



# **Information you should monitor regularly**

StorageGRID 11.7

NetApp  
April 10, 2024

# Table of Contents

- Information you should monitor regularly . . . . . 1
  - What and when to monitor . . . . . 1
  - Monitor system health . . . . . 1
  - Monitor storage capacity . . . . . 6
  - Monitor information lifecycle management. . . . . 14
  - Monitor networking and system resources. . . . . 16
  - Monitor tenant activity . . . . . 19
  - Monitor load balancing operations . . . . . 23
  - Monitor grid federation connections. . . . . 25
  - Apply hotfixes or upgrade software if necessary . . . . . 29
  - Monitor archival capacity . . . . . 29

# Information you should 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
<a href="#">System health status</a>	Daily
Rate at which <a href="#">Storage Node object and metadata capacity</a> is being consumed	Weekly
<a href="#">Information lifecycle management operations</a>	Weekly
<a href="#">Networking and system resources</a>	Weekly
<a href="#">Tenant activity</a>	Weekly
<a href="#">Load balancing operations</a>	After the initial configuration and after any configuration changes
<a href="#">Grid federation connections</a>	Weekly
<a href="#">Availability of software hotfixes and software upgrades</a>	Monthly
<a href="#">Capacity of the external archival storage system</a>	Weekly

## Monitor system health

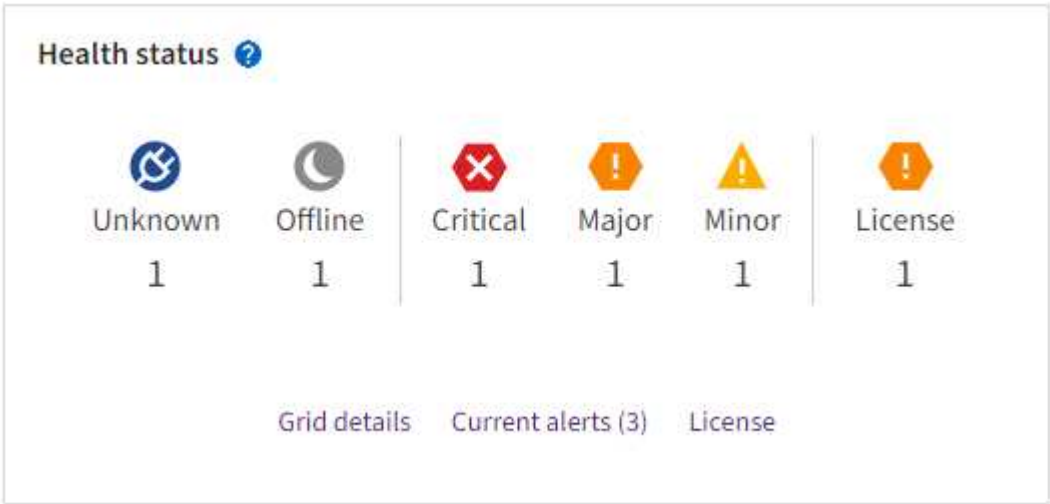
Monitor the overall health of your StorageGRID system on a daily basis.

### About this task

The StorageGRID system can continue to operate when parts of the grid are unavailable. Potential issues indicated by alerts or alarms (legacy system) 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 <a href="#">currently active</a> .
Recently resolved alerts	Alerts triggered in the past week <a href="#">are now resolved</a> .
License	There is an issue with the software license for this StorageGRID system. You can <a href="#">update license information as needed</a> .

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><b>Not connected - Unknown</b></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 <b>Unable to communicate with node</b> alert might also be triggered. Other alerts might also be active.</p>	<p>Requires immediate attention. <a href="#">Select each alert</a> 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><b>Note:</b> A node might appear as Unknown during managed shutdown operations. You can ignore the Unknown state in these cases.</p>
	<p><b>Not connected - Administratively down</b></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, <a href="#">select each alert</a> and follow the recommended actions.</p>
	<p><b>Connected</b></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 for StorageGRID 11.7](#)



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.
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> <b>Critical:</b> 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> <b>Major:</b> 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> <b>Minor:</b> 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><b>Current alerts:</b> 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><b>Resolved alerts:</b> 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 <b>All alerts</b> 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.

Column header	Description
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 <b>Low object data storage</b> alert include the percentage of disk space used, the total amount of disk space, and the amount of disk space used.</p> <p><b>Note:</b> If multiple current alerts are grouped, current values aren't shown in the title row.</p>
Triggered values (resolved alerts only)	<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 <b>Low object data storage</b> alert include the percentage of disk space used, the total amount of disk space, and the amount of disk space used.</p>

## 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:

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

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

- b. 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

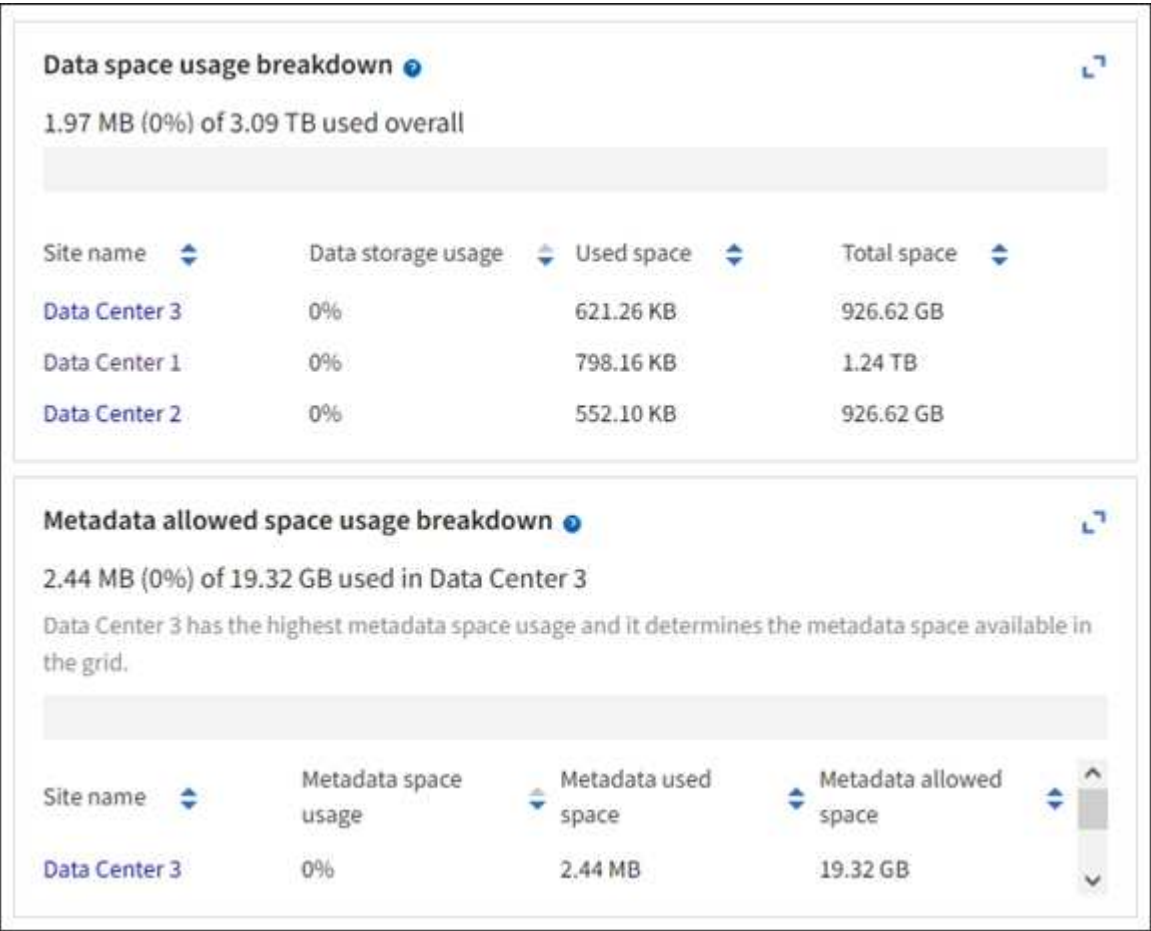


each data center. The Nodes page provides more detailed values for object data and object metadata.

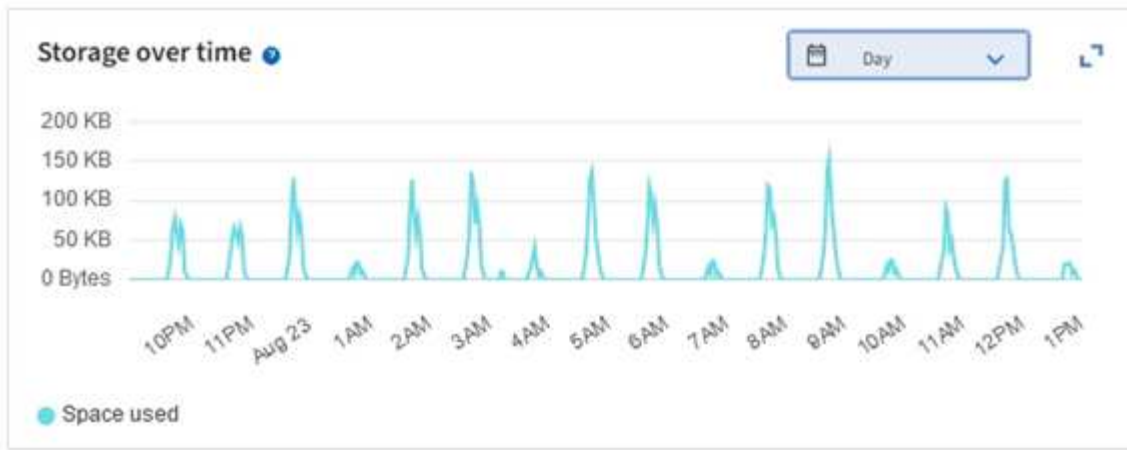
Steps

- 1. Assess how much storage is available for the entire grid and for each data center.
  - a. Select **Dashboard > Overview**.
  - b. 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.

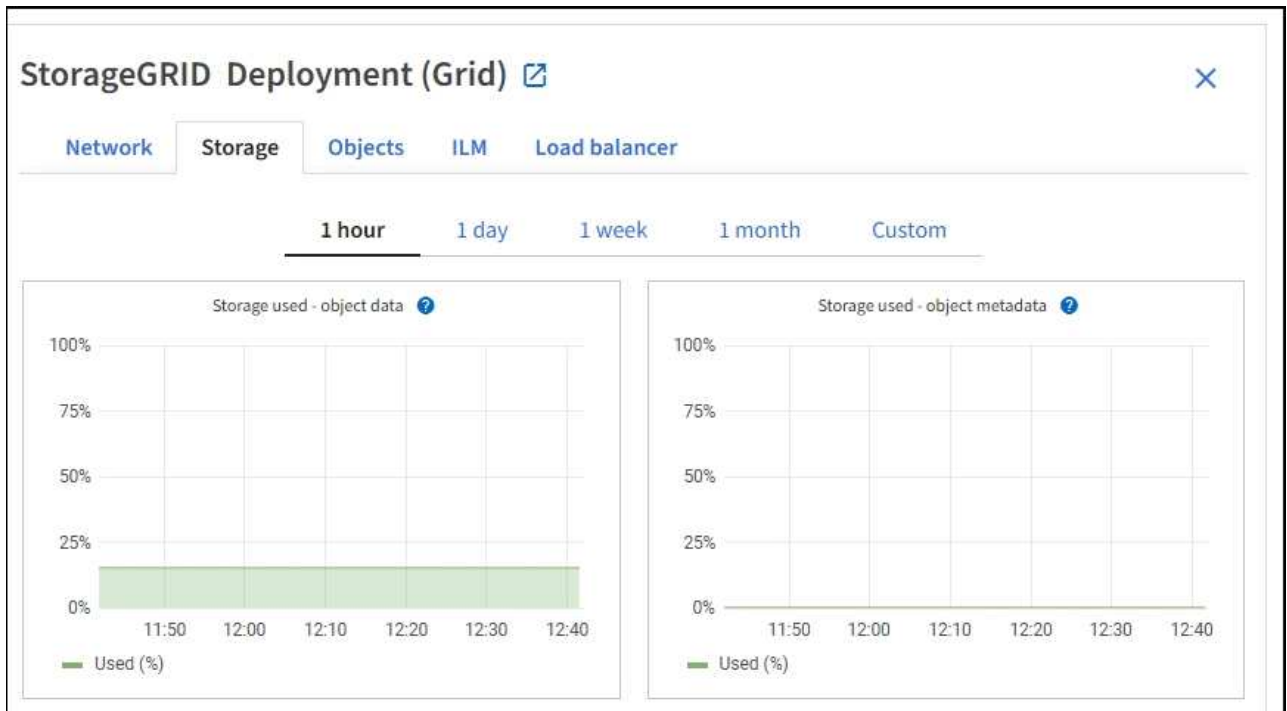
 The summary does not include archival media.



- 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.
  - a. Select **NODES**.
  - b. 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.

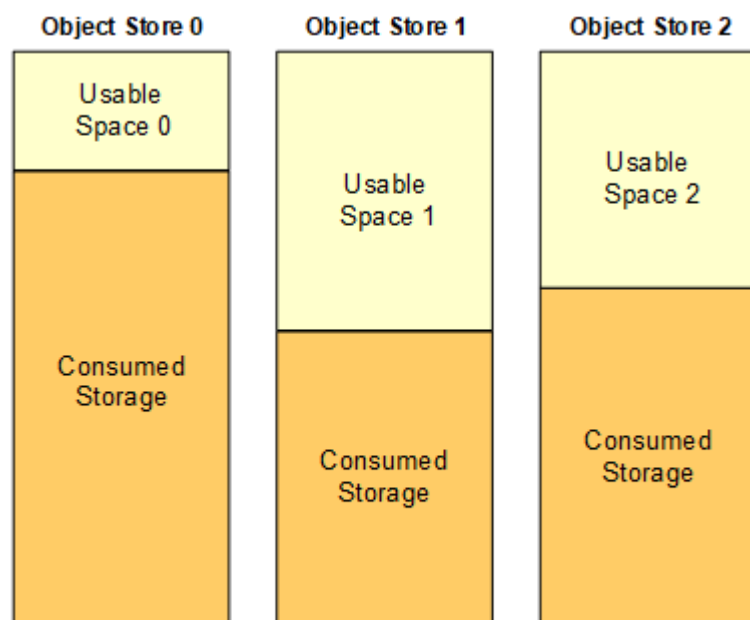
For more information about planning a storage expansion, see the [instructions for expanding StorageGRID](#).

## 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.



$$\text{Total Usable Space} = \text{Usable Space 0} + \text{Usable Space 1} + \text{Usable Space 2}$$

### Steps

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

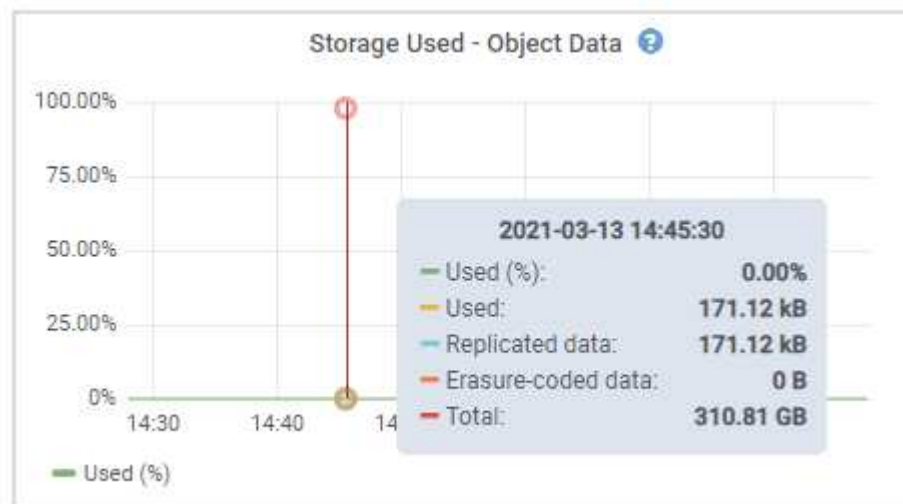
The graphs and tables for the node appear.

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

- Monitor the values over time to estimate the rate at which usable storage space is being consumed.
- 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

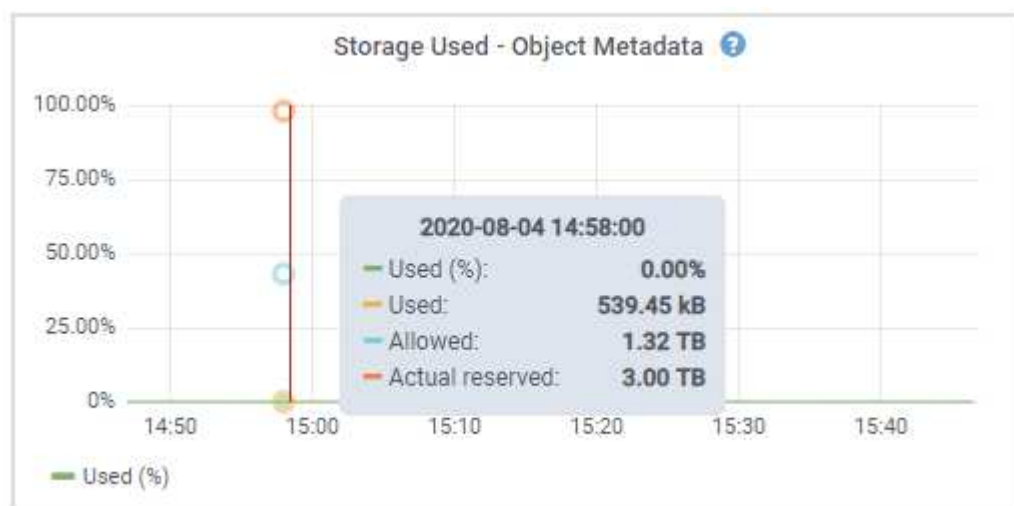
StorageGRID maintains three copies of object metadata at each site to provide redundancy and to protect object metadata from loss. The three copies are evenly distributed across all Storage Nodes at each site using the space reserved for metadata on storage volume 0 of each Storage Node.

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

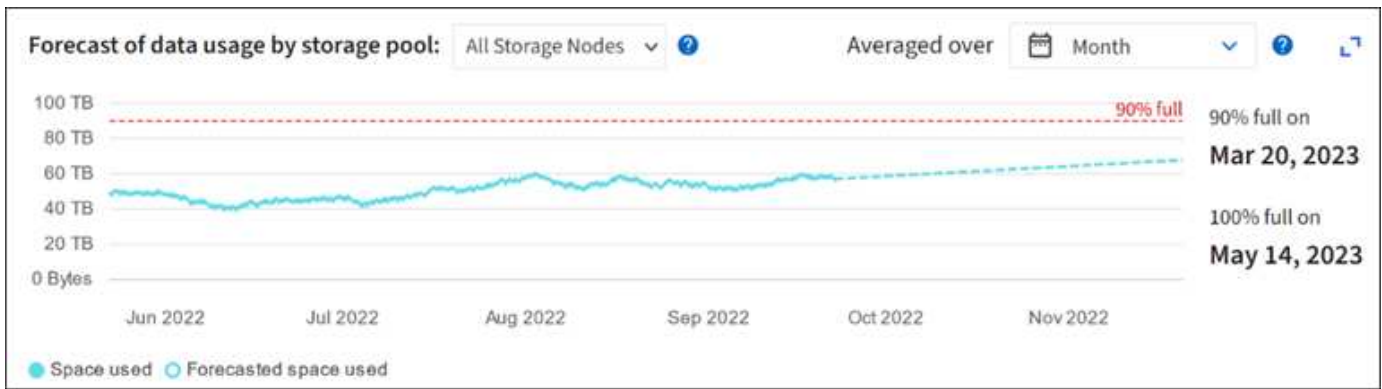
Monitor space usage forecasts for user data and metadata to estimate when you will need to [expand your grid](#).

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 required.

### About this task

The StorageGRID system manages objects by applying the active ILM policy. The ILM policy 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.

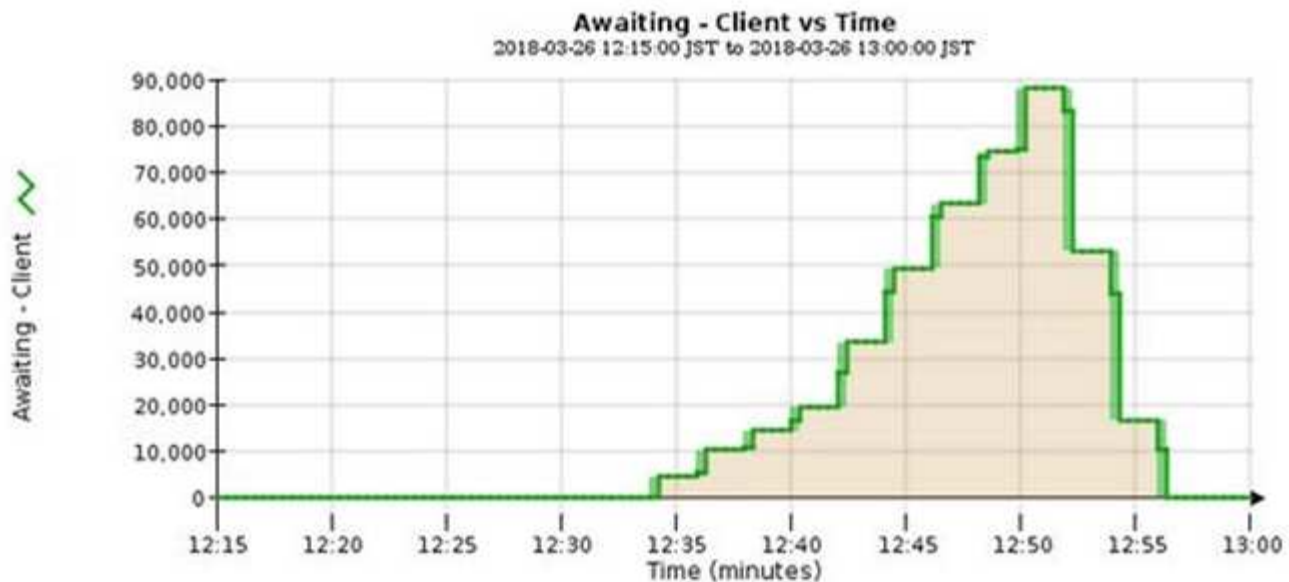
Object ingest and other object-related activities can exceed the rate at which StorageGRID can evaluate ILM, causing the system to queue objects whose ILM placement instructions can't be fulfilled in near real time. You can monitor whether StorageGRID is keeping up with client actions by charting the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

To chart this attribute:

1. Sign in to the Grid Manager.
2. From the dashboard, locate the **Awaiting - Client** entry on the Information Lifecycle Management (ILM) tab.
3. Click the chart icon .

The example chart shows a situation where the number of objects awaiting ILM evaluation temporarily increased in an unsustainable manner, then eventually decreased. Such a trend indicates that ILM was temporarily not fulfilled in near real time.





Temporary spikes in the chart of Awaiting - Client are to be expected. But if the value shown on the chart continues to increase and never declines, the grid requires more resources to operate efficiently: either more Storage Nodes, or, if the ILM policy places objects in remote locations, more network bandwidth.

You can further investigate ILM queues using the **NODES** page.

### Steps

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.

Network interfaces					
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.

<div><div>+ Create</div><div>Edit</div><div>✕ Remove</div><div>Metrics</div></div>			
	Name	Description	ID
<input 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-7665bddc894b
Displaying 2 traffic classification policies.			

- 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**.
- 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](#)

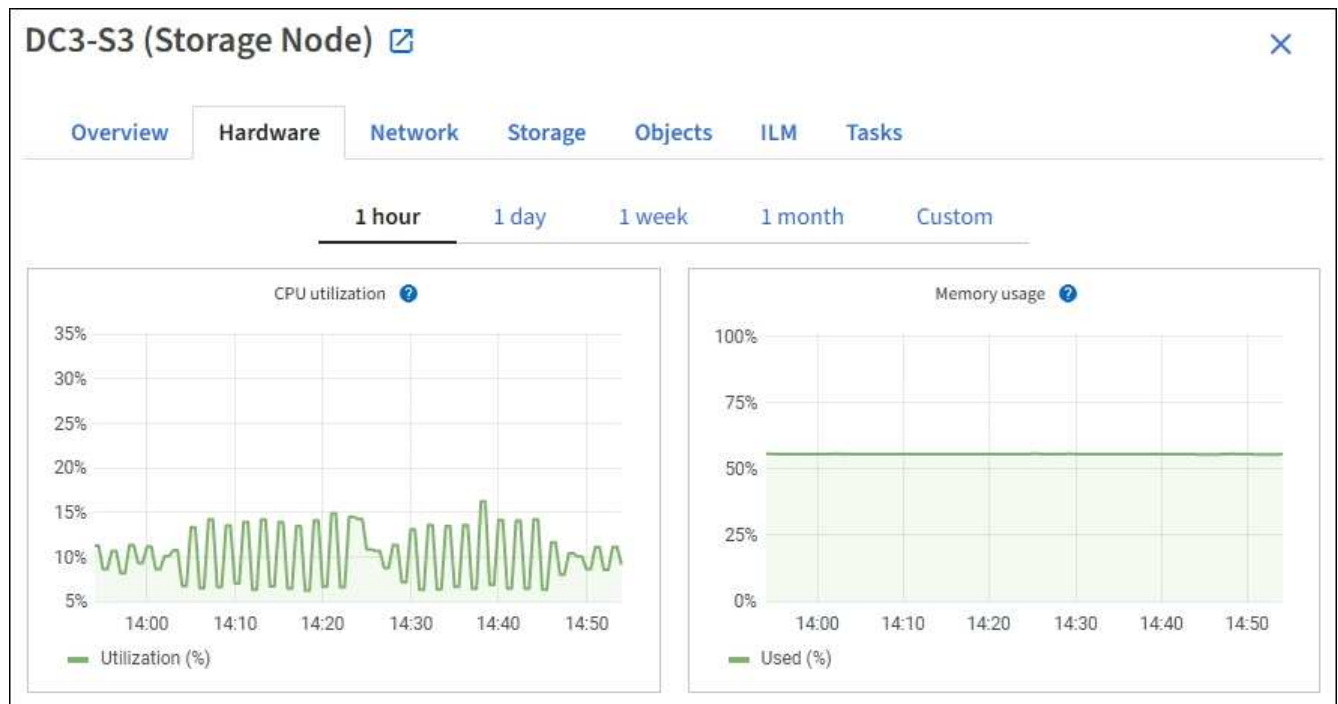
[Monitor node connection states](#)

### 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

- From the **NODES** page, select the node.
- 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 and Swift 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 utilization, Quota, and Object count are listed for each tenant. If a quota is not set for a tenant, the Quota utilization 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 ▾	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 ?	
<input type="checkbox"/>	Tenant 01	2.00 GB	<div><div></div></div> 10%	20.00 GB	100	<a href="#">→</a> <a href="#">📄</a>	
<input type="checkbox"/>	Tenant 02	85.00 GB	<div><div></div></div> 85%	100.00 GB	500	<a href="#">→</a> <a href="#">📄</a>	
<input type="checkbox"/>	Tenant 03	500.00 TB	<div><div></div></div> 50%	1.00 PB	10,000	<a href="#">→</a> <a href="#">📄</a>	
<input type="checkbox"/>	Tenant 04	475.00 TB	<div><div></div></div> 95%	500.00 TB	50,000	<a href="#">→</a> <a href="#">📄</a>	
<input type="checkbox"/>	Tenant 05	5.00 GB	—	—	500	<a href="#">→</a> <a href="#">📄</a>	

- Optionally, sign in to a tenant account by selecting the sign-in link [→](#) in the **Sign in/Copy URL** column.
- Optionally, copy the URL for a tenant's sign-in page by selecting the copy URL link [📄](#) in the **Sign in/Copy URL** column.
- 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	1100000000	500	S3
03521145586975586321	Tenant 03	60500000000	50	150000	10000	S3
44251365987569885632	Tenant 04	4750000000	95	140000000	50000	S3
36521587546689565123	Tenant 05	5000000000	Infinity		500	S3

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

- 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.

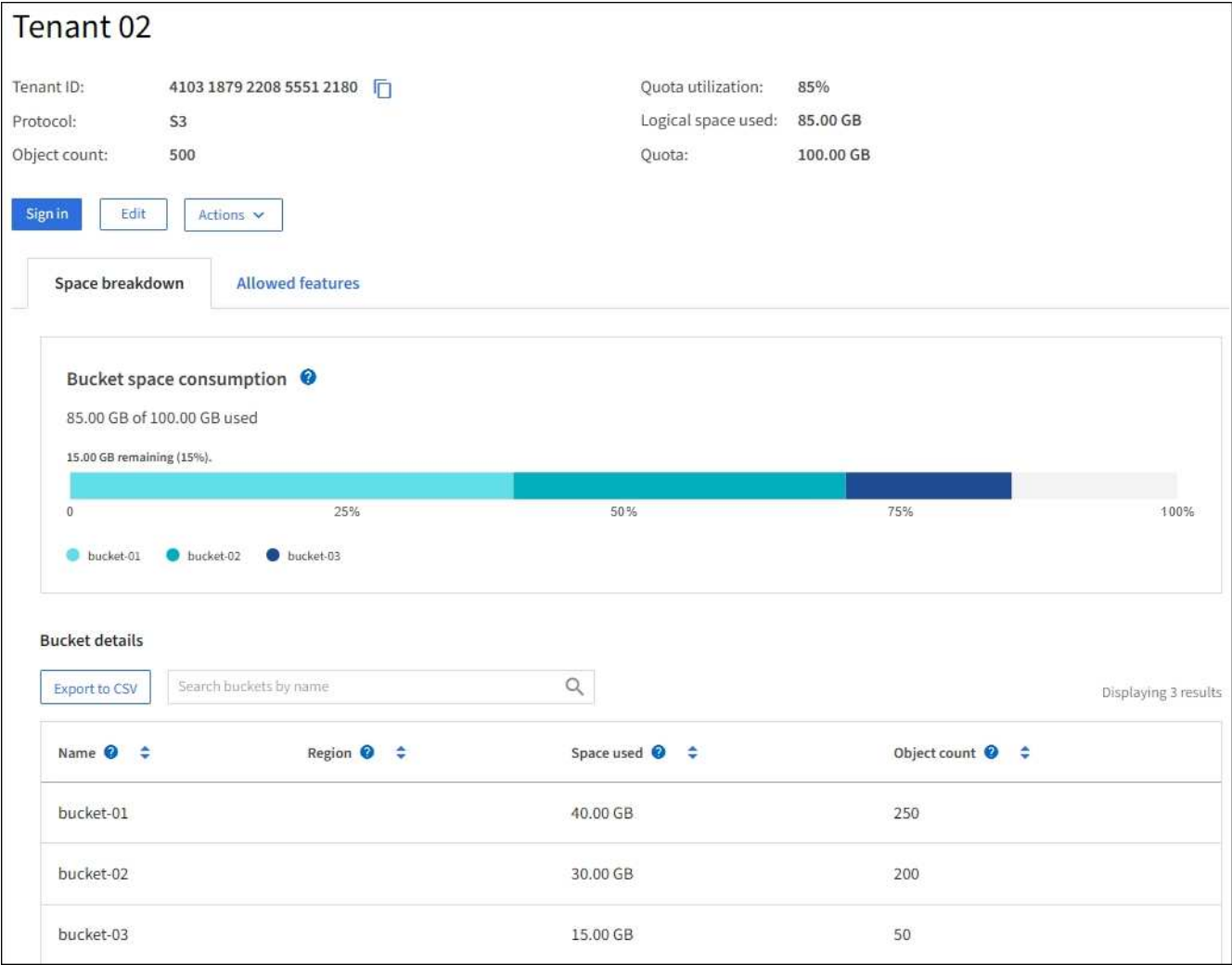
# View a specific tenant

You can view details for a specific tenant.

## Steps

- 1. Select the tenant name from the Tenants page.

The tenant details page appears.



- 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 utilization, logical space used, and quota setting.

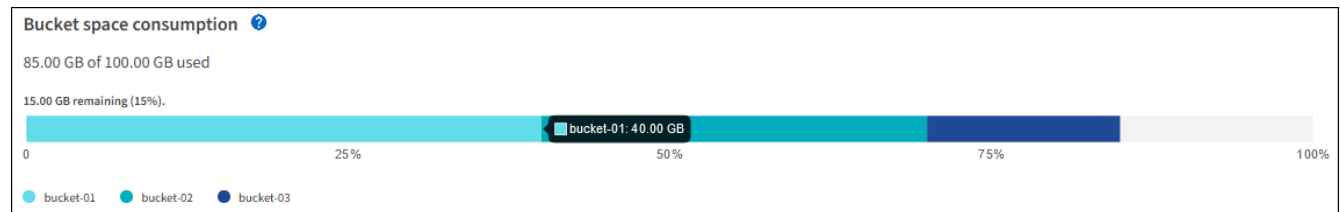
- 3. From the **Space breakdown** tab, review the **Space consumption** chart.

This chart shows the total space consumption for all of the tenant's S3 buckets (or Swift containers).

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 utilization 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 utilization is recalculated. Quota utilization calculations can take 10 minutes or longer.



A tenant's quota utilization indicates the total amount of object data the tenant has uploaded to StorageGRID (logical size). The quota utilization 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 (or Swift containers) 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 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 and Swift client connections](#).

### Steps

1. If S3 or Swift 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

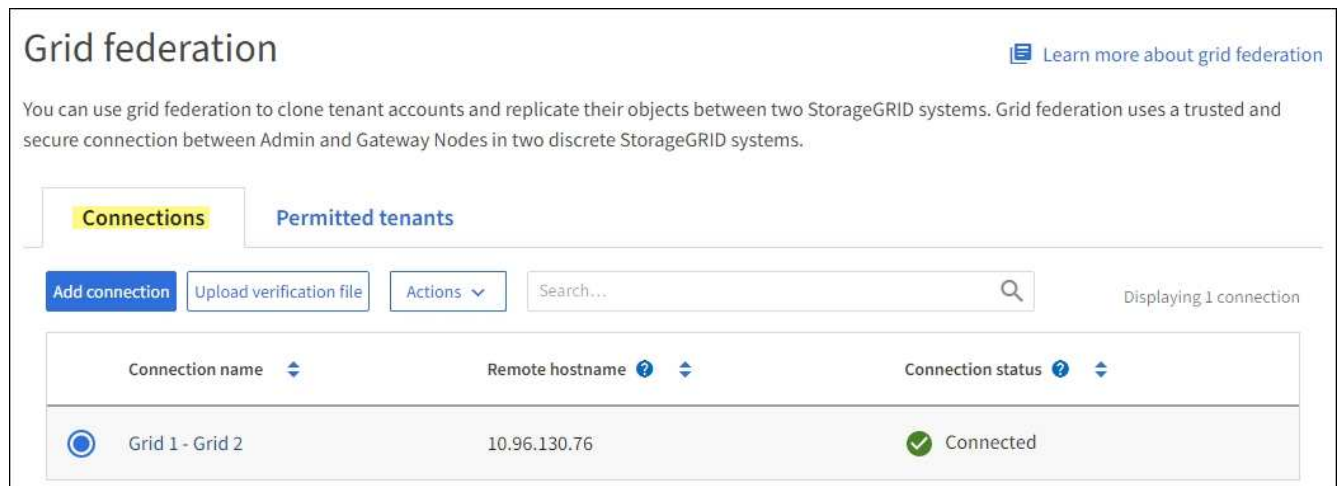
1. Select **CONFIGURATION > System > Grid federation**.

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](#).



The screenshot shows the 'Grid federation' page with the 'Connections' tab selected. The page includes a header with a 'Learn more about grid federation' link, a description of grid federation, and two tabs: 'Connections' (active) and 'Permitted tenants'. Below the tabs are buttons for 'Add connection', 'Upload verification file', and an 'Actions' dropdown. A search bar and 'Displaying 1 connection' text are also present. A table lists the connections with columns for 'Connection name', 'Remote hostname', and 'Connection status'. One connection is shown: 'Grid 1 - Grid 2' with remote hostname '10.96.130.76' and status 'Connected'.

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.

Connections

Permitted tenants



Remove permission

Clear error

Search...

Q

Displaying one result

Tenant name	Connection name	Connection status	Remote grid hostname	Last error
 Tenant A	Grid 1 - Grid 2	 Connected	10.96.130.76	<a href="#">Check for errors</a>

## 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...

Q

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

Remove

## Certificates

### Rotate certificates

Client

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-----  
MIIGdTCBFB2GwIBAgIHIIHIG43a6yhgOWDQYJKoZIhvcNAQENBQAwZDZELMAKGAIUE  
HBMCMVWmExEzARBGNVBAGMCKNhbG1bm3JuaWExEQAQ8GNVBACMCVNB1bm55dmF3ZTEU  
AHTCCT1hY2VudG9AZBAGNVBAsMEKElDEFB7CB7CG9uXWd1R111

## 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](#).

## Apply hotfixes or upgrade software if necessary

If a hotfix or a new version of StorageGRID software is available, you should assess whether the update is appropriate for your system, and install it if required.

### About this task

StorageGRID hotfixes contain software changes that are made available outside of a feature or patch release. The same changes are included in a future release.

### Steps

1. Go to [NetApp Downloads: StorageGRID](#).
2. Select the down arrow for the **Type/Select Version** field to see a list of the updates that are available to download:
  - **StorageGRID software versions:** 11.x.y
  - **StorageGRID hotfixes:** 11.x.y.z
3. Review the changes that are included in the update:
  - a. Select the version from the menu, and select **Go**.
  - b. Sign in using the username and password for your NetApp account.
  - c. Read and accept the End User License Agreement.

The downloads page for the version you selected appears.

4. Learn about the changes included in the software version or hotfix.
  - For a new software version, see [What's new](#) for the version you selected.
  - For a hotfix, download the README file for a summary of the changes included in the hotfix.
5. If you decide a software update is required, locate the instructions before proceeding.
  - For a new software version, carefully follow the instructions for [upgrading software](#).
  - For a hotfix, see the [StorageGRID hotfix procedure](#).

## Monitor archival capacity

You can't directly monitor an external archival storage system's capacity through the StorageGRID system. However, you can monitor whether the Archive Node can still send object data to the archival destination, which might indicate that an expansion of archival media is required.

### About this task

You can monitor the Store component to check if the Archive Node can still send object data to the targeted archival storage system. The Store Failures (ARVF) alarm might also indicate that the targeted archival storage system has reached capacity and can no longer accept object data.

### Steps

1. Select **SUPPORT > Tools > Grid topology**.

2. Select **Archive Node > ARC> Overview> Main**.
3. Check the Store State and Store Status attributes to confirm that the Store component is Online with No Errors.


Overview

Alarms

Reports

Configuration





















Main



Overview: ARC (DC1-ARC1-98-165) - ARC

Updated: 2015-09-15 15:59:21 PDT

---

ARC State:	Online	 
ARC Status:	No Errors	 
Tivoli Storage Manager State:	Online	 
Tivoli Storage Manager Status:	No Errors	 
Store State:	Online	 
Store Status:	No Errors	 
Retrieve State:	Online	 
Retrieve Status:	No Errors	 
Inbound Replication Status:	No Errors	 
Outbound Replication Status:	No Errors	 

An offline Store component or one with errors might indicate that targeted archival storage system can no longer accept object data because it has reached capacity.



## Copyright information

Copyright © 2024 NetApp, Inc. All Rights Reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system—without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP “AS IS” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

LIMITED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (b)(3) of the Rights in Technical Data -Noncommercial Items at DFARS 252.227-7013 (FEB 2014) and FAR 52.227-19 (DEC 2007).

Data contained herein pertains to a commercial product and/or commercial service (as defined in FAR 2.101) and is proprietary to NetApp, Inc. All NetApp technical data and computer software provided under this Agreement is commercial in nature and developed solely at private expense. The U.S. Government has a non-exclusive, non-transferrable, nonsublicensable, worldwide, limited irrevocable license to use the Data only in connection with and in support of the U.S. Government contract under which the Data was delivered. Except as provided herein, the Data may not be used, disclosed, reproduced, modified, performed, or displayed without the prior written approval of NetApp, Inc. United States Government license rights for the Department of Defense are limited to those rights identified in DFARS clause 252.227-7015(b) (FEB 2014).

## Trademark information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.