is added to the list.

View storage pool details

You can view the details of a storage pool to determine where the storage pool is used and to see which nodes and storage grades are included.

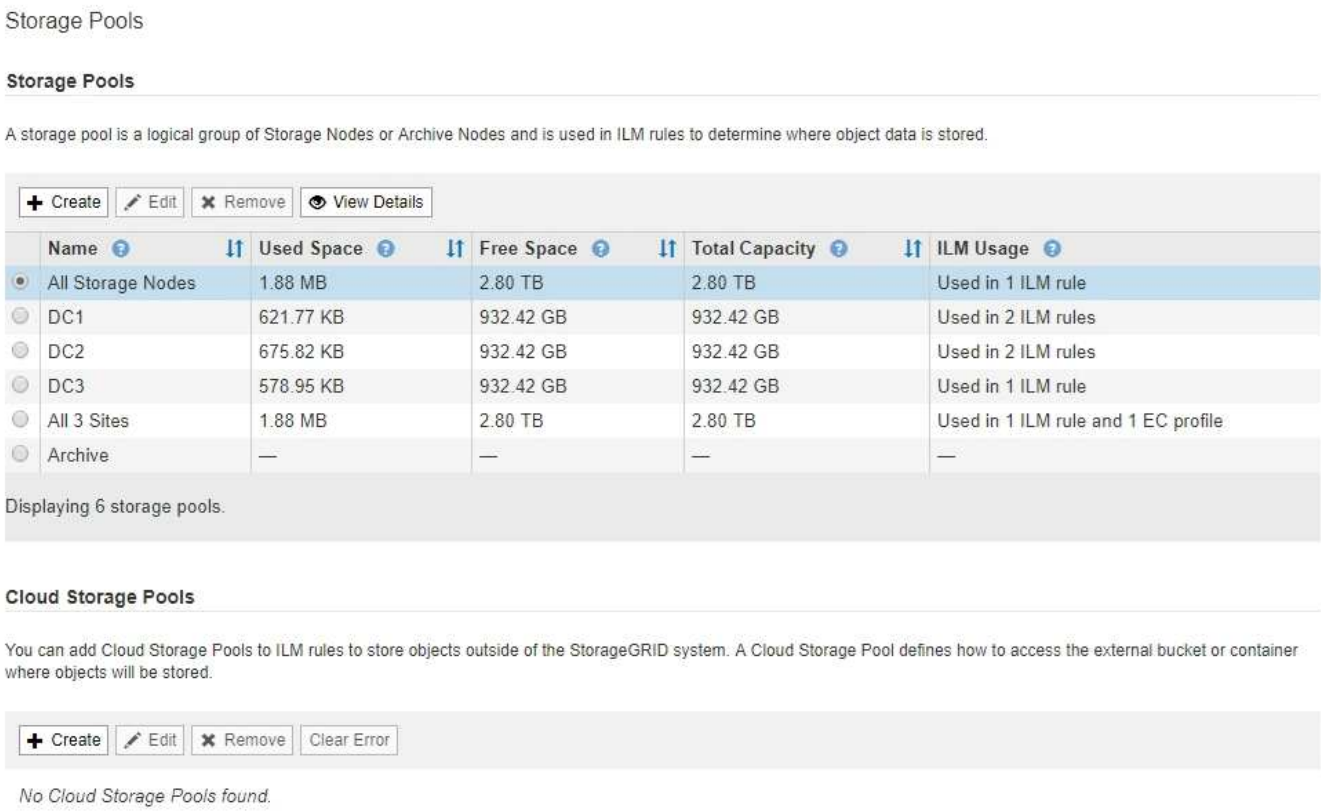
What you'll need

- You are signed in to the Grid Manager using a supported web browser.
- You have specific access permissions.

Steps

1. Select **ILM** > **Storage pools**.

The Storage Pools page appears. This page lists all defined storage pools.



The table includes the following information for each storage pool that includes Storage Nodes:

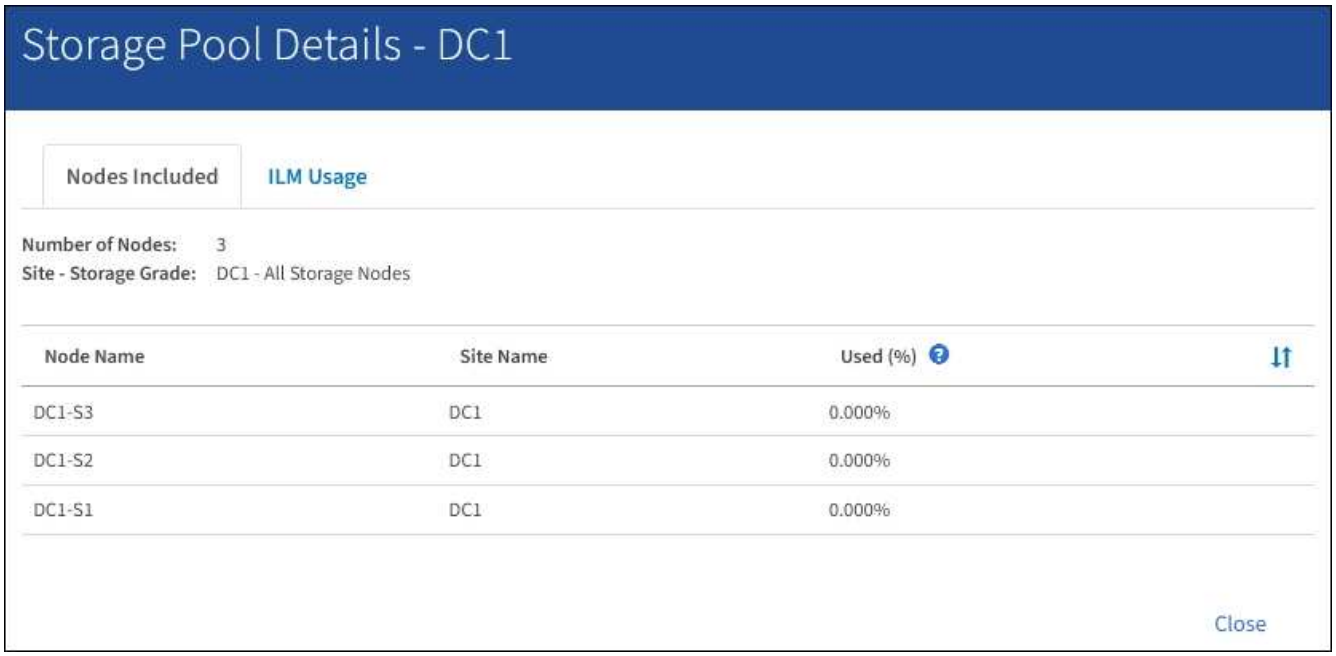
- **Name**: The unique display name of the storage pool.
- **Used Space**: The amount of space that is currently being used to store objects in the storage pool.
- **Free Space**: The amount of space that remains available to store objects in the storage pool.
- **Total Capacity**: The size of the storage pool, which equals the total amount of usable space for object data for all nodes in the storage pool .
- **ILM Usage**: How the storage pool is currently being used. A storage pool might be unused or it might be used in one or more ILM rules, Erasure Coding profiles, or both.

> You cannot remove a storage pool if it is being used.

2. To view details about a specific storage pool, select its radio button and select **View Details**.

   The Storage Pool Details modal appears.

3. View the **Nodes Included** tab to learn about the Storage Nodes or Archive Nodes included in the storage pool.



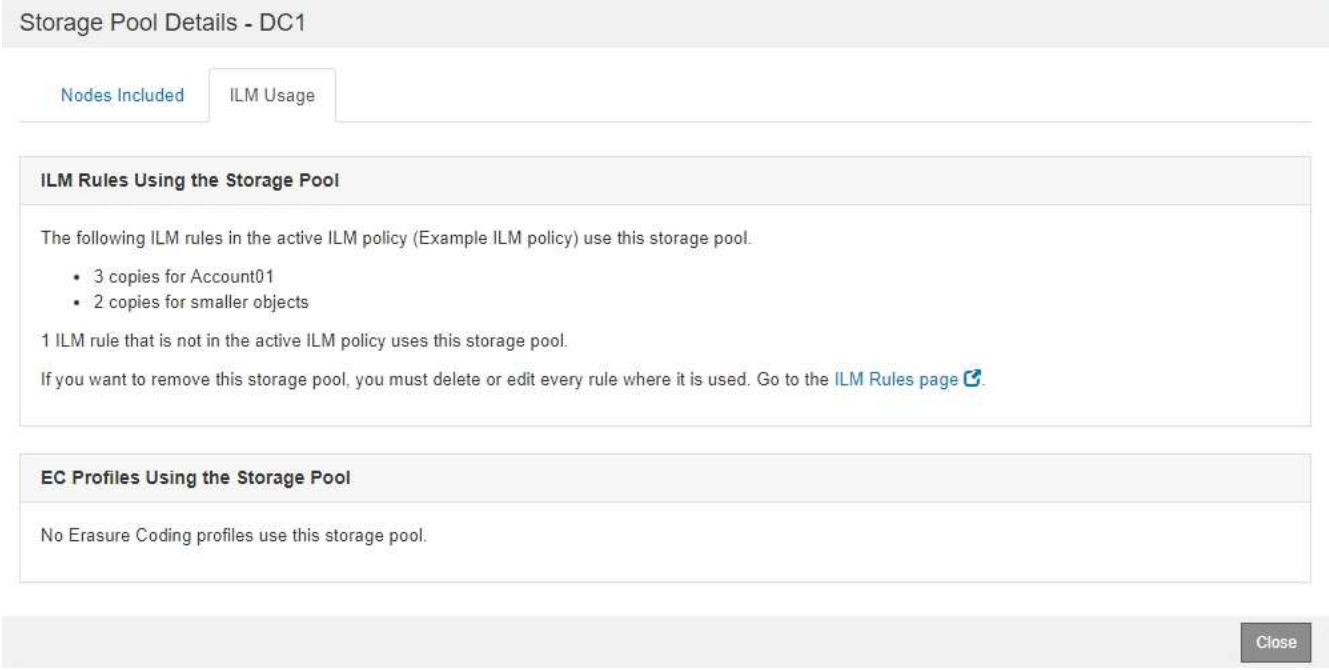
The table includes the following information for each node:

- Node Name
- Site Name
- Used (%): For Storage Nodes, the percentage of the total usable space for object data that has been used. This value does not include object metadata.

> The same Used (%) value is also shown in the Storage Used - Object Data chart for each Storage Node (select **NODES** > ***Storage Node*** > **Storage**).

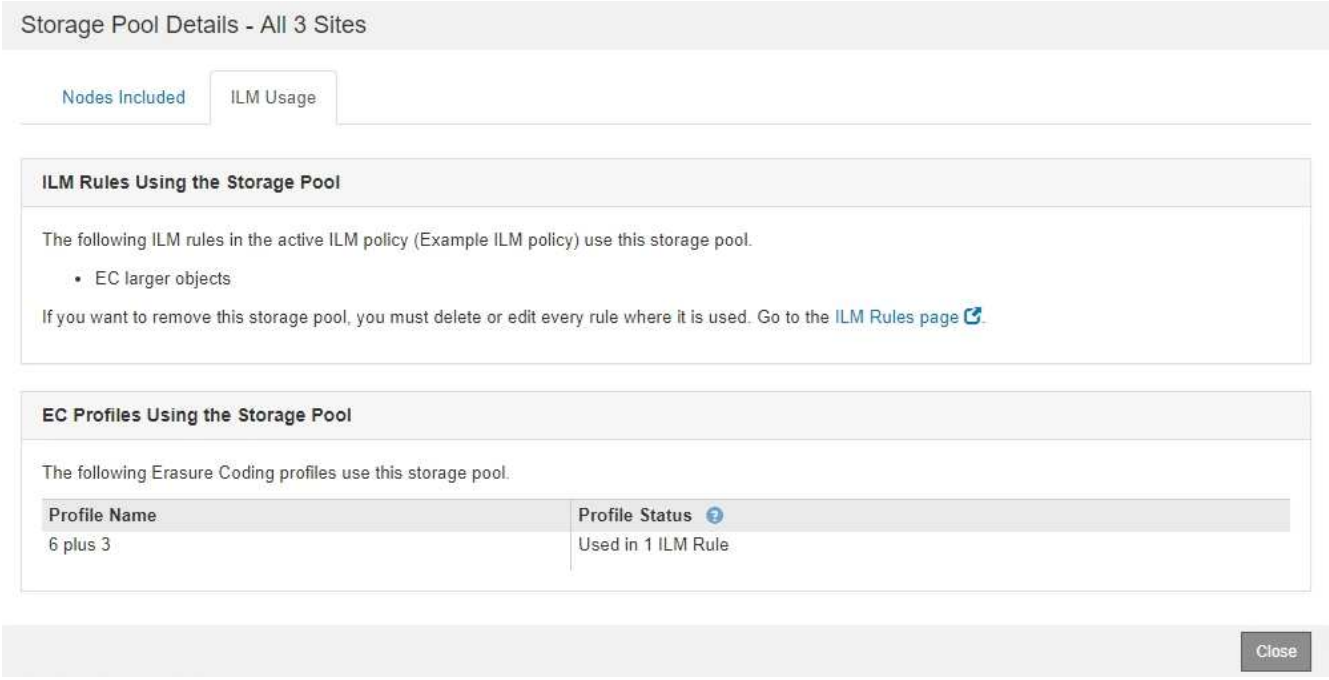
4. Select the **ILM Usage** tab to determine if the storage pool is currently being used in any ILM rules or Erasure Coding profiles.

   In this example, the DC1 storage pool is used in three ILM rules: two rules that are in the active ILM policy and one rule that is not in the active policy.



You cannot remove a storage pool if it is used in an ILM rule.

In this example, the All 3 Sites storage pool is used in an Erasure Coding profile. In turn, that Erasure Coding profile is used by one ILM rule in the active ILM policy.



You cannot remove a storage pool if it is used in an Erasure Coding profile.

5. Optionally, go to the **ILM Rules page** to learn about and manage any rules that use the storage pool.

   See the instructions for working with ILM rules.

6. When you are done viewing storage pool details, select **Close**.

Related information

Work with ILM rules and ILM policies

Edit storage pool

You can edit a storage pool to change its name or to update sites and storage grades.

What you'll need

- You are signed in to the Grid Manager using a supported web browser.
- You have specific access permissions.
- You have reviewed the guidelines for creating storage pools.
- If you plan to edit a storage pool that is used by a rule in the active ILM policy, you have considered how your changes will affect object data placement.

About this task

If you are adding a new storage grade to a storage pool that is used in the active ILM policy, be aware that the Storage Nodes in the new storage grade will not be used automatically. To force StorageGRID to use a new storage grade, you must activate a new ILM policy after saving the edited storage pool.

Steps

1. Select **ILM** > **Storage pools**.

   The Storage Pools page appears.

2. Select the radio button for the storage pool you want to edit.

   You cannot edit the All Storage Nodes storage pool.

3. Select **Edit**.
4. As required, change the storage pool name.
5. As required, select other sites and storage grades.

   > You are prevented from changing the site or storage grade if the storage pool is used in an Erasure Coding profile and the change would cause the erasure-coding scheme to become invalid. For example, if a storage pool used in a Erasure Coding profile currently includes a storage grade with only one site, you are prevented from using a storage grade with two sites since the change would make the erasure-coding scheme invalid.

6. Select **Save**.

After you finish

If you added a new storage grade to a storage pool used in the active ILM policy, activate a new ILM policy to force StorageGRID to use the new storage grade. For example, clone your existing ILM policy and then activate the clone.

Remove a storage pool

You can remove a storage pool that is not being used.

What you'll need

- You are signed in to the Grid Manager using a supported web browser.
- You have specific access permissions.

Steps

1. Select **ILM** > **Storage pools**.

   The Storage Pools page appears.

2. Look at the ILM Usage column in the table to determine whether you can remove the storage pool.

   You cannot remove a storage pool if it is being used in an ILM rule or in an Erasure Coding profile. As required, select **View Details** > **ILM Usage** to determine where a storage pool is used.

3. If the storage pool you want to remove is not being used, select the radio button.
4. Select **Remove**.
5. Select **OK**.

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