Expansion guidelines

StorageGRID software

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Expansion guidelines

Guidelines for adding object capacity in StorageGRID

You can expand the object storage capacity of your StorageGRID system by adding storage volumes to existing Storage Nodes or by adding new Storage Nodes to existing sites. You must add storage capacity in a way that meets the requirements of your information lifecycle management (ILM) policy.

Guidelines for adding storage volumes

Before adding storage volumes to existing Storage Nodes, review the following guidelines and limitations:

- You must examine your current ILM rules to determine where and when to add storage volumes to increase the storage available for replicated objects or erasure-coded objects.
- You can't increase the metadata capacity of your system by adding storage volumes because object metadata is stored only on volume 0.
- Each software-based Storage Node can support a maximum of 48 storage volumes. If you need to add capacity beyond that, you must add new Storage Nodes.
- You can add one or two expansion shelves to each SG6060 appliance. Each expansion shelf adds 16 storage volumes. With both expansion shelves installed, the SG6060 can support a total of 48 storage volumes.
- You can add one or two expansion shelves to each SG6160 appliance. Each expansion shelf adds 60 storage volumes. With both expansion shelves installed, the SG6160 can support a total of 180 storage volumes.
- You can't add storage volumes to any other storage appliance.
- You can't increase the size of an existing storage volume.
- You can't add storage volumes to a Storage Node at the same time you are performing a system upgrade, recovery operation, or another expansion.

After you have decided to add storage volumes and have determined which Storage Nodes you must expand to satisfy your ILM policy, follow the instructions for your type of Storage Node:

- To add one or two expansion shelves to an SG6060 storage appliance, go to Add expansion shelf to deployed SG6060.
- To add one or two expansion shelves to an SG6160 storage appliance, go to Add expansion shelf to deployed SG6160
- For a software-based node, follow the instructions for adding storage volumes to Storage Nodes.

Guidelines for adding Storage Nodes

Before adding Storage Nodes to existing sites, review the following guidelines and limitations:

- You must examine your current ILM rules to determine where and when to add Storage Nodes to increase the storage available for replicated objects or erasure-coded objects.
- You should not add more than 10 Storage Nodes in a single expansion procedure.

- You can add Storage Nodes to more than one site in a single expansion procedure.
- You can add Storage Nodes and other types of nodes in a single expansion procedure.
- Before starting the expansion procedure, you must confirm that all data-repair operations performed as part of a recovery are complete. See Check data repair jobs.
- If you need to remove Storage Nodes before or after performing an expansion, you should not decommission more than 10 Storage Nodes in a single Decommission Node procedure.
- Add sufficient Storage Nodes to maintain underlying storage I/O performance. Write operations will be distributed among Storage Nodes based on available storage capacity. If the expanded Storage Nodes have significantly more available storage capacity, those nodes will receive significantly more writes. In particular, when the existing Storage Nodes are nearly full, new writes will rely only on the expanded Storage Nodes. Read and delete operations will be handled according to your specific workload.

Guidelines for ADC service on Storage Nodes

When configuring the expansion, you must choose whether to include the Administrative Domain Controller (ADC) service on each new Storage Node. The ADC service keeps track of the location and availability of grid services.

- You can move the ADC service from one Storage Node to another on the same site.
- The StorageGRID system requires a quorum of ADC services to be available at each site and at all times.
- At least three Storage Nodes at each site must include the ADC service.
- Adding the ADC service to every Storage Node is not recommended. Including too many ADC services can cause slowdowns due to the increased amount of communication between nodes.
- A single grid should not have more than 48 Storage Nodes with the ADC service. This is equivalent to 16 sites with three ADC services at each site.
- In general, when you select the **ADC Service** setting for a new node, you should select **Automatic**. Select **Yes** only if the new node will replace another Storage Node that includes the ADC service. Because you can't decommission a Storage Node if too few ADC services would remain, selecting **Yes** ensures that a new ADC service is available before the old service is removed.

Guidelines for adding metadata capacity in StorageGRID

To ensure that adequate space is available for object metadata, you might need to perform an expansion procedure to add new Storage Nodes at each site.

StorageGRID reserves space for object metadata on volume 0 of each Storage Node. Three copies of all object metadata are maintained at each site, evenly distributed across all Storage Nodes.

You can use the Grid Manager to monitor the metadata capacity of Storage Nodes and to estimate how quickly metadata capacity is being consumed. In addition, the **Low metadata storage** alert is triggered for a Storage Node when the used metadata space reaches certain thresholds.

Note that a grid's object metadata capacity might be consumed faster than its object storage capacity, depending on how you use the grid. For example, if you typically ingest large numbers of small objects or add large quantities of user metadata or tags to objects, you might need to add Storage Nodes to increase metadata capacity even though sufficient object storage capacity remains.

For more information, see the following:

- Manage object metadata storage
- Monitor object metadata capacity for each Storage Node

Guidelines for increasing metadata capacity

Before adding Storage Nodes to increase metadata capacity, review the following guidelines and limitations:

- Assuming sufficient object storage capacity is available, having more space available for object metadata increases the number of objects you can store in your StorageGRID system.
- You can increase a grid's metadata capacity by adding one or more Storage Nodes to each site.
- The actual space reserved for object metadata on any given Storage Node depends on the Metadata Reserved Space storage option (system-wide setting), the amount of RAM allocated to the node, and the size of the node's volume 0.
- You can't increase metadata capacity by adding storage volumes to existing Storage Nodes, because metadata is stored only on volume 0.
- You can't increase metadata capacity by adding a new site.
- StorageGRID keeps three copies of all object metadata at every site. For this reason, the metadata capacity for your system is limited by the metadata capacity of your smallest site.
- When adding metadata capacity, you should add the same number of Storage Nodes to each site.

Metadata-only Storage Nodes have specific hardware requirements:

- When using StorageGRID appliances, metadata-only nodes can be configured only on SGF6112 appliances with twelve 1.9 TB or twelve 3.8 TB drives.
- When using software-based nodes, metadata-only node resources must match the existing Storage Nodes resources. For example:
  - If the existing StorageGRID site is using SG6000 or SG6100 appliances, the software-based metadata-only nodes must meet the following minimum requirements:
    - 128 GB RAM
    - 8 core CPU
    - 8 TB SSD or equivalent storage for the Cassandra database (rangedb/0)
  - If the existing StorageGRID site is using virtual Storage Nodes with 24 GB RAM, 8 core CPU, and 3 TB or 4TB of metadata storage, the software-based metadata-only nodes should use similar resources (24 GB RAM, 8 core CPU, and 4TB of metadata storage (rangedb/0)).
- When adding a new StorageGRID site, the new site total metadata capacity should, at minimum, match existing StorageGRID sites and new site resources should match the Storage Nodes at existing StorageGRID sites.

See the description of what Metadata Reserved Space is.

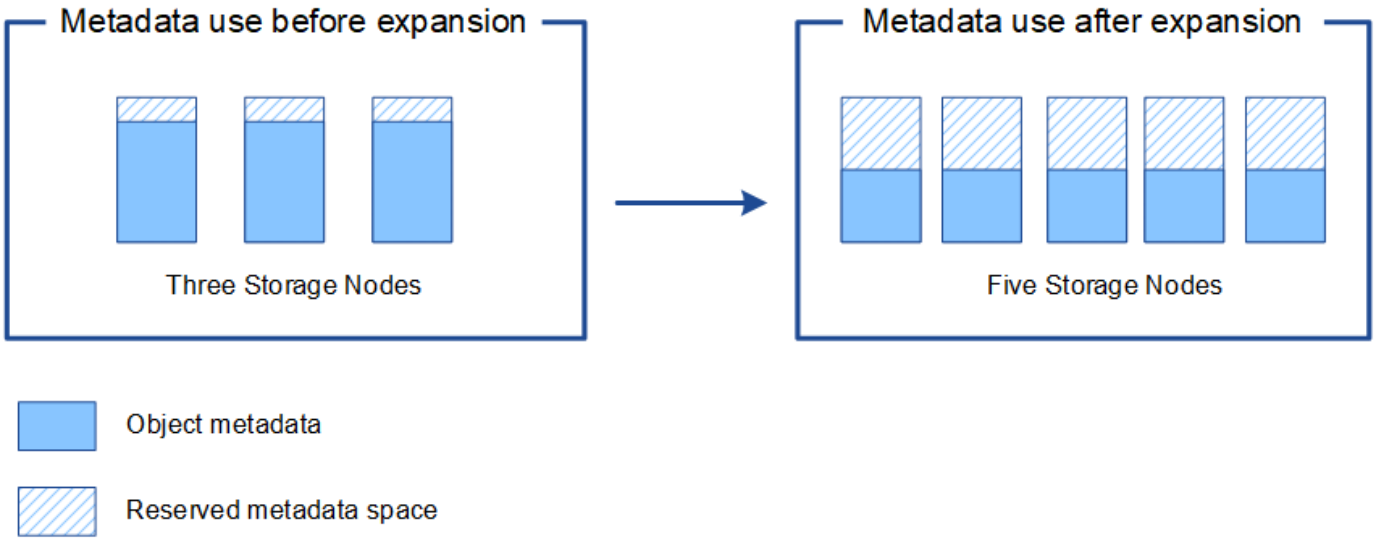
How metadata is redistributed when you add Storage Nodes

When you add Storage Nodes in an expansion, StorageGRID redistributes the existing object metadata to the new nodes at each site, which increases the overall metadata capacity of the grid. No user action is required.

The following figure shows how StorageGRID redistributes object metadata when you add Storage Nodes in an expansion. The left side of the figure represents volume 0 of three Storage Nodes before an expansion. Metadata is consuming a relatively large portion of each node's available metadata space, and the **Low**

metadata storage alert has been triggered.

The right side of the figure shows how the existing metadata is redistributed after two Storage Nodes are added to the site. The amount of metadata on each node has decreased, the **Low metadata storage** alert is no longer triggered, and the space available for metadata has increased.



Guidelines for adding grid nodes in StorageGRID

You can add redundancy or additional capabilities to a StorageGRID system by adding new grid nodes to existing sites.

For example, you might choose to add Gateway Nodes to use in a high availability (HA) group, or you might add an Admin Node at a remote site to permit monitoring using a local node.

You can add one or more of the following types of nodes to one or more existing sites in a single expansion operation:

- Non-primary Admin Nodes
- Storage Nodes
- Gateway Nodes

When preparing to add grid nodes, be aware of the following limitations:

- The primary Admin Node is deployed during the initial installation. You can't add a primary Admin Node during an expansion.
- You can add Storage Nodes and other types of nodes in the same expansion.
- When adding Storage Nodes, you must carefully plan the number and location of the new nodes. See Guidelines for adding object capacity.
- If the **Set new node default** option is **Untrusted** on the Untrusted Client Networks tab on the Firewall control page, client applications that connect to expansion nodes using the Client Network must connect using a load balancer endpoint port (**Configuration** > **Security** > **Firewall control**). See the instructions to change the security setting for the new node and to configure load balancer endpoints.

Guidelines for adding a new site in StorageGRID

You can expand your StorageGRID system by adding a new site.

Guidelines for adding a site

Before adding a site, review the following requirements and limitations:

- You can only add one site per expansion operation.
- You can't add grid nodes to an existing site as part of the same expansion.
- All sites must include at least three Storage Nodes.
- Adding a new site does not automatically increase the number of objects you can store. The total object capacity of a grid depends on the amount of available storage, the ILM policy, and the metadata capacity at each site.
- When sizing a new site, you must ensure that it includes enough metadata capacity.

  StorageGRID keeps a copy of all object metadata at every site. When you add a new site, you must ensure that it includes enough metadata capacity for the existing object metadata and enough metadata capacity for growth.

  For more information, see the following:

  - Manage object metadata storage
  - Monitor object metadata capacity for each Storage Node
- You must consider the available network bandwidth between sites, and the level of network latency. Metadata updates are continually replicated between sites even if all objects are stored only at the site where they are ingested.
- Because your StorageGRID system remains operational during the expansion, you must review ILM rules before starting the expansion procedure. You must ensure that object copies aren't stored to the new site until the expansion procedure is complete.

  For example, before you begin the expansion, determine if any rules use the default storage pool (All Storage Nodes). If they do, you must create a new storage pool that contains the existing Storage Nodes and update your ILM rules to use the new storage pool. Otherwise, objects will be copied to the new site as soon as the first node at that site becomes active.

  For more information about changing ILM when adding a new site, see the example for changing an ILM policy.

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