



Information to monitor regularly

StorageGRID software

NetApp
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Information to monitor regularly

What and when to monitor

Even though the StorageGRID system can continue to operate when errors occur or parts of the grid are unavailable, you should monitor and address potential issues before they affect the grid's efficiency or availability.

Before you begin

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have [specific access permissions](#).

About monitoring tasks

A busy system generates large amounts of information. The following list provides guidance about the most important information to monitor on an ongoing basis.

What to monitor	Frequency
System health status	Daily
Rate at which Storage Node object and metadata capacity is being consumed	Weekly
Information lifecycle management operations	Weekly
Networking and system resources	Weekly
Tenant activity	Weekly
S3 client operations	Weekly
Load balancing operations	After the initial configuration and after any configuration changes
Grid federation connections	Weekly

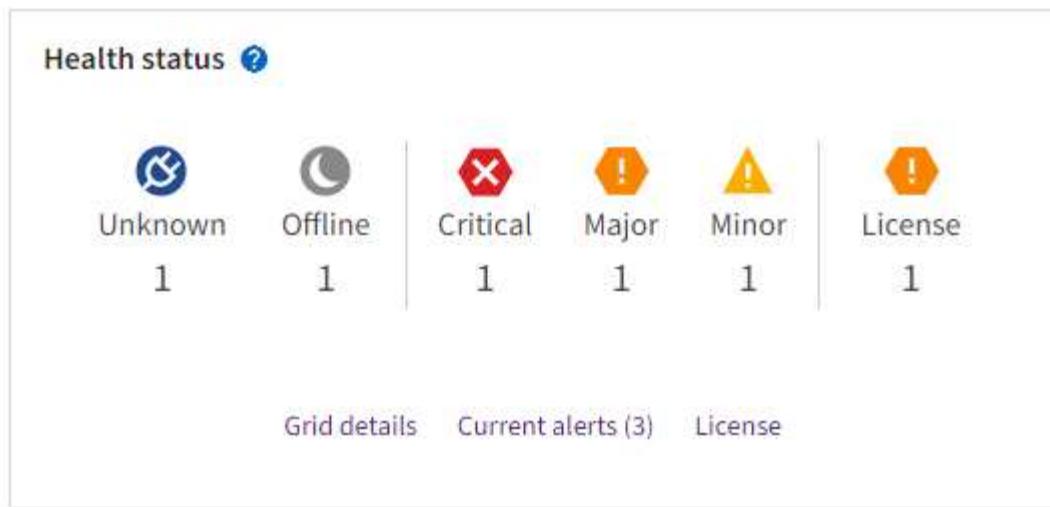
Monitor system health

Monitor the overall health of your StorageGRID system on a daily basis.

About this task

The StorageGRID system can continue to operate when parts of the grid are unavailable. Potential issues indicated by alerts aren't necessarily issues with system operations. Investigate issues summarized on the Health status card of the Grid Manager Dashboard.

To be notified of alerts as soon as they are triggered, you can [set up email notifications for alerts](#) or [configure SNMP traps](#).



When issues exist, links appear that allow you to view additional details:

Link	Appears when...
Grid details	Any nodes are disconnected (connection state Unknown or Administratively Down).
Current alerts (Critical, Major, Minor)	Alerts are currently active .
Recently resolved alerts	Alerts triggered in the past week are now resolved .
License	There is an issue with the software license for this StorageGRID system. You can update license information as needed .

Monitor node connection states

If one or more nodes are disconnected from the grid, critical StorageGRID operations might be affected. Monitor node connection states and address any issues promptly.

Icon	Description	Action required
	<p>Not connected - Unknown</p> <p>For an unknown reason, a node is disconnected or services on the node are unexpectedly down. For example, a service on the node might be stopped, or the node might have lost its network connection because of a power failure or unexpected outage.</p> <p>The Unable to communicate with node alert might also be triggered. Other alerts might also be active.</p>	<p>Requires immediate attention. Select each alert and follow the recommended actions.</p> <p>For example, you might need to restart a service that has stopped or restart the host for the node.</p> <p>Note: A node might appear as Unknown during managed shutdown operations. You can ignore the Unknown state in these cases.</p>

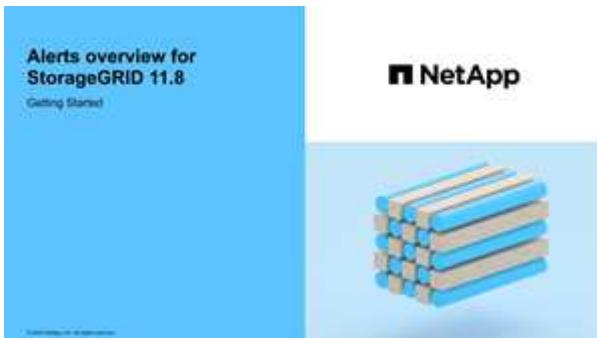
Icon	Description	Action required
	<p>Not connected - Administratively down</p> <p>For an expected reason, node is not connected to grid.</p> <p>For example, the node, or services on the node, has been gracefully shut down, the node is rebooting, or the software is being upgraded. One or more alerts might also be active.</p> <p>Based on the underlying issue, these nodes often go back online with no intervention.</p>	<p>Determine if any alerts are affecting this node.</p> <p>If one or more alerts are active, select each alert and follow the recommended actions.</p>
	<p>Connected</p> <p>The node is connected to the grid.</p>	<p>No action required.</p>

View current and resolved alerts

Current alerts: When an alert is triggered, an alert icon is displayed on the dashboard. An alert icon is also displayed for the node on the Nodes page. If [alert email notifications are configured](#), an email notification will also be sent, unless the alert has been silenced.

Resolved alerts: You can search and view a history of alerts that have been resolved.

Optionally, you have watched the video: [Video: Alerts overview](#)



The following table describes the information shown in the Grid Manager for current and resolved alerts.

Column header	Description
Name or title	The name of the alert and its description.

Column header	Description
Severity	<p>The severity of the alert. For current alerts, if multiple alerts are grouped the title row shows how many instances of that alert are occurring at each severity.</p> <p> Critical: An abnormal condition exists that has stopped the normal operations of a StorageGRID node or service. You must address the underlying issue immediately. Service disruption and loss of data might result if the issue is not resolved.</p> <p> Major: An abnormal condition exists that is either affecting current operations or approaching the threshold for a critical alert. You should investigate major alerts and address any underlying issues to ensure that the abnormal condition does not stop the normal operation of a StorageGRID node or service.</p> <p> Minor: The system is operating normally, but an abnormal condition exists that could affect the system's ability to operate if it continues. You should monitor and resolve minor alerts that don't clear on their own to ensure they don't result in a more serious problem.</p>
Time triggered	<p>Current alerts: The date and time the alert was triggered in your local time and in UTC. If multiple alerts are grouped, the title row shows times for the most recent instance of the alert (<i>newest</i>) and the oldest instance of the alert (<i>oldest</i>).</p> <p>Resolved alerts: How long ago the alert was triggered.</p>
Site/Node	The name of the site and node where the alert is occurring or has occurred.
Status	Whether the alert is active, silenced, or resolved. If multiple alerts are grouped and All alerts is selected in the drop-down, the title row shows how many instances of that alert are active and how many instances have been silenced.
Time resolved (resolved alerts only)	How long ago the alert was resolved.
Current values or <i>data values</i>	<p>The value of the metric that caused the alert to be triggered. For some alerts, additional values are shown to help you understand and investigate the alert. For example, the values shown for a Low object data storage alert include the percentage of disk space used, the total amount of disk space, and the amount of disk space used.</p> <p>Note: If multiple current alerts are grouped, current values aren't shown in the title row.</p>
Triggered values (resolved alerts only)	The value of the metric that caused the alert to be triggered. For some alerts, additional values are shown to help you understand and investigate the alert. For example, the values shown for a Low object data storage alert include the percentage of disk space used, the total amount of disk space, and the amount of disk space used.

Steps

1. Select the **Current alerts** or **Resolved alerts** link to view a list of alerts in those categories. You can also view the details for an alert by selecting **Nodes** > **node** > **Overview** and then selecting the alert from the **Alerts** table.

By default, current alerts are shown as follows:

- The most recently triggered alerts are shown first.
- Multiple alerts of the same type are shown as a group.
- Alerts that have been silenced aren't shown.
- For a specific alert on a specific node, if the thresholds are reached for more than one severity, only the most severe alert is shown. That is, if alert thresholds are reached for the minor, major, and critical severities, only the critical alert is shown.

The Current alerts page is refreshed every two minutes.

2. To expand groups of alerts, select the down caret . To collapse individual alerts in a group, select the up caret , or select the group's name.
3. To display individual alerts instead of groups of alerts, clear the **Group alerts** checkbox.
4. To sort current alerts or alert groups, select the up/down arrows  in each column header.
 - When **Group alerts** is selected, both the alert groups and the individual alerts within each group are sorted. For example, you might want to sort the alerts in a group by **Time triggered** to find the most recent instance of a specific alert.
 - When **Group alerts** is cleared, the entire list of alerts is sorted. For example, you might want to sort all alerts by **Node/Site** to see all alerts affecting a specific node.
5. To filter current alerts by status (**All alerts**, **Active**, or **Silenced**), use the drop-down menu at the top of the table.

See [Silence alert notifications](#).

6. To sort resolved alerts:
 - Select a time period from the **When triggered** drop-down menu.
 - Select one or more severities from the **Severity** drop-down menu.
 - Select one or more default or custom alert rules from the **Alert rule** drop-down menu to filter on resolved alerts related to a specific alert rule.
 - Select one or more nodes from the **Node** drop-down menu to filter on resolved alerts related to a specific node.
7. To view details for a specific alert, select the alert. A dialog box provides details and recommended actions for the alert you selected.
8. (Optional) For a specific alert, select **Silence this alert** to silence the alert rule that caused this alert to be triggered.

You must have the [Manage alerts](#) or [Root access](#) permission to silence an alert rule.



Be careful when deciding to silence an alert rule. If an alert rule is silenced, you might not detect an underlying problem until it prevents a critical operation from completing.

9. To view the current conditions for the alert rule:

- From the alert details, select **View conditions**.

A pop-up appears, listing the Prometheus expression for each defined severity.

- To close the pop-up, click anywhere outside of the pop-up.

10. Optionally, select **Edit rule** to edit the alert rule that caused this alert to be triggered.

You must have the [Manage alerts or Root access permission](#) to edit an alert rule.



Be careful when deciding to edit an alert rule. If you change trigger values, you might not detect an underlying problem until it prevents a critical operation from completing.

11. To close the alert details, select **Close**.

Monitor storage capacity

Monitor the total usable space available to ensure that the StorageGRID system does not run out of storage space for objects or for object metadata.

StorageGRID stores object data and object metadata separately, and reserves a specific amount of space for a distributed Cassandra database that contains object metadata. Monitor the total amount of space consumed for objects and for object metadata, as well as trends in the amount of space consumed for each. This will enable you to plan ahead for the addition of nodes and avoid any service outages.

You can [view storage capacity information](#) for the entire grid, for each site, and for each Storage Node in your StorageGRID system.

Monitor storage capacity for the entire grid

Monitor the overall storage capacity for your grid to ensure that adequate free space remains for object data and object metadata. Understanding how storage capacity changes over time can help you plan to add Storage Nodes or storage volumes before the grid's usable storage capacity is consumed.

The Grid Manager dashboard lets you quickly assess how much storage is available for the entire grid and for each data center. The Nodes page provides more detailed values for object data and object metadata.

Steps

1. Assess how much storage is available for the entire grid and for each data center.

- Select **Dashboard > Overview**.
- Note the values on the Data space usage breakdown and the Metadata allowed space usage breakdown cards. Each card lists a percentage of storage usage, the capacity of used space, and the total space available or allowed by site.



The summary does not include archival media.

Data space usage breakdown ?

1.97 MB (0%) of 3.09 TB used overall

Site name	Data storage usage	Used space	Total space
Data Center 3	0%	621.26 KB	926.62 GB
Data Center 1	0%	798.16 KB	1.24 TB
Data Center 2	0%	552.10 KB	926.62 GB

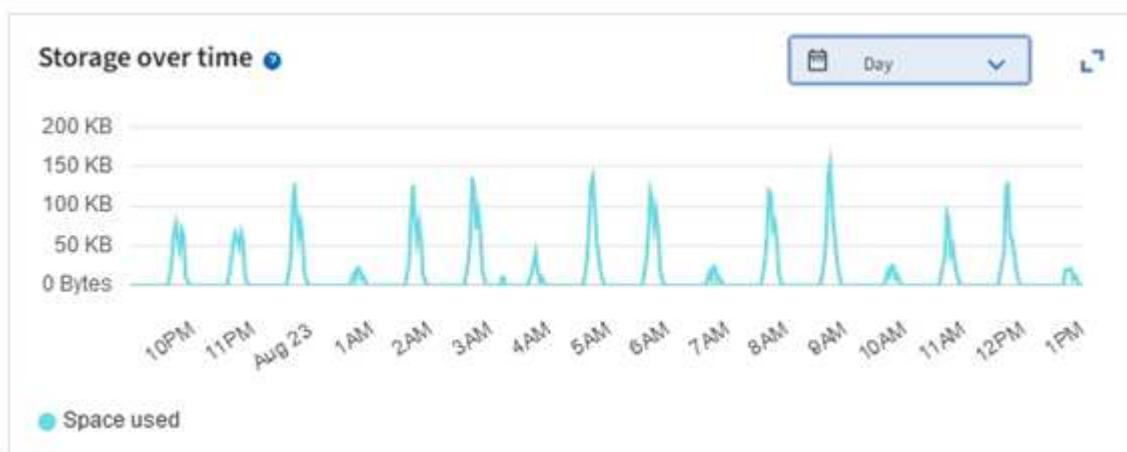
Metadata allowed space usage breakdown ?

2.44 MB (0%) of 19.32 GB used in Data Center 3

Data Center 3 has the highest metadata space usage and it determines the metadata space available in the grid.

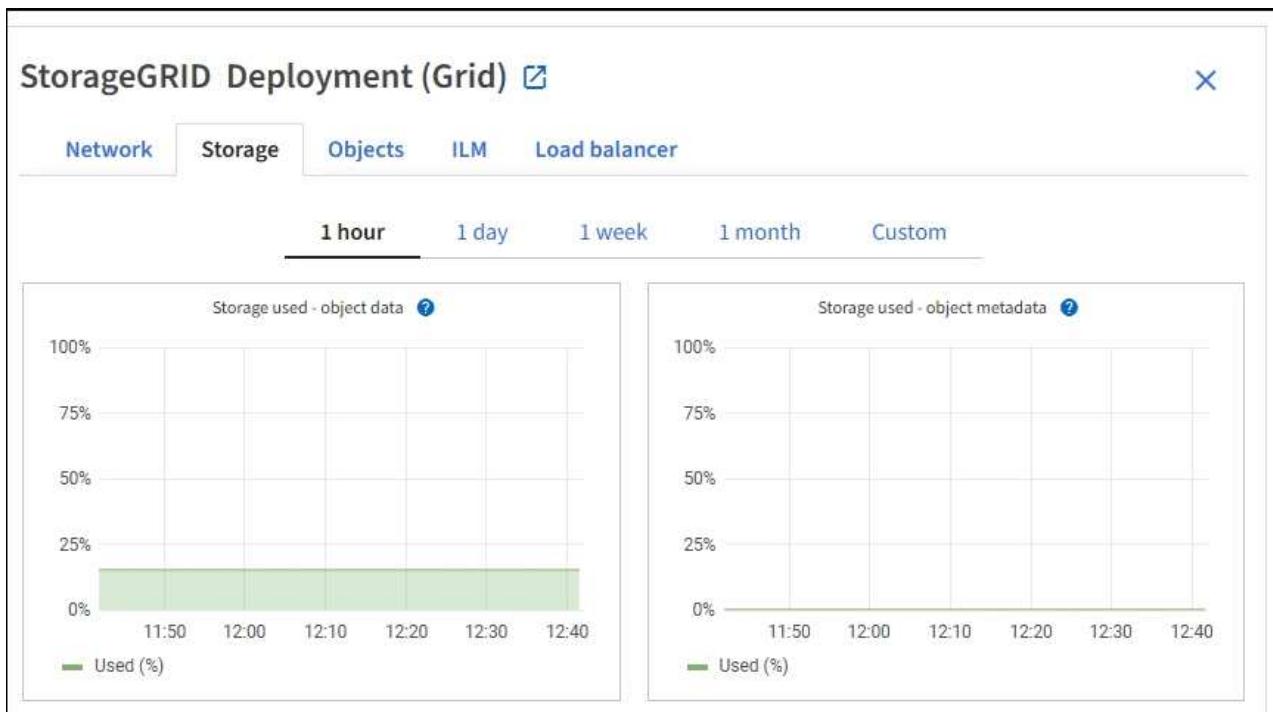
Site name	Metadata space usage	Metadata used space	Metadata allowed space
Data Center 3	0%	2.44 MB	19.32 GB

c. Note the chart on the Storage over time card. Use the time period drop-down to help you determine how quickly storage is consumed.



2. Use the Nodes page for additional details on how much storage has been used and how much storage remains available on the grid for object data and object metadata.

- Select **NODES**.
- Select **grid > Storage**.



c. Position your cursor over the **Storage used - object data** and the **Storage used - object metadata** charts to see how much object storage and object metadata storage is available for the entire grid, and how much has been used over time.



The total values for a site or the grid don't include nodes that have not reported metrics for at least five minutes, such as offline nodes.

3. Plan to perform an expansion to add Storage Nodes or storage volumes before the grid's usable storage capacity is consumed.

When planning the timing of an expansion, consider how long it will take to procure and install additional storage.



If your ILM policy uses erasure coding, you might prefer to expand when existing Storage Nodes are approximately 70% full to reduce the number of nodes that must be added.

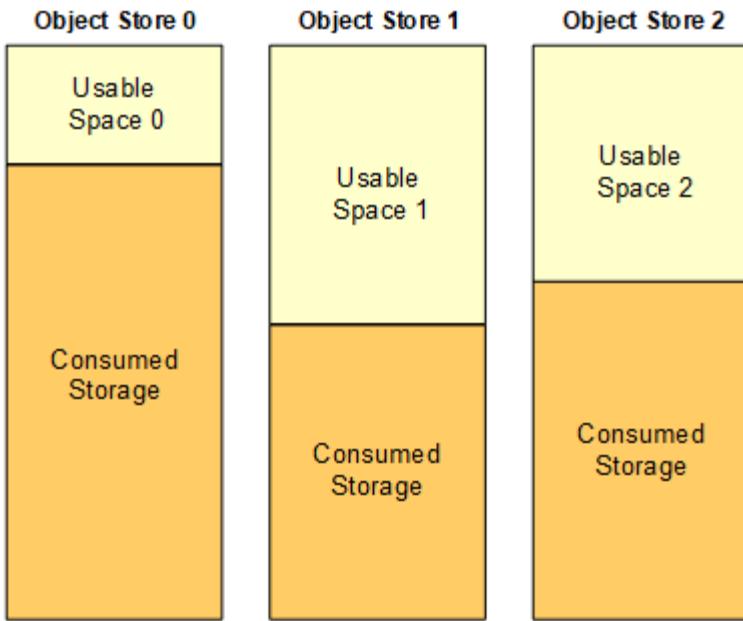
For more information about planning a storage expansion, see the [instructions for expanding StorageGRID](#).

Monitor storage capacity for each Storage Node

Monitor the total usable space for each Storage Node to ensure that the node has enough space for new object data.

About this task

Usable space is the amount of storage space available to store objects. The total usable space for a Storage Node is calculated by adding together the available space on all object stores within the node.



Total Usable Space = Usable Space 0 + Usable Space 1 + Usable Space 2

Steps

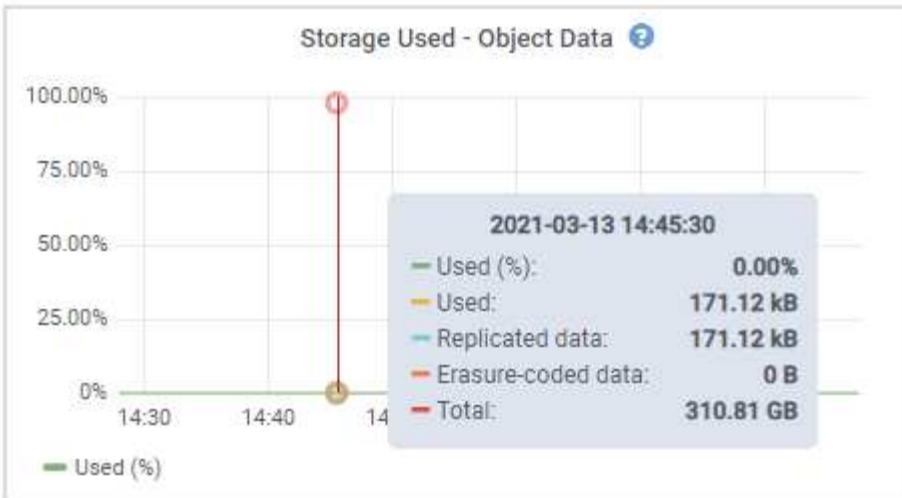
1. Select **NODES > Storage Node > Storage**.

The graphs and tables for the node appear.

2. Position your cursor over the Storage used - object data graph.

The following values are shown:

- **Used (%)**: The percentage of the Total usable space that has been used for object data.
- **Used**: The amount of the Total usable space that has been used for object data.
- **Replicated data**: An estimate of the amount of replicated object data on this node, site, or grid.
- **Erasure-coded data**: An estimate of the amount of erasure-coded object data on this node, site, or grid.
- **Total**: The total amount of usable space on this node, site, or grid. The Used value is the `storagegrid_storage_utilization_data_bytes` metric.



3. Review the Available values in the Volumes and Object stores tables, below the graphs.



To view graphs of these values, click the chart icons  in the Available columns.

Disk devices					
Name	World Wide Name	I/O load	Read rate	Write rate	
croot(8:1,sda1)	N/A	0.04%	0 bytes/s	3 KB/s	
cvloc(8:2,sda2)	N/A	0.67%	0 bytes/s	50 KB/s	
sdc(8:16,sdb)	N/A	0.03%	0 bytes/s	4 KB/s	
sdd(8:32,sdc)	N/A	0.00%	0 bytes/s	82 bytes/s	
sde(8:48,sdd)	N/A	0.00%	0 bytes/s	82 bytes/s	

Volumes					
Mount point	Device	Status	Size	Available	Write cache status
/	croot	Online	21.00 GB	14.75 GB	Unknown
/var/local	cvloc	Online	85.86 GB	84.05 GB	Unknown
/var/local/rangedb/0	sdc	Online	107.32 GB	107.17 GB	Enabled
/var/local/rangedb/1	sdd	Online	107.32 GB	107.18 GB	Enabled
/var/local/rangedb/2	sde	Online	107.32 GB	107.18 GB	Enabled

Object stores						
ID	Size	Available	Replicated data	EC data	Object data (%)	Health
0000	107.32 GB	96.44 GB	124.60 KB	0 bytes	0.00%	No Errors
0001	107.32 GB	107.18 GB	0 bytes	0 bytes	0.00%	No Errors
0002	107.32 GB	107.18 GB	0 bytes	0 bytes	0.00%	No Errors

4. Monitor the values over time to estimate the rate at which usable storage space is being consumed.
5. To maintain normal system operations, add Storage Nodes, add storage volumes, or archive object data before usable space is consumed.

When planning the timing of an expansion, consider how long it will take to procure and install additional storage.



If your ILM policy uses erasure coding, you might prefer to expand when existing Storage Nodes are approximately 70% full to reduce the number of nodes that must be added.

For more information about planning a storage expansion, see the [instructions for expanding StorageGRID](#).

The [Low object data storage](#) alert is triggered when insufficient space remains for storing object data on a Storage Node.

Monitor object metadata capacity for each Storage Node

Monitor the metadata usage for each Storage Node to ensure that adequate space remains available for essential database operations. You must add new Storage Nodes at each site before object metadata exceeds 100% of the allowed metadata space.

About this task

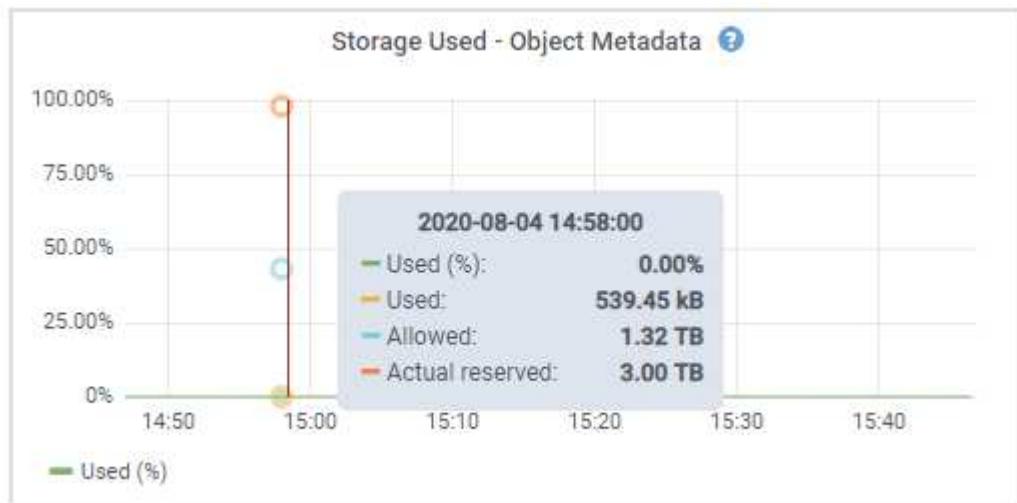
StorageGRID maintains three copies of object metadata at each site to provide redundancy and to protect object metadata from loss. The three copies are evenly distributed across all Storage Nodes at each site using the space reserved for metadata on storage volume 0 of each Storage Node.

In some cases, the grid's object metadata capacity might be consumed faster than its object storage capacity. For example, if you typically ingest large numbers of small objects, you might need to add Storage Nodes to increase metadata capacity even though sufficient object storage capacity remains.

Some of the factors that can increase metadata usage include the size and quantity of user metadata and tags, the total number of parts in a multipart upload, and the frequency of changes to ILM storage locations.

Steps

1. Select **NODES > Storage Node > Storage**.
2. Position your cursor over the Storage used - object metadata graph to see the values for a specific time.



Used (%)

The percentage of the allowed metadata space that has been used on this Storage Node.

Prometheus metrics: `storagegrid_storage_utilization_metadata_bytes` and `storagegrid_storage_utilization_metadata_allowed_bytes`

Used

The bytes of the allowed metadata space that have been used on this Storage Node.

Prometheus metric: `storagegrid_storage_utilization_metadata_bytes`

Allowed

The space allowed for object metadata on this Storage Node. To learn how this value is determined for each Storage Node, see the [full description of Allowed metadata space](#).

Prometheus metric: `storagegrid_storage_utilization_metadata_allowed_bytes`

Actual reserved

The actual space reserved for metadata on this Storage Node. Includes the allowed space and the required space for essential metadata operations. To learn how this value is calculated for each Storage Node, see the [full description of Actual reserved space for metadata](#).

Prometheus metric will be added in a future release.



The total values for a site or the grid don't include nodes that have not reported metrics for at least five minutes, such as offline nodes.

3. If the **Used (%)** value is 70% or higher, expand your StorageGRID system by adding Storage Nodes to each site.



The **Low metadata storage** alert is triggered when the **Used (%)** value reaches certain thresholds. Undesirable results can occur if object metadata uses more than 100% of the allowed space.

When you add the new nodes, the system automatically rebalances object metadata across all Storage Nodes within the site. See the [instructions for expanding a StorageGRID system](#).

Monitor space usage forecasts

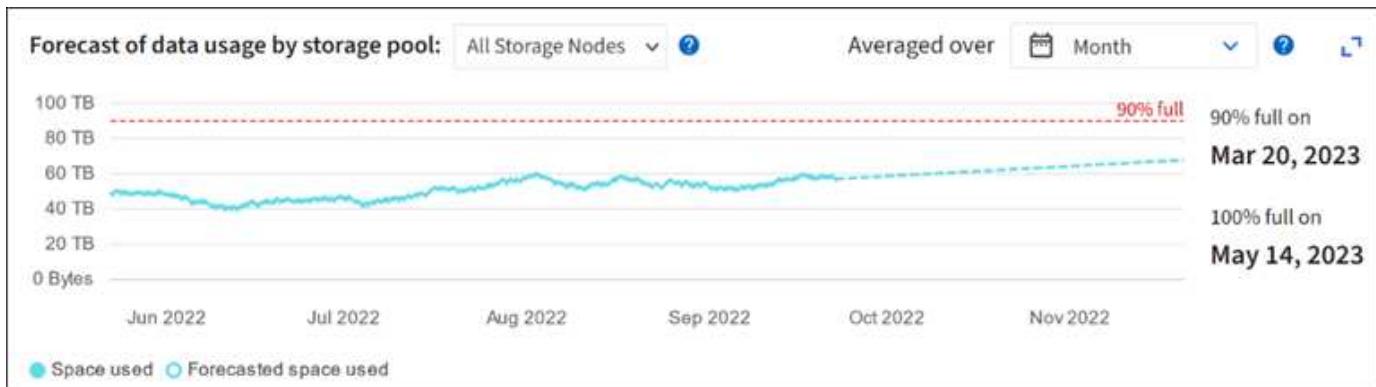
Monitor space usage forecasts for user data and metadata to estimate when you will need to [expand a grid](#).

If you notice that the rate of consumption changes over time, select a shorter range from the **Averaged over** pull-down to reflect only the most recent ingest patterns. If you notice seasonal patterns, select a longer range.

If you have a new StorageGRID installation, allow data and metadata to accumulate before evaluating the space usage forecasts.

Steps

1. On the dashboard, select **Storage**.
2. View the dashboard cards, Forecast of data usage by storage pool and Forecast of metadata usage by site.
3. Use these values to estimate when you will need to add new Storage Nodes for data and metadata storage.



Monitor information lifecycle management

The information lifecycle management (ILM) system provides data management for all objects stored on the grid. You must monitor ILM operations to understand if the grid can handle the current load, or if more resources are needed.

About this task

The StorageGRID system manages objects by applying the active ILM policies. The ILM policies and associated ILM rules determine how many copies are made, the type of copies that are created, where copies are placed, and the length of time each copy is retained.

Object ingest and other object-related activities can exceed the rate at which StorageGRID can evaluate ILM, causing the system to queue objects whose ILM placement instructions can't be fulfilled in near real time. You should monitor whether StorageGRID is keeping up with client actions.

Use Grid Manager dashboard tab

Steps

Use the ILM tab on the Grid Manager dashboard to monitor ILM operations:

1. Sign in to the Grid Manager.
2. From the dashboard, select the ILM tab and note the values on the ILM queue (Objects) card and ILM evaluation rate card.

Temporary spikes in the ILM queue (Objects) card on the dashboard are to be expected. But if the queue continues to increase and never declines, the grid needs more resources to operate efficiently: either more Storage Nodes, or, if the ILM policy places objects in remote locations, more network bandwidth.

Use the NODES page

Steps

Additionally, investigate ILM queues using the **NODES** page:



The charts on the **NODES** page will be replaced with the corresponding dashboard cards in a future StorageGRID release.

1. Select **NODES**.
2. Select **grid name > ILM**.

3. Position your cursor over the ILM queue graph to see the value of following attributes at a given point in time:
 - **Objects queued (from client operations):** The total number of objects awaiting ILM evaluation because of client operations (for example, ingest).
 - **Objects queued (from all operations):** The total number of objects awaiting ILM evaluation.
 - **Scan rate (objects/sec):** The rate at which objects in the grid are scanned and queued for ILM.
 - **Evaluation rate (objects/sec):** The current rate at which objects are being evaluated against the ILM policy in the grid.

4. In the ILM Queue section, look at the following attributes.

-  The ILM queue section is included for the grid only. This information is not shown on the ILM tab for a site or Storage Node.
- **Scan period - estimated:** The estimated time to complete a full ILM scan of all objects.
-  A full scan does not guarantee that ILM has been applied to all objects.
- **Repairs attempted:** The total number of object repair operations for replicated data that have been attempted. This count increments each time a Storage Node tries to repair a high-risk object. High-risk ILM repairs are prioritized if the grid becomes busy.
-  The same object repair might increment again if replication failed after the repair.

These attributes can be useful when you are monitoring the progress of Storage Node volume recovery. If the number of Repairs attempted has stopped increasing and a full scan has been completed, the repair has probably completed.

Monitor networking and system resources

The integrity and bandwidth of the network between nodes and sites, and the resource usage by individual grid nodes, are critical to efficient operations.

Monitor network connections and performance

Network connectivity and bandwidth are especially important if your information lifecycle management (ILM) policy copies replicated objects between sites or stores erasure-coded objects using a scheme that provides site-loss protection. If the network between sites is not available, network latency is too high, or network bandwidth is insufficient, some ILM rules might not be able to place objects where expected. This can lead to ingest failures (when the Strict ingest option is selected for ILM rules), or to poor ingest performance and ILM backlogs.

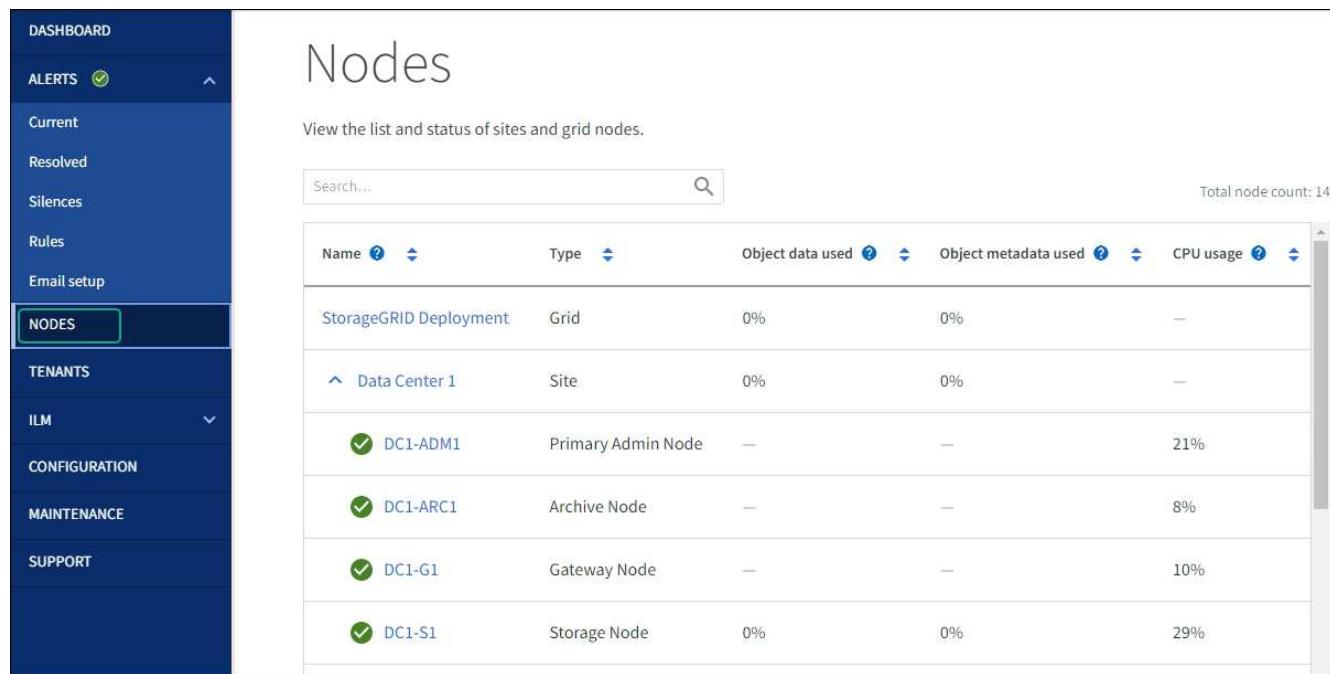
Use the Grid Manager to monitor connectivity and network performance, so you can address any issues promptly.

Additionally, consider [creating network traffic classification policies](#) so that you can monitor traffic related to specific tenants, buckets, subnets, or load balancer endpoints. You can set traffic limiting policies as needed.

Steps

1. Select **NODES**.

The Nodes page appears. Each node in the grid is listed in table format.



Name	Type	Object data used	Object metadata used	CPU usage
StorageGRID Deployment	Grid	0%	0%	—
▲ Data Center 1	Site	0%	0%	—
✓ DC1-ADM1	Primary Admin Node	—	—	21%
✓ DC1-ARC1	Archive Node	—	—	8%
✓ DC1-G1	Gateway Node	—	—	10%
✓ DC1-S1	Storage Node	0%	0%	29%

2. Select the grid name, a specific data center site, or a grid node, and then select the **Network** tab.

The Network Traffic graph provides a summary of overall network traffic for the grid as a whole, the data center site, or for the node.



a. If you selected a grid node, scroll down to review the **Network Interfaces** section of the page.



Name	Hardware address	Speed	Duplex	Auto-negotiation	Link status
eth0	00:50:56:A7:66:75	10 Gigabit	Full	Off	Up

b. For grid nodes, scroll down to review the **Network Communication** section of the page.

The Receive and Transmit tables show how many bytes and packets have been received and sent across each network as well as other receive and transmission metrics.

Network communication							
Receive							
Interface	Data	Packets	Errors	Dropped	Frame overruns	Frames	
eth0	2.89 GB	19,421,503	0	24,032	0	0	
Transmit							
Interface	Data	Packets	Errors	Dropped	Collisions	Carrier	
eth0	3.64 GB	18,494,381	0	0	0	0	

3. Use the metrics associated with your traffic classification policies to monitor network traffic.

a. Select **CONFIGURATION > Network > Traffic classification**.

The Traffic Classification Policies page appears, and the existing policies are listed in the table.

Traffic Classification Policies

Traffic classification policies can be used to identify network traffic for metrics reporting and optional traffic limiting.

<input type="button" value="Create"/>	<input type="button" value="Edit"/>	<input type="button" value="Remove"/>	<input type="button" value="Metrics"/>
Name	Description	ID	
<input checked="" type="radio"/> ERP Traffic Control	Manage ERP traffic into the grid	cd9afbc7-b85e-4208-b6f8-7e8a79e2c574	
<input checked="" type="radio"/> Fabric Pools	Monitor Fabric Pools	223b0cbb-6968-4646-b32d-7665bddd894b	

Displaying 2 traffic classification policies.

b. To view graphs that show the networking metrics associated with a policy, select the radio button to the left of the policy, and then click **Metrics**.

c. Review the graphs to understand the network traffic associated with the policy.

If a traffic classification policy is designed to limit network traffic, analyze how often traffic is limited and decide if the policy continues to meet your needs. From time to time, [adjust each traffic classification policy as needed](#).

Related information

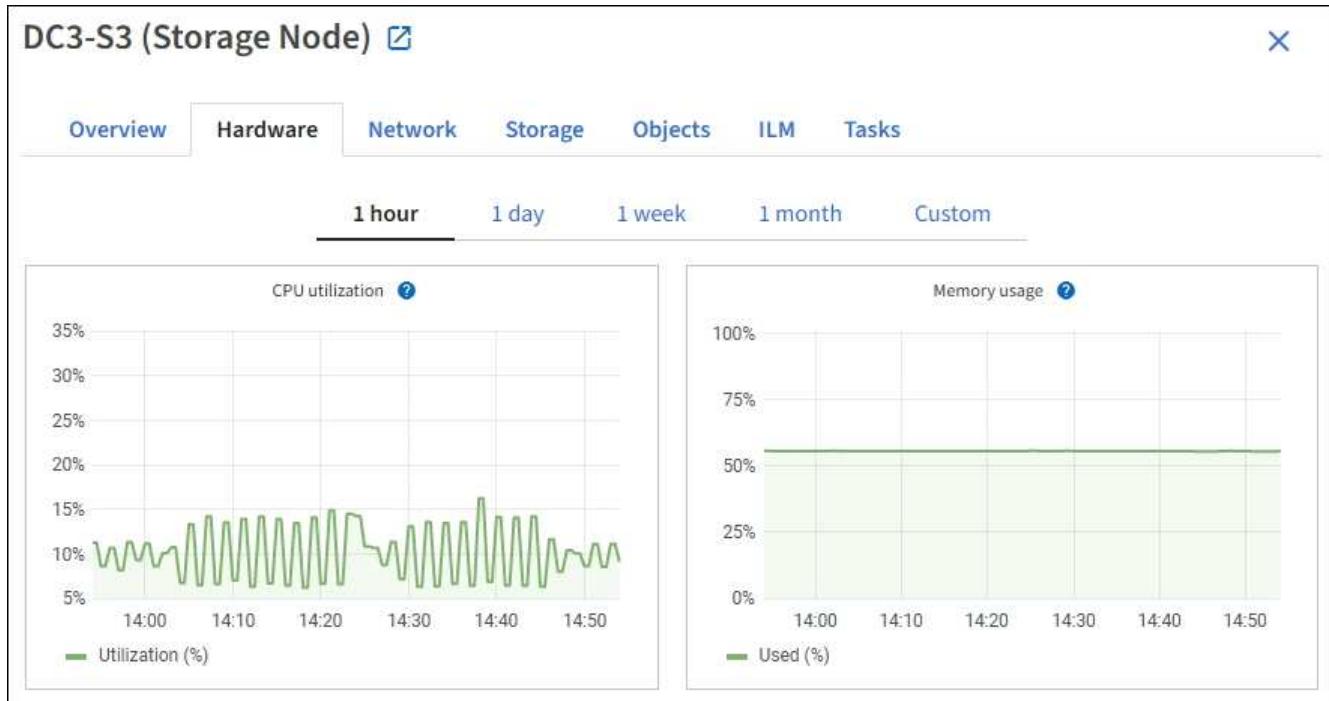
- [View the Network tab](#)
- [Monitor node connection states](#)

Monitor node-level resources

Monitor individual grid nodes to check their resource usage levels. If nodes are consistently overloaded, more nodes might be required for efficient operations.

Steps

1. From the **NODES** page, select the node.
2. Select the **Hardware** tab to display graphs of CPU Utilization and Memory Usage.



3. To display a different time interval, select one of the controls above the chart or graph. You can display the information available for intervals of 1 hour, 1 day, 1 week, or 1 month. You can also set a custom interval, which allows you to specify date and time ranges.
4. If the node is hosted on a storage appliance or a services appliance, scroll down to view the tables of components. The status of all components should be "Nominal." Investigate components that have any other status.

Related information

- [View information about appliance Storage Nodes](#)
- [View information about appliance Admin Nodes and Gateway Nodes](#)

Monitor tenant activity

All S3 client activity is associated with StorageGRID tenant accounts. You can use the Grid Manager to monitor the storage usage or network traffic for all tenants or a specific tenant. You can use the audit log or Grafana dashboards to gather more detailed information about how tenants are using StorageGRID.

Before you begin

- You are signed in to the Grid Manager using a [supported web browser](#).

- You have the [Root access or Tenant accounts permission](#).

View all tenants

The Tenants page shows basic information for all current tenant accounts.

Steps

1. Select **TENANTS**.
2. Review the information shown on the Tenant pages.

The Logical space used, Quota usage, Quota, and Object count are listed for each tenant. If a quota is not set for a tenant, the Quota usage and Quota fields contain a dash (—).



The space used values are estimates. These estimates are affected by the timing of ingests, network connectivity, and node status.

Tenants

View information for each tenant account. Depending on the timing of ingests, network connectivity, and node status, the usage data shown might be out of date. To view more recent values, select the tenant name.

	Create	Export to CSV	Actions	<input type="text"/> Search tenants by name or ID		Displaying 5 results	
	<input type="checkbox"/>	Name	Logical space used	Quota utilization	Quota	Object count	Sign in/Copy URL
1	<input type="checkbox"/>	Tenant 01	2.00 GB	<div style="width: 10%;">10%</div>	20.00 GB	100	
2	<input type="checkbox"/>	Tenant 02	85.00 GB	<div style="width: 85%;">85%</div>	100.00 GB	500	
3	<input type="checkbox"/>	Tenant 03	500.00 TB	<div style="width: 50%;">50%</div>	1.00 PB	10,000	
4	<input type="checkbox"/>	Tenant 04	475.00 TB	<div style="width: 95%;">95%</div>	500.00 TB	50,000	
5	<input type="checkbox"/>	Tenant 05	5.00 GB	—	—	500	

3. Optionally, sign in to a tenant account by selecting the sign-in link in the **Sign in/Copy URL** column.
4. Optionally, copy the URL for a tenant's sign-in page by selecting the copy URL link in the **Sign in/Copy URL** column.
5. Optionally, select **Export to CSV** to view and export a `.csv` file containing the usage values for all tenants.

You are prompted to open or save the `.csv` file.

The contents of the `.csv` file look like the following example:

Tenant ID	Display Name	Space Used (Bytes)	Quota utilization (%)	Quota (Bytes)	Object Count	Protocol
12659822378459233654	Tenant 01	2000000000	10	20000000000	100	S3
99658234112547853685	Tenant 02	85000000000	85	110000000	500	S3
03521145586975586321	Tenant 03	60500000000	50	150000	10000	S3
44251365987569885632	Tenant 04	47500000000	95	140000000	50000	S3
36521587546689565123	Tenant 05	50000000000	Infinity		500	S3

You can open the .csv file in a spreadsheet application or use it in automation.

6. If no objects are listed, optionally, select **Actions > Delete** to remove one or more tenants. See [Delete tenant account](#).

You can't remove a tenant account if the account includes any buckets or containers.

View a specific tenant

You can view details for a specific tenant.

Steps

1. Select the tenant name from the Tenants page.

The tenant details page appears.

The screenshot shows the tenant details page for 'Tenant 02'. At the top, there is a summary table with the following data:

Tenant ID:	4103 1879 2208 5551 2180	Quota utilization:	85%
Protocol:	S3	Logical space used:	85.00 GB
Object count:	500	Quota:	100.00 GB

Below the summary are three buttons: 'Sign in', 'Edit', and 'Actions ▾'. Underneath these buttons are two tabs: 'Space breakdown' (selected) and 'Allowed features'.

The 'Space breakdown' tab displays a chart titled 'Bucket space consumption'. The chart shows that 85.00 GB of 100.00 GB is used, with 15.00 GB remaining (15%). The chart is a horizontal bar divided into three segments: bucket-01 (light blue), bucket-02 (medium blue), and bucket-03 (dark blue). The x-axis is marked at 0, 25%, 50%, 75%, and 100%. Below the chart, there is a legend: bucket-01 (light blue), bucket-02 (medium blue), and bucket-03 (dark blue).

The 'Bucket details' section shows a table with the following data:

Name	Region	Space used	Object count
bucket-01		40.00 GB	250
bucket-02		30.00 GB	200
bucket-03		15.00 GB	50

At the top of the 'Bucket details' section, there are buttons for 'Export to CSV' and 'Search buckets by name' with a magnifying glass icon. To the right, it says 'Displaying 3 results'.

2. Review the tenant overview at the top of the page.

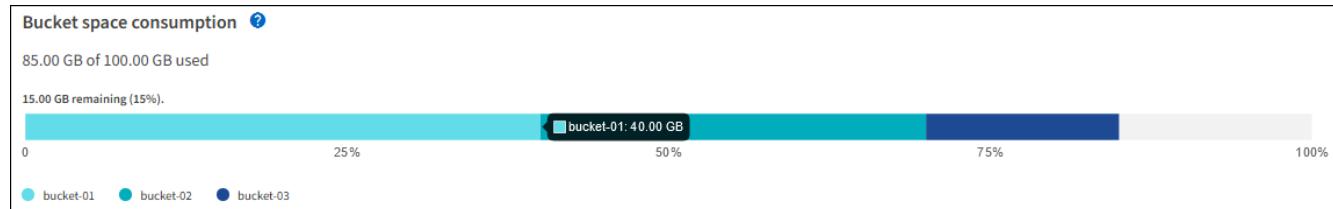
This section of the details page provides summary information for the tenant, including the tenant's object count, quota usage, logical space used, and quota setting.

3. From the **Space breakdown** tab, review the **Space consumption** chart.

This chart shows the total space consumption for all of the tenant's S3 buckets.

If a quota was set for this tenant, the amount of quota used and remaining is displayed in text (for example, 85.00 GB of 100 GB used). If no quota was set, the tenant has an unlimited quota, and the text includes only an amount of space used (for example, 85.00 GB used). The bar chart shows the percentage of quota in each bucket or container. If the tenant has exceeded the storage quota by more than 1% and by at least 1 GB, the chart shows the total quota and the excess amount.

You can place your cursor over the bar chart to see the storage used by each bucket or container. You can place your cursor over the free space segment to see the amount of storage quota remaining.



Quota usage is based on internal estimates and might be exceeded in some cases. For example, StorageGRID checks the quota when a tenant starts uploading objects and rejects new ingests if the tenant has exceeded the quota. However, StorageGRID does not take into account the size of the current upload when determining if the quota has been exceeded. If objects are deleted, a tenant might be temporarily prevented from uploading new objects until the quota usage is recalculated. Quota usage calculations can take 10 minutes or longer.



A tenant's quota usage indicates the total amount of object data the tenant has uploaded to StorageGRID (logical size). The quota usage does not represent the space used to store copies of those objects and their metadata (physical size).



You can enable the **Tenant quota usage high** alert rule to determine if tenants are consuming their quotas. If enabled, this alert is triggered when a tenant has used 90% of its quota. For instructions, see [Edit alert rules](#).



4. From the **Space breakdown** tab, review the **Bucket details**.

This table lists the S3 buckets for the tenant. Space used is the total amount of object data in the bucket or container. This value does not represent the storage space required for ILM copies and object metadata.

5. Optionally, select **Export to CSV** to view and export a .csv file containing the usage values for each bucket or container.

The contents of an individual S3 tenant's .csv file look like the following example:

Tenant ID	Bucket Name	Space Used (Bytes)	Number of Objects
64796966429038923647	bucket-01	88717711	14
64796966429038923647	bucket-02	21747507	11
64796966429038923647	bucket-03	15294070	3

You can open the .csv file in a spreadsheet application or use it in automation.

6. Optionally, select the **Allowed features** tab to see a list of the permissions and features that are enabled

for the tenant. See [Edit tenant account](#) if you need to change any of these settings.

7. If the tenant has the **Use grid federation connection** permission, optionally select the **Grid federation** tab to learn more about the connection.

See [What is grid federation?](#) and [Manage the permitted tenants for grid federation](#).

View network traffic

If traffic classification policies are in place for a tenant, review the network traffic for that tenant.

Steps

1. Select **CONFIGURATION > Network > Traffic classification**.

The Traffic Classification Policies page appears, and the existing policies are listed in the table.

2. Review the list of policies to identify the ones that apply to a specific tenant.
3. To view metrics associated with a policy, select the radio button to the left of the policy, and select **Metrics**.
4. Analyze the graphs to determine how often the policy is limiting traffic and whether you need to adjust the policy.

See [Manage traffic classification policies](#) for more information.

Use the audit log

Optionally, you can use the audit log for more granular monitoring of a tenant's activities.

For instance, you can monitor the following types of information:

- Specific client operations, such as PUT, GET, or DELETE
- Object sizes
- The ILM rule applied to objects
- The source IP of client requests

Audit logs are written to text files that you can analyze using your choice of log analysis tool. This allows you to better understand client activities, or to implement sophisticated chargeback and billing models.

See [Review audit logs](#) for more information.

Use Prometheus metrics

Optionally, use Prometheus metrics to report on tenant activity.

- In the Grid Manager, select **SUPPORT > Tools > Metrics**. You can use existing dashboards, such as S3 Overview, to review client activities.



The tools available on the Metrics page are primarily intended for use by technical support. Some features and menu items within these tools are intentionally non-functional.

- From the top of the Grid Manager, select the help icon and select **API documentation**. You can use the metrics in the Metrics section of the Grid Management API to create custom alert rules and dashboards for tenant activity.

See [Review support metrics](#) for more information.

Monitor S3 client operations

You can monitor object ingest and retrieval rates as well as metrics for object counts, queries, and verification. You can view the number of successful and failed attempts by client applications to read, write, and modify objects in the StorageGRID system.

Before you begin

- You are signed in to the Grid Manager using a [supported web browser](#).

Steps

1. From the dashboard, select the **Performance** tab.
2. Refer to the S3 charts, which summarize the number of client operations performed by Storage Nodes and the number of API requests received by Storage Nodes during the selected time frame.
3. Select **NODES** to access the Nodes page.
4. From the Nodes home page (grid level), select the **Objects** tab.

The chart shows S3 ingest and retrieve rates for your entire StorageGRID system in bytes per second and the amount of data ingested or retrieved. You can select a time interval or apply a custom interval.

5. To see information for a particular Storage Node, select the node from the list on the left, and select the **Objects** tab.

The chart shows the ingest and retrieve rates for the node. The tab also includes metrics for object counts, metadata queries, and verification operations.



Monitor load balancing operations

If you are using a load balancer to manage client connections to StorageGRID, you should monitor load balancing operations after you configure the system initially and after you make any configuration changes or perform an expansion.

About this task

You can use the Load Balancer service on Admin Nodes or Gateway Nodes or an external third-party load balancer to distribute client requests across multiple Storage Nodes.

After configuring load balancing, you should confirm that object ingest and retrieval operations are being evenly distributed across Storage Nodes. Evenly distributed requests ensure that StorageGRID remains responsive to client requests under load and can help maintain client performance.

If you configured a high availability (HA) group of Gateway Nodes or Admin Nodes in active-backup mode, only one node in the group actively distributes client requests.

For more information, see [Configure S3 client connections](#).

Steps

1. If S3 clients connect using the Load Balancer service, check that Admin Nodes or Gateway Nodes are actively distributing traffic as you expect:
 - a. Select **NODES**.
 - b. Select a Gateway Node or Admin Node.
 - c. On the **Overview** tab, check if a node interface is in an HA group and if the node interface has the role of Primary.

Nodes with the role of Primary and nodes that aren't in an HA group should be actively distributing requests to clients.
 - d. For each node that should be actively distributing client requests, select the [Load Balancer tab](#).
 - e. Review the chart of Load Balancer Request Traffic for the last week to ensure that the node has been actively distributing requests.

Nodes in an active-backup HA group might take the Backup role from time to time. During that time the nodes don't distribute client requests.
 - f. Review the chart of Load Balancer Incoming Request Rate for the last week to review the object throughput of the node.
 - g. Repeat these steps for each Admin Node or Gateway Node in the StorageGRID system.
 - h. Optionally, use traffic classification policies to view a more detailed analysis of traffic being served by the Load Balancer service.
2. Verify that these requests are being evenly distributed to Storage Nodes.
 - a. Select **Storage Node > LDR > HTTP**.
 - b. Review the number of **Currently Established incoming Sessions**.
 - c. Repeat for each Storage Node in the grid.

The number of sessions should be roughly equal across all Storage Nodes.

Monitor grid federation connections

You can monitor basic information about all [grid federation connections](#), detailed information about a specific connection, or Prometheus metrics about cross-grid replication operations. You can monitor a connection from either grid.

Before you begin

- You are signed in to the Grid Manager on either grid using a [supported web browser](#).

- You have the [Root access permission](#) for the grid you are signed in to.

View all connections

The Grid federation page shows basic information about all grid federation connections and about all tenant accounts that are permitted to use grid federation connections.

Steps

1. Select **CONFIGURATION > System > Grid federation**.

The Grid federation page appears.

2. To see basic information for all connections on this grid, select the **Connections** tab.

From this tab, you can:

- [Create a new connection](#).
- Select an existing connection to [edit or test](#).

Grid federation [Learn more about grid federation](#)

You can use grid federation to clone tenant accounts and replicate their objects between two StorageGRID systems. Grid federation uses a trusted and secure connection between Admin and Gateway Nodes in two discrete StorageGRID systems.

Connections **Permitted tenants**

Add connection **Upload verification file** **Actions** **Search...** Displaying 1 connection

Connection name	Remote hostname	Connection status
Grid 1 - Grid 2	10.96.130.76	Connected

3. To see basic information for all tenant accounts on this grid that have the **Use grid federation connection** permission, select the **Permitted tenants** tab.

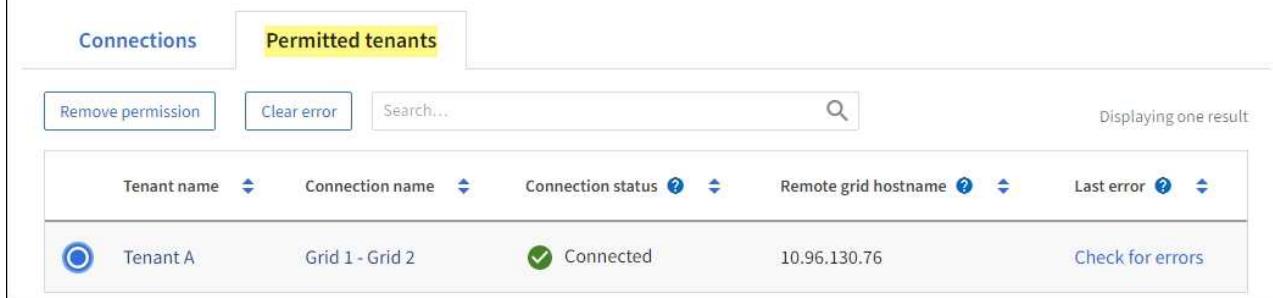
From this tab, you can:

- [View the details page for each permitted tenant](#).
- View the details page for each connection. See [View a specific connection](#).
- Select a permitted tenant and [remove the permission](#).
- Check for cross-grid replication errors and clear the last error, if any. See [Troubleshoot grid federation errors](#).

Grid federation

[Learn more about grid federation](#)

You can use grid federation to clone tenant accounts and replicate their objects between two StorageGRID systems. Grid federation uses a trusted and secure connection between Admin and Gateway Nodes in two discrete StorageGRID systems.



Tenant name	Connection name	Connection status	Remote grid hostname	Last error
Tenant A	Grid 1 - Grid 2	Connected	10.96.130.76	Check for errors

View a specific connection

You can view details for a specific grid federation connection.

Steps

1. Select either tab from the Grid federation page and then select the connection name from the table.

From the details page for the connection, you can:

- See basic status information about the connection, including the local and remote hostnames, port, and connection status.
- Select a connection to [edit, test, or remove](#).

2. When viewing a specific connection, select the **Permitted tenants** tab to view details about the permitted tenants for the connection.

From this tab, you can:

- [View the details page for each permitted tenant](#).
- [Remove a tenant's permission](#) to use the connection.
- Check for cross-grid replication errors and clear the last error. See [Troubleshoot grid federation errors](#).

Grid 1 - Grid 2

Local hostname (this grid): 10.96.130.64
Port: 23000
Remote hostname (other grid): 10.96.130.76
Connection status:  Connected

[Edit](#) [Download file](#) [Test connection](#) [Remove](#)

Permitted tenants

Certificates

[Remove permission](#)

[Clear error](#)

Search...



Displaying one result.

Tenant name 

Last error 



Tenant A

[Check for errors](#)

3. When viewing a specific connection, select the **Certificates** tab to view the system-generated server and client certificates for this connection.

From this tab, you can:

- [Rotate connection certificates](#).
- Select **Server** or **Client** to view or download the associated certificate or copy the certificate PEM.

Grid A-Grid B

Local hostname (this grid): 10.96.106.230
Port: 23000
Remote hostname (other grid): 10.96.104.230
Connection status:  Connected

[Edit](#) [Download file](#) [Test connection](#) [Remove](#)

[Permitted tenants](#)

Certificates

[Rotate certificates](#)

[Server](#) [Client](#)

[Download certificate](#)

[Copy certificate PEM](#)

Metadata

Subject DN: /C=US/ST=California/L=Sunnyvale/O=NetApp Inc./OU=NetApp StorageGRID/CN=10.96.106.230
Serial number: 30:81:B8:DD:AE:B2:86:0A
Issuer DN: /C=US/ST=California/L=Sunnyvale/O=NetApp Inc./OU=NetApp StorageGRID/CN=GPT
Issued on: 2022-10-04T02:21:18.000Z
Expires on: 2024-10-03T19:05:13.000Z
SHA-1 fingerprint: 92:7A:03:AF:6D:1C:94:8C:33:24:08:84:F9:2B:01:23:7D:BE:F2:DF
SHA-256 fingerprint: 54:97:3E:77:EB:D3:6A:0F:8F:EE:72:83:D0:39:86:02:32:A5:60:9D:6F:C0:A2:3C:76:DA:3F:4D:FF:64:5D:60
Alternative names: IP Address:10.96.106.230

Certificate PEM

```
-----BEGIN CERTIFICATE-----  
MIIGdTCCBF2gAwIBAgIIMIG3a6yhgowDQYJKoZIhvvcNAQENBQAwdzELMAkGA1UE  
BhMCVVMxExARBgNVBAgICkNhbG1mb3JuaWExEjAQBgNVBAcMCVN1bm55dmFsZTEU  
NBTG115CwIwV00fV4vA7eANVBAsMEh1dEFcRA74g9Wd1R11
```

Review cross-grid replication metrics

You can use the Cross-Grid Replication dashboard in Grafana to view Prometheus metrics about cross-grid replication operations on your grid.

Steps

1. From the Grid Manager, select **SUPPORT > Tools > Metrics**.



The tools available on the Metrics page are intended for use by technical support. Some features and menu items within these tools are intentionally non-functional and are subject to change. See the list of [commonly used Prometheus metrics](#).

2. In the Grafana section of the page, select **Cross Grid Replication**.

For detailed instructions, see [Review support metrics](#).

3. To retry replication of objects that failed to replicate, see [Identify and retry failed replication operations](#).

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