Configure Erasure Coding profiles

StorageGRID

NetApp
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Configure Erasure Coding profiles

Create an Erasure Coding profile

To create an Erasure Coding profile, you associate a storage pool containing Storage Nodes with an erasure-coding scheme. This association determines the number of data and parity fragments created and where the system distributes these fragments.

What you'll need

- You are signed in to the Grid Manager using a supported web browser.

- You have specific access permissions.

- You have created a storage pool that includes exactly one site or a storage pool that includes three or more sites. No erasure-coding schemes are available for a storage pool that has only two sites.

About this task

The storage pools used in Erasure Coding profiles must include exactly one site or three or more sites. If you want to provide site redundancy, the storage pool must have at least three sites.
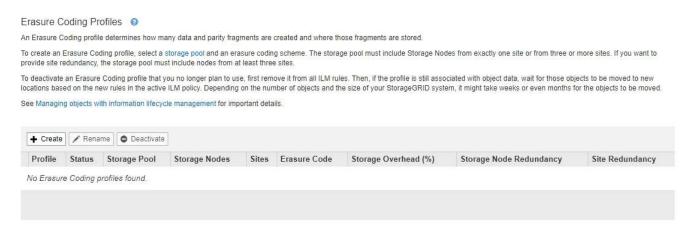
> ⓘ   You must select a storage pool that contains Storage Nodes. You cannot use Archive Nodes for erasure-coded data.
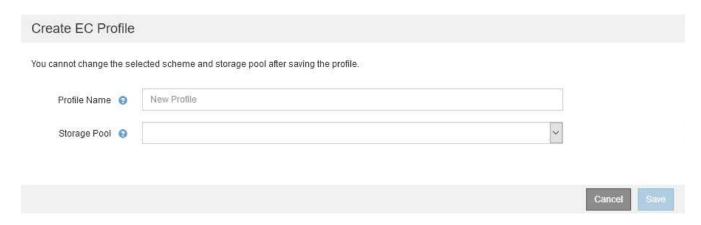
Steps

1. Select **ILM** > **Erasure coding**.

   The Erasure Coding Profiles page appears.

   Erasure Coding Profiles ⓘ

   An Erasure Coding profile determines how many data and parity fragments are created and where those fragments are stored.

   To create an Erasure Coding profile, select a storage pool and an erasure coding scheme. The storage pool must include Storage Nodes from exactly one site or from three or more sites. If you want to provide site redundancy, the storage pool must include nodes from at least three sites.

   To deactivate an Erasure Coding profile that you no longer plan to use, first remove it from all ILM rules. Then, if the profile is still associated with object data, wait for those objects to be moved to new locations based on the new rules in the active ILM policy. Depending on the number of objects and the size of your StorageGRID system, it might take weeks or even months for the objects to be moved.

   See Managing objects with information lifecycle management for important details.

+ Create	✎ Rename	⊝ Deactivate						
Profile	Status	Storage Pool	Storage Nodes	Sites	Erasure Code	Storage Overhead (%)	Storage Node Redundancy	Site Redundancy
No Erasure Coding profiles found.								

2. Select **Create**.

   The Create EC Profile dialog box appears.

Create EC Profile

You cannot change the selected scheme and storage pool after saving the profile.

Profile Name ❓ [New Profile]

Storage Pool ❓ [⌄]

[Cancel] [Save]

3. Enter a unique name for the Erasure Coding profile.

   Erasure Coding profile names must be unique. A validation error occurs if you use the name of an existing profile, even if that profile has been deactivated.

   > ⓘ The Erasure Coding profile name is appended to the storage pool name in the placement instruction for an ILM rule.

From day [365]   store [forever ▾]   **Erasure Coding profile name**   [Add] [Remove]

Type [erasure coded ▾]   Location [All 3 sites (6 plus 3) ▾]   Copies [1]   [+] [✕]

Storage pool name

4. Select the storage pool you created for this Erasure Coding profile.
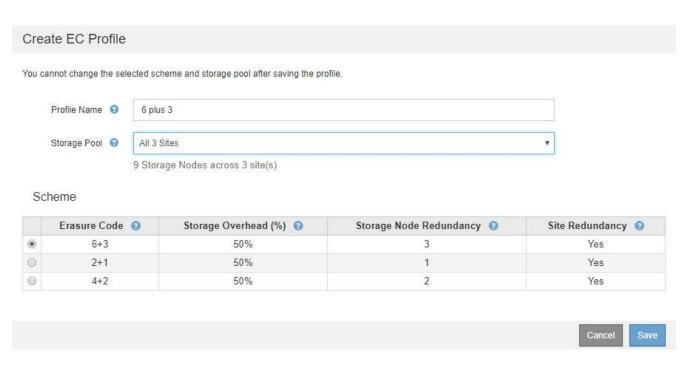
   > ⓘ If your grid currently includes only one site, you are prevented from using the default storage pool, All Storage Nodes, or any storage pool that includes the default site, All Sites. This behavior prevents the Erasure Coding profile from becoming invalid if a second site is added.

   > ⓘ If a storage pool includes exactly 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.

   When you select a storage pool, the list of available erasure-coding schemes is shown, based on the number of Storage Nodes and sites in the pool.

Create EC Profile

You cannot change the selected scheme and storage pool after saving the profile.

Profile Name ❓ | 6 plus 3

Storage Pool ❓ | All 3 Sites ▼

9 Storage Nodes across 3 site(s)

Scheme

	Erasure Code ❓	Storage Overhead (%) ❓	Storage Node Redundancy ❓	Site Redundancy ❓
⦿	6+3	50%	3	Yes
○	2+1	50%	1	Yes
○	4+2	50%	2	Yes

Cancel Save

The following information is listed for each available erasure-coding scheme:

- **Erasure Code**: The name of the erasure-coding scheme in the following format: data fragments + parity fragments.

- **Storage Overhead (%)**: The additional storage required for parity fragments relative to the object's data size. Storage Overhead = Total number of parity fragments / Total number of data fragments.

- **Storage Node Redundancy**: The number of Storage Nodes that can be lost while still maintaining the ability to retrieve object data.

- **Site Redundancy**: Whether the selected erasure code allows the object data to be retrieved if a site is lost.

  To support site redundancy, the selected storage pool must include multiple sites, each with enough Storage Nodes to allow any site to be lost. For example, to support site redundancy using a 6+3 erasure-coding scheme, the selected storage pool must include at least three sites with at least three Storage Nodes at each site.

Messages are displayed in these cases:

- The storage pool you selected does not provide site redundancy. The following message is expected when the selected storage pool includes only one site. You can use this Erasure Coding profile in ILM rules to protect against node failures.

Scheme

	Erasure Code ❓	Storage Overhead (%) ❓	Storage Node Redundancy ❓	Site Redundancy ❓
⦿	2+1	50%	1	No

The selected storage pool and erasure coding scheme cannot protect object data from loss if a site is lost.
To provide site redundancy, the storage pool must have at least three sites.
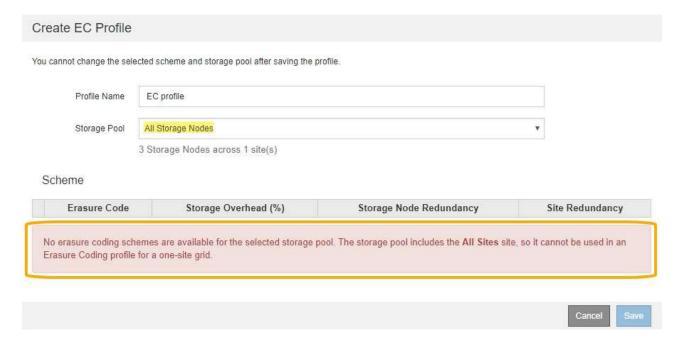
- The storage pool you selected does not satisfy the requirements for any erasure-coding scheme. For example, the following message is expected when the selected storage pool includes exactly two sites. If you want to use erasure coding to protect object data, you must select a storage pool with exactly
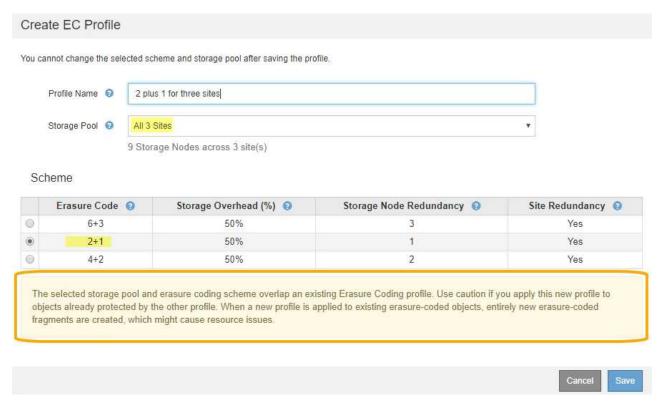
one site or a storage pool with three or more sites.

Scheme

Erasure Code ❓	Storage Overhead (%) ❓	Storage Node Redundancy ❓	Site Redundancy ❓

No erasure coding schemes are supported for the selected storage pool because it contains two sites. You must select a storage pool that contains exactly one site or a storage pool that contains at least three sites.

- Your grid includes only one site and you selected the default storage pool, All Storage Nodes, or any storage pool that includes the default site, All Sites.

Create EC Profile

You cannot change the selected scheme and storage pool after saving the profile.

Profile Name: EC profile

Storage Pool: All Storage Nodes ▼

3 Storage Nodes across 1 site(s)

Scheme

Erasure Code	Storage Overhead (%)	Storage Node Redundancy	Site Redundancy

No erasure coding schemes are available for the selected storage pool. The storage pool includes the **All Sites** site, so it cannot be used in an Erasure Coding profile for a one-site grid.

Cancel Save

- The erasure-coding scheme and storage pool you selected overlap with another Erasure Coding profile.

In this example, a warning message appears because another Erasure Coding profile is using the 2+1 scheme and the storage pool for the other profile also uses one of the sites in the All 3 Sites storage pool.

While you are not prevented from creating this new profile, you must be very careful when you start using it in the ILM policy. If this new profile is applied to existing erasure-coded objects already protected by the other profile, StorageGRID will create an entirely new set of object fragments. It will not reuse the existing 2+1 fragments. Resource issues might occur when you migrate from one Erasure Coding profile to the other, even though the erasure-coding schemes are the same.

5. If more than one erasure-coding scheme is listed, select the one you want to use.

   When deciding which erasure-coding scheme to use, you should balance fault tolerance (achieved by having more parity segments) against the network traffic requirements for repairs (more fragments equals more network traffic). For example, when deciding between a 4+2 scheme and 6+3 scheme, select the 6+3 scheme if additional parity and fault tolerance are required. Select the 4+2 scheme if network resources are constrained to reduce network usage during node repairs.

6. Select **Save**.

Rename an Erasure Coding profile

You might want to rename an Erasure Coding profile to make it more obvious what the profile does.

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** > **Erasure coding**.

   The Erasure Coding Profiles page appears. The **Rename** and **Deactivate** buttons are both disabled.

	Profile	Status	Storage Pool	Storage Nodes	Sites	Erasure Code	Storage Overhead (%)	Storage Node Redundancy	Site Redundancy
○	DC1 2-1		DC1	3	1	2+1	50	1	No
○	DC2 2-1		DC2	3	1	2+1	50	1	No
○	DC3 2-1		DC3	3	1	2+1	50	1	No
◉	All sites 6-3	Deactivated	All 3 Sites	9	3	6+3	50	3	Yes

2. Select the profile you want to rename.

   The **Rename** and **Deactivate** buttons become enabled.

3. Select **Rename**.

   The Rename EC Profile dialog box appears.

   ### Rename EC Profile

   Profile Name | EC DC3

   Cancel | Save

4. Enter a unique name for the Erasure Coding profile.

   The Erasure Coding profile name is appended to the storage pool name in the placement instruction for an ILM rule.

   From day | 365 | store | forever ▾ | **Erasure Coding profile name** | Add | Remove

   Type | erasure coded ▾ | Location | All 3 sites (6 plus 3) ▾ | Copies | 1 | + | ✕

   Storage pool name

   (i) Erasure Coding profile names must be unique. A validation error occurs if you use the name of an existing profile, even if that profile has been deactivated.

5. Select **Save**.

Deactivate an Erasure Coding profile

You can deactivate an Erasure Coding profile if you no longer plan to use it and if the profile is not currently used in any ILM rules.

What you'll need

- You are signed in to the Grid Manager using a supported web browser.

- You have specific access permissions.

- You have confirmed that no erasure coded data repair operations or decommission procedures are in process. An error message is returned if you attempt to deactivate an Erasure Coding profile while either of these operations are in progress.

About this task

When you deactivate an Erasure Coding profile, the profile still appears on the Erasure Coding Profiles page, but its status is **Deactivated**.

	Profile	Status	Storage Pool	Storage Nodes	Sites	Erasure Code	Storage Overhead (%)	Storage Node Redundancy	Site Redundancy
○	DC1 2-1		DC1	3	1	2+1	50	1	No
○	DC2 2-1		DC2	3	1	2+1	50	1	No
○	DC3 2-1		DC3	3	1	2+1	50	1	No
◉	All sites 6-3	Deactivated	All 3 Sites	9	3	6+3	50	3	Yes

You can no longer use an Erasure Coding profile that has been deactivated. A deactivated profile is not shown when you create the placement instructions for an ILM rule. You cannot reactivate a deactivated profile.

StorageGRID prevents you from deactivating an Erasure Coding profile if either of the following is true:

- The Erasure Coding profile is currently used in an ILM rule.

- The Erasure Coding profile is no longer used in any ILM rules, but object data and parity fragments for the profile still exist.

Steps

1. Select **ILM** > **Erasure Coding**.

   The Erasure Coding Profiles page appears. The **Rename** and **Deactivate** buttons are both disabled.

2. Review the **Status** column to confirm that the Erasure Coding profile you want to deactivate is not used in any ILM rules.

   You cannot deactivate an Erasure Coding profile if it is used in any ILM rule. In the example, the **2_1 EC Profile** is used in at least one ILM rule.

	Profile	Status	Storage Pool	Storage Nodes	Sites	Erasure Code	Storage Overhead (%)	Storage Node Redundancy	Site Redundancy
○	2_1 EC Profile	Used In ILM Rule	DC1	3	1	2+1	50	1	No
○	Site 1 EC Profile	Deactivated	DC1	3	1	2+1	50	1	No

3. If the profile is used in an ILM rule, follow these steps:

   a. Select **ILM** > **Rules**.

   b. For each rule listed, select the radio button and review the retention diagram to determine if the rule uses the Erasure Coding profile you want to deactivate.

      In the example, the **Three site EC for larger objects** rule uses a storage pool called **All 3 Sites** and the **All sites 6-3** Erasure Coding profile. Erasure Coding profiles are represented by this icon: ⊞

ILM Rules

Information lifecycle management (ILM) rules determine how and where object data is stored over time. Every object ingested into StorageGRID is evaluated against the ILM rules that make up the active ILM policy. Use this page to manage and view ILM rules. You cannot edit or remove an ILM rule that is used by an active or proposed ILM policy.

	Name	Used In Active Policy	Used In Proposed Policy
○	2 copy replication for smaller objects	✔	
●	Three site EC for larger objects	✔	
○	Make 2 Copies		

Three site EC for larger objects

Description:	6-3 erasure coding at 3 sites for objects larger than 200 KB
Ingest Behavior:	Balanced
Reference Time:	Ingest Time
Filtering Criteria:	

Matches all of the following metadata:

System Metadata	Object Size (MB)	greater than	0.2

Retention Diagram:

Trigger	Day 0	
All 3 Sites (All sites 6-3)		
Duration	Forever	

c. If the ILM rule uses the Erasure Coding profile you want to deactivate, determine if the rule is used in either the active ILM policy or a proposed policy.

In the example, the **Three site EC for larger objects** rule is used in the active ILM policy.

d. Complete the additional steps in the table, based on where the Erasure Coding profile is used.

Where has the profile been used?	Additional steps to perform before deactivating the profile	Refer to these additional instructions
Never used in any ILM rule	No additional steps required. Continue with this procedure.	*None*
In an ILM rule that has never been used in any ILM policy	1. Edit or delete all affected ILM rules. If you edit the rule, remove all placements that use the Erasure Coding profile. 2. Continue with this procedure.	Work with ILM rules and ILM policies

Where has the profile been used?	Additional steps to perform before deactivating the profile	Refer to these additional instructions
In an ILM rule that is currently in the active ILM policy	1. Clone the active policy. 2. Remove the ILM rule that uses the Erasure Coding profile. 3. Add one or more new ILM rules to ensure objects are protected. 4. Save, simulate, and activate the new policy. 5. Wait for the new policy to be applied and for existing objects to be moved to new locations based on the new rules you added. **Note:** Depending on the number of objects and the size of your StorageGRID system, it might take weeks or even months for ILM operations to move the objects to new locations, based on the new ILM rules. While you can safely attempt to deactivate an Erasure Coding profile while it is still associated with data, the deactivation operation will fail. An error message will inform you if the profile is not yet ready to be deactivated. 6. Edit or delete the rule you removed from the policy. If you edit the rule, remove all placements that use the Erasure Coding profile. 7. Continue with this procedure.	• Create an ILM policy • Work with ILM rules and ILM policies
In an ILM rule that is currently in a proposed ILM policy	1. Edit the proposed policy. 2. Remove the ILM rule that uses the Erasure Coding profile. 3. Add one or more new ILM rules to ensure all objects are protected. 4. Save the proposed policy. 5. Edit or delete the rule you removed from the policy. If you edit the rule, remove all placements that use the Erasure Coding profile. 6. Continue with this procedure.	• Create an ILM policy • Work with ILM rules and ILM policies

Where has the profile been used?	Additional steps to perform before deactivating the profile	Refer to these additional instructions
In an ILM rule that is in a historical ILM policy	1. Edit or delete the rule. If you edit the rule, remove all placements that use the Erasure Coding profile. (The rule will now appear as a historical rule in the historical policy.) 2. Continue with this procedure.	Work with ILM rules and ILM policies

     e. Refresh the Erasure Coding Profiles page to ensure that the profile is not used in an ILM rule.

4. If the profile is not used in an ILM rule, select the radio button and select **Deactivate**.

The Deactivate EC Profile dialog box appears.

5. If you are sure you want to deactivate the profile, select **Deactivate**.

   ◦ If StorageGRID is able to deactivate the Erasure Coding profile, its status is **Deactivated**. You can no longer select this profile for any ILM rule.

   ◦ If StorageGRID is not able to deactivate the profile, an error message appears. For example, an error message appears if object data is still associated with this profile. You might need to wait several weeks before trying the deactivation process again.